#### Equal - height Spacers Introduction

### 1. Product Introduction

### 1.1 Definition and Function

Equal - height spacers are solid, block - shaped mechanical components with a consistent and precisely controlled height. Unlike adjustable counterparts, their height remains fixed, providing a stable and unchanging elevation for various objects. These spacers are engineered to:

- **Provide Stable Support**: Offer a reliable foundation for workpieces, machinery, or equipment, ensuring they are held at a uniform height. By using multiple equal height spacers, users can maintain parallelism and balance, preventing uneven stress distribution that could lead to deformation or instability.
- Enable Accurate Alignment: Play a crucial role in aligning components during assembly or machining processes. They help ensure that parts are positioned correctly relative to each other, which is vital for the proper functioning and performance of the final product.
- Facilitate Height Adjustment in Sets: When used in combination, different thickness equal height spacers can be stacked to achieve specific height requirements, providing flexibility in setups where a fixed height solution is needed.

### **1.2 Structure and Components**

- Material:
  - Metal:
    - Steel: Carbon steel is commonly used for its high strength and affordability, making it suitable for general industrial applications. Alloy steel, with enhanced properties like improved hardness and wear resistance, is preferred for heavy - duty and high - stress scenarios. Stainless steel offers excellent corrosion resistance, making it ideal for use in harsh environments such as marine, chemical, or food - processing industries.
    - **Aluminum Alloy**: Lightweight yet strong, aluminum alloy spacers are popular in applications where weight reduction is essential, like aerospace manufacturing or portable equipment assembly.
  - Non Metal:
    - Plastic: Materials such as nylon, polyethylene, and polypropylene are used for their low cost, chemical resistance, and non - conductive properties. Plastic equal - height spacers are often found in electronics manufacturing, where they can insulate components and prevent short circuits.
    - Ceramic: Known for their high hardness, thermal stability, and chemical inertness, ceramic spacers are used in high - temperature, high - precision applications, such as semiconductor manufacturing and laboratory equipment.
    - Granite: In precision demanding fields like metrology and optical

instrument manufacturing, granite equal - height spacers are favored. Their low coefficient of thermal expansion, exceptional flatness, and resistance to abrasion ensure stable and accurate support for sensitive equipment.

## • Shape:

- Rectangular/Square: The most common shapes, featuring flat top and bottom surfaces that ensure stable contact with the supported object and the base. The flatness of these surfaces is typically tightly controlled, often with a surface roughness (Ra) value in the range of 0.8 - 3.2 μm for high - precision applications.
- **Cylindrical**: Sometimes used when a circular contact area is required, or when the spacer needs to fit into a corresponding cylindrical hole for precise positioning.
- **Custom Shapes**: Can be manufactured to specific shapes based on unique application requirements, such as irregularly shaped cavities or specialized assembly needs.

### 2. Application Scenarios

# 2.1 Manufacturing and Machining

- **CNC Machining**: In CNC milling, turning, and grinding operations, equal height spacers support workpieces on the machine table. They keep the workpiece level and at a consistent height, which is critical for achieving accurate machining results, especially when working with complex geometries and tight tolerances.
- **Die and Mold Making**: When fabricating dies and molds, these spacers help position components accurately during assembly. They ensure that different parts of the mold are aligned correctly, which directly impacts the quality of the molded products.
- Sheet Metal Fabrication: Used to support and space sheet metal parts during processes like bending, punching, and welding. By maintaining a consistent height, they help achieve uniform bends and accurate hole positioning.

### 2.2 Assembly Operations

- Automotive Assembly: In automotive manufacturing, equal height spacers are used to support engine blocks, transmission components, and chassis parts during assembly. They assist in aligning these heavy components precisely, ensuring smooth integration and proper fitment.
- **Electronics Assembly**: For assembling printed circuit boards (PCBs) and other electronic components, plastic or ceramic equal height spacers provide insulation and precise spacing. They prevent components from touching each other, reducing the risk of electrical shorts and ensuring proper component alignment on the PCB.
- **Furniture Manufacturing**: In woodworking, equal height spacers help in assembling furniture by supporting wooden panels at the right height. They ensure that drawers, shelves, and doors are level and aligned correctly, enhancing the overall quality and functionality of the furniture.

### 2.3 Metrology and Quality Control

• Calibration Laboratories: Equal - height spacers serve as reference standards in calibration labs. They are used to set up known - height intervals for calibrating

measuring instruments such as height gauges, calipers, and coordinate measuring machines (CMMs), ensuring the accuracy and reliability of these tools.

• **Quality Inspection**: During quality inspection processes, these spacers are used to support workpieces on inspection tables. They help in accurately measuring dimensions, flatness, and parallelism by providing a stable and consistent reference height.

### 2.4 Construction and Infrastructure

- **Building Construction**: In construction, equal height spacers can be used to support precast concrete elements, ensuring they are placed at the correct elevation and level. They also help in aligning structural components like beams and columns during assembly.
- **Bridge Construction**: For assembling bridge components, such as girders and decking, equal height spacers ensure that parts are properly aligned and at the right height, contributing to the structural integrity and stability of the bridge.

### 3. Maintenance, Repair, and Troubleshooting

### 3.1 Maintenance

- **Regular Cleaning**: After each use, clean the equal height spacers with an appropriate cleaning method depending on the material. For metal spacers, use a soft brush and a mild cleaning agent to remove dirt, debris, metal shavings, and oil, then wipe dry to prevent rust. Plastic and ceramic spacers can be cleaned with a soft cloth and a non abrasive cleaner. Granite spacers should be cleaned gently to avoid scratching the surface.
- Inspection: Periodically inspect the spacers for signs of wear, damage, or deformation. Check the flatness of the top and bottom surfaces using a precision straightedge or optical flat. Look for cracks, chips, or uneven areas, especially in the contact regions. For metal spacers, check for rust or corrosion, and for plastic spacers, look for signs of degradation or cracking.
- Lubrication (if applicable): Some equal height spacers with moving parts or threads may require lubrication. Use a suitable lubricant, such as a light machine oil for metal components or a dry film lubricant for parts where oil may attract dirt, to ensure smooth operation and prevent wear.
- **Storage**: Store the spacers in a clean, dry environment. Metal spacers should be protected from moisture to prevent rusting, and plastic and ceramic spacers should be stored away from direct sunlight and extreme temperatures to avoid degradation. Stack them carefully to prevent deformation, and consider using dedicated storage racks or containers to keep them organized.

#### 3.2 Repair

- **Minor Damage**: For minor surface damage on metal spacers, such as small scratches or shallow dents, the surface can often be repaired by grinding or polishing. Minor chips or cracks on plastic or ceramic spacers may sometimes be filled with an appropriate adhesive or repair compound, although this may affect the precision to some extent.
- **Major Damage**: In cases of severe damage, such as large cracks, significant deformation, or broken parts, it is usually more practical to replace the equal height

spacer. Trying to repair major damage may not restore the spacer's original precision and performance.

### 3.3 Troubleshooting

- Uneven Support:
  - **Cause**: Uneven placement of the spacers, a damaged or uneven base surface, or slight variations in the height of the spacers due to manufacturing tolerances or wear.
  - **Solution**: Check the placement of the spacers and ensure they are on a flat and stable base. If the base surface is uneven, consider using additional shims or leveling the surface. If the spacers have height variations, select spacers with more consistent dimensions or replace the inaccurate ones.

# Component Misalignment:

- **Cause**: Incorrectly positioned spacers, worn out spacers that no longer provide accurate height, or external forces causing the spacers to shift.
- **Solution**: Re position the spacers to ensure proper alignment. Replace any worn out spacers that do not meet the required height tolerance. Secure the spacers more firmly in place to prevent them from shifting under external forces, for example, by using clamps or adhesives if appropriate.
- Excessive Wear or Damage:
  - **Cause**: Overloading the spacers, exposure to harsh environmental conditions (such as high temperatures, corrosive substances), or improper handling.
  - **Solution**: Ensure that the spacers are used within their rated load capacity. Protect the spacers from harsh environments by using appropriate coatings or enclosures. Handle the spacers carefully to avoid damage, and consider using more durable materials if the application involves extreme conditions.

### 4. Performance Characteristics

- **High Precision**: Equal height spacers are manufactured with tight height tolerances, often within ±0.01 0.05 mm for high quality products. This precision ensures accurate positioning and alignment in critical applications.
- **Stable Load Bearing Capacity**: Depending on the material and size, these spacers can support a wide range of loads, from a few grams in delicate electronics assembly to several tons in heavy machinery applications. Their robust construction and uniform design enable them to distribute loads evenly.
- **Durability**: Made from high quality materials, equal height spacers are designed to withstand repeated use and harsh operating conditions. Metal spacers resist wear and impact, while non metal ones offer excellent chemical resistance and insulation properties.
- Versatility: Available in various materials, shapes, and sizes, equal height spacers can be customized to meet specific application needs. They can be used in a wide range of industries and processes, from precision manufacturing to large scale construction.
- **Cost Effectiveness**: Compared to complex adjustable components, equal height spacers are generally more cost effective due to their simple design and manufacturing process. Their affordability makes them a practical choice for both

routine and specialized applications.

