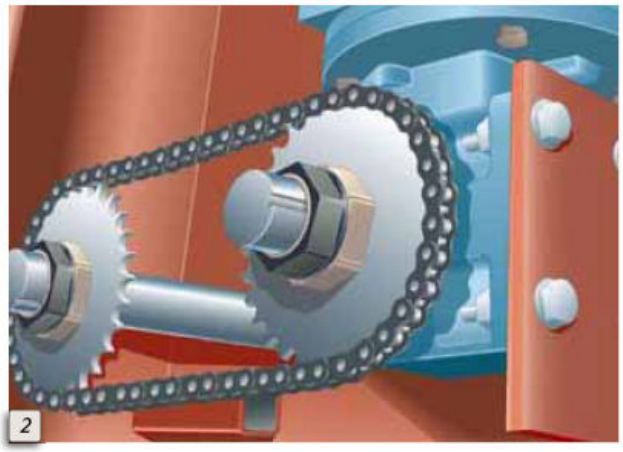
Trantorque®



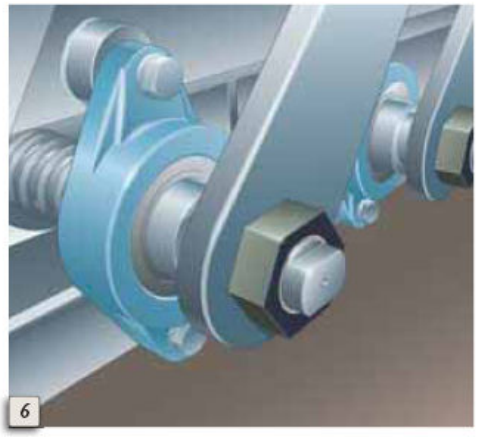




1. Trantorque GT connects a timing pulley to shaft on a canning machine.
2. Trantorque GT mounts a roller chain sprocket to a keyless reducer output shaft.
3. Trantorque GT connects a synchronous belt pulley to rear wheel of hybrid vehicle (transparent view).
4. Trantorque OE ensures zero backlash on a rack and pinion drive.
5. Trantorque Mini provides a solution for mounting components in tight spaces on very small shafts, such as for this timing pulley on a linear slide.







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Application illustrations by Mick Hill



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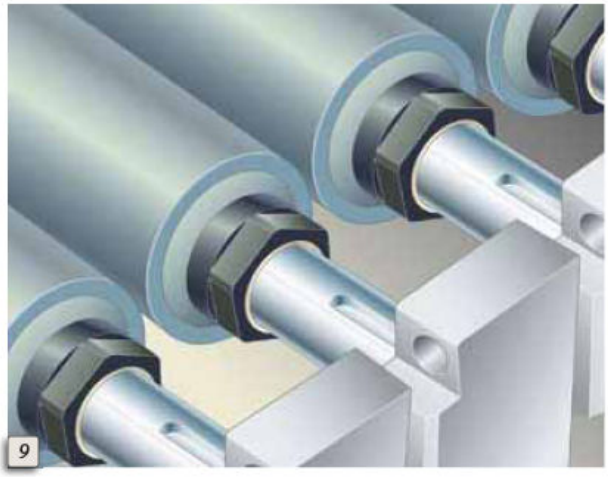

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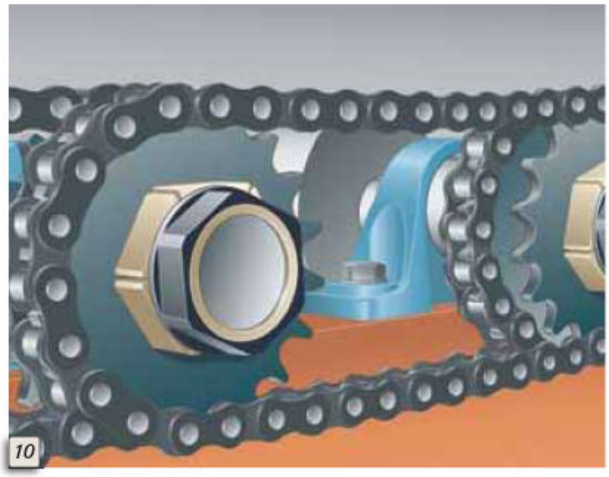

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6 Trantorque S positions a series of lever arms, greatly simplifying installation and timing.

7 The Trantorque GT units on this battling robot allowed the designers to eliminate keys and keyways, resulting in a lighter yet stronger machine.

8 Trantorque GT is perfect for high speed, low torque applications where balance is critical, as on this fan hub.

9 Trantorque NT allows worn conveyor rolls to be replaced quickly and easily.

10 This Trantorque GT — like all of our keyless bushings — features infinite radial positioning, making timing of this run-out table chain drive quick and easy.

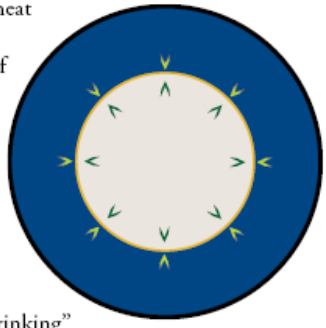
Fenner Drives Keyless Bushings & Specialty Locking Devices

From the moment the wheel came into existence, man has been faced with the seemingly simple task of mounting his invention to a shaft so that something useful could be accomplished. Though it has been over 5,500 years since these rotating components have made their way into use, many designs still utilize mounting methods not much improved from the days of antiquity. These traditional connection methods include: interference fits (shrink or press), keys and keyways, splines and quick detachable bushings. In the sections that follow, we compare and contrast these component mounting techniques and explain the principles behind the ingenious Fenner Drives Keyless Bushing.

Traditional Connection Methods

Interference Fits (Shrink and Press)

A shrink fit is a procedure whereby heat is used to facilitate a mechanical interference fit between two pieces of metal, such as a steel shaft and hub. Extreme heat is applied to the hub, causing it to expand and increasing the size of its machined bore. The expanded hub is removed from the heat source and quickly positioned onto the shaft. As the hub cools, its bore contracts back to its original machined dimension, effectively "shrinking" the hub onto the shaft.



Shrink/Press

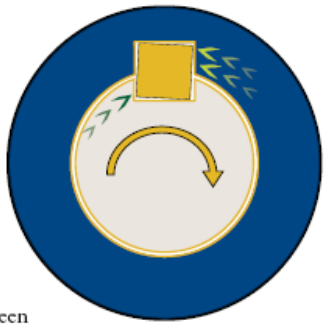
A press fit achieves the same end as a shrink fit — a mechanical interference fit between a steel shaft and hub — but does so through different means. Press fits rely on the application of simple brute force to "press" the hub onto the shaft.

Interference fits offer several advantages, such as zero backlash and uniform fit pressures, but these advantages come at a price. High capacity interference fits require long fit lengths, close tolerances, expensive and sometimes hazardous heat sources or hydraulic presses, and field maintenance is extremely difficult. Finally, separated components can rarely be re-used.

Keys, Keyways & Splines

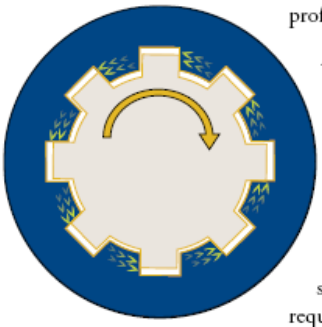
The centuries-old industry standard shaft-to-hub mounting technique is the key and keyway. While ubiquitous and intuitively easy to understand, the key and keyway is a remarkably ineffective technology. Machining a keyway into a shaft is not inexpensive, nor is the equipment required to do so, though these costs are often unknown or overlooked. Keyways introduce notch factors, which account for the reduced effective cross section and abridged fatigue life that occurs when a shaft is keyed and lead, in turn, to systematic over-sizing of shaft diameters. This translates to more shaft material and weight, larger bearings and other drive components, and increased cost.

Further, keyed connections require fit clearance for assembly, both between key and keyway and between shaft and hub.



Key & Keyway

The combined effect of these clearances is backlash. In applications with frequent starts/stops, direction changes, and/or shock overloads, this backlash can lead to pounded out keyways, fatigue failures, fretting corrosion or some combination of these failure modes. Nor do keys and keyways lend themselves to motion control applications, since backlash erodes the accuracy of motion profiles over time.



Spline

A splined connection is simply a series of keys and keyways that suffers the same limitations and drawbacks associated with a single keyed connection. Manufacturing costs are high, especially on hollow shafts, and special surface treatment is often required to increase strength.

Keyed Bushing Systems

Both QD and Taper-Lock® bushing and weld-on hub systems are popular component mounting technologies. Yet both are ultimately keyed connections and as a result suffer from the same operational drawbacks as described above. As their name indicates, the weld-on hubs require an additional, and expensive, manufacturing step. And while the bushings can be used without a weld-on hub, doing so requires machining a taper and drilling and tapping holes in the mating part.



Taper-Lock



QD

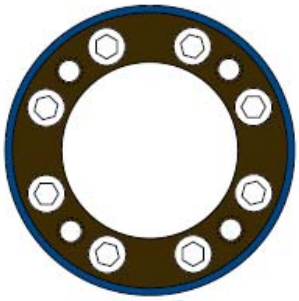
Why Go Keyless

Today's global marketplace demands precise, efficient machines that optimize productivity while minimizing material and fabrication costs. When compared to traditional connection methods, Fenner Drives Keyless Bushings offer the following advantages:

- A mechanical interference fit with a uniform pressure distribution similar to that achieved through a shrink or press fit.
- A true zero backlash shaft-to-hub connection with none of the operational drawbacks of keyways or splines.
- The ability to mount on plain shafting, which need not be over-sized to compensate for notch factors. This allows the use of smaller shafts and bearings for more cost effective designs.



Trantorque®



B-LOC®

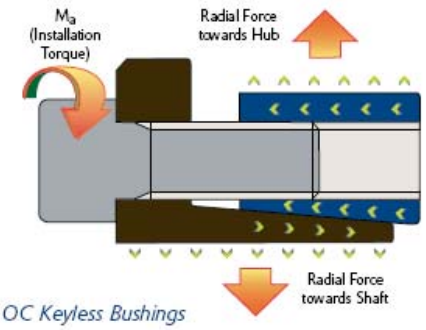
- The flexibility to mount over existing keyways if desired.
- Straight bore machining of the mounted component, generous machining tolerances and as-turned surface finishes.
- Complete axial and radial adjustability.
- Simple installation, adjustment and removal, even in the field.

Principles of Operation

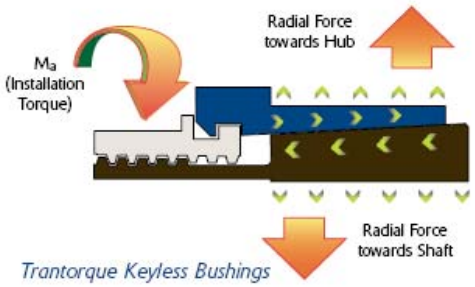
Though offered in many shapes and sizes, Fenner Drives Keyless Bushings and Specialty Locking Devices all operate using the simple wedge principle. An axial force is applied — by either a hex nut or a series of annular screws — to engage circular steel rings with mating tapers. In the case of keyless bushings, the resulting wedge action creates a radial force on the tapered rings, one of which contracts to squeeze the shaft while the other expands and presses into the component bore.

In the case of specialty locking devices, similar tapered geometry generates a radial force that is concentrated (in the case of our Shrink Discs) around a solid steel hub, squeezing so tightly that the hub "shrinks" onto the underlying shaft, or (in the case of our WK Series Couplings) simultaneously onto two solid shaft ends to form a high-capacity rigid coupling.

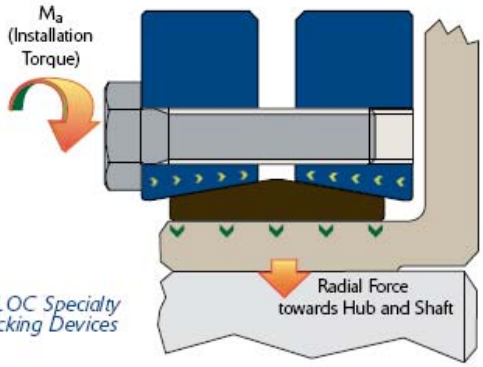
In all cases, the product of the radial force applied to the shaft, the radius of that shaft and the coefficient of friction between the surfaces being joined equals the rated torque capacity of the connection.



B-LOC Keyless Bushings



Trantorque Keyless Bushings

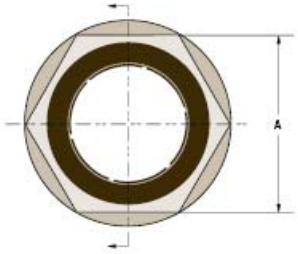


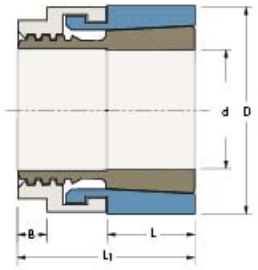
B-LOC Specialty Locking Devices

Comparison Chart	B-LOC	Trantorque	Interference Fit	Keyed Connection	Splined Connection	QD or TL Bushings
Keyless frictional connection	✻	✻	•			
Infinite radial and axial adjustment	✻	✻				
Easy installation	✻	✻		•	•	•
Easy removal	✻	✻				•
Backlash free connection	✻	✻	•			
Transmits shock and torque reversals	✻	✻	•			
Transmits reversing bending moments	✻	✻	•			

Trantorque
MINI







TOLERANCE (T_L)

T_L for shaft and bore is ± .0015" for all sizes

Trantorque Mini Inch

Part Number	d (inch)	D (inch)	L (inch)	L_1 (inch)	Wrench Size A (inch)	B (inch)	M_a Install Torque (in lb)	M_t Maximum Transmitted Torque (in lb)	Th Maximum Transmitted Thrust (lbs)	P_h Hub Pressure (psi)	D_N* Minimum Hub Diameter (inch)	Shipping Weight (lb)
6202102	1/8	5/8	3/8	3/4	1/2	1/8	125	100	700	5200	0.702	0.1
6202103	3/16	5/8	3/8	3/4	1/2	1/8	125	100	700	5200	0.702	0.1
6202105	1/4	5/8	3/8	3/4	1/2	1/8	125	150	790	5200	0.702	0.1
6202107	5/16	3/4	7/16	7/8	5/8	1/8	150	200	890	3700	0.814	0.1
6202109	3/8	3/4	7/16	7/8	5/8	1/8	150	250	925	3700	0.814	0.1
6202110	7/16	7/8	1/2	1	3/4	3/16	175	300	950	2700	0.929	0.1
6202112	1/2	7/8	1/2	1	3/4	3/16	175	350	980	2700	0.929	0.1
6202114	9/16	1	5/8	1 1/8	7/8	3/16	200	400	990	1800	1.041	0.1
6202115	5/8	1	5/8	1 1/8	7/8	3/16	200	450	1000	1800	1.041	0.1
6202119	3/4	1 1/4	3/4	1 3/8	1 1/16	1/4	700	1500	2000	8000	1.496	0.3

*Required hub OD for 1045 h.r. steel hub assuming 45 ksi (310 N/mm²) Yield Point and Stress Reduction Factor C=1 (see page 16 for details)



Trantorque Mini metric sizes are plated with RoHS compliant clear Zinc.

TOLERANCE (T_L)

T_L for shaft and bore is ± .04mm for all sizes

Trantorque Mini Metric

Part Number	d (mm)	D (mm)	L (mm)	L_1 (mm)	Wrench Size A (mm)	B (mm)	M_a Install Torque (Nm)	M_t Maximum Transmitted Torque (Nm)	Th Maximum Transmitted Thrust (kN)	P_h Hub Pressure (N/mm^2)	D_N* Minimum Hub Diameter (mm)	Shipping Weight (kg)
6202640	3	16.0	9.5	19.1	13	3.2	14.1	12	3.2	36	18.0	0.05
6202645	4	16.0	9.5	19.1	13	3.2	14.1	12	3.2	36	18.0	0.05
6202650	5	16.0	9.5	19.1	13	3.2	14.1	12	3.2	36	18.0	0.05
6202660	6	16.0	9.5	19.1	13	3.2	14.1	16	3.4	36	18.0	0.05
6202670	7	19.0	11.1	22.2	16	3.2	17	20	3.5	26	20.7	0.05
6202680	8	19.0	11.1	22.2	16	3.2	17	23	4.0	26	20.7	0.05
6202690	9	19.0	11.1	22.2	16	3.2	17	26	4.1	26	20.7	0.05
6202700	10	22.5	12.7	25.7	19	4.8	19.8	30	4.2	19	23.9	0.05
6202710	11	22.5	12.7	25.7	19	4.8	19.8	34	4.2	19	23.9	0.05
6202720	12	22.5	12.7	25.7	19	4.8	19.8	39	4.3	19	23.9	0.05
6202740	14	25.5	15.9	28.6	22	4.8	22.6	44	4.4	12	26.5	0.05
6202750	15	25.5	15.9	28.6	22	4.8	22.6	45	4.4	12	26.5	0.05
6202760	16	25.5	15.9	28.6	22	4.8	22.6	50	4.5	12	26.5	0.05
6202770	17	32.0	19.1	34.9	27	6.4	80	170	8.9	55	38.3	0.14

*Required hub OD for 1045 h.r. steel hub assuming 45 ksi (310 N/mm^2) Yield Point and Stress Reduction Factor C=1 (see page 16 for details)