

# Software QTSteel

**Computer Simulation of the Heat Treatment Response of through Hardened, Carbon and Alloy Steels in Terms of Microstructure and Mechanical Properties**

The screenshot displays the QTSteel software interface with several key components:

- Tempering conditions list:** A panel on the left for selecting or defining tempering conditions.
- Tempering conditions graph:** A plot showing temperature (°C) vs. time (s) for a 'default condition'.
- Cooling curves list:** A panel for selecting cooling curves (e.g., RCOO - centre, RCOO - surface).
- Cooling curves graph:** A plot showing temperature (°C) vs. time (s) for a 'new curve'.
- Chemical composition table:** A table listing elements and their percentages for 'carbon & alloyed steels'.
 

Element	Range (%)	Value (%)
C	[0.000-0.600]	0.06
Mn	[0.000-0.005]	0.3
Si	[0.000-0.005]	0.1
Cr	[0.000-0.005]	0
Ni	[0.000-0.005]	0
Mo	[0.000-0.005]	0
V	[0.000-0.005]	0
W	[0.000-0.005]	0
Ti	[0.000-0.005]	0
Nb	[0.000-0.005]	0
Al	[0.000-0.005]	0
N	[0.000-0.005]	0
B	[0.000-0.004]	0
Cu	[0.000-0.005]	0
Sn	[0.000-0.005]	0
S	[0.000-0.005]	0
P	[0.000-0.005]	0
- Temperatures for the time: 200 sec:** A color-coded diagram showing the temperature distribution across a cross-section of a rod.
- Input fields:** Fields for 'Thermal treated body' (Rod), 'Initial temperature [°C]' (900), and 'Cooling process' (1, 200, 99).
- Properties of initial austenite:** Fields for 'Grain size' (max. 200 µm), 'Austenitizing temperature' (max. 1200 °C), and 'Soak time' (max. 600 min).
- Modifications & Corrections:** Checkboxes for 'use predefined tempering curves', 'use correction of steel properties', and 'use modified CCT diagram'.
- Tempering after quenching:** Radio buttons for 'no tempering', 'tempering' (hours at 100 °C), and 'predefined tempering conditions'.

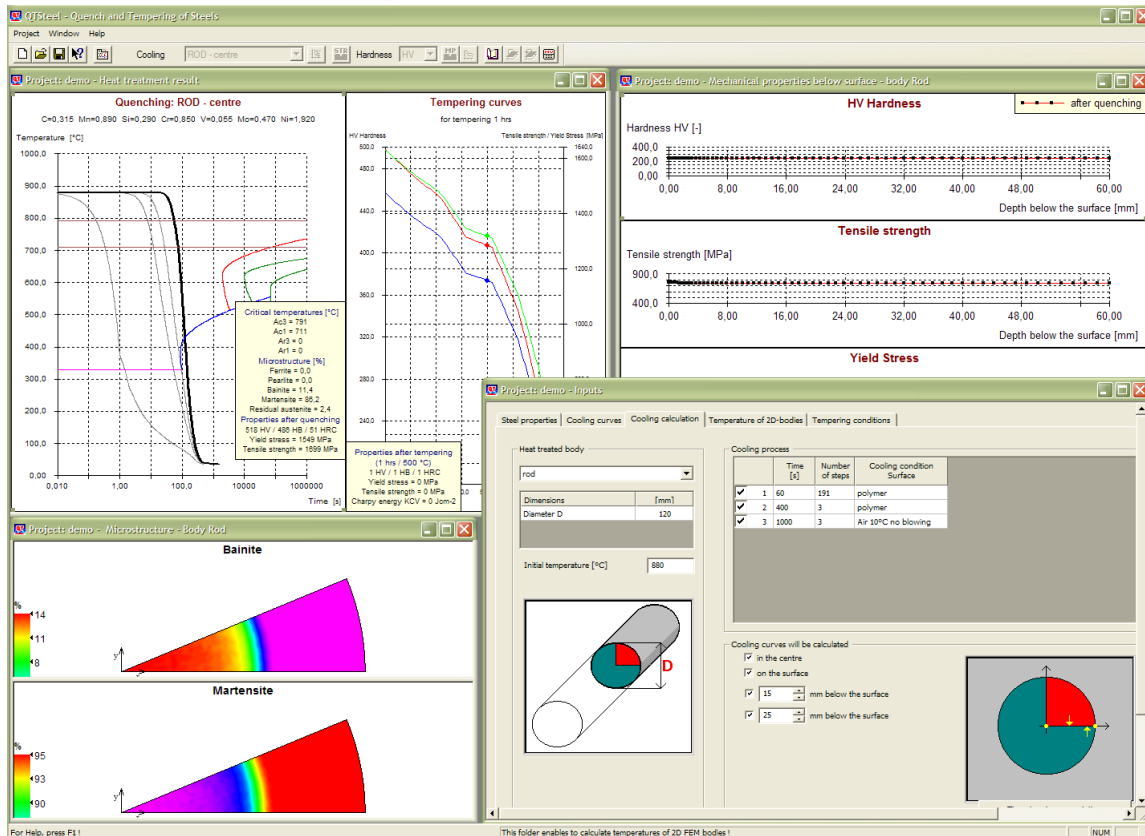
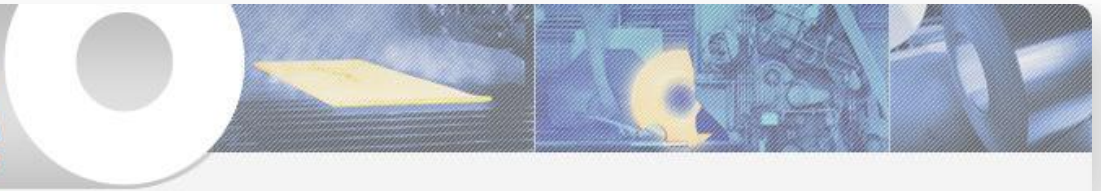
Input screens for setting of steel properties and quench and tempering conditions

## Standard scope of the software:

Carbon and structural steels with amount of C from 0.1 % to 0.6 % and with the total sum of alloying additions up to 10 % (upper limits: Mn 2 %, Si 1.8 %, Cr 4.5 %, Ni 3.5 %, Mo 2.5 %, V 0.4 %, B 0.004 %)

## Input data:

- **Steel properties** (chemistry, grain size of austenite, austenitizing temperature, soak time),
- **Quench conditions** (dimensions, initial temperature and cooling conditions of standard 2D-bodies),
- **Tempering conditions** (tempering temperature and time, user specified tempering curves possible).



Results of the heat treatment simulation of the rounded bar

**QTSteel provides the following information:**

- **CCT-diagram of steel** based on chemical composition with the possibility to modify particular CCT-curves,
- **Cooling curves of standard 2D-bodies** (rounded and rectangular bars, cylinders, tubes, rings) for specified cooling conditions and depths below the surface (Quenchant database available),
- **Microstructure of the steel** (shares of ferrite, pearlite, bainite, martensite or residual austenite) **and mechanical properties of the steel** (HV, HB, HRC, HSH, yield stress, ultimate tensile strength) for one selected cooling curve or across the standard 2D-body after quenching and subsequent tempering,
- **Mechanical properties of the steel** after quenching and subsequent tempering in dependence on the depth below the surface of the standard 2D-body.

**QTSteel works on a standard PC under Win7 or Win10!**  
**The installation of training version can be downloaded from**  
[http://www.ita-tech.cz/sw/QTSteel/setup\\_34\\_training\\_uk.zip](http://www.ita-tech.cz/sw/QTSteel/setup_34_training_uk.zip)