Press Brake Air-Bending Tonnage

SheetMetal · Engineering reference · Checked 2026-11-04

Typical engineering values — confirm against the applicable standard and your machine before quoting.

Air-bending force in tonnes-force, kilonewtons and US tons for a 1000 mm bend, by thickness and V-die opening.

Formula

Air-bending force in tonnes-force:

`T = 1.33 × tensile strength (MPa) × thickness² (mm²) × bend length (mm) / (9.80665 × 1000 × V opening (mm))`

The 1.33 factor is an empirical coefficient for ordinary air-bending conditions. The thickness term is squared, so doubling thickness at the same V opening quadruples the force. Force rises in direct proportion to bend length and tensile strength, and falls as the V opening widens. One tonne-force is taken as 9.80665 kN; one US short ton-force is 907.18474 kg-force.

Tonnage by thickness and V opening — 1 m bend, mild steel at 450 MPa

Thickness (mm)	V opening (mm)	V / t	Tonnes-force	Force (kN)	Force (US tons)
1	6	6	10.2	99.8	11.21
1	8	8	7.63	74.8	8.41
1	10	10	6.10	59.8	6.73
1	12	12	5.09	49.9	5.61
1.5	9	6	15.3	149.6	16.82
1.5	12	8	11.4	112.2	12.61
1.5	15	10	9.15	89.8	10.09
1.5	18	12	7.63	74.8	8.41
2	12	6	20.3	199.5	22.42
2	16	8	15.3	149.6	16.82
2	20	10	12.2	119.7	13.45
2	24	12	10.2	99.8	11.21
3	18	6	30.5	299.3	33.64
3	24	8	22.9	224.4	25.23
3	30	10	18.3	179.6	20.18
3	36	12	15.3	149.6	16.82
4	24	6	40.7	399.0	44.85

4	32	8	30.5	299.3	33.64
4	40	10	24.4	239.4	26.91
4	48	12	20.3	199.5	22.42
5	30	6	50.9	498.7	56.06
5	40	8	38.1	374.1	42.05
5	50	10	30.5	299.3	33.64
5	60	12	25.4	249.4	28.03
6	36	6	61.0	598.5	67.27
6	48	8	45.8	448.9	50.46
6	60	10	36.6	359.1	40.36
6	72	12	30.5	299.3	33.64

Reference table at the usual V = 8t starting point

The seven rows below use the common starting rule V = 8 × thickness for mild steel. This PDF retains its 1–6 mm scope. The website separately provides calculated estimates for three materials through 20 mm; that wider calculated table does not extend the archived factory evidence. No capacity allowance is included in these force columns.

Thickness (mm)	V opening (mm)	Tonnes-force	Force (kN)	Force (US tons)
1	8	7.63	74.8	8.41
1.5	12	11.4	112.2	12.61
2	16	15.3	149.6	16.82
3	24	22.9	224.4	25.23
4	32	30.5	299.3	33.64
5	40	38.1	374.1	42.05
6	48	45.8	448.9	50.46

Material factors

Force is proportional to tensile strength. The factors below are relative to mild steel at 450 MPa, so they are a starting estimate rather than a catalogue value. High-strength or work-hardened grades can need more force again.

Material	Tensile strength (MPa)	Force factor vs mild steel
Mild steel	450	1.00
Stainless steel	600	1.33
Aluminium	250	0.56

A stainless steel grade near 600 MPa needs roughly one third more force than mild steel; soft aluminium near 250 MPa needs roughly half. Start from the actual tensile strength rather than from a single material factor.

Why a chart alone can pick the wrong machine

- A printed chart usually fixes the material, the V opening and the bend length. A real job often changes all three.
- Force is proportional to bend length. A chart for a 1 m bend understates a 2.5 m bend by two and a half times.
- A wider V opening lowers the force but increases the inside radius and the minimum flange.
- Air bending, bottoming and coining use different force levels. A chart without a process label is ambiguous.
- Select a machine with capacity above the calculated force, not exactly at it, and confirm the capacity plate with engineering.