Roller Chain Length and Centre Distance

Number of links of a roller chain for two sprockets and a centre distance, rounded to an even number, and the exact centre distance for that chain length.

Method: Shigley's Mechanical Engineering Design; ch. 17 (roller chain geometry)

Input parameters

Unit system: SI

Parameter	Value	Unit
Chain pitch	19.050	mm
Teeth on the small sprocket	19.000	
Teeth on the large sprocket	57.000	
Centre distance wanted	762.00	mm

Calculated results

Parameter	Value	Unit
Chain length in pitches (exact)	118.91	
Links, rounded up to an even number	120.00	
Centre distance for that chain	772.46	mm
Chain length	2,286.0	mm
Speed ratio z_2/z_1	3.0000	

Notes for this case

- Allow adjustment or a tensioner for chain wear; an odd number of links needs an offset link.

Formula and method

$$\frac{L}{p} = \frac{2C}{p} + \frac{z_1 + z_2}{2} + \left(\frac{z_2 - z_1}{2\pi}\right)^2 \frac{p}{C}$$

$$C_e = \frac{p}{4}\left[A + \sqrt{A^2 - 8\left(\frac{z_2 - z_1}{2\pi}\right)^2}\right], \quad A = N_L - \frac{z_1 + z_2}{2}$$

Variables

p	Chain pitch	m
z_1	Teeth on the small sprocket	-
z_2	Teeth on the large sprocket	-
C	Centre distance wanted	m
L/p	Chain length in pitches (exact)	-
N_L	Links, rounded up to an even number	-
C_e	Centre distance for that chain	m
L	Chain length	m
i	Speed ratio z_2/z_1	-
A	Links less the mean tooth number	-

Method and standards

The chain length in pitches for two sprockets (Shigley, ch. 17); the second formula is its exact inverse for the rounded even link count.

Assumptions and limits

- Two sprockets, open drive; no idlers.
- About 30 to 50 pitches is the usual centre distance; under 30 or over 80 pitches is flagged.

References

• Shigley's Mechanical Engineering Design
• ch. 17 (roller chain geometry)

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/machine-design/chain-length-sprockets

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.