Springs in Series and Parallel: Equivalent Rate

Equivalent stiffness of up to three springs in series or in parallel, the deflection under a load and the load carried by each spring.

Method: Hooke's law for combined springs

Input parameters

Unit system: SI

Parameter	Value	Unit
Rate of spring 1	20.000	N/mm
Rate of spring 2	30.000	N/mm
Rate of spring 3 (0 if there is no third spring)	0	N/mm
Arrangement	Parallel (side by side)	
Load	1.0000	kN

Calculated results

Parameter	Value	Unit
Equivalent rate	50.000	N/mm
Deflection under the load	20.000	mm
Load on spring 1	0.40000	kN

Formula and method

$$k_{par} = \sum k_i, \quad \frac{1}{k_{ser}} = \sum \frac{1}{k_i}$$

Variables

k_1	Rate of spring 1	N/m
k_2	Rate of spring 2	N/m
k_3	Rate of spring 3 (0 if there is no third spring)	N/m
arr	Arrangement	-
F	Load	N
k	Equivalent rate	N/m
δ	Deflection under the load	m
F_1	Load on spring 1	N

Method and standards

Equal deflection (parallel) or equal force (series).

Assumptions and limits

- Linear springs; k_3 = 0 means there is no third spring, in either arrangement.

References

- Hooke's law for combined springs

Report details

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Release checks	4 reference cases of this calculator, computed independently, are checked on every release

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

This calculator online

https://calc.firecad.com/mechanical/machine-design/springs-series-parallel

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.