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Apex has been supplying universal joints for military and commercial applications since 1933. Over these 70+ years we have provided engineered solutions for thousands of demanding applications worldwide. Today, Apex is recognized as the “Less downtime, more Lifetime” leader in pin and cube universal joint designs and applications. Our primary markets are:

**Government/Military Applications**

Apex meets the demanding requirements of military applications such as gun systems, remote valve control, Unmanned Aerial Vehicles (UAV), thrust vector control systems, and fan drive universal joints.

**Aerospace**

Commercial, military, business jets, and private aircraft all utilize Apex universal joints. Typical uses include flap/slat actuation, “hinges” for cargo doors and windows, mechanical linkages for steering, trim control and door latching mechanisms. Apex double universal joints have even been used to replace gear boxes. These high strength-to-weight ratio universal joints have excellent torsional freeplay (i.e., backlash) characteristics suited to this environment.

**Off-highway/Construction Equipment**

Applications include steering columns, a variety of mechanical linkages and power take offs. Also included are custom designs for specialty equipment (e.g., fire trucks.)
Apex Universal Joints Overview

Performance Racing
Our MS series of universal joints have become the standard by which all other universal joints are measured. The same aerospace design considerations are applicable in this competitive market. Primary uses are for steering, shift linkages, and chassis adjustment applications.

Industrial Power Transmission
This represents the most diverse area of applications. Some typical uses are steel leveling equipment, links to conveyor systems, pump drive systems, multiple spindle drill heads, bowling alley pin setters, canning equipment, centerless grinders, bottling machines, industrial sewing machines, control linkages, mixing equipment, packaging machinery, and industrial scales. This list represents only a fraction of the applications where Apex universal joints are used. Our "quick-change" universal joints are extremely popular in this area. They eliminate precision alignment requirements and allow for quick repair of critical machinery and assembly/conveyor lines.

Apex universal joints consistently deliver performance in process industries where continuous operation is the norm and equipment availability/uptime is critical. Whatever your application, you can depend on Apex universal joints to provide rigidity and exceptionally high strength-to-weight ratios with less deflection, superior fatigue resistance and high overload capacity. Add to this Apex's wide selection of elastomeric covers that seal lubrication in and protect the universal joint from harsh operating environments (e.g., dirt, water, abrasive slurry, etc.), and you have unsurpassed reliability for your application. All of these features can be incorporated into single, double, telescopi, or quick-change universal joints. We specialize in make-to-order products engineered to optimize your application and reduce operating costs. Apex is the Performance Authority for pin-and-cube universal joints.

Apex Offers A Variety of Solutions For Your Standard or Custom Application

If your application calls for something other than our standard 300 or 400 series universal joints, Apex can provide it for you. Our engineers are ready to solve your application problems. Some of the options available are:

- **Universal Joint Configurations:**
  - In addition to the standard plain bearing design, there is also a "Press Fit" design which improves fatigue life in reverse loading applications. For higher RPMs, we offer a needle bearing line.
- **Materials:**
  - Alloy steels (4140, 4150, 4340), Austenitic stainless steel (303, 304, 316, Nitronic 60), Martensitic stainless steel (416, 440C, 13-8, 17-4, 15-6), carbon steel (1020, 8620) and specially steels (such as Stressproof and S-2 Modified).
- **Bearings:**
  - Apex utilizes plain, rolling element and polymer bearings in its designs. Selecting the right bearing maximizes the performance of the universal joint, minimizes/eliminates maintenance, and increases the life of the universal joint.
- **Heat Treatment:**
  - Apex proprietary heat treat, selective through hardening, induction hardening, and case hardening.
- **Surface Treatment:**
  - Light oil, cadmium (electrolytic and vacuum), electrolytic zinc, nickel (electrolytic and electroleass), black oxide, phosphate (manganese and zinc), solid film lubricant, and a variety of paint solutions.
- **Cover Materials:**
  - Silicone, Nitrile, EPDM, Viton, Neoprene, FDA approved food polymer, vinyl, Silicon/Dacron, Fluoro-Silcon/Nomex.
- **Cover Styles:**
  - Bubbous, flat, and convoluted.

- **Lubricants:**
  - High pressure gear oil, "natural" grease, synthetic grease, synthetic grease with additives (improves "dry start" characteristics), non-outgassing grease, food grade grease, graphite powder, and solid film lubricant.
- **Geometry:**
  - Square, Hex, Threaded, splines (involute or straight-sided), gears, split collar with lug bolt, keyways, precision diameters (.002"), gears, whistle-notch, and quick-release. Where applicable, these are available in male or female.
  - Additionally, multiple features can be combined on the same hub. Apex engineers utilize these options daily to design the product right for your needs. From extreme loading (including seismic) to harsh environments (-80˚ to 600˚ F), Apex is your Total Solution Source.

**Quality**

Apex universal joints are supplied from our Dayton facility which has AS9100 certification, AS9100 is a widely adopted and standardized quality management system for the aerospace industry and incorporates fully the entirety of the current version of ISO 9001.

Our Dayton facility, manufacturing site of Apex Universal Joints, has AS9100 Quality System Certification. The driving force behind the implementation of the Quality System is the commitment "to provide our customers with the best value delivered by offering only products and services that meet or exceed their expectations."
The most useful tool, however, is the knowledge gained from providing application solutions for over 60 years. Use the application sheet at the back of this catalog to find out how Apex universal joints can improve the performance of your application.

Short delivery times required for replacement parts or product development samples can be produced in the “Short Run Cell.” This cell has all of the manufacturing capability to produce almost any configuration universal joint in an expedited manner. A single machinist takes ownership of the job and is responsible for it from production to final assembly. Please ask about this service if you have an expedited need for a small quantity of parts.

**The Apex Total Solution Designed Into Every Universal Joint**

The illustration below highlights many of the common design features that have made Apex the Market Leader in providing “less downtime, more lifetime” for some of the most demanding applications. At the heart of this success is engineering excellence that created and continues to refine this design to meet the ever increasing challenges of new applications. To further compliment this, add Apex’s manufacturing capabilities and its proprietary heat-treat processes. The result is a “balanced” design that provides the highest strength-to-weight ratio pin and cube universal joint available. It is not uncommon for Apex to outperform the competition by at least 30% in strength for equivalent size products.

**Performance Features:**

- Efficient operation up to 35° standard (higher operating angles available)
- Designed-in overload capacity for greater reliability. (Temporary torsional overloads up to 80% and axial overloads up to 150% of the rated ultimate capacity can occur without harmful binding)
- Proprietary heat treat of alloy steel maximizes “toughness”
- Available with covers that seal in lubrication and greatly improve service life.

**Drive pins (main pin and bushings)**

- Heat treated alloy steel, precision ground for minimum backlash and long service life.
- Designed for balanced design with earform.

**Earform geometry**

- Designed, developed, and tested for “balanced design” load carrying capability.

**Cube**

- Heat treated alloy steel, precision machined to minimize backlash, side play, and endplay of the assembly. Geometric control of pin and bushing operation.

**Cross pin**

- Strengthens the assembly during intermittent overload or severe bending conditions.

**Interchangeability**

- We offer a wide variety of hub configurations (bore, keyway, hex, split, square, threads) to meet your requirements.

**Apex Universal Joints Overview**

Apex has extensive in-house testing and validation capabilities.

- Drive pins (main pin and bushings)
- Earform geometry
- Cube
- Cross pin
- Interchangeability
### 300 Series Single Universal Joints

#### Single universal joint with operating angles up to 35 degrees
- Full range of sizes from 3/8” to 2”
- Ultimate static strength up to 28,040 lbs-in
- Available with or without lubrication covers
- Standard cover supplied is Neoprene or Nitrile, others available
- Select from solid hubs, bored hubs and bores with keyways
- Hubs not need to be the same on both ends
- Field/customer machinable alloy steel
- Plating available upon request

### Solid Hubs

<table>
<thead>
<tr>
<th>Part Number (Uncovered)</th>
<th>A +/-.001” Outside Diameter</th>
<th>B +/-.001” Overall Length</th>
<th>Weight of Solid Hub (Flanged Assembly)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>in</td>
<td>lbs</td>
<td></td>
</tr>
<tr>
<td>300-6-5</td>
<td>0.375 9.5 1.750 44.4</td>
<td>0.093 0.042</td>
<td></td>
</tr>
<tr>
<td>300-10-5</td>
<td>0.625 15.9 2.188 56.6</td>
<td>0.233 0.106</td>
<td></td>
</tr>
<tr>
<td>300-12-5</td>
<td>0.750 19.1 2.500 63.5</td>
<td>0.356 0.162</td>
<td></td>
</tr>
<tr>
<td>300-14-5</td>
<td>0.875 22.2 3.000 76.2</td>
<td>0.538 0.231</td>
<td></td>
</tr>
<tr>
<td>300-16-5</td>
<td>1.000 25.4 3.375 85.7</td>
<td>0.758 0.345</td>
<td></td>
</tr>
<tr>
<td>300-20-5</td>
<td>1.250 31.8 3.750 95.2</td>
<td>1.247 0.567</td>
<td></td>
</tr>
<tr>
<td>300-24-5</td>
<td>1.500 38.1 4.500 114.3</td>
<td>2.156 0.980</td>
<td></td>
</tr>
<tr>
<td>300-28-5</td>
<td>1.750 44.1 5.000 127.0</td>
<td>3.125 1.409</td>
<td></td>
</tr>
<tr>
<td>300-32-5</td>
<td>2.000 50.8 5.500 139.7</td>
<td>4.500 2.045</td>
<td></td>
</tr>
</tbody>
</table>

#### Bored Hubs

<table>
<thead>
<tr>
<th>Part Number (Uncovered)</th>
<th>C +/-.001” Bore Depth</th>
<th>D +/-.001” Bore Diameter</th>
<th>Keyway Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>in</td>
<td>in</td>
<td></td>
</tr>
<tr>
<td>300-6-4</td>
<td>0.375 9.5 0.500 12.7</td>
<td>0.125 3.2</td>
<td>0.063 1.6</td>
</tr>
<tr>
<td>300-8-4</td>
<td>0.500 12.7 0.625 15.9</td>
<td>0.125 3.2</td>
<td>0.063 1.6</td>
</tr>
<tr>
<td>300-12-4</td>
<td>0.750 19.1 0.625 15.9</td>
<td>0.188 4.8</td>
<td>0.094 2.4</td>
</tr>
<tr>
<td>300-16-4</td>
<td>1.000 25.4 0.625 15.9</td>
<td>0.188 4.8</td>
<td>0.094 2.4</td>
</tr>
<tr>
<td>300-20-4</td>
<td>1.250 31.8 0.750 19.0</td>
<td>0.188 4.8</td>
<td>0.094 2.4</td>
</tr>
<tr>
<td>300-24-4</td>
<td>1.500 38.1 0.875 22.2</td>
<td>0.188 4.8</td>
<td>0.094 2.4</td>
</tr>
<tr>
<td>300-28-4</td>
<td>1.750 44.1 1.000 25.4</td>
<td>0.250 6.3</td>
<td>0.125 3.2</td>
</tr>
<tr>
<td>300-32-4</td>
<td>2.000 50.8 1.125 28.6</td>
<td>0.313 8.0</td>
<td>0.156 4.8</td>
</tr>
</tbody>
</table>

#### Keyways

- 300-12-8-4: 0.750 19.1 0.500 12.7 0.125 3.2 0.063 1.6
- 300-14-8-4: 0.938 23.8 0.500 12.7 0.125 3.2 0.063 1.6
- 300-16-10-6: 0.938 23.8 0.625 15.9 0.188 4.8 0.094 2.4
- 300-20-10-6: 1.000 25.4 0.625 15.9 0.188 4.8 0.094 2.4
- 300-28-16: 1.250 31.8 1.000 25.4 0.250 6.3 0.125 3.2
- 300-32-18: 1.375 34.9 1.125 28.6 0.313 8.0 0.156 4.8

#### Performance specifications for standard products

| Size        | Minimum Ultimate Static Torsional Strength | Ultimate Axial Strength | Maximum Momentary Stall (overload) Torque | Maximum Peak Torque (for shock load or reversal conditions) | Torsional Play |
|-------------|--------------------------------------------|-------------------------|------------------------------------------|----------------------------------------------------------------|
| Lbs-in      | in                                         | lbs                      | lbs-in                                    | lbs-in                                                        | Max Degrees   |
| 3/8”        | 276                                         | 31                       | 500                                       | 2,224                                                      | 0.45 1.00     |
| 1/2”        | 504                                         | 67                       | 1,400                                     | 6,228                                                       | 0.45 0.80     |
| 5/8”        | 960                                         | 108                      | 2,500                                     | 11,121                                                     | 0.45 0.64     |
| 3/4”        | 1,680                                       | 190                      | 4,600                                     | 25,017                                                     | 0.45 0.53     |
| 7/8”        | 2,520                                       | 286                      | 7,000                                     | 31,138                                                     | 0.90 0.46     |
| 1”          | 4,500                                       | 508                      | 12,500                                    | 55,603                                                     | 0.90 0.40     |
| 1-1/4”      | 7,200                                       | 813                      | 19,700                                    | 87,630                                                     | 0.90 0.32     |
| 1-1/2”      | 12,000                                      | 1,356                    | 24,000                                    | 106,757                                                    | 0.90 0.27     |
| 1-3/4”      | 15,600                                      | 1,763                    | 29,000                                    | 128,998                                                    | 0.90 0.23     |
| 2”          | 26,040                                      | 2,942                    | 39,000                                    | 173,481                                                    | 0.50 0.20     |

In addition to these standard configurations, different end configurations can be combined. Please call for further assistance. Metric and special sizes available upon request. Please call or fax form at the back of catalog.
Extra Heavy-Duty Industrial Universal Joints

400 Series

- Operating angles up to 35 degrees
- Sizes from 2-1/2" to 4"
- Ultimate static strength up to 139,200 lbs-in
- Available with or without lubrication covers
- Select from solid, bored, and keyway hubs
- In addition to the standard items listed, each hub can have a unique interface geometry
- Available with plain bearings, bronze-sleeved bearings (field-replaceable wear item to extend universal joint life), and rolling element bearings (field-replaceable wear item to extend universal joint life), and rolling element
- Plating available upon customer request
- Field/customer rebuild kits available

**Note:** The first number(s) after the 300 or 400 series prefix represent the outside diameter of the universal joint in 16ths of an inch. A number following this is the diameter of the bore in 16ths of an inch. For example, 300-20-12-6 is a 1.25" O.D. (20/16") universal joint with a .75" (12/16") bore on each end and a .188" (6/32") keyway.

<table>
<thead>
<tr>
<th>Keyway Size</th>
<th>Part Number (Uncovered)</th>
<th>A +001, -000</th>
<th>B +001, -000</th>
<th>Weight of Solid-hub Covered Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>400-40-4-12</td>
<td>1.750</td>
<td>4.44</td>
<td>1.50</td>
<td>38.1</td>
</tr>
<tr>
<td>400-40-28-16</td>
<td>2.375</td>
<td>6.03</td>
<td>1.75</td>
<td>44.5</td>
</tr>
<tr>
<td>400-40-36-20</td>
<td>3.000</td>
<td>7.52</td>
<td>2.50</td>
<td>50.8</td>
</tr>
<tr>
<td>400-40-42</td>
<td>4.000</td>
<td>2.50</td>
<td>2.00</td>
<td>63.5</td>
</tr>
</tbody>
</table>

**Part Number (Covered) = Part Number (Uncovered) + Number of Covers**

**Note:** Universal joint assemblies are available with different bore/keyway sizes on each hub. Many combinations are standard products. Please call for part numbers, price and availability.

<table>
<thead>
<tr>
<th>Size</th>
<th>Minimum Ultimate Static Torsional Strength</th>
<th>Ultimate Axial Strength</th>
<th>Maximum Momentary Shaft (overload) Torque</th>
<th>Maximum Peak Torque (flat check load or reversal conditions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lbs-in</td>
<td>N-m</td>
<td>Lbs</td>
<td>N</td>
</tr>
<tr>
<td>2-1/2</td>
<td>38,040</td>
<td>4,298</td>
<td>54,000</td>
<td>240,204</td>
</tr>
<tr>
<td>3</td>
<td>61,440</td>
<td>6,942</td>
<td>75,000</td>
<td>333,616</td>
</tr>
<tr>
<td>4</td>
<td>139,200</td>
<td>15,728</td>
<td>125,000</td>
<td>556,028</td>
</tr>
</tbody>
</table>

**Performance specifications for standard products**

Metric and special sizes available upon request. Please call or fax form at the back of catalog.
Double Universal Joints

- Double universal joint with operating angles up to 70 degrees
- Full range of sizes from 3/8" to 4"
- Center hub available with bearing support
- Available with or without lubrication covers
- Standard cover supplied is Neoprene or Nitrile, others available
- Select from solid hubs, bored hubs, and bores with keyways
- In addition to the standard items listed, each hub can have a unique interface geometry
- Field/customer machinable alloy steel
- Available with needle bearings
- Plating available upon request

**Note:** The first number(s) after the 300 or 400 series prefix represent the outside diameter of the universal joint's an inch. A number following this is the diameter of the bore in 16ths of an inch. If the product has a keyway it will be represented by a number following the bore size and is in 32nds of an inch. For example, 300-20-12 is a 1.25" (32/32") universal joint with a 7/16" (12/16") bore on each end and a .188" (8/32") keyway.

### Size

<table>
<thead>
<tr>
<th>Size</th>
<th>Minimum Ultimate Shear Strength</th>
<th>Ultimate Axial Strength</th>
<th>Maximum Peak Torque (for shock load or reversal conditions)</th>
<th>Torsional Play per joint (Maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lbs-in</td>
<td>lbs</td>
<td>N-m</td>
<td>Degrees</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>276</td>
<td>31</td>
<td>500</td>
<td>2,224</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>544</td>
<td>57</td>
<td>1,400</td>
<td>6,228</td>
</tr>
<tr>
<td>9/16&quot;</td>
<td>980</td>
<td>108</td>
<td>2,500</td>
<td>11,121</td>
</tr>
<tr>
<td>7/8&quot;</td>
<td>1,250</td>
<td>131</td>
<td>4,500</td>
<td>20,017</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1,680</td>
<td>190</td>
<td>5,000</td>
<td>70,017</td>
</tr>
<tr>
<td>1-1/4&quot;</td>
<td>2,720</td>
<td>813</td>
<td>19,700</td>
<td>87,630</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>12,000</td>
<td>1,356</td>
<td>24,000</td>
<td>106,738</td>
</tr>
<tr>
<td>1-3/4&quot;</td>
<td>15,600</td>
<td>1,753</td>
<td>29,000</td>
<td>138,998</td>
</tr>
<tr>
<td>2&quot;</td>
<td>26,040</td>
<td>2,942</td>
<td>39,000</td>
<td>173,481</td>
</tr>
</tbody>
</table>

### Performance specifications for standard products

- 3/8" 276 31 500 2,224 156 18 55 6 4 0.45 1.00
- 1/2" 544 57 1,400 6,228 300 34 110 12 4 0.45 0.80
- 9/16" 980 108 2,500 11,121 576 65 190 21 4 0.45 0.64
- 7/8" 1,250 131 4,500 20,017 1,008 114 340 38 4 0.45 0.53
- 1" 1,680 190 5,000 70,017 1,250 171 500 56 8 0.00 0.46
- 1-1/4" 2,720 813 19,700 87,630 4,320 488 1,450 164 8 0.00 0.32
- 1-1/2" 12,000 1,356 24,000 106,738 7,200 813 2,400 271 8 0.00 0.27
- 1-3/4" 15,600 1,753 29,000 138,998 9,360 1,058 3,100 350 8 0.00 0.23
- 2" 26,040 2,942 39,000 173,481 15,600 1,763 5,200 588 8 0.00 0.20

Metric and special sizes available upon request. Please call or fax form at the back of catalog.
Apex Telescopic/Quick-Change universal joint assemblies consist of two universal joints mounted at opposite ends of a special spring-loaded connector. Spring tension holds the assembly in driving position, yet permits instant removal by compressing one end of the assembly and lifting it clear.

Proper alignment (as shown above in the "correct" diagram) is critical for telescopic applications.

Replacement Universal Joints

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Used On</th>
<th>Style</th>
<th>Cover*</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-135</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>6 1/4 to 6 5/8</td>
</tr>
<tr>
<td>10-141</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>7 5/8 to 5 5/16</td>
</tr>
<tr>
<td>10-143</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>7 5/8 to 6 1/16</td>
</tr>
<tr>
<td>10-144</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>5 1/4 to 4 5/16</td>
</tr>
<tr>
<td>10-146</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/N</td>
<td>5 11/32 to 4 7/16</td>
</tr>
<tr>
<td>10-147</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>5 11/32 to 4 7/16</td>
</tr>
<tr>
<td>10-171</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/C</td>
<td>7 5/8 to 5 15/16</td>
</tr>
<tr>
<td>14-110</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/C</td>
<td>8 7/8 to 7 9/16</td>
</tr>
<tr>
<td>14-190</td>
<td>Elto Drill Head</td>
<td>X</td>
<td>C/C</td>
<td>7 15/16 to 9 1/16</td>
</tr>
<tr>
<td>UJ-130</td>
<td>U.S. Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>3 29/32</td>
</tr>
<tr>
<td>UJ-248-E</td>
<td>U.S. Drill Head</td>
<td>X</td>
<td>C/F</td>
<td>3 7/8</td>
</tr>
<tr>
<td>UJ-305E</td>
<td>U.S. Drill Head</td>
<td>X</td>
<td>C/C</td>
<td>10 to 8 1/4</td>
</tr>
<tr>
<td>UJ-193-A</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>C</td>
<td>1 7/16</td>
</tr>
<tr>
<td>UJ-193-C</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>F</td>
<td>1 7/16</td>
</tr>
<tr>
<td>UJ-296-A</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>C</td>
<td>1 3/4</td>
</tr>
<tr>
<td>UJ-296-C</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>F</td>
<td>1 5/8</td>
</tr>
<tr>
<td>UJ-331-A</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>C</td>
<td>2 1/2</td>
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<tr>
<td>UJ-331-H</td>
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<td>F</td>
<td>2 1/4</td>
</tr>
<tr>
<td>16-610-A</td>
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<td>S</td>
<td>C</td>
<td>2 1/2</td>
</tr>
<tr>
<td>16-610-H</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>F</td>
<td>2 1/2</td>
</tr>
<tr>
<td>20-791-A</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>C</td>
<td>3 3/4</td>
</tr>
<tr>
<td>20-791-B</td>
<td>Johnson Drill Head</td>
<td>S</td>
<td>F</td>
<td>3 3/4</td>
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<tr>
<td>10-240</td>
<td>Burgmaster Drill Head</td>
<td>X</td>
<td>C/C</td>
<td>12 1/2</td>
</tr>
<tr>
<td>10-250</td>
<td>Burgmaster Drill Head</td>
<td>S</td>
<td>C/C</td>
<td>18 1/2 to 17 1/2</td>
</tr>
<tr>
<td>UJ-794-A</td>
<td>Burgmaster Drill Head</td>
<td>S</td>
<td>C</td>
<td>3 3/4</td>
</tr>
<tr>
<td>UJ-794-B</td>
<td>Burgmaster Drill Head</td>
<td>S</td>
<td>C</td>
<td>3 3/4</td>
</tr>
<tr>
<td>204-307</td>
<td>Burgmaster Drill Head</td>
<td>S</td>
<td>C</td>
<td>5 1-6B spline</td>
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<tr>
<td>204-538</td>
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<td>S</td>
<td>C</td>
<td>5 1-6B spline</td>
</tr>
<tr>
<td>33-151</td>
<td>Burgmaster Drill Head</td>
<td>S</td>
<td>C</td>
<td>5 1/2</td>
</tr>
<tr>
<td>33-253</td>
<td>Burgmaster Drill Head</td>
<td>S</td>
<td>C</td>
<td>5 1/2</td>
</tr>
<tr>
<td>UJ-1066-B</td>
<td>Jarvis Drill Head</td>
<td>X</td>
<td>N</td>
<td>3 5/8</td>
</tr>
<tr>
<td>UJ-207-B</td>
<td>Jarvis Drill Head</td>
<td>X</td>
<td>N</td>
<td>3 5/8</td>
</tr>
<tr>
<td>12-191-A</td>
<td>Jarvis Drill Head</td>
<td>X</td>
<td>C</td>
<td>3 7/8</td>
</tr>
<tr>
<td>UJ-253-C</td>
<td>Commander Drill Head</td>
<td>S</td>
<td>C</td>
<td>2 17/32</td>
</tr>
<tr>
<td>UJ-301</td>
<td>Commander Drill Head</td>
<td>X</td>
<td>C/C</td>
<td>7 21/32 to 6 3/8</td>
</tr>
</tbody>
</table>

*Cover Designations:  C = Bulbous Cover  F = Low Profile Cover  N = No Cover

*Hex Designations:  C = Female hex  M = Male hex
Light-Duty Military Standard Universal Joints

**MS 270 Series**

- Light-duty MS 270 military standard universal joints have undergone qualification testing and meet or exceed the requirements of Military Specification MIL-DTL-6193 and Standard Drawing MS20270.

**Dimensions**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Shape</th>
<th>Overall Length</th>
<th>Bore Depth</th>
<th>Cover Dia.</th>
<th>Angle</th>
<th>Test Torque</th>
<th>Maximum Ultimate Static Torque</th>
<th>Axial Tension &amp; Compression</th>
<th>Endurance Torque Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-20270-B6</td>
<td>B</td>
<td>1.245</td>
<td>0.372</td>
<td>50.80</td>
<td>15°</td>
<td>15,500</td>
<td>339.00</td>
<td>32.21</td>
<td>18.31</td>
</tr>
<tr>
<td>MS-20270-B8</td>
<td>B</td>
<td>1.188</td>
<td>0.452</td>
<td>50.80</td>
<td>15°</td>
<td>14,241</td>
<td>311.36</td>
<td>28.57</td>
<td>16.11</td>
</tr>
<tr>
<td>MS-20270-B10</td>
<td>B</td>
<td>1.125</td>
<td>0.620</td>
<td>50.80</td>
<td>15°</td>
<td>3,000</td>
<td>675.00</td>
<td>50.00</td>
<td>25.67</td>
</tr>
<tr>
<td>MS-20270-B12</td>
<td>B</td>
<td>1.063</td>
<td>0.745</td>
<td>50.80</td>
<td>15°</td>
<td>2,534</td>
<td>600.00</td>
<td>44.48</td>
<td>22.35</td>
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<tr>
<td>MS-20270-B14</td>
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<td>0.870</td>
<td>50.80</td>
<td>15°</td>
<td>2,000</td>
<td>531.00</td>
<td>37.55</td>
<td>19.76</td>
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<tr>
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<td>0.995</td>
<td>50.80</td>
<td>15°</td>
<td>1,500</td>
<td>470.00</td>
<td>28.54</td>
<td>15.35</td>
</tr>
<tr>
<td>MS-20270-B18</td>
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<td>0.687</td>
<td>1.062</td>
<td>50.80</td>
<td>15°</td>
<td>1,000</td>
<td>414.00</td>
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<td>10.53</td>
</tr>
<tr>
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<td>B</td>
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<td>343.00</td>
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<tr>
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<td>15°</td>
<td>490.00</td>
<td>293.00</td>
<td>7.01</td>
<td>3.56</td>
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<tr>
<td>MS-20270-B24</td>
<td>B</td>
<td>0.250</td>
<td>1.750</td>
<td>50.80</td>
<td>15°</td>
<td>390.00</td>
<td>213.00</td>
<td>4.88</td>
<td>2.44</td>
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</tbody>
</table>

**Part Number**

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K
- L
- M
- N
- O
- P
- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z

---

Heavy-Duty Military Standard Universal Joints

**MS 271 Series**

- Heavy-duty MS 271 military standard universal joints have undergone qualification testing and meet or exceed the requirements of Military Specification MIL-DTL-6193 and Standard Drawing MS20271.

**Dimensions**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Shape</th>
<th>Overall Length</th>
<th>Bore Depth</th>
<th>Cover Dia.</th>
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<th>Test Torque</th>
<th>Maximum Ultimate Static Torque</th>
<th>Axial Tension &amp; Compression</th>
<th>Endurance Torque Tests</th>
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</thead>
<tbody>
<tr>
<td>MS-20271-B6</td>
<td>B</td>
<td>1.245</td>
<td>0.372</td>
<td>50.80</td>
<td>15°</td>
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<td>339.00</td>
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<td>B</td>
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<td>0.452</td>
<td>50.80</td>
<td>15°</td>
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<td>311.36</td>
<td>28.57</td>
<td>16.11</td>
</tr>
<tr>
<td>MS-20271-B10</td>
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<td>1.125</td>
<td>0.620</td>
<td>50.80</td>
<td>15°</td>
<td>3,000</td>
<td>675.00</td>
<td>50.00</td>
<td>25.67</td>
</tr>
<tr>
<td>MS-20271-B12</td>
<td>B</td>
<td>1.063</td>
<td>0.745</td>
<td>50.80</td>
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<td>1,000</td>
<td>414.00</td>
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<td>B</td>
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<td>1.495</td>
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<td>390.00</td>
<td>213.00</td>
<td>4.88</td>
<td>2.44</td>
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- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z

---

**Apex**

**MS 270 Series**

- MS 270 Series

**MS 271 Series**

- MS 271 Series
Apex military standard universal joints are designed to strict specifications to assure unsurpassed strength-to-weight ratios, torsional and axial overload capacity and low torsional deflection. Built to withstand the most demanding service life, the original may last the service life of the vehicle or machine. Apex military standard universal joints can be ordered with or without protective lubrication covers. Consult your Apex representative for application details.

High rigidity means low deflection rates

The deflection curves below prove the axial and torsional strength of Apex military standard universal joints. You get maximum overload protection, trouble-free operation and long service life.

**MS Series Military Standard Universal Joints**

**TORQUE**

N-m  Lbs.-in.

110

High rigidity means low deflection rates

- Ideal for high capacity, critical applications
- Hand-assembled needles eliminate torsional free-play/"Backlash"
- Designed for continuous duty
- Available in single, double and telescopic designs
- Midget grease fittings in hubs allow field lubrication
- Elastomeric cover optional for harsh environments
- Ideal for applications over 2000 rpm's
- Meet performance requirements of SAE AS9831
- Operating angles up to 25 degrees
- Shaft/hub configurations designed to meet your application needs

**Needle Bearing Universal Joints**

**Dimensions and Specifications: Spline Hub**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in</td>
<td>mm</td>
</tr>
<tr>
<td>12A-101</td>
<td>2.656</td>
<td>67.46</td>
</tr>
<tr>
<td>20A-1448**</td>
<td>3.312</td>
<td>84.12</td>
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**Dimensions and Specifications: Bored Hub**

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<th>Part Number</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>L</th>
<th>Weight Max.</th>
<th>Static Torque Max.</th>
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<tbody>
<tr>
<td></td>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>mm</td>
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<td>mm</td>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>lbs.</td>
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<td>23.53</td>
<td>0.505</td>
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</table>

*Supercedes MS-24312

**Dimensions and Specifications: Spline Hub**

<table>
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<tr>
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<th>N</th>
<th>Weight Joint Total Max.</th>
<th>Static Torque Max.</th>
<th>16/32 Diameter Pitch External Involute Spline Data</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>in</td>
<td>mm</td>
<td>lbs.</td>
<td>kg</td>
<td>lbs.-in.</td>
</tr>
<tr>
<td>12A-101</td>
<td>2.656</td>
<td>67.46</td>
<td>36.51</td>
<td>0.57</td>
<td>0.259</td>
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<tr>
<td>20A-1448**</td>
<td>3.312</td>
<td>84.12</td>
<td>50.80</td>
<td>1.20</td>
<td>0.644</td>
</tr>
</tbody>
</table>

*Supercedes MS-370A

**TORQUE MIN.**

**Light-Duty Military — 1/2” (12.70 mm)**

Spec. Ultimate

**TORQUE MIN.**

**Light-Duty Military — 1-1/4” (31.75 mm)**

Spec. Ultimate

**HEAVY DUTY**

**DEGREES DEFLCTION**

**Light-Duty Military — 1/2” (12.70 mm)**

**TORQUE MIN.**

**Light-Duty Military — 1-1/4” (31.75 mm)**

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**HEAVY DUTY**

**DEGREES DEFLCTION**

**Light-Duty Military — 1/2” (12.70 mm)**

**TORQUE MIN.**

**Light-Duty Military — 1-1/4” (31.75 mm)**

Spec. Ultimate

**DEGREES DEFLCTION**

**A P E X**

**A P E X**
Instructions To Calculate The Correct Joint Size

For Intermittent Operation:
1. Multiply operating speed (in RPMs) by operating angle (in degrees) to get the RPM-working angle factor (X-Axis).

Intermittent Operation Parameters:
• Operating angle less than 5°: On time must not exceed 50% of total cycle time and cannot be greater than 5 minutes.
• Operating angle 5°-10°: On time must not exceed 30% of total cycle time and cannot be greater than 4 minutes.
• Operating angle greater than 10°: On time must not exceed 20% of total cycle time and cannot be greater than 3 minutes.

2. Find the intersecting point between transmitted torque (Y-Axis) and RPM-working angle factor (X-Axis).
3. Choose the universal joint performance curve which is directly above the intersecting point from Step 2.

For Continuous Operation:
2. Find the intersecting point between 2 times the transmitted torque (Y-Axis) and RPM-working angle factor (X-Axis).
3. Choose the universal joint performance curve which is directly above the intersecting point from Step 2.

Request For Information

Request for information only — this is NOT an order. Important: To expedite quote, fill out form completely and FAX to 937-228-1736 or use the online form at http://apexuniversal.com/UJquote.cfm.

Company Name: ____________________________
Address: ___________________________________________________________________________
City: ___________ State: ___________ Zip: ___________ Country: ____________________________________________________________________
Individual’s Name: _________________________
Title: _____________________________________________________________________________
Phone: ___________ Fax: ___________ E-mail: ____________________________

1. Application: _____________________________ Military Application? ___________ Yes ___________ No

2. Quantity to be quoted: _____________________

3. Nature of Operation:
   a. Continuous: [ ] Hours per day ___________ or: Intermittent: [ ] Time on ___________ Time off ___________
      Cycles per day: _________________________
   b. Operating temperature: Maximum ___________ Minimum ___________
   b. Non-operating temperature: Maximum ___________ Minimum ___________

4. Describe operating environment (such as corrosive, abrasive, extremes in temperature, etc.): ______________________________________________________________________________

5. Horsepower transmitted by universal joint or torque: ____________________________

6. R.P.M. ____________________________ If variable, state range: ____________________________

7. Operating angle: Maximum angle required: ____________________________

8. Backlash (torsional freeplay) condition desired: [ ] MIL-J-6193 [ ] MIL-U-3963 [ ] Not Critical [ ] Other

For Intermittent Operation:
1. Multiply operating speed (in RPMs) by operating angle (in degrees) to get the RPM-working angle factor (X-Axis).

MINIMUM CLEARANCE FROM CENTERLINE Offset Between Shafts

Telescopic & Quick-Change

DISTANCE BETWEEN SHAFTS

UJ Geometry is [ ] Male [ ] Female

DISTANCE BETWEEN SHAFTS

Overall Length

Double

Single
POWER TOOLS SALES & SERVICE CENTERS

Please note that all locations may not service all products. Contact the nearest Apex Tool Group Sales & Service Center for the appropriate facility to handle your service requirements.

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Fax: +1 (248) 391-6295

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