

Chapter 3: HDPE Material Properties

3.1 Physical Properties of Polyethylene

Properties	Typical Value	Unit	Test Method
Raw Material Properties			
Density			
Base resin	948	kg/m ³	ISO 1872 Annex B
Compound	958	kg/m ³	ISO 1872 Annex B
Melt flow index			
2.16 Kg	0.10	g/10 min.	ISO 1133 Cond 4
5.00 Kg	0.50	g/10 min.	ISO 1133 Cond 18
Carbon Black Content	≥ 2.00	%	ASTM D 1603
Mechanical Properties			
Tensile strength at yield	22.00	N/mm ²	ISO/DIS 6259
Ultimate elongation	>600	%	ISO/DIS 6259
ESCR, F ₅₀	>600	h	ASTM D 1693 Cond A
Hardness	62.00	Shore D	ISO 868
Charpy Impact Strength	No Failure	kJ/m ²	ISO 179
Creep modulus			
E ₀	900	MPa	SS 3519
E ₅₀	200	MPa	SS 3519
Thermal Properties			
Brittleness temperature	<-70	°C	ASTM D 746
Linear thermal expansion	1.90	mm/m °C	ASTM D Value 696
(Average Value over temperature range 20-90 °C)			
Thermal conductivity (20°C)	0.42	W/m K	DIN 52612 (20 °C)
Specific heat, C _p	2.00	kJ/Kg K	DSC, at 20 °C
Specific heat, C _p	2.70	kJ/Kg K	DSC, at 200 °C
Crystalline melting range	125-130	°C	DSC
Thermal Stability			
Induction temp	254	°C	ASTM D 3350
Induction time	15.00	min	Isothermal in Oxygen at 210 °C
Vicat softening temperature	122	°C	ISO 306 A-50
Electrical Properties			
Volume resistivity	>10 ¹⁶	Ω .cm	DIN 53482 ; VDE 0303, part 3
Surface resistance	>10 ¹³	Ω	DIN 53482 ; VDE 0303, part 3
Dielectric strength	700	kV/cm	DIN 53481 ; VDE 0303, part 2
Dielectric constant ε _r at 2 x 10 ⁶ Hz	2.50	-	DIN 53483 ; VDE 0303, part 4 (immersion method)
Dielectric loss factor tan δ			
at 50 Hz	6 x 10 ⁻⁴	-	DIN 53483 ; VDE 0303, part 4
10 ³ Hz	5 x 10 ⁻⁴	-	
10 ⁴ Hz	5 x 10 ⁻⁴	-	
10 ⁵ Hz	6 x 10 ⁻⁴	-	
Tracking resistance	KA 3c	stage	DIN 53480
		KC>600	VDE 0303, part 1
Arc resistance	L 4	stage	DIN 53484, VDE 0303, part 5