MATERIAL DATA SHEET

STEEL GRADE

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OVAKO

C45 All

General Information

C45 is a medium carbon steel for e.g. mechanical engineering and automotive components.

Variant SB8673 / SB-C45 is a variant with a narrowed chemical composition in order to reach a high hardenability and it is fine grain treated with Al

Variant SB1672 is a standard variant of C45 with medium Carbon for all purpose use

Variant 5081 is a M-treated variant wich is offered under the name Imatra 4M

Variant 5155 is similar to 5081 but is a non M-steel with lower Sulphur content

Variant 047A is an ingot cast variant. High hardness and high strength can be achieved after hardening thanks to the relatively high carbon content. The steel is suitable for various type of applications where high strength is needed.

M-Steel®

The basis for the concept is that non-metallic inclusions are modified and controlled with calcium treatment in a way to minimize tool wear and to maximize chip control in machining operations. Our M-Steel treatment can be applied to any steel grade.

Similar designations

C43, C44, C45R - 1.1201, C45E - 1.1191, Ck45, St70-2, SAE 1045, 080A42, SS 1672, XC 48, C 45, S 45 C, GOST 45, AISI/SAE/ASTM 1045, 1.0503

Chemical composition

Variant	Cast	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	V %	Ti %	Cu %	Al %	DI %
SB8673	CC	CEV 0.71_{max}	Min	0.46	0.15	0.70	-	0.020	0.25	0.10	-	-	-	-	0.020	1.70
		Pcm 0.55_{max}	Max	0.49	0.35	0.80	0.020	0.035	0.30	0.20	-	-	-	0.25	0.040	2.00
SB1672	CC	CEV 0.72_{max}	Min	0.42	0.10	0.50	-	0.020	-	-	-	-	-	-	-	1.10
		Pcm 0.55_{max}	Max	0.50	0.40	0.90	0.045	0.045	0.40	0.40	0.10	-	-	-	-	1.80
5081	CC	CEV 0.72_{max}	Min	0.42	0.10	0.50	-	0.020	-	-	-	-	-	-	-	1.10
		Pcm 0.55_{max}	Max	0.50	0.40	0.90	0.030	0.035	0.40	0.40	0.10	-	-	-	-	1.80
5155	CC	CEV 0.72_{max}	Min	0.44	0.10	0.50	-	-	-	-	-	-	-	-	-	1.10
		Pcm 0.55_{max}	Max	0.49	0.40	0.80	0.030	0.025	0.40	0.40	0.10	-	-	-	-	1.80
047A	IC	CEV 0.76_{max}	Min	0.46	0.15	0.50	-	0.020	-	-	-	-	-	-	0.015	-
		Pcm 0.6_{max}	Max	0.50	0.40	0.80	0.030	0.030	0.25	0.25	0.10	0.100	0.005	0.25	0.030	-
C45 EN ISO 683-1	Std	CEV $_{max}$	Min	0.42	0.10	0.50	-	-	-	-	-	-	-	-	-	-
		Pcm $_{max}$	Max	0.50	0.40	0.80	0.045	0.045	0.40	0.40	0.10	-	-	0.30	-	-

The Di-value is in inches.

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) $strength_{min}$
SB1672			< 16	320**	590-740	14	-	165-220 HB	-
			16 < 40	310**	590-740	14	-	165-220 HB	-
			40 < 63	300**	590-740	14	-	165-220 HB	-
			63 < 120	280**	590-740	14	-	165-220 HB	-
5081	+AR	Round bar	20 < 160	-	-	-	-	< 230 HB	-
	+QT	Round bar	20 < 40	430**	650-800	16	40	190-240 HB	20 °C 25 J (long)
		Round bar	40 < 100	370**	630-780	17	45	185-235 HB	20 °C 25 J (long)
5155	+AR	Round bar	25 < 180	-	-	-	-	< 230 HB	-
	+QT	Round bar	25 < 40	430**	650-800	16	40	190-240 HB	20 °C 25 J (long)
		Round bar	40 < 100	370**	630-780	17	45	185-235 HB	20 °C 25 J (long)
047A	+U	Tube,wall	10 < 36	320	650 typical	16	-	200 HB typical	-
		Tube,wall	36 < 60	300	630 typical	16	-	200 HB typical	-
		Tube,wall	> 60	280	600 typical	16	-	200 HB typical	-
		Round bar	10 < 36	320	650 typical	16	-	200 HB typical	-
		Round bar	36 < 60	300	630 typical	16	-	200 HB typical	-
		Round bar	< 60	280	600 typical	16	-	200 HB typical	-
	+N	Tube,wall	< 10	320	660 typical	16	-	190 HB typical	-
		Tube,wall	10 < 50	300	630 typical	16	-	190 HB typical	-
		Tube,wall	< 50	280	600 typical	16	-	190 HB typical	-
		Round bar	< 10	320	660 typical	16	-	190 HB typical	-
		Round bar	10 < 50	300	630 typical	16	-	190 HB typical	-
		Round bar	< 50	280	600 typical	16	-	190 HB typical	-
	+QT	Tube,wall	10 < 40	370	690-770	14	-	210-240 HB	-
		Round bar	10 < 40	370	690-770	14	-	210-240 HB	-

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

Transformation temperatures

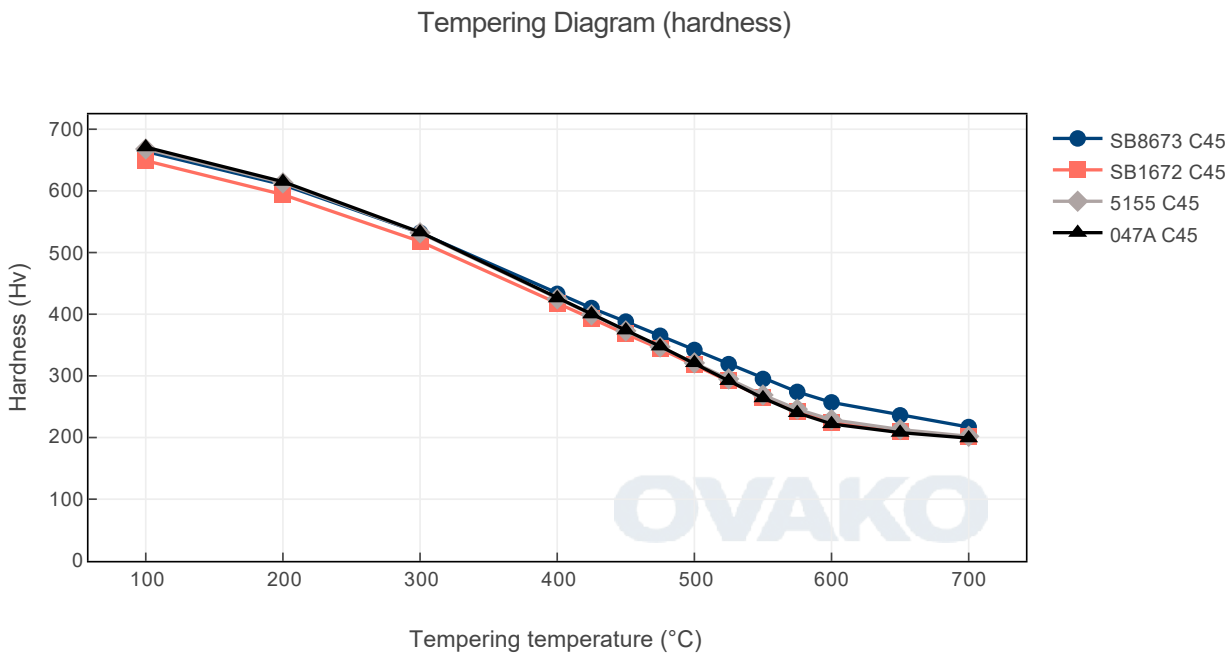
	Temperature °C
MS	305
AC1	725
AC3	760

Heat treatment recommendations

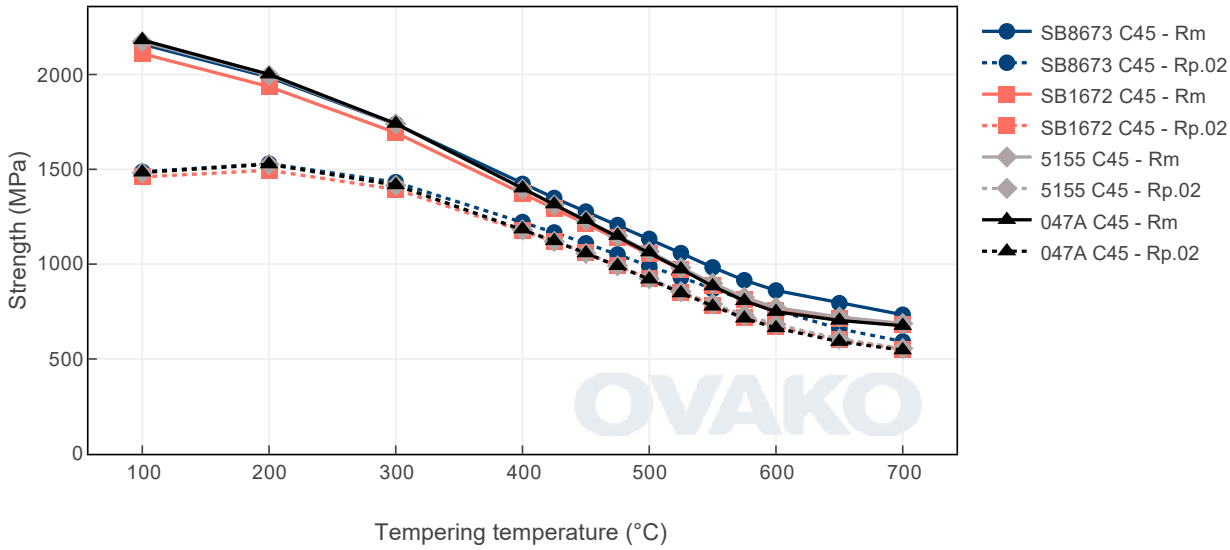
Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+U	800-1150°C	In still air
Normalizing	+N	840-870°C	In still air
Soft annealing	+SA	650-700°C	In still air
Stress relieve annealing	+SRA	550-650°C	In still air
Quench & Tempering	+QT	840-870°C	In oil Temper immediately
Quench & Tempering	+QT	820-850°C	In water Temper immediately
Induction or Flame hardening	I-F	870-900°C	In oil Temper immediately

Heat Treatment Guide generated Graphs

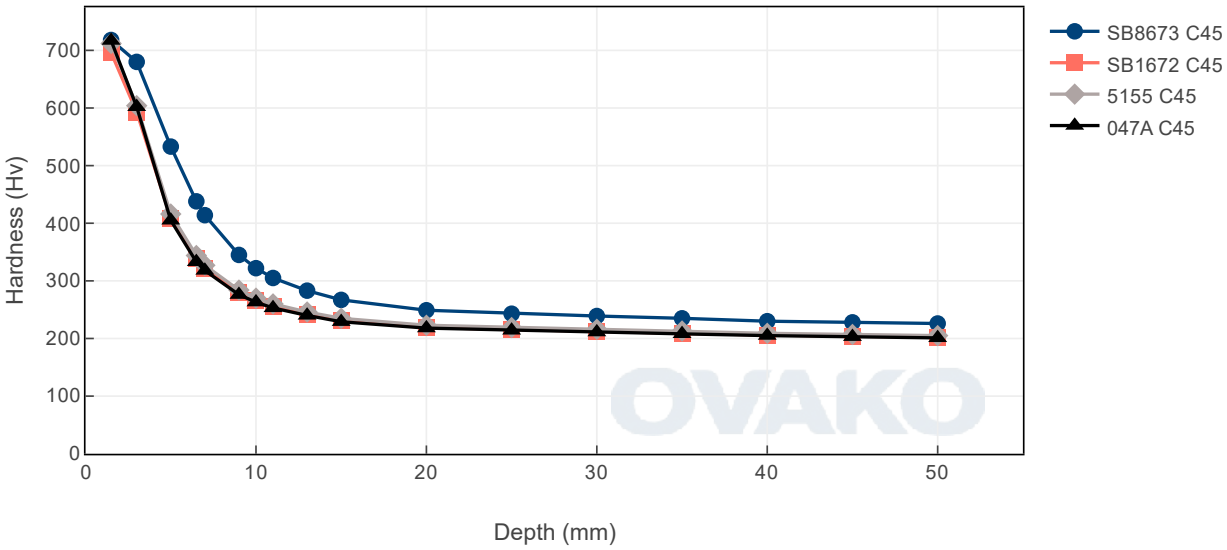
The following graphs are generated from a theoretical model. For further info see the Heat treatment guide module. Select a specific grade version for individual display.



Tempering Diagram (strength)



Jominy


Hardness (Hv)
700
600
500
400
300
200
100
0
0
10
20
30
40
50
Depth (mm)
SB8673 C45
SB1672 C45
5155 C45
047A C45
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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)
047A	Round bar	+AR	573
047A	Round bar	+N	579
047A	Tube,wall	+AR	593
047A	Tube,wall	+N	601
SB1672	Flat bar	+AR	392
SB8673	Flat bar	+A	398
5081, Imatra 4 M	Round bar	+AR	782
5155	Round bar	+AR	786

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/