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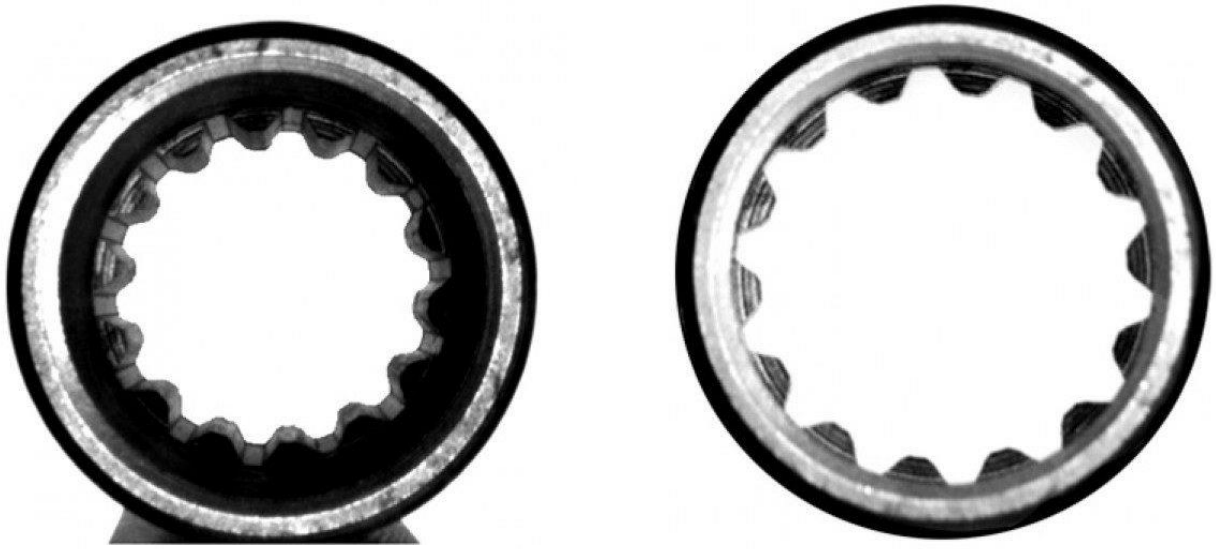
Fundamentals of Industrial Measurement Technology

Lens



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Why is it critical?

In geometric measurement systems, the lens’s role is to **project the real-world scene onto the camera sensor**. The accuracy of the measurement is heavily influenced by the type of optics we choose. What should we consider?

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Magnification

- Determines how many **millimeters** correspond to **1 pixel** on the sensor.
- Magnification + camera resolution together **define** the measurement **resolution** and the visible area (FOV)

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Depth of Field (DOF)

- The range in which the image **remains sharp.**
- Even within the DOF objects closer to the lens appear larger → this can introduce geometric error

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Telecentric lenses

- Provide the **same measured** size for objects at **different distances** (within the DOF range)
- Industrial advantage: **distortion-free** dimensional measurement
- Drawback: **larger physical size** and **higher cost**

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