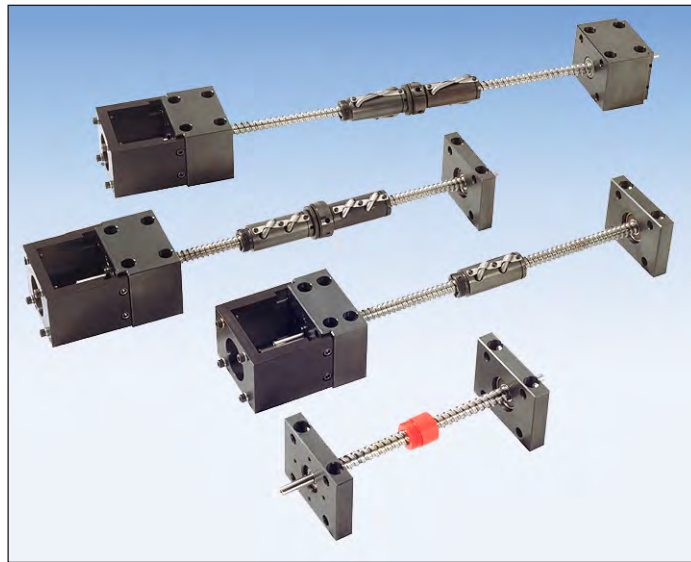
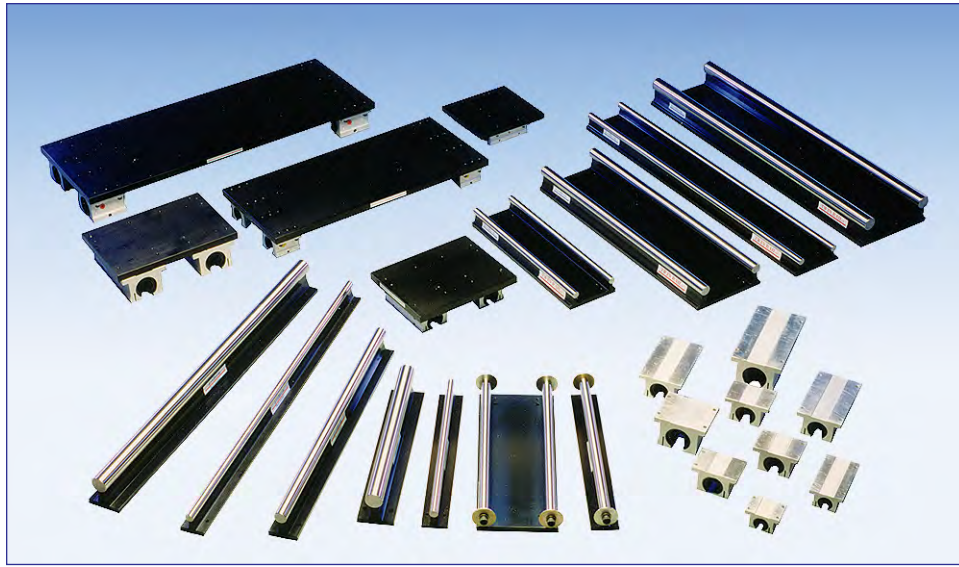




Positioning Components



INSTALLATION & SERVICE MANUAL

Welcome to *LINTECH*®



For over 43 years *LINTECH* has designed, engineered, and manufactured mechanical motion solutions for use in a wide range of applications. Whether it is a standard positioning component or a custom positioning system, *LINTECH* takes great pride in manufacturing a quality product.

At *LINTECH* we are proud to provide the motion control user with this general product guide. It was developed to assist you with acquiring the general knowledge of what *LINTECH* has to offer. You can find complete details on all *LINTECH* products via our website.

Depending on the requirements, standard positioning components can often be assembled and shipped in less than 2 weeks. Custom positioning assemblies require a different approach. We evaluate your special application, use our many years of experience to guide you, and then manufacture a quality product designed to meet your performance specifications.

LINTECH's technical support consists of a well trained inside customer service department, an experienced application engineering staff, and a versatile machining facility.

Our local technical support group consists of Automation Specialists located throughout the World. These Automation Specialists are experienced in the use of electronic and mechanical motion control products. They are well trained on the performance capabilities of *LINTECH* positioning components.

LINTECH is constantly designing new products and improving upon the many options available with our standard products. Whether it is a standard or custom positioning system required, visit our website, call, or e-mail us. We look forward to hearing from you.

Visit our website, or call us for the location of the nearest Automation Specialist in your area:

LINTECH®

1845 Enterprise Way
Monrovia, CA. 91016

Toll Free: (800) 435 - 7494

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Web Site: www.LintechMotion.com

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version: 01/2014

Overview

Thank you for purchasing a *LINTECH* positioning component. **This manual provides you with important information about your *LINTECH* product. It also points out some precautions which should be taken to ensure proper operation, and the longest possible life of your *LINTECH* component.** *LINTECH* manufactures both standard and custom positioning components which are used in a wide variety of applications and industries. For a full description and details on your component, please refer to the proper *LINTECH* Positioning Component catalog or your original quotation if a custom assembly was purchased.

Technical Assistance

Please do not hesitate to call *LINTECH* with any questions you have. You may contact the *LINTECH* Automation Specialist in your area for local help, visit our web site, or call the factory direct. If, for any reason, you need to contact *LINTECH*, or an Automation Specialist, please have ready the Model & Serial numbers of your positioning component, as this may speed the process of answering your question.

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Standard Warranty Policy

All *LINTECH* positioning components are guaranteed to be free from defects in material and workmanship, under normal use, for a period of one year after date of shipment. This warranty covers the repair or replacement of a product when it is sent prepaid to *LINTECH*. *LINTECH* does not assume liability for installation, abuse, alteration, insufficient application data provided for a design, or misuse of any positioning component. Products furnished by *LINTECH*, but not manufactured by *LINTECH* (motors, gearheads, encoders, amplifiers, etc....), are subject to the manufacturers standard warranty terms and conditions.

Return Policy

Any product requiring a return to *LINTECH* (for warranty or non-warranty repair) requires pre-approval from the factory prior to shipment. Contact the customer service department at (800) 435-7494 in order to obtain a RMA (Return Materials Authorization) number. At that time, please have your system Model & Serial numbers available, along with the reason for the return. The RMA number should be clearly marked on the returned package label and your packing list, or shipping document. Return product freight prepaid in its original package, or one with comparable protection. *LINTECH* will not accept return shipments sent freight collect. Product damage incurred during return shipment, from poor packaging, will not be warranted by *LINTECH*. Keeping original packing materials is recommended until initial inspection & testing is completed.

Dimensions and Product Changes

Published dimensions shown in the Positioning Component catalogs are known to be accurate at the time of printing. *LINTECH* shall not be held liable, under any circumstances, for any wrongly documented dimension or specification. Changes in design are made whenever *LINTECH* believes its product will improve by the change. No obligation to incorporate these changes in units manufactured prior to a change, will be assumed.

Handling - Ball Screw Assemblies

Every *LINTECH* Ball Screw Assembly must be handled carefully so as not to introduce "bending" of the screw thread, scratching of the screw thread, or nicking of the screw thread. Any of the above will result in unexpected operation of the Ball Screw Assembly. Independent of the assembly length, the Ball Screw assembly should **NEVER** be held in the middle only, since the unsupported housing weight and handling of the unit could bend the screw thread. When unpacking the assembly, support the unit on each end when moving and installing the unit. **WARNING** - Improper handling of a Ball Screw Assembly will void the warranty of your assembly.

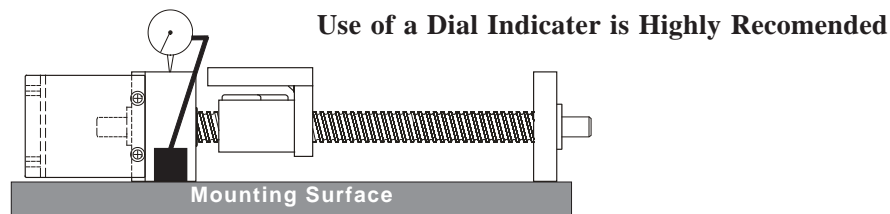
Installation Tips

Precise alignment of a *LINTECH* Ball Screw Assembly with the linear bearings & rail, mounting surface, and carriage surface of an overall mechanical assembly is critical to ensure proper operation, and to obtain the required life of the system per the catalog ratings. The exact parallelism, and tolerances required will depend largely upon the bearing & rail type (square, round, roller, etc.), and any mechanical alignment compensation that the machine designer incorporates (i.e. slotted mounting holes, floating keyways, etc.) in the mechanical assembly. Also, examine the surfaces of the nut adapter flange (carriage plate) & housings. These mounting surfaces should be flat, smooth, and unpainted.

Mounting and Alignment

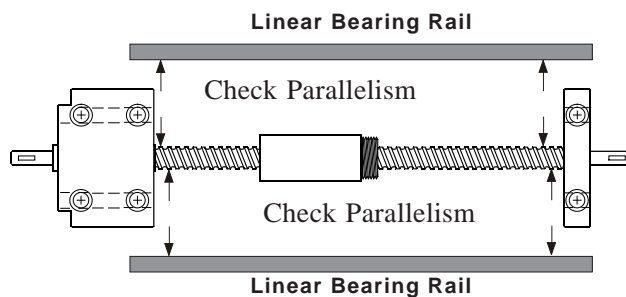
Use of a dial indicator or a laser alignment device is required for this procedure. Without either, it will be impossible to define exact parallelism and height alignment of the assembly. **WARNING** - Improper alignment of a Ball Screw Assembly can cause excessive noise, binding, vibration, rough operation and outright failure after only a few operating cycles. Improper alignment will void the warranty of your assembly.

It is extremely important that the ball nut is **ONLY** loaded axially (with no radial loading or side to side loading). The ball nut is rated for a "pure" thrust load. If a dial indicator is not used, it will be difficult to measure any height variances. Height variances will lead to rough/noisy operation, and premature (or immediate) failure.



To assist in proper installation, please follow the general step by step procedure below and on the next page. Before proceeding, please note that the Ball Screw Assembly should be lubricated with an operational oil/grease prior to moving the attached nut.

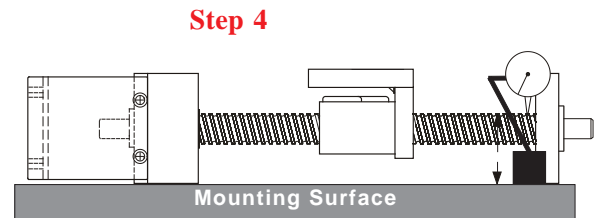
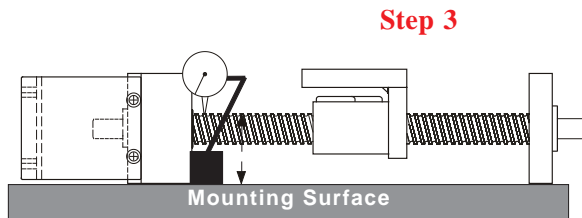
- Step 1:** Place the Ball Screw Assembly on your mounting surface and attach the support housing mounting screws on both ends. **DO NOT FULLY** tighten "only finger tighten" these screws during this step.
- Step 2:** Precisely check the system parallelism over the entire length, of your linear bearing & rails to the screw shaft. Adjust the Ball Screw Assembly accordingly.



Mounting and Alignment

Step 3: Without the NUT Bracket attached to the Carriage (Load) plate - Precisely measure from the mounting surface to the top of the screw thread near the motor mount housing.

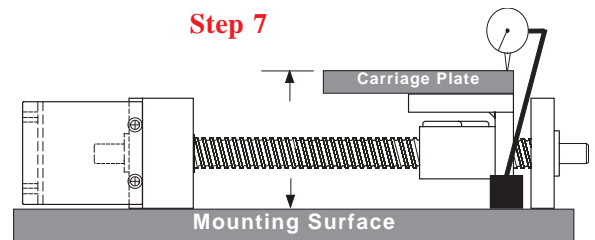
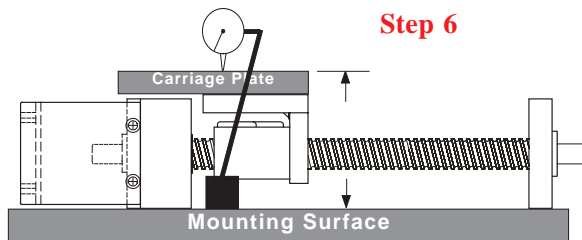
Step 4: Without the NUT Bracket attached to the Carriage (Load) plate - Precisely measure from the mounting surface to the top of the screw thread near the housing opposite the motor mount end.



Step 5: Compare the values in Step 3 and Step 4 above. Shim the support housings accordingly to obtain the same height values. Repeat steps 3 & 4 above until the same heights are obtained.

Step 6: With **NO SYSTEM LOAD** on the Carriage (Load) plate - Insert the mounting screws from your carriage plate (which should be supported by the linear bearing & rail system) into the NUT bracket. **DO NOT FULLY** tighten "only finger tighten" these screws during this step. Shim accordingly to correct for gaps between the carriage plate and NUT bracket. Slowly move the Carriage & nut bracket to the drive support housing (motor mount end) and precisely measure from the mounting surface to the top of the nut bracket.

Step 7: With **NO SYSTEM LOAD** on the Carriage (Load) plate - Slowly move the Carriage & nut bracket to the opposite support housing and precisely measure from the mounting surface to the top of the nut bracket.

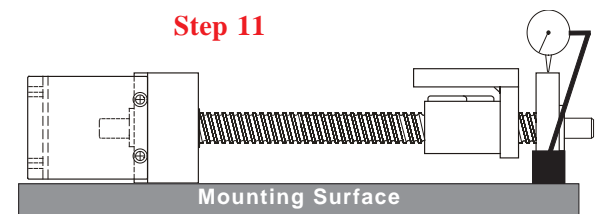
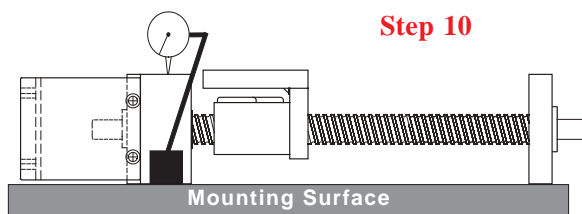


Step 8: Compare the values in Step 6 and Step 7 above. Shim the support housings accordingly to obtain the same values. Repeat steps 3 & 4 above until the same heights are obtained.

Step 9: Slowly slide the carriage back to the drive end and stop before the nut touches the housing. If the travel to this end was smooth (no binding), tighten screws on the carriage to nut bracket. If not - go back to step 1.

Step 10: Place a dial indicator on top of the drive housing, and tighten down these screws. There should be little or no movement of the dial indicator. If there is, additional shimming may be required at the bottom of the housing, or top of the nut flange.

Step 11: Slowly slide the carriage back to the opposite end and repeat step 10 above for this housing.



Step 12: Move the carriage back-n-forth to ensure that it travels smooth (no binding, or roughness) to verify that the components are aligned properly. If not - go back to step 1.

Lubrication - Ball Screw Assemblies

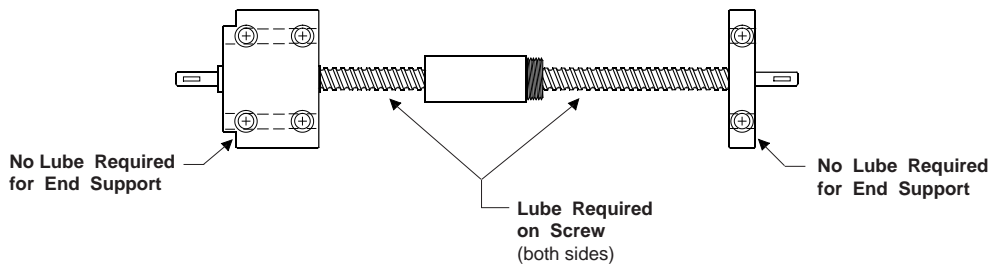
Every *LINTECH* Ball Screw Assembly requires a small amount of grease or oil for proper, long term operation. Lubrication will decrease system wear and the potential for oxidation of the ball screw surface. For most applications, a medium to heavy oil, light grease, or Synthetic Teflon based lubricant is recommended. The many built-in pockets within the ball screw nut allow the adhesive properties of these lubricants to be stored for extended periods of time.

For high speed applications, a light grease is recommended, while the ball screw should NEVER be operated dry for any length of time. For some low speed and lightly loaded applications, a ball screw assembly can typically be operated without lubrication, but for the most part, this is not recommended. Use of WD-40, or other cleaning solvents, should strictly be avoided, as they can cause damage to the ball screw nut.

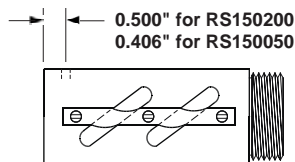
Because turcite nut ball screw assemblies have a solid surface contacting a solid surface, sufficient lubrication becomes a must. If there is not proper lubrication, the higher frictional forces of these nuts will cause excess wear to the assembly, thus preventing required screw life from occurring. Applying lubrication directly onto the entire length of the screw on a regular basis is highly recommended.

All ball screw assemblies are shipped with a lightly coated rust preventative oil on the ball screw threads & ball nut. This oil is not meant as an operational lubricant. It is highly recommended that the proper lubricant be applied to the ball screw and linear rails prior to operation. Also, periodic re-lubrication helps assure that the rated life of the ball screw assembly is attained.

All support housings do NOT require lubrication. The housings and bearings are internally lubricated for life, and sealed to prevent outside contamination from getting in.



Two *LINTECH* Ball Screw Assembly series come standard with a lube hole in the side of the ball nut. This hole is a 1/8-27 NPT, and the location is shown in the below diagram. This can be used for an automated lubrication tube to disperse oil directly into the nut if required. This is available only with the RS150050, and RS150200 series.



Recommended Lubrication Types

The type of lubrication may vary depending upon the application, speed, and environment in which the ball screw assembly is installed into. The recommended lubrication types include: High Grade Bearing Grease, Light Weight Oil (50 weight or higher), 80/90 Weight Gear Oil, or a Synthetic Teflon based compound. These type of lubricants should be available through your local lubricant supplier, or hardware/automotive supply store. Use of WD-40, or other cleaning solvents, **should strictly be avoided**, as they can cause damage to the screw assembly.

Guidelines for Lubrication

There is no specific equation *LINTECH* can provide for lubrication. We can only provide guidelines based upon numerous ball screw assembly installations. Ultimately, the frequency of lubrication is determined by your personal preference and the ball screw assembly application. Some applications will require a high frequency of lubrication. These include but are not limited to: high linear speeds, heavy loads, extreme smoothness, high accelerations, high duty cycles, applications which require friction free motion, or high frequency oscillating moves.

High speed applications can use grease or oil type lubrication. The screw assembly should NEVER be operated dry for any length of time. Grease is the preferred type since the grease stays on the ball screw for a longer period of time than oil lubricants. Oil type lubricants can also cause oil "splattering" to surrounding equipment. However, an automatic oil lubrication system may be required for some 24 hours per day, 7 days per week continuous operating applications.

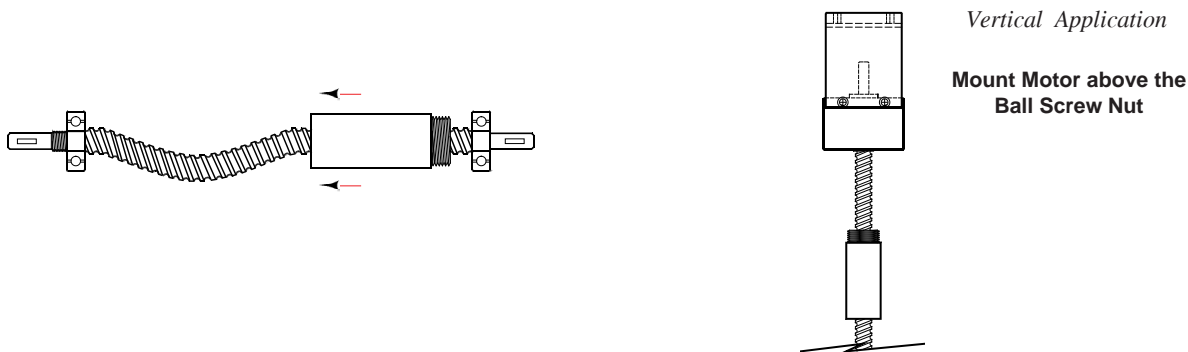
Maximum Acceleration Rate & Thrust Forces

This rating is the maximum acceleration that a ball nut or support housing can handle on a regular basis. It is also limited by the maximum thrust force a particular nut or support housing can sustain. For example, if the maximum acceleration for a ball screw assembly is 772 inches/sec², but a specific load accelerated at 100 inches/sec² produces the maximum thrust force for the ball screw or support housing - then the maximum acceleration rate for that load is 100 inches/sec². ($F = MA$). Refer to the Ball Screw Assembly catalog specification section for the maximum acceleration rate and thrust force capacity for a particular Ball Screw model number. **WARNING - Exceeding these ratings can cause damage to, and/or shorten the life of, the Ball Screw Assembly and should be avoided.**

Maximum Compression Load

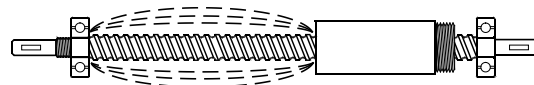
A compression load is a force that tends to compress, or buckle a ball screw shaft. If a compressive force is applied to a screw that exceeds its column strength, the screw will bend. Thus causing premature, or permanent failure. This can happen in either horizontal or vertical applications. In some cases, you may have to select a more rigid end support housing arrangement, and/or a larger diameter screw in order for the ball screw assembly to withstand your compression load. Refer to the Positioning Component catalog specification section for the maximum compression load for a particular Ball Screw model number.

If a sufficiently heavy load is applied to a nut with a long ball screw in a horizontal application, the ball screw could buckle. In a vertical application, if a Fixed or Rigid motor driven housing is mounted below the ball screw, the ball screw weight & load weight could buckle the screw. Therefore, in a vertical application, installing the motor driven support housing above the ball screw puts the ball screw assembly in a tension mode, while the bottom end support bearing is free to "float axially" and is used only to guide the end of the screw. By loading the screw in tension, most of the time you avoid any compression load issues, and only need to be concerned with the load capacity of the nut and end support bearings. However in some vertical applications with the ball screw mounted in a tension mode, you will have to be concerned about compression loads if you have a reversing force that exceeds the load weight being moved. **WARNING - Exceeding these ratings can cause damage to the Ball Screw Assembly and should be avoided.**



Maximum Speed

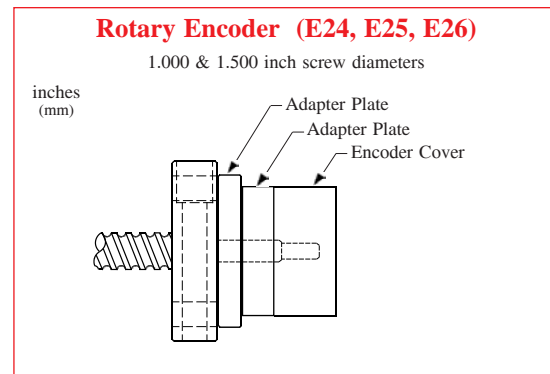
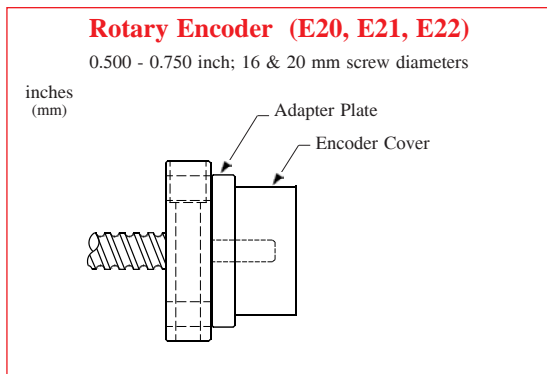
The maximum rotational speed of a ball screw assembly (RPM's) depends on the diameter of the screw, the length of the screw, and the support housing configuration. This is the point at which the rotational speed of the ball screw creates excessive vibration within the assembly. The maximum speed should never be exceeded since it could cause immediate, or premature failure of a ball screw assembly. Refer to the Positioning Component catalog specification section for the maximum speed for a particular Ball Screw model number. **WARNING - Exceeding these ratings can cause damage to the Ball Screw Assembly and should be avoided.**



Rotary Incremental Encoders

If a rotary encoder is supplied by *LINTECH*, it comes installed on the ball screw assembly opposite the motor mount end. This rotary encoder is shaftless and is physically mounted to the screw shaft extension. **WARNING - It is important NOT to remove the rotary encoder from the ball screw assembly. Removing the encoder will void its warranty.** The glass disk is pre-aligned by *LINTECH* for proper operation. Removing the encoder could effect its performance. The encoder is protected with a sheet metal cover, which is not totally sealed. Therefore if splashing fluid, or other materials is present, precautions should be made to redirect these items away from the encoder housing since contaminants which penetrate the housing can cause encoder failure.

Specification	ROTARY ENCODERS		
	E20/E24	E21/E25	E22/E26
Line Count	500 lines/rev	1000 lines/rev	1270 lines/rev
Pre Quadrature Resolution	0.002 revs/pulse	0.001 revs/pulse	0.00079 revs/pulse
Post Quadrature Resolution	0.0005 revs/pulse	0.00025 revs/pulse	0.00019 revs/pulse
Maximum Speed	60 revs/sec		
Maximum Accel	4 G's		
Excitation Power	+ 5 VDC @ 125 ma		
Operating Temperature	32° F to 230° F (0° C to 100° C)		
Humidity	20% to 98% non condensing		
Shock	50 G's for 11 msec duration		
Weight	4.5 ounces		
Cable Length	10 ft (3 m), unterminated 26 gauge leads		
Zero Reference Output	Once per revolution		
Outputs	TTL square wave; Two channel (A+ & B+); Differential (A- & B-); Line Driver		



Wire Color	Description
White	Channel A ⁺ (or A)
Blue	Channel A ⁻ (or \bar{A})
Green	Channel B ⁺ (or B)
Orange	Channel B ⁻ (or \bar{B})
White/Black	Channel Z ⁺ (or Z)
Red/Black	Channel Z ⁻ (or \bar{Z})
Black	Common
Red	+ 5 vdc (+/- 5%)

Notes:

1. Rotary encoders are not totally sealed, and precautions should be taken to protect the encoder in corrosive or fluid splashing type of environments.
2. **DO NOT** remove rotary encoders from the ball screw assembly. Their mounting orientation is critical for proper operation. Encoders are adjusted by *LINTECH*, prior to shipping, for proper operation.

Motor Couplings

LINTECH provides three different types of couplings that can be used to mount a motor to a ball screw assembly. These couplings compensate for misalignment between the motor shaft & screw drive shaft extension. This provides for trouble-free operation as long as certain precautions are taken. The connected motor output torque should never exceed the coupling maximum torque capacity.

These couplings are not limited by speed, but can be damaged if a move profile has large acceleration rates or is constantly "SLAMMED" into a mechanical hard stop (or nut bracket). Large inertia loads with quick acceleration and deceleration rates could also have the damaging effects to a coupling by weakening it over time. Couplings with larger torque capacity may be required for high accelerations, large back driving vertical loads, high torque output motors or gear boxes, etc..

One common cause for coupling failure is from the user not connecting EOT switches to a position controller. This situation can result in the carriage over traveling the EOT switches to the point where the nut bracket collides with the ball screw end supports. This sudden mechanical stop fatigues the coupling, which can cause coupling failure. This also can destroy the ball screw nut assembly. Therefore, it is not a good practice to use any positioning systems's mechanical hard stops as a normal stopping procedure.

Another cause of coupling failure can occur during the tuning of a servo system that is attached to the ball screw assembly. When servo gains are first adjusted, violent oscillations can occur, which can fatigue, or damage, a coupling. Care should be taken to limit these wild oscillations, by either tuning the servo system before coupling the motor to the ball screw assembly, or by limiting the current in the servo drive during the tuning process.

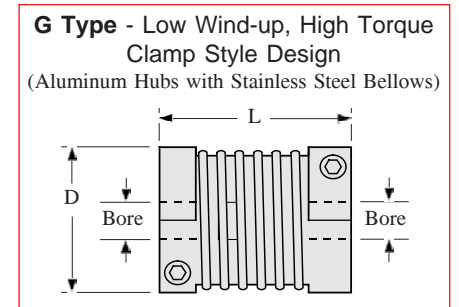
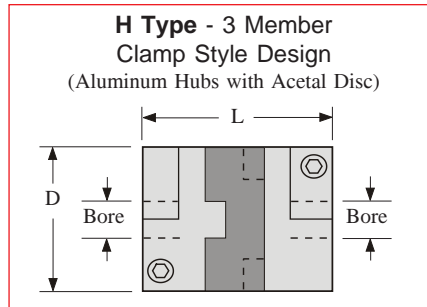
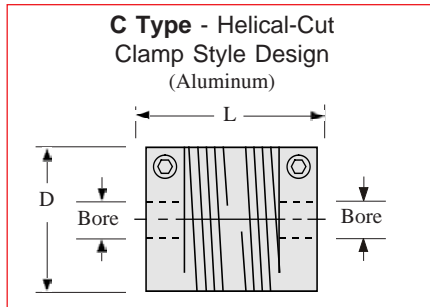
Motor Adapter Brackets - Another important area of coupling concern is in cases where a non- *LINTECH* motor adapter bracket is being installed by the user to a ball screw assembly. In some cases, the added bracket thickness along with a potentially short motor shaft extension, can cause the *LINTECH* supplied coupling to be too short to "clamp" onto the motor shaft. If such a situation arises, a different coupling with a longer length may be required. See page 9 for a list of standard *LINTECH* couplings. Custom couplings will require factory contact to determine torque capacity.

Specification		Ball Screw Diameters								
		0.500 inch		0.625 inch & 16 mm		0.750 inch & 20 mm		1.000 inch		1.500 inch
		NEMA 23 Mount	NEMA 34 Mount	NEMA 23 Mount	NEMA 34 Mount	NEMA 23 Mount	NEMA 34 Mount	NEMA 34 Mount	NEMA 42 Mount	NEMA 42 Mount
Shaft extension diameter at motor mount end	inches (mm)	.312 (7,92)		.375 (9,52)		.500 (12,70)		.625 (15,87)		.750 (19,05)
Maximum coupling diameter	inches (mm)	2.00 (50,8)	2.00 (50,8)	2.00 (50,8)	2.00 (50,8)	2.00 (50,8)	2.00 (50,8)	3.20 (81,3)	2.80 (71,1)	3.80 (96,5)
Maximum coupling length	inches (mm)	2.10 (53,3)	2.10 (53,3)	2.10 (53,3)	2.10 (53,3)	2.10 (53,3)	2.10 (53,3)	2.60 (66,0)	3.60 (91,4)	3.40 (86,4)

Note: Custom motor mounts available upon request.

Coupling Maximum Torque values shown on page 9 define the input torque at which the coupling can immediately fail. It is "good practice" to select a coupling which has at least 2x (two times) the safety margin above the PEAK coupling input torque. Example: 15 N-m of peak output torque from a motor/gearhead should utilize a coupling which has a Maximum Torque value of at least 30 N-m.

Motor Couplings



Model #	D inches (mm)	L inches (mm)	Table	Bore Diameters				Weight ounces (grams)	Inertia oz-in ² (g-cm ²)	Wind-up arc-sec/oz-in (deg/N-m)	Max Torque oz-in (N-m)
				Motor	Minimum (in) (mm)	Maximum (in) (mm)					
C075-xxx-aaa	0.75 (19,1)	1.00 (25,4)	xxx	aaa	.187 5	.250 8	0.8 (23)	0.06 (10)	45.0 (1,8)	200 (1,4)	
C100-xxx-aaa	1.00 (25,4)	1.50 (38,1)	xxx	aaa	.250 6	.375	1.5 (43)	.19 (35)	23.0 (0,9)	400 (2,8)	
C125-xxx-aaa	1.25 (31,8)	2.00 (50,8)	xxx	aaa	.250 6	.500	3.5 (99)	.68 (124)	15.0 (0,59)	700 (4,9)	
C150-xxx-aaa	1.50 (38,1)	2.37 (60,2)	xxx	aaa	.375	.625	5.5 (156)	1.54 (282)	13.0 (0,51)	950 (6,7)	
H075-xxx-aaa	0.75 (19,1)	1.02 (25,9)	xxx	aaa	.187 5	.250 8	0.5 (14)	0.04 (6)	12.6 (0,50)	225 (1,5)	
H100-xxx-aaa	1.00 (25,4)	1.28 (32,5)	xxx	aaa	.250 6	.375	1.2 (34)	.15 (27)	7.2 (0,28)	450 (2,8)	
H131-xxx-aaa	1.31 (33,3)	1.89 (48,0)	xxx	aaa	.250 6	.625	2.9 (82)	.62 (114)	2.5 (0,098)	1,000 (7,1)	
H163-xxx-aaa	1.63 (41,4)	2.00 (50,8)	xxx	aaa	.375	.750	5.4 (153)	1.79 (328)	1.2 (0,047)	2,000 (14,1)	
H197-xxx-aaa	1.97 (50,0)	2.35 (59,7)	xxx	aaa	.375	.750	7.6 (215)	3.69 (674)	1.1 (0,043)	3,600 (25,4)	
H225-xxx-aaa	2.25 (57,2)	3.07 (78,0)	xxx	aaa	.500	1.000	13.1 (371)	8.29 (1516)	0.6 (0,024)	5,300 (37,4)	
G075-xxx-aaa	0.79 (20,0)	1.02 (26,0)	xxx	aaa	.187 5	.375	0.8 (22)	0.06 (11)	2.0 (0,079)	300 (2,1)	
G100-xxx-aaa	0.99 (25,2)	1.26 (32,0)	xxx	aaa	.250 6	.500	1.3 (36)	.16 (29)	1.0 (0,39)	500 (3,5)	
G126-xxx-aaa	1.26 (32,1)	1.62 (41,0)	xxx	aaa	.250 6	.625	2.7 (74)	.54 (99)	0.3 (0,012)	1,100 (7,7)	
G158-xxx-aaa	1.58 (40,2)	1.85 (47,0)	xxx	aaa	.375	.750	4.3 (120)	1.34 (245)	0.2 (0,008)	2,400 (17,0)	
G177-xxx-aaa	1.77 (45,0)	2.48 (63,0)	xxx	aaa	.375	.750	7.1 (200)	2.78 (508)	0.2 (0,008)	4,250 (30,0)	
G220-xxx-aaa	2.20 (56,0)	2.56 (65,0)	xxx	aaa	.500	1.000	10.6 (300)	6.41 (1172)	0.04 (0,002)	7,100 (50,0)	
G260-xxx-aaa	2.60 (66,0)	3.07 (78,0)	xxx	aaa	.625	1.000	21.2 (600)	17.91 (3276)	0.03 (0,001)	9,600 (68,0)	
Possible values for xxx & aaa	250 = .250 inch 375 = .375 inch 500 = .500 inch 625 = .625 inch	750 = .750 inch 999 = 1.000 inch			005 = 5 mm 006 = 6 mm 008 = 8 mm 010 = 10 mm	012 = 12 mm 014 = 14 mm 016 = 16 mm 018 = 18 mm		019 = 19 mm 020 = 20 mm 024 = 24 mm			

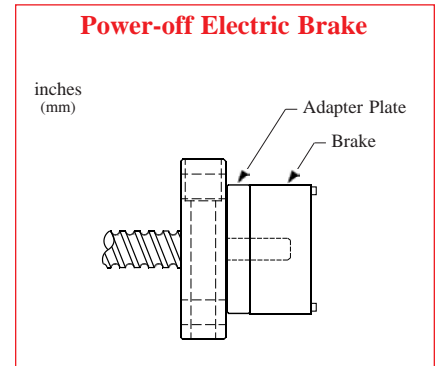
Power-Off Electric Brakes - Operation & Interface

This mechanical brake is primarily used in vertical ball screw applications. Since a ball screw is a very efficient drive mechanism, the load attached to the ball nut has the potential to backdrive when motor power is off (for most applications). Thus, if a power-off electric brake is used, and properly interfaced with a position controller, it will hold the ball nut in-place whenever motor power is off, or in case of a power failure. The brake is a "friction type" and is mounted to the screw shaft extension on the end support opposite the motor mount end. When power is applied to the brake, the brake is opened or "released". When power is removed, the brake is activated which prevents the ball screw from moving, so long as the brake holding torque is greater than the backdriving force of the screw with the attached load.

The brake comes with two wires for power (24 or 90 VDC). These should be wired directly to an external power supply, or user supplied relay network. In most cases, your motor drive and brake power should come from the same source. Thus, when the drive loses power, so will the brake. For stepper & servo systems, further interfacing is required to ensure power-off braking if a motor stalls or there is a drive fault. This requires an encoder to be interfaced to a position controller which will activate relays to remove brake power when a fault occurs. Below is a block diagram of a recommended interface.

Brakes

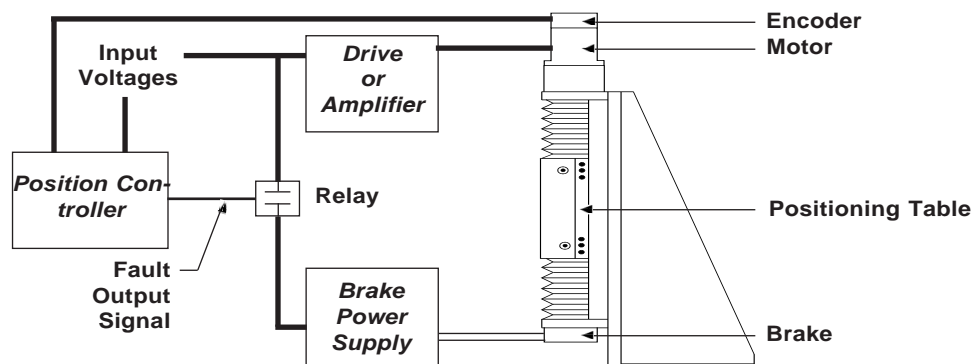
Screw Diameters	Brake Version	Holding Force	Excitation Voltage	Current
		in-lbs (N-m)	volts	amps
0.500 to 0.750 inch 16 & 20 mm	B20	18 (2,03)	24 VDC	0.733
	B21	18 (2,03)	90 VDC	0.178
1.000 inch	B22	84 (9,49)	24 VDC	0.973
	B23	84 (9,49)	90 VDC	0.239
1.500 inch	B24	180 (20,3)	24 VDC	1.136
	B25	180 (20,3)	90 VDC	0.287



Power Supplies

Model Number	DC Output			AC Input		
	volts	amps	style	volts	amps	Hz
41970	5	3.0	regulated	120 / 240	0.8 / 0.4	47-63
37488	24	1.2	regulated	120 / 240	0.8 / 0.4	47-63
37489	90	0.8	unregulated	120	1.0	50/60
37490	90	0.8	unregulated	240	0.5	50/60

Note: The power-off electric brake **MUST NOT** be engaged when the positioning table is in motion. Moving the table with the brake applied could damage the brake and the positioning table. Also, continuous use of the brake to stop a table (and load) that is in motion, could damage the brake.



SA (Shaft Assemblies) Alignment

For most applications it is recommended that two (2) shaft assemblies (SA's) and four (4) linear bearings be used. This will assure system stability as well as optimum performance. This will require two (2) SLBO's, or one (1) DLBO, linear bearing to be used on each SA. The ratio of the two (2) SA assemblies spacing versus two (2) of the SLBO spacing on one SA assembly should always be less than three (3) to one (1). This will assure a constant breakaway and operating friction.

In order to achieve the published flatness of 0.002 in/ft for the SA series, the mounting surface must be as flat, or flatter, than 0.002 in/ft. Shimming may be required between your base and the bottom of the SA assembly.

The maximum acceptable out of parallelism between the two (2) SA's is .001 inch over the entire full system length. Loosely mount both SA assemblies to your mounting surface. Then using indicators, micrometers, or straight edges properly align the two (2) SA assemblies. For more precise applications, use auto-collimators, lasers, or alignment telescopes.

The carriage surface plate where the SLBO's, or DLBO's, are mounted to needs to be flat within 0.002 in/ft. Slide the SLBO's, or DLBO's, on to the SA assemblies and then loosely mount the carriage surface plate to the linear bearings. Move the carriage surface plate from one end of travel to the other end, making sure there is no binding in the assembly. Then securely tighten the linear bearing housings to the carriage surface plate.

TRSA (Shaft Assemblies) Alignment

The TRSA shaft assembly is a complete pre-aligned assembly which simplifies the use of a linear bearing system in a mechanical positioning application. Two (2) shafts are mounted and pre-aligned on a common precision machined aluminum plate, therefore eliminating the time consuming alignment process normally required for two separate shafts.

In order to achieve the published flatness of 0.002 in/ft for the TRSA series, the mounting surface must be as flat, or flatter, than 0.002 in/ft. Each 6, 12, 18, & 24 inch aluminum support has two (2) threaded holes at one end, to assist in leveling the assembly in the final mechanical structure.

LINTECH's TRCA carriage assemblies are an ideal partner to the TRSA shaft assemblies. The SLBO or DLBO linear bearings are doweled and pre-aligned on a precision machined aluminum plate.

Maximum Speed & Acceleration Rate

The maximum acceleration rating is a limitation on how quickly the bearing can start/stop motion (772 inches/sec^2). This rating refers to what a linear bearing can handle on a regular basis.

The maximum linear speed (118 IPS) of a Linear Bearing or Carriage Assembly refers to the peak speed which the bearing can handle on a regular basis. This is the speed at which the recirculating balls within the linear bearing can create excessive vibration and heat within the bearing itself, or on the shaft. The maximum speed should never be exceeded since it could cause immediate, or premature failure of a Linear Bearing or Carriage Assembly. **WARNING - Exceeding these ratings can cause damage to, and/or shorten the life of, the Linear Bearing or Carriage Assembly, and should be avoided.**

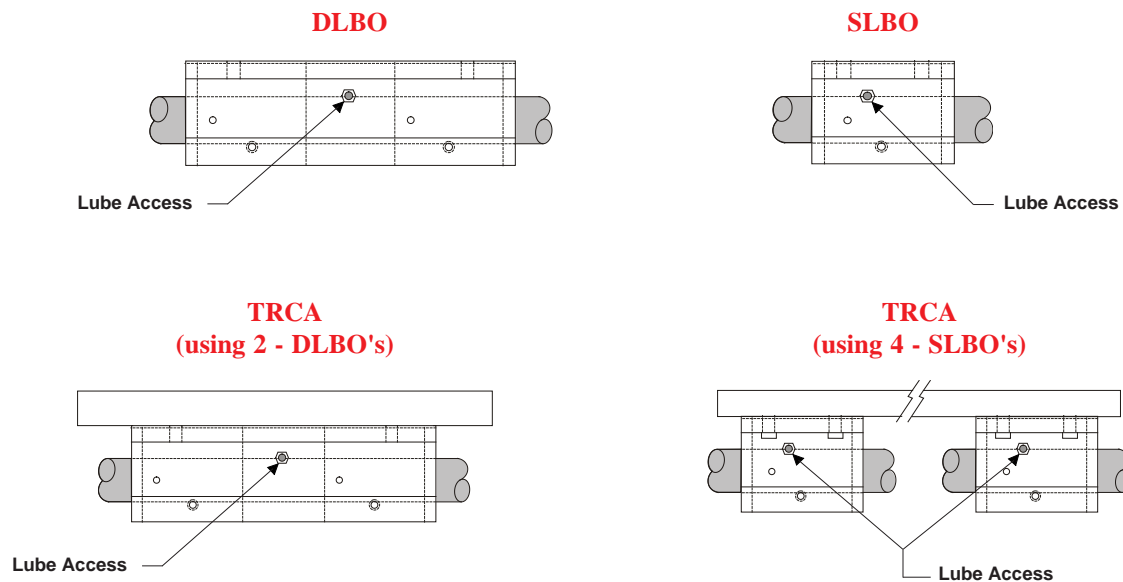
Lubrication - Linear Bearings, Carriage Assemblies

LINTECH carriage assemblies & linear bearings require a small amount of grease or oil for proper, long term operation. Lubrication will decrease system wear and the potential for rusting of linear bearing surfaces. For most applications a medium to heavy oil, light grease, or Synthetic Teflon based lubricant is recommended. The many built-in pockets within the linear bearing allows the adhesive properties of these lubricants to be stored for extended periods of time while minimizing sealing problems.

For high speed applications a medium grease is recommended. The linear bearings should be prevented from operating dry for any length of time. For some low speed and lightly loaded applications, the linear bearings can be used without lubrication, but for the most part this is not recommended.

All *LINTECH* Linear Bearings & Carriage Assemblies are shipped with a small amount of rust preventative internal oil. This will help prevent corrosion during transportation & storage due to environmental conditions. It is highly recommended that all linear bearings & Carriage Assemblies be lubricated during installation, or prior to operation. Also, periodic re-lubrication of the linear bearings helps assure the rated life of the system is attained.

Use of WD-40, or other cleaning solvents, should strictly be avoided, as they can cause damage to the linear bearing and shaft.



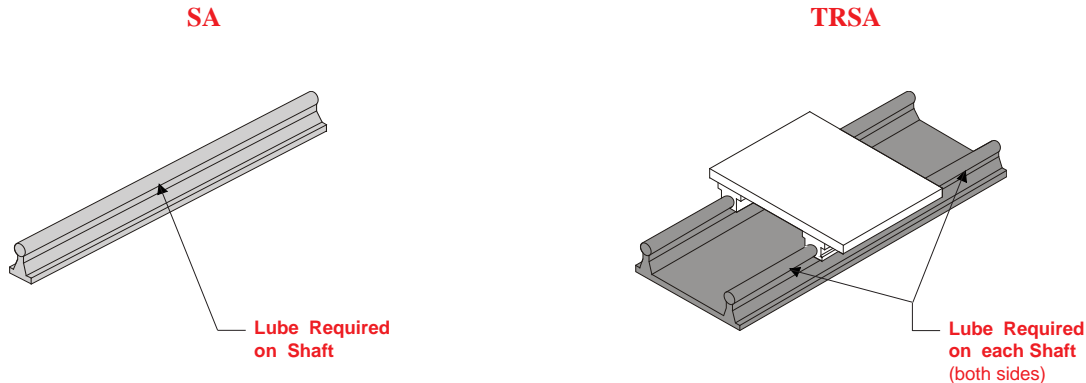
The lubrication access specifications for the carriage assemblies are the same for the *LINTECH* Linear Bearings (SLBO & DLBO). The SLBO & DLBO-8 has a lubrication fitting. The SLBO has a single bearing and the lubrication goes directly into the bearing. The DLBO has two bearings that are spaced a part from each other. Thus, the access port directs the lubrication to a "pad/sponge" for storage and disbursements during operation to both bearings. Because of this absorption pad, it is best to use a light oil with the DLBO, while the SLBO can utilize an oil or grease. The SLBO & DLBO-10, 12, 16, 20, 24 and 32 have a 1/4-28 threaded hole for lubrication interface.

Lubrication - Shaft Assemblies

LINTECH Shaft Assemblies require a small amount of grease or oil for proper, long term operation. Lubrication will decrease system wear and the potential for rusting of shaft surfaces. For most applications a medium to heavy oil, light grease, or Synthetic Teflon based lubricant is recommended.

All *LINTECH* Shaft Assemblies are shipped with a small amount of rust preventative oil over the shafts. This will help prevent corrosion during transportation & storage due to environmental conditions. It is highly recommended that all rail surfaces of the Shaft Assemblies be lubricated during installation, or prior to operation. Also, periodic re-lubrication of the shafts helps assure the rated life of the system is attained.

Use of WD-40, or other cleaning solvents, should strictly be avoided, as they can cause damage to the linear bearing and shaft.



Recommended Lubrication Types

The type of lubrication may vary depending upon the application, speed, and environment in which the shaft assembly is installed into. The recommended lubrication types include: High Grade Bearing Grease, Light Weight Oil (50 weight or higher), 80/90 Weight Gear Oil, or a Synthetic Teflon based compound. These type of lubricants should be available through your local lubricant supplier, or hardware/automotive supply store. Use of WD-40, or other cleaning solvents, **should strictly be avoided**, as they can cause damage to the shaft assembly.

Guidelines for Lubrication

There is no specific equation *LINTECH* can provide for lubrication. We can only provide guidelines based upon numerous shaft assembly installations. Ultimately, the frequency of lubrication is determined by your personal preference and the shaft assembly application. Some applications will require a high frequency of lubrication. These include but are not limited to: high linear speeds, heavy loads, extreme smoothness, high accelerations, high duty cycles, applications which require friction free motion, or high frequency oscillating moves.

High speed applications can use grease or oil type lubrication. The shaft assembly should NEVER be operated dry for any length of time. Grease is the preferred type since the grease stays on the shaft assembly for a longer period of time than oil lubricants. Oil type lubricants can also cause oil "splattering" to surrounding equipment. However, an automatic oil lubrication system may be required for some 24 hours per day, 7 days per week continuous operating applications.

Unit Conversions

Torque Conversions

Present Units	Convert To	Multiply By
Gram-centimeters	newton-meters -----	0.0000981
Gram-centimeters	ounce-inches -----	0.0138874
Gram-centimeters	pound-inches -----	0.000868
Gram-centimeters	pound-feet -----	0.0000723
Newton-meters	gram-centimeters ----	10,197.162
Newton-meters	ounce-inches -----	141.612
Newton-meters	pound-inches -----	8.85
Newton-meters	pound-feet -----	0.73756
Ounce-inches	gram-centimeters ----	72.0077
Ounce-inches	newton-meters -----	0.007062
Ounce-inches	pound-inches -----	0.0625
Ounce-inches	pound-feet -----	0.005208
Pound-inches	gram-centimeters ----	1,152.0
Pound-inches	newton-meters -----	0.11299
Pound-inches	ounce-inches -----	16.0
Pound-inches	pound-feet -----	0.08333
Pound-feet	gram-centimeters ----	13,825.5
Pound-feet	newton-meters -----	1.3558
Pound-feet	ounce-inches -----	192.0
Pound-feet	pound-inches -----	12.0

Distance Conversions

Present Units	Convert To	Multiply By
Arc-minutes	degrees -----	0.016666
Arc-seconds	degrees -----	0.000277
Centimeters	inches -----	0.3937
Centimeters	feet -----	0.03280
Centimeters	microns -----	10,000.0
Degrees	arc-minutes ----	60.0
Degrees	arc-seconds ----	3,600.0
Degrees	radians -----	0.017453
Feet	centimeters -----	30.48
Feet	meters -----	0.3048
Inches	centimeters ----	2.54
Inches	Km -----	0.0000254
Inches	meters -----	0.0254
Inches	microns -----	25,400.0
Inches	millimeters ----	25.4
Km	inches -----	39,370.0
Meters	feet -----	3.2808
Meters	inches -----	39.37
Meters	microns -----	1,000,000.0
Microns	centimeters ----	0.0001
Microns	inches -----	0.00003937
Microns	meters -----	0.000001
Microns	millimeters ----	0.001
Millimeters	inches -----	0.03937
Millimeters	microns -----	1,000.0
Radians	degrees -----	57.295779

Inertia Conversions

Present Units	Convert To	Multiply By
Gram-cm ²	ounce-inches ² ----	0.00546745
Gram-cm ²	ounce-inch-sec ² --	0.000014161
Gram-cm ²	pound-inches ² ----	0.000341716
Gram-cm ²	pound-inch-sec ² --	0.000000885
Gram-cm ²	pound-feet-sec ² --	0.000000074
Ounce-inches ²	gram-cm ² -----	182.901
Ounce-inches ²	ounce-inch-sec ² --	0.00259008
Ounce-inches ²	pound-inches ² ----	0.0625
Ounce-inches ²	pound-inch-sec ² --	0.00016188
Ounce-inches ²	pound-feet-sec ² --	0.00001349
Ounce-inch-sec ²	gram-cm ² -----	70,615.4
Ounce-inch-sec ²	ounce-inches ² ----	386.0
Ounce-inch-sec ²	pound-inches ² ----	24.13045
Ounce-inch-sec ²	pound-inch-sec ² --	0.0625
Ounce-inch-sec ²	pound-feet-sec ² --	0.00520833
Pound-inches ²	gram-cm ² -----	2,926.41
Pound-inches ²	ounce-inches ² ----	16.0
Pound-inches ²	ounce-inch-sec ² --	0.0414413
Pound-inches ²	pound-inch-sec ² --	0.00259008
Pound-inches ²	pound-feet-sec ² --	0.00021584
Pound-inch-sec ²	gram-cm ² -----	1,129,850.0
Pound-inch-sec ²	ounce-inches ² ----	6,177.4
Pound-inch-sec ²	ounce-inch-sec ² --	16.0
Pound-inch-sec ²	pound-inches ² ----	386.0
Pound-inch-sec ²	pound-feet-sec ² --	0.0833333
Pound-feet-sec ²	gram-cm ² -----	13,558,200.0
Pound-feet-sec ²	ounce-inches ² ----	74,128.9
Pound-feet-sec ²	ounce-inch-sec ² --	192.0
Pound-feet-sec ²	pound-inches ² ----	4,633.06
Pound-feet-sec ²	pound-inch-sec ² --	12.0

Load Conversions

Present Units	Convert To	Multiply By
Grams	newtons -----	0.009806
Grams	ounces -----	0.03528
Grams	pounds -----	0.002204
Kilograms	pounds -----	2.2046
Newtons	grams -----	101.971
Newtons	ounces -----	3.59692
Newtons	pounds -----	0.224808
Ounces	grams -----	28.3495
Ounces	newtons -----	0.27802
Ounces	pounds -----	0.0625
Pounds	grams -----	453.592
Pounds	kilograms -----	0.45359
Pounds	newtons -----	4.44824
Pounds	ounces -----	16.0
Pounds	tons -----	0.0005
Tons	pounds -----	2,000.0

Reference : Handbook of Tables for Applied Engineering Science

Terms of Sale

To Order

Any standard, or custom, product from *LINTECH* may be ordered by mail, email, on-line, phone, or fax from an Automation Specialist in your area. To obtain the name of your local Automation Specialist call:

LINTECH®

1845 Enterprise Way
Monrovia, CA 91016

Toll Free: (800) 435 - 7494

Phone: (626) 358 - 0110

Fax: (626) 303 - 2035

Web Site: www.LintechMotion.com

E-Mail: Lintech@LintechMotion.com

All required options should be reviewed using the part numbering guide for each model series. Your local Automation Specialist or factory personnel can assist you with any questions you may have.

Delivery

All shipping promises are made in good faith. Any shipping dates appearing on acknowledgments of orders or given to a customer in any other manner are approximate. Where the customer delays in supplying information necessary to proceeding with an order, the date of shipment may be extended accordingly. Standard products from *LINTECH* are usually available for delivery within 1 to 6 weeks of receipt of a purchase order. However, component shortages, labor disputes, or any other unforeseen circumstance may delay the delivery of an order. *LINTECH* shall not be held liable under any circumstance. All products are shipped F.O.B. Monrovia, CA. *LINTECH* packages all standard and custom products carefully. However, *LINTECH* is not liable for damage incurred during shipment. Contact the carrier immediately if damage to a package or shipment is noticed upon receipt of such shipment.

Payment Terms

Unless otherwise specified, payment shall be made by C.O.D, credit card (AMEX, Visa, or Master Card), or net thirty (30) days (pending credit approval) from date of shipment of the items purchased hereunder in U.S. currency. *LINTECH* reserves the right to require deposit payments on non-standard items, customs, or product built to Buyer's designs or specifications. Amounts not timely paid shall bear interest at the rate of 1.5% for each month or a portion thereof that Buyer is late in making payments. No responsibility is assumed by *LINTECH* for damages arising from delivery delays, fires, strikes, material shortages, accidents, or any other cause whatsoever, and purchase orders are accepted subject only to these conditions irrespective of statements or stipulations on purchase orders.

Minimum Order Amount

LINTECH requires a minimum of \$30 List Price U.S. currency on all orders.

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All *LINTECH* products are guaranteed to be free from defects in material and workmanship, under normal use, for a period of one year after date of shipment. This warranty covers the repair or replacement of a product when it is sent prepaid to *LINTECH*. *LINTECH* does not assume liability for installation, abuse, alteration, insufficient application data provided for a design, or misuse of any positioning system. Products furnished by *LINTECH*, but not manufactured by *LINTECH* (motors, gearheads, encoders, amplifiers, etc...), are subject to the manufacturers standard warranty terms and conditions.

Returns

Any product requiring a return to *LINTECH* (for warranty or non-warranty repair) requires pre-approval from the factory prior to shipment. Contact the customer service department at (800) 435-7494 in order to obtain a RMA (Return Materials Authorization) number. At that time, please have your system Model & Serial numbers available, along with the reason for the return. The RMA number should be clearly marked on the returned package label and your packing list, or shipping document. Return product freight prepaid in its original package or one with comparable protection. *LINTECH* will not accept return shipments sent freight collect. Product damage incurred during return shipment, from poor packaging, will not be warranted by *LINTECH*. Keeping original packing materials is recommended until initial inspection and testing is completed.

Dimensions and Product Changes

Published dimensions shown in *LINTECH* catalogs are known to be accurate at time of printing. *LINTECH* shall not be held liable, under any circumstances, for any wrongly documented dimension or specification. Changes in design are made whenever *LINTECH* believes its products will improve by the change. No obligation to incorporate these changes in units manufactured prior to a change will be assumed.

Cancellations

All items entered for production and on which a cancellation is requested shall be paid for on the basis of actual cost of labor, materials, and supplies applied to the production of such items plus proper overhead expenses determined in accordance with good accounting practice, plus 25% of the total of such cost and expenses; provided that such cost and expense plus 25% shall in no case exceed 100% of the quoted price of original order. Upon cancellation, *LINTECH* may dispose of materials used in the manufacture of cancelled order as it sees fit.



Mechanical Motion Solutions

For over 42 years, *LINTECH*[®] has designed and manufactured numerous standard and custom mechanical motion control products that are used in a wide range of applications and markets. This document highlights cut to length round rail precision shafting, round rail linear bearings (with or without pillow blocks), steel & aluminum shaft supports, shaft assemblies (single & *TWINRAIL*[®]), *TWINRAIL*[®] carriage assemblies, profile rail linear bearings, rolled & ground ball screw assemblies, acme & ball screw driven actuators, belt driven slides, worm gear driven rotary tables, and a wide range of custom positioning assemblies.



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