CKD

SMB-06

Instruction manual

Torque Saver

Overload Protection Device for Index man Output Shaft

TSF Series

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

Fifth Edition

CKD株式会社

In order to use this product safely

Read this before using the product

The torque saver is a device for protecting the Index man from overload.

When designing and constructing equipment using an Index man and torque saver, the manufacturer has an obligation to ensure and check that the safety of the machine mechanism of the device, and the electric system that controls such mechanism is ensured, and to manufacture a safe product.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.

Observe the warnings and precautions to ensure the device's safety.

WARNING: Incorrect handling may result in hazardous conditions that can cause death or serious injury to the user.

CAUTION: Incorrect handling may result in hazardous conditions that can cause minor injury to the user or property damage.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.

All precautions are equally important and must be observed.

If there are special specifications, the product specifications may differ from those described in this manual.

Check each product's specifications.

⚠ WARNING:

- Use within product-specific specifications.
  Use with load exceeding the specifications range may result in damage, operation faults, or inaccurate operation.
- Do not touch any moving parts while the Index man is running.
  Doing so may result in injury.
- Do not stop the input shaft abruptly while the output section is operating.

① If the input shaft is stopped abruptly with the clutch/brake, load torque exceeding the design value may apply causing the torque saver to be released resulting in the table to overrun, which causes serious injury or damage to the entire unit.

② If it should be stopped for emergency to ensure safety, slowly stop it so the torque saver is not released.

- Do not service or inspect the unit while power is being supplied.
  It may suddenly run due to an error or control circuit failure resulting in injury.
- Do not use in an atmosphere where there is a risk of explosion or fire.

⚠ CAUTION:

- The installation of the unit to the machinery should be conducted by a qualified person who has knowledge of machine assembly.
  Incorrect installation may cause injury or damage to the unit.
- Be sure to make the Index man start and stop within a dwell interval.
  If the input shaft is stopped abruptly, load torque exceeding the design value may apply causing the torque saver to be released resulting in the table to overrun, which causes serious injury or damage to the entire unit.
- When the input shaft is equipped with a release detection switch, check its position periodically for any misalignment.
  If there is a misalignment due to a loosened screw, the unit may malfunction resulting in injury.
- Do not use the product in an environment where water or oil may be splashed over the unit.
  This product is not water-proof nor splash-proof. If water or oil is splashed on it, it may malfunction or get damaged.
  If there is water or oil, use a cover or other measures.
- The torque saver is coated with grease. Oil may seep out while it is being used. Conduct periodic inspections and provide countermeasures such as an oil drip pan if this may cause a product defect.

Terms and conditions of warranty

The warranty period and coverage are as follows:

1). Warranty period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.

2). Coverage

In the event that any defect clearly attributable to CKD is found during the warranty period, CKD shall, at its own discretion, repair the defect or replace the relevant product in whole or in part and at no cost, according to its own judgment.

Note however the following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure because durability (number of times, distance, time, etc.) has been exceeded, and failures related to expendable parts.
- Failures not caused by the product.
- Failures caused by use not intended for the product.
- Failures caused by modifications/alterations or repairs carried out with no involvement from CKD.
- Failures caused by things that could not have been foreseen with the level of technology available at the time of delivery.
- Failures resulting from natural disasters or accidents for which CKD is not liable.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

2-1) Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

Contents

Overload protection device for Index man output shaft

TSF Series

Instruction Manual No. SMB-06

Preface

Thank you very much for purchasing CKD's torque saver.
This device is to be mounted to the output shaft of an Index man to protect the Index man from overload.
It ensures high rigidity and accuracy using a simple structure so that the accuracy of the Index man can be utilized.

However, it has many mechanical units, and its handling and maintenance greatly affect the product's performance and life.
Precautions for use and service and inspection items are described below. Please read this Instruction Manual before operating the machine in order to maintain its performance indefinitely and to use it without failure.

1. Unpacking

Make sure that the product is what you ordered.

1) Product model No.

2) Is there any damage caused by any accident during transport?
If any problem such as a missing screw or bent part is found, please contact the business office or distributor from whom you purchased the product.

2. Installation method

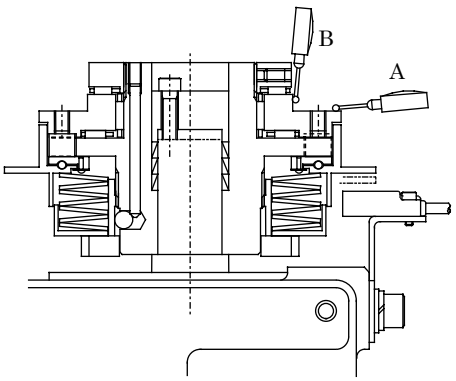
CAUTION: The installation of the unit to the machinery should be conducted by a qualified person who has knowledge of machine assembly. Incorrect installation may cause injury or damage to the unit.

1). TSF Series

(1). The torque saver is normally fixed to the Index man's output shaft with a taper ring before it is shipped. However, if the torque saver is detached due to an adjustment of the machine or other reason, please tighten the taper ring while centering within the following allowances. (Refer to Figure1)

A: End face runout within 0.04 T.I.R
B: Radial runout within 0.04 T.I.R

The tapering ring should be inserted with the inner shaft facing down and the outer shaft facing up.
In addition, in order to obtain sufficient transmission torque, lubricate the taper ring with oil (machine oil can be used) and tighten the hexagon socket set screws and hexagon socket bolts in Figures 2 to 4 evenly according to the tightening torque shown in Table 1.
(Note: The number of taper rings varies depending on the release adjustment range.)



(Figure 1)

(Table 1) Tightening torques for tightening bolts

Tightening bolt	M4 hex socket bolt	M5 hex socket bolt	M6 hex socket bolt	M8 hex socket bolt
Tightening torque (Nm)	3.72	7.5	12.7	34.3

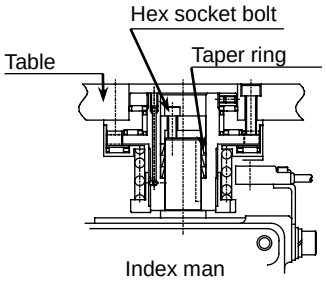


Figure 2 TSF4,5

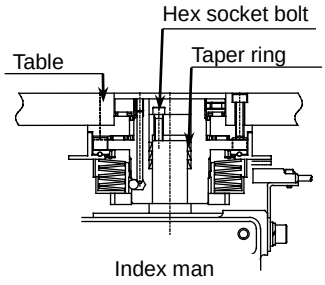


Figure 3 TSF6

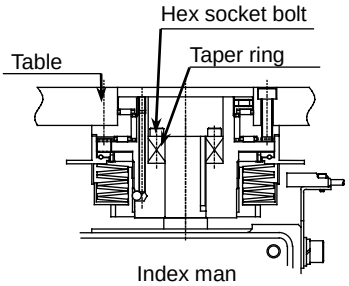
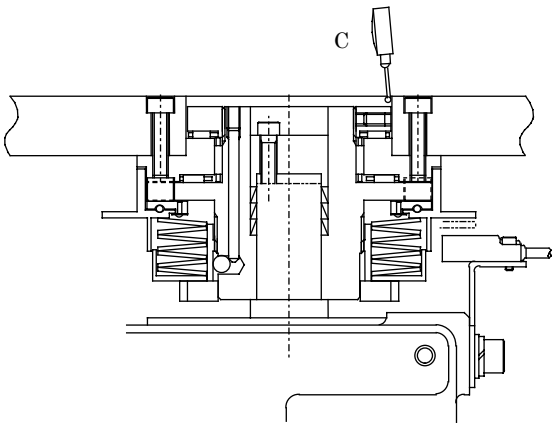


Figure 4 TSF8 to14

(2). When mounting a table, etc. to the drive plate of a torque saver, be aware of the concentricity, etc. (runout of dial gauge C). The larger the eccentricity, the larger the indexing error. (Refer to Figure 5)

(3). When mounting a table, etc. to the drive plate of the torque saver, forcibly hammering it with a hammer, etc. may damage the torque saver and worsen its accuracy.



(Figure 5)

(4). Drive plate tapping depth

When installing a table, etc. on the drive plate of the torque saver, check the tapping depths in Table 2. If you use a bolt that exceeds the depth, it may interfere with the internal parts, and it may not release properly.

Table 2 Torque saver mounting tapping depth

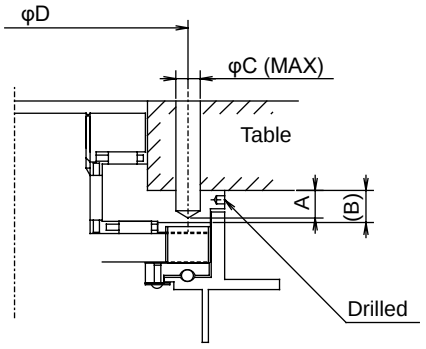
Model No.	TSF4	TSF5	TSF6	TSF8	TSF11	TSF14
Tapping depth	4-M5 depth 4.5	6-M6 depth 7	6-M6 depth 9	6-M8 depth 10	6-M10 depth 15	6-M12 depth 16

(5). Positioning pin drilling

When securing the table with knock pins, observe the dimensions and locations shown in Table 3 and Figures 6 to 9.

Table 3 Positioning pin hole dimensions table

Symbol / Model	A	B	C	D
TSF4	4.5 or less	(5.5)	5	55
TSF5	7 or less	(8.0)	6	75
TSF6	9 or less	(10)	6	100
TSF8	10 or less	(11)	8	120
TSF11	14 or less	(16)	10	150
TSF14	16 or less	(18)	12	180



(Figure 6)

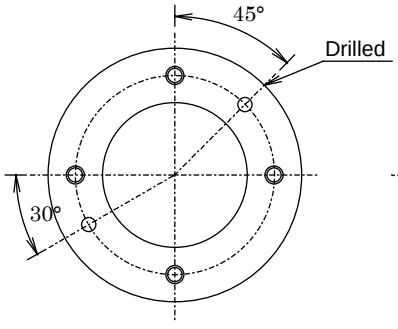


Figure 7 TSF4

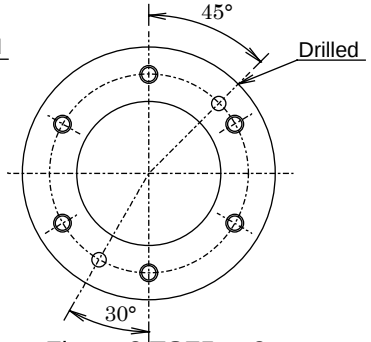


Figure 8 TSF5 to 8

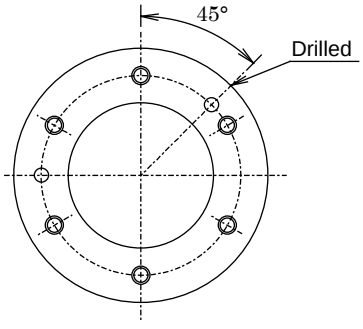


Figure 9 TSF11 to 14

3. Operation preparations

1). If there is a release detection switch

The proximity switch's detection distance may change depending on temperature, voltage, etc. Check that the torque saver release is detected correctly after the device is installed.

2). Release torque

(1). If it is shipped with a mechanical indexer installed and the release torque value is not specified, it will be set to the lowest value in the adjustment range before shipment.
Adjust the release torque when assembling the device.

(2). After adjusting the release torque, check whether it has been adjusted correctly using a torque meter or other device.

(3). If the adjustment nut is tightened beyond the maximum tightness T (Table 4), it may not release during overload.

Table 4 When using TSF

Model		T (mm)	Model		T (mm)
TSF4	A	5.0	TSF8	A	9.0
	B	4.0		B	8.0
	C	6.0		C	8.0
	D	5.5		D	7.0
TSF5	A	10.5	TSF11	A	6.0
	B	8.0		B	5.5
	C	9.0		C	9.0
	D	9.0		D	5.0
TSF6	A	4.0	TSF14	A	6.0
	B	4.5		B	6.0
	C	6.0		C	9.0
	D	5.0		D	7.0

T: Maximum tightness of the adjustment nut from a spring tightness of 0

3). How to adjust the release torque

For the torque saver, the release torque can be adjusted in a stepless manner by turning the adjustment nut.

After adjusting, check that the release torque is correctly adjusted using a torque meter or other device. Use the following procedure while referring to the release torque adjustment ranges and amounts of torque change per revolution of the adjustment nut shown in Table 5.

(1) Determine the actual load torque Te of the Index man.

(2) Determine the release torque Taj. (Taj = Te x 1.3)

Loosen the lock pin on the end face of the drive boss and the hex socket bolts (2 bolts) on the side of the adjustment nut. (TSF5 to 14)

(3) Adjustment nut

Tighten the adjustment nut according to the amount of torque change per revolution (Table 5).

(4) Check that the adjustment is correct using a torque meter or other device.

(5) Securely fasten the adjustment nut.

Tighten the lock pin on the end face of the drive boss and the hex socket bolt on the side of the adjustment nut. (TSF5 to 14)

Table 5 Amount of torque change per adjustment nut revolution by model

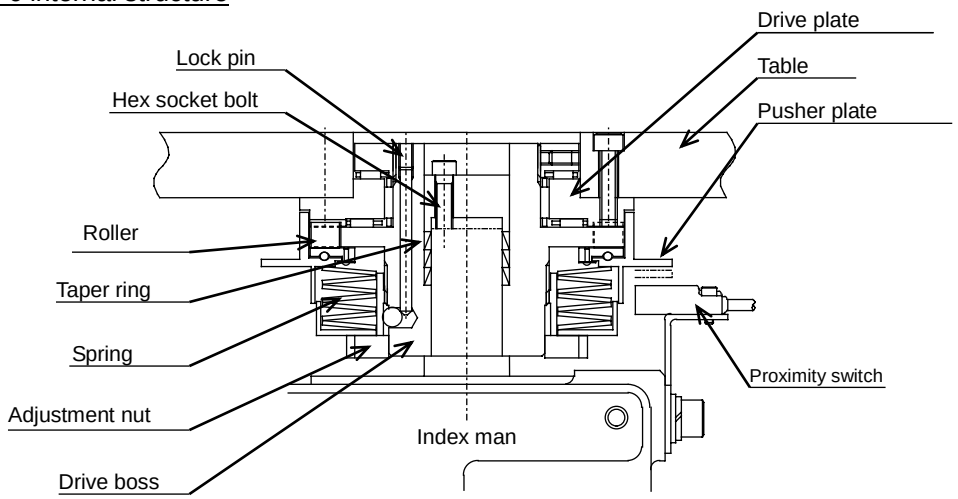
Model	Release torque adjustment range (N·m)		Amount of torque change per adjustment nut revolution (N·m)	Model	Release torque adjustment range (N·m)		Amount of torque change per adjustment nut revolution (N·m)
TSF4	A	1.47 to 4.91	1.47	TSF8	A	29.4 to 88.3	19.6
	B	1.96 to 7.85	2.94		B	49.1 to 147	37.3
	C	2.94 to 12.8	3.24		C	88.3 to 294	74.6
	D	5.40 to 21.6	5.89		D	147 to 441	98.1
TSF5	A	2.94 to 7.85	1.18	TSF11	A	68.7 to 196	64.7
	B	3.92 to 11.8	2.26		B	88.3 to 294	108
	C	9.81 to 29.4	4.91		C	216 to 589	128
	D	19.6 to 58.9	9.81		D	294 to 1180	275
TSF6	A	9.81 to 29.4	14.7	TSF14	A	98.1 to 294	98.1
	B	19.6 to 58.9	26.5		B	147 to 441	147
	C	39.2 to 118	39.2		C	392 to 1180	265
	D	58.9 to 177	70.6		D	589 to 1860	451

4. Proper usage

1). Description of the operation

The release torque is adjusted by changing the pressure of the spring with the adjustment nut. When the table has an overload exceeding the load of the release torque, the spring's pressure will cause the roller held by the drive plate groove to fly out, and the transferred torque from the output shaft will be cut off. In this case, the pusher plate can move and be detected using a proximity switch, etc. After removing the overload, manually rotate the table to make it automatically return to its original location. (Refer to Figure 10)

TSF6 internal structure



(Figure 10)

2). Proper usage

WARNING: Use within product-specific specifications.
Use with load exceeding the specifications range may result in damage, operation faults, or inaccurate operation.

WARNING: Do not touch any moving parts while the Index man is running.
Doing so may result in injury.

WARNING: Do not stop the input shaft abruptly while the output section is operating.
① If the input shaft is stopped abruptly with the clutch/brake, load torque exceeding the design value may apply causing the torque saver to be released resulting in the table to overrun, which causes serious injury or damage to the entire unit.
② If it should be stopped for emergency to ensure safety, slowly stop it so the torque saver is not released.

CAUTION: Be sure to make the Index man start and stop within a dwell interval.
If the input shaft is stopped abruptly, load torque exceeding the design value may apply causing the torque saver to be released resulting in the table to overrun, which causes serious injury or damage to the entire unit.

(1). Return after release

When the torque saver is released, restore the torque saver by manually rotating the table slowly.

The Index man's cam may stop at the indexing section's location.

In the same manner, manually rotate the Index man slowly so the cam revolves to a dwell interval.

WARNING: Do not use in an atmosphere where there is a risk of explosion or fire.

CAUTION: Do not use the product in an environment where water or oil may be splashed over the unit.
The Index man is not water-proof nor splash-proof. If water or oil is splashed on it, it may malfunction or get damaged.
If there is water or oil, use a cover or other measures.

5. Maintenance

WARNING: Do not service or inspect the unit while power is being supplied. It may suddenly run due to an error or control circuit failure resulting in injury.

CAUTION: When the input shaft is equipped with a release detection switch, check its position periodically for any misalignment.
If there is a misalignment due to a loosened screw, the unit may malfunction resulting in injury.

CAUTION: The torque saver is coated with grease. Oil may seep out while being used. Conduct periodic inspections and provide countermeasures such as an oil drip pan if this may cause a product defect.

6. Failures and measures

Event			Measures
There is a shock to the rotating table	Torque saver body	Problem with release torque value	Adjust the release torque.
		Adjustment nut is loose	Check and tighten the mounting screws.
		Large amount of motion is lost	Replace or contact CKD.
		Load torque over	Reconsider the torque saver model No.
	Index man body	There is no shock at lower input shaft revolving speeds.	Output shaft torque is excessive. Reconsider the Index man unit model No.
		Same as above. Continuous shock.	Applied torque or driving system may have a problem. Contact CKD for help.
		Internal unusual sound or temperature rise is suspected.	Internal damage is suspected. Contact CKD for replacement of the mechanical indexer. Replace the Index man.
	Index man driveline	Refer to the Index man Instruction Manual.	
The stop position is wrong	Torque saver body	Torque saver fastening slips	TSF: Check and tighten the taper ring tightening screws.
		Faulty mounting and centering	Adjust the mounting.
		Poor repeatability when releasing	Replace or contact CKD.
		Large amount of motion is lost	Replace or contact CKD.
	Method of mounting subsidiary table	Insufficient tightening torque or loose knock pins	Check and tighten.
	Method of fixing the Index man body	Incomplete mounting and tightening	Firmly secure.
	Index man body	Unusual load	Calculate applied torque and contact CKD for countermeasures.
Torque saver does not release (switch does not detect)	Torque saver body	Torque saver body internal fault	Replace or contact CKD.
		Wrong torque setting	Adjust the torque setting.
		Interference by table mounting bolts	Replace it with a bolt with the specified length.
	Switch section	Broken switch	Replace the switch
		Faulty switch mounting	Adjust the switch's mounting position and check the mounting screws to see if they need to be tightened more.

7. Disposal

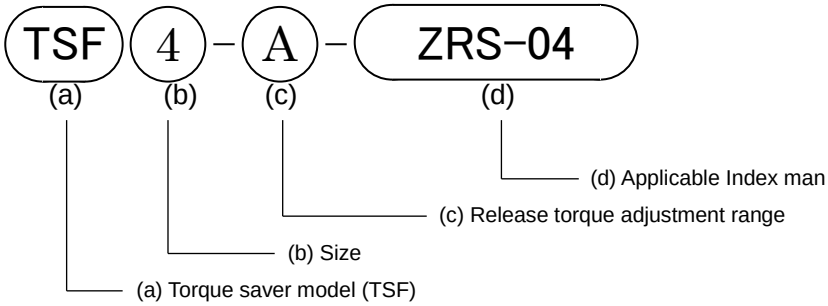
Metal, rubber, and lubricant are used for this product.

Since this product cannot be burned, it must be disposed as industrial waste.

8. Product specifications

1) Product model No.

(Example)



(a) (b) Models and sizes	(c) Release torque adjustment range	(d) Applicable Index man
TSF4 TSF5 TSF6 TSF8 TSF11 TSF14	A B C D	Refer to Table 6 for the applicable Index mans

Table 6. Applicable Index man table

● Standard type
(Roller gear cam)

Applicable Index man		Torque saver	Name plate model No.
RGIS	040	TSF4	TSF4-□-RGIS040
		TSF5	TSF5-□-RGIS040
	050	TSF5	TSF5-□-RGIS050
		TSF6	TSF6-□-RGIS050
	063	TSF6	TSF6-□-RGIS063
	080	TSF8	TSF8-□-RGIS080
	110	TSF11	TSF11-□-RGIS110
	140	TSF14	TSF14-□-RGIS140
ZRS	04	TSF4	TSF4-□-ZRS-04
		TSF5	TSF5-□-ZRS-04
	05	TSF5	TSF5-□-ZRS-05
		TSF6	TSF6-□-ZRS-05
	06	TSF6	TSF6-□-ZRS-06
	08	TSF8	TSF8-□-ZRS-08
	11	TSF11	TSF11-□-ZRS-11
	14	TSF14	TSF14-□-ZRS-14

● Standard type
(Parallel cam)

Applicable Index man		Torque saver	Name plate model No.
PCIS	040	TSF4	TSF4-□-PCIS040
	050	TSF5	TSF5-□-PCIS050
	063	TSF5	TSF5-□-RGIS050
		TSF6	TSF6-□-RGIS050
	080	TSF6	TSF6-□-RGIS063
	100	TSF8	TSF8-□-RGIS080
	125	TSF11	TSF11-□-RGIS110

CAUTION
The applicable Index mans on the TSF nameplate are uniformly labeled as "RGIS□□□" or "ZRS-□□" depending on the shaft hole diameter, so they may differ from the Index mans to be mounted.

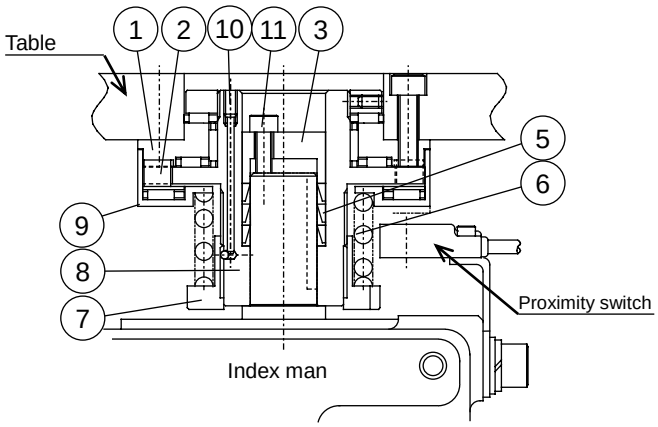
2). Characteristics table

(1). TSF Series

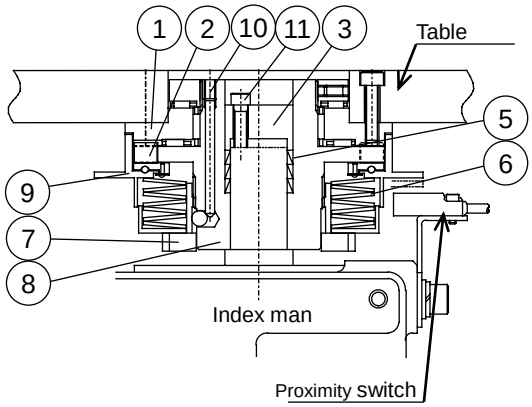
Model	Release adjustment Range (Nm)		Allowable thrust force (N)	Allowable radial Force (N)	Allowable bending Moment force (N)	Moment of inertia ($kg \cdot m^2$)	Mass (kg)	Amount of torque change per adjustment nut revolution (N·m)
TSF4	A	1.47 to 4.91	392	196	9.81	2.65×10^{-4}	0.56	1.47
	B	1.96 to 7.85						2.94
	C	2.94 to 12.8						3.24
	D	5.40 to 21.6						5.89
TSF5	A	2.94 to 7.85	7850	3430	147	1.01×10^{-3}	1.34	1.18
	B	3.92 to 11.8						2.26
	C	9.81 to 29.4						4.91
	D	19.6 to 58.9						9.81
TSF6	A	9.81 to 29.4	9810	6870	196	5.47×10^{-3}	3.7	14.7
	B	19.6 to 58.9						26.5
	C	39.2 to 118						39.2
	D	58.9 to 177						70.6
TSF8	A	29.4 to 88.3	14700	9810	392	1.42×10^{-2}	6.6	19.6
	B	49.1 to 147						37.3
	C	88.3 to 294						74.6
	D	147 to 441						98.1
TSF11	A	68.7 to 196	21600	14700	687	3.74×10^{-2}	11.8	64.7
	B	88.3 to 294						108
	C	216 to 589						128
	D	294 to 1180						275
TSF14	A	98.1 to 294	28400	23500	981	9.10×10^{-2}	19.8	98.1
	B	147 to 441						147
	C	392 to 1180						265
	D	589 to 1860						451

9. Internal structure drawings

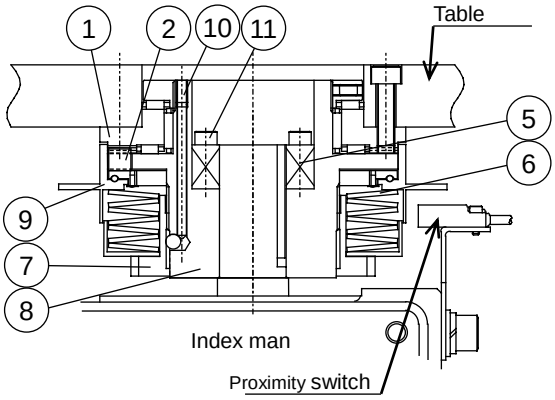
TSF4 to 5



TSF6



TSF8 to 14



Part No.	Part name	Part No.	Part name
1	Drive plate	8	Drive boss
2	Roller	9	Pusher plate
3	Spannling presser	10	Lock pin
4	Hexagon socket set screw	11	Hex socket bolt
5	Taper ring	12	Hex socket bolt
6	Spring	13	Hexagon socket set screw
7	Adjustment nut		

10. Miscellaneous

The device can continue to operate normally if the above precautions are observed.

If any malfunction occurs, check the product model number (refer to 8.1) before contacting the nearest business office or distributor to request repair.

Contact CKD if there is anything suspicious while handling the device.