



**DIAMETERS  
AS SMALL AS  
2 MM**

## Miniature Lead Screws

Precise Linear Motion Components for Small-Scale Applications



## Lead Screws to Meet Today's Design Challenges

As the demand for increasingly compact devices grows within various industries, the need for ever smaller components has grown with it. To help engineers meet these stringent design requirements, the Thomson line of miniature lead screws delivers the linear motion precision you've come to know from our lead screws with diameters as small as two millimeters.

### **Big Precision in a Little Package**

With these miniature lead screws, Thomson enables engineers to achieve designs once considered impossible. Devices that traditionally could not be made portable or mobile can now be reduced in size and weight without having to compromise precision, life or function.

Thomson miniature lead screws' tiny diameters are complemented by miniscule anti-backlash nuts that are pre-designed and catalogued as standard. The screws are part of an extensive product offering of standard screws and nuts that allow for an easily configurable solution for many small-scale or space-constrained applications. Finally, their quick-mount integrated coupler allows for quick and simple installation using basic hand tools.



**MINIATURE.**  
**CONFIGURABLE.**  
**EASY TO INSTALL.**

### Revolutionary Anti-Backlash Design

Thomson miniature lead screws offer the option of one of the world's smallest anti-backlash nuts, which is designed to add minimal size and weight to the overall lead screw assembly. The anti-backlash nut is specifically designed for optimal performance at a miniature scale. This technology eliminates any clearance between the lead screw and lead nut threads while also compensating for thread wear developed via normal operation.



### Configurability

Thomson offers the industry's most comprehensive small-scale lead screw product line, consisting of various lead screw diameter and lead options, lead nut geometries and backlash types, as well as many standard lead screw end configurations.



### Quick-Mounting Integrated Coupler

The all-new integrated coupler design allows end-users to easily mount their Thomson miniature lead screw using only basic hand tools. Simply insert the required mating shaft in the coupler and torque down the lock nut for a secure and accurate connection.



### Customization

Whether a custom lead nut, modified lead screw or a completely new, complex modification is required, Thomson engineers can work with you to provide a solution that is tailor-made to your design needs. Common customization options include end machining, special coatings, unique nut design and end configurations, and more.





## Miniature Lead Screws at a Glance

When it comes to your small-scale linear motion applications, choosing the ideal miniature lead screw can help optimize performance and life expectancy. That's why Thomson offers several configuration options. Which miniature lead screw is best for your next design?

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### LEAD SCREWS

| Diameters | Leads    |
|-----------|----------|
| 2 mm      | 0.375 mm |
| 3 mm      | 0.5 mm   |
| 4 mm      | 0.75 mm  |
|           | 1.5 mm   |
|           | 3 mm     |
|           | 4 mm     |

| Material        | Lengths      |
|-----------------|--------------|
| Stainless Steel | Up to 150 mm |



4

### SUPPORT END CONFIGURATIONS

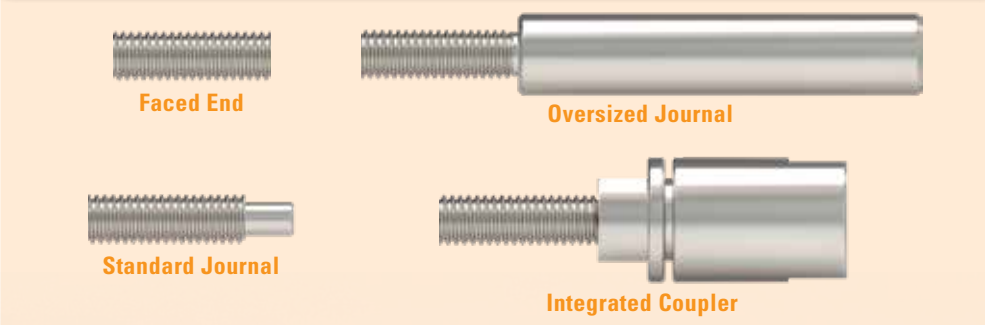


Faced End



Standard Journal

**2 DRIVE END CONFIGURATIONS**



**3 LEAD NUTS**



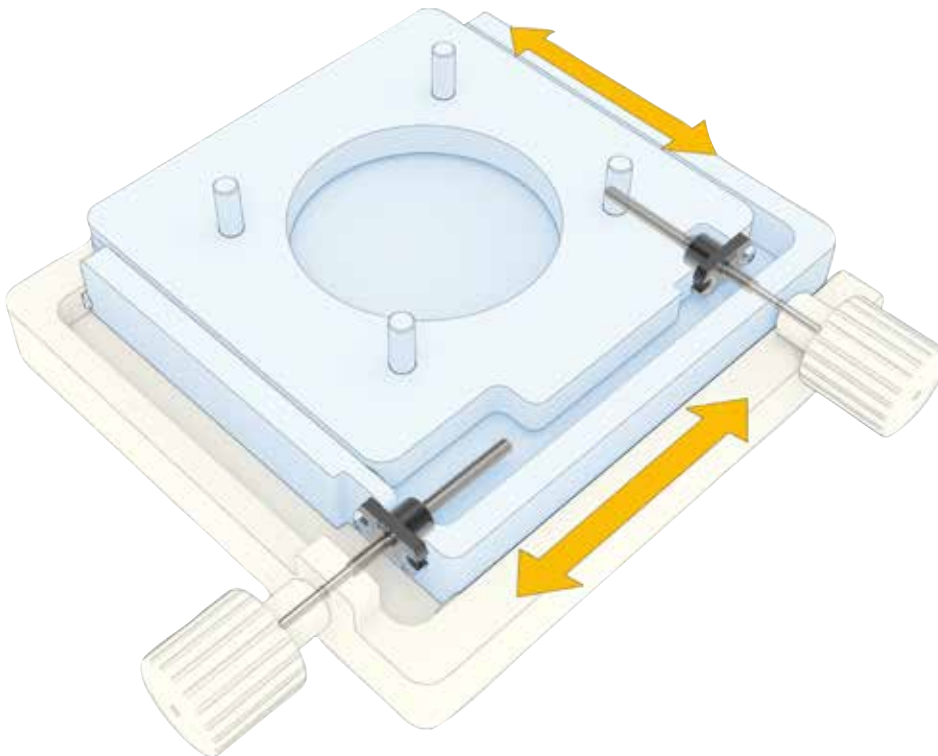
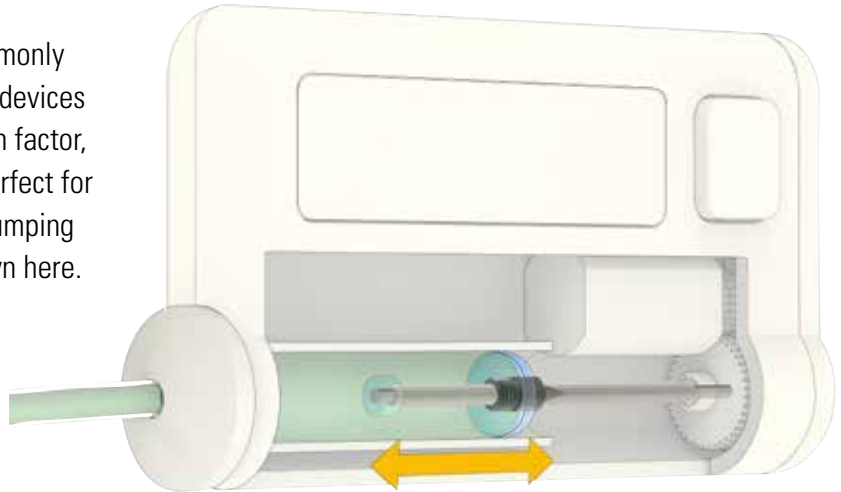


## Application Examples

Thomson miniature lead screws and nuts provide a high level of quality and precision in a compact envelope, affording engineers newfound flexibility when designing for a variety of applications.

### Handheld Pumping Device

Precision lead screws are already commonly used as drive mechanisms in pumping devices today. However, due to their small form factor, Thomson miniature lead screws are perfect for incorporating into smaller, handheld pumping devices such as the insulin pump shown here.

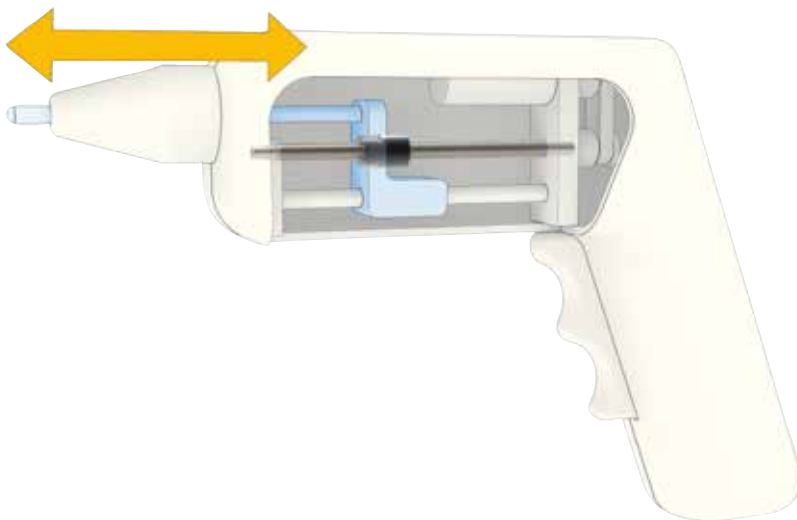
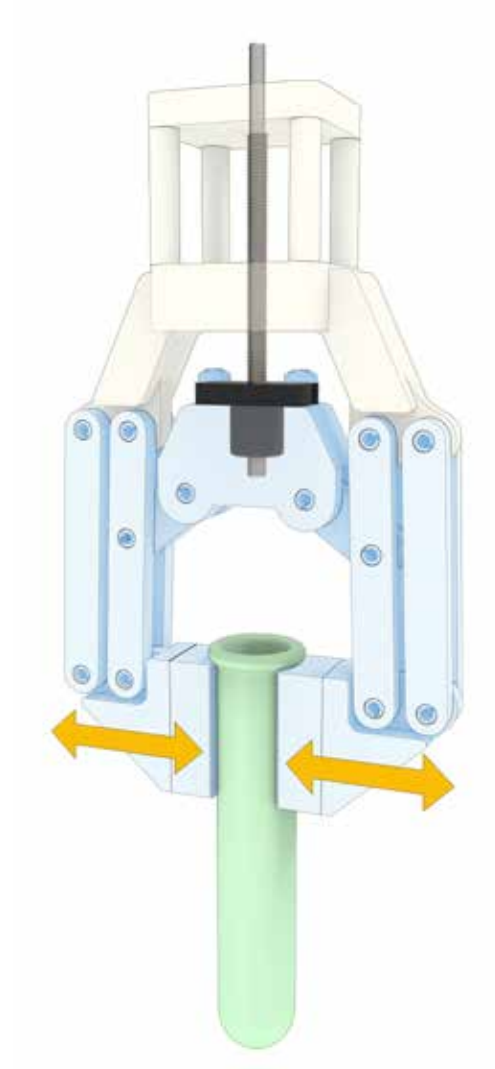


### Microscope XY Stage

For optimal focus, microscope stages often require very small and precise planar movements. Miniature lead screws can aid in delivering these movements, while taking up minimal space thanks to their compact and unobtrusive form factor.

### Micro Gripper

Robotic applications utilizing a gripper cater to many industrial tasks such as pick-and-place, material handling and test tube instrument holders. For smaller, precise micro-gripping mechanisms, Thomson miniature lead screws, in combination with a motor, can be the perfect linear drive mechanism.



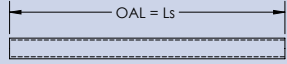
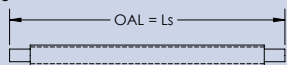
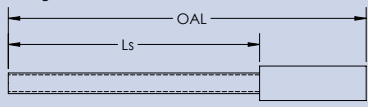
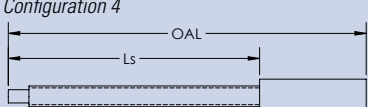
### Handheld Examination Device

Medical devices continue to improve over time. These design iterations allow for easier use, better quality and faster diagnoses. One example is a smaller footprint found in the handheld ear scanning device shown here. Smaller medical devices like this can benefit from Thomson miniature lead screws in their design application.



# Ordering Key

## Miniature Lead Screw

| 1  | 2        | 3          | 4        | 5  | 6        | 7        | 8          | 9  | 10       |           |          |          |             |
|--|----------|------------|----------|--|----------|----------|------------|--|----------|-----------|----------|----------|-------------|
| <b>CM</b>  | <b>3</b> | <b>100</b> | <b>-</b> | <b>0450</b>  | <b>N</b> | <b>-</b> | <b>C15</b> | <b>J10</b>   | <b>-</b> | <b>SF</b> | <b>D</b> | <b>-</b> | <b>0001</b> |
| <p><b>1. Series</b><br/>CM = CM-Series Miniature Lead Screws</p> <p><b>2. Diameter</b><br/>2 = 2 mm<br/>3 = 3 mm<br/>4 = 4 mm</p> <p><b>3. Lead (Linear Travel/Rev)</b><br/>038 = 0.375 mm<br/>050 = 0.50 mm<br/>075 = 0.75 mm<br/>100 = 1.00 mm<br/>150 = 1.50 mm<br/>300 = 3.00 mm<br/>400 = 4.00 mm<br/>600 = 6.00 mm<br/>800 = 8.00 mm</p> <p><b>4. Overall Length (OAL)</b><br/>(see diagrams below)<br/><i>Screw only (config 1 and 2 below)</i><br/>OAL = 0250 to 1500 (25.0 to 150.0 mm)</p> <p><i>Screw + oversized journal or coupler (config 3 and 4)<sup>(1)</sup></i><br/>OAL = 0400 to 1700 (40.0 to 170.0 mm)</p> <p><i>Configuration 1</i></p>  <p><i>Configuration 2</i></p>  <p><i>Configuration 3</i></p>  <p><i>Configuration 4</i></p>  |          |            |          | <p><b>5. Screw Coating</b><br/>N = None</p> <p><b>6. Drive End Configuration</b><br/>A00 = No machining (faced end)<br/>XXX = Custom machining<sup>(2)</sup></p> <p><i>Integrated Coupler</i><br/>C15 = for Ø 1.5 mm shaft<br/>C20 = for Ø 2.0 mm shaft<br/>C30 = for Ø 3.0 mm shaft<br/>C40 = for Ø 4.0 mm shaft<br/>C50 = for Ø 5.0 mm shaft</p> <p><i>Standard Journal</i><sup>(3)</sup><br/>J10 = Ø 1.0 mm x 1.0 mm<br/>J20 = Ø 2.0 mm x 3.0 mm<br/>J25 = Ø 2.5 mm x 3.0 mm</p> <p><i>Oversized Journal</i><sup>(4)</sup><br/>K30 = Ø 3.0 mm x 25.0 mm<br/>K40 = Ø 4.0 mm x 25.0 mm<br/>K50 = Ø 5.0 mm x 25.0 mm<br/>K60 = Ø 6.0 mm x 25.0 mm<br/>K70 = Ø 7.0 mm x 25.0 mm</p> <p><b>7. Support End Configuration</b><sup>(5)</sup><br/>A00 = No machining (faced end)<br/>XXX = Custom machining<sup>(2)</sup></p> <p><i>Standard Journal</i><br/>J10 = Ø 1.0 mm x 1.0 mm<br/>J20 = Ø 2.0 mm x 3.0 mm<br/>J25 = Ø 2.5 mm x 3.0 mm</p> |          |          |            | <p><b>8. Lead Nut</b><br/>SF = MSF Standard backlash, flanged mount<br/>AF = MAF Anti-backlash, flanged mount<br/>ST = MST Standard backlash, thread mount<br/>SC = MSC Standard backlash, thread mount (compact configuration)<br/>XX = Custom lead nut<sup>(2)</sup><br/>00 = No lead nut</p> <p><b>9. Nut Direction</b><br/>D = Flange or thread mount facing "Drive Side"<br/>S = Flange or thread mount facing "Supported Side"<br/>M = Symmetrical end configurations<sup>(6)</sup><br/>X = Custom/see print<sup>(2)</sup><br/>0 = No lead nut</p> <p><b>10. Custom Designation</b><br/>(blank) = Standard configuration<br/>0000-9999 = Custom configuration<sup>(2)</sup><br/>(When custom property is required - to be assigned by Thomson)</p> |          |           |          |          |             |
| <p>(1) For screw configurations with oversized journals or couplers, lead screw portion (Ls) must not exceed 150 mm.<br/>(2) All custom designations to be assigned by Thomson.<br/>(3) Standard journal diameter to be smaller than selected lead screw diameter.<br/>(4) Oversized journal diameter to be greater than selected lead screw diameter.<br/>(5) Oversized or integrated coupler end configurations not available on "support" end of lead screw.<br/>(6) Symmetrical (M) nut direction to be selected only when drive end configuration = support end configuration.</p>  |          |            |          |  |          |          |            |  |          |           |          |          |             |

## Lead Screws Product Availability

| Diameter [mm] | Lead [mm] |     |      |   |     |   |   |   |   |
|---------------|-----------|-----|------|---|-----|---|---|---|---|
|               | 0.375     | 0.5 | 0.75 | 1 | 1.5 | 3 | 4 | 6 | 8 |
| 2             | ●         |     | ●    |   | ●   | ● |   |   |   |
| 3             |           | ●   |      | ● |     | ● |   | ● |   |
| 4             |           |     |      | ● |     |   | ● |   | ● |

For all other lead screw availability, please see standard lead screw catalog. For any custom diameter and/or leads, please contact Thomson customer support for more information.



# Specifications

| Basic Specifications                           |                 |                                    |                                    |                                    |
|--|-----------------|------------------------------------|------------------------------------|------------------------------------|
| Lead Screw                                     |                 | 2 mm                               | 3 mm                               | 4 mm                               |
| Major diameter                                 | [mm]            | 2                                  | 3                                  | 4                                  |
| Lead accuracy                                  | [mm/mm (in/in)] | 0.0005 (0.0005)                    |                                    |                                    |
| Straightness                                   | [mm (in)]       | 0.05 (0.002)                       |                                    |                                    |
| Thread direction                               |                 | right hand                         |                                    |                                    |
| Max. screw length <sup>(1)</sup>               | [mm (in)]       | 150 (5.9)                          |                                    |                                    |
| Max. speed <sup>(2)</sup>                      | [RPM]           | 1000                               |                                    |                                    |
| Max. input torque integrated coupler           | [N-m (oz-in)]   | 1.1 (150)                          |                                    |                                    |
| Material                                       |                 | stainless steel                    |                                    |                                    |
| Weight   | [mg/mm (oz/in)] | 26 (0.02)                          | 40 (0.04)                          | 70 (0.06)                          |
| Lead Nut                                       |                 | 2 mm                               | 3 mm                               | 4 mm                               |
| Drag torque for standard nut                   | [mN-m (oz-in)]  | free wheeling                      |                                    |                                    |
| Drag torque for anti-backlash nut              | [mN-m (oz-in)]  | 3.5 (0.5)                          |                                    |                                    |
| Dynamic load capacity for standard nut         | [N (lbf)]       | 8.9 (2)                            | 22.2 (5)                           | 44.5 (10)                          |
| Dynamic load capacity for anti-backlash nut    | [N (lbf)]       | 4.4 (1)                            | 11.1 (2.5)                         | 22.2 (5)                           |
| Min. life for standard nut <sup>(3)</sup>      | [revs]          | 200 Million                        |                                    |                                    |
| Min. life for anti-backlash nut <sup>(4)</sup> | [revs]          | 100 Million                        |                                    |                                    |
| Max. temperature                               | [°C (°F)]       | 82 (180)                           |                                    |                                    |
| Coefficient of friction <sup>(5)</sup>         |                 | 0.12 – 0.16                        |                                    |                                    |
| Efficiency                                     | %               | 37 – 79 <sup>(6)</sup>             |                                    |                                    |
| Max. axial backlash for standard nut           | [mm (in)]       | 0.058 (0.0023)                     | 0.058 (0.0023)                     | 0.064 (0.0025)                     |
| Max. axial backlash for anti-backlash nut      | [mm (in)]       | 0                                  |                                    |                                    |
| Positional repeatability for standard nut      | [mm (in)]       | 0.013 – 0.058<br>(0.0005 – 0.0023) | 0.013 – 0.058<br>(0.0005 – 0.0023) | 0.013 – 0.064<br>(0.0005 – 0.0025) |
| Positional repeatability for anti-backlash nut | [mm (in)]       | < 0.013 (0.0005)                   |                                    |                                    |
| Material                                       |                 | bearing grade PEEK                 |                                    |                                    |

1. Max screw length does not include oversized journal or coupler.

2. Faster speeds can be achieved but is not recommended. For optimal performance, speed should be under 500 RPM.

3. Under nominal loads and speeds.

4. Life of anti-backlash nut is number of cycles until mechanism no longer fully takes up clearance between lead screw and nut threads.

5. With dry lead screw. A lower coefficient of friction can be achieved by using grease or lubricants.

6. Efficiency calculated assuming COF = 0.12.

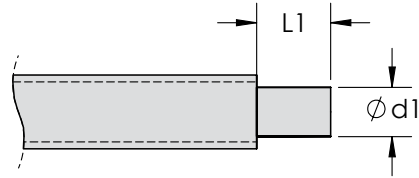


# Standard End Configurations

## Faced End (A00)

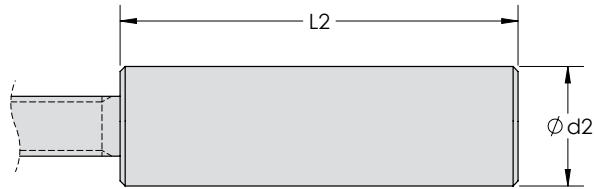


## Standard Journal (Jxx)



| P/N Code | Dimensions [mm (in)]         |                 | Compatible Screws [mm] |
|----------|------------------------------|-----------------|------------------------|
|          | d1                           | L1              |                        |
| J10      | 1.00/0.99<br>(0.0394/0.0390) | 1.00<br>(0.039) | 2, 3, 4                |
| J20      | 2.00/1.99<br>(0.0787/0.0783) | 3.00<br>(0.118) | 3, 4                   |
| J25      | 2.50/2.49<br>(0.0984/0.0980) | 3.00<br>(0.118) | 4                      |

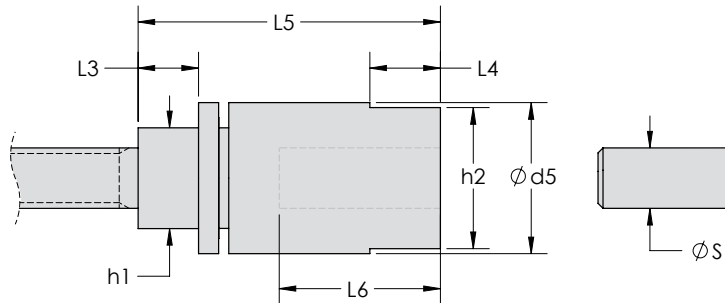
## Oversized Journal (Kxx)



| P/N Code | Dimensions [mm (in)]       |                | Compatible Screws [mm] |
|----------|----------------------------|----------------|------------------------|
|          | d2                         | L2             |                        |
| K30      | 3.00/2.97<br>(0.118/0.117) | 25.0<br>(0.98) | 2                      |
| K40      | 4.00/3.97<br>(0.157/0.156) | 25.0<br>(0.98) | 2, 3                   |
| K50      | 5.00/4.97<br>(0.197/0.196) | 25.0<br>(0.98) | 2, 3, 4                |
| K60      | 6.00/5.97<br>(0.236/0.235) | 25.0<br>(0.98) | 2, 3, 4                |
| K70      | 7.00/6.97<br>(0.276/0.275) | 25.0<br>(0.98) | 2, 3, 4                |

For custom end machining or end configurations, please contact Thomson Customer Support.

### Integrated Coupler (Cxx)



| P/N Code | Bore Size [mm] | Lead Screw [mm] | Dimensions [mm (in)] |              |              |              |              |                 |                                 |                     |
|----------|----------------|-----------------|----------------------|--------------|--------------|--------------|--------------|-----------------|---------------------------------|---------------------|
|          |                |                 | d5                   | h1           | h2           | L3           | L4           | L5              | S <sup>1</sup>                  | L6 <sup>2</sup> MAX |
| C15      | Ø1.5           | 2               | 6.00 (0.236)         | 4.00 (0.157) | 5.50 (0.217) | 3.00 (0.118) | 3.50 (0.138) | 14.5 (0.57) MAX | 1.500 / 1.490 (0.0591 / 0.0587) | 9.00 (0.35)         |
|          |                | 3               | 6.50 (0.256)         | 5.00 (0.197) | 6.00 (0.236) |              |              |                 |                                 | 8.00 (0.31)         |
|          |                | 4               | 7.00 (0.276)         | 5.50 (0.217) | 6.50 (0.256) |              |              |                 |                                 | 7.00 (0.28)         |
| C20      | Ø2.0           | 2               | 6.50 (0.256)         | 4.00 (0.157) | 6.00 (0.236) | 3.00 (0.118) | 3.50 (0.138) | 15.0 (0.59) MAX | 2.000 / 1.990 (0.0787 / 0.0783) | 9.50 (0.37)         |
|          |                | 3               |                      | 5.00 (0.197) |              |              |              |                 |                                 | 8.50 (0.33)         |
|          |                | 4               |                      | 5.50 (0.217) |              |              |              |                 |                                 | 7.50 (0.3)          |
| C30      | Ø3.0           | 2               | 7.50 (0.295)         | 4.00 (0.157) | 7.00 (0.276) | 3.00 (0.118) | 3.50 (0.138) | 15.5 (0.61) MAX | 3.000 / 2.990 (0.1181 / 0.1177) | 10.00 (0.39)        |
|          |                | 3               |                      | 5.00 (0.197) |              |              |              |                 |                                 | 9.00 (0.35)         |
|          |                | 4               |                      | 5.50 (0.217) |              |              |              |                 |                                 | 8.00 (0.31)         |
| C40      | Ø4.0           | 2               | 8.50 (0.335)         | 4.00 (0.157) | 8.00 (0.315) | 3.00 (0.118) | 3.50 (0.138) | 15.5 (0.61) MAX | 4.000 / 3.988 (0.1575 / 0.157)  | 10.00 (0.39)        |
|          |                | 3               |                      | 5.00 (0.197) |              |              |              |                 |                                 | 9.00 (0.35)         |
|          |                | 4               |                      | 5.50 (0.217) |              |              |              |                 |                                 | 8.00 (0.31)         |
| C50      | Ø5.0           | 4               | 9.50 (0.374)         | 6.00 (0.236) | 9.00 (0.354) | 3.00 (0.118) | 3.50 (0.138) | 15.5 (0.61) MAX | 5.000 / 4.988 (0.1969 / 0.1964) | 8.00 (0.31)         |

1. S = Recommended mating shaft diameter for optimal coupling. Recommended shaft diameter tolerance = h7.  
 2. L6 = Max insertion depth of shaft (S).  
 3. For required lock nut torques and installation instructions, see page 21.



# Miniature Lead Nuts

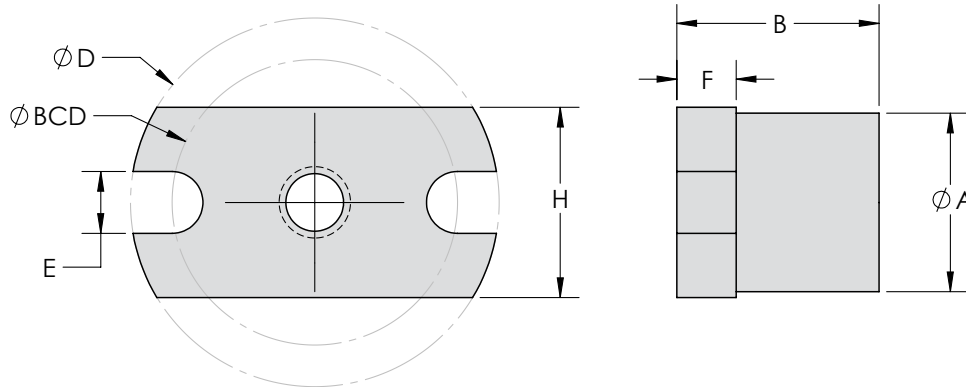
## MSF Flange Mount / Standard Backlash



### Features and Benefits

- The smallest Thomson flange mount nuts available.
- Injection-molded in a high-performance, bearing-grade material, specifically designed for demanding applications.
- For lead screw diameters of 2, 3 and 4 mm.
- Design loads of up to 10 lbf (44 N).

### Dimensions and Specifications



| Full P/N | Dimensions [mm (in)]     |               |            |             |             |                         |            |             |               | Max. Dynamic Load [N (lbf)] | Max. Screw Speed [RPM] | Drag Torque [mN-m (oz-in)] | Efficiency <sup>(2)</sup> [%] |
|----------|--------------------------|---------------|------------|-------------|-------------|-------------------------|------------|-------------|---------------|-----------------------------|------------------------|----------------------------|-------------------------------|
|          | Lead Screw Diameter [mm] | Lead          | A          | B           | D           | E                       | F          | H           | BCD           |                             |                        |                            |                               |
| MSF2038  | 2                        | 0.375 (0.015) | 5.3 (0.21) | 7.0 (0.28)  | 11.9 (0.47) | 1.93/1.80 (0.076/0.071) | 2.0 (0.08) | 5.8 (0.23)  | 8.89 (0.350)  | 8.9 (2)                     | 1000 <sup>(1)</sup>    | Free Wheeling              | 36.6                          |
| MSF2075  |                          | 0.75 (0.030)  |            |             |             |                         |            |             |               |                             |                        |                            | 53.0                          |
| MSF2150  |                          | 1.50 (0.059)  |            |             |             |                         |            |             |               |                             |                        |                            | 67.7                          |
| MSF2300  |                          | 3.00 (0.118)  |            |             |             |                         |            |             |               |                             |                        |                            | 76.8                          |
| MSF3050  | 3                        | 0.50 (0.020)  | 7.5 (0.30) | 8.5 (0.34)  | 15.5 (0.61) | 2.74/2.59 (0.108/0.102) | 2.5 (0.10) | 8.0 (0.32)  | 11.99 (0.472) | 22.2 (5)                    | 1000 <sup>(1)</sup>    | Free Wheeling              | 33.4                          |
| MSF3100  |                          | 1.00 (0.039)  |            |             |             |                         |            |             |               |                             |                        |                            | 49.6                          |
| MSF3300  |                          | 3.00 (0.118)  |            |             |             |                         |            |             |               |                             |                        |                            | 72.0                          |
| MSF3600  |                          | 6.00 (0.236)  |            |             |             |                         |            |             |               |                             |                        |                            | 78.4                          |
| MSF4100  | 4                        | 1.00 (0.039)  | 9.0 (0.35) | 10.3 (0.40) | 19.0 (0.75) | 3.05/2.90 (0.120/0.114) | 3.0 (0.12) | 10.3 (0.40) | 15.24 (0.600) | 44.5 (10)                   | 1000 <sup>(1)</sup>    | Free Wheeling              | 43.7                          |
| MSF4400  |                          | 4.00 (0.157)  |            |             |             |                         |            |             |               |                             |                        |                            | 72.5                          |
| MSF4800  |                          | 8.00 (0.315)  |            |             |             |                         |            |             |               |                             |                        |                            | 78.5                          |

1. For optimal performance, speed should be limited to 500 RPM.  
 2. Efficiency calculated assuming a COF of 0.12.

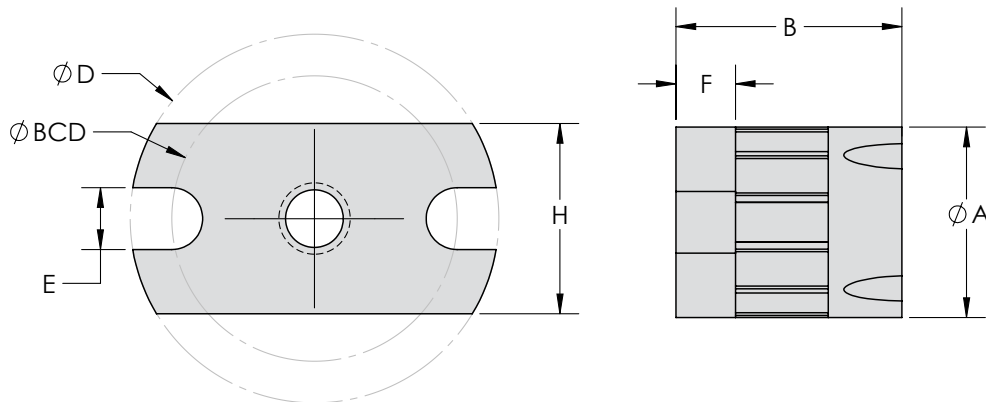
**MAF Flange Mount / Anti-Backlash**



**Features and Benefits**

- The smallest Thomson anti-backlash nuts available.
- Injection-molded in a high-performance, bearing-grade material, specifically designed for demanding applications.
- For lead screw diameters of 2, 3 and 4 mm.
- Design loads of up to 5 lbf (22 N).

**Dimensions and Specifications**



| Full P/N | Dimensions [mm (in)]     |               |             |                 |             |                         |            |             |               | Max. Dynamic Load [N (lbf)] | Max. Screw Speed [RPM] | Drag Torque [mN-m (oz-in)] | Efficiency <sup>(2)</sup> [%] |
|----------|--------------------------|---------------|-------------|-----------------|-------------|-------------------------|------------|-------------|---------------|-----------------------------|------------------------|----------------------------|-------------------------------|
|          | Lead Screw Diameter [mm] | Lead          | A           | B               | D           | E                       | F          | H           | BCD           |                             |                        |                            |                               |
| MAF2038  | 2                        | 0.375 (0.015) | 5.8 (0.23)  | 7.8 (0.31) MAX  | 11.9 (0.47) | 1.93/1.80 (0.076/0.071) | 2.0 (0.08) | 5.8 (0.23)  | 8.89 (0.350)  | 4.4 (1)                     | 1000 <sup>(1)</sup>    | 3.5 (0.5) MAX              | 36.6                          |
| MAF2075  |                          | 0.75 (0.030)  |             |                 |             |                         |            |             |               |                             |                        |                            | 53.0                          |
| MAF2150  |                          | 1.50 (0.059)  |             |                 |             |                         |            |             |               |                             |                        |                            | 67.7                          |
| MAF2300  |                          | 3.00 (0.118)  |             |                 |             |                         |            |             |               |                             |                        |                            | 76.8                          |
| MAF3050  | 3                        | 0.50 (0.020)  | 8.0 (0.32)  | 9.9 (0.39) MAX  | 15.5 (0.61) | 2.74/2.59 (0.108/0.102) | 2.5 (0.10) | 8.0 (0.32)  | 11.99 (0.472) | 11.1 (2.5)                  | 1000 <sup>(1)</sup>    | 3.5 (0.5) MAX              | 33.4                          |
| MAF3100  |                          | 1.00 (0.039)  |             |                 |             |                         |            |             |               |                             |                        |                            | 49.6                          |
| MAF3300  |                          | 3.00 (0.118)  |             |                 |             |                         |            |             |               |                             |                        |                            | 72.0                          |
| MAF3600  |                          | 6.00 (0.236)  |             |                 |             |                         |            |             |               |                             |                        |                            | 78.4                          |
| MAF4100  | 4                        | 1.00 (0.039)  | 10.3 (0.40) | 12.4 (0.49) MAX | 19.0 (0.75) | 3.05/2.90 (0.120/0.114) | 3.0 (0.12) | 10.3 (0.40) | 15.24 (0.600) | 22.2 (5)                    | 1000 <sup>(1)</sup>    | 3.5 (0.5) MAX              | 43.7                          |
| MAF4400  |                          | 4.00 (0.157)  |             |                 |             |                         |            |             |               |                             |                        |                            | 72.5                          |
| MAF4800  |                          | 8.00 (0.315)  |             |                 |             |                         |            |             |               |                             |                        |                            | 78.5                          |

1. For optimal performance, speed should be limited to 500 RPM.  
 2. Efficiency calculated assuming a COF of 0.12.



# Miniature Lead Nuts

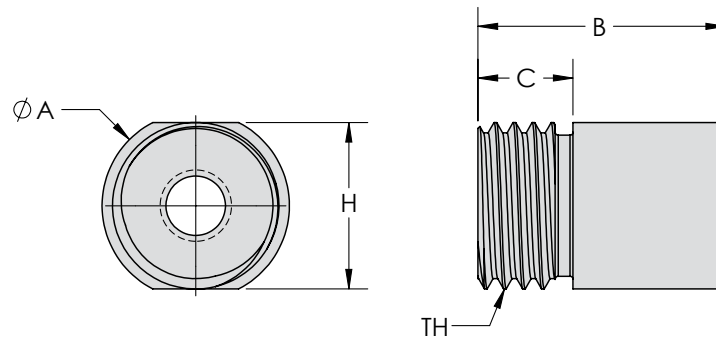
## MST Thread Mount / Standard Backlash



### Features and Benefits

- Metric thread mount lead nut.
- Manufactured from a high-performance, bearing-grade material, specifically designed for demanding applications.
- For lead screw diameters of 2, 3 and 4 mm.
- Design loads of up to 10 lbf (44 N).

### Dimensions and Specifications



| Full P/N | Dimensions [mm (in)]     |               |             |             |              |            |             | Max. Dynamic Load [N (lbf)] | Max. Screw Speed [RPM] | Drag Torque [mN-m (oz-in)] | Efficiency <sup>(2)</sup> [%] |
|----------|--------------------------|---------------|-------------|-------------|--------------|------------|-------------|-----------------------------|------------------------|----------------------------|-------------------------------|
|          | Lead Screw Diameter [mm] | Lead          | A           | B           | C            | H          | TH          |                             |                        |                            |                               |
| MST2038  | 2                        | 0.375 (0.015) | 5.6 (0.22)  | 8.1 (0.32)  | 3.50 (0.138) | 5.0 (0.20) | M5x0.8 -6g  | 8.9 (2)                     | 1000 <sup>(1)</sup>    | Free Wheeling              | 36.6                          |
| MST2075  |                          | 0.75 (0.030)  |             |             |              |            |             |                             |                        |                            | 53.0                          |
| MST2150  |                          | 1.50 (0.059)  |             |             |              |            |             |                             |                        |                            | 67.7                          |
| MST2300  |                          | 3.00 (0.118)  |             |             |              |            |             |                             |                        |                            | 76.8                          |
| MST3050  | 3                        | 0.50 (0.020)  | 7.9 (0.31)  | 10.4 (0.41) | 4.00 (0.157) | 7.0 (0.28) | M7x0.75 -6g | 22.2 (5)                    | 1000 <sup>(1)</sup>    | Free Wheeling              | 33.4                          |
| MST3100  |                          | 1.00 (0.039)  |             |             |              |            |             |                             |                        |                            | 49.6                          |
| MST3300  |                          | 3.00 (0.118)  |             |             |              |            |             |                             |                        |                            | 72.0                          |
| MST4100  | 4                        | 1.00 (0.039)  | 10.2 (0.10) | 12.7 (0.50) | 5.00 (0.197) | 9.0 (0.36) | M9x1.0 -6g  | 44.5 (10)                   | 1000 <sup>(1)</sup>    | Free Wheeling              | 43.7                          |
| MST4400  |                          | 4.00 (0.157)  |             |             |              |            |             |                             |                        |                            | 72.5                          |
| MST4800  |                          | 8.00 (0.315)  |             |             |              |            |             |                             |                        |                            | 78.5                          |

1. For optimal performance, speed should be limited to 500 RPM.  
 2. Efficiency calculated assuming a COF of 0.12.

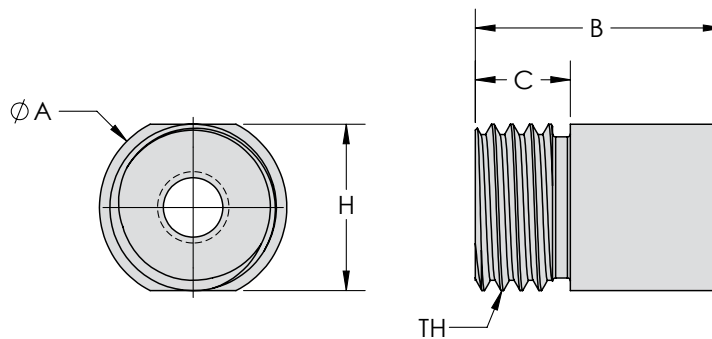
**MSC Compact Thread Mount / Standard Backlash**



**Features and Benefits**

- The smallest Thomson standard lead nut ever manufactured.
- Compact version of the MST nut.
- For lead screw diameters of 2, 3 and 4 mm.
- Manufactured from a high-performance, bearing-grade material, specifically designed for demanding applications.
- Design loads of up to 5 lbf (22 N).

**Dimensions and Specifications**

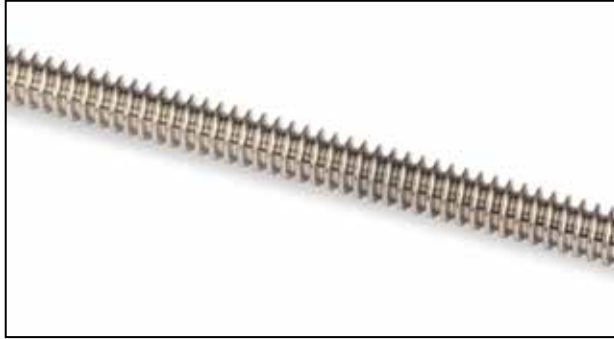


| Full P/N | Dimensions [mm (in)]     |               |            |             |              |            |              | Max. Dynamic Load [N (lbf)] | Max. Screw Speed [RPM] | Drag Torque [mN-m (oz-in)] | Efficiency <sup>(2)</sup> [%] |
|----------|--------------------------|---------------|------------|-------------|--------------|------------|--------------|-----------------------------|------------------------|----------------------------|-------------------------------|
|          | Lead Screw Diameter [mm] | Lead          | A          | B           | C            | H          | TH           |                             |                        |                            |                               |
| MSC2038  | 2                        | 0.375 (0.015) | 4.0 (0.16) | 6.0 (0.24)  | 3.00 (0.118) | 3.5 (0.14) | M3.5x0.6 -6g | 4.4 (1)                     | 1000 <sup>(1)</sup>    | Free Wheeling              | 36.6                          |
| MSC2075  |                          | 0.75 (0.030)  |            |             |              |            |              |                             |                        |                            | 53.0                          |
| MSC2150  |                          | 1.50 (0.059)  |            |             |              |            |              |                             |                        |                            | 67.7                          |
| MSC2300  |                          | 3.00 (0.118)  |            |             |              |            |              |                             |                        |                            | 76.8                          |
| MSC3050  | 3                        | 0.50 (0.020)  | 5.6 (0.22) | 8.1 (0.32)  | 3.50 (0.138) | 5.0 (0.20) | M5x0.8 -6g   | 8.9 (2)                     | 1000 <sup>(1)</sup>    | Free Wheeling              | 33.4                          |
| MSC3100  |                          | 1.00 (0.039)  |            |             |              |            |              |                             |                        |                            | 49.6                          |
| MSC3300  |                          | 3.00 (0.118)  |            |             |              |            |              |                             |                        |                            | 72.0                          |
| MSC4100  | 4                        | 1.00 (0.039)  | 7.9 (0.31) | 10.4 (0.41) | 4.00 (0.157) | 7.0 (0.28) | M7x0.75 -6g  | 22.2 (5)                    | 1000 <sup>(1)</sup>    | Free Wheeling              | 43.7                          |
| MSC4400  |                          | 4.00 (0.157)  |            |             |              |            |              |                             |                        |                            | 72.5                          |
| MSC4800  |                          | 8.00 (0.315)  |            |             |              |            |              |                             |                        |                            | 78.5                          |

1. For optimal performance, speed should be limited to 500 RPM.  
 2. Efficiency calculated assuming a COF of 0.12.



# Miniature Lead Screws



### Features and Benefits

- New precision-grade lead screw in 2, 3 and 4 mm diameters
- Various lead options available
- Up to 150 mm length

### Dimensions and Specifications

| Major Diameter [mm] | Lead [mm (in)] | Part Number | Pitch [mm (in)] | No. Of Thread Starts | Accuracy [mm/mm (in/in)] | Material        | Thread Direction |
|---------------------|----------------|-------------|-----------------|----------------------|--------------------------|-----------------|------------------|
| 2                   | 0.375 (0.015)  | CM2038      | 0.375 (0.015)   | 1                    | 0.0005 (0.0005)          | Stainless Steel | Right Hand       |
|                     | 0.75 (0.030)   | CM2075      |                 | 2                    |                          |                 |                  |
|                     | 1.50 (0.059)   | CM2150      |                 | 4                    |                          |                 |                  |
|                     | 3.00 (0.118)   | CM2300      |                 | 8                    |                          |                 |                  |
| 3                   | 0.50 (0.020)   | CM3050      | 0.5 (0.020)     | 1                    | 0.0005 (0.0005)          | Stainless Steel | Right Hand       |
|                     | 1.00 (0.039)   | CM3100      |                 | 2                    |                          |                 |                  |
|                     | 3.00 (0.118)   | CM3300      |                 | 6                    |                          |                 |                  |
|                     | 6.00 (0.236)   | CM3600      |                 | 12                   |                          |                 |                  |
| 4                   | 1.00 (0.039)   | CM4100      | 1 (0.039)       | 1                    | 0.0005 (0.0005)          | Stainless Steel | Right Hand       |
|                     | 4.00 (0.157)   | CM4400      |                 | 4                    |                          |                 |                  |
|                     | 8.00 (0.315)   | CM4800      |                 | 8                    |                          |                 |                  |

For availability of all other lead screws, please see the standard Thomson lead screw catalog. For any custom diameter and/or leads, please contact Thomson customer support for more information.



## Make it Yours – Customize Your Miniature Lead Screw

### End Machining

Besides our standard end configurations, Thomson can machine many custom features onto our lead screws. Simply send over a drawing or provide guidance to one of our sizing specialists to review. Our machining options include flats, counterbores, internal /external hex, mounting threads and snap ring grooves.



### Custom Lead Nuts and Assemblies

If our standard nut geometry or material is not suitable for your application, Thomson can custom manufacture a solution, specially catered to you. Thomson has decades of experience making the most complex nut geometries and working with many different materials.



### Coatings & Surface Treatments

Thomson can also specially treat our lead screws with many different coating and surface treatment options such as low friction PTFE coating, Dicronite, passivation, electropolish, and heat treating.



### Other possible customizations can include the following:

- Diameters and leads
- Thread forms
- Screw material and hardness
- End support and bearing assemblies
- Motorized assemblies

Start your custom solution journey now by contacting Thomson and we'll set you up with one of our experienced engineers.

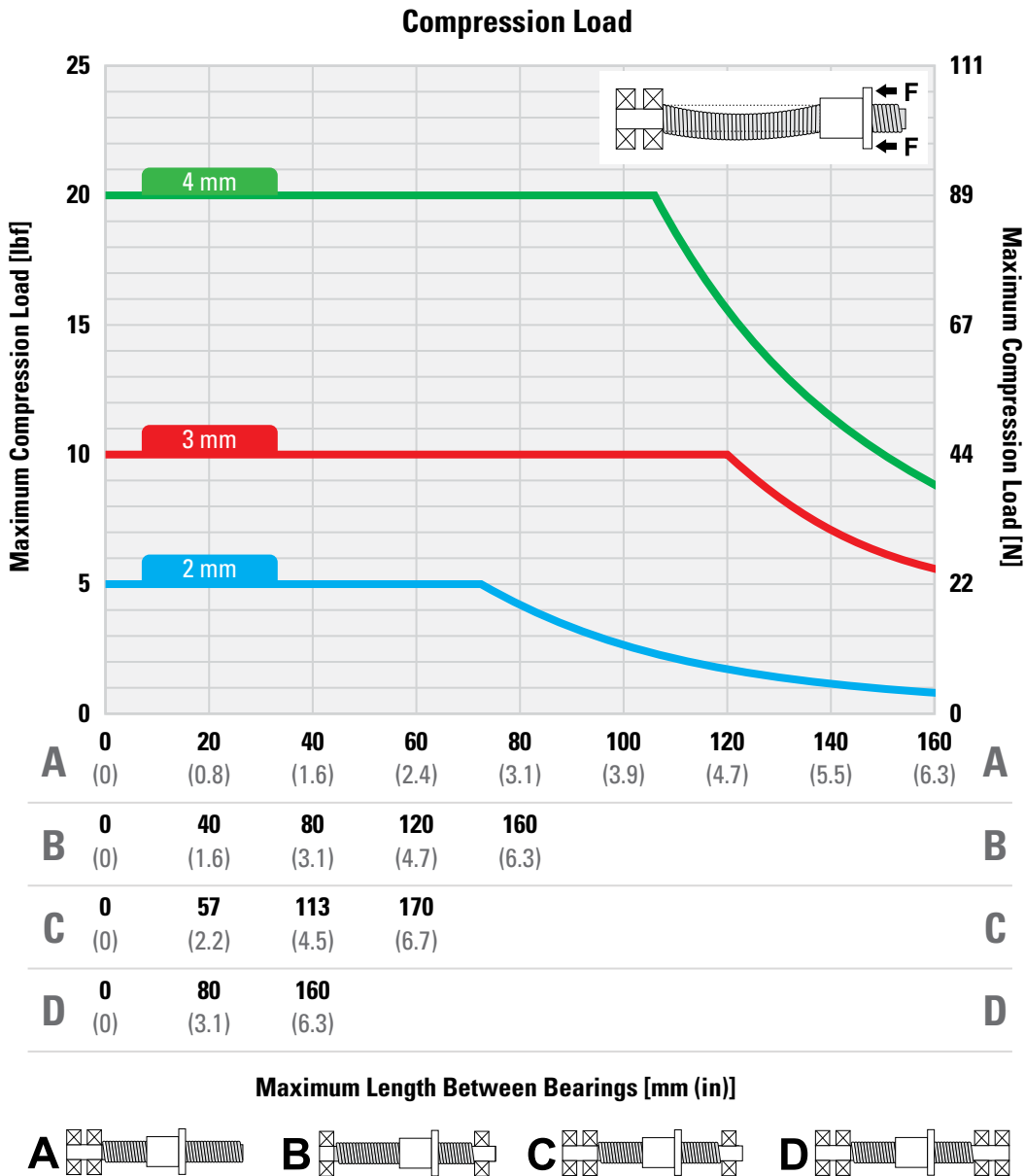


# Engineering Guidelines

## Column Loading Capacities Chart for Miniature Lead Screws

Use the chart below to determine the maximum compression load for the lead screw. Usually, lead screws operated in tension can handle loads up to the rated capacity of the lead nut, provided the screw length is within standard lengths. However, end supports need to be accounted for as well because they can have an effect on the load capacity of the screw. The four most common loading variations are shown below with corresponding rating adjustments. Find the point of intersecting lines of load and length to determine the smallest screw diameter that would suffice in a given application.

**Warning: DO NOT EXCEED nut capacity. Curves for the screw diameters shown are based on the smallest root (minor) diameter of the standard screws within the nominal size range.**



## Lead Screw Formulas

### TORQUE, ROTARY TO LINEAR

Rotating the lead screw to translate the nut or rotating the nut to translate the lead screw.

$$\text{Torque} = \frac{\text{Load} \times \text{Lead}}{2\pi \times \text{Efficiency}}$$

### TORQUE, LINEAR TO ROTARY

Translating the lead screw to rotate the nut or translating the nut to rotate the screw.

$$\text{Torque} = \frac{\text{Load} \times \text{Lead} \times \text{Efficiency}}{2\pi}$$

### EFFICIENCY

$$\% \text{ Efficiency} = \frac{\text{Tan (Helix Angle)}}{\text{Tan (Helix Angle} + \text{Arctan } f)} \times 100$$

$f$  = coefficient of friction

Systems with an efficiency of 50% and greater are not self-locking. For efficiency, see appropriate lead nut sections on pages 12-15. The efficiencies listed in the brochure are calculated for a coefficient of friction of 0.1.

### COLUMN LOAD STRENGTH\* (Max compression load on screw)

$$P_{cr} = \frac{1.405 \times 10^7 \times F_c \times d^4}{L^2}$$

$P_{cr}$  = maximum loads (lbs)

$F_c$  = end support factor

0.25 one end fixed, other free

1.00 both ends supported

2.00 one end fixed, other supported

4.00 both ends fixed

$d$  = root diameter of screw (in.)

$L$  = distance between nut and load carrying bearing (in)

When possible, design for tension loads to eliminate the buckling factor and reduce the required screw size.

\* Formula only valid if  $L/d \geq 18.25$

### CRITICAL SCREW SHAFT SPEED (Max rotational speed of screw)

$$C_s = F_c \times 4.76 \times 10^6 \times \frac{d}{L^3}$$

$C_s$  = critical speed (rpm)

$d$  = root diameter of screw (in.)

$L$  = length between supports (in.)

$F_c$  = end support factor

0.36 one end fixed, other free

1.00 both ends supported

1.47 one end fixed, other supported

2.23 both ends fixed

Critical shaft speed should be reduced to 80% to allow for other factors such as alignment and straightness.

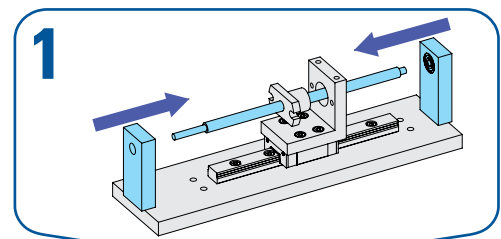


## Installation Overview

For optimal performance and component life, proper installation of miniature lead screw assemblies is required. Careful consideration must be taken when it comes to nut/end configuration selection, mounting supports and installation alignment. The following diagrams outline the general procedure for properly installing a miniature lead screw and nut assembly into your system.

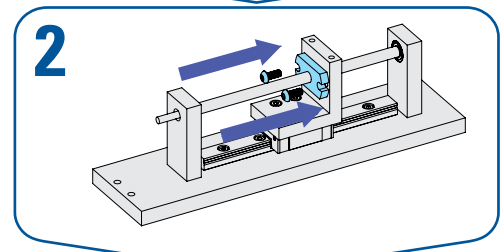
### 1. Mount Miniature Lead Screw

Install miniature lead screw onto end supports, ensuring good concentricity between machined surfaces on lead screw and support bearings.



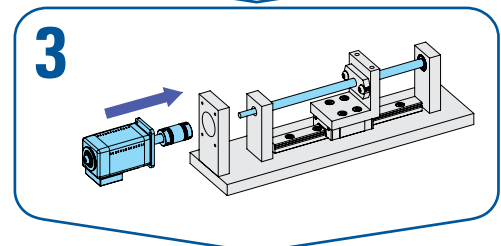
### 2. Mount Miniature Lead Nut

Install miniature lead nut onto guided carriage. Ensure that lead nut stays concentric to lead screw, and flange/thread mount faces remain perpendicular to lead screw when fastening down. Manually move carriage back and forth over the stroke of the lead screw to check for excessive resistance and confirm proper mounting.



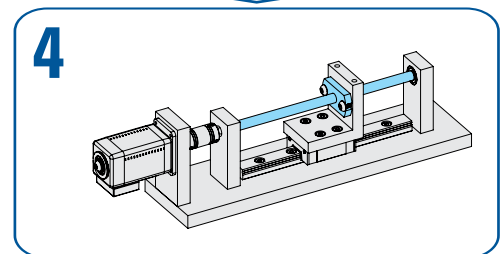
### 3. Install Motor or Drive Mechanism

Couple motor or other drive mechanism to lead screw. Ensure rotational axis is concentric to lead screw or coupler compensates for misalignment.



### 4. Complete Installation

Manually rotate screw and translate carriage throughout entire stroke length of screw to ensure everything is properly aligned and there are no areas with high amounts of resistance. Once confirmed, tighten down all fasteners to specification. Installation is complete.



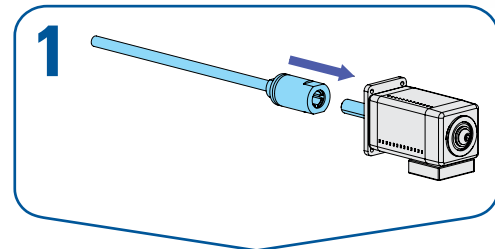
### Integrated Coupler Installation

For customers requiring a quick, simple, and effective way of installing a miniature lead screw into their assembly, Thomson's new integrated coupler can be utilized. A basic installation guide and install specifications can be found in the following sections. For more detailed installation instructions, please contact Thomson.



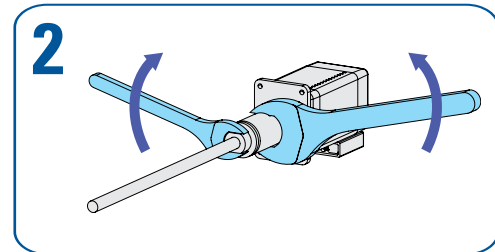
#### 1. Mount Integrated Coupler

With lock nut loosened up, slide Integrated Coupler on to mating shaft. Ensure mating shaft is inserted in to integrated coupler to a depth of at least 2X the shaft diameter.

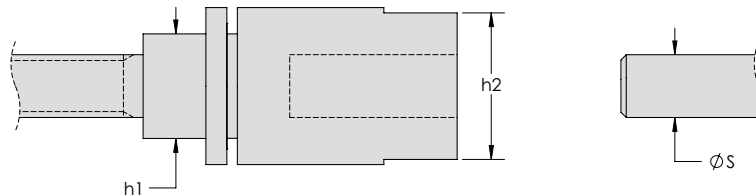


#### 2. Tighten Lock Nut

With the two appropriate wrenches, tighten lock nut to appropriate torque specification as outlined in table below.



### Installation Specifications



| P/N Code | Bore Size [mm] | Lead Screw [mm] | Wrench Size [mm] |     | Mating Shaft Diameter [mm (in)]    | Required Lock Nut Torque [N-m (in-lbf)] |
|----------|----------------|-----------------|------------------|-----|------------------------------------|---|
|          |                |                 | h1               | h2  |                                    |   |
| C15      | Ø1.5           | 2               | 4                | 5.5 | 1.500 / 1.490<br>(0.0591 / 0.0587) | 4 (35)                                  |
|          |                | 3               | 5                | 6   |                                    |   |
|          |                | 4               | 5.5              | 6.5 |                                    |   |
| C20      | Ø2.0           | 2               | 4                | 6   | 2.000 / 1.990<br>(0.0787 / 0.0783) | 4 (35)                                  |
|          |                | 3               | 5                |     |                                    |   |
|          |                | 4               | 5.5              |     |                                    |   |
| C30      | Ø3.0           | 2               | 4                | 7   | 3.000 / 2.990<br>(0.1181 / 0.1177) | 4 (35)                                  |
|          |                | 3               | 5                |     |                                    |   |
|          |                | 4               | 5.5              |     |                                    |   |
| C40      | Ø4.0           | 2               | 4                | 8   | 4.000 / 3.988<br>(0.1575 / 0.157)  | 4 (35)                                  |
|          |                | 3               | 5                |     |                                    |   |
|          |                | 4               | 5.5              |     |                                    |   |
| C50      | Ø5.0           | 4               | 6                | 9   | 5.000 / 4.988<br>(0.1969 / 0.1964) | 4 (35)                                  |



# Lubrication



## Overview

Thomson-branded Trigel 1200SC grease lubrication is ideal for applications requiring lower friction, higher efficiency, reduced noise or increased life. This high-quality lubricant was specially formulated to improve the overall performance of lead screw and nut assemblies as needed.

## Specifications

|  |   |
|--|---|
| Part number                            | TRIGEL1200SC-1CC  |
| Main components                        | Synthetic oil, PTFE   |
| About                                  | <ul style="list-style-type: none"> <li>Increases lead nut efficiency and life</li> <li>Minimal friction change with increased temperature</li> <li>Lowers starting torque</li> <li>Compatible with reactive chemicals</li> <li>Compatible with clean room and high vacuum applications</li> </ul> |
| Loaded material                        | Plastic nut on metal lead screw   |
| Mechanical load                        | Light / Medium  |
| Coefficient of friction                | 0.06 - 0.08   |
| Max. temperature                       | 250 °C<br>(482 °F)  |
| Vapor pressure                         | 1 x 10 <sup>6</sup> Pa  |
| Relubrication frequency <sup>(1)</sup> | 500,000 inches of travel or 3-4 months (whichever comes first)  |
| Packaging <sup>(2)</sup>               | 1 cc pipette  |

1. General guidance only. Re-lubrication intervals are highly dependent on application. Testing should be conducted to determine proper frequency. Screws may require lubrication frequently depending on both environmental and operating conditions. If the lubricant appears to be dispersed before this point or has become dry, the maintenance interval should be more frequent.

2. Other packaging sizes available - contact Thomson for more information.  
Note: Other grease options available - contact Thomson for more information

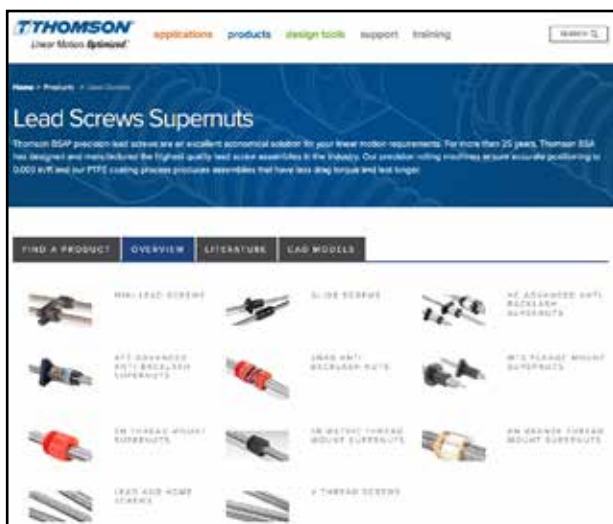
## Online Resources

Thomson offers a wide variety of online application, selection and training tools to help you in the lead screw selection process. An experienced team of engineers is also available to help size and select a lead screw to best fit your application needs. To explore additional technical resources and options, contact customer support at [www.thomsonlinear.com/cs](http://www.thomsonlinear.com/cs).

### Lead Screws on the Web

Find additional information and learn more about lead screws on this content-rich web page.

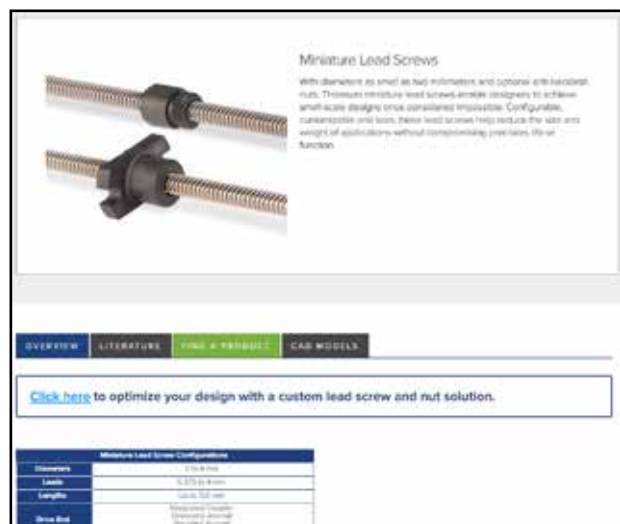
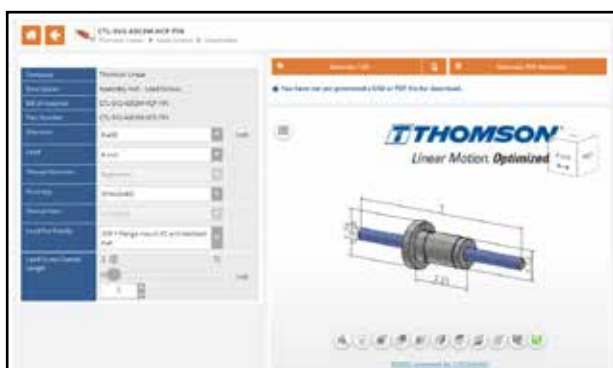
<https://www.thomsonlinear.com/en/products/lead-screws#overview>



### Interactive 3D CAD Models

Download free interactive 3D CAD models in the most common CAD formats.

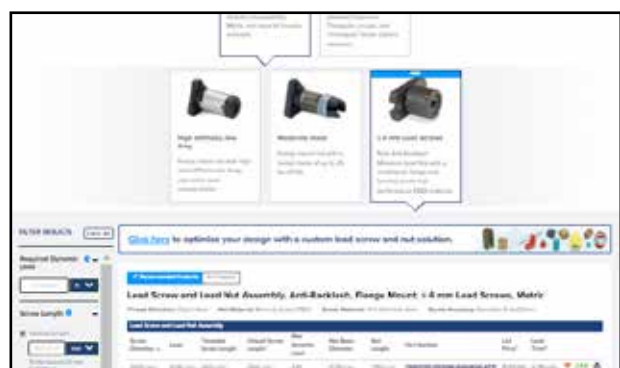
<https://www.thomsonlinear.com/en/products/lead-screws#drawings>



### Selector Tool

This tool greatly simplifies the tasks of searching and selecting with a visual selection process that immediately narrows down your lead screw options.

<https://www.thomsonlinear.com/ls>



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[www.thomsonlinear.com](http://www.thomsonlinear.com)

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