BMG

Innovation in Motion
TSUBAKI

BACKSTOP SOLUTIONS
Technical Guide

BEE 4
EMPOWERING SUPPLIER

ISO 9001	Certified
ISO 14001	Certified
ISO 45001	Certified

TABLE OF CONTENTS

INDEX

CAM CLUTCH OVERVIEW

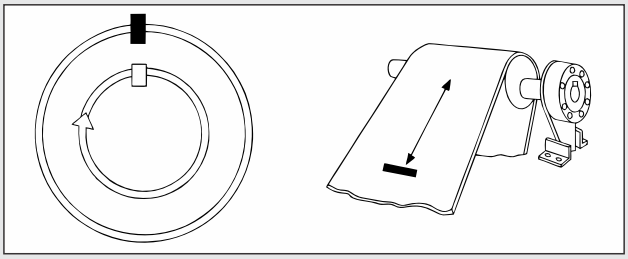
A Complete & Versatile Selection of One-way Clutches

Cam Clutches are precision devices, which locks the inner and outer races, through the wedging action of cams, to transmit torque in one direction of rotation and overrun in the opposite direction. These units are often referred to as freewheels, sprag, overrunning, indexing, backstops or one-way clutches, depending on their application.

All Tsubaki Cam Clutch products utilize the same principles of operation. BMG offer a variety of products to address the many types of applications where Cam Clutch products are most often used. The three most common types of applications are listed below:

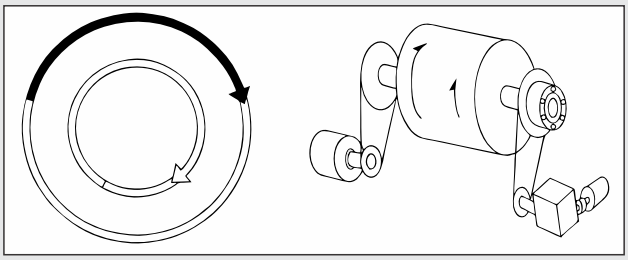
- **Backstopping**

  Clutches are used to prevent reverse rotation of the drive shafts, which may cause damage to the machinery and expensive equipment. The inner race can overrun freely in one direction of rotation. The Reverse rotation is instantaneously prevented by the automatic engagement of the clutch. Typical backstop applications are inclined conveyor systems, gear reducers and industrial fans. Tsubaki has pioneered the non-rollover design.



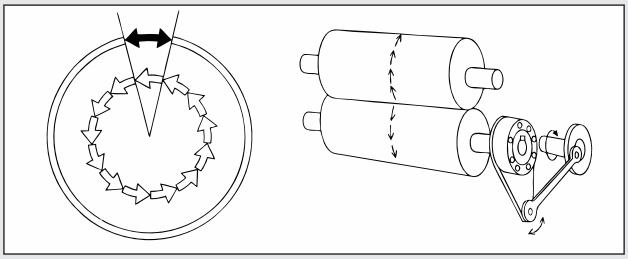
- **Overrunning**

  Clutches used in this type of application overturn at either the inner or outer race during the majority of the clutch operating time, and are occasionally called upon to lock up and drive. A typical application is a two-speed drive, where an electronic motor and a geared motor are connected to a single driven shaft through one-way clutches. The machine can be driven by either the electric motor or geared motor. When the gear motor drives at low speed, the clutch engages. When the faster turning electric motor drives the machine, the clutch overruns. The clutch automatically switches between low speed and high speed.



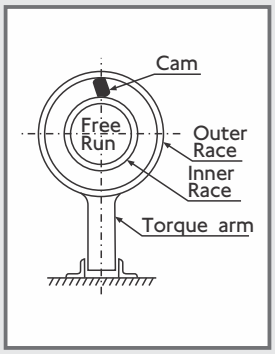
- **Indexing**

  The reciprocating motion applied to the clutch, transforms into one-direction motion. A crank mechanism provides the reciprocating motion, to drive the Cam Clutch. The clutch drives in the forward stroke (index) and overruns on the return stroke, indexing the feeding roller forward.



- Air Cleaning Plants
- Agricultural Machinery
- Bucket Elevators
- Compressors
- Inclined or Vertical Conveyors
- Cranes & Hoists
- Dry-cleaning Machinery
- Duplicator Equipment
- Fishnet Machinery
- Heat-treatment Furnaces
- Induced Draft Fans
- Multi-state Conveyors
- Packaging Machinery
- Printing Machinery
- Inclined or Vertical Pumps
- Punch Presses & Feeders
- Power Plants
- Refinery Equipment
- Speed Reducers
- Standby Power Units
- Textile Looms
- Two-speed Grinders
- Two-speed Shiftovers
- Washing Machinery
- Wire-winding Machinery

Backstopping is used to prevent the rotating shaft from rotating in the reverse direction. The Cam Clutch is overrunning, while the shaft continues to rotate normally. It engages, just before this occurs, to prevent reverse shaft rotation.



The Behavior & Function of the Cam Clutch

Normally, the inner race is mounted onto the rotation shaft, and the outer race is fixed to the machine frame. The inner race is set on the overrunning side. As soon as the shaft begins to rotate in reverse, the cams engage with the inner and outer races, to prevent reverse rotation and to support the load.

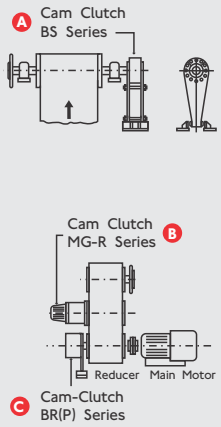
Three Classifications

Backstopping is grouped into three types, depending on the overrunning speed and load conditions. Prevention of reverse rotation of the inclined and vertical conveyors, is a typical example of how backstopping is used. The following A, B and C types are available for different Cam Clutch mounting positions, and the series' listed are designed to handle each specification.

Purpose of Use			Overrunning Speed	Engagement	Major Applications
Backstopping	1	Backstopping for low-speed overrunning	Continuous overrunning at 150 r/min or less	Irregular, low-frequency engagement	For backstopping of conveyor shafts, pumps.
	2	Backstopping for medium-speed overrunning	Continuous overrunning at 150 to 700 r/min		For backstopping of intermediate shafts of conveyor-drive reduction gears.
	3	Backstopping for high-speed overrunning	Continuous overrunning at 700 to 3,600 r/min		For backstopping of high-speed rotating shafts in conveyor-drive machines, pumps.

Type of Mounting	Mounting Position	Use	Specification (overrunning speed / reversing torque)	Applicable Series
A	Pulley Shaft	Backstopping for low-speed overrunning	0 to approx. 150 r/min.; Large reversing torque.	BS BS-R BSEU
B	Intermediate Shaft of the Reduction Gears	Backstopping for medium-speed overrunning	Approx. 150 to 700 r/min.; Medium reversing torque.	MG-R
C	Directly Connected to the Motor Shaft	Backstopping for high-speed overrunning	300 to 3,600 r/min.; Small reversing torque.	BR BREU

A, B, & C Mounting Types

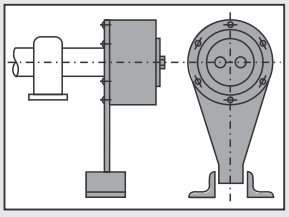


Backstopping For Low-Speed Overrunning

Overrunning Speed at 150 r/min or less)

In this application, the inner race of the Cam Clutch is mounted directly onto the conveyor head pulley or the other shaft, with a low rotation speed. The outer race is anchored to the conveyor frame, to prevent reverse rotation. Since reverse rotation is prevented directly by the conveyor shaft without using a drive chain, gears or couplings, it is regarded as the safest and most reliable mounting method. Additionally, a low overrunning speed, minimizes the cam overrunning slip speed, as well as the overall slipping distance. As a result, wear on the cam is reduced and a prolonged service life can be expected. In addition to conveyors, this system is also used to prevent reverse rotation in inclined and screw pumps.

Series	Maintenance
BS 30 to BS 135 BSEU 25 to BSEU 90	Grease is sealed in so lubrication maintenance is not required.
BS 160 to BS350	Grease lubrication with replacement once or twice a year.



TSUBAKI CAM CLUTCH RANGE OVERVIEW

Design Features

Full Cam Complement

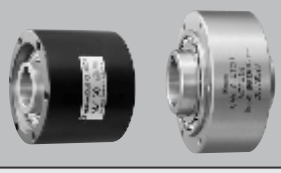
The full complement of cams, provide the maximum number of load transmitting members per given diameter. The result is a greater torque capacity, size-for-size, than other clutches.

Cam Design

Precision formed cams are made of a special alloy steel, to provide extra long wear and fatigue life.

High Quality Components

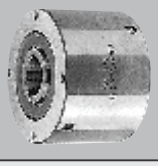
The clutch races are made of high-quality Alloy Steel, with high surface hardness and core toughness. The races are precision ground to provide excellent concentricity and surface finish in order to obtain accurate cam rotation.

MZ, MZ-G, MZEU Series	200 Series	BB Series	TSS Series
			
The MZ Series clutches are pre-lubricated with a special grease and requires no lubrication maintenance. Ideal for general applications. The outer race of the MZ-G series is machine finished. The MZEU series clutch is an European style model.	The 200 Series clutches are shaft-mounted and pre-lubricated with special greases. The shaft must be supported by two bearings.	The BB series clutches has the bearing characteristics and dimensions of 62 type ball bearing. This design provides easy handling and installation. Ideal for general applications.	The TSS series clutch is designed for press fit installation. The Outside dimensions are the same as that of the series 62 ball bearings. This design provides easy handling and installation. Ideal for general applications.
MZ: Bore Range: ø15 to ø70 mm Torque Range: 186 to 3,040 N·m MZ-G: Bore Range: ø15 to ø70 mm Torque Range: 186 to 3,040 N·m MZEU: Bore Range: ø12 to ø150 mm Torque Range: 60 to 33,800 N·m	Bore Range: ø16.5 to ø79.3 mm Torque Range: 39 to 1,390 N·m	Bore Range: ø15 to ø40 mm Torque Range: 29 to 260 N·m	Bore Range: ø8 to ø60 mm Torque Range: 6 to 649 N·m

TFS Series	PB Series	LD Series	MDEU Series
			
The TFS series clutches are designed for press fit installations. The TFS has two vertical keyways on the outer race. The outside dimensions are the same as that of the series 63 ball bearings. This design provides easy handling and installation. Ideal for general applications.	The PB Series clutches are packed with a special grease for general applications. The outer race has provision for mounting gears, pulleys and sprockets.	The LD Series clutches are packed with a special grease and requires no lubrication maintenance. This model is easily installed and ideal for light-duty applications.	The MDEU series clutches are European style clutches and eliminates the need for bearings, due to the CAM and roller construction. The Spirolox on the outer race, allows for easy installation on sprockets, pulleys and flanges. This is ideal for medium-duty applications.
Bore Range: ø12 to ø80 mm Tor que Range: 18 to 3,924 N·m	Bore Range: ø10 to ø45 mm Tor que Range: 29 to 2,110 N·m	Bore Range: ø10 to ø30 mm Tor que Range: 5 to 49 N·m	Bore Range: ø15 to ø80 mm Tor que Range: 70 to 2,300 N·m

TSUBAKI CAM CLUTCH RANGE OVERVIEW

MX Series



The MX Series clutches are best suited for indexing applications. This model ensures a long life and accurate, intermittent motion at the driven race.

Bore Range: ø22 to ø70 mm
Torque Range: 78 to 784 N·m

MI-S Series

The MI-S Series clutches have special surface-treated cams for use in large feed angle indexing applications.

Bore Range: ø20 to ø30 mm
Torque Range: 43 to 196 N·m

PO, PG, PS Series'

These series' are designed for use in printing machines, but can be used for general applications as well. The PO and PG Series have swing arms. The PS Series provides a precision feed action, for seal printing machines.

Torque Range:
PO: 44 to 441 N·m
PG: 19 to 58 N·m
PS: 196 to 392 N·m

BS, BSF, BSEU Series

The BS Series clutches are exclusively used in backstop applications for conveyors and bucket elevators. The BSEU series clutches are of European style. The BS-F Series offer a higher torque and speed with I-Beam design.

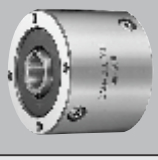
BS: Bore Range: ø20 to ø450 mm
BS-F: Bore Range: ø60 to ø465 mm
BSEU: Bore Range: ø20 to ø90 mm

BR, BR-P, BREU Series

The BR Series clutches are mainly used as a backstop of the inner race high-speed over running. The BR-P Series is the BR Series but with a bearing. The BREU series clutches are of European style.

BR: Bore Range: ø20 to ø240 mm
Torque Range: 306 to 62,034 N·m
BR-P: Bore Range: ø20 to ø240 mm
Torque Range: 306 to 62,034 N·m
BREU: Bore Range: ø30 to ø150 mm
Torque Range: 607 to 33,908 N·m

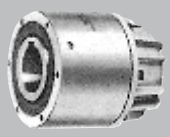
MG, MI, MR Series



The MG Series clutches are used for low to medium speed, inner race overrunning. The MI Series is for indexing applications. The MR Series is for outer race, high-speed overrunning applications.

MG, MI: Bore Range: ø19 to ø250 mm
Torque Range: 314 to 176,000 N·m
MR: Bore Range: ø85 to ø160 mm
Torque Range: 9,510 to 33,800 N·m

MG-R Series



The MG-R Series clutches with an oil reservoir, can be used in the backstop service of the inner race continuous and medium-speed overrunning applications.

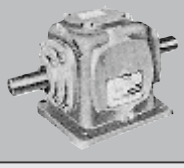
Bore Range: ø19 to ø250 mm
Torque Range: 314 to 176,000 N·m

MZ-C, MG-C Series

The MZ-C Series clutches are clutch couplings, utilizing the MZ Series clutches. The MG-C Series clutches are clutch couplings, utilizing MG Series clutches.

MZ-C: Bore Range: ø20 to ø70 mm
Torque Range: 323 to 3,040 N·m
MG-C: Bore Range: ø19 to ø160 mm
Torque Range: 314 to 33,800 N·m

OB-ON Series



The OB-ON Series clutches are enclosed units, containing Cam Clutches and Shafts. They can be used for high-speed and continuous overrunning applications. Lubrication is by oil bath.

Torque Range: 314 to 5,880 N·m

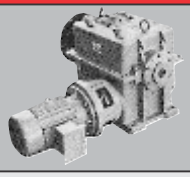
OB-SF, SN, S, PN Series

These are enclosed units, containing Cam Clutches and Shafts. Used for high-speed and continuous overrunning applications.
Lubrication methods are:

SF	Self-lubrication with fins for water cooling	S	External forced lubrication
SN	Self-lubrication	PN	Oil bath

Torque Range: 3,140 to 40,200 N·m

TB Series



The TB Series clutches are enclosed units, containing Cam Clutches and Worm Gear Reducers for turning and inching applications.

Torque Range: 3,140 to 24,500 N·m
Motor Capacity: 0.75 to 22 kW
Reduction Range: 10:1 to 60:1

SLOW SPEED BS SERIES BACKSTOP SELECTION

For Belt Conveyors

Selection Procedure:

(1) Calculate the power needed to move an empty belt and its idlers: (P_1)

$$P_1 = 0.06 \times f \times W \times V \times \frac{r + r_0}{367} \text{ (kW)}$$

(2) Calculate the power needed to move a loaded belt horizontally: (P_2)

$$P_2 = f \times Qt \times \frac{r + r_0}{367} \text{ (kW)}$$

(3) Calculate the power needed to move the load vertically: (P_3)

$$P_3 = \frac{h \times Qt}{367} \text{ (kW)}$$

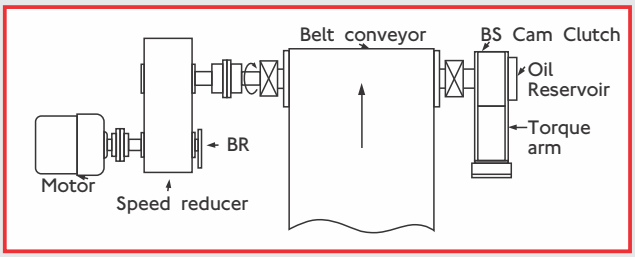
(4) Calculate the backstop power: (Pr)

$$Pr = P_3 - 0.7(P_1 + P_2) \text{ (kW)}$$

(5) Calculate the backstop torque: (T)

$$T = \frac{9550 \times Pr}{N} \times SF \text{ (N·m)}$$

(6) Select the proper clutch which satisfies the calculated backstop torque (T).



NOTE:

f = Friction co-efficient of the rollers which is normally 0.03
W = Weight of the moving parts of the conveyor in the unloaded condition (kn/m)

Use the values from the table below.

Width of Belt (mm)	400	450	500	600	750	900
Estimated Weight: (W)	22.4	28	30	35.5	53	63

Width of Belt (mm)	1050	1200	1400	1600	1800	2000
Estimated Weight: (W)	80	90	112	125	150	160

V = Velocity of the conveyor (m/min)
Qt = Max. possible load (hour)
h = Total lift (m)
r = Horizontal distance between the head and tail pulley (m)
r_0 = Modification co-efficient for 49 m (normally used)
N = Shaft speed (r/min) on which the clutch is mounted.
SF = Service factor

Select the service factor from the table below:

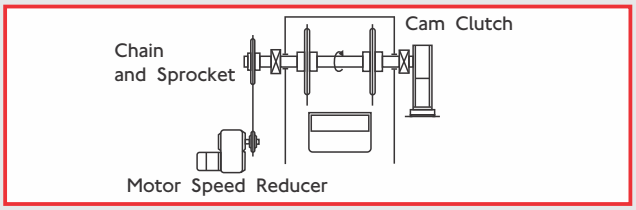
SF	Service Condition
1.5	Backstopping: Several times a day
2.0	Backstopping: More than several times a day

For Bucket Elevators

Selection Procedure:

(1) $$T = \frac{9.8 \times (L + D) \times Qt \times D \times 1000}{120 \times V} \times SF \text{ (N·m)}$$

(2) Select the proper clutch which satisfies the calculated backstop torque (T).



NOTE:

L = Total lift (m)
D = Pitch circle diameter of the head sprocket (m)
Qt = Possible maximum load (tons/hour)
V = Velocity of the conveyor (m/min)
SF = Service factor

Use the values from the table below.

SF	Service Condition
1.5	Several times a day
2.0	More than several times a day

NOTE:

For the conveyor types other than those in the above example, calculate the backstop torque accordingly.

Always allow for the maximum possible load in your calculations, since backstopping often occurs when the conveyor is loaded above its normal loading capacity.

Motor Stall Torque Method

Another method used to select the proper backstop clutch size for conveyors, is to use the motor name plate ratings, plus the motors ability to produce excess torque. Depending on the motor size, it may develop over 300% of the rated torque. After stalling, an overloaded conveyor can overload the backstop. For proper selection of the backstop, all facets of the mechanical system should be considered, to ensure that the backstop is not the weakest link in the conveyor drive. If the motor breakdown torque is not known, refer to the motor manufacturer.

Selection is based on the following formula:

$$\text{Motor Stall Torque } T = \frac{\text{Motor Transmission Power (9550kW)}}{\text{Shaft Speed N (r/min)}} \times \frac{S}{100} \leqq T_{max}$$

S = Stall Torque Percentage
T_{max} = Torque Capacity

NOTE:

The above selection procedures, are for BS series only. For other series, please consult BMG.

Regarding the general use of BS Cam Clutches, we recommend BS30 - BS135, BS160HS (BS160) to BS450HS (BS450). (BS30 to BS350HS (BS350) is grease lubrication. We have the BS-R series for the demand of oil lubrication. Under the condition of little dust, we recommend the BSEU series.

BS Series Slow Speed Backstops

In this application, the inner race is mounted directly onto the conveyor head pulley, or driven shaft. The outer race is connected to the conveyor frame to prevent reverse rotation. Since reverse rotation is prevented directly by the conveyor shaft without using a drive chain, gears, or couplings, this is regarded as the safest and most reliable mounting method. Furthermore, due to the fact that the Cam Clutch is connected to the conveyor pulley, low overrunning slip speed is reduced, as well as the slipping distance. The result is reduced wear and long service life.

In addition to conveyor systems, this system is also used to prevent reverse rotation on inclined conveyors and bucket elevators

Bore Range: 20 to 450 mm Torque Range: 294 to 980,000 Nm

SLOW SPEED BS SERIES BACKSTOP

Model	Torque Capacity (N·m)	Max. Overrunning (r/min) Inner Race	Drag Torque (N·m)	A	B	C	PCD D	E	S	H-M Size w Pitch w No.of Tapped Holes	Grease Filler Hole (Size)	Qty of Grease (kg)
BS 30	294	350	0.58	64	90	64	80	45	13	M6 w P1.0 w 4	ç	ç
BS 50	784	300	0.98	67	125	67	110	70	16	M8 w P1.25 w 4	ç	ç
BS 65	1,570	340	3.92	90	160	85	140	90	20	M10 w P1.5 w 6	ç	ç
BS 75	2,450	300	5.88	90	170	85	150	100	20	M10 w P1.5 w 6	ç	ç
BS 85	5,880	300	7.84	115	210	110	185	115	30	M12 w P1.75 w 6	ç	ç
BS 95	7,840	250	9.8	115	230	110	200	130	30	M14 w P2.0 w 6	ç	ç
BS 110	10,800	250	14.7	115	270	110	220	150	30	M16 w P2.0 w 6	ç	ç
BS 135	15,700	200	19.6	135	320	130	280	180	30	M16 w P2.0 w 8	ç	ç
BS 160	24,500	100	34.3	135	360	130	315	220	40	M20 w P2.5 w 10	PT 1/4	0.12
BS 200	37,200	100	44.1	150	430	145	380	265	40	M22 w P2.5 w 8	PT 1/4	0.14
BS 220	49,000	80	73.5	235	500	230	420	290	40	M20 w P2.5 w 16	PT 1/4	0.8
BS 250	88,200	50	93.1	295	600	290	530	330	50	M24 w P3.0 w 16	PT 1/4	1.1
BS 270	123,000	50	98	295	650	290	575	370	50	M24 w P3.0 w 16	PT 1/4	1.2
BS 300	176,000	50	108	295	780	290	690	470	60	M30 w P3.5 w 16	PT 1/4	1.3
BS 335	265,000	50	137	305	850	320	750	495	70	M36 w P4.0 w 16	PT 1/4	1.4
BS 350	314,000	50	157	320	930	360	815	535	70	M36 w P4.0 w 16	PT 1/4	1.5
BS 425	510,000	50	216	440	1,030	450	940	635	70	M36 w P4.0 w 18	ç	Oil 6,000ml
BS 450	686,000	50	245	450	1,090	480	990	645	80	M42 w P4.5 w 18	ç	Oil 7,000ml

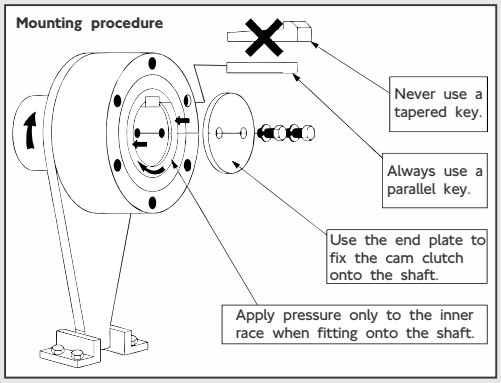
Dimensions in mm

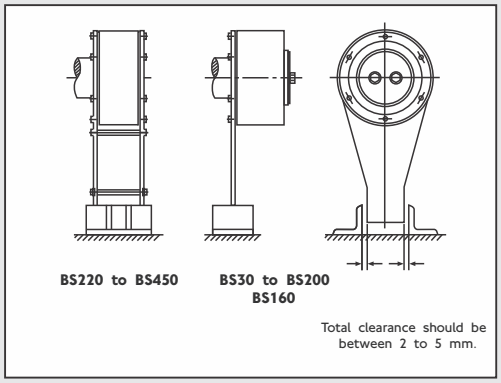
Lubrication Method & Dust Prevention Features:

	BS30 - BS135	BS160 - BS450
Lubrication Specifications	Lubrication Maintenance free type, Internaly Lubricated	Grease Lubricated Type. Change grease once or twice a year
Dust Prevention	• Dust Seal • Double Lip Oil Seal	• Dust Plate • Double Lip Oil Seal

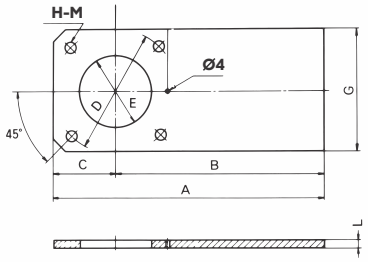
Installation and Usage

- Recommended shaft tolerance is h7 or h8.
- Before installation, verify that the direction of the rotation of the inner race of the BS Cam Clutch (shown by the arrow on the end face of the inner race), is the same as the direction of the rotation of the conveyor.
- Install the torque arm to the BS Cam Clutch securely by using bolts with a strength class of 10.9 grade or higher.
- Make sure the surface of the torque arm that touches the end face of the outer race, is flat and free of dust, in order to get enough frictional force.
- Apply pressure only on the end face of the inner race, when inserting the BS Cam Clutch onto the shaft. **Do not** hit the inner race directly with a hammer, or apply pressure on the outer race, oil seal, or grease fitting.
- Always use a parallel key for installation onto the shaft. Fix the BS Cam Clutch to the shaft with the end plate. The key must have a 1 - 1,5 mm top clearance to avoid creating internal clearance reduction and increase friction.
- When installing models BS160 and above (grease lubrication types), place one of the four socket plugs underneath the Cam Clutch. This will allow for easy drainage of the grease during maintenance.
- The end tip of the torque arm will swing to some extent while the conveyor is operating. Support the torque arm end tip in the direction of the rotation, but be sure to allow for a certain amount of free movement axially. (Refer to installation diagram.) The Cam Clutch will sustain damage if the torque arm end tip is fixed securely.

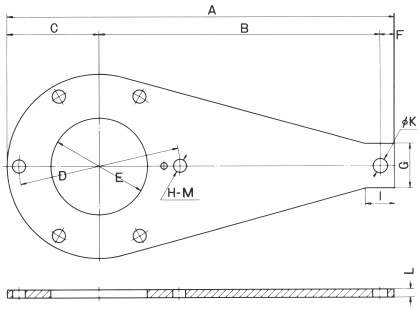




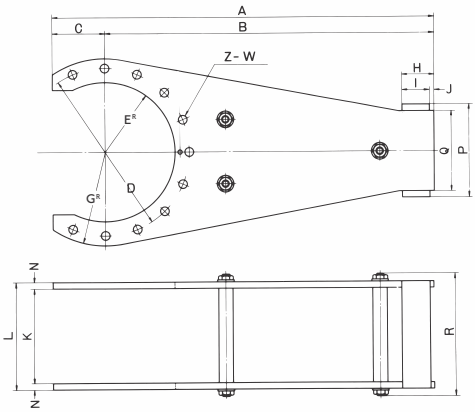
- A single torque arm is sufficient for models from BS30 to BS220, BS160 and BS200. One torque arm on each side is required for models from BS220 to BS450 to stop the rotation so that the reverse load operates on the torque arms evenly. It is recommended to use the standard torque arm and safety cover for the BS Cam Clutch.
- In case the ambient temperature rises to 40°C and above, it is recommended to set a shield or a roof and to avoid direct sunlight, in order to extend the life span of the Cam Clutch.



BS30TA to BS50TA



BS65TA to BS200TA



BS220TA to BS450TA

BS30TA - BS200TA (Single Torque Arm)

Torque Arm No.	A	B	C	D	E	F	G	I	K	L	H - M	Weight (kg)
BS 30TA	168	130	38	80	55	-	75	-	-	6	4 ↓ 6.6	0.5
BS 50TA	230	180	50	110	80	-	100	-	-	6	4 ↓ 9	0.8
BS 65TA	306	210	80	140	90	16	50	30	13.5	6	6 ↓ 11	1.2
BS 75TA	354	250	85	150	100	19	65	35	16.5	6	6 ↓ 11	1.6
BS 85TA	434	300	105	185	115	29	95	45	20.5	9	6 ↓ 14	3.8
BS 95TA	497	350	115	200	130	32	105	55	20.5	9	6 ↓ 16	4.7
BS 110TA	560	385	135	220	140	40	110	60	26	12	6 ↓ 18	8.3
BS 135TA	666	470	160	280	180	36	120	65	26	12	8 ↓ 18	11.1
BS 160TA	792	580	180	315	260	32	120	65	31	19	10↓ 22	20.0
BS 200TA	838	580	215	380	310	43	130	70	41	19	8 ↓ 24	23.8

Dimensions are in mm

BS220TA - BS450TA (Double Torque Arm)

Torque Arm No.	A	B	C	D	E	G	H	I	J	K	L	N	P	Q	R	Z - W	Weight (kg)
BS 220TA	950	820	130	420	176	235	80	70	10	235	259	12	238	200	311	11↓ 22	59
BS 250TA	1170	1000	170	530	214	300	100	90	10	295	319	12	288	250	375	11↓ 26	96
BS 270TA	1120	1100	170	575	235	325	110	100	10	295	319	12	298	260	375	11↓ 26	110
BS 300TA	1480	1300	180	690	285	285	135	120	15	295	333	19	356	300	396	11↓ 32	240
BS 335TA	1730	1500	230	750	307	307	135	120	15	305	343	19	386	330	405	11↓ 39	270
BS 350TA	1850	1600	250	815	328	328	135	120	15	320	358	19	414	350	430	11↓ 39	330
BS 425TA	2110	1800	310	940	380	380	165	150	15	440	484	22	474	410	570	13↓ 39	480
BS 450TA	2320	2000	320	990	400	400	165	150	15	450	494	22	526	450	580	13↓ 45	560

Dimensions are in mm

NOTES: 1. Torque Arms up to BS250TA are stock items.
2. Mounting bolts and spring washers for installation are attached.

Extended Torque Arms

Torque Arm No.	A Extended	B Extended
BS 110EXT TA	960	920
BS 135EXT TA	1286	1250
BS 160EXT TA	1482	1450
BS 200EXT TA	1743	1700
BS 220EXT TA	1700	-
BS 250EXT TA	1850	-

Torque Arms can also be manufactured to the customer's specifications.

SLOW SPEED BS SERIES BACKSTOP

BS30 to BS135: Pre-lubricated with grease. No lubrication maintenance required, unless specified.
BS160 to BS350: Pre-lubricated with grease. Drain and clean inside the Cam Clutch and inject new grease once or twice a year.

No need to remove the backstop from the shaft or application.

1. Grease discharge and cleaning inside
   - 1.1. Pour the paraffin into the maintenance kit.
   - 1.2. Remove the upper plug.
   - 1.3. Loosen both the side plugs.
   - 1.4. Fix the maintenance kit plug to the upper inlet tap and fill the Cam Clutch with paraffin.
   - 1.5. Tighten the plugs on both sides and fasten the upper plug.
   - 1.6. Run the conveyor for a full day. This will enable the paraffin to clean inside the Cam Clutch. (Maintenance can be carried-out while the conveyor runs)

2. Re-Clean
   - 2.1. Drain the paraffin from the Cam Clutch by removing the bottom plug and then the upper plug.
   - 2.2. Fix the maintenance kit plug to the upper hole and re-fill with paraffin while the conveyor is running.
   - 2.3. When the oil exiting the Cam Clutch becomes transparent, re-cleaning is complete.
   - 2.4. Fix the bottom plug.

3. Fill new grease
   - 3.1. Fix the grease nipple to the upper tap and loosen the side plug.
   - 3.2. Fill the Cam Clutch with the correct grease, using a grease gun.
   - 3.3. Tighten the side plug and replace the grease nipple with the plug at the top.

Maintenance on the BS series Cam Clutches are carried out in 1 year intervals.
NB: Too much grease will cause the Cam Clutch to fail.

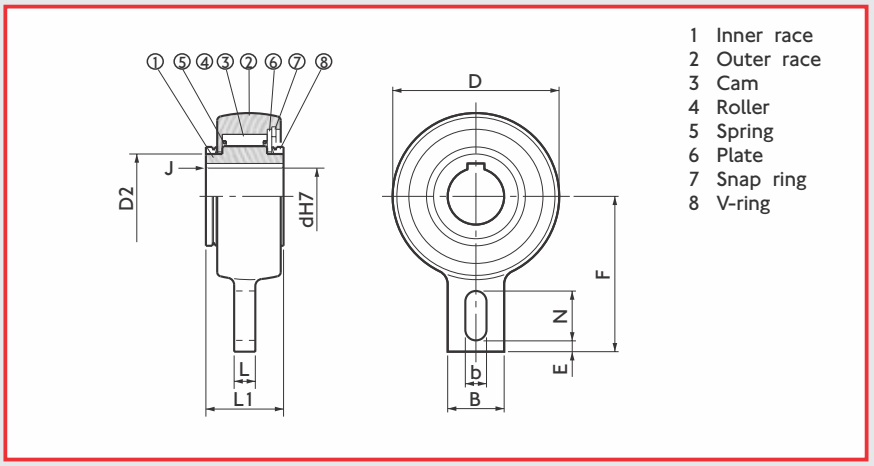
Quantity of Paraffin & Grease										
Model	BS160	BS200	BS220	BS250	BS270	BS300	BS335	BS350	BS425	BS450
Paraffin (L)	1.0	1.0	1.0	3.0	3.0	3.0	3.0	3.0	4.5	4.5
Grease (g)	120	140	800	1,100	1,200	1,300	1,400	1,500	---	---

Maintenance Kit

BMG recommends using the Maintenance Kit for easy and effective maintenance of the BS Series Cam Clutch.

Good lubrication reduces the wear on all the parts; cams, inner and outer races and improves the operating life.

TSUBAKI Approved (EP Free) grease is available from BMG.



Dimensions and Capacities

Dimensions are in mm

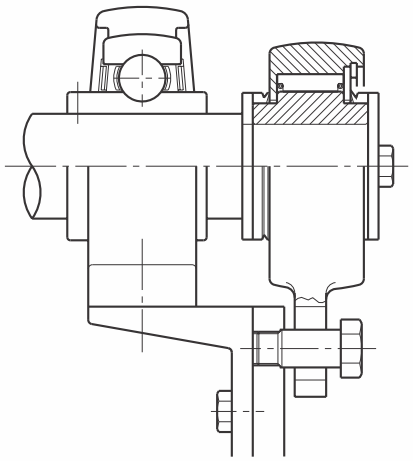
Model No.	Bore Size		Torque Capacity (Nm)	Max. Overrunning (r/min) Inner Race	D	D2	L1	L	B	F	b	N	E	J	Min. Weight (kg)	Max. Weight (kg)
	Dia. (H7)	Keyway														
BSEU25-20	20^{W}	6 2.8	216	500	83	42	35	12	40	90	15	35	5	1.0	1.0	0.95
BSEU25-25	25^{W}	8 3.3	216	500	83	42	35	12	40	90	15	35	5	1.0		
BSEU40-20	20^{W}	6 2.8	1,440	450	118	60	55	15	40	110	15	35	8	1.5	3.8	3.4
BSEU40-25	25^{W}	8 3.3	1,440	450	118	60	55	15	40	110	15	35	8	1.5		
BSEU40-30	30^{W}	8 3.3	1,440	450	118	60	55	15	40	110	15	35	8	1.5		
BSEU40-35	35^{W}	10 3.3	1,440	450	118	60	55	15	40	110	15	35	8	1.5		
BSEU40-40	40^{W}	12 3.3	1,440	450	118	60	55	15	40	110	15	35	8	1.5		
BSEU70-45	45^{W}	14 3.8	3,140	350	165	90	59	20	80	140	18	35	10	1.5	7.6	6.5
BSEU70-50	50^{W}	14 3.8	3,140	350	165	90	59	20	80	140	18	35	10	1.5		
BSEU70-55	55^{W}	16 4.3	3,140	350	165	90	59	20	80	140	18	35	10	2.0		
BSEU70-60	60^{W}	18 4.4	3,140	350	165	90	59	20	80	140	18	35	10	2.0		
BSEU70-65	65^{W}	18 4.4	3,140	350	165	90	59	20	80	140	18	35	10	2.0		
BSEU70-70	70^{W}	20 4.9	3,140	350	165	90	59	20	80	140	18	35	10	2.0		
BSEU90-75	75^{W}	20 4.9	4,700	250	190	120	63	20	80	165	20	40	15	2.0	10.0	9.3
BSEU90-80	80^{W}	22 5.4	4,700	250	190	120	63	20	80	165	20	40	15	2.0		
BSEU90-85	85^{W}	22 5.4	4,700	250	190	120	63	20	80	165	20	40	15	2.0		
BSEU90-90	90^{W}	25 5.4	4,700	250	190	120	63	20	80	165	20	40	15	2.0		

W. Min Weight at Minimum Bore
W. Max Weight at Maximum Bore

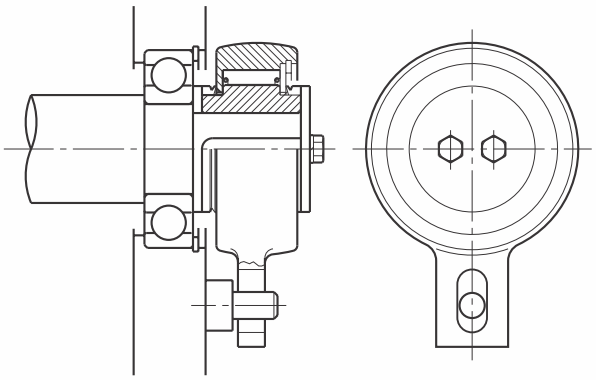
BSEU Series Cam Clutch.

The BSEU Series Cam Clutches were developed as a European style Backstop. It has a Cam and Roller construction. The Roller works as a Bearing and the Cams work as the anti-rollback in the Backstop. The BSEU Cam Clutch series ranges from a 20 mm shaft size to 90 mm in 5 mm increments. Because of the excellent sealing properties of the BSEU Cam Clutch, it is suited for both clean or extremely dusty environments on inclined conveyors or bucket elevators.

Installation & Usage



Typical Installation 1



Typical Installation 2

Installation and Usage Guide for the BSEU Series

1 We recommend using a shaft tolerance of h7 or h8 for Cam Clutch installation.

2 ISO R773 (DIN6885.1) keyway is standard.

3 Before installation, verify that the direction of rotation of the inner race of the Cam Clutch (shown by the arrow on the inner race) is the same as the direction of rotation of the conveyor.

4 When inserting the Cam Clutch on the shaft, apply pressure on the surface of the inner race with a soft hammer. Never strike the Cam Clutch with a steel hammer or apply unnecessary impact loads.

5 Always use a parallel key for installation onto the shaft and then fix the Cam Clutch to the shaft with the end plate. Never use a tapered key. Allow for a clearance between the top of the clutch keyway and the top of the key for pressure ventilation. A pressure ventilation hole is provided on the keyway of the clutch's inner race.

6 Use the frame or a pin to eliminate outer race rotation.

7 Set a 0.5 mm degree clearance between the torque arm and the frame (torque arm stopper) or the long slit in the torque arm and the pin. If the torque arm is rigidly mounted, it will apply a load to the Cam Clutch, which may eventually damage it.

8 The Cam Clutch is pre-packed with low temperature grease before shipment and is ready for installation and operation. No lubrication maintenance is required. The ambient operational temperature range is –40° to 50°C. The maximum temperature should be determined depending on the number of shaft revolutions. If the number of shaft revolutions is low, a higher ambient operational temperature range is allowable. Consult with BMG for more details.

Backstop Cam Clutch

Rollers function as bearings and orbit while rotating on their axis, supporting the outer race. There is a slight clearance between the rollers, the inner and outer races. Therefore, the bottom of the cam space between the inner and outer races is slightly wider, compared to the top of the cam. Cams always maintain contact by spring force and the slant of the cams are automatically different at the top than at the bottom.

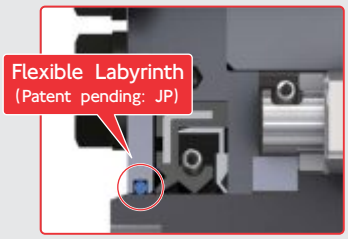
The cams continuously orbit by changing the contact point with the inner and outer races. The wear on the cams due to overrunning, is diminished to a minimum and the overrunning wear life on the Cam Clutch is at a maximum length.

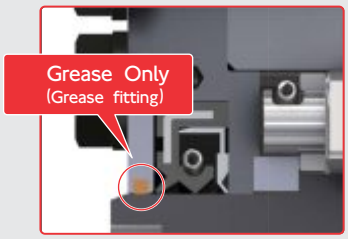
For the conveyor, which is always in an overrunning condition during the operation, the self-lubrication and the sliding speed diminishing function, is one of the major features of a cam and roller cage to realize a long operating life.

Ideal for a Tough Environment

Special Labyrinth Seal Mechanism for a Dusty Environment

The flexible labyrinth blocks dust and water in cement and tough mining conditions.

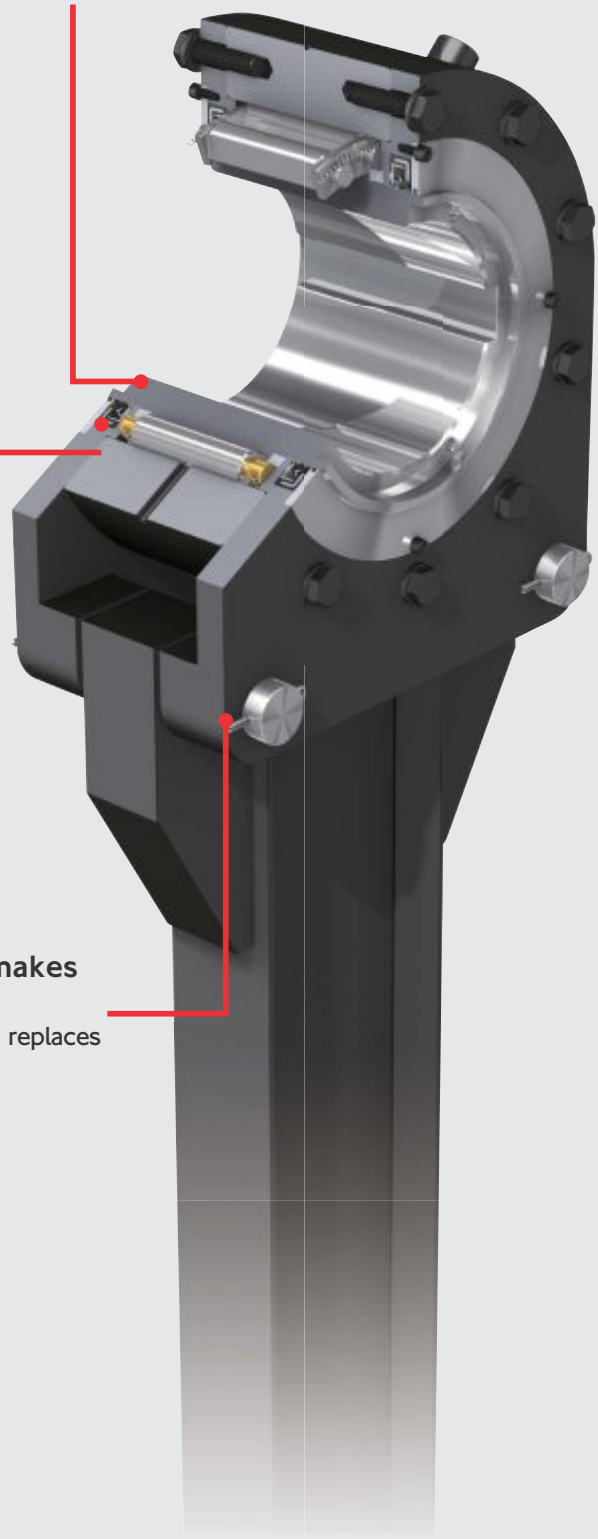




Sealing Performance Test by Cement Powder

TSUBAKI BS-F
(Flexible labyrinth)

Others
(Grease fitting)



Special Double Lip Oil Seal & Multi-Temperature Grease, for a Wide Temperature Range

Ambient Temperature Range:

- -40°C to 65°C (-40°F to 149°F)

Drop-in Design

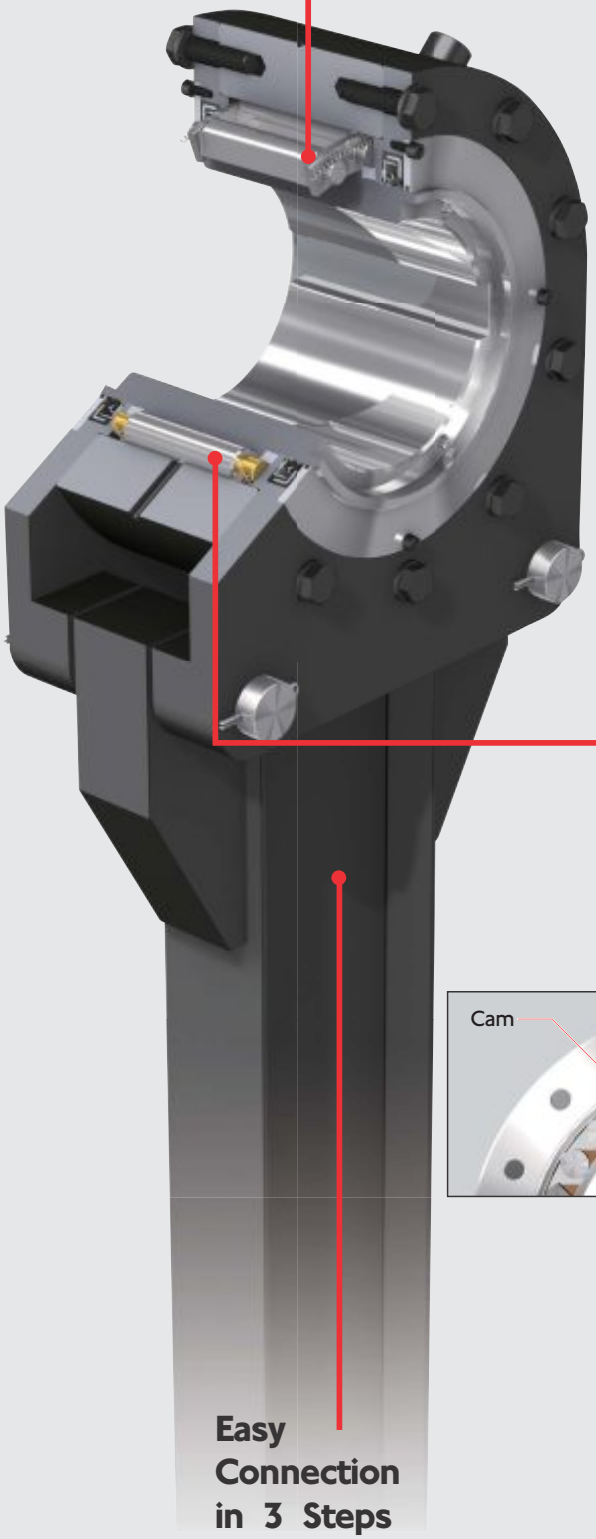
The narrowest width with the I-beam structure, makes installation easier for the customers current layout

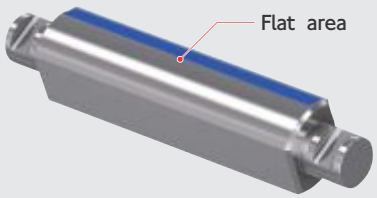
- No need to modify the current layout when a customer replaces the BACKSTOP.
- New conveyor systems have the benefit to save space and reduce installation time.

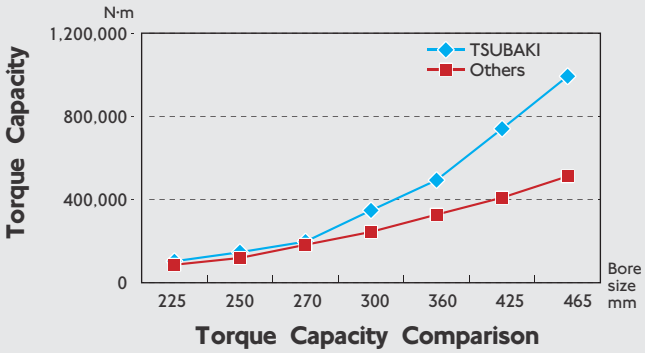
Ingenious BACKSTOP Mechanism

Non-rollover Cam

TSUBAKI's original cam design can hold higher backstop torque as well as excessive torque by the flat area.





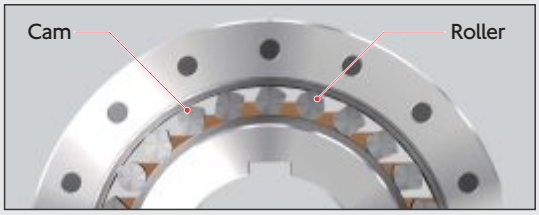


Torque Capacity Comparison

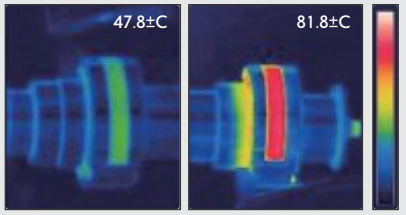
Cam & Roller Cage for Longer Life at Overrunning

Cam and Roller Cage Orbit at Low Speed to convey grease from the bottom to the top, continuously.

- Ideal lubricant condition
- Wear on the cams is diminished



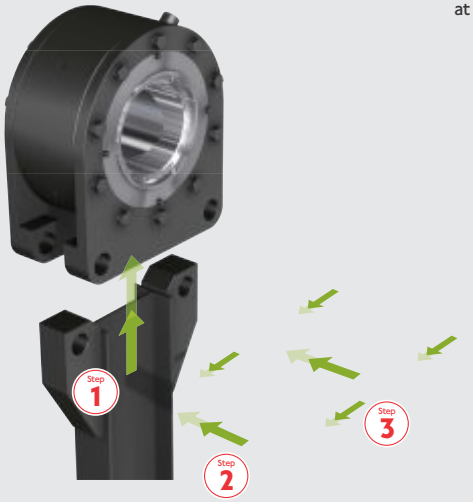
Cam & Roller Construction



TSUBAKI Cam Clutch Roller Ramp Clutch

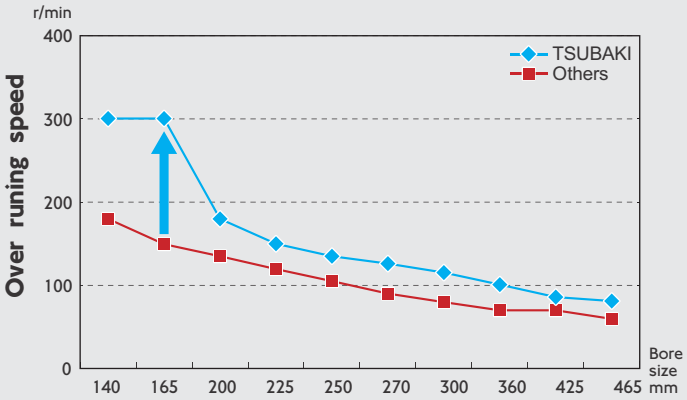
Temperature comparison at the same overrunning speed

Easy Connection in 3 Steps

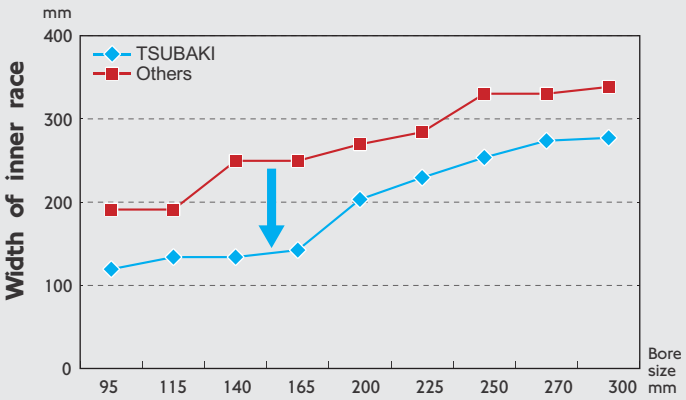


High Speed & Down Sizing

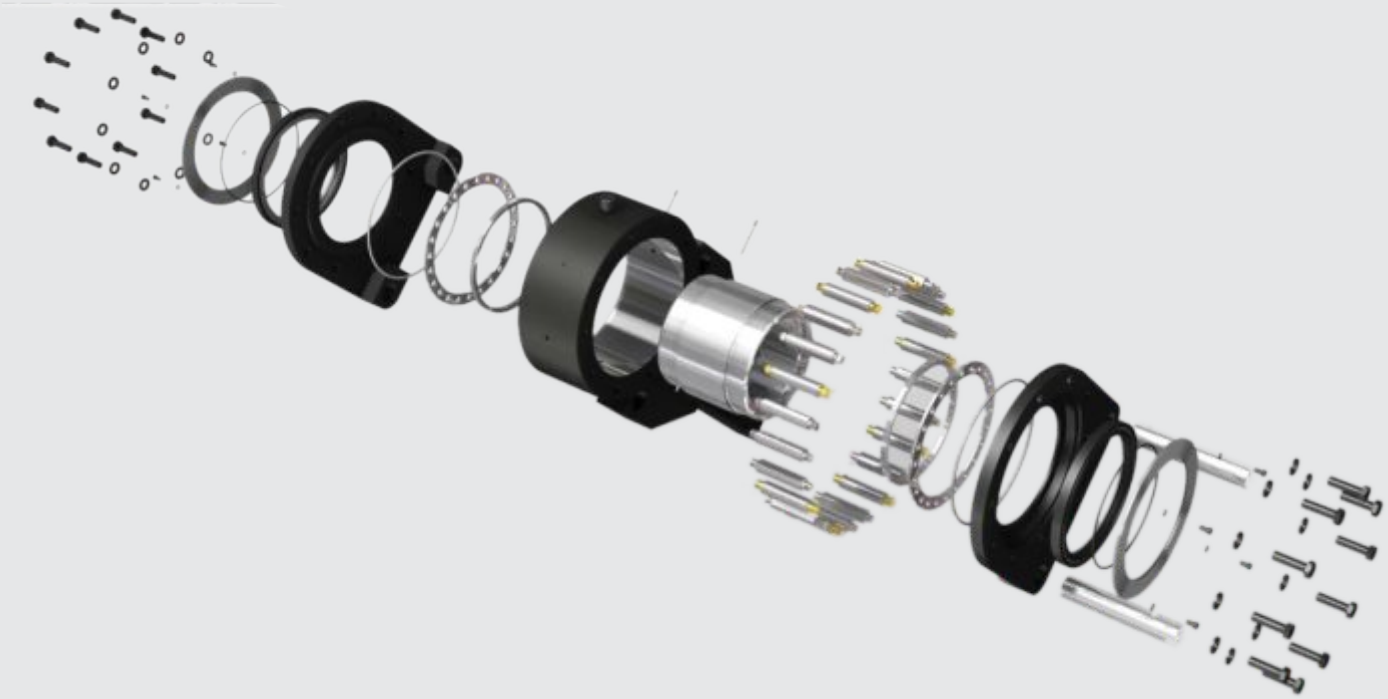
TSUBAKI BACKSTOP BS-F series meets the high speed trends of inclined conveyors, as well as reducing the width with the new and improved design. It is an easy replacement from the customers current BACKSTOP.

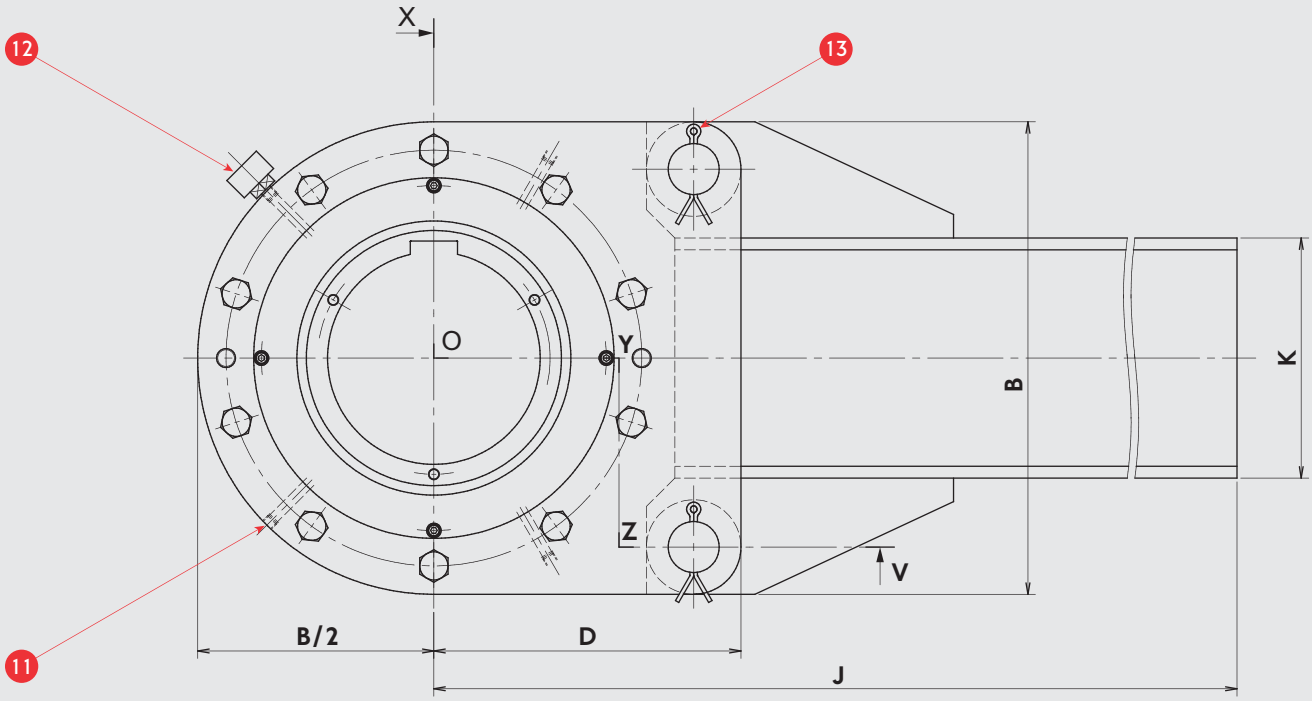


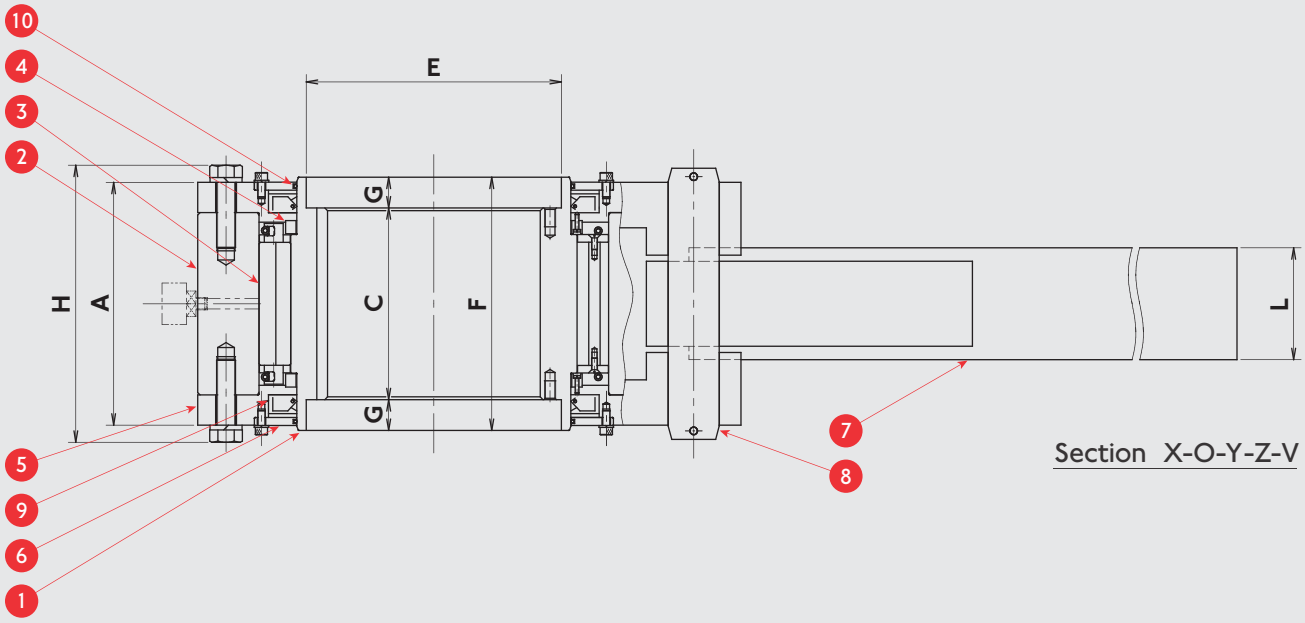
Over Runing Speed Comparison



Width of Inner Race Comparison







Section X-O-Y-Z-V

Part Names

1. Inner Race
2. Outer Race
3. Cam Cage
4. Thrust Bearing
5. Side Plate
6. Labyrinth Plate
7. Torque Arm
8. Pin
9. Oil Seal
10. Labyrinth Ring
11. Socket Plug
12. Air Breather
13. Cotter Pin

HIGH SPEED BS-F SERIES BACKSTOP

Capacities

Size	Torque Capacity (Nm)	Maximum Overrunning Speed (r/min)	Bore Range (mm)		Drag Torque (Nm)	Mass (Kg)				Amount of Grease (Kg)
						Within Torque Arm		Without Torque Arm		
		Inner Race	Minimum	Maximum		Min. Bore	Max. Bore	Min. Bore	Max. Bore	
BS85F	6760	300	60	85	8	43	40	31	28	0.065
BS95F	8940	300	70	95	10	52	48	37	34	0.075
BS115F	16300	300	80	115	15	82	76	59	53	0.105
BS140F	24400	300	90	140	20	114	104	84	74	0.15
BS165F	44100	300	100	165	34	174	159	118	103	0.16
BS200F	61700	180	100	200	44	263	235	185	157	0.19
BS225F	102000	150	150	225	74	489	439	386	336	1.3
BS250F	147000	135	175	250	93	692	635	556	499	1.4
BS270F	192000	125	200	270	98	889	828	692	631	1.6
BS300F	345000	115	230	300	108	1300	1230	1050	973	1.8
BS360F	489000	100	250	360	157	1870	1750	1580	1460	1.9
BS425F	735000	85	325	425	216	3080	2890	2610	2420	3.5
BS465F	980000	80	350	465	245	3770	3510	3160	2900	4.4

Dimensions

Size	A	B	C	D	E	F	G	H	J	K	L
BS85F	107	210	105	151	106	120	7.5	127	813	76	64
BS95F	107	230	112	161	120	120	4	127	914	102	71
BS115F	127	270	127	181	142	135	4	149	1270	102	71
BS140F	127	320	134	207.5	170	142	4	151	1422	127	76
BS165F	141	360	134	242.5	209	142	4	169	1676	152	91
BS200F	150	430	142	284	251	150	4	178	1829	203	106
BS225F	257	500	203	325	270	268	32.5	293	1981	254	118
BS250F	247	600	229	385	300	272	21.5	283	2083	305	127
BS270F	267	650	254	415	344	280	13	303	2235	305	140
BS300F	278	780	273	490	430	286	6.5	320	2388	381	143
BS360F	292	930	278	585	490	286	4	345	2540	457	152
BS425F	380	1030	396	645	600	404	4	433	2743	508	162
BS465F	410	1090	417	690	600	432	7.5	474	3048	610	184

Model Name Explanation

BS 300 F - 280 J

Model Name
BS: BACKSTOP
300: SIZE
F: F SERIES

Bore Size in mm
280: 280mm H7

Keyway
J: JIS B1301-1996, ISO R773

Recommended Grease

Brand	BS-F Series
Exxon Mobil	Beacon 325

Maintenance Instructions

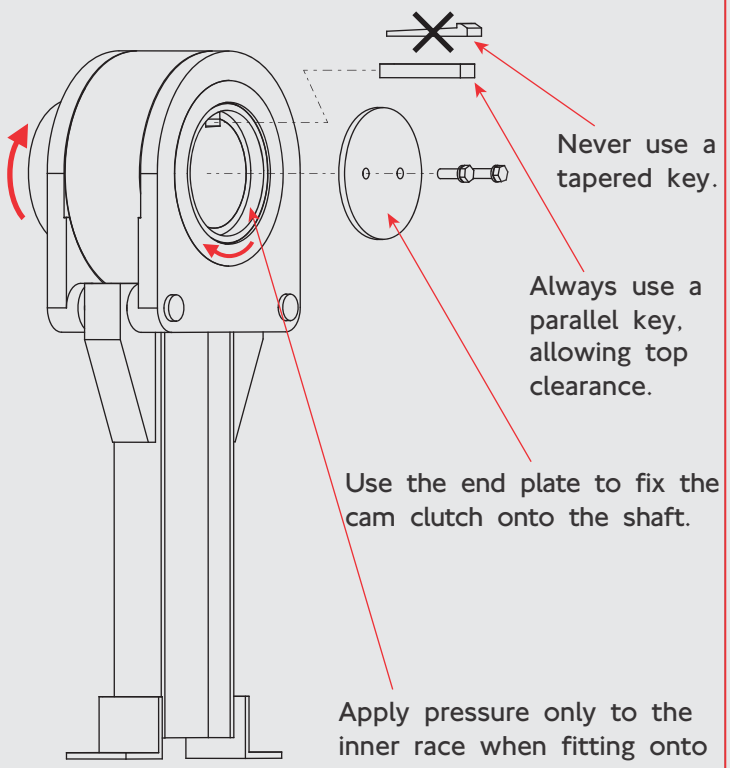
Series		Lubrication	Maintenance
BS-F	85 - 465	Grease	Pre-lubricated with grease. Drain and clean inside of the Backstop and inject new grease, minimum once a year.

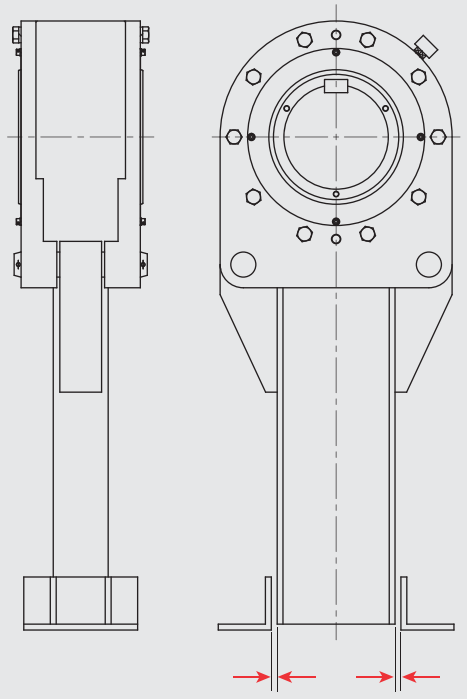
NOTE:

1. Do not use grease that contains EP additives. Tsubaki approved (no EP additives) grease is available from BMG
2. The ambient operating temperature range of the grease listed above is -40°C (-40°F) and +65°C (+149°C). Consult BMG if the temperature is outside of this range.

Installation Guide

- Recommended shaft tolerance is h7 or h8.
- Before installation, verify that the direction of the rotation of the inner race of the BS-F Cam Clutch (shown by the arrow on the end face of the inner race), is the same as the direction of the rotation of the conveyor.
- Securely install the torque arm to the BS-F Cam Clutch using the supplied torque arm pins and cotter pins.
- Apply pressure only on the end-face of the inner race, when inserting the BS-F Cam Clutch on to the shaft. **Do not** hit the inner race directly with a hammer or apply pressure on the side plate, labyrinth plate or bolts.
- Always use a parallel key for installation onto the shaft. Fix the BS-F Cam Clutch to the shaft with the end plate. Never use a tapered key.
- The end of the torque arm will swing to some extent, while the conveyor is operating. (See illustration below). The Cam Clutch will sustain damage if the torque arm tip is fixed securely.
- The key must have a top-clearance to avoid creating internal clearance reduction in the Cam Clutch.





Total clearance should be between 2 to 5 mm.

Backstop Mounting Arrangements

Preventing reverse rotation of inclined or vertical conveyor systems is one of the most common applications for backstops. There are many configurations of conveyors systems that employ backstops. The following information presents the most common types of mountings and provides examples and calculations needed to properly size backstops in order to maximize performance and improve the safety of the conveying systems.

*Suggested arrangement may not meet local design standards, please check local design standards.

Single and Dual Drives

Backstops for low speed overrunning are installed directly on the extended head shaft, as shown in Figure 1 and 2. BMG recommends the single installation of the backstop to prevent the reverse rotation of head shaft.

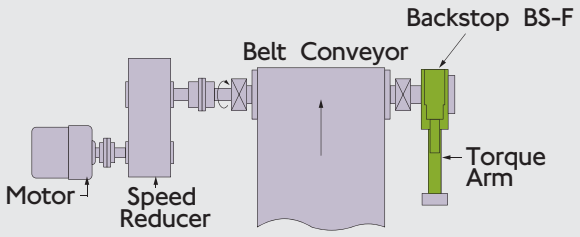


Figure 1

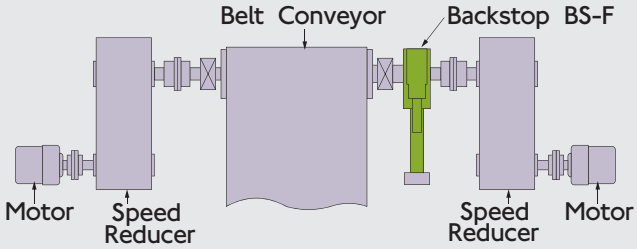


Figure 2

Tandem Drives

When the conveyor arrangement needs a primary and secondary drive, as shown in Figure 3, the backstop on the primary drive unit holds the full load. The backstop on the secondary drive unit holds the back tension from the belt. It keeps belt traction on both conveyor systems. BMG recommends that the backstop, having the torque capacity equal to the sum of the primary and secondary motors, be installed on the primary drive unit.

The backstop for the secondary drive should be sized from secondary drive motors only.

*Suggested arrangement may not meet local design standards, please check local design standards.

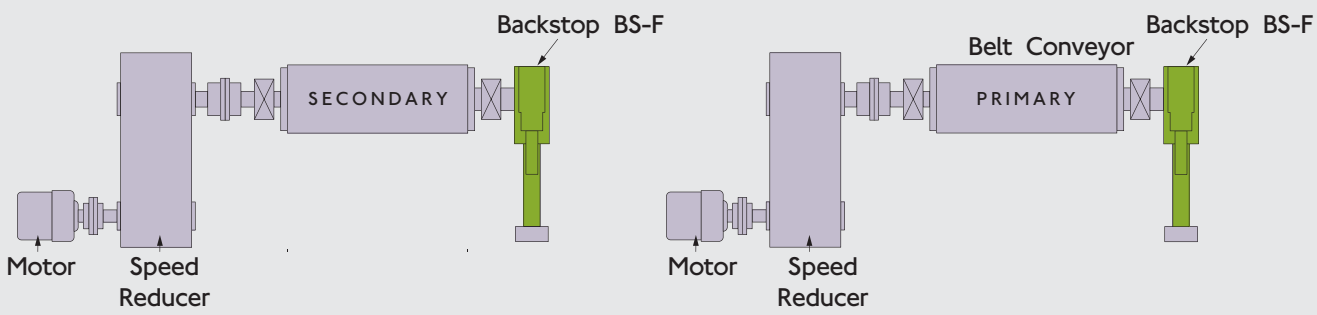


Figure 3

Backstop Size Selection

Service Factor

A backstop operates by stopping a load from moving in a reverse direction.
Torque requirements should be based on maximum or worst case conditions and not on average or normal loads.

Any backstop failure may result in costly damage or injury. Exercise caution when considering possible loads and select appropriate service factors. The backstop needs to be sized to match the breakdown or stalled torque of the drive motors. The following table shows typical service factors to be applied, when selecting backstops.

Required torque for selection = Motor Nominal Torque X Service Factor

Maximum Stalled Torque or Breakdown Torque % of Normal Motor Rating	Service Factor
175%	1.30
200%	1.30
250%	1.67
300%	2.00

Motor Stalled Torque = Motor maximum torque experienced with no shaft rotation

Load Sharing

The backstop has no backlash, two backstops can share the total calculated torque 50% / 50% theoretically. However, we have to consider the "load sharing factor" because load sharing of backstops on conveyors with multiple drives is a key factor.

Dual Drive Application

If the required backstop capacity of dual drive and a single head shaft is in excess of the listed capacity in the brochure, a twin arrangement of backstop Cam Clutches is the solution, as shown in Figure 4. The "Load sharing factor" needs to be considered as well.

In this arrangement, load sharing factor becomes 1.7 for two backstop Cam Clutches. For proper load sharing, the torque arm gap clearance should be reduced to a zero gap, thus no swing of the torque arm before the cams in both backstops prevent the inner race from rolling back.

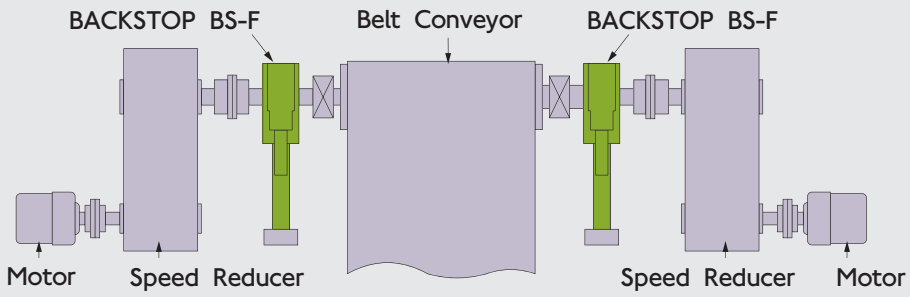


Figure 4

HIGH SPEED BS-F SERIES BACKSTOP

Information for Backstop Torque Selection

Selection Procedure:

1.) Determine the mode of operation.

2.) Refer to the selection procedure corresponding to the mode of operation.

Belt Conveyors (Short inclined yard conveyors):

Selection Procedure:

1.) Calculate the power to move an empty belt and idlers: (P1)

$$P1 = 0.06 \times f \times W \times V \times \frac{\ell + \ell 0}{367} \text{ (kW)}$$

2.) Calculate the power to move a loaded belt horizontally: (P2)

$$P2 = f \times Qt \times \frac{\ell + \ell 0}{367} \text{ (kW)}$$

3.) Calculate the power to move the load vertically: (P3)

$$P3 = \frac{h \times Qt}{367} \text{ (kW)}$$

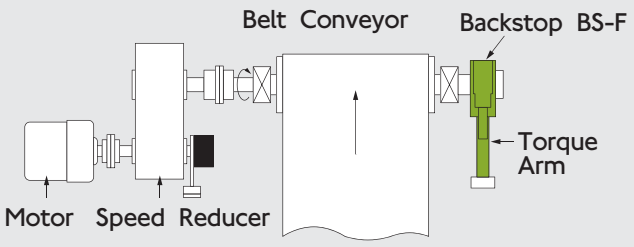
4.) Calculate the back stop power: (Pr)

$$Pr = P3 - 0.7\ (P1 + P2) \text{ (kW)}$$

5.) Calculate the back stop torque: (T)

$$T = \frac{9950 \times Pr}{N} \times SF \text{ (N·m)}$$

6. Select the proper clutch which satisfies the calculated backstop torque.



NOTE:

f = Friction coefficient of rollers
= 0.03 (normally used)

W = Weight of moving parts of the conveyor in the unloaded condition (kg/m)

Use the values from the table below.

Width of Belt (mm)	400	450	500	600	750	900
Estimated Weight: (W)	22.4	28	30	35.5	53	63

Width of Belt (mm)	1050	1200	1400	1600	1800	2000
Estimated Weight: (W)	80	90	112	125	150	160

V = Velocity of conveyor (m / min)
Qt = Max. possible load (tonnes / hour)
h = Total lift (m)
ℓ = Horizontal distance between head pulley and tail pulley (m)
ℓ_0 = Modification coefficient for ℓ
= 49 m (normally used)
N = Shaft speed (r / min) on which the clutch is mounted.
SF = Service factor

Use the values from the table below.

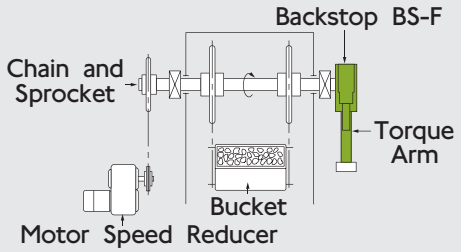
SF	Service Condition
1.5	Several times a day
2.0	More than several times a day

Information for Bucket Elevator Selection

Selection Procedure:

1.) $T = \frac{(L + D) \times Qt \times D \times 9800}{120 \times V} \times SF \text{ (N·m)}$

2.) Select the correct clutch which satisfies the calculated backstop torque (T).



NOTE:

L = Total lift (m)
D = Pitch circle dia. of head sprocket (m)
Qt = Possible maximum load (tons/hour)
V = Velocity of conveyor (m/min)
SF = Service factor

Use the values from the table below.

SF	Service Condition
2.0	One or more times a day

NOTE:

For the conveyor types other than those in the above examples, calculate the backstop torque accordingly. Always allow for the maximum possible load in your calculations, since backstopping often occurs when the conveyor is loaded above its normal loading capacity.

BACKSTOP APPLICATION REQUEST FORM

Date: / /	Name of Contact:
Company Name:	Tel:
Address:	Fax:
	E-mail:

For Belt Conveyor

1. The net weight of the moving parts on the conveyor or the width of the belt.	kg mm
2. Velocity of the conveyor:	m/min
3. Maximum possible load:	tons/hour
4. Total lift:	m
5. Horizontal distance between the head pulley and the tail pulley:	m
6. Modification co-efficient for l = 49 m (normally used):	
7. Shaft speed on which the clutch is mounted:	r/m

For Bucket Elevator

1. Total lift:	
2. Pitch circle dia. of head sprocket:	m
3. Possible max load:	tons/hour
4. Velocity of conveyor:	m/min

For Motor Stall Torque Method

1. Motor name plate:	kW
2. Shaft speed:	r/min
3. Stall torque percentage:	%

Motor:		kW
Horsepower:	HP, at	r/m
Shaft bore:		
Maximum torque at the clutch (excluding SF):		
Clutch oparating time:		hours/day
Ambient temperature:		
Exposed to:	Dirt	
	Other ( )	
Key size:		
Quantity required:		
Power source:	Electric motor	
	Diesel engine	
	Petrol engine	
	Other ( )	

Please provide a layout if available.

NOTES

Be PART

24 HR TOLL-FREE EMERGENCY
BRANCH HELPLINE:
0800 022 224
WEBSITE:
www.bmgworld.net

BMG

An Invicta Holdings Group Company

BEARINGS • SEALS • POWER TRANSMISSION • DRIVES & MOTORS
MATERIALS HANDLING • FASTENERS & TOOLS • HYDRAULICS
PNEUMATICS • FILTRATION • LUBRICATION • VALVES
TECHNICAL RESOURCES • FIELD SERVICES

BEE 4
EMPOWERING SUPPLIER

ISO 9001	Certified
ISO 14001	Certified
ISO 45001	Certified