Material data sheet
Steel grade

Last revised: Fri, 16 Jun 2023 14:05:22 GMT

OVAKO

100Cr6 All

General Information

100Cr6 is a through hardening bearing steels intended for rolling contact and other high fatigue applications. In the hardened condition the high hardness, high strength and high cleanliness provides the steel with the right properties to withstand high cycle, high stress fatigue. 100Cr6 is mainly used for small and medium sized bearing components. It is also regularly used for other machine components that require high tensile strength and high hardness. The hardenability approximately corresponds to a ring with max. 17 mm wall thickness.

This steel is delivered in a number of variants. The most common are listed below.

803Q - Isotropic properties and better fatigue strength due to higher cleanliness levels, and a finer size and distribution of non-metallic inclusions (IQ)

803Z - Improved cold forming properties due to the reduced silicon content (BQ)

803D - Improved machinability due to the higher sulphur content.

803P - With a reduced sulphur content to reduce the number of sulphide inclusions (BQ)
803A - With a reduced controlled sulphur content to reduce the number of sulphide inclusions but ensure consistent machinability (BQ)
803F - With a controlled sulphur content for consistent machining properties (BQ)
803N - Slightly increased carbon range to meet the requirements of some international standards (BQ)
803J - Standard (BQ)

5620 / 802F - A continuous cast variant of 100Cr6 (BQ)

IQ-Steel®
IQ-Steel® is an isotropic quality ultra clean steel optimized for high fatigue strength under multi axial loading.
BQ-Steel®
BQ-Steel® is a bearing quality clean steel optimized for fatigue strength and is also ideal for new design solutions outside the bearing industry.

Similar designations

SS 2258, SAE 52100, 1.3505 , 100 Cr 6 , SUJ2S, SUJ2Z, 100C6, GCr15, B00150

Chemical composition

Variant	Cast		C%	Si%	Mn%	P%	S%	Cr%	Ni%	Mo%
803A	IC	Min	0.93	0.15	0.25	-	0.003	1.35	-	-
		Max	0.98	0.35	0.45	0.025	0.008	1.60	0.25	0.10
803D	IC	Min	0.98	0.20	0.30	-	0.017	1.40	-	-
		Max	1.05	0.35	0.40	0.025	0.023	1.60	0.25	0.08
803F	IC	Min	0.95	0.20	0.30	-	0.005	1.40	-	-
		Max	1.00	0.35	0.40	0.020	0.015	1.60	0.20	0.08
803J	IC	Min	0.95	0.20	0.20	-	-	1.35	-	-
		Max	1.00	0.35	0.40	0.025	0.015	1.60	0.25	0.08
803N	IC	Min	0.98	0.20	0.25	-	0.005	1.35	-	-
		Max	1.05	0.30	0.40	0.025	0.015	1.60	0.25	0.08
803P	IC	Min	0.98	0.20	0.25	-	0.003	1.35	-	-
		Max	1.05	0.35	0.40	0.020	0.008	1.60	0.20	0.06
803Q	IC	Min	0.93	0.20	0.25	-	-	1.40	-	-
		Max	1.00	0.40	0.40	0.015	0.001	1.60	0.25	0.06
803Z	IC	Min	0.94	-	0.25	-	0.003	1.40	-	-
		Max	1.00	0.15	0.40	0.025	0.015	1.50	0.25	0.08
5620 / 802F	CC	Min	0.93	0.15	0.25	-	0.003	1.35	-	-
		Max	0.98	0.35	0.45	0.025	0.008	1.60	0.25	0.10
EN ISO 683-17	Std	Min	0.93	0.15	0.25	-	-	1.35	-	-
		Max	1.05	0.35	0.45	0.025	0.015	1.60	-	0.10

ISO 683-17 display the chemical composition according to the standard.

Mechanical Properties

Variant	Condition	Format	Dimension [mm]	Yield strength min [MPa]	Tensile strength [MPa]	Elongation A_5 [%]	Hardness
803A	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803D	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803F	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803J	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803N	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803P	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803Q	+SA	All formats	25 < 120	410	700 typical	27	210 HB typical
	+C	All formats	< 120	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
803Z	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical
5620 / 802F	+AR	Round bar	40 < 160	-	-	-	340-400 HB
	+AC	Round bar	25 < 150	-	-	-	< 220 HB
	+SA	All formats	24 < 190	410	700 typical	27	210 HB typical
	+C	All formats	24 < 190	740	930 typical	13	290 HB typical
	+Q/T(m)	All formats	-	1700	2300 typical	2	61 HRC typical
	+Q/T(b)	All formats	-	2000	2200 typical	7	59 HRC typical

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

Transformation temperatures

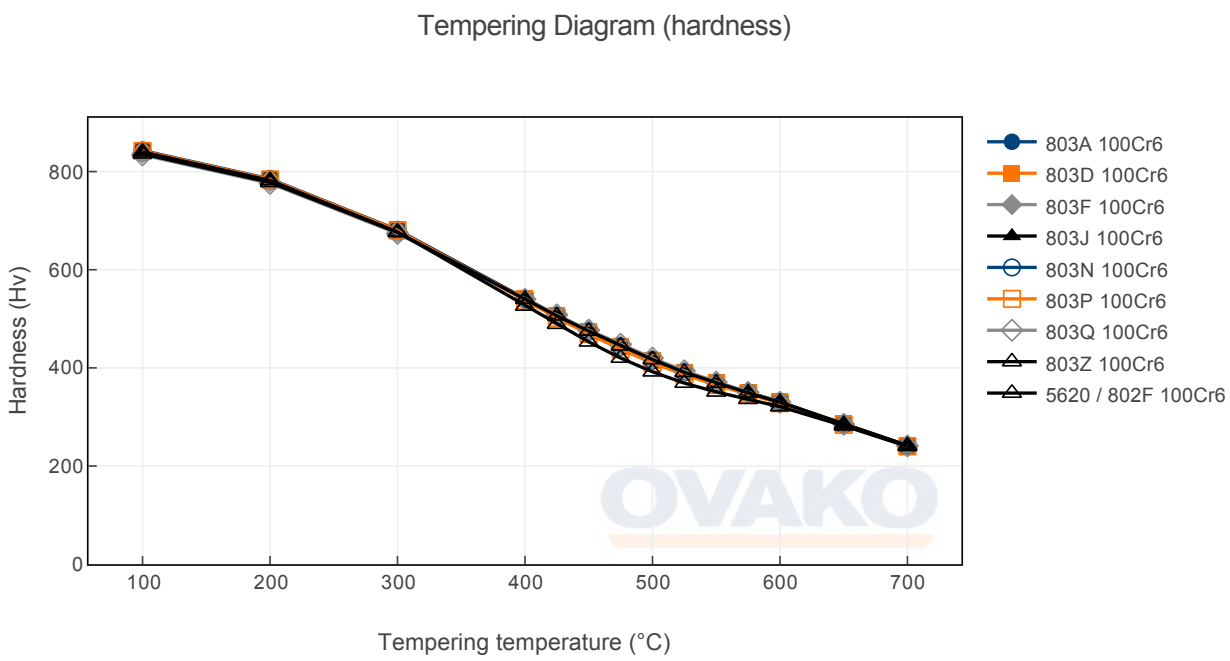
	Temperature °C
MS	218
AC1	745
AC3	910

Heat treatment recommendations

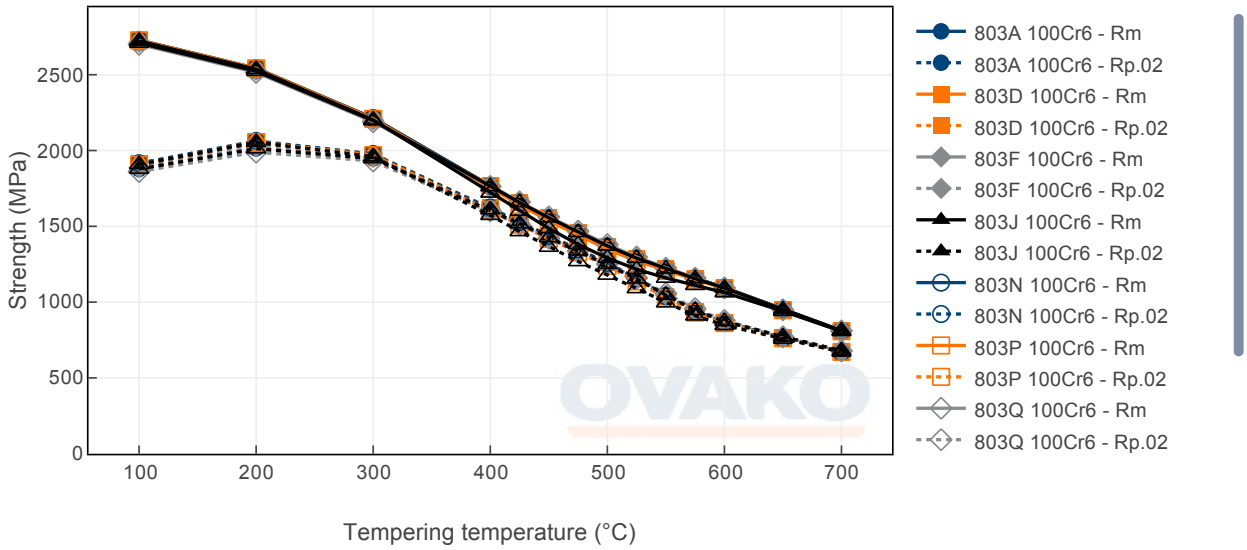
Treatment	Condition	Temperature cycle	Cooling/quenching
Hot forging	+AR	800-1100°C	Air cool.
Spheroidize annealing	+SA	RT-820°C 1h 820°C 2h 820-740°C 1h 740-690°C 10h	In air
Stress relieve annealing	+SRA	550-650°C 1h	In air
Q/T (martensite)	+Q/T(m)	830-870°C 10-60 min	Oil quench (+tempering within 2h at minimum 160°C. See diagram)
Q/T (bainite)	+Q/T(b)	850-875°C 10-60 min.	Salt bath 220-250°C 3-7h. See diagram
Tempering	+T	160-500°C. See diagram	In air

Heat Treatment Guide generated Graphs

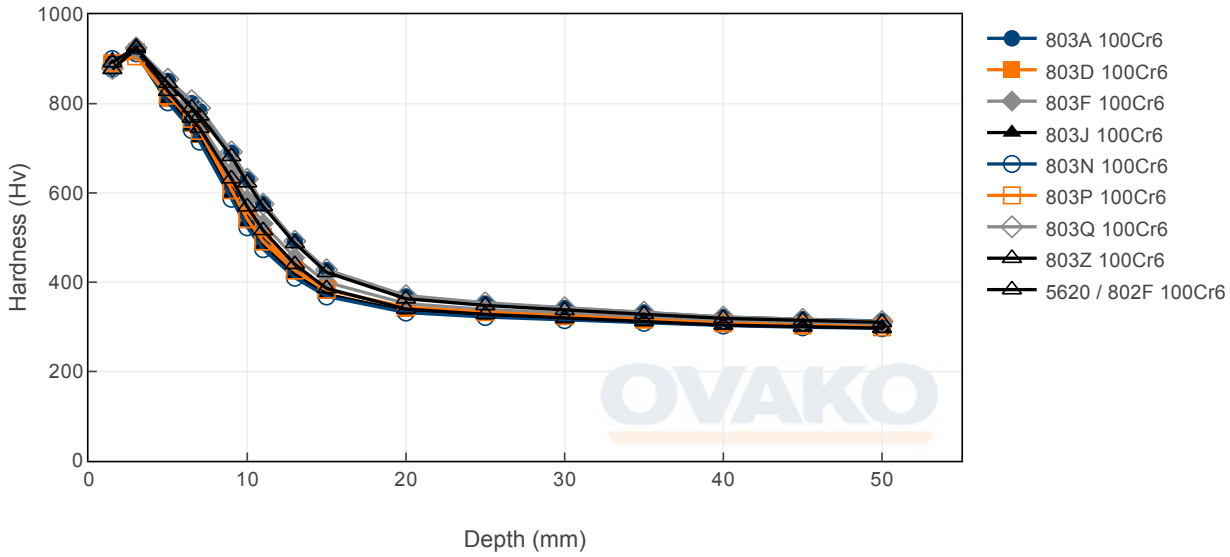
The following graphs are generated from a theoretical model. For further info see the Heat treatment guide module. Select a specific grade version for individual display.



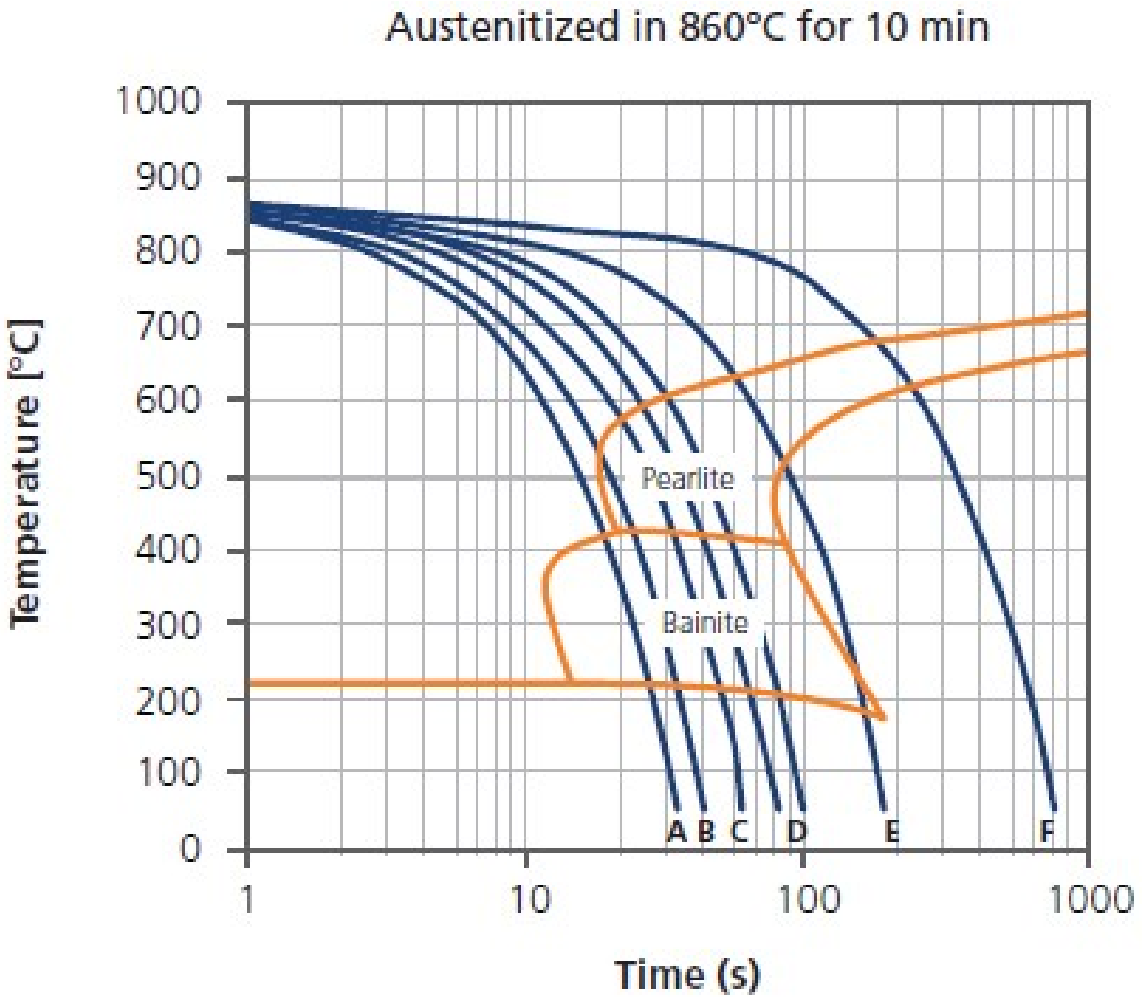
Tempering Diagram (strength)



Jominy


Hardness (Hv)
1000
800
600
400
200
0
0
10
20
30
40
50
Depth (mm)
803A 100Cr6
803D 100Cr6
803F 100Cr6
803J 100Cr6
803N 100Cr6
803P 100Cr6
803Q 100Cr6
803Z 100Cr6
5620 / 802F 100Cr6

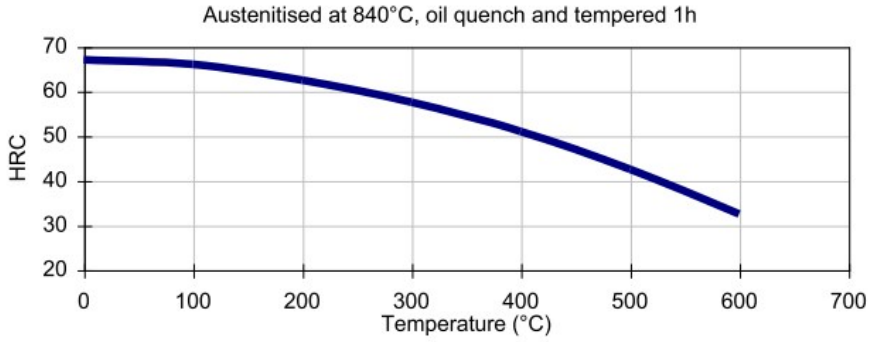
CCT



CCT data

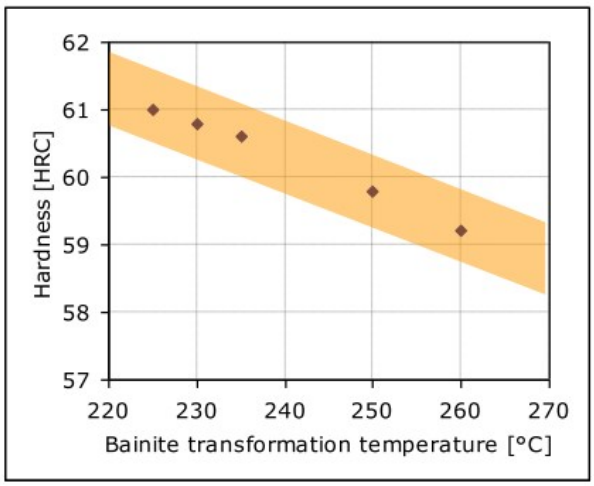
	A	B	C	D	E	F
t_{8-5} [s]	13	17	23	30	75	300
Hv_{30}	854	844	751	640	366	308

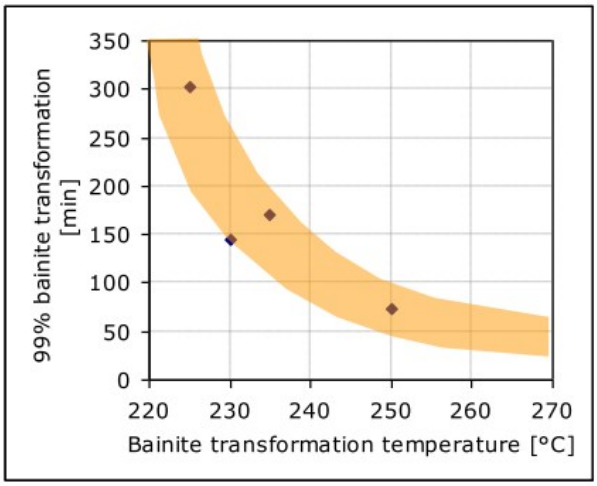
Tempering response



Tempering response after martensitic hardening

Bainite transformation





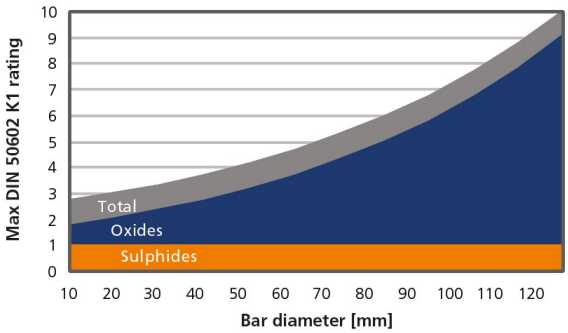
Steel cleanliness

Micro inclusions - IC								
Applied standard	ASTM E45							
Sampling	ASTM A295							
Maximum average limits	A		B		C		D	
	Th	He	Th	He	Th	He	Th	He
	2,0	1,5	0,8	0,1	0	0	0,5	0,3

Macro inclusions - IC	
Applied standard	ISO 3763 (Blue fracture)
Sampling	Statistical testing on billets
Limits	< 2,5 mm/dm^2

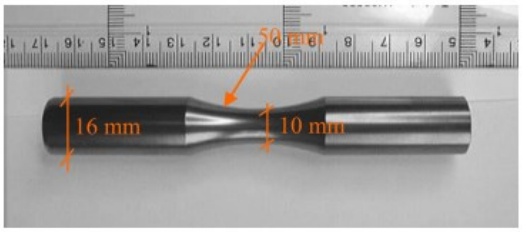
IQ

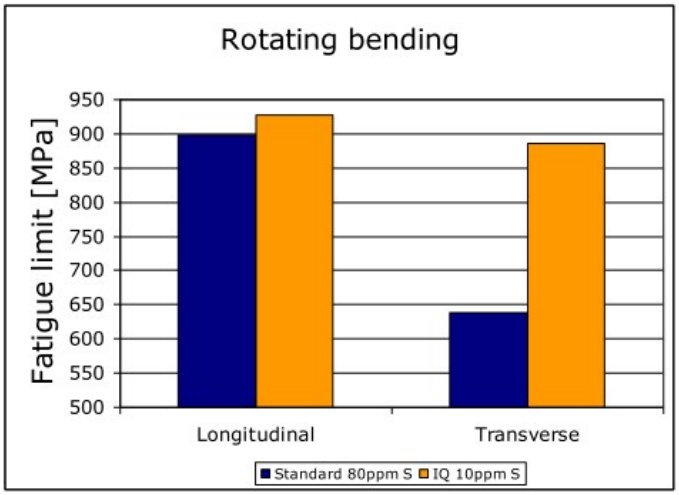
Inclusion limits IQ-processed steel



Fatigue properties

Test method:	Rotating beam
Test procedure:	Stair-case 25 MPa steps
Specimen:	Hourglass shape Ø 10 mm
Heat treatment:	Martensitically hardened
Grades:	803J—Standard 803Q—IQ
Hardness:	62 HRC





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.

In many international comparisons the crude steel Scope 1-2 emission is a key parameter, ie. the CO_2 emission from the steel works itself.
As of 1 January 2022 we carbon offset all our scope 1 and 2 volume shown below.

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)
803	Round bar	+SA	589	193
803	Tube,wall	+SA	611	209
5620 / 802F	Tube,wall	+SA	605	255
5620 / 802F	Round bar	+SA	551	248

As of 1 January 2022 we use carbon offset for all our scope 1- 2 emissions, so in practice the climate compensated data is the same as the full Scope 3 level.
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/