



# HARDNESS TESTING



Student:

Year:

Date:

Teacher:

## Program:

- What is hardness?
- Rockwell, Vickers and Brinell hardness.
- Reporting of hardness.

## A) Rockwell Hardness Test HRC (EN ISO 6508-1)

**Task:** Measure hardness of tool steel (EN X210Cr12). Measure hardness of material ten times and calculate the average Rockwell Hardness.

### 1. Conditions of measurement:

used equipment:

indenter:

load: -

time:

### 2. Procedure:

### 3. Experimental part:

Material: EN X210Cr12

Round off the  $\overline{HRC}$  to the nearest whole number.

**TABLE 1:** Measured values

	1	2	3	4	5	6	7	8	9	10	$\overline{HRC}$
HRC											

$\overline{HRC}$  = average value of 10 measurements

## B) Vickers Hardness Test HV (EN ISO 6507-1)

**Task:** Measure hardness of structural steel (EN 10025 S235JR). Measure hardness of material five times and calculate the average Vickers Hardness.

Determination of measured quantity:

$$HV = 0,1891 \frac{F}{d^2} \quad d = \frac{d_1 + d_2}{2}$$

F [N] ... Testing load

d [mm] ... Arithmetic mean of the two diagonals  $d_1$  and  $d_2$

HV ... Vickers hardness

### 1. Conditions of measurement:

used equipment:

indenter:

load: 293,4 N (i.e. 30 kp)

time:

### 2. Procedure:

### 3. Experimental part:

Material: EN 10025 S235JR

Round off the  $\overline{HV}$  to the nearest whole number.

**TABLE 2:** Measured values

	$d_1$ [mm]	$d_2$ [mm]	d [mm]	HV
1				
2				
3				
4				
5				
$\overline{HV}$	X	X	X	

$\overline{HV}$  = average value of 5 measurements

### C) Brinell Hardness Test HBW (EN ISO 6506-1)

**Task:** Measure hardness of cast iron (EN-GJL-200). Measure hardness of material three times and calculate the average Brinell Hardness.

Determination of measured quantity:

$$HB = 0,102 \frac{2F}{\pi D(D - \sqrt{D^2 - d^2})}$$

F [N] ... Testing load

D [mm] ... Diameter of indenter

d [mm] ... Diameter of indentation

HB ... Brinells hardness

- if the indenter is made of tungsten carbide → report of hardness is HBW

- if the indenter is made of quenched steel (for soft materials) → report of hardness is HBS

#### 1. Conditions of measurement:

used equipment:

indenter:

load:

time:

#### 2. Procedure:

#### 3. Experimental part:

Material: EN-GJL-200

Round off the  $\overline{HBW}$  to the nearest whole number.

**TABLE 3:** *Measured values*

	1	2	3	$\overline{HBW}$
d [mm]				
HBW				

$\overline{HBW}$  = average value of 3 measurements

**Conclusion:**