

Automotive Steel Types & Grades

Mild, IF, BH, HSLA, DP, TRIP, martensitic, press-hardened, galvanized and stainless steels

Steel Types at a Glance

Steel	Strength	Typical uses
Low-carbon (mild)	Lowest strength, highest formability	Outer panels, closures, brackets
Interstitial-free (IF)	Low strength, elongation ~50%; C 20-50 ppm	Very deep-drawn complex parts
Bake-hardening (BH)	Gains strength in paint bake	Dent-resistant Class A panels
HSLA	300-550 MPa min yield	Structural and chassis parts
Dual-phase (DP)	590-980 MPa min UTS	Structural, crash-relevant parts
TRIP	High strength + high elongation	Complex crash-relevant parts
Martensitic	Very high; lowest AHSS elongation	Bumper beams, door intrusion beams
Press-hardened (22MnB5)	~1,500 MPa after die quench	Pillars, roof rails, safety cage
Galvanized	Depends on base steel	Panels exposed to moisture and salt
Stainless (e.g. 409)	Depends on grade	Exhaust systems

Mechanical Properties Compared

Grade	YS (MPa)	UTS (MPa)	Total el. (%)	Uniform el. (%)	n
Mild steel	181	296	42.4	21.4	0.208
HSLA 340	375	480	24	13	0.15
DP600	355	623	26	19	0.18
DP800	440	825	17	18	0.13
TRIP800	503	831	27.6	21.5	0.236

Elongation over 50 mm, ISO #1 tensile bar.

Grade Minimums

Grade	Min YS (MPa)	Min UTS (MPa)	Min el. (%)
DP600 / DP800 / DP1000	340 / 420 / 550	590 / 780 / 980	21 / 14 / 8
HSLA 300 / 340 / 380	300 / 340 / 380	400 / 410 / 450	27 / 25 / 23
HSLA 420 / 550	420 / 550	490 / 620	18-22 / 16-18

Microstructures

DP	Ferrite + martensite (1970s); high strength with good elongation and fatigue resistance.
TRIP	Retained austenite turns to martensite during straining: high uniform elongation and toughness.
Martensite	Hardest phase, from rapid quench; hardness rises with carbon content.
Press hardening	Heat blank to austenite, form in cooled die, quench to martensite. Higher cost, slower cycle, harder to trim and join.

Where Each Goes in the BIW

- **Outer panels:** mild, IF, BH.
- **Crush zones / rails:** HSLA, DP, TRIP.
- **Safety cage:** press-hardened, martensitic.
- **Underbody / chassis:** HSLA, DP.
- **Exhaust:** stainless.
- **Trade-off:** higher strength → thinner gauge but less elongation, more springback, tighter process windows.