Model a stepped spur pinion shaft with integral gear and wrench flats

Software: Siemens NX

Task statement

Model a stepped spur pinion shaft in millimetres as a single solid body, and produce its detail drawing. Use the supplied dimensioned diagrams diagram_01.png, diagram_01_detail01.png, diagram_01_detail02.png, diagram_01_detail03.png and diagram_01_detail04.png as the design reference.

The part is a turned shaft on one straight axis. Its overall length is 100 mm and its envelope diameter is 40 mm, which is set by the gear tip circle. Working from the left end, the shaft has:

- a short plain journal
- a larger collar
- an integral spur gear with 20 teeth and a 40 mm outside diameter
- a second larger collar
- a long reduced shank

Apply the features shown on the sheets:

- Blend concave fillets between the gear faces and the adjacent collars.
- Round the tooth tip edges.
- Mill a pair of opposed wrench flats into the right-hand end of the shank.
- Chamfer or round the end.
- Drill a small centre hole on the axis in the right-hand end face.

The end view dimensions an R11.5 (Ø23) circular feature. The model must match this value. Take step lengths and the remaining diameters from the supplied diagrams, keeping the proportions shown.

Save the part as Stepped_Gear_Shaft.prt. It shall contain one solid body with no extra bodies or sheet geometry.

Create a drawing file, Stepped_Gear_Shaft_dwg1.prt, that references the part. It shall be on one A3 sheet at 1:1 scale in third angle projection, with a side view, an end view and an isometric view.

Show these dimensions:

- the 40 overall diameter
- the 100 overall length
- the Ø23 (R11.5) circle on the end view

Fill in the title block with a title, a drawing number, the sheet size and the scale, and state that dimensions are in millimetres.

Rubrics

- **R1:** The model shall have an overall length of 100 mm along the shaft axis.
- **R2:** The model shall have a maximum diameter of 40 mm at the gear teeth tips.
- **R3:** The model shall include an integral spur gear with 20 teeth.
- **R4:** The model shall include a stepped shaft with a collar on each side of the gear and a reduced-diameter journal at the left end.
- **R5:** The model shall include a pair of opposed wrench flats at the right-hand end of the shank.

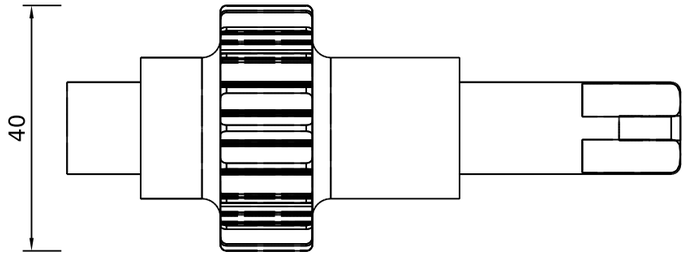
- **R6:** The model shall include an axial centre hole in the right-hand end face.
- **R7:** The model shall include concave fillets blending the gear faces into the adjacent collars.
- **R8:** The model shall include an R11.5 (Ø23) circular feature.
- **R9:** The drawing shall contain a side view, an end view and an isometric view of the shaft.
- **R10:** The drawing shall dimension the 100 overall length and the 40 overall diameter.
- **R11:** The drawing shall dimension the Ø23 (R11.5) circle on the end view.
- **R12:** The drawing shall have a title block with a title, a drawing number, size A3 and scale 1:1, and state that dimensions are in millimetres.
- **R13:** The drawing shall indicate third angle projection.
- **R14:** The model shall be saved as Stepped_Gear_Shaft.prt containing exactly one solid body.
- **R15:** The drawing shall be saved as Stepped_Gear_Shaft_dwg1.prt referencing the shaft part.
- **R16:** The model shall use millimetres as its units.

Input files

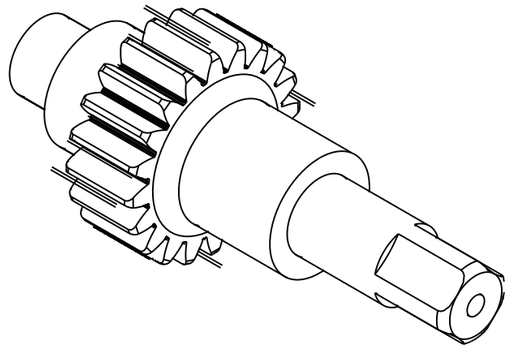
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- task_files/diagrams/diagram_01.png
- task_files/diagrams/diagram_01_detail01.png
- task_files/diagrams/diagram_01_detail02.png
- task_files/diagrams/diagram_01_detail03.png
- task_files/diagrams/diagram_01_detail04.png

Deliverables

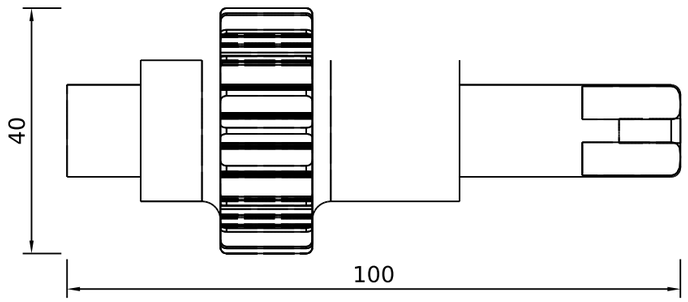
- **.prt:** output_files/project_files/Stepped_Gear_Shaft.prt: The deliverable is a single-solid Stepped_Gear_Shaft.prt of the 100 mm long, 40 mm diameter 20-tooth pinion shaft, plus Stepped_Gear_Shaft_dwg1.prt containing the dimensioned A3 four-view drawing.
- **.prt:** output_files/project_files/Stepped_Gear_Shaft_dwg1.prt: The deliverable is a single-solid Stepped_Gear_Shaft.prt of the 100 mm long, 40 mm diameter 20-tooth pinion shaft, plus Stepped_Gear_Shaft_dwg1.prt containing the dimensioned A3 four-view drawing.
- **.stp:** output_files/project_files/Stepped_Gear_Shaft.stp: STEP export of the model in the same units.



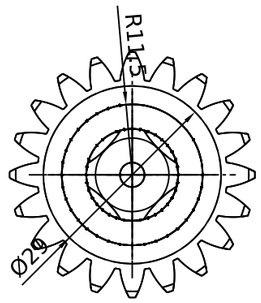
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



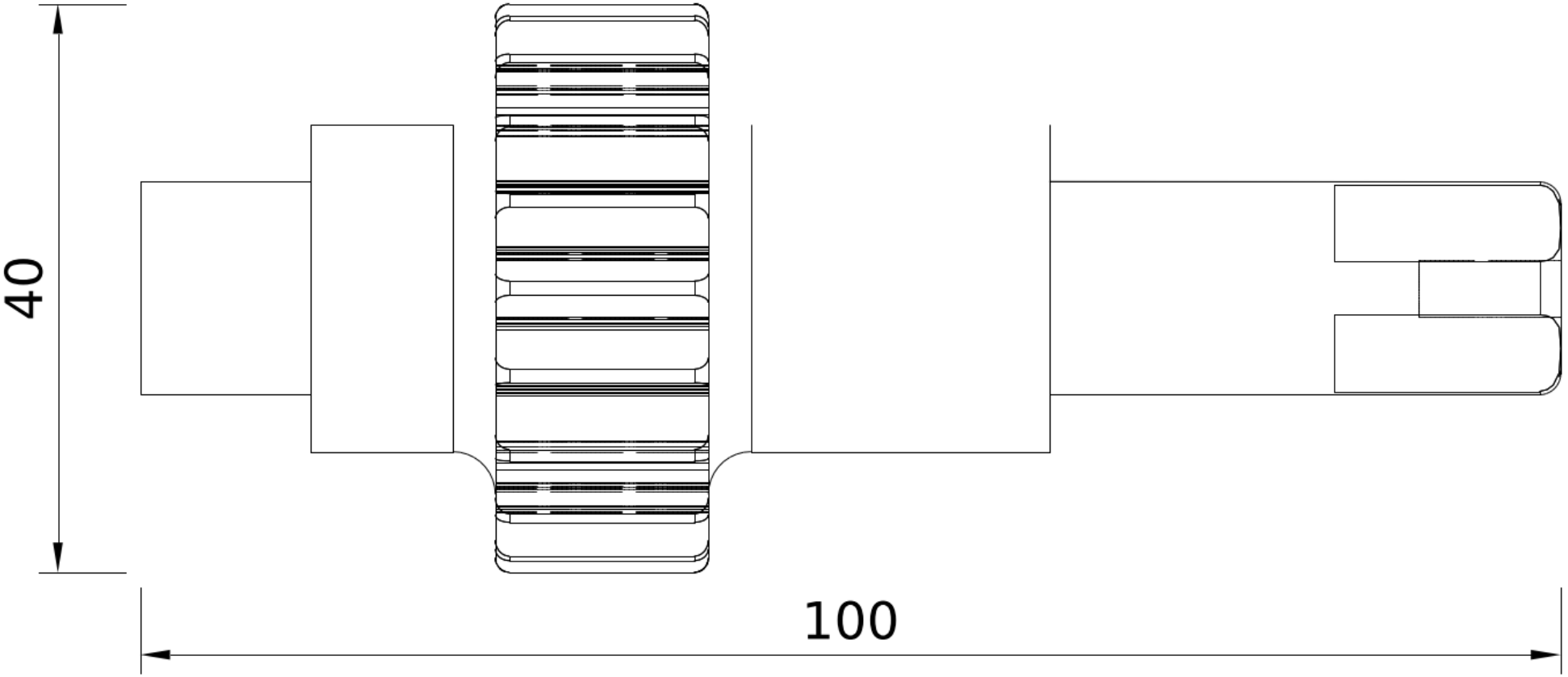
RIGHT SIDE VIEW

NOTES
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.
2. DO NOT SCALE THE DRAWING; USE THE FIGURED DIMENSIONS.
3. VIEWS IN THIRD ANGLE PROJECTION.

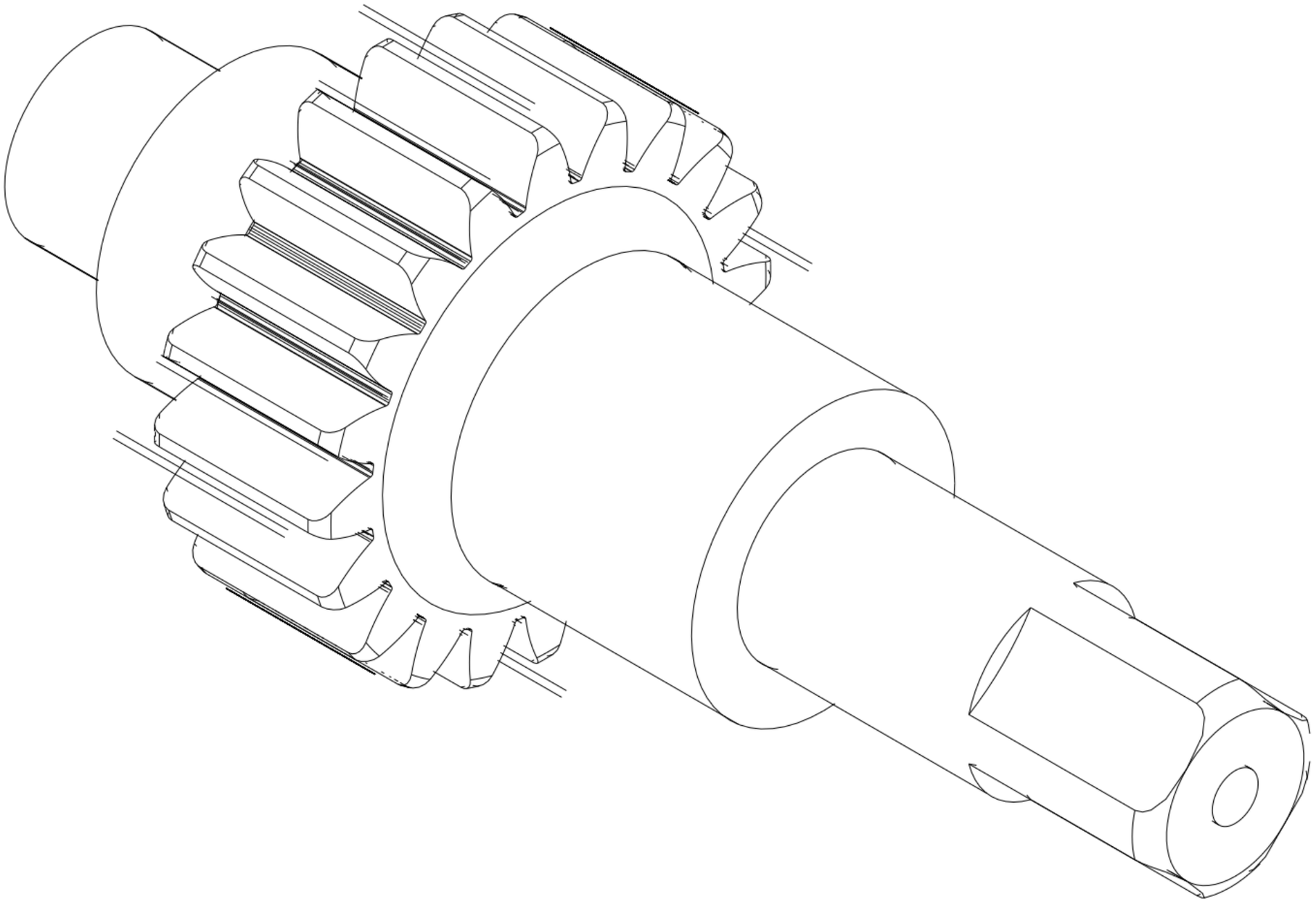
UNITS	SCALE	PROJECTION
MILLIMETRES	**1:1**	

TITLE	SIZE
STEPPED SPUR PINION SHAFT WITH INTEGRAL GEAR AND WRENCH FLATS	**A3**

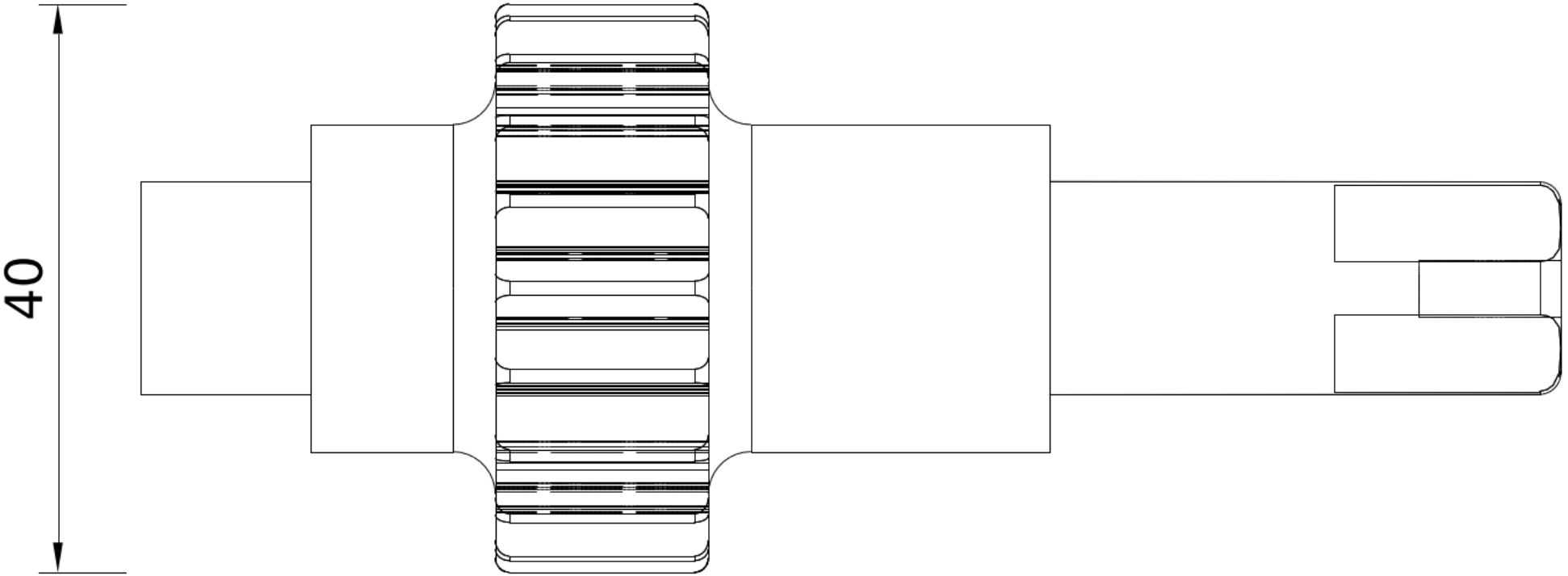
DRAWING NO.	REV	SHEET
MKV-5878B1E1-01	**0**	**1 OF 1**



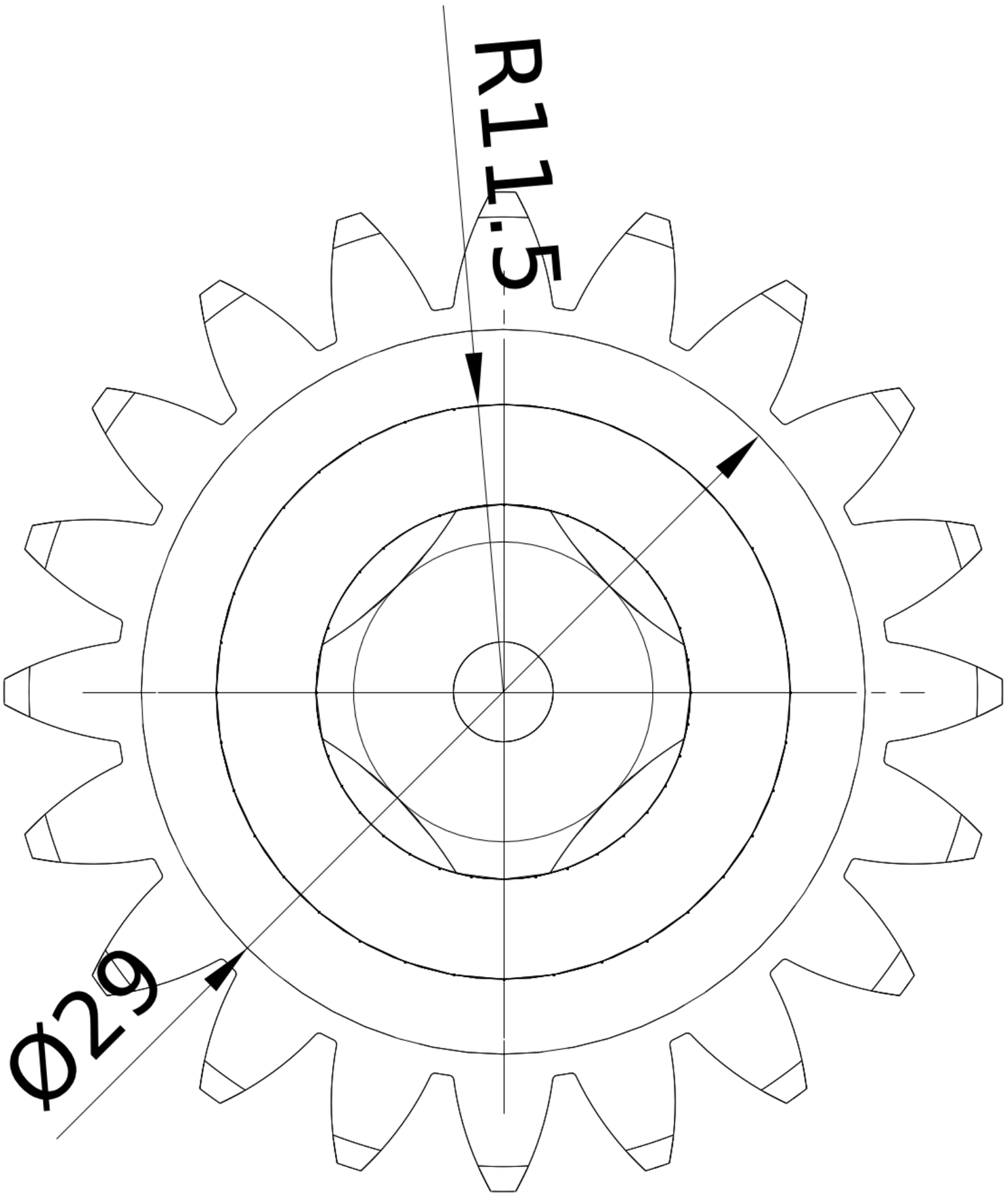
FRONT VIEW



ISOMETRIC VIEW



TOP VIEW


R11.5
Φ29