



**Mechanical
Clutches and
Torque
Overload
Devices**



EMERSON. CONSIDER IT SOLVED.™

	Pages
I. General Clutch Information	
Clutch Product Offering	4 - 7
Modes of Operation	8
Principles of Operation	9 - 10
Design Features	11
Design Function	12 - 13
Part Number Explanation	12 - 13
II. Mechanical Cam Clutches	
M Series	14 - 27
MZEU Series	28 - 32
Conveyor Backstop Clutches	33 - 44
KK® Series	45 - 51
NSS Series	52 - 53
NFS Series	54 - 55
B Series	56 - 59
PB Series	60 - 61
HT Series	62 - 63
BR Series	64 - 71
III. Engineering Information	
Clutch Lubrication	72
Dimensions and Tolerances	73
Bore Sizes and Shaft Tolerances	74
Clutch Selection Procedures	75
Clutch Application Data Selection	76
IV. Torque Overload Device	
Torque Overload Device Product Offering	80 - 81
Torque Overload Device Design Function	82 - 83
Browning Shear Pin Hubs and Sprockets	84 - 87
Morse Torque Limiters	88 - 94
Morse Torque Limiter Couplings	93
Browning Torque Limiters	95 - 96
Browning Torq/Pro®	97 - 110
Browning Torq/Gard®	111 - 116
Browning Axial Gard	117 - 121
V. General Information	122
VI. Standard Terms and Conditions	128



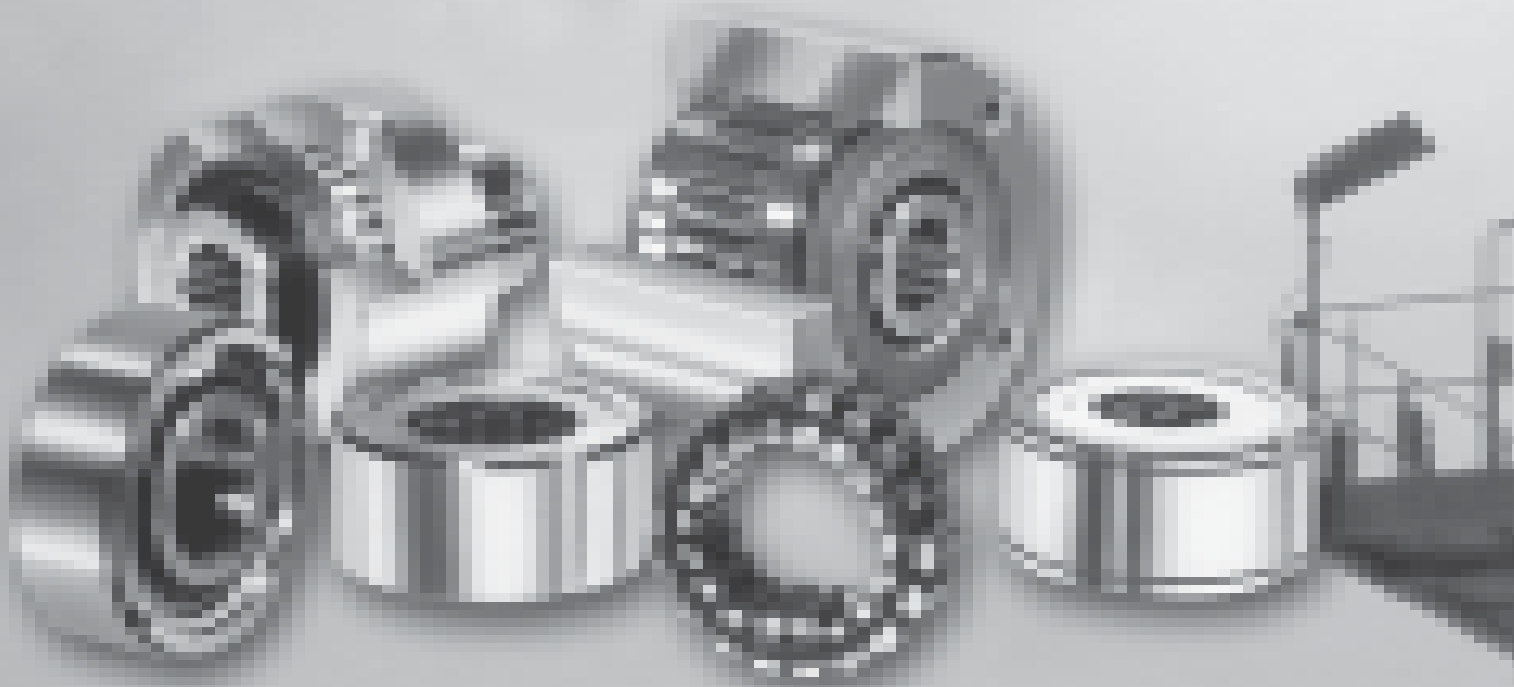
Custom Design

The Morse line of clutches covers a wide range of sizes and capacities, which handle the majority of industrial applications. However, there are applications that require special designs to meet specific application needs.

Emerson Power Transmission offers engineering assistance in both design and application to help meet these specialized requirements.

For selection assistance, call Application Engineering at 1-800-626-2093 or fax the completed form on page 76 to:

Emerson Power Transmission Application Engineering
Fax: (606) 564-2079





Morse mechanical cam clutches are precision devices that lock the inner and outer races through the wedging action of cams to transmit torque in one direction of rotation while overrunning in the opposite direction of rotation. These type units are often referred to as freewheels, sprag, overrunning, backstop or one-way clutches, depending upon their application.

Clutches are available with a bore range up through 17.7" and a torque range up through 500,000 lb. ft. and are the most complete and versatile cam clutches available for a variety of applications – from small business machines to giant steel slitters.

Eleven series of clutches perform three basic modes of operation:

- Overrunning
- Indexing
- Backstopping

These units have set standards of performance, offering:

- Higher overrunning speeds
- Greater torque capacities
- Longer service life

M Series Clutch

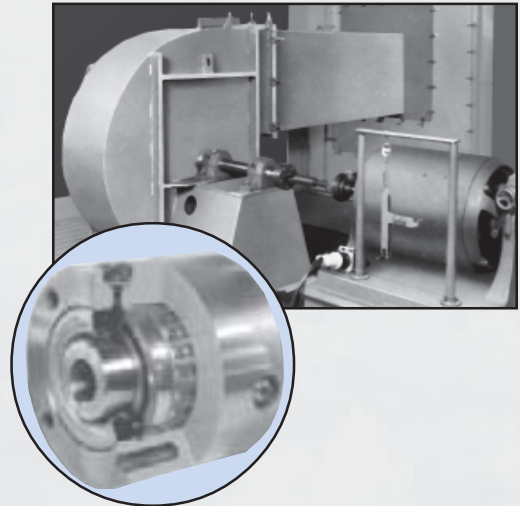
(Page 14)

Features

- Self-contained clutch designed for a wide variety of applications
- Cam cage assembly engineered for optimum performance and increased capacity
- Two ball bearings included to support radial load and concentricity between races
- Close tolerance outer diameter to mount sheave, gears, sprockets and torque arms
- Positive contact lip or felt seals provided for grease or oil lubrication
- Tapped holes machined on ends of outer race for mounting auxiliary components
- Metric bore and keyway available
- Mounting accessories available

Bore range 0.5" – 6.437"

Torque range 275 – 25,000 lb-ft.



MZEU Series

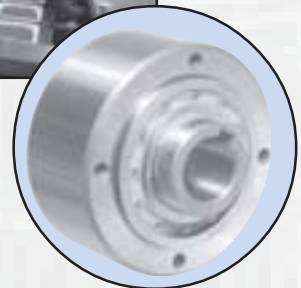
(Page 28)

Features

- Full complement of cams
- Two bearings incorporated for concentricity control
- Symmetric, building block components
- Close tolerance outer diameter to mount sheave, gears, sprockets and torque arms
- Tapped holes at both ends of races to mount accessories
- Flange, torque arms and covers available

Bore range 0.472" – 5.9"

Torque range 44 – 25,000 lb-ft.



Conveyor Backstop Clutches

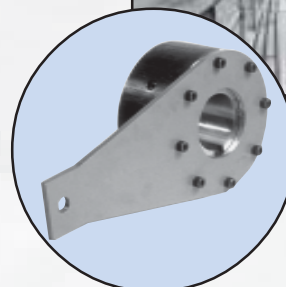
(Page 33)

Features

- Self-contained clutches created for high torque applications where reverse rotation of a head-shaft must be prevented
- Manufactured with large diameter rollers to provide bearing, clutch support, and maintain concentricity between inner and outer races
- Torque arm available to help prevent reverse rotations, plus an external felt seal and internal lip seal for low maintenance
- Available with an external felt seal and internal lip seal for low maintenance
- Retaining plate option available to secure backstop to shaft

Bore range 2.25" – 17.7"

Torque range 6,500 - 500,000 lb-ft.



KK15 - KK40 Series

(Page 45)

Features

- Self-contained ball bearing and cam clutch
- Designed with same dimensions as standard metric light series ball bearing
- Press fit option for shaft and housing
- Available with keyed inner and outer races
- Furnished filled with grease to increase wear life
- Seal options available for contaminated environments

Bore range 0.59" – 1.57" (15mm - 40mm)

Torque range 21.4 – 190 lb-ft.



NSS Series

(Page 52)

Features

- Designed with the same overall dimensions of a metric 200 light series ball bearing
- Created with an inner race containing a keyseat and an outer race that press fits in housing
- Excellent for applications where space is a consideration

Bore range 0.32" – 2.36" (8mm - 50mm)

Torque range 4.94 – 480 lb-ft.



Value-Added Capabilities

- Special bores (splined, dual keyways, extended with setscrews)
- Special width
- Custom seal designs (viton, all rubber, etc)
- Special greases (low-temp, food grade, etc.)
- Dual cages for higher capacity in a wider but small OD package
- Gear or sprocket tooth cut into OD of clutch
- Special label needs such as inclusion of OEM part numbers
- Ability to kit products for final assembly
- Assembled to sprocket, coupling, etc.
- Custom engineering designs for OEMs

NFS Series

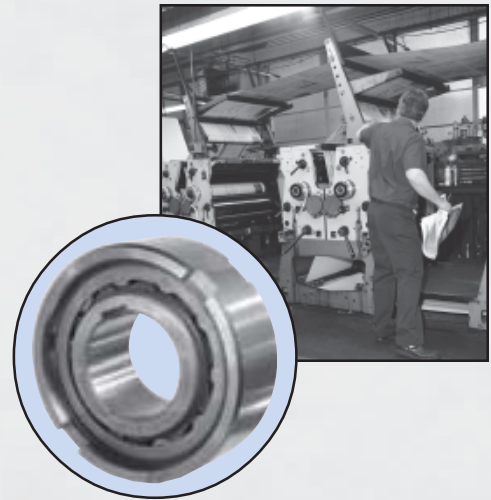
(Page 54)

Features

- Designed with the same overall dimensions as medium 300 series metric ball bearing
- Manufactured with an inner race containing a key-seat and an outer race containing key slots
- Furnished with protective oil

Bore range 0.47" – 3.15" (12mm - 80mm)

Torque range 13.27 – 2,900 lb-ft.



B Series Clutches

Features

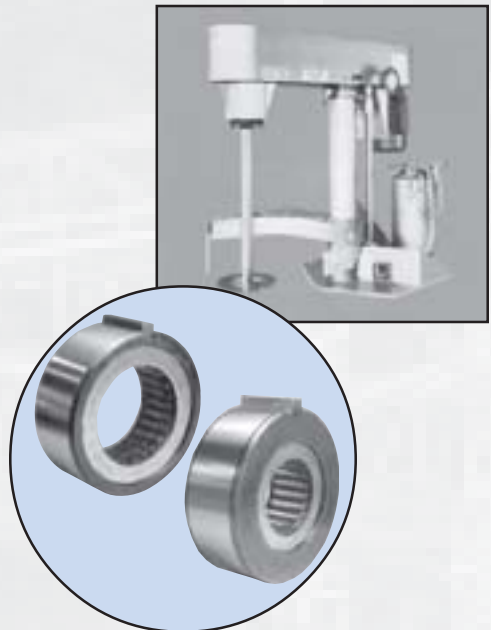
- Rugged cam clutch designed for applications where space and weight are factors in clutch selection
 - Full complement of cams held in the outer races
 - Input shaft used as the inner race must be hardened and ground to size
 - Interchangeable with competitors' products
 - Bearing support and lubrication required
-
- Primarily used for backstop applications

B-200A Series

(Page 56)

Bore range 0.650" - 2.209"

Torque range 39 - 575 lb-ft.



B-500A Series

(Page 58)

Bore range 0.650" - 2.04"

Torque range 60 - 1,250 lb-ft.

PB3A - PB16A Series

(Page 60)

Features

- Self-contained clutch designed with a bronze bushing for bearing support
- Hub diameter used for mounting auxiliary components such as gears, pulleys and sprockets

Bore range 0.375" – 2.00"

Torque range 40 – 1,800 lb-ft.



HT Series

(Page 62)

Features

- Designed for use on the end of a shaft
- Created for applications requiring space restrictions
- Integral bearing to help maintain concentricity
- Factory drilled and tapped holes for mounting accessories

Bore range 0.425" – 2"

Torque range 42 – 440 lb-ft.



BR Series

(Page 64)

Features

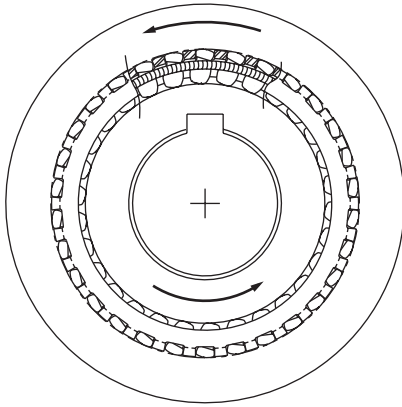
- Lift-off cam design provides contact free operation between the cams and races for increased wear life
- Symmetrical design allows operation in either direction
- External bearing support must be provided for concentricity between housing and shaft

Bore range 0.8" – 9.4"

Torque range 282 – 45,750 lb-ft.



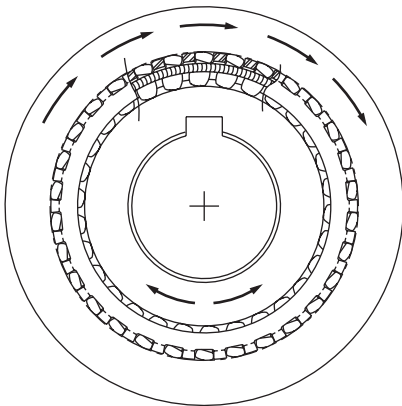
Morse cam clutches are precision devices that positively lock to transmit torque in one direction of rotation but overrun (freewheel) in the opposite direction of rotation. Eleven series of clutches are available, all using the same principles of operation. Since clutch applications encompass a variety of load and speed characteristics, Morse clutches are manufactured in a range of capacities and styles that are designed to provide the best functional characteristics in performing the three basic modes of operation.



I. General Overrunning

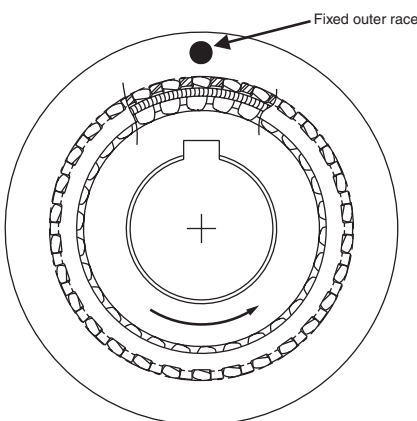
Clutches used in this type of application overrun at either the inner or outer race and are occasionally called upon to lock up and drive.

A typical application is a standby drive where an electric motor and a standby diesel engine are connected to a single driven fan shaft through one-way clutches. The fan can be driven by the motor or diesel engine. The diesel drive clutch overruns when the motor drives the fan. The motor clutch automatically overruns when the load is transferred to the diesel engine.



II. Indexing

In this mode of operation, reciprocating motion applied to the driving race of the clutch is transformed into unidirectional, intermittent motion at the driven race. For example, on a printing press application, the clutch is mounted to an inking roll and a pinion is mounted to the driving race of the clutch. A rack meshing with the pinion provides reciprocating motion to the driving race. The clutch drives in the forward stroke (index) and overruns on the return stroke accomplishing intermittent unidirectional motion of the inking roll.



III. Backstopping

In backstop (holdback) applications, the clutches are used to prevent reverse rotation of drive shafts, which could damage machinery and other expensive equipment. With the outer race of the clutch anchored to a stationary member, the inner race can overrun freely in one direction of rotation; reverse rotation is prevented by the automatic engagement of the clutch. Typical backstop applications occur in conveyor systems and gear reducers.



B-200A, B-500, PB-A, HT, CB, M, NSS, NFS, MZEU Series

Morse clutches utilize a full complement of cams, which are placed between concentric inner and outer races. A light spring helps keep the cams in contact with the races. Torque is transmitted from one race to the other by wedging action of the cams between the races.

Morse mechanical clutches provide engagement or disengagement with minimal backlash.

Figure 1 shows the cams in a position to allow the inner race to overrun counter-clockwise or the outer race to overrun in a clockwise direction.

Figure 2 shows the cams are fully loaded and loads can be transmitted through the cams from a clockwise rotation of the inner race or a counter-clockwise rotation of the outer race.

KK Series

The KK clutch consists of a standard metric ball bearing combined with cams. The clutch design is unique, incorporating an independent cam-cage assembly installed alongside the offset ball cage. The clutch has the same overall dimensions of the metric bearing. The clutches are entirely self-contained, and do not require additional bearing support.

The cam-cage assembly uses an energizing spring to help keep the entire complement of cams in light contact with the races to provide rapid engagement when torque transmission occurs. The wedging action of the full set of cams produces significant torque capability in a compact, economical package.

Figure 3 shows the cam-cage assembly in the KK clutch in a position to allow the inner race to overrun clockwise or the outer race to overrun in a counterclockwise direction.

Figure 4 shows the cam-cage assembly provides a full complement of cams to wedge against inner and outer races allowing torque transmission through the clutch.

Figure 1
(Overrunning)

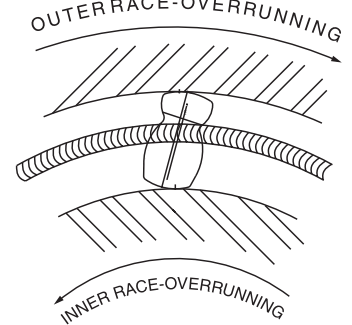


Figure 2
(Driving)

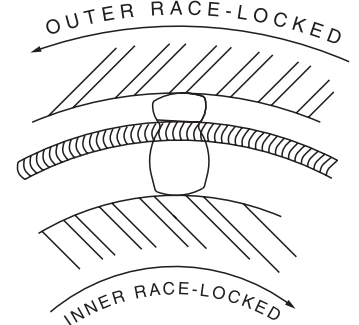


Figure 3

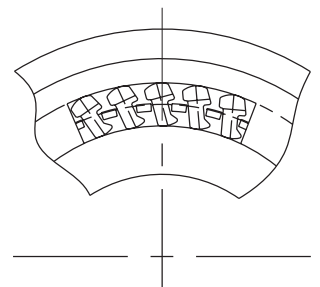
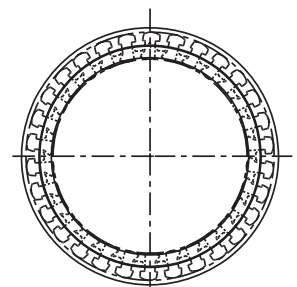


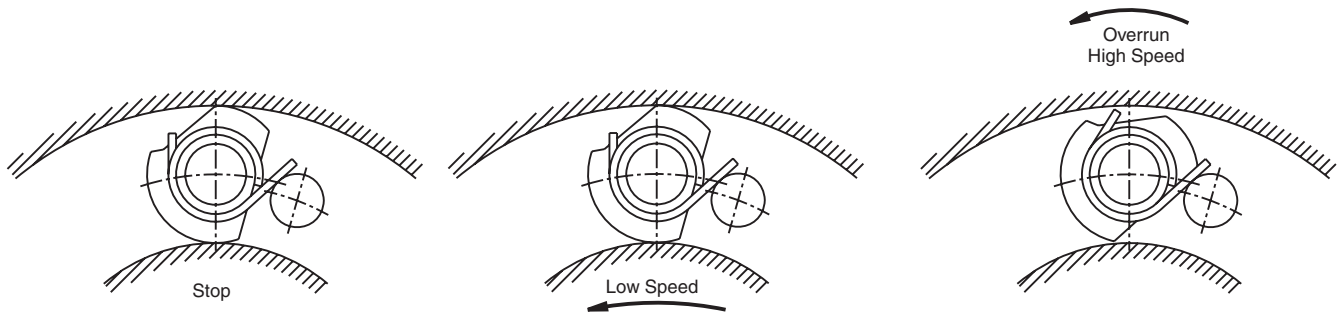
Figure 4



BR Series

The cam of the BR Series clutch is designed to lift off and have no contact with the inner and outer race while overrunning. This is due to centrifugal force and is the reason this type of cam clutch is known as a lift off type. These cam clutches are suitable for “overrunning

- high speed inner race/low speed engaged outer race” or “backstopping-high speed inner race overrunning”. There are two types available, an open type installed directly onto a motor or inside a reducer, or a package type that is installed on the outside of the application.



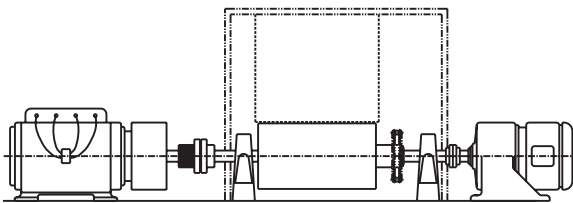
Morse mechanical clutches are utilized in many applications such as:

Aircraft arresting gear equipment
Compressors
Conveyors
Cranes and hoists
Dry cleaning machinery
Duplicator equipment
Food processing machinery
Heat-treat furnaces

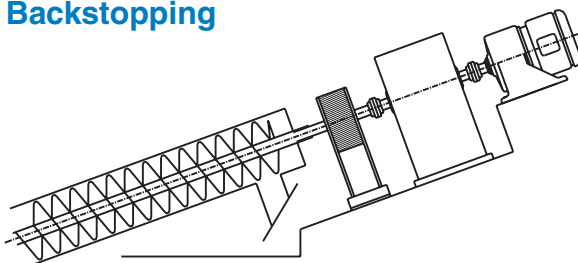
Induction draft fans
Multi-state conveyors
Packaging machinery
Printing machinery
Pumps
Punch presses and feeds
Railroad crossing gates
Shoe machinery

Speed reducers
Standby power units
Textile looms
Two-speed grinders
Two-speed shiftovers
Washing machines
Wire winding machinery

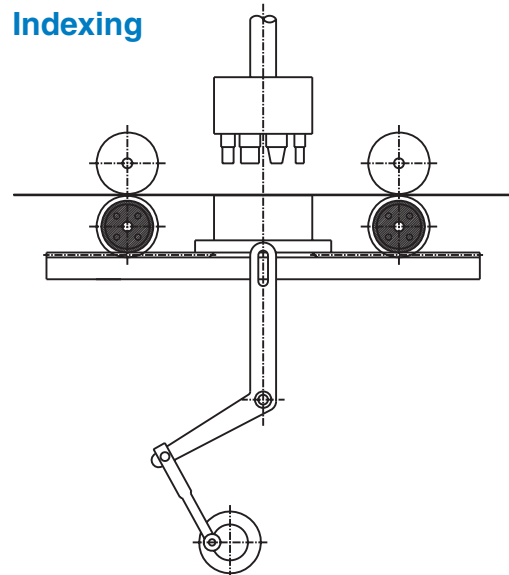
General Overrunning



Backstopping



Indexing



Full Cam Complement

A full complement of cams provides the maximum number of load transmitting members per given diameter, resulting in greater torque capacity size-for-size than other clutches.

Cam Design

Precision formed cams made of high carbon steel provide extra long wear and fatigue life. M Series models utilize formed cams providing uniform distribution of load between mating surfaces, resulting in low contact pressure levels.

Cage Construction

M Series models 300A - 700A contain a heavy duty, machined or stamped cage assembly providing equal placement and accurate positioning of each cam. The MI Series offers a patented, low inertial indexing cage design for engagement and disengagement of the cams. A contracting, energizing spring helps keep the cams in constant contact with both races for quick cam reaction.

High Quality Components

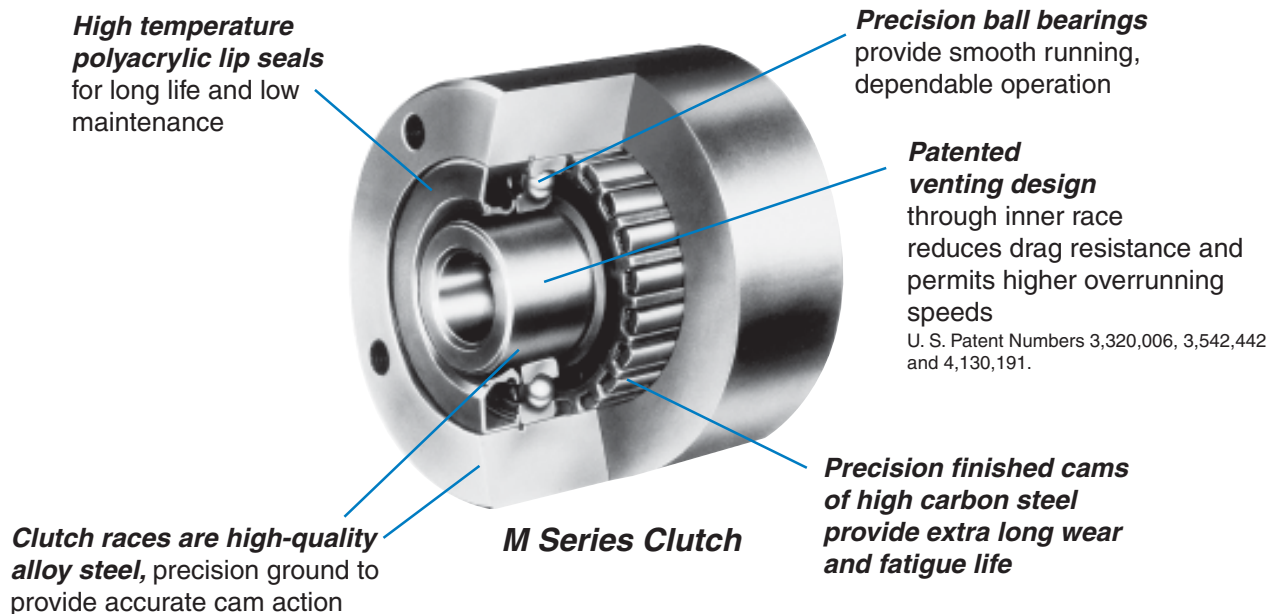
The clutch races are made of high quality alloy steel with high surface hardness and core toughness. Precision ground races provide excellent concentricities and surface finish for accurate cam action.

M series models are equipped with precision ball bearings and polyacrylic lip type seals for long life and low maintenance.

Overrunning Performance

Oil lubricated M Series clutches contain an exclusive patented venting method to reduce oil pressure buildup and permit higher overrunning speeds.

Morse mechanical cam clutches are an ideal solution for overrunning, indexing or backstopping applications.



Function			Self-Contained	Model No.	Torque Range	
Overrunning	Indexing	Backstopping			lb - ft	N - m
X	X	X	-	B203A - B210A	39 - 575	53 - 780
-	-	X	-	B501A - B513	60 - 2,125	81 - 2,881
-	-	X	X	CB7C - CB500C	6,500 - 500,000	8,813 - 686,000
X	X	-	X	MZEU12 E1 - E2 - MZEU150 E1 -E2	44 - 25,000	60 - 33,800
-	-	X	X	MZEU12 E2 - E3 - MZEU150 E2 -E3	44 - 25,000	60 - 33,800
-	-	X	X	MZEU12 E3 - E4 - MZEU150 E3 -E4	44 - 25,000	60 - 33,800
-	X	-	X	HT10 - HT30	42 - 440	57 - 597
X	-	-	X	KK15- KK40	20 - 190	29 - 260
X	-	-	X	KK15-2GD - KK40-2GD	20 - 190	29 - 260
X	-	-	X	KK15-2GD 1K - KK40-2GD 1K	20 - 190	29 - 260
X	-	-	X	KK15-1K - KK40-1K	20 - 190	29 - 260
X	-	-	X	KK15-2K - KK40-2K	20 - 190	29 - 260
X	X	X	X	M300A - M700A	275 - 5,000	373 - 6,779
X	X	X	X	M750A - M1000	7,000 - 25,000	9,491 - 33,896
X	-	-	-	NFS 12 - NFS 80	13 - 2,900	18 - 3,924
X	-	-	-	NSS 8 - NSS 60	5 - 480	6.7 - 649
X	X	X	X	PB3A - PB16A	40 - 1,800	54 - 2,441
-	-	X	-	BR20 - BR240	240 - 45,750	328 - 62,034
-	-	X	X	BR-P	240 - 45,750	328 - 62,034

X = Available.

Clutch Ordering Procedure

Specify the Information Checked (x) in the Table Below

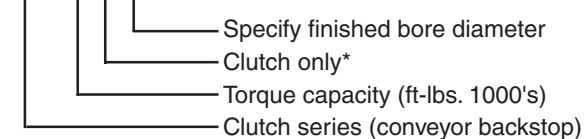
Clutch Series	KK	NSS	NFS	200A	B-500	PB-A	HT	M	MZEU	BR
Catalog Model No.	x	x	x	x	x	x	x	x	x	x
Bore	-	-	-	-	-	x	x	x	-	-
Rotation (RH or LH)	-	-	-	-	-	x	x	-	-	-

Note: Clutches requiring non-stock bores, tolerances, keyways, lubricants, or other special requirements must be clearly specified on the order.

Part Number Explanation

Conveyor Backstop Series

CB - 45 C FB

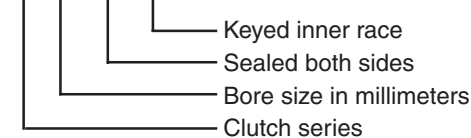


Conveyor backstop clutch built with standard keyway unless requested otherwise.

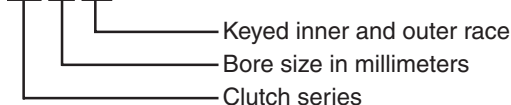
* Torque arm, to be used with conveyor backstop clutch, should be ordered separately ex. CB-45TA.

KK Series

KK 30-2GD 1K

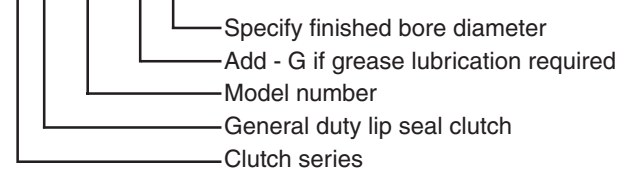


KK 25 2K

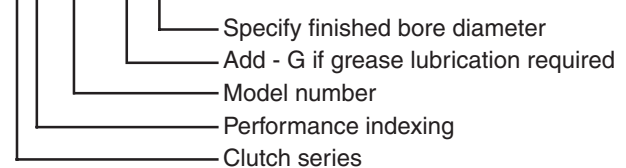


M Series

M G 500A - G FB



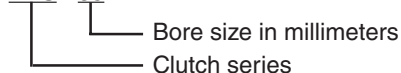
M I 500A - G FB



Examples for M series derivatives: MG (for general duty) ex: MG900 FB, MI (for indexing) ex: MI800 FB, MO (for overrunning) ex: MO600A-G FB and MR (for high-speed outer race overrunning) ex: MR600A FB.

NFS Series

NFS - 35



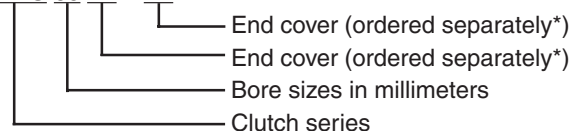
Bore Range		Overrunning Speed (RPM)		Lubrication		
in	mm	Inner Race	Outer Race	Oil	Grease	Metric
0.649 - 2.209	17 - 56	1,800 - 2,500	-	X	X	-
0.650 - 2.046	17 - 52	1,800 - 2,500	-	X	X	-
2.250 - 17.7	57 - 450	50 - 150	-	-	X	-
0.472 - 5.906	12 - 150	240 - 2,000	80 - 1,000	-	X	X
0.472 - 5.906	12 - 150	240 - 2,000	-	-	X	X
0.472 - 5.906	12 - 150	240 - 2,000	-	-	X	X
0.425 - 2.000	11 - 51	1,800	-	X	-	-
0.591 - 1.575	15 - 40	1,800 - 3,600	900 - 2,000	X	X	X
0.591 - 1.575	15 - 40	1,800 - 3,600	900 - 2,000	X	X	X
0.591 - 1.575	15 - 40	1,800 - 3,600	900 - 2,000	X	X	X
0.591 - 1.575	15 - 40	1,800 - 3,600	900 - 2,000	X	X	X
0.591 - 1.575	15 - 40	1,800 - 3,600	900 - 2,000	X	X	X
0.500 - 2.937	13 - 75	400 - 2,900	400 - 2,900	X	X	-
2.437 - 6.437	62 - 164	325 - 1,800	325 - 2,600	X	X	-
0.472 - 3.150	12 - 80	670 - 4,500	340 - 2,300	X	-	X
0.315 - 2.362	8 - 60	910 - 6,000	460 - 3,000	X	-	X
0.375 - 2.000	10 - 51	950 - 1,800	300 - 900	-	X	-
0.787 - 9.449	20 - 240	310 - 3000	-	X	-	X
0.787 - 9.449	20 - 240	310 - 3000	-	X	-	X

X = Available.

Part Number Explanation

MZEU Series

MZEU 60 E1 + E2



* Covers ordered separately. Example: MZEU60-E1 cover or MZEU60-E2 cover.

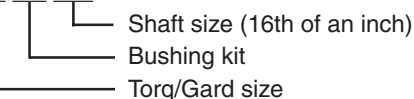
Torq/Gard

TGC 60



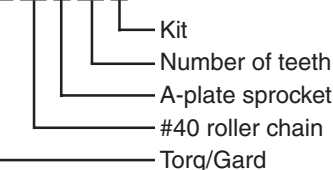
If required shaft bushing is ordered separately ex.

60 BU 012



Bushing kit includes key and set screws. Torq/Gards can be made into couplings by ordering separate components. Single strand TG sprocket kits to bolt on are stocked.

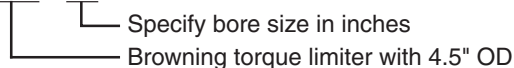
TG 40 A 45 K



Includes mounting bolts.

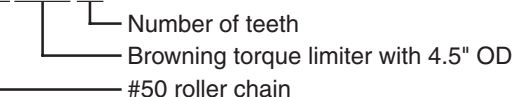
Browning Torque Limiter

T45L x FB



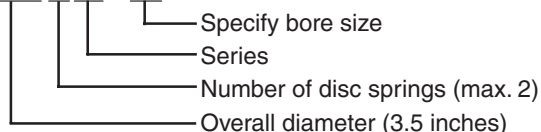
Bushing is supplied with Browning torque limiter.
Sprocket for torque limiter is ordered separately 50T45L26.

50 T45L 26



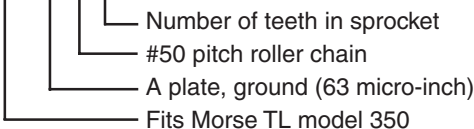
Morse Torque Limiter

350A -2 TL x FB



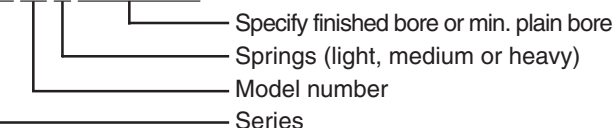
Required bushing is ordered separately; bushing length determined by sprocket selection.

350 AG 5 26



Browning Torq/Pro

TP 30 H FB or MPB



When ordering a Torq/Pro coupling specify Torq/Pro unit, Torq/Pro sprocket, coupling chain and adjoining sprocket.

Models M300A - M700A

The M Series ball bearing clutches contain precision formed cams made from high quality steel that are hardened then precision finished. Our most versatile and custom configurable clutch, this unit is the workhorse of the industry. The unique finishing process provides a smooth cam surface resulting in uniform contact with the races, providing even load distribution and prolonged wear life. These clutch models are designed to mount on through shafts and are secured to the shaft by a matching key provided with each stock bore clutch. Grease lubrication for each series can be provided at no additional cost.



U. S. Patent Numbers 3,320,006,
3,542,442 and 4,130,191.

MG300A - 700A Series

Primarily used for general duty applications. Overrunning, back-stopping and light duty indexing. The MG model offers precise spring energizing to provide long overrunning wear life.

MI300A - 700A Series

Recommended for high performance indexing, used on applications greater than 150 strokes per minute or applications requiring high indexing accuracy. Incorporating a patented, low inertia cage and heavy duty energizing spring for quick cam reaction.

MO300A - 700A Series

Made with felt grease seals to minimize seal drag for high speed inner race overrunning applications. The MO model is delivered with standard grease lubrication.

MR300A - 700A Series

Intended for high-speed outer race overrunning, incorporating a unique cam cage construction that uses centrifugal force to minimize cam drag. The driving speed of the clutch cannot exceed the rpm shown in the table for the inner race.

Model No.	Torque Capacity		Maximum Overrunning rpm		Nominal Over-running Drag		Stock Bores ¹		Keyways ¹		Dimensions			
	lb.-ft.	N-m	Inner Race	Outer Race	lb.-ft.	N-m	Inches	mm	Inches	mm	A		B	
											Inches	mm	Inches	mm
MG300A	275	373	2900	800	.17	0.2	.500	12.70	0.125 x 0.167	3.18 x 4.24	3.000 2.998	76.15 / 76.20	2 5/8	66.68
MI300A			-	-			.625	15.88	0.188 x 0.094	4.76 x 2.38				
MO300A			3600	800			.750	19.05	0.188 x 0.094	4.76 x 2.38				
MR300A			800	2900										
MG400A	400	542	2700	800	.21	0.3	.625	15.88	0.188 x 0.094	4.76 x 2.38	3.500 3.498	88.85 / 88.90	2 7/8	73.03
MI400A			-	-			.750	19.05						
MO400A			3600	800			.875	22.23						
MR400A			800	2700										
MG500A	1175	1593	2400	750	.38	0.5	.875	22.23	0.188 x 0.094	4.76 x 2.38	4.250 4.248	107.90 / 107.95	3 5/8	92.08
MI500A			-	-			1.000	25.40	0.25 x 0.125	4.76 x 2.38				
MO500A			3000	750			1.125	28.58	0.25 x 0.125	6.35 x 3.18				
MR500A			750	2400			1.250	31.75	0.25 x 0.125	6.35 x 3.18				
MG600A	2250	3051	1800	700	.63	0.9	1.250	31.75	0.25 x 0.125	6.35 x 3.18	5.375 5.373	136.47 / 136.53	4 3/4	120.65
MI600A			-	-			1.375	34.93	0.313 x 0.156	7.94 x 3.97				
							1.500	38.10	0.375 x 0.188	9.53 x 4.76				
							1.625	41.28	0.375 x 0.188	9.53 x 4.76				
							1.750	44.45	0.375 x 0.188	9.53 x 4.76				
							1.937	49.20	0.50 x 0.188	9.53 x 4.76				
MR600A			700	2100			2.000	50.80	0.50 x 0.188	12.70 x 4.76				
MG700A	5000	6779	1200	400	1.3	1.8	2.000	50.80	0.50 x 0.250	12.70 x 6.35	7.125 7.123	180.92 / 180.98	6 1/4	158.75
MI700A			-	-			2.250	57.15	0.50 x 0.250	12.70 x 6.35				
							2.437	61.90	0.50 x 0.250	12.70 x 6.35				
							2.500	63.50	0.625 x 0.313	15.88 x 7.94				
							2.750	69.85	0.625 x 0.313	15.88 x 7.94				
MR700A			400	1750			2.937	74.60	0.625 x 0.125	15.88 x 3.18				

¹ Stock bore sizes have hardened inner races and cannot be reworked. Non-stock bores can be furnished at an additional charge. To minimize critical stresses in keyway area of inner race, clutch keyways have radius in corners; a matching key is furnished with each stock bore clutch, except metric.

² Mounting holes are equally spaced on all models except model 700 which has six equally spaced mounting holes plus two additional positioned 30° from the equally spaced holes and 180° apart.

Features

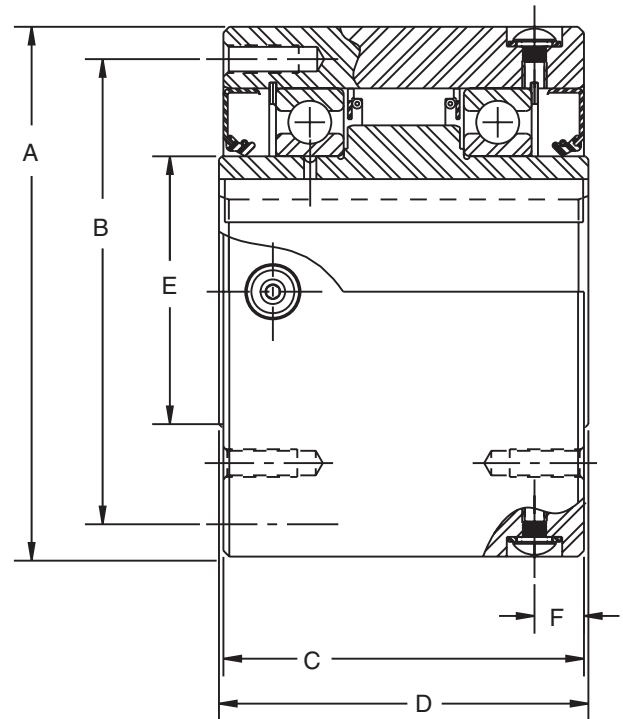
- Self-contained clutch designed for high-speed applications
- Cam cage assembly engineered for optimum performance and increased capacity
- Two ball bearings included to support radial load and concentricity between races
- Positive contact lip or felt seals provided for grease or oil lubrication
- Tapped holes are machined on ends of outer race for mounting auxiliary components
- Metric bore and keyway available
- Mounting accessories available

Industries Served

- Corrugated
- Food and beverage
- Glass manufacturing
- Packaging
- Paper converting
- Printing
- Aggregate

Field Applications

- Amusement rides
- Auxiliary drives
- Conveyors
- Food processing
- Heat treat furnaces
- HVAC systems
- Packaging machinery
- Punch press machinery
- Start-up drives



Model No.	Dimensions								No. of Tap (Mt.) Holes	Thread Size		Usable Thread Depth		Lube	Lube Cap. Oz.	Weight	
	C		D		E		F			Inches	mm	Inches	mm			lbs	kg
	Inches	mm	Inches	mm	Inches	mm	Inches	mm									
MG300A	2.375	60.33	2.50	63.5	1.125	28.58	.35	8.9	4	0.250 - 28	6.35 - 711	0.500	12.70	Oil	.85	4	2
MI300A														Oil	1.25		
MO300A														Grease	.5		
MR300A														Oil	.85		
MG400A	2.625	66.68	2.75	69.9	1.250	31.75	.45	11.4	4	0.313 - 24	7.94 - 610	0.625	15.88	Oil	1.1	6	3
MI400A														Oil	1.4		
MO400A														Grease	.5		
MR400A														Oil	1.1		
MG500A	3.375	85.73	3.50	88.9	1.750	44.45	.48	12.2	4	0.313 - 24	7.94 - 610	0.625	15.88	Oil	1.8	11	5
MI500A														Oil	3.0		
MO500A														Grease	1.0		
MR500A														Oil	1.8		
MG600A	3.625	92.08	3.75	95.3	2.750	69.85	.50	12.7	6	0.313 - 24	7.94 - 610	0.625	15.88	Oil	2.8	19	9
MI600A														Oil	4.5		
MO600A														Grease	1.5		
MR600A														Grease			
MG700A	4.875	123.83	5.00	127.0	4.000	101.60	.68	17.3	8	0.375 - 24	9.53 - 610	0.750	19.05	Oil	4.6	43	20
MI700A														Oil	10.9		
MO700A														Grease	2.9		
MR700A														Grease			
														Oil	4.6		

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Models M750 - M1000

Models M750 – M1000 are ball bearing clutches. All models contain precision-formed cams and all clutch models are designed to mount on through shafts and are secured to the shaft.

Models MG750 - MG1000

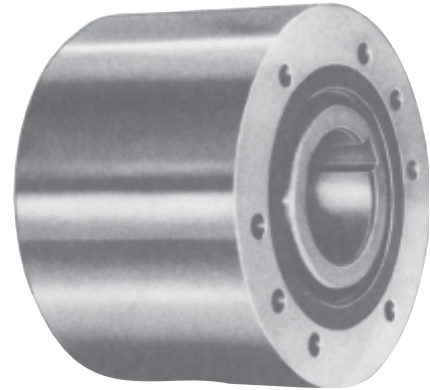
Are designed with a cam cage specifically for inner race overrunning.

Models MR750 – MR1000

Are designed with a cam cage specifically for outer race overrunning.

Models MI750 – MI1000

MI models have stronger energizing springs for greatest response in indexing.



U. S. Patent Number 3,542,442.

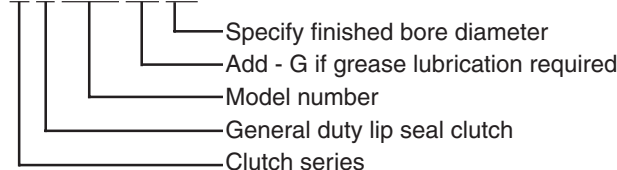
Model No.	Torque Capacity		Max. Over-running rpm		Nominal Over-running Drag (lb-ft.)		Stock Bore ¹		Keyways ¹		DIMENSIONS			
											A		B	
	Ft.-lbs.	N-m	Inner Race	Outer Race	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
MG750	7000	9,491	1800	600	2.5	3	2.437	61.90	0.625 x 0.313	15.88 x 7.94	8.748 / 8.750	222.20 / 222.25	7.0000	177.800
							2.500	63.50	0.625 x 0.313	15.88 x 7.94				
							2.750	69.85	0.625 x 0.313	15.88 x 7.94				
MR750			525	2600			2.937	74.60	0.750 x 0.375	19.05 x 9.53				
							3.000	76.20	0.750 x 0.375	19.05 x 9.53				
MI750			-	-			3.250	82.55	0.750 x 0.250	19.05 x 6.35				
							3.437	87.30	0.750 x 0.188	19.05 x 4.76				
MG800	13,000	17,626	1300	475	4.0	5	3.000	76.20	0.750 x 0.375	19.05 x 9.53	9.998 / 10.000	253.95 / 254.00	8.9375	227.013
							3.250	82.55	0.750 x 0.375	19.05 x 9.53				
							3.437	87.30	0.875 x 0.438	22.23 x 11.11				
MR800			475	2100			3.500	88.90	0.875 x 0.438	22.23 x 11.11				
							3.750	95.25	0.875 x 0.438	22.23 x 11.11				
MI800			-	-			3.937	100.00	1 x 0.50	25.40 x 12.70				
							4.000	101.60	1 x 0.50	25.40 x 12.70				
							4.250	107.95	1 x 0.375	25.40 x 9.53				
							4.437	112.70	1 x 0.250	25.40 x 6.35				
MG900	18,000	24,405	1200	400	5.0	7	4.000	101.60	1 x 0.50	25.40 x 12.70	11.997 / 12.000	304.72 / 304.80	9.7500	247.650
							4.250	107.95	1 x 0.50	25.40 x 12.70				
							4.437	112.70	1 x 0.50	25.40 x 12.70				
MR900			400	1850			4.500	114.30	1 x 0.50	25.40 x 12.70				
							4.750	120.65	1 x 0.50	25.40 x 12.70				
MI900			-	-			4.937	125.40	1 x 0.375	25.40 x 9.53				
							5.000	127.00	1 x 0.375	25.40 x 9.53				
							5.250	133.35	1 x 0.250	25.40 x 6.35				
							5.437	138.10	1 x 0.250	25.40 x 6.35				
MG1000	25,000	33,896	1200	325	6.0	8	5.000	127.00	1.250 x 0.625	31.75 x 15.88	14.997 / 15.000	380.92 / 381.00	11.7500	298.450
							5.250	133.35	1.250 x 0.625	31.75 x 15.88				
							5.437	138.10	1.250 x 0.625	31.75 x 15.88				
MR1000			325	1600			5.500	139.70	1.250 x 0.625	31.75 x 15.88				
							5.750	146.05	1.250 x 0.438	31.75 x 11.11				
MI1000			-	-			5.937	150.80	1.250 x 0.438	31.75 x 11.11				
							6.000	152.40	1.250 x 0.438	31.75 x 11.11				
							6.250	158.75	1.250 x 0.375	31.75 x 9.53				
							6.437	163.50	1.250 x 0.375	31.75 x 9.53				

¹ Stock bore sizes have hardened inner races and cannot be reworked. Non-stock bores can be furnished at an additional charge. To minimize critical stresses in keyway area of inner race, clutch keyways have radius in corners; a matching key is furnished with each stock bore clutch, except metric.

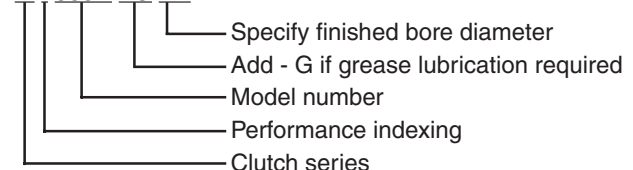
² Mounting holes are equally spaced on all models except model 750 which has six equally spaced mounting holes plus two additional positioned 30° from the equally spaced holes and 180° apart.

Part Number Explanation

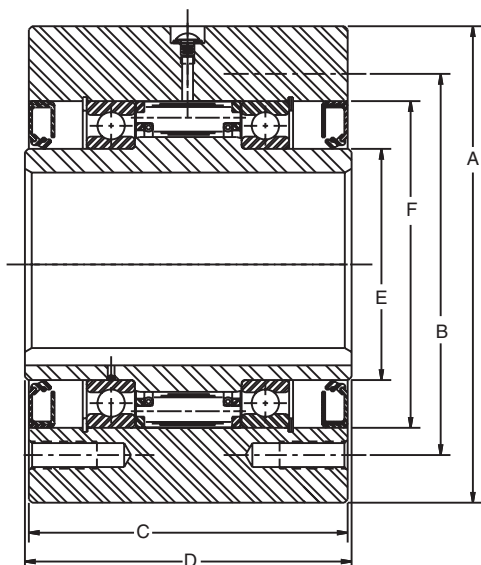
M G 500A - G FB



M I 500A - G FB



Examples for M series derivatives: MG (for general duty) ex: MG900 FB, MI (for indexing) ex: MI800 FB, MO (for overrunning) ex: MO600A-G FB and MR (for high-speed outer race overrunning) ex: MR600A FB.



Model Number	Mode of Operation	Std. Lubrication
MG750-1000	General Backstopping and Overrunning	Oil
MR750-1000	Overrunning Outer Race	Oil
MI 750-1000	Indexing	Oil
MO 750-1000	General Backstopping and Overrunning	Grease

Model No.	DIMENSIONS										No. of Tapped (Mnt'g.) Holes²	Thread Size	Usable Thread Depth	Oil Hole Size	Lube	Approx. Wt.	
	C		D		E		F		G							lbs.	kg
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm							
MG750															Oil		
MR750	5.875	149.23	6	152	4.25	108.0	6.000 / 6.001	152.40 / 152.43	0.2500	6.350	8	.50 - 20	1	.250 - 28	Oil	84	38
MI750															Oil		
MG800															Oil		
MR800	5.875	149.23	6	152	5.50	139.7	7.500 / 7.501	190.50 / 190.53	0.1875	4.763	8	.50 - 20	1	.250 - 28	Oil	105	48
MI800															Oil		
MG900															Oil		
MR900	6.250	158.75	6.375	162	6.50	165.1	8.750 / 8.751	222.25 / 222.28	0.1875	4.763	10	0.625 - 18	1.25	.250 - 28	Oil	158	72
MI900															Oil		
MG1000															Oil		
MR1000	6.750	171.45	7	178	7.75	196.9	10.500 / 10.501	266.70 / 266.73	0.1875	4.763	12	0.625 - 18	1.25	.250 - 28	Oil	253	115
MI1000															Oil		

¹ Stock bore sizes have hardened inner races and cannot be reworked. Non-stock bores can be furnished at an additional charge. To minimize critical stresses in keyway area of inner race, clutch keyways have radius in corners; a matching key is furnished with each stock bore clutch, except metric.

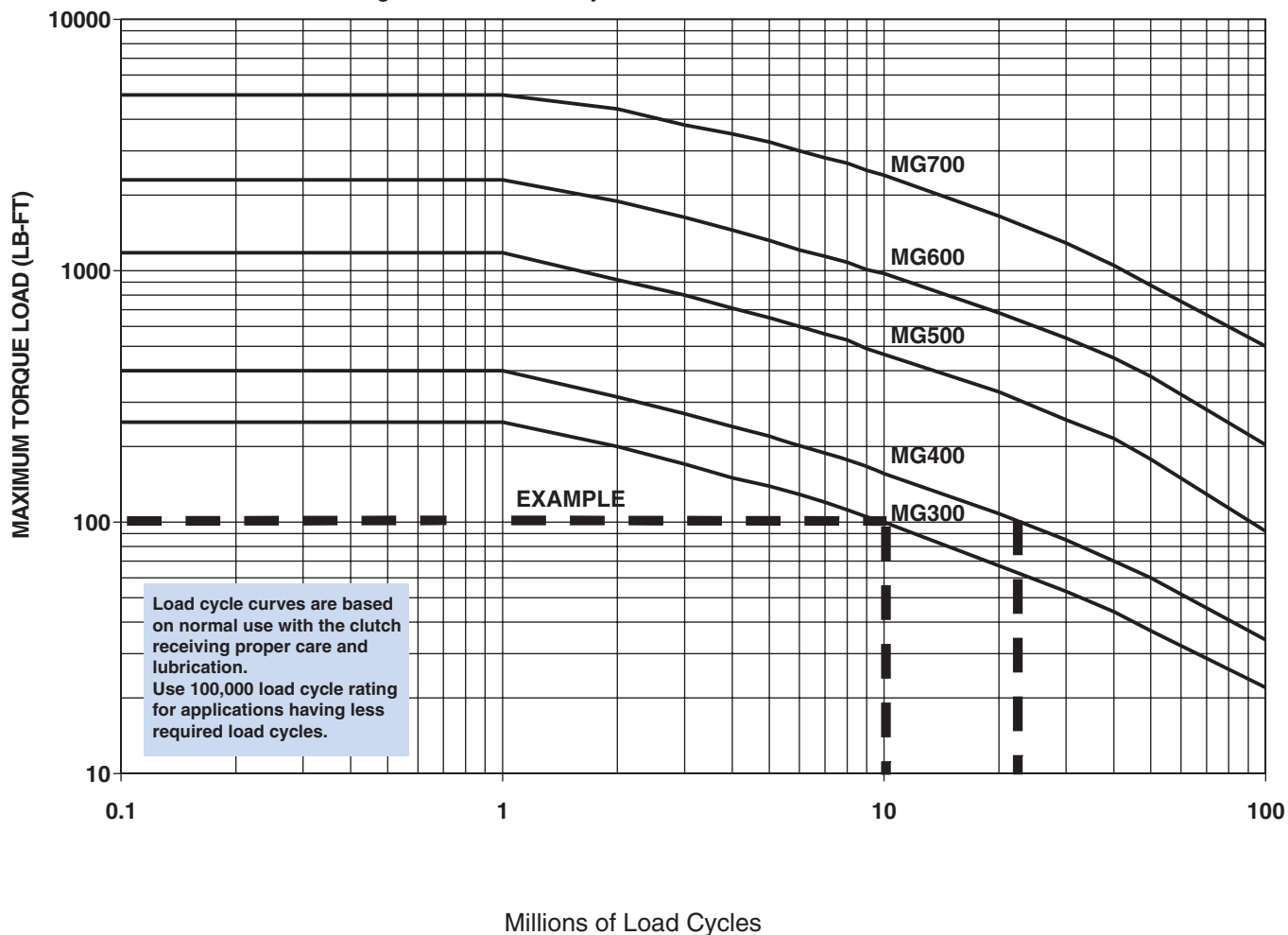
² Mounting holes are equally spaced on all models except model 700 which has six equally spaced mounting holes plus two additional positioned 30° from the equally spaced holes and 180° apart.

Load-Cycle Performance Curves, Models MG & MI (300 - 700A)

The load life cycle curves in Figure 1 apply to clutches used in indexing applications. Using actual torque calculated from Step 4 on page 75, clutch selection can be made from Figure 1. Locate the point at which the horizontal torque line intersects clutch curve(s). At intersections, draw a line vertically downward to read life cycle expectancy in millions of load cycles. If the torque line intersects more than one clutch curve, select a clutch on the basis of desired life. Check to see that the selected clutch meets bore requirements.

Example: A clutch is required for indexing application on a low speed press. The actual torque = 100 lb. - ft. and bore requirement is 3/4 inches, the cyclic rate = 130 strokes/minute. From Figure 1, 100 lb. - ft. torque line intersects clutch curves MG300A and MG400A. Models MG300A and MG400A meet the torque and bore requirements of the application. Clutch selection to be based on desired cyclic life (MG300A, 10 million cycles; MG400A, 23 million cycles).

Figure 1. Load Life-Cycle for Morse MG Clutch Models

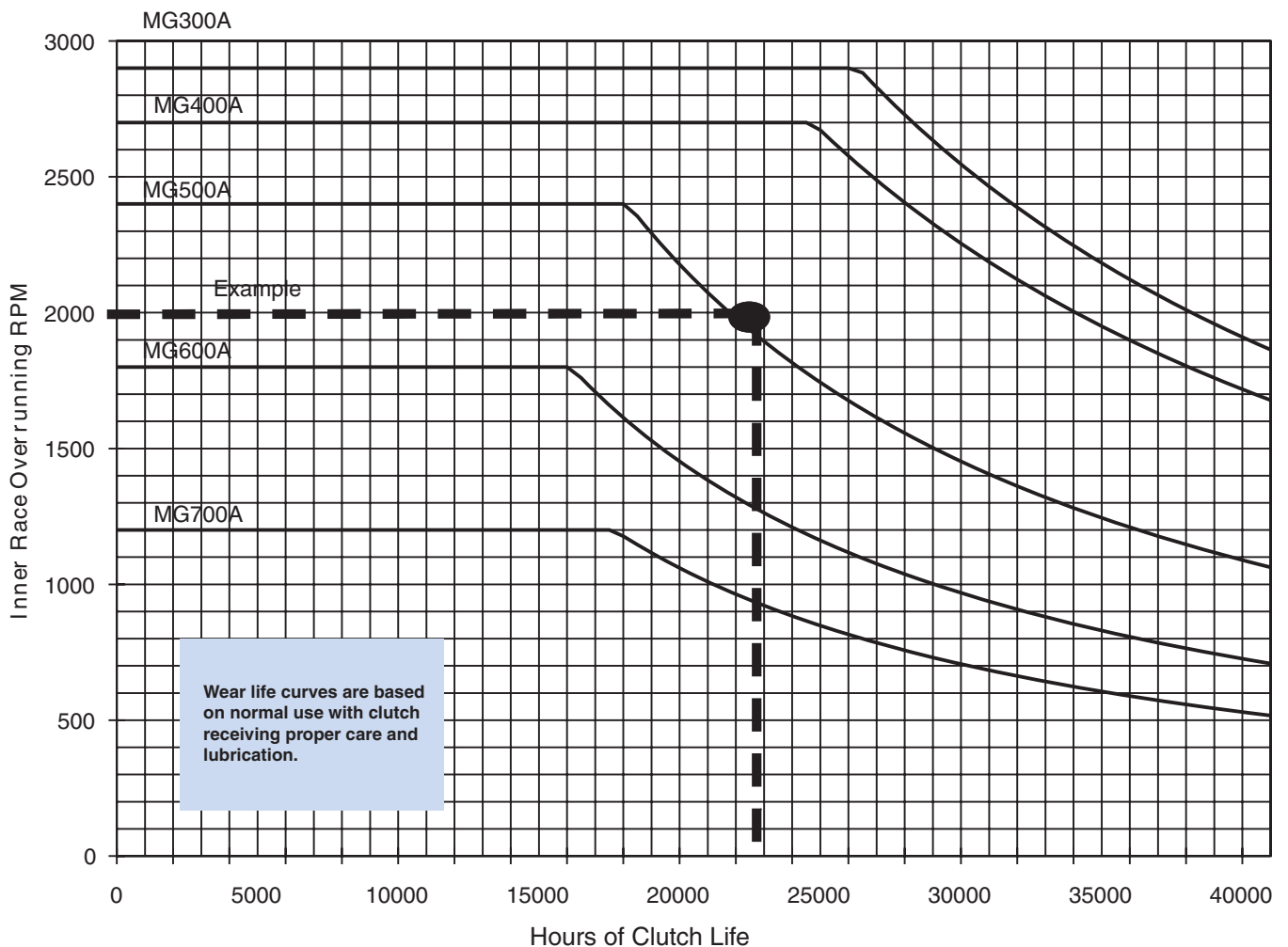


Clutch Wear Life Curves, Models MG (300 - 700A)

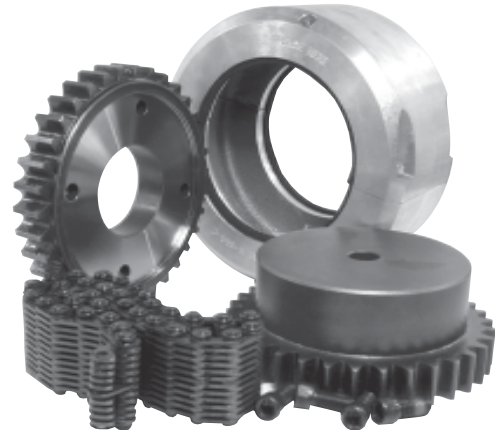
The wear life curves shown in Figure 2 apply to clutches used in overrunning or backstopping applications. Use inner race overrunning rpm and clutch size selected in steps 6 and 7 on page 75 to determine expected wear life.

Example: Assume clutch selected is Model MG500A, which operates at an inner race overrunning speed of 2000 rpm. From Figure 2, the 2000 rpm line is drawn horizontally to point of intersection with the MG500A curve. From the point of intersection, draw a line vertically downward to read hours of clutch life (23,000).

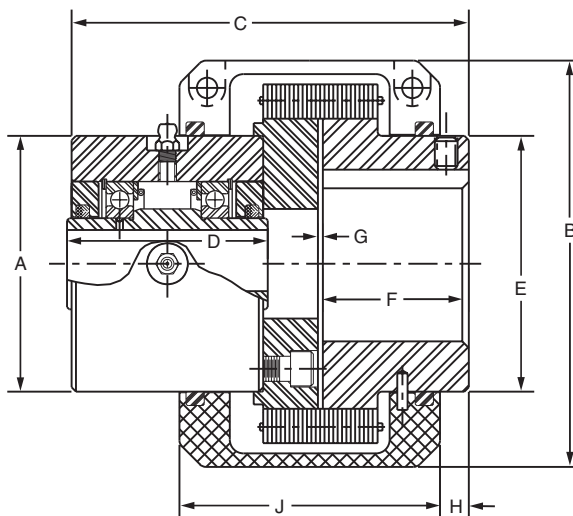
Figure 2. Clutch Wear Life Model MG (300A - 700A)



- Morse clutch couplings are used in applications that require the coupling of two in-line shafts, such as a motor shaft and a generator shaft.
- Coupling numbers C-3 through C-7 consist of Morse silent chain flexible couplings and are used with clutch models MG300A-700A.
- Coupling bore tolerances are the same as M Series bore tolerances.
- Order clutch couplings and clutch separately. The clutch coupling is normally stocked minimum plain bore. For finished bore, standard rework charges apply.



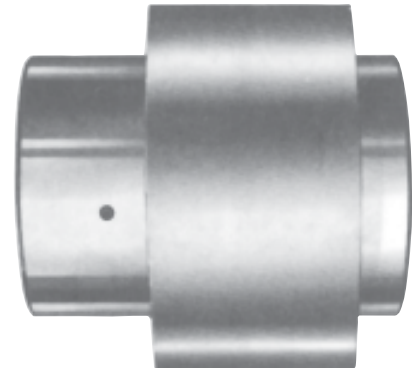
Model No	Torque Capacity		Clutch Model No.	Maximum Overrunning rpm		Coupling Bore				Clutch Stock Bore Size and Keyway				A		B	
				Inner Race	Outer Race	Min. (Stock)		Max.									
	Lb-Ft	N-m				Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm		
C-3	275	373	MG-300A	2,900	800	.488 / .490	12.40 / 12.45	2,000	50,800	0.500	0.125 x 0.063	12.70	3.18 x 1.59	2.988 / 3.000	75.90 / 76.20	4.875	123.83
			MO-300A	3,500						0.625		15.88					
			MR-300A	2,900						0.750	0.188 x 0.094	19.05	4.76 x 2.38				
C-4	400	542	MG-400A	2,700	800	.613 / .615	15.57 / 15.62	2,375	60,325	0.625	0.188 x 0.094	15.88	4.76 x 2.38	3.498 / 3.500	88.85 / 88.90	5.563	141.29
			MO-400A	3,300						0.750		19.05					
			MR-400A	2,700						0.875	0.188 x 0.094	22.23	4.76 x 2.38				
C-5	1175	1593	MG-500A	2,400	750	.613 / .615	15.57 / 15.62	2,500	63,500	0.875	0.188 x 0.094	22.23	4.76 x 2.38	4.248 / 4.250	107.90 / 107.95	6.625	168.28
			MO-500A	2,900						1.000		25.40					
			MR-500A	2,400						1.125	0.250 x 0.125	28.58	6.35 x 3.18				
C-6	2250	3051	MG-600A	1,800	700	.738 / .740	18.75 / 18.80	3,500	88,900	1.250	0.250 x 0.125	31.75	6.35 x 3.18	5.373 / 5.375	136.47 / 136.53	8.438	214.31
				1,375						0.313 x 0.156	34.93	7.94 x 3.97					
			MO-600A	2,200						1.500		38.10					
				2,200						1.625	0.375 x 0.188	41.28	9.53 x 4.76				
				2,100						1.750		44.45					
C-7	5000	6779	MG-700A	1,200	400	1.488 / 1.490	37.80 / 37.85	4,000	101,600	2.000	0.50 x 0.250	50.80	12.70 x 6.35	7.123 / 7.125	180.92 / 180.98	9.750	247.65
				2,250							57.15						
			MO-700A	1,800						2.437		61.90					
				1,800						2.500	0.625 x 0.313	63.50	15.88 x 7.94				
				1,750						2.750		69.85					
			MR-700A	1,750					2.937	0.625 x 0.125	74.60	15.88 x 3.18					



Model No	C		D		E		F		G		H		I		J		Max. End Float		Max. Angular Misalignment	Max. Parallel Misalignment		Approximate Weight Clutch Coupling Assembly	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Degree	Inches	mm	lb	kg
C-3	4.938	125.41	2.50	63.5	3.000	76.20	1.813	46.04	0.125	3.18	0.469	11.91	2.938	74.61	2.94	74.7	+0.094 -0	+2.38 -0	1/2	0.010	0.25	8	4
C-4	5.563	141.29	2.75	69.9	3.500	88.90	2.000	50.80	0.125	3.18	0.406	10.32	3.563	90.49	3.56	90.4	+0.188 -0	+4.76 -0	1/2	0.010	0.25	12	5
C-5	6.313	160.34	3.50	88.9	4.250	107.95	2.000	50.80	0.125	3.18	0.375	9.53	3.563	90.49	3.56	90.4	+0.188 -0	+4.76 -0	1/2	0.010	0.25	19	9
C-6	7.813	198.44	3.75	95.3	5.375	136.53	3.000	76.20	0.125	3.18	0.938	23.81	4.563	115.89	4.56	115.8	+0.250 -0	+6.35 -0	1/2	0.015	0.38	34	15
C-7	9.313	236.54	5.00	127.0	7.125	180.98	3.250	82.55	0.125	3.18	0.938	23.81	4.563	115.89	4.56	115.8	+0.250 -0	+6.35 -0	1/2	0.015	0.38	52	24

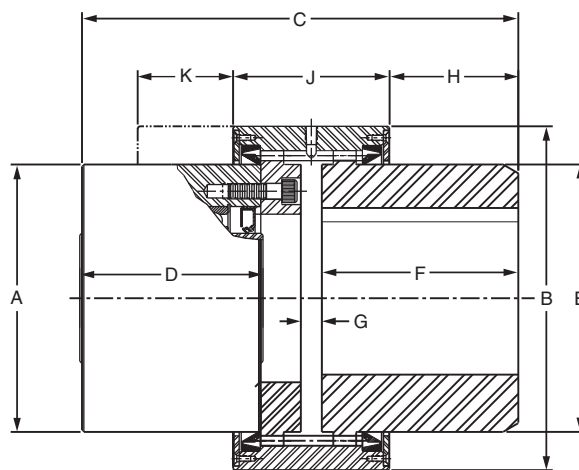
Coupling Package C7.5 Through C10

- Morse clutch couplings are used in applications that require the coupling of two in-line shafts, such as a motor shaft and generator shaft.
- Coupling numbers C-7.5 through C-10 are used with MG750 - 1000 clutches for inner race overrunning applications and with MR750 - 1000 clutches for outer race overrunning applications.
- Order clutch couplings and clutch separately. The clutch coupling is normally stocked minimum plain bore. For finished bore, standard rework charges apply.



Model No	Torque Capacity		Clutch Model No.	Maximum Overrunning rpm		Coupling Bore				Clutch Stock Bore Size and Keyway				A		B	
				Inner Race	Outer Race	Min. (Stock)		Max.									
	Lb-Ft	N-m				Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm		
C-7.5	7,000	9,491	MG-750	1,800	600	1.5	38	6.0	152	2.437	0.625 x 0.313	61.90	15.88 x 7.94	8.748 / 8.750	222.20 / 222.25	11.250	285.75
										2.500		63.50					
										2.750		69.85					
										2.937	0.750 x 0.375	74.60	19.05 x 9.53				
			3.000	76.20													
			3.250	0.750 x 0.250	88.90					19.05 x 6.35							
			3.437	0.750 x 0.188	87.30					19.05 x 4.76							
			C-8	13,000	17,626					MG-800	1,300	475	1.5				
3.250	88.90																
3.437	87.30																
3.500	0.875 x 0.438	88.90				22.23 x 11.11											
3.750		95.25															
3.937		1 x 0.50					100.00	25.40 x 12.70									
4.000	101.60																
4.250	1 x 0.375					107.95	25.40 x 9.53										
4.437	1 x 0.250	112.70	25.40 x 6.35														
C-9	18,000	24,405	MG-900	1,200	400	2.5	64	8.0	203	4.000	1 x 0.50	101.60	25.40 x 12.70	11.997 / 12.000	304.72 / 304.80	14.875	377.83
										4.250		107.95					
										4.437		112.70					
										4.500	114.30						
			4.750	1 x 0.375	120.65					25.40 x 9.53							
			4.937		125.40												
			5.000		127.00												
			5.250	1 x 0.250	133.35					25.40 x 6.35							
5.437	138.10																
C-10	25,000	33,896	MG-1000		1,200	325	2.5	64	8.0		203	5.000	1.250 x 0.625	127.00	31.75 x 15.88	14.997 / 15.000	380.92 / 381.00
				5.250						133.35							
				5.437						138.10							
				5.500						139.70							
			5.750	1.250 x 0.438	146.05	31.75 x 11.11											
			5.937		150.80												
			6.000		152.40												
			6.250	1.250 x 0.375	158.75	31.75 x 9.53											
6.437	163.50																

Coupling Package C7.5 Through C10

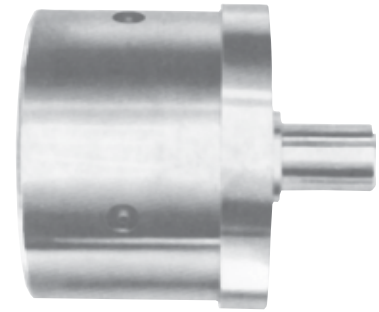


Model No	C		D		E		F		G		H		J		K		Max. End Float		Max. Angular Misalign-ment	Max. Parallel Misalignm-ent		Approximate Weight Clutch Coupling Assembly	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Degree	Inches	mm	lb	kg
C-7.5	14.375	365.13	6.000	152.40	8.75	222.3	6.438	163.51	0.688	17.46	4.188	106.36	5.125	130.18	3.125	79.38	+ 0.250 -0.625	+6.35 -15.88	0.50	0.010	0.25	150	68
C-8	14.375	365.13	6.000	152.40	10.00	254.0	6.438	163.51	0.688	17.46	4.188	106.36	5.125	130.18	3.125	79.38	+ 0.250 -0.625	+6.35 -15.88	0.50	0.010	0.25	170	77
C-9	14.938	379.41	6.375	161.93	12.00	304.8	6.625	168.28	0.688	17.46	4.250	107.95	5.375	136.53	3.125	79.38	+ 0.250 -0.625	+6.35 -15.88	0.50	0.010	0.25	250	113
C-10	16.125	409.58	7.000	177.80	12.00	304.8	7.250	184.15	0.688	17.46	4.938	125.41	5.250	133.35	3.125	79.38	+ 0.250 -0.625	+6.35 -15.88	0.50	0.010	0.25	300	136

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Flanged Stub-Shaft Adapters

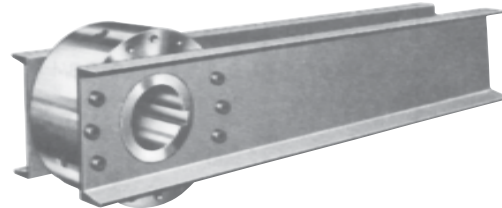
The Morse flanged stub-shaft adapter is used when it is impractical to mount a sprocket, gear, sheave or other mechanical device directly to the mounting holes of the M Series clutch models M300A - M1000. The stub shaft diameter is designed to take full advantage of the clutch torque capacity, but may be turned to smaller diameters for an extra charge.



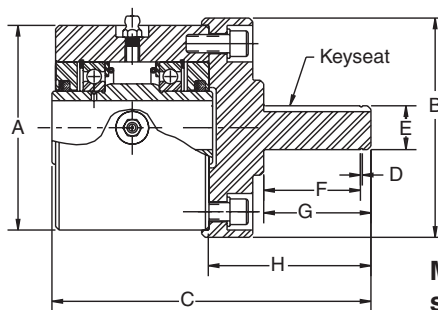
Adapter Number	Clutch Model Number	Dimensions									
		A (Clutch Diameter)		B (Flange Diameter)		C (Overall Length)		D (Groove Width)		E (Stub Shaft Diameter)	
		Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
A - 3	300A	2.998 / 3.000	76.15 / 76.20	3.250	82.55	4.844	123.03	.033 / .043	0.84 / 1.09	.750 / .751	19.05 / 19.08
A - 4	400A	3.498 / 3.500	88.85 / 88.90	3.750	95.25	5.094	129.38	.033 / .043	0.84 / 1.09	.750 / .751	19.05 / 19.08
A - 5	500A	4.248 / 4.250	107.90 / 107.95	4.500	114.30	6.188	157.16	.045 / .055	1.14 / 1.40	1.250 / 1.251	31.75 / 31.78
A - 6	600A	5.373 / 5.375	136.47 / 136.53	5.625	142.88	6.750	171.45	.055 / .065	1.40 / 1.65	1.750 / 1.751	44.45 / 44.48
A - 7	700A	7.123 / 7.125	180.92 / 180.98	7.375	187.33	8.438	214.31	.103 / .113	2.62 / 2.87	2.750 / 2.752	69.85 / 69.90
A - 7.5	750	8.748 / 8.750	222.20 / 222.25	8.313	211.14	10.500	266.70	.103 / .113	2.62 / 2.87	3.250 / 3.252	82.55 / 82.60
A - 8	800	9.998 / 10.000	253.95 / 254.00	10.250	260.35	11.125	282.58	.120 / .130	3.05 / 3.30	4.250 / 4.252	107.95 / 108.00
A - 9	900	11.997 / 12.000	304.72 / 304.80	11.500	292.10	12.250	311.15	.139 / .149	3.53 / 3.78	5.250 / 5.252	133.35 / 133.40
A -10	1000	14.997 / 15.000	380.92 / 381.00	14.000	355.60	13.875	352.43	.094 / .104	2.39 / 2.64	6.250 / 6.252	158.75 / 158.80

Torque Arms

MG and MO series clutch models can be provided with torque arms. The torque arms are fastened to the outer race by the tapped holes in the ends of the clutch. The outer ends of the torque arms should be restrained to prevent rotation of the clutch, but the torque arms must never be rigidly secured. The torque arms must be free to float to prevent any tendency toward bearing preload.

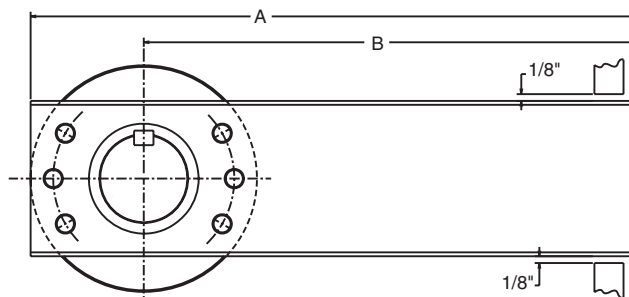
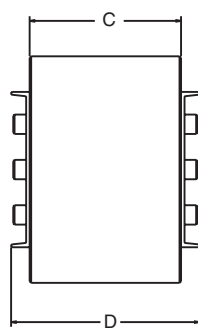
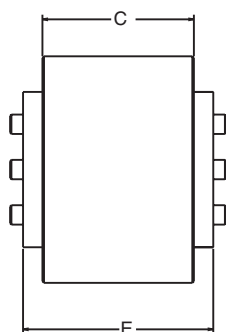


Torque Arm Number		Clutch Model Number	Dimensions					
Channel	Plate		A (Clutch Diameter)		B (Flange Diameter)		C (Overall Length)	
			Inches	mm	Inches	mm	Inches	mm
TC - 7.5	TP - 7.5	750	36.375	923.93	32	813	5.875	149.23
TC - 8	TP - 8	800	37.000	939.80	32	813	5.875	149.23
TC - 9	TP - 9	900	50.000	1270.00	44	1118	6.250	158.75
TC - 10	TP - 10	1000	54.000	1371.60	47	1194	6.750	171.45



M Series clutch with stub-shaft adapter to attach to coupling.

Adapter Number	Dimensions									
	F (Face to Snap Ring)		G (Face to Shaft End)		H (Clutch End to Shaft End)		Keyseat		Weight	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	lb	kg
A - 3	1.347 / 1.351	34.21 / 34.32	1.50	38.1	2.406	61.12	.250 x .125	6.35 x 3.18	1.4	1
A - 4	1.347 / 1.351	34.21 / 34.32	1.50	38.1	2.406	61.12	.250 x .125	6.35 x 3.18	1.6	1
A - 5	1.579 / 1.584	40.11 / 40.23	1.75	44.5	2.750	69.85	.313 x .156	7.94 x 3.97	3.2	1
A - 6	1.835 / 1.840	46.61 / 46.74	2.00	50.8	3.063	77.79	.375 x .188	9.53 x 4.76	5.8	3
A - 7	2.335 / 2.340	59.31 / 59.44	2.50	63.5	3.500	88.90	.625 x .312	15.88 x 7.94	12.6	6
A - 7.5	2.804 / 2.809	71.22 / 71.35	3.00	76.2	4.563	115.89	.750 x .375	19.05 x 9.53	23.8	11
A - 8	3.566 / 3.571	90.58 / 90.70	3.75	95.3	5.188	131.76	1 x .50	25.40 x 12.70	40.5	18
A - 9	4.316 / 4.321	109.63 / 109.75	4.50	114.3	5.938	150.81	1.250 x .625	31.75 x 15.88	62.8	28
A - 10	5.140 / 5.145	130.56 / 130.68	5.50	139.7	7.000	177.80	1.250 x .625	31.75 x 15.88	103.4	47



Torque Arm Number			Dimensions							
Channel	Plate	Clutch Model Number	D Width (Two Channels)		E Width (Two Plates)		Channel Size Width x lb./ft.	Plate Size	Weight (Each Arm)	
			Inches	mm	Inches	mm	Inches	mm	lb	kg
TC - 7.5	TP - 7.5	750	9.625	244.48	7.375	187.33	6 x 8.2	0.750 x 6	52	24
TC - 8	TP - 8	800	10.375	263.53	7.625	193.68	8 x 11.5	0.875 x 8	73	33
TC - 9	TP - 9	900	11.500	292.10	8.000	203.20	10 x 15.3	0.875 x 12	129	59
TC - 10	TP - 10	1000	12.000	304.80	8.500	215.90	10 x 15.3	0.875 x 12	138	63

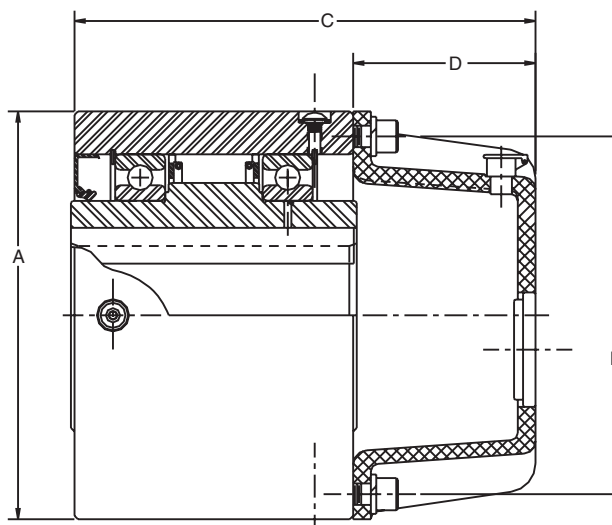
Oil Reservoirs

An oil reservoir attachment is available for applications such as backstops on the high speed shaft of a reducer, backstops on the head shaft of conveyors and applications where clutches are relatively inaccessible or where a minimum of maintenance is required. The reservoir is designed for direct mounting on any stock MG clutch. Reservoirs can only be used where the clutch is in backstop service (inner race overrunning).

Since the direction of rotation cannot always be specified, clutches are shipped with oil seals in both ends of the clutch. When attaching the reservoir to the clutch, the user should remove the oil seal on the reservoir side after determining the proper direction of rotation of the clutch. This seal should not be reused because it is damaged by the removal process. The reservoir is an aluminum casting with cooling fins and has an oil sight gauge.



Reservoir Number	Fits Clutch Model Number	Maximum I.R. Overrunning rpm	Dimensions	
			A (Clutch Diameter)	
			Inches	mm
R-3	300A	2900	2.998 / 3.000	76.15 / 76.20
R-4	400A	2700	3.498 / 3.500	88.85 / 88.90
R-5	500A	2400	4.248 / 4.250	107.90 / 107.95
R-6	600A	2100	5.373 / 5.375	136.47 / 136.53
R-7	700A	1500	7.123 / 7.125	180.92 / 180.98
R-7.5	750	1800	8.748 / 8.750	222.20 / 222.25
R-8	800	1300	9.998 / 10.000	253.95 / 254.00
R-9	900	1200	11.997 / 12.000	304.72 / 304.80
R-10	1000	1200	14.997 / 15.000	380.92 / 381.00



Reservoir Number	Dimensions						Weight	
	B (Bolt Circle)		C (Overall Length)		D (Reservoir Length)			
	Inches	mm	Inches	mm	Inches	mm	lb	kg
R-3	2.6250	66.675	4.5625	115.888	2.1250	53.975	0.50	0.2
R-4	2.8750	73.025	4.8125	122.238	2.1250	53.975	0.60	0.3
R-5	3.6250	92.075	6.0625	153.988	2.6250	66.675	0.90	0.4
R-6	4.7500	120.650	6.5000	165.100	2.8125	71.438	1.50	0.7
R-7	6.2500	158.750	8.1250	206.375	3.1875	80.963	2.70	1.2
R-7.5	7.0000	177.800	11.0000	279.400	5.0625	128.588	5.00	2.3
R-8	8.9375	227.013	11.5000	292.100	5.5625	141.288	10.00	4.5
R-9	9.7500	247.650	12.2500	311.150	5.9375	150.813	14.00	6.4
R-10	11.7500	298.450	13.0000	330.200	6.1250	155.575	25.00	11.3

The sprag type MZEU Series cam clutch is a leader in its class. This one-way clutch began as a ratchet ramp clutch, transitioned to a roller ramp clutch and was later refined into the cam style clutch it is today. The MZEU Series clutch delivers longer life to the clutch mechanism than other types of one way clutches. The MZEU Series cam clutch is suitable for overrunning and middle speed backstopping.



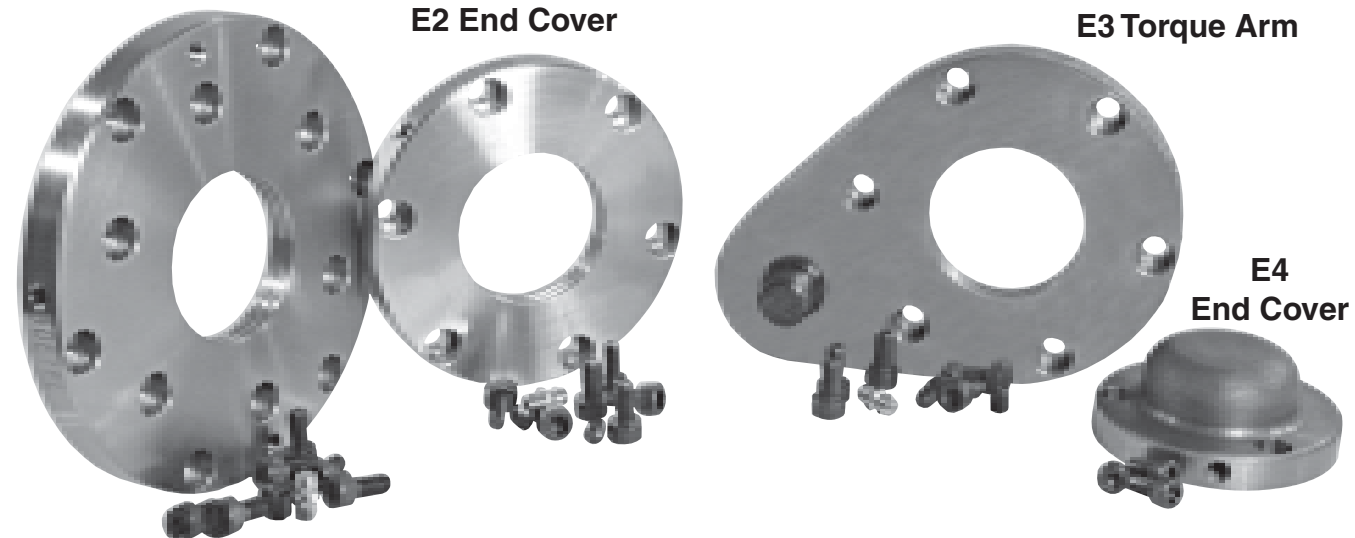
Model No.	Torque Capacity		Max. Overrunning Speed		Drag Torque	Bore Size		Keyway	A		B (h7)		C	
			Inner Race	Outer Race										
	N-m	ft/lbs.	rpm	rpm	N-m	H7 (mm)	H7 (in)		mm	inch	(mm)	in	mm	inch
MZEU12	60	44.3	2000	1000	0.20	12	0.472	4x1.8	42	1.654	62	2.441	20	0.787
MZEU15	100	73.8	1800	900	0.20	15	0.591	5x2.3	52	2.047	68	2.677	28	1.102
MZEU20	245	180.7	1600	700	0.29	20	0.787	6x2.8	57	2.244	75	2.953	34	1.339
MZEU25	425	313.5	1600	600	0.33	25	0.984	8x3.3	60	2.362	90	3.543	35	1.378
MZEU30	735	542.1	1500	500	0.39	30	1.181	8x3.3	68	2.677	100	3.937	43	1.693
MZEU35	1015	748.6	1400	300	0.49	35	1.378	10x3.3	74	2.913	110	4.331	45	1.772
MZEU40	1350	995.7	1400	300	0.59	40	1.575	12x3.3	86	3.386	125	4.921	53	2.087
MZEU45	1620	1194.9	1400	300	0.69	45	1.772	14x3.8	86	3.386	130	5.118	53	2.087
MZEU50	2070	1526.8	1300	250	0.79	50	1.969	14x3.8	94	3.701	150	5.906	64	2.520
MZEU55	2400	1770.2	1300	250	0.88	55	2.165	16x4.3	104	4.094	160	6.299	66	2.598
MZEU60	2950	2175.8	1200	250	0.98	60	2.362	18x4.4	114	4.488	170	6.693	78	3.071
MZEU70	4210	3105.2	1100	250	1.27	70	2.756	20x4.9	134	5.276	190	7.480	95	3.740
MZEU80	5170	3813.2	800	200	1.38	80	3.150	22x5.4	144	5.669	210	8.268	100	3.937
MZEU90	12000	8850.9	450	150	4.70	90	3.543	25x5.4	158	6.220	230	9.055	115	4.528
MZEU100	17600	12981.3	400	130	5.39	100	3.937	28x6.4	182	7.165	270	10.630	120	4.724
MZEU130	24500	18070.5	320	110	6.76	130	5.118	32x7.4	212	8.346	310	12.205	152	5.984
MZEU150	33800	24929.9	240	80	8.13	150	5.906	36x8.4	246	9.685	400	15.748	180	7.087

E1 End Cover

E2 End Cover

E3 Torque Arm

E4 End Cover



Features

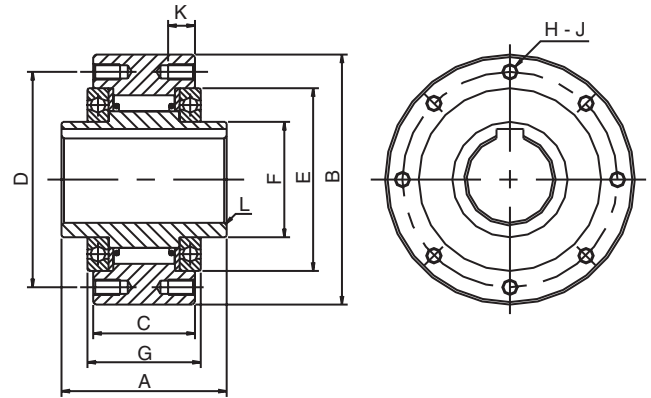
- Sprag type one way clutch
- High torque and longer life than roller ramp clutches
- A variety of options, such as torque arm, flanges, and cover are available according to your installation requirements

Industries Served

- Food and beverage
- Gearing
- Manufacturing
- Textiles

Field Applications

- Conveyors
- External gearbox backstop
- General equipment backstop for drive shaft



Model No.	D		E		F		G		H-J	K		L		Weight	
	mm	inch	mm	inch	mm	inch	mm	inch		mm	inch	mm	inch	Kg	lb.
MZEU12	51	2.008	42	1.654	20	0.787	27	1.063	3-Ø5.5	-	-	0.5	0.020	0.5	1.1
MZEU15	56	2.205	47	1.850	25	0.984	32	1.260	3-M5	8	0.315	0.8	0.031	0.8	1.8
MZEU20	64	2.520	55	2.165	30	1.181	39	1.535	4-M5	8	0.315	0.8	0.031	1.2	2.6
MZEU25	78	3.071	68	2.677	40	1.575	40	1.575	4-M6	10	0.394	1.0	0.039	1.8	4.0
MZEU30	87	3.425	75	2.953	45	1.772	48	1.890	6-M6	10	0.394	1.0	0.039	2.6	5.7
MZEU35	96	3.780	80	3.150	50	1.969	51	2.008	6-M6	12	0.472	1.0	0.039	3.2	7.1
MZEU40	108	4.252	90	3.543	55	2.165	59	2.323	6-M8	14	0.551	1.5	0.059	4.8	10.6
MZEU45	112	4.409	95	3.740	60	2.362	59	2.323	8-M8	14	0.551	1.5	0.059	6.2	13.7
MZEU50	132	5.197	110	4.331	70	2.756	72	2.835	8-M8	14	0.551	1.5	0.059	8.2	18.1
MZEU55	138	5.433	115	4.528	75	2.953	72	2.835	8-M10	16	0.630	2.0	0.079	9.5	20.9
MZEU60	150	5.906	125	4.921	80	3.150	89	3.504	10-M10	16	0.630	2.0	0.079	12.3	27.1
MZEU70	165	6.496	140	5.512	90	3.543	108	4.252	10-M10	16	0.630	2.5	0.098	18.1	39.9
MZEU80	185	7.283	160	6.299	105	4.134	108	4.252	10-M10	16	0.630	2.5	0.098	23.1	50.9
MZEU90	206	8.110	180	7.087	120	4.724	125	4.921	10-M12	20	0.787	3.0	0.118	28.1	61.9
MZEU100	240	9.449	210	8.268	140	5.512	131	5.157	10-M16	24	0.945	3.0	0.118	46.3	102.1
MZEU130	278	10.945	240	9.449	160	6.299	168	6.614	12-M16	24	0.945	3.0	0.118	70.2	154.8
MZEU150	360	14.173	310	12.205	200	7.874	194	7.638	12-M20	32	1.260	4.0	0.157	146.3	322.5

Building Block Principle of Standardization

The MZEU series clutches offer various combinations of covers, which can be assembled to meet a full range of applications. These units incorporate two metric ball bearings between the inner and outer races giving excellent concentricity control.

The outer diameter of the outer race is produced to a close tolerance and can be used for mounting gears, v-belt sheaves, indexing arms, etc. Tapped holes are provided at the face of the outer race and are used to secure the various covers. These tapped holes can also be used for attaching specially designed covers or adapter plates to suit special design considerations. The range of application for these clutches is very extensive and by using the various combinations of covers, it is possible to build units for overrunning applications (MZEU with E1-E2), to prevent reverse rotation (backstopping) MZEU E2-E3 or E3-E4 or to convert linear motion to rotary motion (indexing) MZEU E1-E2 with indexing arm bolted to cover E1.

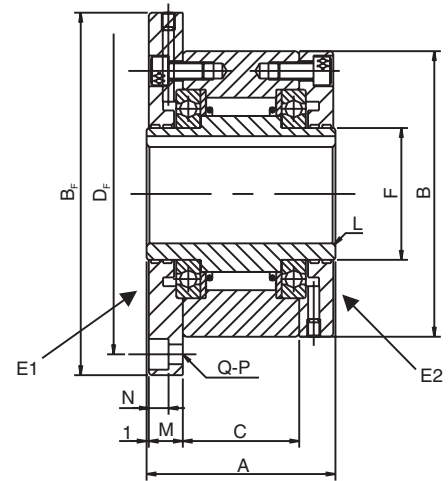
Part Number Explanation

MZEU 60 E1 + E2

- End cover (ordered separately*)
- End cover (ordered separately*)
- Bore sizes in millimeters
- Clutch series

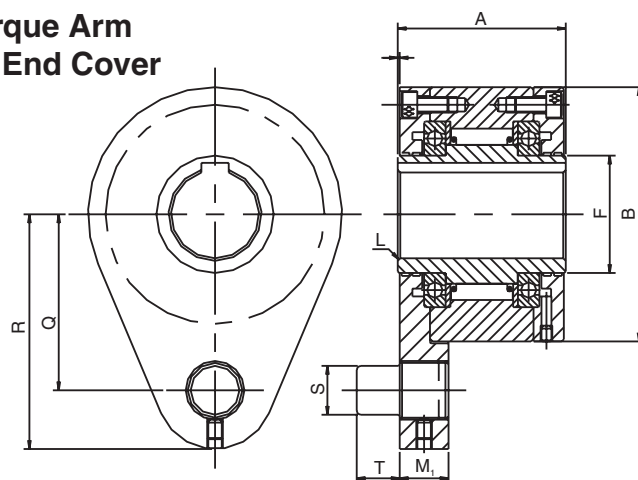
* Covers ordered separately. Example: MZEU60-E1 cover or MZEU60-E2 cover.

E1 + E2 End Covers



Model No.	Torque Capacity		Max. Overrunning Speed		Drag Torque	Bore Size (H7)		Keyway	A		B (h7)		B _F		C	
			Inner Race	Outer Race												
	N-m	ft/lbs.	rpm	rpm	N-m	mm	inch		mm	inch	mm	inch	mm	inch	mm	inch
MZEU12 E1+E2	60	44.3	2000	1000	0.20	12	0.472	4x1.8	42	1.654	62	2.441	85	3.346	20	0.787
MZEU15 E1+E2	100	73.8	1800	900	0.20	15	0.591	5x2.3	52	2.047	68	2.677	92	3.622	28	1.102
MZEU20 E1+E2	245	180.7	1600	700	0.29	20	0.787	6x2.8	57	2.244	75	2.953	98	3.858	34	1.339
MZEU25 E1+E2	425	313.5	1600	600	0.33	25	0.984	8x3.3	60	2.362	90	3.543	118	4.646	35	1.378
MZEU30 E1+E2	735	542.1	1500	500	0.39	30	1.181	8x3.3	68	2.677	100	3.937	128	5.039	43	1.693
MZEU35 E1+E2	1015	748.6	1400	300	0.49	35	1.378	10x3.3	74	2.913	110	4.331	140	5.512	45	1.772
MZEU40 E1+E2	1350	995.7	1400	300	0.59	40	1.575	12x3.3	86	3.386	125	4.921	160	6.299	53	2.087
MZEU45 E1+E2	1620	1194.9	1400	300	0.69	45	1.772	14x3.8	86	3.386	130	5.118	165	6.496	53	2.087
MZEU50 E1+E2	2070	1526.8	1300	250	0.79	50	1.969	14x3.8	94	3.701	150	5.906	185	7.283	64	2.520
MZEU55 E1+E2	2400	1770.2	1300	250	0.88	55	2.165	16x4.3	104	4.094	160	6.299	204	8.031	66	2.598
MZEU60 E1+E2	2950	2175.8	1200	250	0.98	60	2.362	18x4.4	114	4.488	170	6.693	214	8.425	78	3.071
MZEU70 E1+E2	4210	3105.2	1100	250	1.27	70	2.756	20x4.9	134	5.276	190	7.480	234	9.213	95	3.740
MZEU80 E1+E2	5170	3813.2	800	200	1.38	80	3.150	22x5.4	144	5.669	210	8.268	254	10.000	100	3.937
MZEU90 E1+E2	12000	8850.9	450	150	4.70	90	3.543	25x5.4	158	6.220	230	9.055	278	10.945	115	4.528
MZEU100 E1+E2	17600	12981.3	400	130	5.39	100	3.937	28x6.4	182	7.165	270	10.630	335	13.189	120	4.724
MZEU130E1+E2	24500	18070.5	320	110	6.76	130	5.118	32x7.4	212	8.346	310	12.205	380	14.961	152	5.984
MZEU150 E1+E2	33800	24929.9	240	80	8.13	150	5.906	36x8.4	246	9.685	400	15.748	485	19.094	180	7.087

Model No.	D _F		F		L		M		N		Q-P	Weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		Kg	lbs.
MZEU12 E1+E2	72	2.835	20	0.787	0.5	0.020	10	0.394	5.7	0.224	3-Ø5.5	1.1	2.4
MZEU15 E1+E2	78	3.071	25	0.984	0.8	0.031	11	0.433	5.7	0.224	3-Ø5.5	1.5	3.3
MZEU20 E1+E2	85	3.346	30	1.181	0.8	0.031	10.5	0.413	5.7	0.224	4-Ø5.5	1.9	4.2
MZEU25 E1+E2	104	4.094	40	1.575	1.0	0.039	11.5	0.453	6.8	0.268	4-Ø6.6	2.9	6.4
MZEU30 E1+E2	114	4.488	45	1.772	1.0	0.039	11.5	0.453	6.8	0.268	6-Ø6.6	4.0	8.8
MZEU35 E1+E2	124	4.882	50	1.969	1.0	0.039	13.5	0.531	6.8	0.268	6-Ø6.6	5.2	11.5
MZEU40 E1+E2	142	5.591	55	2.165	1.5	0.059	15.5	0.610	9.0	0.354	6-Ø9	7.9	17.4
MZEU45 E1+E2	146	5.748	60	2.362	1.5	0.059	15.5	0.610	9.0	0.354	8-Ø9	9.3	20.5
MZEU50 E1+E2	166	6.535	70	2.756	1.5	0.059	14	0.551	9.0	0.354	8-Ø9	11.7	25.8
MZEU55 E1+E2	182	7.165	75	2.953	2.0	0.079	18.0	0.709	11.0	0.433	8-Ø11	15.3	33.7
MZEU60 E1+E2	192	7.559	80	3.150	2.0	0.079	17.0	0.669	11.0	0.433	10-Ø11	17.7	39.0
MZEU70 E1+E2	212	8.346	90	3.543	2.5	0.098	18.5	0.728	11.0	0.433	10-Ø11	25.5	56.2
MZEU80 E1+E2	232	9.134	105	4.134	2.5	0.098	21	0.827	11.0	0.433	10-Ø11	33.2	73.2
MZEU90 E1+E2	254	10.000	120	4.724	3.0	0.118	20.5	0.807	13.0	0.512	10-Ø14	38.3	84.4
MZEU100 E1+E2	305	12.008	140	5.512	3.0	0.118	30.0	1.181	17.5	0.689	10-Ø18	68.8	151.7
MZEU130E1+E2	345	13.583	160	6.299	3.0	0.118	29.0	1.142	17.5	0.689	12-Ø18	98.2	216.5
MZEU150 E1+E2	445	17.520	200	7.874	4.0	0.157	32.0	1.260	21.5	0.846	12-Ø22	198.2	437.0


E3 Torque Arm
with E2 End Cover


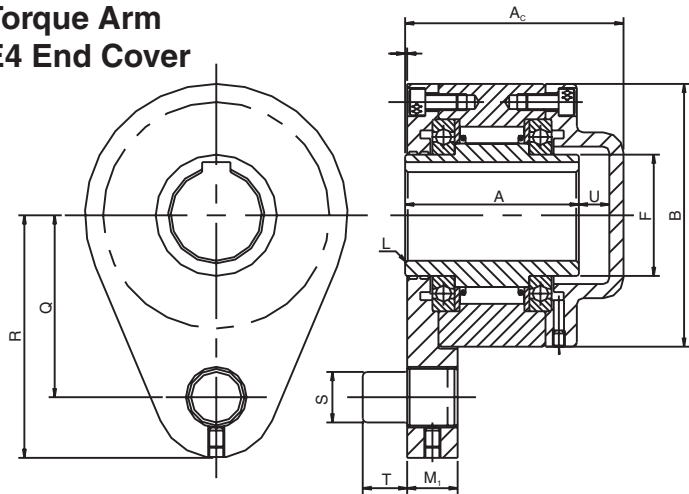
Model No.	Torque Capacity		Max. Overrunning Speed	Drag Torque	Bore Size (H7)		Keyway	A		B (h7)		F	
			Inner Race										
	N-m	lb/ft	rpm		mm	inch		mm	inch	mm	inch	mm	inch
MZEU12 E2+E3	60	44.3	2000	0.20	12	0.472	4x1.8	42	1.654	62	2.441	20	0.787
MZEU15 E2+E3	100	73.8	1800	0.20	15	0.591	5x2.3	52	2.047	68	2.677	25	0.984
MZEU20 E2+E3	245	180.7	1600	0.29	20	0.787	6x2.8	57	2.244	75	2.953	30	1.181
MZEU25 E2+E3	425	313.5	1600	0.33	25	0.984	8x3.3	60	2.362	90	3.543	40	1.575
MZEU30 E2+E3	735	542.1	1500	0.39	30	1.181	8x3.3	68	2.677	100	3.937	45	1.772
MZEU35 E2+E3	1015	748.6	1400	0.49	35	1.378	10x3.3	74	2.913	110	4.331	50	1.969
MZEU40 E2+E3	1350	995.7	1400	0.59	40	1.575	12x3.3	86	3.386	125	4.921	55	2.165
MZEU45 E2+E3	1620	1194.9	1400	0.69	45	1.772	14x3.8	86	3.386	130	5.118	60	2.362
MZEU50 E2+E3	2070	1526.8	1300	0.79	50	1.969	14x3.8	94	3.701	150	5.906	70	2.756
MZEU55 E2+E3	2400	1770.2	1300	0.88	55	2.165	16x4.3	104	4.094	160	6.299	75	2.953
MZEU60 E2+E3	2950	2175.8	1200	0.98	60	2.362	18x4.4	114	4.488	170	6.693	80	3.150
MZEU70 E2+E3	4210	3105.2	1100	1.27	70	2.756	20x4.9	134	5.276	190	7.480	90	3.543
MZEU80 E2+E3	5170	3813.2	800	1.38	80	3.150	22x5.4	144	5.669	210	8.268	105	4.134
MZEU90 E2+E3	12000	8850.9	450	4.70	90	3.543	25x5.4	158	6.220	230	9.055	120	4.724
MZEU100 E2+E3	17600	12981.3	400	5.39	100	3.937	28x6.4	182	7.165	270	10.630	140	5.512
MZEU130 E2+E3	24500	18070.5	320	6.76	130	5.118	32x7.4	212	8.346	310	12.205	160	6.299
MZEU150 E2+E3	33800	24929.9	240	8.13	150	5.906	36x8.4	246	9.685	400	15.748	200	7.874

Model No.	L		M ₁		Q		R		S		T		Weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Kg	lbs.
MZEU12 E2+E3	0.5	0.020	13.5	0.531	44	1.732	59	2.323	10	0.394	10	0.394	1.0	2.2
MZEU15 E2+E3	0.8	0.031	13.5	0.531	47	1.850	62	2.441	10	0.394	10	0.394	1.4	3.1
MZEU20 E2+E3	0.8	0.031	15.0	0.591	54	2.126	72	2.835	12	0.472	11	0.433	1.8	4.0
MZEU25 E2+E3	1.0	0.039	19.0	0.748	62	2.441	84	3.307	16	0.630	14	0.551	2.7	6.0
MZEU30 E2+E3	1.0	0.039	19.0	0.748	68	2.677	92	3.622	16	0.630	14	0.551	4.1	9.0
MZEU35 E2+E3	1.0	0.039	22.0	0.866	76	2.992	102	4.016	20	0.787	18	0.709	5.1	11.2
MZEU40 E2+E3	1.5	0.059	22.0	0.866	85	3.346	112	4.409	20	0.787	18	0.709	7.4	16.3
MZEU45 E2+E3	1.5	0.059	25.0	0.984	90	3.543	120	4.724	25	0.984	22	0.866	9.1	20.1
MZEU50 E2+E3	1.5	0.059	25.0	0.984	102	4.016	135	5.315	25	0.984	22	0.866	11.6	25.6
MZEU55 E2+E3	2.0	0.079	30.0	1.181	108	4.252	142	5.591	32	1.260	25	0.984	14.6	32.2
MZEU60 E2+E3	2.0	0.079	30.0	1.181	112	4.409	145	5.709	32	1.260	25	0.984	17.0	37.5
MZEU70 E2+E3	2.5	0.098	35.0	1.378	135	5.315	175	6.890	38	1.496	30	1.181	25.4	56.0
MZEU80 E2+E3	2.5	0.098	35.0	1.378	145	5.709	185	7.283	38	1.496	30	1.181	32.6	71.9
MZEU90 E2+E3	3.0	0.118	45.0	1.772	155	6.102	205	8.071	50	1.969	40	1.575	38.9	85.8
MZEU100 E2+E3	3.0	0.118	45.0	1.772	180	7.087	230	9.055	50	1.969	40	1.575	65.2	143.7
MZEU130 E2+E3	3.0	0.118	60.0	2.362	205	8.071	268	10.551	68	2.677	55	2.165	97.3	214.5
MZEU150 E2+E3	4.0	0.157	60.0	2.362	255	10.039	325	12.795	68	2.677	55	2.165	191.4	422.0

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



**E3 Torque Arm
with E4 End Cover**



Model No.	Torque Capacity		Max. Overrunning Speed	Drag Torque	Bore Size (H7)		Keyway	A		A _C		B h7		F	
			Inner Race												
	N-m	ft/lb.	rpm	N-m	mm	inch		mm	inch	mm	inch	mm	inch	mm	inch
MZEU12 E3+E4	60	44.3	2000	0.20	12	0.472	4x1.8	42	1.654	53	2.087	62	2.441	20	0.787
MZEU15 E3+E4	100	73.8	1800	0.20	15	0.591	5x2.3	52	2.047	68	2.677	68	2.677	25	0.984
MZEU20 E3+E4	245	180.7	1600	0.29	20	0.787	6x2.8	57	2.244	73	2.874	75	2.953	30	1.181
MZEU25 E3+E4	425	313.5	1600	0.33	25	0.984	8x3.3	60	2.362	76	2.992	90	3.543	40	1.575
MZEU30 E3+E4	735	542.1	1500	0.39	30	1.181	8x3.3	68	2.677	84	3.307	100	3.937	45	1.772
MZEU35 E3+E4	1015	748.6	1400	0.49	35	1.378	10x3.3	74	2.913	92	3.622	110	4.331	50	1.969
MZEU40 E3+E4	1350	995.7	1400	0.59	40	1.575	12x3.3	86	3.386	105	4.134	125	4.921	55	2.165
MZEU45 E3+E4	1620	1194.9	1400	0.69	45	1.772	14x3.8	86	3.386	108	4.252	130	5.118	60	2.362
MZEU50 E3+E4	2070	1526.8	1300	0.79	50	1.969	14x3.8	94	3.701	113	4.449	150	5.906	70	2.756
MZEU55 E3+E4	2400	1770.2	1300	0.88	55	2.165	16x4.3	104	4.094	126	4.961	160	6.299	75	2.953
MZEU60 E3+E4	2950	2175.8	1200	0.98	60	2.362	18x4.4	114	4.488	137	5.394	170	6.693	80	3.150
MZEU70 E3+E4	4210	3105.2	1100	1.27	70	2.756	20x4.9	134	5.276	164.5	6.476	190	7.480	90	3.543
MZEU80 E3+E4	5170	3813.2	800	1.38	80	3.150	22x5.4	144	5.669	168	6.614	210	8.268	105	4.134
MZEU90 E3+E4	12000	8850.9	550	3.76	90	3.543	25x5.4	158	6.220	192	7.559	230	9.055	120	4.724
MZEU100 E3+E4	17600	12981.3	500	4.31	100	3.937	28x6.4	182	7.165	217	8.543	270	10.630	140	5.512
MZEU130 E3+E4	24500	18070.5	400	5.39	130	5.118	32x7.4	212	8.346	250	9.843	310	12.205	160	6.299
MZEU150E3+E4	33800	24929.9	300	6.47	150	5.906	36x8.4	246	9.685	286	11.260	400	15.748	200	7.874

Model No.	L		M _I		Q		R		S		T		U		Weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Kg	lbs.
MZEU12 E3+E4	0.5	0.020	13.5	0.531	44	1.732	59	2.323	10	0.394	10	0.394	6.0	0.236	1.0	2.2
MZEU15 E3+E4	0.8	0.031	13.5	0.531	47	1.850	62	2.441	10	0.394	10	0.394	10.0	0.394	1.5	3.3
MZEU20 E3+E4	0.8	0.031	15.0	0.591	54	2.126	72	2.835	12	0.472	11	0.433	10.0	0.394	2.0	4.4
MZEU25 E3+E4	1.0	0.039	19.0	0.748	62	2.441	84	3.307	16	0.630	14	0.551	10.0	0.394	2.9	6.4
MZEU30 E3+E4	1.0	0.039	19.0	0.748	68	2.677	92	3.622	16	0.630	14	0.551	10.0	0.394	4.3	9.5
MZEU35 E3+E4	1.0	0.039	22.0	0.866	76	2.992	102	4.016	20	0.787	18	0.709	12.0	0.472	5.3	11.7
MZEU40 E3+E4	1.5	0.059	22.0	0.866	85	3.346	112	4.409	20	0.787	18	0.709	12.0	0.472	7.8	17.2
MZEU45 E3+E4	1.5	0.059	25.0	0.984	90	3.543	120	4.724	25	0.984	22	0.866	15.0	0.591	9.6	21.2
MZEU50 E3+E4	1.5	0.059	25.0	0.984	102	4.016	135	5.315	25	0.984	22	0.866	12.0	0.472	12.1	26.7
MZEU55 E3+E4	2.0	0.079	30.0	1.181	108	4.252	142	5.591	32	1.260	25	0.984	15.0	0.591	15.2	33.5
MZEU60 E3+E4	2.0	0.079	30.0	1.181	112	4.409	145	5.709	32	1.260	25	0.984	15.0	0.591	17.7	39.0
MZEU70 E3+E4	2.5	0.098	35.0	1.378	135	5.315	175	6.890	38	1.496	30	1.181	22.5	0.886	26.5	58.4
MZEU80 E3+E4	2.5	0.098	35.0	1.378	145	5.709	185	7.283	38	1.496	30	1.181	16.0	0.630	33.6	74.1
MZEU90 E3+E4	3.0	0.118	45.0	1.772	155	6.102	205	8.071	50	1.969	40	1.575	27.0	1.063	39.0	86.0
MZEU100 E3+E4	3.0	0.118	45.0	1.772	180	7.087	230	9.055	50	1.969	40	1.575	28.0	1.102	67.4	148.6
MZEU130 E3+E4	3.0	0.118	60.0	2.362	205	8.071	268	10.551	68	2.677	55	2.165	30.0	1.181	100.2	220.9
MZEU150E3+E4	4.0	0.157	60.0	2.362	255	10.039	325	12.795	68	2.677	55	2.165	32.0	1.260	194.8	429.5



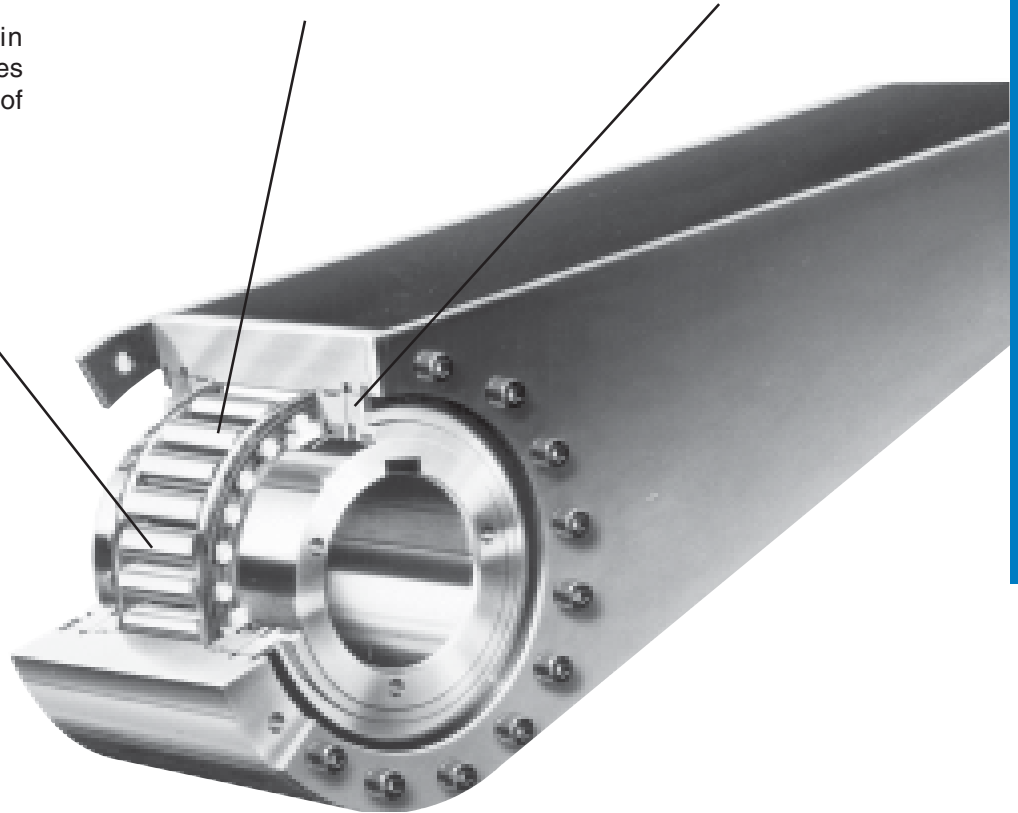
Conveyor Backstop Clutches

Synthetic high-performance grease, continually circulated by rotating cam and roller cage.

Full-width rollers maintain concentricity between the races and provide even distribution of bearing load.

Spring-loaded cams are in constant contact with both races for rapid engagement.

Multiple seals. Combination double lip and felt seals helps keep grease in and dirt out.



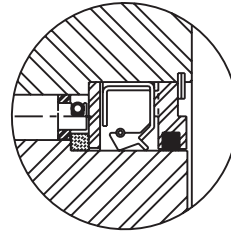
Options available

- Taconite seals
- Made-to-order torque arms
- Retaining plates

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

High Capacity, Longer Life, Lower Initial Cost Features

- Combination double lip and felt seals help keep grease in and dirt out for long life and less costly lube oil maintenance
- Synthetic grease lubricant allows operation in temperatures from - 40°F to 150°F
- Plate torque arm design lowers initial cost and provides easier installation
- Rotating cage evenly distributes grease for longer service life
- Larger bore range for a given torque than other units permits use of a smaller clutch for a given shaft size for further cost savings
- Full-width rollers and cams distribute bearing and torque loads evenly over a greater area, a significant improvement over competitive designs
- Rugged, anti-rollover cam design helps prevent sudden loss of load in demanding applications
- Available in torque capacities ranging from 6,500 to 500,000 lb.-ft. and bore sizes from 2 1/4 to 17 2/3 inches



Combination double lip and felt seals help keep grease in and dirt out.



Multiple seals standard on all sizes.

Model Number	Torque Capacity		Max. rpm *	Drag		Bore Range **		A (Overall Diameter)		B (Width)		C (Inner Race Length)	
	lb - ft	N-m		lb - ft	N-m	inches	mm	inches	mm	inches	mm	inches	mm
CB-7C	6,500	8,813	150	10	14	2.250 - 4.000	57.15 - 101.60	10.625	270.00	5.141	130.57	5.000	127.00
CB-12C	12,000	16,270	100	14	19	3.250 - 5.250	82.55 - 133.35	12.563	319.02	5.688	144.46	5.547	140.89
CB-19C	19,000	25,761	100	25	34	3.750 - 6.250	95.25 - 158.75	14.188	360.43	5.688	144.46	5.547	140.89
CB-30C	30,000	40,675	100	32	43	3.750 - 7.750	95.25 - 196.85	17.000	431.80	6.297	159.94	6.187	157.16
CB-45C	45,000	61,012	80	52	71	5.500 - 8.500	139.70 - 215.90	19.625	498.60	9.547	242.49	9.438	239.71
CB-65C	65,000	88,128	50	65	88	7.000 - 9.500	177.80 - 241.30	23.750	603.25	11.328	287.73	11.078	281.38
CB-90C	90,721	123,000	50	72	98	See page 36 for dimensions.							
CB-150C	150,000	203,373	50	80	108	8.000 - 11.500	203.20 - 292.10	30.750	781.05	11.328	287.73	11.078	281.38
CB-200C	195,456	265,000	50	101	137	See page 36 for dimensions.							
CB-250C	250,000	338,955	50	115	156	9.000 - 13.500	228.60 - 342.90	36.500	927.10	13.828	351.23	13.625	346.08
CB-375C	376,161	510,000	50	159	216	See page 36 for dimensions.							
CB-500C	505,974	686,000	50	180	245								

* High speed options are also available. Contact Application Engineering at 1-800-626-2093.

** Note: Any bore size within the range indicated will be provided without additional cost.

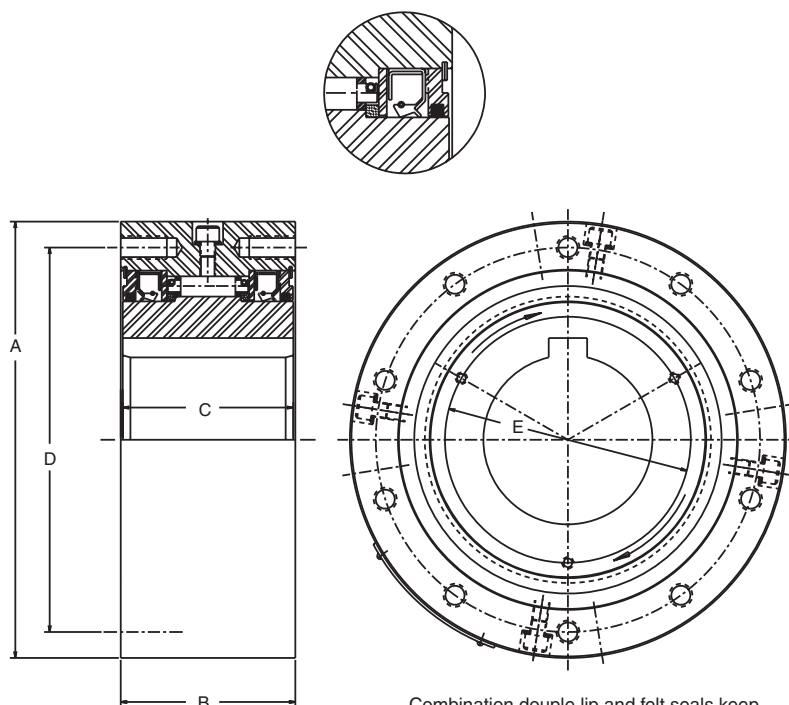
For torque arms see pages 38 - 40.

Industries Served

- Aggregate processing
- Agriculture
- Conveyor manufacturing

Field Applications

- Belt conveyor
- Bucket elevator
- Conveyors
- Low rpm head-shafts
- Inclined conveyor



Model Number	D (Mounting Bolt Circle)		Mounting Holes				Inner Race Holes							
			Bolt	Thread Size	Depth		E Bolt Circle for Retaining Plate		No. of Bolts	Thread Size	Depth		Approximate Weight	
	inches	mm			inches	mm	inches	mm			inches	mm	lb	kg
CB-7C	9.0	229	6	.625 - 18 UNF	0.875	22.23	5.25	133.4	3	.375 - 24 UNF	0.500	12.70	80.0	36.3
CB-12C	11.0	279	8	.625 - 18 UNF	0.875	22.23	6.50	165.1	3	.375 - 24 UNF	0.500	12.70	160.1	72.6
CB-19C	12.5	318	10	.750 - 10 UNC	1.125	28.58	8.00	203.2	3	.375 - 24 UNF	0.500	12.70	195.1	88.5
CB-30C	15.0	381	10	.875 - 9 UNC	1.375	34.93	9.50	241.3	3	.500 - 20 UNF	0.625	15.88	330.0	149.7
CB-45C	17.5	445	16	.750 - 10 UNC	1.375	34.93	10.00	254.0	3	.500 - 20 UNF	0.625	15.88	625.0	283.5
CB-65C	21.0	533	16	1.000 - 8 UNC	1.625	41.28	12.00	304.8	3	.500 - 20 UNF	0.625	15.88	1300.1	589.6
CB-90C	See page 37 for dimensions.													
CB-150C	27.5	699	16	1.250 - 7 UNC	2.125	53.98	17.00	431.8	3	.625 - 11 UNC	0.875	22.23	1300.1	952.5
CB-200C	See page 37 for dimensions.													
CB-250C	32.0	813	16	1.250 - 7 UNC	1.875	47.63	20.00	508.0	3	.750 - 10 UNC	1.375	34.93	3500.1	1587.6
CB-375C	See page 37 for dimensions.													
CB-500C														

High Capacity, Longer Life, Lower Initial Cost Features

- Combination double lip and felt seals help keep grease in and dirt out for long life and less costly lube oil maintenance
- Synthetic grease lubricant allows operation in temperatures from - 40°F to 150°F
- Plate torque arm design lowers initial cost and provides easier installation
- Rotating cage evenly distributes grease for longer service life
- Larger bore range for a given torque than other units permits use of a smaller clutch for a given shaft size for further cost savings
- Full-width rollers and cams distribute bearing and torque loads evenly over a greater area, a significant improvement over competitive designs
- Rugged, anti-rollover cam design helps prevent sudden loss of load in demanding applications
- Available in torque capacities ranging from 6,500 to 500,000 pound-feet and bore sizes from 2 1/4 to 17 2/3 inches



Multiple seals standard on all sizes.

Model Number	Max. Torque Capacity		Inner Race rpm * (Max.)	Overrunning Drag		Bore Range **		Dimensions					
								A		B		C	
	lb - ft	N-m		lb - ft	N-m	inch	mm	inch	mm	inch	mm	inch	mm
CB-45C	See page 34 for dimensions.												
CB-65C													
CB-90C	90,721	123,000	50	72	98	7.87-10.63	200 to 270	11.60	295	25.59	650	11.42	290
CB-150C	See page 34 for dimensions.												
CB-200C	195,456	265,000	50	101	137	9.84-13.19	250 to 335	12.01	305	33.47	850	12.60	320
CB-250C	See page 34 for dimensions.												
CB-375C	376,161	510,000	50	159	216	12.8-16.73	325 to 425	17.32	440	40.55	1030	17.72	450
CB-500C	505,974	686,000	50	180	245	13.78-17.72	350 to 450	17.72	450	42.91	1090	18.90	480

* High speed backstop options are available. Contact Application Engineering at 1-800-626-2093 for further details.

** Note: Any bore size within the range indicated will be provided without additional cost.

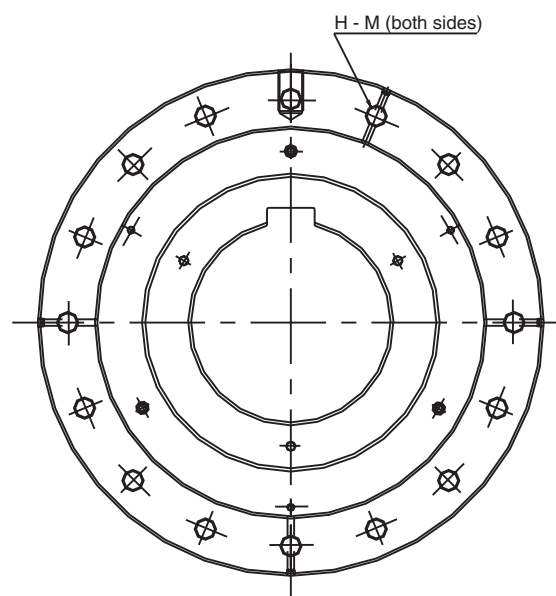
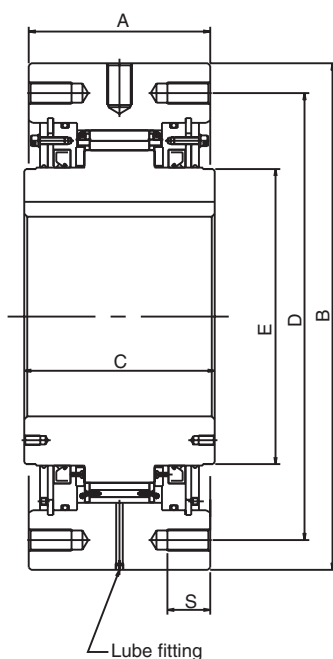
For torque arms see pages 38 - 40.

Industries Served

- Aggregate processing
- Agriculture
- Conveyor manufacturing

Field Applications

- Belt conveyor
- Bucket elevator
- Conveyors
- Low rpm head-shafts
- Inclined conveyor

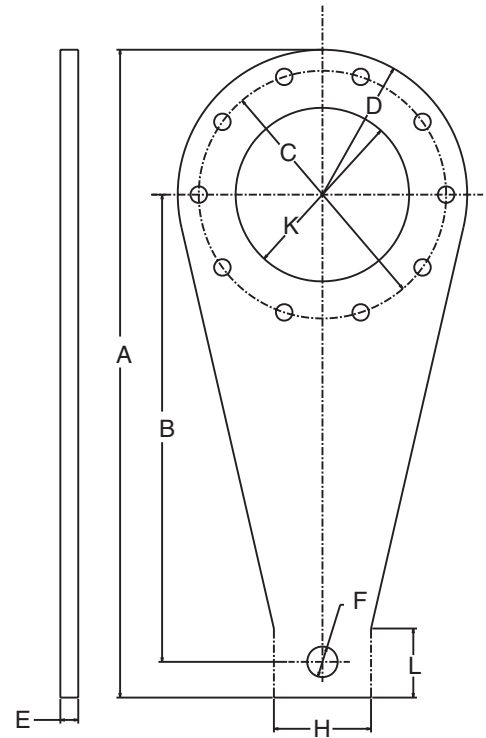


Combination single lip and felt seals keep grease in and dirt out.

Model Number	Dimensions											
	D		E		S		H-M No. of Tapped Holes x Size x Pitch (mm)	Lube Fitting Hole	Quantity of Grease		Weight w/o Torque Arm	
	inch	mm	inch	mm	inch	mm			ounces	grams	lb	kg
CB-45C	See page 35 for dimensions.											
CB-65C												
CB-90C	22.64	575	14.57	370	1.97	50	16xM24xP3.0	PT 1/4	126.98	3,600	1367	620
CB-150C	See page 35 for dimensions.											
CB-200C												
CB-250C	29.53	750	19.49	495	2.76	70	16xM36xP4.0	PT 1/4	158.73	4,800	2502	1135
CB-375C	See page 35 for dimensions.											
CB-500C												
CB-375C	37.01	940	25.00	635	2.76	70	18xM36xP4.0	OIL	OIL	OIL	5401	2450
CB-500C	38.98	990	25.40	645	3.15	80	18xM42xP4.5	OIL	OIL	OIL	6217	2820

For assembly with CB-7C to CB-30C clutches

Single Torque Arm



Model Number	Dimensions											
	A (Overall Length)		B (Shaft Center to End of Arm)		C		D (End Radius)		E (Thickness)		F (End Hole)	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CB-7TA	22.3	567	15.3	387	9.0	229	5.3	135	0.5	13	1.25	31
CB-12TA	26.4	671	18.6	473	11.0	279	6.3	159	0.5	13	1.25	31
CB-19TA	31.7	806	22.9	581	12.5	318	7.1	180	0.9	22	1.50	38
CB-30TA	33.5	851	23.0	584	15.0	381	8.5	215	0.9	22	1.75	44

Model Number	Dimensions						Number of Bolts	Mounting Holes			Weight	
	H (Arm End Width)		K (Radius)		L (Straight Side Length)			Thread Size	Length			
	inch	mm	inch	mm	inch	mm			inch	mm	lb	kg
CB-7TA	4.375	111	5.625	143	2.906	74	6	5/8-18 UNF	1.50	38.1	20	9
CB-12TA	4.750	120	6.750	171	3.563	91	8	5/8-18 UNF	1.50	38.1	30	14
CB-19TA	4.750	120	8.500	216	3.375	86	10	3/4-10 UNC	1.75	44.5	60	27
CB-30TA	5.250	133	10.500	267	3.375	86	10	7/8-9 UNC	2.00	50.8	75	34

Made-to-Order Torque Arms

Custom torque arms are available on a made-to-order basis for your unique requirements. For selection assistance, call Application Engineering at 1-800-626-2093 or fax the information to: Emerson Power Transmission Application Engineering Fax: (606) 564-2079

Part Number Explanation

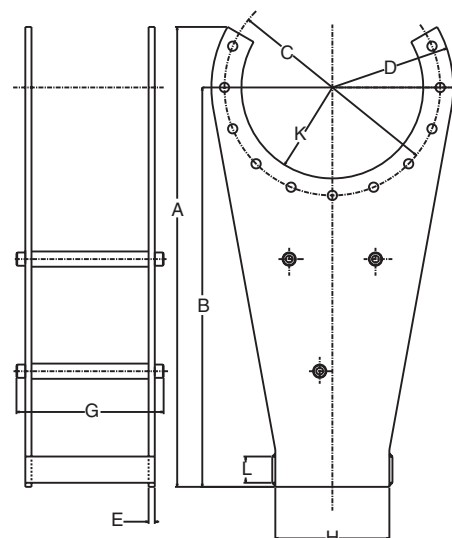
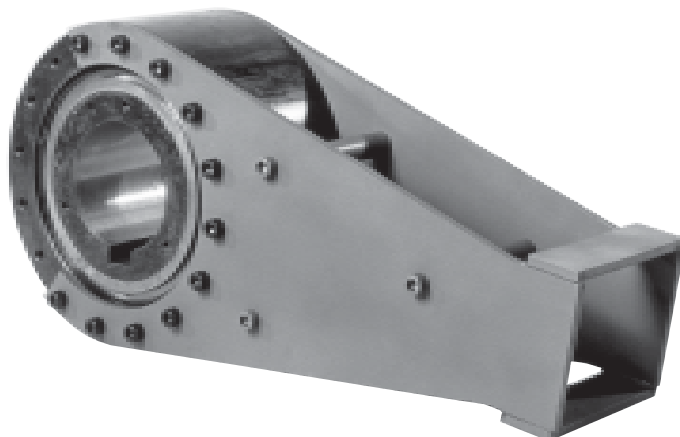
CB - 45 C FB

- Specify finished bore diameter
- Clutch only*
- Torque capacity (ft-lbs. 1000's)
- Clutch series (conveyor backstop)

Conveyor backstop clutch built with standard keyway unless requested otherwise.

* Torque arm, to be used with conveyor backstop clutch, should be ordered separately ex. CB-45TA.

Double Torque Arm



Model Number	Dimensions											
	A (Overall Length)		B (Shaft Center to End of Arm)		C (Bolt Circle)		D (End Radius)		E (Thickness)		G (Overall Width)	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CB-45TA	37.3	946	32.4	822	17.5	445	9.8	249	0.5	13	12.1	308
CB-65TA	45.3	1149	39.4	1000	21.0	533	11.9	302	0.5	13	14.4	366
CB-90TA	See page 40 for dimensions.											
CB-150TA	58.9	1495	51.3	1301	27.5	699	15.4	391	0.9	22	15.4	396
CB-200TA	See page 40 for dimensions.											
CB-250TA	72.0	1829	63.0	1600	32.0	813	18.3	464	0.9	22	18.3	459
CB-375 TA	See page 40 for dimensions.											
CB-500 TA												

Model Number	Dimensions						Number of Bolts	Mounting Holes			Weight	
	H (Arm End Width)		K (Radius)		L (Straight Side Length)			Thread Size	Length			
	inch	mm	inch	mm	inch	mm			inch	mm	lb	kg
CB-45TA	9.1	232	14.8	374.65	3.0	76	22	3/4-10 UNC	1.75	44.5	160	73
CB-65TA	11.2	281	18.0	457.20	3.0	76	22	1-8 UNC	2.00	50.8	235	107
CB-90TA	See page 40 for dimensions.											
CB-150TA	13.8	349	23.4	593.73	4.5	114	22	1 1/4-7 UNC	2.50	63.5	580	263
CB-200TA	See page 40 for dimensions.											
CB-250TA	15.8	400	27.0	685.80	6.0	152	22	1 1/4-7 UNC	2.50	63.5	835	379
CB-375 TA	See page 40 for dimensions.											
CB-500 TA												

Made-to-Order Torque Arms

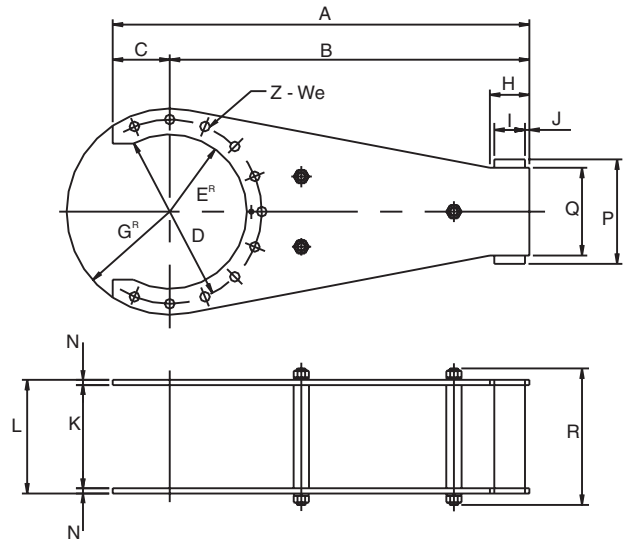
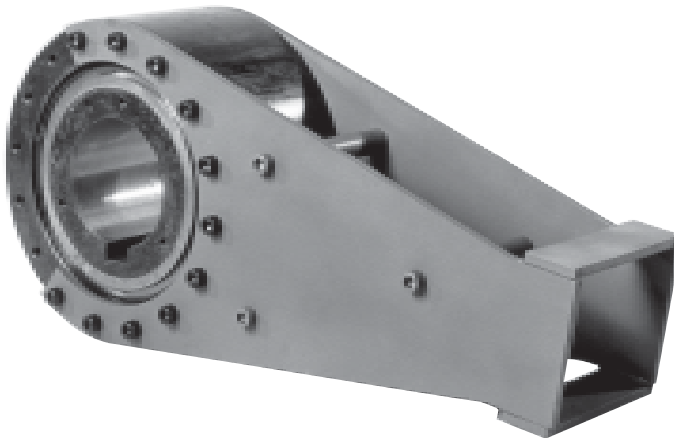
Custom torque arms are available on a made-to-order basis for your unique requirements.

For selection assistance, call Application Engineering at 1-800-626-2093 or fax the information to:

Emerson Power Transmission Application Engineering

Fax: (606) 564-2079

Double Torque Arm



Model Number	Dimensions													
	A		B		C		D		E ^R		G ^R		H	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CB-45TA	See page 39 for dimensions.													
CB-65TA														
CB-90TA	50.0	1270	43.3	1100	6.7	170	22.6	575	9.3	235	12.8	325	4.3	110
CB-150TA	See page 39 for dimensions.													
CB-200TA	68.1	1730	59.1	1500	9.1	230	29.5	750	12.1	307	16.7	425	5.3	135
CB-250TA	See page 39 for dimensions.													
CB-375 TA	83.1	2110	70.9	1800	12.2	310	37.0	940	15.0	380	20.3	515	6.5	165
CB-500 TA	91.3	2320	78.7	2000	12.6	320	39.0	990	15.7	400	21.5	545	6.5	165

Model Number	Dimensions																	Weight	
	I		J		K		L		N		P		Q		R		Z-W		
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		lb	kg
CB-45TA	See page 39 for dimensions.																		
CB-65TA																			
CB-90TA	4.0	100	0.394	10	11.6	295	12.6	319	0.472	12	11.7	298	10.2	260	14.8	375	11-26	243	110
CB-150TA	See page 39 for dimensions.																		
CB-200TA	4.7	120	0.591	15	12.0	305	13.5	343	0.748	19	15.2	386	13.0	330	15.9	405	11-39	595	270
CB-250TA	See page 39 for dimensions.																		
CB-375 TA	5.9	150	0.591	15	17.3	440	19.0	484	0.866	22	18.6	474	16.1	410	22.4	570	13-39	1058	480
CB-500 TA	5.9	150	0.591	15	17.7	450	19.4	494	0.866	22	17.7	450	17.7	450	22.8	580	13-45	1235	560

Backstop torque can be calculated using different methods based on conveyor configuration. The methods shown below are for basic selections and are based on CEMA (Conveyor Equipment Manufacturing Association) standards.

Backstop Torque Calculation

$$HP = \frac{T \times N}{5250} \quad \begin{array}{l} N = \text{rpm of clutch at headpulley shaft} \\ T = (\text{lb-ft.}) \text{ torque} \end{array}$$

N = RPM @ headpulley shaft =

$$\text{Torque CB} = \frac{SF \times HP \text{ Total} \times 5250}{N}$$

Bucket Elevator Backstop Selection

Friction resistance is ignored in the selection due to its small magnitude relative to the elevator capacity.

$$HP \text{ Total} = \frac{QH}{990} \quad \begin{array}{l} Q = \text{Maximum load, tons per hour} \\ H = \text{Vertical height of conveyor (feet)} \end{array}$$

Same nomenclature as conveyor method.

$$\text{Torque CB} = \frac{SF \times HP - \text{Motor Nameplate} \times 5250}{N}$$

Motor Breakdown/Locked Rotor Torque Method

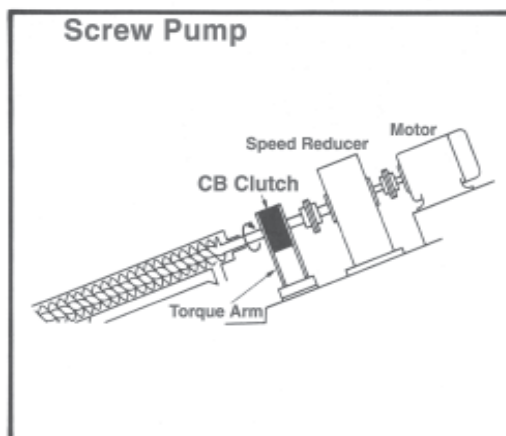
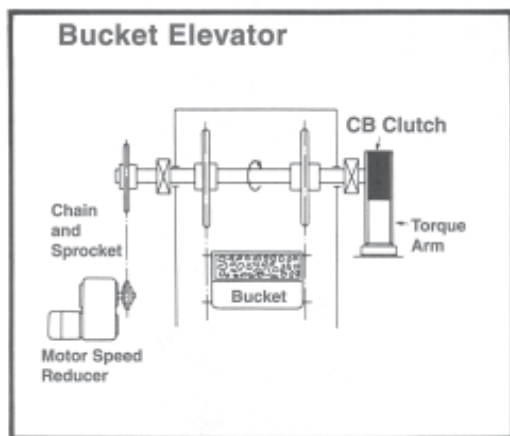
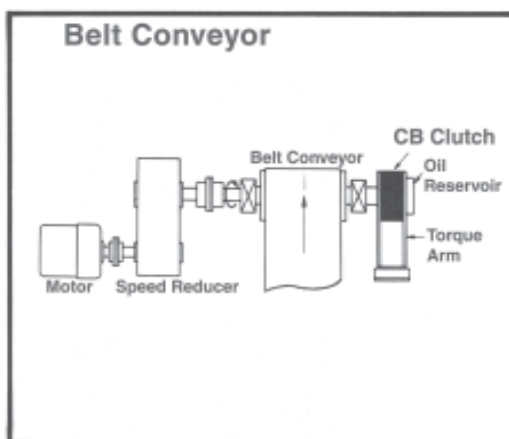
Selection is based on the following formula:

Depending on motor breakdown torque, apply the following service factors:

- 1.0 Breakdown torque less than or equal to 175%.
- 1.2 Breakdown torque greater than 175% to 250%.
- 1.5 Breakdown torque greater than 250% TO 400%.

⚠ CAUTION

A backstop is a critical part of the conveyor design. Selection methods shown above should cover most basic conveyor applications. When designing a conveyor, it is necessary that the backstop is selected to handle the maximum load that the conveyor system is designed to handle. Consult Application Engineering at 1-800-626-2093 for backstop selection where conveyor design deviates from the methods shown.



Pre-installation

1. Before installation, check the direction of shaft rotation during operation, often referred to as free shaft rotation. The backstop clutch overruns in this direction and is indicated by stamped rotational arrows on both ends of the clutch inner race.
2. It is important that the clutch fit the shaft properly. These clutches are intended to be installed with a slip fit-interference or shrink fits are not recommended. Bore tolerances and standard keyway dimensions are shown below.

Dimensions - Inches

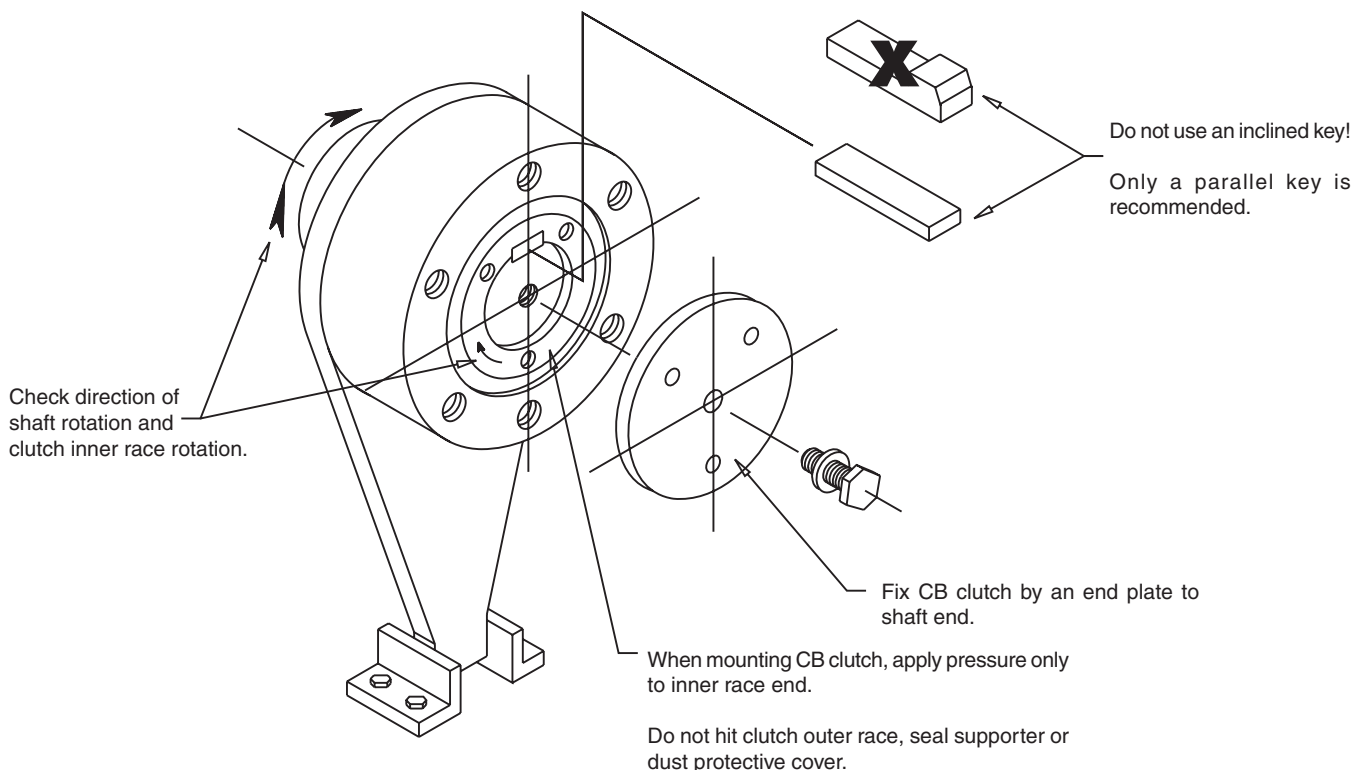
Nominal Shaft and Bore Dia.		Bore Tolerance	Standard Keyway Width* and Depth
Over	Thru	Nominal - .000	
2 1/4	2 3/4	+ .0020	5/8 x 5/16
2 3/4	3 1/4	+ .0020	3/4 x 3/8
3 1/4	3 3/4	+ .0020	7/8 x 7/16
3 3/4	4 1/2	+ .0020	1 x 1/2
4 1/2	5 1/2	+ .0025	1 1/4 x 5/8
5 1/2	6 1/2	+ .0025	1 1/2 x 3/4
6 1/2	7 1/2	+ .0030	1 3/4 x 3/4
7 1/2	9	+ .0030	2 x 3/4
9	11	+ .0035	2 1/2 x 7/8
11	13	+ .0040	3 x 1

* Width tolerances are plus .002 minus .000; keyway depth is nominal plus .010 tolerance.

3. Use only parallel keys, do not use tapered keys. The key should be tight along both sides and in contact with the keyseat. Clearance has been allowed along the top. The key should not extend beyond the length of the clutch. Cover plate on shaft end is recommended for key keep.

Installation

1. The shaft must be clean and free of burrs. Coat both shaft and key with oil, grease or a similar substance to ease installation.
2. Double check shaft rotation and arrow marks on the end of the clutch inner race to ensure correct rotational direction.
3. Push the backstop clutch on the shaft by applying pressure only to the end of the inner race. If hammering is required, use only a lead or rubber headed hammer to avoid damage to the inner race end. Do not hit the clutch outer race or seal support as internal damage may result. Exercise caution during installation to prevent seal damage.
4. Secure backstop clutch in position on the shaft. Use lock washers, snap rings, lock collars, end plates, adjacent components or similar items to hold clutch in position.



Installation of Torque Arms

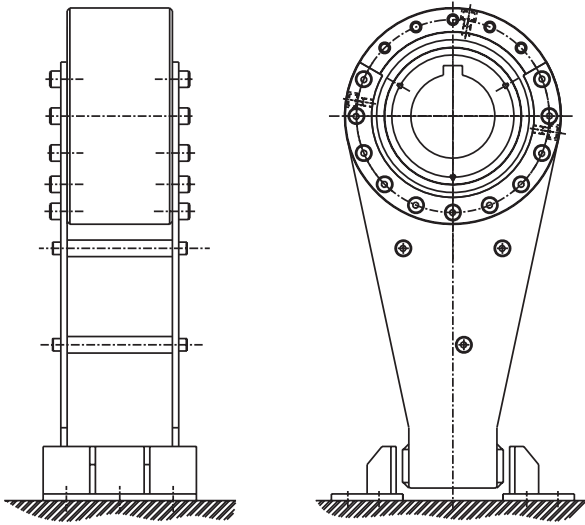
Installation of Torque Arms

Torque Arm Mounting:

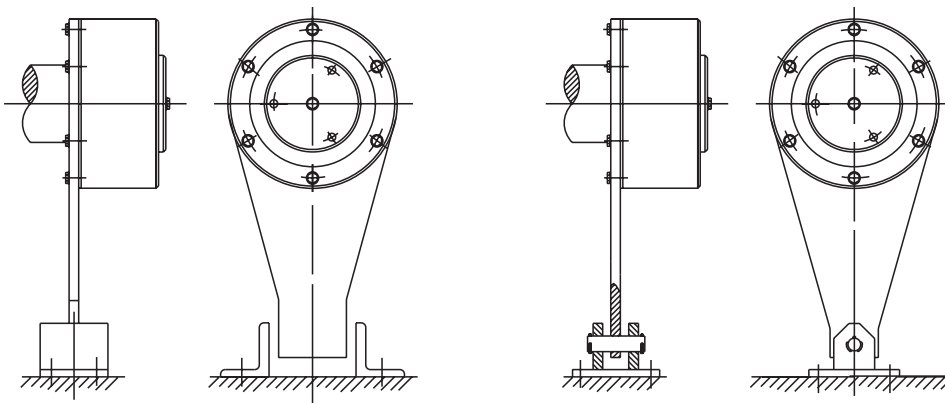
1. Restrain end of the torque arm to prevent rotation either by use of a pin or angle irons. Do not rigidly fasten the torque arm end.
2. Make sure the torque arm is free to move axially to prevent any preloading of the clutch bearings, due to shaft movement, misalignment or distortion of both conveyor frame and shafting.

3. Make sure that foreign material or ice cannot accumulate on the torque arm end to restrict its movement.
4. When using a pin, its diameter must be smaller by 1/16 inch than the hole in torque arm.
5. Torque arm may be mounted at any desired angle.
6. Make sure that the mounting surfaces of the clutch outer race and torque arms are clean and free of foreign particles, rust, or oil to ensure proper mounting.
7. Tighten torque arm mounting bolts to the following torque values. Use only ANSI grade 8 bolts minimum as supplied.

CB-45 to CB-500



CB-7 to CB-30

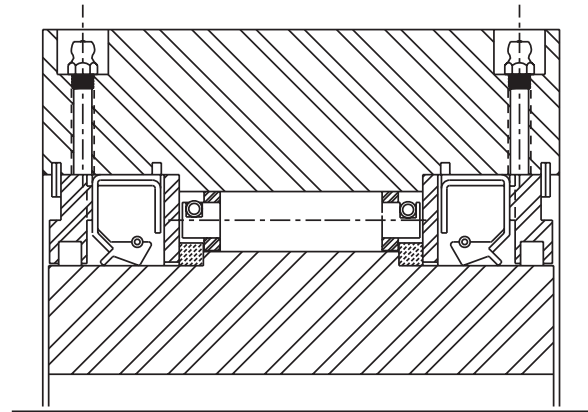


Bolt Size	Torque
1/2-20 UNF	110 lb. - ft.
5/8 -18 UNF	220 lb. - ft.
3/4 - 10 UNC	375 lb. - ft.
7/8- 9 UNC	580 lb. - ft.
M24xP3.0	822 lb. - ft.
1-8 UNC	865 lb. - ft.
M36xP4.0	1634 lb. - ft.
1 1/4 - 7 UNC	1750 lb. - ft.
M42xP4.5	2855 lb. - ft.

For plated bolt, reduce torque by 25%.

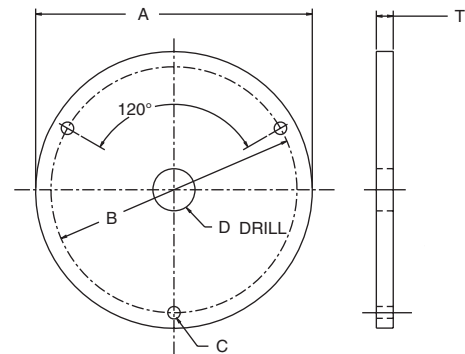
Sealing Options

Purging seals are available for harsh, contaminated environments. With the torque arm protection, this sealing system provides 4-way protection by using double-lip seals, a grease chamber and an outer chamber through the torque arm. Custom sealing systems are available upon request. Consult Application Engineering for details.



Retaining Plate

Retaining plates offer a means of positively securing the conveyor backstop clutch to a mating shaft and to prevent the key from walking. The retaining plate bolts to three drilled and tapped holes machined in the inner race. An additional hole provided in the plate is intended to align with a drilled and tapped hole machined in the end of the shaft.



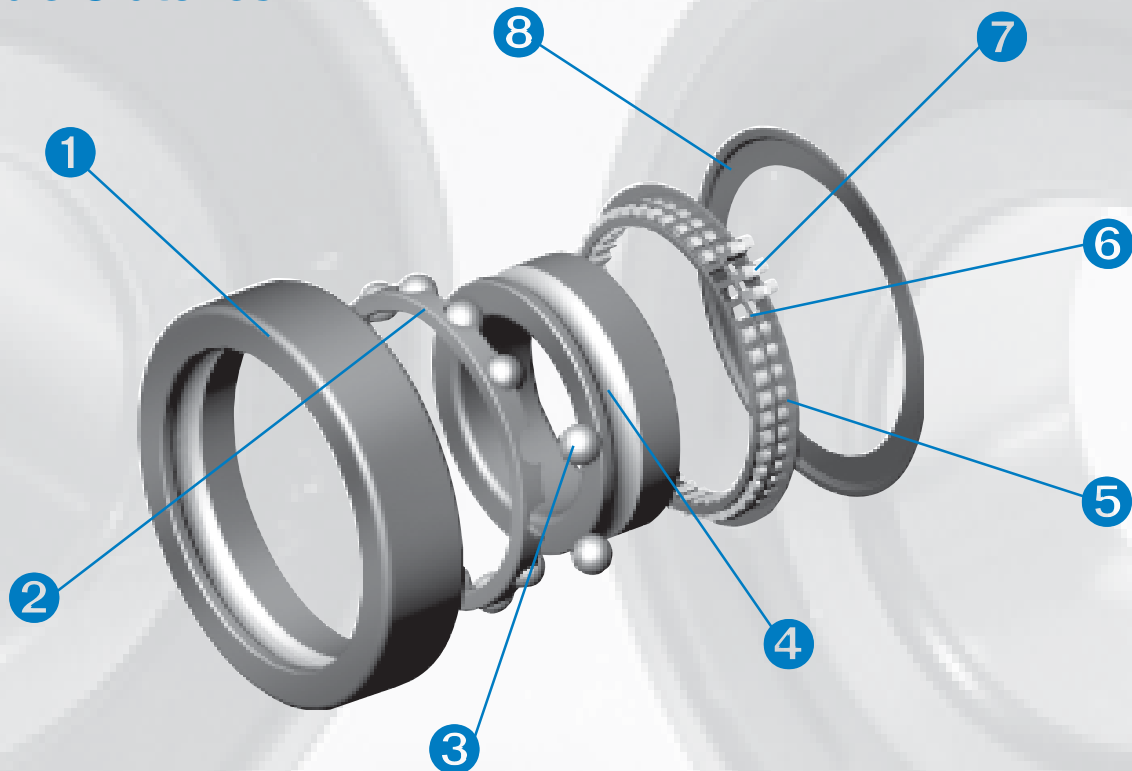
Retaining Plate Number	Dimension in Inches										Weight	
	A (Overall Diameter)		B (Bolt Circle)		C (Bolt Hole)		D (Center Hole)		T (Thickness)			
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	lb.	kg
CB-7RP	6.00	152.4	5.25	133.3	0.406	10.31	0.687	17.45	.575 .535	14.61 13.59	4.25	1.9
CB-12RP	7.25	184.2	6.50	165.1	0.406	10.31	0.687	17.45			6.50	2.9
CB-19RP	9.00	228.6	8.00	203.2	0.406	10.31	0.687	17.45			10.00	4.5
CB-30RP	11.00	279.4	9.50	241.3	0.531	13.49	0.781	19.84	.692 .646	17.58 16.41	18.00	8.2
CB-45RP	11.50	292.1	10.00	254.0	0.531	13.49	0.781	19.84			20.00	9.1
CB-65RP	13.50	342.9	12.00	304.8	0.531	13.49	0.781	19.84			27.50	12.5
CB-150RP	19.25	489.0	17.00	431.8	0.687	17.45	1.031	26.19	.924	23.47	75.00	34.0
CB-250RP	22.75	577.9	20.00	508.0	0.781	19.84	1.031	26.19	.840	21.34	100.00	45.4

Lubrication - Grease

- Morse CB clutches are prelubricated with Exxon Beacon® #325 grease. This grease is acceptable in environments with temperature ranges from -40°F to 150°F (-40°C to 65°C). Consult Application Engineering for lubricants beyond this temperature range.
- When relubrication is deemed necessary, remove one plug of the four found in the outer race of the clutch and replace with a zerk fitting. When relubricating, remove another plug opposite the grease fitting and pump grease into the clutch until grease flows freely from the plug opening. Replace the plug.
- Do not use lubricants that contain EP additives, as these are detrimental to the operation of the backstop.
- Use of non-compatible grease could cause clutch failure; contact Application Engineering when using grease other than specified.

ExxonBeacon is believed to be a trademark and/or a trade name of ExxonMobil Corporation and is not owned or controlled by Emerson Power Transmission Corporation. This trademark and/or registered trademark of others is used herein for product comparison purposes only, is the property of their respective owners and is not owned or controlled by Emerson Power Transmission Corporation. While reasonable efforts have been made to confirm ownership of the marks and names listed above, Emerson Power Transmission Corporation cannot and does not represent or warrant the accuracy of this information.

Continuous Enhancements, Reliable Clutches



- 1 - High-Strength Outer Race** - Made from high carbon alloy steel, our precision-ground outer race provides fatigue life reliability.
- 2 - Rotating Bearing Retainer** - Located flush with the outer race, this retainer contains evenly spaced, hardened steel balls to provide equal distribution of load for optimized concentricity between the inner and outer races.
- 3 - Hardened Steel Ball Bearings** - Individually formed from hardened chrome alloy steel, the balls are secured within the retainer to provide concentricity and equal distribution of radial load within the clutch.
- 4 - Precision-Ground Inner Race** - Similar to a 6000 Series metric bearing, the ball pathway and cam wear surface are hardened and ground to enable rapid cam engagement and low drag operation.
- 5 - Durable Cam-Cage** - Made from molded nylon, the cam-cage provides equal spacing between each cam. When cams articulate within the cage, cam engagement is uniform providing equal distribution of load and more uniform stress on the cams and inner race.
- 6 - Heavy-Duty Garter Spring** - Located within the cam cage, the energizing garter spring creates the drag torque needed for accuracy of cam engagement.
- 7 - Profiled Cams** - Manufactured from high carbon steel, the cams carry high compressive loads when the clutch is locked and transmitting torque.
- 8 - Lightweight Retaining Endplate/Dust Shield** - Attached to the outer race, the end plate helps retain lubrication and protect components within the clutch assembly. Felt and contact lip seal designs are available.

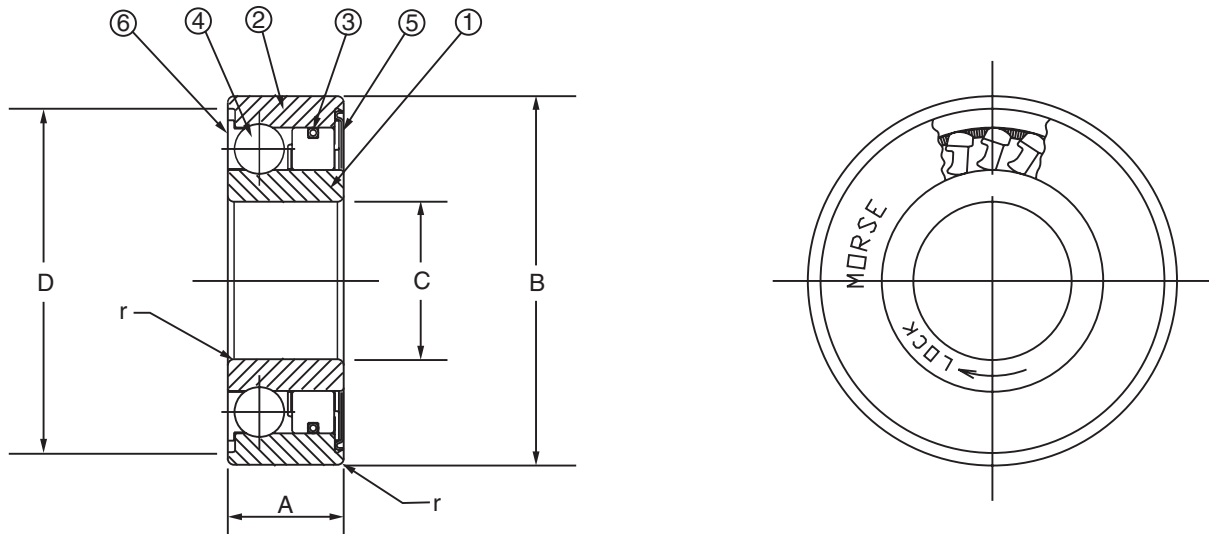
Morse brand KK clutches incorporate a compact cam clutch with built-in bearing support. This unique construction combines a cam clutch with a 6200 Series metric ball bearing for use in applications ranging from exercise equipment to industrial machinery. This general purpose clutch is intended for backstopping, indexing and overrunning applications and can be utilized with both oil and grease lubrication.



Dimensions and Capacities

Size	A		B		C		D		r		Weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	g	lb
15	11	0.433	35	1.378	15	0.591	32.6	1.283	0.6	0.024	50	0.1
17	12	0.472	40	1.575	17	0.669	36.1	1.421	0.6	0.024	80	0.2
20	14	0.551	47	1.850	20	0.787	41.7	1.642	1.0	0.039	120	0.3
25	15	0.591	52	2.047	25	0.984	47.1	1.854	1.0	0.039	150	0.3
30	16	0.630	62	2.441	30	1.181	56.6	2.228	1.0	0.039	230	0.5
35	17	0.669	72	2.835	35	1.378	64.0	2.520	1.1	0.043	320	0.7
40	22	0.866	80	3.150	40	1.575	71.0	2.795	1.1	0.043	400	0.9

Size	Torque Capacity		Max. Overrunning Speed		Drag Torque		Radial Load Capacity			
	N-m	Ft-lb	Inner Race RPM	Outer Race RPM	N-m	Ft-lb	Dynamic		Static	
							N	lb	N	lb
15	29	21.4	3,600	2,000	0.010	0.0074	5,950	1337.6	3,230	726.1
17	43	31.7	3,500	1,900	0.010	0.0074	7,000	1573.7	3,700	831.8
20	61	45.0	3,000	1,600	0.014	0.0103	8,500	1910.9	4,900	1101.6
25	78	57.5	2,500	1,400	0.017	0.0125	10,700	2405.5	6,300	1416.3
30	140	103.3	2,000	1,100	0.030	0.0221	11,900	2675.2	7,900	1776.0
35	173	127.6	1,800	1,000	0.034	0.0251	13,500	3034.9	9,700	2180.6
40	260	191.8	1,800	900	0.040	0.0295	14,500	3259.7	11,700	2630.3



Shaft Tolerance

Size	Shaft Diameter			
	inches		mm	
15	0.5906	+0.0009 +0.0005	15	+0.023 +0.012
17	0.6693	+0.0009 +0.0005	17	+0.023 +0.012
20	0.7874	+0.0011 +0.0006	20	+0.028 +0.015
25	0.9843	+0.0011 +0.0006	25	+0.028 +0.015
30	1.1811	+0.0011 +0.0006	30	+0.033 +0.017
35	1.3780	+0.0013 +0.0007	35	+0.033 +0.017
40	1.5748	+0.0013 +0.0007	40	+0.033 +0.017

Housing Tolerance

Size	Housing Diameter			
	inches		mm	
15	1.3779	-0.0005 -0.0011	35	-0.012 -0.028
17	1.5748	-0.0005 -0.0011	40	-0.012 -0.028
20	1.8504	-0.0005 -0.0011	47	-0.012 -0.028
25	2.0472	-0.0006 -0.0013	52	-0.014 -0.033
30	2.4409	-0.0006 -0.0013	62	-0.014 -0.033
35	2.8346	-0.0006 -0.0013	72	-0.014 -0.033
40	3.1496	-0.0006 -0.0013	80	-0.014 -0.033

- ① Inner race
- ② Outer race
- ③ Cam cage
- ④ Ball
- ⑤ Shield
- ⑥ Retainer

Part Number Explanation

KK 25 1K 2GD

- Series
- Bore size
- Keyed inner
- Incorporates 2 seals

KK 25 2K 2GD

- Series
- Bore size
- Keyed inner and outer
- Incorporates 2 seals

Morse KK clutches incorporate a compact cam clutch with built-in bearing support. This unique construction combines a cam clutch with a 6200 Series metric ball bearing for use in applications ranging from exercise equipment to industrial machinery. This general purpose clutch is intended for backstopping, indexing and overrunning applications and can be utilized with both oil and grease lubrication.

Industries Served

- Fitness
- Manufacturing
- Printing
- Textile

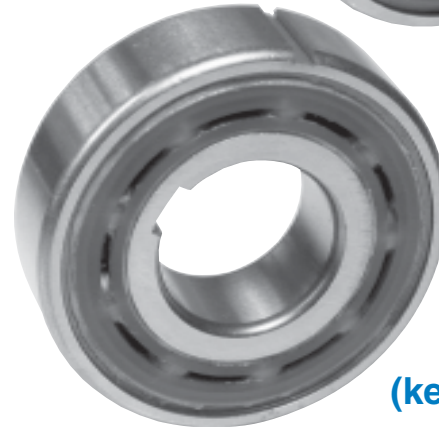
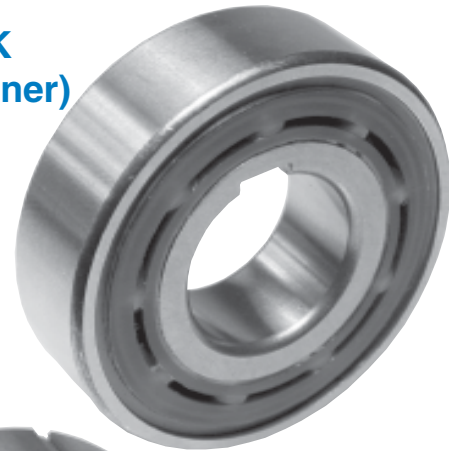
Field Applications

- Electric motor backstops
- Exercise equipment
- Household appliances
- Pump backstops

Enhancements

- New sizes added
- New sealing and shielding options
- Both inner and outer race keyway options

KK-1K
(keyed inner)



KK-2K
(keyed inner and outer)

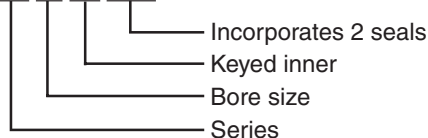
Dimensions and Capacities

Size	Torque Capacity		Max. Overrunning Speed		Drag Torque		Radial Load Capacity			
	N-m	Ft-lb	Inner Race r/min	Outer Race r/min	N-m	Ft-lb	Dynamic		Static	
							N	lb	N	lb
15	29	21.4	3,600	2,000	0.010	0.0074	5,950	1337.6	3,230	726.1
17	43	31.7	3,500	1,900	0.010	0.0074	7,000	1573.7	3,700	831.8
20	61	45.0	3,000	1,600	0.014	0.0103	8,500	1910.9	4,900	1101.6
25	78	57.5	2,500	1,400	0.017	0.0125	10,700	2405.5	6,300	1416.3
30	140	103.3	2,000	1,100	0.030	0.0221	11,900	2675.2	7,900	1776.0
35	173	127.6	1,800	1,000	0.034	0.0251	13,500	3034.9	9,700	2180.6
40	260	191.8	1,800	900	0.040	0.0295	14,500	3259.7	11,700	2630.3

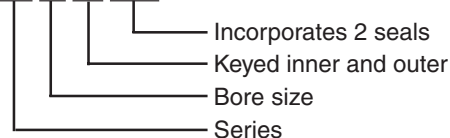
Note: Model No. marked on the inner race is only K for both 1K and 2K. (I. R. the marked KK17-K for both KK-17-1K and KK-17-2K).

Part Number Explanation

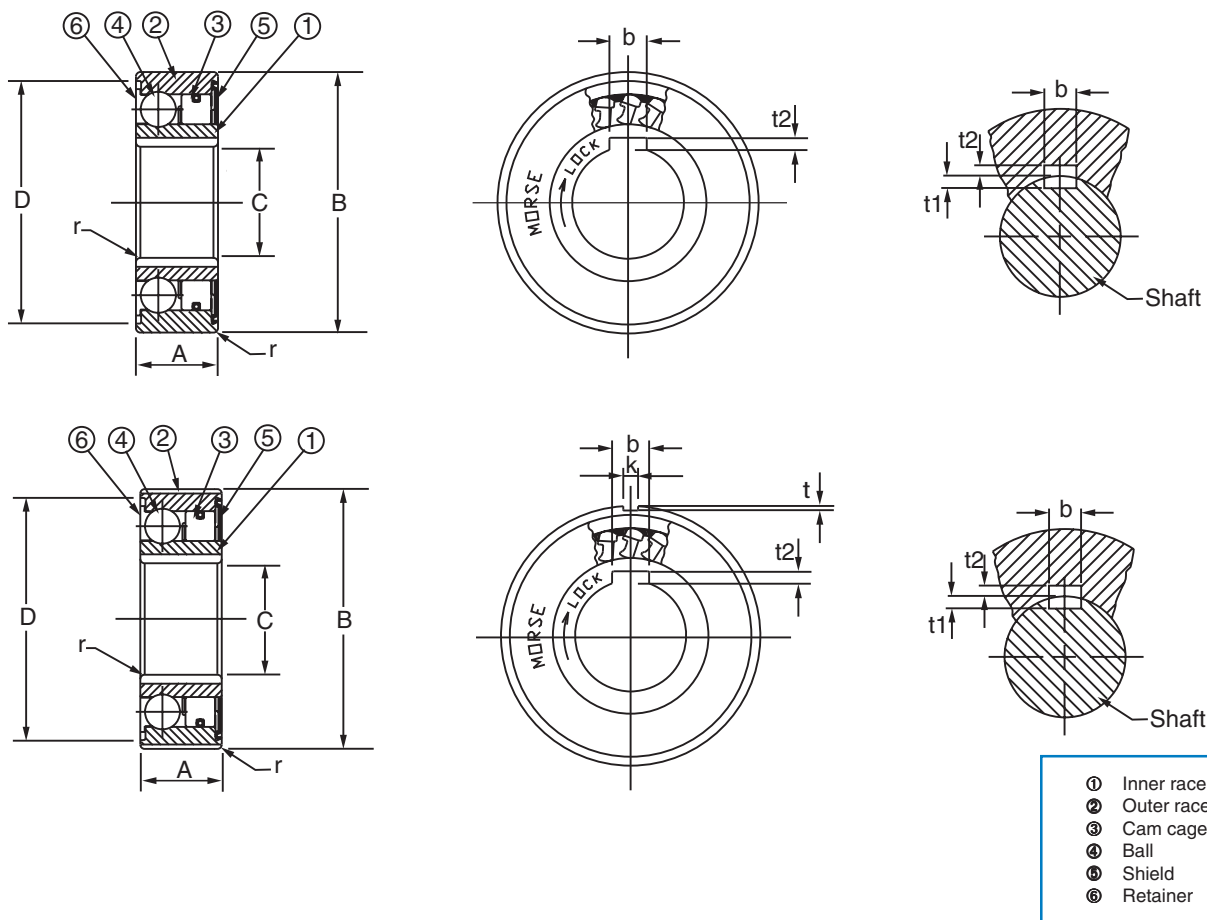
KK 25 1K 2GD



KK 25 2K 2GD



For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



- ① Inner race
- ② Outer race
- ③ Cam cage
- ④ Ball
- ⑤ Shield
- ⑥ Retainer

Dimensions and Capacities

Size	A		B		C		D		r		Weight	
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	lb	g
15	0.433	11	1.378	35	0.591	15	1.283	32.6	0.024	0.6	0.1	50
17	0.472	12	1.575	40	0.669	17	1.421	36.1	0.024	0.6	0.2	80
20	0.551	14	1.850	47	0.787	20	1.642	41.7	0.039	1.0	0.3	120
25	0.591	15	2.047	52	0.984	25	1.854	47.1	0.039	1.0	0.3	150
30	0.630	16	2.441	62	1.181	30	2.228	56.6	0.039	1.0	0.5	230
35	0.669	17	2.835	72	1.378	35	2.520	64.0	0.043	1.1	0.7	320
40	0.866	22	3.150	80	1.575	40	2.795	71.0	0.043	1.1	0.9	400

Note: Model No. marked on the inner race is only K for both 1K and 2K. (I. R. the marked KK17-K for both KK-17-1K and KK-17-2K).

Keyway Dimensions

Model	b js 10	t1	t2*	k js9	t
KK15-1K	5.0	+0.024	1.9	1.2	-
KK15-2K	5.0	+0.024	1.9	1.2	-
KK17-1K	5.0	+0.024	1.9	1.2	-
KK17-2K	5.0	+0.024	1.9	1.2	-
KK20-1K	6.0	+0.024	2.5	1.6	-
KK20-2K	6.0	+0.024	2.5	1.6	-
KK25-1K	8.0	+0.029	3.6	1.5	-
KK25-2K	8.0	+0.029	3.6	1.5	-
KK30-1K	8.0	+0.029	3.1	2.0	-
KK30-2K	8.0	+0.029	3.1	2.0	-
KK35-1K	10.0	+0.029	3.7	2.4	-
KK35-2K	10.0	+0.029	3.7	2.4	-
KK40-1K	12.0	+0.035	3.3	5.0	-
KK40-2K	12.0	+0.035	3.3	5.0	-

Dimensions in mm

* The dimension of t2 for KK25-1K and KK25-2K is 0.5 mm shallow compared to DIN 6885. 3. Process the keyway on the shaft 0.5 mm deeper to use DIN.

Shaft Tolerance

Size	Shaft Diameter	
	mm	inches
15	15 -0.008 -0.028	0.5906 -0.0003 -0.0011
17	17 -0.008 -0.028	0.6693 -0.0003 -0.0011
20	20 -0.010 -0.031	0.7874 -0.0004 -0.0012
25	25 -0.010 -0.031	0.9843 -0.0004 -0.0012
30	30 -0.010 -0.031	1.1811 -0.0004 -0.0012
35	35 -0.012 -0.037	1.3780 -0.0005 -0.0015
40	40 -0.012 -0.037	1.5748 -0.0005 -0.0015

Housing Tolerance

Model	Housing Diameter	
	mm	inches
KK15-1K	35 -0.012 -0.028	1.3779 -0.0005 -0.0011
KK15-2K	35 -0.012 -0.028	1.3779 -0.0005 -0.0011
KK17-1K	40 -0.012 -0.028	1.5748 -0.0005 -0.0011
KK17-2K	40 -0.012 -0.028	1.5748 -0.0005 -0.0011
KK20-1K	47 -0.012 -0.028	1.8504 -0.0005 -0.0011
KK20-2K	47 -0.012 -0.028	1.8504 -0.0005 -0.0011
KK25-1K	52 -0.014 -0.033	2.0472 -0.0006 -0.0013
KK25-2K	52 -0.014 -0.033	2.0472 -0.0006 -0.0013
KK30-1K	62 -0.014 -0.033	2.4409 -0.0006 -0.0013
KK30-2K	62 -0.014 -0.033	2.4409 -0.0006 -0.0013
KK35-1K	72 -0.014 -0.033	2.8346 -0.0006 -0.0013
KK35-2K	72 -0.014 -0.033	2.8346 -0.0006 -0.0013
KK40-1K	80 -0.014 -0.033	3.1496 -0.0006 -0.0013
KK40-2K	80 -0.014 -0.033	3.1496 -0.0006 -0.0013

Model KK- 2GD and KK-2GD 1K

KK-2GD
(sealed both sides)



KK-2GD 1K
(sealed both sides,
keyed inner)



Dimensions and Capacities

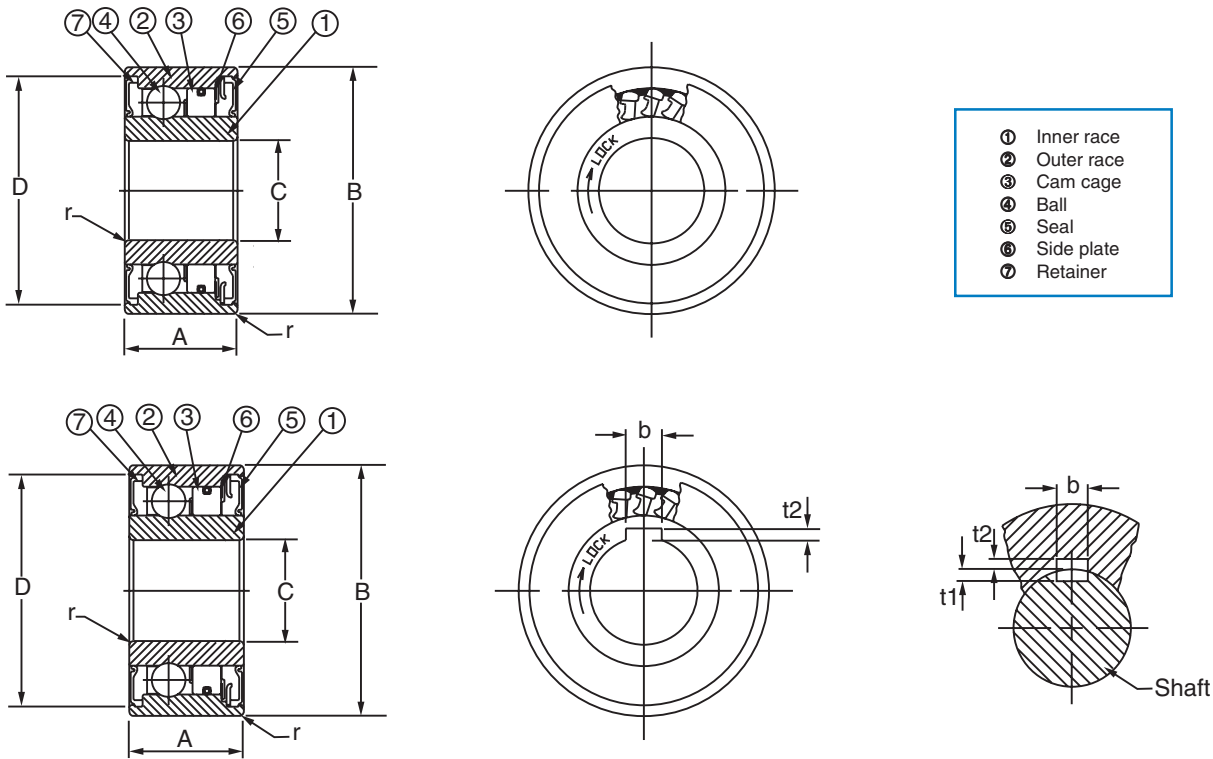
Size	Torque Capacity		Max. Overrunning Speed		Drag Torque		Radial Load Capacity			
	N-m	Ft-lb	Inner Race r/min	Outer Race r/min	N-m	Ft-lb	Dynamic		Static	
							N	lb	N	lb
15	29	21.4	3,600	2,000	0.040	0.0295	5,950	1337.6	3,230	726.1
17	43	31.7	3,500	1,900	0.050	0.0369	7,000	1573.7	3,700	831.8
20	61	45.0	3,000	1,600	0.055	0.0406	8,500	1910.9	4,900	1101.6
25	78	57.5	2,500	1,400	0.055	0.0406	10,700	2405.5	6,300	1416.3
30	140	103.3	2,000	1,100	0.058	0.0428	11,900	2675.2	7,900	1776.0
35	173	127.6	1,800	1,000	0.060	0.0443	13,500	3034.9	9,700	2180.6
40	260	191.8	1,800	900	0.080	0.0590	14,500	3259.7	11,700	2630.3

Housing Tolerance

Size	Housing Diameter			
	inch		mm	
15	1.3779	-0.0005 -0.0011	35	-0.012 -0.028
17	1.5748	-0.0005 -0.0011	40	-0.012 -0.028
20	1.8504	-0.0005 -0.0011	47	-0.012 -0.028
25	2.0472	-0.0006 -0.0013	52	-0.014 -0.033
30	2.4409	-0.0006 -0.0013	62	-0.014 -0.033
35	2.8346	-0.0006 -0.0013	72	-0.014 -0.033
40	3.1496	-0.0006 -0.0013	80	-0.014 -0.033

Shaft Tolerance

Model	Shaft Diameter			Model	Shaft Diameter		
	inches		mm		inches		mm
KK15-2GD	0.5906	+0.0009 +0.0005	15	KK15-2GD 1K	0.5906	-0.0003 -0.0011	15
KK17-2GD	0.6693	+0.0009 +0.0005	17	KK17-2GD 1K	0.6693	-0.0003 -0.0011	17
KK20-2GD	0.7874	+0.0011 +0.0006	20	KK20-2GD 1K	0.7874	-0.0004 -0.0012	20
KK25-2GD	0.9843	+0.0011 +0.0006	25	KK25-2GD 1K	0.9843	-0.0004 -0.0012	25
KK30-2GD	1.1811	+0.0011 +0.0006	30	KK30-2GD 1K	1.1811	-0.0004 -0.0012	30
KK35-2GD	1.3780	+0.0013 +0.0007	35	KK35-2GD 1K	1.3780	-0.0005 -0.0015	35
KK40-2GD	1.5748	+0.0013 +0.0007	40	KK40-2GD 1K	1.5748	-0.0005 -0.0015	40



Dimensions and Capacities

Size	A		B		C		D		r		Weight	
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	lb	g
15	0.630	16	1.378	35	0.591	15	1.278	32.45	0.024	0.6	0.2	70
17	0.669	17	1.575	40	0.669	17	1.435	36.45	0.024	0.6	0.2	100
20	0.748	19	1.850	47	0.787	20	1.667	42.35	0.039	1.0	0.3	150
25	0.787	20	2.047	52	0.984	25	1.852	47.05	0.039	1.0	0.4	200
30	0.827	21	2.441	62	1.181	30	2.189	55.60	0.039	1.0	0.6	280
35	0.866	22	2.835	72	1.378	35	2.543	64.60	0.043	1.1	0.9	410
40	1.063	27	3.150	80	1.575	40	2.819	71.60	0.043	1.1	1.3	600

Keyway Dimensions

Model	b js 10	t1	t2
KK15-2GD 1K	5.0	+0.024	1.9 1.2
KK17-2GD 1K	5.0	+0.024	1.9 1.2
KK20-2GD 1K	6.0	+0.024	2.5 1.6
KK25-2GD 1K	8.0	+0.029	3.6 1.5
KK30-2GD 1K	8.0	+0.029	3.1 2.0
KK35-2GD 1K	10.0	+0.029	3.7 2.4
KK40-2GD 1K	12.0	+0.035	3.3 5.0

Dimensions in mm

* The dimension of t2 for KK25-2GD 1K is 0.5 mm shallow compared to DIN 6885. 3. Process the keyway on the shaft 0.5 mm deeper to use DIN.

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

The NSS Series clutch is available in 12 sizes and is designed with the same overall dimensions as a light metric series ball bearing. The inner race offers a key seat and the outer race press fits into the housing. The clutch is furnished with protective oil and must be lubricated before operating. These clutches do not have bearings to support radial force, so additional bearing support is required. The NSS Series clutch is excellent for applications where space is restricted, and is suitable for overrunning.

Lubrication

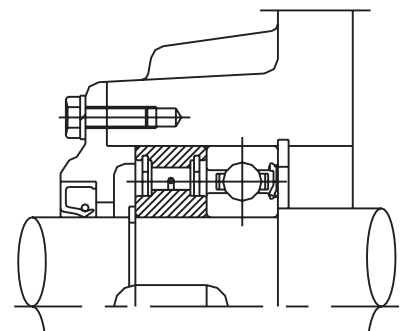
1. Oil lubrication is recommended.
2. Do not use greases or lubricants with EP additives.



Model Number	Torque Capacity		Maximum Overrunning Speed		Drag Torque		Bore Size H7				Keyway		Dimensions	
			Inner Race	Outer Race									A	
	lb - ft	N-m	rpm	rpm	lb - ft	N-m	Inches		mm		Inches	mm	Inches	mm
NSS-8	4.9	6.7	6,000	3,000	0.004	0.005	0.3150	+0.0006 -0.000	8	+0.015 -0.000	0.08 x 0.04	2 x 1.0	0.315	8
NSS-10	8.9	12.0	4,500	2,300	0.005	0.007	0.3937	+0.0006 -0.000	10	+0.015 -0.000	0.12 x 0.06	3 x 1.4	0.354	9
NSS-12	12.5	17.0	4,000	2,000	0.007	0.009	0.4724	+0.0007 -0.000	12	+0.018 -0.000	0.16 x 0.07	4 x 1.8	0.394	10
NSS-15	16.2	22.0	3,500	1,800	0.007	0.010	0.5906	+0.0007 -0.000	15	+0.018 -0.000	0.20 x 0.05	5 x 1.2	0.433	11
NSS-20	30.2	41.0	2,600	1,300	0.007	0.010	0.7874	+0.0008 -0.000	20	+0.021 -0.000	0.24 x 0.06	6 x 1.6	0.551	14
NSS-25	41.3	56.0	2,200	1,100	0.015	0.020	0.9843	+0.0008 -0.000	25	+0.021 -0.000	0.32 x 0.08	8 x 2.0	0.591	15
NSS-30	77.4	105.0	1,800	900	0.022	0.030	1.1811	+0.0008 -0.000	30	+0.021 -0.000	0.32 x 0.08	8 x 2.0	0.629	16
NSS-35	100.3	136.0	1,600	800	0.022	0.030	1.3780	+0.0010 -0.000	35	+0.025 -0.000	0.39 x 0.10	10 x 2.4	0.669	17
NSS-40	218.3	296.0	1,400	700	0.133	0.180	1.5748	+0.0010 -0.000	40	+0.025 -0.000	0.47 x 0.09	12 x 2.2	0.709	18
NSS-45	255.9	347.0	1,300	650	0.155	0.210	1.7717	+0.0010 -0.000	45	+0.025 -0.000	0.55 x 0.08	14 x 2.1	0.748	19
NSS-50	297.2	403.0	1,200	600	0.162	0.220	1.9685	+0.0010 -0.000	50	+0.025 -0.000	0.55 x 0.08	14 x 2.1	0.787	20
NSS-60	478.7	649.0	910	460	0.243	0.330	2.3622	+0.0012 -0.000	60	+0.030 -0.000	0.71 x 0.09	18 x 2.3	0.866	22

Installation and Usage

1. The NSS series cam clutch is designed for press fit installation. Correct interference dimensions must be maintained to obtain maximum clutch performance.
2. Make sure the housing has enough strength to withstand the pressure required for the press fitting installation of the clutch. The internal diameter of the housing should meet the H7 tolerance.



Features

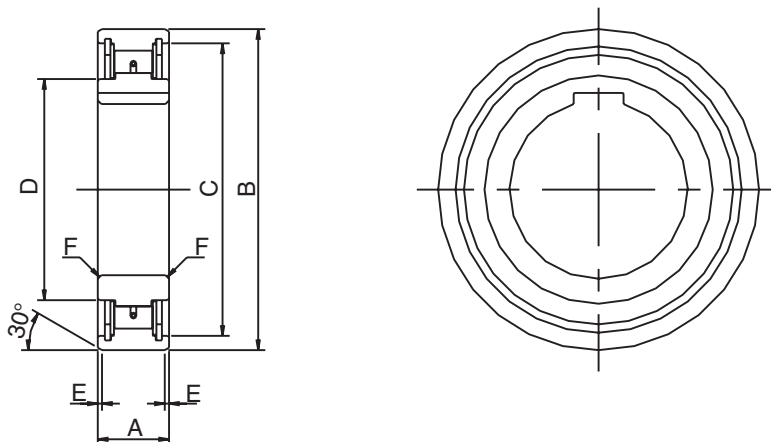
- Sprag type one way clutch
- High torque and longer life than roller ramp clutches
- Full metric design
- Overrunning speed is higher than roller ramp clutches

Industries Served

- Food and beverage
- Gearing
- Printing
- Textile

Field Applications

- Exercise equipment
- Food processing equipment
- Printing presses
- Roll conveyors



Model Number	Dimensions										Weight	
	B		C		D		E		F			
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	lbs.	g
NSS-8	0.944	24	0.874	22.2	0.448	11.4	0.024	0.6	0.024	0.6	0.03	14
NSS-10	1.229	30	1.063	27.0	0.614	15.6	0.024	0.6	0.020	0.6	0.1	27
NSS-12	1.311	32	1.161	29.5	0.709	18.0	0.024	0.6	0.020	0.6	0.1	31
NSS-15	1.434	35	1.260	32.0	0.811	20.6	0.024	0.6	0.020	0.6	0.1	39
NSS-20	1.926	47	1.575	40.0	1.051	26.7	0.031	0.8	0.030	0.8	0.3	115
NSS-25	2.131	52	1.772	45.0	1.260	32.0	0.031	0.8	0.030	0.8	0.3	140
NSS-30	2.541	62	2.165	55.0	1.575	40.0	0.031	0.8	0.040	1.0	0.5	215
NSS-35	2.951	72	1.417	36.0	1.772	45.0	0.031	0.8	0.040	1.0	0.7	300
NSS-40	3.279	80	2.835	72.0	1.969	50.0	0.031	0.8	0.040	1.0	0.9	425
NSS-45	3.484	85	2.972	75.5	2.244	57.0	0.047	1.2	0.040	1.0	1.1	495
NSS-50	3.689	90	3.228	82.0	2.441	62.0	0.047	1.2	0.040	1.0	1.2	545
NSS-60	4.508	110	3.937	100.0	3.149	80.0	0.047	1.2	0.060	1.5	2.1	950

Installation and Usage (continued)

- When installing the clutch, mount it with a type 62 bearing to avoid radial force, since this clutch does not have any bearings inside.
- Confirm the direction of rotation before installation.
- The recommended shaft tolerance is H7, and the key profile should be in accordance with the following standard.
- NSS-8 – 12.....DIN 6885. 1
- NSS-15 - 60 DIN 6885. 3
- Suitable surface pressure of the key should be selected according to your company design standards.

Models NFS-12 - NFS-80

The NFS Series clutch is available in 13 sizes and is designed with the same overall dimensions as a medium metric series ball bearing. The NFS Series clutch offers approximately twice the torque capacity of the NSS Series clutch. The inner race contains a key seat and the outer race is designed with European key slots. The clutch is furnished with protective oil and must be lubricated before installation. In addition, bearing support is required.

Lubrication

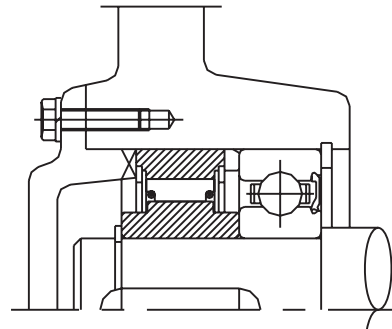
1. Oil lubrication is recommended.
2. Do not use greases or lubricants with EP additives.



Model Number	Torque Capacity		Maximum Overrunning Speed		Drag Torque		Bore Size H7				Keyway		Dimensions	
	Rated Torque Capacity		Inner Race	Outer Race									A	
	Ft.-Lbs.	N-m	r/min	r/min	Lb-Ft	N-m	mm		Inch		mm	in.	mm	in.
NFS-12	13.276	18	4,500	2,300	0.030	0.04	12	+0.018 -0.000	0.4724	+0.0007 -0.0000	4 x 1.8	0.16 x 0.07	13	0.512
NFS-15	20.652	28	3,500	1,800	0.044	0.06	15	+0.018 -0.000	0.5906	+0.0007 -0.0000	5 x 1.2	0.20 x 0.05	18	0.709
NFS-17	36.879	50	3,200	1,600	0.081	0.11	17	+0.018 -0.000	0.6693	+0.0007 -0.0000	5 x 1.2	0.20 x 0.05	19	0.748
NFS-20	61.956	84	2,500	1,300	0.133	0.18	20	+0.021 -0.000	0.7874	+0.0008 -0.0000	6 x 1.6	0.24 x 0.06	21	0.827
NFS-25	94.409	128	2,000	1,000	0.140	0.19	25	+0.021 -0.000	0.9843	+0.0008 -0.0000	8 x 2.0	0.32 x 0.08	24	0.945
NFS-30	147.514	200	1,600	800	0.155	0.21	30	+0.021 -0.000	1.1811	+0.0008 -0.0000	8 x 2.0	0.32 x 0.08	27	1.063
NFS-35	350.347	475	1,400	700	0.310	0.42	35	+0.025 -0.000	1.3780	+0.0010 -0.0000	10 x 2.4	0.39 x 0.10	31	1.220
NFS-40	447.706	607	1,300	650	0.339	0.46	40	+0.025 -0.000	1.5748	+0.0010 -0.0000	12 x 2.2	0.47 x 0.09	33	1.299
NFS-45	557.604	756	1,100	550	0.413	0.56	45	+0.025 -0.000	1.7717	+0.0010 -0.0000	14 x 2.1	0.55 x 0.08	36	1.417
NFS-50	829.031	1124	1,000	500	0.443	0.60	50	+0.025 -0.000	1.9685	+0.0010 -0.0000	14 x 2.1	0.55 x 0.08	40	1.575
NFS-60	1456.705	1975	840	420	0.642	0.87	60	+0.030 -0.000	2.3622	+0.0012 -0.0000	18 x 2.3	0.71 x 0.09	46	1.811
NFS-70	1854.256	2514	750	380	0.671	0.91	70	+0.030 -0.000	2.7559	+0.0012 -0.0000	20 x 2.7	0.79 x 0.11	51	2.008
NFS-80	2894.232	3924	670	340	0.900	1.22	80	+0.030 -0.000	3.1496	+0.0012 -0.0000	22 x 3.1	0.87 x 0.12	58	2.283

Installation and Usage

1. The outer race of the NFS Series cam clutch is designed for press fit installation to the housing. Correct interference dimensions of the outer race must be maintained to obtain maximum clutch performance. The internal diameter of the housing should meet the H7 tolerance. Keyways should be made in the end faces of the clutch for proper installation.
2. Make sure the housing has enough strength to withstand the pressure required for the press fitting installation of the clutch.



Features

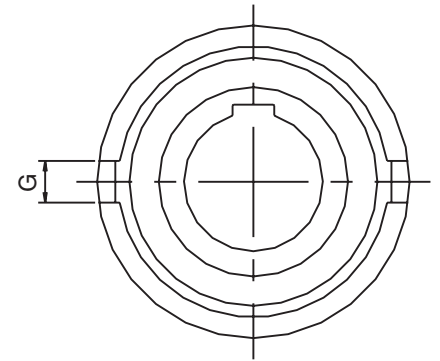
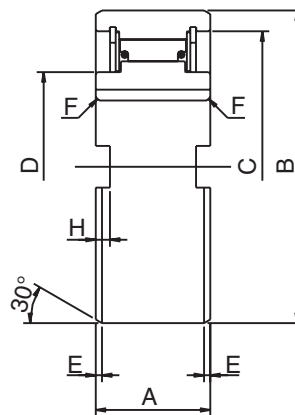
- Sprag type one way clutch
- High torque and longer life than roller ramp clutches
- Full metric design
- Overrunning speed is higher than roller ramp clutches

Industries Served

- Food and beverage
- Printing
- European machinery
- Gearing
- Textile

Field Applications

- Exercise equipment
- Roll conveyors
- Printing presses
- Food processing equipment



Model Number	Dimensions														Weight	
	B		C		D		E		F		G		H			
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	g.	lb.
NFS-12	35	1.378	30	1.181	18	0.709	0.6	0.024	0.3	0.012	4	0.157	1.4	0.055	68	0.1
NFS-15	42	1.654	36	1.417	22	0.866	0.8	0.031	0.3	0.012	5	0.197	1.8	0.071	120	0.
NFS-17	47	1.850	38	1.496	22	0.866	1.2	0.047	0.8	0.031	5	0.197	2.3	0.091	150	0.3
NFS-20	52	2.047	45	1.772	27	1.063	1.2	0.047	0.8	0.031	6	0.236	2.3	0.091	220	0.5
NFS-25	62	2.441	52	2.047	35	1.378	1.2	0.047	0.8	0.031	8	0.315	2.8	0.110	360	0.8
NFS-30	72	2.835	62	2.441	40	1.575	1.8	0.071	1.0	0.039	10	0.394	2.5	0.098	530	1.2
NFS-35	80	3.150	70	2.756	48	1.890	1.8	0.071	1.0	0.039	12	0.472	3.5	0.138	790	1.7
NFS-40	90	3.543	78	3.071	55	2.146	1.8	0.071	1.0	0.039	12	0.472	4.1	0.161	1050	2.3
NFS-45	100	3.937	85	3.358	59	2.323	1.8	0.071	1.0	0.039	14	0.551	4.6	0.181	1370	3.0
NFS-50	110	4.331	92	3.622	65	2.559	1.8	0.071	1.0	0.039	14	0.551	5.6	0.220	1900	4.2
NFS-60	130	5.118	110	4.331	84	3.307	2.6	0.102	1.5	0.059	18	0.709	5.5	0.217	3110	6.9
NFS-70	150	5.906	125	4.921	91	3.583	2.6	0.102	1.5	0.059	20	0.787	6.9	0.272	4390	9.7
NFS-80	170	6.693	140	5.512	100	3.937	2.6	0.102	1.5	0.059	20	0.787	7.5	0.295	6440.0	14.2

Installation and Usage (continued)

- When installing the clutch, mount it with a type 63 bearing to avoid radial force, since this clutch does not have any bearings inside.
- Mount the clutch on the shaft by rotating it in the direction marked by the arrow shown on the clutch plate.
- The recommended shaft tolerance is H7, and the key profile should be in accordance with the following standard.
NFS-12 DIN 6885. 1
NFS-15 – 80 DIN6885. 3
Suitable surface pressure of the key should be selected according to your company design standards.

Part Number Explanation

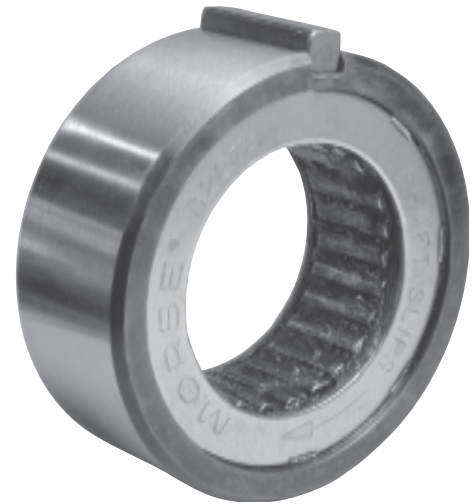
NFS - 35

— Bore size in millimeters

— Clutch series

The B200 Series clutch is designed with a full complement of cams retained in the outer race and requires bearing support, lubrication and sealing. The B200A clutch is primarily used for backstopping applications, such as a pump backstop application, but can be used for indexing or overrunning applications as well. The outer race diameter is the same as the metric 200 series ball bearing to facilitate assembly adjacent to the ball bearing.

* Same O. D. as 200 series ball bearing.



Model Number	Torque Capacity		Shaft Overrun rpm Max.	Dimensions			
				A (Overall Diameter)		B (Width)	
	lb-ft	N-m		Inches	mm	Inches	mm
B203A	39	53	2500	1.573 / 1.574	39.95 / 39.99	1.000	25.40
B204A	50	68	2500	1.848 / 1.849	46.95 / 46.99	1.000	25.40
B205A	80	108	2500	2.045 / 2.046	51.99 / 51.98	1.000	25.40
B206A	175	237	2000	2.439 / 2.440	61.95 / 61.98	1.125	28.58
B207A	275	373	2000	2.832 / 2.834	71.95 / 71.99	1.125	28.58
B208A	405	549	1800	3.148 / 3.149	79.95 / 79.99	1.250	31.75
B210A	575	780	1800	3.541 / 3.543	89.95 / 89.99	1.250	31.75

Key furnished with each clutch.

Lubrication

Series B200A series clutches are furnished prelubricated with a special light grease. In service they may be either oil or grease lubricated. Lubrications with EP additives should be avoided.

Features

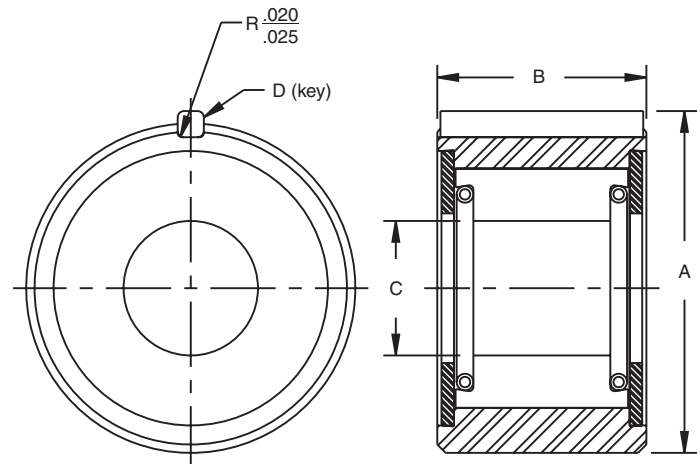
- Shaft mounted
- Primarily backstop applications, may also be used in indexing and overrunning applications
- For freewheeling applications, the shaft that the clutch is mounted on should be the overrunning member
- Clutches require bearing support to ensure concentricity between inner and outer races. Taper on this shaft should not exceed .0002 inches per inch.
- No inner race (shaft is used as inner race)

Industries Served

- Fitness
- Food processing
- Textile

Field Applications

- Gearbox manufacturing
- Winches, hoists
- Industrial transmissions
- Pumps
- Shaft mount reducers
- Textile drives

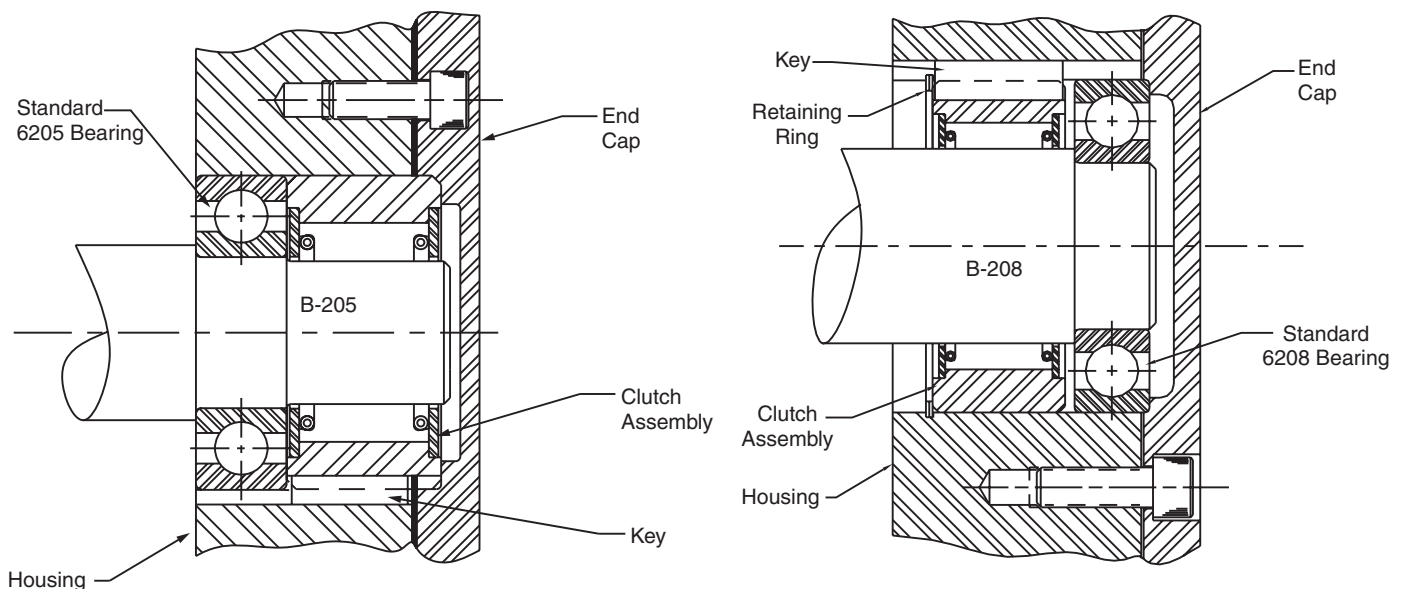


Mounting Data

* Shaft (not included) - harden to obtain RC 58-62 and .050 - .060 case depth after grinding. Concentricity between shaft and housing bore should not exceed .002" T.I.R.

Model Number	Dimensions			Use with Bearing Number	Weight	
	* C (Shaft Diameter)		D (Key Size with Key)		lb.	kg
	Inches	mm				
B203A	.649 / .650	16.48 / 16.51	0.125 x 0.06	203	0.50	0.2
B204A	.739 / .740	18.77 / 18.80	0.19 x 0.09	204	0.75	0.3
B205A	.929 / .930	23.60 / 23.62	0.19 x 0.09	205	0.75	0.3
B206A	1.289 / 1.290	32.74 / 32.77	0.25 x 0.13	206	1.00	0.5
B207A	1.656 / 1.657	42.06 / 42.09	0.25 x 0.13	207	1.25	0.6
B208A	1.840 / 1.841	46.74 / 46.76	0.38 x 0.19	208	1.75	0.8
B210A	2.208 / 2.209	56.08 / 56.11	0.38 x 0.19	210	2.00	0.9

Key furnished with each clutch.



Features

- Dimensionally interchangeable with competitor's series
- Precision formed and honed cams provide extended wear life
- Versatile, compact design adaptable to numerous industrial applications

Industries Served

- Fitness
- Food processing
- Textile

Field Applications

- Gearbox manufacturing
- Winches and hoists
- Industrial transmissions
- Pumps
- Shaft mount reducers
- Textile drives

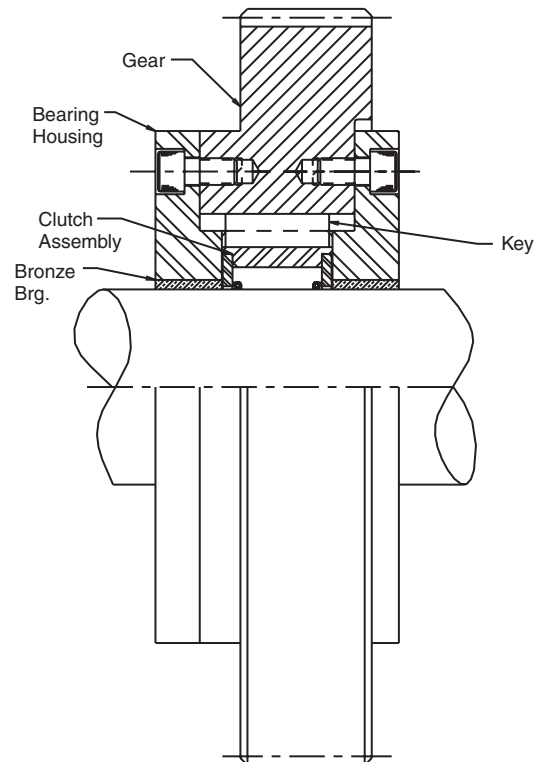


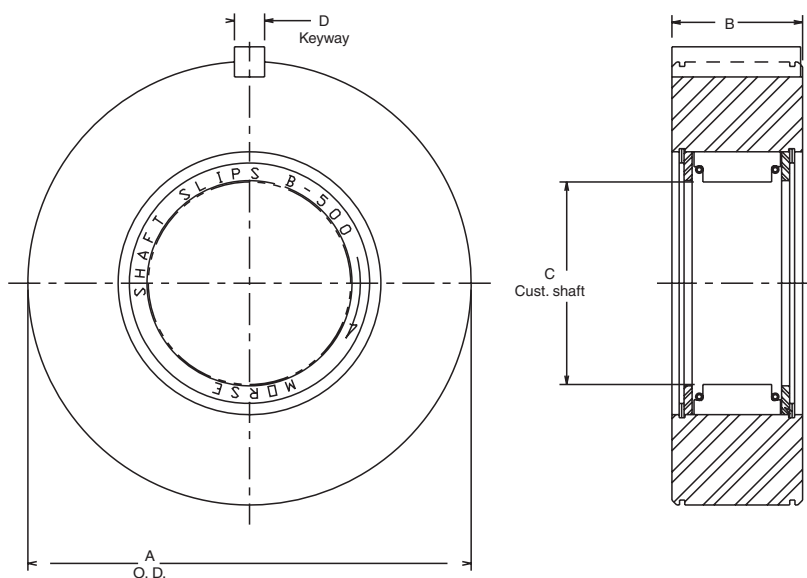
Reservoir Number	Torque Capacity *		Max. Torque Capacity *		Shaft Overrun RPM Max.	Dimensions	
						A (Overall Diameter)	
	lb-ft	N-m	lb-ft	N-m		Inches	mm
B501A	60	81	102	138	2500	1.5735 / 1.5745	39.967 / 39.992
B502	60	81	102	138	2500	1.8480 / 1.8490	46.939 / 46.965
B506	160	217	272	369	2000	2.4385 / 2.4395	61.938 / 61.963
B507A	160	217	272	369	2000	2.4385 / 2.4395	61.938 / 61.963
B509A	250	339	425	576	2000	2.8322 / 2.8332	71.938 / 71.963
B510A	250	339	425	576	2000	3.1470 / 3.1485	79.934 / 79.972
B511A	525	712	892	1209	2000	3.1480 / 3.1490	79.959 / 79.985
B512A	650	881	1,105	1498	2000	3.5410 / 3.5420	89.941 / 89.967
B513	1,250	1,695	2,125	2881	1800	4.7490 / 4.7500	120.625 / 120.650

* Torque rating is based on 10⁶ load cycles fatigue life. Maximum capacity is based on 10⁵ load cycles fatigue life.

Lubrication

B500 series clutches are furnished prelubricated with a light grease. In service they may be either oil or grease lubricated. Lubrications containing EP additives should be avoided.





Reservoir Number	Dimensions						Weight	
	B (Width)		* C (Shaft Diameter)		D (Key Size)			
	Inches	mm	Inches	mm	Inches	mm	lb.	kg
B501A	1.000	25.40	.6495 / .6500	16.497 / 16.510	0.125 x 0.06	3.3 x 1.5	0.50	0.2
B502	0.875	22.23	.7378 / .7383	18.740 / 18.753	0.25 x 0.13	6.4 x 3.3	0.75	0.3
B506	1.000	25.40	1.1325 / 1.1335	28.766 / 28.791	0.25 x 0.13	6.4 x 3.3	0.75	0.3
B507A	1.125	28.58	.9696 / .9706	24.628 / 24.653	0.25 x 0.13	6.4 x 3.3	1.00	0.5
B509A	1.250	31.75	1.1325 / 1.1335	28.766 / 28.791	0.25 x 0.13	6.4 x 3.3	1.50	0.7
B510A	1.375	34.93	1.2955 / 1.2965	32.906 / 32.931	0.375 x 0.19	9.7 x 4.8	1.75	0.8
B511A	1.625	41.28	1.3770 / 1.3776	34.976 / 34.991	0.375 x 0.19	9.7 x 4.8	2.00	0.9
B512A	1.625	41.28	1.5400 / 1.5410	39.116 / 39.141	0.375 x 0.19	9.7 x 4.8	2.00	0.9
B513	1.750	44.45	2.0447 / 2.0457	51.935 / 51.961	0.500 x 0.25	12.7 x 6.4	2.50	1.1

Mounting Data

- * Required shaft diameter - harden to obtain Rc58-62 and .050 - .060 case depth after grinding. Grind to 16 microinch finish. Concentricity between shaft and housing bore should not exceed .003" T.I.R. Adequate bearing support must be provided between the shaft and clutch housing to maintain proper concentricity and support radial loads.

Models PB-3A - PB-16A

Features

- PB series clutches feature precision formed cams, which provide highest torque capacities size-for-size combined with excellent wear life.
- These models are suitable for general purpose applications - overrunning, indexing and backstopping.
- Models PB-5A through PB-16A contain sealed construction and snap ring groove provided on hub of each clutch for attachment of gear, sheave, etc.

Clutch is not to be used as a coupling. Specify direction of rotation when ordering.



Model Number	Torque Capacity		Maximum Overrunning rpm		Bore Size			
					Stock w/Kwy and Setscrew			
	lb - ft	N-m	Inner Race	Outer Race	Bore (inch)	Key (inch)	Bore (mm)	Key (mm)
PB-3A	40	54	1800	900	0.375	1/8 x 1/16	9.52	3.18 x 1.59
					0.5	Roll Pin	12.70	Roll Pin
PB-5A	110	149	1800	900	0.5	1/8 x 1/16	12.70	3.18 x 1.59
					0.625	3/16 x 3/32	15.86	4.76 x 2.38
PB-6A	300	406	1800	800	0.75	3/16 x 3/32	19.05	4.76 x 2.38
PB-8A	450	610	1600	650	0.875	3/16 x 3/32	22.23	4.76 x 2.38
					1	1/4 x 1/8	25.40	6.35 x 3.18
PB-10A	675	915	1200	400	1.125	1/4 x 1/8	28.58	6.35 x 3.18
					1.25	1/4 x 1/8	31.75	6.35 x 3.18
PB-12A	1350	1830	1200	300	1.375	5/16 x 5/32	34.93	7.94 x 3.97
					1.5	3/8 x 3/16	38.10	9.53 x 4.76
PB-14A	1600	2170	950	300	1.625	3/8 x 3/16	41.28	9.53 x 4.76
					1.75	3/8 x 3/16	44.45	9.53 x 4.76
PB-16A	1800	2440	950	300	1.875	1/2 x 1/4	47.64	12.7 x .635
					2	1/2 x 1/4	50.80	12.7 x .635

Model Number	Dimensions							
	A Clutch Length		B Overall Diameter		C Hub Diameter		D	
	inch	mm	inch	mm	inch	mm	inch	mm
PB-3A	1.880	47.60	2.000	50.80	0.874 / 0.875	22.20 / 22.23	0.781	19.80
PB-5A	2.750	69.80	2.000	50.80	1.249 / 1.250	31.73 / 31.75	1.250	31.70
PB-6A	3.188	81.00	2.875	73.00	1.374 / 1.375	34.90 / 34.93	1.563	39.70
PB-8A	3.563	90.50	3.250	82.60	1.749 / 1.750	44.42 / 44.45	1.688	42.90
PB-10A	3.625	92.10	3.750	95.20	2.249 / 2.250	57.13 / 57.15	1.719	43.70
PB-12A	3.875	98.40	4.438	112.70	2.499 / 2.500	63.48 / 63.50	1.875	47.60
PB-14A	4.375	111.10	5.500	139.70	2.874 / 2.875	73.00 / 73.03	2.125	54.00
PB-16A	4.375	111.10	5.500	139.70	3.249 / 3.250	82.53 / 82.55	2.125	54.00

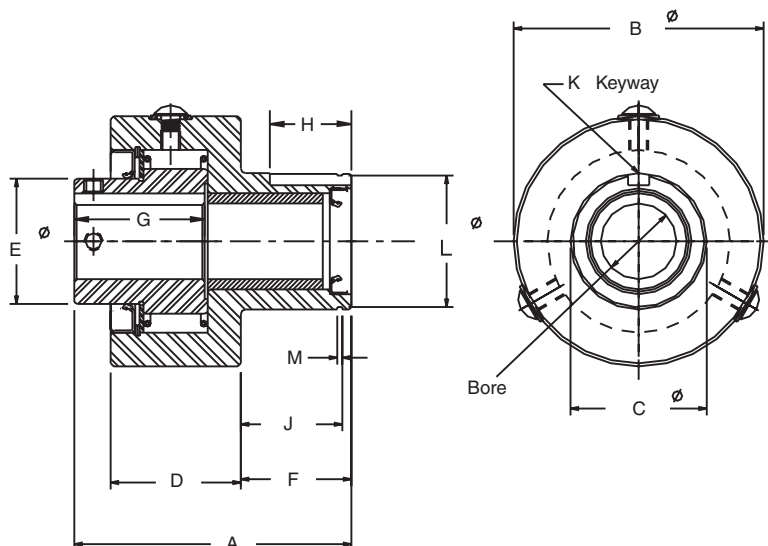
For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Industries Served

- Packaging
- Printing

Field Applications

- Indexing drives
- Print processing equipment



Model Number	Dimensions									
	E		F		G		H		J	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
PB-3A	0.781	21.40	0.813	20.60	0.938	23.80	0.500	12.70	0.715 / 0.720	18.16 / 18.29
PB-5A	1.000	25.40	1.000	25.40	1.563	39.70	0.688	17.50	0.900 / 0.905	22.86 / 22.99
PB-6A	1.375	34.90	1.313	33.30	1.625	41.30	1.000	25.40	1.215 / 1.220	30.86 / 30.99
PB-8A	1.625	41.30	1.438	36.50	1.750	44.50	1.063	27.00	1.315 / 1.320	33.40 / 33.53
PB-10A	2.000	50.80	1.438	36.50	1.688	42.90	1.063	27.00	1.340 / 1.345	34.04 / 34.16
PB-12A	2.375	60.30	1.438	36.50	2.063	52.40	1.125	28.60	1.311 / 1.321	33.30 / 33.55
PB-14A	3.000	76.20	1.750	44.50	2.000	50.80	1.375	34.90	1.625 / 1.630	41.28 / 41.40
PB-16A	3.250	82.60	1.750	44.50	2.125	54.00	1.438	36.50	1.650 / 1.655	41.91 / 42.04

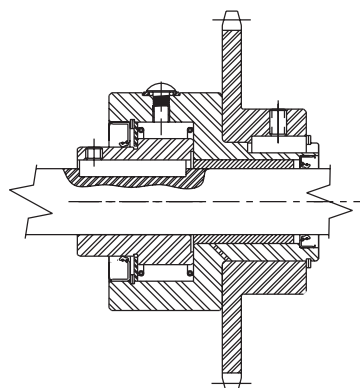
Model Number	Dimensions						S Recommended Snap Ring **	Weight	
	K Key Size		L Snap Ring Groove Diameter **		M Snap Ring Groove Width **				
	inch	mm	inch	mm	inch	mm		lb	kg
PB-3A	0.125 x 0.063	3.18 x 1.59	0.835 / 0.841	21.21 / 21.36	.036 / .056	0.91 / 1.42	RS87	0.75	0.34
PB-5A	0.188 x 0.094	4.76 x 2.38	1.198 / 1.206	30.43 / 30.63	.048 / .068	1.22 / 1.73	RS125	1.75	0.80
PB-6A	0.188 x 0.094	4.76 x 2.38	1.319 / 1.327	33.51 / 33.71	.048 / .068	1.22 / 1.73	RS137	3.50	1.60
PB-8A	0.250 x 0.125	6.35 x 3.18	1.686 / 1.696	42.82 / 43.08	.056 / .076	1.42 / 1.93	RS175	3.75	1.70
PB-10A	0.313 x 0.156	7.94 x 3.97	2.170 / 2.182	55.12 / 55.42	.056 / .076	1.42 / 1.93	RS225	6.00	2.73
PB-12A	0.375 x 0.188	9.53 x 4.76	2.379 / 2.391	60.43 / 60.73	.120 / .130	3.05 / 3.30	RST250	8.50	3.86
PB-14A	0.438 x 0.219	11.11 x 5.56	2.775 / 2.787	70.49 / 70.79	.056 / .076	1.42 / 1.93	RS287	14.75	6.69
PB-16A	0.500 x 0.250	12.70 x 6.35	3.144 / 3.156	79.86 / 80.16	.068 / .088	1.73 / 2.24	RS325	15.00	6.80

** Furnished by customer.

Lubrication

PB series clutches are prelubricated with grease and are ready for installation. These units can be operated in ambient temperatures of +20° F to +125° F.

All filler plugs are 1/4-28. All models have three filler holes at 120° except PB-3A, which has only one. Clutch models PB-5A through PB-16A can be oil lubricated by specifying on order.



Features

- Best used on indexing applications
- One end of clutch tapped for attaching sprockets, gear or ratchet arms
- May be used on overrunning and backstopping applications
- Intended for use on end of a shaft
- For freewheeling applications, the inner race should be overrunning

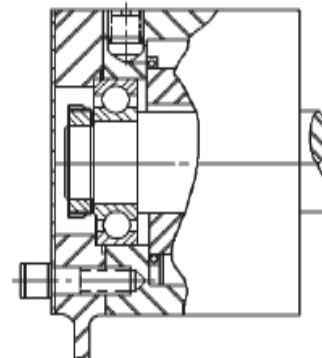


Model Number	Torque Capacity		Bore Size			
			Min.		Max.	
	lb - ft	N-m	Inches	mm	Inches	mm
HT 10	42	57	.425 / .428	10.80 / 10.86	0.625	15.875
HT 20	154	209	.488 / .490	12.38 / 12.45	1.313	33.338
HT 30	440	597	.613 / .615	15.56 / 15.62	2.000	50.800

Model Number	Stock with Std. Keyway		Dimensions			
			A (Clutch Length)		B (Clutch Diameter)	
	Inches	mm	Inches	mm	Inches	mm
HT 10	.625 (.188 x .0938)	15.8750 (4.7625 x 2.3813)	2.125	53.98	2.375	60.33
HT 20	1.00, 1.125, 1.25 (.250 x .125)	25.40, 28.58, 31.75 (6.35 x 3.18)	2.281	57.94	3.563	90.49
	1.313 (.313 x .156)	33.34 (7.94 x 3.97)				
HT 30	1.50, 1.75 (.375 x .188)	38.10, 44.45 (9.53 x 4.76)	2.750	69.85	4.500	114.30
	1.938, 2.00 (.50 x .250)	49.21, 50.80 (12.70 x 6.35)				

Installation and Lubrication

- Before installation a snap-ring ball bearing must be inserted in the counterbored end, complete with a gasket or seal to retain the lubricant.
- Always apply pressure on the inner race, never on the outer race when installing. It is important that the clutch fit snugly on the shaft and have proper fitting keys.
- HT series clutches are furnished with a light lubrication prior to shipment only as an anticorrosive measure and must be fully lubricated after the snap-ring ball bearing has been incorporated by the customer.
- Use Type A automatic transmission fluid and fill until oil runs out between hub and end cap.

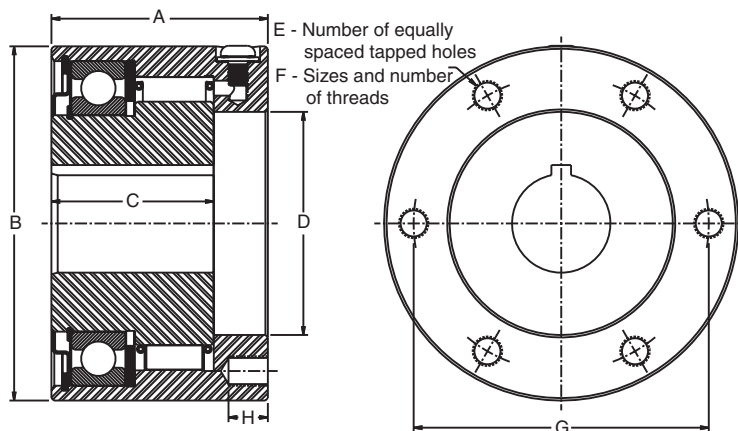


Industries Served

- Equipment rebuild

Field Applications

- Indexing
- Printing press
- Conveyor
- Poly bag machinery
- Plastic bag machinery



Model Number	Dimensions										
	C (Inner Race Length)		D (Bearing Housing Diameter)		E Number of Tapped Holes	F Tapped Hole Thread		G Bolt Circle		H Thread Depth	
	Inches	mm	Inches	mm		Inches	mm	Inches	mm	Inches	mm
HT 10	1.563	39.69	1.1811 / 1.1816	30.000 / 30.013	4	.2500 - 28	6.350 - 711	1.875	47.63	0.375	9.53
HT 20	1.688	42.86	2.0470 / 2.0475	51.994 / 52.007	4	.3125 - 24	7.938 - 610	2.750	69.85	0.375	9.53
HT 30	2.063	52.39	2.8345 / 2.8350	71.996 / 72.009	6	.3750 - 24	9.525 - 610	3.750	95.25	0.469	11.91

Model Number	**Snap Ring Ball Bearing to Fit D Counter Bore			Approximate Weight	
	Bearing No.	Bearing ID (Inches)	mm	lb	kg
HT 10	200	0.3937	10	2.6	1.2
HT 20	205 / 304	.7874 / .9843	20 / 25	5.0	2.3
HT 30	207 / 306	1.1811 / 1.3780	30 / 35	11.0	5

** Furnished by customer.

Models BR-20 - BR-70

The cam of the BR Series clutch is designed to lift off and has no contact with the inner and outer race when it overruns. This is due to centrifugal force and is known as a lift off type. These cam clutches are suitable for overrunning: high speed inner race/low speed engaged outer race or backstopping-high speed inner race overrunning.



Model	Rated Torque Capacity		rpm at Cam Lift-off	Recommended Speed of Inner Race (rpm)		Standard Bore Size			
	lb - ft	N-m		Min.	Max.	mm		inch	
BR-20	225	306	350	880	3600	20	+0.021 -0.000	0.7879	+0.00008 -0.0000
BR-25	283	384	350	880	3600	25	-0.000 +0.021	0.9843	+0.00008 -0.0000
BR-30	448	607	350	880	3600	30	+0.021 -0.000	1.1811	+0.00008 -0.0000
BR-35	506	686	300	740	3600	35	+0.025 -0.000	1.3780	+0.0010 -0.0000
BR-40	723	980	300	720	3600	40	+0.025 -0.000	1.5748	+0.0010 -0.0000
BR-45	795	1078	280	670	3600	45	+0.025 -0.000	1.7717	+0.0010 -0.0000
BR-50	1265	1715	240	610	3600	50	0.025 -0.000	1.9685	+0.0010 -0.0000
BR-60	2566	3479	200	490	3600	60	+0.030 -0.000	2.3622	+0.0012 -0.0000
BR-70	3492	4735	200	480	3600	70	+0.030 -0.000	2.7559	+0.0012 -0.0000

Model	Outer Race Inner Diameter D (h7)				E		F (Open Type Only)		Mounting Holes (Open Type Only)			Pull-off Holes (Open Type Only)	H (Open Type Only)		I (Open Type Only)		J (Open Type Only)		
	Bolt Circle Diamter - G		No. of Mounting Holes	Diameter of Holes															
	mm				in.		mm	in.	mm	in.	S-T	mm	in.	mm	in.	mm	in.		
BR-20	66	+0.000 -0.030	2.5984	+0.0000 -0.0012	40.7	1.60	40.7	1.60	78	3.0709	6	6.6	2-M6	53	2.1	0	0	0	0
BR-25	70	+0.000 -0.030	2.7559	+0.0000 -0.0012	44.7	1.76	44.7	1.76	82	3.2283	6	6.6	2-M6	58	2.3	0	0	0	0
BR-30	75	+0.000 -0.030	2.9527	+0.0000 -0.0012	49.7	1.96	49.7	1.96	87	3.4252	6	6.6	2-M6	64	2.5	0	0	0	0
BR-35	80	+0.000 -0.030	3.1496	+0.0000 -0.0012	54.7	2.15	54.7	2.15	96	3.7795	8	6.6	2-M6	70	2.8	0	0	0	0
BR-40	90	+0.000 -0.035	3.5433	+0.0000 -0.0014	64.7	2.55	64.7	2.55	108	4.2512	8	9	2-M8	81	3.2	0	0	0	0
BR-45	95	+0.000 -0.035	3.7401	+0.0000 -0.0014	69.7	2.74	69.7	2.74	112	4.4094	8	9	2-M8	86	3.4	0	0	0	0
BR-50	110	+0.000 -0.035	4.3307	+0.0000 -0.0014	84.7	3.33	84.7	3.33	132	5.1968	8	9	2-M8	103	4.1	0	0	0	0
BR-60	125	+0.000 -0.040	4.9212	+0.0000 -0.0016	80.0	3.15	80.0	3.15	155	6.1023	8	11	2-M10	110	4.3	5	0.2	5	0.2
BR-70	140	+0.000 -0.040	5.5118	+0.0000 -0.0016	95.0	3.74	95.0	3.74	165	6.4960	12	11	2-M10	125	4.9	5	0.2	5	0.2

Features

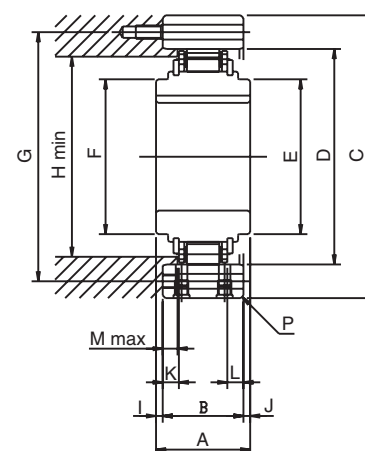
- Lift-off cam design provides contact free operation between the cams and the races for increased wear-life
- Symmetrical design allows operation in either direction
- External bearing support must be provided for concentricity between the housing and shaft

Industries Served

- Gearing
- Manufacturing
- Packaging
- Textile

Field Applications

- Conveyors
- Shaft mount reducers
- Vertical shaft backstop



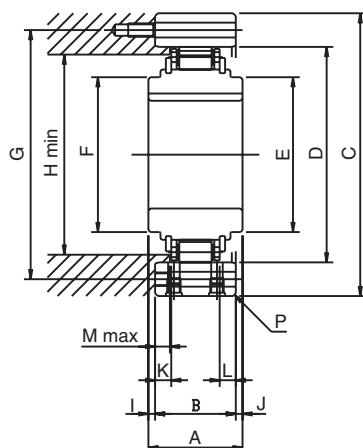
Model	Shaft Hole				Inner Race A		Outer Race B		C (h7)			
	Keyway		Chamfer									
	mm	in.	mm	in.	mm	in.	mm	in.	mm		in.	
BR-20	6 X 2.8	0.24 x 0.11	0.5	0.02	35	1.4	35	1.4	90	+0.000 -0.035	3.5433	+0.0000 -0.0014
BR-25	8 X 3.3	0.32 x 0.13	0.5	0.02	35	1.4	35	1.4	95	+0.000 -0.035	3.7401	+0.0000 -0.0014
BR-30	8 X 3.3	0.32 x 0.13	1.0	0.04	35	1.4	35	1.4	100	+0.000 -0.035	3.9370	+0.0000 -0.0014
BR-35	10 X 3.3	0.39 x 0.13	1.0	0.04	35	1.4	35	1.4	110	+0.000 -0.035	4.3307	+0.0000 -0.0014
BR-40	12 X 3.3	0.47x 0.13	1.0	0.04	35	1.4	35	1.4	125	+0.000 -0.04	4.9212	+0.0000 -0.0016
BR-45	14 X 3.8	0.55 x 0.15	1.0	0.04	35	1.4	35	1.4	130	+0.000 -0.04	4.9212	+0.0000 -0.0016
BR-50	14 X 3.8	0.55 x 0.15	1.0	0.04	40	1.6	40	1.6	150	+0.000 -0.04	5.9055	+0.0000 -0.0016
BR-60	18 X 4.4	0.71 x 0.17	1.5	0.06	60	2.4	50	2.0	175	+0.000 -0.04	6.8897	+0.0000 -0.0016
BR-70	20 X 4.9	0.79 x 0.19	1.5	0.06	60	2.4	50	2.0	190	+0.000 -0.046	7.4803	+0.0000 -0.0018

Model	K (Open Type Only)		L (Open Type Only)		M max (Open Type Only)		P		No. Of Oil Plugs	Weight		Inertial Movement GD2 kg-m ²
	mm	in.	mm	in.	mm	in.	mm	in.		kg.	lb.	
BR-20	5.0	0.20	5.0	0.20	4.0	0.16	1.5	0.06	3XPT-1/8	1.3	2.8	2.25 X 10 ⁻⁴
BR-25	5.0	0.20	5.0	0.20	4.0	0.16	1.5	0.06	3XPT-1/8	1.4	3.0	3.28 X 10 ⁻⁴
BR-30	5.0	0.20	5.0	0.20	4.0	0.16	1.5	0.06	3XPT-1/8	1.5	3.3	4.44 X 10 ⁻⁴
BR-35	5.0	0.20	5.0	0.20	4.0	0.16	1.5	0.06	4XPT-1/8	1.9	4.1	5.65 X 10 ⁻⁴
BR-40	5.0	0.20	5.0	0.20	4.0	0.16	1.5	0.06	4XPT-1/8	2.4	5.2	1.01 X 10 ⁻³
BR-45	5.0	0.20	5.0	0.20	4.0	0.16	1.5	0.06	4XPT-1/8	2.6	5.7	1.22 X 10 ⁻³
BR-50	7.5	0.30	7.5	0.30	6.5	0.26	2.0	0.08	4XPT-1/8	4.1	9.0	2.64 X 10 ⁻³
BR-60	7.0	0.28	7.0	0.28	6.0	0.24	2.0	0.08	4XPT-1/8	7.3	16.0	3.73 X 10 ⁻³
BR-70	7.0	0.28	7.0	0.28	6.0	0.24	2.0	0.08	4XPT-1/8	8.1	17.8	6.65 X 10 ⁻³



Model	Rated Torque Capacity		rpm at Cam Lift-off	Recommended Speed of Inner Race (rpm)		Standard Bore Size (mm)			
	Ft-lbs.	N-m		Min.	Max.	mm		inch	
BR-80	4807	6517	190	450	3600	80	+0.030 -0.000	3.1496	+0.0012 -0.0000
BR-90	6288	8562	180	420	3000	90	+0.035 -0.000	3.5433	+0.0014 -0.0000
BR-100	10481	14210	200	460	2700	100	+0.035 -0.000	3.937	+0.0014 -0.0000
BR-130	15034	20384	180	420	2400	130	+0.040 -0.000	5.1181	+0.0016 -0.0000
BR-150	25009	33908	160	370	1300	150	+0.040 -0.000	5.9055	+0.0016 -0.0000
BR-180	25009	33908	160	370	3500	180	+0.046 -0.000	7.0866	+0.0018 -0.0000
BR-190	30358	41160	140	340	3000	190	+0.046 -0.000	7.4803	+0.0018 -0.0000
BR-220	37658	51058	140	330	3000	220	+0.046 -0.000	8.6614	+0.0018 -0.0000
BR-240	45754	62034	130	310	3000	240	+0.046 -0.000	9.4488	+0.0018 -0.0000

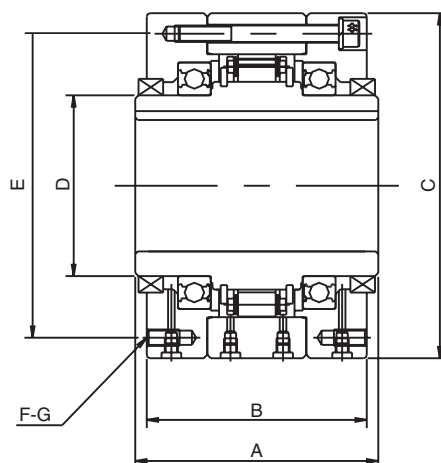
Model	Outer Race Inner Diameter D (h7)				E		F (Open Type Only)		Mounting Holes (Open Type Only)				Pull-off Holes (Open Type Only)	H min (Open Type Only)		I (Open Type Only)		J (Open Type Only)	
									Bolt Circle Diamter - G		No. of Mounting Holes	Diameter of Hole							
	mm	in.	mm	in.	mm	in.	S-T	mm	in.	mm			in.	mm	in.				
BR-80	160	+0.000 -0.040	6.2992	+0.0000 -0.0016	115.0	4.53	115.0	4.53	185	7.2834	12	11	2-M10	148	5.8	5	0.2	5	0.2
BR-90	180	+0.000 -0.046	7.0866	+0.0000 -0.0018	135.0	5.31	135.0	5.31	206	8.1102	12	13.5	2-M12	170	6.7	5	0.2	5	0.2
BR-100	210	+0.000 -0.046	8.2677	+0.0000 -0.0018	143.0	5.63	143.0	5.63	240	9.4488	12	17.5	2-M16	180	7.1	5	0.2	5	0.2
BR-130	240	+0.000 -0.046	9.4488	+0.0000 -0.0018	173.0	6.81	173.0	6.81	278	10.9449	12	17.5	2-M16	210	8.3	5	0.2	5	0.2
BR-150	310	+0.000 -0.052	12.2047	+0.0000 -0.0020	243.0	9.57	243.0	9.57	360	14.1732	12	17.5	2-M16	280	11.0	5	0.2	5	0.2
BR-180	310	+0.000 -0.052	12.2047	+0.0000 -0.0020	290.0	11.42	270.0	10.63	360	14.1733	12	17.5	2-M16	280	11.0	5	0.2	20	0.8
BR-190	330	+0.000 -0.057	12.9921	+0.0000 -0.0022	310.0	12.20	280.0	11.02	380	14.9606	16	17.5	2-M16	300	11.8	5	0.2	20	0.8
BR-220	360	+0.000 -0.057	14.1732	+0.0000 -0.0022	340.0	13.39	320.0	12.60	410	16.1417	18	17.5	2-M16	330	13.0	5	0.2	20	0.8
BR-240	390	+0.000 -0.057	15.3543	+0.0000 -0.0022	370.0	14.57	350.0	13.78	440	17.3228	18	17.5	2-M16	360	14.2	5	0.2	20	0.8



Model	Shaft Hole				Inner Race A		Outer Race B		C (h7)			
	Keyway		Chamfer									
	mm	in.	mm	in.	mm	in.	mm	in.	mm		in.	
BR-80	22 X 5.4	0.87 x 0.21	1.5	0.06	70	2.8	60	2.4	210	+0.000 -0.046	8.2677	+0.0000 -0.0018
BR-90	25 X 5.4	0.98 x 0.21	1.5	0.06	80	3.1	70	2.8	230	+0.000 -0.046	9.0551	+0.0000 -0.0018
BR-100	28 X 6.4	1.10 x 0.25	1.5	0.06	90	3.5	80	3.1	270	+0.000 -0.052	10.6299	+0.0000 -0.0020
BR-130	32 X 7.4	1.26 x 0.29	2.0	0.08	90	3.5	80	3.1	310	+0.000 -0.052	12.2047	+0.0000 -0.0020
BR-150	36 X 8.4	1.42 x 0.33	2.0	0.08	90	3.5	80	3.1	400	+0.000 -0.057	15.7480	+0.0000 -0.0022
BR-180	45 X 10.4	1.77 x 0.41	2.0	0.08	105	4.1	80	3.1	400	+0.000 -0.057	15.7480	+0.0000 -0.0022
BR-190	45 X 10.4	1.77x 0.41	2.0	0.08	105	4.1	80	3.1	420	+0.000 -0.063	16.5354	+0.0000 -0.0025
BR-220	50 X 11.4	1.97 x 0.45	2.0	0.08	105	4.1	80	3.1	460	+0.000 -0.063	18.1102	+0.0000 -0.0025
BR-240	56 X 12.4	2.20 x 0.49	2.0	0.08	105	4.1	80	3.1	490	+0.000 -0.063	19.2913	+0.0000 -0.0025

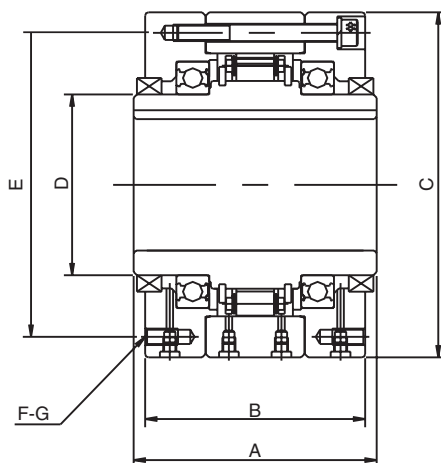
Model	K (Open Type Only)		L (Open Type Only)		M max (Open Type Only)		P		No. Of Oil Plugs	Weight		Inertial Movement GD2 kg-m ²
	mm	in.	mm	in.	mm	in.	mm	in.		kg.	lb.	
BR-80	12.0	0.47	12.0	0.47	11.0	0.43	2.0	0.08	4XPT-1/8	12.0	26.4	1.77 X 10 ⁻²
BR-90	17.0	0.67	17.0	0.67	16.0	0.63	2.0	0.08	4XPT-1/8	16.0	35.2	3.16 X 10 ⁻²
BR-100	13.7	0.54	13.7	0.54	12.0	0.47	2.0	0.08	4XPT-1/4	23.0	50.7	6.31 X 10 ⁻²
BR-130	13.7	0.54	13.7	0.54	12.0	0.47	2.0	0.08	4XPT-1/4	31.0	68.3	0.109
BR-150	13.7	0.54	13.7	0.05	12.0	0.47	3.0	0.12	4XPT-1/4	58.0	127.8	0.365
BR-180	11.5	0.45	15.9	0.63	14.0	0.55	3.0	0.12	4XPT-1/4	60.0	132.2	0.435
BR-190	12.5	0.49	8.9	0.35	7.5	0.30	3.0	0.12	4XPT-1/4	65.0	143.3	0.563
BR-220	12.5	0.49	10.9	0.43	9.0	0.35	3.0	0.12	4XPT-1/4	76.0	167.5	0.789
BR-240	12.5	0.49	10.9	0.43	9.0	0.35	3.0	0.12	4XPT-1/4	84.0	185.1	1.05

Model	Rated Torque Capacity		rpm at Cam Lift-off	Recommended Speed of Inner Race (rpm)		Standard Bore Size (mm)			
	Ft-lbs.	N-m		Min.	Max.	mm		inch	
BR-20P	225	306	350	880	3600	20	+0.021 -0.000	0.7879	+0.0008 -0.0000
BR-25P	283	384	350	880	3600	25	+0.021 -0.000	0.9843	+0.0008 -0.0000
BR-30P	448	607	350	880	3600	30	+0.021 -0.000	1.1811	+0.0008 -0.0000
BR-35P	506	686	300	740	3600	35	+0.025 -0.000	1.3780	+0.0010 -0.0000
BR-40P	723	980	300	720	3600	40	+0.025 -0.000	1.5748	+0.0010 -0.0000
BR-45P	795	1,078	280	670	3600	45	+0.025 -0.000	1.7717	+0.0010 -0.0000
BR-50P	1,265	1,715	240	610	3600	50	+0.025 -0.000	1.9685	+0.0010 -0.0000
BR-60P	2,566	3,479	200	490	3600	60	+0.030 -0.000	2.3622	+0.0012 -0.0000
BR-70P	3,492	4,735	200	480	3600	70	+0.030 -0.000	2.7559	+0.0012 -0.0000



Model	Shaft Hole		Inner Race A		Outer Race B		C (h7)			Outer Race Inner Diameter D (h7)		E		F-G	
	Keyway														
	mm	in.	mm	in.	mm	in.	mm		in.		mm	in.	mm		in.
BR-20P	6 X 2.8	0.24 x 0.11	87	3.4	79	3.1	94	+0.000 -0.035	3.7008	+0.0000 -0.0014	30	1.2	78	3.1	6-M 6
BR-25P	8 X 3.3	0.32 x 0.13	89	3.5	81	3.2	98	+0.000 -0.035	3.8583	+0.0000 -0.0014	35	1.4	82	3.2	6-M 6
BR-30P	8 X 3.3	0.32 x 0.13	94	3.7	85	3.3	103	+0.000 -0.035	4.0551	+0.0000 -0.0014	45	1.8	87	3.4	6-M 6
BR-35P	10 X 3.3	0.39 x 0.13	94	3.7	85	3.3	112	+0.000 -0.035	4.4094	+0.0000 -0.0014	50	2.0	96	3.8	8-M 6
BR-40P	12 X 3.3	0.47 x 0.13	100	3.9	91	3.6	130	+0.000 -0.040	5.1181	+0.0000 -0.0016	55	2.2	108	4.3	8-M 8
BR-45P	14 X 3.8	0.55 x 0.15	100	3.9	91	3.6	135	+0.000 -0.040	5.3149	+0.0000 -0.0016	60	2.4	112	4.4	8-M 8
BR-50P	14 X 3.8	0.55 x 0.15	107	4.2	98	3.9	152	+0.000 -0.040	5.9842	+0.0000 -0.0016	70	2.8	132	5.2	8-M 8
BR-60P	18 X 4.4	0.71 x 0.17	122	4.8	112	4.4	180	+0.000 -0.040	7.0866	+0.0000 -0.0016	80	3.1	155	6.1	8-M 10
BR-70P	20 X 4.9	0.79 x 0.19	128	5.0	120	4.7	190	+0.000 -0.046	7.4803	+0.0000 -0.0018	90	3.5	165	6.5	12-M 10

Model	Rated Torque Capacity		rpm at Cam Lift-off	Recommended Speed of Inner Race (rpm)		Standard Bore Size (mm)			
	Ft-lbs.	N-m		Min.	Max.	mm		inch	
BR-80P	4,807	6,517	190	450	3600	80	+0.030 -0.000	3.1496	+0.0012 -0.0000
BR-90P	6,288	8,526	180	420	3000	90	+0.035 -0.000	3.5433	+0.0014 -0.0000
BR-100P	10,481	14,210	180	460	2500	100	+0.035 -0.000	3.937	+0.0014 -0.0000
BR-130P	15,034	20,384	180	420	2200	130	+0.040 -0.000	5.1181	+0.0016 -0.0000
BR-150P	25,009	33,908	160	370	1300	150	+0.040 -0.000	5.9055	+0.0016 -0.0000
BR-180P	25,009	33,908	160	370	1800	180	+0.040 -0.000	7.0866	+0.0016 -0.0000
BR-190P	30,358	41,160	140	340	1800	190	+0.046 -0.000	7.4803	+0.0018 -0.0000
BR-220P	37,658	51,058	140	330	1800	220	+0.046 -0.000	8.6614	+0.0018 -0.0000
BR-240P	45,754	62,034	130	310	1800	240	+0.046 -0.000	9.4488	+0.0018 -0.0000



Model	Shaft Hole		Inner Race A		Outer Race B		C (h7)				Outer Race Inner Diameter D (h7)		E		F-G
	Keyway														
	mm	in.	mm	in.	mm	in.	mm		in.		mm	in.	mm	in.	
BR-80P	22 X 5.4	0.87 x 0.21	148	5.8	134	5.3	210	+0.000 -0.046	8.2677	+0.0000 -0.0018	110	4.3	185	7.3	12-M 10
BR-90P	25 X 5.4	0.98 x 0.21	152	6.0	138	5.4	235	+0.000 -0.046	9.2519	+0.0000 -0.0018	120	4.7	206	8.1	12-M 12
BR-100P	28 X 6.4	1.10x 0.25	186	7.3	172	6.8	275	+0.000 -0.052	10.8267	+0.0000 -0.0020	130	5.1	240	9.4	12-M 16
BR-130P	32 X 7.4	1.26 x 0.29	208	8.2	188	7.4	314	+0.000 -0.052	12.3622	+0.0000 -0.0020	160	6.3	278	10.9	12-M 16
BR-150P	36 X 8.4	1.42 x 0.33	226	8.9	204	8.0	400	+0.000 -0.063	15.7478	+0.0000 -0.0025	200	7.9	360	14.2	12-M 16
BR-180P	45 X 10.4	1.77 x 0.41	240	9.4	233	9.2	400	+0.000 -0.063	15.7478	+0.0000 -0.0025	220	8.7	260	10.2	12-M 16
BR-190P	45 X 10.4	1.77 x 0.41	250	9.8	242	9.5	420	+0.000 -0.063	16.5354	+0.0000 -0.0025	240	9.4	380	15.0	16-M 16
BR-220P	50 X 11.4	1.97 x 0.45	250	9.8	242	9.5	460	+0.000 -0.063	18.1102	+0.0000 -0.0025	260	10.2	410	16.1	18-M 16
BR-240P	56 X 12.4	2.21 x 0.49	260	10.2	252	9.9	490	+0.000 -0.063	19.2913	+0.0000 -0.0025	280	11.0	440	17.3	18-M 16

Grease Lubrication

- Morse recommends an NLGI, Grade 1 or 2 premium bearing grease, mineral oil based in a lithium soap thickener, non-EP type.
- Synthetic polyurea base fluid greases are also acceptable.
- EP greases (having extreme pressure characteristics) with slippery additives such as graphite or molybdenum disulfide must not be used. They can cause the clutch to malfunction.
- Clutches specified as grease are filled at the factory and are ready-to-use.
- Grease is not recommended for low temperatures or for performance indexing applications.
- Generally relubricate every two months and more often for dirty environments.
- For operation in ambient temperatures over +200°F or below +20°F, consult Application Engineering.

General use: (+20°F to +125°F, NLGI #2)

- Texaco Multifak® AFB 2, Texaco Polystar RB
- Mobilith® SHC 100
- Shell Alvania® #2

Food grade applications (USDA Grade H-1, up to +300°F):

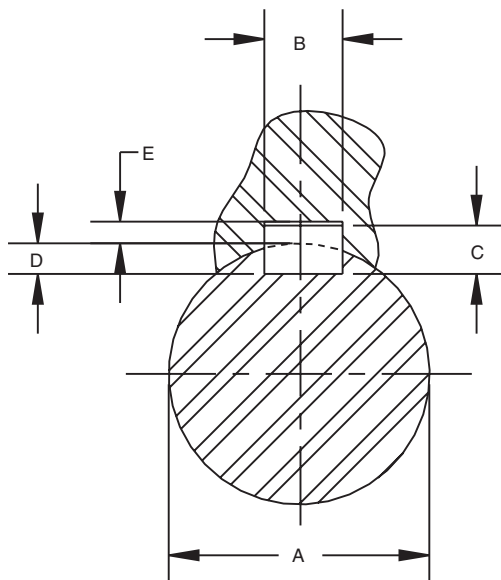
- Keystone Nevastane® HT/AW-1 or -2
- Mobil® FM 101, 102
- Lubriplate® FML-1, FML-2

Note: Not all greases are compatible and clutch performance can be affected.

Oil Lubrication

- Morse standard oil is a multipurpose automatic transmission fluid, good from -20°F to +150°F. For temperatures outside this range, use synthetic ATF oil.
- Oils with EP additives must not be used. They can cause the clutch to malfunction.
- Clutches ordered with oil are partially filled and then drained after factory run-in. Therefore, the clutch must be filled half full with oil before being operated.
- The standard oil lip seal is made from a polyacrylic compound, which is good to +250°F.
- Oil is recommended for indexing applications.

Check the oil level monthly. See the maintenance and installation sheet provided with each unit.



Metric Keyway Dimensions and Tolerances in Inches

Bore Shaft Size				Key Width		Models MZEU & BR					
A				B		Key Height					
Over		To				C		D		E	
inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
0.2	6	0.3	8	.0780 / .0795	2	0.0787	2	.047 / .051	1.1938 / 1.2954	.039 / .051	0.9906 / 1.2954
0.3	8	0.4	10	.1173 / .1189	3	0.1181	3	.071 / .075	1.8034 / 1.905	.055 / .067	1.397 / 1.7018
0.4	10	0.5	12	.1565 / .1584	4	0.1575	4	.098 / .102	2.4892 / 2.5908	.071 / .083	1.8034 / 2.1082
0.5	12	0.7	17	.1959 / .1979	5	0.1969	5	.118 / .122	2.9972 / 3.0988	.091 / .102	2.3114 / 2.5908
0.7	17	0.9	22	.2353 / .2372	6	0.2362	6	.138 / .142	3.5052 / 3.6068	.110 / .122	2.794 / 3.0988
0.9	22	1.2	30	.3138 / .3161	8	0.2756	7	.158 / .165	4.0132 / 4.191	.130 / .146	3.302 / 3.7084
1.2	30	1.5	38	.3926 / .3948	10	0.3149	8	.197 / .205	5.0038 / 5.207	.130 / .146	3.302 / 3.7084
1.5	38	1.7	44	.4709 / .4739	12	0.315	8	.197 / .205	5.0038 / 5.207	.130 / .146	3.302 / 3.7084
1.7	44	2.0	50	.5497 / .5527	14	0.3543	9	.217 / .224	5.5118 / 5.6896	.150 / .165	3.81 / 4.191
2.0	50	2.3	58	.6284 / .6314	16	0.3937	10	.236 / .244	5.9944 / 6.1976	.169 / .185	4.2926 / 4.699
2.3	58	2.6	65	.7072 / .7102	18	0.4331	11	.276 / .284	7.0104 / 7.2136	.173 / .189	4.3942 / 4.8006
2.6	65	3.0	75	.7857 / .7891	20	0.4724	12	.295 / .303	7.493 / 7.6962	.193 / .209	4.9022 / 5.3086

Bore Shaft Size				Key Width		Models NSS & NFS					
A				B		Key Height					
Over		To				C		D		E	
inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
0.2	6	0.3	8	.0780 / .0795	2	0.0787	2	.047 / .051	1.1938 / 1.2954	.039 / .051	0.9906 / 1.2954
0.3	8	0.4	10	.1173 / .1189	3	0.1181	3	.071 / .075	1.8034 / 1.8034	.055 / .067	1.397 / 1.7018
0.4	10	0.5	12	.1565 / .1584	4	0.1575	4	.098 / .102	2.4892 / 2.5908	.071 / .083	1.8034 / 2.1082
0.5	12	0.7	17	.1959 / .1979	5	0.1181	3	.075 / .079	1.90 / 2.0066	.047 / .051	1.1938 / 1.2954
0.7	17	0.9	22	.2353 / .2372	6	0.1575	4	.098 / .102	2.4892 / 2.5908	.063 / .075	1.6002 / 1.905
0.9	22	1.2	30	.3138 / .3161	8	0.1969	5	.122 / .126	3.0988 / 3.2004	.079 / .091	2.0066 / 2.3114
1.2	30	1.5	38	.3926 / .3948	10	0.2362	6	.146 / .154	3.7084 / 3.9116	.095 / .106	2.413 / 2.6924
1.5	38	1.7	44	.4709 / .4739	12	0.2362	6	.154 / .161	3.9116 / 4.0894	.087 / .098	2.2098 / 2.4892
1.7	44	2.0	50	.5497 / .5527	14	0.2362	6	.157 / .165	3.9878 / 4.191	.083 / .094	2.1082 / 2.3876
2.0	50	2.3	58	.6284 / .6314	16	0.2756	7	.185 / .193	4.699 / 4.9022	.095 / .106	2.413 / 2.6924
2.3	58	2.6	65	.7072 / .7102	18	0.2756	7	.189 / .197	4.8006 / 5.0038	.091 / .102	2.3114 / 2.5908
2.6	65	3.0	75	.7857 / .7891	20	0.3149	8	.213 / .220	5.4102 / 5.588	.106 / .118	2.6924 / 2.9972

Models	Nominal Bore		Bore Diameter		Shaft Diameter	
	inches	mm	inches	mm	inches	mm
PB-3A through PB-16A and HT	0.3750	9.525	0.3750 / 0.3760	9.525 / 9.550	0.3745 / 0.3740	9.512 / 9.500
	0.5000	12.700	0.5000 / 0.5010	12.700 / 12.725	0.4995 / 0.4990	12.687 / 12.675
	0.6250	15.875	0.6250 / 0.6260	15.875 / 15.900	0.6245 / 0.6240	15.862 / 15.850
	0.7500	19.050	0.7500 / 0.7510	19.050 / 19.075	0.7495 / 0.7490	19.037 / 19.025
	0.8750	22.225	0.8750 / 0.8760	22.225 / 22.250	0.8745 / 0.8740	22.212 / 22.200
	1.0000	25.400	1.0000 / 1.0010	25.400 / 25.425	0.9995 / 0.9990	25.387 / 25.375
	1.1250	28.575	1.1250 / 1.1260	28.575 / 28.600	1.1245 / 1.1235	28.562 / 28.537
	1.2500	31.750	1.2500 / 1.2510	31.750 / 31.775	1.2495 / 1.2485	31.737 / 31.712
	1.3125	33.338	1.3125 / 1.3135	33.338 / 33.363	1.3120 / 1.3110	33.325 / 33.299
	1.3750	34.925	1.3750 / 1.3760	34.925 / 34.950	1.3745 / 1.3735	34.912 / 34.887
	1.5000	38.100	1.5000 / 1.5010	38.100 / 38.125	1.4995 / 1.4985	38.087 / 38.062
	1.6250	41.275	1.6250 / 1.6260	41.275 / 41.300	1.6245 / 1.6235	41.262 / 41.237
	1.7500	44.450	1.7500 / 1.7510	44.450 / 44.475	1.7495 / 1.7485	44.437 / 44.412
	1.8750	47.625	1.8750 / 1.8760	47.625 / 47.650	1.8745 / 1.8735	47.612 / 47.587
	1.9375	49.213	1.9375 / 1.9385	49.213 / 49.238	1.9370 / 1.9360	49.200 / 49.174
	2.0000	50.800	2.0000 / 2.0010	50.800 / 50.825	1.9995 / 1.9985	50.787 / 50.762
All Models M300 through M1000	0.5000	12.700	0.4990 / 0.5000	12.675 / 12.700	0.4990 / 0.4980	12.675 / 12.649
	0.6250	15.875	0.6240 / 0.6250	15.850 / 15.875	0.6240 / 0.6230	15.850 / 15.824
	0.7500	19.050	0.7490 / 0.7500	19.025 / 19.050	0.7490 / 0.7480	19.025 / 18.999
	0.8750	22.225	0.8740 / 0.8750	22.200 / 22.225	0.8740 / 0.8730	22.200 / 22.174
	1.0000	25.400	0.9990 / 1.0000	25.375 / 25.400	0.9990 / 0.9980	25.375 / 25.349
	1.1250	28.575	1.1240 / 1.1250	28.550 / 28.575	1.1240 / 1.1230	28.550 / 28.524
	1.2500	31.750	1.2490 / 1.2500	31.725 / 31.750	1.2490 / 1.2480	31.725 / 31.699
	1.3750	34.925	1.3740 / 1.3750	34.900 / 34.925	1.3740 / 1.3730	34.900 / 34.874
	1.5000	38.100	1.4990 / 1.5000	38.075 / 38.100	1.4990 / 1.5000	38.075 / 38.100
	1.6250	41.275	1.6240 / 1.6250	41.250 / 41.275	1.6240 / 1.6230	41.250 / 41.224
	1.7500	44.450	1.7490 / 1.7500	44.425 / 44.450	1.7490 / 1.7480	44.425 / 44.399
	1.8750	47.625	1.8740 / 1.8750	47.600 / 47.625	1.8740 / 1.8730	47.600 / 47.574
	2.0000	50.800	1.9990 / 2.0000	50.775 / 50.800	1.9990 / 1.9980	50.775 / 50.749
	2.2500	57.150	2.2485 / 2.2500	57.112 / 57.150	2.2485 / 2.2475	57.112 / 57.087
	2.5000	63.500	2.4985 / 2.5000	63.462 / 63.500	2.4985 / 2.4975	63.462 / 63.437
	3.0000	76.200	2.9985 / 3.0000	76.162 / 76.200	2.9985 / 2.9975	76.162 / 76.137
	3.5000	88.900	3.4985 / 3.5000	88.862 / 88.900	3.4985 / 3.4975	88.862 / 88.837
	4.0000	101.600	3.9985 / 4.0000	101.562 / 101.600	3.9985 / 3.9975	101.562 / 101.537
	4.5000	114.300	4.4980 / 4.5000	114.249 / 114.300	4.4980 / 4.4970	114.249 / 114.224
	5.0000	127.000	4.9980 / 5.0000	126.949 / 127.000	4.9980 / 4.9970	126.949 / 126.924
	5.5000	139.700	5.4980 / 5.5000	139.649 / 139.700	5.4980 / 5.4970	139.649 / 139.624
	6.0000	152.400	5.9980 / 6.0000	152.349 / 152.400	5.9980 / 5.9970	152.349 / 152.324

On applications where a press fit is required, do not exceed .001 inch.

Backstop applications which permit or require looser fits than those listed can use the following fits shown below.

Bore sizes up to: Shaft to bore clearance

2.375	.003
4.25	.004
6.00	.004
6.00 and over	.006

Clutch Repair

Morse cam clutches are precision mechanisms made by experienced workmen under careful supervision and high quality control standards; clutch repair requires this same attention which can be provided only by the manufacturer. Clutch should not be disassembled in the field for repair.

Installation and Maintenance

Specific instruction sheets are packed with each clutch which cover the installation, lubrication and maintenance of each unit.

They can also be found on www.emerson-ept.com.

1. Calculate torque to be transmitted:

$$T \text{ (Lb-Ft)} = \frac{\text{HP} \times 5252}{\text{rpm}}$$
 2. Determine mode of operation (overrunning, indexing, backstopping). Refer to Modes of Operation on page 8.
 3. Select service factor from tables below.
 4. Calculate design torque. (Multiply torque from step 1 by service factor).
 5. Determine bore requirements of clutch.
 6. Determine overrunning speed and overrunning member (inner or outer race).
 7. Select clutch based upon:
 - A. Design torque requirements
 - B. Bore size
 - C. Mode of operation
 - D. Speed
- Refer to pages 4 through 7 for condensed description and application guide. See also data pages on specific series. Consider M Series clutches for longer life. See page 20 for indexing life. On overrunning and backstopping applications, refer to page 21 for expected wear life data.
8. Specify catalog number and bore size as:

Catalog No.	Bore Size	Rotation
MG-600A	1.500/1.4999	See page #9
 9. Direction of rotation must be specified for clutch series PB, HT and for clutch models used with couplings and reservoirs.
 10. Refer vertical or other special applications to Application Engineering. Supply complete application information including sketch of drive system.

Service Factors

Overrunning

Type of Load	Service Factor (All Models)
1. Gradually applied	1.25
2. Suddenly applied - minor shock loads	1.75
3. Suddenly applied - heavy shock loads	2.50
4. Severe shock	5.00

Applications where linear or torsional vibration is present, such as reciprocating engines, or where impact loads occur due to sudden engagement and pickup of high inertia loads, greater service factors should be used. Consult Application Engineering for more information.

Indexing

Load Cycles/Minute	Degrees/Load Cycle	KK	NSS	NFS	200A	B-500	PB-A	HT	M*	MZEU
Up through 150	Less than 90°	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5
Greater than 150	Less than 90°	2	2	2	3	3	3	2	2	2
Up through 150	90° or greater	2	2	2	3	3	3	2	2	2
Greater than 150	90° or greater	3	3	3	4	4	4	3	2.5	3

* Use model MI for applications requiring more than 150 cycles/minute or greater than 90° stroke angle. Also, use MI model when greater accuracy of index is required up to a limit of 1200 load cycles/minute.

Backstopping

Service factors are generally 1.0 to 2.0 where occasional loading occurs and 1.5 to 2.5 where frequent loading is used. The maximum service factor selected is dependent upon overload conditions as specified by the purchaser.

Selection Example

A fan drive requires a clutch to overrun from fan speed to zero speed when power is shut off. The drive consists of a 50 HP motor at 1750 rpm, a 1.7:1 reduction to fan and a fan shaft diameter of 1.500".

Steps	Solution
1. Torque to be transmitted	$T = \frac{\text{HP} \times 5252}{\text{rpm}} = \frac{50 \times 5252}{1030} = 255 \text{ Lb-Ft}$
2. Determine mode of operation	Overrunning
3. Proper service factor	Use 1.25 service factor for fan
4. Design torque	$255 \times 1.25 = 319 \text{ Lb-Ft}$
5. Bore requirement	1.50 inches
6. Overrunning speed and member	Inner race overruns at 1030 RPM to zero
7. and 8. Clutch selection and specification	Clutch which satisfies shaft size, torque and speed is MG-600A/1.50 model no. MG-600A bore 1.500/1.4999 inch dia. w/std. kwy.

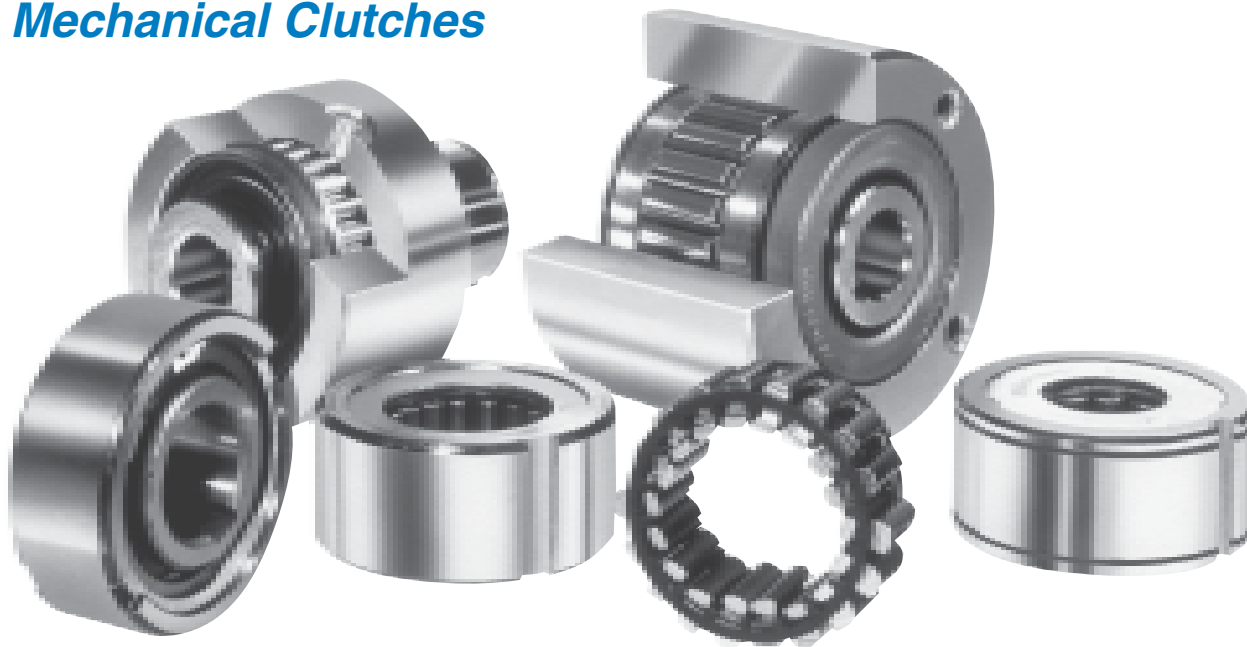
For selection assistance, call Application Engineering at 1-800-626-2093 or fax the information to:
Emerson Power Transmission
P. O. Box 687
Maysville, KY 41056
Fax (606) 564-2079

1. Application: State purpose of clutch and equipment clutch will be used on: _____
2. Main operating mode: Overrunning _____ Backstopping _____ Indexing _____
3. Power driving clutch: Electric _____ Diesel _____ Gasoline _____ Other _____
Horsepower _____ Hp, at _____ rpm
4. Torque through clutch: _____ lb-feet, at a Driving rpm _____ on the clutch.
5. Load type/(service factor): Gradual (1.5) _____ Sudden load, minor shock (1.75) _____
Sudden load, heavy shock (2.5) _____ Severe shock (5.0) _____
6. Lubrication: Oil _____ Grease _____ Specific type _____ Serviced? _____
7. Environment: Ambient Temp. (F) _____ Exposed to: Dirt, dust? _____ Moisture? _____
8. Shaft diameter (inches) _____ Keyway size, if known _____
Clutch Mounting Position: Horizontal _____ Vertical _____
9. Indexing applications only: Max indexes per minute _____ Degrees per index _____
Hours per day in use _____ Days used per year _____
10. All other applications: Continuous duty, _____ hours per day
If intermittent duty cycle; Driving (%) _____ Overrunning (%) _____ Idle (%) _____
If overrunning; Inner race maximum rpm _____ Outer race max rpm _____
11. Quantity required: This application _____ Annually _____
12. Additional comments? _____
13. Please provide sketch if possible. _____

Thank you!

Morse[®]

Mechanical Clutches



The industry's broadest line of conveyor backstop, overrunning and indexing clutches.

Morse mechanical clutches offer the most complete and versatile selection in the industry. Eleven series of clutches perform three basic modes of operation:

- Overrunning
- Indexing
- Backstopping

These units have set standards of performance, offering:

- Higher overrunning speeds
- Greater torque capacities
- Longer service life

Cam clutches are precision devices that lock the inner and outer races through the wedging action of cams to transmit torque in one direction of rotation while overrunning in the opposite direction of rotation. These units are often referred to as freewheels, sprag, overrunning, backstop or one-way clutches, depending upon their application.

Protect your equipment with Morse and Browning Torque Overload Devices.

Browning and Morse torque overload devices are designed to protect machinery when an overload or jam occurs. Utilizing a torque overload device can help increase production, reduce downtime and prevent costly repairs. Emerson Power Transmission offers eight different types of torque overload devices available in shear pin, ball detent and friction facing designs. These units are available with up to 1800 rpm, 21,500 ft/lbs of torque and at best, can maintain trip torque within $\pm 3\%$ accuracy to meet the needs of the most demanding applications.



For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



Torque Overload Devices

Emerson Power Transmission offers one of the broadest lines of torque overload devices to help you cost-effectively handle a wide range of applications.

Emerson Power Transmission offers torque overload devices for the protection of equipment and machinery with eight types of devices for many applications and uses.

By utilizing a torque overload device you can:

- Help protect against the increasing cost and hassle of overload related damage
- Increase production by reducing downtime



Browning and Morse torque overload devices are suitable for many different applications. Browning shear pin hubs and Browning and Morse torque limiters are a cost-effective solution to help protect primary drives and conveyors. For higher-precision applications such as wrapping or cartoning equipment, Browning Torq/Pro delivers repeatability and accuracy. In applications requiring an ON/OFF switch, such as a press machine or for high-speed applications like packaging conveyors, the Torq/Pro TPZ is the best-suited device. For servo motor driven applications choose the Torq/Pro TPX and for wash-down applications, such as filling equipment, the Torq/Gard is the best solution. If you need application assistance, please contact Application Engineering at 1-800-626-2093.

Torq/Gard

TGC 60

- Size (1/10 of the maximum torque capacity, in.-lbs.)
- Series

If required shaft bushing is ordered separately ex.

60 BU 012

- Shaft size (16th of an inch)
- Bushing kit
- Torq/Gard Size

Bushing kit includes key and set screws. Torq/Gards can be made into couplings by ordering separate components. Single strand TG sprocket kits to bolt on are stocked.

TG 40 A 45 K

- Kit
- Number of teeth
- A-Plate
- #40 roller chain
- Torq/Gard

Includes mounting bolts.

Browning Torque Limiter

T45L x FB

- Specify bore size in inches
- Browning torque limiter with 4.5" OD

Bushing is supplied with Browning torque limiter.
Sprocket for torque limiter is ordered separately 50T45L26.

50 T45L 26

- Number of teeth
- Browning torque limiter with 4.5" OD
- #50 roller chain

Morse Torque Limiter

350A -2 TL x FB

- Specify bore size
- Series
- Number of disc springs (max. 2)
- Overall diameter (3.5 inches)

Required bushing is ordered separately; bushing length determined by sprocket selection.

350 AG 5 26

- Number of teeth in sprocket
- #50 pitch roller chain
- A plate, ground (63 micro-inch)
- Fits Morse TL model 350

Browning Torq/Pro

TP 30 H FB or MPB

- Specify finished bore or min. plain bore
- Springs (light, medium or heavy)
- Model number
- Series

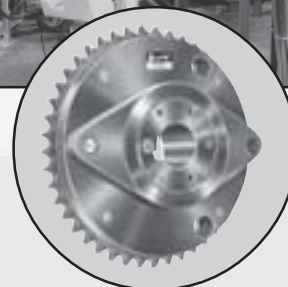
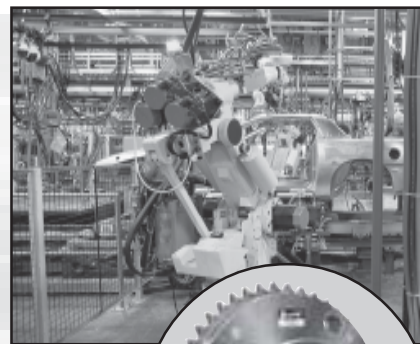
When ordering a Torq/Pro coupling specify Torq/Pro unit, Torq/Pro sprocket, coupling chain and adjoining sprocket.

Browning Shear Pin Hubs and Sprockets

(Page 84)

Features

- Helps prevent damage to machinery due to sudden overload by shearing a necked pin at a predetermined load, allowing the sprocket to rotate freely without the hub
 - New shear pins must be installed to reengage drive
- Bore range 0.38" - 5"
 Torque range 0.88 - 21,572 lb-ft.
 Precision tripping torque $\pm 20\%$

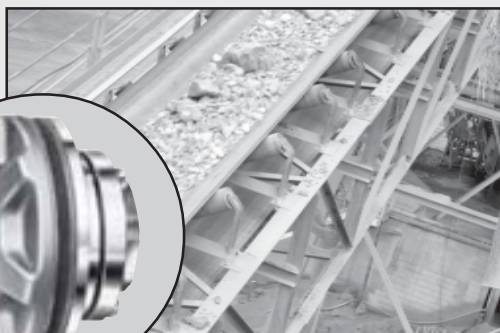


Morse Torque Limiters

(Page 88)

Features

- Overload protection for mechanical drive systems
 - Adjustable spring pressure determines overload setting and reengages drive when overload condition subsides
 - Also available as a torque-limiting coupling
- Bore range 0.38" - 4.87"
 Torque range 1 - 6,300 lb-ft.
 Precision tripping torque $\pm 25\%$



Browning Torque Limiters

(Page 95)

Features

- Torque control devices that slip under excessive load
 - Adjustable spring pressure determines overload setting and reengages drive when overload condition subsides
 - Effective overload protection for a wide variety of applications
- Bore range 0.5" - 2.5"
 Torque range 67 - 733 lb-ft.
 Precision tripping torque $\pm 25\%$

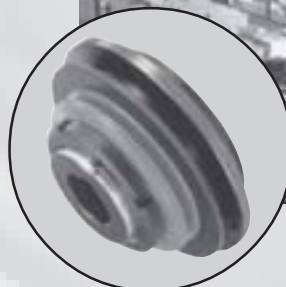


Browning Torq/Pro

(Page 97)

Features

- Overload protection with increased accuracy
 - Adjustable spring pressure transmits torque through a ball-in-detent arrangement
 - Resets to the same initial position
- Bore range 0.19" - 5.12"
 Torque range 2.6 - 5,270 lb-ft.
 Precision tripping torque $\pm 10\%$



Browning Torq/Pro X (TPX)

(Page 104)

Features

- Patent pending, innovative ball and wedge mechanism, helps prevent backlash
- Ball and pocket are uniquely designed to fit together in only one position
- Adjust trip torque by simply turning the adjustment nut
- Torque setting can be easily verified by checking the torque scale and indicator

Bore range 0.28" - 2.75"

Torque range 1.25" - 578 lb-ft.

Precision tripping torque $\pm 3\%$

Browning Torq/Pro Z (TPZ)

(Page 108)

Features

- TPZ is reset by applying a load in the direction of the shaft, either manually or by means of external force.
- Shaft revolution can be started or stopped at will- it can be used as a mechanical ON-OFF clutch
- The ball and pocket act as the torque transmission element and are uniquely designed to fit together in only one position

Bore range 0.31" - 1.96"

Torque range 1.77 - 332 lb-ft.

Precision tripping torque $\pm 10\%$

Browning Torq/Gard

(Page 111)

Features

- Precise overload protection with an elegant yet rugged cam-in-detent system
- Fast reaction and automatic reset provide unsurpassed protection
- Detector plates, coupling options and other accessories enhance design flexibility

Bore range 0.75" - 2.44"

Torque range 1 - 675 lb-ft.

Precision tripping torque $\pm 5\%$

Browning Axial Gard (TPA)

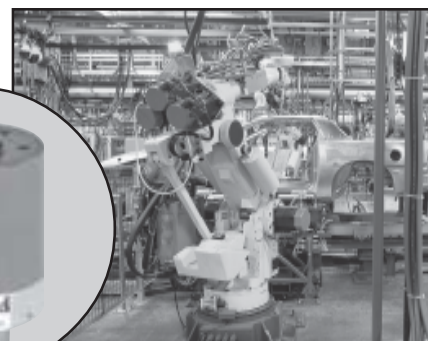
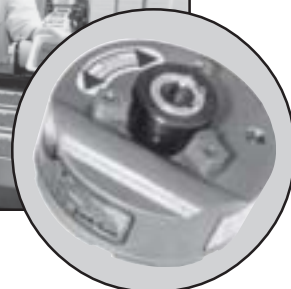
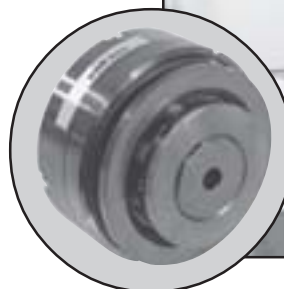
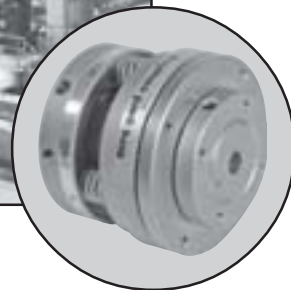
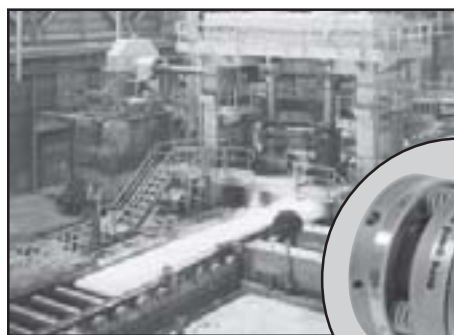
(Page 117)

Features

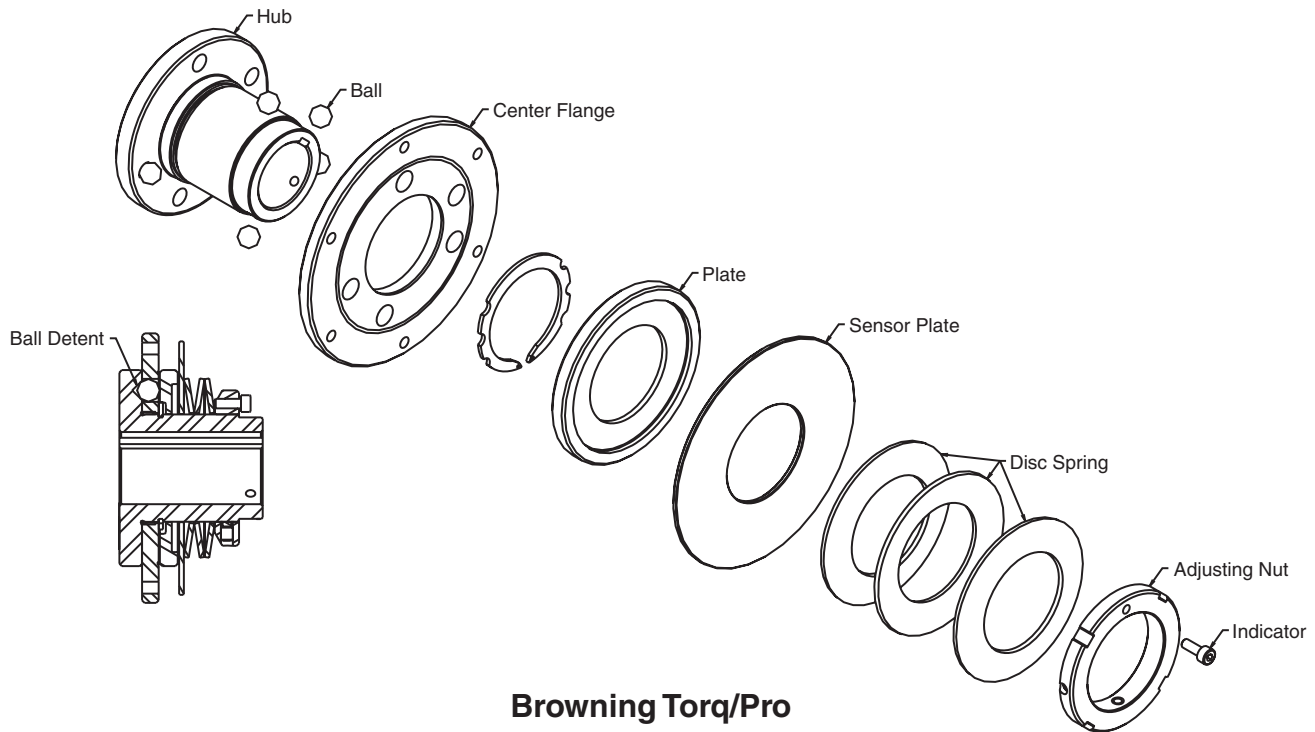
- High accuracy: Trip load doesn't change over $\pm 15\%$ after many trips
- Torsional stiffness of axial direction is high allowing the axial gard to prevent backlash
- Trip load is easily set by rotating the adjustment screw - trip loads in either direction are the same

Precision tripping torque $\pm 10\%$

Select the most suitable torque overload devices to cover all your complex application needs.



Designed to help protect your equipment!



Browning Torq/Pro

Browning shear pin hubs have the most basic design. When the pre-determined overload occurs, the pin breaks. The inner part of the hub remains in place, while the outer part rotates freely, allowing the drive to idle.

Morse and Browning torque limiters are more sophisticated and utilize friction facings to allow slipping when an overload occurs. Both units reengage automatically after the overload has been removed.

Browning Torq/Pro, Torq/Pro X and Torq/Pro Z (refer to image above) all function using a ball and detent design, which allows for one position engagement and practically eliminates backlash. Torque is transmitted from the center flange through the ball to the detent in the hub. When an overload occurs, the ball is released and rolls between the plate and the hub.

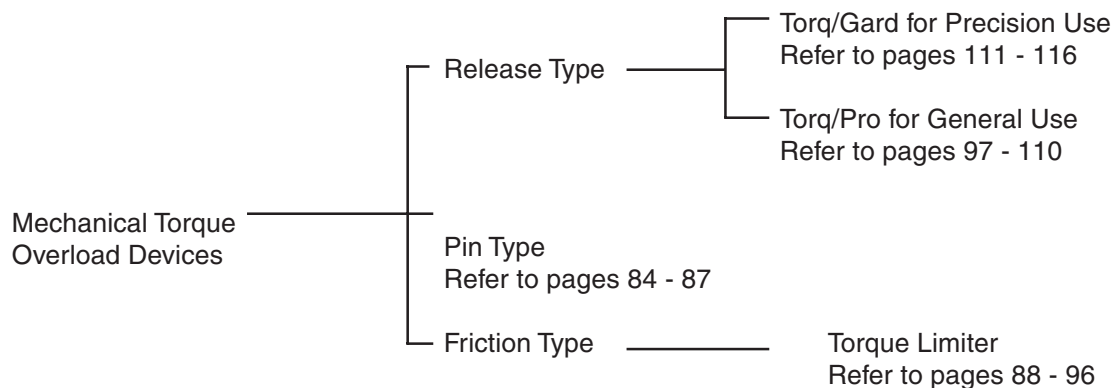
Browning Torq/Gard has a spring-loaded cam follower seated in a single hub cam detent causing the hub and clutch body to rotate as a unit. When the preset torque limit is exceeded by an overload condition, the follower is released from the cam detent disconnecting the hub from the body.

The Browning axial gard functions different than the other torque overload devices as it is meant for linear applications. The thrust load from the slide shaft leads to the case transferred by the steel balls. When the thrust load exceeds the setting load the steel balls run on and the slide shaft becomes free.

Torque Overload Device Product Types

Types	Shear Pin Hub	Browning Torque Limiter	Morse Torque Limiter	Torq/Pro	TPX	TPZ	Torq/Gard	TPA
Drive Feature	Pin	Friction Pad	Friction Pad	Ball Detent	Zero Backlash Ball Detent	Manual Reset Ball Detent	Precision Cam Follower	Axial Type Ball Detent
Featured Use	Economical Good Accuracy	Economical	Economical	General Use	High Precision	Quick Response ON/OFF Capabilities	Fully Enclosed Maintenance Free	Axial Overload Protection
Accuracy of Trip Torque	+20%	+25%	+25%	+10%	+3%	+10%	+5%	+10%
Max. Torque Range (Ft/Lbs)	21,572	733	6300	5270	578	332	675	771*
Max. Speed (rpm)	500	1400	1400	1200	1400	1800	900	N/A
Max. Bore Inches (mm)	5" (127)	2.5" (63)	4.87" (123)	5.118 (130)	2.755 (70)	1.96 (50)	2.44 (62)	N/A
Resetting Type	Manual	Automatic	Automatic	Jog	Jog	Manual	Jog	Manual
Single Position Reset	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Backlash	Zero	Friction Slip type	Friction Slip type	Small	Zero	Small	Small	Small

* Axial Gard trip loads are in pounds-force (lbf).



For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



Browning shear pin hubs are designed to prevent damage to machinery due to sudden overload or jamming by shearing the necked pin at a predetermined load. The inner part of the hub is keyed to the shaft and remains stationary while the outer part, to which the sprocket is bolted, rotates freely after pin breakage, allowing the drive to idle.

Browning shear pin hubs and sprockets consist of three separate stock parts:

- Steel sprockets
- Hub assembly
- Malleable bushing

Each part is individually packaged. The hub assembly includes sprocket mounting bolts, two hardened liners and one minimum strength shear pin. Additional liners and shear pins are available from stock in a wide range of shear strengths. Sprockets are available in pitches and numbers of teeth shown on page 85, machined to fit shear pin hubs. Stock Browning type "A" sprockets with other numbers of teeth can be machined to fit these hubs. Bushings are stock Browning split taper bushings. Both Type 1 and Type 2 shear pin hubs are grease packed to provide low friction rotation in case of pin breakage. Type 2 hubs are provided with a grease fitting for relubrication.

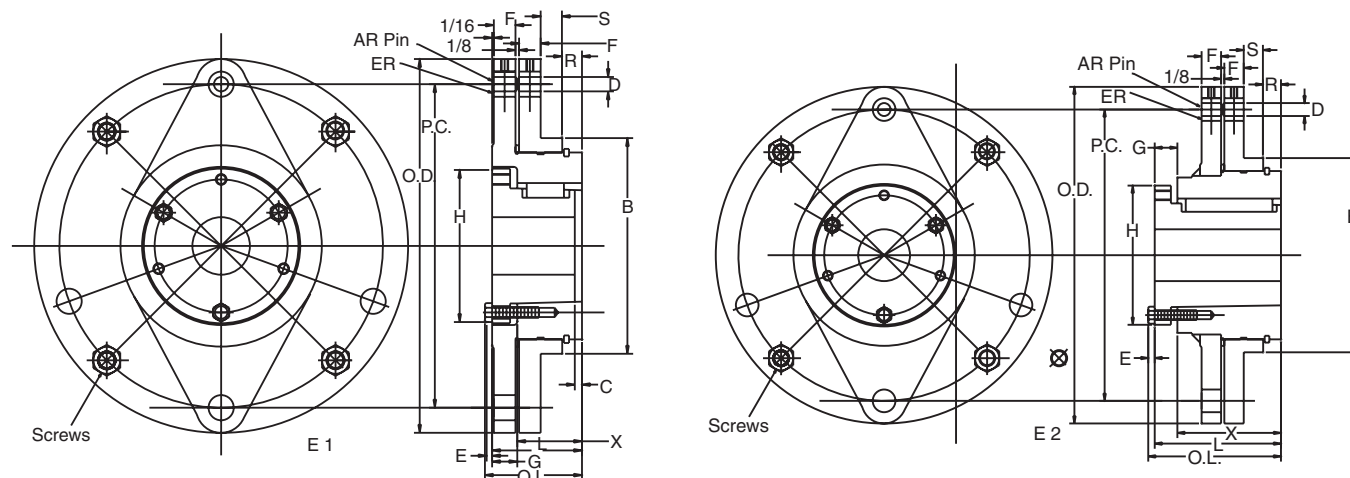


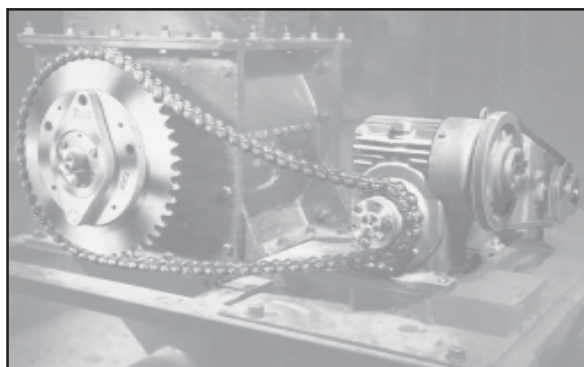
Table 1

Stock Shear Pin Hubs - Specifications

Part No.	Type	Dimensions																	Capscrews	
		O.D.	O.L.	P.C.	B	C	D	E	F	G	H	L	P	R	S	T	X	No.	Size	
SHH1	1	5 1/2"	2 1/4"	4.500"	3.250"	13/16"	1/4"	3/16"	1/2"	4/9"	2 1/2"	1 1/4"	-	1/2"	5/16"	2 1/16"	1 5/8"	3	3/8	
SHP1	1	7 5/8	2 3/8	6.500	4.500	3/16	3/8	1/4	1/2	5/8	3	1 15/16	-	1/2	7/16	2 1/8	1 1/2	3	1/2	
SHQ1	1	10	3 9/32	8.625	6.000	1/2	1/2	3/8	3/4	3/4	4 1/8	2 1/2	-	11/16	5/8	3	2 1/4	4	1/2	
SHR1	1	13	3 11/32	11.250	7.500	3/16	1/2	1/2	3/4	7/8	5 3/8	2 7/8	-	5/8	3/4	3 1/16	2 3/16	4	5/8	
SHR2	2	16 1/4	5 5/32	14.000	7.500	-	3/4	1/2	7/8	7/8	5 3/8	4 7/8	1 1/2	3/4	3/4	-	4	4	5/8	
SHS2	2	18 3/8	7 1/8	16.000	8.000	-	3/4	3/4	1	1	6 3/8	6 3/4	1 2/3	1 13/16	1 1/8	-	5 11/16	4	3/4	

Table 2 Specifications

Part No.	Hub	Bushing	Bore Range	Torque Range Inch Pounds	Wt. Less Bushing
SHH1	H	H	3/8" - 1 1/2"	930 - 3730	5.2
SHP1	P1	P1	1/2" - 1 3/4"	1340 - 14950	10.8
SHQ1	Q1	Q1	3/4" - 2 11/16"	7140 - 38890	27.3
SHR1	R1	R1	1 1/8" - 3 3/4"	9310 - 50720	45.8



Industries

- Wood products
- Aggregate processing
- Conveyor manufacturing
- Agriculture

Applications

- Primary drives
- Conveyors
- Wrapping and cartoning equipment
- Industrial equipment
- Agricultural equipment

Steel Liners for Shear Pin Hubs



Hardened and Ground

Table 3

Part No.	Hub Size	Dimensions			Wt. Lbs.
		O.D.	I.D.	Length	
HL	SHH1	0.502	0.25	1/2	.02
PL	SHP1	0.752	0.375	1/2	.05
QL	SHQ1, SHR1	0.877	0.5	3/4	.08
R2L	SHR2	1.252	0.75	7/8	.20

Liners are packaged three of a size to a box. Weights shown are per liner.

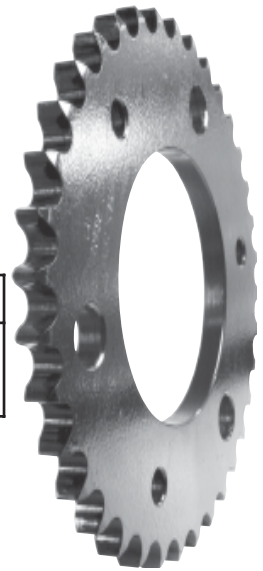


Table 4

Stock Sprockets for Shear Pin Hubs

Part No.	Diameter		Chain Size	No. Teeth	Fits Hub	Wt. Lbs.	Part No.	Diameter		Chain Size	No. Teeth	Fits Hub	Wt. Lbs.
	Outside	Pitch						Outside	Pitch				
S40H40	6.65"	6.373"	40	40	SHH1	1.8	S80Q36	11.98"	11.474"	80	36	SHQ1	11.7
S40H45	7.45	7.168	40	45	SHH1	2.8	S80Q40	13.31	12.746	80	40	SHQ1	16.3
S40H48	7.93	7.645	40	48	SHH1	3.0	S80Q45	14.9	14.336	80	45	SHQ1	20
S40H60	9.84	9.554	40	60	SHH1	5.0	S80Q48	15.86	15.29	80	48	SHQ1	24.7
S50H36	7.52	7.171	50	36	SHH1	2.9	S80Q54	17.77	17.198	80	54	SHQ1	31.4
S50H40	8.32	7.966	50	40	SHH1	3.9	S80Q60	19.68	19.107	80	60	SHQ1	39.3
S60P60	14.76	14.331	60	60	SHP1	18.3	S120R248	23.79	22.935	120	48	SHR2	88
S60P72	17.63	17.194	60	72	SHP1	27.8	S120R260	29.52	28.661	120	60	SHR2	144
S60Q45	11.18	10.752	60	45	SHQ1	7.7	S120S245	22.35	21.503	120	45	SHS2	74
S60Q48	11.89	11.467	60	48	SHQ1	9.5	S120S260	29.52	28.661	120	60	SHS2	142
S60Q54	13.33	12.899	60	54	SHQ1	12.5	S140S240	23.29	22.305	140	40	SHS2	81
S60Q60	14.76	14.0331	60	60	SHQ1	16.8	S140S245	26.08	25.087	140	45	SHS2	105
S60Q72	17.63	17.194	60	72	SHQ1	25.3	S140S260	34.44	33.438	140	60	SHS2	200
							S160U245	29.8	28.671	160	45	SHU2	182
							S160U260	39.36	38.215	160	60	SHU2	329

Stock Type "A" sprockets can be reworked to fit shear pin hubs.

Table 5

Stock Shear Pins

SHH1 Hub		SHP1 Hub		SHQ1 and SHR1 Hubs		SHR2 Hub		SHS2 Hub		SHU2 Hub	
Part No.	Wt. Lbs.	Part No.	Wt. Lbs.	Part No.	Wt. Lbs.	Part No.	Wt. Lbs.	Part No.	Wt. Lbs.	Part No.	Wt. Lbs.
1H	0.03	1P	0.06	1Q	0.09	1R	0.13	1S	0.25	1U	0.38
2H	0.03	2P	0.06	2Q	0.09	2R	0.13	2S	0.25	2U	0.38
3H	0.03	3P	0.06	3Q	0.09	3R	0.13	3S	0.25	3U	0.38
4H	0.03	4P	0.06	4Q	0.09	4R	0.13	4S	0.25	4U	0.38
		5P	0.06	5Q	0.09	5R	0.13	5S	0.25	5U	0.38

Shear pins are packaged five pieces per carton. Weights shown are per pin.

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



Table 6

Stock Shear Pins

Shear Pin Neck Diameter	Shear Pin Hub Number															
	SHH1				SHP1				SHQ1				SHR1			
	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.
3/32"	1H	930	1.4	3/4"	1P	1340	2.1	7/8"	-	-	-	-	-	-	-	-
1/8	2H	1660	2.6	7/8	2P	2390	3.8	1	-	-	-	-	-	-	-	-
5/32	3H	2590	4.1	1	3P	3740	5.9	1 1/8	-	-	-	-	-	-	-	-
3/16	4H	3730	5.9	1 1/8	4P	5380	8.5	1 3/8	1Q	7140	11.3	1 7/16"	1Q	9310	14.7	1 9/16"
7/32	-	-	-	-	5P	7330	11.6	1 7/16	2Q	9720	15.4	1 5/8	2Q	12690	20.1	1 3/4
1/4	-	-	-	-	6P	9570	15.1	1 9/16	3Q	12700	20.1	1 3/4	3Q	16570	26.2	1 15/16
9/32	-	-	-	-	7P	12100	19.2	1 3/4	4Q	16060	25.4	1 7/8	4Q	20950	33.2	2 1/16
5/16	-	-	-	-	8P	14950	23.7	*1 3/4	5Q	19840	31.4	2	5Q	25880	41.0	2 1/4
11/32	-	-	-	-	-	-	-	-	6Q	24010	38.0	2 1/8	6Q	31320	49.6	2 3/8
3/8	-	-	-	-	-	-	-	-	7Q	28590	45.3	2 1/4	7Q	37290	59.1	2 1/2
13/32	-	-	-	-	-	-	-	-	8Q	33530	53.2	2 7/16	8Q	43740	69.4	2 5/8
7/16	-	-	-	-	-	-	-	-	9Q	38890	61.7	2 1/2	9Q	50720	80.4	2 3/4

Shear Pin Neck Diameter	Shear Pin Hub Number											
	SHR2				SHS2				SHU2			
	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.	Pin Part No.	In. Lbs. Torque	H.P. at 100 rpm	Minimum Recommended Shaft Dia.
9/32"	1R	26080	41.2	2 1/4"	-	-	-	-	-	-	-	-
5/16	2R	32210	51.1	2 3/8	-	-	-	-	-	-	-	-
11/32	3R	38970	61.8	2 1/2	1S	44540	70.6	2 5/8"	-	-	-	-
3/8	4R	46410	73.6	2 3/4	2S	53040	84.1	2 7/8	1U	59670	94.7	2 15/16"
13/32	5R	54430	86.3	2 7/8	3S	62200	98.7	3	2U	69980	111.0	3 1/8
7/16	6R	63120	100.1	3	4S	72140	114.5	3 1/8	3U	81160	128.8	3 1/4
15/32	7R	72490	115.0	3 1/8	5S	82840	131.4	3 1/4	4U	93200	147.9	3 7/16
1/2	8R	82480	130.9	3 1/4	6S	94270	149.6	3 7/16	5U	106050	168.3	3 9/16
17/32	9R	93110	147.7	3 7/16	7S	106410	168.9	3 9/16	6U	119710	190.0	3 3/4
9/16	10R	104370	165.6	3 1/2	8S	119280	189.3	3 3/4	7U	134190	212.9	3 7/8
19/32	11R	116290	184.5	3 5/8	9S	132910	210.9	3 7/8	8U	149520	237.3	4
5/8	12R	128850	204.5	*3 5/8	10S	147250	233.7	4	9U	165670	262.9	4 1/8
21/32	13R	142040	225.4	*3 5/8	11S	162330	257.6	4 1/8	10U	182620	289.8	4 1/4
11/16	14R	155900	247.4	*3 5/8	12S	178170	282.8	*4 3/16	11U	200440	318.1	4 7/16
23/32	-	-	-	-	-	-	-	-	12U	219070	347.7	4 9/16
3/4	-	-	-	-	-	-	-	-	13U	238570	378.6	4 11/16
25/32	-	-	-	-	-	-	-	-	14U	258870	410.9	4 13/16

* Note: These sizes require extra capacity alloy steel shafting to ensure against shaft distortion under peak load. The above table is representative of average field conditions. Minimum shaft diameters shown are based on the standard shaft size formula:

$$D = \sqrt[3]{\frac{5.1T}{S}} \text{ where}$$

D = Shaft diameter in inches

T = Torque in inch pounds

S = Allowable torsional shearing stress of 12000 lbs/in²

For severe or unusual applications, refer to Application Engineering at 1-800-626-2093.

Torque ratings shown are in inch pounds and are based on 60,000 pounds ultimate shear strength.

Horsepower ratings are shown at 100 rpm. Horsepower varies directly with speed, therefore the horsepower for 200 rpm would be twice that shown, etc. Shear pin hubs should not be used on high speed drives.

Use only Browning shear pins with Browning shear pin hubs.

Selection of Shear Pin Hubs and Sprockets

In selecting Browning shear pin hubs and sprockets, check torque requirements (including a suitable starting load factor of 1.5 or more) and select a hub and pin neck diameter to suit, see Table 6 above. Also check selected hub for size of sprocket and bore range. When shear torque is not known, it may be computed from either of the following formula:

$$1. \quad T = \frac{63000 \times \text{HP} \times F}{\text{RPM}}$$

$$2. \quad T = \frac{D \times \text{CL} \times F}{2}$$

where
 T = Torque in inch pounds
 D = Pitch diameter of sprocket in inches
 HP = Horsepower
 RPM = Speed in revolutions per minute
 CL = Chain pull in pounds
 F = Starting load factor, usually 1.5 or more

Both overload service factors and starting load factors must be considered when designing a drive with a shear pin hub, but both are not considered at the same time. Overload service factors are expressions of drive life desired in chain and sprocket drives while the starting load factor reflects only the starting torque that must be overcome by the shear pin. Therefore, the drive

should be calculated on the overload service factor, but the shear pin selection should be made on the starting load factor.

Example:

A chain drive with shear pin protection is desired from a speed reducer to a belt conveyor. The speed reducer is driven by a 10 HP normal torque motor. Speed reducer output shaft is 1 1/4 diameter and output speed is 550 rpm. Conveyor shaft is 1 7/16 and speed is 192 rpm. Center distance is approximately 30".

A. For example if the overload service factor is 1.2 and a drive consisting of a #60 chain, 122 links long, a 21 tooth driver sprocket, and a 60 tooth driven sprocket will deliver 12.3 HP, which is ample.

B. Using a starting load factor of 1.5, the torque is:

$$T = \frac{63000 \times 10 \times 1.5}{192} = 4922 \text{ inch pounds}$$

C. From Table 6 above, select the hub and shear pin with the torque value nearest 4922 inch pounds. An SHP1 hub with a 4P pin has a torque rating of 5380 inch pounds, which is ample.

D. Required drive is as follows:

1—60P21 sprocket, P1 1 1/4 bushing

1—SHP1 hub with 4P shear pin and S60P60 sprocket

1—#60 riveted chain, 7.625 feet complete (121 links plus 1 connecting link).

Dimensions for Machining Parts to Fit Stock Shear Pin Hubs

Table 7

Part No.	B	C	D	P. C.
SHH1	3.252"	9/16"	13/32"	4.500"
SHP1	4.502	13/16	17/32	6.5
SHQ1	6.002	15/16	17/32	8.625
SHR1	7.502	15/16	21/32	11.25
SHR2	7.502	1 5/16	23/32	14
SHS2	8.002	1 7/16	25/32	16

Exercise extreme care in machining the bore to avoid undesirable run-out of the part. Use Browning stock sprockets shown in Table 4, page 85 whenever possible. These sprockets are precision machined and ready to use.

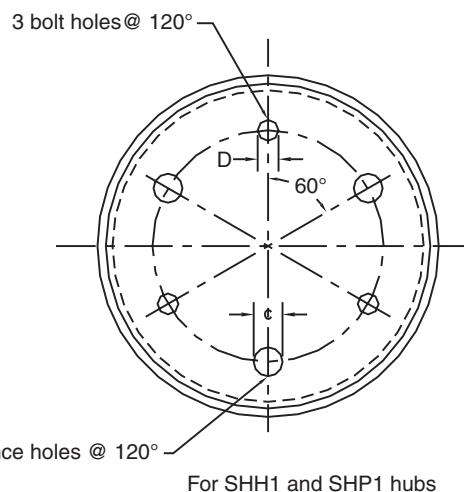
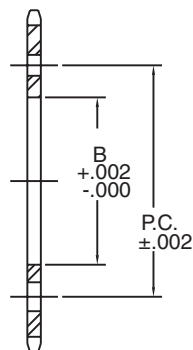
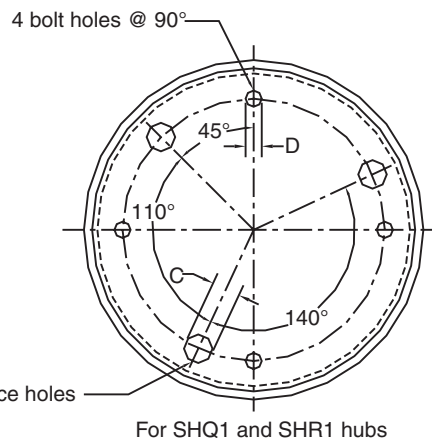


Table 8 Minimum Possible Sprocket Sizes for Stock Shear Pin Hubs

Part No.	Minimum Number of Teeth for Chain Size										
	No. 35	No. 41	No. 40	No. 50	No. 60	No. 80	No. 100	No. 120	No. 140	No. 160	No. 200
SHH1	50	38	38	31	27	*	*	*	*	*	*
SHP1	67	51	51	42	36	28	*	*	*	*	*
SHQ1	-	66	66	54	45	35	29	*	*	*	*
SHR1	-	-	85	69	58	44	36	*	*	*	*
SHR2	-	-	-	85	72	55	44	38	33	*	*

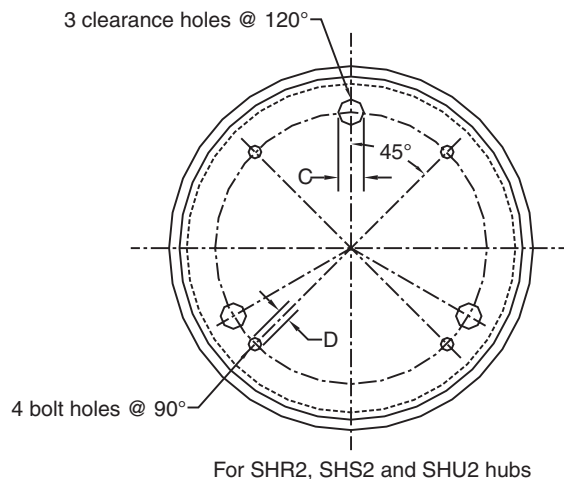
* These sizes of hubs should not be used with these sizes of chain.



Made-to-Order Shear Pin Sprockets



In addition to the stock shear pin hubs and sprockets shown on pages 85 and 86, many sizes of the shear pin sprockets can be made-to-order in either finished bore or bushing type.



For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

In response to industry needs, Morse introduced the first spring loaded, friction type protective device in 1949, called the Morse torque limiter. As the originator of the torque limiter, Morse has gained wide experience in its design and application. Through the years, Morse has successfully adapted torque limiters to thousands of conveyor, material handling and agricultural applications.

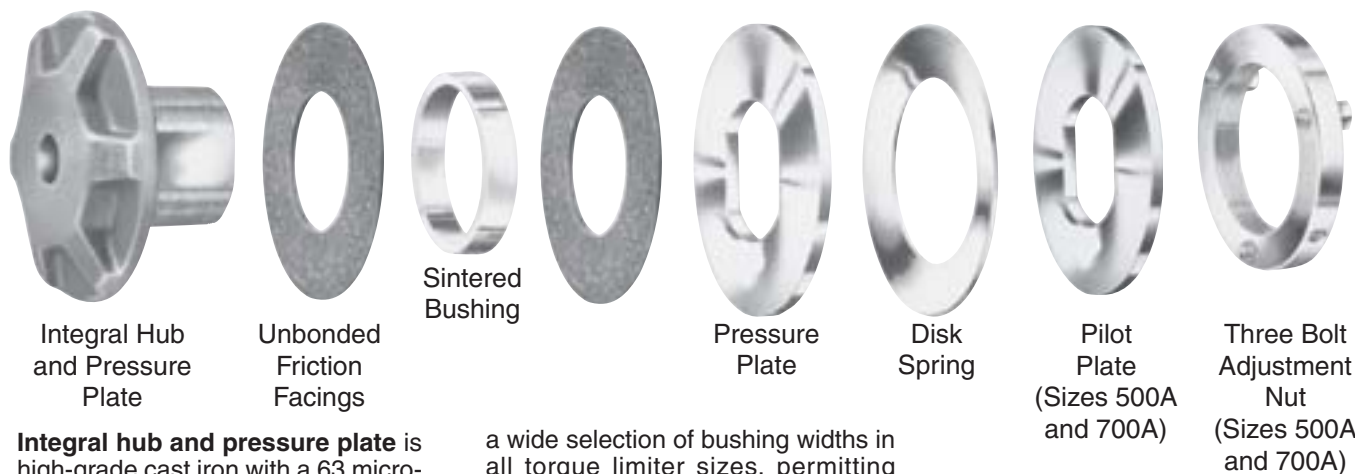
The Morse torque limiter is a protective device that limits torque transmitted in a drive system by slipping when the torque demand exceeds a preset value as a result of shock loads, overloads or machine jams. It automatically reengages when the overload torque has passed; no resetting is required. The Morse torque limiter helps prevent machine damage and eliminates costly downtime. Using spring loaded friction surfaces for its operation, the Morse torque limiter presets slip torque by adjustment of the spring force. This device can be used with a sprocket, gear, sheave or flange plate as the center member that is clamped between two friction facings.

Features

- Simple design
- Economical
- Easy adjustment
- Compact
- Wide torque range
- Dependable
- Minimum maintenance
- Durable
- Safe, non-asbestos, no-lead pads
- Replacement parts in stock
- Friction facings



The Morse torque limiter is available in seven sizes – 150, 250A, 350A, 500A, 700A, 13" and 20". Morse has over 50 years of experience in designing and applying torque limiters as trouble-free, long lasting devices to protect machinery.



Integral hub and pressure plate is high-grade cast iron with a 63 micro-inch finish on the friction facing side. Sturdy ribbed construction aids in heat dissipation, helps prevent deflection under spring load and maintains contact between the friction facing and pressure plate. The resulting uniform distribution of the spring load over the friction surfaces minimize face pressure (psi) and friction facing wear and provides accurate slip control.

Unbonded friction facings are made of non-asbestos, non-lead material, providing a high coefficient of friction and long wear.

Sintered steel bushing on which the center member and friction facings rides are coated with a dry film lubricant; therefore, no oil is present to contaminate friction facings and reduce torque capacity. The bushing "free floats" on the hub. Morse offers

a wide selection of bushing widths in all torque limiter sizes, permitting close matching of center member and bushing width to minimize bearing pressure and promote longer bushing life.

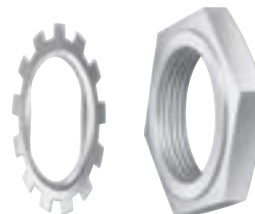
Pressure plate is designed with flats to fit securely on the hub with a 63 micro-inch finish on the facing side.

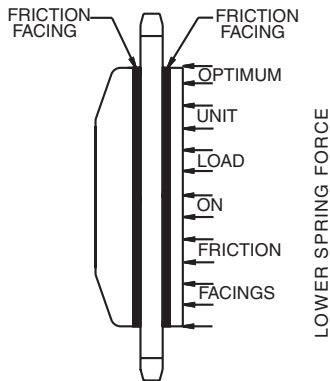
Disk spring provides axial load to the pressure plate, friction facings and center member.

Pilot plate serves as "back-up" to the pressure plate on the 500A and 700A models and ensures even distribution of load over the full diameter of the disk spring. The tabbed lockwashers acts as a pilot for models 250A and 350A.

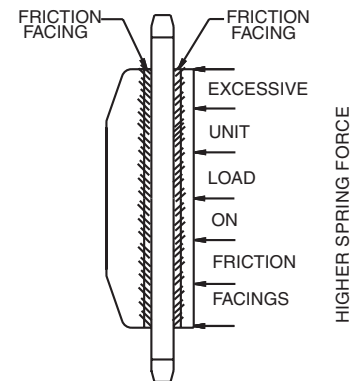
Three bolt adjustment nut on the 500A and 700A sizes make adjustment easy. This principle was originated by Morse and has been standard for many years on 13" and 20" size torque limiters.

Multiple torque adjustment settings are provided on sizes 250A and 350A. Adjust the single hex nut with adjustable or open end wrenches and lock in position with a lock washer.





Torque limiter capacities are directly proportional to the spring force applied to the friction surfaces and it is a simple matter to increase capacity by increasing spring force – but not without sacrifice. The higher the unit load or pressure (psi) on the friction surfaces, the quicker the friction facings will deteriorate as they slip against the pressure plates and center member. If ratings are established on the basis of extremely high friction face loadings, the torque limiter serves as nothing more than a shear pin mechanism, instead of the solution developed by Morse.



The spring is designed so that its force varies little over a wide deflection range at the rated capacity of the torque limiter. This provides load re-engagement near the pre-set torque level as the friction facing wears.

Torque Limiter Accessories

Ground Sprockets

As a stock item, Morse offers “A” plate sprockets with faces ground to 63 micro-inches and bores sized specifically for torque limiter applications. Select your ground sprocket from the stock sizes listed on page 92. The sprocket will be shipped “off-the-shelf” as Morse continues to deliver prompt and efficient service.

Couplings

For overload slip protection combined with the ability to couple driving and driven shafts, Morse offers a torque limiter coupling in four sizes. This device consists of a stock torque limiter and a roller chain type coupling.

Morse also offers 13" and 20" torque limiters. See the following pages for details.

Part Number Explanation

350A -2 TL x FB

- Specify bore size
- Series
- Number of disc springs (max. 2)
- Overall diameter (3.5 inches)

Required bushing is ordered separately; bushing length determined by sprocket selection.

350 AG 5 26

- Number of teeth in sprocket
- #50 pitch roller chain
- A plate, ground (63 micro-inch)
- Fits Morse TL model 350

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



Model
150

Models
250A* and
350A*
(U.S. Patent No. 3,447,342)



Models
500A* and
700A*
(U.S. Patent No. 3,201,953)



Model No.	Torque Capacity Lb-Ft.**		Max. Bore W/Std. KW and SS	Stock Min. Plain Bore	Stock Finished Bore with Std. Keyway and Setscrew	Approx. Wt. Lbs.	Std.* Bushing Lengths
	Min.	Max.					
150	1	15	1/2	3/8	3/8, 7/16, 1/2	0.6	Not Used
250A-1	5	20	7/8	1/2	1/2, 5/8, 3/4, 7/8	1	.365 .425
250A-2	10	40	7/8	1/2	1/2, 5/8, 3/4, 7/8	1	.480 .540
350A-1	15	55	1 1/8	3/4	3/4, 7/8, 1	2 1/2	.365 .425 .480
350A-2	25	110	1 1/8	3/4	3/4, 7/8, 1	2 1/2	.540 .655 .770
500A-1	35	155	1 3/4	7/8	7/8, 1, 1 1/8, 1 3/16, 1 1/4, 1 3/8, 1 7/16, 1 1/2, 1 5/8	6 1/2	.425 .480 .540
500A-2	65	310	1 3/4	7/8	7/8, 1, 1 1/8, 1 3/16, 1 1/4, 1 3/8, 1 7/16, 1 1/2, 1 5/8	6 1/2	.655 .770
700A-1	85	420	2 5/8	1	1 1/2, 1 3/4, 1 15/16, 2	15	.520 .580 .695 .810
700A-2	165	800	2 5/8	1	1 1/2, 1 3/4, 1 15/16, 2	15	.925 1.155 1.375
13-8	500	1450	3 1/4	1 1/2	Subject to rebore Charge for bore, keyway, and setscrew	85	3/8 1/2
13-16	1000	2300	3 1/4	1 1/2		85	9/16
20-5	1575	3150	4 7/8	2		250	1/2
20-10	3150	6300	4 7/8	2		250	5/8

* When ordering, specify required bushing length.

** When more than half of maximum torque is to be used at over 500 rpm refer application to Application Engineering.

Keyways	
Diam. of Shaft	*Keyway Width & Depth
1/2 - 9/16	1/8 x 1/16
5/8 - 7/8	3/16 x 3/32
15/16 - 1 1/4	1/4 x 1/8
1 5/16 - 1 3/8	5/16 x 5/32
1 7/16 - 1 3/4	3/8 x 3/16
1 13/16 - 2 1/4	1/2 x 1/4
2 5/16 - 2 3/4	5/8 x 5/16

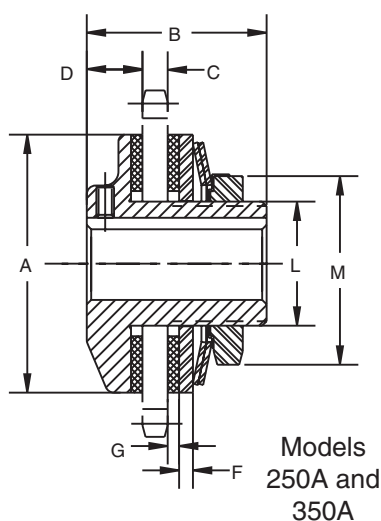
* Width tolerances for straight and tapered keyways are plus .002 minus .000.

Standard Bore Tolerance		
Nominal Diameter		
Over	Thru	Tolerance
-	3"	+ .002 - .000
3"	4"	+ .003 - .000
4"	5"	+ .004 - .000

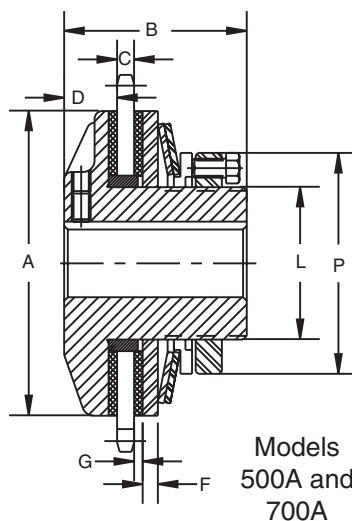
Models
13 and 20



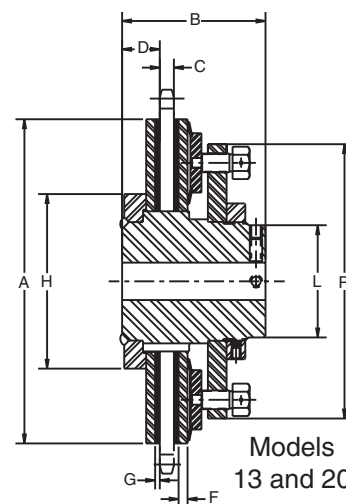
For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com



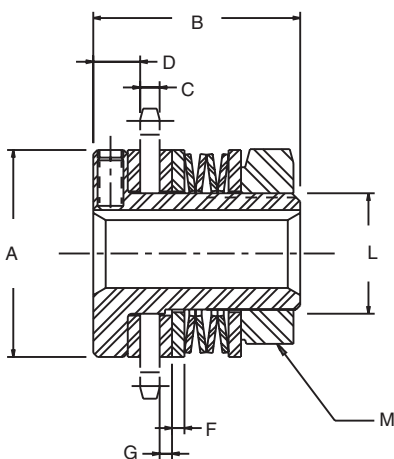
Models
250A and
350A



Models
500A and
700A



Models
13 and 20



Model 150**

Dimensions

Model Number	A Overall Dia. (Pad Dia.)	B Overall Length	C Width of Center Member (Max)	D End Face to Center Member (Offset)	F Pressure Plate Thickness	G Friction Pad Thickness	H Collar Dia.	L Hub Dia.	M Nut Dia. (Hex)	P Nut Dia.	S.S Hole Size
150	1 1/2	1 1/2	9/32	5/16	3/32	3/32	-	7/8	1 5/16	-	#10 - 24
250A-1	2 1/2	1 7/8	11/32	5/8	3/16	5/32	-	1 3/8	1 7/8	-	#10 - 24
250A-2	2 1/2	1 7/8	11/32	5/8	3/16	5/32	-	1 3/8	1 7/8	-	#10 - 24
350A-1	3 1/2	2 7/16	5/8	3/4	3/16	5/32	-	1 11/16	2 3/8	-	1/4 - 20
350A-2	3 1/2	2 7/16	5/8	3/4	3/16	5/32	-	1 11/16	2 3/8	-	1/4 - 20
500A-1	5	3	5/8	7/8	1/4	5/32	-	2 1/2	-	3 5/8	5/16 - 18
500A-2	5	3	5/8	7/8	1/4	5/32	-	2 1/2	-	3 5/8	5/16 - 18
700A-1	7	3 7/8	1 1/8	15/16	5/16	3/16	-	3 3/4	-	5 1/4	3/8 - 16
700A-2	7	3 7/8	1 1/8	15/16	5/16	3/16	-	3 3/4	-	5 1/4	3/8 - 16
13-8	13	5 3/4	27/32	1 7/16	3/8	3/16	7	4 1/2	-	11	1/2 - 13
13-6	13	5 3/4	27/32	1 7/16	3/8	3/16	7	4 1/2	-	11	1/2 - 13
20-5	20	7 1/4	15/16	1 13/16	1/2	3/16	9 3/4	6 1/2	-	16 1/4	5/8 - 11
20-10	20	7 1/4	15/16	1 13/16	1/2	3/16	9 3/4	6 1/2	-	16 1/4	5/8 - 11

Minimum Sprocket Teeth and Bushing Length																																	
Model No.	Spkt. Bore Diam. Over Bushing	Sprocket Pitch and Number of Teeth																															
		3/8" - #35			1/2" - #41			1/2" - #40			5/8" - #50			3/4" - #60			1" - #80			1 1/4" - #100			1 1/2" - #120			1 3/4" - #140			2" - #160				
		Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length	Sprocket Min. Teeth		Bush Length		
		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO		Stock	MTO
250A-1	1.627 / 1.629	25	25	.365	*20	20	.425	20	20	.480	*16	16	.540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
250A-2	1.627 / 1.629	25	25	.365	*20	20	.425	20	20	.480	*16	16	.540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
350A-1	1.940 / 1.942	35	33	.365	*26	26	.425	*26	26	.480	*21	21	.540	18	18	.655	*15	15	.770	-	-	-	-	-	-	-	-	-	-	-	-	-	-
350A-2	1.940 / 1.942	35	33	.365	*26	26	.425	*26	26	.480	*21	21	.540	18	18	.655	*15	15	.770	-	-	-	-	-	-	-	-	-	-	-	-	-	-
500A-1	2.878 / 2.880	-	-	-	*35	35	.425	35	35	.480	30	29	.540	25	25	.655	*19	19	.770	-	-	-	-	-	-	-	-	-	-	-	-	-	-
500A-2	2.878 / 2.880	-	-	-	*35	35	.425	35	35	.480	30	29	.540	25	25	.655	*19	19	.770	-	-	-	-	-	-	-	-	-	-	-	-	-	-
700A-1	4.129 / 4.131	-	-	-	-	-	-	-	*48	48	.520	*40	39	.580	*35	33	.695	26	26	.810	*21	21	.925	*18	18	1.155	*16	16	1.155	*15	15	1.375	
700A-2	4.129 / 4.131	-	-	-	-	-	-	-	*48	48	.520	*40	39	.580	*35	33	.695	26	26	.810	*21	21	.925	*18	18	1.155	*16	16	1.155	*15	15	1.375	
13-8	6.378 / 6.380	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*45	44	3/8	*36	36	1/2	*32	31	9/16	*30	27	9/16	*24	24	9/16		
13-16	6.378 / 6.380	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*45	44	3/8	*36	36	1/2	*32	31	9/16	*30	27	9/16	*24	24	9/16		
20-5	8.753 / 8.756	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*54	54	1/2	*60	46	5/8	*40	40	5/8	*35	35	5/8	
20-10	8.753 / 8.756	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*54	54	1/2	*60	46	5/8	*40	40	5/8	*35	35	5/8	

Sprockets must be counter bored to fit torque limiter.

* Stock minimum plain bore (MPB) only; require rebores and face grind for torque limiter use.

** Model 150 does not use bushing. Sprocket bore should be .876 - .878.

For more precise torque setting and for applications where slippage may be frequent, use a ground center member (63 micro-inch). Rated torque capacity can only be obtained with dry friction facings and with a ground center member, which has been run-in for 4 minutes at approximately 650 rpm at a torque setting of 70 to 80% of the 1 spring rating - rate of run-in is

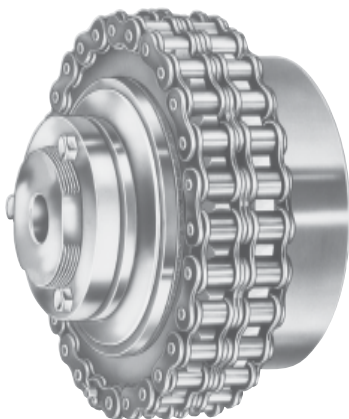
not to exceed 80 rpm. Center member faces should be flat, parallel, square with bore, and free from rust, scale and oil for optimum torque limiter performance. If center members are not in accordance with these specifications or are unground, torque limiter capacity will be erratic and generally lower than capacity with ground center members.

Ground Sprockets

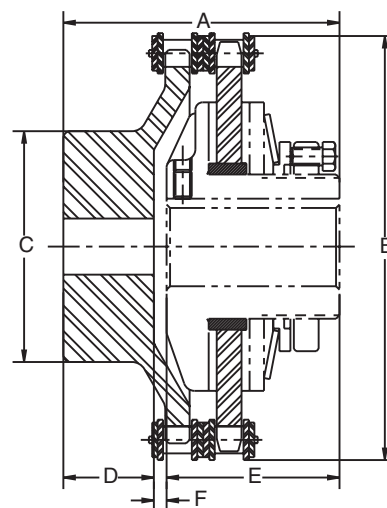
These “A” plate sprockets are stock items that are furnished with ground faces. For most economical drive designs, use these stock sprockets with the Morse torque limiter.

Sprocket No.	Fits Torque Limiter Model	Pitch	No. Teeth	O.D.	Approx. Wt. Lbs.	Bushing Lengths
250-AG325	250	#35	25	3.194	.2	.365
250-AG326	250	#35	26	3.314	.3	.365
250-AG420	250	#40	20	3.457	.5	.480
250-AG422	250	#40	22	3.778	.6	.480
250-AG424	250	#40	24	4.098	.8	.480
250-AG428	250	#40	28	4.738	1.0	.480
250-AG430	250	#40	30	5.057	1.2	.480
250-AG517	250	#50	17	3.719	.6	.540
250-AG521	250	#50	21	4.522	1.0	.540
250-AG522	250	#50	22	4.722	1.1	.540
350-AG335	350	#35	35	4.392	.6	.365
350-AG340	350	#35	40	4.990	.8	.365
350-AG428	350	#40	28	4.738	.9	.480
350-AG430	350	#40	30	5.057	1.1	.480
350-AG432	350	#40	32	5.377	1.3	.480
350-AG522	350	#50	22	4.722	1.1	.540
350-AG524	350	#50	24	5.122	1.4	.540
350-AG525	350	#50	25	5.322	1.5	.540
350-AG526	350	#50	26	5.522	1.7	.540
350-AG618	350	#60	18	4.704	1.4	.655
350-AG620	350	#60	20	5.185	1.8	.655
500-AG435	500	#40	35	5.855	1.2	.480
500-AG530	500	#50	30	6.321	1.9	.540
500-AG532	500	#50	32	6.721	2.2	.540
500-AG625	500	#60	25	6.387	2.3	.655
500-AG626	500	#60	26	6.627	2.8	.655
500-AG628	500	#60	28	7.107	3.8	.655
500-AG630	500	#60	30	7.586	4.0	.655
500-AG820	500	#80	20	6.914	3.9	.770
500-AG822	500	#80	22	7.555	4.9	.770
500-AG824	500	#80	24	8.196	6.1	.770
700-AG636	700	#60	36	9.022	5.6	.695
700-AG826	700	#80	26	8.836	6.1	.810
700-AG828	700	#80	28	9.475	8.2	.810
700-AG830	700	#80	30	10.114	8.8	.810
700-AG836	700	#80	36	12.030	13.8	.810
700-AG1022	700	#100	22	9.444	10.4	.925
700-AG1024	700	#100	24	10.245	12.9	.925

Note: Bushing must be ordered in addition to sprocket.



The torque limiter coupling combines overload slip protection with the ability to couple driving and driven shafts. Some angular and parallel misalignment can be accommodated by the double roller chain design.



Note: Coupling assembly includes “A” plate sprocket, “B” sprocket, bushing and double strand roller chain. The torque limiter must be ordered separately.

Coupling Model Number	Misalign		Torque Capacity Lbs. Ft.	Max. Bore		Spkt. Size	Dimensions (Inches)						Approx. Wt. Lbs.
	Max Parallel	Max Angular		Torque Limiter	Cplg. Spkt.		A Overall Width	B Overall Diameter	C Hub Diameter	D Length thru Bore Coupling Sprocket	E Length thru Bore Torque Limiter	F Clearance	
250CP	.010	1/2°	40	7/8	1 1/4	422	3	4	2	1	1 7/8	1/8	4 1/2
350CP	.012	1/2°	110	1 1/8	1 3/4	524	4 1/16	5 3/8	2 3/4	1 1/2	2 7/16	1/8	11 1/2
500CP	.015	1/2°	310	1 3/4	2 1/2	628	4 3/4	7 3/8	4	1 5/8	3	1/8	27
700CP	.020	1/2°	800	2 5/8	3 1/2	828	6 5/8	9 7/8	6	2 5/8	3 7/8	1/8	69

* Coupling sprocket minimum plain bore.

** Torque limiter only, includes one (1) setscrew.

Standard Bore Tolerance		
Nominal Diameter		
Over	Thru	Tolerance
-	3"	+ .002 - .000
3"	4"	+ .003 - .000
4"	5"	+ .004 - .000

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Selection

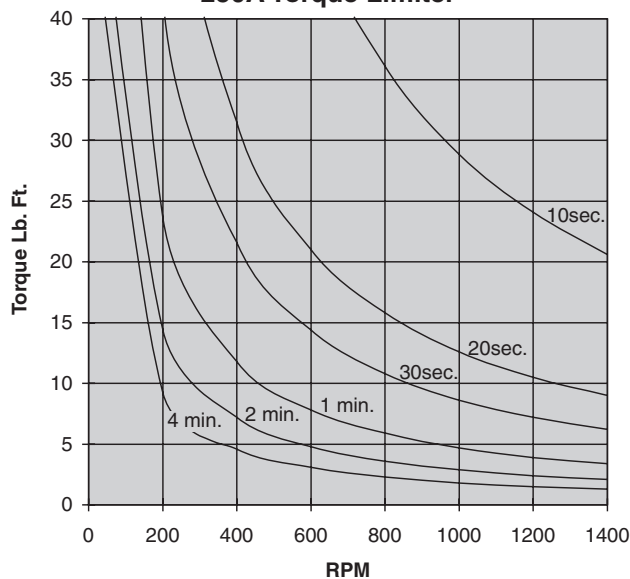
1. Select a torque limiter size with a torque capacity that slightly exceeds the required slip torque for the application.
2. Confirm the required torque limiter hub bore is available. Stock finished bores are shown in this catalog.
3. Check "minimum sprocket teeth and bushing length" table to determine that the specific sprocket to be assembled in the torque limiter is compatible.

4. If a slip condition is expected to persist for more than a few seconds, refer to the maximum duration chart. Torque limiters subjected to extended slipping beyond the recommended time limit may be damaged and may malfunction.

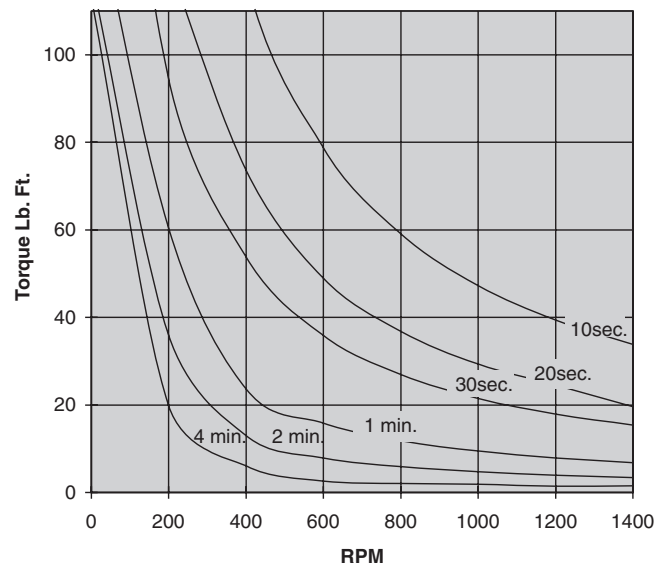
Note: Because of widely varied applications, no maximum speed is specified, however, the effects of sprocket run-out on a specific application should be considered.

For longest wear life, mount torque limiter on the "low-speed" shaft of a drive.

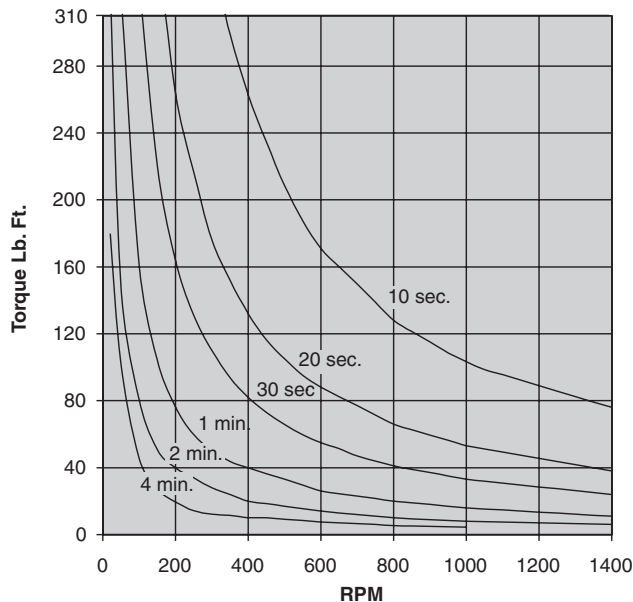
250A Torque Limiter



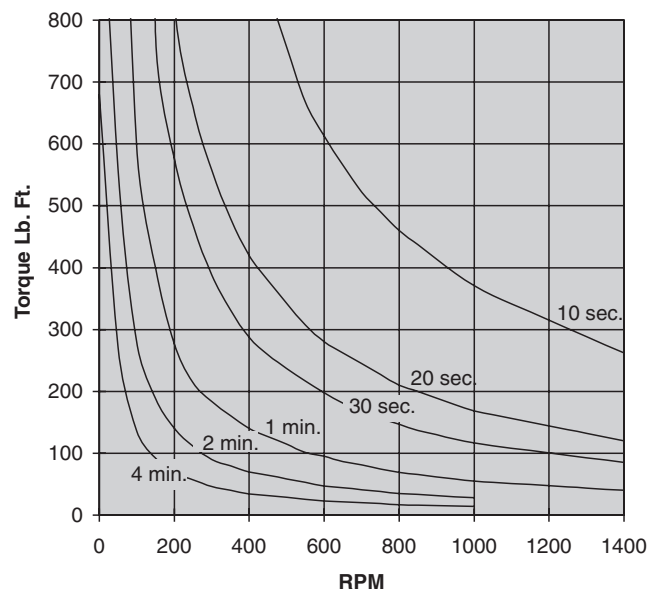
350A Torque Limiter



500A Torque Limiter



700A Torque Limiter



Browning torque limiters are torque control devices that slip under excessive load but automatically carry the desired load after the excess has been removed. The device can be easily adjusted to slip at a desired overload, and automatically reengage when overload is removed. Overload should be removed promptly since prolonged slippage can be detrimental to the friction disc. Generally, no resetting is required after the torque limiter has slipped. Torque limiters help prevent machine and product damage and costly downtime caused by shock loads, overloads or machine jams but should not be used as clutches.

Torque limiters are primarily used with sprockets and Browning stocks a wide variety of sizes as indicated. Other stock Type "A" sprockets can be reworked for torque limiters.

Maximum torque ratings can be obtained by using a drive member with center flanges ground to approximately 100 micro-inches surface finish. Rough or rusty center flanges will cause erratic torque values and rapid wear on friction discs. Oil or grease on the center flange or friction discs will reduce torque values.

Browning torque limiters are friction-type torque overload devices that reset to any position. Torque limiters offer:

- High accuracy
- Low cost
- Compact
- Reversible
- Non asbestos pads
- No need to reset

Industries Served

- Material handling
- Agricultural
- General industrial
- Aggregate processing
- Conveyor manufacturing
- Food and beverage

Applications

- Primary drives
- Conveyors
- Wrapping and cartoning equipment
- Industrial equipment
- Agricultural equipment

Torque Limiter Adjustment

Adjustment of Browning torque limiters is fast, simple and positive. Only an open end wrench and a socket head setscrew wrench are needed.

1. Back-off the three cap screws until the points are recessed in the threaded adjusting collar.
2. Tighten the threaded adjusting collar by hand and then tighten the cap screws with an open end wrench until the heads bottom.
3. Try the unit in its application and if further adjustment is necessary, loosen cap screws until points are recessed in the adjusting collar. Torque can also be checked by applying tension to one strand of chain with a spring scale or other means.
4. Tighten or loosen the adjusting collar as needed, then retighten the cap screws until the heads bottom.

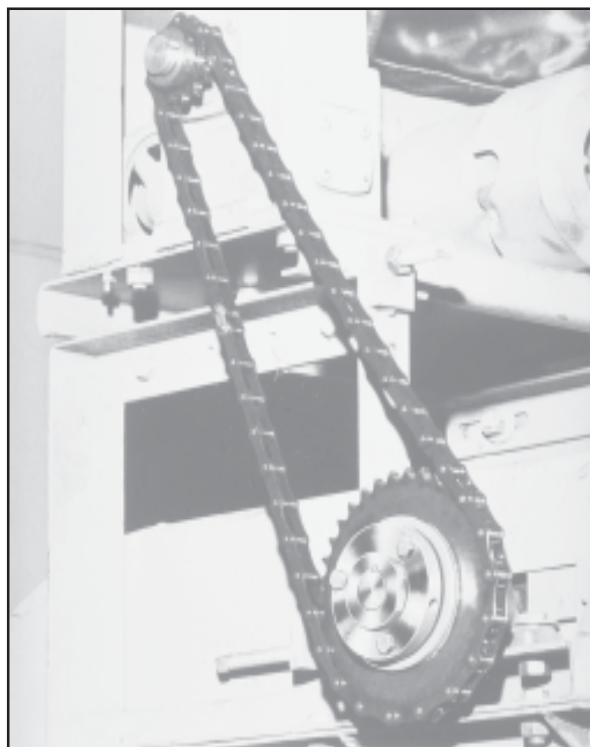
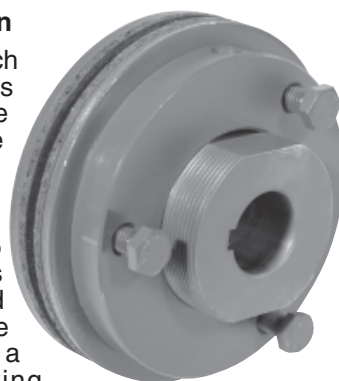
Torque Limiter Selection

When the torque at which the device should slip is determined, simply choose a torque limiter from Table 10, which has a maximum torque rating as great or greater than the required torque. Check Table 11 to see if required bore is available. It is a good practice to select the torque limiter with a maximum torque rating reasonably greater than the required torque when possible. Do not use torque limiters on high speed drives.

Example:

To prevent damage to a conveyor system, a device is needed on the head pulley shaft that will slip at 2100 inch pounds of torque. Shaft size is 1 1/4" diameter.

From Table 10, note that a T45L torque limiter will produce a maximum torque of 2800 inch pounds. It is also available with a 1 1/4" bore. The proper torque limiter is T45L x 1 1/4.



Part Number Explanation

T45L x FB

- Specify bore size in inches
- Browning torque limiter with 4.5" OD

Bushing is supplied with Browning torque limiter.
Sprocket for torque limiter is ordered separately 50T45L26.

50 T45L 26

- Number of teeth
- Browning torque limiter with 4.5" OD
- #50 roller chain

Table 1 Stock Sizes and Parts

Torque Limiters		Replacement Discs ①		Replacement Springs ②		Replacement Bearings ③	
Part No.	Wt. Lbs.	Part No.	Wt. Lbs.	Part No.	Wt. Lbs.	Part No.	Wt. Lbs.
T25L	1.3	25D	0.06	25S	0.06	25B	0.06
T35L	2.9	35D	0.06	35S	0.06	35B	0.06
T45L	5.6	45D	0.06	45S	0.13	45B	0.06
T55L	9.6	55D	0.13	55S	0.25	55B	0.06
T65L	15.8	65D	0.13	65S	0.31	65B	0.06

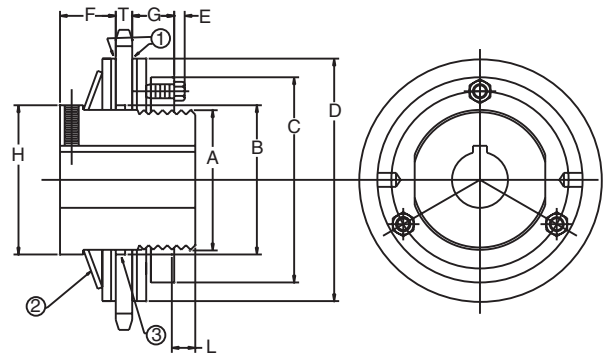


Table 2 Torque Ratings and Specifications

Part No.	Maximum Torque Ratings in Inch-Pounds		Dimensions											
			A	B	C	D	E	F*		G	H	L	T	
	With One Spring	With Two Springs						One Spring	Two Springs				Min.	Max.
T25L	800	1100	1 1/4	1 1/2	2 3/8	2 1/2	3/16	7/8	15/16	13/16	1 1/2	2 1/16	3/16	3/8
T35L	1800	3000	1 3/4	2	3 1/8	3 1/2	3/16	7/8	15/16	13/16	2	2 1/4	3/16	1/2
T45L	2800	4900	2 1/4	2 1/2	4	4 1/2	1/4	1 1/16	1 7/32	15/16	2 1/2	2 3/4	1/4	5/8
T55L	3800	6800	2 3/4	3	4 3/4	5 1/2	1/4	1 1/4	1 3/8	1 1/8	3	3 1/4	1/4	3/4
T65L	4800	8800	3 3/4	4	5 1/2	6 1/2	9/32	1 3/8	1 1/2	1 1/8	4	3 5/8	5/16	1

* These dimensions are the torque limiter set by tightening the adjusting collar by hand and tightening the cap screw until the heads bottom.

Note: Only one spring is furnished; extra springs must be purchased separately.

Table 3 Stock Bores

Part No.	Stock Bores Marked "x"															
	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 3/16"	1 1/4"	1 3/8"	1 7/16"	1 1/2"	1 5/8"	1 3/4"	1 15/16"	2"	2 1/2"
T25L	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-
T35L	-	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-
T45L	-	-	x	x	x	x	x	x	x	-	-	-	-	-	-	-
T55L	-	-	-	-	x	x	x	x	x	x	x	x	-	-	-	-
T65L	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x

Browning torque limiters are furnished with standard keyseats and setscrews, except 1/2" bore which has no keyseat.

Minimum Number Sprocket Teeth and Number of Bearings Required for Torque Limiters

Table 4

Torque Limiter	Chain Size											
	35		41		40		50		60		80	
	Min. No. Teeth	Number Bearings	Min. No. Teeth	Number Bearings	Min. No. Teeth	Number Bearings	Min. No. Teeth	Number Bearings	Min. No. Teeth	Number Bearings	Min. No. Teeth	Number Bearings
T25L	25	1	20	1	20	1	-	-	-	-	-	-
T35L	-	-	26	1	26	1	21	2	-	-	-	-
T45L	-	-	-	-	32	1	26	1	22	2	-	-
T55L	-	-	-	-	-	-	32	1	27	2	21	2
T65L	-	-	-	-	-	-	-	-	32	1	24	2

Stock torque limiters are furnished with one bearing. Where stock torque limiter sprockets require more than one bearing, the extra bearings are furnished with the sprockets.



Table 5 Sprockets for Torque Limiters

Part No.	Diameter		Chain Size	No. Teeth	Fits Torque Limiter	Wt. Lbs.	Part No.	Diameter		Chain Size	No. Teeth	Fits Torque Limiter	Wt. Lbs.
	Outside	Pitch						Outside	Pitch				
35T25L25	3.19"	2.992"	35	25	T25L	.61	50T55L32	6.72"	6.376"	50	32	T55L	2.0
35T25L30	3.79	3.588	35	30	T25L	.61	50T55L35	7.32	6.972	50	35	T55L	2.6
35T35L35	4.39	4.183	35	35	T25L	.63	50T55L40	8.32	7.966	50	40	T55L	3.8
41T25L20	3.45	3.196	41	20	T25L	.61	60T45L22	5.67	5.27	60	22	T45L	1.7
41T25L30	5.06	4.783	41	30	T25L	.68	60T45L30	7.59	7.175	60	30	T45L	4.0
41T25L40	6.65	6.373	41	40	T25L	1.67	60T45L40	9.98	9.559	60	40	T45L	8.1

Browning stock sprockets for torque limiters are ground for proper release and re-engagement. Stock Type A sprockets can also be reworked for torque limiters.

Design Features



Features

- One position type: the non-symmetric arrangement of balls and pockets allows only one engagement position.
- Automatic resetting: once the overload is removed, it reengages automatically by rotating a driving member.
- Accuracy of trip torque within $\pm 10\%$: even with repeated tripping the precision remains within $\pm 10\%$.
- Easy torque setting and adjusting: by tightening or loosening the adjusting nuts (bolts), the desired torque can be easily set
- Visual torque setting: the indicator and the torquemeter can confirm the setting torque.

Browning Torq/Pro is a release-type ball-detent torque overload device with a single position reset configuration and offers:

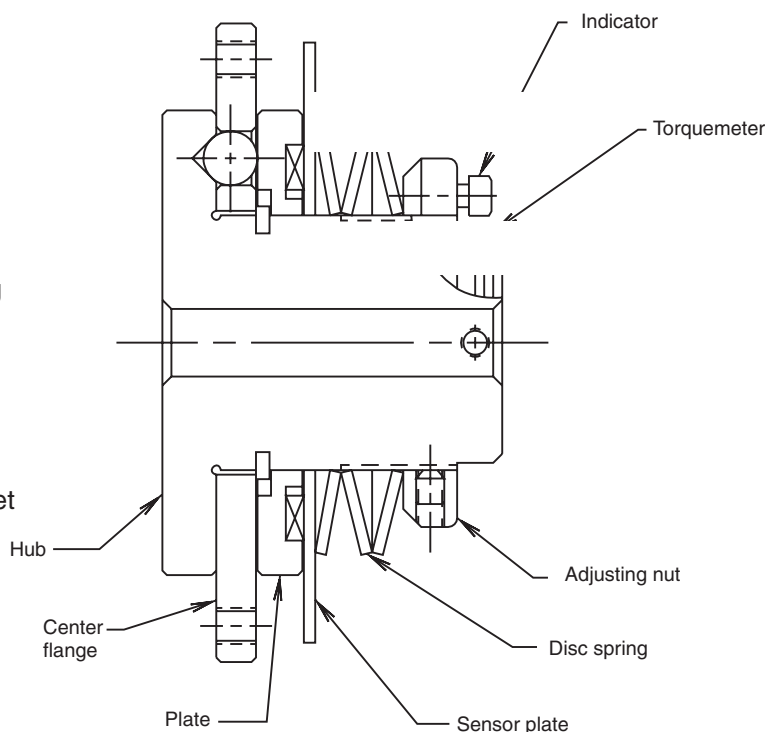
- Improved accuracy
- Simple design
- Reversible
- Torque set scale
- Switch detector plate

Structure

1. Torque is transmitted by the balls and pockets. The irregular arrangement of the balls and pockets results in only one position engagement.
2. During normal machine operation torque will be transmitted from the center flange through the balls to the pockets with the hub. If overloaded the balls are released from the pockets and roll between the plate and the hub. On tripping, the needle bearing provides smooth and light rotation.
3. On tripping, the center flange will move in the direction 2-3 mm, then the sensor plate catches the overload.
4. Adjust torque by tightening the adjusting nuts (bolts). The indicator and torquemeter show set tripping torques.

Production Protection

There is a strong push toward automating manufacturing facilities and equipment. Depending on material flow, various machines are systematically coordinated to achieve high efficiency, productivity and performance in the total production layout. In this situation, however, small mishaps can occasionally add to total system downtime and subsequent losses. Browning Torq/Pro is based on a design concept to not only help protect machines from overload but also minimize downtime, which may be caused by the problems of just one of the interacting machines.



Part Number Explanation

TP 30 H FB or MPB

- Specify finished bore or min. plain bore
- Springs (light, medium or heavy)
- Model number
- Series

When ordering a Torq/Pro coupling specify Torq/Pro unit, Torq/Pro sprocket, coupling chain and adjoining sprocket.

Selecting Torq/Pro

Like other overload protection devices, position the Torq/Pro at the nearest place to the driving part where overload will occur.

1. Decide the trip limit torque from the maximum torque limit, strength of the driving part and the expected overload.
2. Confirm the bore size and rpm.
3. Select a suitable size from the ratings table.

Like other overload devices, it is best to position the Torq/Pro nearest the driven equipment where the overload is most likely to occur.

Tripping torque should be 25% greater than the operating torque to compensate for motor starting torque and intermittent, shock and reversing loads.

Tripping Torque = Operating Torque × SF

$$\text{Torque (In. Lbs.)} = \frac{\text{Horsepower} \times 63025}{\text{rpm}}$$

$$\text{Horsepower} = \frac{\text{Torque (In. Lbs.)} \times \text{rpm}}{63025}$$

1. Determine the tripping torque by either the HP or torque formula shown.
2. Select the correct Torq/Pro based on this rating.
3. Check for max. rpm and confirm stock bore size.

Installation

1. The torque of the Torq/Pro is set at the minimum value when shipped. Please check to ensure that the indicator is pointing to zero on the torque scale.
2. Loosen the fit-drive setscrew of the adjustment nut and remove the lock plug.
3. Look at the tightening graph to determine the angle to which the adjustment nut must be tightened to produce the trip torque determined above. The torque scale is divided into increments of 60°. First turn the adjustment nut to an angle 60° before the angle determined from the graph, install the Torq/Pro onto the machine, and do a trip test. Then gradually tighten the nut until the required torque is reached.
4. After the torque is set, insert the lock plug and tighten the screw with hole so that it holds loosely.
5. Do not turn the adjustment nut beyond the largest value on the torque scale. If this is done, the spring will not have sufficient flexible leeway and the device will lock when tripping occurs.

Torque Setting

TP-08, 12, 16

1. Torque is set with adjustment nut.
2. Tighten the adjustment nut at the tightening angle which is equivalent to the trip torque per tightening angle – trip torque diagram.
3. At first, tighten the adjustment nut at 60 degrees smaller than the required value and test. Then gradually increase the tripping torque to the best value.

Do not turn the adjustment nut over the maximum value of the torque indicator. Otherwise there is no margin of coil spring when tripping.

TP-20, 30, 50

1. Torque setting is adjusted by tightening or loosening the adjustment nut. Make sure that the setscrew in the nut is loosened to prevent hub thread damage. Note: There is a brass lock plug under setscrew.
2. Refer to catalog torque to determine approximate rotation of adjustment nut to obtain desired torque. It is suggested that the nut is first tightened to a value less than desired (60 degrees) and final adjusted on the shaft after making a test run.
3. Adjust to final torque by gradually tightening adjustment nut.
4. After setting torque, tighten setscrew to prevent loosening.
5. Note: Do not tighten the adjustment nut beyond maximum limit of scale because the TP unit may not trip even under overloading conditions.

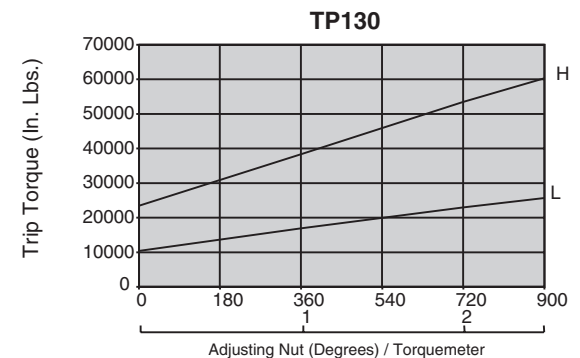
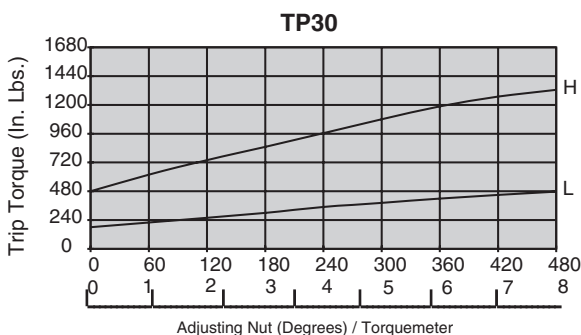
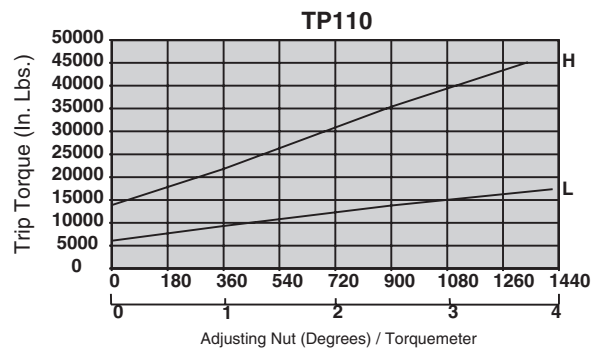
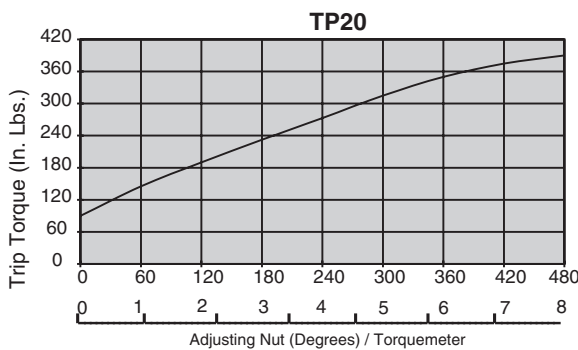
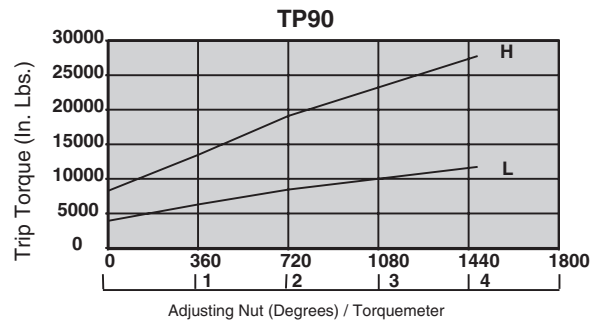
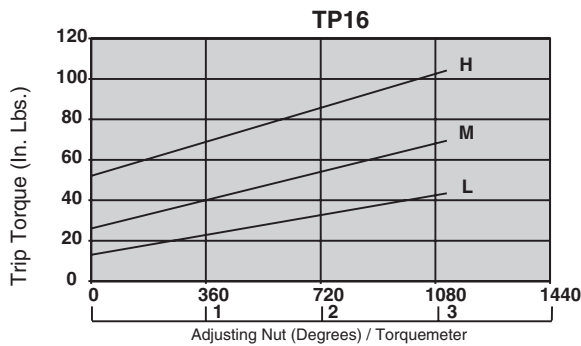
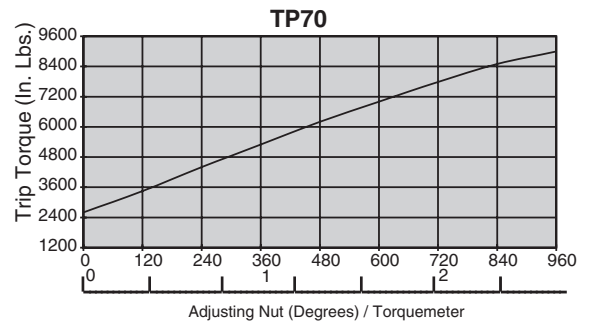
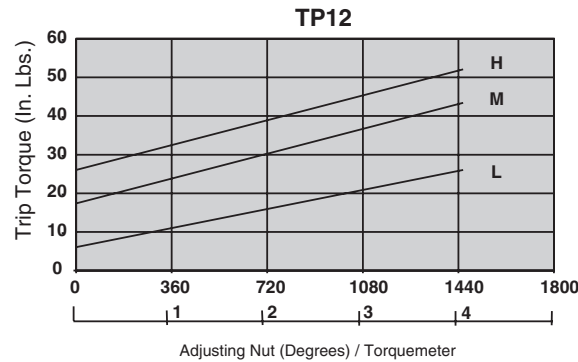
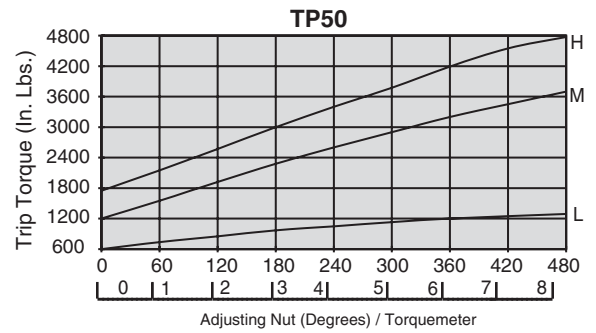
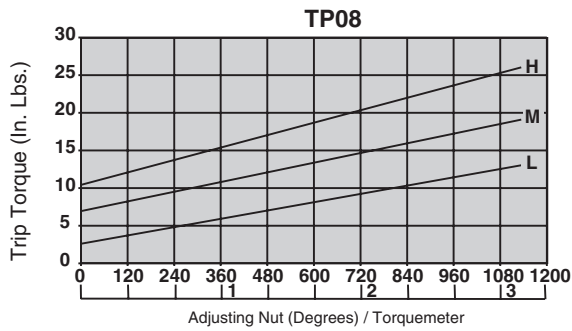
TP-70, 90, 110 and 130

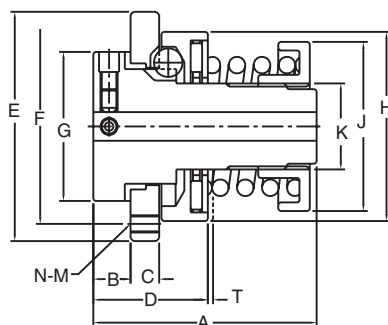
1. Torque adjustment is accomplished by the three adjustment bolts. First, loosen the lock nuts on the adjustment bolts **and remove the lock plugs (TP 70 and 90 do not have lock plugs)**. Then, check that the match mark of the hub and adjustment plate line up and the setscrew is tight.
2. Refer to catalog torque to determine approximate rotation of the adjustment bolt to obtain desired torque. It is suggested that initially the bolt is tightened to a value less than desired (60 degrees) and final adjusted on the shaft after making a test run.
3. Adjust to final torque by gradually tightening the three adjusting bolts evenly.
4. Tighten the lock nuts to prevent the adjustment bolts from loosening.
5. Note: Do not tighten the adjusting bolts beyond the maximum limit of the scale because the TP unit may not trip even under overloading conditions.

Resetting

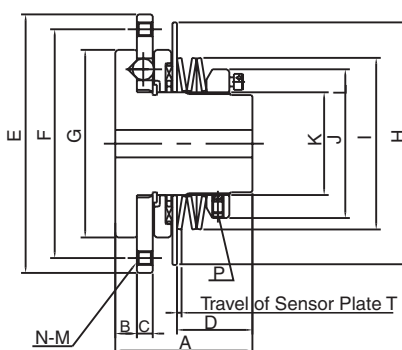
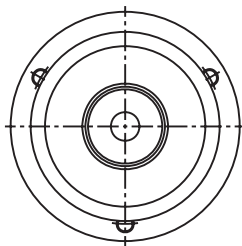
- a. When TP trips, stop the drive and remove the source of the overload.
- b. Reset by either rotating at 50 rpm or less or by jogging the motor.
- c. When resetting, an audible sound will be heard as the ball snaps into the detent.

Torque Settings





TP08 - TP16



TP20 - TP50

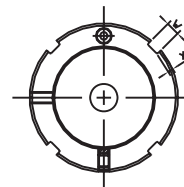


Table 1

Model	rpm Max.	Bore (inch)		Torque (in. lbs.)		Disc Spring Color
		Min.	Max.	Min.	Max.	
TP08L	1200	0.197	0.315	3	13	Yellow
TP08M				7	19	Blue
TP08H				10	26	Orange
TP12L	1000	0.236	0.472	6	26	Yellow
TP12M				17	43	Blue
TP12H				26	52	Orange
TP16L	900	0.276	0.630	13	43	Yellow
TP16M				26	69	Blue
TP16H				52	104	Orange
TP20	700	0.320	0.875	85	400	Orange
TP30L	500	0.470	1.188	175	475	Yellow
TP30H				475	1475	Orange
TP50L	300	0.860	1.938	600	1300	Yellow
TP50M				1200	3600	Blue
TP50H				1735	4775	Orange

Note: Example: Torq/Pro part number for minimum plain bore is TP50L.

Table 2

Model	Dimensions All Dimensions Are In Inches														Wt. (lb.)
	A Overall Width	B Drive Plate Offset	C Drive Plate Thickness	D Sensor Plate Offset	E Pilot Diameter	F Bolt Circle	G Hub Diameter	H Sensor Plate Diameter	I Spring Diameter	J Adjusting Nut Diameter	K Hub Diameter	M Capscrew Threads	N Number of Mounting Holes	T	
TP08	1.535	0.256	0.197	0.787	1.575	1.339	1.024	1.299	-	1.161	0.591	M3	3	0.035	0.3
TP12	1.850	0.315	0.236	0.925	1.890	1.575	1.260	1.575	-	1.378	0.787	M4	3	0.039	0.5
TP16	2.205	0.335	0.315	1.091	2.283	1.969	1.535	1.890	-	1.772	0.984	M4	3	0.047	1.0
TP20	1.850	0.300	0.220	0.980	3.500	3.000	2.440	3.230	2.130	1.890	1.180	10 -24	4	.07	2.0
TP30	2.360	0.370	0.280	1.300	4.440	3.940	3.230	4.170	2.950	2.560	1.670	1/4 - 20	6	.08	4.5
TP50	3.190	0.570	0.340	1.760	6.250	5.500	4.800	5.910	4.590	3.860	2.760	5/16 - 18	6	.11	13.0

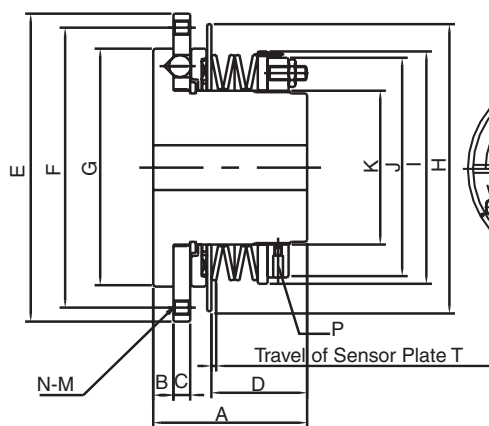
Table 3

Torq/Pro Stocked Finished Bores

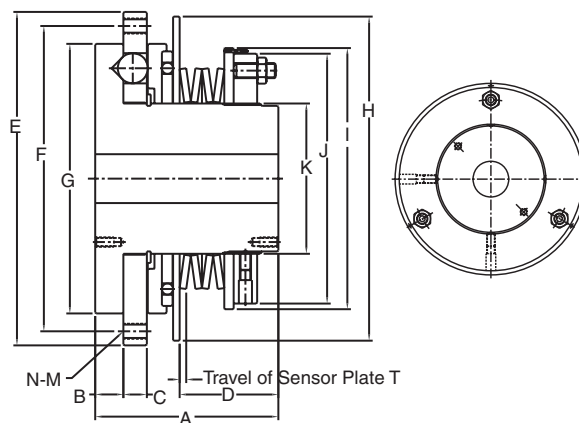
Stock Bores																					
Stock Bores Marked "x"																					
Part Number	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 3/16"	1 1/4"	1 3/8"	1 7/16"	1 1/2"	1 5/8"	1 3/4"	1 15/16"	2"	2 1/8"	2 1/4"	2 7/16"	2 1/2"	2 3/4"
TP20	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30L	-	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-
TP30H	-	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-
TP50L	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	-	-	-	-	-	-
TP50M	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	-	-	-	-	-	-
TP50H	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	-	-	-	-	-	-
TP70	-	-	-	-	-	-	-	-	-	-	-	x	-	x	x	x	x	x	x	x	x

Note: Example: Torq/Pro part number for finished bore is TP50L x 1 1/8.

Finished bores are available for all sizes upon request.



TP70 - TP90



TP110 - TP130

Table 4

Model	rpm Max.	Bore (inch)		Torque (in. lbs.)		Disc Spring Color
		Min.	Max.	Min.	Max.	
TP70	160	1.260	2.755	2600	9550	Yellow
TP90L	120	1.654	3.543	3903	11710	Yellow
TP90H				8240	27756	Orange
TP110L	100	2.047	4.331	6072	17347	Yellow
TP110H				13878	45103	Orange
TP130L	80	2.362	5.118	10408	26889	Yellow
TP130H				23419	63318	Orange

Table 5

Model	Dimensions All Dimensions Are In Inches														Wt. (lb.)
	A Overall Width	B Drive Plate Offset	C Drive Plate Thickness	D Sensor Plate Offset	E Pilot Diameter	F Bolt Circle	G Hub Diameter	H Sensor Plate Diameter	I Spring Diameter	J Adjusting Nut Diameter	K Hub Diameter	M Capscrew Threads	N Number of Mounting Holes	T	
TP70	4.330	0.570	0.470	2.700	8.630	7.880	6.690	8.070	6.540	6.180	4.170	3/8 -16	6	.13	37.0
TP90	6.181	0.984	0.866	3.488	11.614	10.433	9.291	11.417	8.386	7.992	5.118	M12	8	0.21	82.7
TP110	7.677	1.181	0.984	4.134	13.976	12.795	11.299	13.583	10.945	10.472	6.299	M16	6	0.24	153.4
TP130	9.055	1.378	1.063	5.118	15.748	14.173	12.559	15.354	12.441	11.969	7.480	M16	8	0.26	224.9

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Chain Couplings and Sprockets

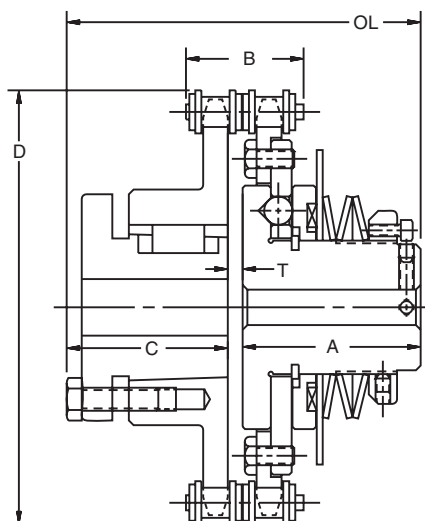


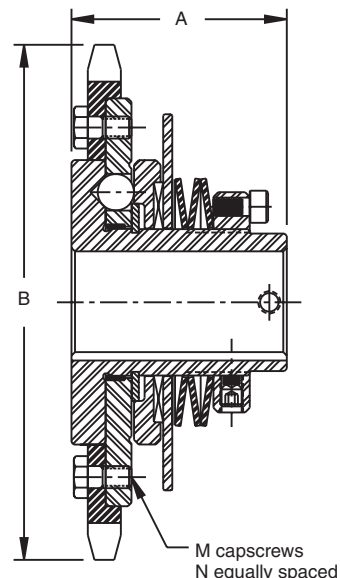
Table 1 Torq/Pro Chain Coupling

Model	Single Strand Sprocket Part Number	Single Sprocket for Split Taper Bushing Part Number	Coupling Chain with Link Part Number	Dimensions in Inches					
				A Length Through Bore	B Width of Chain	C Length Through Coupling Sprocket	D Overall Diameter	E Clearance	L Overall Length
TPC20	20TP40A26K	40P26	C4026	1.85	1.22	2 3/16	4.61	.16	4.20
TPC30L	30TP60A24K	60P24	C6024	2.36	1.89	2 3/16	6.45	.20	4.75
TPC30H	30TP60A24K	60P24	C6024	2.36	1.89	2 3/16	6.45	.20	4.75
TPC50L	50TP60A30K	60P30	C6030	3.19	1.89	2 25/32	7.85	.20	6.17
TPC50M	50TP60A30K	60P30	C6030	3.19	1.89	2 25/32	7.85	.20	6.17
TPC50H	50TP60A30K	60P30	C6030	3.19	1.89	2 25/32	7.85	.20	6.17
TPC70	70TP80A32K	80Q32	C8032	4.33	2.43	2 25/32	11.11	.39	7.50

Note: For complete coupling order: 1, Torq/Pro; 1, TP sprocket; 1, bushed sprocket and bushing; and 1, coupling chain.
Coupling packages are available for all Torq/Pro sizes. For more information contact Application Engineering at 1-800-626-2093.

Table 2 Single Strand Sprocket Kits

Model	Sprocket Part Number	No. of Teeth	A Overall Length	B Overall Sprocket Diameter	M Capscrew	N
TP20	20TP40A26K	26	1.85	4.42	10-24 X 3/8	4
	20TP40A30K	30	1.85	5.06	10-24 X 3/8	4
	20TP40A36K	36	1.85	6.02	10-24 X 3/8	4
	20TP40A40K	40	1.85	6.65	10-24 X 3/8	4
	20TP50A25K	25	1.89	5.32	10-24 X 1/2	4
	20TP50A30K	30	1.89	6.32	10-24 X 1/2	4
TP30	30TP40A36K	36	2.36	6.02	1/4 -20 X 1/2	6
	30TP40A40K	40	2.36	6.65	1/4 -20 X 1/2	6
	30TP50A26K	26	2.36	5.52	1/4 -20 X 1/2	6
	30TP50A30K	30	2.36	6.32	1/4 -20 X 1/2	6
	30TP50A36K	36	2.36	7.52	1/4 -20 X 1/2	6
	30TP60A24K	24	2.41	6.15	1/4 -20 X 1/2	6
TP50	50TP60A30K	30	3.19	7.59	5/16 -18 X 3/4	6
	50TP60A36K	36	3.19	9.02	5/16 -18 X 3/4	6
	50TP80A24K	24	3.27	8.20	5/16 -18 X 3/4	6
TP70	70TP80A32K	32	4.44	10.75	3/8-16 X 1	6
	70TP80A36K	36	4.44	11.98	3/8-16 X 1	6
	70TP100A26K	26	4.56	11.05	3/8-16 X 1	6



Installation and Maintenance

Reboring

1. TP Torq/Pro Hub:
 - A. Disassemble all parts from hub, being careful to keep clean and free of nicks and any damage.
 - B. Chuck on flange of hub and align as illustrated (Figure 1).
 - C. Rebore to desired size within catalog bore range.
2. Coupling Sprocket:
 - A. Chuck on sprocket hub, indicate for alignment, and rebore.
 - B. Do not exceed maximum bore.

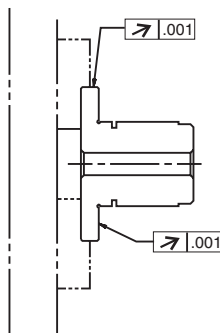


Figure 1

Reassemble and Minimum Torque Setting

1. Reassemble:
 - A. Assemble parts in reverse order. Refer to cross section drawing.
 - B. Apply grease to balls and needle bearing.
 - C. Be careful to orient the springs as illustrated.
2. Reset to minimum torque:
 - A. This auto-resetting type only requires re-starting of the motor, etc. at the drive side for re-engagement. Remove the cause of overload after stopping the equipment when the Torq/Pro trips. Reset TP with input rotation of 50 rpm or slower or by inching of motor. Never reset manually. If you hear the "clicks", the balls are back in the pocket holes.
 - B. TP 08, 12, 16, 20, 30, 50: Set the indicator to the "0" point on the sticker by tightening the adjustment nut.
 - C. TP 70, 90, 110, 130: Make sure that adjustment bolt and nuts are loose, lineup match mark on hub and adjustment plate. Then tighten the setscrews in the adjustment plate to lock position on the hub. For TP-110 and 130, tighten setscrew with lock plug. Tighten the three adjustment bolts equally to locate the indicator to the "0" point.

Mounting of the Drive Member

1. Drive member will pilot over center flange with a clearance fit.
2. Dimensions of drive member and mounting bolts are listed (Figure 2).

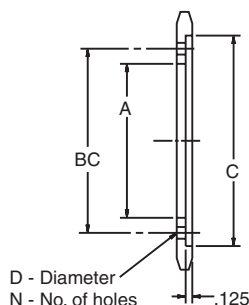


Figure 2

Model	A	B	C	D	N
TP20	2.50	3.00	3.502–3.505	7/32	4
TP30	3.38	3.94	4.439–4.442	9/32	6
TP50	4.94	5.50	6.252–6.255	11/32	6
TP70	6.75	7.88	8.627–8.630	13/32	6

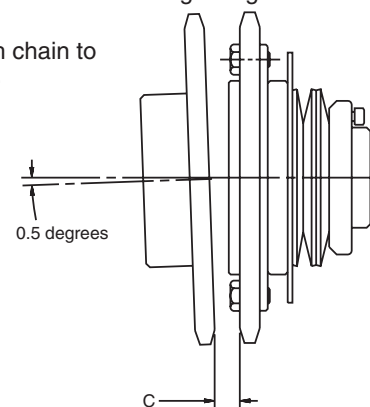
Note: Dimension .125 changes to .200 if using #60 sprocket with TP30.

Mounting of TP on Shaft

Use of a parallel key is required. Tighten the setscrew to secure to the shaft. Use of lock-tite is suggested to prevent the setscrew from loosening.

Coupling

1. Alignment:
 - A. Angular misalignment should be held within 0.5 degrees. To indicate measure dimension "C" along outside edge of sprocket in at least three locations (Figure 3).
 - B. Parallel misalignment should be within limit "E" listed in table and measured with a straight edge and feeler gauges.
2. Wrap sprockets with chain to complete assembly.



Model	C	E
TP20	.291	.009
TP30	.382	.015
TP50	.382	.015
TP70	.602	.020

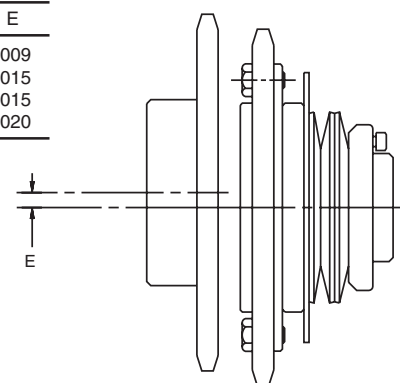


Figure 3

Maintenance

1. Disassemble unit and apply grease on the ball and bearing once a year or 1000 trips.
2. Use NGI 2 lithium based EP grease.

Overload Detection

With use of a proximity switch the operating system can be shut down. Whenever the TP unit trips due to an overload, the sensor plate will move a sufficient amount. Use an Omron® switch number EZE-X1R5YZ or equivalent.

Omron is believed to be a trademark and/or a trade name of Omron Electronics LLC and is not owned or controlled by Emerson Power Transmission Corporation. This trademark and/or registered trademark of others is used herein for product comparison purposes only, is the property of their respective owners and is not owned or controlled by Emerson Power Transmission Corporation. While reasonable efforts have been made to confirm ownership of the marks and names listed above, Emerson Power Transmission Corporation cannot and does not represent or warrant the accuracy of this information.

Design Features

For the Protection of Servo Drives and High-Speed Response Drive Systems

With the advent of new industrial automation technologies, higher levels of precision are being introduced in the positioning and indexing of all types of machinery and systems, especially servomotors.

Operating errors in high tech mechanical systems can cause damage and accidents, resulting in considerable loss of time and money. The TPX high precision torque overload device satisfies the demand for precision and functionality in these types of machines and systems. This series provides drive disengagement when overload occurs and also includes features such as backlash prevention, high rigidity and easy adjustment by means of a torque scale.

Industries Served

- Automotive
- Food and beverage
- Steel
- Textiles

Field Applications

- Conveyors
- Food and beverage equipment
- Machine tools
- Mixers
- Packaging equipment
- Textile machinery
- X-ray machinery

Features

Backlash – Patent pending, innovative ball and wedge mechanism nearly eliminates backlash.

High precision tripping – Little motion lost during tripping. Reoccurrence of trip torque (dispersion rate) is held within $\pm 3\%$.

Coupling capability – In the coupling model, misalignment of $0.5^\circ - 1^\circ$ due to angling error, parallelism or displacement of axis direction, is compensated for by the ball and wedge mechanism.

One position – Ball and pocket are uniquely designed to fit together in only one position, which allows the system reset to be kept in place.

Easy torque adjustment – Adjust trip torque by simply turning the adjustment nut.

Verification of torque setting – Torque setting can be easily verified by checking the torque scale and indicator.



Browning Torq/Pro TPX is a release-type ball-detent torque overload device with a single position reset configuration and offers:

- Improved accuracy
- Simple design
- Reversible
- Torque set scale
- Switch detector plate

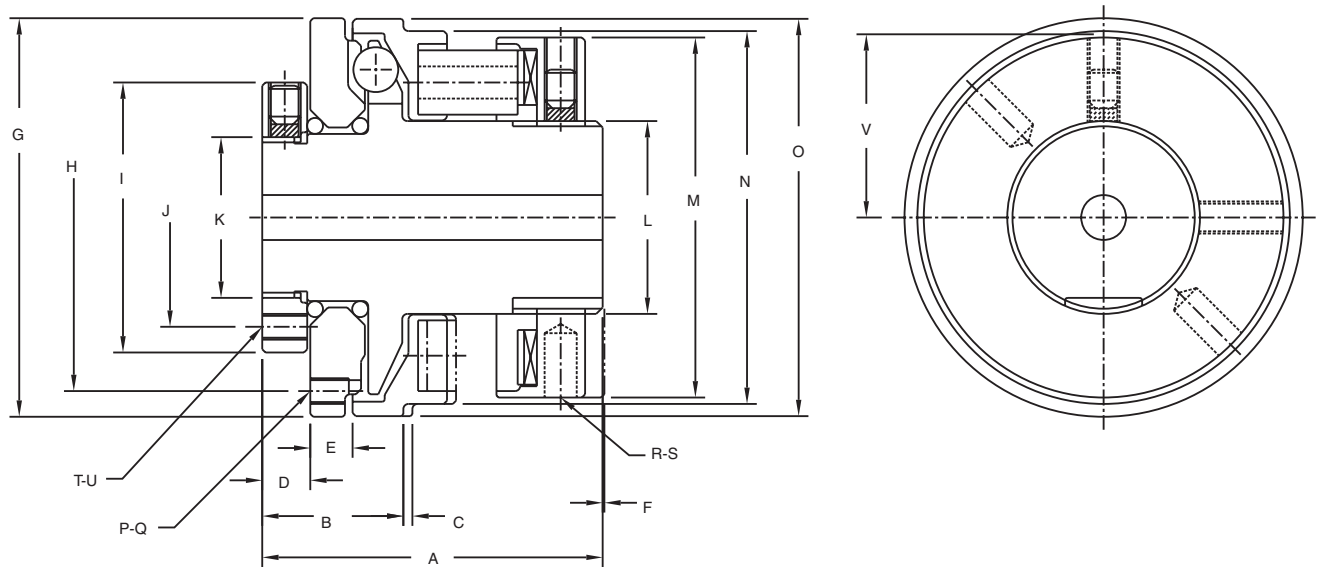


Table 1

Model	rpm Max.	Bore				Torque				Disc Spring Color
		mm		inches		Nm		lb/ft		
		Min.	Max.	Min.	Max.	Min.		Max.		
TPX10L	1400	7	15	5/16	9/16	1.7	6.4	1.25	4.70	Yellow x 3
TPX10M						5.4	15	3.98	11.06	Red x 3
TPX10H						11	29	8.11	21.39	Red x 6
TPX20L	1100	8.5	25	3/8	15/16	6.5	24	4.79	17.70	Yellow x 6
TPX20M						13	34	9.59	25.08	Red x 3
TPX20H						25	68	18.44	50.16	Red x 6
TPX35L	800	12	35	1/2	1 3/8	23	68	16.96	50.16	Red x 5
TPX35M						43	98	31.72	72.28	Green x 5
TPX35H						87	196	64.17	144.56	Green x 10
TPX50L	600	18	55	3/4	2 1/8	45	118	33.19	87.03	Red x 5
TPX50M						90	196	66.38	144.56	Green x 5
TPX50H						176	392	129.81	289.13	Green x 10
TPX70L	480	23	70	15/16	2 3/4	127	363	93.67	267.74	Red x 8
TPX70M						265	510	195.46	376.16	Green x 8
TPX70H						392	784	289.13	578.26	Green x 12

Note: Example: Torq/Pro part number for minimum plain bore is TPX50L MPB.

Table 2

Model	Dimensions																					
	A Overall Width		B		C Travel of Pressure Plate		D Driven Plate Offset		E Drive Plate thickness		F		G Outer Diameter		H Bolt Circle		I Lock Nut Diameter		J Diameter		K Hub Diameter	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
TPX10	53	2.087	22	0.866	1.40	0.055	8	0.295	6.60	0.256	+0.3	+0.012	62	2.441	54	2.126	42	1.654	34	1.339	25	0.984
TPX20	64	2.520	35	1.378	1.60	0.063	10	0.394	13.40	0.528	+0.7	+0.028	86	3.386	74	2.913	60	2.362	50	1.969	40	1.575
TPX35	68	2.677	38	1.476	2.00	0.079	11	0.433	11.60	0.457	-0.5	-0.020	107	4.213	88	3.465	70	2.754	60	2.362	50	1.969
TPX50	92	3.622	55	2.157	2.60	0.102	15	0.591	19.50	0.768	+0.3	+0.012	148	5.827	130	5.118	105	4.134	-	-	80	3.150
TPX70	98	3.858	61	2.402	3.50	0.138	15	0.591	19.20	0.756	+1	+0.039	185	7.283	164	6.457	135	5.315	-	-	100	3.937

Model	Dimensions																		Wt.			
	L Hub Diameter		M Adjustment Nut Diameter		N		O Pressure plate Diameter		P Number of Mounting Holes		Q Capscrew threads		R Diameter		S Depth		T Number of Thread				U Depth of Thread	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches				metric	mm	inches	kg	lb.
TPX10	30	1.181	56	2.205	58	2.283	62	2.43	4	M 4 x 6	5	0.197	10	0.394	4		M4 x 7	30	1.181	0.75	1.653	
TPX20	40	1.575	70	2.756	73	2.874	86	3.39	6	M5 x 8	5	0.197	10	0.394	6		M5 x 7	37	1.457	1.67	3.681	
TPX35	55	2.165	88	3.465	91	3.583	107	4.21	6	M 6 x 7	6	0.236	10	0.394	6		M5 x 8	46	1.811	2.51	5.533	
TPX50	80	3.150	123	4.843	129	5.079	148	5.83	6	M 8 x 13	9	0.354	17	0.669	-	-		64	2.520	7.03	15.498	
TPX70	100	3.937	148	5.827	153	6.024	185	7.28	6	M 10 x13	10	0.394	18	0.709	-	-		76	2.992	11.40	25.132	

Selection Guide

Install the TPX as close as possible to the location where overload is likely to occur.

Selecting Trip Torque - TPX only

Set trip torque equal to the maximum amount of torque that can be applied, based on conditions such as the strength of the machine and load. When the maximum amount of torque is unclear, calculate the rated torque from the rated output and rpm of the shaft onto which the torque overload device is to be installed and multiply this figure by the service factor. The result may be taken as the trip torque.

$$T = \frac{974 \times P}{N} \times S.F.$$

T = trip torque (kgf-m)
 P = rated output (kW)
 N = revolutions per minute (rpm)
 $S.F.$ = service factor

1. Verification of shaft bore diameter and rpm
2. Model number selection

Determination of Service Factor

S.F.	Operating Conditions
1.25	Normal starting and stopping, intermittent motion
1.50	Load with severe shocks, forward and reverse motion

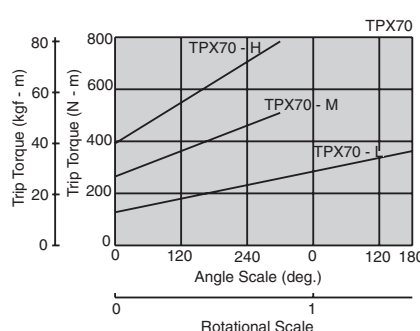
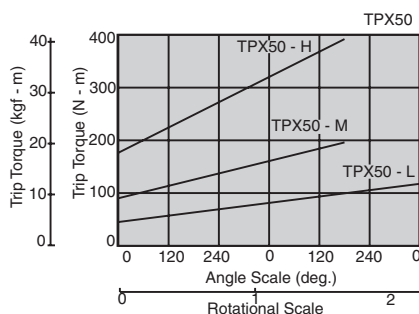
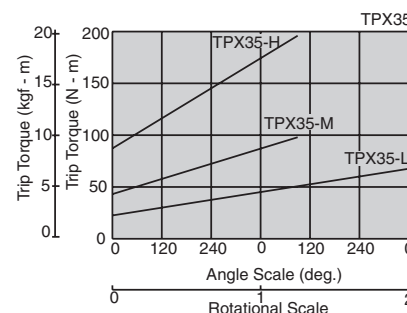
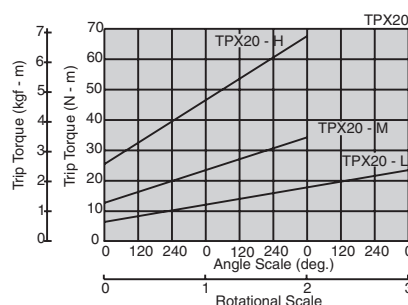
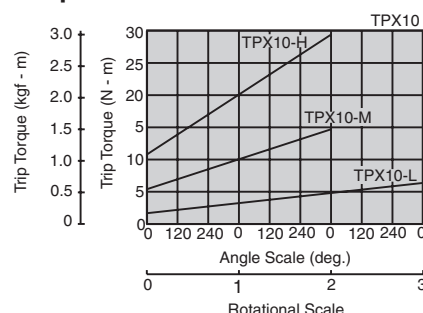
Setting Trip Torque

1. The torque of all TPX torque overload devices is set at the minimum value when shipped. Please check to make sure that the indicator is pointing to zero on the torque scale.
2. Loosen the fit-drive set screw of the adjustment nut and remove the lock plug.
3. Look at the tightening-torque graph below to determine the angle to which the adjustment nut must be tightened to produce the trip torque determined above. The torque scale is divided into increments of 60°. First turn the adjustment nut to an angle of 60° before the angle determined from the graph, install the TPX onto the machine, and do a trip test. Then gradually tighten the nut until the required torque is reached.
4. After the torque is set, insert the lock plug and tighten the screw with hole so that it holds loosely.
5. Do not turn the adjustment nut beyond the largest value on the torque scale. If this is done, the coiled spring will not have sufficient flexible leeway and the guard will lock when tripping occurs.

Resetting

1. The guard automatically resets when the motor or drive is restarted.
2. When tripping occurs, stop the machine and remove the cause of the overload.
3. When restarting the motor to reset the TPX, keep the revolution speed low and increase it gradually. It is very dangerous to use your hands, so keep them away from the torque overload device. When it resets it will make a "clicking" sound.

Torque Correlation



Design Features



Direct Attachment Offers Greater Protection

Browning TPZ torque overload device allows the input side to continue to revolve freely after tripping. The TPZ includes an ON-OFF clutch capability for starting and stopping rotary transmissions. It may be used as a clutch to stop rotary transmissions when applying, disconnecting or adjusting required torque needs.

Industries Served

- Material handling
- Food and beverage
- Packaging

Field Applications

- Binding machinery
- Food and beverage equipment
- Machine tools
- Packaging equipment

Features

Release type – after tripping due to overload, the input side continues to revolve freely.

External force resetting – after the machine has been stopped and the source of overload has been removed, the TPZ is reset by applying a load in the direction of the shaft, either manually or by means of external force.

ON-OFF clutch capability – shaft revolution can be started or stopped at will. It can be used as a mechanical ON-OFF clutch.

Single position reset – the ball and pocket act as the torque transmission element and are uniquely designed to fit together in only one position.

Torque tripping precision – precision is within $\pm 10\%$ – even with repeated tripping, precision remains within $\pm 10\%$.

Easy torque adjustment – trip torque is adjusted by simply turning the adjustment nut.

Easy-to-read torque scale – torque setting may be easily verified using the rpm and angle scales.

Maintenance

Lubrication intervals depend upon the type of application, speed, temperature and other external conditions. For general use, apply a thin layer of EP grease to the ball and bearing section every year or after every 1000 trips. Experience will determine the best interval for each specific application.



Table 1

Model	rpm Max.	Bore				Torque				Disc Spring Color
		mm		inches		Nm		lb/ft		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
TPZ20L	1800	8	20	3/8	3/4	2.4	8.3	1.77	6.12	Yellow x 3
TPZ20M						4.1	16	3.02	11.80	Blue x 3
TPZ20H						8.2	31	6.05	22.87	Blue x 6
TPZ30L	1800	12	30	1/2	1 1/8	5.9	21	4.35	15.49	Yellow x 4
TPZ30M						20	42	14.75	30.98	Red x 4
TPZ30H						39	108	28.77	79.66	Red x 8
TPZ40L	1800	17	40	11/16	1 9/16	25	93	18.44	68.59	Blue x 5
TPZ40M						44	127	32.45	93.62	Red x 5
TPZ40H						88	245	64.91	180.71	Red x 10
TPZ50L	1800	22	50	7/8	1 15/16	63	157	46.47	115.80	Red x 5
TPZ50M						127	304	93.67	224.22	Red x 10
TPZ50H						245	451	180.71	332.65	Green x 10

Note: Example: Torq/Pro part number for minimum plain bore is TPZ50L.

Table 2

Model	Dimensions																					
	A Overall Width		B		C		D Pressure Plate Groove		E Pressure Plate Thickness		F		G		H		I Travel of Pressure Plate		J Diameter		K Bolt Circle	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
TPZ20	74	2.913	73	2.874	1.0	0.039	8	0.315	6	0.236	13.5	0.531	0.80	0.031	11.00	0.433	4.10	0.161	96	3.781	86	3.386
TPZ30	83.5	3.287	82	3.228	1.5	0.059	8	0.315	6	0.236	14.5	0.571	1.10	0.043	11.50	0.453	4.70	0.185	118	4.646	106	4.173
TPZ40	101	3.976	100	3.937	1.0	0.039	9	0.354	8	0.315	20	0.787	1.10	0.043	14.00	0.551	5.90	0.232	152	5.984	139	5.472
TPZ50	114.5	4.508	112	4.409	2.5	0.098	10	0.394	9	0.354	20.2	0.795	1.20	0.047	16.00	0.630	7.00	0.276	178	7.008	162	6.378

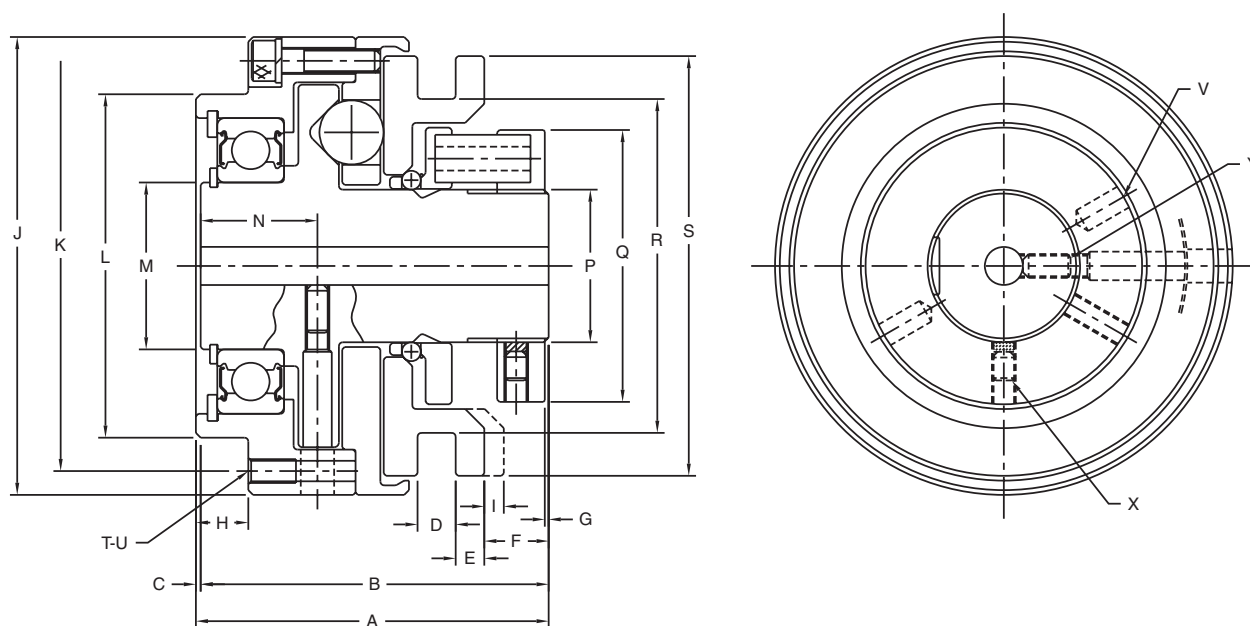


Table 3

Model	Dimensions																										
	L		M Hub Diameter		N Pilot Hole		P Hub Diameter		Q Adjustment Nut Diameter		R Diameter		S Pressure Plate Diameter		T Number of Thread	U Screw Dia. x Number		V Diameter		W Depth of V		X Screw Size x Length		Y Screw Size x Length		Weight	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in		Metric	mm	in	mm	in	Metric	Metric	kg	lbs			
TPZ20	72	2.835	35	1.378	24.5	0.965	32	1.260	58	2.283	70	2.756	88	3.465	4	M5 x 10	5	0.197	10	0.394	M5 x 10	M5 x 10	2.57	5.7			
TPZ30	87	3.425	45	1.772	27.5	1.083	45	1.772	76	2.992	88	3.465	108	4.252	4	M6 x 12	6	0.236	10	0.394	M5 x 10	M6 x 10	4.17	9.2			
TPZ40	114	4.488	65	2.560	32.5	1.261	65	2.559	104	4.094	119	4.685	141	5.551	6	M6 x 12	8	0.315	14	0.551	M8 x 10	M8 x 10	8.71	19.2			
TPZ50	133	5.236	75	2.953	37	1.457	75	2.953	114	4.488	138	5.433	166	6.535	6	M8 x 16	9	0.354	14	0.551	M8 x 10	M8 x 10	13.70	30.2			

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Selection Guide

Install the TPZ as close as possible to the location in which overload is likely to occur.

Selecting the Trip Torque

1. Set the trip torque equal to the maximum amount of torque that can be applied, based on conditions such as the strength of the machine and load. When the maximum amount of torque is unclear, calculate the rated torque from the rated output and rpm of the shaft onto which the torque overload device is to be installed and multiply this figure by the service factor. The result may be taken as the trip torque.

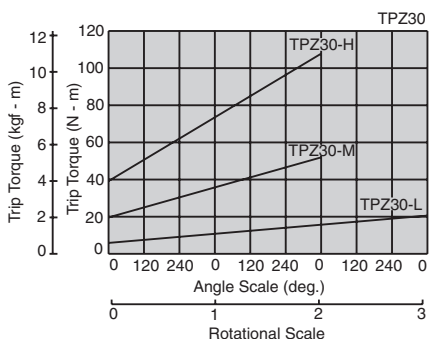
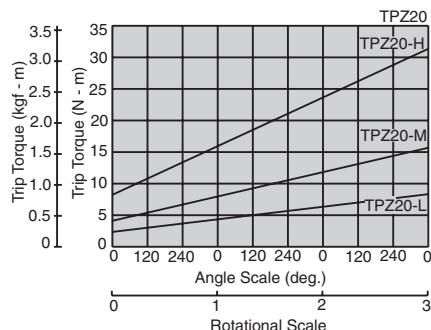
$$T = \frac{974 \times P}{N} \times S.F.$$

T = trip torque (kgf-m)
 P = rated output (kW)
 N = revolutions per minute (rpm)
 $S.F.$ = service factor

2. Verification of shaft bore diameter and rpm.
3. Model number selection.

Determination of Service Factor

S.F.	Operating Conditions
1.25	Normal starting and stopping, intermittent motion
1.50	Load with severe shocks, forward and reverse motion

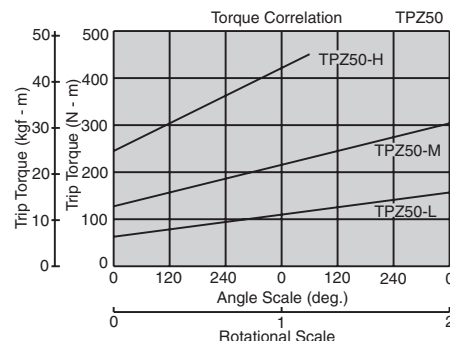
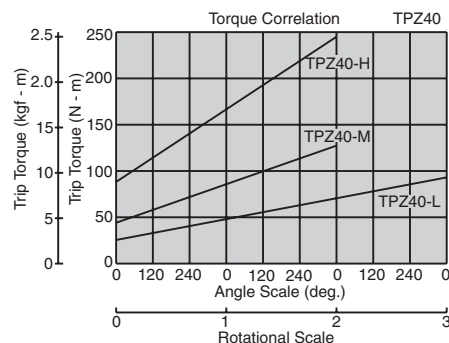


Shaft Bore Machining

1. Before machining – the torque of each TPZ torque overload device is set to the minimum value when shipped. Please verify that the rpm and angle scales both read zero.
2. Disassembly – loosen the setscrew and remove the coiled spring. Disassemble the coiled spring, plate and ball, etc. Remove the stop ring and take out the bearings and driven flange. Take care at this time that no dust or dirt accumulates.
3. Chucking – secure the exterior diameter of the hub flange in a chuck and center at the boss.
4. Machining – machine the keyway directly under the setscrew tap on the hub flange.
5. Assembly – when reassembling the parts after machining the shaft bore, grease balls A and B, the pockets and V groove.

Setting Trip Torque

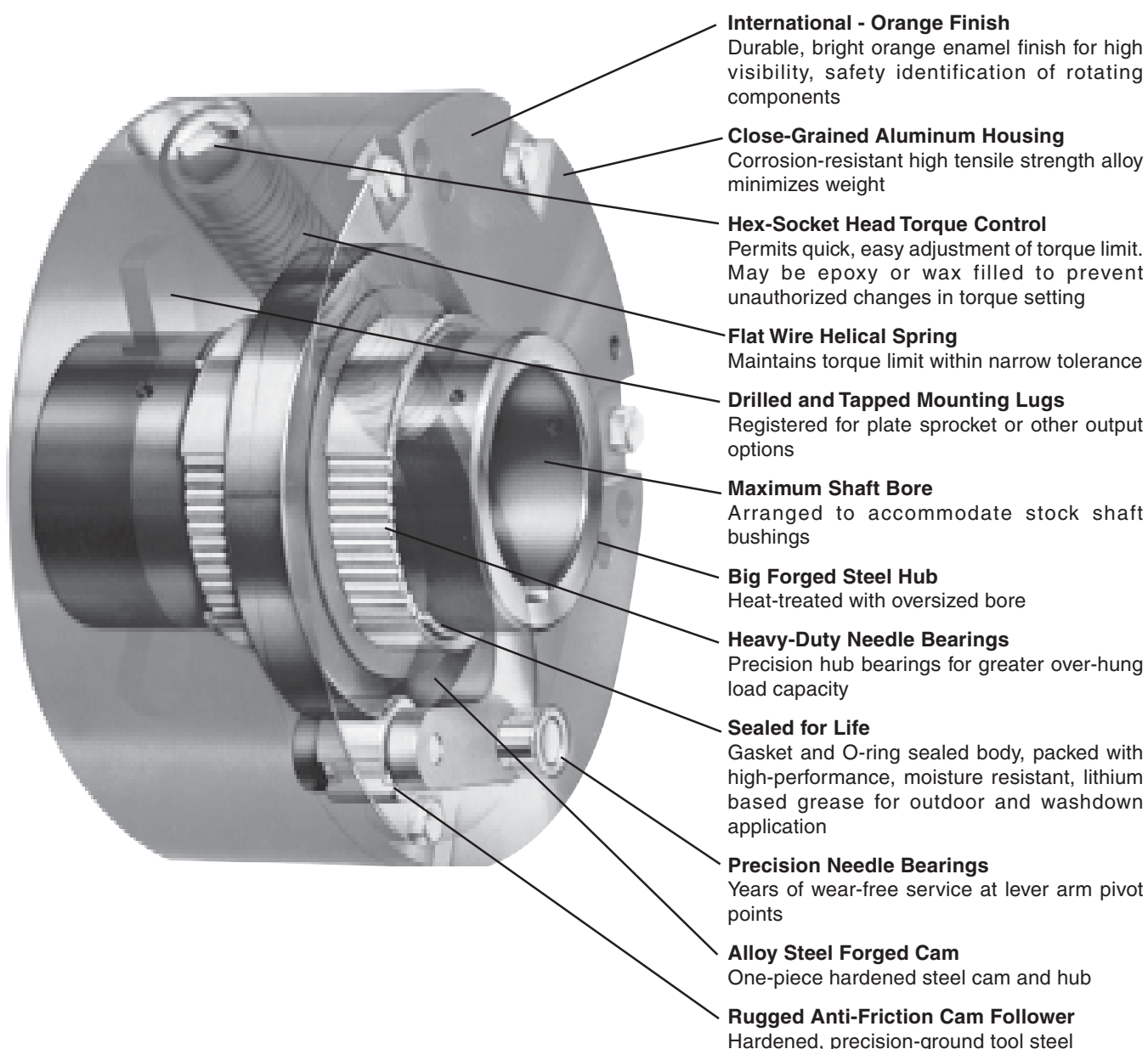
1. The torque of all TPZ torque overload devices is set at the minimum value when shipped. Check to make sure that the indicator is pointing to zero on the torque scale.
2. Loosen the fit-drive set screw of the adjustment nut and remove the lock plug.
3. Look at the tightening-torque graph below to determine the angle to which the adjustment nut must be tightened to produce the trip torque determined above. The torque scale is divided into increments of 60°. First turn the adjustment nut to an angle of 60° before the angle determined from the graph. Install the TPX onto the machine and do a trip test. Then gradually tighten the nut until reaching the required torque.
4. After the torque is set, insert the lock plug and tighten the screw with hole so that it holds loosely.
5. Do not turn the adjustment nut beyond the largest value on the torque scale. If this is done, the coiled spring will not have sufficient flexible leeway and the guard will lock when tripping occurs.



A uniquely simple design concept... ruggedly executed. Provides maximum reliability.

Features

- Modular design – one unit for direct drive, chain drive or other power transmission options
- Universal mounting: eliminates special bore requirements
- Automatic reset
- Single position reset
- Reversible
- Torque repeatability



Torq/Gard Torque Overload Devices - Built Tough so You Can Depend on It!

Torq/Gard overload clutches help protect the entire drive train of your machinery from damage due to excessive torque generated by overloads and jamming. Instant reaction when torque exceeds preset limits provides protection far superior to that of clutches employing friction surfaces.

Unlike friction clutches, the Torq/Gard torque overload device is not subject to torque variations caused by lubricants, heat and water. This unique design maintains precise torque control as it is not subject to significant wear or thermal variations resulting from repeated engagement and disengagement of the unit.

Torq/Gard clutches are more precise than shear pins, easier to reset and are not susceptible to fatigue failures.

Torq/Gard clutches disengage at the precise torque limit you set – every time. And when the overload condition has been corrected, Torq/Gard torque overload devices are automatically reset by “jogging” the machine. Automatic reset minimizes downtime, eliminates manual reset, and permits application in inaccessible locations.

Thermal overload devices, used with electric motors, provide no defense against inertia loads. Their slow reaction time offer little protection to sudden peak torque loads. Torq/Gard clutches give dependable instantaneous response to your overload protection needs every time!

Industries Served

- Food and beverage
- Aggregate processing
- Conveyor manufacturing
- Agriculture

Applications

- Sorting and filling machinery
- Conveyors
- Wrapping and cartoning equipment
- Industrial equipment
- Agricultural equipment



Shaft Bushings



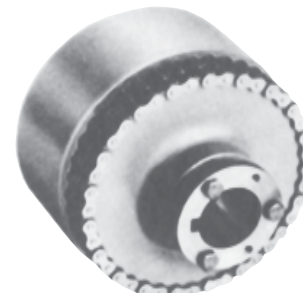
Ever-Flex® Couplings



Chain Drives



Detectors



Chain Couplings

Only Torq/Gard Has All These Standard Features.

Single-Position and Reversible

A spring-loaded cam follower seated in a single hub cam detent causes hub and clutch body to rotate together: thus the clutch always resets in the same position if tripped. Since the cam detent profile is the same in both positions, all Torq/Gard clutches are fully reversible.

Automatic Reset

The Torq/Gard clutch is quickly reset after a jam is cleared by simply jogging the machine until the cam follower reengages the hub cam detent. This avoids potentially dangerous manual resetting and requires no tools.

Bushings Permit a Wide Range of Shaft Sizes

To allow you to use an off-the-shelf Torq/Gard clutch on shafts of various sizes, the clutch was designed with a larger than usual hub bore. Shafts smaller than the maximum diameter are accommodated with standard Browning bushing kits.

Registered Mounting Lugs

All Torq/Gard clutches are designed with tapped mounting lugs to accommodate Browning single strand chain sprockets or gearbelt pulleys - without modification.



Chain Coupling Drive Options

Browning chain coupling kits mount directly on the Torq/Gard clutch. Hubs with split taper bushings simplify drive applications.

Universal Adapter Plate

A universal adapter plate is available for direct mounting of Browning Ever-Flex couplings to the Torq/Gard. The plate may also be modified for special transmission options.

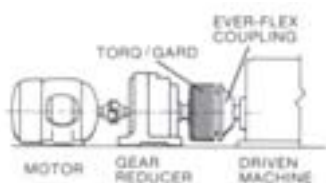
Detector Plate Assembly

The detector mechanism actuates a limit switch, which disconnects the motor from the power source when the Torq/Gard is disengaged. To reset the clutch, simply jog the machine by pressing the motor "start" button. A typical wiring diagram is provided with each Torq/Gard clutch. Detector plates are standard on all sizes. Limit switches are not supplied.

Infinitely Adjustable Within Load Range

Turning a single, hex-socket head control adjusts the Torq/Gard clutch precisely to any setting within its load range. Index marks on the clutch body give approximate settings to facilitate adjustment.

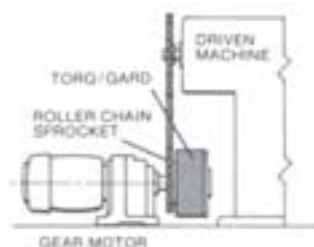
One basic design fits most installations.



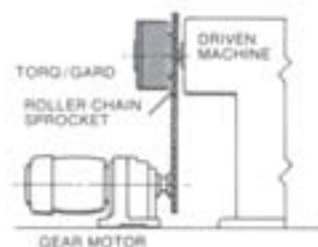
Direct drive application with the Torq/Gard mounted on the low speed output shaft of the reducer. The Torq/Gard is shown with a Browning Ever-Flex half coupling, which mounts on the clutch adapter without modification. Browning chain coupling kits are also available for the Torq/Gard when greater misalignment capabilities are required. Either side of the Torq/Gard can be used as the input.



The Torq/Gard should not be used on the high-speed input side of the reducer. Clutch sensitivity becomes a function of the reducer's gear ratio. As an example, when used with a 100 to 1 reducer, a 100 inch-pound torque variation on the output side will reflect only a 1 inch-pound change on the input side. Do not exceed the maximum rpm shown in the Torq/Gard selection table.



Mounting the clutch on the output of the gear motor or reducer provides the most economical clutch assembly. The Torq/Gard is designed to protect the weakest link in the drive system.



The Torq/Gard is mounted on the driven machine and is powered through a chain and sprocket drive. Mounting the clutch in this position tends to absorb peak starting torques.

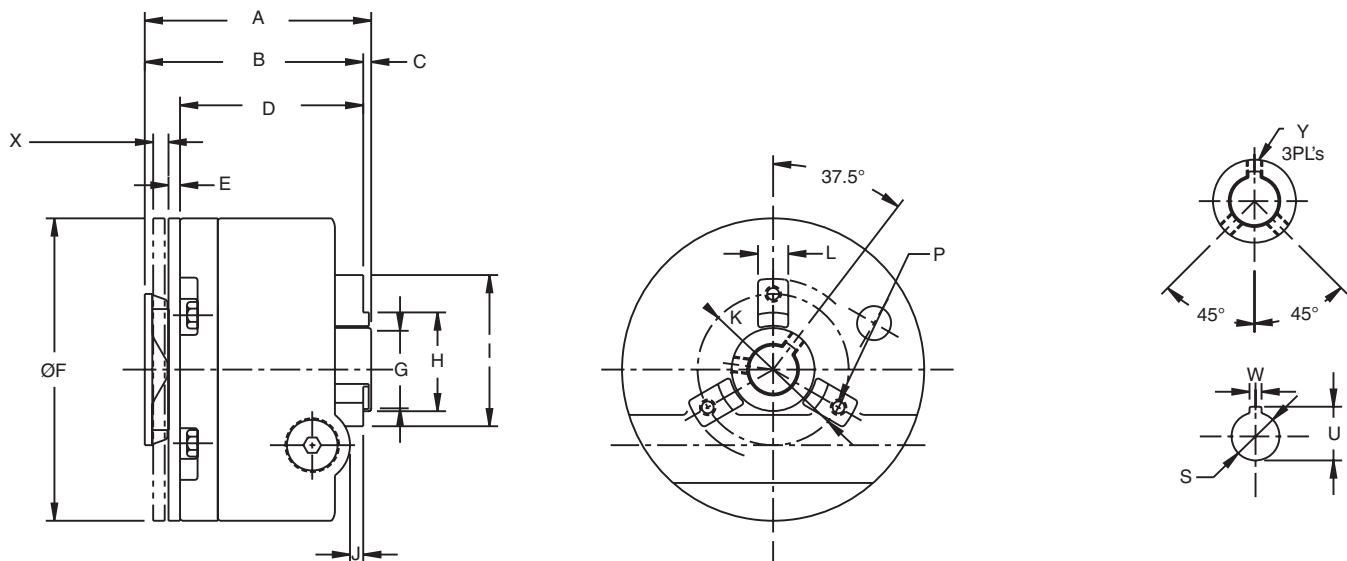


Table No. 1 Mini Torq/Gard Overload Clutches

Model	Max. Bore	A	B	C	D	E	F	G	H	I	J	K	L	P	S	U	W	X	Y
TGC3	.500	2.36	2.24	.08	1.89	.12	3.15	0.87	1.187	1.97	.16	1.575	.32	.164-32	.55	.64	.125	.16	.164-32
TGC6	.500	2.36	2.24	.08	1.89	.12	3.15	0.87	1.187	1.97	.16	1.575	.32	.164-32	.55	.64	.125	.16	.164-32
TGC20	.750	2.76	2.60	.12	2.24	.12	3.94	1.18	1.563	2.36	.16	1.966	.39	.190-24	.75	.86	1.87	.16	.190-24

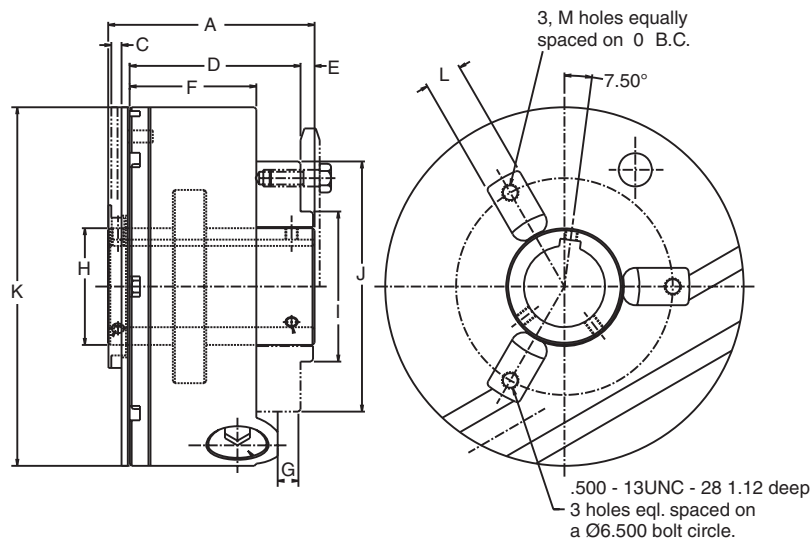


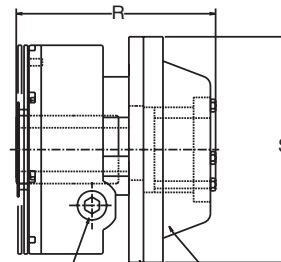
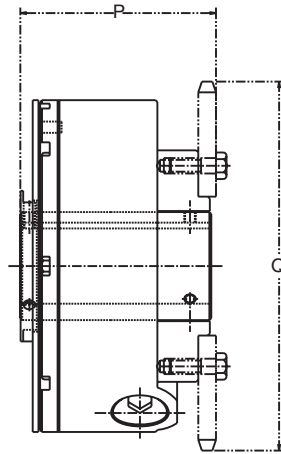
Table No. 2 Torq/Gard Overload Clutches

Model	Max. Bore	Hub Keyseat	A	C	D	E	G	H	I	J	K	L	M	O
TGC60	1.250	1/4 x 1/8	3.50	.25	2.67	.34	.31	1.875	2.375	3.38	5.25	.56	1/4-20NCX 9/16"	2.875
TGC200	1.938	1/2 x 1/8	4.31	.25	3.36	.39	.56	2.750	3.250	5.00	7.00	.75	3/8-16NC X 3/4	4.500
TGC400	2.438	5/8 x 3/16	6.19	.31	5.17	.42	.62	3.500	4.500	7.50	10.75	1.12	1/2-13NC X 11/8	6.500
TGC800	2.438	5/8 x 3 16	6.19	.31	5.17	.42	.62	3.500	4.500	7.50	10.75	1.12	1/2-13NC X 1 1/8	6.500

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

**Table 1 Single Strand Sprockets
ANSI Standard Roller Chain**

Model	Sprocket Part No	No. of Teeth	P	Q
For No. 35, 3/8 Pitch				
TGC3 & TGC6	TG35A30K	30	2.40	3.79
	TG35A36K	36	2.40	4.51
	TG35A45K	45	2.40	5.59
For No. 40, 1/2 Pitch				
	TG60A26K	45	4.38	11.18
	TG60A26K	60	4.38	14.73
	TG60A26K	72	4.38	17.6
For No. 80, 1 Pitch				
TGC400	TG80A28K	28	6.35	9.48
	TG80A36K	36	6.35	12.03
	TG80A45K	45	6.35	14.9
	TG80A60K	60	6.35	19.64
	TG80A72K	72	6.35	23.46
For No. 100, 1 1/4 Pitch				
TGC800	TG100A28K	28	6.46	11.84
	TG100A36K	36	6.46	15.04
	TG100A45K	45	6.46	18.63
	TG100A60K	60	6.46	24.55
	TG100A72K	72	6.46	29.33



Torque adjustment screw 4000-8000"/lbs
Ever-Flex or chain coupling
Adaptor plate

Table 2 Torq/Gard Bushing Kits

Model	Shaft Diameter	Bushing Kit No.
TGC3 & TGC6	3/8	06BU006
TGC20	1/2	20BU008
	5/8	20BU010
TGC200	3/4	60BU012
	7/8	60BU014
	15/16	60BU015
	1	60BU100
	1 1/8	200BU102
	1 3/16	200BU103
	1 1/4	200BU104
	1 5/16	200BU105
	1 3/8	200BU106
	1 7/16	200BU107
	1 1/2	200BU108
	1 5/8	200BU110
	1 11/16	200BU111
	1 3/4	200BU112
	1 15/16	None
	24MM	200BU24MM
	25MM	200BU25MM
	28MM	200BU28MM
	30MM	200BU30MM
	32MM	200BU32MM
	35MM	200BU35MM
	40MM	200BU40MM
	42MM	200BU42MM
	45MM	200BU45MM
TGC400 & TGC800	1 1/4	800BU104
	1 3/8	800BU106
	1 7/16	800BU107
	1 1/2	800BU108
	1 5/8	800BU110
	1 11/16	800BU111
	1 3/4	800BU112
	1 7/8	800BU114
	1 15/16	800BU115
	2	800BU200
	2 1/8	800BU202
	2 3/16	800BU203
	2 1/4	800BU204
	2 7/16	None
	35MM	800BU35MM
	38MM	800BU38MM
	40MM	800BU40MM
	42MM	800BU42MM
	45MM	800BU45MM
	48MM	800BU48MM
	50MM	800BU50MM
	55MM	800BU55MM

Table 3 Torq/Gard Ever-Flex Couplings

Model	Coupling Half Part No.	Adapter Plate Part No.	Split Taper Bushing	R	S
TGC60	CHCFR5H	600CAP5	H	5.91	5.25
TGC200	CHCFR8P	200CAP8	P1	7.06	7.88
TGC400	CHCFR9Q	400CAP9	Q1	9.22	10.75
TGC800	CHCFR10Q	800CAP10	Q1	9.53	10.75

Table 4 Torq/Gard Chain Couplings

Model	Single Strand Sprocket Part No.	Single Sprocket for Split Taper Bushing Part No.	Coupling Chain w/Link Part No.	R	S
TGC60	TG40A26K	40P26	40P26 Chain	6.97	4.42
TGC200	TG60A26K	60P26	60P26 Chain	7.15	6.63
TGC400	TG80A28K	80Q28	C8028 Chain	10.05	9.48
TGC800	TG80A28K	80Q28	C8028 Chain	10.05	9.48

Table 5 Torq/Gard Repair Parts

Model	Detector Plate	Detector Cam	Detector Plate Spring	Torque Adjusting Spring
TGC60	B17056	B17055	A17059	A15731
TGC200	C16927	B16926	A16989	A13732
TGC400	C17076	C17077	A17788	A166821, A166822*
TGC800	C17076	C17077	A17788	A175381, A175382*

*Order both springs.

Selecting the Right Torq/Gard Clutch - Easy as 1 - 2 - 3

1. Torq/Gard clutches may be sized by the speed/torque chart.

Tripping torque should be at least 25% greater than the operating torque to compensate for motor starting torque, intermittent loads, shock loads and reversing loads.

The speed/torque chart incorporates this 25% service factor (S.F.). On shock load or reversing load applications service factor greater than 25% may be required.

2. The Torq/Gard may also be sized by applying one of the following formulas.

$$\text{Torque (in.-lbs.)} = \frac{\text{Horsepower (HP)} \times 63025}{\text{rpm}}$$

$$\text{Horsepower} = \frac{\text{Torque (in.-lbs.)} \times \text{rpm}}{63025}$$

$$\text{Tripping Torque} = \text{Operating Torque} \times \text{S.F.}$$

3. Select the desired Torq/Gard from the rating chart.
The Torq/Gard will successfully operate from 0 speed to the maximum rpm listed.

Part Number Explanation

TGC 60
 Size (1/10 of the maximum torque capacity, in.-lbs.)
 Series

If required shaft bushing is ordered separately ex.

60 BU 012
 Shaft size (16th of an inch)
 Bushing kit
 Torq/Gard size

Bushing kit includes key and setscrews. Torq/Gards can be made into couplings by ordering separate components. Single strand TG sprocket kits to bolt on are stocked.

TG 40 A 45 K
 Kit
 Number of teeth
 A-plate sprocket
 #40 roller chain
 Torq/Gard

Includes mounting bolts.

rpm	Horsepower											
	.007	.013	.027	.050	.090	.15	.25	.50	1.00	2.00	3.00	5.0
20												
40												
60												
80												
100												
200												
300												
400												
500												
600												
700												
800												
900												
1000												
1200												
1400												TG20
1600												
1800					TG3						TG6	

rpm	Horsepower															
	1/4	1/2	3/4	1	1.5	2	3	5	7.5	10	15	20	30	35	40	
20																
40																
60																
80																
100																
200																
300																
400																
500																
600																
700																
800																
900																

Torq/Gard Ratings

Size No.	Torque (in. lbs.)		HP Max.	rpm Max.	Weight (lbs.)	Inertia Wk²	Bore Dia. Max. (inches)
	Min.	Max.					
3	13	32	1.5	1800	1.5	1.4	1/2
6	23	56	2.5	1800	1.5	1.4	1/2
20	56	203	4.0	1800	2.5	5.7	3/4
60	200	600	8.5	900	5.5	10	1 1/4
200	600	2000	21.5	680	12	46	1 15/16
400	2000	4000	22.2	350	38	455	2 7/16
800	4000	8000	44.4	350	38	455	2 7/16

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

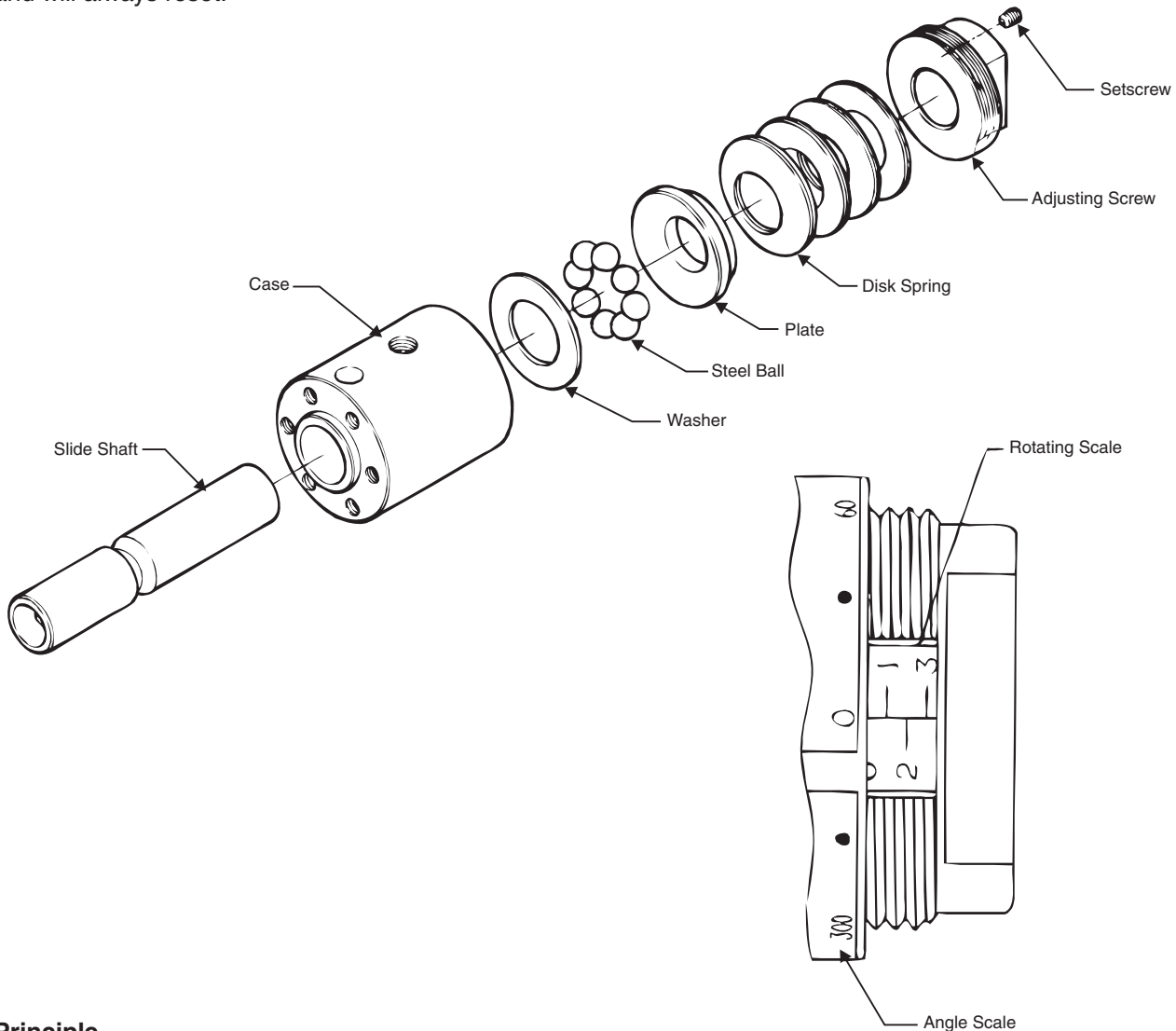
Design Function

Browning Axial Gard TPA

The Browning Axial Gard is suitable for overload of axial direction such as pusher or crank motion and is directly mounted to the shaft to protect the machine from damage due to unexpected stopping. The Browning Axial Gard is designed for easy trip setting and will always reset.

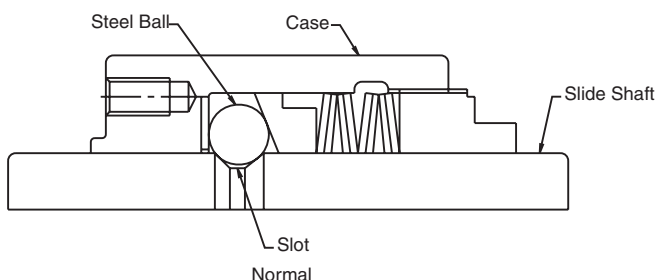
Field Applications

- Automatic machinery
- Machine tools
- Medical treatment machinery
- Packaging equipment
- Special purpose machinery
- Testing machinery

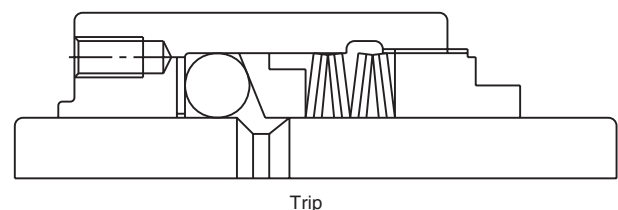


Principle

- A. Thrust load from case (slide shaft) leads to slide shaft (case) through steel ball.



- B. When thrust load exceeds the setting load, steel ball pops out of groove and slide shaft becomes free.

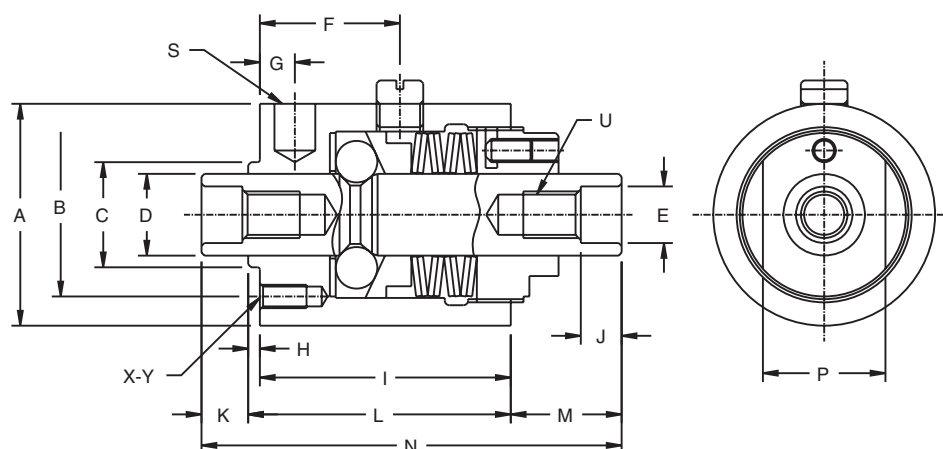


Features and Benefits

- High accuracy: $\pm 15\%$ trip load
- Easy trip setting: trip load is easily set by rotating the adjustment screw. Trip loads in either direction are the same.
- Release type: Axial Gard trips immediately after overload occurs. The device cuts off axial load from the drive shaft to the driven shaft. The Axial Gard is easily reset, which allows the machine to recover quickly.



Model	Trip Load Setting Range (N)		Dimensions (mm)										
			A Case Diameter	B Bolt Circle	C Diameter	D Shaft Diameter	E Diameter	F	G	H Shoulder	I	J Counter Bore Depth	K
	Min.	Max.											
TPA65	147	637	33	23	14	10	7	22.5	5	2.00	40.00	5.00	5
TPA150	588	1470	38	28	18	14	10	24	6	2.00	43.00	7.00	8
TPA250	735	2450	45	34	24	18	14	28	7.5	3.00	50.00	10.00	15
TPA350	980	3430	56	44	28	22	16	34	9	3.00	63.00	10.00	20



Model	Dimensions (mm)									
	L	N	P	S	Hole Depth	U	Thread Depth	X	Y	Weight
	Case Length	Slide Shaft Length	Across Flats	Hole Diameter		Thread Size		Thread	Depth of Thread	
TPA65	42	58	16	5	7.5	M8	7	M3	6	0.20
TPA150	45	72	21	7	8	M8	10	M4	8	0.40
TPA250	53	90	24	8	9	M12	14	M5	10	0.70
TPA350	66	110	30	10	12	M14	15	M6	10	1.20

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Axial Gard Selection Guide

1. Install Axial Gard at the nearest place where overload may occur.
2. To decide setting load, set maximum setting load after you consider normal necessary load or machine strength. If maximum setting load is unknown, set lower load at first and increase setting load gradually.

How to set setting load

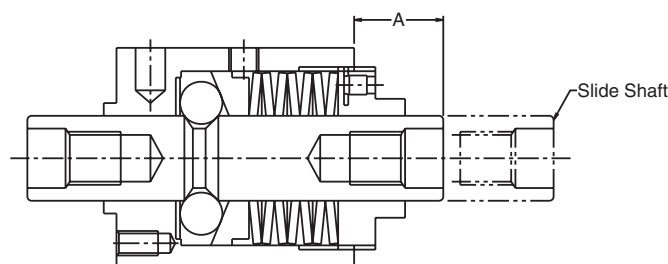
3. Axial Gard is setting at min point (minimum load) when shipped.
4. Loosen setscrew for adjustment screw.
5. Fasten adjustment screw at 60 degrees before the target position according to load correlation graph.
6. Fasten adjustment screw gradually after testing trip.
7. Fasten setscrew for adjustment screw.
8. Don't fasten adjustment screw over maximum load shown in correlation graph.

Resetting

9. Remove the cause of overload after stopping machine.
10. Axial Gard will be reset automatically when you slowly give it opposite load.
11. Check to ensure Axial Gard was reset by checking dimension A.

Model	Resetting Load (N)	A mm
TPA65	83 N	11
TPA150	196 N	19
TPA250	343 N	22
TPA350	490 N	24

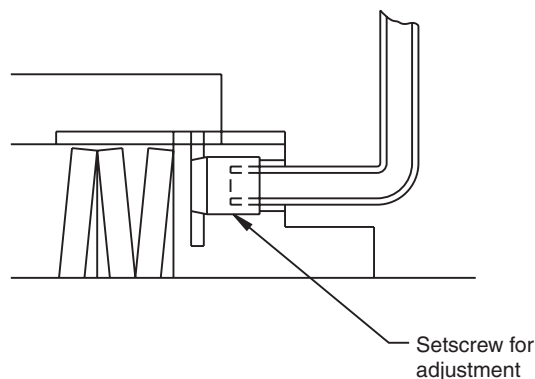
At maximum load



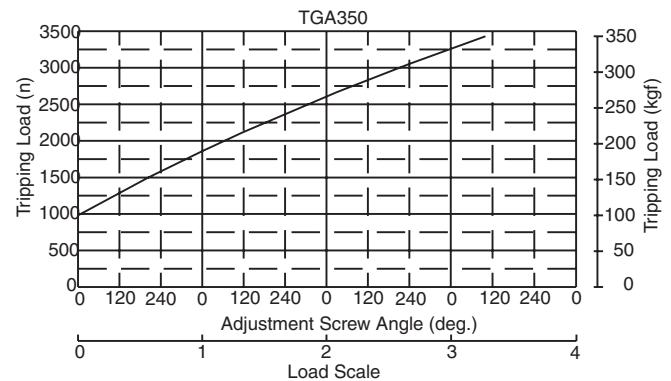
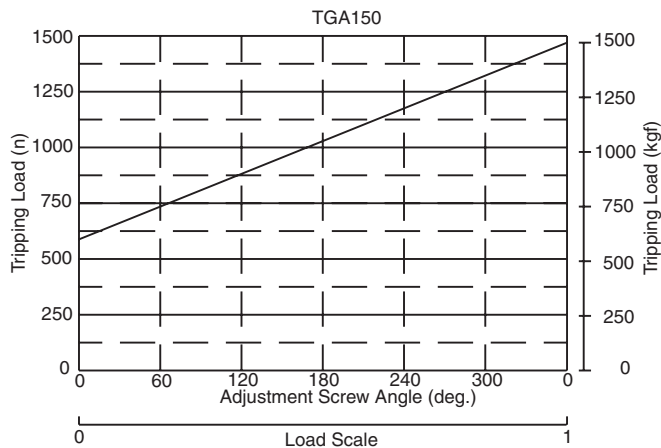
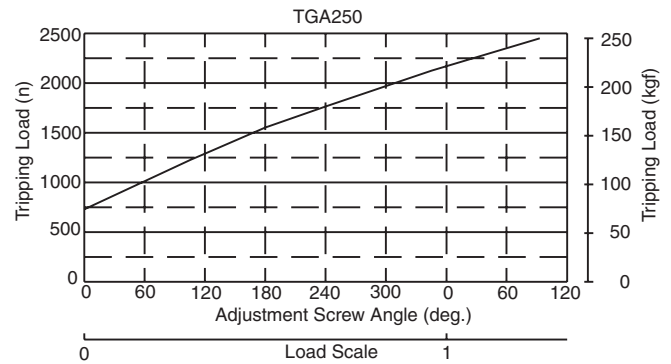
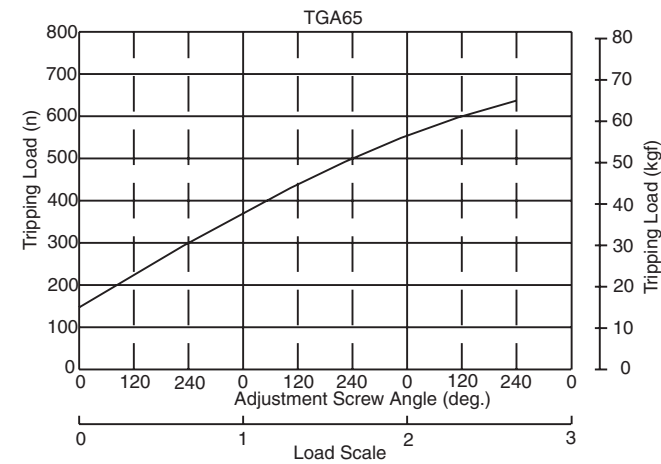
Installation

1. Before installing into the machine, clean the tap holes on the "case" and "slide shaft" and remove dust caps or tips.
2. Adhesive for metal is applied to the screws of "slide shaft" and "case" for preventing looseness.
3. Be careful to align the center of the "case" and "slide shaft".
4. Axial Gard is shipped after applying the grease but apply grease once a year or every 100 times tripping.

See page 121 for load correlation graph.



Load Correlation Graphs



For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Decimal - Millimeter Equivalents

Fractional	Decimal	M.M.	Fractional	Decimal	M.M.
1/64	.015625	.397	33/64	.515625	13.097
1/32	.03125	.794	17/32	.53125	13.494
3/64	.046875	1.191	35/64	.546875	13.891
1/16	.0625	1.588	5625	.5625	14.288
5/64	.078125	1.985	37/64	.578125	14.684
3/32	.09375	2.381	19/32	.59375	15.081
7/64	.109375	2.778	39/64	.609375	15.478
1/8	.125	3.175	625	.625	15.875
9/64	.140625	3.572	41/64	.640625	16.272
5/32	.15625	3.969	21/32	.65625	16.669
11/64	.171875	4.366	43/64	.671875	17.066
3/16	.1875	4.763	11/16	.6875	17.463
13/64	.203125	5.159	45/64	.703125	17.859
7/32	.21875	5.556	23/32	.71875	18.256
15/64	.234375	5.953	47/64	.734375	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.265625	6.747	49/64	.765625	19.447
9/32	.28125	7.144	25/32	.78125	19.844
19/64	.296875	7.541	51/64	.796875	20.241
5/16	.3125	7.938	13/16	.8125	20.638
21/64	.328125	8.334	53/64	.828125	21.034
11/32	.34375	8.731	27/32	.84375	21.431
23/64	.359375	9.128	55/64	.859375	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.390625	9.922	57/64	.890625	22.622
13/32	.40625	10.319	29/32	.90625	23.019
27/64	.421875	10.716	59/64	.921875	23.416
7/16	.4375	11.113	15/16	.9375	23.813
29/64	.453125	11.509	61/64	.953125	24.209
15/32	.46875	11.906	31/32	.96875	24.606
31/64	.484375	12.303	63/64	.984375	25.003
1/2	.500	12.700	1	1.000	25.400

HP and Torque

HP is the common unit of mechanical power.

$$\text{HP} = \frac{\text{Force} \times \text{Feet per Minute}}{33000}$$

$$\text{HP} = \frac{\text{Torque in In.-Lbs.} \times \text{rpm}}{63025}$$

One HP = .746 kilowatt

One kilowatt = 1.34 HP

Torque is a twisting moment or turning effort.

Torque in inch-pounds = Force x Lever Arm (Inches)

$$\text{Torque in inch-pounds} = \frac{63025 \times \text{HP}}{\text{rpm}}$$

The following table gives the torque in Inch-Pounds for one HP at various speeds.

Torque at One HP

rpm	In.-Lbs.	rpm	In.-Lbs.	rpm	In.-Lbs.	rpm	In.-Lbs.
3500	18	580	109	90	700	14	4502
3000	21	500	126	80	788	12	5252
2400	26	400	158	70	900	10	6300
2000	32	300	210	60	1050	8	7878
1750	36	200	315	50	1260	6	10504
1600	39	180	350	40	1576	5	12605
1200	53	160	394	30	2101	4	15756
1160	54	140	450	20	3151	3	21008
1000	63	120	525	18	3501	2	31513
870	72	100	630	16	3939	1	63025

Minimum Sheave Sizes NEMA Standards

The National Electrical Manufacturers Association recommends certain limitations on sheave diameter and width for satisfactory motor operation. The selected sheave diameter should not be smaller nor the width greater than the dimensions below. These dimensions are from NEMA Standard MG1-14.42.

Frame	HP at				V-Belt Sheave (Inches)			
					Conventional		358	
	Sync. Speed, rpm				A, B, C, D and E Sections		3V, 5V and 8V Sections	
	3600	1800	1200	900	Min. Pitch Dia.	Max. Width	Min. Outside Dia.	Max. Width
143T	1 1/2	1	3/4	1/2	2.2	4 1/4	2.2	2 1/4
145T	2-3	1 1/2-2	1	3/4	2.4	4 1/4	2.4	2 1/4
182T	3	3	1 1/2	1	2.4	5 1/4	2.4	2 3/4
182T	5	-	-	-	2.6	5 1/4	2.4	2 3/4
184T	-	2	1 1/2	-	2.4	5 1/4	2.4	2 3/4
184T	5	-	-	-	2.6	5 1/4	2.4	2 3/4
184T	7 1/2	5	-	-	3.0	5 1/4	3.0	2 3/4
213T	7 1/2-10	7 1/2	3	2	3.0	6 1/2	3.0	3 3/8
215T	10	-	5	3	3.0	6 1/2	3.0	3 3/8
215T	15	10	-	-	3.8	6 1/2	3.8	3 3/8
254T	15	-	7 1/2	5	3.8	6 1/2	3.8	4
254T	20	15	-	-	4.4	6 1/2	4.4	4
256T	20-25	-	10	7 1/2	4.4	6 1/2	4.4	4
256T	-	20	-	-	4.6	6 1/2	4.4	4
284T	-	-	15	10	4.6	9	4.4	4 5/8
284T	-	25	-	-	5.0	9	4.4	4 5/8
286T	-	30	20	15	5.4	9	5.2	4 5/8
324T	-	40	25	20	6.0	10 1/4	6.0	5 1/4
326T	-	50	30	25	6.8	10 1/4	6.8	5 1/4
364T	-	-	40	30	6.8	11 1/2	6.8	5 7/8
364T	-	60	-	-	7.4	11 1/2	7.4	5 7/8
365T	-	-	50	40	8.2	11 1/2	8.2	5 7/8
365T	-	75	-	-	9.0	11 1/2	8.6	5 7/8
404T	-	-	60	-	9.0	14 1/4	8.0	7 1/4
404T	-	-	-	50	9.0	14 1/4	8.4	7 1/4
404T	-	100	-	-	10.0	14 1/4	8.6	7 1/4
405T	-	-	75	60	10.0	14 1/4	10.0	7 1/4
405T	-	100	-	-	10.0	14 1/4	8.6	7 1/4
405T	-	125	-	-	11.5	14 1/4	10.5	7 1/4
444T	-	-	100	-	11.0	16 3/4	10.0	8 1/2
444T	-	-	-	75	10.5	16 3/4	9.5	8 1/2
444T	-	125	-	-	11.0	16 3/4	9.5	8 1/2
444T	-	150	-	-	-	-	10.5	8 1/2
445T	-	-	125	-	12.5	16 3/4	12.0	8 1/2
445T	-	-	-	100	10.5	16 3/4	12.0	8 1/2
445T	-	150	-	-	-	-	10.5	8 1/2
445T	-	200	-	-	-	-	13.2	8 1/2

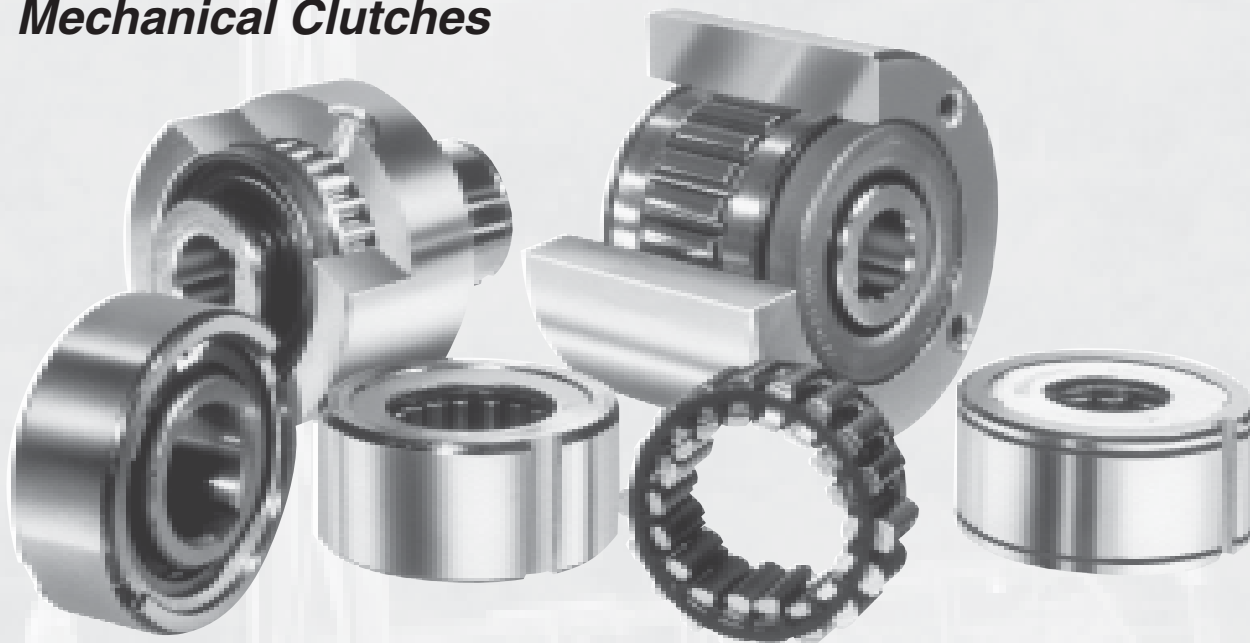
To obtain the minimum pitch diameters for flat belt, gearbelt, Poly-V®, chain or gear drives, multiply the 358 sheave pitch diameters in the table above by the following factors:

Drive	Factor
Chain	0.70
Flat Belt (Single Ply)	1.33
Gearbelt	0.90
Helical Gear	0.85
Poly-V	1.00
Spur Gear	0.75

Poly-V is believed to be a trademark and/or a trade name of Goodyear Tire and Rubber Co. and is not owned or controlled by Emerson Power Transmission Corporation. This trademark and/or registered trademark of others is used herein for product comparison purposes only, is the property of their respective owners and is not owned or controlled by Emerson Power Transmission Corporation. While reasonable efforts have been made to confirm ownership of the marks and names listed above, Emerson Power Transmission Corporation cannot and does not represent or warrant the accuracy of this information.

Morse[®]

Mechanical Clutches



The industry's broadest line of conveyor backstop, overrunning and indexing clutches.

Morse mechanical clutches offer the most complete and versatile selection in the industry. Eleven series of clutches perform three basic modes of operation:

- Overrunning
- Indexing
- Backstopping

These units have set standards of performance, offering:

- Higher overrunning speeds
- Greater torque capacities
- Longer service life

Cam clutches are precision devices that lock the inner and outer races through the wedging action of cams to transmit torque in one direction of rotation while overrunning in the opposite direction of rotation. These units are often referred to as freewheels, sprag, overrunning, backstop or one-way clutches, depending upon their application.

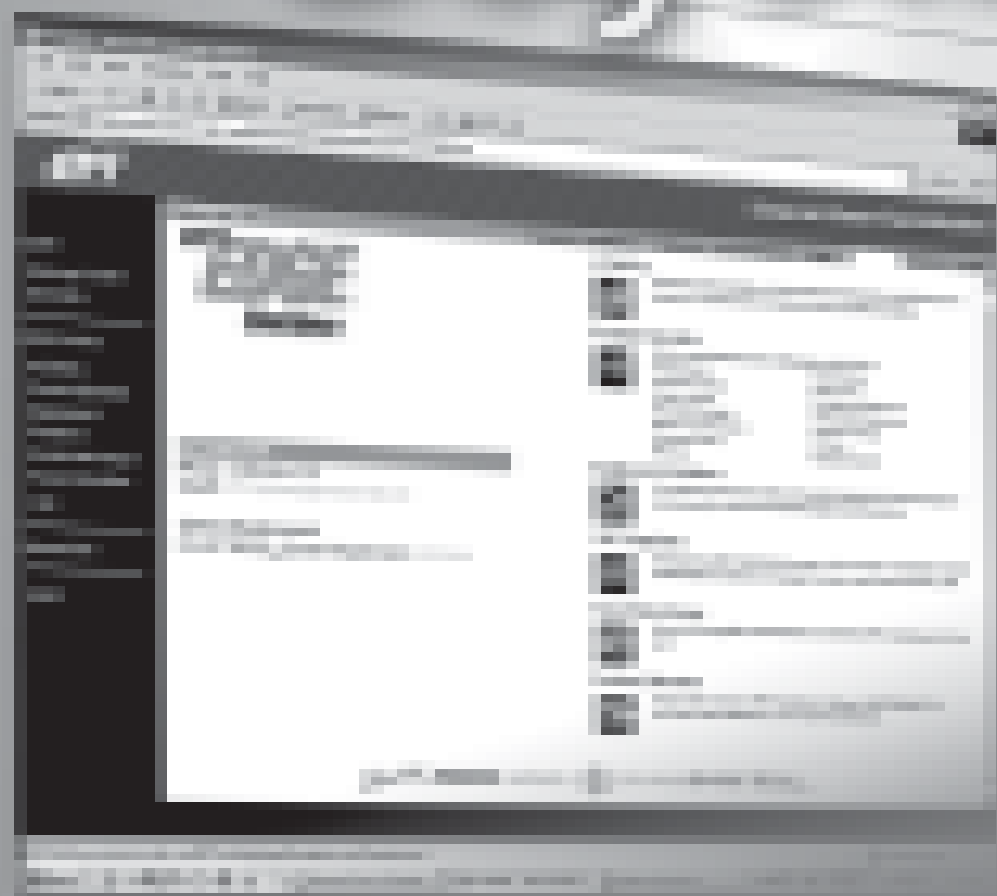
Protect your equipment with Morse and Browning Torque Overload Devices.

Browning and Morse torque overload devices are designed to protect machinery when an overload or jam occurs. Utilizing a torque overload device can help increase production, reduce downtime and prevent costly repairs. Emerson Power Transmission offers eight different types of torque overload devices available in shear pin, ball detent and friction facing designs. These units are available with up to 1800 rpm, 21,500 ft/lbs of torque and at best, can maintain trip torque within $\pm 3\%$ accuracy to meet the needs of the most demanding applications.



For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

Becoming **Force** Beyond



EPT

EDGE

Online

the Printed Page

www.emerson-ept.com

Programs to reduce cost
to you and your customers...

eCatalog

Product Selection

Engineered Solutions

CAD Templates

Smart Interchange

Product Literature



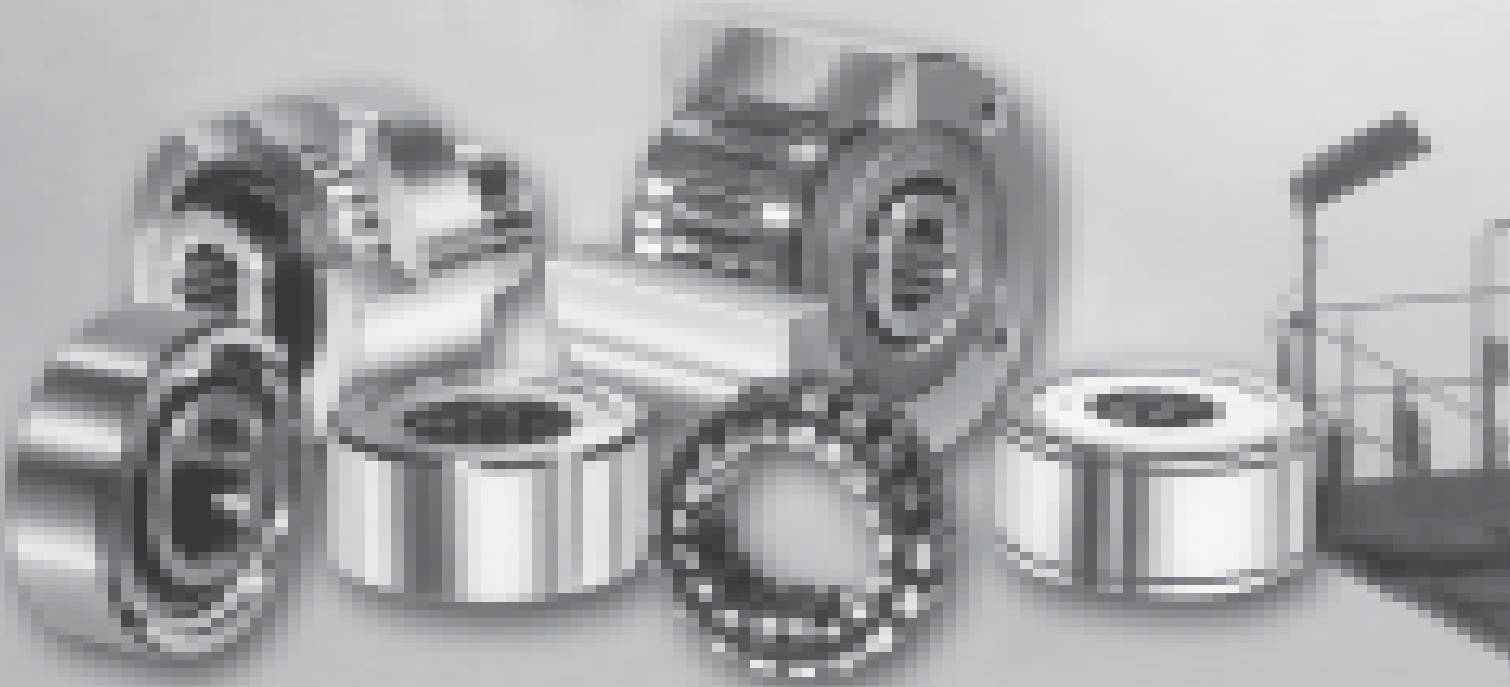
Custom Design

The Morse line of clutches covers a wide range of sizes and capacities, which handle the majority of industrial applications. However, there are applications that require special designs to meet specific application needs.

Emerson Power Transmission offers engineering assistance in both design and application to help meet these specialized requirements.

For selection assistance, call Application Engineering at 1-800-626-2093 or fax the completed form on page 76 to:

Emerson Power Transmission Application Engineering
Fax: (606) 564-2079





Morse mechanical cam clutches are precision devices that lock the inner and outer races through the wedging action of cams to transmit torque in one direction of rotation while overrunning in the opposite direction of rotation. These type units are often referred to as freewheels, sprag, overrunning, backstop or one-way clutches, depending upon their application.

Clutches are available with a bore range up through 17.7" and a torque range up through 500,000 lb. ft. and are the most complete and versatile cam clutches available for a variety of applications – from small business machines to giant steel slitters.

Eleven series of clutches perform three basic modes of operation:

- Overrunning
- Indexing
- Backstopping

These units have set standards of performance, offering:

- Higher overrunning speeds
- Greater torque capacities
- Longer service life

STANDARD TERMS AND CONDITIONS OF SALE (August 15, 2001)

These Terms and Conditions, the attendant quotation or acknowledgment and all documents incorporated by specific reference therein, will be the complete and exclusive statement of the terms of the agreement governing the sale of goods ("Goods") by **Emerson Power Transmission Corporation** and its divisions and subsidiaries ("Seller") to Customer ("Buyer"). Buyer's acceptance of the Goods will manifest Buyer's assent to these Terms and Conditions. If these Terms and Conditions differ in any way from the terms and conditions of Buyer's order, or other documentation, this document will be construed as a counteroffer and will not be deemed an acceptance of Buyer's terms and conditions which conflict herewith.

1. **PRICES:** Unless otherwise specified in writing by Seller, Seller's price for the goods shall remain in effect for thirty (30) days after the date of Seller's quotation or acknowledgment of Buyer's order for the Goods, whichever occurs first, provided an unconditional, complete authorization for the immediate shipment of the Goods is received and accepted by Seller within such time period. If such authorization is not received by Seller within such thirty (30) day period, Seller shall have the right to change the price for the Good to Seller's price for the Goods at the time of shipment.

2. **TAXES:** Any tax or governmental charge or increase in same hereafter becoming effective increasing the cost to Seller of producing, selling or delivering the Goods or of procuring material used therein, and any tax now in effect or increase in same payable by the Seller because of the manufacture, sale or delivery of the Goods, may at Seller's option, be added to the price.

3. **TERMS OF PAYMENT:** Subject to the approval of Seller's Credit Department, terms are net thirty (30) days from date of Seller's invoice in U.S. currency. If any payment owed to Seller is not paid when due, it shall bear interest, at a rate to be determined by Seller, which shall not exceed the maximum rate permitted by law, from the date on which it is due until it is paid. Seller shall have the right, among other remedies, either to terminate the Agreement or to suspend further performance under this and/or other agreements with Buyer in the event Buyer fails to make any payment when due. Buyer shall be liable for all expenses, including attorneys' fees, relating to the collection of past due amounts.

4. **SHIPMENT AND DELIVERY:** Shipments are made F.O.B. Seller's shipping point. Any claims for shortages or damages suffered in transit shall be submitted by the Buyer directly to the carrier. While Seller will use all reasonable commercial efforts to maintain the delivery date acknowledged or quoted by Seller, all shipping dates are approximate. Seller reserves the right to make partial shipments and to segregate "specials" and made-to-order Goods from normal stock Goods. Seller shall not be bound to tender delivery of any Goods for which Buyer has not provided shipping instructions.

5. **QUANTITY:** Buyer agrees to accept overruns of up to ten percent (10%) of the order on "made-to-order" Goods, including parts. Any such additional items shall be priced at the price per item charged for the specific quantity ordered.

6. **LIMITED WARRANTY:** Subject to the limitations of Section 7, Seller warrants that the Goods will be free from defects in material and workmanship under normal use, service and maintenance for a period of one year (unless otherwise specified by Seller in writing) from the date of shipment of the Goods by Seller. **THIS IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY SELLER WITH RESPECT TO THE GOODS AND IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHETHER OR NOT THE PURPOSE OR USE HAS BEEN DISCLOSED TO SELLER IN SPECIFICATIONS, DRAWINGS OR OTHERWISE, AND WHETHER OR NOT SELLER'S PRODUCTS ARE SPECIFICALLY DESIGNED AND/OR MANUFACTURED BY SELLER FOR BUYER'S USE OR PURPOSE.**

This warranty does not extend to any losses or damages due to misuse, accident, abuse, neglect, normal wear and tear, unauthorized modification or alteration, use beyond rated capacity, or improper installation, maintenance or application. To the extent that Buyer or its agents has supplied specifications, information, representation of operating conditions or other data to Seller in the selection or design of the Goods and the preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer, any warranties or other provisions contained herein which are affected by such conditions shall be null and void. If within thirty (30) days after Buyer's discovery of any warranty defects within the warranty period, Buyer notifies Seller thereof in writing, Seller shall, at its option, repair or replace F.O.B. point of manufacture, or refund the purchase price for, that portion of the goods found by Seller to be defective. Failure by Buyer to give such written notice within the applicable time period shall be deemed an absolute and unconditional waiver of Buyer's claim for such defects. Goods repaired or replaced during the warranty period shall be covered by the foregoing warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. Buyer assumes all other responsibility for any loss, damage, or injury to persons or property arising out of, connected with, or resulting from the use of Goods, either alone or in combination with other products/components.

SECTIONS 6 AND 7 APPLY TO ANY ENTITY OR PERSON WHO MAY BUY, ACQUIRE OR USE SELLER'S GOODS, INCLUDING ANY ENTITY OR PERSON WHO BUYS THE GOODS FROM SELLER'S DISTRIBUTOR AND SUCH ENTITY OR PERSON SHALL BE BOUND BY THE LIMITATIONS THEREIN.

7. **LIMITATION OF REMEDY AND LIABILITY: THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY HEREUNDER (OTHER THAN THE WARRANTY PROVIDED UNDER SECTION 13) SHALL BE LIMITED TO REPAIR, REPLACEMENT OR REFUND OF THE PURCHASE PRICE UNDER SECTION 6. SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE AND IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE TO BUYER OF THE SPECIFIC GOODS PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXTEND TO INCLUDE INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. THE TERM "CONSEQUENTIAL DAMAGES" SHALL INCLUDE, BUT NOT BE LIMITED TO, LOSS OF ANTICIPATED PROFITS, LOSS OF USE, LOSS OF REVENUE, COST OF CAPITAL AND DAMAGE OR LOSS OF OTHER PROPERTY OR EQUIPMENT.**

It is expressly understood that any technical advice furnished by Seller with respect to the use of the Goods is given without charge, and Seller assumes no obligation or liability for the advice given, or results obtained, all such advice being given and accepted at Buyer's risk.

GOODS AND/OR SERVICES SOLD HEREUNDER ARE NOT FOR USE IN ANY NUCLEAR AND RELATED APPLICATIONS. Buyer accepts goods and/or services with the foregoing understanding, agrees to communicate the same in writing to any subsequent purchaser or users and to defend, indemnify and hold harmless Seller from any claims, losses, suits, judgments and damages, including incidental and consequential damages, arising from such use, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability.

8. **EXCUSE OF PERFORMANCE:** Seller shall not be liable for delays in performance or for non-performance due to acts of God, acts of Buyer, war, riot, fire, flood, other severe weather, sabotage, or epidemics; strikes or labor disturbances; governmental requests, restrictions, laws, regulations, orders or actions; unavailability of or delays in transportation; default of suppliers; or unforeseen circumstances or any events or causes beyond Seller's reasonable control. Deliveries may be suspended for an appropriate period of time as a result of the foregoing. If Seller determines that its ability to supply the total demand for the Goods, or to obtain material used directly or indirectly in the manufacture of the Goods, is hindered, limited or made impracticable due to causes addressed in this Section 8, Seller may allocate its available supply of the Goods or such material (without obligation to acquire other supplies of any such Goods or material) among itself and its purchasers on such basis as Seller determines to be equitable without liability for any failure of performance which may result therefrom. Deliveries suspended or not made by reason of this section may be canceled by Seller upon notice to Buyer without liability, but the balance of the agreement shall otherwise remain unaffected.

9. **CANCELLATION:** The Buyer may cancel orders only upon written notice and upon payment to Seller of cancellation charges which include, among other things, all costs and expenses incurred and commitments made by the Seller and a reasonable profit thereon.

10. **CHANGES:** Buyer may request changes or additions to the Goods consistent with Seller's specifications and criteria. In the event such changes or additions are accepted by Seller, Seller may revise the price and delivery schedule. Seller reserves the right to change designs and specifications for the Goods without prior notice to Buyer, except with respect to Goods being made-to-order for Buyer.

11. **TOOLING:** Tool, die, and pattern charges, if any, are in addition to the price of the Goods and are due and payable upon completion of the tooling. All such tools, dies and patterns shall be and remain the property of Seller. Charges for tools, dies, and patterns do not convey to Buyer, title, ownership interests in, or rights to possession or removal, nor prevent their use by Seller for other purchasers, except as otherwise expressly provided by Seller and Buyer in writing with reference to this provision.

12. **ASSIGNMENT:** Buyer shall not assign its rights or delegate its duties hereunder or any interest therein or any rights hereunder without the prior written consent of the Seller, and any such assignment, without such consent, shall be void.

13. **PATENTS AND COPYRIGHTS:** Subject to Section 7, Seller warrants that the Goods sold, except as are made specifically for Buyer according to Buyer's specifications, do not infringe any valid U.S. patent or copyright in existence as of the date of delivery. This warranty is given upon the condition that Buyer promptly notify Seller of any claim or suit involving Buyer in which such infringement is alleged, and, that Buyer cooperate fully with Seller and permit Seller to control completely the defense or compromise of any such allegation of infringement. Seller's warranty as to use only applies to infringements arising solely out of the inherent operation (i) of such Goods, or (ii) of any combination of Goods in a system designed by Seller. In the event such Goods, singularly or in combination, are held to infringe a U.S. patent or copyright in such suit, and the use of such Goods is enjoined, or in the case of a compromise by Seller, Seller shall have the right, at its option and expense, to procure for Buyer the right to continue using such Goods, or replace them with non-infringing Goods; or modify same to become non-infringing; or grant Buyer a credit for the depreciated value of such Goods and accept return of them.

14. **MISCELLANEOUS:** These terms and conditions set forth the entire understanding and agreement between Seller and Buyer, and supersede all other communications, negotiations and prior oral or written statements regarding the subject matter of these terms and conditions. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions of Sale shall be binding upon the Seller unless made in writing and signed on its behalf by an officer of the Seller. No conditions, usage or trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these Terms and Conditions shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification shall be affected by the acceptance of purchase orders or shipping instruction forms containing terms at variance with or in addition to those set forth herein. Any such modifications or additional terms are specifically rejected by Seller. No waiver by Seller with respect to any breach or default or any right or remedy and no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver be expressed in writing and signed by the party to be bound. Seller is not responsible for typographical or clerical errors made in any quotation, orders or publications. All such errors are subject to correction. The validity, performance, and all other matters relating to the interpretation and effect of this contract shall be governed by the law of the state of New York. The United Nations Convention on the International Sale of Goods shall not apply to any transaction hereunder.