

## Granite V-Block Introduction

### 1. Product Introduction

#### 1.1 Definition and Function

A granite V-block is a precision positioning and measuring tool crafted from high-quality natural granite, featuring a V-shaped groove (typically with a 90° or 120° angle). Designed to securely hold **cylindrical workpieces** (e.g., shafts, rollers, pipes), it serves as a stable reference for inspecting **roundness**, **straightness**, **parallelism**, and **concentricity**. Key functions include:

- Centering and supporting cylindrical parts during measurement, machining, or assembly.
- Providing a non-magnetic, vibration-dampening platform for high-precision geometric tolerance checks.

*Example:* In automotive engine manufacturing, a granite V-block holds a camshaft to measure its runout with a dial indicator, ensuring smooth engine operation.

#### 1.2 Structure and Materials

- **Material:** Constructed from dense, fine-grained granite (e.g., gneiss or diabase) with:
  - Low thermal expansion (0.5–1.0ppm/°C) for dimensional stability across temperature changes.
  - High resistance to wear, corrosion, and magnetic interference.
- **V-Groove:** Precision-machined to a symmetrical angle (90° or 120°) with a polished surface (Ra 0.2–0.8µm) to minimize friction and ensure uniform workpiece contact.
- **Base and Sides:**
  - **Flat Base:** Ground to high flatness ( $\pm 2\text{--}5\mu\text{m}$ ) for stable placement on inspection tables or machine tools.
  - **Reinforced Edges:** Designed to prevent chipping during handling, with optional tapped holes for fixture mounting.

### 2. Application Scenarios

#### 2.1 Precision Machining and Inspection

- **Roundness/Straightness Checks:** Holds shafts or rollers for inspection using dial indicators or laser scanners.

*Example:* In bearing production, a V-block positions a roller to measure deviations from perfect roundness, critical for bearing lifespan.

- **Concentricity Measurement:** Aligns workpieces for checking the consistency of inner/outer diameters (e.g., in pipe fittings or aerospace fasteners).

#### 2.2 Metrology and Calibration

- Calibrates cylindrical gauges (e.g., plug gauges, ring gauges) by providing a known reference for dimensional accuracy.
- Verifies the accuracy of roundness testers and coordinate measuring machines (CMMs).

#### 2.3 Aerospace and Defense

- Positions turbine shafts, landing gear pins, or missile components for precision alignment and measurement.

*Example:* In jet engine assembly, a V-block ensures turbine blades are concentric with the shaft, reducing vibration and improving efficiency.

## 2.4 Research and Education

- Used in material science labs to test cylindrical specimens (e.g., metal rods, composite tubes) under mechanical stress.
- Teaches geometric measurement principles in technical training programs.

## 3. Maintenance and Troubleshooting

### 3.1 Maintenance

- **Cleaning:** Wipe the V-groove and base with a soft cloth and mild detergent to remove debris or oil. Avoid abrasive tools that could scratch the granite.
- **Storage:** Store in a dry, temperature-controlled environment ( $20\pm2^{\circ}\text{C}$ ) with a protective cover to shield the groove from impacts.
- **Calibration:** Recalibrate annually using a master cylindrical gauge or laser interferometer to verify groove angle and base flatness.

### 3.2 Troubleshooting

- **Inconsistent Workpiece Alignment:**
  - **Cause:** Dirt in the groove, worn surfaces, or thermal expansion.
  - **Solution:** Clean the groove, inspect for chips (replace if damaged), and ensure measurement conditions are thermally stable.
- **Unstable Base:**
  - **Cause:** Uneven support or damage to the base surface.
  - **Solution:** Re-level the V-block on a stable surface; refinish or replace if the base is warped.
- **Groove Wear:**
  - **Cause:** Heavy loads or rough handling.
  - **Solution:** Minor wear can be polished by a professional; severe wear requires replacement.

## 4. Performance Characteristics

Feature		Description
Precision	V-Groove	Angle tolerance within $\pm 5\text{--}10$ arcseconds for $90^{\circ}/120^{\circ}$ grooves, ensuring repeatable alignment.
Thermal Stability		Minimal dimensional change under temperature fluctuations, ideal for 24/7 production.
Durability		Resistant to chipping and corrosion, with a lifespan of 10+ years under proper care.
Vibration Damping		Dense granite structure absorbs machine vibrations, reducing measurement errors.

Feature	Description
Non-Magnetic Design	Safe for use in magnetic environments (e.g., near CNC machines or induction heaters).

#### Key Applications Summary

Industry	Use Case	Benefit
Automotive	Inspecting crankshaft straightness	Reduces engine noise and improves performance
Aerospace	Measuring turbine blade concentricity	Enhances engine balance and safety
Metrology	Calibrating cylindrical measurement tools	Ensures traceable dimensional accuracy
Manufacturing	Holding pipes for surface finish inspection	Improves quality control efficiency

