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BC Backstops to Prevent Reversal of Inclined Conveyors and Vertical Bucket Elevators

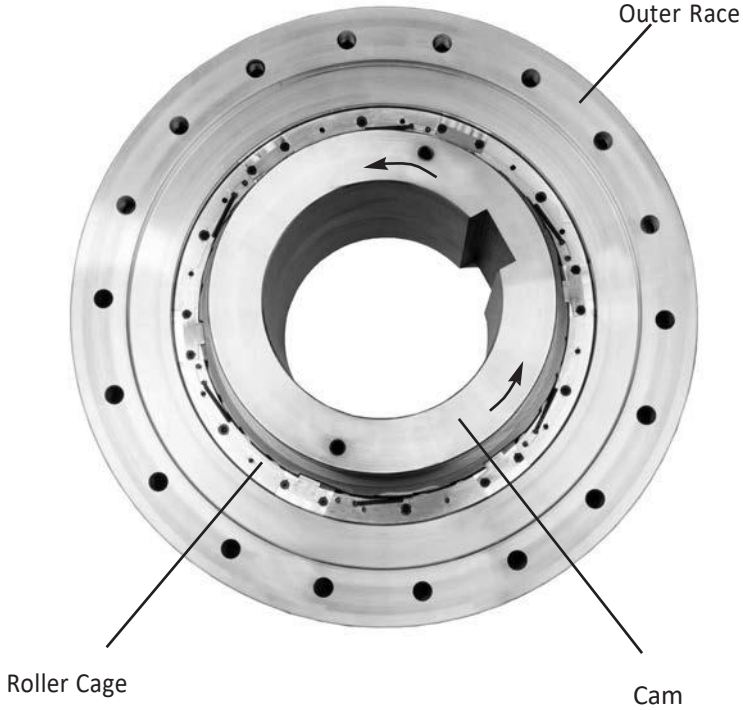
Operating Details

During freewheeling, (normal operation), the cam and roller assembly rotate with the headshaft as shown by the arrows in Illustration 2. The outer race is secured to stationary coverplates and "I" Beam Torque arm. An oil film wedges and separates the rollers from the outer race. This moves the rollers a few thousandths of an inch imparting relative angular motion between the roller cage and cam. This slight movement of the rollers into the deeper cam zones, with a clean lubricant film wedged between rollers and outer race, permits freewheeling without metal to metal contact.

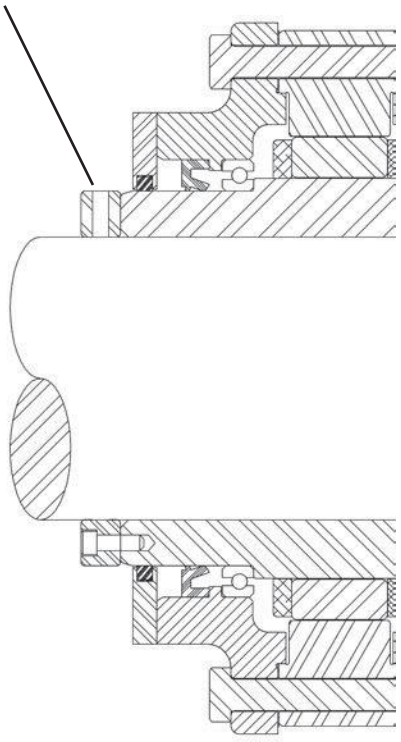
When the conveyor decelerates and the cam subsequently comes to rest, the spring actuated roller cage, Illustration 1, has already positioned the rollers into the contact zone. All rollers have been positively guided to engage uniformly and maintain their relative positions accurately to assure uniform load distribution. The rollers then engage in compression between the precision ground, hardened cam plane surfaces and the inside diameter of the outer race. Relative motion between the cam and outer race is not required to engage rollers. When the backstop is in the "engaged" or "backstopping" condition, the cam, rollers, and outer race are relatively stationary and therefore, not subject to wear if used within normal tabulated rating.

Mounting Details

BC backstops are furnished with a clearance fit between the bore and shaft for easy field installations. The key should be a “drive tight” fit on the sides only. As a result a method of axial shaft retention is required for all backstops. The preferred method of accomplishing this is with the use of set collars which can be furnished upon request.



Shaft Retaining Collar



Design Features

Design Features

BC backstops are completely mechanical, automatic operating units, incorporating a time proven basic operating principle, to provide greater safety and longer life with minimum maintenance requirements. Seventeen standard sizes are available up to 1,200,000 pound-feet of torque. Superior performance is assured by the following design features:

SIMPLE INITIAL INSTALLATION. Backstop is symmetrical and can be mounted for desired free shaft rotation. Arrows on cam faces or inner labyrinth show the direction of free rotation.

The torque arm is a single "I" beam section which is attached to the backstop with two precision ground torque arm pins. This greatly simplifies field installation. The arm may be placed up, down, or at any angle, and provides uniform loading on both coverplates. The preferred position is horizontal to reduce bearing loading for longer bearing life.

SEALED OIL CHAMBER. The Clutch elements and ball bearings are continuously self-oiled in a sealed oil chamber. The recommended lubricant is Mobil DIE Heavy Medium oil for a wide range of ambient temperatures. A double-lip oil seal is provided adjacent to the ball bearings to keep oil in and contaminants out. (See Illustration 3)

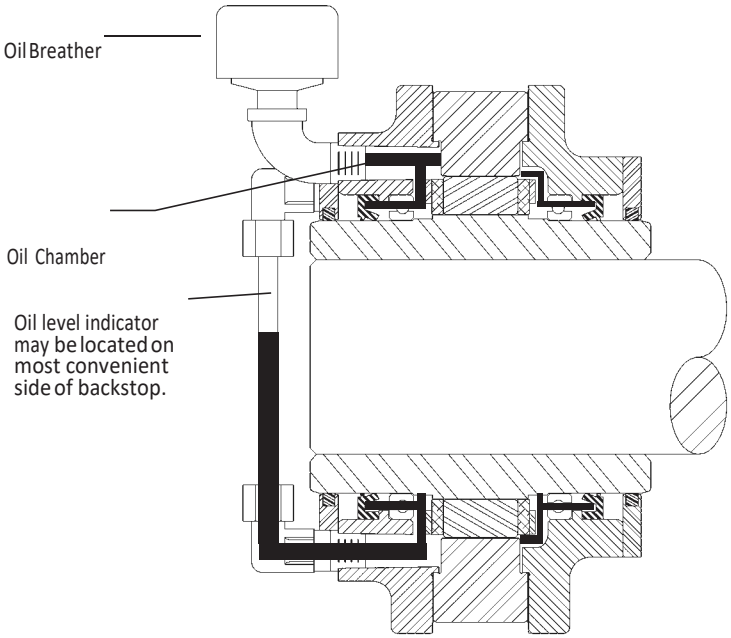
POSITIVE TRIPLE SEALING. (See Illustration 4)

1. All metal labyrinth, grease packed.
2. Full circle square packing against ground inner labyrinth which maintains grease seal and serves as an additional barrier to entry of dirt.
3. Double-lip oil seal to prevent grease from entering oil chamber and oil dilution of sealing grease.

MINIMUM MAINTENANCE. Grease fittings in each outer labyrinth are provided for occasional renewal of grease seal which forces out dirt and old grease through relief fittings. A periodic check of oil level and purity can readily be made through oil level indicator while in operation or at rest. If inspection reveals impurities in the oil, draining, flushing and refilling can be easily accomplished through the piping, tees, and drain plugs furnished.

Special Requirements

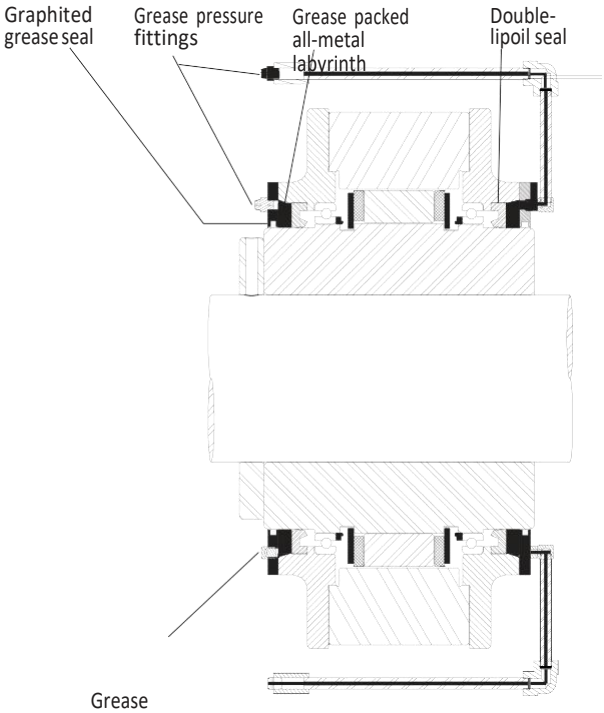
In over 70 years as the recognized leader in the design and manufacture of freewheeling clutches, the engineering staff has been given many unusual and difficult requirements for clutches and backstops. This has resulted in special designs to meet those exacting requirements. If your needs cannot be filled by a standard item, give us the engineering details. It may be that we already have a solution to your problem, and if not, we'll go to work and find one.



Oil Lubricated Clutch

Illustration 3

Shows the sealed oil chamber for continuous lubrication of clutch operating parts and ball bearings.



Grease Shielded Seals

Illustration 4

Positive triple sealing of the oil chamber by grease-packed all-metal labyrinth, graphited grease seal and double-lip oil seal.

Recommended Backstop Locations for Typical Conveyor Arrangments

Single Drive Pulley

For head pulley driven inclined conveyors or elevators, the backstop should be located on the head pulley drive shaft.
With the drive at one end of the head pulley shaft, the backstop should be located at the opposite end, awayfrom the speed reducer and coupling. (See Illustration 7)

For a single drive pulley other thanthe head pulley, the backstop should be located on the drive pulley shaft,rather than on the head pulley shaft. The head pulley may not have sufficient belt wrap to keep the loaded belt from slipping backward when the backstop prevents reversal of the pulley and its shaft. With the drive at one end of the drive pulley shaft, the backstop should be located at the opposite end, away from the speed reducer and coupling. (See Illustration 8)

When dual drives to a single pulley shaft are used as in Illustration 9, the backstops should be located on the shaft between the low speed couplings and adjacent pulley shaft bearings.

Tandem Drive Pulleys

Backstops should be located on both primary and secondary drive pulley shafts. Thus the secondary pulley backstop(s) will insure tractive friction on both pulleys. (See Illustration 10)

Primary drive pulley shaft backstops should have capacity equal to the total primary and secondary motor (or motors) normal rating. Secondary drive pulley shaft backstops should have capacity equal to the secondary motors normal rating.

Illustration 7

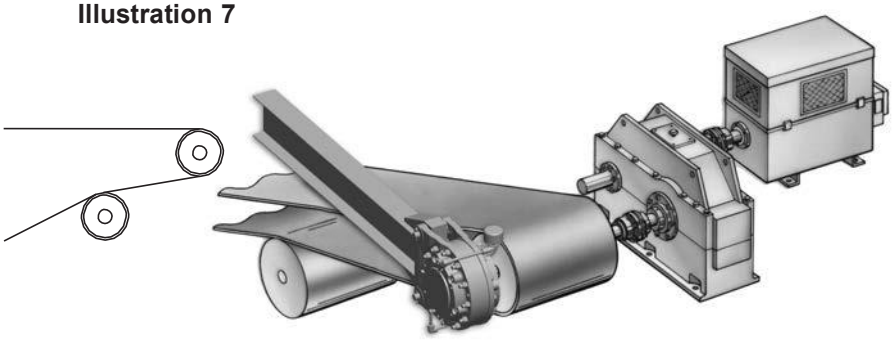


Illustration 8

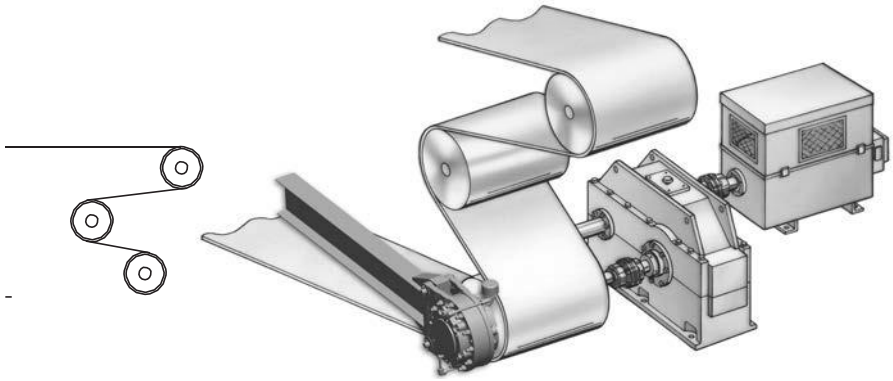


Illustration 9

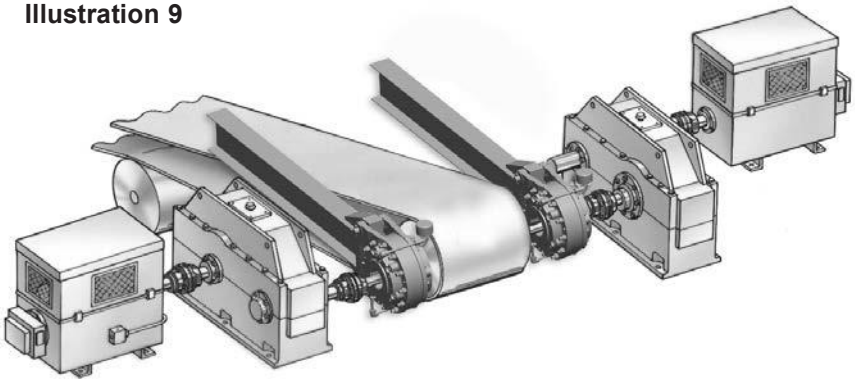
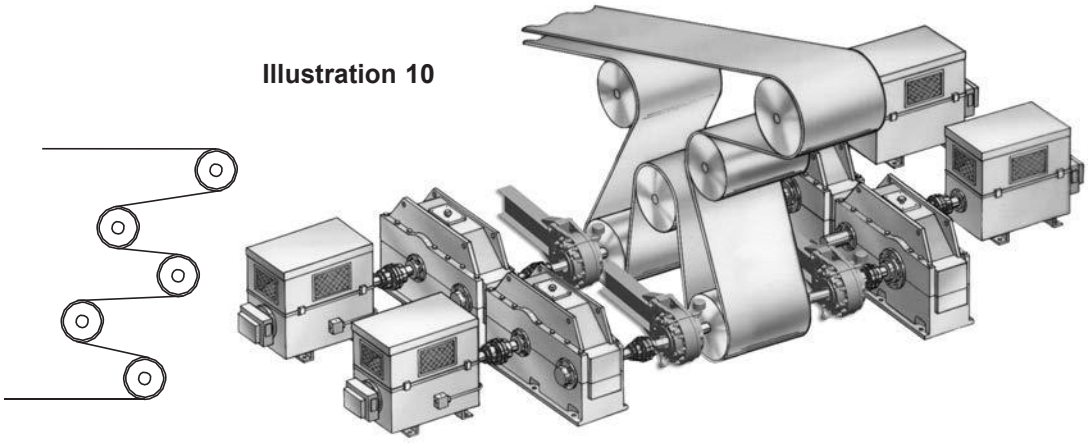


Illustration 10



Principles of Backstop Size Selection for Low Speed Shafts

In the past, the usual basis for determining the size of a backstop included only consideration of calculated lift and frictional loads. In some cases selection was made based on subtraction of all of the frictional load from the lift load to arrive at the net backstop capacity required. Backstops so selected could prove to be of inadequate capacity and could result in very serious and costly damage. More conservative selection was based on subtracting only one-half the frictional load from the lift load. Lift loads were also calculated at the maximum depth "spill load", rather than at normal or recommended conveyor or elevator values, in an attempt to guard against either an expected or intentional overloading of conveyors and their respective backstops. This method dictated the use of larger backstops which reduced the danger from overloads and resulted in fewer runaways. The more conservative selection procedure could be dangerously misleading where a heavily overloaded or completely stalled motor could develop.

Improper Feed Adjustment

Where a conveyor or elevator feed is improperly adjusted during initial installation or later regular operation of the equipment, a stalled condition may develop resulting from flooding of the belt or choking of the elevator. During such overloads, electric motors may develop 200 to 250 percent of normal torque rating before they "cut out" by automatic or manual control in order to prevent damage to the motor windings. Such high torque is transmitted from the motor to the drive pulley shaft where it induces a high tension or "rubber band stretch" in the belt. When the motor "cut out" occurs, the "stretched rubber band" effect of the overloaded or stalled belt reacts on the drive pulley to rotate it in reverse. This condition overloads the backstop to the fully stalled motor torque rating, less only the frictional loss of the driving unit between the stalled motor and the headshaft.

Momentary Starting Under Load

Momentary starting of the drive motor at a time when the stationary belt was already fully loaded to its normal capacity, developed into an overloaded backstop condition. We found that when the motor was so started, stretching the belt so that conveyor motion was just beginning, and at that instant the motor was intentionally cut out, the stored energy in the "rubber band stretch" reacted on the backstop with much greater force than occurs after a fully loaded conveyor comes to a normal stop.

Where an electronic tramp iron detector resulted in such momentary but very frequent stopping and starting condition, the backstop was severely overloaded far beyond the normal motor rating.

Stalled Conveyors

Even though the conveyor equipment has been in satisfactory operation for some time without overloading, the entry of oversize pieces, timbers or structural scrap, jammed between the bin gate and the belt, could cause the conveyor to stall and overload the motor as noted under improper feed adjustment. Under these conditions the backstops could be overloaded much beyond what would ordinarily be the calculated lift or reverse torque loads.

Other Motor Overloading

Studies further showed that conveyor belts also can be stalled due to improper setting of skirt boards, misaligned pulley and idlers. To properly handle such conditions, selection of the backstop should be based on the maximum possible motor overload rather than on the normal belt loading theoretical calculations.

Optional Engineered Solutions

Installation Solutions

- Special cam of keyless fits
- Special torque arm lengths

Maintenance-Monitoring

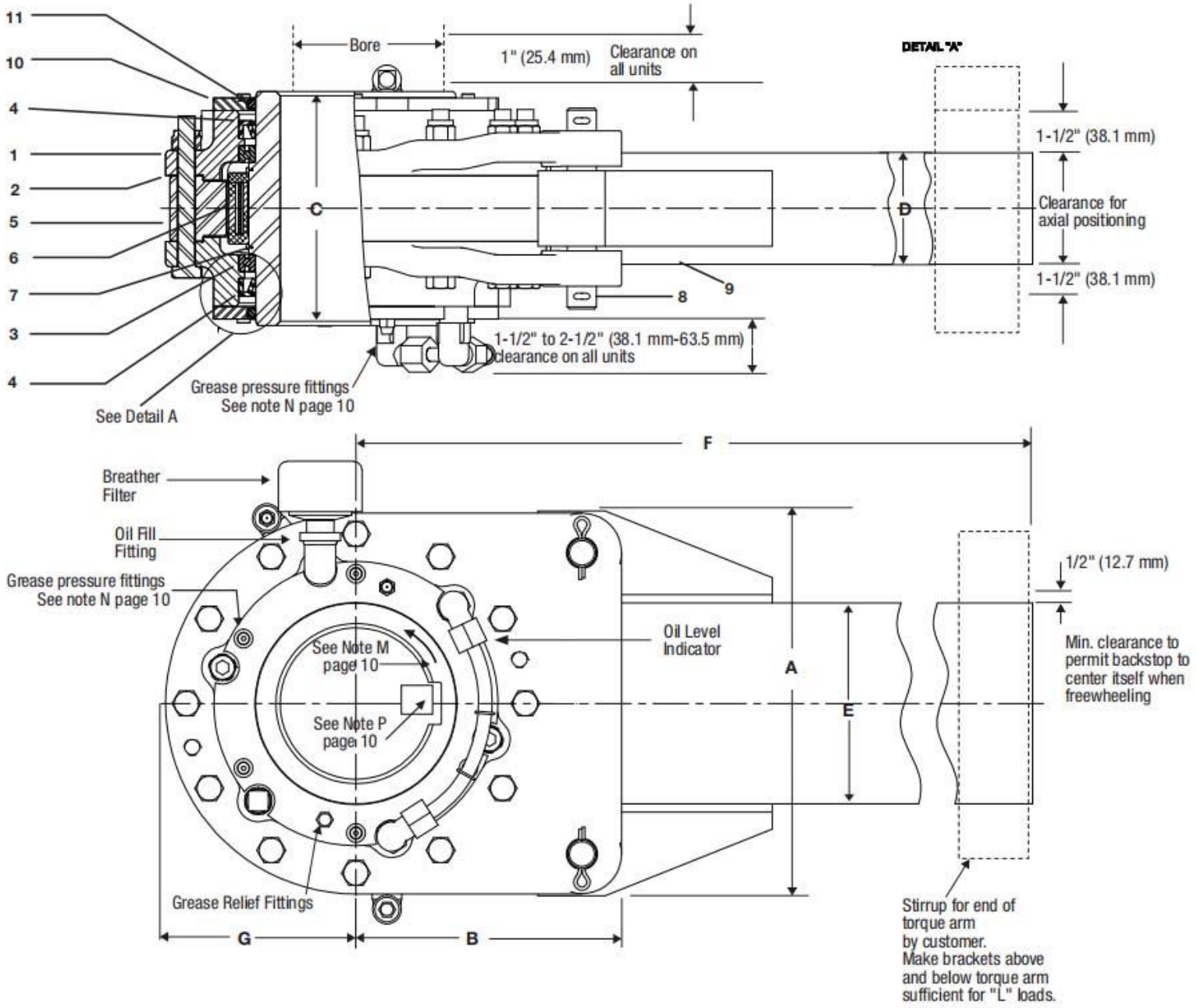
- Automatic Greasers
- Modifications to backstop for mounting of monitoring equipment
- Special sealing arrangements

Systems Solutions

- Various types of load sharing systems based on customer requirements

Backstops Type BC MA 3-18

1	Coverplate	7	Cam
2	Gasket	8	Pin and Cotter Keys
3	Ball Bearing	9	Torque Arm
4	Oil Seal	10	Outer Labyrinth
5	Outer Race	11	Grease Seal
6	Roller Assembly		



Dimensions and Data

The torque arm end must not be rigidly attached to steel framework. The bracket or stirrup for the end of the torque arm must provide clearance to permit the backstop to center itself in axial and angular positions to prevent pinching of bearings and damage or failure of unit, and must be sufficient for "L" loads above and below torque arm for backstop size selected. The preferred position is horizontal to reduce bearing loading for longer bearing life. Refer to certified drawings and instruction bulletins furnished with each order.

Note: M - Backstop is symmetrical and can be mounted for desired rotation. Arrow on cam face or inner labyrinth indicates direction of free shaft rotation. Before mounting on shaft, be sure to check direction of free rotation.

Note: N - Labyrinth seals only are factory packed with grease. Before placing in operation, backstop must be filled internally with recommended oil.

Note: P - When installed, backstop must be restrained from the possibility of axial movement on the shaft by one of the following:

1. Retention collar
2. Retention key
3. Keeper plate
4. Drive tight cam key

*Keys are furnished for all units supplied with maximum bores. Other bore and key sizes are available meeting metric, AGMA and USA standards as well as custom design requirements.

Engineering Data

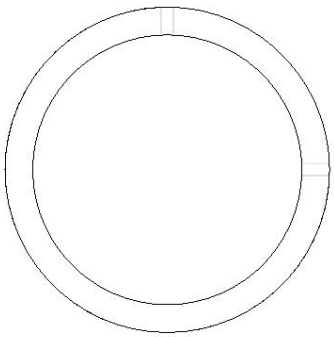
Backstop	Torque	Rated Torque lb.	Max	Load "L" Kgs.	Load "L" lbs.	Max.* Bore	Max.* Bore in.	Max.* Bore Keyway mm	Max.* Bore Keyway	Ship Weight	Ship Weight
3MA	4067	3,000	300	510	1,120	75	2.94	20 x 4.9	.75 x .25	46	100
6MA	8135	6,000	250	920	2,000	95	3.69	25 x 5.4	.88 x .31	69	150
12MA	16270	12,000	210	1325	2,880	115	4.50	32 x 7.4	1.00 x .38	100	220
18MA	24405	18,000	180	1776	3,860	140	5.44	36 x 8.4	1.25 x .44	152	330

Dimensions

Backstop	A		B		C		D		E		F		G	
Size	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
3MA	210	8.25	143	5.62	146	5.75	64	2.50	76	3	813	32	105	4.12
6MA	248	9.75	165	6.50	169	6.62	70	2.75	102	4	914	36	124	4.87
12MA	292	11.50	203	8.00	178	7.00	83	3.25	127	6	1270	50	146	5.75
18MA	343	13.50	235	9.25	189	7.44	92	3.62	152	6	1422	56	168	6.6

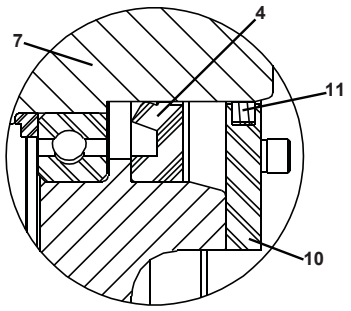
Set Collars

We recommends that all backstops be axially restrained on the shaft to prevent the reaction end of the torque arm from imposing biasing loads on the backstop bearings, which can significantly reduce bearing B-10 life.

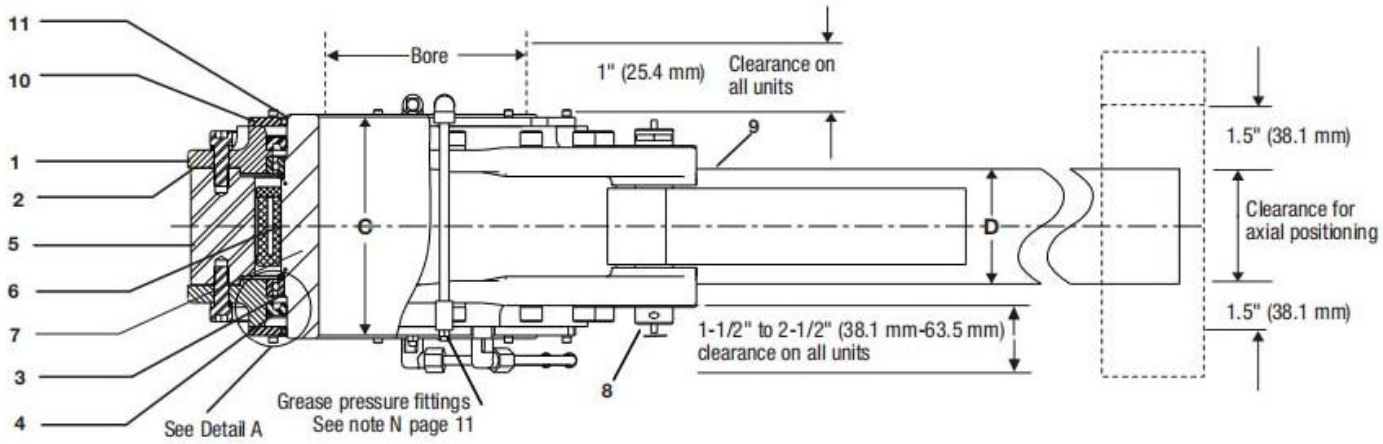


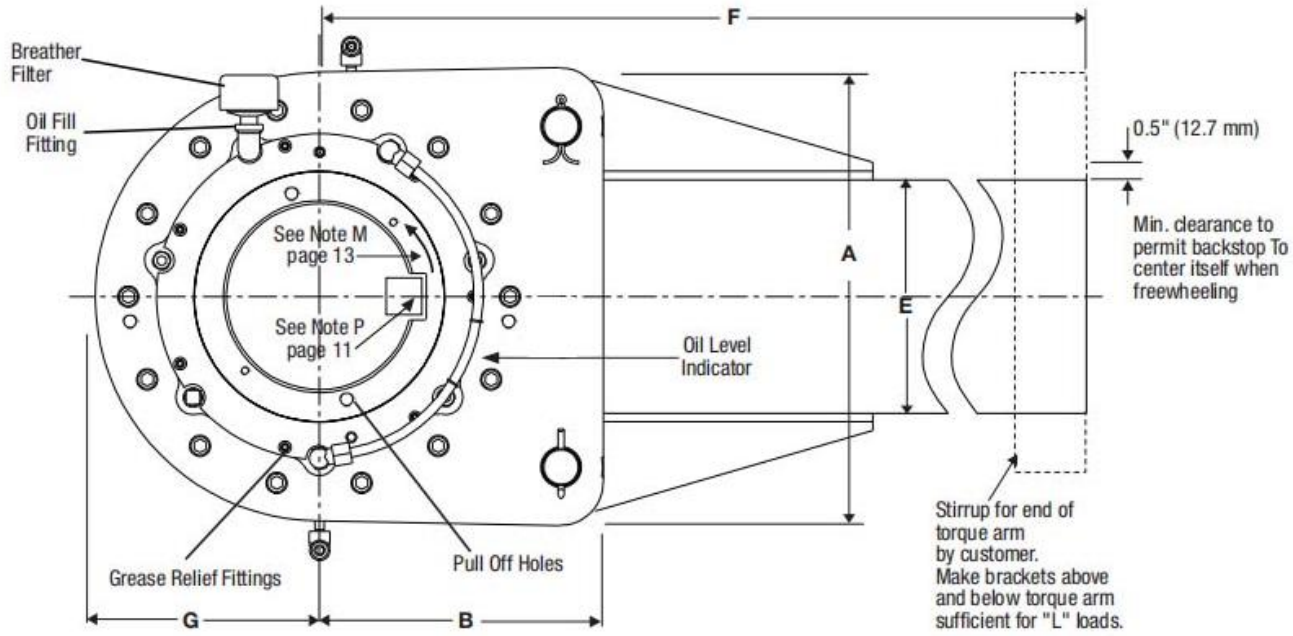
Backstops Type BC MA 27-180

1	Coverplate	7	Cam
2	Gasket	8	Pin and Cotter Keys
3	Ball Bearing	9	Torque Arm
4	Oil Seal	10	Outer Labyrinth
5	Outer Race	11	Grease Seal
6	Roller Assembly		



Detail A





The torque arm end must not be rigidly attached to steel framework. The bracket or stirrup for the end of the torque arm must provide clearance to permit the backstop to center itself in axial and angular positions to prevent pinching of bearings and damage or failure of unit, and must be sufficient for "L" loads above and below torque arm for backstop size selected. The preferred position is horizontal to reduce bearing loading for longer bearing life. Refer to certified drawings and instruction bulletins furnished with each order.

Note: M - Backstop is symmetrical and can be mounted for desired rotation. Arrow on cam face or inner labyrinth indicates direction of free shaft rotation. Before mounting on shaft, be sure to check direction of free rotation.

Note: N - Labyrinth seals only are factory packed with grease. Before placing in operation, backstop must be filled internally with recommended oil.

Note: P - When installed, backstop must be restrained from the possibility of axial movement on the shaft by one of the following:

1. Retention collar
2. Retention key
3. Keeper plate
4. Drive tight cam key

*Keys are furnished for all units supplied with maximum bores. Other bore and key sizes are available meeting metric, AGMA and USA standards as well as custom design requirements.

Engineering Data

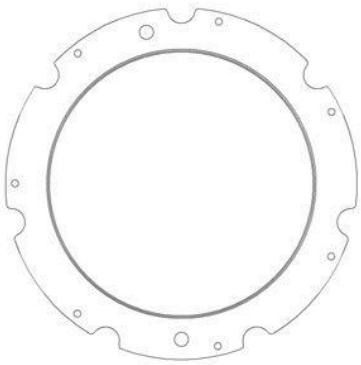
Backstop	Torque	Rated Torque lb.	Max	Load "L" Kgs	Load "L" lbs.	Max.* Bore	Max.* Bore in.	Max.* Bore Keyway mm	Max.* Bore Keyway	Ship Weight	Ship Weight
27MA	36607	27,000	150	2259	4,910	165	6.50	40 x 9.4	1.50 x .50	207	450
45MA	61012	45,000	135	3450	7,500	180	7	45 x 10.4	1.75 x .56	276	600
63MA	85417	63,000	120	4462	9,700	205	8	50 x 11.4	2.00 x .69	381	830
90MA	122024	90,000	105	6072	13,200	235	9	56 x 12.4	2.50 x .75	520	1,130
135MA	183035	135,000	90	8464	18,400	265	10	63 x 12.4	2.50 x .87	690	1,500
180MA	244047	180,000	80	10580	23,000	300	11.75	70 x 14.4	3.00 x 1.00	966	2,100

Dimensions

Backstop Size	A		B		C		D		E		F		G	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
27MA	384	15.12	254	10.00	222	8.75	98	3.87	178	7	1676	66	191	7.50
45MA	445	17.50	289	11.37	235	9.25	105	4.12	203	8	1829	72	216	8.50
63MA	498	19.62	311	12.25	244	9.62	127	5.00	254	10	1981	78	244	9.62
90MA	584	25.75	362	14.25	276	10.87	140	5.50	305	12	2083	82	270	10.62
135MA	654	30.37	406	16.00	314	12.37	143	5.62	381	15	2235	88	308	12.12
180MA	772	34.50	419	16.50	330	13.00	159	6.25	457	18	2388	94	349	13.75

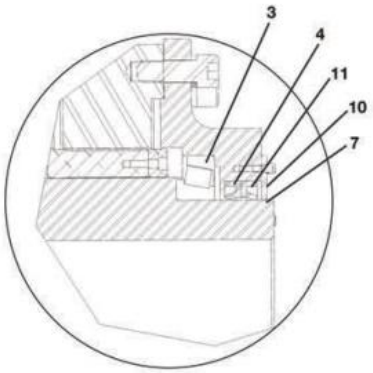
End Covers

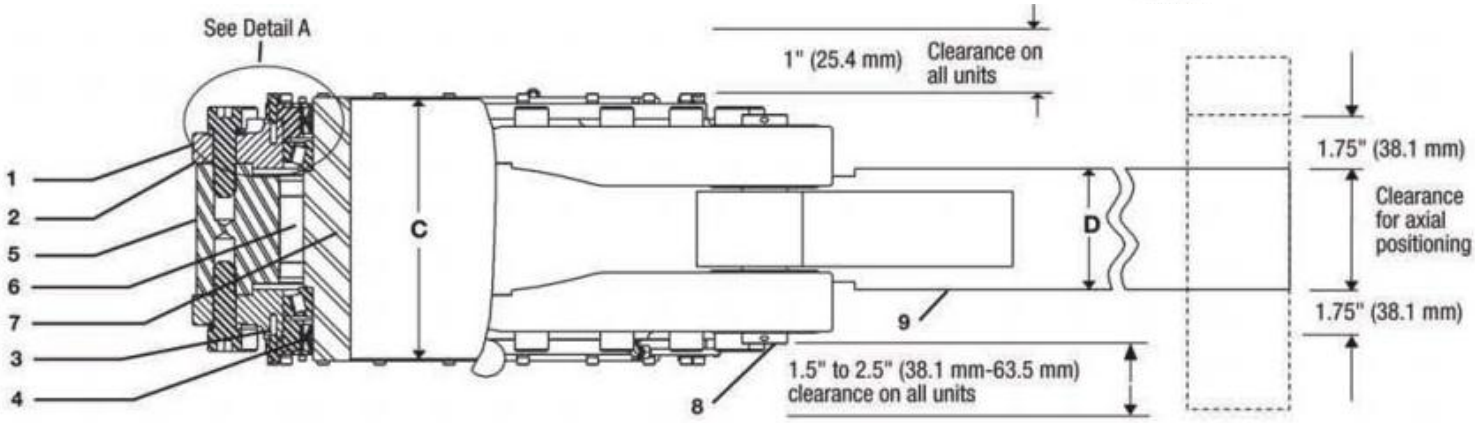
We offers end cover kits that provide not only the stationary cover enclosure required by OSHA, but also provides additional protection for the clutch from abrasive environments as well.

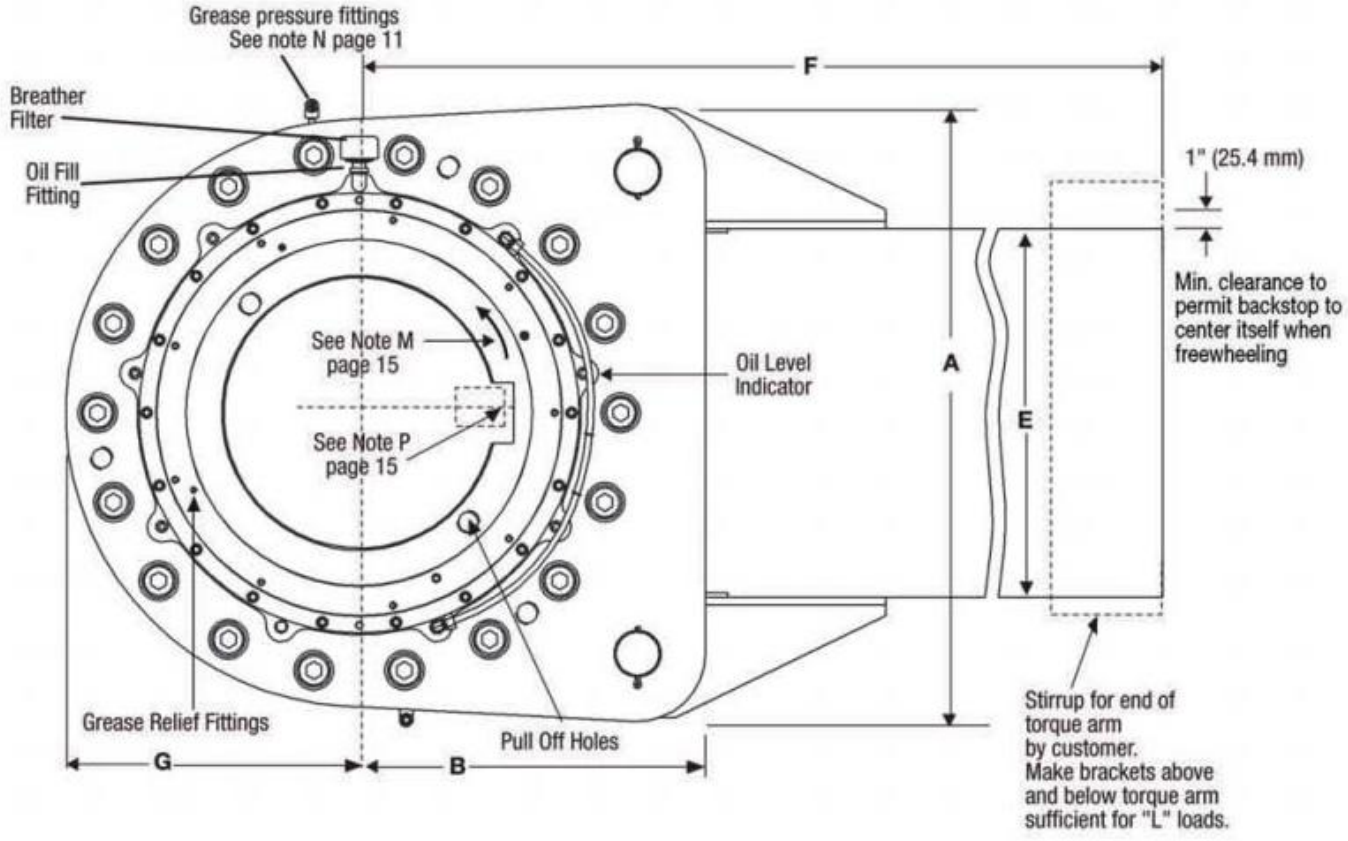


Backstops Type BCMA 240-1200

1 Coverplate
2 Gasket
3 Bearing
4 Oil Seal
5 Outer Race
6 Roller Assembly
7 Cam
8 Pin and Cotter Keys
9 Torque Arm
10 Outer Labyrinth
11 Grease Seal







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*Keys are furnished for all units supplied with maximum bores. Other bore and key sizes are available meeting metric, AGMA and USA standards as well as custom design requiremen

Engineer Data

Backstop Size	Torque N-m	Rated Torque lb. ft.	Max RPM	Load "L" Kgs	Load "L" lbs.	Max.* Bore mm	Max.* Bore in.	Max.* Bore Keyway mm	Max.* Bore Keyway in.	Ship Weight Kgs.	Ship Weight lbs.
240MA	325396	240,000	70	13248	28,800	360	14	80 x 15.4	3.50 x 1.00	1242	3,100
300MA	406745	300,000	70	15180	33,400	360	14	80 x 15.4	3.50 x 1.00	1720	3800
375MA	508432	375,000	60	17250	37,500	460	18	100 x 19.4	4.50 x 1.50	2760	6,000
540MA	732142	540,000	60	20460	45,000	540	21	100 x 21.4	5.0 x 1.75	4140	9,000
720MA	976271	720,000	60	27280	60,000	540	21	100 x 21.4	5.0 x 1.75	4545	10,000
940MA	1274600	940,000	60	32870	72,400	540	21	100 x 21.4	5.0 x 1.75	5455	12,000
1200MA	1626000	1,200,000	60	39100	86,000	600	23.50	TBD	TBD	6591	14,500

Dimensions

Backstop Size	A		B		C		D		E		F		G	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
240MA	876	34.50	457	18	387	15.25	162	7.06	508	20.25	2540	100	413	16.25
300MA	876	34.50	457	18	413	16.25	162	7.06	508	20.25	2745	108	413	16.25
375MA	1041	41	584	23	445	17.50	203	8	622	24.25	3048	120	495	19.50
540MA	1194	47	673	26.50	527	20.75	257	10.12	692	27.25	3658	144	578	22.75
720MA	1194	47	673	26.50	552	21.75	257	10.12	692	27.25	3658	144	578	22.75
940MA	1220	48	700	27.50	584	23.00	257	10.12	692	27.25	3960	156	610	24.00
1200MA	1320	52	750	29.50	625	24.62	267	10.50	762	30.00	4267	168	660	26.0