# LW N°04: Impact Test

The impact test is a standardized method used to evaluate the toughness or impact resistance of materials, particularly metals.

## 1. Objectives

✓ Determine the amount of absorbed energy during the fracture under high-rate loadings.
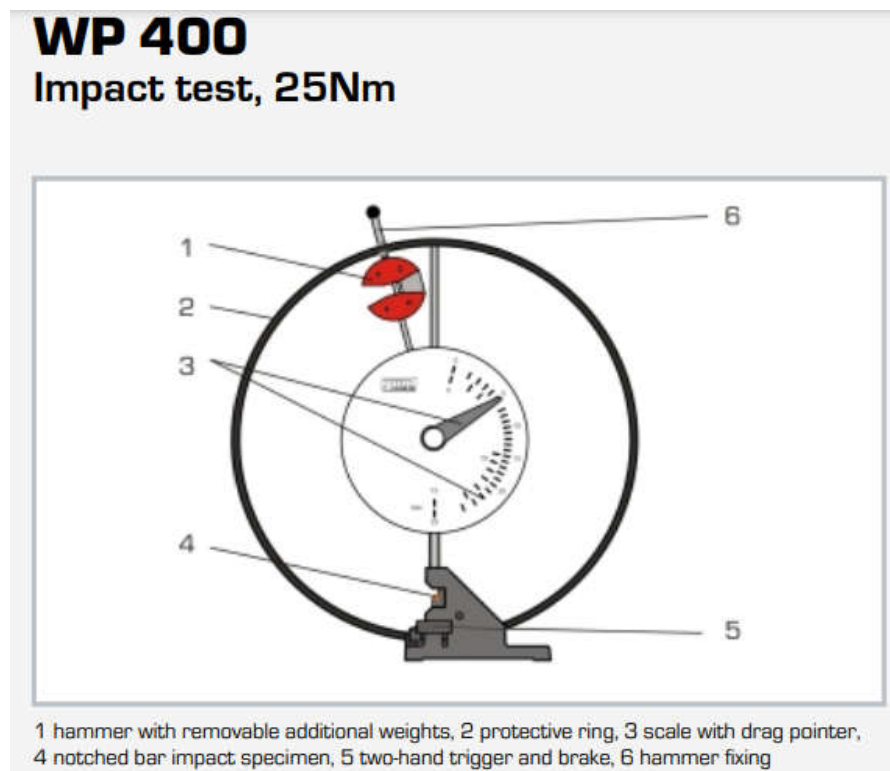
## 2. Test methods

***Charpy Test***: A notched specimen is supported horizontally, and a pendulum strikes it on the opposite side of the notch.
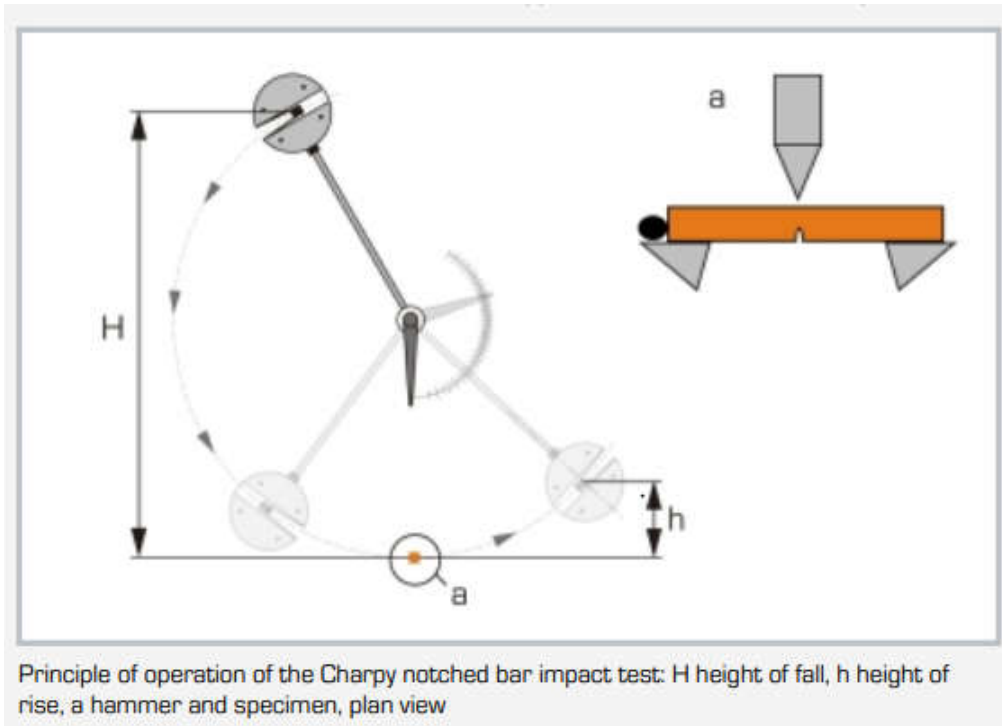
***Izod Test***: A notched specimen is supported vertically as a cantilever beam, and a pendulum strikes it on the same side as the notch

## 3. Charpy Test

The Charpy test consists of a knife attached to a hammer which oscillates in a vertical plane around an axis (see the bellow figure). For a test, the knife is raised to a height *H* corresponding to the initial energy $E_H = m\ g\ H$. As it falls, the knife will cause the specimen to break, which will be accompanied by an absorption of energy **K**, and the hammer will rise to a height *h* with an associated potential energy $E_h = m\ g\ h$, then simply $K = E_H - E_h = mg\ (H-h)$.
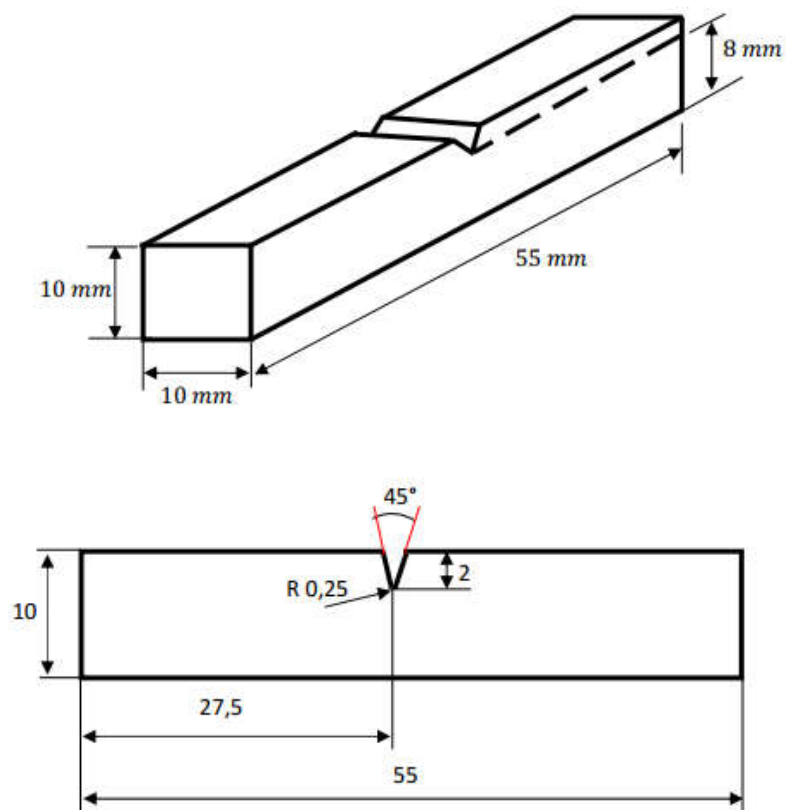
***Resilience*** is defined as the energy of rupture (under impact) reduced to the cross-section *S* of the specimen at the crack location. $a_k = K\ /\ S\ (j/cm^2)$.



**WP 400**
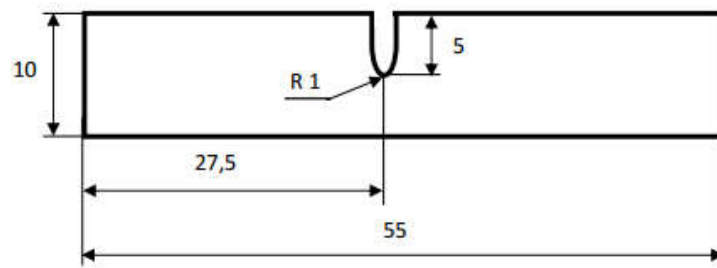Impact test, 25Nm

1 hammer with removable additional weights, 2 protective ring, 3 scale with drag pointer,
4 notched bar impact specimen, 5 two-hand trigger and brake, 6 hammer fixing

Principle of operation of the Charpy notched bar impact test: H height of fall, h height of rise, a hammer and specimen, plan view

## 4. Test sample

*Test sample V*
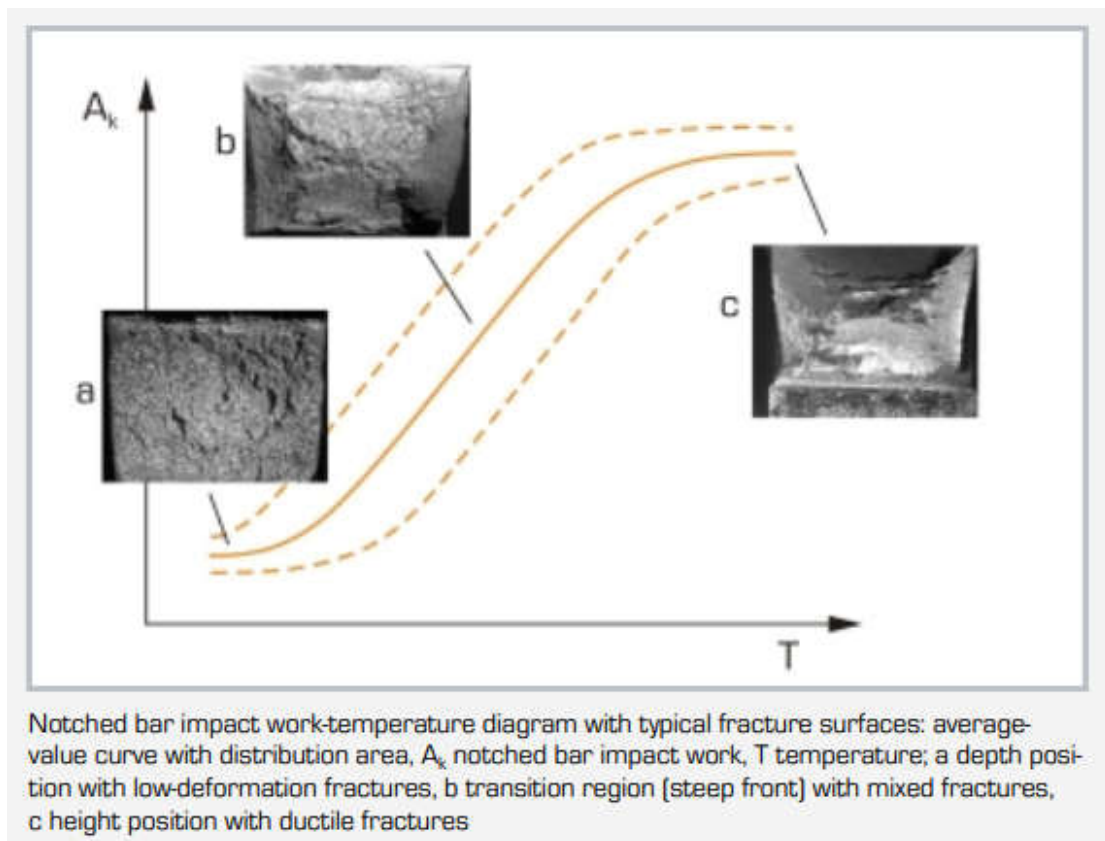


8 mm

55 mm

10 mm

10 mm



45°

R 0,25

2

10

27,5

55

*Test sample U*



## 5. Factors affecting charpy impact energy

a. Material composition and microstructure

b. Notch geometry and orientation

c. Temperature:

Ductile-to-brittle transition temperature (DBTT)



Notched bar impact work-temperature diagram with typical fracture surfaces: average-value curve with distribution area, $A_k$ notched bar impact work, T temperature; a depth position with low-deformation fractures, b transition region (steep front) with mixed fractures, c height position with ductile fractures

### References

Guerira B.2017. Polycopie de résistance des matériaux pour dexieme année tronc commun, Univrsité de Biskra

Website: https://www.gunt.de