Fenner Drives®

Trantorque M

Keyless Bushings™

Trantorque M Keyless Bushings™

A new concept in keyless locking devices

Why Trantorque M?

As engineers continue to take a minimalistic approach to machine design, drive systems are systematically downsized. As a consequence, many motor configurations today incorporate an output shaft of reduced diameter and with no keyway.

Traditional shaft/hub connections incorporating keyways and setscrews, tapered bushings or multi-screw keyless locking assemblies are not well suited for use in applications where position-sensitive, zero-backlash, synchronous motion drives are typically powered by compact servo or stepper motors.

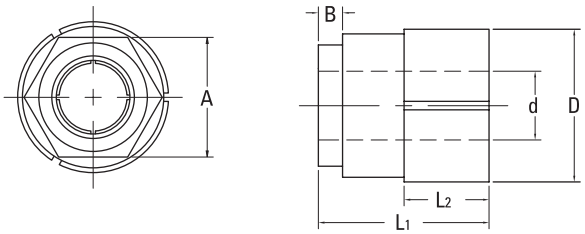
Trantorque M is specifically configured to meet today's technical needs of machine designers – providing an easy-to-use, compact, light-weight, cost-effective device for mounting critical drive system components.

Go keyless… take advantage of these unique added value features and benefits of Trantorque "M" Series.

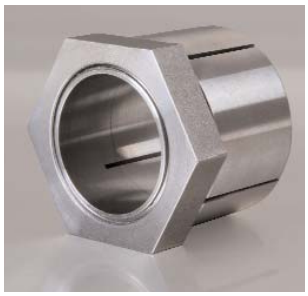
- Precise axial and radial component positioning
- Perfect for zero backlash connections
- Single locking nut for quick installation and adjustments
- Exceptional torque transmission even with only partial shaft engagement
- Low mass and inertia

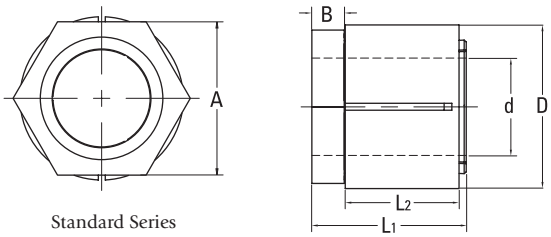
- "Easy on – Easy off" – won't freeze on shaft
- Excellent concentricity and balance
- Minimised outside diameter for mounting thin walled components
- Suitable for use with both keyed and keyless shafts
- RoHS 2002/95/EC Directive compliant

This product is covered by EP Patent No. 0925455.

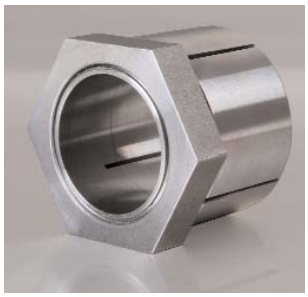


Mini Series



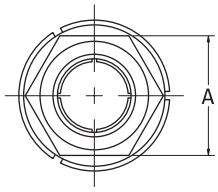


Standard Series

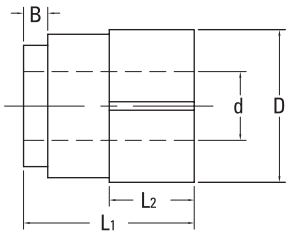


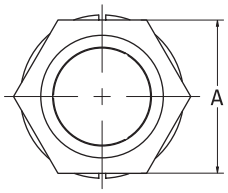
	Part Number	(d) Shaft Ø	(D) Component Bore	Max. Transmissible Torque (Nm)	Max. Transmissible Thrust (kN)	Hub Pressure (N/mm²)	L1	L2	A	B	Weight (gm)	Installation Torque (Nm)
Mini Series	TTQM0516	5	16	9.0	3.1	84.0	19	10	13	3	18.8	9.8
	TTQM0616	6	16	11.6	3.9	93.1	19	10	13	3	18.1	9.8
	TTQM0720	7	20	21.8	5.7	102.9	22	11	16	3	33.9	28.3
	TTQM0820	8	20	32.0	7.4	112.7	22	11	16	3	32.9	28.3
	TTQM0920	9	20	42.2	9.2	122.6	22	11	16	3	31.8	28.3
	TTQM1023	10	23	51.1	10.6	118.7	26	13	19	5	48.9	44.0
	TTQM1123	11	23	59.9	12.0	114.9	26	13	19	5	47.2	44.0
	TTQM1223	12	23	68.8	13.5	111.0	26	13	19	5	45.4	44.0
	TTQM1426	14	26	95.6	14.2	109.7	29	16	22	5	64.9	65.7
	TTQM1526	15	26	122.3	15.0	108.3	29	16	22	5	62.0	65.7
	TTQM1626	16	26	149.1	15.8	107.0	29	16	22	5	59.0	65.7
Standard Series	TTQM1732	17	32	173.6	18.5	99.7	30	22	30	6	118.6	111.4
	TTQM1832	18	32	198.1	21.1	92.3	30	22	30	6	113.9	111.4
	TTQM1932	19	32	222.6	23.7	85.0	30	22	30	6	108.9	111.4
	TTQM2035	20	35	257.8	25.5	82.5	33	24	32	7	144.0	151.0
	TTQM2235	22	35	293.0	27.3	80.0	33	24	32	7	131.5	151.0
	TTQM2438	24	38	330.5	29.3	87.0	35	25	36	8	166.3	185.0
	TTQM2538	25	38	367.9	31.2	94.0	35	25	36	8	158.8	185.0
	TTQM2845	28	45	459.0	38.2	101.2	41	29	46	11	292.9	300.0
	TTQM3045	30	45	550.0	45.2	108.3	41	29	46	11	272.2	300.0
	TTQM3250	32	50	615.6	43.5	99.7	44	30	50	12	377.4	263.0
	TTQM3550	35	50	681.1	41.9	91.0	44	30	50	12	340.2	263.0

Dimensions are in mm and are for reference only.

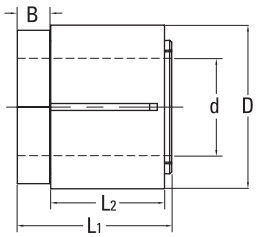


Mini Series





Standard Series



Listed below are the minimum recommended hub diameters needed to resist the outward forces generated by a Trantorque M unit. These values are based on the mounted component completely covering the L_2 dimension of the unit. For those applications where the mounted component does not completely cover the L_2 dimension, the minimum hub diameter should be calculated using the formulas in the SELECTION section of this catalog.

	d Shaft Ø	D Component Bore	Hub Pressure (N/mm²)	Material Yield Strength (N/mm²) Note: 1 N/mm² = 145.0268psi											
				125	150	175	200	225	250	275	300	325	350	375	400
				Minimum Hub Diameter (mm) (Factor of Safety = 1.0)											
Mini Series	5	16	84.0	32.2	28.4	26.1	24.5	23.3	22.5	21.8	21.2	20.7	20.4	20.0	19.8
	6	16	93.1	35.0	30.4	27.6	25.7	24.3	23.3	22.5	21.9	21.3	20.9	20.5	20.2
	7	20	102.9	48.0	40.9	36.7	33.9	31.9	30.4	29.2	28.3	27.5	26.9	26.4	25.9
	8	20	112.7	52.9	44.1	39.0	35.7	33.4	31.6	30.3	29.3	28.4	27.7	27.1	26.6
	9	20	122.6	58.5	47.6	41.6	37.7	35.0	33.0	31.5	30.3	29.3	28.5	27.8	27.2
	10	23	118.7	64.6	53.1	46.6	42.4	39.5	37.3	35.7	34.3	33.3	32.4	31.7	31.0
	11	23	114.9	62.1	51.5	45.5	41.5	38.8	36.7	35.1	33.9	32.9	32.0	31.3	30.7
	12	23	111.0	59.7	50.0	44.4	40.7	38.1	36.1	34.6	33.4	32.5	31.7	31.0	30.4
	14	26	109.7	66.6	56.0	49.7	45.6	42.8	40.6	39.0	37.6	36.6	35.7	34.9	34.3
	15	26	108.3	65.8	55.4	49.3	45.3	42.5	40.4	38.8	37.5	36.4	35.5	34.8	34.1
	16	26	107.0	64.9	54.8	48.9	45.0	42.2	40.2	38.6	37.3	36.2	35.4	34.7	34.0
Standard Series	17	32	99.7	74.4	63.8	57.5	53.2	50.2	47.9	46.2	44.7	43.6	42.6	41.8	41.1
	18	32	92.3	69.5	60.5	54.9	51.2	48.5	46.5	44.9	43.6	42.6	41.7	41.0	40.4
	19	32	85.0	65.0	57.3	52.5	49.3	46.9	45.1	43.7	42.6	41.6	40.8	40.2	39.6
	20	35	82.5	69.5	61.6	56.6	53.2	50.7	48.8	47.4	46.2	45.2	44.4	43.7	43.0
	22	35	80.0	67.9	60.5	55.7	52.5	50.1	48.3	46.9	45.8	44.8	44.0	43.4	42.8
	24	38	87.0	78.6	69.1	63.1	59.1	56.2	54.0	52.3	50.9	49.7	48.8	48.0	47.3
	25	38	94.0	83.8	72.7	65.9	61.4	58.1	55.6	53.7	52.1	50.9	49.8	48.9	48.1
	28	45	101.2	106.2	90.8	81.6	75.5	71.1	67.8	65.3	63.3	61.6	60.2	59.0	58.0
	30	45	108.3	113.8	95.9	85.3	78.4	73.5	69.9	67.1	64.8	63.0	61.5	60.2	59.1
	32	50	99.7	116.3	99.7	89.8	83.2	78.4	74.9	72.1	69.9	68.1	66.6	65.3	64.2
	35	50	91.0	107.2	93.5	85.1	79.4	75.3	72.2	69.8	67.9	66.3	64.9	63.8	62.8

Dimensions are in mm and are for reference only.

Trantorque M Keyless Bushings™

Shaft & Bore Tolerance

Shaft diameter and component bore must be within:

Mini Series:	±0.04mm	(±0.0015")
Standard Series:	±0.08mm	(±0.003")

Shaft & Hub Finish

The Trantorque M unit performs best when the shaft and hub surface finish is between 0.80µm (32) and 3.2µm (125) Ra (roughness average). Lab tests have shown that a 1.6µm (63) Ra finish is optimum. If the surface finish is unknown, a medium grade of emery paper may be used to obtain an adequate surface finish.

Runout Tolerance

The unique design of the Trantorque M provides extremely accurate concentricity and superior balance. All Trantorque M units are concentric within 0.025mm (.001") T.I.R.

Synthetic Mounted Components

Trantorque M units are not recommended for use with any component completely constructed of a synthetic material. Most of these types of materials have a certain amount of creep under load which will cause loosening over time. A Trantorque M unit can be used if the bore of the synthetic component incorporates a reinforcing metal sleeve.

Bearings

Mounting bearings with Trantorque M is not recommended. The expansion forces created when tightening the nut could be sufficient to distort the bearing's inner race, causing premature failure.

Temperature

When the shaft and mating hub are made from steel, Trantorque M units are not affected by temperature within wide limits of -34°C to +204°C (-30°F to +400°F). If the shaft and/or mating component are made from different materials, such as aluminum, engineering compensation should be made for the difference in expansion coefficients. In common factory environments where the temperature may vary 55°C (100°F) from winter to summer, most applications will require no compensation, even when dissimilar metals are used.

Axial Movement

A characteristic of Trantorque M is axial movement as installation torque is applied to the nut. This motion is not unique to Trantorque M, but occurs in any tapered mounting device. This movement from hand-tight to full installation torque is always in the direction in which the nut is being tightened. The inner element will remain secured to the shaft where it was located at hand-tight. The nut, outer element and component will all move together as the nut is tightened. The distance they move is approximately:

Mini Series:	1.1mm	(0.045")
Standard Series:	1.9mm	(0.075")

To select the best Trantorque M unit for your application, simply follow the step-by-step procedure outlined below. Before selecting a Trantorque M unit, you need to know the following information about the application:

1. Shaft size
2. Transmitted torque (Nm), alternatively Power (KW) & Speed (rpm)
3. Component material yield strength (N/mm^2)
4. Prime mover type (electric motor, engine, etc.)
5. DriveN machine (fan, blower, punch press, etc.)

Example: Select a Trantorque M for a 20mm shaft. The application is an electric motor driving a concrete mixer; the mixer requires 135 Nm of torque and imposes an axial thrust of 5KN. The hub to be mounted is 55mm outside diameter and is made of a 250 N/mm^2 yield strength steel. Determine if the wall is thick enough for this application.

Procedure	Solution
1. Shaft diameter is 20mm.	1. Part # TTQM2035 from specifications table.
2. Transmitted torque of 135Nm. Note: If required torque is not available use power and speed to determine torque requirements. Use the following formula: $\text{Torque (Nm)} = \frac{\text{KW x 9950}}{\text{Speed (RPM)}}$	2. Part # TTQM2035 has a maximum transmissible torque rating of 257.8 Nm. (See specifications table.)
2a. The total allowable torque is a combination of force due to torque and force due to thrust. For the total allowable torque, always use the thrust values from the specification table. To determine the maximum transmissible torque (Mtt), multiply the force (F) by the shaft radius. $Mtt = \sqrt{Mt^2 + \left(\frac{Mth \times d}{2}\right)^2}$ where: Mt = transmitted torque Mth = thrust d = shaft diameter	2a. Part # TTQM2035 has a maximum thrust of 25.5KN (x 1000 for N). Therefore: 22500 x 0.01 = 255NM $Mtt = \sqrt{135^2 + \left(\frac{5000 \times 0.02}{2}\right)^2}$ Mtt = 144Nm Acceptable torque and thrust combination.
3. Using the design factor chart, determine the service factor based on the type of prime mover and driven machine. Multiply the total applicable forces by the service factor to obtain the Design Torque.	3. For above example, select a 1.25 service factor (SF) ie. Electric motor, driving a concrete mixer. Design Torque = F total x SF = 185 x 1.25 = 231.25 Nm The Trantoque M selected (TTQM2035) fulfills application requirements for transmissible torque. Catalog rating 257.8Nm.
4. Trantorque M units exert an outward pressure. It is imperative that the component hub diameter is large enough to withstand these pressures. Insufficient hub diameter could result in failure during installation. Use the formula below to calculate minimum hub diameter. Dmin = Minimum required hub diameter D = component bore size Hp = contact hub pressure S = Hub material tensile Yield Strength $Dmin = \frac{Hp \times D}{S - \frac{Hp}{2}} + D$ These figures are based on the mounted component completely engaging the L_2 dimension of the unit. For applications where the component does not cover the L_2, the hub pressures increase proportionately. See formula: $Hp = PP \times \frac{L_2}{L_1}$ where: PP = published hub pressure L_2 = published length L_1 = component length through bore	4. From the product specification chart, component bore is 35mm and the contact hub pressure is 82.5 N/mm^2. $Dmin = \frac{82.5 \times 35}{250 - \frac{82.5}{2}} + 35$ Dmin = 48.83 Hence, the hub diameter of 55mm OD is large enough to fulfill application needs. If the component had only engaged the L2 dimension by 20mm. The hub pressure would increase, requiring the hub diameter to increase. Minimum hub diameter would now be: $Hp = 82.5 \times \frac{24}{20}$ Hp = 99 N/mm^2 $Dmin = \frac{99 \times 35}{250 - \frac{99}{2}} + 35$ Dmin = 52.28 Still acceptable for our 55mm OD hub.

Driven Machine Classifications

Even Loads

Agitators for liquids
Blowers and Exhausters
Centrifugal Pumps / Compressors
Generators
Conveyors: light package, oven
Mixers
Textile Machinery: warpers, twisters, spinning frames, etc.
Bottling Machinery
Clarifier / Classifier
Compressors: screw, lobe
Dynamometer

Electric Motors, Turbines	**1.00**
Multi-Cylinder Engines	**1.25**
Single Cylinder Engines	**1.50**

Moderate Shock Loads

Concrete Mixers
Conveyors: Bucket, Pan, Drag
Piston Compressors
Pumps: Gear, Rotary, Lobe
Printing Press
Paper Mill: Calendar, Dryer
Machine Tools
Laundry Washer / Tumbler

Electric Motors, Turbines	**1.25**
Multi-Cylinder Engines	**1.50**
Single Cylinder Engines	**1.75**

Heavy Shock Loads

Brick Machinery
Punch Presses
Hammer Mills
Pulverizers
Crushers
Lumber Mill Machinery
Piston Compressors
Piston Pumps
Ball / Tube Mills

Electric Motors, Turbines	**1.75**
Multi-Cylinder Engines	**2.00**
Single Cylinder Engines	**2.25**

Trantorque M Keyless Bushings™

A Trantorque Keyless Bushing offers flexible and easy installation while providing exceptional holding power. To ensure a Trantorque unit performs as specified, it must be installed properly.

WARNING: Do not use any lubricants in this installation.
Do not use an impact wrench in this installation.

1. The shaft and component bore must be within +/- 0.08mm of stated bore diameter and must have a surface finish of .80 - 3.2 µM Ra (Roughness Average). If the surface finish is outside of these specified values, consult the factory.
2. Both the shaft and component bore must both be completely free of paint, grease, oil, and dirt. If necessary, clean the surfaces with a non petroleum based solvent (Isopropyl alcohol).

CAUTION: Do not lubricate the Trantorque bushing or shaft. The use of any lubricant on the contact surfaces could result in premature failure and will void all warranties.

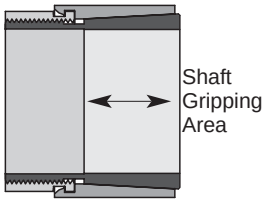


Fig. 1

3. Insert the Trantorque unit into the component to be mounted; making sure the mating hub fully engages up to the nut. See Figure 2.

CAUTION: Do not hammer or use any type of impact to force the Trantorque assembly along the shaft.
WARNING: The shaft must fully engage the shaft gripping area (Fig. 1) of the Trantorque unit. Figure 2 illustrates minimum shaft engagement.

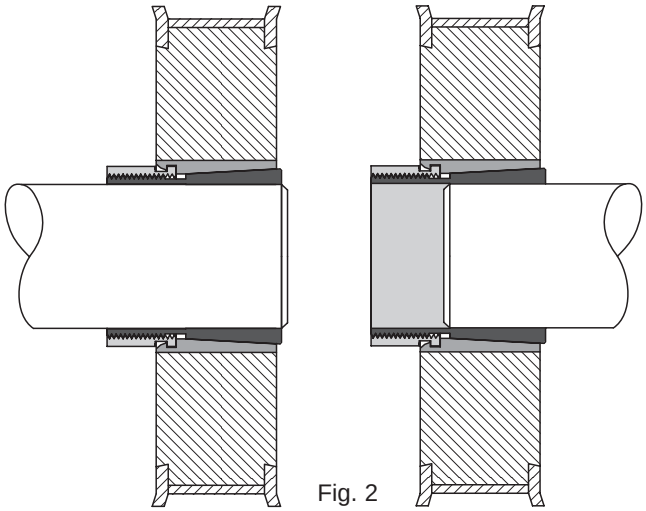


Fig. 2

4. Position the assembly at the desired location on the shaft and hand tighten the nut until the assembly becomes snug on the shaft.
5. Using a torque wrench, tighten the nut to the proper installation torque. Refer to Figure 3.

   Note: At full installation torque the assembly will move approximately 0.9mm axially along the shaft away from the nut. If axial position is critical it may be necessary to loosen the nut and reposition the assembly.

WARNING: Over-tightening the nut could damage the Trantorque unit and/or the mounted unit.

Shaft Size (mm)	Installation Torque (Nm)
5 — 6	10
7 — 9	28
10 — 12	44
14 — 16	66
17 — 19	110
20 — 22	150
24 — 25	185
28 — 30	300
32 — 35	265

Fig. 3

Count on Fenner Drives.

We've got the right product for your application.

EAGLE®
POLYURETHANE BELTING & O-RINGS

PowerTwist Plus®
V-BELTS

SUPER T LINK®
SP WEDGE BELTS

NU T LINK®
V-BELTS

Trantorque®
Keyless Bushings

T-Max™
BELT & CHAIN TENSIONERS

PowerMax™
SHEAVES & IDLERS

Fenner Drives is a proven leader in the design and manufacture of problem-solving power transmission and motion transfer components. Recognized widely for our expertise and innovation in manufacturing technology, we consistently blend reliability, quality and value in our products. Our ISO 9001:2000 certified production facilities are located in Leeds, UK; Manheim, PA and Wilmington, NC, USA. As part of our commitment to provide unsurpassed technical support and service, we maintain extensive engineering, development and testing facilities.

Visit us at www.fennerdrives.com

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