

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.

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% |
|---------|------|-----|------|------|------|-------|-------|------|------|------|
| 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 |

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

Mechanical Properties

| Variant | Condition ^① | Format | Dimension [mm] | Yield strength min [MPa] | Tensile strength [MPa] | Elongation A ₅ [%] | Hardness |
|---------|------------------------|-------------|----------------|--------------------------|------------------------|-------------------------------|----------------|
| 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 |

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

Transformation temperatures

| | Temperature °C |
|-----|----------------|
| MS | 218 |
| AC1 | 745 |
| AC3 | 910 |

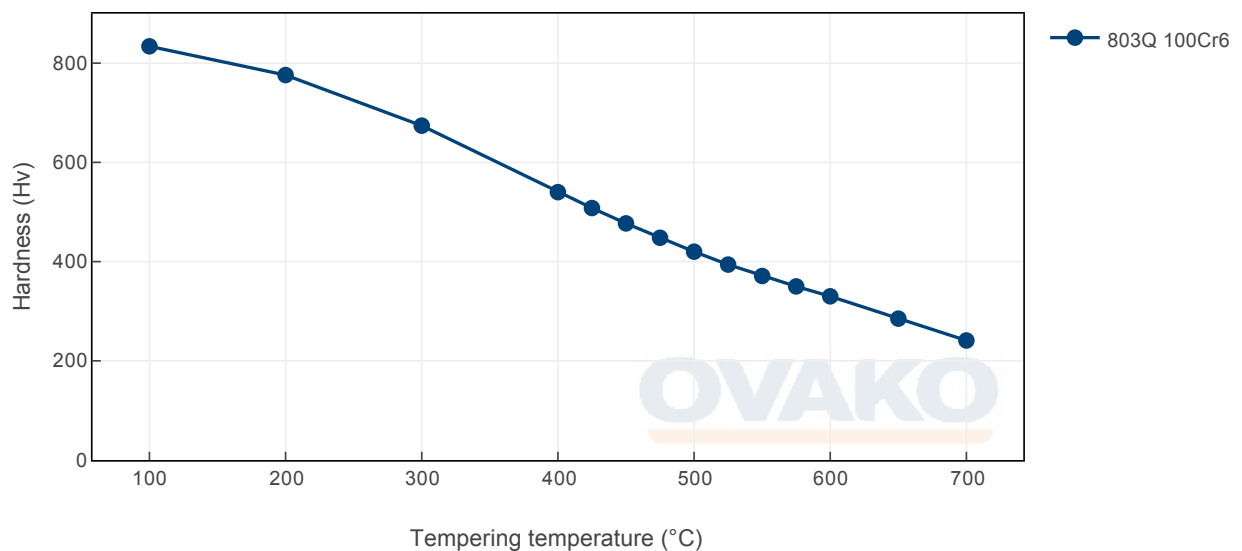
Heat treatment recommendations

| Treatment | Condition ^① | 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 |

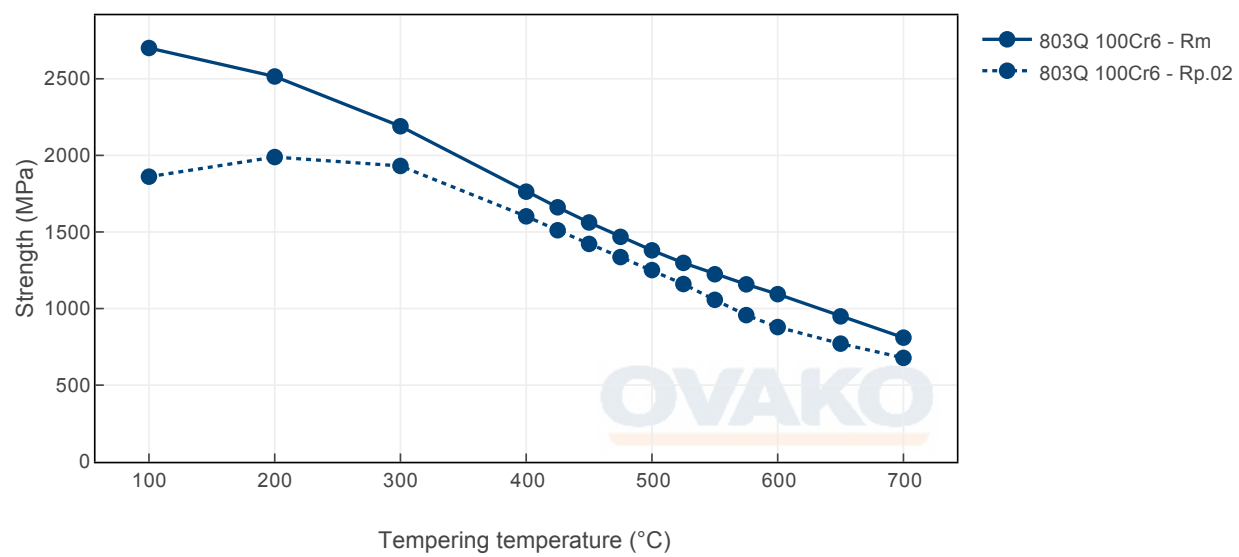
Heat Treatment Guide generated Graphs

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.

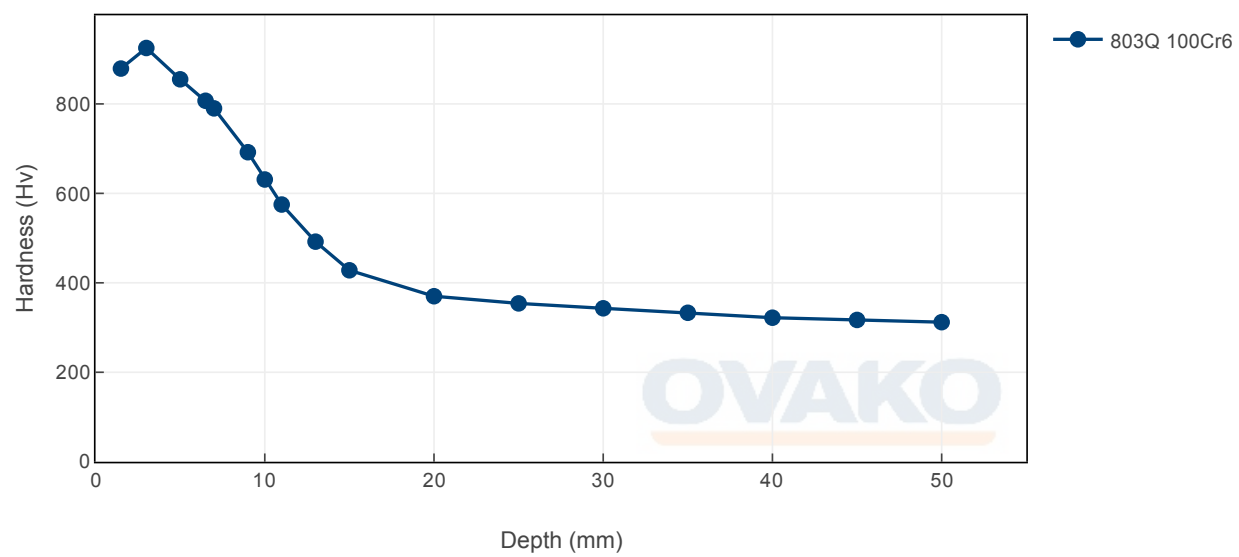
Tempering Diagram (hardness)

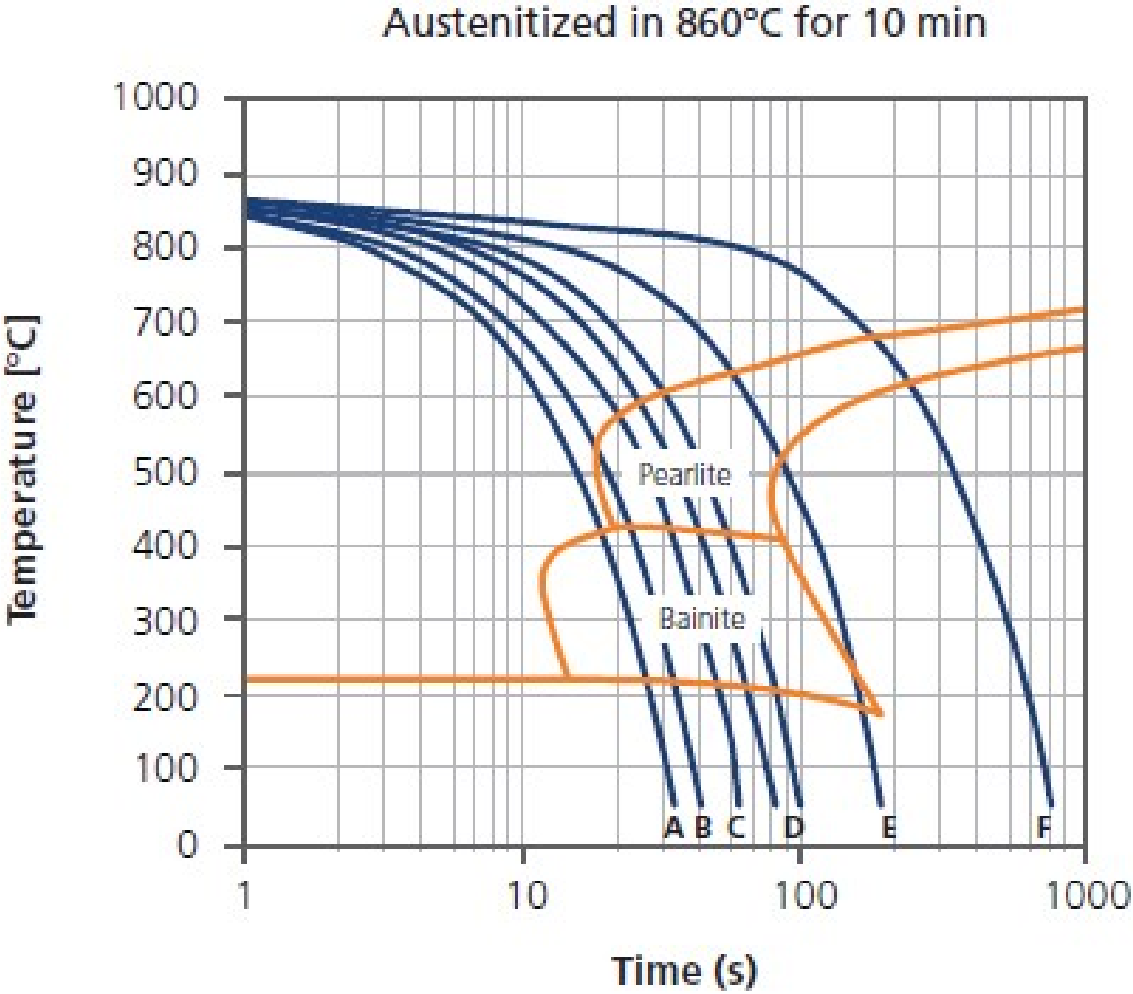


Tempering Diagram (strength)



Jominy

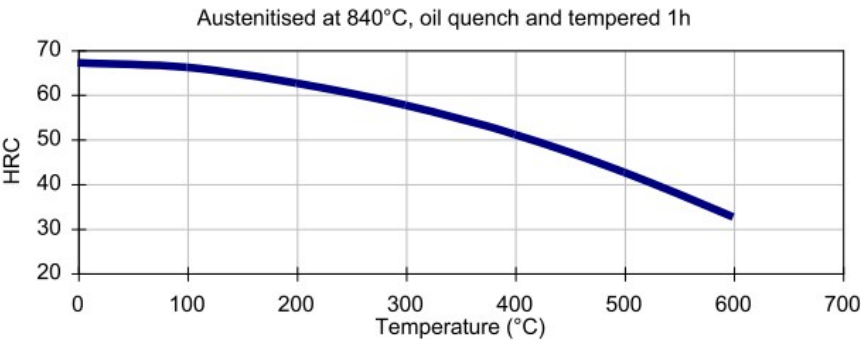




CCT data

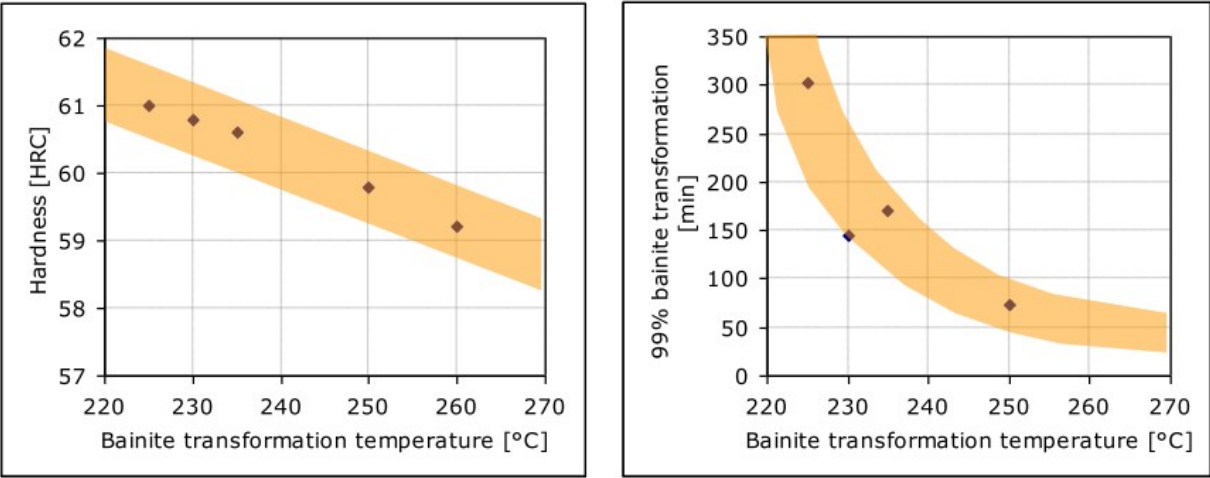
| | A | B | C | D | E | F |
|------------------|-----|-----|-----|-----|-----|-----|
| t_{9-5} [s] | 13 | 17 | 23 | 30 | 75 | 300 |
| HV ₃₀ | 854 | 844 | 751 | 640 | 366 | 308 |

Tempering response



Tempering response after martensitic hardening

Bainite transformation

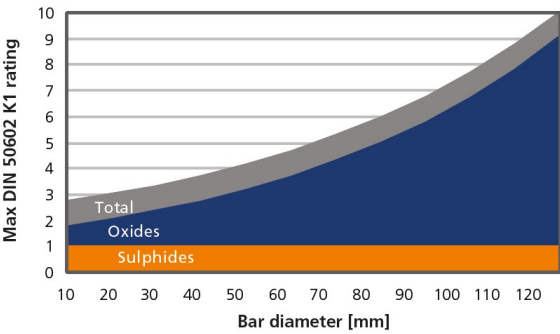


Steel cleanliness

| Micro inclusions - IC | | | | | | | | | Macro inclusions - IC | |
|------------------------|-----------|-----|-----|-----|----|----|-----|-----|-----------------------|--------------------------------|
| 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 | < 2,5 mm/dm² |
| | Th | He | Th | He | Th | He | Th | He | | |
| | 2,0 | 1,5 | 0,8 | 0,1 | 0 | 0 | 0,5 | 0,3 | | |

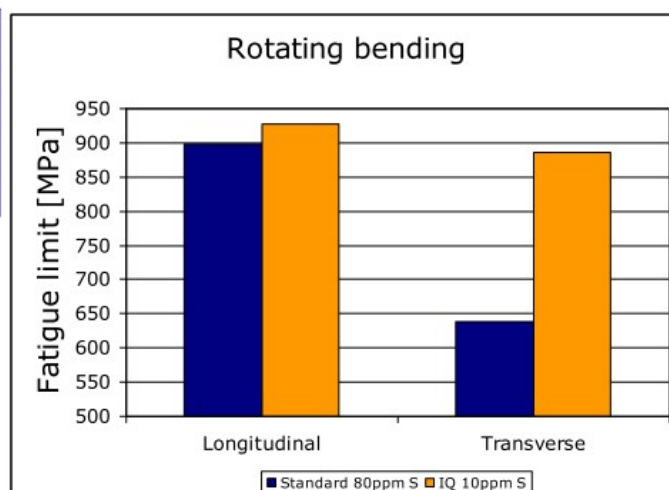
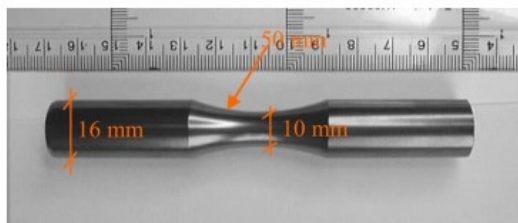
IQ

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 CO₂ 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 |
|----------------------|--------|--------------|--------|
| CO ₂ e/kg | 120 | 62 | 76 |

To get the full picture of our products environmental impact we have to look at all of our CO₂ 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 (CO ₂ e kg /1000 kg steel) | Climate compensated Net emission = Scope 3 (CO ₂ e 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/m ³) |
|-------------------------------|--|--|--|
| 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 resistivity Ambient 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/>

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