Model an oscillating wobbler steam engine assembly

Software: SOLIDWORKS

Task statement

Model a miniature oscillating (wobbler) steam engine as an eight-part assembly, following the supplied dimensioned diagrams (diagram_01.png through diagram_09.png and their detail views). Model the parts in inches, matching the fractional-inch sizes on the sheets. The assembly is presented in millimetres. Overall envelope is about 67.64 x 43.66 mm in the top and front views.

Parts, one of each:

1. COLUMN: a revolved display column 66.67 mm (2.625 in) tall on a Ø34.92 mm (1.375 in) base ring. It has a 1.27 x 45° chamfer, upper and lower flats, small holes, a cross hole and a relief cut.

2. BEARING: a flanged sleeve bushing 17.46 mm (11/16 in) long. Flange Ø9.53 mm (3/8 in), shank Ø7.94 mm (5/16 in), through bore Ø4.76 mm (3/16 in), R0.005 in edge fillet.

3. CRANKSHAFT: a half-disc crank web of Ø17.46 mm, 3.97 mm thick, with a crank pin and a Ø4.76 mm (0.1875 in) x 31.75 mm (1.25 in) main shaft.

4. FLYWHEEL: Ø31.75 mm (1.25 in) x 7.94 mm (5/16 in) with a Ø4.76 mm bore. It has mirrored Ø22.23 mm (0.875 in) face recesses, mirrored Ø9.53 mm (0.375 in) hub bosses and a radial set-screw hole.

5. CYLINDER: an octagonal body 28.58 mm (1.125 in) long with a Ø9.53 mm bore, an end collar, recesses and an integral rod.

6. PISTON: a revolved piston head with an integral rod, ending in a 6.35 mm clevis block with a cross pin hole. Overall length along the rod axis is 38.1 mm.

7. WASHER: Ø0.406 in OD x Ø0.141 in ID x 0.045 in thick.

8. NUT: a hex nut 0.312 in (7.92 mm) across flats and 0.114 in thick, with a Ø1/8 in bore and a double-sided 30° corner chamfer.

Part modelling requirements:

- Build each part from fully defined sketches.
- Give sketches and features descriptive names.
- Assign a steel material to every part.
- Fill in the custom properties Description, PartNo and Material.

Assembly requirements:

- Fix the column.
- Locate all other components with concentric, coincident and tangent mates so that there are no mate errors.
- Arrange the parts as shown in the isometric and right side views: bearing in the column, crankshaft through the bearing, flywheel on the shaft, and cylinder pivoting on the column with washer and nut.
- Give the assembly the custom properties Description, PartNo and Material.

Rubrics

- **R1:** The model shall be an assembly containing exactly eight resolved, unsuppressed components: column, bearing, crankshaft, flywheel, cylinder, piston, washer and nut.

- **R2:** The model's column part shall be a revolved body 66.67 mm (2.625 in) tall with a Ø34.92 mm base ring and a 1.27 x 45° chamfer.
- **R3:** The model's column shall include flats and cross-hole cut features.
- **R4:** The model's bearing shall be a flanged bushing 17.46 mm long with a Ø9.53 mm flange, a Ø7.94 mm shank and a Ø4.76 mm through bore.
- **R5:** The model's crankshaft shall have a half-disc web of Ø17.46 mm, a crank pin, and a main shaft of Ø4.76 mm x 31.75 mm.
- **R6:** The model's flywheel shall be Ø31.75 mm x 7.94 mm with a Ø4.76 mm bore, mirrored Ø22.23 mm face recesses, mirrored Ø9.53 mm hub bosses and a radial set-screw hole.
- **R7:** The model's cylinder shall have an octagonal body 28.58 mm long with a Ø9.53 mm bore and an integral rod.
- **R8:** The model's piston shall have a revolved head and rod with a 6.35 mm clevis block containing a cross pin hole, 38.1 mm overall along the rod axis.
- **R9:** The model's washer shall be Ø0.406 in OD x Ø0.141 in ID x 0.045 in thick.
- **R10:** The model's nut shall be a hex 0.312 in (7.92 mm) across flats and 0.114 in thick, with a Ø1/8 in bore and a 30° corner chamfer on both sides.
- **R11:** The model's assembled envelope shall be approximately 67.64 mm by 43.66 mm in the top/front view directions.
- **R12:** The model shall have the column component fixed and all other components positioned by mates.
- **R13:** The model shall use concentric, coincident and tangent mates, with no mate errors.
- **R14:** The model's part features and sketches shall carry descriptive names, e.g. 'Flanged Bushing Body' and 'Main Shaft Ø0.1875'.
- **R15:** The model's parts shall each have a steel material assigned.
- **R16:** The model's parts and assembly shall each carry Description, PartNo and Material custom properties.

Input files

- task_files/diagrams/diagram_01.pdf
- 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
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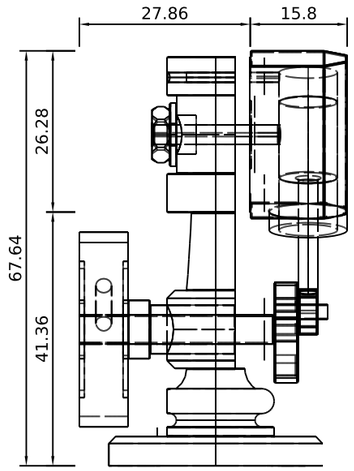
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Deliverables

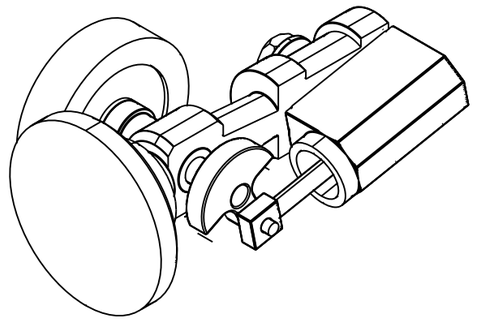
- **.sldasm:** output_files/project_files/Assem2.SLDASM: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/BEARING.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/COLUMN.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/CRANKSHAFT.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/CYLINDER.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/FLYWHEEL.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/NUT.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/PISTON.SLDPRT: A native assembly file referencing eight native part files (column, bearing, crankshaft, flywheel, cylinder, piston, washer, nut), each with named features, steel material and custom properties, located by error-free mates with the column fixed.
- **.sldprt:** output_files/project_files/WASHER.SLDPRT: A native assembly file referencing eight native part

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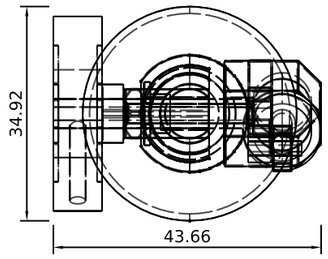
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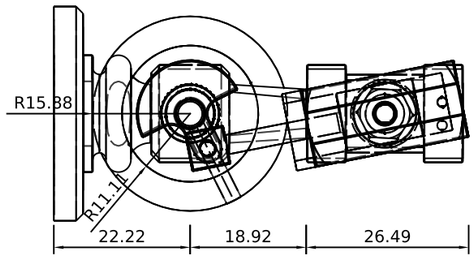
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



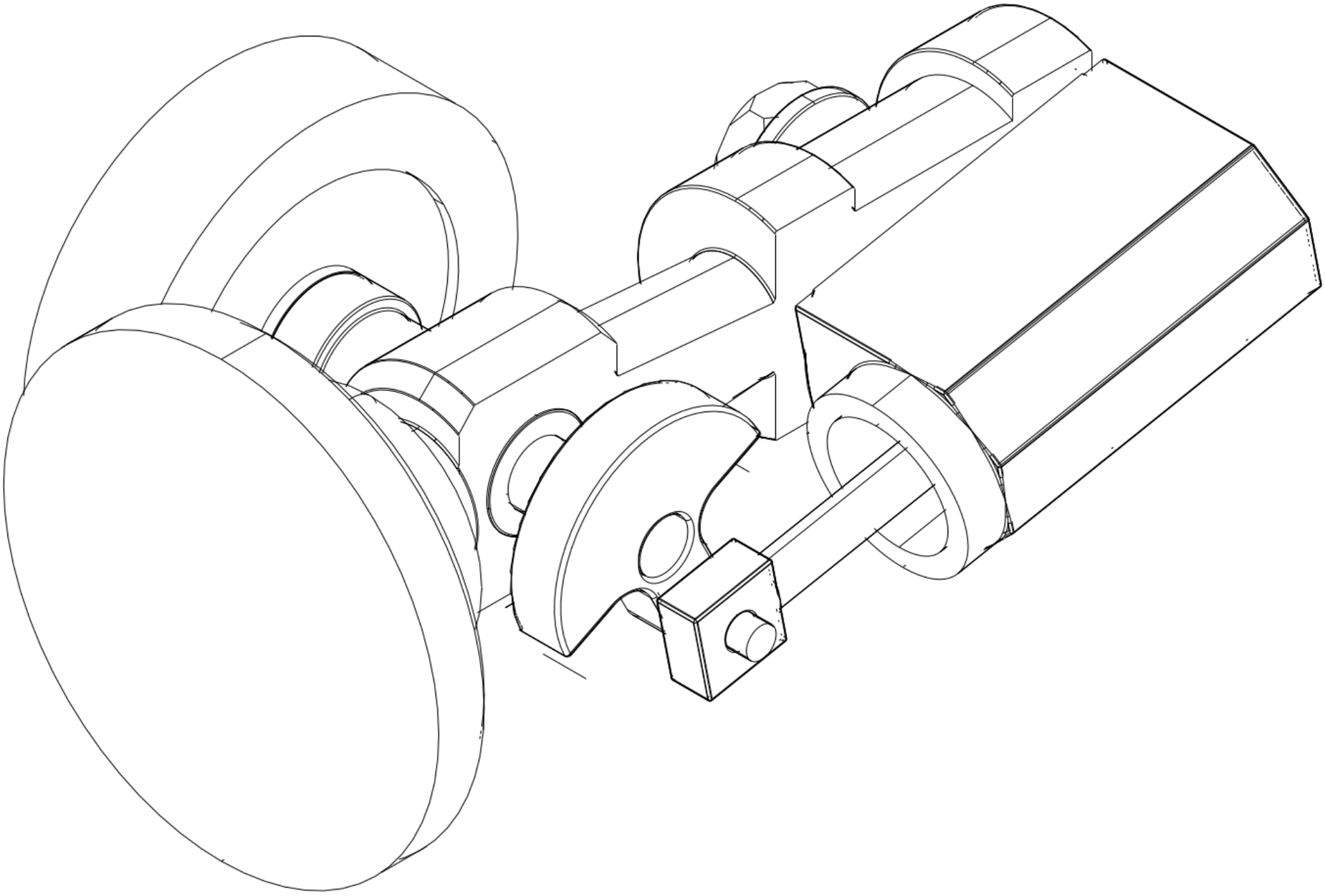
RIGHT SIDE VIEW

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.

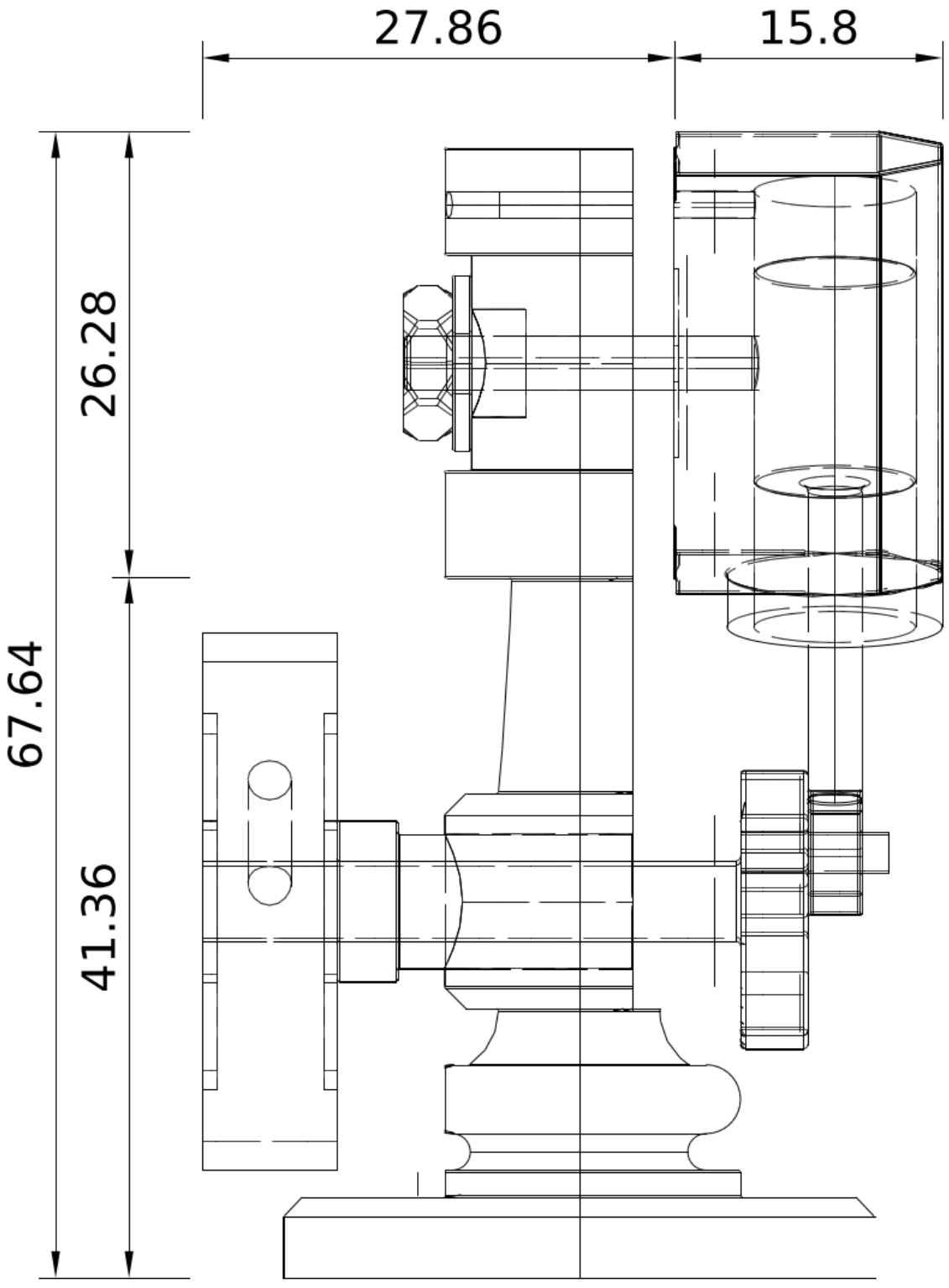
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TITLE	SIZE
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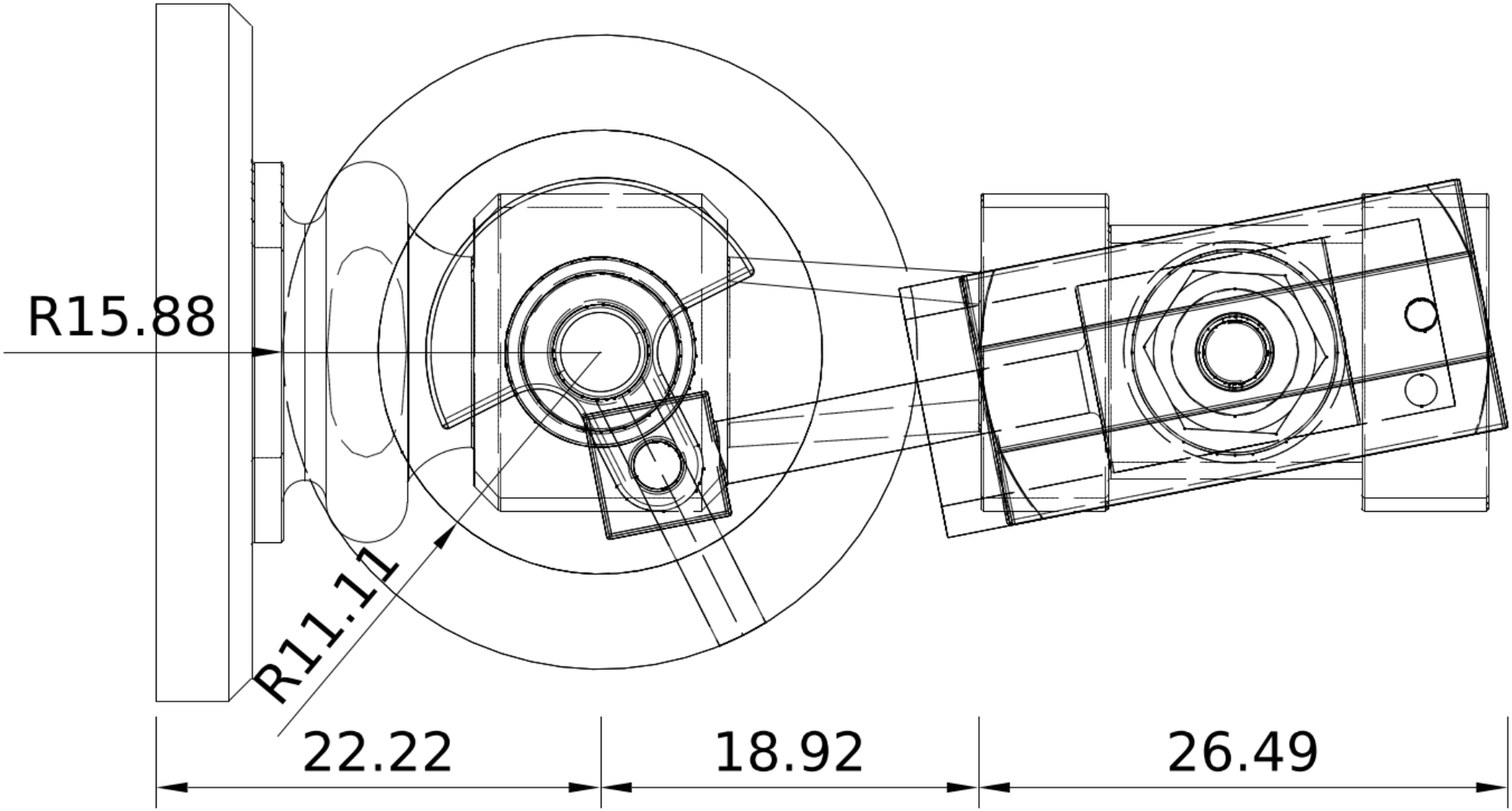
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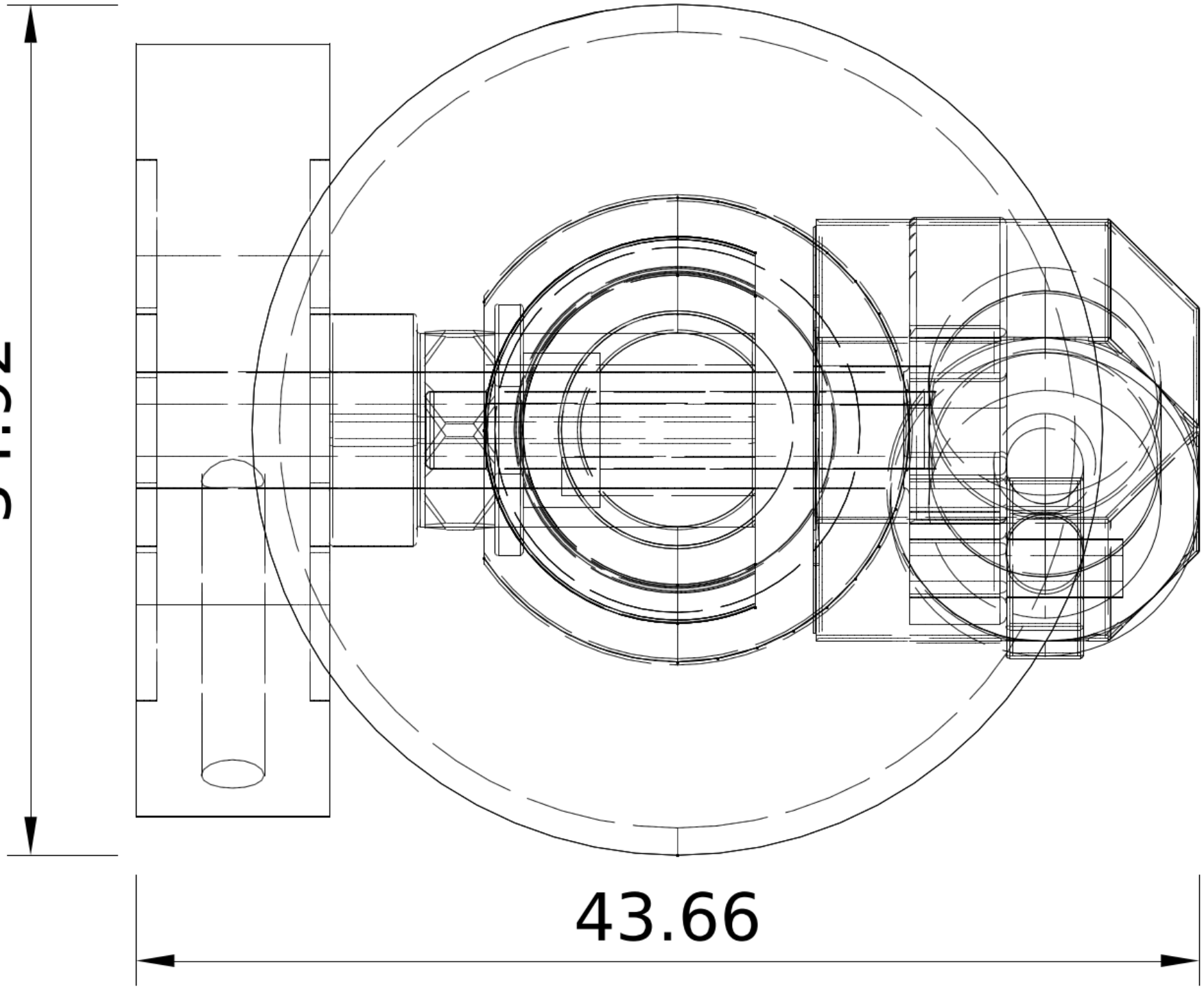
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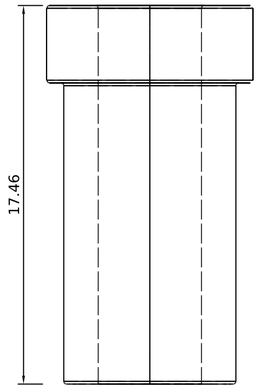
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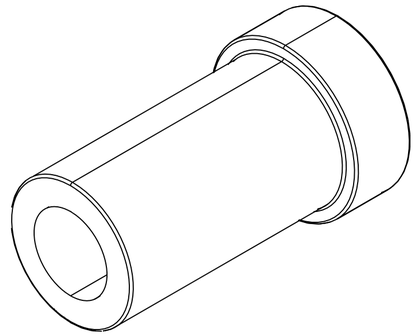
RIGHT SIDE VIEW



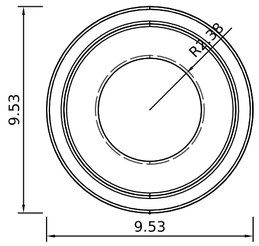
FRONT VIEW



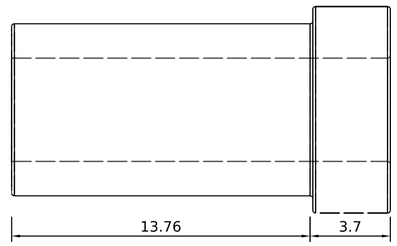
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



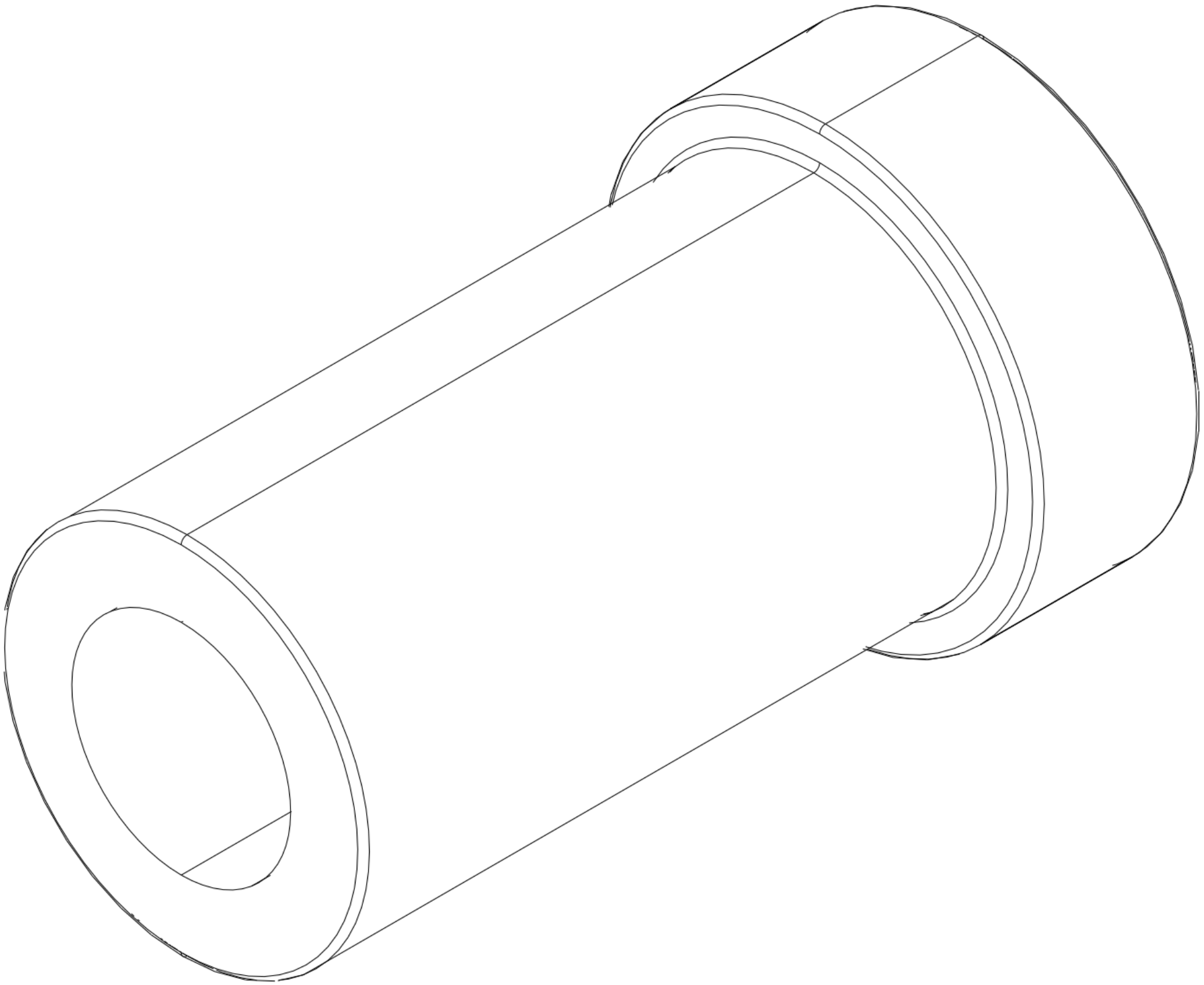
RIGHT SIDE VIEW

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3. VIEWS IN THIRD ANGLE PROJECTION.

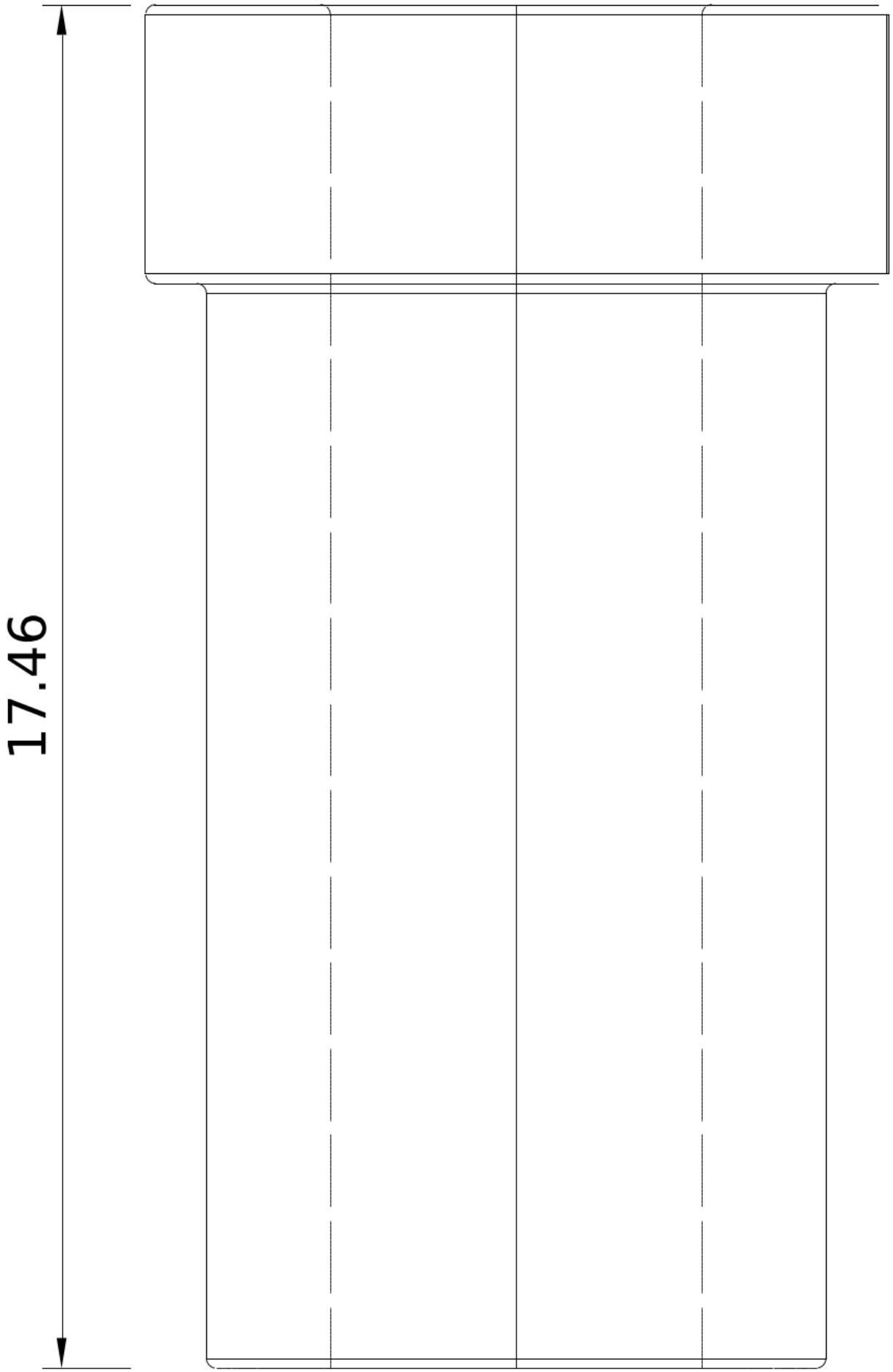
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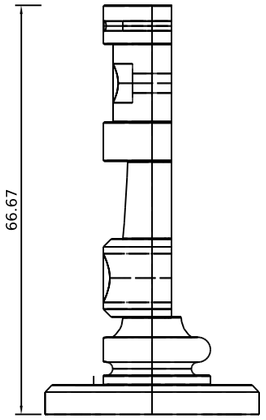
TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A2**

DRAWING NO.	REV	SHEET
MKV-A238B499-02	**0**	**2 OF 9**

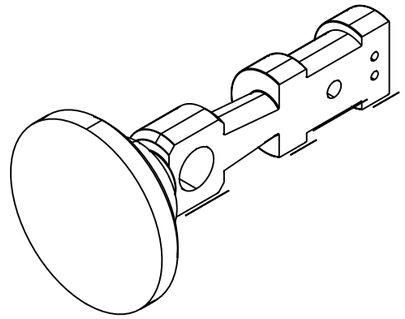


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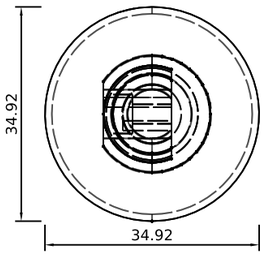

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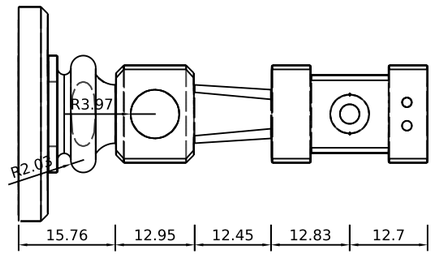
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



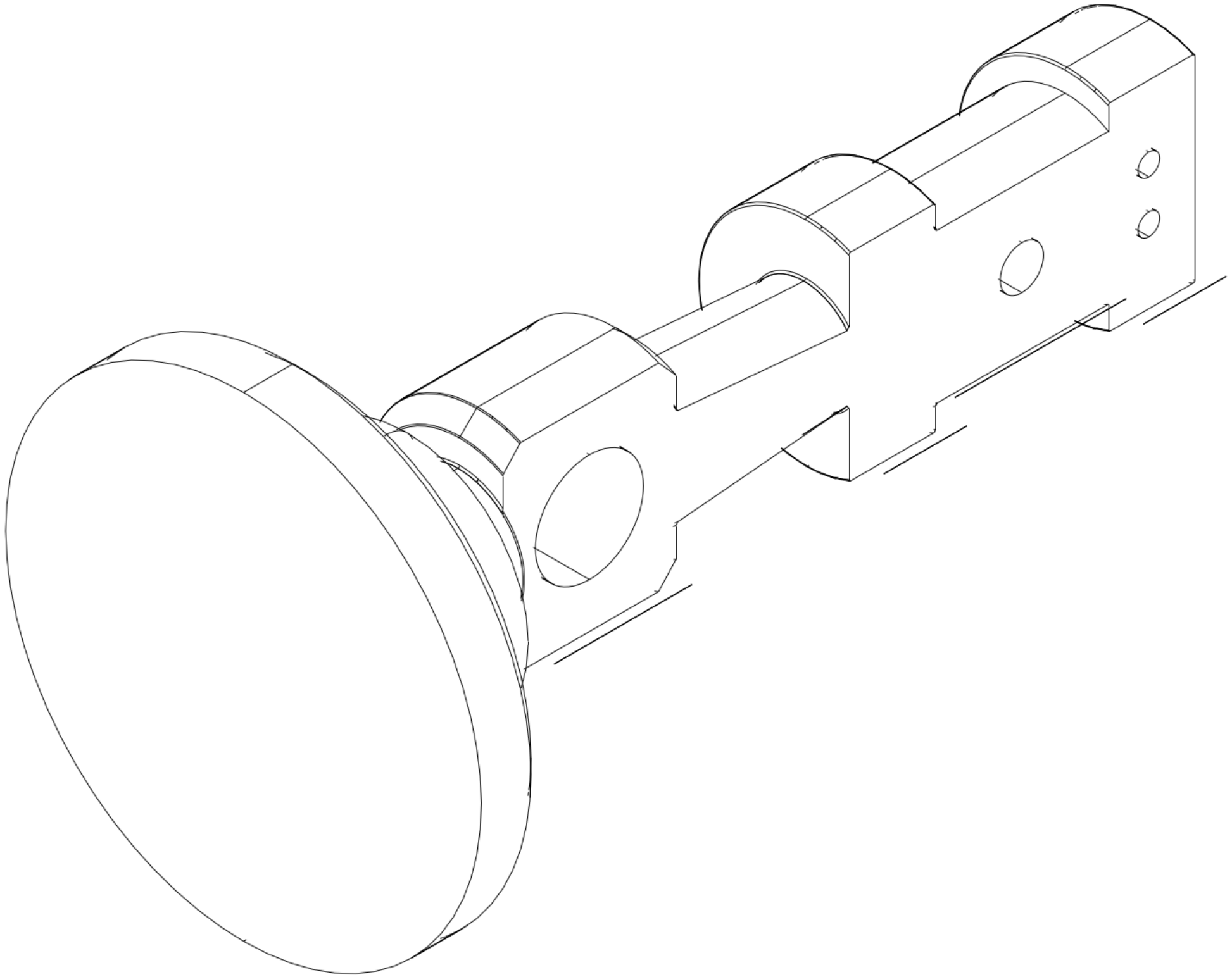
RIGHT SIDE VIEW

NOTES
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2. DO NOT SCALE THE DRAWING; USE THE FIGURED DIMENSIONS.
3. VIEWS IN THIRD ANGLE PROJECTION.

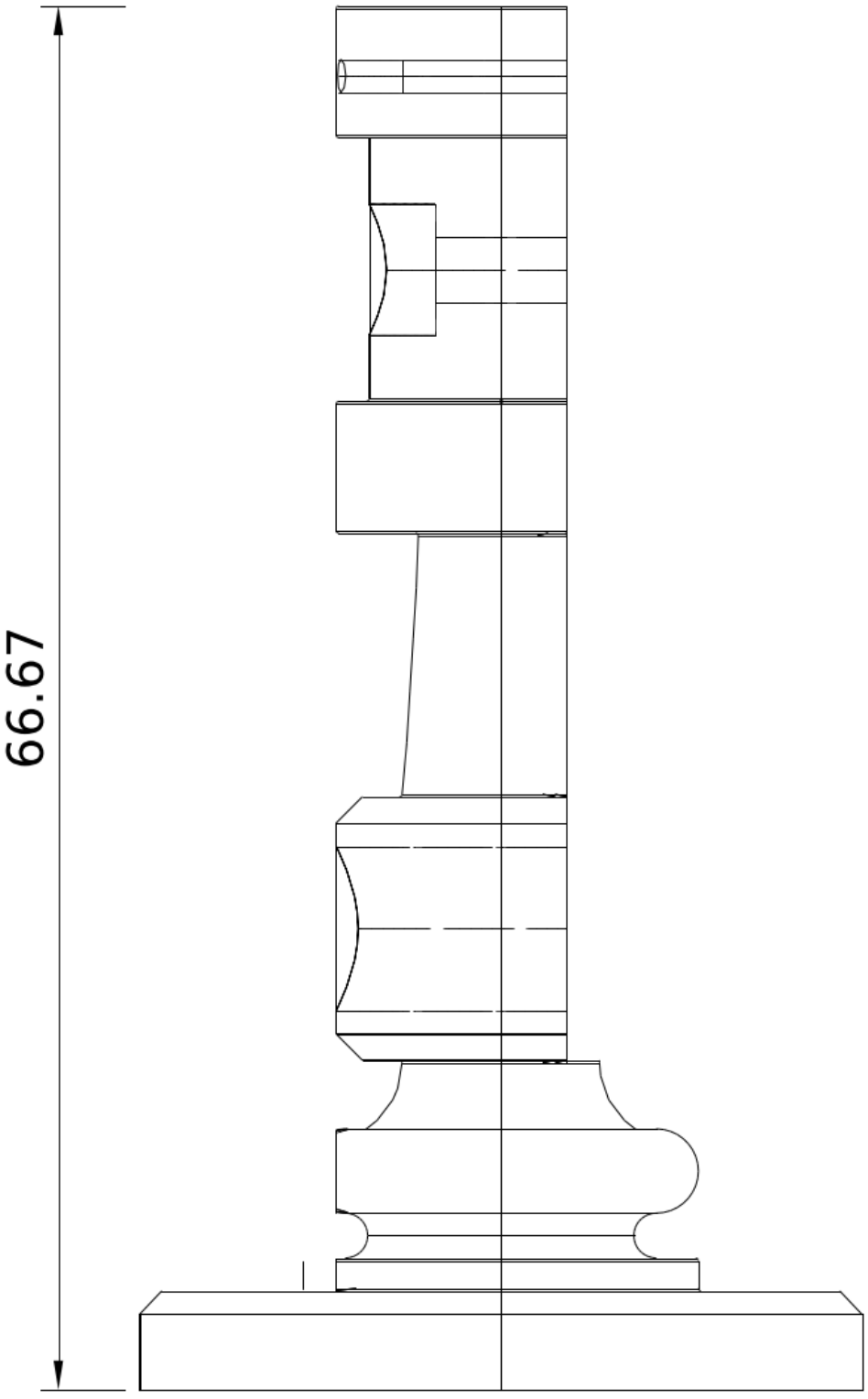
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MILLIMETRES	**1:1**	

TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A3**

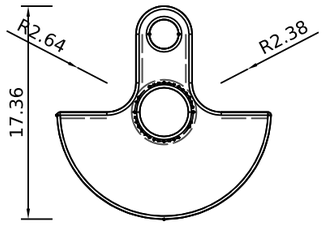
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MKV-A238B499-03	**0**	**3 OF 9**



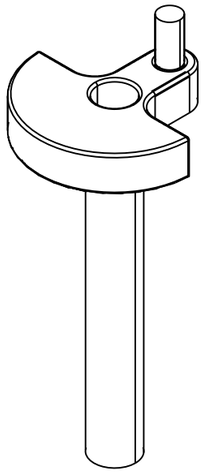
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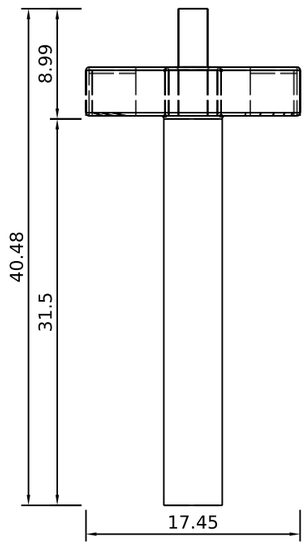
TOP VIEW



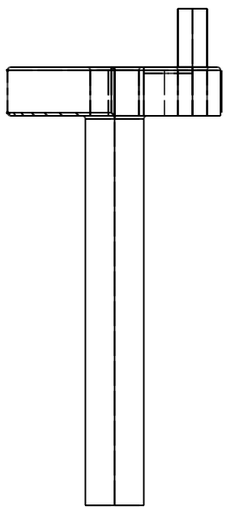
TOP VIEW



ISOMETRIC VIEW



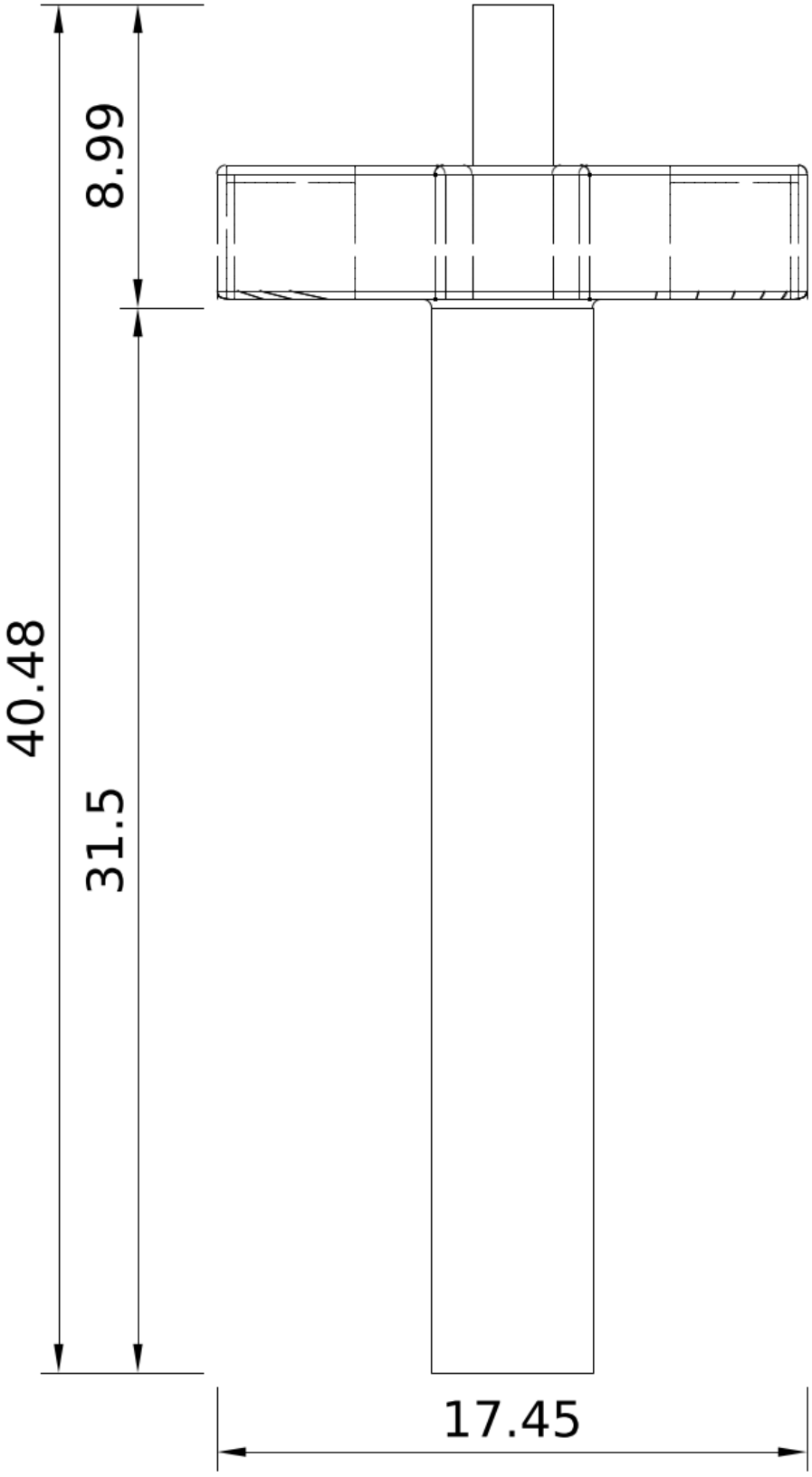
FRONT VIEW



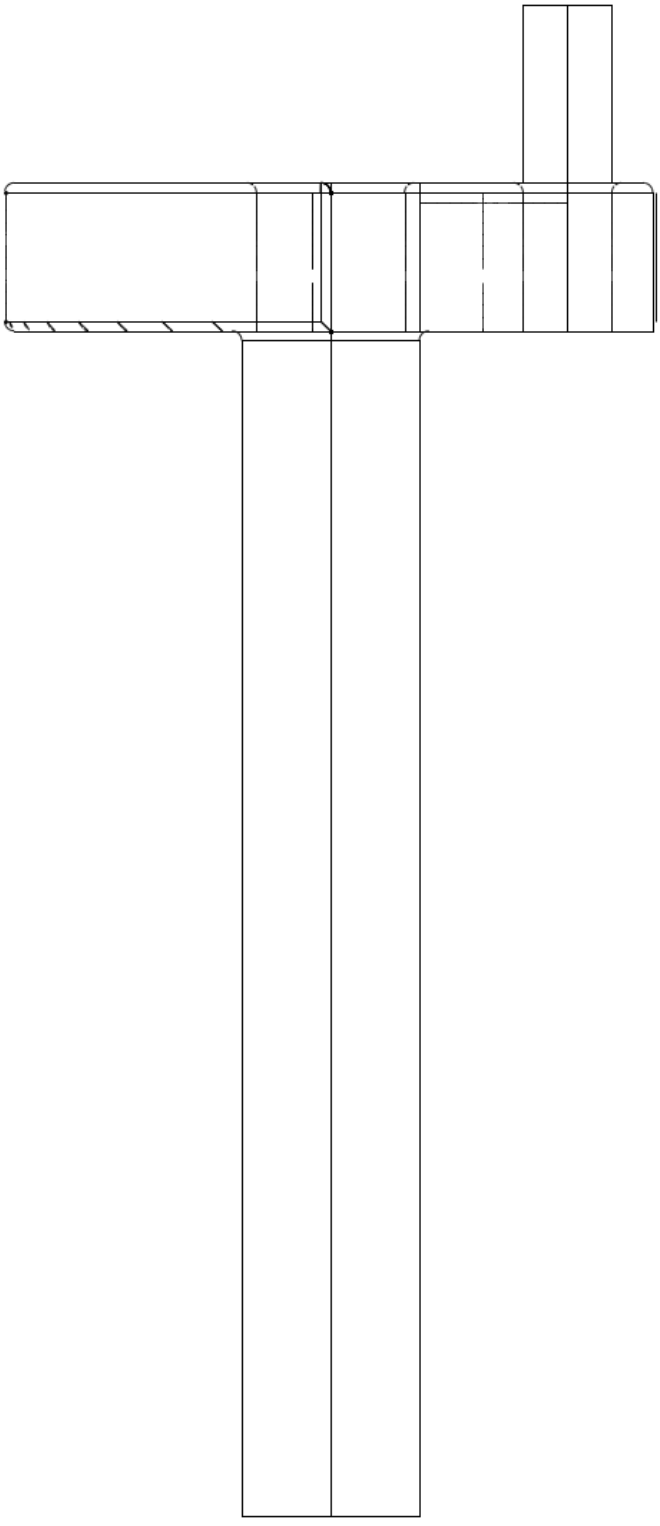
RIGHT SIDE VIEW

NOTES
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2. DO NOT SCALE THE DRAWING; USE THE FIGURED DIMENSIONS.
3. VIEWS IN THIRD ANGLE PROJECTION.

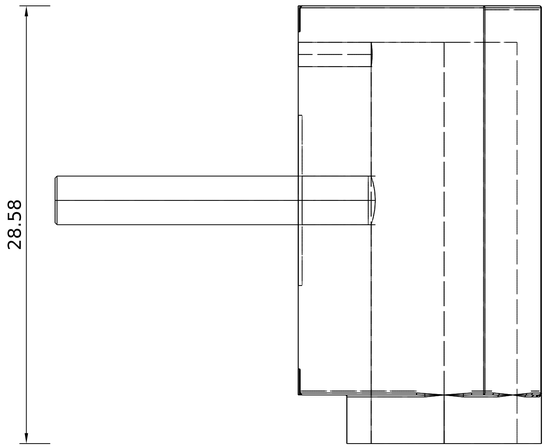
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TITLE **OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY**		SIZE **A3**
DRAWING NO. **MKV-A238B499-04**	REV **0**	SHEET **4 OF 9**



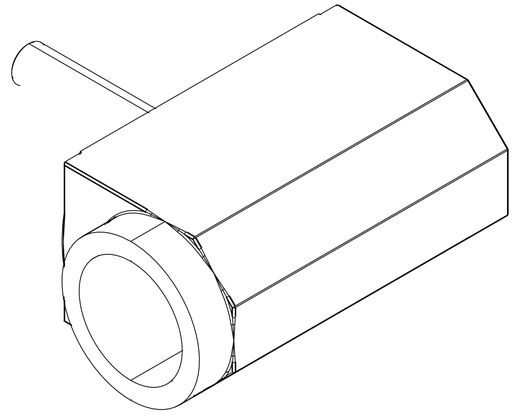
FRONT VIEW



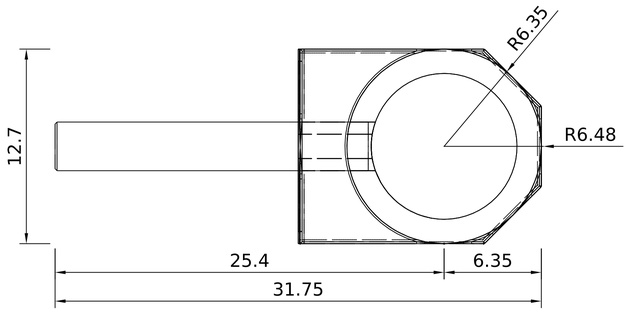
RIGHT SIDE VIEW



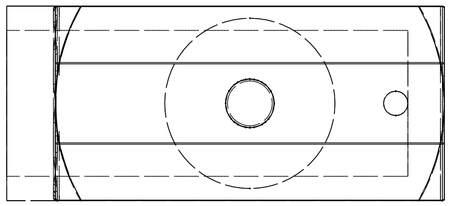
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



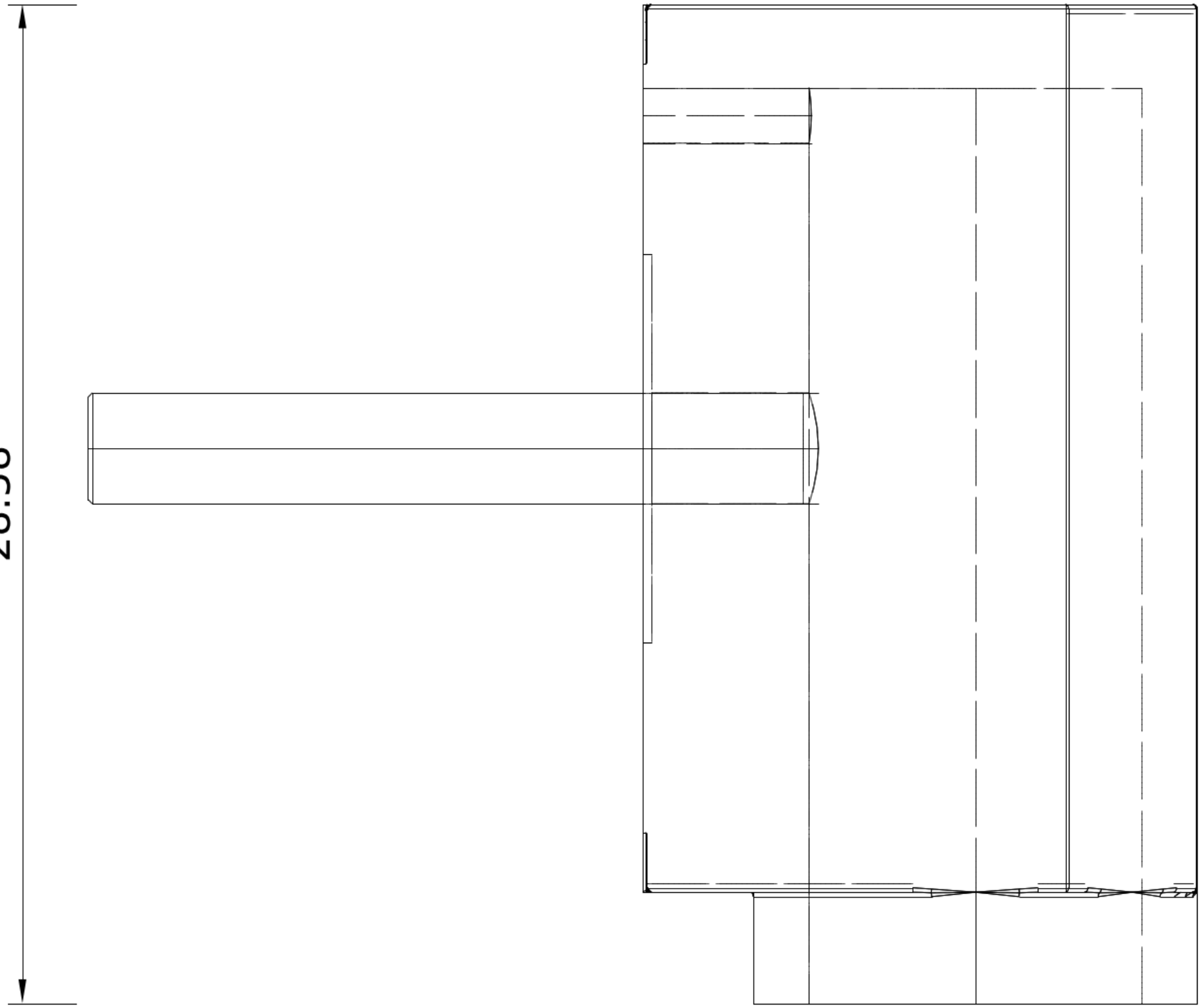
RIGHT SIDE VIEW

NOTES
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3. VIEWS IN THIRD ANGLE PROJECTION.

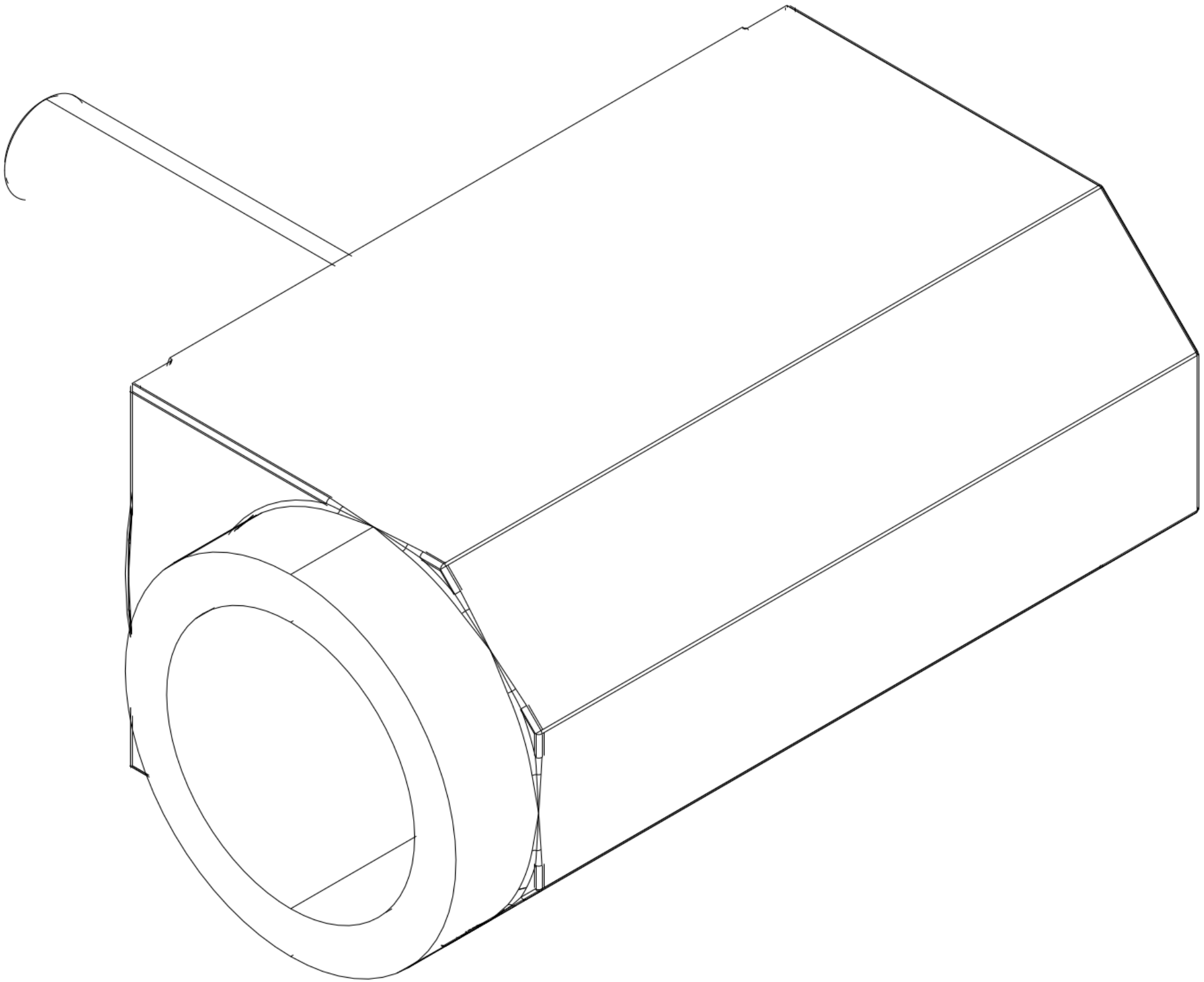
UNITS	SCALE	PROJECTION
MILLIMETRES	**5:1**	

TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A1**

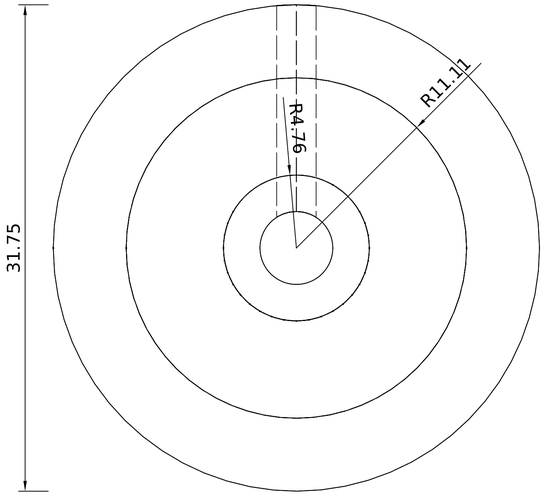
DRAWING NO.	REV	SHEET
MKV-A238B499-05	**0**	**5 OF 9**



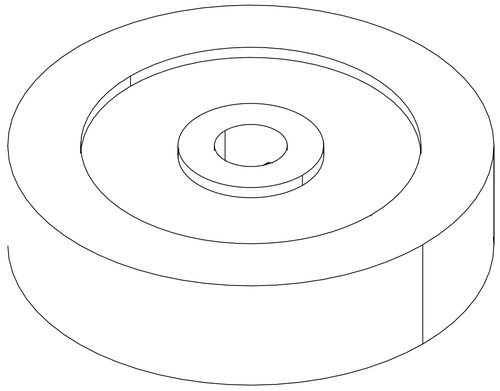
TOP VIEW



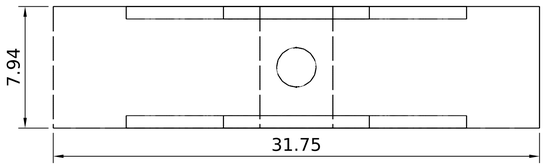
ISOMETRIC VIEW



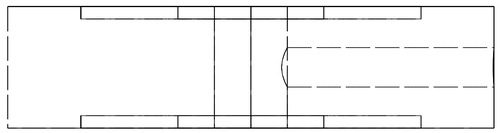
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



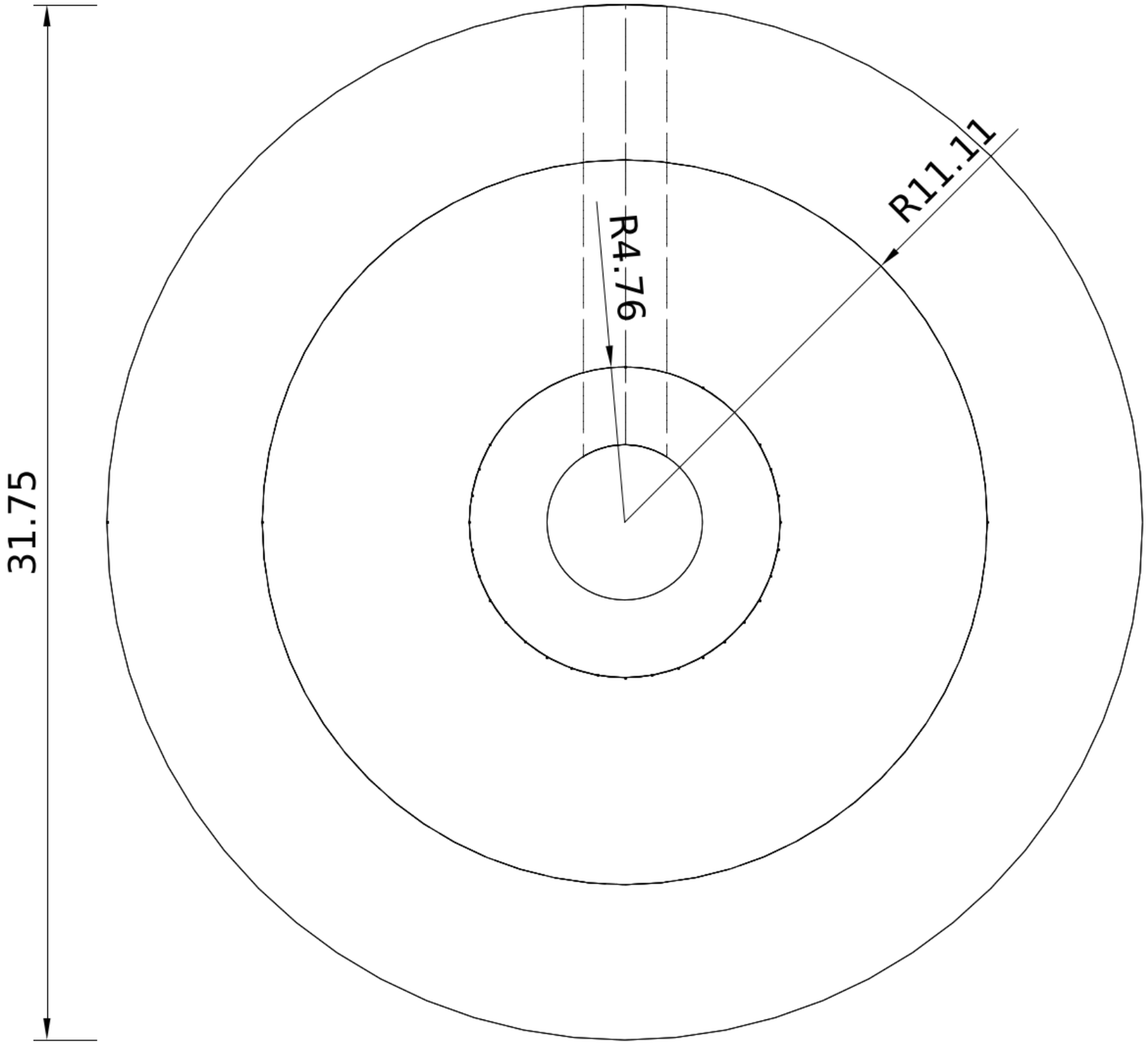
RIGHT SIDE VIEW

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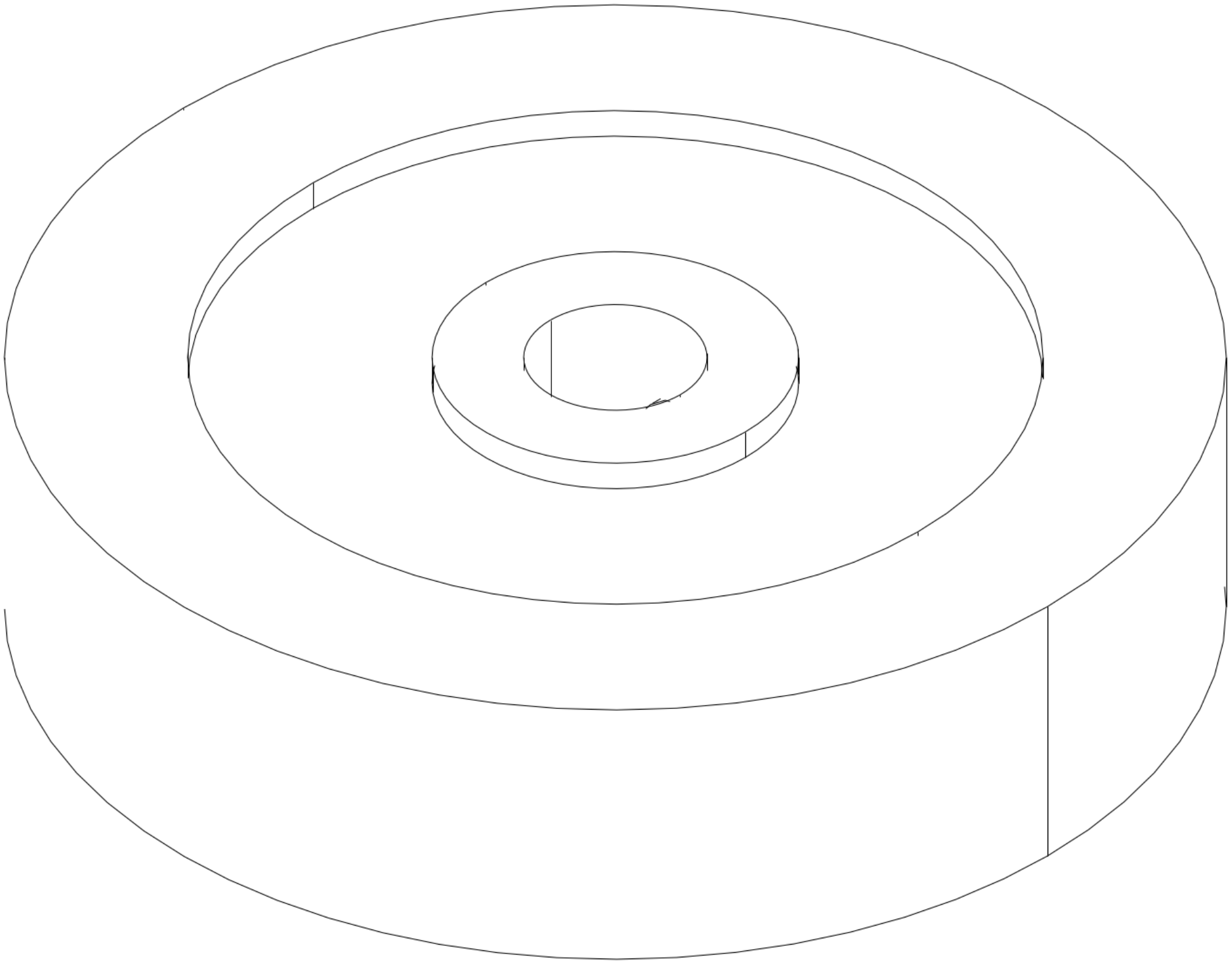
UNITS	SCALE	PROJECTION
MILLIMETRES	**5:1**	

TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A1**

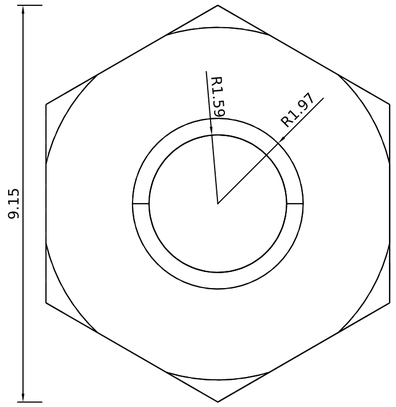
DRAWING NO.	REV	SHEET
MKV-A238B499-06	**0**	**6 OF 9**



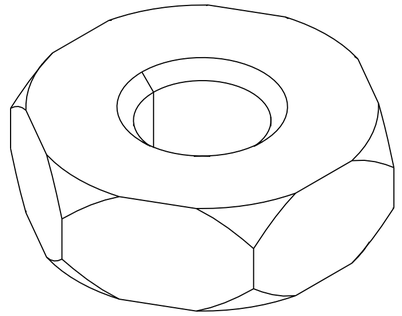
TOP VIEW



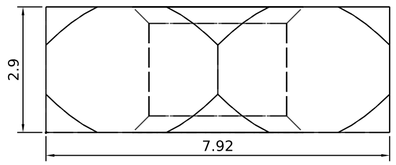
ISOMETRIC VIEW



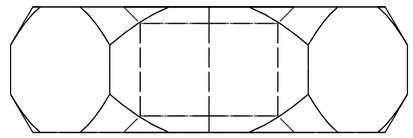
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



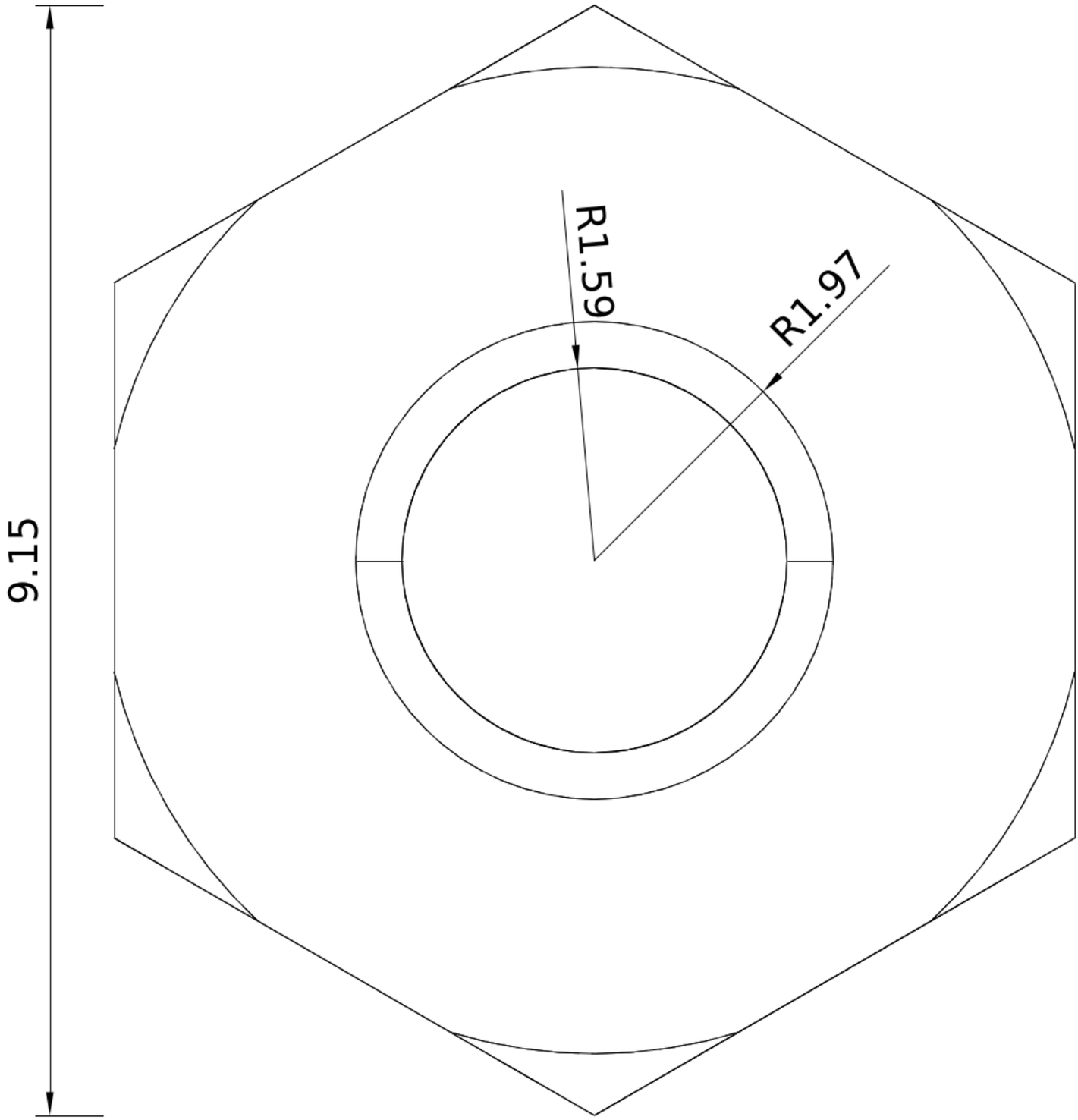
RIGHT SIDE VIEW

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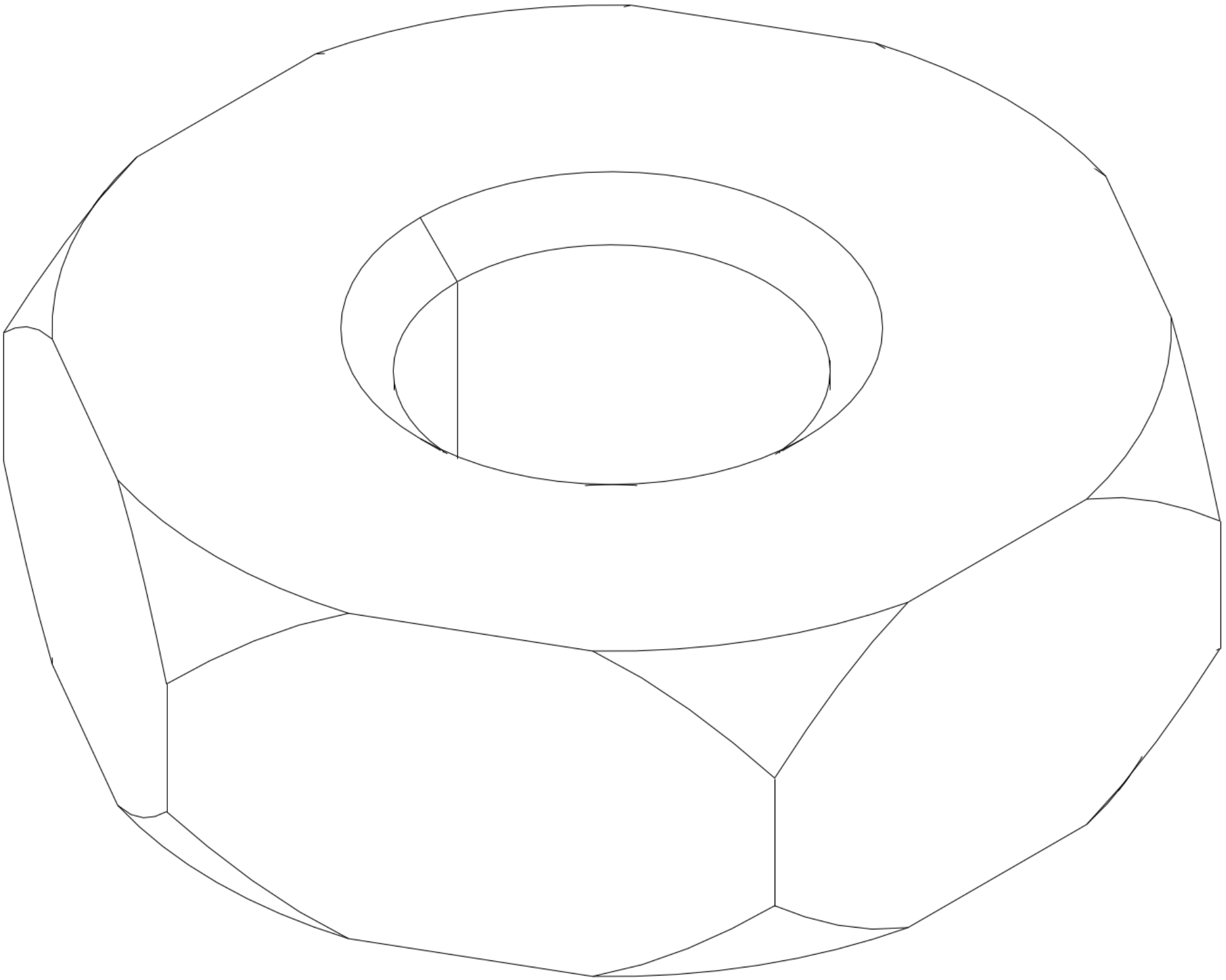
UNITS	SCALE	PROJECTION
MILLIMETRES	**10:1**	

TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A2**

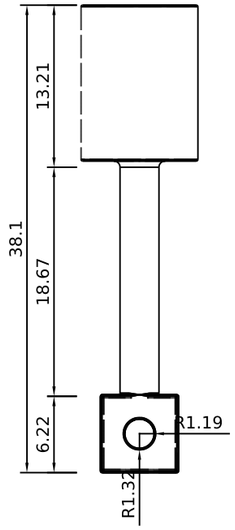
DRAWING NO.	REV	SHEET
MKV-A238B499-07	**0**	**7 OF 9**



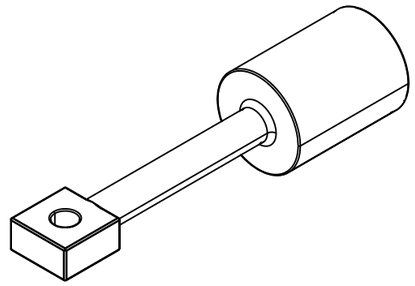
TOP VIEW



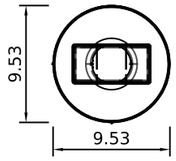
ISOMETRIC VIEW



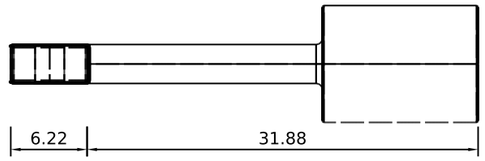
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



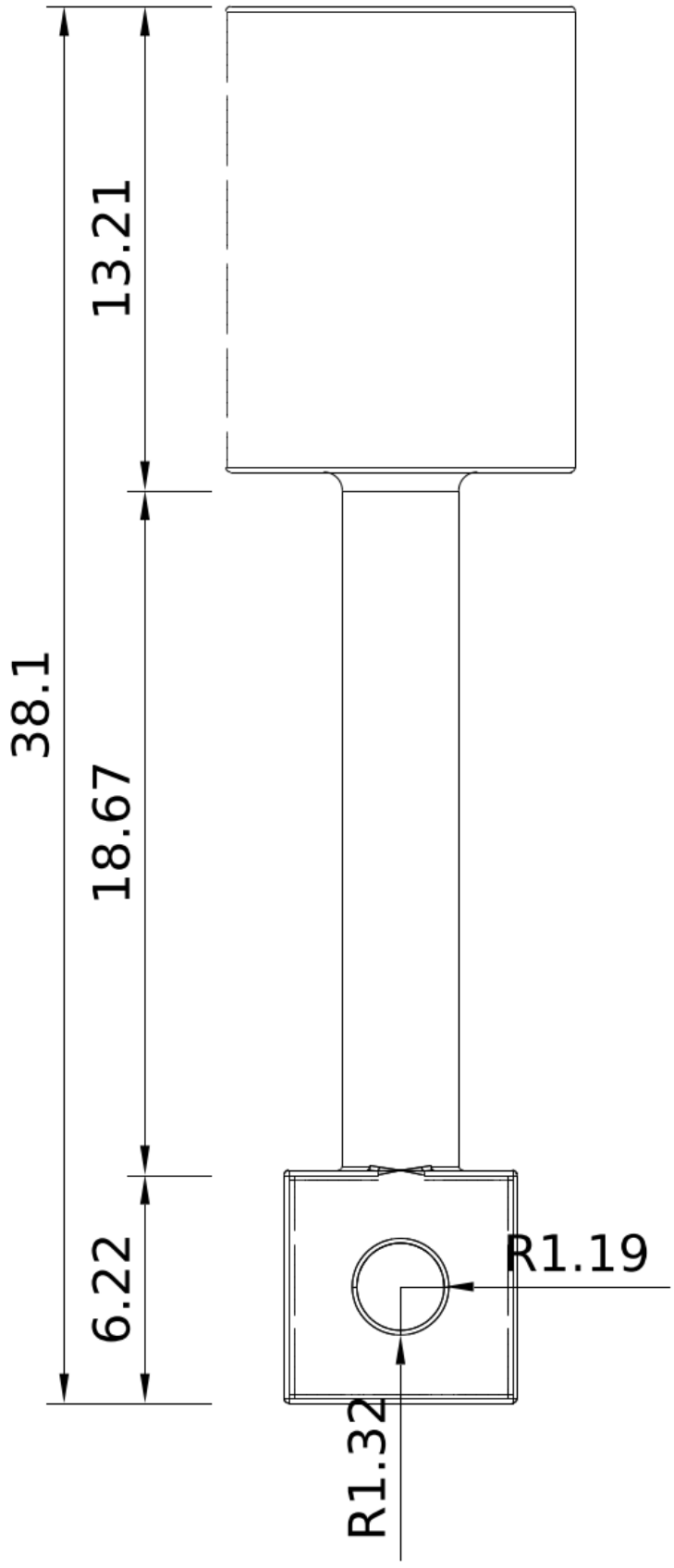
RIGHT SIDE VIEW

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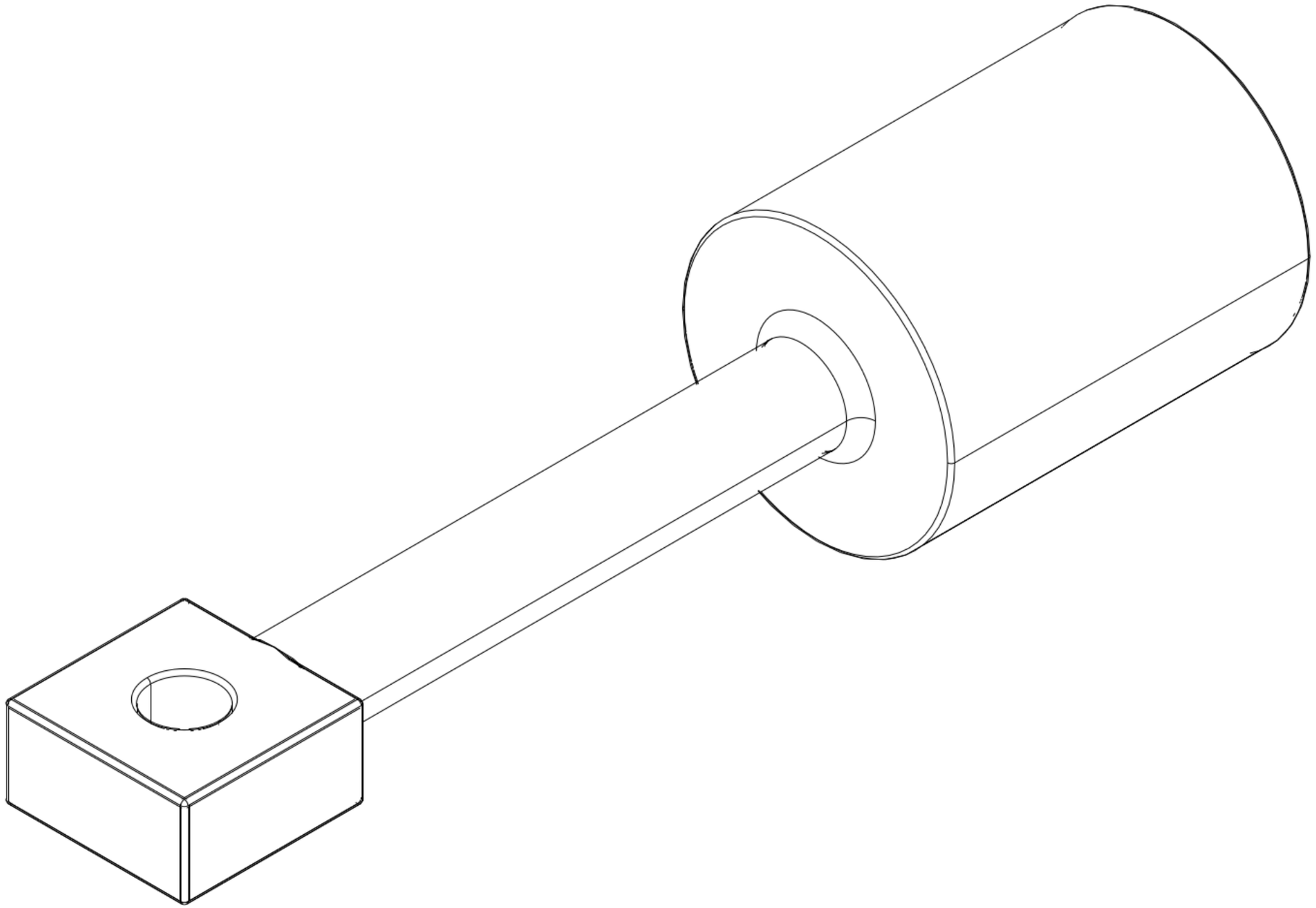
UNITS	SCALE	PROJECTION
MILLIMETRES	**2:1**	

TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A3**

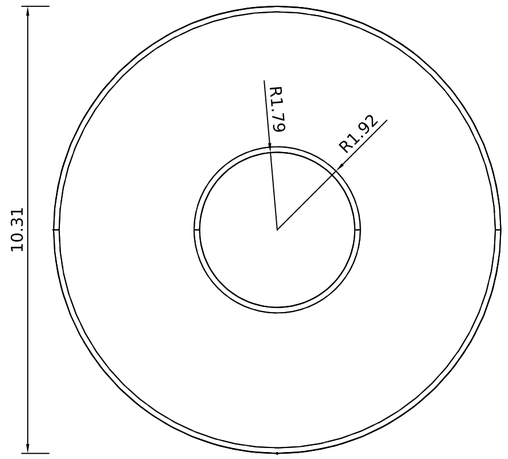
DRAWING NO.	REV	SHEET
MKV-A238B499-08	**0**	**8 OF 9**



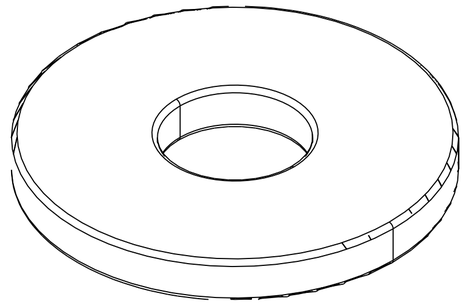
TOP VIEW



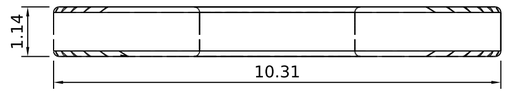
ISOMETRIC VIEW



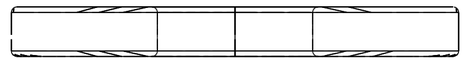
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



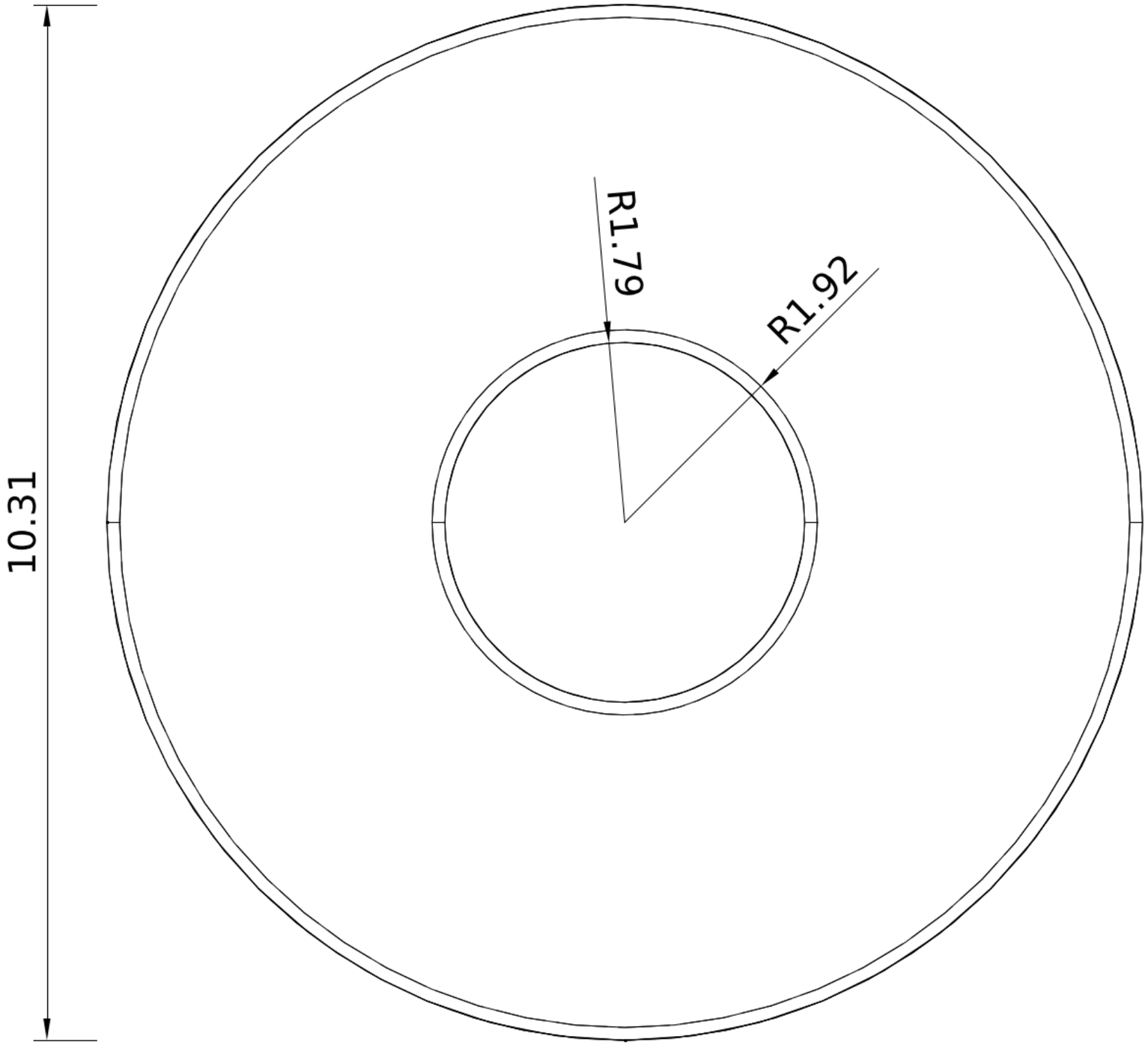
RIGHT SIDE VIEW

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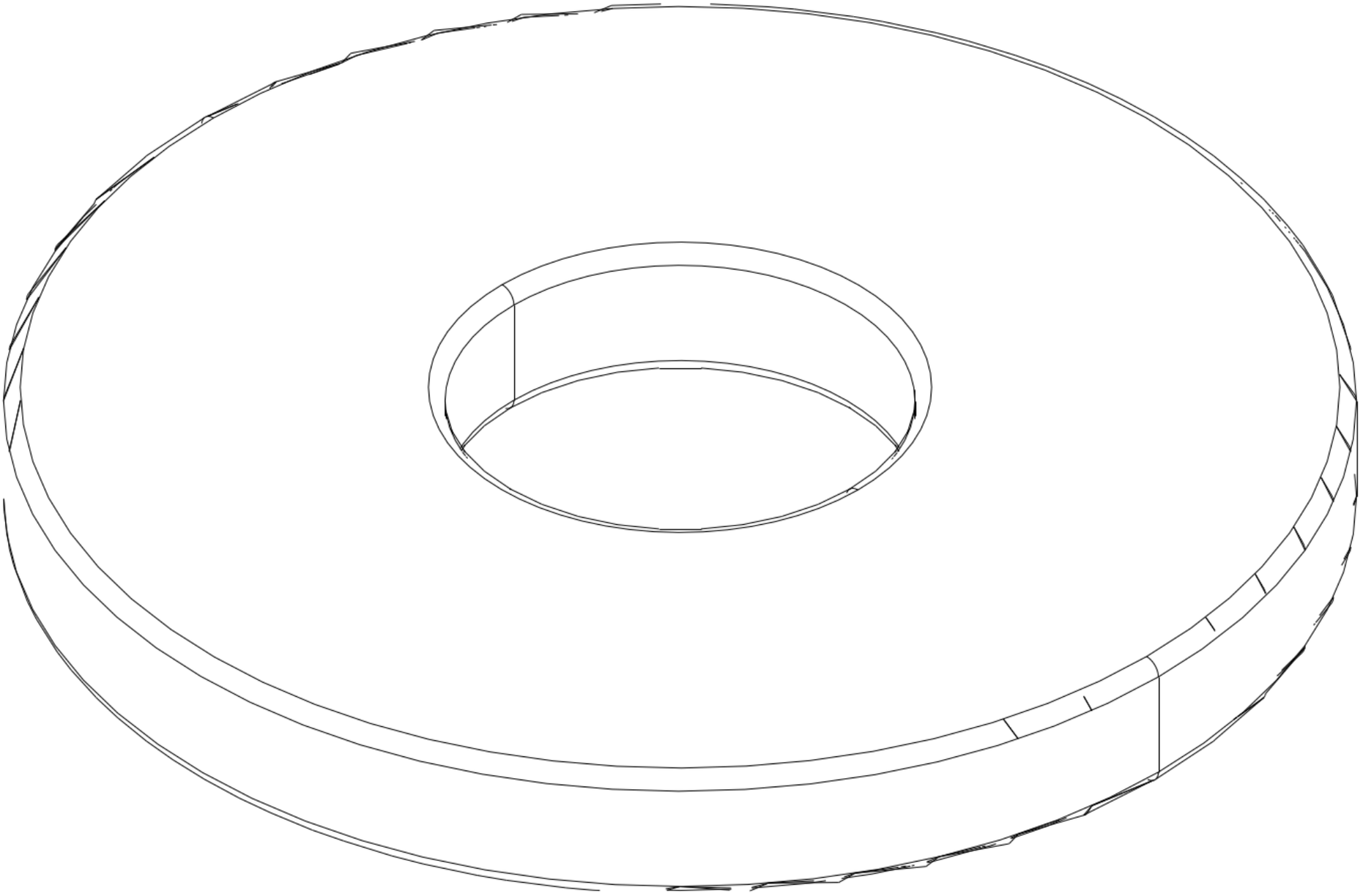
UNITS	SCALE	PROJECTION
MILLIMETRES	**10:1**	

TITLE	SIZE
OSCILLATING WOBBLER STEAM ENGINE ASSEMBLY	**A2**

DRAWING NO.	REV	SHEET
MKV-A238B499-09	**0**	**9 OF 9**



TOP VIEW



ISOMETRIC VIEW