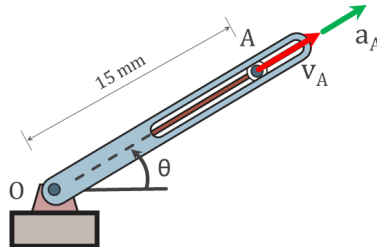


Slider in Rotating Arm



A slider moves inside a rotating radial slot. Determine the acceleration mm/s^2 in radial direction at the instant $t = 3$ seconds. At this time instant the distance between the slider and point O is 15mm , the sliders velocity is 12 mm/s and its acceleration is 4 mm/s^2 . Furthermore, it is given that $v_\theta = 3.75\text{mm/s}$. Round to the nearest integer (no decimals).

Using known expressions:

$$v_\theta = r \cdot \dot{\theta} \quad \Rightarrow \quad \dot{\theta} = \frac{v_\theta}{r} \quad (1)$$

$$a_r = \ddot{r} - r \cdot \dot{\theta}^2 \quad (2)$$

Given:

Velocity in θ direction: $v_\theta = 3.75\text{mm/s}$

Distance between slider and O : $r = 15\text{mm}$

Velocity of the slider: $\dot{r} = 12\text{mm/s}$

Acceleration of the slider: $\ddot{r} = 4\text{mm/s}^2$

Calculating $\dot{\theta}$ using Equation 1 gives:

$$\dot{\theta} = \frac{v_\theta}{r} = \frac{3.75}{15} = 0.25\text{rad/s} \quad (3)$$

Now a_r can be calculated as follows:

$$a_r = \ddot{r} - r \cdot \dot{\theta}^2 = 4 - 15 \cdot 0.25^2 = 3.0625\text{mm/s}^2 \approx 3\text{mm/s}^2 \quad (4)$$