MATERIAL DATA SHEET

STEEL GRADE

Last revised: Thu, 30 Jan 2025 10:41:55 GMT

OVAKO

40SiCrMnMo7-6-6* All

General Information

A medium carbon steel for quench and tempering steel with high hardenability. Ovako 477L has high tensile strength in combination with high toughness, and it is often used for large axles and machine parts. By using air– or gas-quenching it is possible to reduce the amount of quenching distortion. Additionally the use of quenching medias such as oil and salt may be avoided, which improves both safety and environment. The sulphur content is in a low and narrow range for consistent machinability.

Suitable for nitriding

Suitable for induction or flame hardening

Through hardenability corresponding to a bar with approx 60mm diameter (cooling in still air)

Provides low distortion

Weldable under certain conditions

** 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 %
477L	IC	CEV 1.15_{max}	Min	0.38	1.65	1.40	-	0.012	1.50	-	0.43
		Pcm 0.7_{max}	Max	0.42	1.80	1.55	0.020	0.020	1.60	0.30	0.47

Transformation temperatures

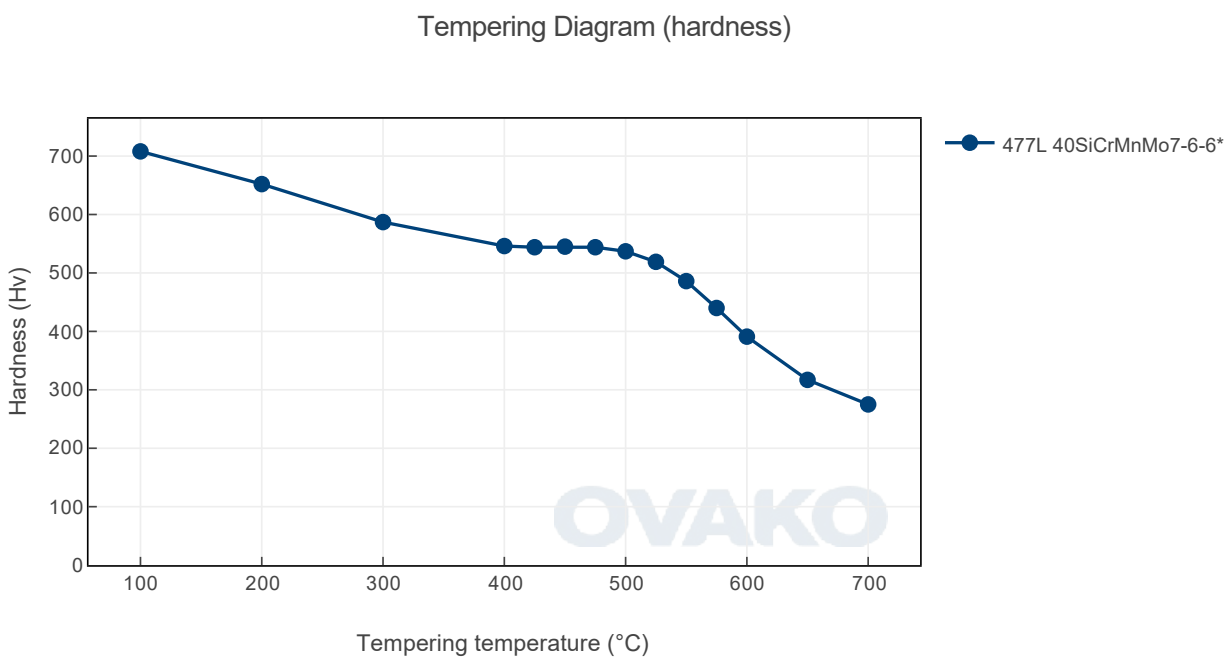
	Temperature °C
AC1	721
AC3	792

Heat treatment recommendations

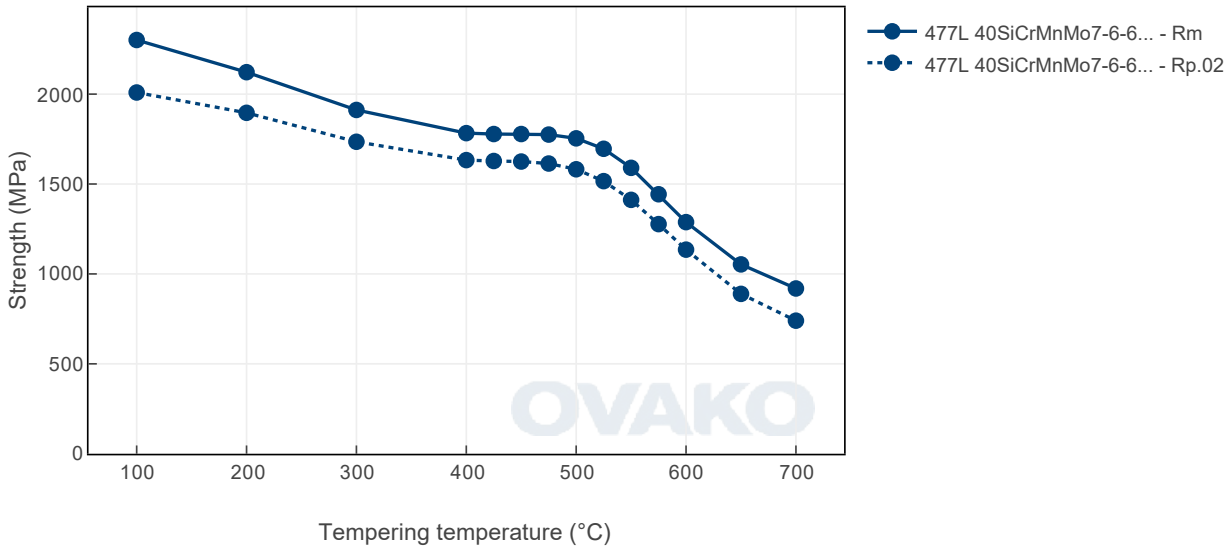
Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+AR	850-1150°C	
Normalizing	+N	900-950°C	In air
Soft annealing	+A	775°C/4h	Slow cooling, 10°C/h down to 650°C 200HB
Hardening	+Q	900-950°C	In air,gas or oil
Tempering	+QT	160-700°C See tempering diagram	

Heat Treatment Guide generated Graphs

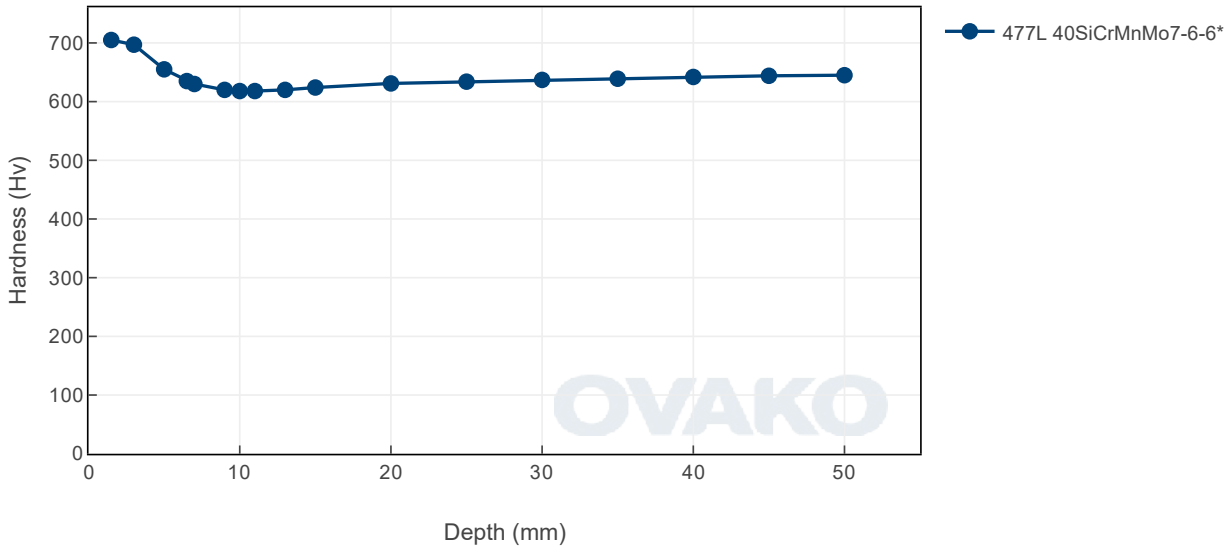
The following graphs are generated from a theoretical model. For further info see the Heat treatment guide module. Select a specific grade version for individual display.



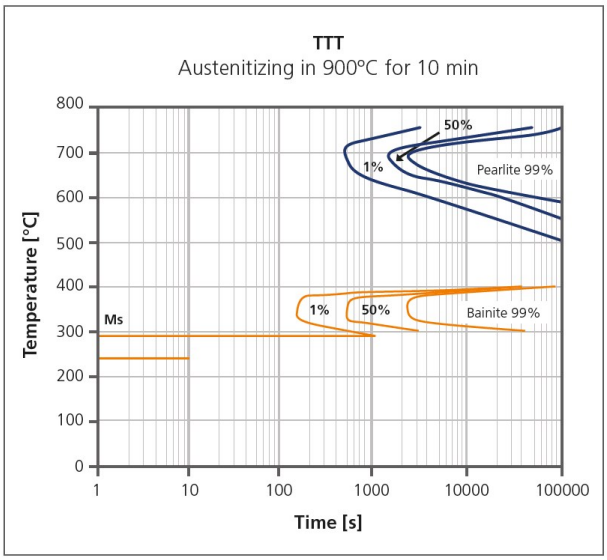
Tempering Diagram (strength)

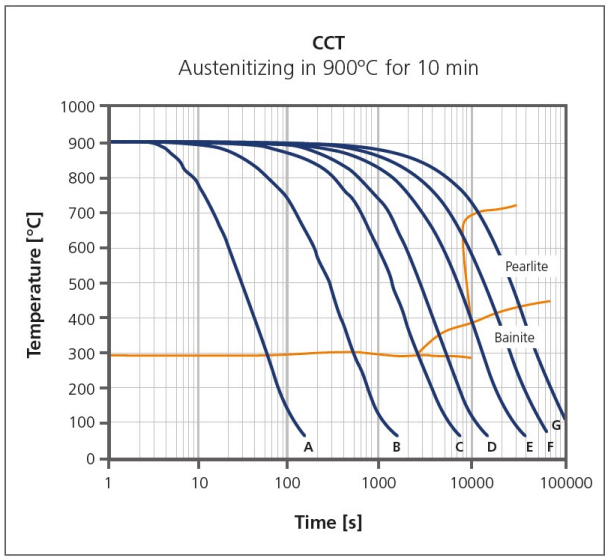


Jominy


Hardness (Hv)
700
600
500
400
300
200
100
0
0
10
20
30
40
50
Depth (mm)
477L 40SiCrMnMo7-6-6*
OVAKO

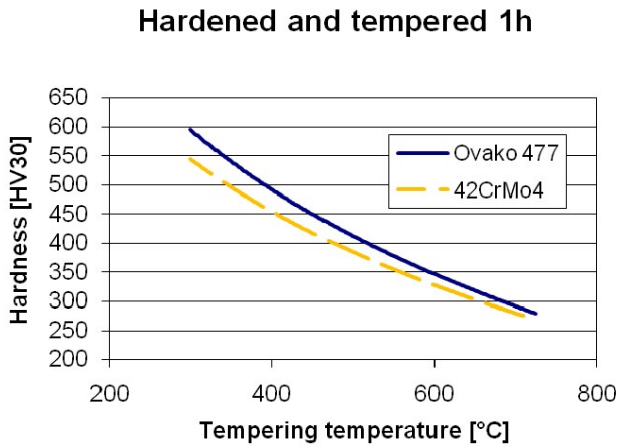
TTT CCT - Ovako 477L





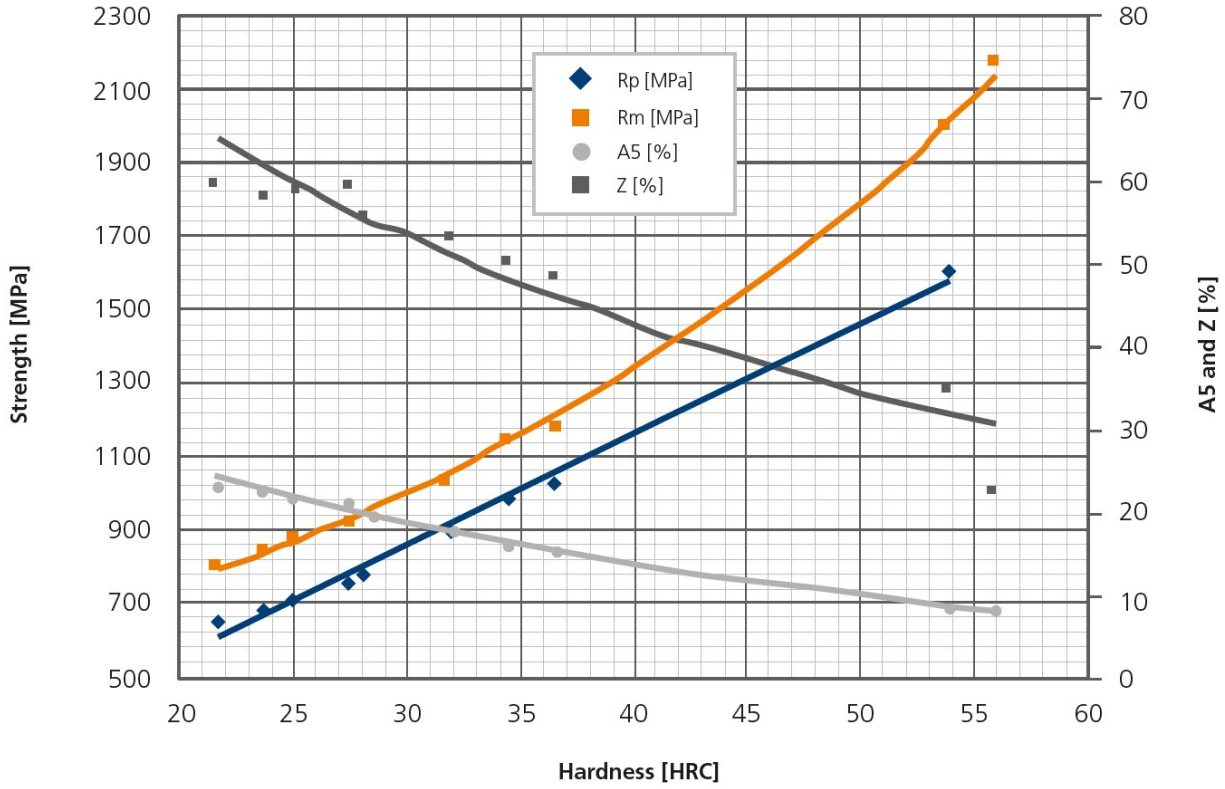
	A	B	C	D	E	F	G
t_{8-5} [s]:	20	200	1000	2000	5000	10000	20000
Hv_{30}:	670	627	609	550	434	401	278

Tempering response - Ovako 477L



Tempering response for Ovako 477 compared to 42CrMo4. Austenitized at 900°C for 30min and hardened in air. Tempered one hour at each tested temperature level.

Mechanical Properties - Ovako 477L



Mechanical properties for Ovako477L from tensile tests performed at different hardness of the material.

Steel cleanliness

Micro inclusions - steel grade Ovako 477L								
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 - 477L	
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)
477L	Round bar	+AR	686	287
477L	Round bar	+T	691	290
477L	Tube,wall	+AR	715	318
477L	Tube,wall	+T	718	320

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/