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<td><strong>Vibration Isolation and Seismic Control Basics:</strong></td>
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</tbody>
</table>

**Vibration Isolation and Seismic Control Basics:**

Mechanical vibration and vibration-induced noise are common sources of occupant complaints in modern buildings. Vibration is caused by reciprocating motion from rotating components within mechanical equipment. All reciprocating, or rotating, equipment should be isolated to reduce transmission of vibration into the structure. Kinetics Noise Control provides technical assistance in the selection and specification of tailor-made isolation systems and vibration isolation products that enable building owners to install complex heating, ventilation, and air-conditioning products without the worry of vibration problems.

If you have a Vibration Issue:

Isolator deflections shown in the following pages are based on the data published in the 2015 ASHRAE Handbook. Recommended isolator type, base type, and minimum static deflection are reasonable and safe recommendations for most HVAC equipment installations. Additional assistance from one of our many qualified representatives or acoustical consultants can also be very useful in resolving these problems.

**Engineering Expertise:**

Building codes are constantly updated with stricter requirements for seismic, wind, and blast protection. Kinetics offers a complete line of restrained vibration isolators to satisfy current building code requirements as well as complete engineering support. Our highly skilled engineering staff focus on labor savings and constructability in line with current directions in mechanical construction. We offer streamlined and cost effective engineered solutions along with professional and stamps to meet any specification requirements in all 50 states. Kinetics’ unsurpassed expertise will ensure success with highly complex hospital, government, and military projects as well as the unique challenges of design/build projects.
Engineering Services

Pipe Stress Analysis
- B31, ASCE Compliance and Certification
- Optimized Seismic Bracing Layouts
- Thermal Loop/Joint Design

Riser Support Design and Analysis
- B31, ASCE Compliance
- Optimized Restraint and Guide Layouts
- Design of Fully Anchored to Fully Floating Systems

Vibration Analysis
- Fully Dynamic/Transient FEA Capability
- Vibration Isolation Efficiency for Complex Systems
- Provide Input for Structure Design

Support Design
- 3D Modeling and Analysis
- Linear & Non-linear Capability
- Code Driven Design of Structural Support Systems and Components

Static and Dynamic Seismic and Wind Analysis on equipment and their attachment details
- Input Response Spectrum
- Peak Stress Plot
- Peak Displacement Plot

Structural Design Support
- Column Design
- Concrete Pad Design
- Foundation and Anchorage Design
Equipment Type:

**Refrigeration Machines and Chillers**

---

### Equipment Location

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>BASE TYPE A: Direct Isolation</th>
<th>BASE TYPE B: Structural Steel Rails or Base</th>
<th>BASE TYPE C: Concrete Inertia Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slab on Grade</td>
<td>No base, isolators attached directly to equipment.</td>
<td>See page 20 for more details</td>
<td>See page 21 for more details</td>
</tr>
</tbody>
</table>

---

### Air Compressors and Vacuum Pumps

---

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>BASE TYPE A: Direct Isolation</th>
<th>BASE TYPE B: Concrete Inertia Base</th>
<th>BASE TYPE C: Restrained Spring Isolator</th>
</tr>
</thead>
<tbody>
<tr>
<td>No base, isolators attached directly to equipment.</td>
<td>See page 20 for more details</td>
<td>See page 18 for more details</td>
<td>See page 18 for more details</td>
</tr>
</tbody>
</table>

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*Data from 2019 ASHRAE Handbook. See back cover for additional notes on Refrigeration Machines.

---

*For seismic & wind applications, use ASHRAE TYPE 4.

---

*Data from 2019 ASHRAE Handbook. See back cover for additional notes on Compressors.
### Equipment Type: Pumps*

#### Equipment: KINETICS

**Direct Isolation**
- Slab on Grade
  - Equipment Type: KINETICS
  - See page 16 for more details

**Floor Isolator or Hanger**
- Large Inline
  - 5 to 25 HP
  - 25 HP
  - End Suction/Split Case
  - Packaged Pump Systems

**Base Type A:**
- No base, isolators attached directly to equipment.

**Base Type B:**
- Structural Steel Rails or Base
  - See page 20 for more details

**Base Type C:**
- Concrete Inertia Base
  - See page 21 for more details

**Floor Span**
- Up to 20 ft (6 m)
  - 20 to 30 ft (6 - 9 m)
  - 30 to 40 ft (9 - 12 m)

#### Equipment Location
- See pages 18-19 for more details

---

### Equipment Type: Axial, Plenum, Cabinet, and Centrifugal Inline Fans*

#### Equipment: KINETICS

**Direct Isolation**
- Slab on Grade
  - Equipment Type: KINETICS
  - See page 17 for more details

**Floor Isolator or Hanger**
- Large Inline
  - 5 to 25 HP
  - 25 HP
  - End Suction/Split Case
  - Packaged Pump Systems

**Base Type A:**
- No base, isolators attached directly to equipment.

**Base Type B:**
- Structural Steel Rails or Base
  - See page 20 for more details

**Base Type C:**
- Concrete Inertia Base
  - See page 21 for more details

**Floor Span**
- Up to 22 in. diameter
  - 24 in. diameter and up
- 12.0 in. SP
  - 12.1 in. SP

**Base Type A:**
- No base, isolators attached directly to equipment.

**Base Type B:**
- Structural Steel Rails or Base
  - See page 20 for more details

**Base Type C:**
- Concrete Inertia Base
  - See page 21 for more details

---

*Data from 2019 ASHRAE Handbook. See back cover for additional notes on Pumps.
**For seismic & wind applications, use ASHRAE TYPE 4
## Equipment Type:

### Centrifugal Fans*

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Equipment Type</th>
<th>Floor Span</th>
<th>Up to 20 ft (6 m)</th>
<th>20 to 30 ft (6 - 9 m)</th>
<th>30 to 40 ft (9-12 m)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Base Type</td>
<td>ASHRAE Type</td>
<td>Base Isolator Def.</td>
<td>Base Type</td>
<td>ASHRAE Type</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
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<td>ASHRAE Type</td>
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<tr>
<td></td>
<td></td>
<td>Base Type</td>
<td></td>
<td>Base Type</td>
<td>ASHRAE Type</td>
</tr>
</tbody>
</table>

### Cooling Towers and Boilers*

<table>
<thead>
<tr>
<th>Equipment Location</th>
<th>Equipment Type</th>
<th>Floor Span</th>
<th>Slab on Grade</th>
<th>Up to 20 ft (6 m)</th>
<th>20 to 30 ft (6 - 9 m)</th>
<th>30 to 40 ft (9-12 m)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Base Type</td>
<td>ASHRAE Type</td>
<td>Base Isolator Def.</td>
<td>Base Type</td>
<td>ASHRAE Type</td>
<td>Base Isolator Def.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASHRAE Type</td>
<td></td>
<td></td>
<td>ASHRAE Type</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Base Type</td>
<td></td>
<td>Base Type</td>
<td>ASHRAE Type</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ASHRAE Type</td>
<td></td>
<td></td>
<td>ASHRAE Type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Base Type</td>
<td></td>
<td>Base Type</td>
<td>ASHRAE Type</td>
<td></td>
</tr>
</tbody>
</table>

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*Data from 2019 ASHRAE Handbook. See back cover for additional notes on Cooling Towers.

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**For seismic & wind applications, use ASHRAE TYPE 4**

**For curb mounted fans see BASE TYPE D**

---

NEW BASE TYPE B OPTIONS

KINETICS QuietRail

KINETICS SBB Structural Rail Base

KINETICS SFB Structural Beam Base

---

NEW BASE TYPE C OPTIONS

KINETICS TITAN

KINETICS FMS

KINETICS FL5S

KINETICS FH5S

---

NEW BASE TYPE D OPTIONS

KINETICS TITAN

KINETICS FMS

KINETICS FL5S

KINETICS FH5S
### Equipment Type:

**Propeller Fans and Ducted Rotating Equipment**

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Propeller Fans</strong></td>
<td><strong>Floor Span</strong></td>
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<tr>
<td><strong>Base Type A:</strong> Direct Isolation</td>
<td>Slab on Grade</td>
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<tr>
<td><strong>ASHRAE Type 1:</strong> Fiberglass or Neoprene Pad</td>
<td>See page 15 for more details</td>
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<tr>
<td><strong>ASHRAE Type 3:</strong> Spring Floor Isolator or Hanger</td>
<td>See pages 17-19 for more details</td>
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<tr>
<td><strong>ASHRAE Type 4/TYPE 5:</strong> Restrained Spring Isolator</td>
<td>See pages 18-19 for more details</td>
</tr>
<tr>
<td><strong>KINETICS Type:</strong></td>
<td><strong>Horsepower and Other</strong></td>
</tr>
<tr>
<td><strong>KINETICS Type:</strong></td>
<td>Slab on Grade</td>
</tr>
<tr>
<td><strong>Horsepower and Other</strong></td>
<td>Slab on Grade</td>
</tr>
</tbody>
</table>

### Equipment Type:

**Packaged AH, AC, H and V Units; Engine-Driven Generators**

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Packaged AH, AC, H and V Units</strong></td>
<td><strong>Floor Span</strong></td>
</tr>
<tr>
<td><strong>Equipment Location</strong></td>
<td><strong>Packaged AH, AC, H and V Units</strong></td>
</tr>
<tr>
<td><strong>Packaged AH, AC, H and V Units</strong></td>
<td><strong>Floor Span</strong></td>
</tr>
</tbody>
</table>

### Notes:
- Data from 2019 ASHRAE Handbook. See back for additional notes on Air-Handling Equipment.
- **For seismic & wind applications, use ASHRAE TYPE 4.**
- **For rooftop mounted equipment use BASE TYPE D.**

---

**KINETICS**

- **KIP**
- **RSP**
- **FDS**
- **SFH**
- **KINETICS TITAN**
- **NEW BASE TYPE B OPTIONS**
- **KINETICS QuietRail**
- **Concrete Inertia Base**
- **KINETICS CIB**

---

**Table Content**

<table>
<thead>
<tr>
<th>Equipment Location</th>
<th><strong>Floor Span</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Packaged AH, AC, H and V Units</strong></td>
<td><strong>Floor Span</strong></td>
</tr>
<tr>
<td><strong>Packaged AH, AC, H and V Units</strong></td>
<td><strong>Floor Span</strong></td>
</tr>
</tbody>
</table>

---

**Table Details**

- **Base Type A:** Direct Isolation
  - No base, isolators attached directly to equipment.
  - **KINETICS KSR Isolation Curb**
  - **KINETICS ESR Isolation Curb**

- **Base Type D:** Direct Isolation
  - No base, isolators attached directly to equipment.
  - **KINETICS SBB Structural Rail Base**
  - **KINETICS QuietRail Cooling Tower Rail**
The Fiberglass Advantage
Kinetics Noise Control manufactures both fiberglass and neoprene isolators. Fiberglass isolators offer the following advantages:

- Varying densities and sizes to suit a variety of load requirements
- Constant pad performance, unaffected by age or high temperatures
- UV resistant for outdoor use constant location performance through seasonal temperature changes
- Ask local rep for fiberglass advantage demonstration

ASHRAE TYPE 1: Fiberglass and Neoprene Pads

**KINETICS KIP-RT**

**Rooftop Equipment Pads**

**Description:** KIP-RT fiberglass pads are used to control vibration that is being transmitted from rooftop equipment. KIP-RT is 1.75" wide x 48" long and is installed between roof-mounted equipment and the supporting curb.

**Application:** Packaged Rooftop Equipment

**Dimensions:** 1.75" wide x 0.5" thick x 48" long

**KINETICS NP / NG, RSP**

**Neoprene Isolation Pads**

**Description:** Single-ribbed or crossed, double-ribbed elastomer-in-shear pads, in combination with steel shims when required, having minimum static deflections as tabulated.

**Application:** Isolate noise, shock, and high frequency vibration, generated by mechanical equipment and industrial machinery located on a grade-supported structural slab.

**Capacity:**

NP/NG: Designed to permit 60 or 120 PSI (4.2 or 8.4 kg/cm²) loading at maximum rated deflections.

RSP: Designed to permit 60 psi (4.2 kg/cm²) loading at a maximum rated deflection of 0.15" (4 mm)

**Dimensions:**

NP/NG pads are available in 4", 6", or 9" (102, 152, 228 mm) squares with capacities from 400 to 9,700 lbs. (181 to 4400 kg), or in full 18" (457 mm) square sheets which can be cut or drilled to meet field requirements.

RSP: 18" x 18" x 3/4" (457 mm x 457 mm x 19 mm) thick sheets, scored into 2" x 2" x 3/4" (51 mm x 51 mm x 19 mm) thick pads

**Deflection:** NP Pads 0.04" to 0.09" (1 mm to 2 mm) NG Pads 0.13" to 0.19" (3 mm to 5 mm)

---

**Equipment Type:**

**Heat Pumps, Fan-Coils, Computer Room Units; Condensing Units; Packaged Rooftop Equipment**

**ASHRAE TYPE 1:** Fiberglass and Neoprene Pads

---

**Equipment Type:**

**Heat Pumps, Fan-Coils, Computer Room Units; Condensing Units; Packaged Rooftop Equipment**

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Slab on Grade</th>
<th>Up to 20 ft (6 m)</th>
<th>20 to 30 ft (6 - 9 m)</th>
<th>30 to 40 ft (9-12 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Type</td>
<td>ASHRAE Type</td>
<td>Isolator Defl.</td>
<td>Base Type</td>
</tr>
<tr>
<td>Heat Pumps, Fan-Coils, Computer Room Units</td>
<td>A</td>
<td>0.75&quot; (19)</td>
<td>A</td>
<td>0.75&quot; (19)</td>
</tr>
<tr>
<td>Condensing Units</td>
<td>A</td>
<td>0.25&quot; (6)</td>
<td>A</td>
<td>0.75&quot; (19)</td>
</tr>
<tr>
<td>Packaged Rooftop Equipment</td>
<td>A/D</td>
<td>1</td>
<td>0.25&quot; (6)</td>
<td>D</td>
</tr>
</tbody>
</table>

*Data from 2019 ASHRAE Handbook. See back for additional notes on Packaged Rooftop Equipment.*
ASHRAE TYPE 2: Floor Isolator or Hanger

**KINETICS AC**
Fiberglass Isolation Mount

Description: A molded inorganic fiberglass isolation pad bonded to a steel load transfer plate, and to a formed steel bolt-down bracket. AC mount includes an equipment anchor bolt with a neoprene grommet to prevent metal-to-metal contact.

Application: Recommended for the isolation of vibration produced by utility ventilating fans, vane axial fans, high speed motors, roof-mounted exhaust fans, and similar mechanical equipment.

Capacity: 40 to 900 lbs. (18 kg to 409 kg)
Deflection: 0.18 in. to 0.70 in. (4 mm to 18 mm)

**KINETICS RD, RDS and RQ**
Neoprene Isolation Mounts

Description: One-piece molded neoprene mounts with encapsulated metal inserts. Available in a housed seismic version.

Application: Recommended for the isolation of vibration produced by small pumps, vent sets, and low pressure packaged air-handling units.

Capacity: 55 lbs. to 4,000 lbs. (25 kg to 1814 kg)
Deflection: RD up to 0.5" (13 mm)
RQ up to 0.13" (3 mm)

**KINETICS FH**
Fiberglass Isolation Hanger

Description: A coded, molded, inorganic fiberglass isolation pad attached to a steel load transfer plate and to a stamped or welded hanger bracket.

Application: Recommended for the isolation of vibration produced by suspended mechanical or electrical equipment, in-line and exhaust fans, ductwork, or piping.

Capacity: 250 lbs. to 900 lbs. (18 kg to 409 kg)
Deflection: 0.18" to 0.27" (4 mm to 7 mm)

**KINETICS RH**
Neoprene Isolation Hanger

Description: A coded elastomer in-shear insert with a load plate, assembled into a stamped or welded hanger bracket.

Application: Recommended for the isolation of vibration produced by suspended mechanical or electrical equipment, in-line and exhaust fans, ductwork, or piping.

Capacity: up to 2,000 lbs (907 kg)
Deflection: 0.20" to 0.57" (5mm to 15 mm)

ASHRAE TYPE 3: Spring Floor Isolator or Hanger

**KINETICS FDS**
Free-Standing Spring Isolator

Description: A high deflection, free-standing, unhoused, large diameter, laterally stable steel springs assembled into an upper load plate and leveling assembly.

Application: Recommended for control of both high and low frequency vibration produced by reciprocating air or refrigeration compressors, pumps, packaged air-handling and air-conditioning equipment, centrifugal and axial fans, and internal combustion engines.

Capacity: 35 lbs. to 23,200 lbs. (16 kg to 10,523 kg)
Deflection: 1" to 4" (25 mm to 102 mm)

**KINETICS SFH, SRH, SH**
Spring Isolation Hangers

Description: Free-standing, laterally stable steel spring, in series with a pre-compressed molded fiberglass insert (SFH), elastomer-in-shear insert (SRH), or elastomeric washer (SH) complete with a load plate (SFH/SRH only) and assembled in a stamped or welded steel bracket.

Hangers will allow support rod misalignment through a 30° arc without short-circuiting. Isolation brackets will carry a 500% overload without failure.

Application: Recommended for the isolation of vibration produced by suspended mechanical equipment, in-line fans, exhaust fans, cabinet fans, pumps, ductwork, and piping.

Capacity: 35 lbs. to 3,850 lbs. (16 kg to 1,747 kg)
Deflection: 1" to 2.40" (25 mm to 61 mm), and 4.05" to 4.75" (104 mm to 112 mm)

**Patented No-Short Self-Centering Cap**
(U.S. Patent No. 5,653,426)
Featured on 1” and 2” spring isolation hangers. Indexed steps in spring cap keep the washer and rod centered in the cap.
### ASHRAE TYPE 4: Restrained Spring Isolator

**KINETICS TITAN**  
(U.S. Patent No. 9,316,279)  
**Vibration Isolator/Restraint**  
**Description:** Comprised of two interfacing but independent elements: two or more high deflection, free-standing, housed, large diameter, laterally stable steel springs, and a seismically rated housing.  
*The steel springs and elastomeric snubber element are each replaceable without having to lift or otherwise remove the supported equipment.*  
**Application:** Recommended for equipment mounted on a structural frame, or concrete inertia base where the top plate of the isolator can be fully utilized.  
**Capacity:** up to 23,200 lbs. (10,523 kg)  
**Deflection:** up to 4” (102 mm)

**KINETICS FHS/FHSL**  
**Restrained Spring Isolator**  
**Description:** FHS Free-Standing Isolator with a steel housing assembly to limit lateral and vertical movement of the supported equipment during an earthquake without degrading the vibration isolation of the spring during normal equipment operating conditions.  
**Application:** Recommended for mechanical equipment located near critically quiet areas when there is a possibility that the equipment to be isolated will be subjected to the external forces associated with an earthquake.  
**Capacity:** up to 5,800 lbs. (2,631 kg)  
**Deflection:** up to 4” (102 mm)

**KINETICS FLS/FLSS**  
**Restrained Spring Isolators**  
**Description:** FLS/FLSS Free-standing, large diameter, laterally stable steel springs assembled into welded steel housing assemblies fabricated to limit vertical movement of the isolated equipment. The housings provide a constant free and operating height to facilitate installation.  
**Application:** Recommended for the isolation of vibration produced by equipment carrying a large fluid load which may be drained, such as boilers and chillers, and for the isolation of outdoor components such as cooling towers and air-cooled condensers.  
**Capacity:** up to 23,200 lbs. (10,523 kg)  
**Deflection:** up to 4” (102 mm)

**KINETICS FMS**  
(U.S. Patent No. 7,028,969)  
**Modular Restraint/Isolator**  
**Description:** The unit is comprised of a restraint module and an optional vibration isolation module. This modular design allows the engineer to design for seismic or wind forces independent of the load and deflection requirements of the vibration isolator.  
**Application:** Ideal for cooling towers, chillers, boilers or other equipment where the potential for wide weight variations during service is anticipated.  
**Capacity:** up to 23,200 lbs. (10,523 kg)  
**Deflection:** up to 4” (102 mm)

### ASHRAE TYPE 4: Restrained Spring Isolator

**KINETICS KCI**  
**Spring Isolator**  
**Description:** Compact lightweight small restrained spring isolator, Plated Steel assembly to limit lateral and vertical movement of the supported equipment during an earthquake or wind storm. Angle top plate or threaded bolt options available for equipment attachment.  
**Application:** Recommended for small to medium mechanical equipment near critically quiet areas when there is also need for Wind or Seismic restraint. Can also be used with strut to isolate equipment farms.  
**Deflection:** up to 2” (51 mm)

**KINETICS LDR**  
**Light Duty Rail System**  
**Description:** A low-cost solution designed to isolate residential style condensing units and other light weight equipment.  
**Application:** Recommended for the isolation of rooftop condensing units to eliminate vibration from penetrating into the structure below and disturbing the occupants.  
**Capacity:** up to 810 lbs. (10,523 kg)  
**Deflection:** 1” (25 mm)

### ASHRAE TYPE 5: Thrust Restraint

**KINETICS HSR**  
**Thrust Restraint**  
**Description:** A high deflection, large diameter, laterally stable steel coil spring assembled into a threaded rod and bracket assembly.  
**Application:** Used to counteract the discharge force created by fans during operation. Recommended for all fan heads, suspended fans, and all base-mounted and suspended air-handling equipment operating at 2 inches or greater total static pressure (TSP). HSR Thrust Restraints are always installed in pairs and often work in conjunction with inertia bases for floor-mounted fans to counteract fan thrust.  
**Capacity:** 35 lbs to 1,975 lbs. (16 to 896 kg)  
**Deflection:** 1” to 2” (25 mm to 51 mm)

### ASHRAE TYPE 6: Air Springs

**KINETICS KAM and CAM**  
**Air Vibration Isolation Mounts**  
**Description:** Pneumatic, elastomeric vibration mounts. The CAM is available in four (4) sizes supporting loads up to 7,500 lbs. The KAM is available in seven (7) sizes with capacities from 500 to 22,000 lbs. per mount.  
**Application:** Recommended for mechanical equipment and industrial process equipment requiring low natural frequency isolation, as well as protecting sensitive equipment from disturbing floor-borne vibration.
BASE TYPE A: Direct Isolation

Used when equipment is unitary and rigid and does not require additional support. Direct isolation can be used with large chillers, some fans, packaged air-handling units, and air-cooled condensers. If there is any doubt that the equipment can be supported directly on isolators, use structural bases (type B) or inertia bases (type C), or consult the equipment manufacturer.

BASE TYPE B: Structural Rails or Bases

**KINETICS QUIETRAIL**
Cooling Tower Rail
- **Description**: Specifically designed and engineered to support cooling towers and chillers requiring a supplemental mounting frame.
- **Application**: Designed to provide a wind and seismic rated vibration isolation frame without the need for additional equipment support steel. The frames provide a means by which the equipment can be stabilized and motion reduced by lowering the equipment center of gravity.

**KINETICS CRFS**
Computer Room Floor Stand
- **Description**: Structural steel floor stands provide rigid mounting for seismic restraint and/or isolation of computer room air conditioning units (CRAC).
- **Application**: Specifically designed and engineered to support computer room A/C units requiring seismic restraint and/or vibration isolation.

**KINETICS SFB**
Structural Frame Base
- **Description**: Welded structural frame bases with channels, angles, or WF beams, which are complete with outboard height-saving isolator brackets and prelocated equipment anchor bolts.
- **Application**: Recommended for support and isolation of reciprocating chillers, close coupled pumps, vent sets, packaged air handling units, centrifugal fans, evaporative condensers, and similar types of equipment.

**KINETICS PS**
Seismic Inline Pump Stand
- **Description**: Provide seismic restraint for vertical inline pumps without the need for intermediate support, delivering significant labor savings for contractors in the field.
- **Application**: The stands utilize a structural design that supports and restrains the inline pump and the associated piping to meet the latest seismic and wind restraint requirements.

**KINETICS KSIP**
Suspended Inline Pump Support
- **Description**: Provides a bracket for suspended vertical inline pumps without the need for intermediate support, delivering significant labor savings for contractors in the field and ease of installation.
- **Application**: Engineered to carry the weight of a suspended inline pump.

BASE TYPE C: Concrete Inertia Base

**KINETICS CIB**
Concrete Inertia Base
- **Description**: A unique structural design which integrates perimeter channels, isolator support brackets, reinforcing rods, anchor bolts, and concrete fill into a controlled load transfer system, utilizing steel in tension and concrete in compression, resulting in high strength and stiffness with minimum steel frame weight.
- **Application**: Recommended for use with open-type centrifugal chillers, reciprocating air and refrigeration compressors, chillers, and heat pumps, close-mounted and base-mounted pumps, centrifugal fans, internal combustion engines, and similar types of equipment.

**KINETICS KINFLEX**
Flexible Connectors
- **Description**: Prevent stresses due to expansion and contraction, isolate against the transfer of noise and vibration, and compensate for misalignment.
- **Application**: Used on both hot and chilled water circulation lines, suction and discharge sides of pumps, and header connections.

**KINFLEX Seismic V-Loops** solve the problems of pipe motion caused by thermal pipe growth and the movements associated with seismic activity. Seismic V-loops limit amount of space required for installation and hold in more heat than to traditional large pipe loops.
**BASE TYPE D: Curb-Mounted Base**

**KINETICS KSR 2.0**

Vibration Isolation Roof Curb Rail

KSR 2.0 equipment isolation rail is engineered to isolate packaged rooftop equipment from the roof structure. KSR 2.0 vibration isolation rails are specifically designed and engineered for use as a noise and vibration isolation system for roof curb-mounted mechanical equipment.

**The 2.0 Advantage**
- Improved design with fewer components than the previous KSR
- Extremely easy installation with factory assembled parts
- Pre-installed weather strip
- Integrated seismic and wind restraints that do not require additional labor to install
- Adjustable height to adapt to a multitude of curb mounted equipment designs
- Isolation rail is engineered to meet the latest building code requirements

**KINETICS Z-CLIP**

Wind Restraint Bracket

Designed to secure attachment of unit to the roof curb. Each bracket is engineered to fit specific application. Bolt toggle design allows for a secure through bolt attachment without needing access to the inside of the curb, reducing number of clips required and field labor.

**KINETICS KSCR and ESR**

Vibration Isolation Curbs

Complete assemblies designed to resiliently support equipment at the specified elevation and constitute a fully enclosed air and weather-tight system.

**Standard Features**
- Seismic and wind restraint
- Up to 4” (102 mm) deflection, powder-coated steel springs with 50% overload capacity
- Supply and return flexible connector support
- Environmentally inert elastomeric seal for an air and water-tight closure between the curb and rail
- High profile, non-interference aluminum rail (only KSCR)
- Accessible ports for each isolator to inspect, level, or change springs after equipment placement (only ESR)

**Options**
- Deflections over 4” (102 mm)
- Interface for sloped or multi-pitched roofs
- Additional height for plenums & silencers
- Exterior thermal insulation
- Acoustical treatments
- Certification of seismic and wind load engineering

**In Curb Acoustical Treatments**

Add an “in curb” acoustical treatment to control breakout noise from equipment fans and compressors into the space below.

**KINETICS RT-7**

RT-7 Acoustical Treatment

STC 37

Exclusively from Kinetics Noise Control, specially designed to control breakout noise from rooftop equipment in curbs, RT-7 is a cost-effective solution and a contractor favorite due to its light weight and overall ease of installation.

**KINETICS NOISEBLOCK**

Acoustical Panels

STC 40 / 43 / 48 / 52

Kinetics versatile NOISEBLOCK acoustical panels are double-walled perforated metal panels. For rooftop equipment, Kinetics specifies 22-gauge perforated panels that are manufactured to fit and laid into the bottom of the curb delivering superior sound absorption (noise reduction) and transmission loss (noise blocking).

**KINETICS ESSR**

Sound and Vibration Isolation Curb

Kinetics ESSR vibration isolated curb system addresses all noise sources associated with packaged rooftop equipment. Here is how:

1. Vibration from fans and compressors (source 1) and vibration from casing radiated noise caused by duct turbulence and the airborne noise of the fans and compressors (source 2) are controlled with Kinetics high deflection, laterally stable coil spring isolators and high frequency neoprene noise pads.
2. Duct-borne noise from the supply and return air fans (source 3) are controlled using an aerodynamic acoustical silencer on the supply fan and an acoustical plenum on the return air side - both with minimal pressure drop.
3. Breakout noise through the bottom of the rooftop unit (source 4) is controlled by the NOISEBLOCK STL acoustical panel located in the floor of the ESSR.
Seismic Restraint
Seismic restraint systems limit movement and keep equipment captive during a seismic event. Proper utilization of these systems can reduce the threat to life and minimize long-term costs due to equipment damage and associated loss of service. Additional seismic restraint products can be found within ASHRAE Type 4 (page 15) and Base Type D (page 18).

KINETICS QuakeLoc™
Seismic Cable Restraint Kits
Piping, duct, electrical cable trays, and suspended equipment
- Reduces Installation Time and Cost
- Contractor Friendly Design
- IBC Code Compliant

Accessories
KHRC Adjustable Angle Rod Stiffeners: Securely attach a length of steel angle to a conventional hanging threaded rod.
KSBC Seismic Beam Clamp: Attach seismic restraints to roof or floor support I-beams.

KINETICS QuakeStrut™
Rigid Seismic Bracing
FM Approved Class 1950
QuakeStrut-1 is used when you are through bolting to the strut and offers an economical rigid bracing option. QuakeStrut-2 is the full assembly with all of the hardware to connect the strut.

KINETICS HS Series
Seismic Snubbers
Description: Heavy structural steel assemblies designed to minimize equipment motion within the product’s design capabilities without failing.
Seismic Snubbers are designed to be used in pairs and serve to keep supported equipment contained when the equipment is subjected to lateral or vertical forces along any axis.

Seismic Mounting Brackets
KINETICS KSMS: Solid-mount equipment to the building structure
KINETICS KSMG: Resiliently mount and restrain equipment to the building structure
KINETICS KSMF: Solid-mount mushroom fans to the curb

Riser Supports, Anchors, and Guides
KINETICS® riser supports, anchors, and guides isolate the pipe from the structure to minimize noise and vibration transmission, while also allowing the pipe to expand and contract with minimal change in the support forces. KINETICS offers custom engineering services to assist in the design of your riser system. Please see KINETICS Pipe Riser Selection Guide for details.

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**PIPING/HANGER SELECTION DATA (U.S.)**

<table>
<thead>
<tr>
<th>KNC Hanger Model No.</th>
<th>Wt. @ 10 ft. Spacing (lb.)</th>
<th>Wt. per Lin. Ft. (lb.)</th>
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<tbody>
<tr>
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<td>5.0</td>
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<tr>
<td>7.0</td>
<td>0.3</td>
<td>8.5</td>
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**Approximate Flanged Fitting Weights (lb.)**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Check Valve</th>
<th>Gate Valve</th>
<th>Elbow</th>
<th>Flange</th>
</tr>
</thead>
<tbody>
<tr>
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<td>4</td>
<td>15</td>
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<tr>
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<td>4</td>
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<td>6</td>
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<td>8</td>
<td>12</td>
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<td>28</td>
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</table>

**PIPING/HANGER SELECTION DATA (SI)**

<table>
<thead>
<tr>
<th>KNC Hanger Model No.</th>
<th>Recommended Rod Size (mm)</th>
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<tbody>
<tr>
<td>SH/SRH/SFH -1</td>
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<tr>
<td>SH/SRH/SFH -2</td>
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</tr>
<tr>
<td>Elbow</td>
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</table>

**Approximate Flanged Fitting Weights (kg)**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Check Valve</th>
<th>Gate Valve</th>
<th>Elbow</th>
<th>Flange</th>
</tr>
</thead>
<tbody>
<tr>
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<td>36</td>
<td>26</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>32</td>
<td>51</td>
<td>26</td>
<td>11</td>
<td>4</td>
</tr>
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<td>50</td>
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</tr>
<tr>
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<td>10.1</td>
<td>2.3</td>
</tr>
<tr>
<td>200</td>
<td>16.2</td>
<td>8.2</td>
<td>10.1</td>
<td>2.3</td>
</tr>
</tbody>
</table>

**Note:**
- Wt. per Hanger (lb.)
- Insulation:
  - Rod: 0.88
  - Flange: 1.00
- Recommended Rod Size (mm)**
- Approximate Flanged Fitting Weights (lb.)
- Approximate Flanged Fitting Weights (kg)
- *Inclusion weight based on industry standard insulation
- *Mod size recommendation and max. hanger spacing based on MSS SP-69
Isolation Notes for Specific Equipment*


**Refrigeration Machines**
Large centrifugal, screw, and reciprocating refrigeration machines may generate very high noise levels; special attention is required when such equipment is installed in upper-story locations or near noise-sensitive areas. If equipment is located near extremely noise-sensitive areas, follow the recommendations of an acoustical consultant.

**Compressors**
The two basic reciprocating compressors are (1) single- and double-cylinder vertical, horizontal or L-head, which are usually air compressors; and (2) Y, W, and multthead or multicylinder air and refrigeration compressors. Single- and double-cylinder compressors generate high vibratory forces requiring large inertia bases (type C) and are generally not suitable for upper-story locations. If this equipment must be installed in an upper-story location or at-grade location near noise-sensitive areas, the expected maximum unbalanced force data must be obtained from the equipment manufacturer and a vibration specialist consulted for design of the isolation system.

When using Y, W, and multthead and multicylinder compressors, obtain the magnitude of unbalanced forces from the equipment manufacturer so the need for an inertia base can be evaluated.

Base-mounted compressors through 5 hp and horizontal tank-type air compressors through 10 hp can be installed directly on spring isolators (type 3) with structural bases (type B) if required, and compressors 15 to 100 hp on spring isolators (type 3) with inertia bases (type C) weighing 1 to 2 times the compressor weight.

**Pumps**
Concrete inertia bases (type C) are preferred for all flexible-coupled pumps and are desirable for most close-coupled pumps, although steel bases (type B) can be used. Close-coupled pumps should not be installed directly on individual isolators (type A) because the impeller usually overhangs the motor support base, causing the rear mounting to be in tension. The primary requirements for type C bases are strength and shape to accommodate base elbow supports. Mass is not usually a factor, except for pumps over 75 hp, where extra mass helps limit excess movement due to starting torque and forces. Concrete bases (type C) should be designed for a thickness of one-tenth the longest dimension with minimum thickness as follows: (1) for up to 30 hp, 6 in.; (2) for 40 to 75 hp, 8 in.; and (3) for 100 hp and up, 12 in. Pumps over 75 hp and multistage pumps may exhibit excessive motion at start-up ("heaving"); supplemental restraining devices can be installed if necessary. Pumps over 125 hp may generate high starting forces; consult a vibration specialist.

**Cooling Towers**
These are normally isolated with restrained spring isolators (type 4) directly under the tower or tower dunnage. High deflection isolators proposed for use directly under the motor-fan assembly must be used with extreme caution to ensure stability and safety under all weather conditions.

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**Packaged Rooftop Air-Conditioning Equipment**
This equipment is usually installed on lightweight structures that are susceptible to sound and vibration transmission problems. The noise problems are compounded further by curb-mounted equipment, which requires large roof openings for supply and return air.

The table shows type D vibration isolator selections for all spans up to 20 ft, but extreme care must be taken for equipment located on spans of over 20 ft, especially if construction is open web joists or thin, lightweight slabs. The recommended procedure is to determine the additional deflection caused by equipment in the roof. If additional roof deflection is 0.25 in. or less, the isolator should be selected for up to 10 times the additional roof deflection. If additional roof deflection is over 0.25 in., supplemental roof stiffening should be installed to bring the roof deflection down below 0.25 in., or the unit should be relocated to a stiffer roof position.

For mechanical units capable of generating high noise levels, mount the unit on a platform above the roof deck to provide an air gap (buffer zone) and locate the unit away from the associated roof penetration to allow acoustical treatment of ducts before they enter the building.

Some rooftop equipment has compressors, fans, and other equipment isolated internally. This isolation is not always reliable because of internal short-circuiting, inadequate static deflection, or panel resonances. It is recommended that rooftop equipment over 300 lb be isolated externally, as if internal isolation was not used.

**Fans and Air-Handling Equipment**
Consider the following in selecting isolation systems for fans and air-handling equipment:

1. Fans with wheel diameters of 22 in. and less and all fans operating at speeds up to 300 rpm do not generate large vibratory forces. For fans operating under 300 rpm, select isolator deflection so the isolator natural frequency is 40% or less than the fan speed. For example, for a fan operating at 275 rpm, 0.4 x 275 = 110 rpm. Therefore, an isolator natural frequency of 110 rpm or lower is required. This can be accomplished with a 3 in. deflection isolator (type 3).

2. Flexible duct connectors should be installed at the intake and discharge of all fans and air-handling equipment to reduce vibration transmission to air duct structures.

3. Inertia bases (type C) are recommended for all class 2 and 3 fans and air-handling equipment because extra mass allows the use of stiffer springs, which limit heaving movements.

4. Thrust restraints (type 5) that incorporate the same deflection as isolators should be used for all fan heads, all suspended fans, and all base-mounted and suspended air-handling equipment operating at 2 in. or more total static pressure. Restraint movement adjustment must be made under normal operational static pressures.

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