Dynaflex® LCD Series Couplings

- ***Maintenance Free:*** elastomer flexibility accommodates all motion without wear, eliminates the need for lubrication.
- ***Noise Reduction:*** no metal-to-metal contact; elastomer attenuates structure-borne noise and isolates vibration from components that would act as noise generators.
- ***Attachment:*** fits many standard SAE flywheels.
- ***Design Flexibility:*** standard rubber molds are used to produce each different size coupling shown in this catalog. Often it is necessary to change metal components for custom applications. This is common.
- ***Systems Engineering:*** Lord has in-house computer capabilities for multi-mass torsional analysis to assist in proper coupling selection.

Standardization of Proven Concept
Using the experience gained in designing and producing special Dynaflex couplings, Lord has developed a new standard product line of heavy-duty Dynaflex couplings. These couplings have a specially designed elastomeric element bonded to a metal inner member which is then preloaded and friction-fit into an outer member.

This unique concept provides low torsional spring rates which effectively isolate critical vibratory disturbances in driveline and accessory systems, thus prolonging equipment life. Misalignment and torsional shock loads are absorbed by shear deflection in the elastomeric element.

The ability of the coupling to slip at the outer member with short duration shock overloads protects the driveline and accessory components from premature failure. The Dynaflex coupling has been particularly successful for diesel driven applications.

Dynaflex couplings are available in 75 to 2000 hp ratings at a nominal 2000 rpm. Each size is also available in two stiffness values. These are referred to as the A and C stiffness values. The C stiffness parts are normally stocked.

Load Deflection Data
Figures 1 through 3 illustrate the torque or load versus deflection characteristics for the -A and -C stiffnesses of the LCD-0400 size couplings. The general characteristics of these curves are typical for all Dynaflex couplings.

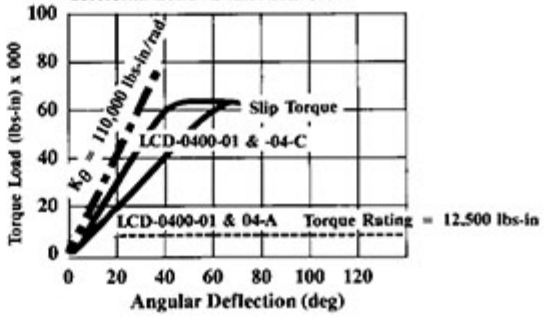
Figure 1 shows the linearity of the coupling spring rate at (and well above) the rated capacity of 12,500 lbs.-in. torque. The curves also demonstrate the unique overload slip characteristic at about 60,000 lbs.-in. torque. It should be noted, however, that the overload protection results from slipping of the coupling. This slipping generates heat, and therefore continuous running at overload could be injurious to the coupling.

Figures 2 and 3 illustrate the flexibility of Dynaflex couplings to accommodate axial and radial misalignment. The "A" variation is made in a softer elastomer to produce a lower torsional spring rate and therefore had the lower axial and radial spring rates. All spring rates are ideally linear over the normal operating range of deflection.

Dynamic Torsional Stiffness, K_θ
The dynamic torsional stiffness is higher than the static stiffness at *room temperature.* When the LCD couplings are attached to diesel engine flywheels, the elastomer gets warm. At an operating temperature in the 170° to 200°F range, the dynamic stiffness is nearly the same as the static stiffness at room temperature. The stiffness values shown in the performance characteristics chart are for computer modelling and in other types of torsional analysis work.

Static Load Deflection Characteristics of LCD-0400-01-A & -C and LCD-0400-04-A & -C
Curves of other LCD parts show similar characteristics and are available upon request.

Figure 1
Torsional Load / Deflection Curve



Dynaflex® LCD Series Couplings

Figure 2
Axial Load/Deflection Curve

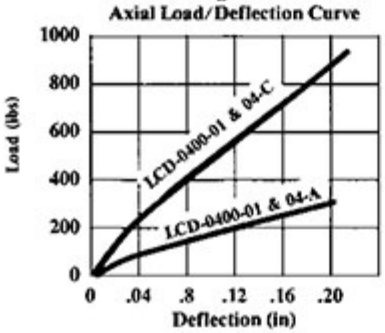
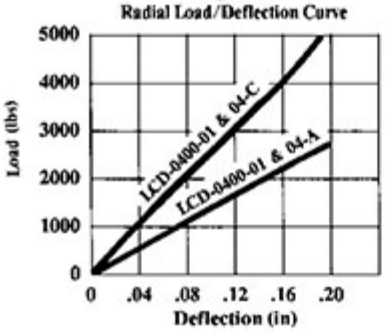


Figure 3
Radial Load/Deflection Curve



Typical Applications

Dynaflex couplings are useful for a wide range of rotary drive applications, from off-highway truck drivelines to auxiliary compressor drives on diesel locomotives. The soft torsional stiffness of these couplings makes them ideally suited for diesel applications with remotely mounted driven components. Typical applications have included:

Typical End Product	Application
Mining Dump Truck	Increased Engine and Transmission Life
Diesel Locomotive	Eliminated Accessory Driveline Failure
Portable Air Compressor	Replaced Short-Lived Gear Coupling; Smooth Operation
4-Wheel Drive Farm Tractor	Reduced Noise and Extended Drive Train Life
Military Vehicle	Eliminated Accessory Shaft Breakage
Dynamometer	Prevented Driveline Failure
Mining Dump Truck	Prolonged U-Joint Life

In addition, Dynaflex couplings have been used in these types of applications:

Main Drive

Engine — Generator; Engine — Compressor; Engine — Transmission; Engine — Pump; Electric Motor — Pump; Electric Motor — Compressor

Accessories

Starters; Fans and Blowers; Alternators; Power Take-Offs

Specifications

Materials

The elastomer used in the LCD coupling is a high quality natural rubber which meets Lord specifications (available upon request) and exceeds SAE standards. Natural rubber is used because of its excellent physical properties, such as tensile strength, tear and abrasion resistance, fatigue resistance and low temperature characteristics. The elastomer-to-metal bonds are even stronger than the elastomers.

Standard LCD catalog parts are all made in two stiffnesses of natural rubber. The A elastomer is per Lord Spec MAP092, having a durometer of approximately 45. The C elastomer is Lord Spec MAP094, having a durometer of approximately 57. The metal parts for this series are of alloy steel or ductile iron.

Environmental

Extensive experience with similar parts indicates that heavy-duty Dynaflex couplings will perform satisfactorily when exposed to the normal fluid, temperature and other environmental conditions found in driveline systems. For operation in ambient temperatures exceeding 170°F (77°C), consult Lord Corporation. LCDs are often recommended for use in applications where the temperature is above 170°F. Temperatures above 200°F could present problems. Customers should know what the ambient operating temperature is and whether additional air circulation can be provided. Consultation with Lord Corporation engineers is necessary if the ambient temperature is above 170°F.

Dynaflex® LCD Series Couplings

Selection Guide

This selection guide can be used to determine the size and series coupling to suit your general requirements. Final selection of the specific coupling to satisfy all of the application requirements generally necessitates a system engineering analysis. These computerized analyses of torsional systems can be provided by Lord Corporation's Engineering Department.

Figure 4

**Typical LCD Dynaflex Coupling "X Series"
Type I Housing Couplings (0075, 0150, 0200, 0300)
(With Tapered Inner Member)**

NOTE: The LCD-0075-13 design is the same as the "20 Series" except the outer member flange O.D. is very small.

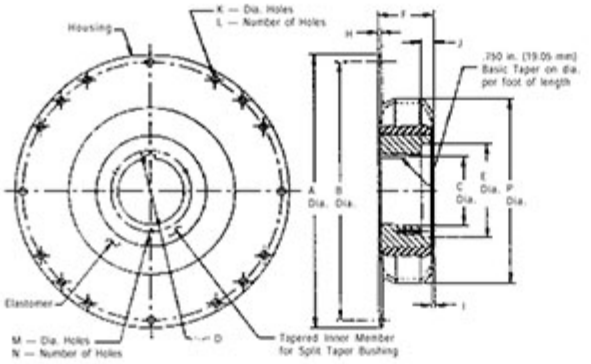


Figure 5

**Typical LCD Dynaflex Coupling "XX Series"
Type II Housing Couplings (0075, 0150, 0200, 0300)
(With Flanged Inner Member)**

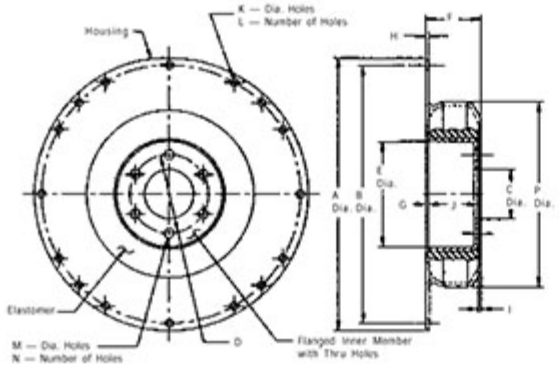


Figure 6

**Typical LCD Dynaflex Coupling "01 Series"
Type III Housing Couplings (400 hp and above)
(0400-04 has tapered inner member)
(0600 and above do not have tapered inner member)**

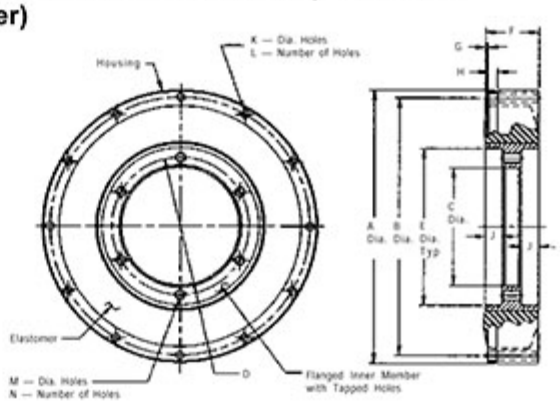


Figure 7

**Typical LCD Composite Outer Member
(0075, with tapered inner member)**

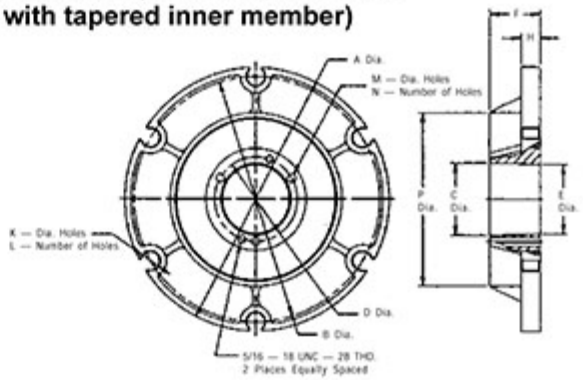


Table A — Split Tapered Bushings

Dynaflex Coupling Part Number	P/N	Browning Bushing			
		Bore Range			
		Type 1 Dia.		Type 2 Dia.	
		in	mm	in	mm
LCD-0040	P1	1/2 - 1-7/16	12.70 - 36.51	1-1/2 - 1-3/4	38.10-44.45
LCD-0075	Q1	3/4 - 2-1/16	19.05 - 52.3	2-1/8 - 2-11/16	54.0 - 68.3
LCD-0150-XR	Q1	3/4 - 2-1/16	19.05 - 52.3	2-1/8 - 2-11/16	54.0 - 68.3
LCD-0200-XR	R1	1-1/8 - 2-13/16	28.16 - 71.4	2-7/8 - 3-3/4	73.0 - 95.2
LCD-0300-XR	R1	1-1/8 - 2-13/16	28.16 - 71.4	2-7/8 - 3-3/4	73.0 - 95.2
LCD-0400-XX	R1	1-1/8 - 2-13/16	28.16 - 71.4	2-7/8 - 3-3/4	73.0 - 95.2

Application Note: Sustained operation at torsional resonance can produce vibratory torques which might cause damage to the coupling and other driveline components. Please consult Lord Engineering for application review and approval.

Dynaflex® LCD Series Couplings

Misalignment
Misalignment capability applies to speeds up to 2500 rpm. Operation up to 3500 rpm is permitted with reduced misalignment. (Consult Lord when a potential application requires special consideration).

At normal rated operating conditions, the LCD Dynaflex couplings are designed to accommodate misalignment.

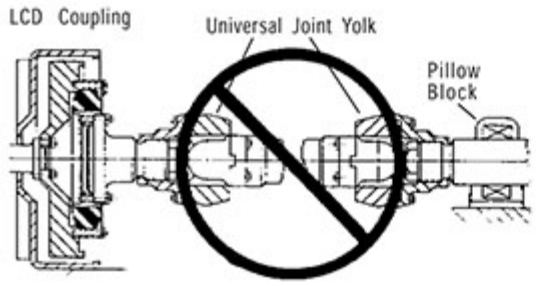
Angular— 1 1/2° max.
Parallel— 1/64 in.
Axial— + 1/16 in. dynamic
+ 1/8 in. static

Testing/Performance
Periodic load deflection tests are run to assure consistency of torsional spring rate and slip torque characteristics.

Damping Coefficient, C_θ
The natural rubber elastomer used in LCD couplings offer hysteresis damping which dissipates energy at resonance. The "damping coefficient" is a function of many variables. Among them are dynamic strain, frequency, elastomer type and stiffness, temperature and torque loading. Damping coefficients for this series have been determined and can be provided for torsional analysis work by contacting Lord.

Installations
For engine applications, the outer member is usually bolted directly to the flywheel; for other applications, to a suitable adaptor. The inner member normally attaches to the driven shaft. The smaller LCD couplings generally have a tapered bore, which accommodates a standard split tapered bushing which grips the drive shaft. (See Table A - Page 112). This configuration provides easy installation.

Figures 13 and 14 on the next page show typical installations involving universal joints.



This arrangement must not be used. Suitable bearing supports are required to react cardan-induced cocking loads. Consult Lord Engineering for application review.

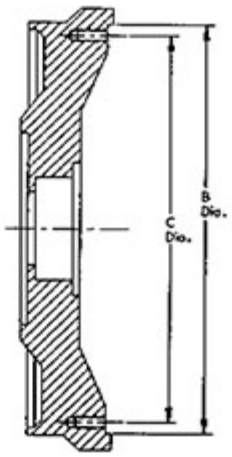
Table 4
Flywheels for Engine Mounted Torque Converters
SAE J927 Nov 88

Converter Flywheel No.	B		C		Tapped Holes	
	in	mm	in	mm	No.	Size
20	9.50	241.30	8.750	222.25	12	5/16-18
40	10.375	263.52	9.625	244.48	12	5/16-18
60	13.875	352.42	13.125	333.38	12	3/8-16
80	13.875	352.42	13.125	333.38	12	3/8-16
100	13.875	352.42	13.125	333.38	12	3/8-16
120	15.500	393.70	14.625	371.48	12	3/8-16
140	18.375	466.72	17.250	438.15	12	1/2-13
160	20.375	517.52	19.250	488.95	12	1/2-13
180	22.500	571.52	21.375	542.92	12	5/8-11
210	26.500	673.10	25.250	641.35	12	5/8-11
240	28.875	733.42	27.250	642.15	12	3/4-10

Table 5
Flywheels for Industrial Engines With Industrial Power Take-Offs — SAE J620 Oct 88

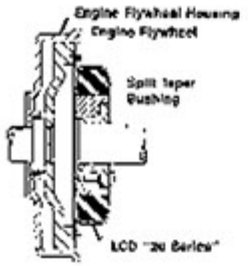
Clutch Size	B		C		Tapped Holes	
	in	mm	in	mm	No.	Size
165 (6-1/2)	8.500	215.90	7.875	200.02	6	5/16-18
190 (7-1/2)	9.500	241.30	8.750	222.25	8	5/16-18
200 (8)	10.375	263.52	9.625	244.48	6	3/8-16
255 (10)	12.375	314.32	11.625	295.28	8	3/8-16
290 (11-1/2)	13.875	352.42	13.125	333.38	8	3/8-16
355 (14)	18.375	466.72	17.250	438.15	8	1/2-13
405 (16)	20.375	517.52	19.250	488.95	8	1/2-13
460 (18)	22.500	571.50	21.375	542.92	6	5/8-11
530 (21)	26.500	673.10	25.250	641.35	12	5/8-11
610 (24)	28.875	733.42	27.250	692.15	12	3/4-10

Flywheel drawing for Tables 4 and 5:

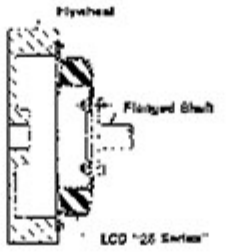


Dynaflex® LCD Series Couplings

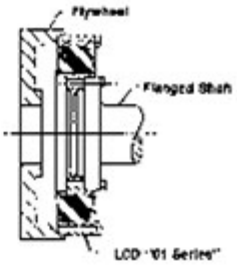
Typical Installations



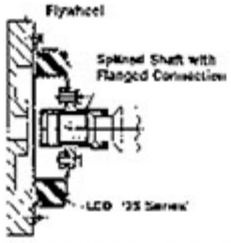
ENGINE FLYWHEEL TO KEYED SHAFT — DIRECT
FIGURE 8



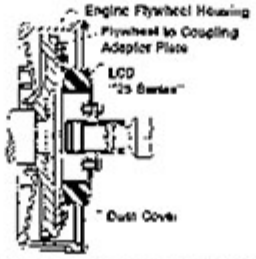
FLYWHEEL TO FLANGED SHAFT — DIRECT
FIGURE 9



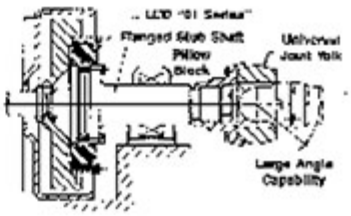
FLYWHEEL TO FLANGED SHAFT — DIRECT
FIGURE 10



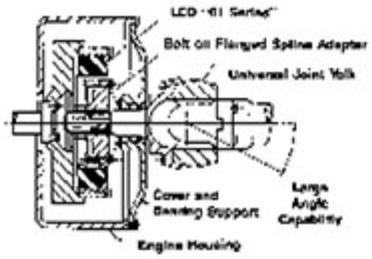
FLYWHEEL TO INTERNALLY SPLINED SHAFT
FREE FLOATING SPLINED CONNECTION
FIGURE 11



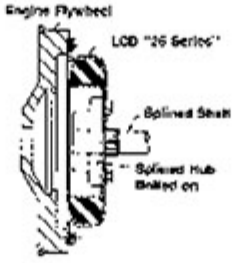
FLYWHEEL TO ADAPTER TO COUPLING AND
THROUGH AN INTERNALLY SPLINED CONNECTION
FIGURE 12



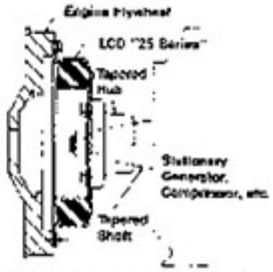
STATIONARY ENGINE TO LOAD BY USE OF A PILLOW
BLOCK ON A COMMON FRAME —
PERMITS LARGE DRIVE ANGLES
FIGURE 13



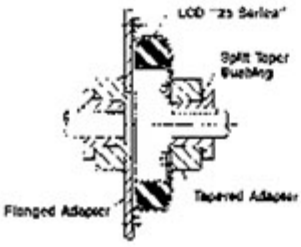
VEHICLE ENGINE WITH LARGE ANGLE
DRIVE REQUIREMENTS
FIGURE 14



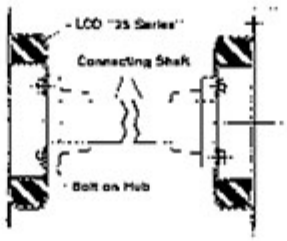
FLYWHEEL TO FLANGED HUB TO SPLINED SHAFT
FREE FLOATING SPLINED CONNECTION
FIGURE 15



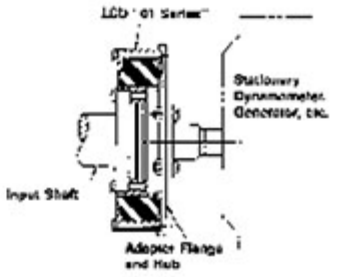
STATIONARY EQUIPMENT HAVING A TAPERED
SHAFT CONNECTION
FIGURE 16



SHAFT TO SHAFT ARRANGEMENT USING SPLIT
TAPER BUSHINGS AT BOTH SIDES
FIGURE 17



TWO LCD DYNAFLEX COUPLINGS IN SERIES
FOR INCREASED FLEXIBILITY IN ALL DIRECTIONS
FIGURE 18



STATIONARY EQUIPMENT HAVING INPUT SHAFT
ATTACHED TO COUPLING INNER MEMBER
FIGURE 19

Dynaflex® LCD Series Couplings

Torsional System Analysis
Input Requirements
Dynaflex couplings offer unique advantages with the soft torsional spring rate that isolates torsional vibration, mitigates shock and reduces noise transmission. In order to benefit from these advantages, an analysis must be made of the application and a coupling selected which meets the specific requirements. The following checklist sets forth the information required to initiate the analysis:

Application Data
- What is the driving unit, driven unit? Include enough information to determine disturbing frequencies (e.g. type of engine, number of cylinders, number of cycles).
- What is the operating torque (normal, maximum)?
- What is the operating speed (range, at normal torque and at maximum torque)?
- What are the environmental conditions (temperature, oil type and amount of exposure, corrosive factors, other factors)?

Coupling Requirements
- What are the primary functions of the coupling (torsional vibration isolation, torsional shock mitigation, noise attenuation, shaft misalignment accommodation—angular, parallel, axial)?
- If known, what torsional spring rate should the coupling have?
- If the required torsional spring rate is not known, what are the rotational moments on inertia of the driving and driven masses?
- How much misalignment must the coupling accommodate (angular, parallel, axial)?
- How much, if any, axial thrust will be on the coupling?

Design Parameters
What space is available for the coupling (maximum length, diameter)?

What is the maximum weight the coupling can be, if weight is limited?

What are the shaft diameters and method of attachment (keyway, spline, set screws, flange)?

What special features are required? (Inner member design—hubs, flanges, splines, etc. Outer member design—pilot diameter bolt pattern, etc.)

Remote Driven Units
Multiple U-joint shafts (especially longer shafts) and the speed at which the shaft rotates (especially higher rpm's) can create complex stability problems. To assure satisfactory coupling performance, all design layouts for remote mounted driven units should be reviewed by Lord Engineering. Lord analytical capability is only one part of the engineering service available on all coupling applications.

What Else?
If your application is unique or unusual, include any information that you believe will have an effect on the coupling design or selection. If you have any questions as you prepare this data, call us. See following page for data form.

Reference Literature from Lord Corporation
Design Monograph 1107
Understanding Torsional Vibration