

## Freewheels - Description

### General Description

Tsubaki's freewheels are market standard freewheels in premium quality, with easy handling and installation. They are very well suited for many applications.

Clamping sprag clutches are precision devices which lock the inner and outer races, through the wedging action of sprags, to transmit torque in one direction of rotation and overrun in the opposite direction (freewheeling or overrunning). The engagement or disengagement is automatic. Their development went through the propeller clutch, the ratchet type (ratchet wheels with ratchet braces), the roller type to the various designs of today's sprag types. Depending on the area of application, they are referred to as overrunning clutches, backstops or indexing freewheels. They can replace complex and expensive clutches in a wide variety of applications and protect equipment.

**General Overrunning:** In one direction of rotation, the clamping acts between the inner ring and outer ring as long as the speed of the two rings remains the same. As soon as the outer ring runs faster than the inner ring, the torque transmission is interrupted (overrunning operation, e.g. at the starter of an internal combustion engine). In the other direction of rotation, torque transmission is also interrupted (No-load operation).

**Backstopping:** A rotary movement is only possible in one direction. Reverse rotation is prevented (e.g. on inclined conveyors to prevent the conveyor belt from running back when the drive is switched off).

**Indexing:** In this operating mode, a recurring reciprocating motion of the drive is converted into a rotary motion with only one direction (e.g. indexed feed).

### Versions / Basic Forms

#### 1. Differentiation according to the method of installation

**Internal freewheel:** Optionally with integrated bearing (ball bearing freewheel) or without bearing. The bearing freewheels are generally ready for installation. In the case of non-bearing freewheels, adequate bearing support, lubrication and sealing must be ensured.

**Integrated freewheel:** Externally mounted, classic backstop for low speeds, with integrated bearing.

#### 2. Differentiation according to the type of sprags

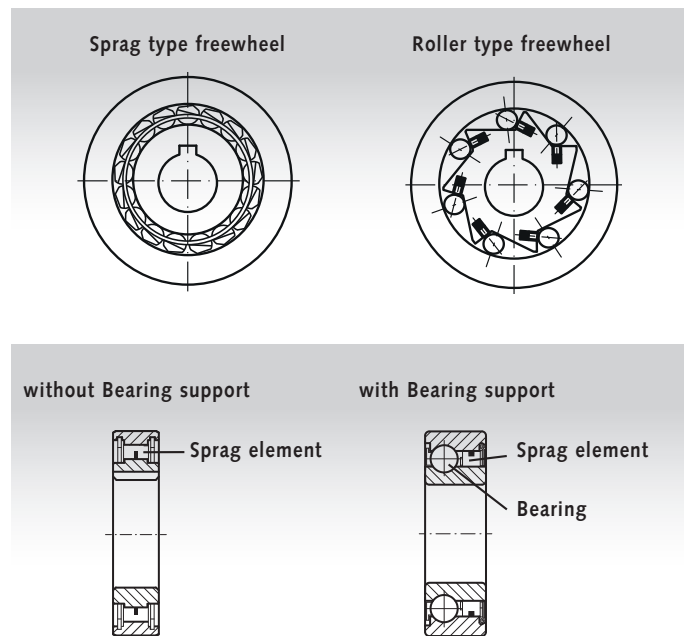
##### Clamping sprag freewheel (catalog version):

Torque transmission between the inner and outer ring is effected via uniformly arranged, asymmetrical sprags. The freewheel locks slip-free. Depending on the requirements of the application, the sprags can be adapted.

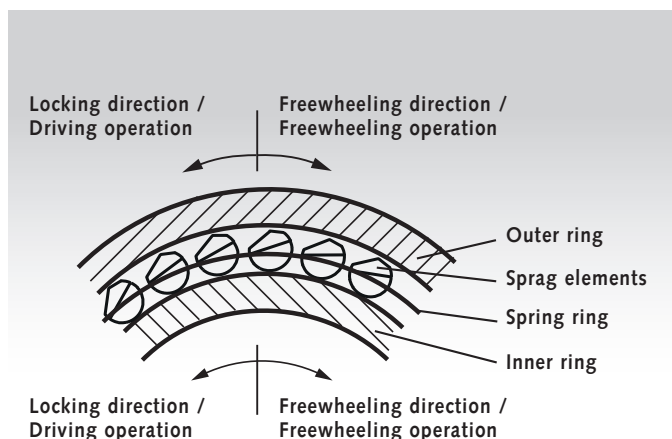
##### Clamping roller freewheel (on request):

Torque is transmitted between the freewheel inner ring and outer ring via several individually sprung cylindrical rollers. The freewheel locks slip-free.

The force transmission between the sprag roller or sprag body and the rings takes place via line contact. With a sprag freewheel, more sprags are possible than rollers with a roller freewheel. Sprag clutches can transmit higher torques than roller clutches.



### Function of the Sprag Freewheel



**Inner ring and Outer ring:** Precision components with hardened and ground sliding surfaces that withstand the compressive loads of sprag engagement and sliding abrasion when overrunning.

**Sprag element:** The regularly intervals sprags act as props or sliders, depending on the direction of rotation of the inner ring and outer ring. This process causes the engagement (clutching) and disengagement (overrunning) of the inner and outer rings.

**Spring ring:** Compressed springs are set at both side of the sprags to ensure that all of the sprags contact the inner and outer races at all times. Thus, the sprags are always ready for immediate engagement. This is important so as to ensure that the load is spread evenly across all sprags when they engage with the inner and outer races.

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### Standard Versions in the Catalogue

#### BB / BB-2GD Side N203:

Sprag freewheels with integrated ball bearings, optionally with or without keyway.  
Lubricated with special grease. Oil lubrication only after consultation.  
In medium/low speed indexing freewheel operation and small feed angle up to 90°, a max. indexing frequency of 100 min<sup>-1</sup> is permissible.

#### TSS / TFS Side N204:

Sprag freewheels without bearing support. Bearing, lubrication and sealing are the responsibility of the user.  
These freewheels should be properly maintained and lubricated to ensure a long service life. The oil must be changed and the freewheel cleaned every 6 months.  
See oil recommendation table below.

#### BSEU Side N205:

Sprag freewheel with additional, integrated rollers. The rollers serve as bearings and ensure continuous lubricant distribution and long service life. Maintenance is usually not required. The design is dust-tight and can be used primarily as a backstop. In very dusty environments and when used outdoors, please consult us.

A big advantage of these sprag freewheels with additional, integrated rollers over other, comparably sized sprag freewheels is the significantly lower heating during freewheeling. This allows optimum lubrication to be achieved for a longer service life. The high torque capacity of the freewheel enables high fatigue strength.

The backstop of the BSEU series can also be used in slow applications as a switching freewheel. The prerequisite is a max. switching frequency of 50 min<sup>-1</sup> and a 2.5-fold safety compared to the working torque.

### Selection Guide

The selection of the correct freewheel depends on several factors. If the torque is known, the freewheel can be selected according to the following criteria:

- Operating mode: Overrunning, indexing or backstopping.
- Internal- or integrated freewheel.
- with or without bearing supports.
- Overrunning speed.
- Shaft-Ø and outer dimension.
- Lubrication and maintenance.

Other versions on request.

Application / Freewheel	BB	BB-2GD	TSS	TFS	BSEU
<b>Overrunning</b>					
High speed overrun, Engage medium speed					
Medium speed overrun, Engage low speed	+	+	+	+	+
Engage in one-way direction, overrun in reverse direction	+	+	+	+	+
Free wheeling	+	+	+	+	
Manual drive	+	+	+	+	
<b>Indexing</b>					
High speed, small feed angle					
Low /medium speed, small feed angle	+	+	+	+	
Low speed, large feed angle					
Backstopping device for indexing	+	+	+	+	
Indexing furnished with stopper / <b>Consultation required</b>					
Infinites variable feed	+	+	+	+	
Single feed					
<b>Backstopping</b>					
Low speed overrun	+	+	+	+	++
Medium speed overrun	+	+	+	+	
High speed overrun	++	++	++		

+ = suitable, ++ = most suitable

### Oil Recommendation for Freewheels TSS / TFS

Brand/ Manufacturer	Overrunning or Backstop Applications		Indexing Applications
	In low speed applications (below 1/3 of maximum overrun speed) or ambient temperature from -10°C to 30°C	In high speed applications (over 1/3 of maximum overrun speed) or ambient temperature from 30°C to 50°C	
Shell	Turbo Oil T32, Rimulla D Oil 10W, Shell New Super ATF, Gelco ATF	Rimulla D Oil 20W/20, Rimulla D Oil 30, White Parrot Super S-3-20W-20, 30	-
Exxon mobil	DTE Oil Light, Multipurpose ATF Delvac Hydraulic 10W, Teresso 32, Esso ATF Multipurpose	Delvac 1330, Essolube XT1 10W-30	Samic Arctic Oil Light
JX Nippon Oil & Energy	FBK Turbine 32, Pan Automatic D2, FBK Oil R032, Diamond Turbine 32, Diamond ATF 2 (N), JOMO Turbine 32, JOMO ATF K	FBK Oil R068, Delster D10W-30, Delster D30	-
Idemitsu Kosan	Daphne Turbine Oil 32, Apolloil ATF-DX	Apolloil Dieselmotive S-320, S-330	Daphne Oil CR10
Cosmo Oil	Cosmo Turbine Super 32, Cosmo ATF (2)	Cosmo Diesel CD20W	-