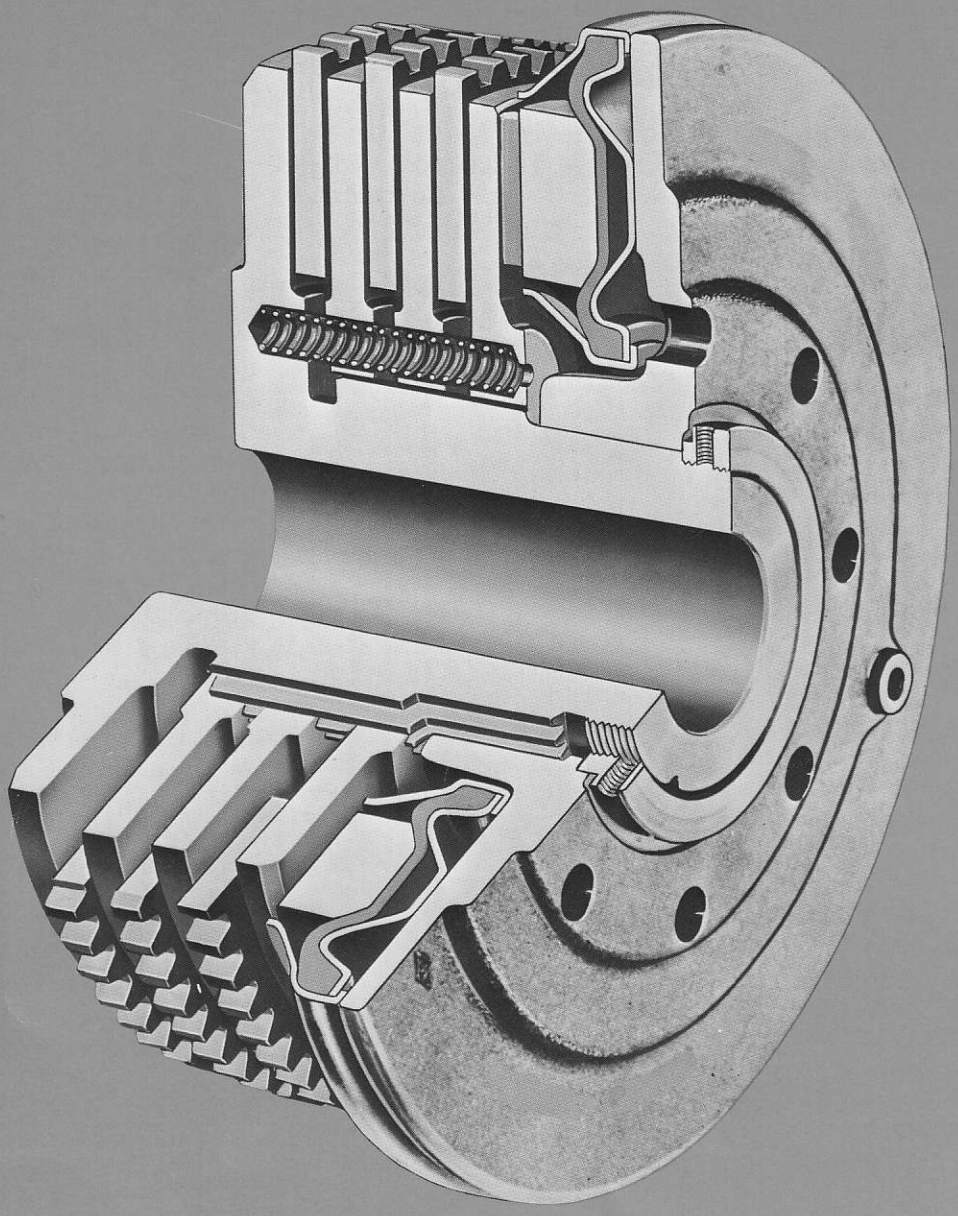
TWIN DISC®

BULLETIN 326-M

Dry Clutches

Air and Mechanically-Actuated Dry Clutches



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General Information

(ALL DIMENSIONS ARE IN INCHES)

Experience

Twin Disc specializes in giving engineering services to the person with a power transmission problem. More than 60 years of clutch experience is available to you. From as low as ¼ hp to as high as 35,000 hp, Twin Disc has a clutch to match your requirement.

Fluid Drives

In addition to clutches, Twin Disc manufactures fluid couplings as well as single-stage and three-stage hydraulic torque converters.

Special Designs

If you are an original equipment manufacturer with quantity requirements, consideration can be given to designing special power transmission products for your individual needs. The tremendous number of standard component items currently manufactured makes it possible that many of these can be used, holding tooling costs to a minimum.

Unbiased Recommendations

Your Twin Disc Application Engineer gives you unbiased recommendations because of his complete line of products. For engineering information, it may be more convenient for you to contact one of the District Offices or your Twin Disc Authorized Distributor.

Service

All Twin Disc products are backed by an extensive worldwide parts and service organization . . . to protect you from unnecessary downtime and loss of production. In addition to the network of strategically located Twin Disc Authorized Distributors, parts stocks are maintained by thousands of distributors who represent the major manufacturers of the powered equipment and machinery you use. Twin Disc Distributors are also located throughout the free world, and Twin Disc products are built by foreign manufacturing licensees. Users of Twin Disc products can operate virtually any place in the free world and have full assurance of Twin Disc parts and service.

Dry Clutch Information

The clutches described in this bulletin are of two basic types: air-actuated and mechanically-actuated. Each has particular advantages and disadvantages depending upon the application.

Air Clutches

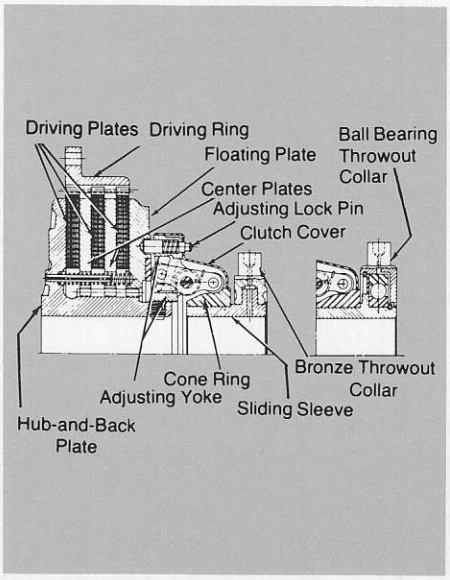
Twin Disc Air Clutches do not require adjustment for friction plate wear. Further, air clutches exert more torque for a given diameter because of the large air diaphragm providing the clamping force. But air clutches are not uniformly used because of the impossibility or difficulty of providing air to many installations.

Air clutches have the further advantage of being remote controlled quite easily. They can be readily tied into the machine cycle with push button control, automatic actuation through limit switches, or other devices of this nature. Control valves are of two general types. When sudden rapid engagement is permissible, a simple "on-off" valve can be used. Where smooth engagement or partial torques are required, a controlled pressure valve is selected. The pressure admitted through this type is proportional to the throw of the control lever.

Mechanically-Actuated Clutches

Mechanically-actuated clutches require adjustment for wear on the friction plates. Twin Disc Mechanically-Actuated Clutches are easily adjusted with a simple single-point feature. Wear is a function of the energy of clutch engagement so no simple rule can be set as to how often adjustment is necessary. However, under average cut-off conditions, usually several thousand engagements can be made before takeup is required.

The torque of a mechanically-actuated clutch is, of course, proportional to the degree of adjustment. Values set forth for Twin Disc clutches are torques that can be obtained with reasonable manual effort. Higher torques are, of course, possible with hydraulic or air cylinders, but such applications are not normally encouraged unless the installation is such that only low horsepower is required.



Driving Plates

Gear Tooth Type: The driving (friction) plates can be furnished either in solid construction or radially split. Split plates permit quick replacement when a driving ring is used. But their use can cause trouble if high disengaged speeds are required and the driving ring is the driving member, which is normally the case. The split plates tend to wedge through centrifugal force into the ring and thus cause drag. Multiple plate clutches, with more rubbing surfaces for the same fixed amount of release, are more subject to this condition.

Solid plates are normally preferable, particularly on applications where engagements are infrequent since replacement then is seldom, if ever, necessary. On installations where the clutch shaft is subject to torsional vibrations, solid plates will occasionally cause noise since the driving plate necessarily has backlash clearance in the driving ring. Splitting the plates usually reduces or eliminates this noise.

continued on page 3

Throwout Collars

Throwout collars are furnished on all Twin Disc Mechanically-Actuated Clutches. With Model CL Clutches, there is a choice of using bronze or ball bearing collars. Bronze collars are lower in price and have the advantage of being radially split for easy replacement. Ball bearing collars, however, have much longer life and therefore are usually recommended for use where frequent engagements are necessary.

Throwout Forks

Throwout forks can be furnished for all Model CL Clutches.

Application Data

Clutch Selection

Twin Disc has amassed over 60 years experience in selecting and applying the right clutch to each particular job. The services of the Application Department are available to you without cost. Simply write the Application Department at Racine, Wisconsin outlining your problem. The following information is necessary for a complete evaluation: type and horsepower of prime mover, torque and speed of prime mover, space for clutch, desired clutch shaft speed and diameter, description and speed of driven machine, duty cycle including number of clutch engagements per hour, environmental conditions and any other information that might be of value. A freehand sketch or drawing of the proposed installation is of great value.

The following selection procedure will normally permit the engineer to make a tentative conservative selection for layout purposes. It is advisable that this selection be verified with Twin Disc before purchasing.

Maximum Speeds

The maximum speeds listed in this bulletin are safe permissible speeds possible with cast iron driving rings. The driving ring is normally the most critical member because it has the largest diameter. It should be remembered that the maximum speed listed is usually set considerably above the desired operating speed in the average installation.

Steel driving rings are available in most sizes for high speed applications. Consult Twin Disc for availability and speed limitations for clutches equipped with these rings.

Maximum speed should not be exceeded without Twin Disc approval. Clutch failure due to centrifugal force can be likened to a shrapnel burst. Check each installation to see that backdriven speeds do not exceed calculated forward speeds. Also caution must be used in applying clutches to D.C. series-wound motors or gasoline engines with velocity type governors that might permit an engine runaway if the load is suddenly removed.

Engagement Forces Mechanically-Actuated Clutches

It must be realized that the axial force figures listed in this bulletin are approximate values. They are to be used as a rough guide only.

Axial force figures vary, for a given size clutch, within a wide range (as much as ±50% or more) depending upon clutch adjustment and the type of application. Engaging effort is substantially affected by factors such as whether the clutch body is rotating or at rest when being engaged, the amount of vibration present, degree of lever and pin lubrication, etc.

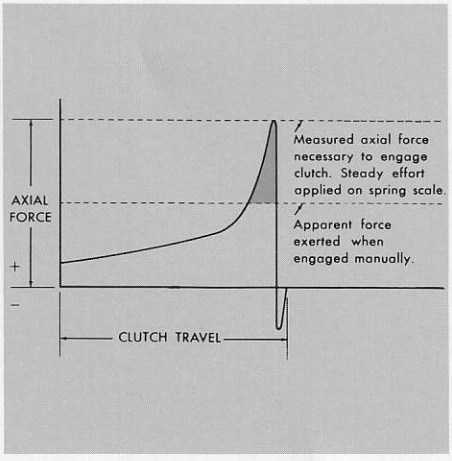
The listed figures, though approximate, will provide satisfactory operation. However, if the axial force is divided by the mechanical advantage of the lever and throwout fork, the lever force will usually appear to be uncomfortably high.

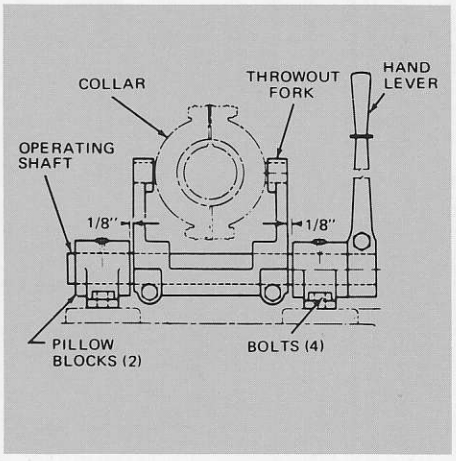
This apparent discrepancy is explained by consulting the graph below which illustrates the axial force which must be exerted at any one point over the length of the clutch travel.

It will be noted that the actual axial force is not a constant figure, requiring maximum force for only a brief period as the clutch goes over-center. The work or energy expended during this short period (illustrated by the shaded area) is so small that it is provided in a normal quick engagement by the inertia force resident in the body of the individual working the clutch. As the hand effort builds up, the operator automatically leans into the lever thus releasing sufficient body inertia to affect engagement.

Of course, when remote engaging devices are desired with air or hydraulic cylinders, it is necessary that these be selected with provision to accommodate the full factor, since they normally do not have sufficient inertia force to provide the peak engaging effort required. In addition, linkages of this type usually have considerable friction loss.

It is important also that engaging mechanisms be so designed to relieve the engaging thrust on the throwout collar once engagement is effected.





Selecting for Clutch Size and Capacity

The following selection procedure should give ample margin of capacity over actual requirements, which is the best assurance of long and trouble-free life.

1. Determine the duty service, the maximum horsepower requirements of the driven equipment, type of prime mover, approximate number of clutch engagements per hour, clutch shaft speed, and clutch shaft diameter.
2. Using the clutch shaft speed and maximum horsepower figure from Step 1, determine torque requirements with these formulae:

$$\text{TORQUE (lbs.-ft.)} = \frac{\text{KW} \times 1.34 \times 5252}{\text{RPM}}$$

$$\text{TORQUE (lbs.-ft.)} = \frac{\text{CONT. HP} \times 5252}{\text{RPM}}$$

Where load horsepower requirement cannot accurately be determined, the prime mover continuous horsepower can be used. Be sure to deduct all continuous parasitic loads (i.e., fans, alternator, etc.). Air compressors, hydraulic pumps or motors may be cyclic rather than continuous loads. Review drive train carefully and completely.

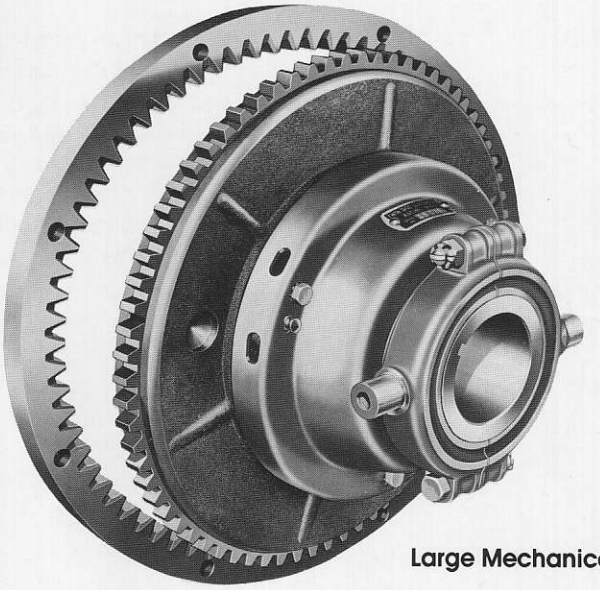
3. Choose the Duty Service Classification from Table No. 1 which most closely describes the application. Note carefully if clutch is selected by horsepower or torque classification.
4. If clutch is Duty CLASS I (torque requirement), refer to the Clutch Capacity Chart for the type of clutch you are considering (V, CL, E or EH mechanical or PO air), and select a clutch with a working torque (50% of slip torque for mechanical clutches and 75% for PO Air Clutches) capacity equal to or greater than the torque figure from Step 2. You will probably use a clutch of larger diameter and one plate, if you have a length problem. A two- or three-plate clutch would be proper if diameter is of concern. In the case of an electric motor prime mover, the peak motor torque must be considered. It is desirable to "cover" this peak motor torque with the slip torque of the selected clutch.
5. If clutch is Duty CLASS II, III or IV (horsepower requirement), select the model clutch with a rating equal to or greater than continuous horsepower rating of the drive.
6. Check the bore size chart of selected clutch. Determine if a bore size is available to fit the drive shaft requirement.
7. Check that the maximum safe speed of the clutch is not exceeded by the drive.
8. Review and select the required accessories to complete the clutch installation.

Table No. 1

Duty Service Classification

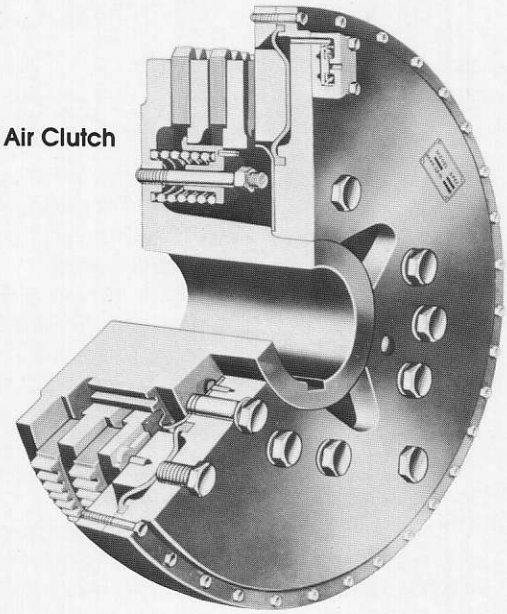
Class I (Disconnect)	Class II (Light Duty)	Class III (Normal Duty)	Class IV (Heavy Duty)
1) Pumps—centrifugal	1) Bow Thruster	1) Agitators—solids or semi-solids	1) Cranes & Hoists—working clutch
2) Hydraulic Pumps (w/o pre-charge)	2) Cookers—cereal	2) Batchers—textile	2) Crushers—ore and stone†
3) Feeders—disc type	3) Elevators, bucket—uniformly loaded—all types	3) Blowers and Fans—lobe	3) Drums—barking†
4) Agitators—pure liquids	4) Generators	4) Bottling machines	4) Compressors—lobe rotary plus three or more cylinder reciprocating type
5) Irrigation Pumps	5) Kettle—brew	5) Compressors—all centrifugal	5) Haulers—car puller and barge type
6) Blowers/Fans Centrifugal	6) Line Shafts—light duty	6) Elevators, bucket—non-uniformly loaded or fed	6) Machines—impact load types
	7) Machines, general—all types with uniform loads, non-reversing	7) Feeders—apron, belt, screw or vane	7) Mills—ball type†
	8) Textile machinery	8) Filling machine—can type	8) Paper Mill machinery—except calenders and driers
	9) Stokers	9) Mixers—continuous	9) Presses—brick and clay
		10) Pumps—two or more cylinder	10) Mud Pumps—reciprocating type
		11) Conveyors, uniformly loaded	

†Beware of operator misuse.



Large Mechanical Clutch

Large Air Clutch



Duty Service Classification

Attention is called to the fact that other application factors must be considered in the selection process in addition to duty service, such as:

• SPEED LIMITS • SIDE LOAD LIMITS • CLUTCH TORQUE LIMITS

The selections are usual dry clutch applications in which the clutch is engaged infrequently and after engagement, it is used in the engaged mode for a long time before disengagement. Generally, the engine speed is reduced below 50% of governed engine speed for smoother clutch engagement, but this is not a requirement insofar as the clutch is concerned.

Duty Class I: The clutch is used for disconnecting the power from the load. When engaging, so little work is done that the clutch shows no temperature increase at the pressure plate outer surface. Use maximum input torque from the Class I Table, disregard horsepower. The mechanism is operated one (1) or more hours before disconnecting.

Examples: Engagement of clutches with the driven equipment having WR^2 less than that of the clutch and whose torque demand curve is similar to that of a centrifugal pump.

Duty Class II: The clutch is used primarily for disconnect, but does more work during engagement than in Duty Class I. The clutch will engage within two (2) seconds, never heat the pressure plate more than 50°F (27.8°C) above ambient, and once engaged is operated for one (1) or more hours before disconnecting. The maximum horsepower which the clutch can absorb is given in Class II Table.

Examples: Power shovel master clutch, generator, line shafts and similar light duty drives.

Duty Class III: The clutch will engage within three (3) seconds, never heat the pressure plate more than 100°F (55.6°C) above ambient, and once engaged is operated for one (1) or more hours before disconnecting. The maximum horsepower which the clutch can absorb is given in Class III Table.

Examples: Engine PTO starting average loads, and clutches whose starting load is up to 1.4 times the running load. Blowers, fans, screw compressor, conveyors and similar normal duty drives.

Duty Class IV: The clutch will engage within four (4) seconds, never heat the pressure plate more than 150°F (83.3°C) above ambient, and once engaged is operated for one (1) or more hours before disconnecting. The maximum horsepower which the clutch can absorb is given in Class IV Table.

Examples: Engine PTO starting heavy loads such as rock crushers, mud pumps, and other large inertia machinery and clutches whose starting load is up to 1.8 times the running load typical of heavy duty drives.

Duty Class V: The clutch is used to start large inertia loads which require four (4) seconds to start the largest load, with the longest slip period per engagement not to exceed ten (10) seconds. The clutch must be selected according to its horsepower absorption capability. Clutch applications in this Duty Class or those which require frequent engagements require factory review. Contact General Products Application Department for consultation on the drive.

Mechanical Clutches
Model CL—Sizes 5, 6, 8, 10 and 11 inches

Most Sizes Available in 1, 2 or 3 Plate Construction

Model CL Clutches are of the positive over-center design. They are engaged by mechanically moving a sliding sleeve on which is mounted a hardened cylindrical cam known as a "cone sleeve."

This type clutch is of unusually heavy-duty construction. All clutch surfaces are of high-strength cast iron with generous sections to absorb clutch heat without distress. Yet overall dimensions are held to a minimum to provide a small space package for machine installation. Maximum bore sizes are adequate for oversize shafts. High production runs render Model CL Clutches relatively inexpensive.

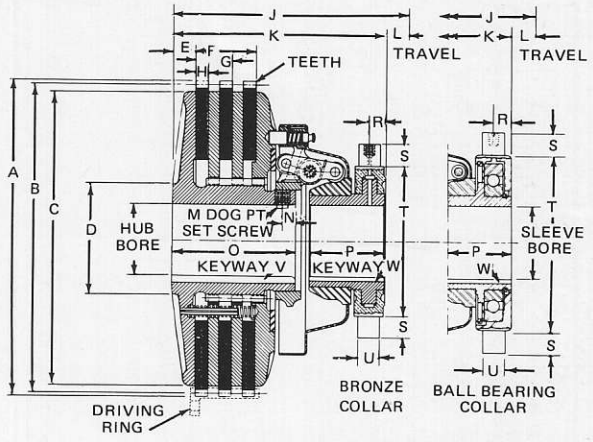
For service involving frequent engagements, the single-plate clutch is normally used. For medium or normal service, the two- and three-plate clutches provide double and triple torque capacity within the same diameter. Single-point adjustment is provided for wear.

The driving plates, furnished of high-quality molded non-asbestos material, have external splined gear teeth which mate with gear tooth driving rings.

Standard Available Bore Sizes

Model	Standard Hub Bores	Std. Cyl. Bore Less Keyway	Standard Cone Sleeve Bores
CL-105	1, 1 1/4, 1 7/16	1	1, 1 1/8, 1 3/16, 1 1/4, 1 3/8, 1 7/16 in any combination with a standard hub bore.
CL-205	1 1/4, 1 7/16		
CL-106	1, 1 1/8, 1 1/4, 1 5/16, 1 3/8, 1 7/16		
CL-206	1 3/16, 1 1/4, 1 7/16		
CL-306	1 7/16		
CL-108	1 7/16, 1 1/2, 1 9/16, 1 3/4, 2 7/16	1 3/8	1 3/8, 1 7/16, 1 1/2, 1 9/16, 1 5/8, 1 3/4, 1 15/16, 2, 2 1/8, 2 3/16, 2 1/4, 2 7/16 in any combination with a standard hub bore.
CL-208	1 1/2, 1 5/8, 1 15/16, 2 3/16, 2 7/16	1 1/2	
CL-308	1 1/2, 2 3/16, 2 7/16	1 3/4	
CL-110	1 15/16, 2	1 3/8	
CL-210	1 3/4, 1 15/16	1 1/2	
CL-310	2 1/4, 2 7/16	1 3/4	
CL-111	1 5/8, 1 15/16, 2 7/16	1 3/8	
CL-211	1 15/16, 2 1/8, 2 7/16	1 1/2	
CL-311	2 1/8, 2 1/4, 2 7/16	1 3/4	

Hub bores will be held to our standard tolerance of nominal size plus .000 minus .001; and cone sleeve bores will be held to nominal size plus .004 plus .006.
Standardized keyway sizes have been established for all bores listed above.



Standard Keyways

Hub Bore Size	Hub Keyway	Cone Sleeve Keyway
1-1 1/8	1/4 x 1/8	1/4 x 5/64 for CL-105 thru CL-306
1 3/16-1 7/16	5/16 x 5/32	
1 1/2-1 11/16	3/8 x 3/16	1/4 x 9/64 for CL-108 thru CL-311
1 3/4-2 7/16	1/2 x 1/4	

Capacity Data

Clutch Model	Application Duty Classification				Axial Force* (Lbs.)	Maximum Safe Operating Speed†		Weight (Lbs.)
	Class I Work Torque Lbs.-Ft.	Maximum HP Rating				Solid Plates	Split Plates	
		Class II	Class III	Class IV				
CL-105	130	29	19	14	350	3500	3200	13 1/4
CL-205	260	58	38	29			2950	15 1/2
CL-106	137	40	27	20	350	3500	2850	15 3/4
CL-206	275	81	54	41			3150	18 1/4
CL-306	412	121	81	61			2250	20 1/2
CL-108	240	61	41	31	450	3100	2550	32
CL-208	480	123	82	61			3100	38 1/2
CL-308	720	184	123	92			3100	49
CL-110	388	96	64	48	640	2675	2100	38
CL-210	776	192	128	96		3600	2750	61
CL-310	1164	288	192	144		3650	2650	83
CL-111	450	124	82	62	640	2325	1800	46
CL-211	900	247	165	124		2325	1800	75
CL-311	1350	371	247	186		3250	2450	105

* See page 3 regarding axial force information.
† See page 3 regarding maximum speeds.

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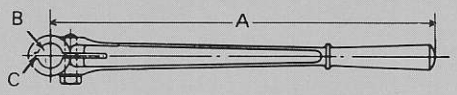


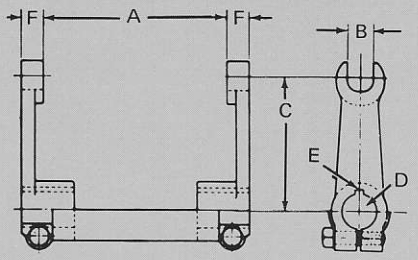
Clutch Accessories

Hand Levers

Model	Lever Number	A	B	C
CL-105, CL-205, CL-106, CL-206, CL-306, CL-108, CL-208, CL-308, CL-110, CL-210, CL-310, CL-111, CL-211, CL-311	3039	15 3/8	1.001-1.002	1/4 x 1/8

Throwout Forks

Model	Type Collar	Fork Number	A	B	C	D	E	F
CL-105, CL-205, CL-106, CL-206, CL-306	Ball Bearing	125A	4 1/2	.749-.755	3	1.003-1.005	1/4 x 1/8	3/4
	Bronze	1037	3 5/8	.623-.629				5/8
CL-108, CL-208, CL-308, CL-110, CL-210, CL-310, CL-111, CL-211, CL-311	Ball Bearing	A3545	6 1/8	.749-.755	3 3/4	1.003-1.005	1/4 x 1/8	5/8
	Bronze	3507	5 1/4					



Clutch Driving Rings

Model	Driving Ring Number	Type Ring	A +.000 −.005	B	C	D	E	F	Holes No.-Size	Teeth 20° P.A.
CL-105	6938	A	7 1/2	6 7/8	6	9/16	—	—	6 21/64	36 — 6/8 P.
CL-205	A5789					1 1/8				
CL-106	6939	A	8 1/2	7 7/8	7	5/8	—	—	6 21/64	42 — 6/8 P.
CL-206	6719		9	8 1/8		1 1/2			6 13/32	
CL-306	6722		9	8 1/8		2 3/8			6 13/32	
CL-108	5805	A	10 3/8	9 5/8	8 1/2	5/8	—	—	6 13/32	51 — 6/8 P.
CL-208	5796	B	11 1/4	10 1/4		1 7/16	3/8	9 1/4		
CL-308	6724	B	11 1/4	10 1/4		2 3/8	3/8	9 1/4		
CL-110	6187A	A	12 3/8	11 5/8	10 1/2	7/8	—	—	8 13/32	63 — 6/8 P.
CL-210	6672	B	13 1/4	12 1/2		1 7/8	3/8	11 3/8		
CL-310	5882	B	13 1/4	12 1/2		2 3/8	3/8	11 3/8		
CL-111	6625A	A	13 7/8	13 1/8	12	7/8	—	—	8 13/32	72 — 6/8 P.
CL-211	6931	A	13 7/8	13 1/8		1 7/8	—	—	8 13/32	
CL-311	6532	B	15 1/2	14 3/8		2 5/8	1/2	13	8 17/32	

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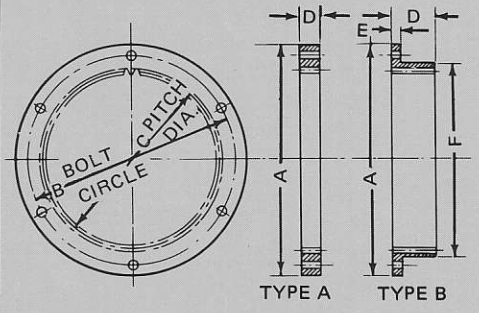

Dimensional Data—Refer to Drawing on Page 6

Model	DRAWING NO. Bronze Collar	DRAWING NO. Ball Bearing Collar	Max. Hub Bore +.000 −.001	Max. Sleeve Bore +.004 +.006	A	B	C	D	E	F	G	H	L	M	N	O	Maximum Keyway V	Keyway W
CL-105	XA5742	XA5742A	1 7/16	1 7/16	6 1/4	6	5 1/2	2	9/16	—	—	3/8	11/16	3/8	3/8	2 1/16	5/16 x 5/32	1/4 x 5/64
CL-205	XA5743	XA5743A									15/16					2 9/16		
CL-106	XA5744	XA5744A	1 7/16	1 7/16	7 1/4	7	6 1/2	2	9/16	—	—	7/16	11/16	3/8	3/8	2 1/16	5/16 x 5/32	1/4 x 5/64
CL-206	XA5745	XA5745A								—	1 1/16					2 11/16		
CL-306	XA6024	XA6024A								1 11/16	—					3 5/16		
CL-108	XA5747	XA5747A	2 7/16	2 7/16	8 3/4	8 1/2	8	3 3/4	11/16	—	—	7/16	7/8	1/2	7/16	2 1/2	1/2 x 1/4	1/4 x 9/64
CL-208	XA5748	XA5748A								—	1 1/4					3 5/16		
CL-308	XA5749	XA5749A								2 1/16	—					4 1/8		
CL-110	XA5750	XA5750A	2 7/16	2 7/16	10 3/4	10 1/2	10	3 3/4	13/16	—	—	7/16	7/8	1/2	7/16	2 5/8	1/2 x 1/4	1/4 x 9/64
CL-210	XA5751	XA5751A								—	1 1/4					3 7/16		
CL-310	XA5752	XA5752A								2 1/16	—					4 1/4		
CL-111	XA5753	XA5753A	2 7/16	2 7/16	12 1/4	12	11 3/8	3 3/4	1	—	—	7/16	7/8	1/2	7/16	2 7/8	1/2 x 1/4	1/4 x 9/64
CL-211	XA5754	XA5754A								—	1 1/4					3 5/8		
CL-311	XA5755	XA5755A								2 1/16	—					4 7/16		

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Model	DRAWING NO. Bronze Collar	DRAWING NO. Ball Bearing Collar	BRONZE COLLAR J	K	P	R	S	T	U	BALL BEARING COLLAR J	K	P	R	S	T	U	TEETH 20° P.A.
CL-105	XA5742	XA5742A	5 5/16	4 5/8	2 5/32	11/32	19/32	3 9/16	5/8	5 13/32	4 23/32	2 1/4	7/16	3/4	4 3/8	3/4	36–6/8 P.
CL-205	XA5743	XA5743A	5 7/8	5 3/16						5 31/32	5 9/32						
CL-106	XA5744	XA5744A	5 3/8	4 11/16	2 5/32	11/32	19/32	3 9/16	5/8	5 15/32	4 25/32	2 1/4	7/16	3/4	4 3/8	3/4	42–6/8 P.
CL-206	XA5745	XA5745A	6	5 5/16						6 3/32	5 13/32						
CL-306	XA6024	XA6024A	6 5/8	5 15/16						6 23/32	6 1/32						
CL-108	XA5747	XA5747A	6 1/2	5 5/8	2 19/32	9/16	3/4	5 1/8	3/4	6 1/2	5 5/8	2 5/8	19/32	3/4	5 7/8	3/4	51–6/8 P.
CL-208	XA5748	XA5748A	7 5/16	6 7/16						7 5/16	6 7/16						
CL-308	XA5749	XA5749A	8 1/8	7 1/4						8 1/8	7 1/4						
CL-110	XA5750	XA5750A	6 5/8	5 3/4	2 19/32	9/16	3/4	5 1/8	3/4	6 5/8	5 3/4	2 5/8	19/32	3/4	5 7/8	3/4	63–6/8 P.
CL-210	XA5751	XA5751A	7 7/16	6 9/16						7 7/16	6 9/16						
CL-310	XA5752	XA5752A	8 1/4	7 3/8						8 1/4	7 3/8						
CL-111	XA5753	XA5753A	6 13/16	5 15/16	2 19/32	9/16	3/4	5 1/8	3/4	6 13/16	5 15/16	2 5/8	19/32	3/4	5 7/8	3/4	72–6/8 P.
CL-211	XA5754	XA5754A	7 5/8	6 3/4						7 5/8	6 3/4						
CL-311	XA5755	XA5755A	8 7/16	7 9/16						8 7/16	7 9/16						

Medium Air Clutches
Model PO—Sizes 8, 10 and 11 3/8 inches

Available in 1, 2 or 3 Plate Construction

Twin Disc PO Air Clutches are designed to give the user maximum dependability and lowest possible installation and operating costs. They are used extensively by leading manufacturers of rock crushers, tractor winches, pipe-extruding machines, drilling rigs, machine tools, pug mills and other industrial equipment.

Twin Disc PO Air Clutches, in small size units, offer many outstanding advantages.

No Adjustment for Wear

Twin Disc Medium PO Air Clutches are available in triple-plate, double-plate and single-plate construction with maximum slip torque capacity of 4628 lbs.-ft. They provide constant torque capacity without adjustment and are self-compensating for wear.

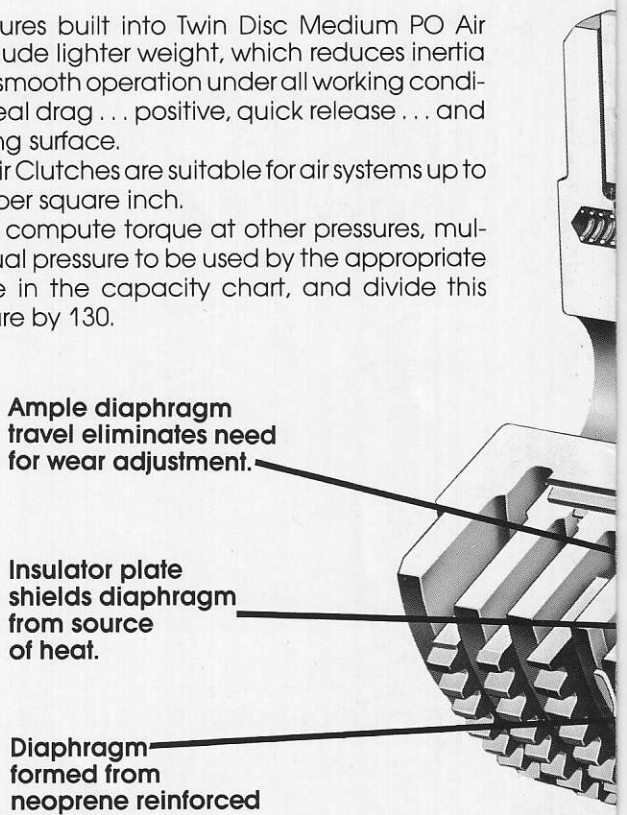
The design of the Medium PO Air Clutch permits highest capacity to comparably sized air clutches. An exclusive cartridge-type diaphragm of long-lasting neoprene reinforced with nylon eliminates leakage and provides long life.

Twin Disc Medium PO Air Clutches are compact and rugged with clutch mass properly distributed relative to friction area, providing long life on high energy loads. They are narrow in width permitting replacement of old-style drum or band clutches.

Other features built into Twin Disc Medium PO Air Clutches include lighter weight, which reduces inertia mass . . . fast, smooth operation under all working conditions . . . no seal drag . . . positive, quick release . . . and ample cooling surface.

Twin Disc Air Clutches are suitable for air systems up to 130 pounds per square inch.

In order to compute torque at other pressures, multiply the actual pressure to be used by the appropriate torque value in the capacity chart, and divide this resultant figure by 130.

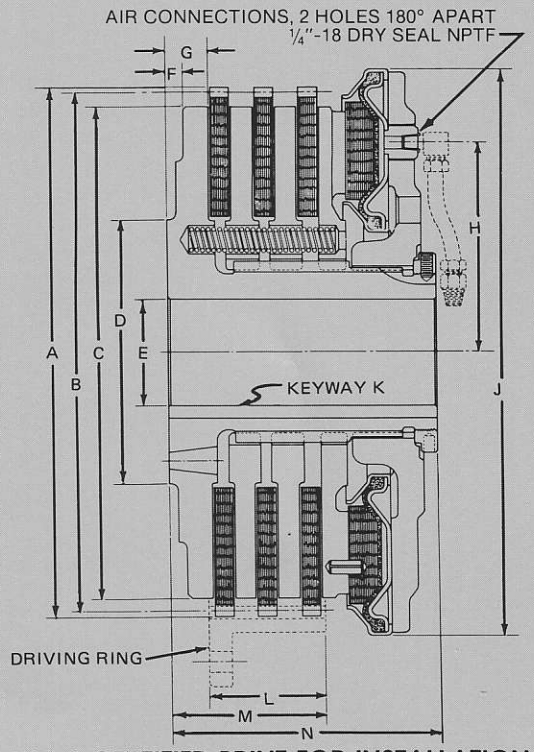


Capacity Data

Clutch Model	Application Duty Classification				Slip Torque @ 130 PSI Lbs.-Ft.	Maximum Safe Operating Speed†		Air Volume to Engage (fully worn) (Cu. in.)
	Class I Work Torque Lbs.-Ft.	Maximum HP Rating						
		Class II	Class III	Class IV		Solid Plates	Split Plates	
PO-108	388	61	41	31	518	3600	3050	6
PO-208	778	123	82	61	1037	4200	3650	11
PO-308	1166	184	123	92	1555	4250	3650	13
PO-110	658	96	64	48	877	3100	2650	9
PO-210	1317	192	128	96	1756	3600	2900	16
PO-310	1975	288	192	144	2633	3650	2950	19
PO-111	1157	124	82	62	1543	2850	2200	14
PO-211	2314	247	165	124	3085	2850	2200	25
PO-311	3471	371	247	186	4628	3250	2720	31

For best clutch performance when used as:
Master or Operating Clutch—Limit use to 75% of slip torque and derate for apply pressures less than 130 psi.

† See page 3 regarding maximum speeds.



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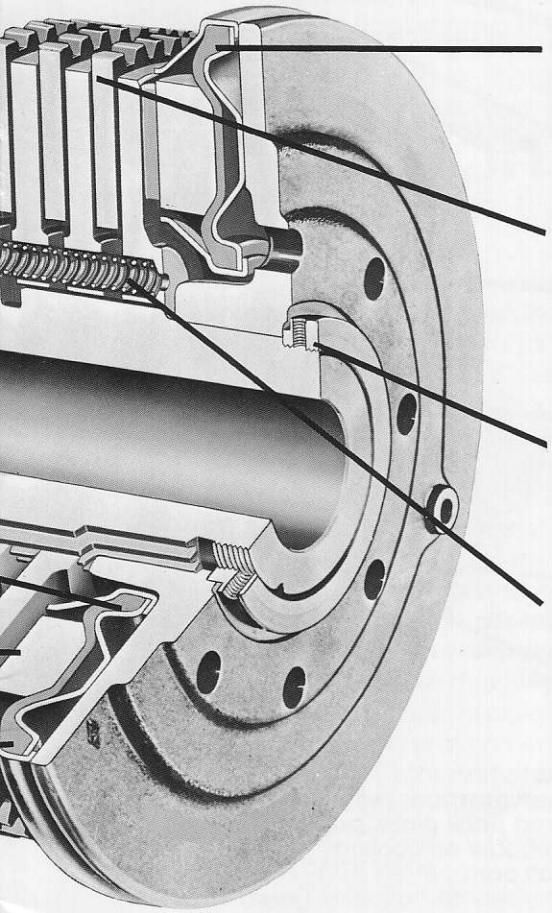


Cartridge-type diaphragm assembly eliminates leakage problems

Molded non-asbestos gear-tooth driving plates furnished as standard.

Threaded nut provides quick disassembly.

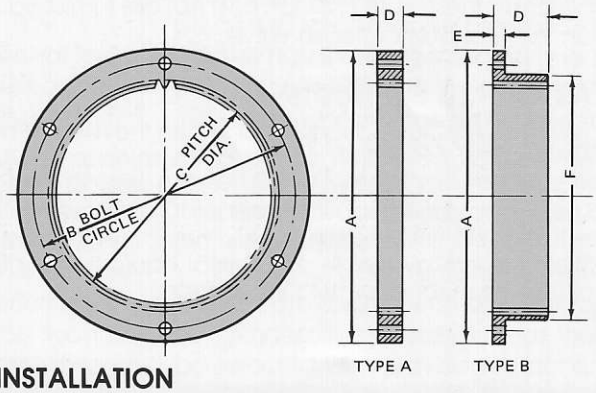
Generous release springs provide fast, positive release.

Standard Available Bore Sizes

Model	Hub Bore Size	Standard Cylinder Bore Size Less Keyway
PO-108	1 3/8, 1 3/4, 2 7/16	1 3/8
PO-208	1 1/2, 1 15/16, 2 7/16	1 1/2
PO-308	1 3/4, 2 3/16, 2 7/16	1 3/4
PO-110	1 3/8, 2	1 3/8
PO-210	1 1/2, 1 15/16	1 1/2
PO-310	1 3/4, 2 7/16	1 3/4
PO-111	1 3/8, 1 15/16, 2 7/16	1 3/8
PO-211	1 1/2, 1 15/16, 2 1/8, 2 7/16	1 1/2
PO-311	1 3/4, 2 1/4, 2 7/16	1 3/4

Standard Keyway Sizes

Hub Bore	1 3/8 thru 1 3/4	1 13/16 thru 2 7/16
Hub Keyway	3/8 x 3/16	1/2 x 1/4



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Clutch Driving Rings

Model	Driving Ring Number	Type Ring	A +.000 −.005	B	C	D	E	F	Holes No.-Size	Teeth 20° P.A.
PO-108	5805	A	10 3/8	9 5/8	8 1/2	5/8	—	—	6 — 13/32	51 — 6/8 P.
PO-208	5796	B	11 1/4	10 1/4		1 7/16	3/8	9 1/4		
PO-308	6724	B	11 1/4	10 1/4		2 3/8	3/8	9 1/4		
PO-110	6187A	A	12 3/8	11 5/8	10 1/2	7/8	—	—	8 — 13/32	63 — 6/8 P.
PO-210	6672	B	13 1/4	12 1/2		1 7/8	3/8	11 3/8		
PO-310	5882	B	13 1/4	12 1/2		2 3/8	3/8	11 3/8		
PO-111	6625A	A	13 7/8	13 1/8	12	7/8	—	—	8 — 13/32	72 — 6/8 P.
PO-211	6931	A	13 7/8	13 1/8		1 7/8	—	—	8 — 13/32	
PO-311	6532	B	15 1/2	14 3/8		2 5/8	1/2	13	8 — 17/32	

Dimensional Data—Refer to Drawing on Page 8

Model	Drawing Number	Weight (Lbs.)	A	B	C	D	E (Maximum)	F	G	H	J	K	L	M	N
PO-108	X9720	32	8.75	8.500	8.00	6.00	2.4375/2.4365	.06	.50	3.66	10.06	1/2 x 1/4	.62	1.09	3.54
PO-208	X9721	35											1.44	1.95	4.39
PO-308	X9722	43											2.38	2.80	5.24
PO-110	X9714	52	10.75	10.500	10.00	6.25	2.4375/2.4365	.18	.71	4.31	11.69	1/2 x 1/4	.88	1.36	3.89
PO-210	X9715	62											1.88	2.22	4.74
PO-310	X9716	72											2.38	3.07	5.60
PO-111	X9709	70	12.25	12.000	11.37	6.12	2.500/2.499	.37	.93	4.88	13.18	1/2 x 1/4	.88	1.58	4.11
PO-211	X9710	85											1.88	2.57	5.09
PO-311	X9711	100											2.62	3.48	6.07

For accessories such as air unions and air control valves, contact Twin Disc, Incorporated.

Large Air Clutches

Model PO—Sizes 14, 18, 24, 30, 36, and 42 inches

Most Sizes Available in 1, 2 or 3 Plate Construction

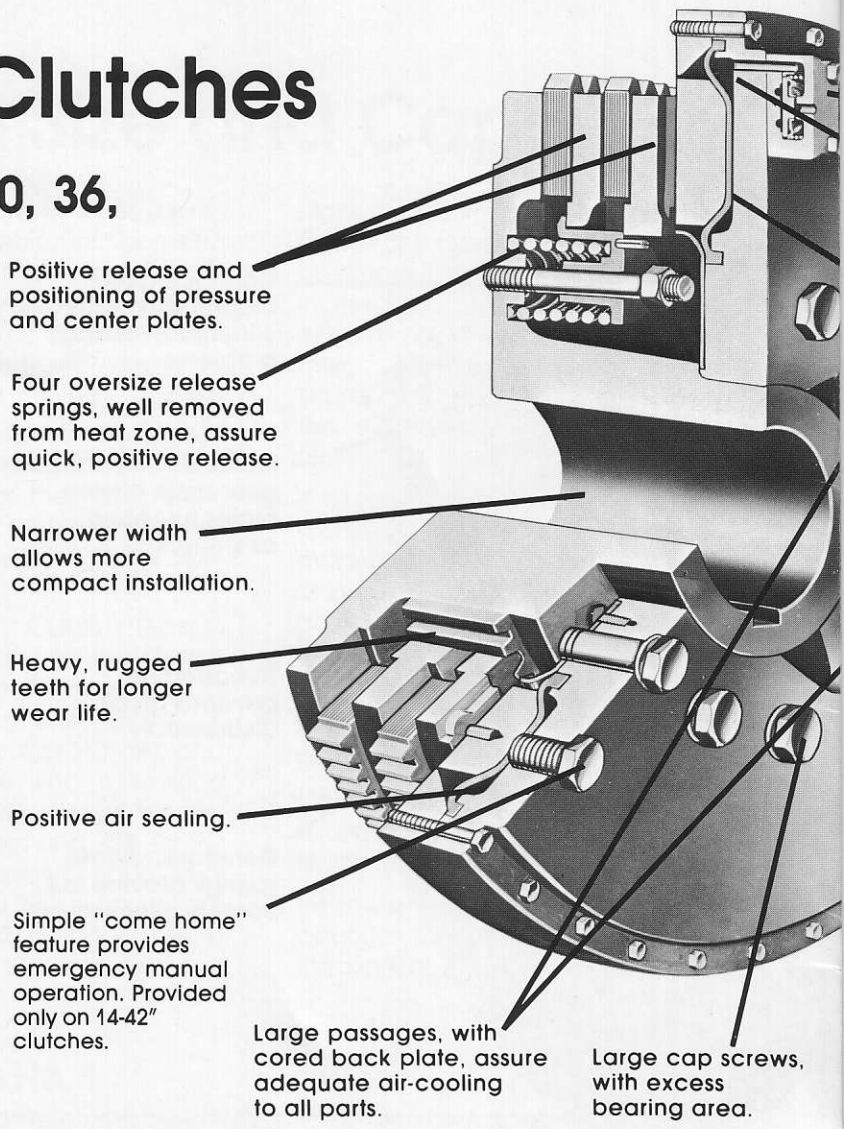
The heart of the Large PO Air Clutch is the diaphragm, perfected after many years of research and development. Extensive tests in field and laboratory enable Twin Disc to state without qualification that this diaphragm will outlast any other clutch tube or diaphragm in use today.

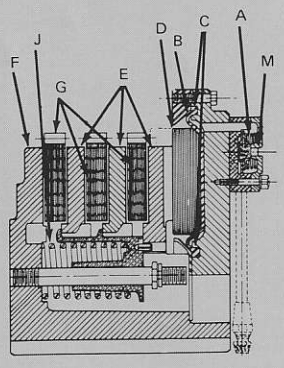
In large clutches, the weight of the floating plates sometimes creates insufficient clearance and a tendency to drag in the released position. Large PO Air Clutch design eliminates this source of trouble through the use of a unique release spring design. This feature mechanically separates the plates in the released position.

Because air volume is required to engage the larger clutches, these sizes (14-inch and up) are furnished with an integral quick-release valve.

Air Clutch Silencers

Twin Disc Air Clutch Silencers dampen the release noise emitted by operation of the quick-release valve integral with Air Clutches in the 14-inch and larger sizes. These compact units will keep Air Clutch noise within established dBA noise levels. These inexpensive Air Silencers are available as original equipment options or in kit form for easy field installation.

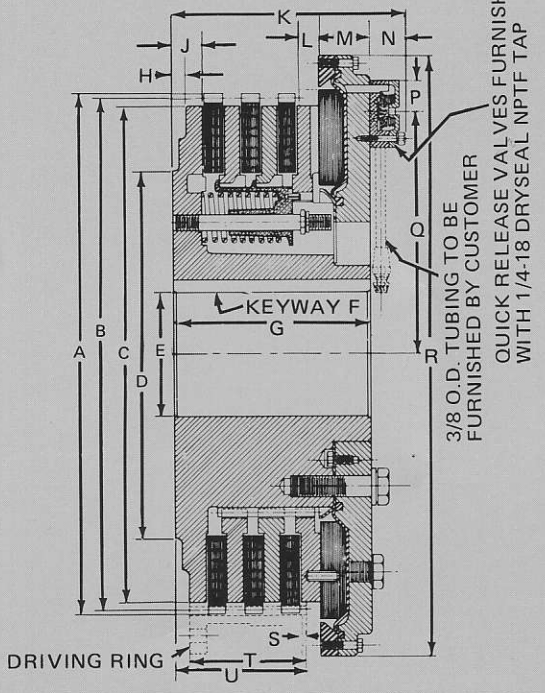




Air Clutch Operation

When the control valve is in the "ON" position, air pressure compresses spring M, which closes port A and opens an air passage leading to the chamber behind diaphragm B. Air is retained behind the diaphragm by diaphragm sealing action at points C. The pressure moves insulator block D to the left, thus moving floating plate E to the left and clamping driving plates G tightly against back plate F. Floating plate movement compresses release springs J.

When the control valve is in the "OFF" position, the air pressure from supply is reduced to zero. Spring M returns to normal, which opens port A to exhaust air to atmosphere. Compression springs J move the floating plates E and insulator block D to the right, thus releasing driving plates G. Each floating plate E is positioned mechanically to provide positive clearance.



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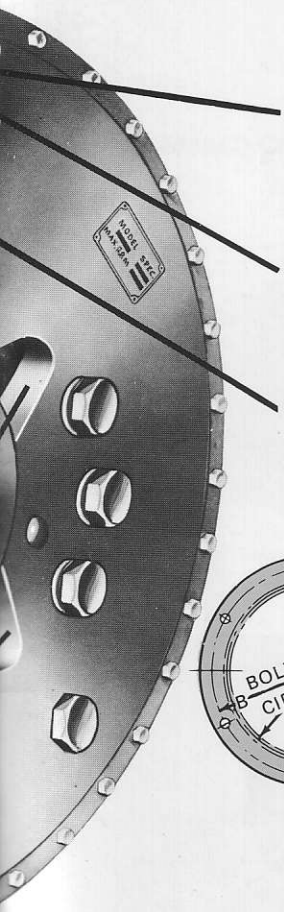
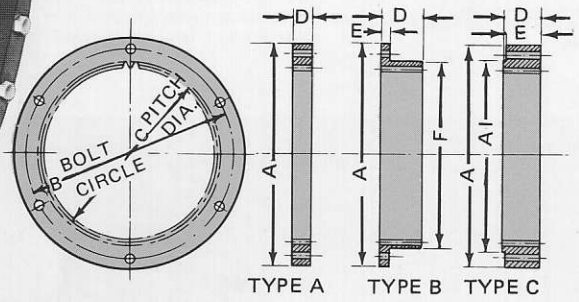


Compact, built-in quick-release valves. Provided only on 14-42" clutches.

Large diaphragm area provides up to 35 per cent higher torque capacity.

Trouble-free diaphragm eliminates release drag; field-proven for long life.



Capacity Data

Clutch Model	Application Duty Classification				Slip Torque @ 130 PSI Lbs.-Ft.	Max. Air Vol. to Engage (Cu. In.)	Maximum Safe Operating Speed†	
	Class I Work Torque Lbs.-Ft.	Maximum HP Rating Class II	Class III	Class IV			Solid Plates	Split Plates
PO-114	2812	188	125	94	3750	34	2400	1950
PO-214	5625	376	251	188	7500	66	2500	1950
PO-314	8437	564	376	282	11,250	71	2500	1920
PO-118	5587	311	207	156	7450	56	1800	1550
PO-218	11,175	622	415	311	14,900	105	1950	1550
PO-318	16,762	933	622	467	22,350	157	2050	1550
PO-124	12,975	553	368	276	17,300	115	1400	1150
PO-224	25,950	1106	737	553	34,600	220	1450	1000
PO-324	38,925	1659	1106	829	51,900	331	1450	975
PO-230	48,750	1728	1152	864	65,000	335	1100	925
PO-330	73,125	2592	1728	1296	97,500	510	1100	925
PO-236	83,400	2488	1659	1244	111,200	510	825	600
PO-336	125,100	3732	2488	1866	166,800	760	1100*	850*
PO-342	207,000	5080	3387	2540	276,000	1580	1100*	825*

For best clutch performance when used as master or operating clutch, limit use to 75% of slip torque and derate for apply pressures less than 130 psi.

† See page 3 regarding maximum speeds.

* Steel Driving Ring.

Clutch Driving Rings

Model	Driving Ring Number	Type Ring	A +.000 −.005	A1	B	C	D	E	F	Holes No.-Size	Teeth 20° P.A.
PO-114	5712	B	18 3/8	—	17 1/4	14 3/4	1 1/8	1/2	16	8 — 17/32	59 — 4/5 P.
PO-214	5713						2 3/8				
PO-314	A6117						4				
PO-118	6924	A	22 1/2	—	21 3/8	18 3/4	1 1/8	—	—	6 — 21/32	75 — 4/5 P.
PO-218	6925	B					3 1/16	5/8	20		
PO-318	6926A	B					4 1/4	5/8	20 1/8		
PO-124	5673	A	28 7/8	—	27 1/4	24 3/4	1 1/2	—	—	12 — 25/32	99 — 4/5 P.
PO-224	5826X	B					3 1/2	3/4	25 7/8		
PO-324	5831A	B					5 1/2	3/4	25 7/8		
PO-230	8459	C	34 3/4	32	33	30 3/4	4 1/2	4 3/8	—	12 — 25/32	123 — 4/5 P.
PO-330	9321						7	6 7/8	—		
PO-236	8490	C	40	37 1/2	38 1/2	36 3/4	4 3/4	4 5/8	—	12 — 25/32	147 — 4/5 P.
PO-336	9349A						7 1/2	7 3/8	—	24 — 25/32	
PO-342	9741	C	46 3/4	46	45	42 3/4	7 1/2	7 3/8	—	24 — 25/32	171 — 4/5 P.

Dimensional Data—Refer to Drawing on Page 10

Model	Drawing Number	Weight (Lbs.)	A	B	Gear Tooth Data			C	D	E (Max.)	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
				P.D.	Teeth	Pitch	P.A.																	
PO-114	X9656	145	15.15	14.745	59	4/5	20°	14.00	10.00	3.500	7/8 x 7/16	4.39	.19	.88	5.87	.28	1.55	1.48	1.50	6.62	18.50	.12	1.12	1.68
PO-214	X9657	185		14.725						3.499		5.77			7.25	.56							2.38	3.09
PO-314	X9658	220										7.14			8.62	.56							4.00	4.46
PO-118	X9651	260	19.15	18.750	75	4/5	20°	18.00	9.00	4.500	1 x 1/2	4.80	.27	1.08	6.28	.20	1.74	1.48	1.50	8.62	22.50	.12	1.12	1.90
PO-218	X9652	350		18.744						4.499		6.42			7.90	.46							3.06	3.55
PO-318	X9653	420										8.05			9.53	.73							4.25	5.20
PO-124	X9665	570	25.15	24.750	99	4/5	20°	24.00	17.75	6.000	1 1/4 x 5/8	5.93	.66	1.44	7.41	.22	2.46	1.48	1.50	11.75	28.88	.12	1.50	2.54
PO-224	X9632	660		24.730						5.998		7.63			9.11	.53							3.50	4.25
PO-324	X9633	880										9.38			10.86	.87							5.50	5.98
PO-230	X9639	1120	31.15	30.745	123	4/5	20°	30.00	20.75	7.000	1 1/2 x 3/4	8.49	1.00	1.88	9.78	.59	2.44	1.48	1.50	14.54	34.50	.12	4.38	4.86
PO-330	X9640	1300		30.720						6.997		10.39			11.68	.93							6.88	6.76
PO-236	X9659	1850	37.15	36.750	147	4/5	20°	36.00	23.75	7.750	2x1	10.20	.75	2.18	11.05*	.62	2.50	1.48	1.50	17.24	40.00	.12	4.62	6.03
PO-336	X9660	2400		36.740						7.747		12.70			13.55*	.96							7.38	8.53
PO-342	X9740	3880	43.15	42.750	171	4/5	20°	42.00	34.00	10.000	2x1	13.50	1.64	2.86	16.30*	1.24	3.15	1.48	1.50	20.25	46.75	-.09	7.50	10.25
				42.740						9.997														

* Maximum width: PO-236—11.08; PO-336—13.58; PO-342—16.46

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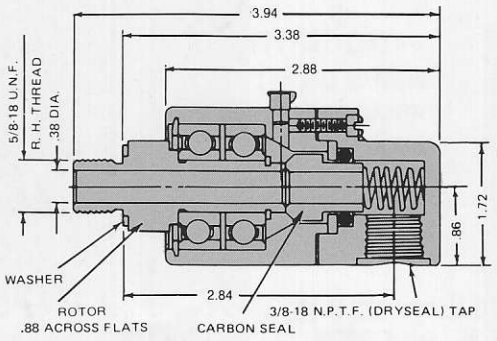
Air Unions

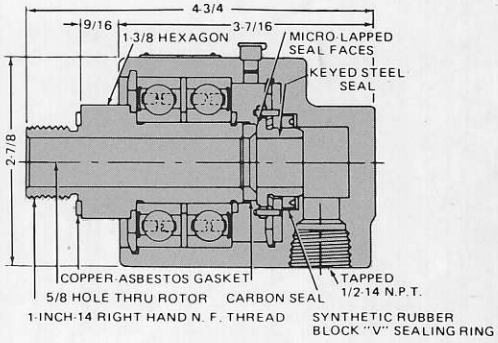
Rotating Air Unions Available from Twin Disc

To introduce air to the clutch, the clutch shaft must be drilled and one of the unions shown here screwed into the shaft end. These seals are suitable for pressures up to 150 psi and are capable of maximum clutch speeds without leakage or overheating. Manufactured by the Deublin Company, they use a carbon optically-flat face seal running against a micro-lapped steel rotor. The unions are readily field serviceable and do not need to be returned to the factory for repair.

for 8 through 24" PO Clutches (M-2301-A) **for 30 through 52" PO Clutches (M-2180-A)**

(Max Differential Speed Limit, 3500 RPM)



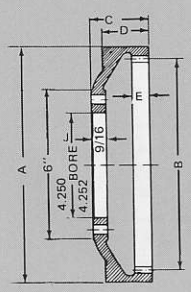


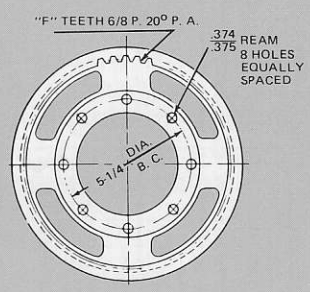
Spider Flanges

Dimensional Data

Model	Flange Drawing Number	A	B	C	D	E	F	Approx. Weight (Lbs.)
CL-108	A5927	9 1/2	8 1/2	2 3/8	1 7/8	11/16	51	10
CL-208	A5928			3 3/16	2 11/16	1 1/2		13
CL-308	A5929			4	3 1/2	2 5/16		16
CL-110	A5930	11 1/2	10 1/2	2 9/16	1 7/8	3/4	63	14
CL-210	A5931			3 3/8	2 11/16	1 9/16		17
CL-310	A5932			4 3/16	3 1/2	2 3/8		20 1/2
CL-111	A5936	13 1/8	12	2 3/4	1 7/8	13/16	72	17
CL-211	A5937			3 9/16	2 11/16	1 5/8		25
CL-311	A5938			4 3/8	3 1/2	2 7/16		27

for some Model CL Clutches





Dimensional Data

Model	Flange Drawing Number	A	B	C	D	E	F	G	H +.002 −.000	J	K	L	Approx. Weight (Lbs.)
E-114 & PO-114	8687-1	16	14 3/4	3 1/8	2 1/16	7/8	59	9	6 1/2	5/8	8	1/2	27
E-214 & PO-214	8687-2			4 1/2	3 7/16	2 1/4							36
PO-314	8687-3			6	4 15/16	3 3/4							55
E-116	8768-1*	18 1/4	16 3/4	3 1/16	2 1/8	7/8	67	9	6 1/2	13/16	8	1/2	40
E-216	8768-2*			4 3/8	3 7/16	2 3/16							56
EH-118 & PO-118	8520-1*	20 1/4	18 3/4	3 1/4	2 5/16	1 1/16	75	9	6 1/2	13/16	8	1/2	55
EH-218 & PO-218	8520-2*			4 15/16	4	2 3/4							81
EH-318 & PO-318	8520-3*			6 5/16	5 3/8	4 1/8							97 1/2
PO-124	8157-1*	26 1/4	24 3/4	4 1/2	3 1/4	1 3/8	99	11 1/2	8	15/16	10	5/8	121
PO-224	8157-2*			6 3/8	5 1/8	3 1/4							154
PO-324	8157-3*			8 5/16	7 1/16	5 3/16							180

*Cast Steel or Nodular Iron.

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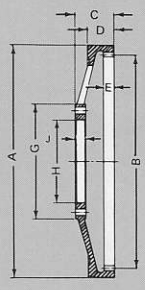
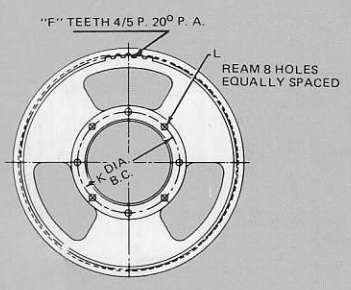
for some Model E, EH and PO Clutches





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IMPORTANT NOTICE: Twin Disc, Incorporated reminds users of these products that their safe operation depends on use in compliance with engineering information provided in this catalog. Users are also reminded that safe operation depends on proper installation, operation and routine maintenance and inspection under prevailing conditions. It is the responsibility of users (and not Twin Disc, Incorporated) to provide and install guards or safety devices which may be required by recognized safety standards or by the Occupational Safety and Health Act of 1970 and its subsequent provisions.

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