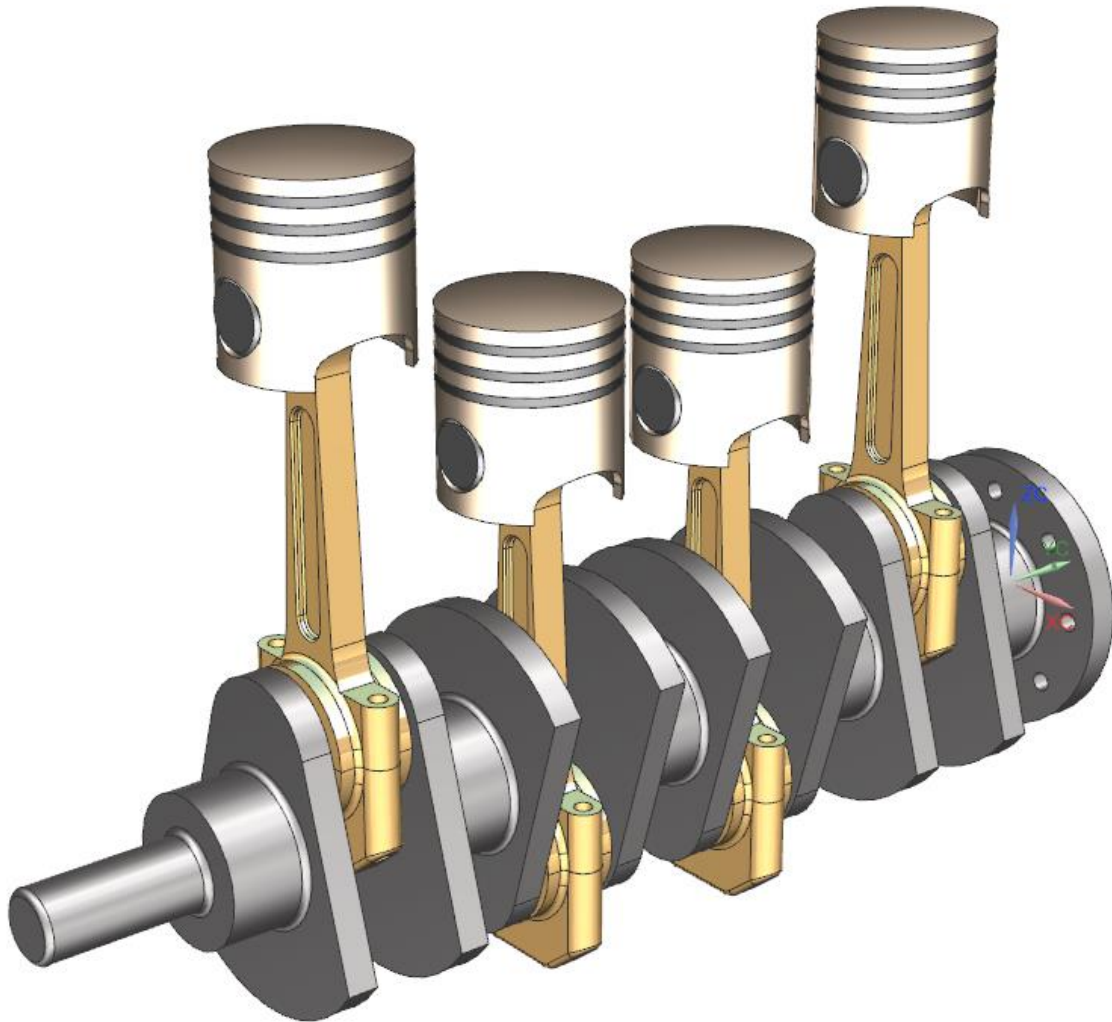


# 3D Modeling of a 4-Cylinder Engine Assembly



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# PROJECT OVERVIEW

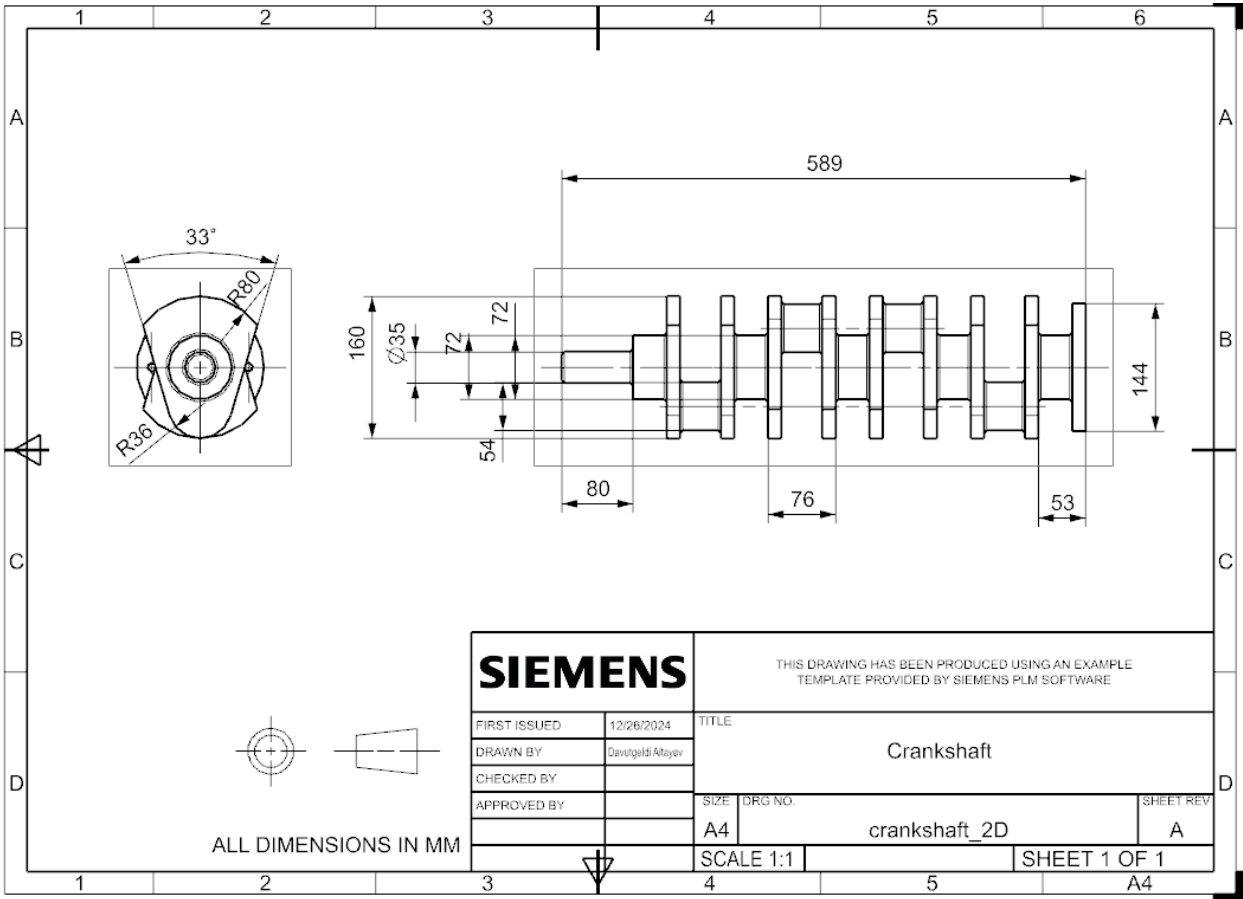
This project focuses on the creation of a detailed **3D model of a 4-cylinder engine assembly**, capturing the intricate interplay of components required for smooth and efficient engine operation. The assembly includes a **crankshaft, piston rings, piston pins, pistons, connecting rods, and connecting rod caps**, modeled with precision using **Siemens NX** to reflect real-world designs. The project provides a comprehensive visualization of the engine's internal mechanics, enabling insights into its structure, functionality, and potential areas for optimization. High-quality images and video materials are included to showcase the model and its operation.

## 1. WHAT IS A 4-CYLINDER ENGINE ASSEMBLY?

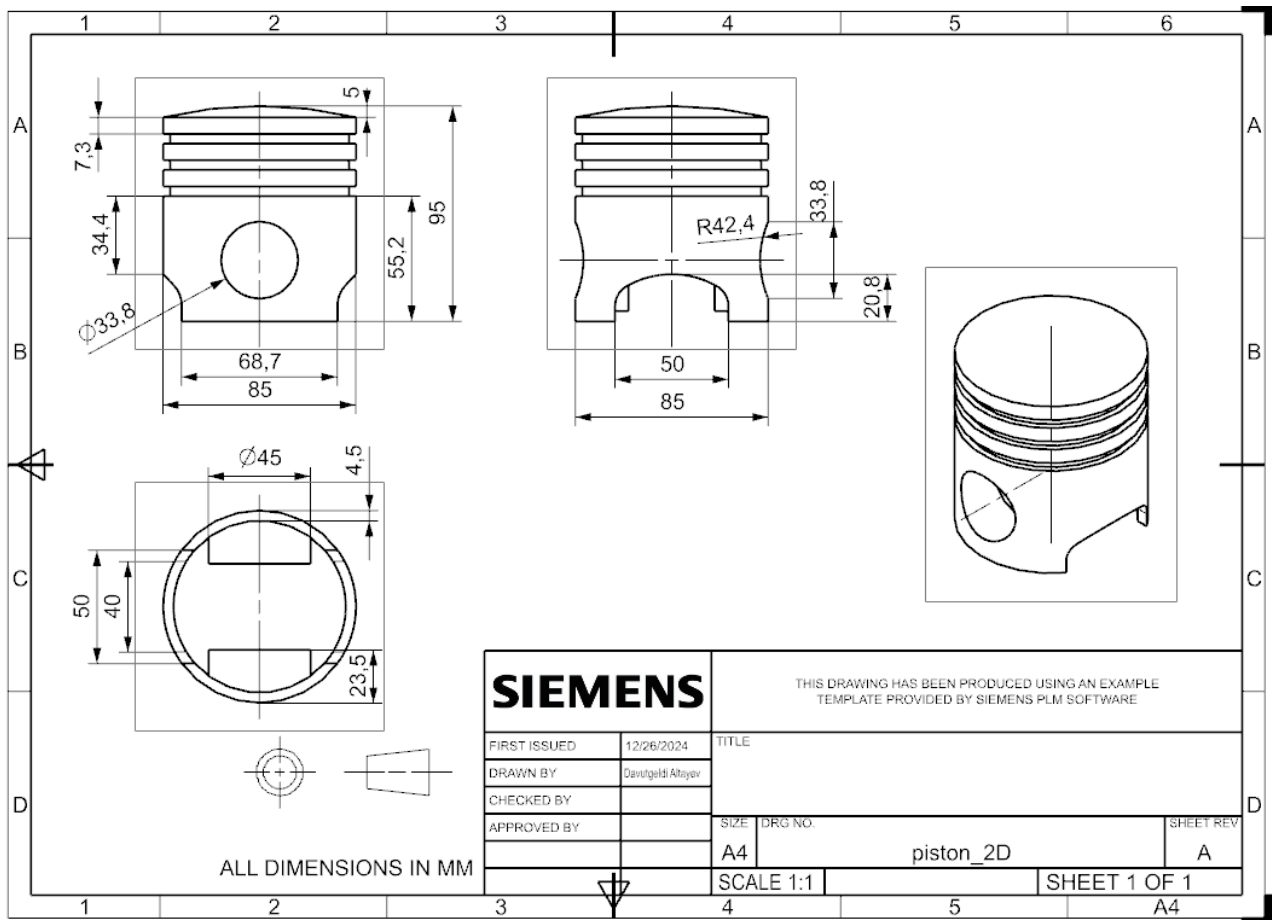
A **4-cylinder engine assembly** is a widely used internal combustion engine configuration, valued for its balance of power, efficiency, and compact design. The engine's operation is based on the coordinated movement of its components to convert fuel energy into mechanical power.

Key components of the assembly include:

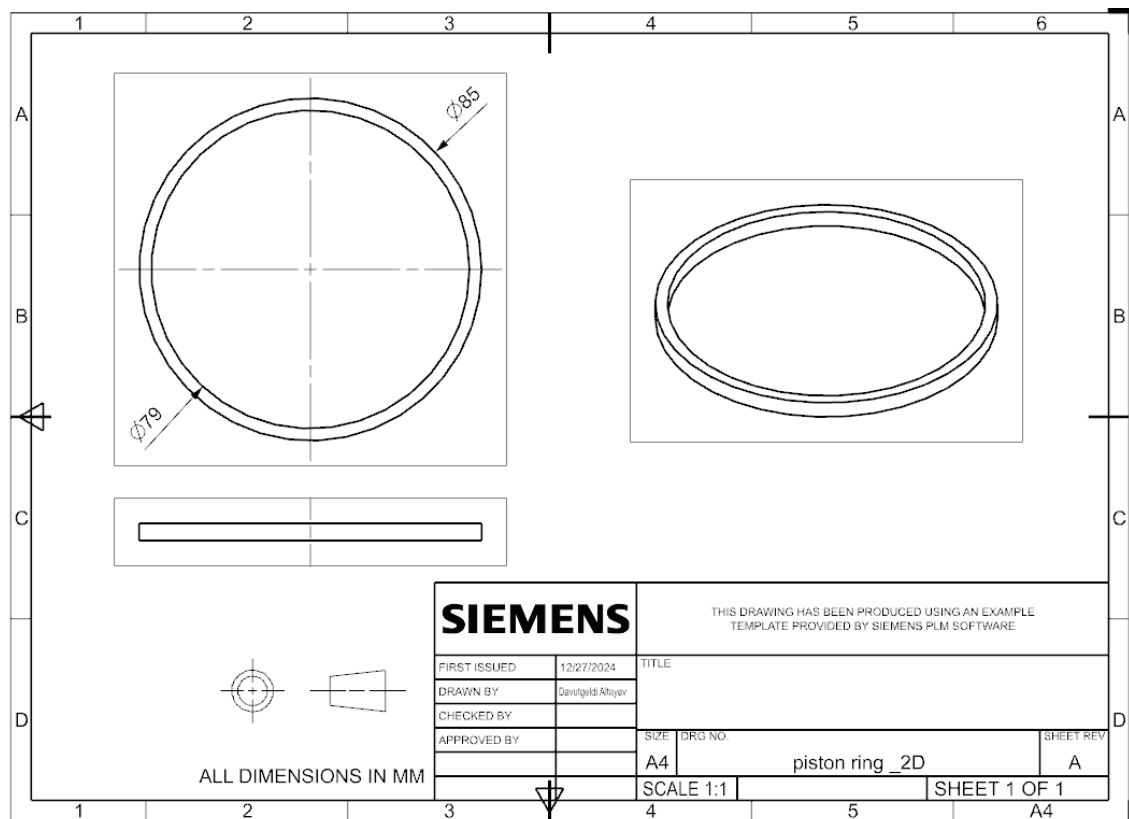
- **Crankshaft:** Converts the reciprocating motion of pistons into rotational motion, driving the output power.



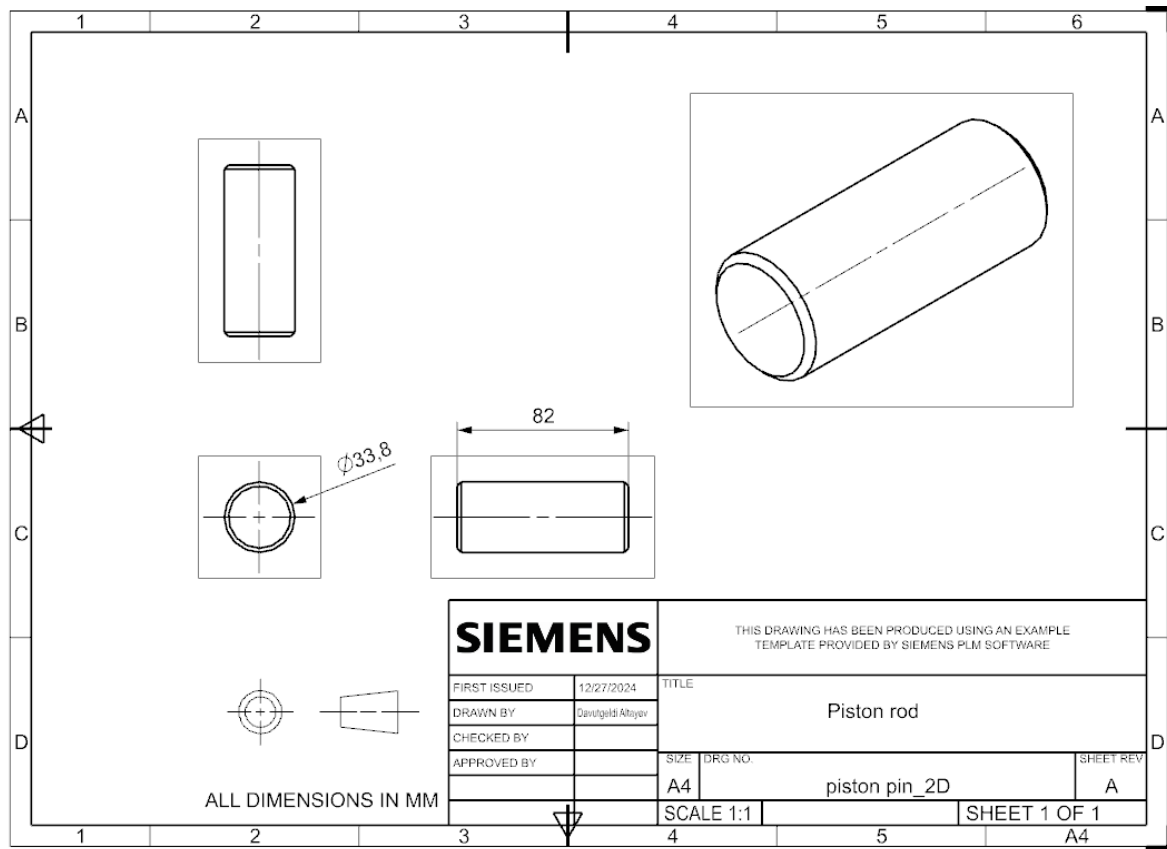
- **Pistons:** Move within the cylinder to compress fuel and air mixtures and transfer the resulting combustion force to the crankshaft.



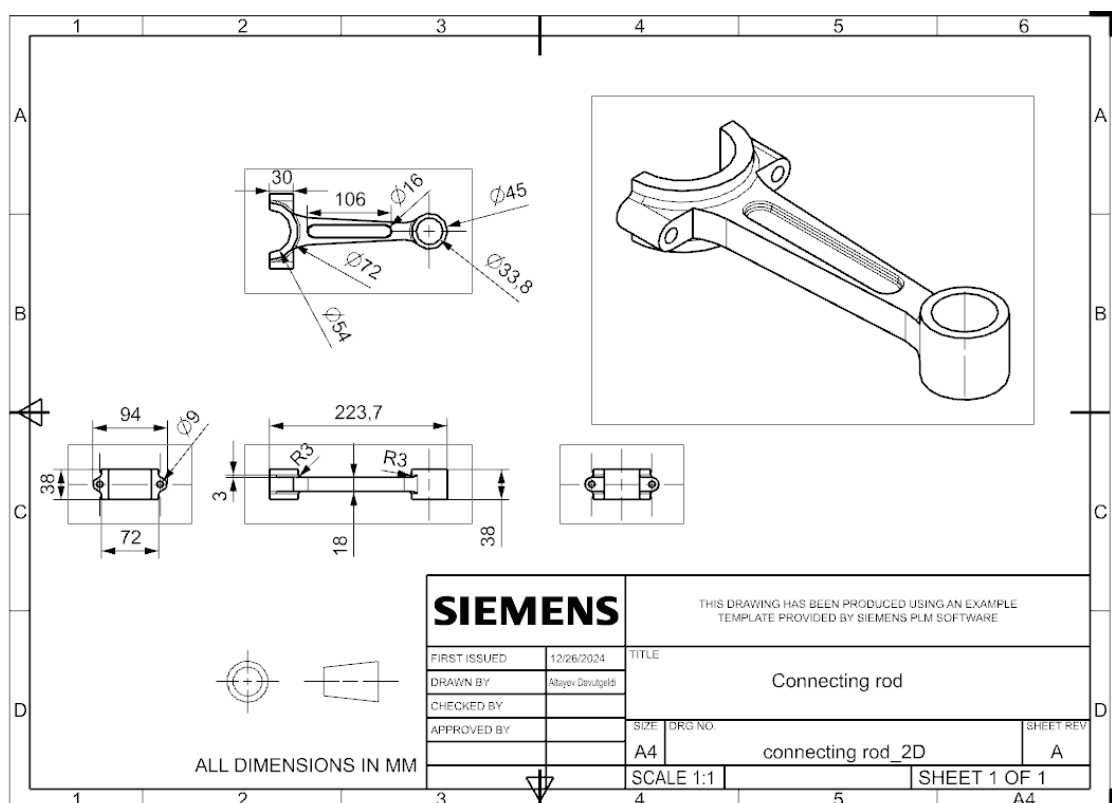
- **Piston Rings:** Ensure an effective seal between the piston and the cylinder wall, minimizing gas leakage and oil consumption.

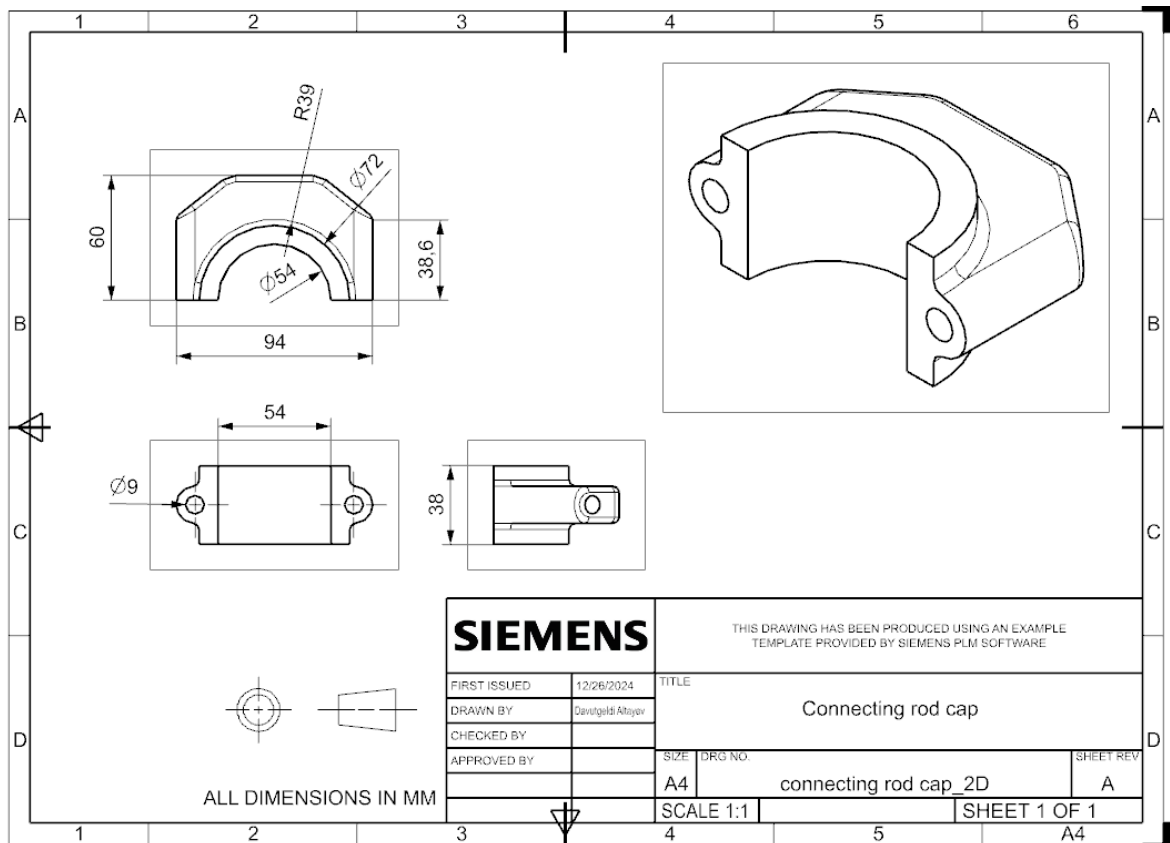


- **Piston Pins:** Serve as the pivot for the piston's connection to the connecting rod.

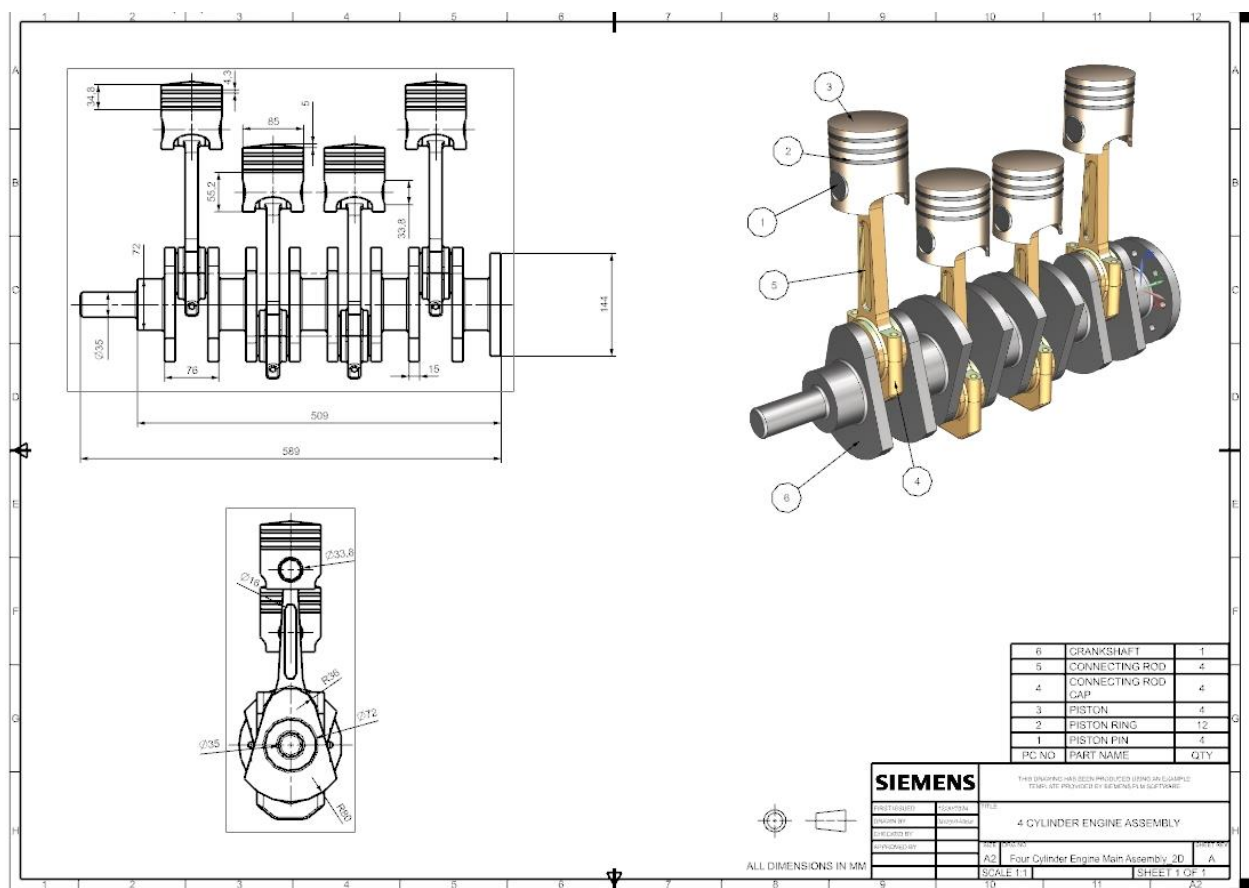


- **Connecting Rods and Caps:** Link the pistons to the crankshaft, transferring forces efficiently while maintaining alignment.





This assembly represents the core of the internal combustion engine, forming the foundation of many automotive powertrains.



## 2. KEY DESIGN AND FUNCTIONAL CONSIDERATIONS

Designing a 4-cylinder engine assembly involves accounting for mechanical, thermal, and material considerations to ensure functionality and reliability:

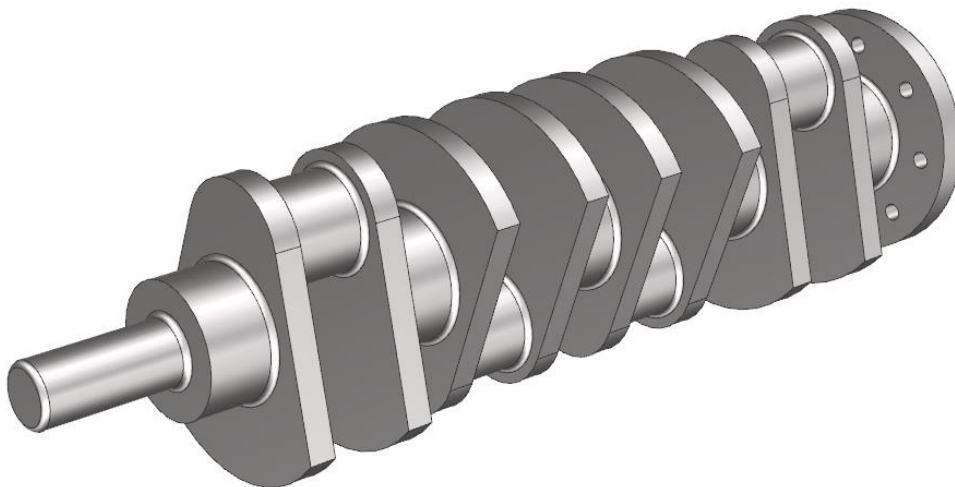
- **Compactness and Symmetry:** The design balances power output and space efficiency, making it suitable for applications in modern vehicles.
- **Component Integration:** Each part must interface seamlessly, requiring precise alignment and tolerances.
- **Material Strength:** Components are typically crafted from high-strength alloys to withstand the stresses of combustion and reciprocating motion.
- **Lubrication and Cooling:** Key to maintaining the durability of moving parts under high-temperature and high-friction conditions.

The design reflects a balance of engineering principles, ensuring both performance and longevity.

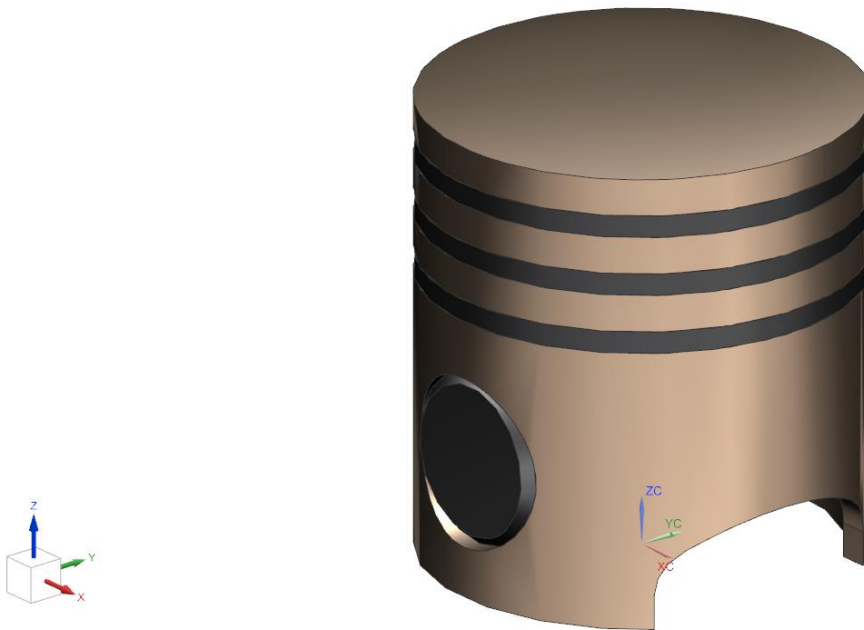
## 3. 3D MODELING PROCESS

The modeling process was implemented using **Siemens NX**, a powerful CAD tool that enables high-precision 3D modeling and simulation:

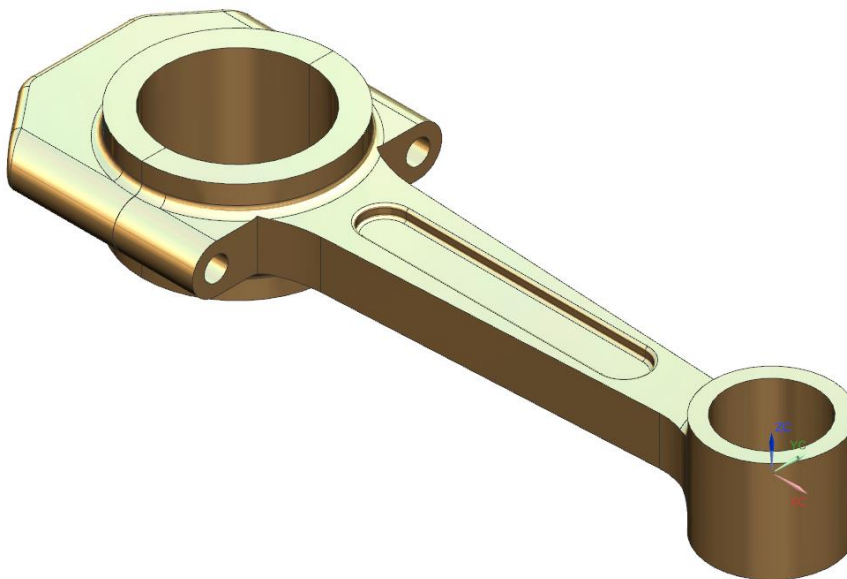
- **Crankshaft:** Modeled with detailed journals and counterweights to replicate its critical role in power transmission.



- **Pistons and Rings:** Designed to fit precisely within the cylinders while maintaining functional clearances.

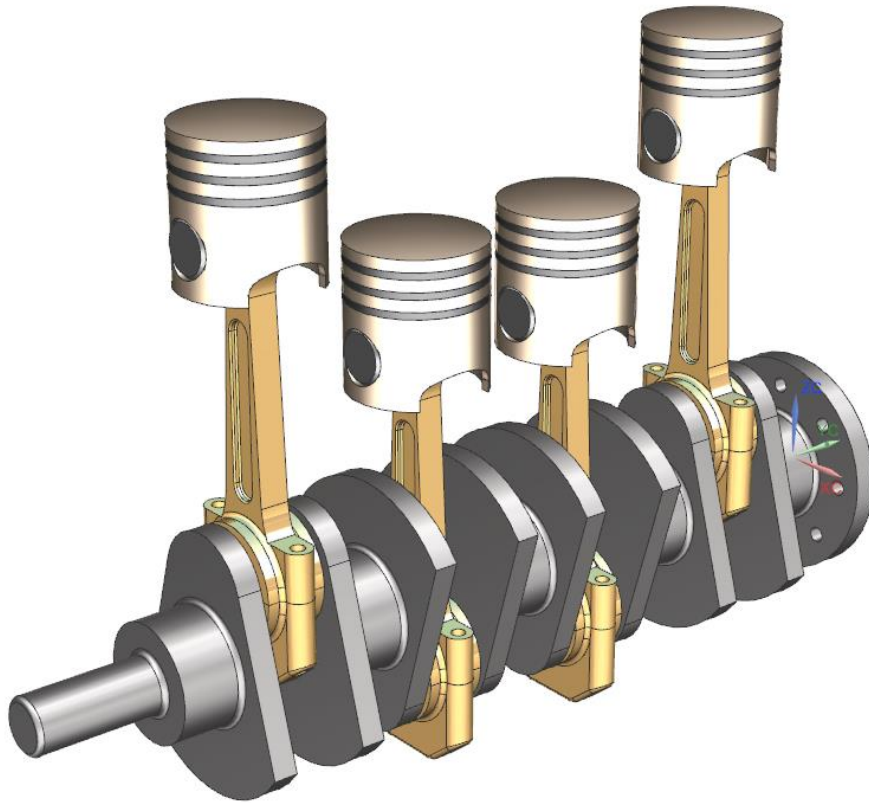


- **Connecting Rods and Caps:** Incorporated features for secure attachment and smooth transfer of forces.





The 3D model was created to represent real-world dimensions and geometries, enabling a clear understanding of component relationships and movement.



## CONCLUSION

This project presents a comprehensive 3D model of a 4-cylinder engine assembly, created using **Siemens NX**, demonstrating the integration and functionality of its components. The model provides valuable insights into the design and operation of internal combustion engines, forming a basis for further refinement or educational purposes. The visual materials included offer a clear and engaging perspective on the project.