MATERIAL DATA SHEET

STEEL GRADE

Last revised: Thu, 30 Jan 2025 11:18:09 GMT

OVAKO

51CrV4 All

General Information

51CrV4 is a high strength quench and tempering steel suitable for quenched and tempered springs. What Ovako offer includes a number of variants with tight chemical composition, suitable for different applications and material thicknesses. They all meet the overall requirements set by EN10089.

Variant SB4292 is a strong variant with hardenability in the upper part of the +HH band and low content of non-metallic inclusions.

Variant SB4290 has somewhat lower hardenability, but is still strong.

Variant SB4282 has medium hardenability and is a good start for applications with normal requirements.

Variant SB4212 which has a good surface hardness, but it will not through harden for thicker dimensions. It is instead a good pick for thin sections.

Variants Ovako 593B and 593Q are also mainly used for springs, but frequently used for shafts and machine components.

Ovako 593Q is an IQ (isotropic quality) variant.

Similar designations

1.8159, 735A51, SS2230, SB4292 - 52CrMn5-4, SB4290 - 52CrMn5-4, SB4282 - 52CrMn4-4, SB4212-50CrMn4-4, AISI 6150

Chemical composition

Variant	Cast	Di	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	V %	Ti %	Cu %	Al %
7408	CC	6.09	CEV 0.93_{max}	Min	0.47	0.20	0.70	-	-	0.95	-	-	0.100	-	-	-
			Pcm 0.65_{max}	Max	0.55	0.30	1.10	0.025	0.025	1.20	0.30	0.06	0.250	0.040	0.25	0.050

Mechanical Properties

Variant	Condition	Format	Dimension [mm]	Yield strength min [MPa]	Tensile strength [MPa]	Elongation A_5 [%]	Reduction of area Z_{min} [%]	Hardness
7408	+AR	Round bar	25 < 160	-	-	-	-	< 420 HB
	+A	Round bar	25 < 160	-	-	-	-	< 248 HB
	+QT	Round bar	25 < 100	700	900-1100	15	50	-

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

Impact tests in +QT normally performed on U-notched samples.

The reference treatment for 51CrV4 EN10089:2002 is quench from 850 °C followed by tempering at 450 °C

Transformation temperatures

	Temperature °C
MS	273
AC1	738
AC3	778

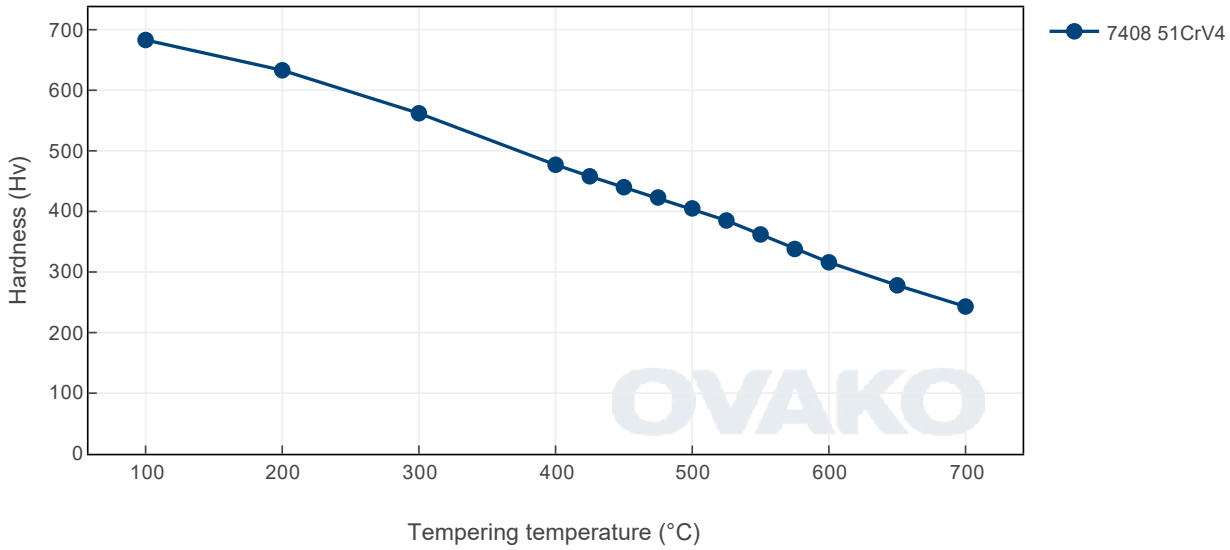
Heat treatment recommendations

Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+AR	Soaking 800-1100ºC	In still air
Normalizing	+N	Soaking at 840-880ºC	In still air
Soft annealing	+A	Soaking at 730-750ºC for 2 hrs	20ºC/h to 650ºC and then in still air
Stress relieve annealing	+SRA	Soaking at 550-650ºC	In still air
Hardening	+QO	Soaking at 830-860ºC	Quenching in oil
Tempering	+QT	Tempering 380-680ºC for 1 h	In air

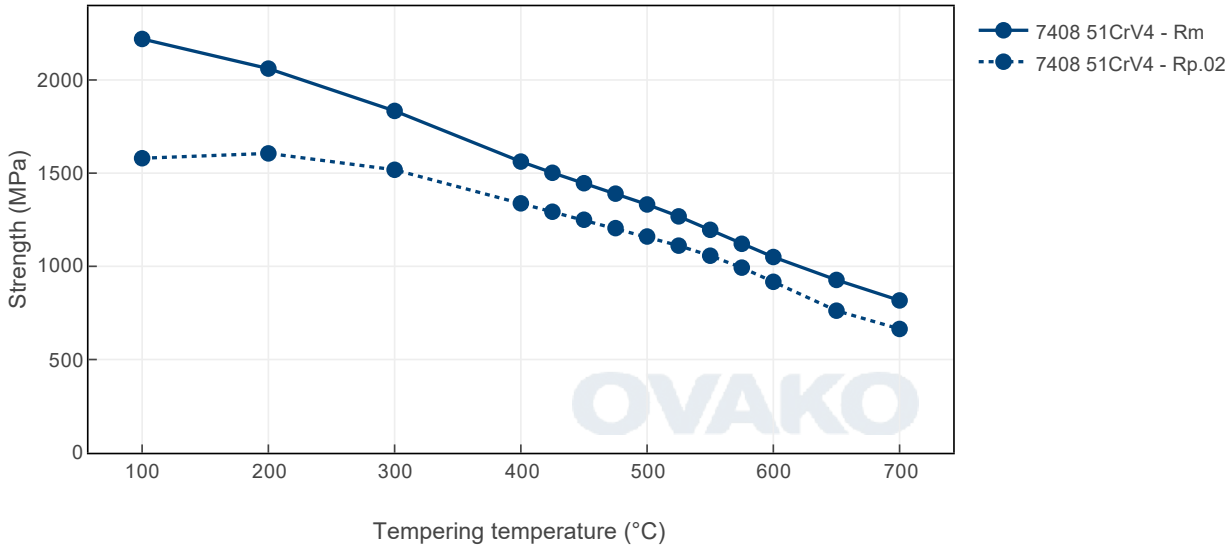
Heat Treatment Guide generated Graphs

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.

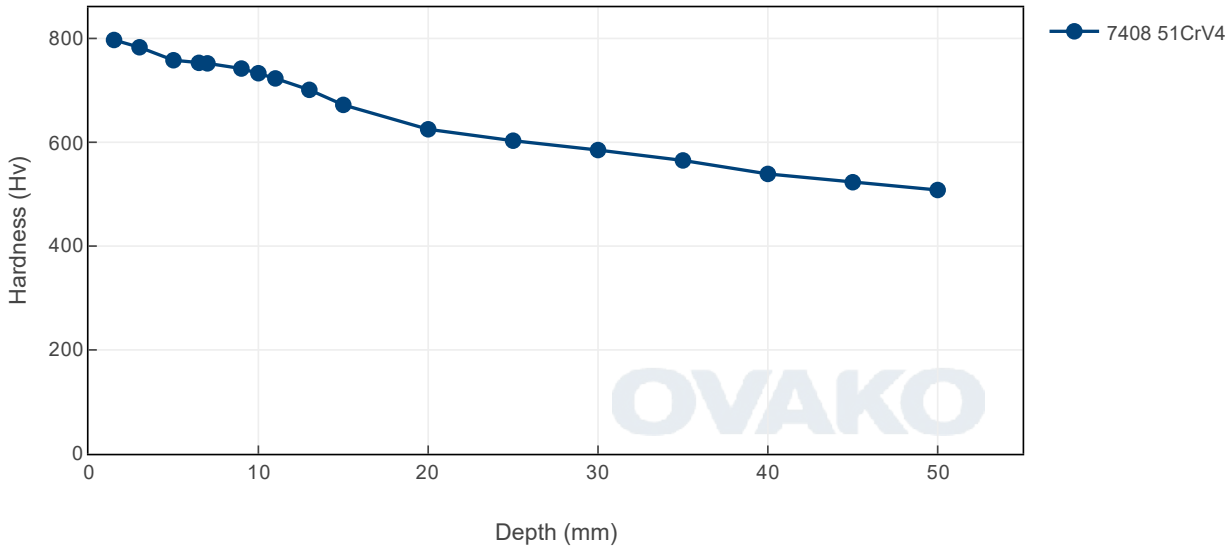
Tempering Diagram (hardness)



Tempering Diagram (strength)



Jominy

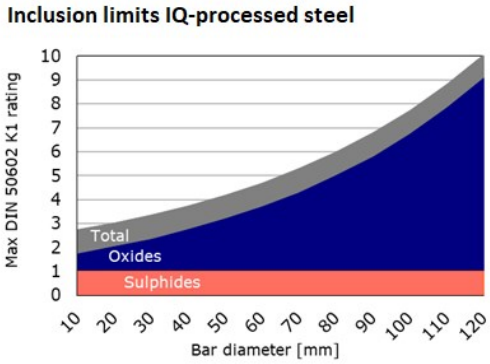

Hardness (Hv)
800
600
400
200
0
0
10
20
30
40
50
Depth (mm)
7408 51CrV4
OVAKO

Steel cleanliness

Micro inclusions - 593B										Macro inclusions - 593B	
Applied standard	ASTM 45									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	1.5	0.5	0	0	1.0	0.5			

Micro inclusions - IQ - 593Q		Macro inclusions - IQ - 593Q		
Applied standard	DIN 50602 K1	Applied standard	ISO 3763 (Blue fracture)	10 M Hz UST (Ovako internal procedure)
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	< 1mm /dm^2	<5 defects /dm^3 > 0.2 mm FBH

IQ



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)
593	Round bar	+AR	602	209
593	Round bar	+N	615	214
593	Tube,wall	+AR	628	228
593	Tube,wall	+N	630	228
SB9292	Flat bar	+AR	440	206
SB9290	Flat bar	+AR	446	212
SB9212	Flat bar	+AR	419	182
7408	Round bar	+AR	607	271

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/