

## 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.

### 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 % | DI % |
|---------|------|-------------------------|-----|------|------|------|-------|-------|------|------|------|------|
| SB1672  | CC   | CEV 0.72 <sub>max</sub> | Min | 0.42 | 0.10 | 0.50 | -     | 0.020 | -    | -    | -    | 1.10 |
|         |      | Pcm 0.55 <sub>max</sub> | Max | 0.50 | 0.40 | 0.90 | 0.045 | 0.045 | 0.40 | 0.40 | 0.10 | 1.80 |

The DI-value is in inches.

## Mechanical Properties

| Variant | Dimension [mm] | Yield strength min [MPa] | Tensile strength [MPa] | Elongation A <sub>5</sub> [%] | Hardness   |
|---------|----------------|--------------------------|------------------------|-------------------------------|------------|
| 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 |

$R_{p0.2}$  \*  $R_{eh}$  \*\*  $R_{el}$

## Transformation temperatures

|     | Temperature °C |
|-----|----------------|
| MS  | 305            |
| AC1 | 725            |
| AC3 | 760            |

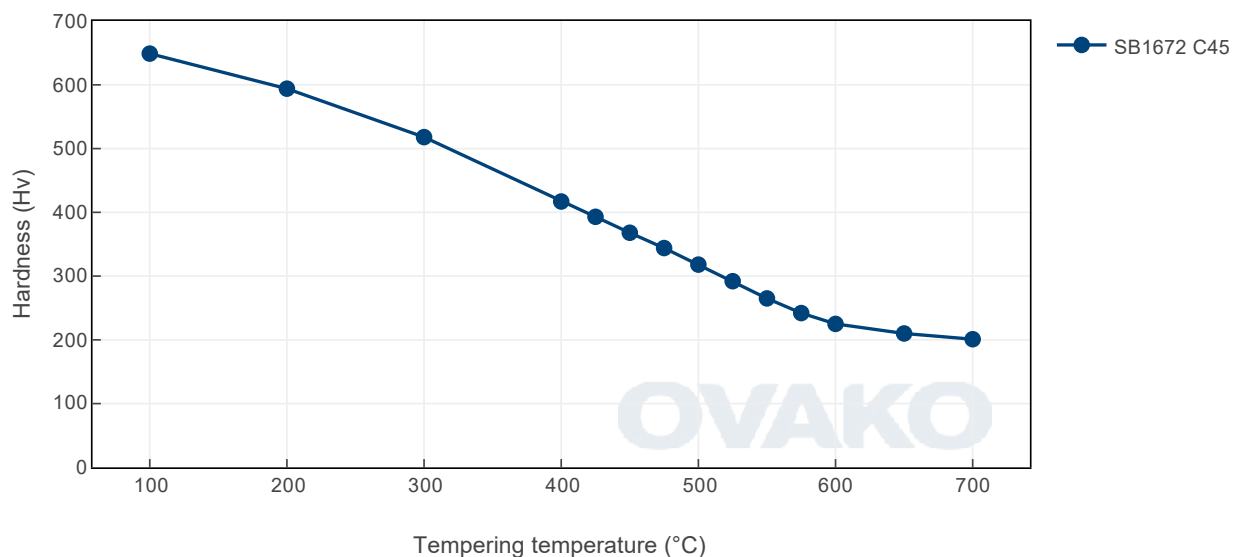
## Heat treatment recommendations

| 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   |

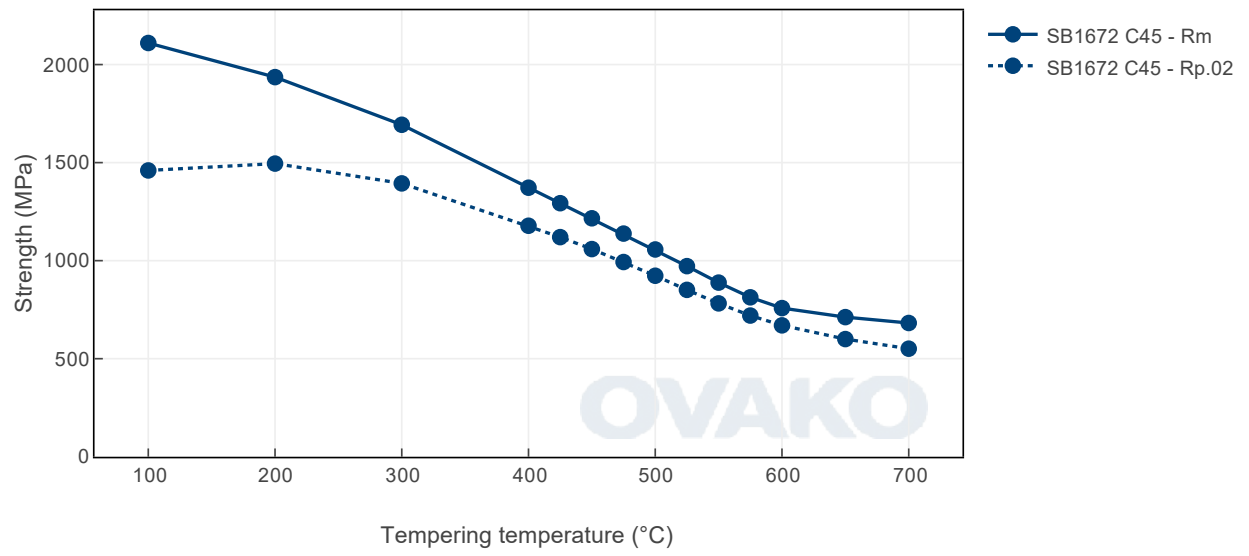
## Heat Treatment Guide generated Graphs

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.

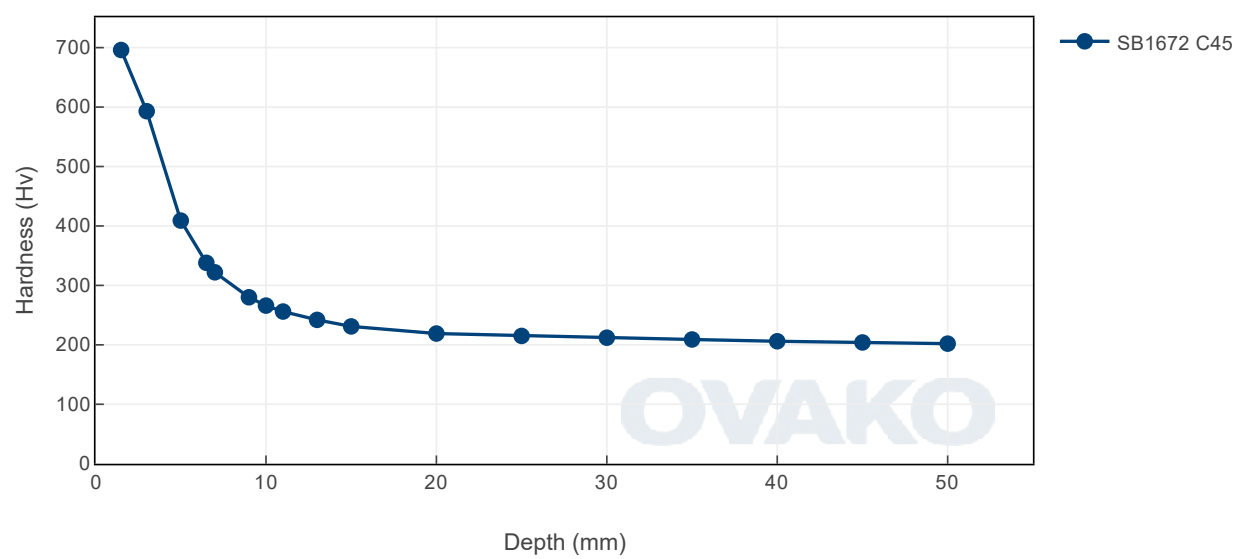
Tempering Diagram (hardness)



Tempering Diagram (strength)



# Jominy



## 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 |
|----------------------|--------|--------------|--------|
| CO <sub>2</sub> e/kg | 120    | 62           | 76     |

To get the full picture of our products environmental impact we have to look at all of our CO<sub>2</sub> 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 <sup>1</sup> | Scope 1-3 (CO <sub>2</sub> e 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/m <sup>3</sup> )                     |
|-------------------------------|-------------------------------------------|--------------------------------------------------|--------------------------------------------------|
| 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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Via telephone: +46 8 622 1300

For more detailed information please visit <http://www.ovako.com/en/Contact-Ovako/>

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