

## Definition

A keyway plug gauge is a precision measuring tool designed to inspect the width and depth of keyways (slots or grooves) in shafts, hubs, or other mechanical components. It is a type of limit gauge, consisting of two or more fixed dimensions (go and no-go ends), to quickly determine if the keyway meets specified tolerance requirements without requiring numerical measurements.

## Functions

1. **Keyway Width Inspection:** Verifies that the keyway width is within the allowable tolerance range using "go" and "no-go" ends.
  - **Go End:** Must fit into the keyway if the width is at minimum acceptable size.
  - **No-Go End:** Should not fit if the width exceeds the maximum allowable size.
2. **Depth Verification (Optional):** Some designs include a depth gauge or step feature to check keyway depth.
3. **Rapid Conformance Testing:** Provides instant pass/fail results for high-efficiency quality control in manufacturing.

## Structural Components

1. **Go End:** The smaller-dimensioned end used to check the minimum acceptable keyway width.
2. **No-Go End:** The larger-dimensioned end used to check the maximum allowable keyway width.
3. **Handle/Shank:** Provides grip for manual operation, often marked for easy identification of go/no-go ends.
4. **Depth Measuring Feature (Optional):** A stepped or extended portion to assess keyway depth (common in combined width/depth gauges).
5. **Material:** Typically made of hardened steel or carbide for durability and resistance to wear, with corrosion-resistant coatings (e.g., chrome plating).

## Application Scenarios

- **Mechanical Engineering:** Inspecting keyways in shafts, gears, pulleys, and couplings to ensure proper fit with keys (e.g., square keys, Woodruff keys).
- **Manufacturing Industries:**
  - Automotive: Checking keyways in crankshafts, transmission components, or drive shafts.
  - Industrial Machinery: Quality control for keyways in motors, pumps, or heavy equipment parts.
  - Aerospace: Ensuring precision in keyway dimensions for critical mechanical assemblies.
- **Maintenance and Repair:** Verifying worn keyways during component refurbishment.

## Maintenance

1. **Cleaning:**
  - Wipe with a lint-free cloth after each use to remove debris, oil, or coolant.
  - Use a mild solvent (e.g., isopropyl alcohol) for stubborn residue, then dry thoroughly.
2. **Calibration:**
  - Periodically check against master gauges or precision measuring instruments

(e.g., every 3–6 months).

- Recalibrate or replace if wear exceeds tolerance limits (e.g., visible scratches on measuring surfaces).

3. **Storage:**

- Store in a padded case or protective holder in a dry, temperature-controlled environment to prevent rust or deformation.
- Keep go/no-go ends protected from impact or contact with hard surfaces.

4. **Inspection for Wear:**

- Regularly examine measuring surfaces for signs of abrasion, dents, or corrosion.
- Replace the gauge if wear affects measurement accuracy (e.g., rounded edges on go/no-go ends).

**Troubleshooting (Fault 排除)**

| Issue                          | Possible Cause   | Solution   |
|--------------------------------|--|--|
| Go end does not fit            | <ul style="list-style-type: none"><li>- Keyway width is too narrow.</li><li>- Gauge is dirty or damaged.</li></ul>                                     | <ul style="list-style-type: none"><li>- Verify part dimensions with a micrometer.</li><li>- Clean the gauge or check for physical damage (e.g., burrs, rust).</li></ul>                      |
| No-go end fits                 | <ul style="list-style-type: none"><li>- Keyway width is too wide.</li><li>- Gauge is worn or mis-calibrated.</li></ul>                                 | <ul style="list-style-type: none"><li>- Re-inspect the part with a precision tool.</li><li>- Recalibrate the gauge or replace it if worn.</li></ul>  |
| Difficulty inserting the gauge | <ul style="list-style-type: none"><li>- Debris in the keyway.</li><li>- Rough edges or burrs on the gauge or part.</li></ul>                           | <ul style="list-style-type: none"><li>- Clean the keyway and gauge.</li><li>- Deburr the part or polish the gauge's measuring surfaces (if minor wear).</li></ul>                            |
| Inconsistent results           | <ul style="list-style-type: none"><li>- Gauge is not properly aligned with the keyway.</li><li>- Excessive operator force during inspection.</li></ul> | <ul style="list-style-type: none"><li>- Ensure the gauge is inserted straight and perpendicular to the keyway.</li><li>- Use gentle, consistent pressure; avoid forcing the gauge.</li></ul> |

**Performance Characteristics**

1. **Precision:**

- Designed to match industry standard tolerances (e.g., ISO 7739, ANSI B107.47) for keyways and keys.
- Typical measurement accuracy:  $\pm 0.005$  mm for high-precision applications.

2. **Durability:**

- Hardened steel construction with corrosion-resistant coatings for long service life.
- Resistant to wear from repeated use in production environments.
- 3. **Ease of Use:**
  - Simple "go/no-go" design requires no special training for operation.
  - Clear labeling of go/no-go ends for quick identification.
- 4. **Efficiency:**
  - Enables rapid inspection, ideal for high-volume manufacturing.
  - Reduces reliance on time-consuming manual measurements (e.g., calipers).
- 5. **Compatibility:**
  - Available in standard sizes for common keyway widths (e.g., 4 mm, 6 mm, 10 mm) or custom-made for non-standard applications.

