Circular sector

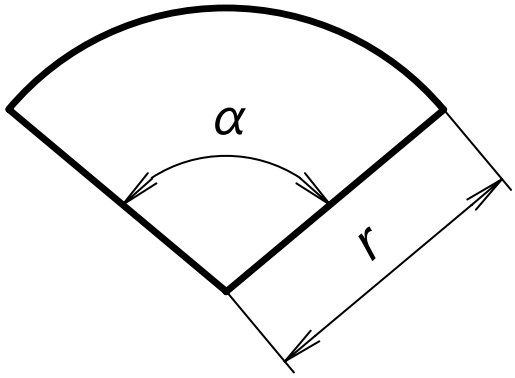

Fig. 1 - Circular sector

Values for calculation:

Twisting moment	T	1000	Nm
Radius	r	40	mm
Angle	α	150	$^\circ$
Length	L	1000	mm
Modulus of rigidity	G	80000	MPa

$$
\begin{aligned}
C &= 0.0034 - 0.0697\frac{\alpha}{180} + 0.5825\left(\frac{\alpha}{180}\right)^2 - 0.295\left(\frac{\alpha}{180}\right)^3 + 0.0874\left(\frac{\alpha}{180}\right)^4 - 0.0111\left(\frac{\alpha}{18}\right. \\
&= 0.0034 - 0.0697\frac{150}{180} + 0.5825\left(\frac{150}{180}\right)^2 - 0.295\left(\frac{150}{180}\right)^3 + 0.0874\left(\frac{150}{180}\right)^4 - 0.0111\left(\frac{15}{18}\right. \\
&= 0.217
\end{aligned}
$$

$$0.1 \leq \frac{\alpha}{180} < 1 \rightarrow 0.1 \leq 0.833 < 1$$

Does suit.

$$B$$

$$= 0.0117 - 0.2137\frac{\alpha}{180} + 2.2475\left(\frac{\alpha}{180}\right)^2 - 4.6709\left(\frac{\alpha}{180}\right)^3 + 5.1764\left(\frac{\alpha}{180}\right)^4 - 2.2\left(\frac{\alpha}{180}\right)$$

$$= 0.0117 - 0.2137\frac{150}{180} + 2.2475\left(\frac{150}{180}\right)^2 - 4.6709\left(\frac{150}{180}\right)^3 + 5.1764\left(\frac{150}{180}\right)^4 - 2.2\left(\frac{150}{180}\right)$$

$$= 0.304$$

Polar moment of inertia:

$$K = Cr^4 = 0.217 \cdot 40^4 = 555520\text{mm}^4$$

Angle of twist:

$$\theta = \frac{T \cdot 10^3 \cdot L}{KG} = \frac{1000 \cdot 10^3 \cdot 1000}{555520 \cdot 80000} = 0.023\text{rad}$$

Torsion stress:

$$\tau_{max} = \frac{T \cdot 10^3}{Br^3} = \frac{1000 \cdot 10^3}{0.304 \cdot 40^3} = 51.4\text{MPa}$$