Sling Leg Tension and Angle Factor

Tension in each leg of a two-, three- or four-leg sling for a load and sling angle, with the angle factor and the minimum working load limit needed per leg.

Method: Statics of a symmetrical sling (definitions)

Input parameters

Unit system: SI

Parameter	Value	Unit
Load mass	5,000.0	kg
Legs sharing the load	2 (also a three-leg sling, counted as 2 for safety)	
Leg angle from horizontal	60.000	°

Calculated results

Parameter	Value	Unit
Angle factor	1.1547	
Tension per leg	28.309	kN
Least rated working load limit per leg (leg tension as mass)	2,886.7	kg

Notes for this case

- Lifting regulations and sling makers' tables govern; they count fewer legs as sharing the load for three- and four-leg slings. The WLL output is the leg tension expressed as a mass: choose a sling whose rated WLL (which already includes the maker's safety factor) is at least this; add any dynamic or uncertainty allowance your rules require.

Formula and method

$$T = \frac{Wg}{n \sin\theta}, \quad WLL = \frac{T}{g}$$

Variables

W	Load mass	kg
n	Legs sharing the load	-
θ	Leg angle from horizontal	rad
$1/\sin\theta$	Angle factor	-
T	Tension per leg	N
WLL	Least rated working load limit per leg (leg tension as mass)	kg
g	Standard gravity, 9.806 65	m/s²

Method and standards

Equilibrium of forces.

Assumptions and limits

- Symmetrical lift; centre of gravity below the hook.
- WLL is the leg tension as a mass with no extra design factor: a sling's rated WLL already includes the maker's safety factor, so pick one rated at least this; dynamic allowances are extra.

References

- Statics of a symmetrical sling (definitions)

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/material-handling/sling-angle-tension

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.