

About Altra Industrial Motion

Altra Industrial Motion (NASDAQ:AMIC) is a leading multi-national designer, producer and marketer of a wide range of electromechanical power transmission products. The company brings together strong brands covering over 40 product lines with production facilities in nine countries.

Altra's leading brands include Boston Gear, Warner Electric, TB Wood's, Formsprag Clutch, Wichita Clutch, Industrial Clutch, Ameridrives Couplings, Kilian Manufacturing, Marland Clutch, Nuttall Gear, Stieber Clutch, Twiflex Limited, Bibby Transmissions, Matrix International, Inertia Dynamics, Huco Dynatork, Ameridrives Power Transmission, Delroyd Worm Gear and Warner Linear. For information on any of these technology leaders, visit www.AltraMotion.com or call 815-389-3771.

Warner Electric

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Twiflex Limited

Kilian Manufacturing

Ameridrives Power
Transmission

Couplings

Eliminating the Load on the Motor During System Design



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Couplings

Eliminating the Load on the Motor During System Design

HELP, I'M STUCK!!

Picture the scene. You've designed a great drive system and all you need to do is attach the motor. The only problem is the stack up of tolerances in the mountings and bearings means the shafts aren't exactly aligned. A rigid connection between the two will put too much side force on the bearings and create more load than the motor was designed for. The last thing many people consider in system design is the coupling. Nevertheless, it is this humble component that not only has to link the two assemblies but also to compensate for design errors and operating conditions. Sometimes the design engineer can get stuck, having designed him or herself into a corner. A common question is, how do I make it fit?

Fortunately, coupling manufacturers are very familiar with this scenario and those with the right experience are able to help the stressed design engineer arrive at the best solution. Every application has its own specific requirements, and accordingly, there is now a wide range of different motion control coupling mechanisms from which the design engineer can choose. Although most will satisfy the need for zero backlash and the control of misalignment, each has individual characteristics which determine its ideal application. So how do you know whether you need a bellows, membrane, sliding disc or helical beam, or other design?

To recommend the best type for the job, the obvious question your supplier will ask is "What do you need the coupling to do?" For example, you may need to connect a servo motor to a ball-screw on a high precision 3-axis measuring system, or simply control the opening and closing of a valve. To size the coupling, consideration first needs to be given to the amount of torque, the shaft size, speed and misalignment. Is the misalignment angular, radial, axial or a combination of all three? How stiff must the coupling be in torsion to ensure accuracy of shaft position? Then, how about the duty cycle? Does the coupling need to work continuously or intermittently, and what will be the nature of its operating environment? And what method of fixing would you need? Set screw or clamp – does it require a keyed shaft?

Fortunately, coupling manufacturers, like Huco Dynatork, can help. A complete engineers' guide to coupling mechanisms, dimensions, performance characteristics and their selection can be found on the company's website (www.huco.com) which also includes a unique coupling selection tool designers can use to identify the coupling types that meet their design criteria. Here are a few coupling types and suggestions for their application:

Bellows

If the overriding need is for high speed operation between 5,000 and 10,000 rpm high acceleration, high torsional stiffness and minimum wind up, a bellows coupling is the most likely recommendation. They are available with different lengths of bellows and numbers of

convolutions which provide different performance. It's a trade-off between misalignment and torsional accuracy. The more misalignment you need to handle, the more you will have to compromise torsional stiffness. Typical applications are closed loop servo systems, positioning slides, metering valves and those involving predominantly inertial loads.

Bellows couplings are available in stainless steel and nickel. Stainless steel is generally stronger and suited to higher loads. The nickel type is the best choice where transfer of intelligence is the main criterion such as in high precision position control, velocity control and applications with very high resolution encoders. In addition to high torsional stiffness, the distinctive properties of the nickel bellows coupling are good flexibility, accommodation of radial misalignment and low bearing loads.

Flexible membrane

Another type of statically balanced design which has similar attributes to the bellows is the flexible membrane coupling. The key factor which differentiates the two is life. If operated within set parameters, the flexible membrane coupling has near infinite life. Its misalignment capacity is limited but this can be overcome using two flexible stages separated by a spacer. It is most suited to applications involving high end servo drives, pulse generators, positioning slides, lead screws and dynamometers.

Helical beam

One of the greatest benefits of the multibeam coupling is that it is a single piece coupling that can be manufactured in a wide choice of materials to suit the application. For example, it can be totally stainless steel for use in clean room applications or those where corrosion is an important consideration. These couplings can be electrically conductive or insulating and are often chosen for their slim line appearance.

The helical beam coupling is available with six beams which allow for higher radial misalignment, or with three beams. The latter is naturally smaller and therefore suitable for applications where space is at a premium and has a greater torque capacity than its six beam counterpart. These are the best choices for light duty power transmission applications.

Sliding disc

Sliding disc Oldham couplings are best employed for lower speed applications of 3,000 rpm or less. They have exceptional radial misalignment capability and their three piece construction allows them to be assembled effortlessly in blind or difficult installations. Typically sliding disc couplings are used in servo systems, micro stepper drives, ball screw drives and any application which requires high torque from a small package. A unique feature of this coupling mechanism is that side loads induced on bearings due to misalignment are minimal and constant for any amount of radial offset (within the coupling's physical limits.)

Another of their attributes is the resilient torque disc which can be used to dampen transfer frequencies caused by stepper motors. This 'mechanical fuse' also protects other elements in the drive chain; and as it is replaceable, it makes the sliding disc coupling a cost effective option in the event of overload.



Unique UniLat

If lack of space is a major issue this coupling type is ideal as it combines the attributes of a sliding disc coupling and a universal joint in a very small space. This is the Unilat coupling, a design originated by Huco. Exceptional angular and radial misalignment and very low side forces are the performance characteristics of this short length coupling package. Generally they are used in conjunction with encoders, resolvers, small pumps, stepper motors and in light push pull applications.

Having discussed all the factors, your supplier or manufacturer should generally be able to provide any of the coupling types in stock. Special requirements can often be met by adapting a standard design but a fully customized design is, of course, the ultimate option.

Huco Dynatork is the only manufacturer of a full range of coupling types for motion control. The breadth of choice now available allows Huco Dynatork to meet the needs of almost all small and precision coupling applications.



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