

12NiCr14-6\* All

General Information

12NiCr14-6\* is a case hardening steel with high toughness of the type SAE 3311.

Ovako 245S - Is an ingot cast steel following Ovako internal BQ-Steel demands ensuring a high microscopic and macroscopic cleanliness.

*\* Designation followed by "\*" is not an official EN standard grade but named according to the rules in EN 10027.*

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

SAE 3311

Chemical composition

| Variant | Cast |     | C%   | Si % | Mn % | P%    | S%    | Cr%  | Ni % | Mo % |
|---------|------|-----|------|------|------|-------|-------|------|------|------|
| 245S    | IC   | Min | 0.10 | 0.15 | 0.40 | -     | 0.003 | 1.35 | 3.25 | -    |
|         |      | Max | 0.15 | 0.35 | 0.60 | 0.015 | 0.008 | 1.60 | 3.75 | 0.15 |

Mechanical Properties

| Variant | Condition | Format      | Hardness   |
|---------|-----------|-------------|------------|
| 245S    | +A        | All formats | 170-229 HB |

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

Transformation temperatures

|     | Temperature °C |
|-----|----------------|
| MS  | 395            |
| AC1 | 694            |
| AC3 | 806            |

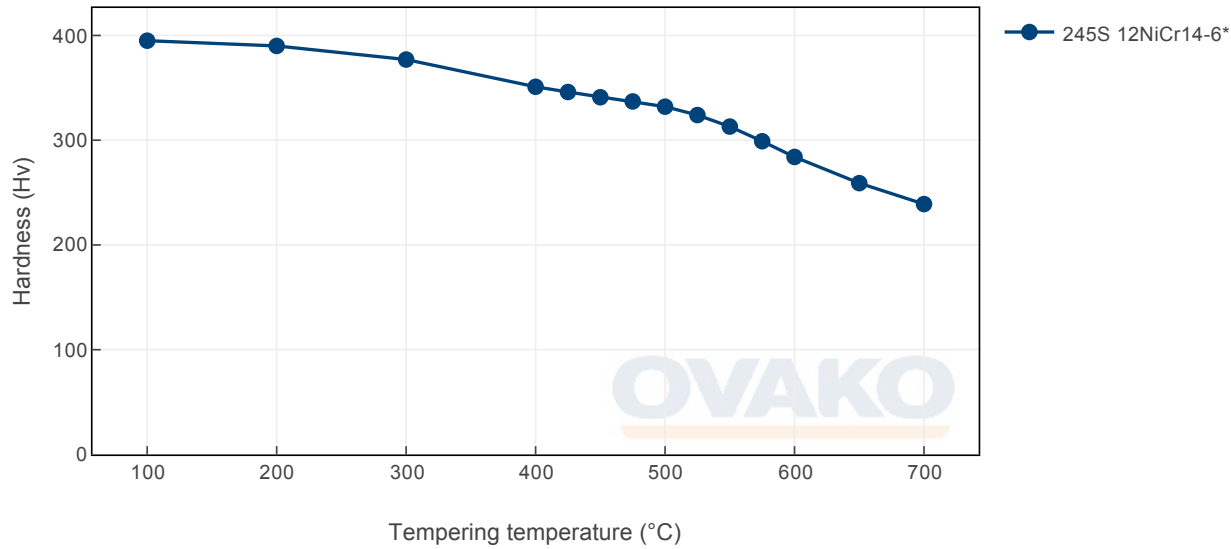
Heat treatment recommendations

| Treatment          | Condition | Temperature cycle                              | Cooling/quenching |
|--------------------|-----------|--|-------------------|
| Hot forging        | +AR       | 800-1200C                                      | In air            |
| Normalizing        | +N        | 860-890C                                       | In air            |
| Soft annealing     | +A        | 670C, 15h                                      | In air            |
| Carburizing        | +C        | 850-930C                                       | -                 |
| Quench & Tempering | +QT       | 840-890C                                       | In oil            |
| Hardening          | +QT       | 780-850C, hardening of as-carburized component | In oil            |

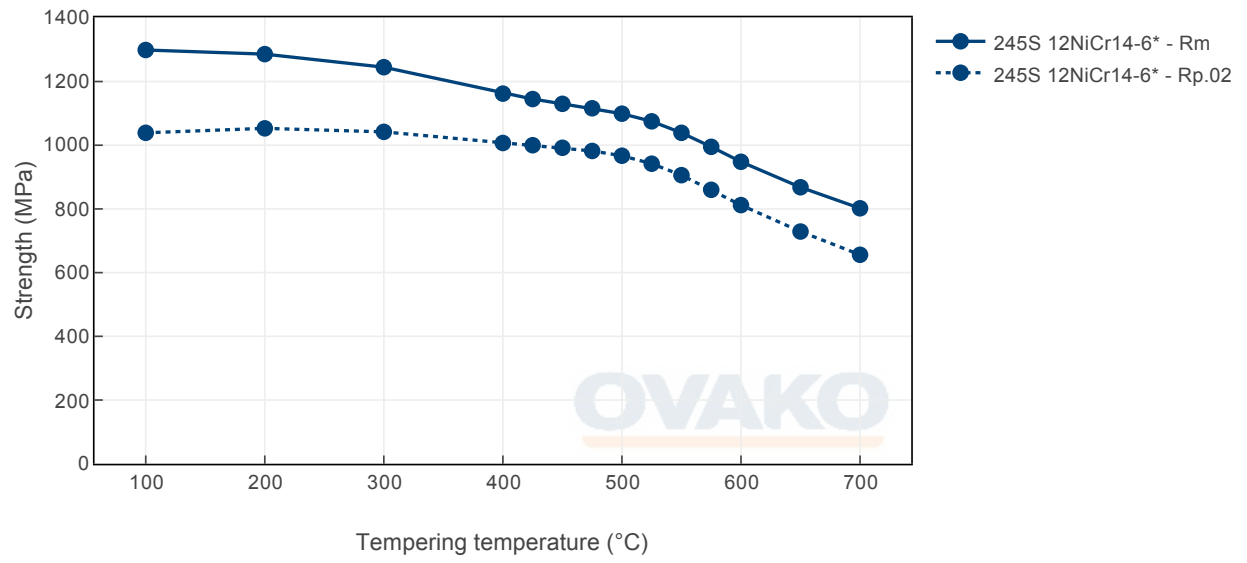
Heat Treatment Guide generated Graphs

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.

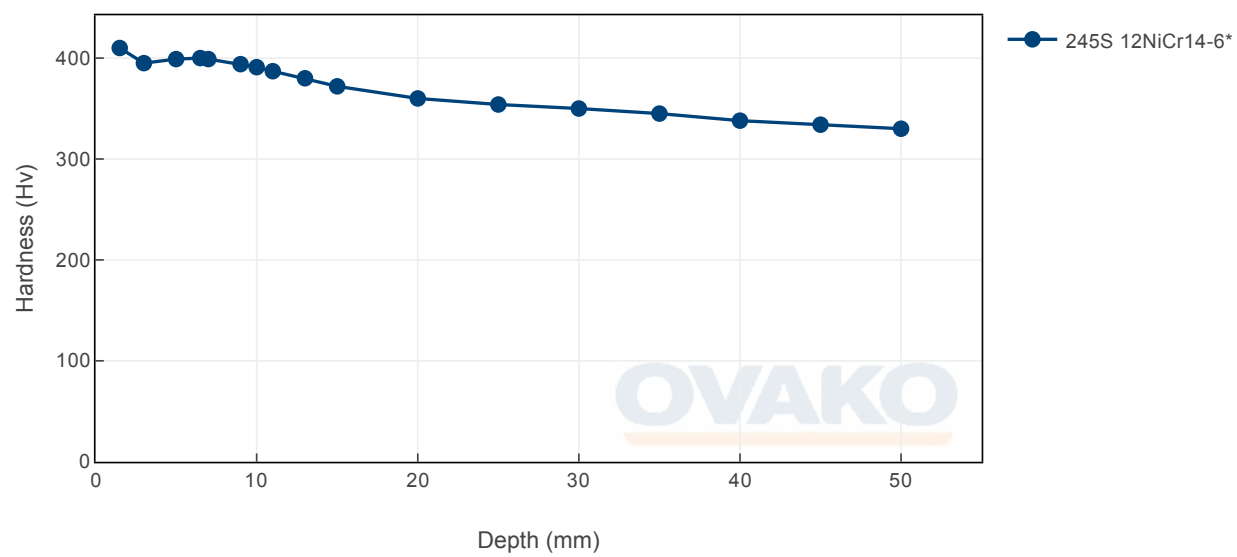
Tempering Diagram (hardness)



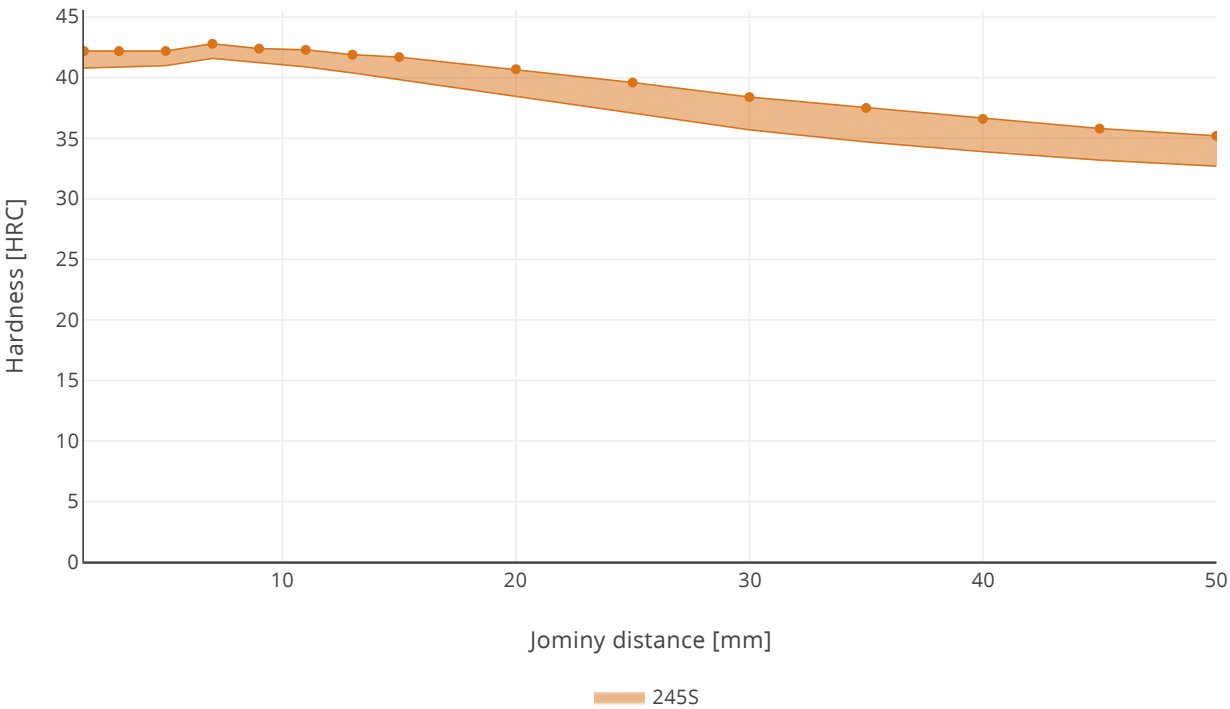
Tempering Diagram (strength)



# Jominy

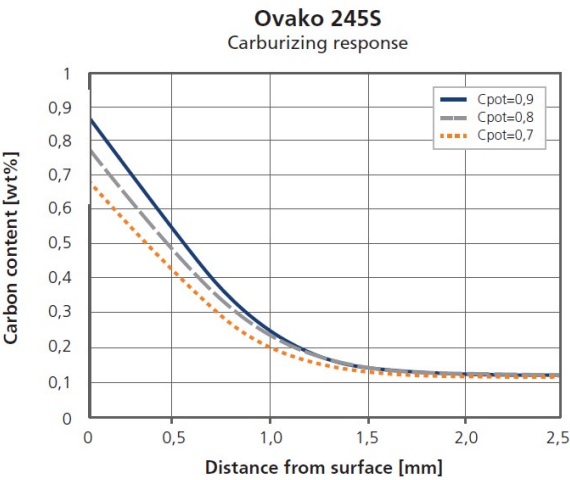


Hardenability

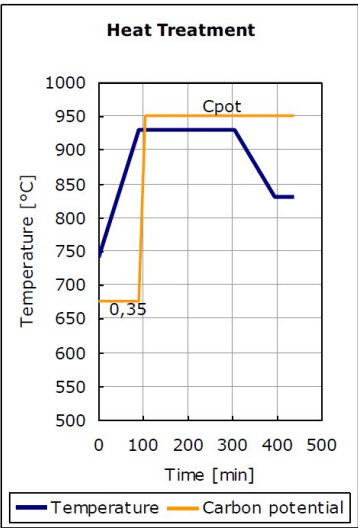


Jominy hardenability of Ovako 245S. Average value with +/- standard deviation. Austenitizing temperature 845°C.

Carburizing response



Heat treatment



Steel cleanliness

| Micro inclusions |           |     |     |     |    |    |     | Macro inclusions |                                |
|------------------|-----------|-----|-----|-----|----|----|-----|------------------|--------------------------------|
| Applied standard | ASTM E45  |     |     |     |    |    |     | Applied standard | ISO 3763<br>(Blue fracture)    |
| Sampling         | ASTM A295 |     |     |     |    |    |     | Sampling         | Statistical testing on billets |
| Maximum average  | A         |     | B   |     | C  |    | D   | Limits           | < 5 mm/dm <sup>2</sup>         |
| limits           | Th        | He  | Th  | He  | Th | He | Th  |                  |                                |
|                  | 2,5       | 1,5 | 0,8 | 0,1 | 0  | 0  | 0,5 |                  |                                |

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<sub>2</sub> 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 <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 ⓘ | Scope 1-3 (CO <sub>2</sub> e kg /1000 kg steel) | Climate compensated Net emission = Scope 3 (CO <sub>2</sub> e kg /1000 kg steel)<br>Scope 1 - 2 = 0 (compensated) |
|-------------|-----------|-------------|---|---|
| 245S        | Round bar | +AR         | 1161  | 767   |
| 245S        | Round bar | +SA         | 1168  | 771   |
| 245S        | Tube,wall | +AR         | 1237  | 836   |
| 245S        | Tube,wall | +SA         | 1238  | 836   |

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### 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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