View Factor Between Two Coaxial Parallel Disks

Radiation view factor from one disk to a coaxial parallel disk from their radii and spacing, and the reverse view factor by reciprocity.

Method: Incropera; DeWitt; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Radius of disk i (emitter)	0.50000	m
Radius of disk j (receiver)	0.50000	m
Distance between the disks	1.0000	m

Calculated results

Parameter	Value	Unit
View factor from i to j	0.17157	
View factor from j to i	0.17157	

Formula and method

$$R_i = \frac{r_i}{L},\ R_j = \frac{r_j}{L},\ S = 1 + \frac{1 + R_j^2}{R_i^2},\quad F_{ij} = \frac{1}{2}\left\{ S - \left[S^2 - 4\left(\frac{r_j}{r_i}\right)^2 \right]^{1/2} \right\}$$

Variables

r_i	Radius of disk i (emitter)	m
r_j	Radius of disk j (receiver)	m
L	Distance between the disks	m
F_{ij}	View factor from i to j	-
F_{ji}	View factor from j to i	-

Method and standards

Analytic view factor.

Assumptions and limits

- The formula is evaluated as F = 2(r_j/r_i)²/[S + √(S² − 4(r_j/r_i)²)], algebraically the same as the textbook form but free of the cancellation that loses digits when the disks are close together.
- Diffuse surfaces, coaxial and parallel.

References

- Incropera
- DeWitt
- Bergman and Lavine
- Fundamentals of Heat and Mass Transfer
- ch. 13
- Table 13.2 (coaxial parallel disks)

Report details

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Release checks	3 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/heat-transfer/view-factor-coaxial-disks

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.