

Rockwell Hardness HRC Scale Definition

Reference values for HRC

Symbol	Test parameter	Reference value	Start measurement	Stop measurement
F_0	Preliminary test force	98,066 5 N ¹	-	-
F	Total test force	1 470,997 5 N ¹	-	-
α	Included angle of the indenter cone (between surface axial-plane line segments)	120°	Line segment start: ±30° (from the axis) ²	Line segment end: 400 μm on conical surface
r	Spherical tip radius of the indenter	200 μm	-30° (from the axis) ²	+30° (from the axis) ²
t_{pa}	Application time of preliminary test force	0,2 s ≤ t_{pa} ≤ 2 s	~1 % F_0	~99 % F_0
t_{pd}	Duration time of constant preliminary test force before initial measurement	(3 - $t_{pa}/2$) s	~99 % F_0	Measurement
t_{aa}	Application time of additional test force	1 s ≤ t_{aa} ≤ 8 s ³	~101 % F_0	~99 % F (loading)
v_{fa}	Mean indentation velocity of final additional test force application	30 μm·s ⁻¹	~80 % F	~99 % F
t_{td}	Duration time of total test force	5 s	~99 % F (loading)	~99 % F (unloading)
t_{ar}	Removal time of additional test force	≤ 2 s	~99 % F (unloading)	~101 % F_0
t_{rd}	Duration time of recovery force before final measurement	4 s	~101 % F_0	Measurement
T	Temperature of test	23 °C	Start of test	End of test

¹ The defined values of preliminary test force and total test force are the SI equivalents of the original Rockwell hardness method-defined forces of 10 kgf and 150 kgf, respectively, converted to N by multiplying the kgf values by the conversion factor 9,806 65.

² These dimensions define the theoretical points of blend between the spherical tip and conical surface of the diamond indenter (see Figure 2). The actual points of blend are usually different; therefore, the blend areas should not be included in the measurement of the tip radius or cone angle.

³ The value of t_{aa} is dependent on the hardness of the material under test. The stated range of 1 s to 8 s is to maintain compliance with consensus standards.

Figure 1. Illustrations of the applied force and the resulting indentation-depth occurring during the HRC test cycle.

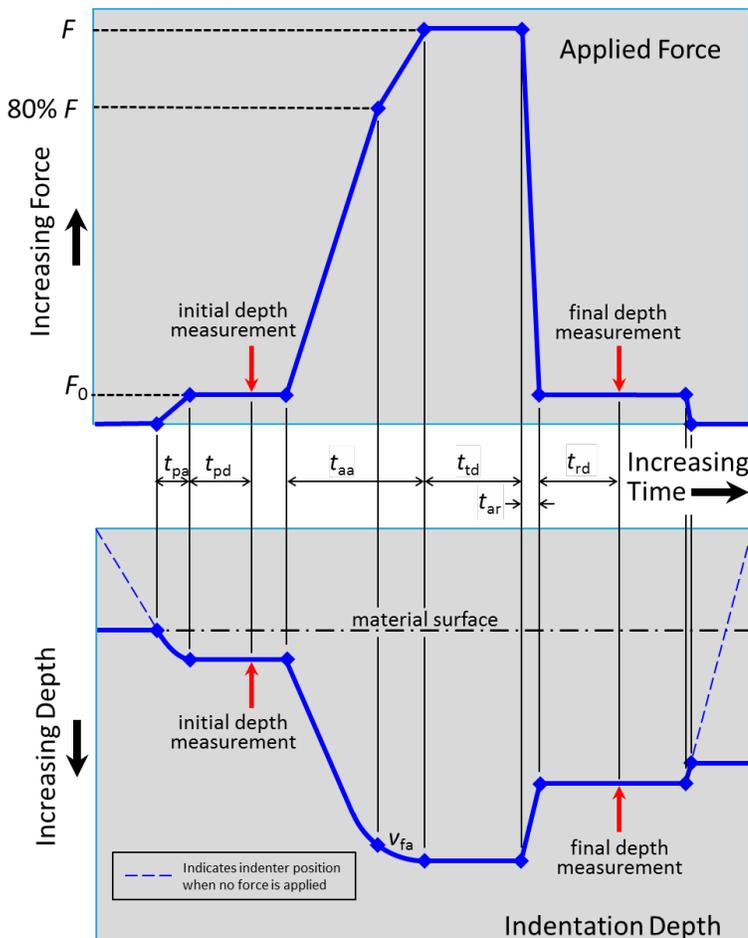


Figure 2. Illustration of the axial cross-section of an ideally-shaped diamond indenter indicating the dimensions specified above and the theoretical points of blend between the spherical tip and conical surface.

