Innovation in Motion
TSUBAKI

TSUBAKI EMERSON
SAFCON
Overload protection and control devices

Safety

Safety devices for protecting machinery from potentially damaging mechanical and electrical overload.
Both mechanical and electrical types are available.

Creating device safety and control

From safety mechanisms like Torque Limiters, Torque Guards and Shock Relays, to controlling devices like Torque Keepers and Shock Monitors, SAFCON provides your vital machinery with top-notch safety and control.

Control

Contributing to device automation.

Torque Limiter
Friction type

Torque Guard
Separation type

Axial Guard
Linear actuating type

Shock Relay
Current type

New model

Shock Relay
ED Series
Digital type

Ministry of Economy, Trade and Industry picks for Good Design Award product

SAFCON

Tsubaki Emerson Safety and Control devices

Torque Keeper
Mechanical type slipping clutch and brake

MINI-KEEPER
Mechanical type slipping clutch and brake

Shock Monitor
Electric type overload protection device and load sensor

Ministry of Economy, Trade and Industry picks for Good Design Award product

Variation

Safety

Overload Protection

Mechanical type

What it detects

- Torque
  - **Disconnection (trip) method**: Ball type
    - **Reset after trip**: Automatic
      - **Construction**: Open
        - **One position reset**: YES
          - **Backlash**: YES → Select by trip torque → **Torque Guard**
            - **Torque Guard TGB Series** — Set torque:0.294～7154Nm / Max. rpm:80～1200r/min / Consecutive repeated trip torque fluctuation:±10% / Backlash:±0.3°  P15
            - **Torque Guard TGX Series** — Set torque:1.7～784Nm / Max. rpm:480～1400r/min / Consecutive repeated trip torque fluctuation:±3% / Backlash:0  P31
          - **Backlash**: NO → Select by trip torque → **Torque Guard**
            - **Torque Guard TGM Series** — Set torque:1.5～902Nm / Max. rpm:150～600r/min / Consecutive repeated trip torque fluctuation:±5% / Backlash:0  P41
            - **Torque Guard TGZ Series** — Set torque:2.4～251Nm / Max. rpm:1800r/min / Consecutive repeated trip torque fluctuation:±10% / Backlash:±0.3°  P49
      - **Construction**: Sealed
        - **One position reset**: YES
          - **Backlash**: NO → Select by trip torque → **Torque Guard**
            - **Torque Guard TGX Series** — Set torque:1.7～784Nm / Max. rpm:480～1400r/min / Consecutive repeated trip torque fluctuation:±3% / Backlash:0 P31
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    - **Reset after trip**: Manual
      - **Construction**: Sealed
        - **One position reset**: YES
          - **Backlash**: NO → Select by trip torque → **Torque Guard**
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            - **Torque Guard TGZ Series** — Set torque:2.4～251Nm / Max. rpm:1800r/min / Consecutive repeated trip torque fluctuation:±10% / Backlash:±0.3° P49
  - **Ball type**
    - **Reset after trip**: Automatic
      - **Construction**: Open
        - **One position reset**: NO
          - **Backlash**: NO → Select by trip torque → **Torque Limiter**
            - **Torque Limiter** — Set torque:1.0～9310Nm / Max. rpm:500～1800r/min  P57
      - **Construction**: Sealed
        - **One position reset**: NO
          - **Backlash**: NO → Select by trip torque → **Torque Limiter**
            - **Torque Limiter** — Set torque:1.0～9310Nm / Max. rpm:500～1800r/min P57
    - **Reset after trip**: Manual
      - **Construction**: Sealed
        - **One position reset**: NO
          - **Backlash**: NO → Select by trip torque → **Torque Limiter**
            - **Torque Limiter** — Set torque:1.0～9310Nm / Max. rpm:500～1800r/min P57
      - **Construction**: Open
        - **One position reset**: NO
          - **Backlash**: NO → Select by trip torque → **Torque Limiter**
            - **Torque Limiter** — Set torque:1.0～9310Nm / Max. rpm:500～1800r/min P57
  - **Thrust Load**
    - **Disconnection (trip) method**: Ball type
      - **Reset after trip**: Automatic
        - **Construction**: Open
          - **One position reset**: YES
            - **Backlash**: YES → Select by trip load → **Axial Guard**
              - **Axial Guard** — Set load:147～3430N / Trip load repeatability:±15% / Backlash:0  P67
        - **Construction**: Sealed
          - **One position reset**: YES
            - **Backlash**: YES → Select by trip load → **Axial Guard**
              - **Axial Guard** — Set load:147～3430N / Trip load repeatability:±15% / Backlash:0 P67
      - **Reset after trip**: Manual
        - **Construction**: Sealed
          - **One position reset**: YES
            - **Backlash**: YES → Select by trip load → **Axial Guard**
              - **Axial Guard** — Set load:147～3430N / Trip load repeatability:±15% / Backlash:0 P67
        - **Construction**: Open
          - **One position reset**: YES
            - **Backlash**: YES → Select by trip load → **Axial Guard**
              - **Axial Guard** — Set load:147～3430N / Trip load repeatability:±15% / Backlash:0 P67

Motor current

Display function

- YES
  - **Display method**: Digital display
    - **Functions**: Standard functions
      - Select by motor capacity → **Shock Relay**
        - **Shock Relay ED Series** — Motor capacity: AC200V0.1～5.5kW / AC400V0.1～11kW  P83
        - **Shock Relay SD Series** — Motor capacity: AC200V0.1～11kW / AC400V0.2～22kW  P86
    - **Functions**: Multi-functions
      - Select by motor capacity → **Shock Relay**
        - **Shock Relay 150 Series** — Motor capacity: AC200V0.2～90kW / AC400V0.2～90kW  P89
        - **Shock Relay SD Series** — Motor capacity: AC200V0.1～11kW / AC400V0.2～22kW P86
  - **Display method**: Analog display
    - **Functions**: Standard functions
      - Select by motor capacity → **Shock Relay**
        - **Shock Relay ED Series** — Motor capacity: AC200V0.1～5.5kW / AC400V0.1～11kW P83
        - **Shock Relay 150 Series** — Motor capacity: AC200V0.2～90kW / AC400V0.2～90kW P89
    - **Functions**: Multi-functions
      - Select by motor capacity → **Shock Relay**
        - **Shock Relay SD Series** — Motor capacity: AC200V0.1～11kW / AC400V0.2～22kW P86
        - **Shock Relay SS Series** — Motor capacity: AC200V0.1～75kW / AC400V0.2～132kW  P93
  - **Display method**: Manual
    - **Functions**: Standard functions
      - Select by motor capacity → **Shock Relay**
        - **Shock Relay ED Series** — Motor capacity: AC200V0.1～5.5kW / AC400V0.1～11kW P83
        - **Shock Relay 150 Series** — Motor capacity: AC200V0.2～90kW / AC400V0.2～90kW P89
    - **Functions**: Multi-functions
      - Select by motor capacity → **Shock Relay**
        - **Shock Relay SD Series** — Motor capacity: AC200V0.1～11kW / AC400V0.2～22kW P86
        - **Shock Relay SS Series** — Motor capacity: AC200V0.1～75kW / AC400V0.2～132kW P93

Control

Slipping clutch and brake

Mechanical type

What it detects

Torque

Slip torque

Large / Small

Select by slip torque

Torque Keeper TFK Series
Set torque:
0.59~650Nm

P103

MINI-KEEPER MK Series
Set torque:1.96~39.2N·cm

P115

Power sensor

Electrical type

What it detects

Motor power

Purpose of use

Contact detection / Wear detection / Crusher control

Select by motor capacity

Shock Monitor TSM3000M1 Type
Motor capacity:
AC200V0.1~110kW
AC400V0.1~110kW

P124

Shock Monitor TSM3000C1 Type
Motor capacity:
AC200V0.1~110kW
AC400V0.1~110kW

P126

Shock Monitor TSM3000M2 Type
Motor capacity:
AC200V0.1~110kW
AC400V0.1~110kW

P125

Electrical type

What it detects

Motor power

Load detection level

NO / Fixed / Follow

Reset after trip

Function

Automatic

Multi-functions / Limited functions

Functions

Standard functions / Limited functions

Motor capacity

0.2~3.7kW / 0.06~0.2kW

Select by motor capacity

Shock Relay 50 Series
Motor capacity:
AC200V0.2~3.7kW
AC400V0.2~3.7kW

P99

Shock Monitor TSM3000 Type
Motor capacity:
AC200V0.1~110kW
AC400V0.1~110kW

P122

Shock Monitor TSM3000H2 Type
Motor capacity:
AC200V0.1~110kW
AC400V0.1~110kW

P123

Shock Relay SA Series
Motor capacity:
AC200V0.1~75kW
AC400V0.2~132kW

P96

Shock Relay SM Series
Motor capacity:
Three-phase:AC200V60~200W
Single-phase:AC200V60~200W
Single-phase:AC100V25~90W

P101

Shock Monitor TSM3000H1Type
Motor capacity:
AC200V0.1~110kW
AC400V0.1~110kW

P122

SAFCON contributes to the protection and control

Starting with the examples below, SAFCON meets a wide range of industrial equipment safety and control needs.

Selection guide

Safety

Category	Machine (Safety or Control)		Protection, detection, applications	Torque Guard TGB Series	Torque Guard TGX Series	Torque Guard TGM Series	Torque Guard TGZ Series	Torque Limiter	Axial Guard TGA Series
									
	Page			P15	P31	P41	P49	P57	P67
Transport equipment	Crane	S	Overload protection for machine overload, jamming, etc.					◉	
	Hoist	S	Overload protection for machine overload, jamming, etc.					●	
	Chain block	S	Overload protection for machine overload, jamming, etc.					●	
	Overhead conveyor	S	Chain breakage protection					●	
	Belt conveyor	S	Belt breakage protection	●		●		◉	
	Chain conveyor	S	Chain breakage protection	●		●		◉	
	Roller conveyor	S	Roller axis damage protection	●		●		◉	
	Screw conveyor	S	Screw damage protection					●	
	Bucket elevator	S	Prevents chain breakage due to bucket jamming					●	
	Industrial robot	S	Drive portion, pivot portion overload protection		◉				◉
Environmental equipment	Garbage disposal equipment	S	Overload protection for garbage conveyor					●	
	Water treatment equipment	S	Overload protection due to chain breakage for scraper and dust collector					●	
	Water gate	S	Gate and rack damage protection	◉					
Pump	Pump	S	Motor protection			●			
	Compressor	S	Motor protection			●			
	Blower	S	Motor protection						
Packaging machine	Bag making and filling machine	S	Overload protection for film feeding and seal/pillow packaging machine cutter	◉	◉	●		●	◉
	Cartoning machine	S	Overload protection for workpiece conveyor and packaging equipment	◉	◉			●	
	Vacuum packaging machine	S	Overload protection for workpiece conveyor and packaging equipment	◉	◉	●		●	
Food processing machine	Flour mill	S	Overload protection for milling, mixing and sifting machine	●		◉		●	
	Noodle-making machine	S	Overload protection for mixer and roller/extruder	●		◉		●	
	Bakery equipment	S	Prevents chain breakage for fermentation oven and cooler	●		●		●	
	Beverages	S	Overload protection for bottle/can conveyor and dehydrating press	●		●		●	●
Machine tools	Turning machine	C	Tip breakage detection						
	Machining	C	Drill wear detection						
	Grinding machine	C	Grinding stone contact detection						
	Tapping machine	C	Tap breakage detection						
	Cutter	C	Saw contact detection						
	Chip conveyor	S	Prevents damage due to jammed chips					●	
Metalworking machinery	Press	S	Punch and transfer portion protection	●	◉				◉
	Casting	S	Overload protection for conveyor unit	●				◉	
Iron and steel	Rolling machine	S	Overload protection for conveyor unit					●	
Plastic processing machines	Injection molding machine	S	Screw, mold clamping protection		●	●	●		
	Extruding machine	S	Screw, gear protection		●	●	●		
Textile machines	Spinning machine	C	Winding-off portion tension control						
	Textile weaving loom	C	Winding portion tension control			●			
Printing machines	Printing machine	C	Printed material tension control						
	Book binder	S	Protects pressure portion and conveyor from overload damage	●	●		●	●	●
IT	Printer	C	Printed material tension control						
	Liquid crystal manufacturing device	S	Conveyor unit overload protection	●	●			●	
	Semiconductor production device	S	Conveyor unit overload protection	●	●			●	
Others	Crusher	S	Crusher blade protection				●	●	
	Raw garbage processor	S	Mixing blade damage protection	●				●	
	Mixer	S	Mixing blade damage protection					●	
	Kneading machine	S	Mixing blade damage protection					●	
	Feeder	S	Workpiece jamming detection						
	Stage device	S	Floor mechanism overload protection						
	Lighting system	S	Overweight detection for lifting devices						

# of a wide range of industrial equipment

◉:Optimal ●:Recommended

Control

	Shock Relay						Shock Monitor			Torque Keeper	Mini Keeper	Shock Monitor		
	ED Series	SD Series	150 Series	SS Series	SA Series	SM Series	TSM3000 Type	TSM3000 H1 Type	TSM3000 H2 Type	TFK Series	MK Series	TSM3000 M1 Type	TSM3000 M2 Type	TSM3000 C1 Type
														
	P83	P86	P89	P93	P96	P101	P122	P122	P123	P103	P115	P124	P125	P126
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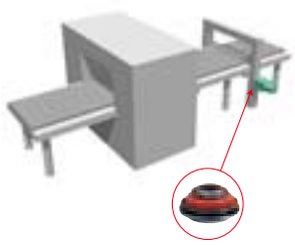
Application Safety

Providing optimal overload protection

Tsubaki Emerson mechanical and electrical safety devices provide overload protection for various applications.

Packaging machine

Cutter drive portion overload protection



TEM product used

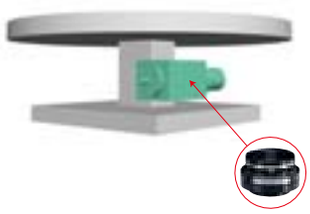
Torque Guard TGB Series P15

Features

- Automatic reset
- Trip torque repeatability ±10%
- Economical

Index table

Indexer protection



TEM product used

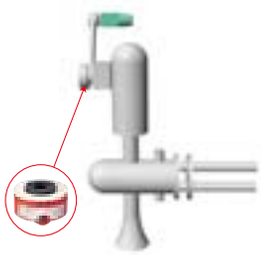
Torque Guard TGX Series P31

Features

- Non-backlash
- Automatic reset
- One position
- Precise trip torque (±3%)

Pump

Protects the pump from highly viscous material



TEM product used

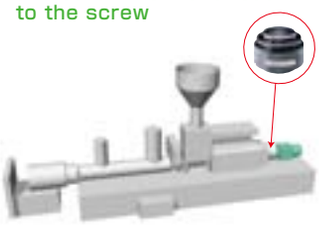
Torque Guard TGM Series P41

Features

- Sealed construction
- One position

Extruding machine

Trips to protect the machine and screw from overload to the screw



TEM product used

Torque Guard TGZ Series P49

Features

- Works with high rpm
- Rotates freely after trip

Conveyor

Protects the machine from overload due to jamming

TEM product used

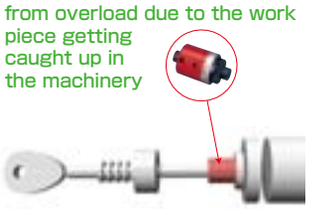
Torque Limiter P57

Features

- Automatic reset
- The sprocket can be directly mounted, making it easy to use

Pusher

Protects the mechanical system from overload due to the work piece getting caught up in the machinery



TEM product used

Axial Guard P67

Features

- Can protect from overload on the axial direction

Lifting and lowering device

Detects overweight

TEM product used

NEW
Shock Relay ED Series P83

Features

- While verifying motor current during operation, the load value can be precisely set on the digital display
- Economical

Overhead conveyor

Prevents chain breakage

TEM product used

Shock Relay SD Series P86

Features

- Motor current can be verified on the digital display during operation
- Warning output

Mechanical type features

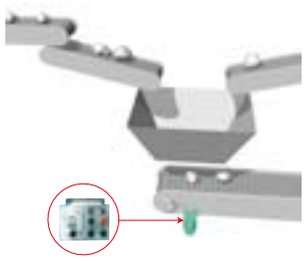
Due to cutting the peak load, overload does not occur.
Excessive power to the loaded axis can be shut off.

Electronic type features

All models are equipped with the start time function.
Price stays same regardless of motor size.

Waste treatment plant, transfer conveyors

Overload protection



TEM product used

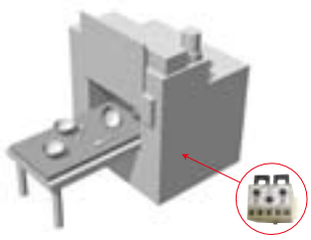
Shock Relay 150 Series P89

Features

- Current can be verified using an analog meter
- Easy to set

Dishwasher

Stops overload when spoons or other utensils get jammed in the machine.



TEM product used

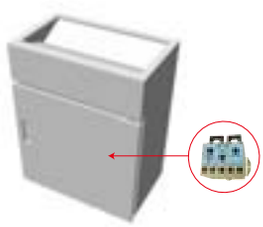
Shock Relay SS Series P93

Features

- Compact and economical

Shredder

Temporarily stops the shredder when the load becomes heavy



TEM product used

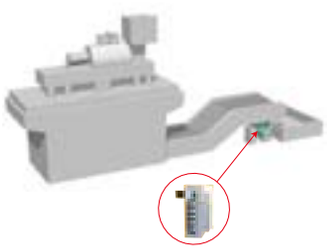
Shock Relay SA Series P96

Features

- Makes frequent stops
- Convenient automatic reset
- Compact
- Economical

Chip conveyor

Detects chip jams



TEM product used

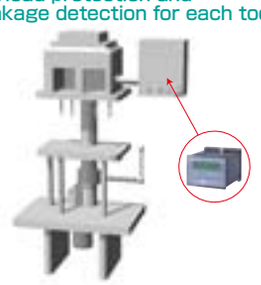
Shock Relay SM Series P101

Features

- Simple to set current value
- Economical

Multi-spindle drilling machine

Overload protection and breakage detection for each tool



TEM product used

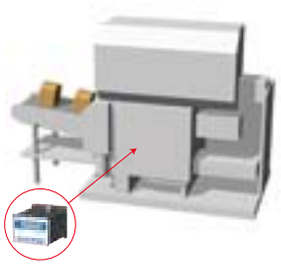
Shock Monitor TSM3000 Type P122

Features

- Detects overload and tool breakage when machining with high precision
- The set value for each tool can be changed (8 types)

Bread making machine

Prevents oven chain breakage



TEM product used

Shock Monitor TSM3000H1 Type P122

Features

- Accurately detects overload to protect your valuable machines from damage

Water treatment equipment

Sewage collector chain breakage prevention

TEM product used

Shock Monitor TSM3000H2 Type P123

Features

- Because of the load following function, the set value can be followed and abnormal load can be detected precisely even if there is a small efficiency change in the high gear ratio reducer

Safety and Control devices
SAFCON

Application Control

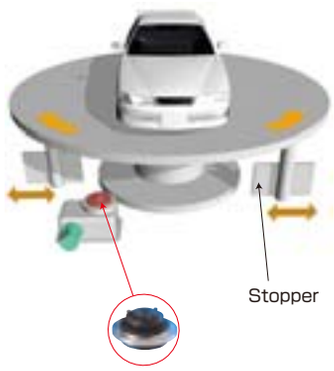
For controlling devices

Slipping clutch and brake

Because it is possible to use even with continuous slipping, it is ideal for braking, accumulation and dragging.

Multistory parking facility

When the table strikes the stopper and stops, the Torque Keeper slips, protecting the drive portion.



TEM product used

Torque Keeper
TFK Series
P103

Features

- Stable slip torque
- Long life
- Simple layout

Wire winding machine

By installing a MINI-KEEPER to the roll, constant tension allows the wire to wind smoothly

TEM product used

MINI-KEEPER
MK Series
P115

Features

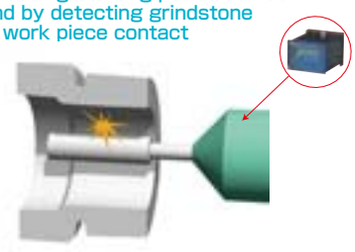
- Continuous slip is possible
- Gives ideal amount of tension for the work piece

Power sensor

Preventitive device maintenance and automation can be realised by detecting minute overload variation for grindstone work piece contacts, tool wear, crusher automatic operation, etc.

Internal grinding machine

The grinding cycle and grindstone processing starting points can be found by detecting grindstone and work piece contact



TEM product used

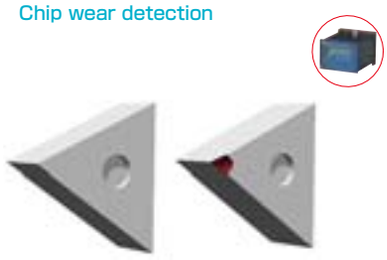
Shock Monitor
TSM3000M1 Type
P124

Features

- Can off-set the load ratio at no load operation before contacting the work-piece, can only detect a tiny contact load

Lathe

Chip wear detection



TEM product used

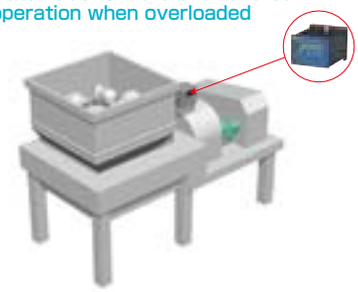
Shock Monitor
TSM3000M2 Type
P125

Features

- Intergrates power consumption during working by detecting minimal load variations due to wear, thus allowing the user to know the appropriate time to change the tips

Crusher

Automatic forward and reverse operation when overloaded



TEM product used

Shock Monitor
TSM3000C1 Type
P126

Features

- Accurately detects hard foreign objects that get caught up in the crusher, thus protecting expensive crushing blades from damage
- With just one Shock Monitor, complex device control can be achieved

SAFCON

Safety Devices

Mechanical Type

Torque Guard, Torque Limiter, Axial Guard

Features

Mechanical type safety devices

Torque Guard, Torque Limiter, Axial Guard

General use, economical

Torque Guard TGB Series

Easy to operate and reasonably priced. Can be used with almost all machines.

Ministry of Economy, Trade and Industry picks for Good Design Award product

High precision, high rigidity

Torque Guard TGX Series

No backlash and unsurpassed operation rigidity.
Ideal for machines that require precision positioning.

Ministry of Economy, Trade and Industry picks for Good Design Award product

Sealed construction

Torque Guard TGM Series

The sealed type possesses unsurpassed precision.
Excels in wet, oily and dusty environments.

ON-OFF, release

Torque Guard TGZ Series

As a release type protection device, as well as an ON-OFF clutch, its simple layout makes it easy to use.

Ministry of Economy, Trade and Industry picks for Good Design Award product

Friction type

Torque Limiter

Traditional friction type. Super low price and easy to use.

Linear actuating type

Axial Guard

This is a new type of overload protection device with ball and groove construction.

Mechanical safety mechanism variation

In order to meet the diverse needs of our customers, we provide a wide range of mechanical safety products. Refer to the chart below to choose the functions and device characteristics that best suit your safety needs.

Product name / Function, capacity	Torque Guard			
	TGB Series			
	Compact size (TGB08-16)	Medium size (TGB20-70)	Large size (TGB90-130)	With sprocket (TGB20-70)
Torque range N·m {kgf·m}	0.294～11.76 {0.03～1.2}	9.8～1080 {1.0～110}	441～7154 {45～730}	9.8～1080 {1.0～110}
Bore range (mm)	6～16	10～70	45～130	10～70
Consecutive repeated trip torque fluctuations	±10%	±10%	±10%	±10%
Backlash	None	Almost none	Almost none	Almost none
Reset method	Automatic	Automatic	Automatic	Automatic
Overload detection	TG Sensor (option p.28)	TG Sensor (option p.28)	TG Sensor (option p.28)	TG Sensor (option p.28)
Torque indicator	Yes	Yes	Yes	Yes
Exterior				

Product name / Function, capacity	Torqe Guard			Torque Limiter	Axial Guard
	TGX Series	TGM Series	TGZ Series	TL	TGA
Torque range N·m {kgf·m}	1.7～784 {0.17～80}	1.5～902 {0.15～92}	2.4～451 {0.24～46}	1.0～9310 {0.1～950}	–
Load range N {kgf}	–	–	–	–	147～3430 {15～350}
Bore range (mm)	8～70	10～60	10～50	8～130	–
Consecutive repeated trip torque fluctuations	±3%	±5%	±10%	–	±15% (trip load)
Backlash	None	None	Almost none	None	None
Reset method	Automatic	Automatic	External force (manual)	Automatic	Automatic
Overload detection	TG Sensor (option p.28)	Limit switch P47	TG Sensor (option p.28)	Proximity switch, tachometer P65	TGA Sensor (option p. 28)
Torque or load indicator	Yes	Yes	Yes	No	Yes
Exterior					

The right mechanical type safety mechanism for your particular needs is available. Using the chart below, select the device that is most right for your machines.

For machinery like positioning and indexing machines that require preciseness.

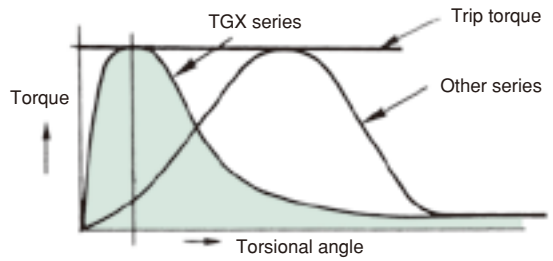
One position function	
TGX Series	YES
TGM Series	YES
TGB Series	YES
TGZ Series	YES
Torque Limiter	NO

Resetting preciseness after trip	
TGX Series	±10s
TGM Series	±10s
TGB Series	±20s
TGZ Series	±20s

Backlash (during normal operation)	
TGX Series	0
TGM Series	0
TGB Series	±0.3°
TGZ Series	±0.3°
Torque Limiter	0

Rigidity	
TGX Series	Superior
TGM Series	Regular
TGB Series	Regular
TGZ Series	Regular

Rigidity

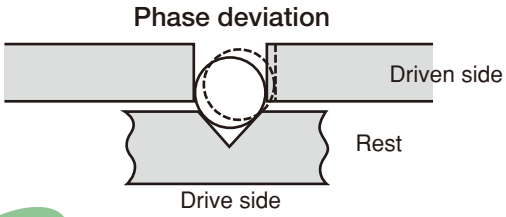


One position

Because of its unique construction, the drive and driven sides only mesh in one position. After tripping the Torque Guard resets and meshes in its original position.

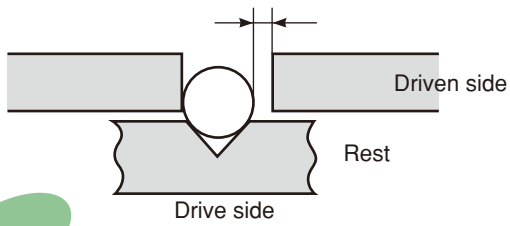
Reset precision

Phase deviation between drive side and load side after tripping and resetting again.



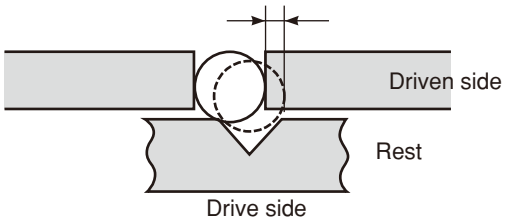
Backlash

Connecting clearance between drive side and load side at normal operation.



Rigidity

Rigidity refers to the degree of deforming ability of a solid material.
It is especially important when a system is driven by a servomotor, etc. (It indicates the input and output side's relative rotational deviation.)



Trip torque repeatability	
TGX Series	±3%
TGM Series	±5%
TGB Series	±10%
TGZ Series	±10%

For the machine that you want to automatically reset after removing overload after trip

TGX Series	Automatic reset
TGB Series	
TGM Series	
Torque Limiter	

For the machine that you want to freely rotate after trip

TGZ Series	Complete release

Arbitrarily shutoff the rotary power transmission as an ON-OFF clutch

TGZ Series	Reset by external force

For the machine that is used in a highly humid environment

TGM Series	Sealed construction

Trip torque repeatability

Side-by-side trip torque fluctuation when the trip is repeated.

Automatic reset

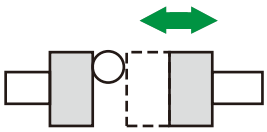
After overload is removed, the overload detection function resets automatically by inching either the drive or load side.

Complete release

After tripping, this function completely eliminates transmission of the drive side rotation to the load side. While in the case of an automatic reset mechanism, the overrunning of the drive side after tripping generates reset shock. This complete release function is best suited for a high speed rotation axis.

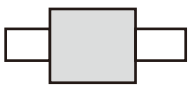
ON-OFF

The ON-OFF function.
Arbitrarily transmit or shutoff torque by external force.

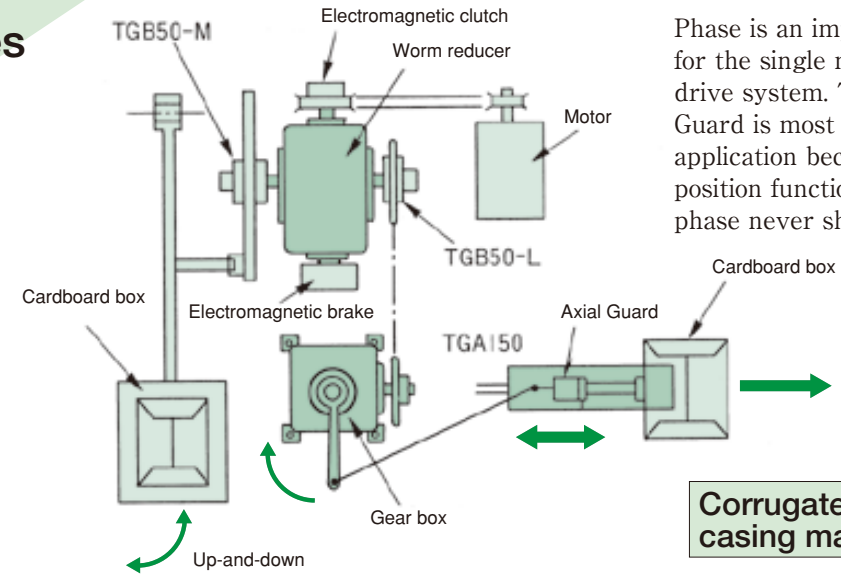


Sealed Construction

Sealed construction using O-ring. Under normal usage conditions it is not necessary to refill the grease.



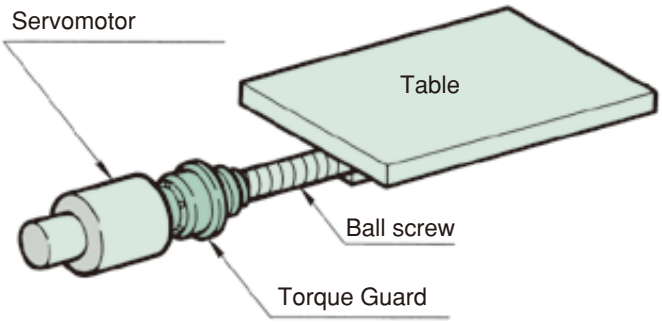
TGB Series



Phase is an important factor for the single motor multiple drive system. The Torque Guard is most suitable for this application because of its "one position function", of which the phase never shifts.

Corrugated cardboard casing machine

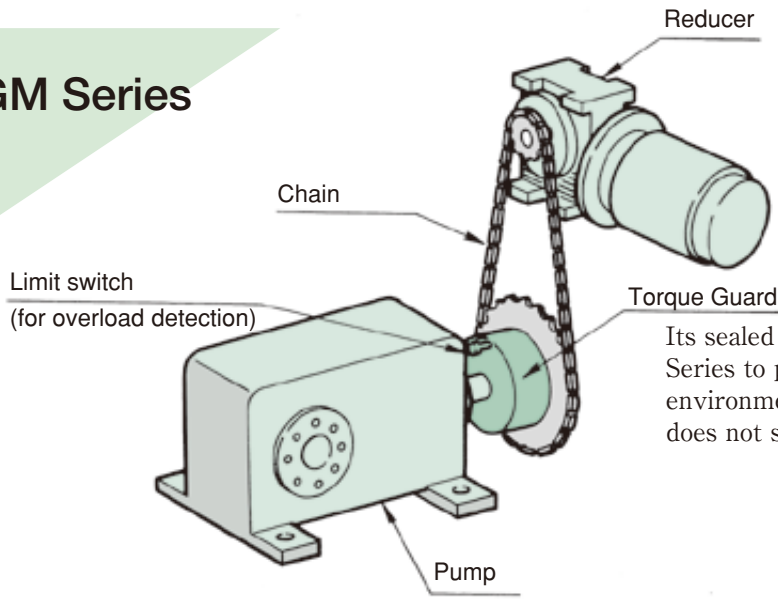
TGX Series



Precise positioning is possible because of its non-backlash and high rigidity characteristics. The TGX Series instantly trips when overload occurs, preventing costly machine damage.

Table positioning

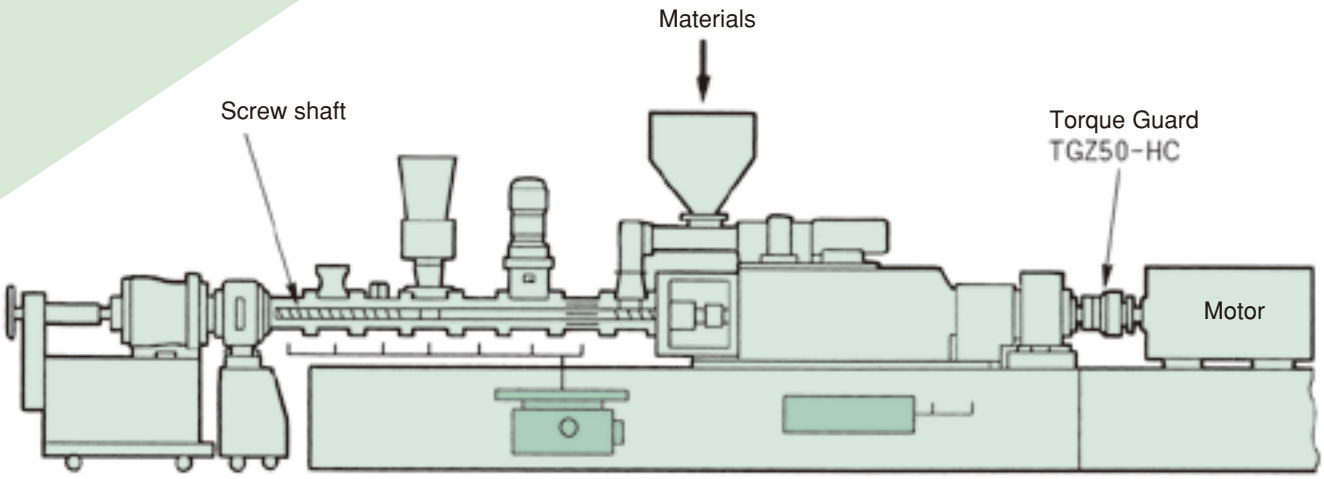
TGM Series



Its sealed construction allows the TGM Series to perform well in wet and dusty environments. As well, the grease or oil does not splatter.

Pump

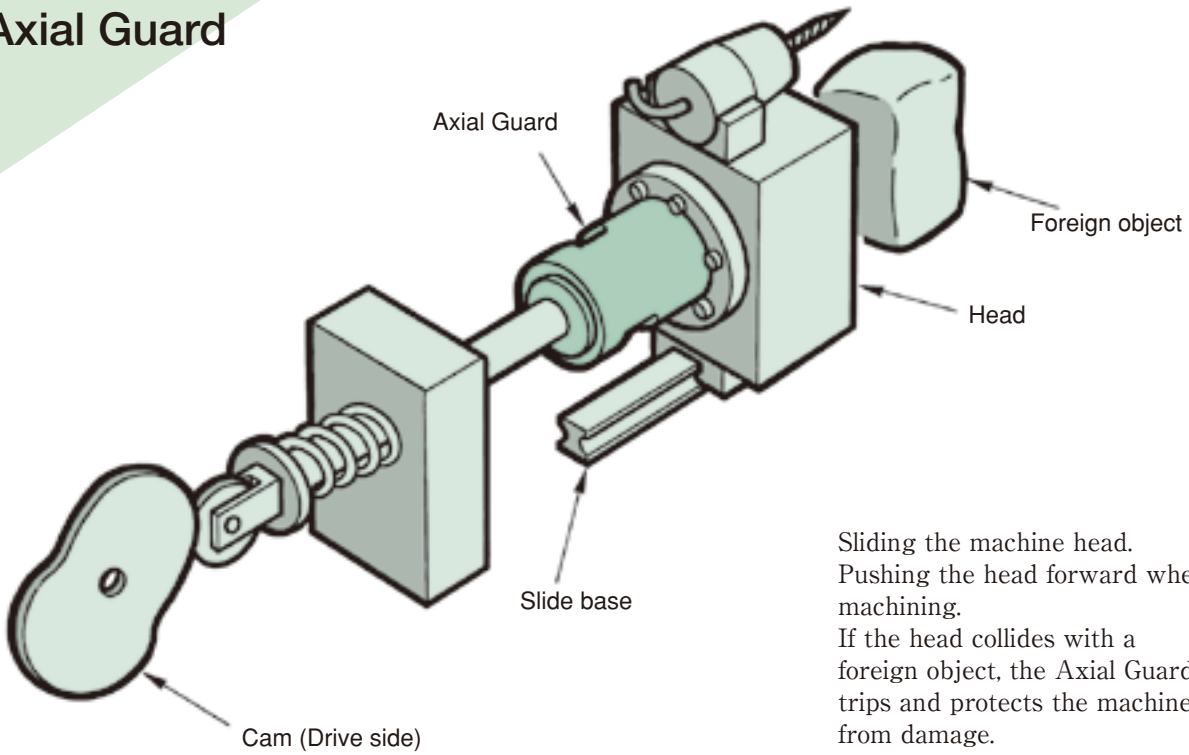
TGZ Series



Due to hardening of the materials or too many materials entering the machine, there is overload on the screw.
At that time, the Torque Guard trips, protecting the screw portion of the machine from damage. Because of the direct-coupled motor (high speed rotation), after trip, the freely rotating TGZ Series is used.

Extruding machine

Axial Guard



Sliding the machine head.
Pushing the head forward when machining.
If the head collides with a foreign object, the Axial Guard trips and protects the machine from damage.

Specialized machinery

Torque Guard TGB Series

Features

Easy to operate and reasonably priced. This standard model can be used with a broad range of applications.

Ministry of Economy, Trade and Industry picks for Good Design Award product

Accuracy of consecutive repeated trip torque fluctuations is within ±10%.

Even with repeated trips, the fluctuating trip torque variation is always within ±10%.

Wide variety of sizes available

From 0.294N・m {0.03kgf・m} to 7154N・m {730kgf・m}, 58 sizes are available.

Automatic reset

After removing the cause of overload, the TGB Series automatically re-engages by rotating the drive side.

One position type

This uniquely assembled torque transmission element ball and pocket configuration only engages in one position.

Simple torque adjustment

By simply turning the adjustment nut (bolts), trip torque can be easily adjusted.

Easy to read torque indicator

By using the indicator and torque indicator, set torque can be verified at any time.

Standard stock

The standard TGB Series are stocked as rough bore products. (Large size TGB90～130 are MTO)

Compact and precise

(TGB08～16)
Ideal for use in compact motors, robots, and compact precision machines.

Non-backlash

(TGB08～16 Does not include a Torque Guard Coupling.)
Because of its special construction there is no backlash.

Standard type overload detection sensor

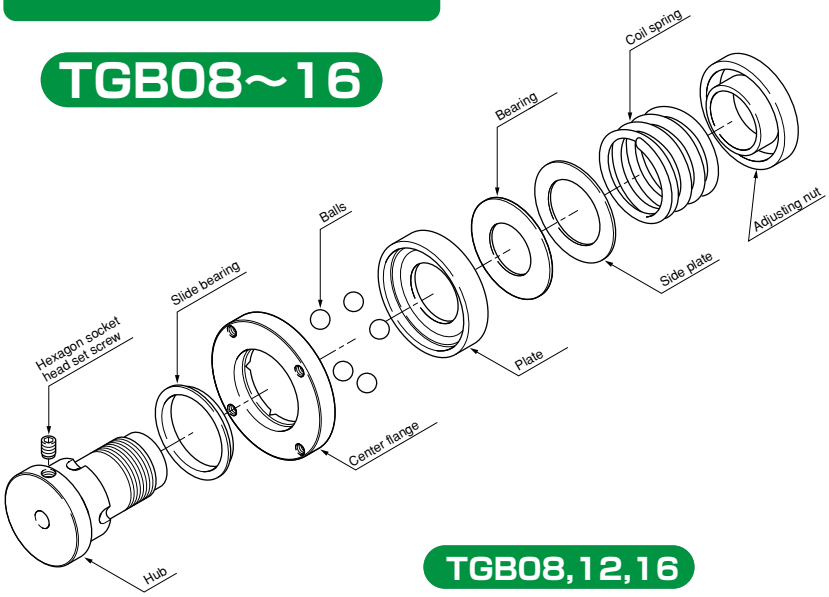
Combined with the TG sensor's non-contact type (refer to pages 28, 29), once overload is detected, the motor can be stopped and an alarm signal can be sent (optional).

Bore finishing for quick delivery

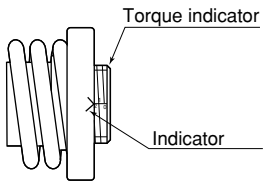
Finished bore products can be made for quick delivery. (Refer to page 22)

Construction

TGB08～16

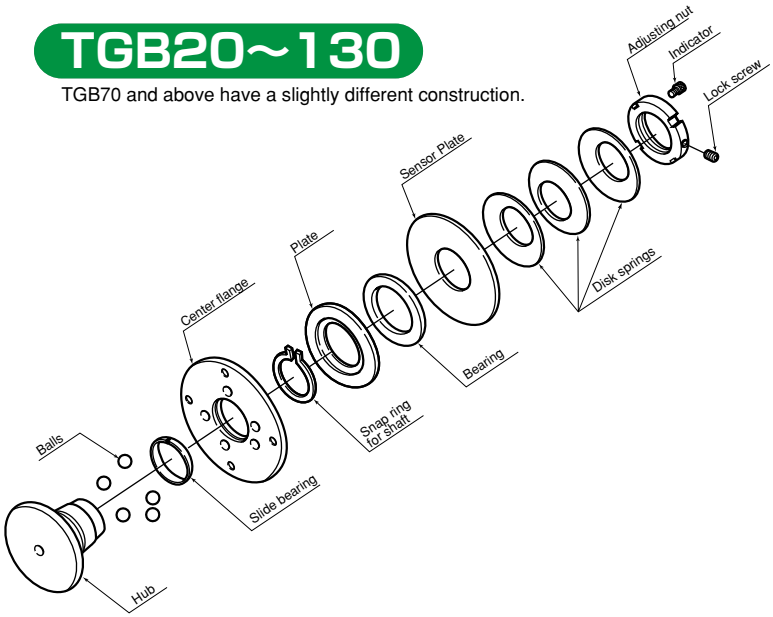


TGB08,12,16

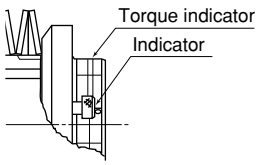


TGB20～130

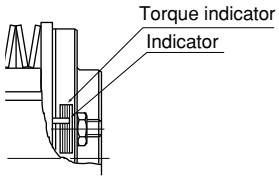
TGB70 and above have a slightly different construction.



TGB20,30,50



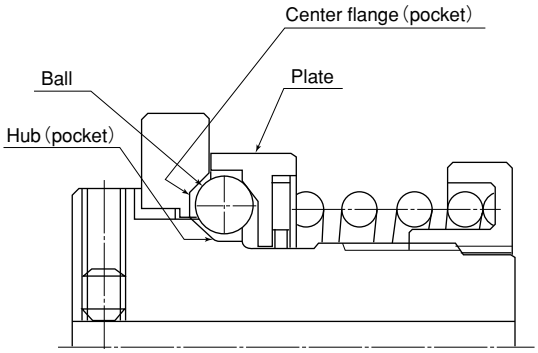
TGB70,90,110,130



Operating principles

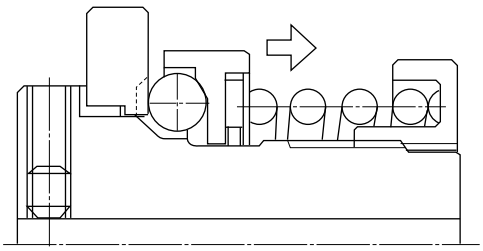
TGB08~16

During normal operation (engagement)



Torque transmission is carried out using several balls. The non-symmetric arrangement of the balls and pockets allows only one engagement position. As well, there is no backlash due to non-clearance engagement between the retained and pressured balls and pockets.
Torque is transmitted from the center flange (pockets) → balls → hub (pockets) → shaft. (As well as the opposite)

During overload (trip)

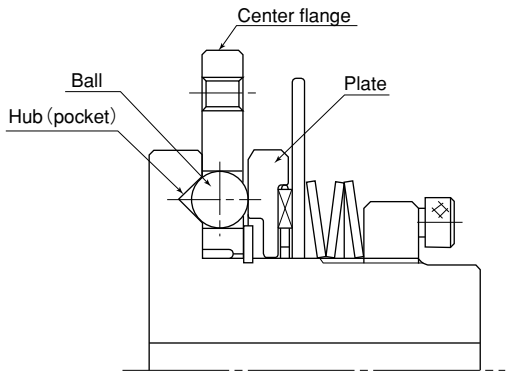


When the TGB Series trips due to overload, the ball pops out of the center flange pocket and it slides between the plate and center flange.

TGB20~50

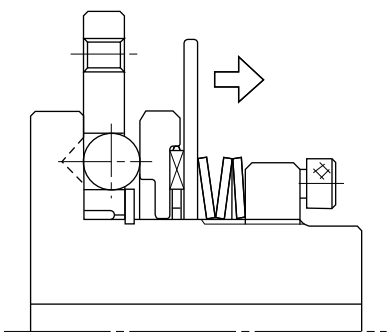
TGB70-130 has the same operating principles.

During normal operation (engagement)



Torque is carried out using several balls. The non-symmetric arrangement of balls and pockets allows only one engagement position. Torque is transmitted from the center flange → balls → hub (pockets) → shaft. (As well as the opposite)

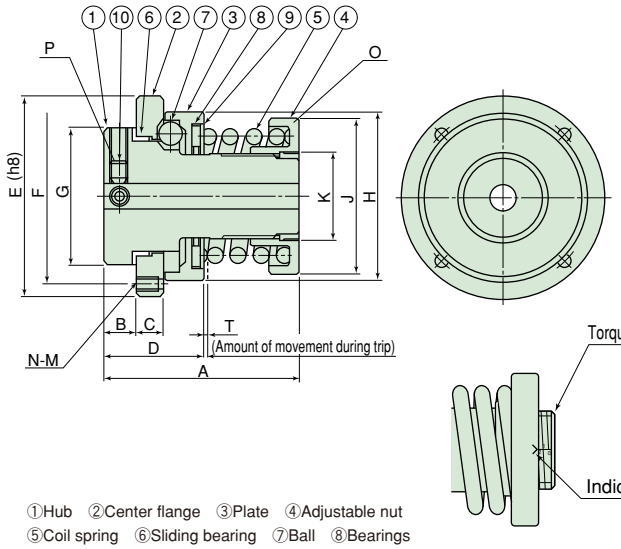
During overload (trip)



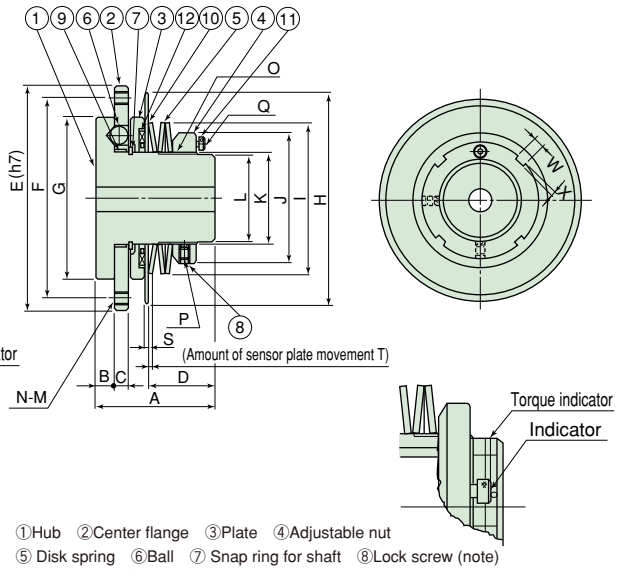
When it trips due to overload, the ball pops out of the hub pocket and rolls between the plate and hub.
When tripping, the rotational portion is entirely received by the bearings, so it rotates lightly and smoothly.

Transmissible Capacity/Dimensions Table

■TGB08～TGB16



■TGB20～TGB50



Note: One lock screw for fastening the adjusting nut is included with the Torque Guard. After setting to the optimal torque, tighten either lock screw with the torque amount given below.
Lock screw size: M5···3.8N.m{38.7kgf.cm} M8···16N.m{163kgf.cm}

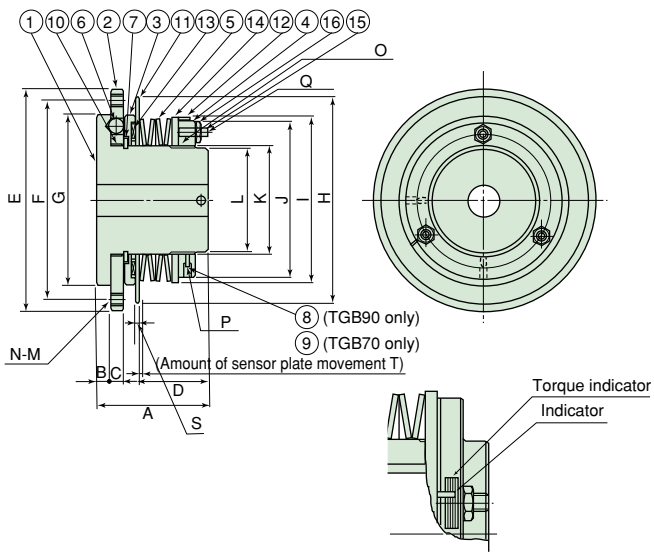
Unit : mm

Model No.	Set torque range N·m{kgf·m}	Maximum r/min	Spring color	※1 Rough bore diameter	Maximum bore diameter	A	B	C	D	E	F P.C.D	G	H	I
TGB08-L	0.294～1.47 {0.03～0.15}	1200	Yellow	5	8	39	6.5	5	20	40	34	26	33	—
TGB08-M	0.784～2.156 {0.08～0.22}		Blue											
TGB08-H	1.176～2.94 {0.12～0.3}		Orange											
TGB12-L	0.686～2.94 {0.07～0.3}	1000	Yellow	6	12	47	8	6	23.5	48	40	32	40	—
TGB12-M	1.96～4.9 { 0.2～0.5}		Blue											
TGB12-H	2.94～5.88 { 0.3～0.6}		Orange											
TGB16-L	1.47～4.9 {0.15～0.5}	900	Yellow	7	16	56	8.5	8	27.7	58	50	39	48	—
TGB16-M	2.94～7.84 { 0.3～0.8}		Blue											
TGB16-H	5.88～11.76 { 0.6～1.2}		Orange											
TGB20-H	9.8 ～44 { 1.0～4.5}	700	Orange	8	20	47	7.5	5.7	25	90	78	62	82	54
TGB30-L	20 ～54 { 2.0～5.5}	500	Yellow	12	30	60	9.5	7	33	113	100	82	106	75
TGB30-H	54 ～167 { 5.5～17}		Orange											
TGB50-L	69 ～147 { 7.0～15}	300	Yellow	22	50	81	14.5	8.5	44.8	160	142	122	150	116.7
TGB50-M	137 ～412 { 14 ～42}		Blue											
TGB50-H	196 ～539 { 20～55}		Orange											

Model No.	J	K	L	M	N	O screw diameter × pitch	P screw diameter × length	Q screw diameter × length	S	T	W	X	Snap ring size Y	Mass kg ※2	Inertia moment ×10²kg·m² ※2	GD² ×10²kgf·m² ※2
TGB08-L	29.5	15	—	M 3	3	M15×1	M3× 4	—	—	0.9	—	—	—	0.14	0.0025	0.010
TGB08-M																
TGB08-H																
TGB12-L	35	20	—	M 4	3	M20×1	M4× 6	—	—	1.0	—	—	—	0.24	0.0065	0.026
TGB12-M																
TGB12-H																
TGB16-L	45	25	—	M 4	3	M25×1.5	M5× 6	—	—	1.2	—	—	—	0.44	0.0180	0.072
TGB16-M																
TGB16-H																
TGB20-H	48	32	30	M 5	4	M32×1.5	M5× 6	M4× 8	2	1.8	5	2	32	0.9	0.058	0.23
TGB30-L	65	45	42.5	M 6	6	M45×1.5	M5× 6	M4×10	2	2	6	2.5	45	2.0	0.20	0.79
TGB30-H																
TGB50-L	98	75	70	M 8	6	M75×2	M5×10	M4×14	3	2.7	8	3.5	75	5.9	1.21	4.84
TGB50-M																
TGB50-H																

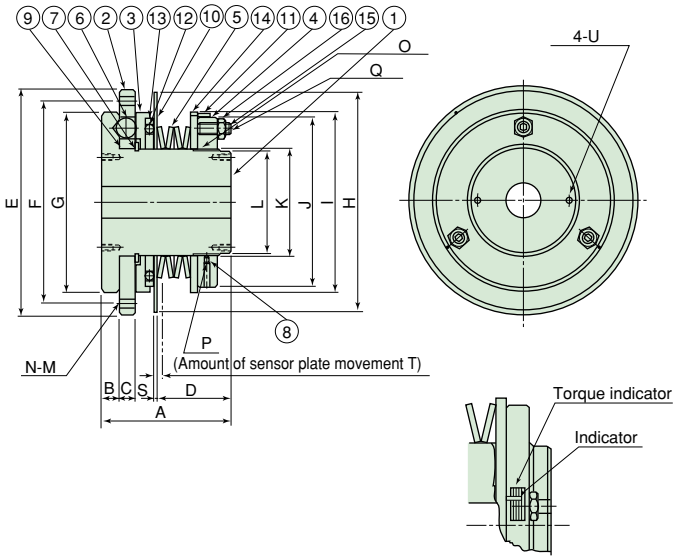
※1. All rough bore products are stock items.
2. Mass, inertia moment and GD2 are based on the bores' maximum diameters.

■TGB70～TGB90



①Hub ②Center flange ③ Plate ④Adjustable nut ⑤Coil spring ⑥Ball
⑦ Sliding bearing ⑧Hexagonal screws ⑨Lock screw (note) ⑩Sliding bearing
⑪Center plate ⑫Indicator ⑬Bearings ⑭Spring retainer
⑮Adjustable bolt ⑯Hexagonal nut

■TGB110～TGB130



①Hub ②Center flange ③ Plate ④Adjustable nut ⑤Coil spring ⑥Ball
⑦ Sliding bearing ⑧Hexagonal screws ⑨Sliding bearing ⑩Center plate
⑪Indicator ⑫Bearings ⑬Ball B ⑭Spring retainer
⑮Adjustable bolt ⑯Hexagonal nut

Note: One lock screw for fastening the adjusting nut is included with the Torque Guard. After setting to the optimal torque, tighten the torque with the amount given below.
Lock screw size: M5···3.8N.m{38.7kgf.cm} M8···16N.m{163kgf.cm}

Unit：mm

Model No.	Set torque range N·m{kgf-m}	Maximum r/min	Spring color	※1 Rough bore diameter	Maximum bore diameter	A	B	C	D	E h7	F P.C.D	G	H	I
TGB 70-H	294～1080{ 30～110}	160	Orange	32	70	110	14.5	12	68.5	220	200	170	205	166
TGB 90-L	441～1320{ 45～135}	120	Yellow	42	90	157	25	22	88.6	295	265	236	290	213
TGB 90-H	931～3140{ 95～320}		Orange											
TGB110-L	686～1960{ 70～200}	100	Yellow	52	110	195	30	25	105	355	325	287	345	278
TGB110-H	1570～5100{160～520}		Orange											
TGB130-L	1176～3038{120～310}	80	Yellow	60	130	230	35	27	130	400	360	319	390	316
TGB130-H	2650～7150{270～730}		Orange											

Model No.	J	K	L	M	N	O screw diameter × pitch	P screw diameter × length	Q screw diameter × length	S	T	U screw diameter × length	Snap ring size Y	Mass kg ※2	Inertia moment ×10²kg·m² ※2	GD² ×10²kgf·m² ※2
TGB 70-H	157	110	106	M10	6	M110×2	M 5×10	M10×28	3	3.3	—	110	17.0	6.3	25.2
TGB 90-L	203	130	124	M12	8	M130×2	M10×20	M16×35	5.5	5.4	M 8×16	130	37.5	33.8	135
TGB 90-H															
TGB110-L	266	160	155	M16	6	M160×3	M12×20	M16×45	7	6	M10×20	160	69.6	91	364
TGB110-H															
TGB130-L	304	190	184	M16	8	M190×3	M16×30	M 20×60	7	6.6	M12×24	190	102	167	668
TGB130-H															

※1. The TGB70 is a rough bore stock item. TGB90-130 are MTO.
2. Mass, inertia moment and GD2 are based on the bores' maximum diameters.

Model No.

TGB 50 - H -40 J-25

- TGB: Series
- 50: Size
- H: Spring strength (L=weak spring, M=medium spring, H=strong spring)
- -40: Finished bore measurements (only when finished bore is indicated)
- J: Key way (J=new JIS standards, E=old JIS 2 type)
- -25: Set torque value is displayed as a gravitational system of units 245N·m{25kgf·m} (Only when set torque is indicated)

Rough Bore Product Model No.

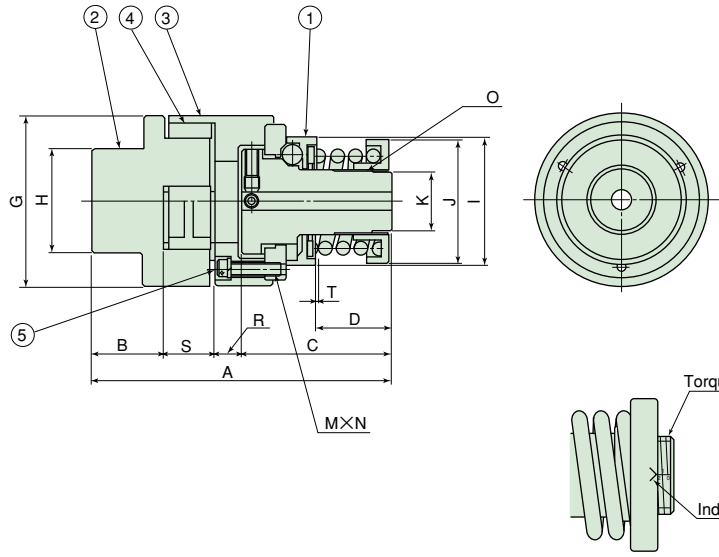
TGB 50 - H

- TGB: Series
- 50: Size
- H: Spring strength (L=weak spring, M=medium spring, H=strong spring)

Transmissible Capacity/Dimensions Table

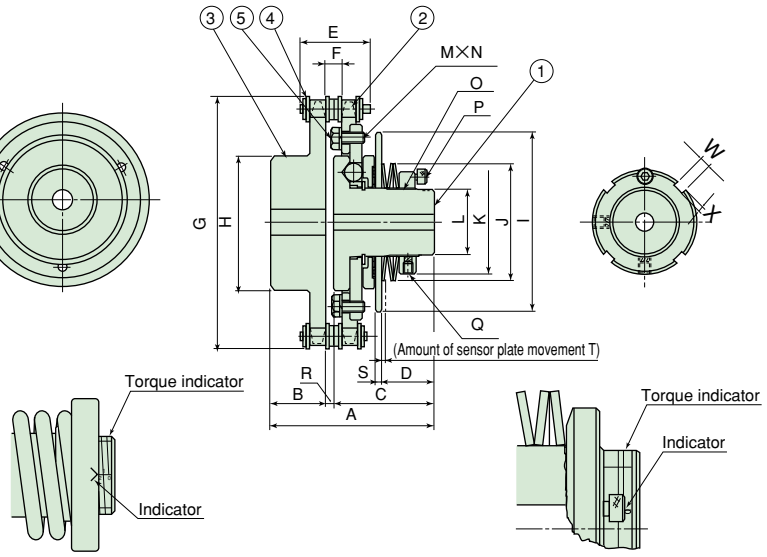
Torque Guard Coupling

■TGB08-C～TGB16-C



① Main Torque Guard unit ②Coupling hub A ③Coupling hub B ④Insert
⑤Hexagonal bolt

■TGB20-C～TGB50-C



① Main Torque Guard unit ②TGB sprocket ③CP sprocket ④Roller chain
⑤Hexagonal bolt

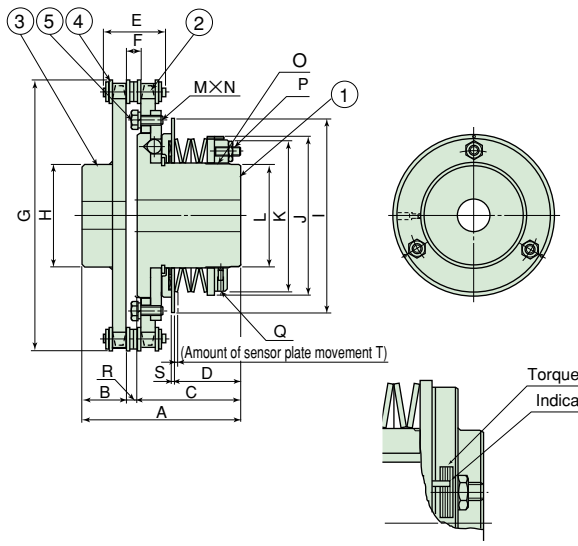
Unit：mm

Model No.	Set torque range N·m{kgf-m}	Maximum r/min	Spring color	Torque Guard		Coupling		A	B	C	D	E	F	G	H	I
				Rough bore diameter※1	Maximum bore diameter	Rough bore diameter※1	Maximum bore diameter									
TGB08-LC	0.294～1.47 {0.03～0.15}	1200	Yellow	5	8	—	15	80	20.6	39	19	—	—	44.5	24	33
TGB08-MC	0.784～2.156 {0.08～0.22}		Blue													
TGB08-HC	1.176～2.94 {0.12～0.3}		Orange													
TGB12-LC	0.686～2.94 {0.07～0.3}	1000	Yellow	6	12	—	20	88	19.9	47	23.5	—	—	53.6	32	40
TGB12-MC	1.96～4.9 { 0.2～0.5}		Blue													
TGB12-HC	2.94～5.88 { 0.3～0.6}		Orange													
TGB16-LC	1.47～4.9 {0.15～0.5}	900	Yellow	7	16	—	25	112	27	56	28.3	—	—	64.3	38	48
TGB16-MC	2.94～7.84 { 0.3～0.8}		Blue													
TGB16-HC	5.88～11.76 { 0.6～1.2}		Orange													
TGB20-HC	9.8 ～44 { 1.0～4.5}	700	Orange	8	20	12.5	42	76	25	47	25	32.6	7.4	117.4	63	82
TGB30-LC	20～54 { 2.0～5.5}	500	Yellow	12	30	18	48	93	28	60	33	40.5	9.7	146.7	73	106
TGB30-HC	54～167 { 5.5～17}		Orange													
TGB50-LC	69～147 { 7.0～15}	300	Yellow	22	50	18	55	126	40	81	44.8	51.0	11.6	200.3	83	150
TGB50-MC	137～412 { 14～42}		Blue													
TGB50-HC	196～539 { 20～55}		Orange													

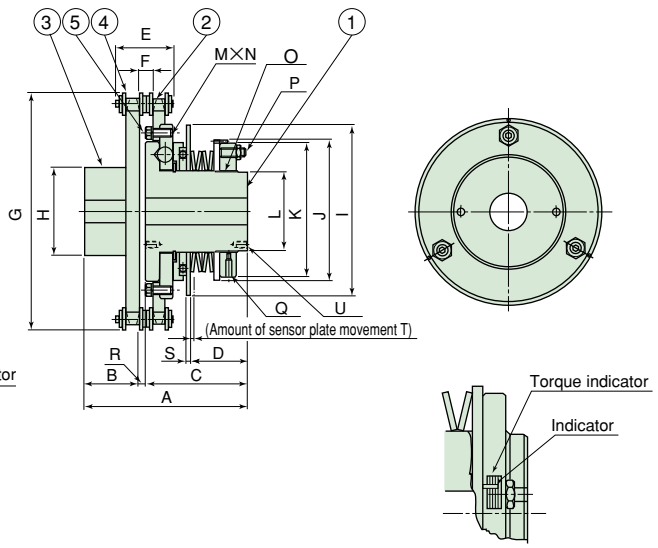
Model No.	J	K	L	M×N×No. of pieces	O screw diameter × pitch	P screw diameter × length	Q screw diameter × length	R	S	T	W	X	Coupling model No. or sprocket	Mass kg ※2	Inertia moment ×10⁻²kg·m² ※2	GD² ×10⁻²kgf·m² ※2
TGB08-LC	29.5	15	—	M3×12ℓ×3	M15×1	—	—	7.2	13.2	0.9	—	—	L075A	0.235	0.0050	0.020
TGB08-MC																
TGB08-HC																
TGB12-LC	37	20	—	M4×16ℓ×3	M20×1	—	—	7.9	13.2	1	—	—	L090A	0.38	0.0123	0.049
TGB12-MC																
TGB12-HC																
TGB16-LC	46	25	—	M4×20ℓ×3	M25×1.5	—	—	10.2	18.8	1.2	—	—	L100A	0.673	0.0324	0.129
TGB16-MC																
TGB16-HC																
TGB20-HC	54	48	30	M5×12ℓ×4	M32×1.5	M4× 8	M5× 6	4	2	1.8	5	2	RS40-26	2.5	0.313	1.25
TGB30-LC	75	65	42.5	M6×16ℓ×6	M45×1.5	M4×10	M5× 6	5	2	2	6	2.5	RS50-26	4.8	0.948	3.79
TGB30-HC																
TGB50-LC	116.7	98	70	M8×20ℓ×6	M75×2	M4×14	M5×10	5	3	2.7	8	3.5	RS60-30	12.2	4.43	17.7
TGB50-MC																
TGB50-HC																

※1. All rough bore products are stock items.
2. Mass, inertia moment and GD2 are based on the bores' maximum diameters.

■TGB70-C～TGB90-C



■TGB110-C～TGB130-C



①Main Torque Guard unit ②TGB sprocket ③ CP sprocket ④Roller chain ⑤Hexagonal bolt

Unit：mm

Model No.	Set torque range N·m{kgf-m}	Maximum r/min	Spring color	Torque Guard		Coupling		A	B	C	D	E	F	G	H	I
				Rough bore diameter	Maximum bore diameter	Rough bore diameter	Maximum bore diameter									
TGB 70-HC	294～1080 { 30～110}	160	Orange	32	70	28	75	165	45	110	68.5	64.8	15.3	283.2	107	205
TGB 90-LC	441～1320 { 45～135}	120	Yellow	42	90	33	103	242	80	157	88.6	78.5	18.2	394.4	147	290
TGB 90-HC	931～3140 { 95～320}		Orange													
TGB110-LC	686～1960 { 70～200}	100	Yellow	52	110	38	113	303	100	195	105	99.2	21.9	473.4	157	345
TGB110-HC	1570～5100 {160～520}		Orange													
TGB130-LC	1176～3038 {120～310}	80	Yellow	60	130	53	145	365	120	230	130	127.3	29.1	534.2	197	390
TGB130-HC	2650～7150 {270～730}		Orange													

Model No.	J	K	L	M×N×No. of pieces	O screw diameter × pitch	P screw diameter × length	Q screw diameter × length	R	S	T	U screw diameter × length	Sprocket	Mass kg ※1	Inertia moment ×10⁻²kg·m² ※1	GD² ×10⁻²kgf·m² ※1
TGB 70-HC	166	157	106	M10×25ℓ×6	M110×2	M10×28	M 5×10	10	3	3.3	—	RS80-32	32.0	22.43	89.7
TGB 90-LC	213	203	124	M12×35ℓ×8	M130×2	M16×35	M10×20	5	5.5	5.4	M 8×16	RS100-36	71.1	117.32	469.29
TGB 90-HC															
TGB110-LC	278	266	155	M16×45ℓ×6	M160×3	M16×45	M12×20	8	7	6	M10×20	RS120-36	130.5	314.15	1256.61
TGB110-HC															
TGB130-LC	316	304	184	M16×50ℓ×8	M190×3	M20×60	M16×30	15	7	6.6	M12×24	RS160-30	202.3	632.66	2530.63
TGB130-HC															

※1.Mass, inertia moment and GD2 are based on the bores' maximum diameters.

Model No.

TGB 50 - L C - T35 J×C45 E-10

- TGB: Series
- 50: Size
- L: Spring strength (L= weak spring, M=medium spring, H=strong spring)
- C: Coupling type
- T35: Torque Guard side finished bore measurements (only when finished bore is indicated)
- J: Key way (J=new JIS standard, E= old JIS 2 type)
- C45: Coupling side finished bored measurements (only when finished bore is indicated)
- E: Key way (J=new JIS standard, E= old JIS 2 type)
- 10: Set torque value is displayed as a gravitational system of units 245N.m {25kgf.m} (Only when set torque is indicated)

Rough Bore Product Model No.

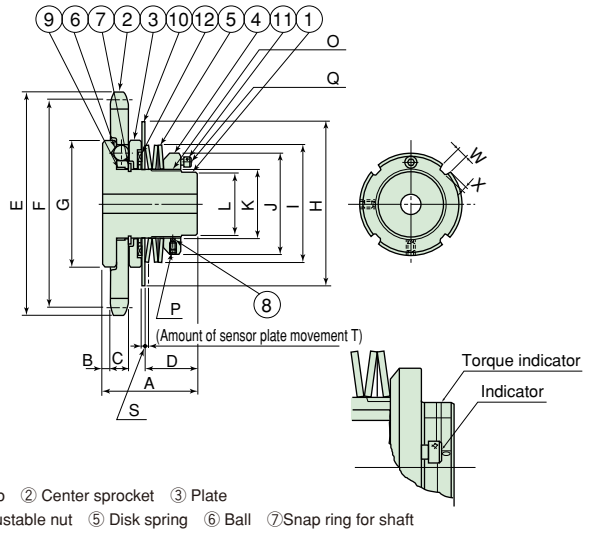
TGB 50 - M C

- TGB: Series
- 50: Size
- M: Spring strength (L= weak spring, M=medium spring, H=strong spring)
- C: Coupling type

Transmissible Capacity/Dimensions Table

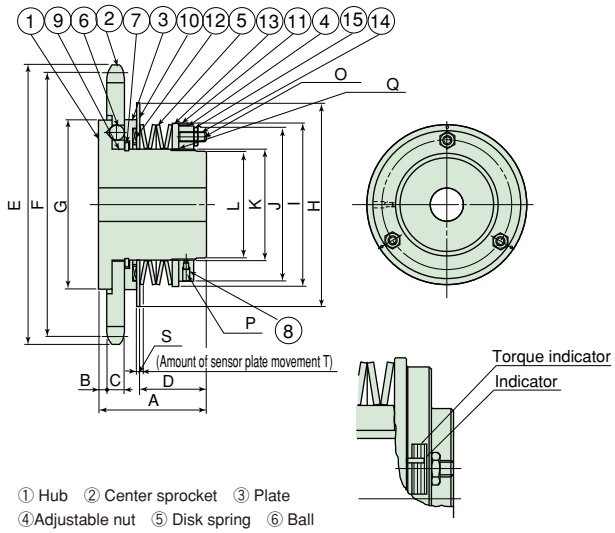
With Sprocket TGB

■TGB20-□～TGB50-□



① Hub ② Center sprocket ③ Plate
④Adjustable nut ⑤ Disk spring ⑥ Ball ⑦Snap ring for shaft
⑧Lock screw (note) ⑨Slipping bearing
⑩ Center plate ⑪Indicator ⑫Bearings

■TGB70-□



① Hub ② Center sprocket ③ Plate
④Adjustable nut ⑤ Disk spring ⑥ Ball
⑦Snap ring for shaft ⑧Lock screw (note) ⑨Slipping bearing
⑩ Center plate ⑪Indicator ⑫Bearings
⑬ Spring retainer ⑭Adjustable bolt ⑮Hexagonal nut

Note: One lock screw for fastening the adjusting nut is included with the Torque Guard. After setting to the optimal torque, tighten the torque with the amount given below.
Lock screw size: M5…3.8N.m{38.7kgf.cm} M8…16N.m{163kgf.cm}

Unit：mm

Model No.	Set torque range N·m{kgf-m}	Maximum r/min	Sprocket specifications	Spring color	Rough bore diameter	Maximum bore diameter	A	B	C	D	E	F P.C.D	G	H	I
TGB20-H-□	9.8～44 { 1.0～4.5}	700	RS40-22T	Orange	8	20	47	5.9	7.2	25	96	89.24	62	82	54
			RS40-27T								116	109.4			
TGB30-L-□	20～54 { 2.0～5.5}	500	RS60-19T	Yellow	12	30	60	4.8	11.6	33	126	115.74	82	106	75
TGB30-H-□	54～167 { 5.5～17}		RS60-24T	Orange							156	145.95			
TGB50-L-□	69～147 { 7.0～15}	300	RS80-20T	Orange	22	50	81	8.42	14.5	44.8	176	162.37	122	150	116.7
TGB50-M-□	137～412 { 14～42}			Yellow											
TGB50-H-□	196～539 { 20～55}		RS80-25T	Orange							216	202.66			
TGB70-H-□	294～1080{ 30～110}	160	RS100-22T	Orange	32	70	110	8.9	17.5	68.5	240	223.10	170	205	166
			RS100-26T								281	263.40			

Model No.	J	K	L	O screw diameter ×pitch	P screw diameter ×length	Q screw diameter ×length	S	T	W	X	Snap ring size Y	Mass kg	Inertia moment ×10⁻²kg·m²	GD² ×10⁻²kgf·m²
TGB20-H-□	48	32	30	M 32×1.5	M5× 6	M 4× 8	2	1.8	5	2	32	0.94	0.255	0.064
												1.15	0.486	0.121
TGB30-L-□	65	45	42.5	M 45×1.5	M5× 6	M 4×10	2	2	6	2.5	45	2.21	1.06	0.264
TGB30-H-□												2.78	2.07	0.517
TGB50-L-□	98	75	70	M 75×2	M5×10	M 4×14	3	2.7	8	3.5	75	6.35	6.10	1.52
TGB50-M-□														
TGB50-H-□												7.66	10.7	2.68
TGB70-H-□	157	110	106	M110×2	M5×10	M10×28	3	3.3	—	—	110	17.8	29.4	7.35
												19.9	42.5	10.6

※1. All products have a short delivery time.
2. Specify the preferable sprocket size.
3.Mass, inertia moment and GD2 are based on the bores' maximum diameters.
4. Sprocket specifications go in the box at the end of the model number. As well, refer to the below chart for Model No.

Model No.

TGB 50 - H - 08025 - 50 J - 30

- TGB: Series
- 50: Size
- H: Spring strength (L=weak spring, M=medium spring, H=strong spring)
- 08025: Sprocket model No.
- 50: Finished bore measurements (only when finished bore is indicated)
- J: Key way (J=new JIS standard, E= old JIS 2 type)
- 30: Set torque value is displayed as a gravitational system of units 294N.m{30kgf.m} (Only when set torque is indicated)

Sprocket Indication Method

Model No.	Sprocket specifications	Indication of Model No.
TGB20	RS40-22T	04022
	RS40-27T	04027
TGB30	RS60-19T	06019
	RS60-24T	06024
TGB50	RS80-20T	08020
	RS80-25T	08025
TGB70	RS100-22T	10022
	RS100-26T	10026

Finished Bore Torque Guard TGB/Torque Guard Coupling TGB-C

Finished bore products have a short delivery time

■Bore/finished keyway

TGB20-TGB70 and TGB20-C-TGB70-C finished bore is standard

■Finished Bore Measurements Chart

Unit：mm

Torque Guard TGB		Finished bore dimensions	
Torque Guard Model No.	Torque Guard Coupling Model No.	Torque Guard side	Coupling side (Torque Guard Coupling only)
TGB20	**TGB20-C**	12,14,15,16,17,18,19,20	14,15,16,17,18,19,20,22,24,25,28,29, 30,32,33,35,36,38,40,42
TGB30	**TGB30-C**	16,17,18,19,20,22,24,25,28,29,30	20,22,24,25,28,29,30,32,33,35,36,38, 40,42,43,45,46,48
TGB50	**TGB50-C**	25,28,29,30,32,33,35,36,38,40,42,43, 45,46,48,50	20,22,24,25,28,29,30,32,33,35,36,38, 40,42,43,45,46,48,50,52,55
TGB70	**TGB70-C**	35,36,38,40,42,43,45,46,48,50,52,55, 56,57,60,63,65,70	30,32,33,35,36,38,40,42,43,45,46,48, 50,52,55,56,57,60,63,65,70,71,75
Delivery time		Ex.-Japan 4 weeks by sea	

Model No.

Torque Guard

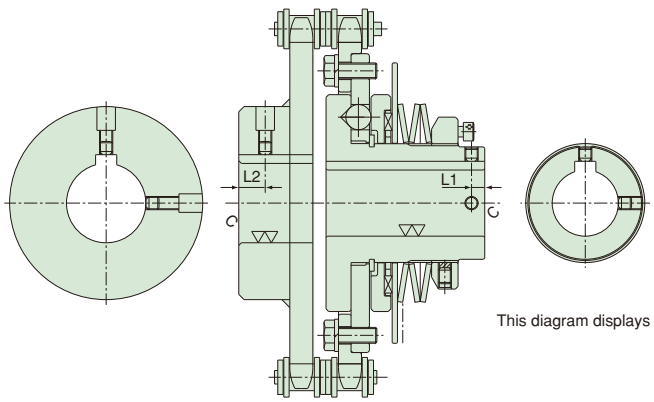
TGB30 - H - 30J

- TGB30: Size
- H: Spring type
- 30J: Bore diameter — New JIS key standard type

Torque Guard Coupling

TGB50 - MC - T40J×C50J

- TGB50: Size
- MC: Spring type
- T40J: Torque Guard side bore diameter — New JIS key standard type
- C50J: Coupling side bore diameter — New JIS key standard type



This diagram displays the Torque Guard Coupling

Keyway portion enlargement

Torque Guard TGB		Torque Guard Side		Coupling Side (Torque Guard Coupling only)	
Torque Guard Model No.	Torque Guard Coupling Model No.	Set screw	Set screw position L1	Set screw	Set screw position L2
TGB20	**TGB20-C**	2-M4× 4	4	2-M4× 4	8
TGB30	**TGB30-C**	2-M5× 5	5	2-M5× 5	10
TGB50	**TGB50-C**	2-M6× 6	6	2-M6× 6	12
TGB70	**TGB70-C**	2-M8×12	6	2-M8×12	15

1. Set screws are located at 2 positions, on the keyway and 90° CW from it.

■Bore Diameter and Keyway Specifications

- Bore diamter tolerance is as follows:
  ϕ 18 and below…0～+0.021mm
  ϕ 19 and above…H7
- The keyway is new JIS (JIS B 1301-1996) "standard".
- Set screws are included in the delivery

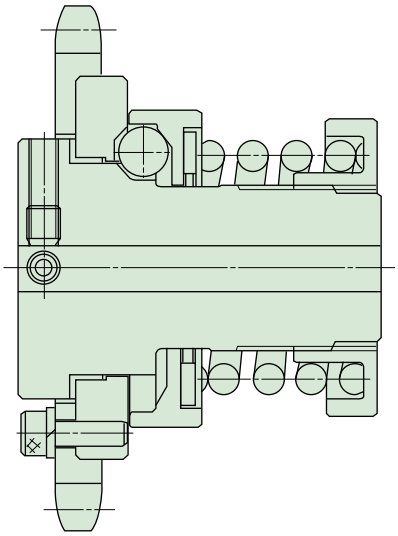
Bore diameter	Chamfer dimensions
ϕ 25 and below	C0.5
ϕ 50 and below	C1
ϕ 51 and above	C1.5

● **Roller chain and sprocket selection**
For more information on roller chain and sprocket selection and handling, refer to the Tsubaki drive chain catalog.

● **Sprocket specifications**
Sprockets are hardened.

● **Sprocket lubrication**
- For more information on sprocket lubrication, refer to the Tsubaki drive chain catalog.
- If the Torque Guard is lubricated in an oil bath or by the rotary plate or forced pump, there is a possibility that the indicator and name sticker may come off.

■ Installation example



Selection

As a safety device, the Torque Guard will be most effective if it is installed in the place nearest to where overload is thought to most likely occur on the driven machine.
For most situations, avoid using the Torque Guard with human transportation or lifting devices. If you decide to use a Torque Guard with these devices, take the necessary precautions to avoid serious injury or death from falling objects.

1. Setting trip torque

$$T_P = T_L \times S.F = \frac{60000 \times P}{2\pi \cdot n} \times S.F \quad \left\{ T_P = \frac{974 \times P}{n} \times S.F \right\}$$

T_P = Trip torque N·m{kgf·m} T_L = Load torque N·m{kgf·m}
P = Transmittance power kW S.F = Service factor
n = rpm r/min

(1) From the machine's strength and load, as well as other information, set the trip torque at the point where it should not go any higher.

(2) When the limit value is not clear, calculate the rated torque by using the rpm of the shaft where the Torque Guard is installed and rated output power. Then, depending on the conditions of use, multiply by the service factor in Table 1.

Table 1.

Service factor	Operating conditions
1.25	In the case of normal start up/stop, intermittent operation
1.50	In the case of a heavy shock load or forward-reverse driving

2. When rpm is relatively high

When rpm is relatively high (more than 500r/m), or when load inertia is large, depending on the motor's start up torque, there is a chance the Torque Guard will trip. In this case, determine the inertia ratio and calculate the torque used in the Torque Guard during start up, then multiply it by the service factor and make this the trip torque.

$$K = \frac{I_L + I_t}{I_s} \quad \left\{ K = \frac{GD_L^2 + GD_t^2}{GD_s^2} \right\} \quad Tt = \frac{K \cdot T_S + T_L}{1 + K} \quad Tp = SF \cdot Tt$$

K : Inertia ratio
I_s : Drive side inertia moment (kg·m²)
{GD_s^2 : Drive side GD² (kgf·m²)}
I_L : Load side inertia moment (kg·m²)
{GD_L^2 : Load side GD² (kgf·m²)}
I_t : Torque Guard inertia moment (kg·m²)
{GD_t^2 : Torque Guard GD² (kgf·m²)}
T_s : Motor starting torque (N·m){kgf·m}
T_t : Torque in Torque Guard during start up (N·m){kgf·m}
T_L : Load torque (N·m){kgf·m}
T_P : Trip torque (N·m){kgf·m}
SF : Service factor

Note) Use the equivalent value to the shaft in which the Torque Guard is installed for each inertia moment, GD² and torque value.

3. Precautions when deciding trip torque

Compared with load torque, if the torque used when starting up becomes large, the setting trip torque value also becomes large, causing a problem from the viewpoint of the overload protection device. (Compared with the load torque, the trip torque is too large.) In this case install it as close to the load side as possible.

4. Choosing the model number

Choose a model where the calculated trip torque is within the minimum to maximum setting range.

5. Verifying bore diameter

Verify that the shaft where the Torque Guard will be installed is in the possible range (refer to the dimensions table) of the bore diameter of the Torque Guard model you selected.
If the shaft diameter is larger than the possible bore range, select a model one size larger that uses a weak spring.

6. Confirming rpm

Confirm that the Torque Guard rpm used is within the maximum rpm value in this catalog.

Handling

1. Setting trip torque

(1) TGB Torque Guard are all set at the "0" point (minimum torque value) for delivery. Confirm that the torque indicator is set at "0" when you receive the Torque Guard. (Refer to each size in the graphs below)

(2) For the TGB70～130, loosen the three hexagonal lock-nuts for adjusting bolts.
(The adjusting nuts of TGB08-50 can be turned as is.)

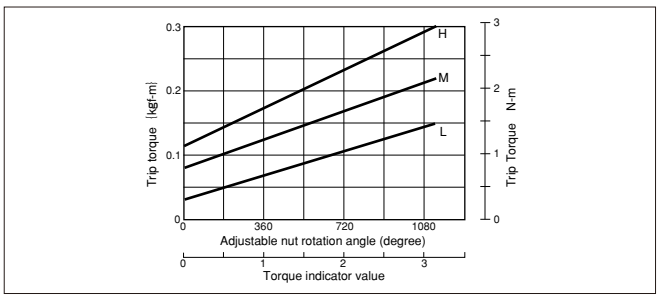
(3) From the "Tightening Amount - Torque Correlation Chart" (below), find the adjusting nut's (bolt) tightening angle equivalent to the predetermined trip torque. Set at 60° toward the determined tightening value, then install to the machine and conduct a trip test. Gradually tighten and set at optimum trip torque.
Each product's trip torque does not always correspond with the value listed in the "Tightening Amount - Torque Correlation Chart", so use them only as a rough guide.

(4) For the TGB20～50, tighten one lock screw for the adjusting nut.
For the TGB70～130, use a hexagonal nut to lock it. (The TGB08～16 adjusting nut is locked with a nylon coating.)

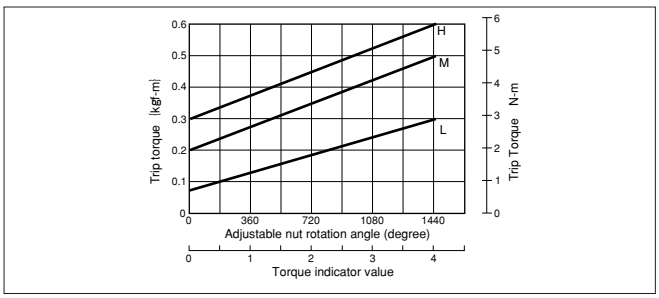
(5) Do not turn the adjusting nut (bolt) more than the torque indicator's maximum value. Doing so will put it in a locked position, and there will be no leeway for the disk spring to bend. (TGB08-16 uses a coil spring)

2. Tightening Amount-Torque Correlation Chart

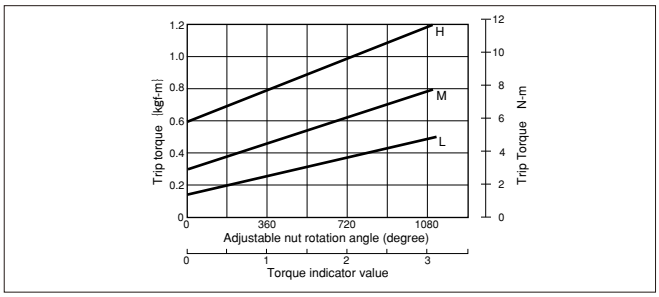
TGB08



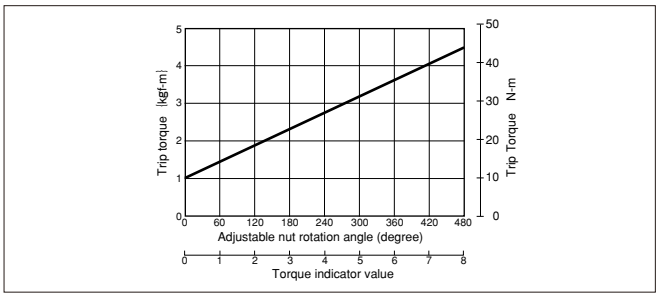
TGB12



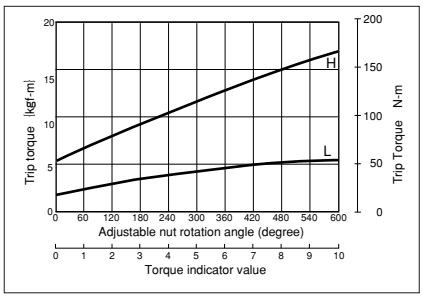
TGB16



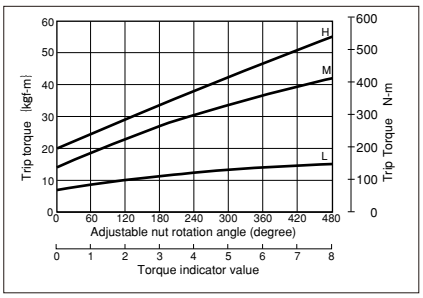
TGB20



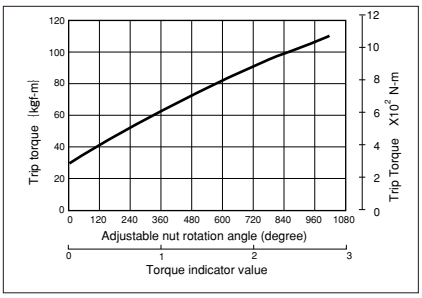
TGB30



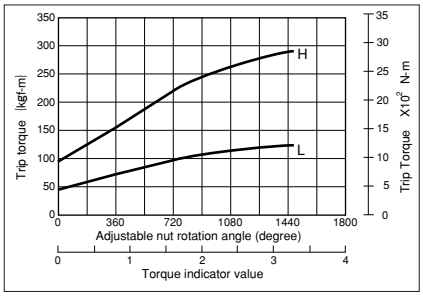
TGB50



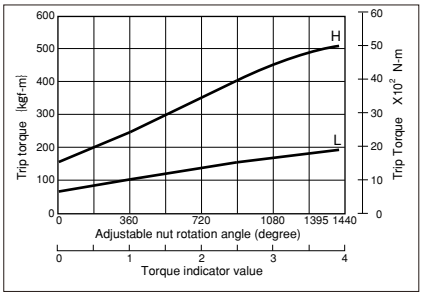
TGB70



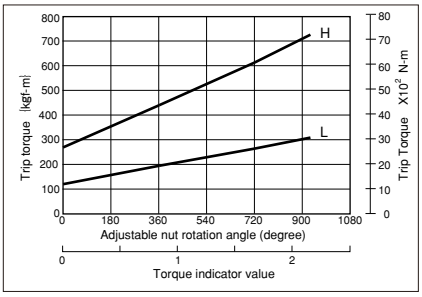
TGB90



TGB110



TGB130

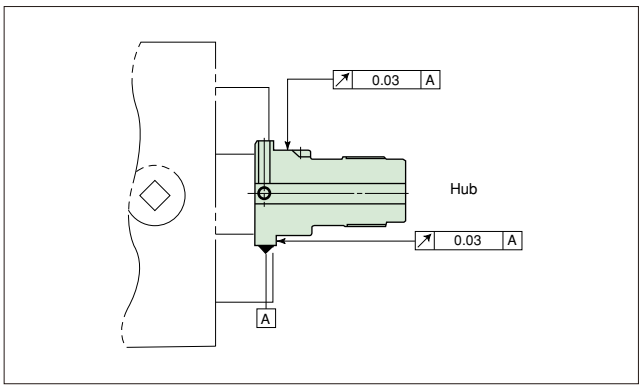


3. Bore finishing

TGB08～16

- The hub's materials are made up of a surface-hardened iron based sintered alloy.

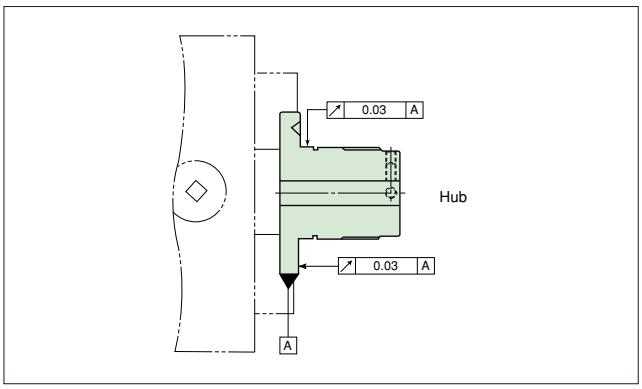
(1) Loosen the adjusting nut and disassemble all components. Make sure not to get any dust or dirt on the components.
(2) Chuck the hub flange's outside diameter and center the hub portion. The hub's material is a surface-hardened iron based sintered alloy, so we recommend the cutting tool be made of a hard material (JIS 9-20, K-01).
(3) Keyway machining should be carried out directly below the setscrew tap.
(4) After bore finishing is completed and you are reassembling the Torque Guard, make sure to coat the ball and bearings with grease.



TGB20～130

- The hub has been thermally refined.

(1) Loosen the adjusting nut and disassemble all components. Remove both the snap ring and the center plate. Make sure not to get any dust or dirt on the components.
(2) Chuck the hub flange's outside diameter and center the hub portion.
(3) Keyway finishing should be carried out directly below the torque indicator's gap space.
(4) Tapping for the set screw should be machined at the torque indicator's space and at 90° phasing from it. This tapping should be on the torque indicator.
(5) After bore finishing is completed and you are reassembling the Torque Guard, make sure to coat the ball and bearings with grease.



Handling

4. Resetting

As it is an automatic reset system, just re-starting the drive side can automatically reset it.

(1) When the Torque Guard trips due to overload, stop the rotation and remove the cause of the overload.

(2) When resetting, reset (re-engage) with input rpm at less than 50r/min or by inching the motor.

⚠ To avoid injury, do not reset the Torque Guard by hand.

(3) A distinct clicking sound is made when the ball settles in its pocket.

Drive member selection and manufacture

A sprocket, gear and pulley can be installed in the Torque Guard to act as the drive member (center member). When selecting and manufacturing a drive member, refer to the precautions listed below.

(1) Use the outer diameter of the center flange as the spigot facing, and fix the drive member with bolts.
Verify the diameter of the Torque Guard's spigot facing with that of the drive member.
Each spigot is as listed in the chart below.

Unit: mm

Model No.	Spigot diameter	Model No.	Spigot diameter
TGB08-L,M,H	40 (h8)	**TGB50-L,M,H**	160 (h7)
TGB12-L,M,H	48 (h8)	**TGB70-H**	220 (h7)
TGB16-L,M,H	58 (h8)	**TGB90-L,H**	295 (h7)
TGB20-H	90 (h7)	**TGB110-L,H**	355 (h7)
TGB30-L,H	113 (h7)	**TGB130-L,H**	400 (h7)

(2) Center flange installation

・TGB08～16

The center flange's installation tap hole is penetrated. If the bolt's length is longer than the center flange, it will make contact with the plate. Make sure it does not stick out on the plate side.

・TGB20～130

The center flange's installation tap hole is penetrated. If the the bolt's length is too long there may be contact with the sensor plate.
The recommended bolt screw lengths are listed in the chart below.

Unit: mm

Model No.	Bolt screw length	Model No.	Bolt screw length
TGB08-L,M,H	4	**TGB50-L,M,H**	9～11
TGB12-L,M,H	5	**TGB70-H**	13～15
TGB16-L,M,H	7	**TGB90-L,H**	23～25
TGB20-H	6～7	**TGB110-L,H**	26～28
TGB30-L,H	8～10	**TGB130-L,H**	28～30

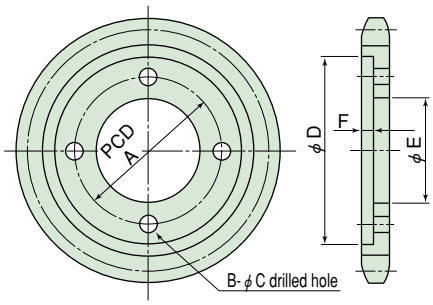
(3) Refer to the chart below for drive member bolt diameters (JIS B1001-1985).

● Bolt bore diameter JIS B1001—1985

Unit: mm

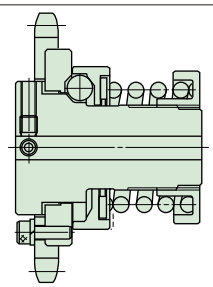
Nominal screw diameter	3	4	5	6	8	10	12	16
Bolt bore diameter	3.4	4.5	5.5	6.6	9	11	13.5	17.5

● Recommended dimensions for drive member finishing

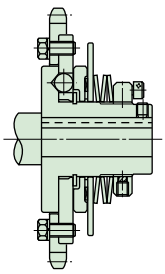


Series name	Drive member finishing dimensions					
	A	B	C	D	E	F
TGB08-L,M,H	34	3	3.4	40_{H7}	28	3
TGB12-L,M,H	40	3	4.5	48_{H7}	33	3
TGB16-L,M,H	50	3	4.5	58_{H7}	41	3
TGB20-H	78	4	5.5	90_{H7}	64	3
TGB30-L,H	100	6	6.6	113_{H7}	84	4
TGB50-L,M,H	142	6	9.0	160_{H7}	124	5
TGB70-H	200	6	11	220_{H7}	172	5
TGB90-L,H	265	8	13.5	295_{H8}	240	5
TGB110-L,H	325	6	17.5	355_{H8}	292	5
TGB130-L,H	360	8	17.5	400_{H8}	325	5

■ Installation example



■ Installation example



●Usable sprocket minimum number of teeth

Sprocket Model No. / TGB size	RS25	RS35	RS41	RS40	RS50	RS60	RS80	RS100	RS120	RS140	RS160
TGB08-L,M,H	(24)	(17)	(14)	14	12	13 (10)					
TGB12-L,M,H	(28)	(20)	(16)	16	13	13 (11)					
TGB16-L,M,H	(32)	(23)	(18)	18	15	14					
TGB20-H	(48)	(34)	(26)	26	22	19	15	13	13 (11)		
TGB30-L,H	(60)	(41)	(32)	32	26	22	18	15	13		
TGB50-L,M,H		(57)	(43)	45 (43)	35	30	24	20	17		
TGB70-H			(58)	60 (58)	48 (47)	40	32 (31)	26	24 (22)		
TGB90-L,H					62	52	40	33	28	25	22
TGB110-L,H					74	62	48	39	33	29	26
TGB130-L,H					83	70	53	43	37	32	24

※ The teeth number in parentheses are not standard A Type sprockets.
Make sure to use a sprocket that has a one size larger number of teeth.
※ The above are the smallest possible installable sprockets. Sprocket transmissible power is not considered, so refer to Tsubaki's drive chain catalog for more information on sprocket selection and handling.

Maintenance

1. Torque Guard (TGB)

Lightly coat the balls and bearings with grease once per year or every 1,000 trips.

●Grease

Exxon Mobil		Showa Shell	Japan-Energy	Idemitsu	Nippon Oil Corporation	Kygnus	Cosmo Oil
Mobilux EP2	Listun EP2	Alvania EP Grease 2	Rizonics EP 2	Daphny Eponex Grease EP 2	Epinoc Grease AP(N)2	Kygnus EP Grease 2	Cosmo Dynamax EP Grease 2

2. Coupling portion (TGB20-C～TGB130-C)

・Coat the roller chain and sprocket with grease once per month.
Use the same grease for the Torque Guard.

3. Sprocket portion

・For more information on sprocket and roller chain maintenance, refer to Tsubakimoto Chain's drive chain catalog.
・If operating with a sprocket and roller chain for a long period of time, even if the trip frequency and number of times is very low, it is possible for the sprocket to wear. Inspect the sprocket for wear on a regular basis. Refer to the Tsubakimoto drive chain catalog for inspection procedures.

Lock screw/tightening torque reference chart

Hexagon socket head screw	Tightening torque N·m{kgf·cm}
M5	3.8 {38.7}
M8	16 {163}

Precautions:

When re-tightening the lock screws, make sure to take the following precautions:

1. Confirm that the plug tip has not been removed. If a lock screw is used with a tipless plug, the hub's thread may be damaged or the hub's pocket may get jammed.
2. Confirm that the plug's tip has not been heavily damaged. If a lock screw is used with a heavily damaged plug tip, the hub's thread may be damaged.

＊If 1. or 2. is found to be the case, exchange the damaged parts with new ones.

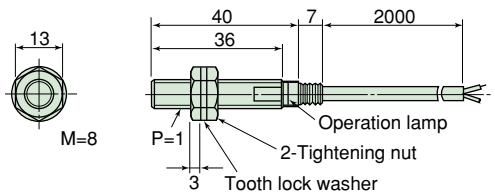
TG Sensor

The TG Sensor is a Torque Guard specific proximity switch system overload detecting sensor. After detecting Torque Guard overload, the motor can be stopped and the alarm can be signaled. It is of course possible to install the TG Sensor on other series' and sizes as well.

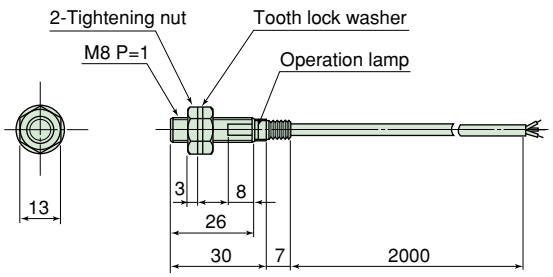
		AC type	DC type
Model no.		**TG-S8**	**TG-S8D**
Power supply voltage	Rating	AC24～240V	DC12～24V
	Range to be used	AC20～264V (50/60Hz)	DC10～30V
Current consumption		Less than 1.7mA (at AC200V)	Less than 13mA
Control output (opening and closing capacity)		5～100mA	Max. 200mA
Indicator lamp		Operation indicator	
Ambient operating temperature		-25～+70C (does not freeze)	
Ambient operating humidity		35～95%RH	
Output form		NC (When not detecting the sensor plate, output opening and closing state is displayed)	
Operation mode		——	NPN
Insulation resistance		More than 50MΩ (at DC50V megger) In between the energized part and the case	
Mass		Approx. 45g (with 2m code)	
Residual voltage		Refer to characteristic data	Less than 2.0V (load current 200mA/code length 2m)

■Dimensions Diagram

●AC type TG-S8



●DC type TG-S8D

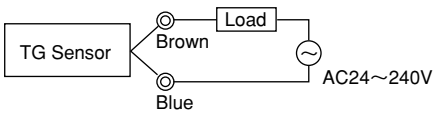


■TG Sensor Handling

＊Do not swing, excessively pull or strike the detecting portion with an object.

AC type TG-S8

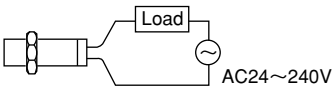
●Circuit diagram



No need to consider the polarity of TG sensor (brown,blue).

●Precautions for wiring

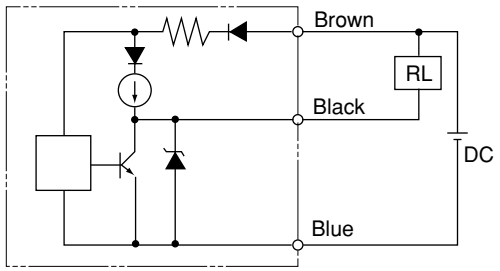
- Make sure to turn on the power after connecting the load, or the machine will likely be damaged.



- In order to prevent damage due to surge and noise when an electric/power line runs close to the TG sensor code, use a single and separate wiring pipe.

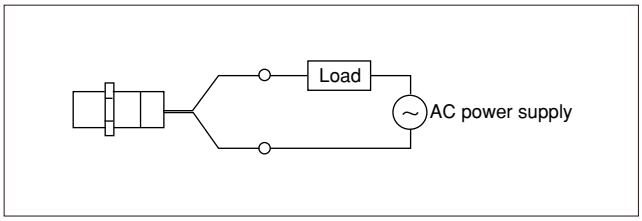
DC type TG-S8D

●Circuit diagram



■Selecting overload and wiring information (AC type for TG-S8)

- **Connecting to a power source**
  Make sure to connect via load. A direct connection will damage the internal elements.



- **Using a metal pipe to prevent malfunction/damage**
  In order to prevent malfunction or damage, insert the proximity switch code inside a metal pipe when it runs close to the power cable.

- **Surge protection**
  The TGA Sensor has built-in absorbing circuits, but when the TGA Sensor is used near a device such as a motor or arc welder where a large surge occurs, make sure to insert a surge absorber such as a varister in the source.

- **Influence of consumption (leakage) current**
  Even when the TG Sensor is OFF, in order to keep the circuits running, a small amount of current flows as current consumption. (Refer to the "Consumption (leakage) Current" graph) Consequently, because there is a small amount of voltage on the load, it may cause the occurring load to malfunction when resetting. Before using the sensor, confirm that this voltage is less than the load reset voltage. As well, when using the relay as load, be aware that due to the relay's construction when the leakage current is OFF, a buzz will sound.

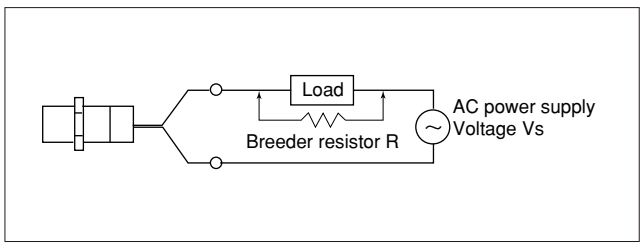
- **When power supply voltage is low**
  When power supply voltage is smaller than AC48V and load current is less than 10mA, the output residual voltage when the TG Sensor is ON will become large, and the load residual voltage will become large when it is OFF. (Refer to the Residual Voltage Load Characteristics graph.) Take note of operating voltage load when using a relay, etc.

- **When load current is small**
  When load current is less than 5mA, load residual voltage becomes large in the TG Sensor. (Refer to the Residual Voltage Load Characteristics graph.)
  In this situation, connect the breeder resistance and load in a parallel formation like in the diagram below. If load voltage is above 5mA make residual voltage less than load reset voltage. The breeder resistance value and allowable power are calculated using the below calculation.
  To be on the safe side, it is recommended to use 20kΩ 1.5W (3W) and above at AC100V, 39kΩ 3W (5W) and above at AC200V.

*When the effect from heat build up becomes a problem, use the wattage in ( ) and above.

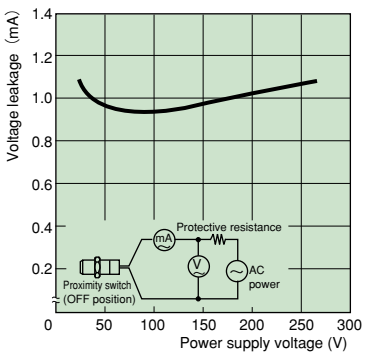
$$R \leqq \frac{Vs}{5-i}\ (k\Omega) \qquad P \leqq \frac{Vs^2}{5-i}\ (mW)$$

P : Breeder resistance W number (As a practical matter, use the number of W several times or more)
i : Load current (mA)



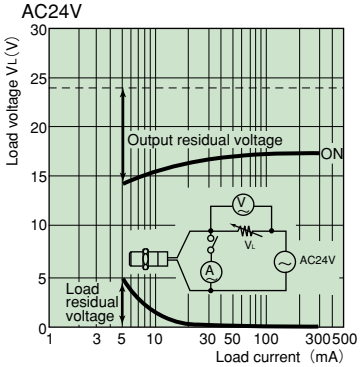
- **The large inrush current load**
  A load with large inrush current such as a lamp or motor can cause damage or deterioration to open-close elements of the sensor. In this type of situation, use the sensor via a relay.

- **Consumption (leakage) Current Characteristics**

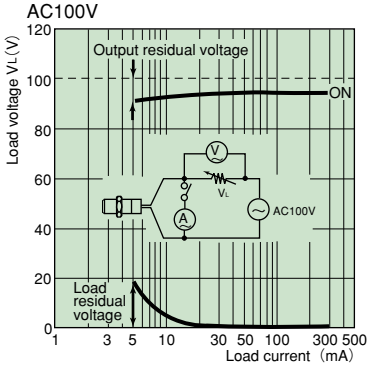


- **Load residual voltage characteristics**

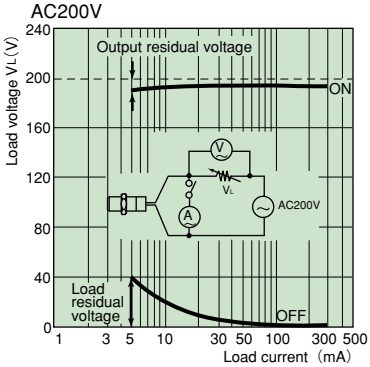
Load residual voltage characteristics
AC24V



Load residual voltage characteristics
AC100V



AC200V

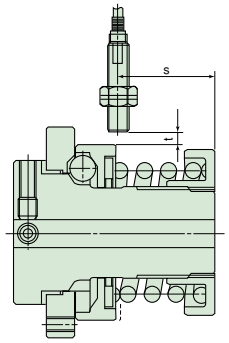


Overload detection

■TG Sensor handling

・The detecting distance of a TG Sensor is 1.5mm. Set the Torque Guard at non-trip condition with the dimensions (s, t) in the chart below.
・Install the TG Sensor at the tripped position. Then, while rotating the Torque Guard by hand, verify that the TG Sensor is functioning (LED at the side is lighting) and there is no interference with the plate. Finally, reset the Torque Guard .

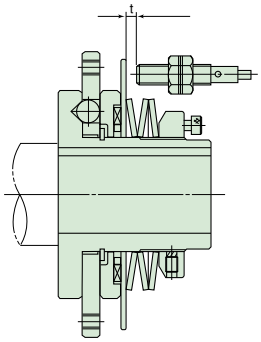
● Installation diagram TGB08～16



Unit: mm

	s	t	Amount of sensor plate movement
TGB08-L,M,H	19.2	1.2	0.9
TGB12-L,M,H	22.7	1.2	1.0
TGB16-L,M,H	27.5	1.2	1.2

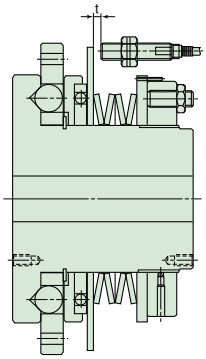
● Installation diagram TGB20～50



Unit: mm

	t	Amount of sensor plate movement
TGB20-H	1.8～3.3	1.8
TGB30-L,H	2.0～3.5	2.0
TGB50-L,M,H	2.7～4.2	2.7

● Installation diagram TGB70～130



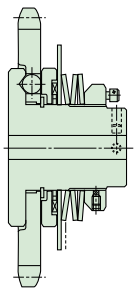
Unit: mm

	t	Amount of sensor plate movement
TGB70-H	3.3～4.8	3.3
TGB90-L,H	5.6～6.8	5.4
TGB110-L,H	6.2～7.4	6.0
TGB130-L,H	6.8～8.0	6.6

Special specifications

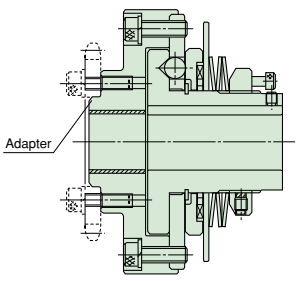
1. With sprocket type

We accept orders for with the sprocket the type that are not included among our standard products. Contact Tsubaki Emerson to help you with your selection.



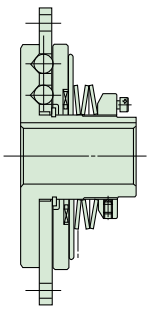
2. Adapter specifications

It is convenient to use sprockets and pulleys with a small outside diameter. Contact Tsubaki Emerson for more information on the sprocket and pulley you will install.



3. Forward-reverse type

Depending on Torque Guard rotation direction, the trip torque set value can be changed. Contact TEM for more information.



Torque Guard TGX Series

Features

Non-backlash. Provides superb rigidity during normal operation. Ideal for applications that require highly accurate positioning.

Ministry of Economy, Trade and Industry picks for Good Design Award product

Highly accurate trip

The lost motion during trip is very small.
Accuracy of consecutive repeated trip torque fluctuations is within ±30%.

Non-backlash

Due to its innovative ball and wedge construction (PAT.), there is almost no backlash.

Coupling function

For the coupling, the ball and wedge construction absorbs the angle, parallel and axial displacement misalignment.

One position

The unique assembly of the TGX Series means the ball and wedge configuration engages in only 1 position.

Easy torque adjustment

Just by turning the adjusting nut, trip torque can be freely adjusted.

Verifying set torque

The easy to read rpm and angle indicators makes verifying the torque setting easy.

Standard type overload detection sensor

It can detect overload by the non-contact type TG Sensor (refer to pages 28, 29),and stop the motor or output an alarm.

Standard stock

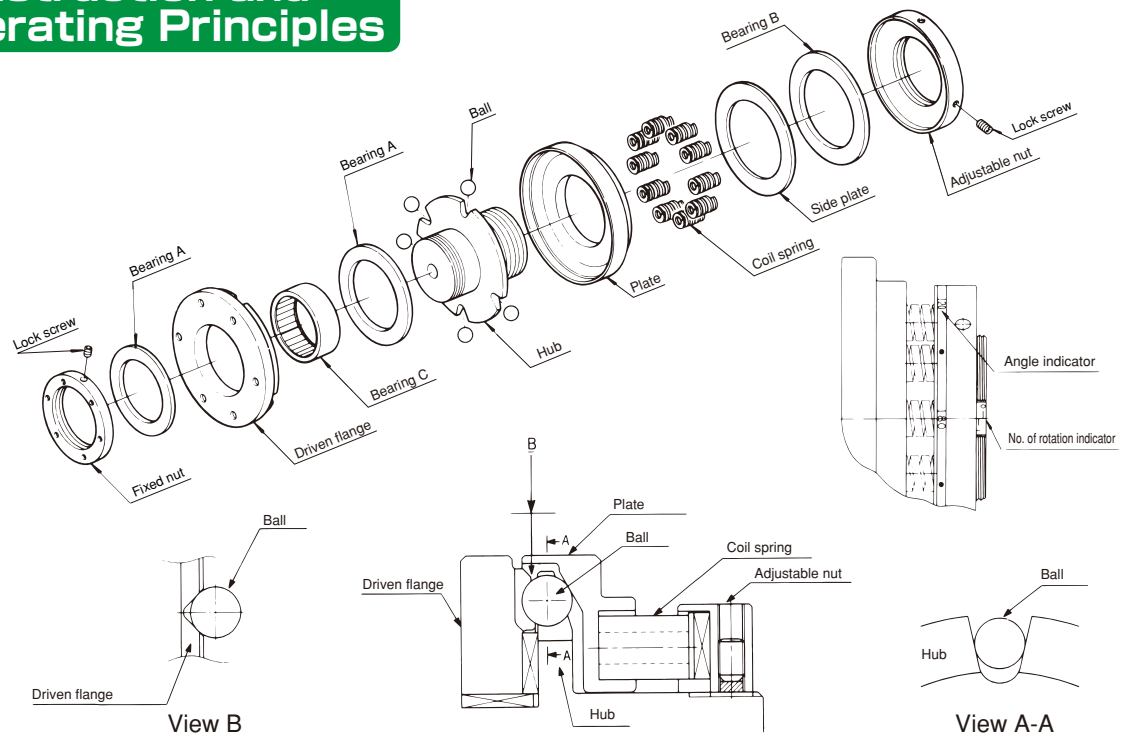
Rough bores are a stock item

Bore finishing for quick delivery

Finished bore products can be made for quick delivery. (Refer to page 35)

TG Sensor

Construction and Operating Principles



Ball and Wedge Mechanism

Torque transmission is transmitted from the hub → steel ball → driven flange. (As well as the reverse direction.)
Due to the force of the coil spring, the steel ball is retained in between the hub and driven flange, and the contact portion of the metal balls are tapered, and the clearance between the steel balls and V-shape retaining portions are always zero.
(View A-A)
In addition, because of the 2 points contact of steel balls with the driven flange at V-shaped pocket, there is no backlash.
(View B)
This mechanism is a ball and wedge mechanism (PAT.).
During overload the steel balls pop out from their pockets and start rolling.
Because of this not sliding but all rolling mechanism, the friction torque when idling is extremely small and it is a highly durable mechanism.
Reset is carried out by an automatic reset system. As operation is resuming, the steel ball resets to its pocket.
As well as the TGB Series, the non-symmetric arrangement of the 5 steel balls and pockets allow only one engagement position, and there is no phase shift.

Model No.

TGX20 — H — 15J — 5.0

- Size
- Coil spring type
- Bore diameter
  (no number is displayed if bore is not finished)
- Fastening method
  For special type there is no key way···J: new JIS standard type or E: old JIS 2type
  Power Lock···no. of Power Locks
- Set torque (unit: kgf.m, no. not displayed if torque not set)

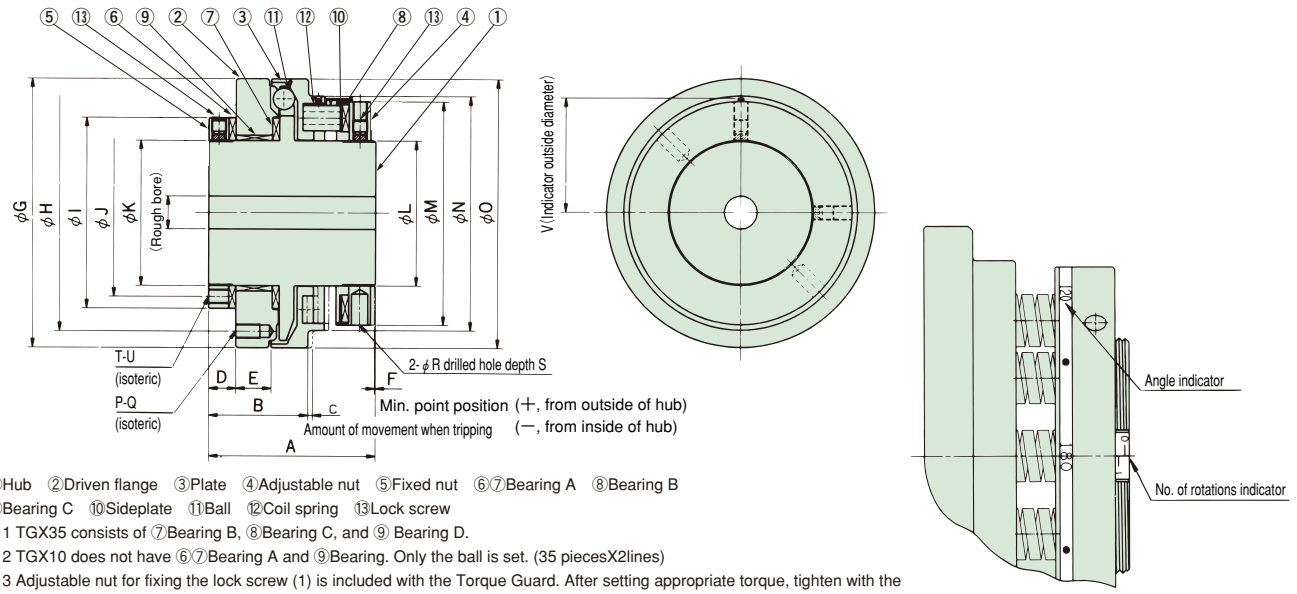
Coupling type

TGX50 — MC — T352 × C502 — 9.5

- Size
- Coil spring type
- Torque Guard side bore diameter
  (no number is displayed if bore is not finished)
- Fastening method
  For special type there is no key way···J: new JIS standard type or E: old JIS 2type
  Power lock···no. of Power Locks
- Coupling side bore diameter
  (no number is displayed if bore is not finished)
- Fastening method
  For special type there is no key way···
  J: new JIS standard type or E: old JIS 2type
  Power lock···No. of Power Locks
- Set torque
  (unit: kgf.m, No. not displayed if torque not set)

Transmissible Capacity/Dimensions Table

Torque Guard (high precision TGX Series)



①Hub ②Driven flange ③Plate ④Adjustable nut ⑤Fixed nut ⑥⑦Bearing A ⑧Bearing B
⑨Bearing C ⑩Sideplate ⑪Ball ⑫Coil spring ⑬Lock screw

＊1 TGX35 consists of ⑦Bearing B, ⑧Bearing C, and ⑨ Bearing D.

＊2 TGX10 does not have ⑥⑦Bearing A and ⑨Bearing. Only the ball is set. (35 piecesX2lines)

＊3 Adjustable nut for fixing the lock screw (1) is included with the Torque Guard. After setting appropriate torque, tighten with the following torque to avoid interference with the hub's pocket.
Lock screw size: M5…3.8N.m{38.7kgf.cm} M8…16N.m{163kgf.cm}

Unit：mm

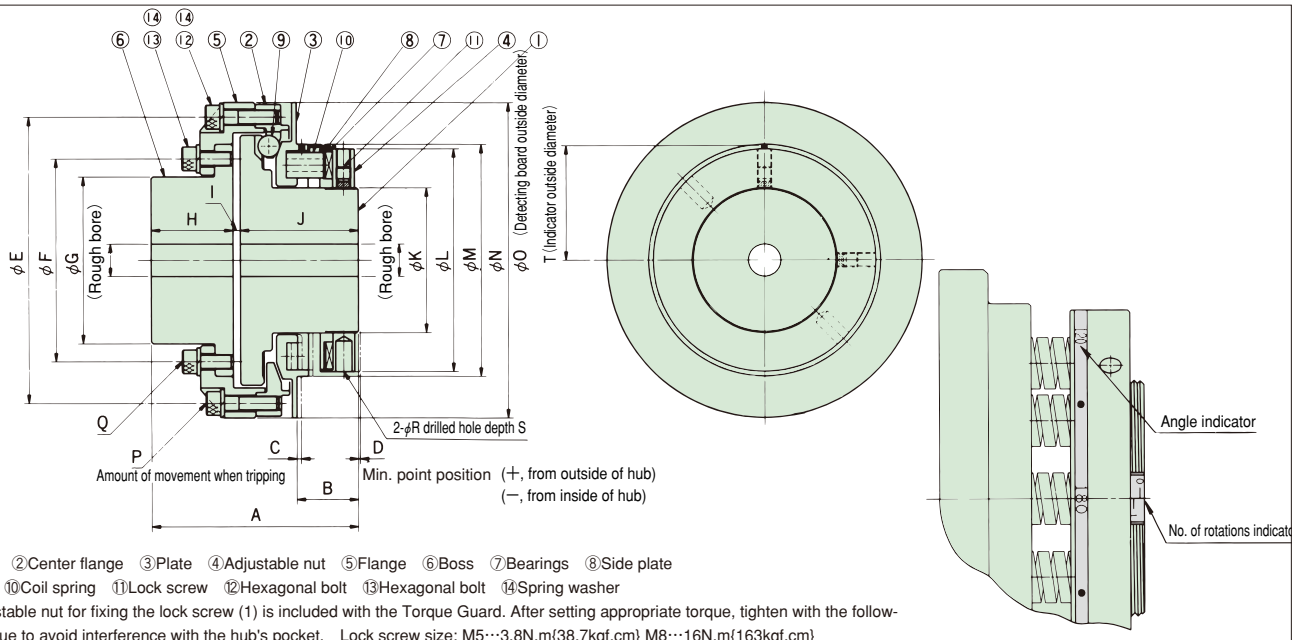
Torque Guard Model No.	Set torque range N·m {kgf·m}	Max. ※r/min	Coil spring color × number	Rough bore diamter	※ Max. bore diameter	A	B	C amount of movement during trip	D	E	F min. point position	G h7	H PCD	I	J PCD
TGX10-L	1.7～6.4 {0.17～0.65}	1400	Yellow × 3	7	15	53	22	1.4	7.5	6.6	+0.3	62	54	42	34
TGX10-M	5.4～15 {0.55～1.5}		Red × 3												
TGX10-H	11～29 {1.1～3.0}		Red × 6												
TGX20-L	6.5～24 {0.66～2.4}	1100	Yellow × 6	8.5	25	64	35	1.6	10	13.4	+0.7	86	74	60	50
TGX20-M	13～34 {1.3～3.5}		Red × 3												
TGX20-H	25～68 {2.6～6.9}		Red × 6												
TGX35-L	23～68 {2.3 ～ 6.9}	800	Red × 5	12	35	68	37.5	2.0	11	11.6	−0.5	107	88	70	60
TGX35-M	43～98 {4.4～10}		Green × 5												
TGX35-H	87～196 {8.9～20}		Green × 10												
TGX50-L	45～118 {4.6～12}	600	Red × 5	18	55	92	54.8	2.6	15	19.5	+0.3	148	130	105	—
TGX50-M	90～196 {9.2～20}		Green × 5												
TGX50-H	176～392 {18～40}		Green × 10												
TGX70-L	127～363 {13～37}	480	Red × 8	23	70	98	61	3.5	15	19.2	+1.0	185	164	135	—
TGX70-M	265～510 {27～52}		Green × 8												
TGX70-H	392～784 {40～80}		Green × 12												

Torque Guard Model No.	K	L	M	N	O	P	Q screw diamter × length	R	S	T	U screw diamete × length	V	※Mass kg	※Inertia moment ×10⁻²kg·m²	※ GD² ×10⁻²kgf·m²
TGX10-L	25	30	56	58	61.8	4	M 4× 6	5	10	4	M4×7	30	0.75	0.0293	0.117
TGX10-M															
TGX10-H															
TGX20-L	40	40	70	73	86	6	M 5× 8	5	10	6	M4×7	37	1.67	0.134	0.535
TGX20-M															
TGX20-H															
TGX35-L	50	55	88	91	107	6	M 6× 7	6	10	6	M5×8	46	2.51	0.333	1.33
TGX35-M															
TGX35-H															
TGX50-L	80	80	123	129	148	6	M 8×13	9	17	–	–	64	7.03	1.83	7.32
TGX50-M															
TGX50-H															
TGX70-L	100	100	148	153	185	6	M10×13	10	18	–	–	76	11.4	4.88	19.5
TGX70-M															
TGX70-H															

※In the case instantaneous stop after tripping by sensor is available, it can be used higher than maximum speed (must be within 3000r/min). Instantaneous stop is not possible, TGX Series is recommended.
※Mass, inertia moment and GD2 are based on the bores' maximum diameters.
※Maximum bore diameter is with key installation. In case of Power-Lock installation, refer to p 38.

Note: All products are stock items.

Torque Guard Coupling



① Hub ②Center flange ③Plate ④Adjustable nut ⑤Flange ⑥Boss ⑦Bearings ⑧Side plate
⑨Ball ⑩Coil spring ⑪Lock screw ⑫Hexagonal bolt ⑬Hexagonal bolt ⑭Spring washer

＊Adjustable nut for fixing the lock screw (1) is included with the Torque Guard. After setting appropriate torque, tighten with the following torque to avoid interference with the hub's pocket. Lock screw size: M5···3.8N.m{38.7kgf.cm} M8···16N.m{163kgf.cm}

Unit：mm

Torque Guard Model No.	Set torque range N·m {kgf·m}	※ Max. r/min	Coil spring color × number	Torque Guard		Coupling		A	B	C	D min. point position	E PCD	F PCD	G	H
				Rough bore diameter	※ Max. bore diameter	Rough bore diameter	※ Max. bore diameter								
TGX10-LC	1.5～5.4 {0.15～0.55}	700	Yellow × 3	7	15	7	19	69	24	1.3	+0.3	62	42	33	25
TGX10-MC	4.6～13 {0.47～1.3}		Red × 3												
TGX10-HC	9.3～25 {0.95～2.6}		Red × 6												
TGX20-LC	5.2～19 {0.53～1.9}	550	Yellow × 6	8.5	25	8.5	35	84	24	1.6	+0.3	89	66	55	35
TGX20-MC	9.8～27 {1.0～2.8}		Red × 3												
TGX20-HC	21～55 {2.1～5.6}		Red × 6												
TGX35-LC	19～57 {1.9～5.8}	400	Red × 5	12	35	12	50	88	24	1.9	−0.5	113	83	70	35
TGX35-MC	36～84 {3.7～8.6}		Green × 5												
TGX35-HC	74～167 {7.5～17}		Green × 10												
TGX50-LC	40～98 {4.1～10}	300	Red × 5	18	55	18	60	114	34	2.4	+0.9	158	112	92	45
TGX50-MC	81～176 {8.3～18}		Green × 5												
TGX50-HC	167～343 {17～35}		Green × 10												
TGX70-LC	118～323 {12～33}	240	Red × 8	23	70	23	80	124	36	3.3	+0.6	200	145	116	50
TGX70-MC	235～461 {24～47}		Green × 8												
TGX70-HC	353～696 {36～71}		Green × 12												

Torque Guard Model No.	I	J	K	L	M	N	O	P screw diameter × length	Q screw diameter × length	R	S	T	※ Mass kg	※ Inertia moment $\times 10^{-2}$kg·m²	※GD² $\times 10^{-2}$kgf·m²	Allowable angular misalignment (deg.)	Allowable parallel misalignment	Allowable shaft direction displacement
TGX10-LC																		
TGX10-MC	2	42	30	56	−	74	74	M 4×18	M 4×10	5	10	30	1.07	0.0555	0.222	0.6	0.1	±0.5
TGX10-HC																		
TGX20-LC																		
TGX20-MC	3	46	40	70	−	98	98	M 5×20	M 5×12	5	10	37	2.38	0.231	0.924	0.6	0.1	±0.5
TGX20-HC																		
TGX35-LC																		
TGX35-MC	3	50	55	88	−	125	125	M 6×25	M 6×15	6	10	46	3.92	0.663	2.65	0.6	0.1	±0.5
TGX35-HC																		
TGX50-LC																		
TGX50-MC	4	65	80	123	128	174	174	M 8×32	M 8×20	9	17	64	10.9	3.35	13.4	0.6	0.1	±0.6
TGX50-HC																		
TGX70-LC																		
TGX70-MC	4	70	100	148	152	218	218	M10×22	M10×38	10	18	76	16.3	8.93	35.7	0.6	0.1	±0.7
TGX70-HC																		

※In the case instantaneous stop after tripping by sensor is available, it can be used higher than maximum speed (must be within 3000r/min). Instantaneous stop is not possible, TGX Series is recommended.
※Mass, inertia moment and GD2 are based on the bores' maximum diameters.
※Maximum bore diameter is with key installation. In case of Power-Lock installation, refer to p 38.

Note: All products are stock items.

Torque Guard TGX, and Torque Guard Coupling TGX-C with Finished Bore

Finished bore products can be made for quick delivery

■Bores and keyways are already finished before delivery.

The finished bores for TGX10～TGX70 and TGX10-C～TGX70-C are standard.

■Finished Bore Dimension Chart

Unit: mm

Torque Guard TGX		Bore dimensions	
Torque Guard Model No.	Torque Gard Coupling Model No.	Torque Guard Side	Coupling side (Torque Guard Coupling only)
TGX10	**TGX10-C**	(10),(11),12,14,15	10,11,12,14,15,16,17,18,19
TGX20	**TGX20-C**	(14),(15),(16),(17),18,19,20,22,24,25	10,11,12,14,15,16,17,18,19,20,22,24,25,28,29,30,32,33,35
TGX35	**TGX35-C**	(14),(15),(16),(17),18,19,20,22,24,25,28,29,30,32,33,35	14,15,16,17,18,19,20,22,24,25,28,29,30,32,33,35,36,38,40,42,43,45,46,48,50
TGX50	**TGX50-C**	20,22,24,25,28,29,30,32,33,35,36,38,40,42,43,45,46,48,50,52,55	20,22,24,25,28,29,30,32,33,35,36,38,40,42,43,45,46,48,50,52,55,56,57,60
TGX70	**TGX70-C**	25,28,29,30,32,33,35,36,38,40,42,43,45,46,48,50,52,55,56,57,60,63,65,70	25,28,29,30,32,33,35,36,38,40,42,43,45,46,48,50,52,55,56,57,60,63,65,70,71,75,80
Delivery		EX.-Japan 4 weeks by sea	

Finished bore dimensions with ( ) at Torque Guard side are applied only for Torque Guard Coupling.

Model No.

Torque Guard

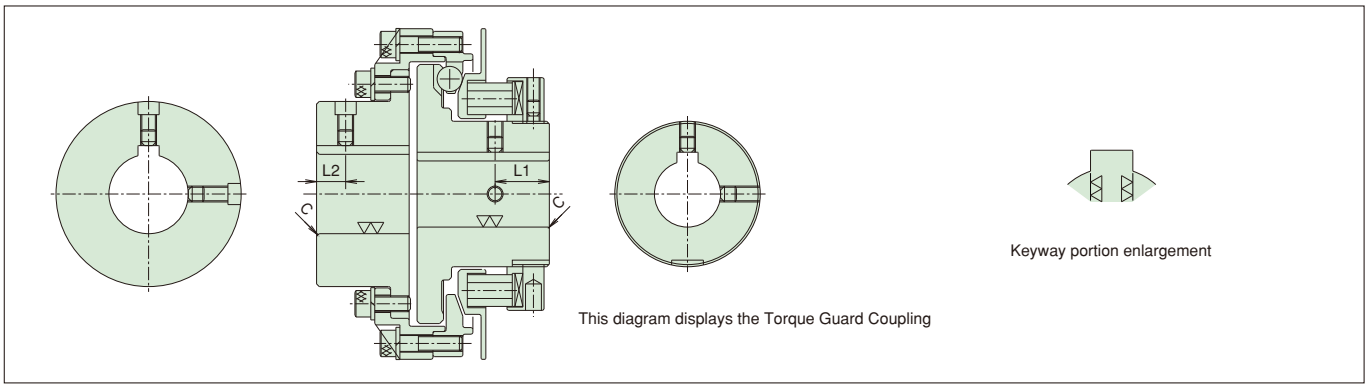
TGX20 - H - 15J

- TGX20: Size
- H: Coil spring type
- 15: Bore diameter
- J: New JIS key standard type

Torque Guard Coupling

TGX50 - MC - T35J×C50J

- TGX50: Size
- MC: Coil spring type
- T35J: Torque Guard side bore diameter
- C50J: Coupling side bore diameter
- J: New JIS key standard type



This diagram displays the Torque Guard Coupling

Keyway portion enlargement

Torque Guard TGX		Torque Guard side			Coupling side (Torque Guard Coupling only)		
Torque Guard Model No.	Torque Guard Coupling Model No.	Bore diameter	Set screw	Set screw position L1	Bore diameter	Set screw	Set screw position L2
TGX10	**TGX10-C**	φ15 and below	2-M4×4	21	φ19 and below	2-M4×4	8
TGX20	**TGX20-C**	φ23 and below	2-M5×5	20.5	φ35 and below	2-M5×5	12
		φ24,25	2-M4×4				
TGX35	**TGX35-C**	φ35 and below	2-M6×6	20.5	φ50 and below	2-M6×6	11
TGX50	**TGX50-C**	φ55 and below	2-M6×6	24.5	φ60 and below	2-M6×6	13
TGX70	**TGX70-C**	φ70 and below	2-M6×6	25	φ80 and below	2-M6×6	15

1.Set screws are located at 2 positions, on the keyway and 90° CW from it.

2.For Torque Guard Couplings, only the TGX10-C has a different keyway phase between the Torque Guard side and the coupling side.

■Bore diameter and keyway specifications

- Bore diameter tolerance is as follows:
  18 mm and below……0～+0.021mm
  19 mm and above……H7
- Keyway is New JIS (JIS B 1301-1996) Normal type
- Set screws are included.

Bore diameter	Chamfer dimensions
25 mm and below	C0.5
50 mm and below	C1
51 mm and above	C1.5

Selection

As a safety device, the Torque Guard will be most effective if it is installed in the place nearest to where overload is thought to most likely occur on the driven machine.
For most situations, avoid using the Torque Guard with human transportation or lifting devices. If you decide to use a Torque Guard with these devices, take the necessary precautions to avoid serious injury or death from falling objects.

1. Setting trip torque

$$T_P = T_L \times S.F = \frac{60000 \times P}{2\pi \cdot n} \times S.F \quad \left\{T_P = \frac{974 \times P}{n} \times S.F\right\}$$

T_P = Trip torque N·m{kgf·m}　　T_L = Load torque N·m{kgf·m}
P = Transmittance power kW　　S.F = Service factor
n = rpm r/min

(1)From the machine's strength and load, as well as other information, set the trip torque at the point where it should not go any higher.
(2)When the limit value is not clear, calculate the rated torque by using the rpm of the shaft where the Torque Guard is installed and rated output power. Then, depending on the conditions of use, multiply by the service factor in Table 1.

Table 1

Service factor	Operating conditions
1.25	In the case of normal start up/stop, intermittent operation
1.50	In the case of a heavy shock load or forward-reverse driving

2. When rpm is relatively high

When rpm is relatively high (more than 500r/m), or when load inertia is large, depending on the motor's start up torque, there is a chance the Torque Guard will trip. In this case, determine the inertia ratio and calculate the torque used in the Torque Guard during start up, then multiply it by the service factor and make this the trip torque.

$$K = \frac{I_L + I_t}{I_S} \quad \left\{K = \frac{GD_L^2 + GD_t^2}{GD_S^2}\right\} \quad Tt = \frac{K \cdot T_S + T_L}{1 + K} \quad Tp = SF \cdot Tt$$

K　: Inertia ratio
I_s　: Drive side inertia moment (kg·m²)
{GD_s^2 : Drive side GD² (kgf·m²)}
I_L　: Load side inertia moment (kg·m²)
{GD_L^2 : load side GD² (kgf·m²)}
I_t　: Torque Guard inertia moment (kg·m²)
{GD_t^2 : Torque Guard GD² (kgf·m²)}
T_s　: Motor starting torque (N·m){kgf·m²}
T_t　: Torque in Torque Guard during start up (N·m){kgf·m²}
T_L　: Load torque (N·m){kgf·m}
T_P　: Trip torque (N·m){kgf·m}
S.F.　: Service factor
Note) Use the equivalent value to the shaft in which the Torque Guard is installed for each inertia moment, GD² and torque value.

3. Precautions when deciding trip torque

Compared with load torque, if the torque used when starting up becomes large, the setting trip torque value also becomes large, causing a problem from the viewpoint of the overload protection device. (Compared with the load torque, the trip torque is too large.) In this case install it as close to the load side as possible.

4. Choosing the model number

Choose a model where the calculated trip torque is within the minimum to maximum setting range.

5. Verifying bore diameter

Verify that the shaft where the Torque Guard will be installed is in the possible range (refer to the dimensions table) of the bore diameter of the Torque Guard model you selected.
If the shaft diameter is larger than the possible bore range, select a model one size larger that uses a weak spring.

6. Confirming rpm

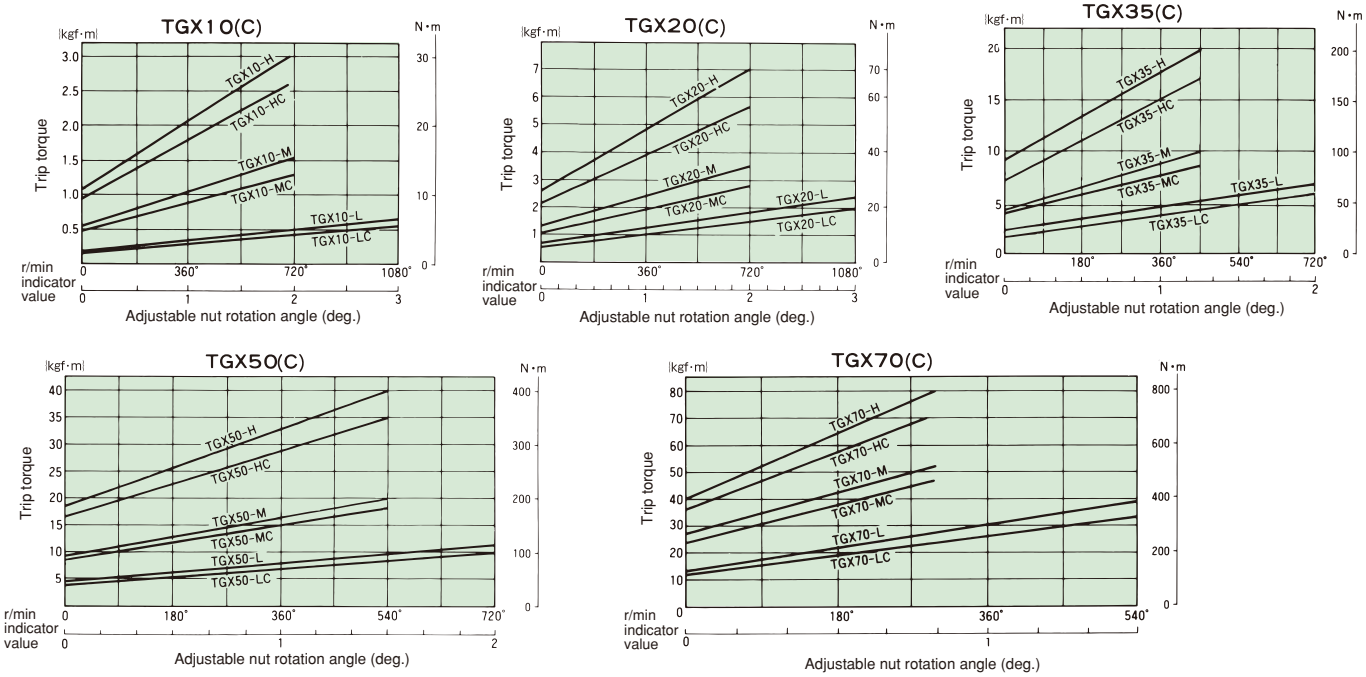
Confirm that the Torque Guard rpm used is within the maximum rpm value in this catalog.

Handling

1. Setting trip torque

(1) TGX Torque Guards are all set at the "0" point (minimum torque value) for delivery. Confirm that the torque indicator is set at "0" when you receive the Torque Guard. (Refer to pages 33, 34)
(2)From the "Tightening Amount Torque Correlation Chart" (below), find the adjusting nut's (bolt) tightening angle equivalent to the predetermined trip torque. The torque indicator is at every 60° pitch. Set at 60° toward the determined tightening value, then install to the machine and conduct a trip test. Gradually tighten and set at optimum trip torque. Each product's trip torque does not always correspond with the value listed in the "Tightening Amount - Torque Correlation Chart", so use these values only as a rough guide.
(3)After setting torque, screw the lock screw to the adjusting nut.
(4)Do not turn the adjusting nut (bolt) more than the torque indicator's maximum value. Doing so will put it in a locked position, and there will be no leeway for the disk spring to bend. Refer to page 27 for the lock screws' tightening torque and precautions.

■Tightening Amount-Torque Correlation Chart



Centering method

(1) **Centering method Ⅰ**

a. Separate the flange from the hub and center flange.
b. Move the flange, then set to the I dimensions shown in Table 1.
c. Fix a dial gauge to the hub (coupling side hub), then measure the run-out of the hub's end face and outer circumference.

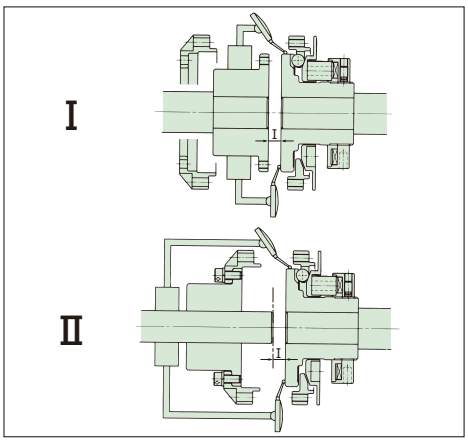
(2) **Centering method Ⅱ**

a. Separate the flange and the center flange.
b. Fix a dial gauge to the shaft, then measure the run-out of the hub's end face and outer circumference.
c. Move the boss (coupling side hub), then set to the I dimensions shown in Table 1.

Note	Make sure to secure it using the I dimensions in Table 1, otherwise the Torque Guard can not be used because backlash will occur.

Table 1 Unit: mm

Model No.	I dimensions
TGX10-C	2
TGX20-C	3
TGX35-C	3
TGX50-C	4
TGX70-C	4



Allowable Misalignment

Unit: mm

Model No.	Allowable angular misalignment deg.	Allowable parallel misalignment	Allowable axial misalignment
TGX10-C	0.6	0.1	±0.5
TGX20-C	0.6	0.1	±0.5
TGX35-C	0.6	0.1	±0.5
TGX50-C	0.6	0.1	±0.6
TGX70-C	0.6	0.1	±0.7

For reference: Hub end face run-out per angular misalignment $\theta = 0.10^{\circ}$ Unit: mm

Model No.	Outside diameter	Hub end face run-out
TGX10-C	ϕ53	0.092
TGX20-C	ϕ75	0.131
TGX35-C	ϕ98	0.171
TGX50-C	ϕ138	0.241
TGX70-C	ϕ177	0.309

Make angular misalignment as small as possible when installing the Torque Guard.

Maintenance

Lightly grease the balls and bearings once per year or every 1,000 trips.

Grease

Exxon Mobil		Showa Shell	Japan-Energy	Idemitsu	Nippon Oil Corporation	Kygnus	Cosmo Oil
Mobilux EP2	Listun EP2	Alvania EP Grease 2	Rizonics EP 2	Daphny Eponex Grease EP 2	Epinoc Grease AP(N)2	Kygnus EP Grease 2	Cosmo Dynamax EP Grease 2

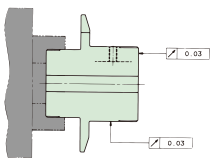
Bore finishing

Refer to the instruction manual for more information on Torque Guard TGX and Torque Guard Coupling TGX-C disassembly for bore finishing, finishing and assembly.

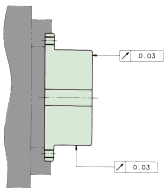
Bore Keyway Set Screw Dimensions

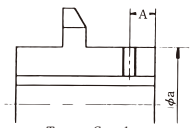
Dimensions / Model No.	A x screw diameter	B x screw diameter	C x screw diameter	a	b	c
TGX10	21 ×M5 and below	——	——	30	—	—
TGX20	20.5×M5	——	——	40	—	—
TGX35	20.5×M6	——	——	55	—	—
TGX50	24.5×M6	——	——	80	—	—
TGX70	26 ×M6	——	——	100	—	—
TGX10-C	——	8×M 4 and below	21 ×M5 and below	—	33	30
TGX20-C	——	12×M 8 and below	20.5×M5	—	55	40
TGX35-C	——	11×M10 and below	20.5×M6	—	70	55
TGX50-C	——	13×M10 and below	24.5×M6	—	92	80
TGX70-C	——	15×M10 and below	25.2×M6	—	116	100

Chuck the hub's end face, then center and finish it as shown in the diagram below.

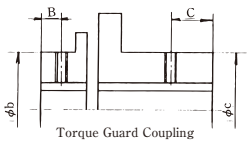


Chuck the flange's outer diameter, then center and finish it as shown in the diagram below.





Torque Guard



Torque Guard Coupling

Overload Detection

TG Sensor Installation

●The detecting distance of a TG Sensor is 1.5mm. Set the Torque Guard in a non-trip condition with the dimensions (s, t) in the chart below.
●Install the TG Sensor with the Torque Guard at the tripped position. Then, while rotating the Torque Guard by hand, verify that the TG Sensor is functioning (LED at the side is lighting) and there is no interference with the plate. Finally, reset the Torque Guard.

Installation diagram

TGX Series

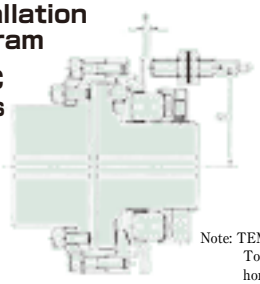
Unit: mm

Dimensions / Model No.	S	t	Amount of plate movement
TGX10	29.9	1.2	1.4
TGX20	28.3	1.2	1.6
TGX35	29.5	1.2	2.0
TGX50	35.6	1.2	2.6
TGX70	34.5	1.2	3.5

Note: The TG Sensor which is installed to the Torque Guard can only be installed in the radial direction.

Installation diagram

TGX-C Series



Unit: mm

Dimensions / Model No.	S	t	Amount of plate movement
TGX10-C	36.5	2.1~2.8	1.3
TGX20-C	45	2.4~3.1	1.6
TGX35-C	59	2.7~3.4	1.9
TGX50-C	83	3.2~3.9	2.4
TGX70-C	105	4.1~4.8	3.3

Note: TEM reccomends that the TG Sensor installed to the Torque Guard Coupling should be installed in a horizontal direction. Contact TEM for a consultation in the case you want to install it in the radial direction.

Combination with a Power Lock

1. Applicable range

It is possible to combine Torque Guards and Torque Guard Couplings with the Power Locks listed below. TEM will also supply the Torque Guard combined with Power Lock and special pressure flange and bolts upon request. The chart shows Power Lock transmissible torque for 1 set. In the case of multiple sets, multiply the coefficient below to get the transmissible torque.

N	S
2	1.55
3	1.85

N = Number of Power Lock sets

S = coefficient

(Example) TGX20: Shaft Diameter = 10 mm Power Lock: PL010X013E 2 sets in series

1.10 x 1.55 = 1.705

Shaft diameter(mm)	Power Lock Model No.	Pressure bolt tightening torque N·m{kgf·m}					
		TGX10(C)	TGX20	TGX35(C)		TGX50(C)	TGX70(C)
		F	F	F	S	F	F
10	PL010×013E	2.94 {0.30}	1.96 {0.20}				
12	PL012×015E	3.14 {0.32}	2.06 {0.21}				
13	PL013×016E		2.16 {0.22}				
14	PL014×018E		3.53 {0.36}				
15	PL015×019E		3.92 {0.40}	2.94 {0.30}	5.00 {0.51}		
16	PL016×020E		4.02 {0.41}	3.04 {0.31}	5.10 {0.52}		
17	PL017×021E		4.02 {0.41}	3.14 {0.32}	5.19 {0.53}		
18	PL018×022E		4.02 {0.41}	3.23 {0.33}	5.39 {0.55}		
19	PL019×024E		4.02 {0.41}	3.63 {0.37}	6.17 {0.63}		
20	PL020×025E			3.72 {0.38}	6.37 {0.65}	5.49 {0.56}	
22	PL022×026E			3.72 {0.38}	6.27 {0.64}	5.59 {0.57}	
24	PL024×028E			3.92 {0.40}	6.66 {0.68}	5.59 {0.57}	
25	PL025×030E			4.02 {0.41}		6.27 {0.64}	5.00 {0.51}
28	PL028×032E			4.02 {0.41}		6.47 {0.66}	5.19 {0.53}
30	PL030×035E			4.02 {0.41}		7.06 {0.72}	5.59 {0.57}
32	PL032×036E			4.02 {0.41}		7.35 {0.75}	5.88 {0.60}
35	PL035×040E			4.02 {0.41}		9.11 {0.93}	7.25 {0.74}
36	PL036×042E					9.51 {0.97}	7.64 {0.78}
38	PL038×044E					9.90 {1.01}	7.94 {0.81}
40	PL040×045E					11.7 {1.19}	9.31 {0.95}
42	PL042×048E					12.3 {1.26}	9.80 {1.00}
45	PL045×052E					13.7 {1.40}	13.7 {1.40}
48	PL048×055E					13.7 {1.40}	13.7 {1.40}
50	PL050×057E					13.7 {1.40}	13.7 {1.40}
55	PL055×062E						13.7 {1.40}
56	PL056×064E						13.7 {1.40}
60	PL060×068E						13.7 {1.40}
63	PL063×071E						13.7 {1.40}
65	PL065×073E						13.7 {1.40}
70	PL070×079E						13.7 {1.40}

Shaft diameter(mm)	Power Lock Model No.	Power Lock transmissible torque N·m{kgf·m}					
		TGX10(C)	TGX20	TGX35(C)		TGX50(C)	TGX70(C)
		F	F	F	S	F	F
10	PL010×013E	10.8 {1.10}	10.8 {1.10}				
12	PL012×015E	15.7 {1.60}	15.7 {1.60}				
13	PL013×016E		18.6 {1.90}				
14	PL014×018E		30.4 {3.10}				
15	PL015×019E		35.3 {3.60}	35.3 {3.60}	35.3 {3.60}		
16	PL016×020E		39.2 {4.00}	40.2 {4.10}	40.2 {4.10}		
17	PL017×021E		43.1 {4.40}	45.1 {4.60}	45.1 {4.60}		
18	PL018×022E		46.1 {4.70}	51.0 {5.20}	51.0 {5.20}		
19	PL019×024E		41.2 {4.20}	56.8 {5.80}	56.8 {5.80}		
20	PL020×025E		44.1 {4.50}	62.7 {6.40}	62.7 {6.40}	62.7 {6.40}	
22	PL022×026E			75.5 {7.70}	75.5 {7.70}	75.5 {7.70}	
24	PL024×028E			90.2 {9.20}	90.2 {9.20}	90.2 {9.20}	
25	PL025×030E			91.1 {9.30}		98.0 {10.0}	98.0 {10.0}
28	PL028×032E			111 {11.3}		123 {12.5}	123 {12.5}
30	PL030×035E			115 {11.7}		141 {14.4}	141 {14.4}
32	PL032×036E			124 {12.7}		160 {16.3}	160 {16.3}
35	PL035×040E			127 {13.0}		217 {22.1}	217 {22.1}
36	PL036×042E					229 {23.4}	229 {23.4}
38	PL038×044E					256 {26.1}	256 {26.1}
40	PL040×045E					312 {31.8}	312 {31.8}
42	PL042×048E					344 {35.1}	344 {35.1}
45	PL045×052E					366 {37.3}	490 {50.0}
48	PL048×055E					398 {40.6}	530 {54.1}
50	PL050×057E					419 {42.8}	557 {56.8}
55	PL055×062E						624 {63.7}
56	PL056×064E						590 {60.2}
60	PL060×068E						644 {65.7}
63	PL063×071E						685 {69.9}
65	PL065×073E						711 {72.6}
70	PL070×079E						724 {73.9}

Unprocessed pressure flange

Special pressure flange and pressure bolts are MTO upon request.
Special pressure bolts are JIS Strength Class 10.9.
Pressure flange is installed with tap holes at the hub or boss (coupling side hub) end faces.
Only when installing the Power Lock for the TGX35 fixed nut side is the S-Type finishing flange used. (Use the tap hole specifically made for installation.) Refer to page 40 for the recommended finishing dimensions.

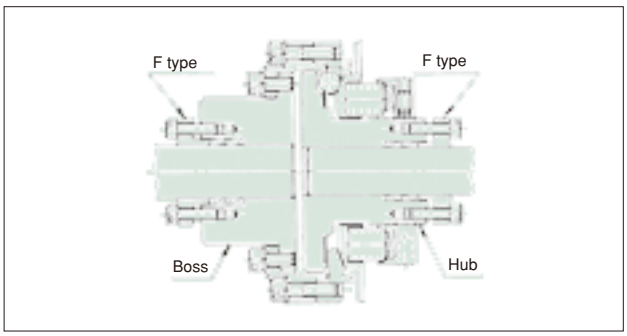
F type adjustable nut side

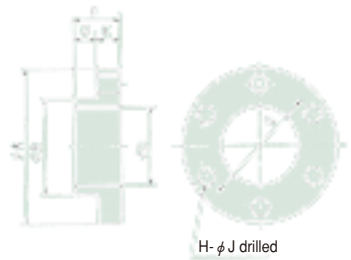
F type fixed nut side (Only the TGX35 is S type)

Bore diameter/Power Lock applicable range

Bore diameter	Power Lock Model No.	Pressure flange type									
		TGX10		TGX20		TGX35		TGX50		TGX70	
		Adjustable nut side	Fixed nut side	Adjustable nut side	Fixed nut side	Adjustable nut side	Fixed nut side	Adjustable nut side	Fixed nut side	Adjustable nut side	Fixed nut side
		F	F	F	F	F	S	F	F	F	F
10	PL010×013E	■	Not applicable	■	■						
12	PL012×015E	■		■	■						
13	PL013×016E			■	■						
14	PL014×018E			■	■						
15	PL015×019E			■	■	■	■				
16	PL016×020E			■	■	■	■				
17	PL017×021E			■	■	■	■				
18	PL018×022E			■	■	■	■				
19	PL019×024E			■	■	■	■				
20	PL020×025E					■	■	■	■		
22	PL022×026E					■	■	■	■		
24	PL024×028E					■	■	■	■		
25	PL025×030E					■		■	■	■	■
28	PL028×032E					■		■	■	■	■
30	PL030×035E					■		■	■	■	■
32	PL032×036E					■		■	■	■	■
35	PL035×040E					■		■	■	■	■
36	PL036×042E							■	■	■	■
38	PL038×044E							■	■	■	■
40	PL040×045E							■	■	■	■
42	PL042×048E							■	■	■	■
45	PL045×052E							■	■	■	■
48	PL048×055E							■	■	■	■
50	PL050×057E							■	■	■	■
55	PL055×062E									■	■
56	PL056×064E									■	■
60	PL060×068E									■	■
63	PL063×071E									■	■
65	PL065×073E									■	■
70	PL070×079E									■	■

Coupling type





Bore diameter/Power Lock applicable range

Shaft diameter	Power Lock Model No.	Pressure flange type									
		TGX10-C		TGX20-C		TGX35-C		TGX50-C		TGX70-C	
		Torque Guard side	Coupling side	Torque Guard side	Coupling side	Torque Guard side	Coupling side	Torque Guard side	Coupling side	Torque Guard side	Coupling side
		F	F	F	F	F	F	F	F	F	F
10	PL010×013E	■	■	■	■						
12	PL012×015E	■	■	■	■						
13	PL013×016E			■	■						
14	PL014×018E			■	■						
15	PL015×019E			■	■	■	■				
16	PL016×020E			■	■	■	■				
17	PL017×021E			■	■	■	■				
18	PL018×022E			■	■	■	■				
19	PL019×024E			■	■	■	■				
20	PL020×025E					■	■	■	■		
22	PL022×026E					■	■	■	■		
24	PL024×028E					■	■	■	■		
25	PL025×030E					■	■	■	■	■	■
28	PL028×032E					■	■	■	■	■	■
30	PL030×035E					■	■	■	■	■	■
32	PL032×036E					■	■	■	■	■	■
35	PL035×040E					■	■	■	■	■	■
36	PL036×042E							■	■	■	■
38	PL038×044E							■	■	■	■
40	PL040×045E							■	■	■	■
42	PL042×048E							■	■	■	■
45	PL045×052E							■	■	■	■
48	PL048×055E							■	■	■	■
50	PL050×057E							■	■	■	■
55	PL055×062E									■	■
56	PL056×064E									■	■
60	PL060×068E									■	■
63	PL063×071E									■	■
65	PL065×073E									■	■
70	PL070×079E									■	■

Rough Bore Pressure Flange Dimensions

Unit: mm

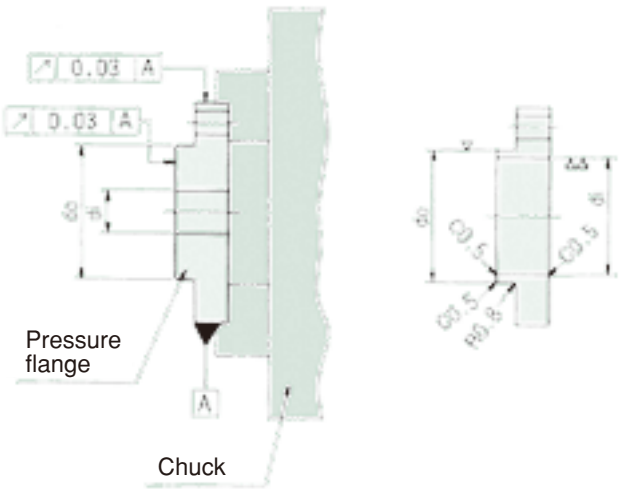
Pressure flange Model No.	A	Rough bore measurements B	C	D	E	F	G PCD	H	J	※1 Mass kg	Inertia moment kg·m²	※2 GD² kgf·m²	Pressure bolt size × the number		Tap side screw effective depth
TGX10-F	30	14.9	10.1	5	6	11	22	4	4.5	0.037	0.043	0.173	M4×14ℓ	4	M4× 8ℓ
TGX20-F	40	24.8	10.1	6	6	12	32	6	4.5	0.080	0.150	0.600	M4×14ℓ	6	M4× 8ℓ
TGX35-F	55	39.8	15.1	6	6	12	47	8	4.5	0.16	0.598	2.39	M4×14ℓ	8	M4× 8ℓ
TGX35-S	70	39.8	15.1	6	8	14	60	6	5.5	0.29	1.698	6.79	M5×16ℓ	6	M5× 8ℓ※3
TGX50-F	81	56.8	20.2	7	10	17	69	8	6.6	0.53	4.240	16.96	M6×22ℓ	8	M6×12ℓ
TGX70-F	101	78.7	25.2	7	10	17	89	10	6.6	0.87	10.83	43.33	M6×22ℓ	10	M6×12ℓ

※1、Weight and ※2 GD2 are together as 1 set of pressure flange (max. bore) and pressure bolt.
※3Already finished at fixed nut (note).
All products are MTO.

2. Pressure flange recommended finishing dimensions

(1) Centering
Chuck and center based on the flange external diameter.

(2) Recommended dimensions
Depending on Power Lock size, choose the finishing dimensions from the chart below.



Pressure flange centering and processing diagram

Unit: mm

Bore diameter (mm)	Power Lock Model No.	TGX10(C) F		TGX20(C) F		TGX35(C) F・S		TGX50(C) F		TGX70(C) F	
		$do_{-0.1}^{0}$	$di_{-0}^{+0.1}$	$do_{-0.1}^{0}$	$di_{-0}^{+0.1}$	$do_{-0.1}^{0}$	$di_{-0}^{+0.1}$	$do_{-0.1}^{0}$	$di_{-0}^{+0.1}$	$do_{-0.1}^{0}$	$di_{-0}^{+0.1}$
10	PL010×013E	12.9	10.1	12.9	10.1						
12	PL012×015E	14.9	12.1	14.9	12.1						
13	PL013×016E			15.9	13.1						
14	PL014×018E			17.9	14.1						
15	PL015×019E			18.9	15.1	18.9	15.1	18.9	15.1		
16	PL016×020E			19.9	16.1	19.9	16.1	19.9	16.1		
17	PL017×021E			20.9	17.1	20.9	17.1	20.9	17.1		
18	PL018×022E			21.9	18.1	21.9	18.1	21.9	18.1		
19	PL019×024E			23.8	19.2	23.8	19.2	23.8	19.2		
20	PL020×025E			24.8	20.2	24.8	20.2	24.8	20.2		
22	PL022×026E					25.8	22.2	25.8	22.2		
24	PL024×028E					27.8	24.2	27.8	24.2		
25	PL025×030E					29.8	25.2	29.8	25.2	29.8	25.2
28	PL028×032E					31.8	28.2	31.8	28.2	31.8	28.2
30	PL030×035E					34.8	30.2	34.8	30.2	34.8	30.2
32	PL032×036E					35.8	32.2	35.8	32.2	35.8	32.2
35	PL035×040E					39.8	35.2	39.8	35.2	39.8	35.2
36	PL036×042E							41.8	36.2	41.8	36.2
38	PL038×044E							43.8	38.2	43.8	38.2
40	PL040×045E							44.8	40.2	44.8	40.2
42	PL042×048E							47.8	42.2	47.8	42.2
45	PL045×052E							51.8	45.2	51.8	45.2
48	PL048×055E							54.8	48.2	54.8	48.2
50	PL050×057E							56.8	50.2	56.8	50.2
55	PL055×062E							61.8	55.2	61.8	55.2
56	PL056×064E									63.8	56.2
60	PL060×068E									67.8	60.2
63	PL063×071E									70.8	63.2
65	PL065×073E									72.8	65.2
70	PL070×079E									78.7	70.3

Refer to the instruction manual for information on hub bore finishing when installing the Power Lock.

Features

Highly accurate sealed type.
Excels in wet, oily and dusty environments.

Sealed construction

The sealed construction is highly resistant to dust, oil and water penetration, and oil leakage as well.

Highly accurate trip torque

Accuracy of consecutive repeated trip torque fluctuations is within ±5%.

Single-position

Because the cam follower and pocket of the cam shaft engage together, there is no phase shift between the drive side and the driven side.

Non-backlash

There is no backlash.

Automatic reset

Long life

Can withstand more than one hundred thousand trips.

LS detection plate for overload detector

If the Torque Guard trips, the limit switch is actuated because the LS detection plate slides along the axial direction.

Simple torque adjustment

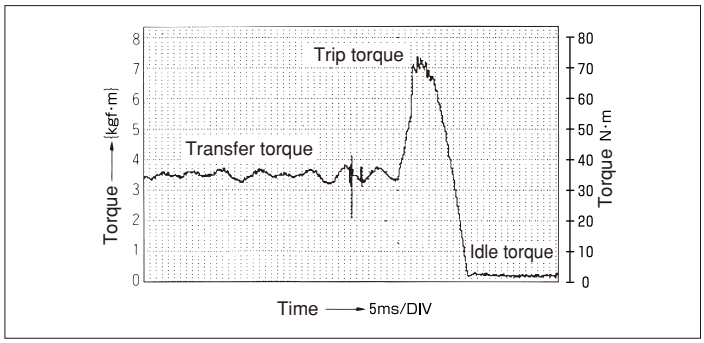
By simply turning the adjusting screw with a hexagonal Allen wrench, precise torque can be set.

No greasing necessary

The Torque Guard TGM Series is packed in high quality grease before shipment, so greasing is not necessary.

●High precision trip torque

Accuracy of consecutive repeated trip torque fluctuations is within ±5%.
One (1) high precision cam follower pressurizes tightly from the radial direction in the precisely machined pocket. A highly rigid and stable load rate rectangular spring is used. Trip movement is a rolling movement, so even a repeat trip produces almost no torque variation.

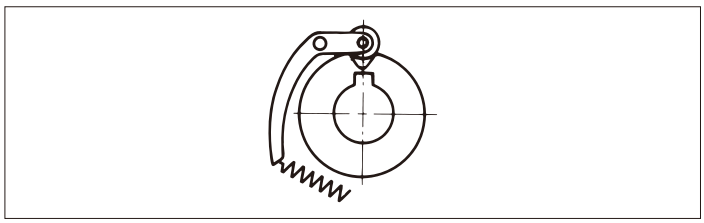


●Sealed construction

Covered in a special aluminum alloy casing, the TGM Series is sealed, so it is almost impossible for dust, oil or water to penetrate it. Therefore, it does not affect trip torque precision, making it an ideal overload protection device.

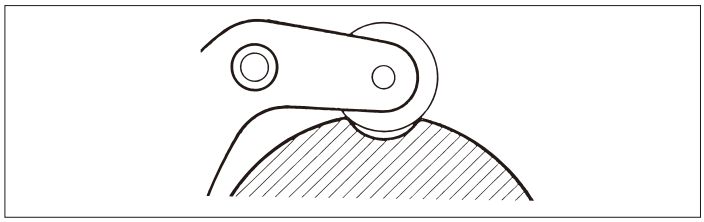
●Single-position

The cam follower and pocket engage together, so there is no phase shift between the drive and the driven sides.



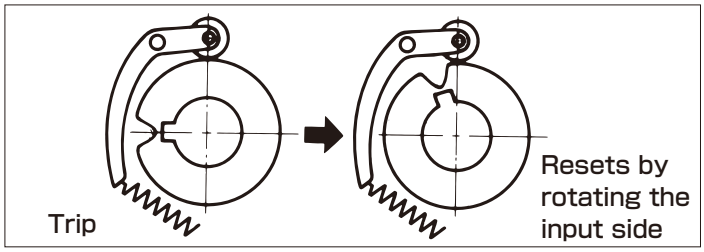
●Non-backlash

The cam follower and pocket's engagement is a 2 point contact pressed against each other, meaning there is no backlash.



●Automatic reset

Once the cause of overload is removed, the Torque Guard automatically moves back to its original position by rotating the input side a little (at less than 50r/min), or by inching the motor.



●Long life

The TGM Series is able to withstand more than one hundred thousand trips. Due to strong materials, thermal processing and precision machining, the cam follower and pocket can withstand even severe repeat trips and not collapse. During trip, the idling part uses a heavy-duty needle bearing, so there is almost no friction.

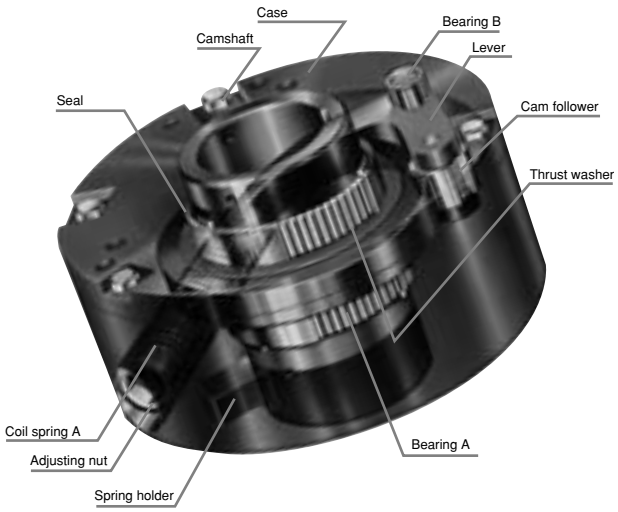
●LS detecting plate for overload detector
When the Torque Guard trips the LS detecting plate slides in the axial direction, so it is easy to actuate the limit switch, shut off the power or set off the alarm.
When tripping it can be used whether it stops on the camshaft side or the housing (Torque Guard case) side. The LS detecting plate can be mounted on all models.

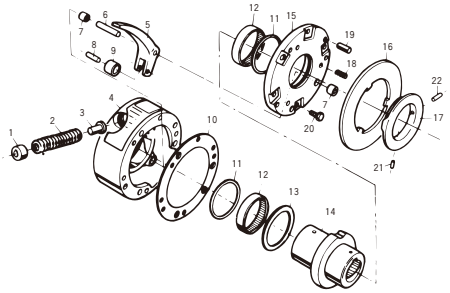
●Easy to use
The camshaft and case can be used on either the drive or driven sides. As well, it can be used in either direction of rotation. For the drive member, you can choose between using a chain, pulley or gear. Assembling with a coupling is also possible. Refer to page 44 to see the assembly of a Torque Guard coupling with a roller chain coupling.

●Torque setting is easy
By simply turning the adjusting screw with a hexagonal Allen Wrench, precise torque can be set. As well, the adjusting nut is on the outer surface of the Torque Guard, so torque setting can be done easily.

●No need to lubricate
The Torque Guard TGM Series is packed in high quality grease before shipment, so greasing is not necessary.

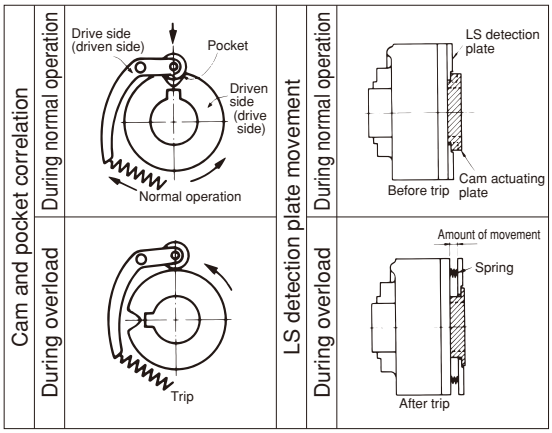
Construction and Operating Principles





❶Adjusting screw
❷Coil spring A
❸Spring seat
❹Case
❺Lever
❻Fulcrum pin
❼Bearing B
❽Roller pin
❾Cam follower
❿Gasket
⓫Seal
⓬Bearing A
⓭Thrust washer
⓮Cam shaft
⓯Cover
⓰LS detecting plate
⓱Cam actuation plate
⓲Coil spring B
⓳Spring pin
⓴Hexagonal bolt
㉑Hexagonal set screw
㉒Hexagonal set screw

1. The cam follower transmits torque by engaging with the camshaft pocket in a radial direction.
   When the machine is overloaded, the cam follower pops out of the pocket, and completely separates from the overload.
2. The cam follower pocket is precision machined and heat treated, so it is able to maintain high torque precision for extended periods of time.
3. The cam follower and pocket are non-backlash, with a 2-point contact system.
4. Using the leverage on one rectangular coil spring pressurizes the cam follower, so it is able to give high precision pressure.
5. Torque level is infinitely adjustable.
6. Due to overload, the idling during trip is received by 5 needle bearings, so there is no slide, and idling friction torque is minute.
7. Because the housing and cover are made from a solution treated aluminum, it has a light but strong construction.
8. Due to its sealed construction, it is highly difficult for dust, water or oil to penetrate the TGM Series.
9. If the Torque Guard trips because of overload, the LS detecting plate slides in the axis direction, so by operating the limit switch, overload detection is easy.

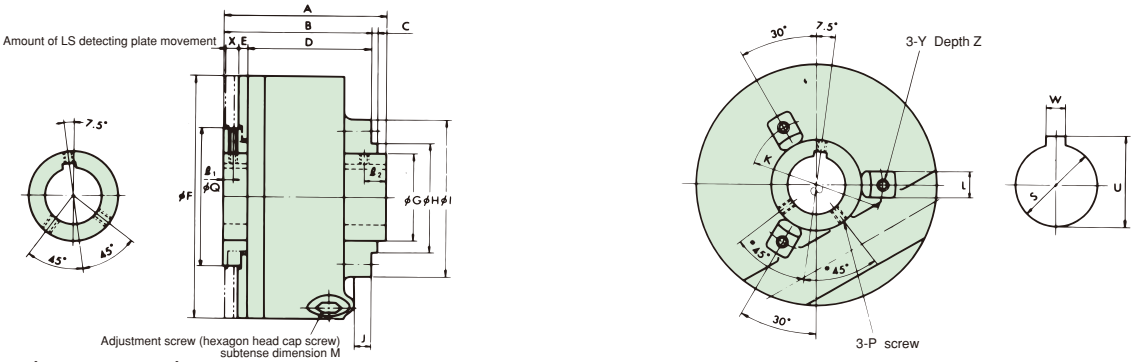


1. Torque is transmitted by the engagement of the cam follower and the pocket with a 2 point contact system.
   The method to pressurize the cam follower to the cam pocket is to hold it by one rectangular coil spring in a radial direction.
   Therefore there is no backlash, allowing it to function as a high trip torque precision overload protection device. Reset is carried out using an automatic reset system, so as the cam follower settles into its pocket position, operation resumes. As it is a two-point contact, there is no phase shift from the original position.

2. When overloaded, the cam follower comes out of its pocket and starts rolling on the outer diameter of the camshaft. As there is no slide section, the idling friction torque is small, making it a highly durable device. As well, the simple one position engagement construction of the TGM Series means its high trip torque precision does not diminish.

3. When the Torque Guard trips, the LS detecting plate slides in the axis direction. From this point, the limit switch can be actuated and the power can be turned off. The alarm can also be sounded. For each one trip, the LS detecting plate slides three times.

Dimensions



Note: The 45° angle of the * is 60° for TGM20 and below models. Screw P of installation seat side for TGM6 and below models are at 2 positions, at the keyway portion and its left side.

■Transmissible capacity

Unit : mm

Model No.	Set torque range N·m {kgf·m}	Max. rpm ※ r/min	Bore range	Stock bore diameter H7	Semi-standard bore diameter H7	Inertia moment ×10⁻²kg·m²	GD² ×10⁻²kgf·m²	Mass kg
TGM3	1.5～3.7 {0.15～0.38}	600	10～14	**14**	10, 12	0.0425	0.17	0.6
TGM6	2.5～6.4 {0.26～0.65}	600	10～14	**14**	10, 12	0.0425	0.17	0.6
TGM20	6.4～20 {0.65～2.0}	500	14～20	**20**	14, 16, 18	0.168	0.67	1.1
TGM60	20～69 {2.0～7.0}	300	20～30	**30**	20, 22, 25, 28	0.938	3.75	2.5
TGM200	68～225 {6.9～23}	200	28～50	**50**	30, 35, 40, 45	4.03	16.1	5.4
TGM400	225～451 {23～46}	150	38～60	—	60	40.0	160	17.2
TGM800	451～902 {46～92}	150	38～60	—	60	40.0	160	17.2

※1.Cam shafts for semi-standard bore diameters are in stock for quick delivery.
2.Please contact TEM for a consultation if you want to use the Torque Guard at an rpm at or above the maximum speed.
3.The keyway is made with JIS1301-1996 (new JIS standard) dimensions.

■Dimensions

Unit : mm

Model No.	A	B	C	D	E	F	G	H h7	I	J	K	L	M	P	Q	ℓ1	ℓ2	S H7	U	W	X	Y	Z
TGM3	60	57	2	48	3	80	22	30	50	3	40	8	5	M4	40	4	6	14	16.3	5	4	M 4	8
TGM6	60	57	2	48	3	80	22	30	50	3	40	8	5	M4	40	4	6	14	16.3	5	4	M 4	8
TGM20	70	66	3	57	3	100	30	40	60	4	50	10	6	M4	50	4	7	20	22.8	6	4	M 5	10
TGM60	89	81	3	68	5	133	47.6	60	86	7	73	14	12	M5	76	6	12	30	33.3	8	6	M 6	13
TGM200	110	100	3	85	5	178	69.9	82	133	14	114	20	12	M6	105	7	14	50	53.8	14	6	M10	19
TGM400	157	147	9	131	5	273	88.9	114	190	17	165	28	17	M8	124	7	16	60	64.4	18	8	M12	28
TGM800	157	147	9	131	5	273	88.9	114	190	17	165	28	17	M8	124	7	16	60	64.4	18	8	M12	28

※1.The model numbers in bold are stock items, and the rest are assembled for shipment. 2.The keyway is made with JIS1301-1996 (new JIS standard) dimensions.
3.Minimum torque is set temporarily when shipped.

Semi-standard

1. Torque setting

If necessary, torque can be set at TEM's factory before shipment. Torque setting tolerance is within ±5%. The set torque value is on the nameplate, and the adjusting nut is coated with Loctite 242, or its equivalent, and tightened. When ordering, indicate set torque value (kgf・m) after bore diameter. (Please refer to the table on the right)

2. Weak spring and strong spring specifications

For when it is necessary to operate with a trip torque other than the standard torque value range:

(1)TGM6 and TGM800 do not have weak spring specifications.

(2)The standard torque range can be replaced by the weak or strong spring torque ranges on the nameplate.

(3)The minimum and maximum torque indicator on the nameplate does not change for the weak and strong springs.

(4)When ordering, indicate weak spring (WS) or strong spring (SS) in the last part of the product number.

Model No.	Weak spring, torque range N·m {kgf·m}	Reinforced spring, torque range N·m {kgf·m}
TGM3(C)	0.59～1.5 {0.06～0.15}	——
TGM6(C)	——	6.0～12.7 {0.61～1.3}
TGM20(C)	3.7～12 {0.38～1.2}	7.3～23 {0.74～2.3}
TGM60(C)	7.6～26 {0.78～2.7}	44～105 {4.5～10.7}
TGM200(C)	30～98 {3.1～10}	101～289 {10.3～29.5}
TGM400(C)	118～235 {12～24}	——
TGM800(C)	——	532～1060 {54.3～108}

Model No.

TGM60－D30－WS－2.5

- TGM60 － D30 : Size / Bore diameter
- WS : Spring specifications (SS : Reinforced spring, WS : Weak spring, Nothing : Standard spring)
- 2.5 : Set torque (unit: kgf.m, No. not displayed if torque not set)

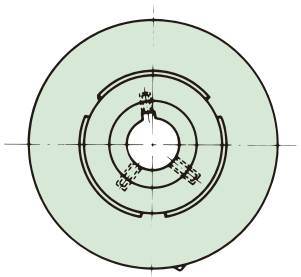
Note 1) Bore diameter tolerance is H7, keyway is made with JIS1301-1996 (new JIS standard) dimensions.
2) In case trip torque is required to set before shipment, allowable tolerance of setting torque is ±5%.

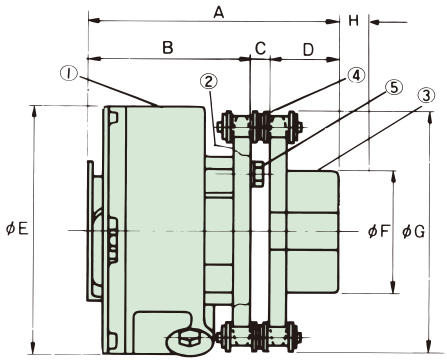
Torque Guard coupling-sprocket combination

■Torque Guard coupling

This is the Torque Guard and roller chain coupling combination series. It is a Torque Guard with high trip torque accuracy and an easy to use roller chain coupling, all in one. It is ideal for direct coupling between the drive and driven machines. (In the case it is coupled with a non-backlash coupling, contact TEM for a consultation.)

Transmissible capacity/dimensions





①Torque Guard
②TG sprocket
③CP sprocket
④Chain
⑤Hexagonal bolt

H: The space necessary for inserting the joint link

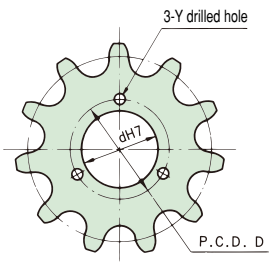
Unit : mm

Torque Guard Coupling Model No.	Set torque range N·m {kgf·m}	Max. rpm ※ r/min	Torque Guard bore		A		A	B	C	D	E	F	G	H	A	A kg	A ×10⁻²kg·m²	GD² ×10⁻²kgf·m²
			Standard bore diameter H7	Semi-standard bore diameter H7	A	A												
TGM3C	1.5~3.7 {0.15~0.38}	600	14	10,12	12.5	30	90	64.2	5.8	20	80	50	70	9	RS35-20	1.12	0.07	0.28
TGM6C	2.5~6.4 {0.26~0.65}																	
TGM20C	6.4~20 {0.65~2.0}	500	20	14,16,18	12.5	32	100	72.2	5.8	22	100	53	82	7	RS35-24	1.78	0.218	0.87
TGM60C	20~69 {2.0~7.0}	300	30	20,22,25,28	12.5	42	120.6	88.2	7.4	25	133	63	117	17	RS40-26	4.15	1.21	4.81
TGM200C	68~225 {6.9~23}	200	50	30,35,40,45	18	55	163.3	111.7	11.6	40	178	83	188	26	RS60-28	11.8	6.80	27.5
TGM400C	225~451 {23~46}	150	–	60	18	75	221.9	161.6	15.3	45	273	107	251	38	RS80-28	31	50.8	203
TGM800C	451~902 {46~92}																	

※1. All model numbers are MTO.
2. Apply the lubricant such as molybdenum disulfide to the chain and top of the sprocket teeth periodically (every 2000 hours).
3. If you intend to use the Torque Guard at a higher rpm than that listed above, contact TEM for a consultation.

■Sprocket combination

When using a sprocket with a drive member, select the appropriate sprocket from the chart below.
This chart lists:
(1)Available sprocket machining dimensions
(2)The minimum number of sprocket teeth and chain size, so the roller chain and Torque Guard do not interfere with each other.



Model No.

TGM60C－D30×C40J－SS－10.0

- Size
- Torque Guard side bore diameter
- Coupling side bore diameter (No symbol if bore not finished)
- Tightening method
- Spring specifications SS:Reinforced spring WS:Weak spring Nothing:Standard spring
- Set torque (unit: kgf.m, No. not displayed if torque not set)

Keyway: J: new JIS standard, E: old JIS second grade, Special: no symbol

Unit : mm

Torque Guard Model No.	Finished sprocket dimensions			Min. No. of sprocket teeth							
	d_{H7}	D	Y	RS 25	RS 35	RS 40	RS 50	RS 60	RS 80	RS100	RS120
TGM3	30	40	4.5	※30	※30	24	20				
TGM6	30	40	4.5	※30	※30	24	20				
TGM20	40	50	5.5	※34	※37	※28	24	20			
TGM60	60	73	6.6		※32	26	30	26	20		
TGM200	82	114	11.0			※37	30	26	20	17	
TGM400	114	165	14.0				※41	35	※27	24	20
TGM800	114	165	14.0				※41	35	※27	24	20

※Not the standard number of sprocket teeth.
Note: Verify the chain transmissible capacity when determining the number of sprocket teeth.
Note: Insert the joint link from the outside of the sprocket.

Selection

As a safety device, the Torque Guard will be most effective if it is installed in the place nearest to where overload is thought to most likely occur on the driven machine.
For most situations, avoid using the Torque Guard with human transportation or lifting devices. If you decide to use a Torque Guard with these devices, take the necessary precautions to avoid serious injury or death.

1. Setting trip torque

$$T_P = T_L \times S.F = \frac{60000 \times P}{2\pi \cdot n} \times S.F \quad \left\{T_P = \frac{974 \times P}{n} \times S.F\right\}$$

T_P = Trip torque N·m{kgf·m}　　T_L = Load torque N·m{kgf·m}
P = Transmittance power kW　　S.F = Service factor
n = rpm r/min

(1)From the machine's strength and load, as well as other information, set the trip torque at the point where it should not go any higher.

(2)When the limit value is not clear, calculate the rated torque by using the rpm of the shaft where the Torque Guard is installed and rated output power. Then, depending on the conditions of use, multiply by the service factor in Table 1.

Table 1

Service factor	Operating conditions
1.25	In the case of normal start up/stop, intermittent operation
1.50	In the case of a heavy shock load or forward-reverse driving

2. When rpm is relatively high

When rpm is relatively high (more than 500r/m), or when load inertia is large, depending on the motor's start up torque, there is a chance the Torque Guard will trip. In this case, determine the inertia ratio and calculate the torque used in the Torque Guard during start up, then multiply it by the service factor and make this the trip torque.

$$K = \frac{I_L + I_t}{I_S} \quad \left\{K = \frac{GD_L^2 + GD_t^2}{GD_S^2}\right\} \qquad Tt = \frac{K \cdot T_S + T_L}{1 + K} \qquad Tp = SF \cdot Tt$$

K : Inertia ratio

I_S : Drive side inertia moment (kg·m²)
{GD_S^2 : Drive side GD² (kgf·m²)}
I_L : Load side inertia moment (kg·m²)
{GD_L^2 : load side GD² (kgf·m²)}
I_t : Torque Guard inertia moment (kg·m²)
{GD_t^2 : Torque Gard GD² (kgf·m²)}

T_S : Motor starting torque (N·m){kgf·m²}

T_t : Torque in Torque Guard during start up (N·m){kgf·m}

T_L : Load torque (N·m){kgf·m}

T_P : Trip torque (N·m){kgf·m}

S.F. : Service factor

Note) Use the equivalent value to the shaft in which the Torque Guard is installed for each inertia moment, GD² and torque value.

3. Precautions when deciding trip torque

Compared with load torque, if the torque used when starting up becomes large, the setting trip torque value also becomes large, causing a problem from the viewpoint of the overload protection device. (Compared with the load torque, the trip torque is too large). In this case install it as close to the load side as possible.

4. Choosing the model number

Choose a model where the calculated trip torque is within the minimum to maximum setting range.

5. Verifying bore diameter

Verify that the shaft where the Torque Guard will be installed is in the possible range (refer to the dimensions table) of the bore diameter of the Torque Guard model you selected.

If the shaft diameter is larger than the possible bore range, select a model one size larger that uses a weak spring.

6. Confirming rpm

Confirm that the Torque Guard rpm used is within the maximum rpm value in this catalog.

Torque setting

By simply turning the adjusting screw with a hexagonal Allen wrench, precise torque can be set.

1. The minimum torque value is set for shipment. The top surface of the adjustable screw is adjusted to the minimum torque (torque indicator 1) printed on the nameplate. This is the base tightening quantity.

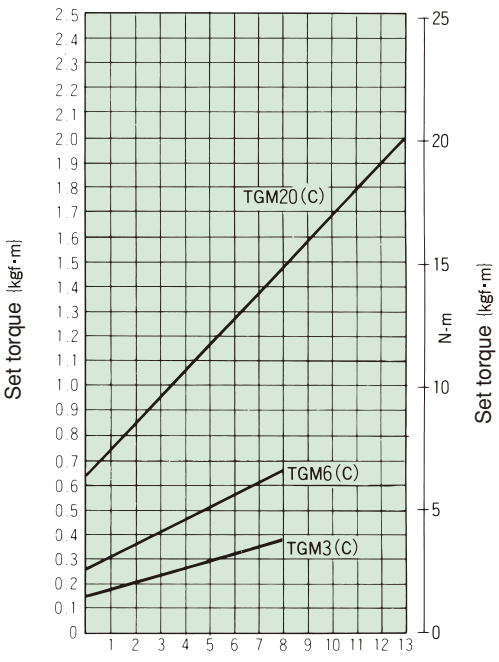
2. Before setting the torque, apply Loctite 242 or an equivalent adhesive to the exposed surface of the adjustable screw's thread portion. After setting torque, it becomes anti-loosing.
3. From the "Tightening Amount Torque Correlation Chart"(below), find the adjusting screw tightening angle equivalent to the predetermined trip torque. Set at 60° toward the determined tightening value, then install to the machine and conduct a trip test. Gradually tighten and set at optimum trip torque. Each product's trip torque does not always correspond with the value listed in the "Tightening Amount - Torque Correlation Chart", so use these values only as a rough guide.
4. Do not set torque lower than the minimum torque (torque indicator 1 on the nameplate). If it is necessary to use a torque level lower than the minimum, use a weak spring type.
5. Do not turn the adjusting screw when the Torque Guard is in a tripped state.
6. Torque setting before shipment is available. (Please refer to page 43).

Model No.	Amount of torque variation per one (1) rotation N·m {kgf·m}	Total number of rotations
TGM3	0.28 {0.029}	8
TGM6	0.48 {0.049}	8
TGM20	1.02 {0.10}	13
TGM60	4.90 {0.5}	10
TGM200	9.80 {1.0}	16
TGM400	20.6 {2.1}	11
TGM800	41.2 {4.2}	11

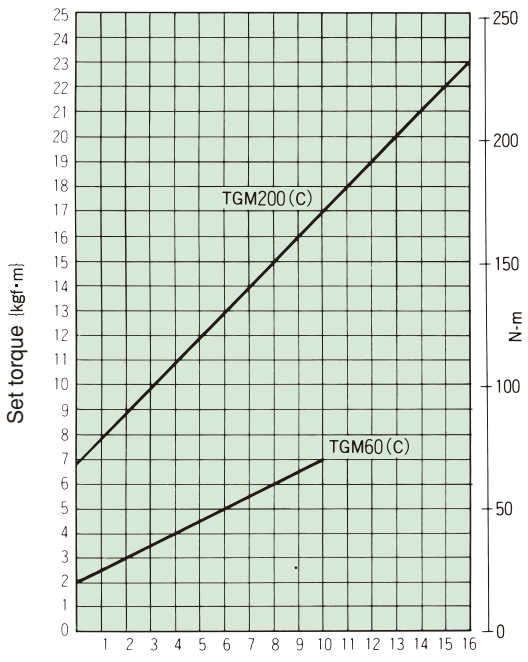
Set torque = min. torque + (amount of torque variation per one (1) rotation X total number of rotations of the adjustable screw)

Tightening Amount-Torque Correlation Chart

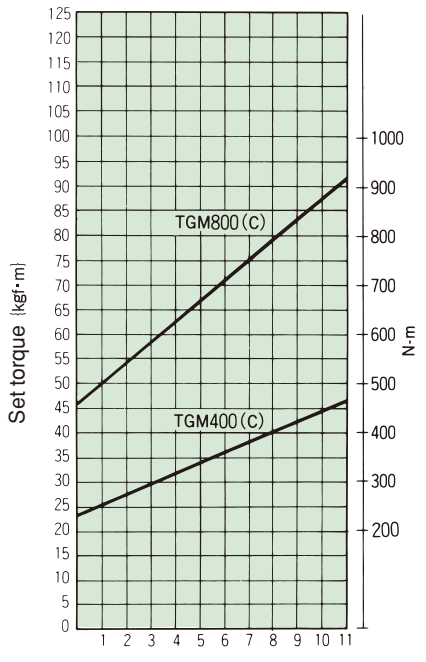
TGM3(C) TGM6(C) TGM20(C)



TGM60(C) TGM200(C)



TGM400(C) TGM800(C)



Overload detection

Using the limit switch, overload can be detected easily.
If the Torque Guard trips due to overload, the cam follower will disengage from the pocket and the camshaft and main unit (case) will idle. At the same time, the LS detecting plate slides in the axial direction.
The limit switch detects this movement, shuts the power off and sets off an alarm. Whether the stopping side is on the camshaft side or the main unit case side, overload can be detected. For every one trip, the LS detecting plate slides three times.

(1)Chart 4 shows LS detecting plate movement and force during trip.
Choose a limit switch from chart 4 that meets the "movement until operation" and its "necessary amount of force".
(2)Diagrams 2 and 3 are limit switch installation examples.
(3)Connect the limit switch's "b contact" parallel to the start button's contact.
(4)Diagram 4 shows an example of a typical circuit. TEM recommends using a built-in holding circuit.

Chart 4

Model No.	Amount of movement mm	Force when moving N {gf}
TGM3	4	3.9 {400}
TGM6	4	3.9 {400}
TGM20	4	3.9 {400}
TGM60	6	3.9 {400}
TGM200	6	5.4 {550}
TGM400	8	5.9 {600}
TGM800	8	5.9 {600}

■Limit Switch Installation Example

Diagram 1

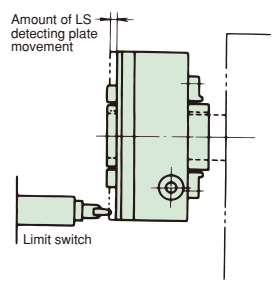
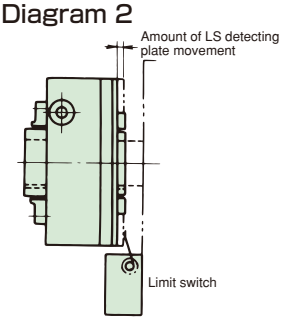
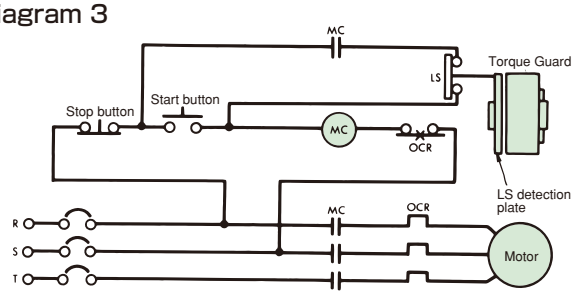


Diagram 2



■Circuit Example

Diagram 3



Installation

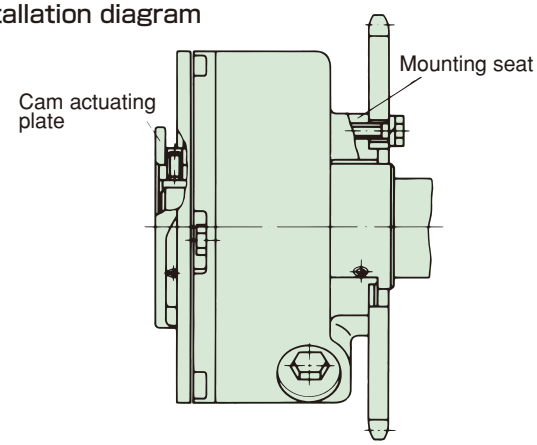
1. Installing to the axis

- A bore diameter tolerance of H6 or H7 for installing the Torque Guard to the shaft is recommended. Use a JIS 1301-1996 (New JIS standards) parallel key. Allow some clearance between the top of the key and keyway
- When installing the cam actuating plate to the shaft, tighten bolts in three places. (For the key, 1 place; for the shaft, 2 places)
- When mounting the Torque Guard to the end face of the shaft, depending on the installation method, the cam actuating plate set screws cannot be used. In this case use the tap holes on the mounting seat side.
  Set screws for these tap holes are not included, so use bolts with a length that fits the bore diameter.
  Take care to ensure that the head of the set screws do not come out from the outer diameter of the camshaft.
  If the head of the screws come out, they will interfere with the inner diameter and lateral side of the mounting seats when the Torque Guard trips.
- If during operation there is a chance vibration will cause the screws to loosen, apply Loctite 242 or an equivalent for anti-loosening.

2. Installation of drive member

- By utilizing 3 mounting seats, tighten the bolts with the torque shown in chart 2 to install the sprockets, pulleys, gears and couplings to the housing.
- Refer to page 44 for sprocket installation. If it is necessary to combine a Tsubaki Power Lock (keyless locking device) with a non-backlash coupling, contact TEM for a consultation.

Installation diagram



3. Installation bolts

The screw-in length of the mounting seat installation bolts and their tightening torque recommended values are listed on table. As well, use JIS B1001 2 class and higher class prepared holes for installation bolts.

Table

Model No.	Bolt screw-in length (mm)	Bolt tightening torque N·m {kgf·m}	Prepared hole diameter for installation bolt (mm)
TGM3	6～ 7	2.0～2.9 {0.2～0.3}	4.5
TGM6	6～ 7	2.0～2.9 {0.2～0.3}	4.5
TGM20	8～ 9	3.9～5.9 {0.4～0.6}	5.5
TGM60	9～11	6.9～11 {0.7～1.1}	6.6
TGM200	15～17	34～51 {3.5～5.2}	11.0
TGM400	18～25	59～89 {6.0～9.1}	14.0
TGM800	18～25	59～89 {6.0～9.1}	14.0

4. Connecting

The input/output connection is placed between the variator, reducer or indexing drive device and the device/machine. Diagrams 1, 2 and 3 show typical connecting examples.

Diagram 1

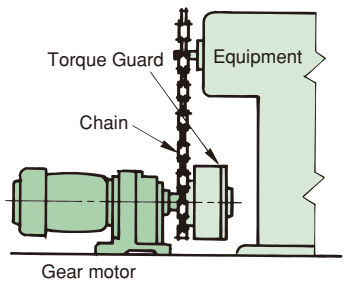


Diagram 2

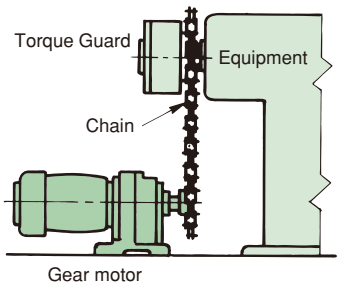
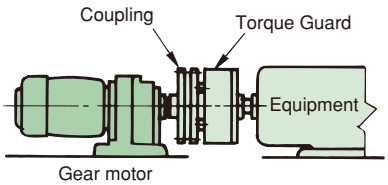


Diagram 3



Resetting

As it is an automatic reset system, just re-starting the drive side can automatically reset it.

1. When the Torque Guard trips due to overload, stop the rotation and remove the cause of the overload.
2. When resetting, reset (re-engage) with input rpm at less than 50r/min or by inching the motor. To avoid injury, do not reset the Torque Guard by hand.
3. A distinct clicking sound is made when the cam follower settles in its pocket.

Grease

Torque Guard TGM Series are packed in high quality grease before shipment, so they can be used as is. Under normal conditions greasing is not necessary.

Grease used:

Exxon Mobil	
Mobilux EP2	Listun EP2

Torque Gard TGZ Series

Features

TGZ Series can be used as a simple layout release type protection device or an ON-OFF clutch.

Ministry of Economy, Trade and Industry picks for Good Design Award product

Release type

After tripping due to overload, the input side freely rotates. Even a high-speed shaft can be operated worry-free.

Resetting by external force

After the Torque Guard has been stopped, remove the cause of overload. Then give load to the axial direction manually or with external force.

ON-OFF function

The rotation (ON) or shut-off (OFF) functions are available arbitrarily. They can be used as an accurate mechanical type ON-OFF clutch.

Single-position type

This uniquely assembled torque transmission element ball and pocket configuration only engages in one position.

Accuracy of consecutive repeated trip torque fluctuations is within ±10%.

Even with repeated trips, the fluctuating trip torque variation is always within ±10%.

Easy torque adjustment

Just by turning the adjusting nut, trip torque can be easily set.

Easy to see torque indicator

By using the revolution indicator and angle indicator, set torque can be monitored at any time.

Standard type overload detecting sensor

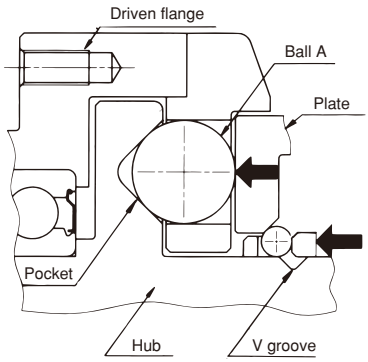
It can detect overload by the non-contact type TG Sensor (refer to pages 28, 29) and stop the motor or output an alarm.

Standard stock

The rough bore TGZ Series is an in-stock item for prompt delivery.
The coupling type is MTO, but the delivery period is short.

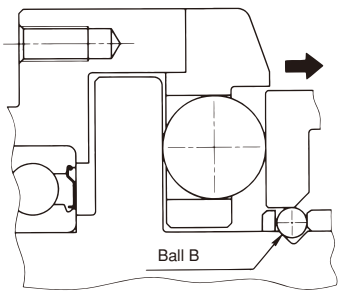
Operating Principles

During normal operation (when meshing)



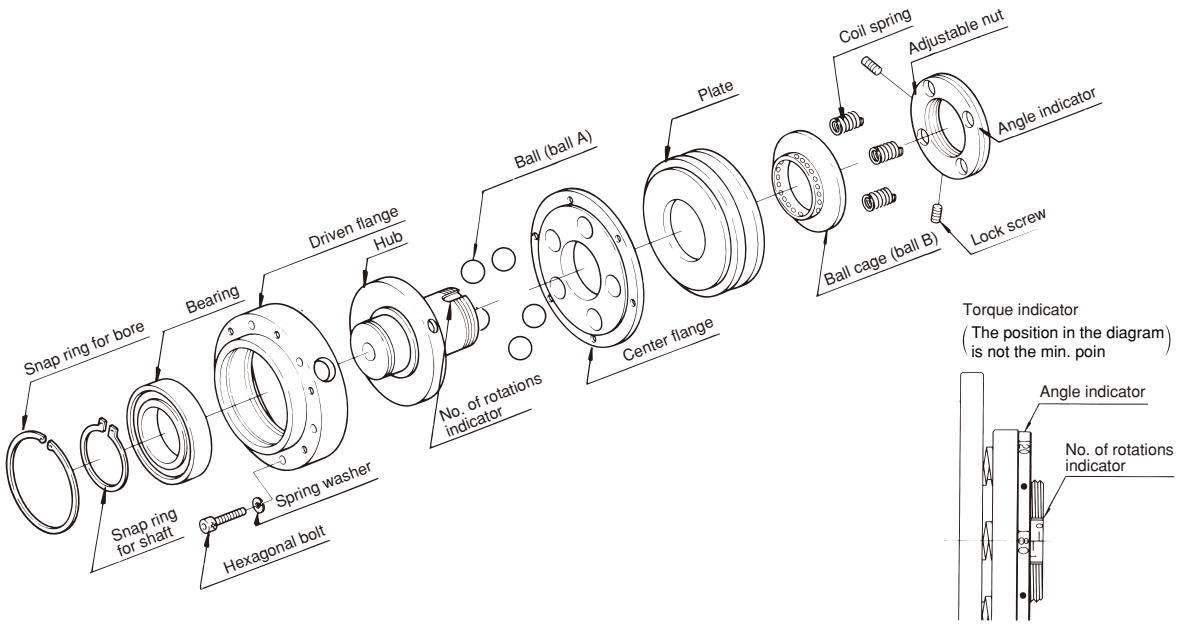
Torque transmission is made by ball A which is pressurized and retained at the hub pocket and the driven flange.
The non-symmetric arrangement of the balls and pockets allows only one engagement position per one rotation, and there is no phase shift after tripping.

During overload (when tripping)



When overloading (when OFF), ball A instantly pops out of its pocket, and the plate and ball B simultaneously move to the adjusting nut side.
Ball A comes completely out of its pocket and ball B enters the hub outer circumference V-groove, and the pressure from the springs is not transferred to the plate. Therefore, ball A freely rotates without resetting to its pocket.

Construction



Model No.

TGZ30—L—25J—1.8

- Torque Guard Series
- Size
- Spring strength (L=weak spring / M=medium strengthen spring / H= strengthen spring)
- Finished bore dimensions (φ25H7, keyway new JIS normal type: J, old JIS second grade: E) (In case bore finish is required.)
- The torque set value is displayed as the gravitational system of units 17.6N·m{1.8kgf·m} (When the torque setting is indicated)

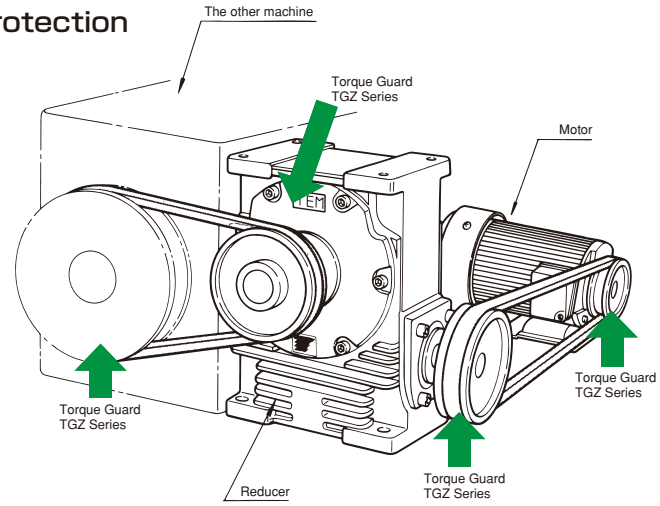
Coupling type

TGZ30—LC—T25J×C35E—1.8

- Coupling type
- Finished bore dimensions Torque Guard side (φ25H7, keyway new JIS normal type: J, old JIS second grade: E) (In case bore finish is required.)
- Finished bore dimensions coupling side (φ35H7, keyway new JIS normal type: J, old JIS second grade: E) (In case bore finish is required.)
- The torque set value is displayed as the gravitational system of units 17.6N·m{1.8kgf·m} (When the torque setting is indicated)

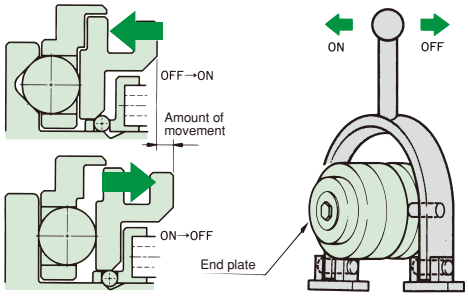
Applications classified by use

1. Overload protection



As demonstrated in the diagram on the left, the TGZ Series can be installed with any motor shaft, reducer (variator) or other machines. When considering the layout, make sure to leave sufficient space to adjust torque and for resetting procedures. After removing the cause of overload, do not reset the machine while it is running.
⚠If the Torque Guard is reset during rotation, the machine will suddenly run.

2. ON-OFF clutch



By using manual or mechanical external force (pneumatic, hydraulic, etc.), the plate can be moved, cutting off the input rotation (OFF) or transmitting it (ON). The necessary axial load for turning the machine ON or OFF is written in the table below.

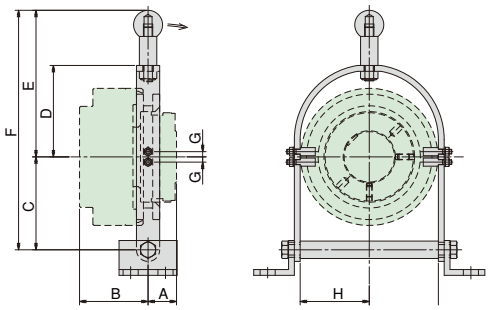
Necessary shaft direction load when ON-OFF

Actuation / Model No.	OFF→ON N {kgf}	ON→OFF N {kgf}	Amount of movement mm
TGZ20-L	49 { 5}	245 { 25}	4.1
TGZ20-M	88 { 9}	431 { 44}	
TGZ20-H	176 {18}	862 { 88}	
TGZ30-L	98 {10}	470 { 48}	4.7
TGZ30-M	235 {24}	1176 {120}	
TGZ30-H	470 {48}	2352 {240}	

Actuation / Model No.	OFF→ON N {kgf}	ON→OFF N {kgf}	Amount of movement mm
TGZ40-L	157 { 16}	774 { 79}	5.9
TGZ40-M	421 { 43}	2087 {213}	
TGZ40-H	833 { 85}	4155 {424}	
TGZ50-L	451 { 46}	2269 {231}	7
TGZ50-M	902 { 92}	4518 {461}	
TGZ50-H	1382 {141}	6919 {706}	

Axial load fluctuates depending on the number of actuations and usage conditions. Set the load with margin.

3. ON - OFF handle reference diagram

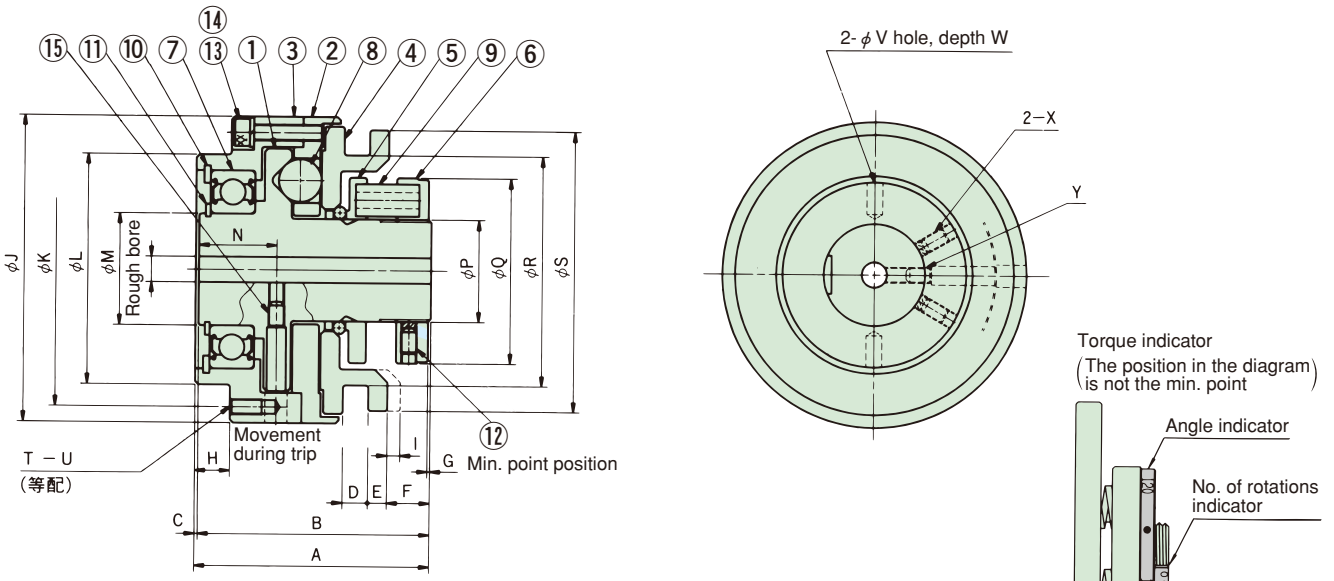


During rotation the pin touches the TGZ plate, so apply lubrication to the pin's surface.

Model no.	A	B	C min.	D min.	E min.	F min.	G	H	Stroke max. deg.	Shaft direction axial force N {kgf}	Pin diameter	Max. pin length
TGZ20	23.5	50.5	60	70	170	230	4.5	49	3.9°	225 {23}	ϕ7	13
TGZ30	24.5	59.0	70	90	210	280	4.5	60	3.9°	588 {60}	ϕ7	15
TGZ40	32.5	68.5	90	100	250	340	5.0	77	3.8°	1098 {112}	ϕ8	16
TGZ50	34.2	80.3	110	120	300	410	6.0	90	3.3°	1852 {189}	ϕ9.5	20

Transmissible capacity/dimensions

Torque Guard (TGZ Series)



① Hub ② Center flange ③ Driven flange ④ Plate ⑤ Ball cage ⑥ Adjustable nut
⑦ Bearing (ZZ type) ⑧ Ball ⑨ Coil spring ⑩ Snap ring for bore ⑪ Snap ring for shaft
⑫ Lock screw ⑬ Hexagon socket head bolt ⑭ Spring washer ⑮ Hexagon socket head set screw
※Adjustable nut for fixing the lock screw (1) is included with the Torque Guard. After setting appropriate torque, tighten with the following torque to avoid interference with the pocket of hub. Lock screw size: M5···3.8N.m{38.7kgf.cm} M8···16N.m{163kgf.cm}

Unit : mm

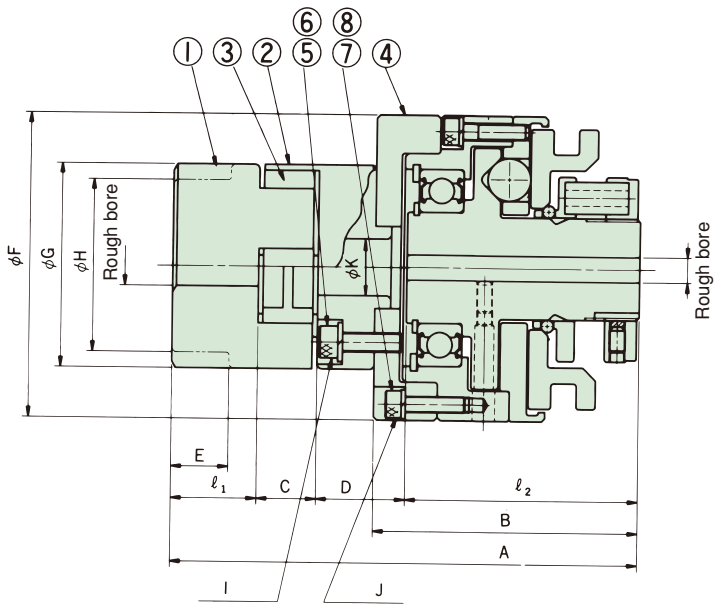
Torque Guard Model No.	Set torque range N·m {kgf·m}	Max. rpm r/min	Coil spring color X the number	Rough bore diameter	Max. bore diameter	A	B	C	D	E	F	G min. point position	H	I amount of movement during trip	J	K PCD
TGZ20-L	2.4～8.3 {0.24～0.85}	1800	Yellow X 3	8	20	74	73	1	8	6	13.5	0.8	11	4.1	96	86
TGZ20-M	4.1～16 {0.42～1.6}		Blue X 3													
TGZ20-H	8.2～31 {0.84～3.2}		Blue X 6													
TGZ30-L	5.9～21 {0.6～2.1}	1800	Yellow X 4	12	30	83.5	82	1.5	8	6	14.5	1.1	11.5	4.7	118	106
TGZ30-M	20～52 {2.0～5.3}		Red X 4													
TGZ30-H	39～108 {4.0～11}		Red X 8													
TGZ40-L	25～93 {2.6～9.5}	1800	Blue X 5	17	40	101	100	1	9	8	20	1.1	14	5.9	152	139
TGZ40-M	44～127 {4.5～13}		Red X 5													
TGZ40-H	88～245 {9.0～25}		Red X10													
TGZ50-L	63～157 {6.4～16}	1800	Red X 5	22	50	114.5	112	2.5	10	9	20.2	1.2	16	7	178	162
TGZ50-M	127～304 {13～31}		Red X10													
TGZ50-H	245～451 {25～46}		Green X10													

Torque Guard Model No.	L h7	M	N	P	Q	R	S	T	U screw diameter X length	V	W	X screw size X length	Y screw size X length	※ Mass kg	※ Inertia moment ×10⁻²kg·m²	※GD² ×10⁻²kgf·m²
TGZ20-L	72	35	24.5	32	57	70	88	4	M5×10	5	10	M5×10	M5×10	2.57	0.273	1.09
TGZ20-M																
TGZ20-H																
TGZ30-L	87	45	27.5	45	75	88	108	4	M6×12	6	10	M5×10	M6×10	4.17	0.695	2.78
TGZ30-M																
TGZ30-H																
TGZ40-L	114	65	32.5	65	103	119	141	6	M6×12	8	14	M8×10	M8×10	8.71	2.40	9.60
TGZ40-M																
TGZ40-H																
TGZ50-L	133	75	37	75	113	138	166	6	M8×16	9	14	M8×10	M8×10	13.7	5.30	21.2
TGZ50-M																
TGZ50-H																

※Mass, inertia moment and GD2 are based on the bores' maximum diameters.

Note: All rough bore products are stock items.

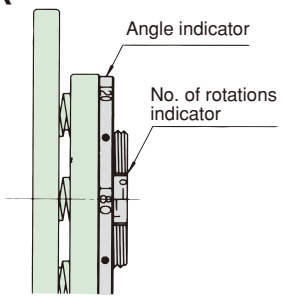
Torque Guard Coupling



① Coupling hub A ② Coupling hub B ③ Insert ④ Adapter
⑤ Hexagon socket head bolt ⑥ Spring washer ⑦ Hexagon socket head bolt ⑧ Spring washer

Combined with TEM's
"Jaw Flex Coupling L Series"

Torque indicator
(The position indicated in the diagram is not the min. point



Unit : mm

Torque Guard Model No.	Set torque range N·m {kgf·m}	Max. rpm r/min	Torque Guard		Coupling		A	B	C	D	ℓ1	ℓ2	E	F
			Rough bore diameter	Max. bore diameter	Rough bore diameter	Max. bore diameter								
TGZ20-LC	2.4～8.3 {0.24～0.85}	1800	8	20	12.7	35	146	83	18.8	27.2	27	73	—	96
TGZ20-MC	4.1～16 {0.42～1.6}													
TGZ20-HC	8.2～31 {0.84～3.2}													
TGZ30-LC	5.9～21 {0.6～2.1}	1800	12	30	18.0	47	180	93.5	22.6	32.5	42.9	82	—	118
TGZ30-MC	20～52 {2.0～5.3}													
TGZ30-HC	39～108 {4.0～11}													
TGZ40-LC	25～93 {2.6～9.5}	1800	17	40	19.1	58	213	111	26.1	32.9	54	100	34.9	152
TGZ40-MC	44～127 {4.5～13}													
TGZ40-HC	88～245 {9.0～25}													
TGZ50-LC	63～157 {6.4～16}	1800	22	50	19.1	63	242	127.5	26.1	40.4	63.5	112	34.9	178
TGZ50-MC	127～304 {13～31}													
TGZ50-HC	245～451 {25～46}													

Torque Guard Model No.	G	H	I No. of pieces-screw size X length	J No. of pieces-screw size X length	※ Mass kg	※ Inertia moment ×10⁻²kg·m²	※GD² ×10⁻²kgf·m²	Model No. of coupling used	K	Allowable angular misalignment (deg.)	Allowable parallel misalignment	Allowable shaft direction displacement
TGZ20-LC	64.3	—	3-M6×20	4-M5×22	4.34	0.44	1.76	L099-H	27	0.5	0.38	±0.5
TGZ20-MC												
TGZ20-HC												
TGZ30-LC	84.1	—	6-M6×22	4-M6×22	7.77	1.22	4.86	L110-H	40	0.5	0.38	±0.7
TGZ30-MC												
TGZ30-HC												
TGZ40-LC	114.3	101.6	6-M6×25	6-M6×25	15.4	4.05	16.2	L190-H	54	0.5	0.38	±1.0
TGZ40-MC												
TGZ40-HC												
TGZ50-LC	127	107.9	6-M8×25	6-M8×25	23.2	8.63	34.5	L225-H	60	0.5	0.38	±1.0
TGZ50-MC												
TGZ50-HC												

※Mass, inertia moment and GD2 are based on the bores' maximum diameters.

Note: All products are MTO.

Selection

As a safety device, the Torque Guard will be most effective if it is installed in the place nearest to where overload is thought to most likely occur on the driven machine.
For most situations, avoid using the Torque Guard with human transportation or lifting devices. If you decide to use a Torque Guard with these devices, take the necessary precautions to avoid serious injury or death from falling objects.

1. Setting trip torque

$$T_P = T_L \times S.F = \frac{60000 \times P}{2\pi \cdot n} \times S.F \quad \left\{ T_P = \frac{974 \times P}{n} \times S.F \right\}$$

T_P = Trip torque N·m{kgf·m} T_L = Load torque N·m{kgf·m}
P = Transmittance power kW SF = Service factor
n = rpm r/min

(1) From the machine's strength and load, as well as other information, set the trip torque at the point where it should not go any higher.
(2) When the limit value is not clear, calculate the rated torque by using the rpm of the shaft where the Torque Guard is installed and rated output power. Then, depending on the conditions of use, multiply by the service factor in Table 1.

Table 1

Service factor	Operating conditions
1.25	In the case of normal start up/stop, intermittent operation
1.50	In the case of a heavy shock load or forward-reverse driving

2. When rpm is relatively high

When rpm is relatively high (more than 500r/m), or when load inertia is large, depending on the motor's start up torque, there is a chance the Torque Guard will trip. In this case, determine the inertia ratio and calculate the torque used in the Torque Guard during start up, then multiply it by the service factor and make this the trip torque.

$$K = \frac{I_L + I_t}{I_s} \quad \left\{ K = \frac{GD_L^2 + GD_t^2}{GD_s^2} \right\} \quad Tt = \frac{K \cdot T_S + T_L}{1 + K} \quad Tp = SF \cdot Tt$$

K : Inertia ratio
I_s : Drive side inertia moment $(kg \cdot m^2)$
$\{GD_s^2$: Drive side GD^2 $(kgf \cdot m^2)\}$
I_L : Load side inertia moment $(kg \cdot m^2)$
$\{GD_L^2$: load side GD^2 $(kgf \cdot m^2)\}$
I_t : Torque Guard inertia moment $(kg \cdot m^2)$
$\{GD_t^2$: Torque Guard GD^2 $(kgf \cdot m^2)\}$
T_s : Motor starting torque $(N \cdot m)\{kgf \cdot m^2\}$
T_t : Torque in Torque Guard during start up $(N \cdot m)\{kgf \cdot m\}$
T_L : Load torque $(N \cdot m)\{kgf \cdot m\}$
T_P : Trip torque $(N \cdot m)\{kgf \cdot m\}$
S.F. : Service factor
Note) Use the equivalent value to the shaft in which the Torque Guard is installed for each inertia moment, GD^2 and torque value.

3. Precautions when deciding trip torque

Compared with load torque, if the torque used when starting up becomes large, the setting trip torque value also becomes large, causing a problem from the viewpoint of the overload protection device. (Compared with the load torque, the trip torque is too large.) In this case install it as close to the load side as possible.

4. Choosing the model number

Choose a model where the calculated trip torque is within the minimum to maximum setting range.

5. Verifying bore diameter

Verify that the shaft where the Torque Guard will be installed is in the possible range (refer to the dimensions table) of the bore diameter of the Torque Guard model you selected.
If the shaft diameter is larger than the possible bore range, select a model one size larger that uses a weak spring.

6. Confirming rpm

Confirm that the Torque Guard rpm used is within the maximum rpm value in this catalog.

Handling

1. Bore finishing

(1) **Before finishing**
The Torque Guard TGZ Series is shipped set at the minimum point (minimum torque value). Once received, confirm that the revolution indicator and angle indicator are set at zero.

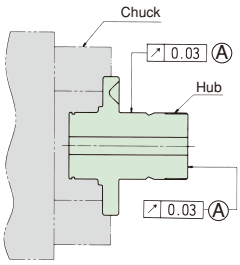
(2) **Disassembly**
Loosen the setscrews, remove the adjusting nut and take out the coil springs, ball cage, plate and balls. Next, take out the shaft snap ring, and remove the bearing and driven flange. When disassembling, take care not to lose the ball B at s ball cage. Make sure the Torque Guard parts do not become dusty or dirty.

(3) **Chucking**
Chuck the hub flange's outside diameter and center the hub portion.

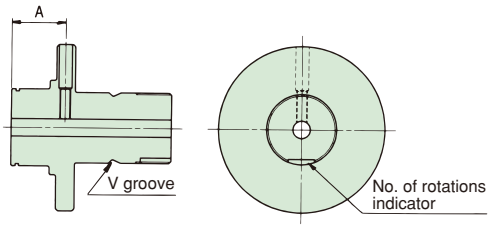
(4) **Keyway**
Keyway machining should be carried out directly below the setscrew tap at the hub flange portion.

(5) **Reassembly**
After bore finishing is completed and you are reassembling the Torque Guard, make sure to coat the pockets of the ball As and ball Bs, and the V-groove with grease.

Centering diagram



Set screw position



Unit: mm

Model No.	A
TGZ20	24.5
TGZ30	27.5
TGZ40	32.5
TGZ50	37.0

Sprockets that can be used with the TGZ Series

TGZ size \ Sprocket Model No.	RS25	RS35	RS41	RS40	RS50	RS60	RS80	RS100	RS120
TGZ20L, M, H	(51)	(35)	(28)	30 (28)	24 (23)	20	16	13	13 (12)
TGZ30L, M, H	(62)	(43)	(33)	35 (33)	30 (27)	24 (23)	18	16	14
TGZ40L, M, H		(54)	(41)	45 (41)	35 (34)	30 (24)	24 (23)	19	16
TGZ50L, M, H		62	(48)	48	40 (39)	35 (33)	26	21	14

※The teeth number in parentheses are not standard A Type sprockets. Make sure to use a sprocket that has a one size larger number of teeth.

2. Trip Torque setting

(1) Torque Guard TGZs are all shipped with torque set at the minimum point (min. torque value). Confirm that the angle indicator and the revolution indicator are set at zero. The revolution indicator can be read at the end face of the adjusting nut. Refer to page 52 for more information.

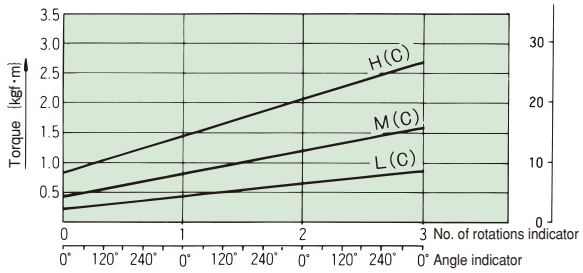
(2)From the "Tightening Amount Torque Correlation Chart" (below), find the adjusting nut tightening angle equivalent to the predetermined trip torque. Set at 60° toward the determined tightening value, then install to the machine and conduct a trip test. Gradually tighten and set at optimum trip torque.

(3)After setting torque, screw the lock screw to the adjusting nut. Refer to page 52 for lock screw tightening torque and points of caution.

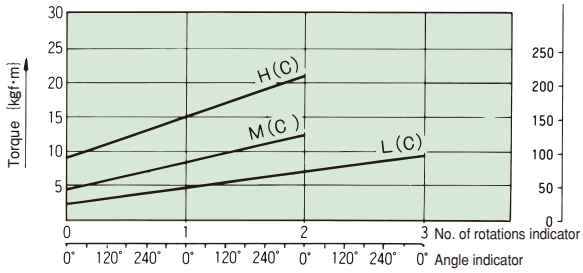
(4)Do not turn the adjusting nut (bolt) more than the torque indicator's maximum value. Doing so will put it in a locked position, and there will be no leeway for the disk spring to bend.

※Each product's trip torque does not always correspond with the value listed in the "Tightening Amount - Torque Correlation Chart", so use these values only as a rough guide.

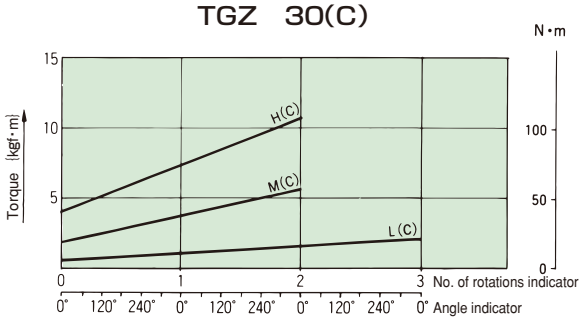
TGZ 20(C)



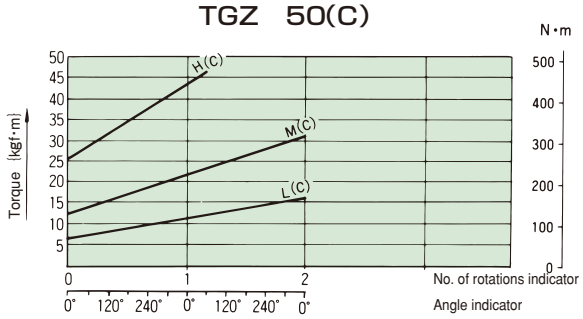
TGZ 40(C)



TGZ 30(C)

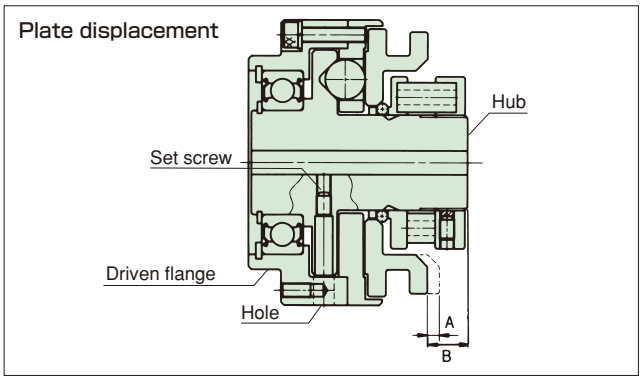


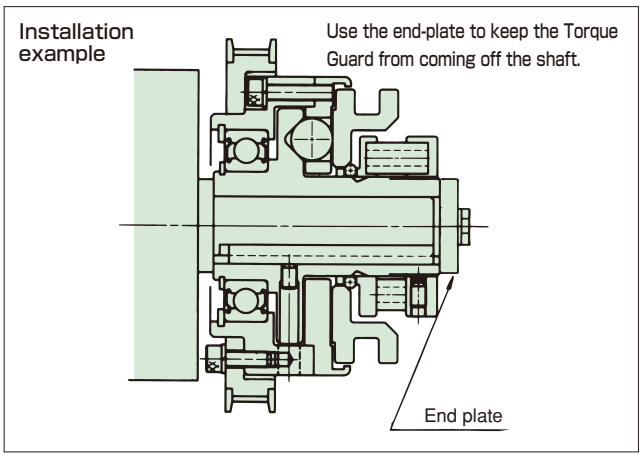
TGZ 50(C)



3. Resetting

Match up one hole of the driven flange with the hub side's setscrew position. (This position is the pocket and ball's correct phase.) Next, apply axial load to the plate to reset (refer to the right chart.). To determine whether the Torque Guard has completely reset, verify it using the measurements of the diagram below (displacement A).





Model No.	Axial load N {kgf}	Amount of displacement A mm	B mm
TGZ20-L	49{5}	4.1	13.5
TGZ20-M	88{9}		
TGZ20-H	176{18}		
TGZ30-L	98{10}	4.7	14.5
TGZ30-M	235{24}		
TGZ30-H	470{48}		
TGZ40-L	157{16}	5.9	20.0
TGZ40-M	421{43}		
TGZ40-H	833{85}		
TGZ50-L	451{46}	7.0	18.2
TGZ50-M	902{92}		
TGZ50-H	1382{141}		

Maintenance

Grease the ball and ball cage either once per year or every thousand trips.

Grease

Exxon Mobil		Showa Shell	Japan-Energy	Idemitsu
Mobilux EP2	Listun EP2	Alvania EP Grease 2	Rizonics EP 2	Daphny Eponex Grease EP 2

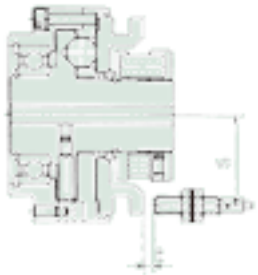
Nippon Oil Corporation	Kygnus	Cosmo Oil
Epinoc Grease AP(N)2	Kygnus EP Grease 2	Cosmo Dynamax EP Grease 2

Overload detection

TG sensor installation

- The detecting distance of a TG Sensor is 1.5mm. Set the Torque Guard in a non-trip condition with the dimensions (s, t) in the chart below.
- Install the TG Sensor with the Torque Guard at the tripped position. Then, while rotating the Torque Guard by hand, verify that the TG Sensor is functioning (LED at the side is lighting) and there is no interference with the plate. Finally, reset the Torque Guard.

Installation diagram TGZ Series



Unit: mm

measurement / Model no.	S	t	Amount of plate movement
TGZ20	40	4.2~5.6	4.1
TGZ30	50	4.8~6.2	4.7
TGZ40	66.5	6~7.4	5.9
TGZ50	79	7.1~8.5	7.0

Installation diagram TGZ Series

Unit: mm

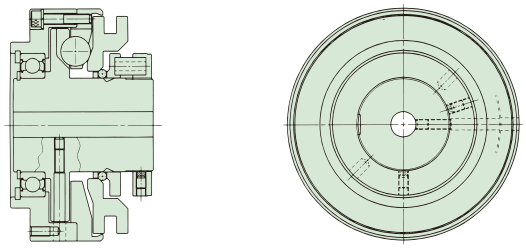
measurement / Model no.	S	t	Amount of plate movement
TGZ20	9.5	1.2	4.1
TGZ30	10.2	1.2	4.7
TGZ40	15	1.2	5.9
TGZ50	12.2	1.2	7.0

Special Specifications

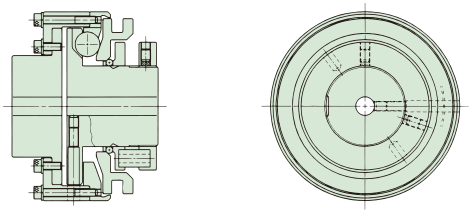
TGXZ Series

Non-backlash and complete release type. With its high-speed specifications (up to 3000r/min), it is ideal for when instant stop isn't possible. Please contact TEM for more information.

■TGXZ Series only



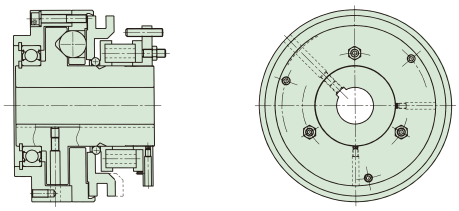
■Coupling type



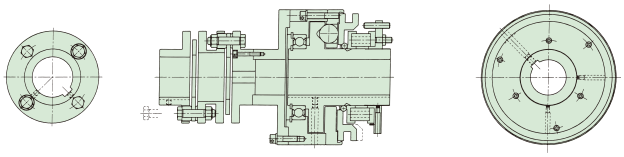
TGZ Large Series

For the application of setting torque 451N・m {46kgf・m} and above, please contact TEM for more information.

■TGXZ Series only



■Coupling type



Torque Limiter

Features

Traditional friction type
Economically priced and easy to use

Easy torque adjustment

Slip torque setting and adjusting can be done by simply tightening the adjusting nut or bolts. The friction of the friction facings and the center member transmits torque, so overload is guaranteed to cause the Torque Limiter to slip, thus protecting the machine.

Automatic reset

If overload occurs the Torque Limiter will slip. If overload is removed it will automatically reset and begin to rotate. Because there are no parts to replace like a shear pin, the Torque Limiter requires little labor to keep it operating.

Can be fixed to each type of drive

Sprockets, gears, pulleys, etc. can be fixed to the center member.

A wide variety of Torque Limiters are available

From small capacity to large, all standard models can be used in all transmission conditions.

Finished bores for quick delivery

Finished bore products can be made for quick delivery.
(Refer to pages 61, 63)

Series

Torque Limiter
Once attached to the shaft, torque transmission is conveyed through roller chains, belts and gears.
Torque Limiter with sprocket
The torque of finished bore Torque Limiters with machined sprockets is factory pre-set.
Torque Limiter coupling
A combined Torque Limiter and roller chain coupling.

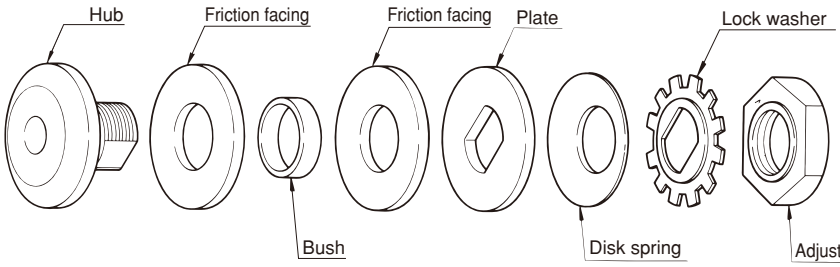
Torque Limiter with sprocket

TL250
TL200～TL700
Torque Limiter (rough bore)

TL10
TL200～TL20
Torque Limiter coupling (rough bore)

TL500-C
TL200-C～TL20-C

Construction and operating principles



- During normal operation, the disk spring inserted between the center member and friction facings applies pressure to the center member. Below the set torque, the frictional force transmits rotation.
- If the operational torque exceeds the set torque due to overload, the center member will slip between the friction facings. When overload is stopped, it automatically resets.

Model No.

1.Torque Limiter

TL350－1－B6.5－20J

- Size
- No. of disk springs
  1…1pc
  2…2pcs
  1L…weak spring
- Bush length(No symbol if there is no bush)
- Shaft diameter
  (No symbol if shaft bore is not finished)
- Keyway type
  (J: New JIS normal type, E: Old JIS 2nd grade,No symbol: special keyway)

2.Torque Limiter coupling

TL350－2C－T20J×C40J－9.0

- Size
- No. of disk springs
  1…1pc
  2…2pcs
  1L…weak spring
- Torque Limiter side bore diameter
  (No symbol if there is no finished bore)
- Keyway type
  (J: New JIS normal type, E: Old JIS 2nd grade , No symbol: special keyway)
- Coupling side bore diameter
  (No symbol if there is no finished bore)
- Keyway type
  (J: New JIS normal type, E: Old JIS 2nd grade, No symbol: special keyway)
- Set torque
  (Unit: kgf.m, No symbol if there is no torque setting)

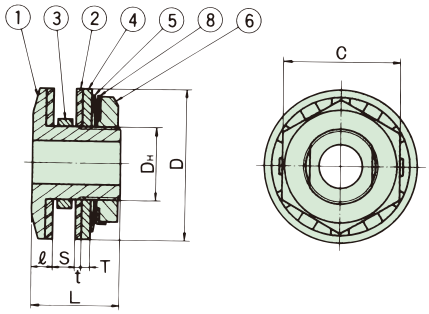
When using the Torque Limiter

Before installing a Torque Limiter rough bore product to the shaft, it is necessary to finish the bore, keyway and center member as well as torque setting.

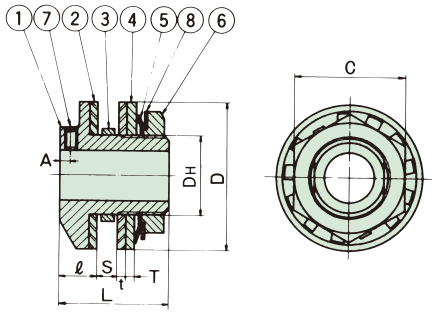
- Refer to page 66 for more information on Torque Limiter selection and center member selection/machining.
- Before assembling the Torque Limiter, remove any oil, rust or dust from the hub, friction facings, plate or center member (gear, pulley, etc.).
- Refer to page 64 for more information on setting torque.

Transmissible capacity/dimensions

TL200



TL250 · TL350



①Hub
②Friction facing
③Bush
④Plate
⑤Disk spring
⑥Adjustable nut
⑦Hexagon socket head set screw
⑧Lock washer

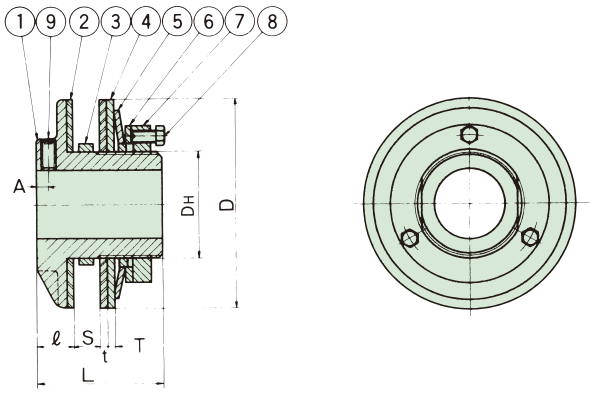
· TL200-1L, TL250-1L and TL350-1L have a spacer between the disk spring and lock washer.

Unit : mm

Model No.	Set torque range N·m {kgf·m}	Max.rpm (r/min)	Rough bore diameter	Max. bore diameter	Bush length	Bush outer diameter	Center member bore diameter	Dimensions D	D_H	L	ℓ	T	t	S max.	A	C	Adjustable nut diameter X pitch	Set screw diameter	Mass kg
TL200-IL	1.0~2.0 {0.1~0.2}	1,800	7	14	3.8	$30^{-0.024}_{-0.049}$	$30^{+0.03}_{0}$	50	24	29	6.5	2.6	2.5	7	—	38	M24×1.0	—	0.2
TL200-1	2.9~9.8 {0.3~1.0}				6.0														
TL200-2	6.9~20 {0.7~2.0}																		
TL250-IL	2.9~6.9 {0.3~0.7}		10	22	4.5	$41^{-0.010}_{-0.045}$	$41^{+0.05}_{0}$	65	35	48	16	4.5	3.2	9	4	50	M35×1.5	M5	0.6
TL250-1	6.9~27 {0.7~2.8}				6.5														
TL250-2	14~54 {1.4~5.5}																		
TL350-IL	9.8~20 {1.0~2.0}		17	25	4.5	$49^{-0.025}_{-0.065}$	$49^{+0.05}_{0}$	89	42	62	19	4.5	3.2	16	6	63	M42×1.5	M6	1.2
TL350-1	20~74 {2.0~7.6}				6.5														
TL350-2	34~149 {3.5~15.2}				9.5														

Note: 1. The products in bold are stock items. The rest are MTO.
2. The hexagon socket head set screw is included.
3. On TL200, setting to the shaft by hexagon socket head set screw is not possible.
Use a snap ring for the shaft or end plate.

TL500, TL700



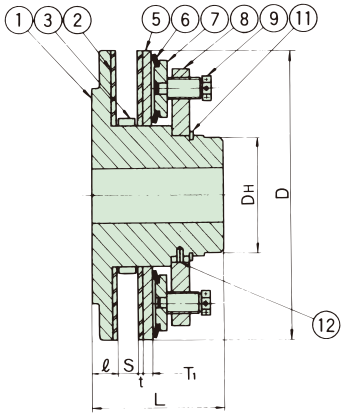
①Hub ②Friction facing ③Bush ④Plate ⑤Disk spring ⑥Pilot plate ⑦Adjustable nut ⑧Adjustable bolt ⑨Hexagon socket headcap set screw

Unit : mm

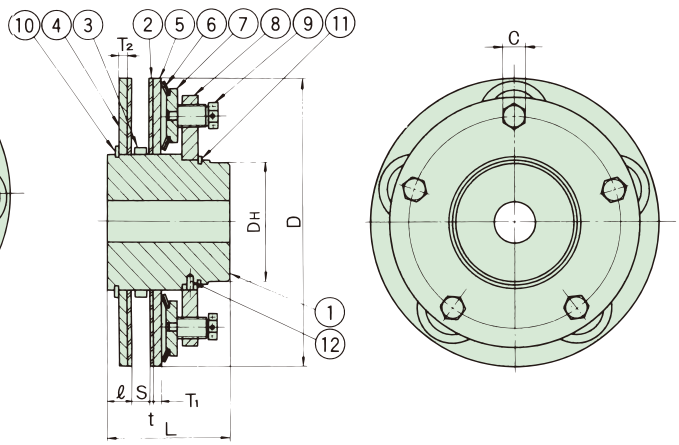
Model No.	Set torque range N·m {kgf·m}	Max.rpm (r/min)	Rough bore diameter	Max. bore diameter	Bush length	Bush outer diameter	Center member bore diameter	Dimensions D	D_H	L	ℓ	T	t	S Max	A	Adjustable nut diameter X pitch	Adjustable bolt diameter X pitch	Set screw diameter	Mass kg
TL500-1L	20~ 49 { 2.0~ 5.0}	1,800	20	42	6.5	$74^{-0.05}_{-0.10}$	$74^{+0.05}_{0}$	127	65	76	22	6	3.2	16	7	M65×1.5	M8×1	M 8	3.5
TL500-1	47~210 { 4.8~21.4}				9.5														
TL500-2	88~420 { 9.0~42.9}																		
TL700-1L	49~118 { 5.0~12 }		30	64	9.5	$105^{-0.075}_{-0.125}$	$105^{+0.05}_{0}$	178	95	98	24	8	3.2	29	8	M95×1.5	M10×1.25	M10	8.4
TL700-1	116~569 {11.8~58.1}				12.5														
TL700-2	223~1080 {22.8~111}																		

Note: 1. The products in bold are stock items. The rest are MTO.
2. The hexagon socket head set screw is included.

TL10



TL14, TL20



①Hub ②Friction facing ③Bush ④Plate (A) ⑤Plate (B) ⑥Disk spring ⑦Spring retainer
⑧Pilot plate ⑨Adjustable bolt ⑩Snap ring for shaft ⑪Spirolox ⑫Spring pin

Unit : mm

Model No.	Set torque range N·m {kgf·m}	Max.rpm (r/min)	Rough bore diameter	Max. bore diameter	Bush length	Bush outer diameter	Center member bore diameter	Dimensions										Mass kg
								D	D_H	L	ℓ	T_1	T_2	t	S max.	C	Adjustable nut diameter X pitch	
TL10－16	392～1247 {40～130}	1,000	30	72	12.5 15.5 19.5	$135^{-0.085}_{-0.125}$	$135^{+0.07}_{0}$	254	100	115	23	8.5	－	4.0	24	19	M18×1.5	21
TL10－24	588～1860 {60～190}																	
TL14－10	882～2666 {90～272}	500	40	100	15.5 19.5 23.5	$183^{-0.07}_{-0.12}$	$183^{+0.07}_{0}$	356	145	150	31	13	13	4.0	29	27	M26×1.5	52
TL14－15	1960～3920 {200～400}																	
TL20－ 6	2450～4900 {250～500}		50	130	15.5 19.5 23.5	$226^{-0.07}_{-0.12}$	$226^{+0.07}_{0}$	508	185	175	36	15	18	4.0	31	36	M32×1.5	117
TL20－12	4606～9310 {470～950}																	

Note : 1. All products are MTO.
2. If the model larger than TL20-12 is required, contact Tsubaki Emerson.

Finished bore Torque Limiter with sprockets

■Finished bore Torque Limiter and finished sprockets are available for quick delivery. If sold as a combination, torque is preset before shipment.

■With sprocket

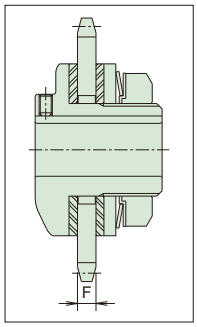
Sprocket comes standard with TL200 to TL700.

■Bores and keyways are already finished

Bore finishing is standard for Torque Limiter TL200C to 700C.

■Easy torque setting

Because the adjustable nut or adjustable bolt is set at the predetermined 120° , it is easy for the customer to set torque.
(Subject models for torque pre-setting)



Sprocket and bore finishing dimension table

Torque Limiter Model No.	Finished bore diameter(mm)		Sprockets					Mass (kg)
			Type	F(mm)	Bush length (mm)	No. of teeth	No. of teeth	
TL200	11,12,14,	10	RS35	$4.3^{0}_{-0.25}$	3.8	20,21,22,23,24,25,26,27,28,30	–	0.3
			RS40	$7^{0}_{-0.35}$	6.0	16,17,18,19,20,21,22,23,24,25,26	–	0.33
TL250	12,14,15, 16,18,19, 20,22	17	RS40	$7^{0}_{-0.35}$	6.5	22,23,24,25,26,27,28,30	21,32	0.85
			RS50	$7^{0}_{-0.25}$	6.5	18,19,20,21,22,23,24,25,26,27,28	17	0.92
TL350	18,19,20, 22,24,25	–	RS40	$7^{0}_{-0.35}$	6.5	26,27,28,30,32,34,35,36,38	40,42,45	1.55
			RS50	$7^{0}_{-0.25}$	6.5	22,23,24,25,26,27,28,30,32	21,34,35,36	1.68
			RS60	$10^{0}_{-0.30}$	9.5	–	18,19,20,21,22,23,24,25,26,27,28,30	1.91
TL500	22,24,25, 28,30,32, 35,38,40, 42	29,33,36	RS50	$7^{0}_{-0.25}$	6.5	30,32,34,35,36,38,40,42,45	48,50	4.3
			RS60	$10^{0}_{-0.30}$	9.5	25,26,27,28,30,32,34,35,36,38	40	4.7
			RS80	$13^{0}_{-0.30}$	9.5	–	19,20,21,22,23,24,25,26,27,28,30	5.2
TL700	35,40,42, 45,50,55, 60,63,64	32,33,36, 38,43,46, 48,52,56, 57	RS60	$10^{0}_{-0.30}$	9.5	35,36,38,40,42,45,48,50,54	–	10.7
			RS80	$13^{0}_{-0.30}$	12.5	26,27,28,30,32,34,35,36,38	–	11.2
			RS100	$16.5^{0}_{-0.30}$	12.5	–	21,22,23,24,25,26,27,28,30	12.2
Delivery	※1	※1				※1	※2	–

Delivery ※1 = Ex.-Japan 4weeks by sea
※2 = Ex.-Japan 6weeks by sea

1. Delivery dates are listed in each column. If ordering the finished bore and with sprocket combination, the longer time of delivery applies.
2. If a finished bore is a size other than that listed in the chart above or hardened teeth are needed, it may be possible to provide this. Contact TEM for a consultation.
3. The thickness of sprocket F is different from the thickness of the standard sprocket.
4. For Torque Limiter dimensions, refer to pages 59 and 60.
5. The mass of the above is based on rough bore and minimum number of sprocket teeth.
6. On TL200, setting to the shaft by hexagon socket head set screw is not possible. Use a snap ring for the shaft or end plate.

Model No.

TL250 - 2 - 040 22 - 20J - 5.0

- TL250 — Size
- 2 — No. of disk springs
- 040 — Sprocket Model No.(RS40)
- 22 — No. of sprocket teeth
- 20J — Bore diameter
  - J — New JIS key normal type
- 5.0 — Set torque(Unit: kgf.m, no number if no torque setting)

■Torque setting

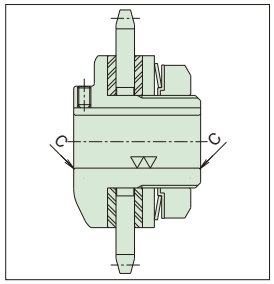
・Torque setting is done at 120° on the "Tightening Amount - Torque Correlation Graph". When using the Torque Limiter, set the torque based on 120° with the adjusting nuts or bolts.

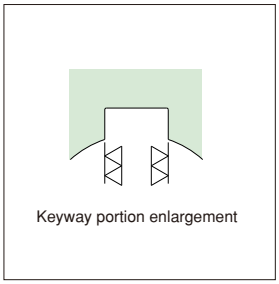
■Bore and keyway specifications

・The bore tolerance is H7.
・The keyway is New JIS (JIS B 1301-1996) "normal type"
・Set screws are included.

■Chamfer and finish

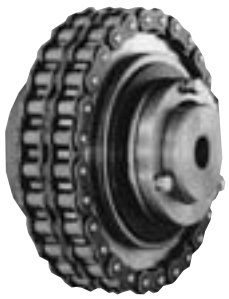
Bore diameter	Chamfer dimensions
25mm and less	C0.5
50 mm and less	C1
51mm and above	C1.5

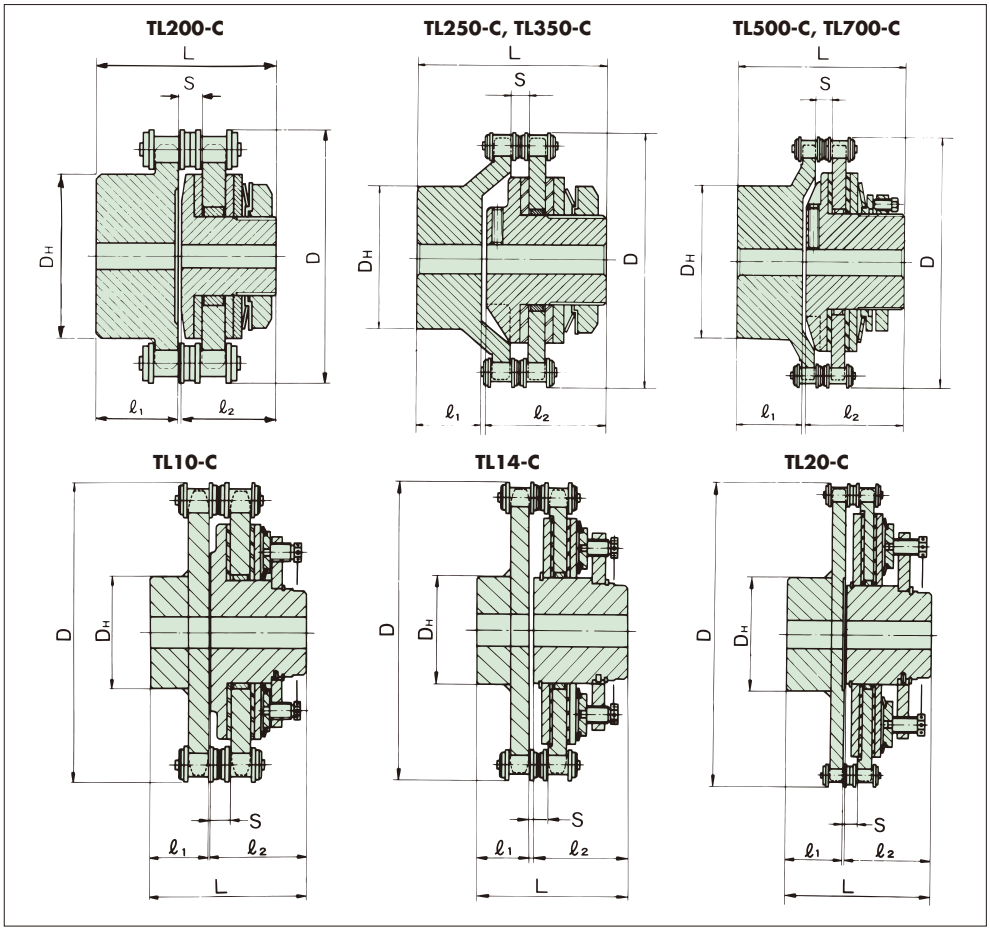




Torque Limiter coupling

The Torque Limiter coupling is a flexible coupling that uses a Torque Limiter and special type sprocket, and is connected by 2 rows of roller chains.
Centering the shaft coupling is easy and handling is simple. The Torque limiter acts as an automatic safety device, protecting machinery from damage due to overload.





• Torque Limiter unit of TL200-1LC, TL250-1LC and TL350-1LC have a spacer between the disk spring and lock washer.

Unit : mm

Model No.	Set torque range N·m {kgf·m}	Max. rpm (r/min) *	Rough bore diameter		Max. shaft diameter		Sprocket	Dimensions						Mass kg
			Coupling side	Torque Limiter side	Coupling side	Torque Limiter side		D	D_H	L	ℓ_1	ℓ_2	S	
TL200-1LC	1.0~2.0 {0.1~0.2}	1200	8	7	31	14	RS 40-16T	76	50	55	24	29	7.5	1.0
TL200-1C	2.9~9.8 {0.3~1.0}													
TL200-2C	6.9~20 {0.7~2.0}													
TL250-1LC	2.9~6.9 {0.3~0.7}	1000	13	10	38	22	RS 40-22T	102	56	76	25	48	7.4	1.9
TL250-1C	6.9~27 {0.7~2.8}													
TL250-2C	14~54 {1.4~5.5}													
TL350-1LC	9.8~20 {1.0~2.0}	800	13	17	45	25	RS 50-24T	137	72	103	37	62	9.7	4.2
TL350-1C	20~74 {2.0~7.6}													
TL350-2C	34~149 {3.5~15.2}													
TL500-1LC	20~49 {2.0~5.0}	500	18	20	65	42	RS 60-28T	188	105	120	40	76	11.6	10
TL500-1C	47~210 {4.8~21.4}													
TL500-2C	88~420 {9.0~42.9}													
TL700-1LC	49~118 {5.0~12}	400	23	30	90	64	RS 80-28T	251	150	168	66	98	15.3	26
TL700-1C	116~569 {11.8~58.1}													
TL700-2C	223~1080 {22.8~111}													
TL10-16C	392~1274 {40~130}	300	33	30	95	72	RS140-22T	355	137	189	71	115	26.2	66
TL10-24C	588~1860 {60~190}													
TL14-10C	882~2666 {90~272}	200	38	40	118	100	RS160-26T	470	167	235	80	150	30.1	140
TL14-15C	1960~3920 {200~400}													
TL20-6C	2450~4900 {250~500}	140	43	50	150	130	RS160-36T	631	237	300	120	175	30.1	285
TL20-12C	4606~9310 {470~950}													

1. The products in bold are all stock items. The rest are MTO.
2. * If you intend to use the Torque Limiter at max. rpm, apply a lubricant like molybdenum disulfide to the chain and sprocket teeth. If you intend to use the Torque Limiter at an rpm above the maximum listed above, consult with TEM for more information.
3. If the model larger than TL20-12 is required, contact Tsubaki Emerson.

Torque Limiter coupling with finished bore

Finished bore products are available for quick delivery.

■Bores and keyways are already finished

Bore finishing is standard for Torque Limiter couplings TL200C to 700C.

■Finished Bore Dimension Chart

Unit : mm

Torque Limiter Coupling Model No.	Finished bore dimensions	
	Torque Limiter side	Coupling side
TL200-1LC	10,11,12,14	10,11,12,14,15,16,17,18,19,20,22,24,25,28,29,30
TL200-1C		
TL200-2C		
TL250-1LC	12,14,15,16,17,18,19,20,22	15,16,17,18,19,20,22,24,25,28,29,30,32,33,35, 36,38
TL250-1C		
TL250-2C		
TL350-1LC	18,19,20,22,24,25	15,16,17,18,19,20,22,24,25,28,29,30,32,33,35, 36,38,40,42,43,45
TL350-1C		
TL350-2C		
TL500-1LC	22,24,25,28,29,30,32,33,35,36,38,40,42	20,22,24,25,28,29,30,32,33,35,36,38,40,42,43, 45,46,48,50,52,55,56,57,60,63,65
TL500-1C		
TL500-2C		
TL700-1LC	32,33,35,36,38,40,42,43,45,46,48,50,52,55,56, 57,60,63,64	25,28,29,30,32,33,35,36,38,40,42,43,45,46,48, 50,52,55,56,57,60,63,65,70,71,75,80,85,90
TL700-1C		
TL700-2C		
Date of delivery	Ex.-Japan 4 weeks by sea	

1.For finished bore and hardened teeth specifications outside those written in the above chart, please conact TEM for more information.

Model No.

TL250 - 2C - T18J×C30J - 5.0

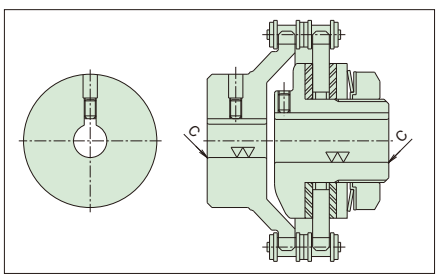
- TL250 — Size
- 2C — No. of disk springs
- T18J — Torque Limiter side bore diameter
- J — Keyway type: (J: new JIS normal type)
- C30J — Coupling side bore diameter
- J — Keyway type: (J: new JIS normal type)
- 5.0 — Set torque (unit: kgf.m, no number is displayed when torque is not set)

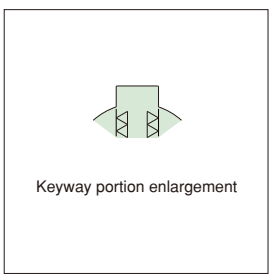
■Bore diameter and keyway specifications

- Bore diameter tolerance is H7.
- The keyway is New JIS (JIS B 1301-1996) "Normal type"
- Setscrews are included.

■Chamfer and finish

Bore diameter	Chamfer dimensions
25mm and less	C0.5
50 mm and less	C1
51mm and above	C1.5





Selection

If using the Torque Limiter with human transportation or lifting devices, take the necessary precautions with equipment to avoid serious injury or death from falling objects.

1 From the machine's strength and load, as well as other information, set the trip torque at the point where it should not go any higher. This torque is the Torque Limiter slip torque.
When the limit value is not clear, calculate the rated torque by using the rpm of the shaft where the Torque Limiter is installed and rated output power of the motor. Then, multiply by 1.5 to 2.0. This is the Torque Limiter slip torque.

2 Slip torque should be lower than rated torque.

3 Using the dimension table, verify that the maximum allowable bore diameter of the Torque Limiter is larger than the installation shaft diameter. If the installation shaft diameter is bigger, use a Torque Limiter one size larger.

4 Depending on the thickness of the center member which is clamped, use an appropriate length of bushing. For the bush length (thickness), choose the longest thickness bush, which is shorter than the thickness of the center member (sprocket, etc.).

Torque setting

Torque Limiter slip torque is set by tightening the adjusting nuts or bolts.

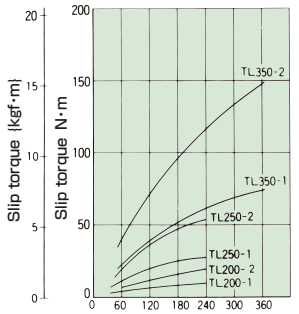
1 After installing the Torque Limiter to the equipment, tighten the adjusting nuts or bolts gradually from a loose position to find the optimal position.
In addition, by using the "Tightening Amount - Torque Correlation Charts" below, the tightening amount of the adjusting nut and bolts for slip torque can be found. However, due to the condition of the friction surface and other factors, the torque for the fixed tightening amount changes.
Using the graph as a rough guide, try test operating the Torque Limiter with the tightening amount slightly loose, then tighten gradually to find the optimal position. This is the most practical method.
When slip torque stability is especially important, hand tighten the adjusting nut or bolts as much as possible, and then slip approximately 500 times for running-in at a wrench-tightened 60° more. If the rotation speed is fast, split several times and subject it to 500 slips.

2 With the center member, the torque can be set to the specified amount. In this case, it is necessary to use a finished bore.

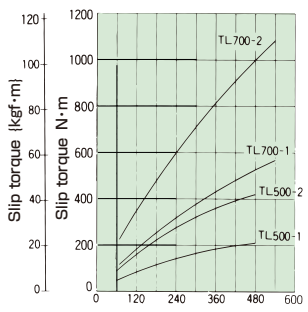
Tightening Amount and Torque Correlation Chart

Zero (0) point is the condition at which the adjustable nut or adjustable bolts are tightened by hand, and the disk spring is fixed.

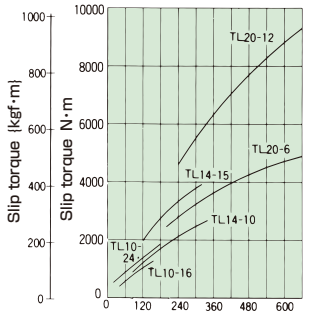
TL200, TL250, TL350



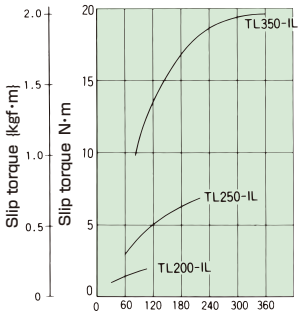
TL500, TL700



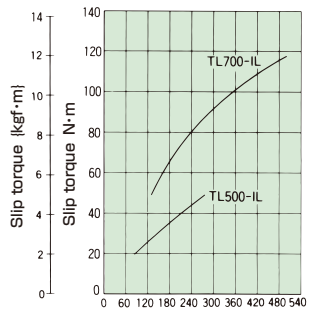
T10 TL14 TL20



TL200 - IL, TL250 - IL, TL350 - IL



TL500 - IL, TL700 - IL



Center member selection and manufacture

Sprockets, gears, V pulleys, etc. can be used as a center member with the Torque Limiter. If the customer intends to select or manufacture the center members by themselves, take the following precautionary steps:

1 For the Torque Limiter's outer diameter, the minimum diameter of the center member is restricted. When using a sprocket with a chain drive, refer to page 66 for minimum number of teeth.

2 Finish the friction face sides of the center member (both sides) in 3s - 6s.

3 For the bore diameter of the center member, machine it within the center member bore diameter tolerance from the dimension table in 3s - 6s.

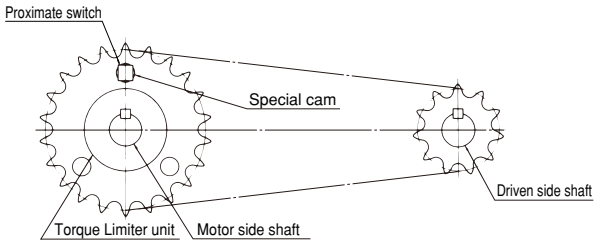
4 The width in which the center member is clamped should be within the S dimension in the dimension table.

Torque Limiter's operation detection

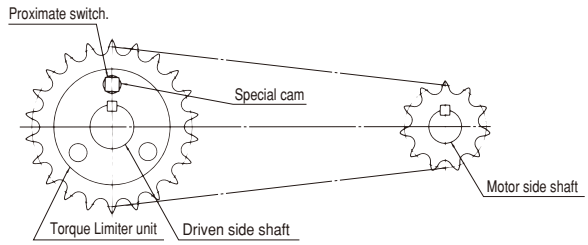
When overload occurs, the Torque Limiter slips and protects the machine, but if the driving source is not stopped, the Torque Limiter will continue to slip. If it continues to slip, the friction facing will be abnormally worn and become unusually hot, making it necessary to stop the drive source immediately.
The following are examples that detect Torque Limiter slips and stop the drive by using a proximate switch and digital tachometer.

■Installation examples

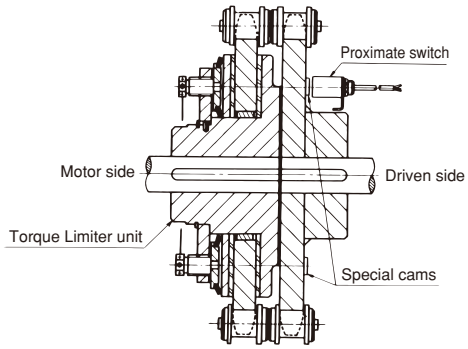
Type1 When the driven side experiences overload and the Torque Limiter's center member stops.



Type2 When the driven side experiences overload, the Torque Limiter unit stops.



Type 3 When the Torque Limiter is used with a coupling type and the center member side stops when overload occurs.



Type 4 When the Torque Limiter is used with a coupling type, and the main unit side stops when overload occurs.

For the installation of Type 4, it is quite difficult to install the special cams, so as much as possible avoid using this type.
When using the Torque Limiter with the coupling type, use Type 3.

Slip can be detected within approximately 1 to 10 seconds based on the rotational detection speed if the number of special cams selected is shown in the chart.

Number of special cams and rotational detection speed

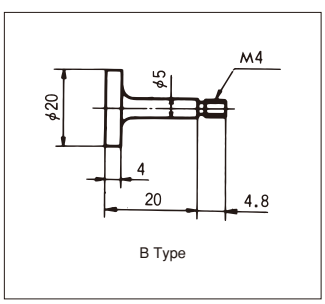
Number of Special cams	Rotational detection speed range r/min	Number of Special cams	Rotational detection speed range r/min
1	6～60	6	1.0 ～10
2	3～30	7	0.85～8.5
3	2～20	8	0.75～7.5
4	1.5～15	9	0.67～6.7
5	1.2～12	10	0.6 ～6.0

Note: In the case of 6 r/min and slower, the range is that of 6～60r/min divided by the number of special cams.

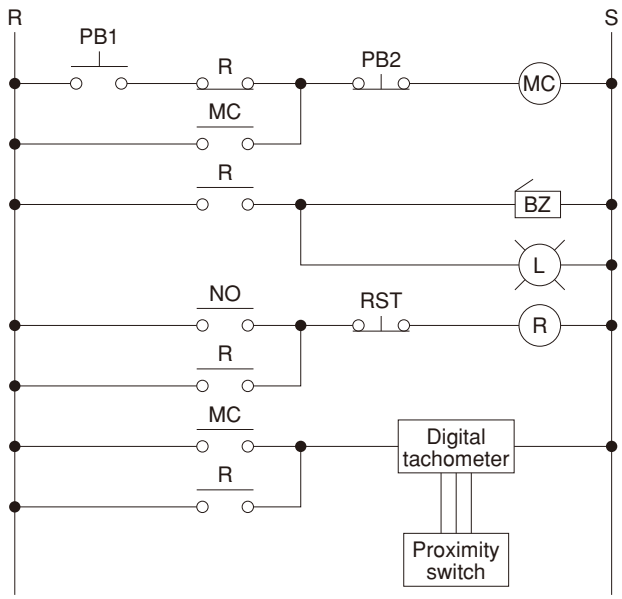
■Special cam dimensions and installation

The special cam is fixed by a screw on the driven side. Use a screw lock to lock the screw.

■Special cam for reference



■Reference Electrical Schematic Diagram



PB1 : Motor start button
PB2 : Motor stop button
RST : BZ, L reset button
MC : Electromagnetic contactor for motor
R : Auxiliary relay
NO : Digital tachometer output a contact
BZ : Buzzer
L : Lamp

Digital tachometer:
OMRON H7CX-R11

Proximity switch:
OMRON TL-N5ME2

Note)
We recommend OMRON digital tachometers and proximate switches for the above. For more information, refer to the OMRON catalog.

■Sprockets for the center member

When using the sprocket as a center member, refer to the notes below. In the below chart, the sprocket is used as a center member for the chain drive.

(1)Minimum number of teeth in which the chain does not interfere with the special cam (same as the reference drawing of the previous page) when using installation types 1 and 2 of the previous page.

(2)Minimum number of teeth in which the chain does not interfere with the friction facings of the Torque Limiter.

(3)Bush length

(4)Sprocket bore diameter (center member bore diameter)

Torque Limiter only and in the case the special cams shown in the previous page are used in type 2.

Torque Limiter Model No.	Sprocket bore diameter (center member bore diameter)	Min. No. of sprocket teeth																	
		RS35		RS40		RS50		RS60		RS80		RS100		RS120		RS140		RS160	
		Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length
TL200	$30^{+0.03}_{0}$	△20	3.8	16	6														
TL250	$41^{+0.05}_{0}$			20	6.5	17	6.5												
TL350	$49^{+0.05}_{0}$			26	4.5	21	6.5	18	9.5	15	9.5								
TL500	$74^{+0.05}_{0}$					△29 (30)	6.5	25	9.5	19	9.5								
TL700	$105^{+0.05}_{0}$							△33 (35)	9.5	26	9.5	21	12.5	18	12.5				
TL10	$135^{+0.07}_{0}$											△29 (30)	12.5	24	15.5	△22	19.5		
TL14	$183^{+0.07}_{0}$											△39 (40)	15.5	△33 (35)	15.5	△29	19.5	△26	23.5
TL20	$226^{+0.07}_{0}$											△54	15.5	△46 (60)	15.5	△40	19.5	△35	23.5

Note : Those marked with "△" are not standard A type sprockets. When using a standard stock sprocket, use the number of teeth in ( ).

In the case the special cams shown in the previous page are used in type 1.

Torque Limiter Model No.	Sprocket bore diameter (center member bore diameter)	Min. No. of sprocket teeth																	
		RS35		RS40		RS50		RS60		RS80		RS100		RS120		RS140		RS160	
		Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length	Min.No. of teeth	Bush length
TL200	$30^{+0.03}_{0}$	△25	3.8	19	6.0														
TL250	$41^{+0.05}_{0}$			24	6.5	20	6.5												
TL350	$49^{+0.05}_{0}$			30	4.5	24	6.5	21	9.5	17	9.5								
TL500	$74^{+0.05}_{0}$					32	6.5	△28 (30)	9.5	21	9.5								
TL700	$105^{+0.05}_{0}$							36	9.5	△28 (30)	9.5	△23 (24)	12.5	20	12.5				
TL10	$135^{+0.07}_{0}$											△31 (32)	12.5	26	15.5	△23	19.5		
TL14	$183^{+0.07}_{0}$											△41 (45)	15.5	35	15.5	△30	19.5	△27	23.5
TL20	$226^{+0.07}_{0}$											△56 (60)	15.5	△47 (60)	15.5	△41	19.5	△36	23.5

Note : Those marked with "△" are not standard A type sprockets. When using a standard stock sprocket, use the number of teeth in ( ).

Axial Guard

Features

The Axial Guard is a new type of mechanical type overload protection device for mechanisms where the load acts linearly, such as pushers or cranks.

Highly accurate trip load

Even with repeated loads, the fluctuating trip load variation is always within ±15%.

Non-backlash

High rigidity means no backlash for overweight axial loads.

Easy load adjustment

By simply turning the adjustable screw, load can be adjusted. In the tensile or compression direction, the Axial Guard trips at almost the same load.

Release type

When overload occurs, the Axial Guard immediately trips and the connection between the drive side and load side is shut off. The drive side's thrust does not transmit.
The resetting requires a small load, making it easy to reset.

Easy installation

The end faces of the case and slide shaft have tap holes for easy built-in design.

Standard stock

All Axial Guards are in stock.

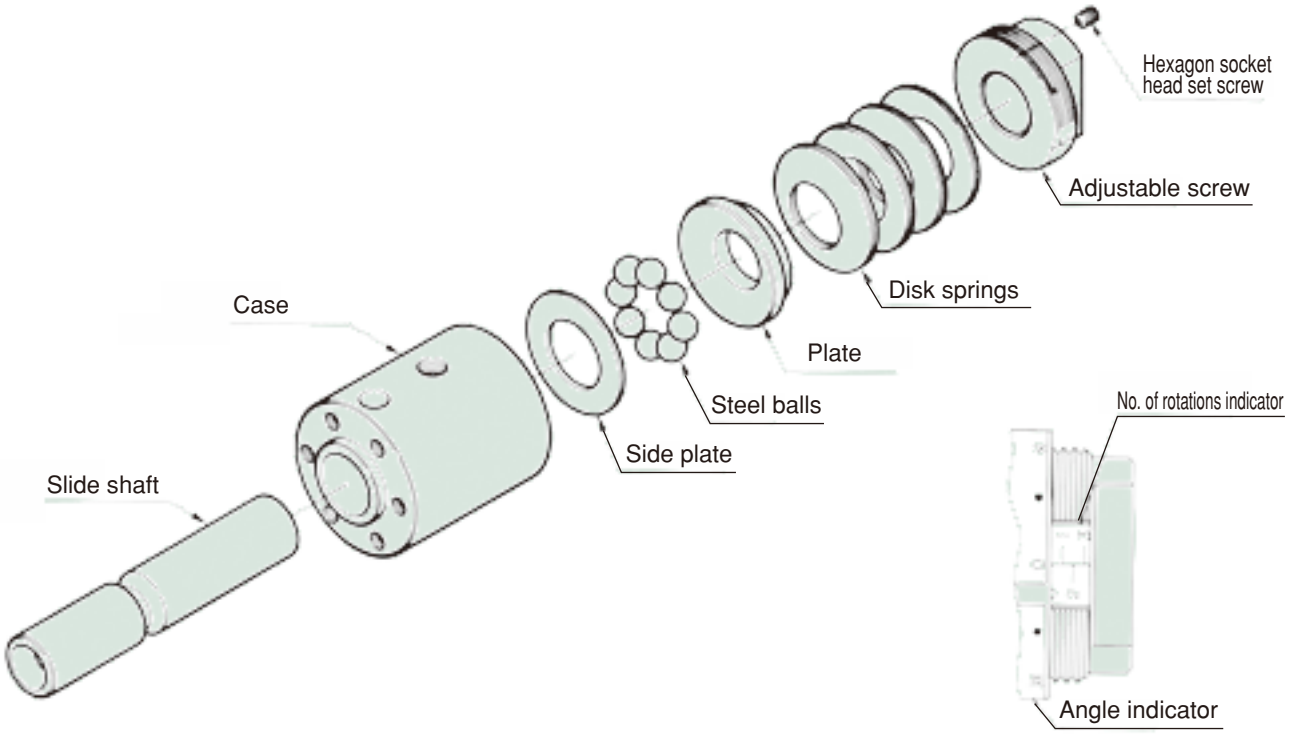
Model No.

TGA150

Series name

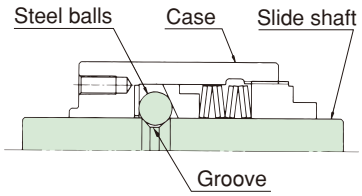
Maximum setting load(kgf):
65、150、250、350 (4 sizes)

Construction



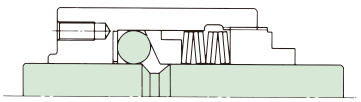
Operating principles

During operation (connected)



Because the metal ball is held in its groove, thrust from the case (or slide shaft) is transmitted to the load side.

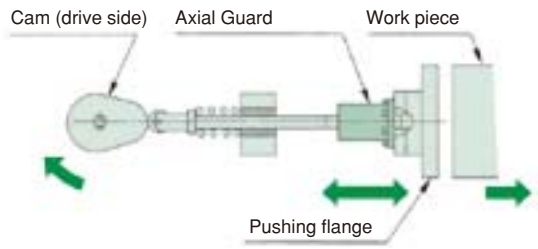
During overload (tripped)



When the load exceeds the pre-set value, the metal ball pops out of its groove; the connection between the slide shaft and the case disengages, and moves in a free state.

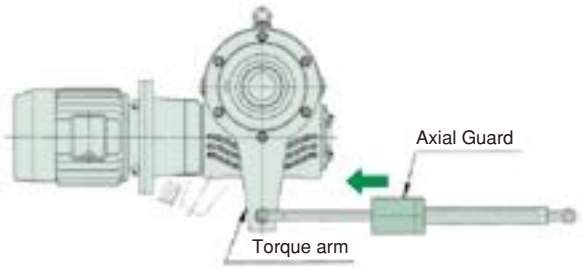
Applications

Pusher



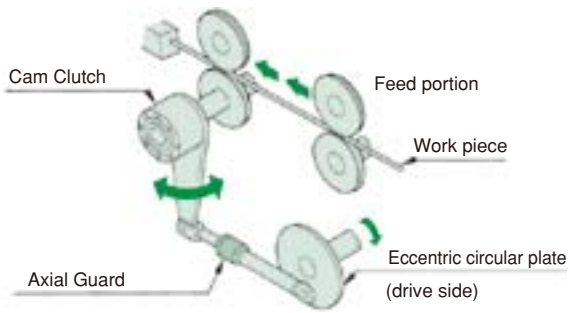
The cam pushes the work piece.
When overload occurs due to the over-weighted work piece or jamming, the Axial Guard trips and protects the machine.

Tie-rod of the shaft-mounted reducer



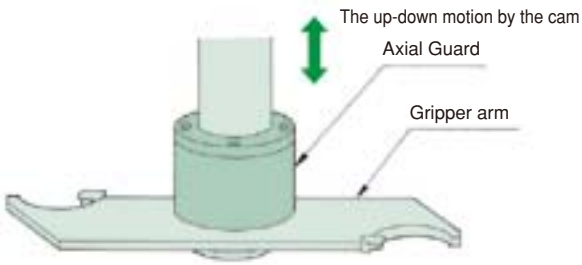
It is installed at the torque arm rotation-prevention portion of the shaft-mounted reducer.
When overload occurs and the moment is higher than the preset value, the Axial Guard trips.

Crank mechanism



The combination of the crank and Cam Clutch motion sends the wire rod. When a foreign object gets caught up in the machine or the wire rod is deformed, overload occurs and the Axial Guard trips, thus protecting the feed portion.

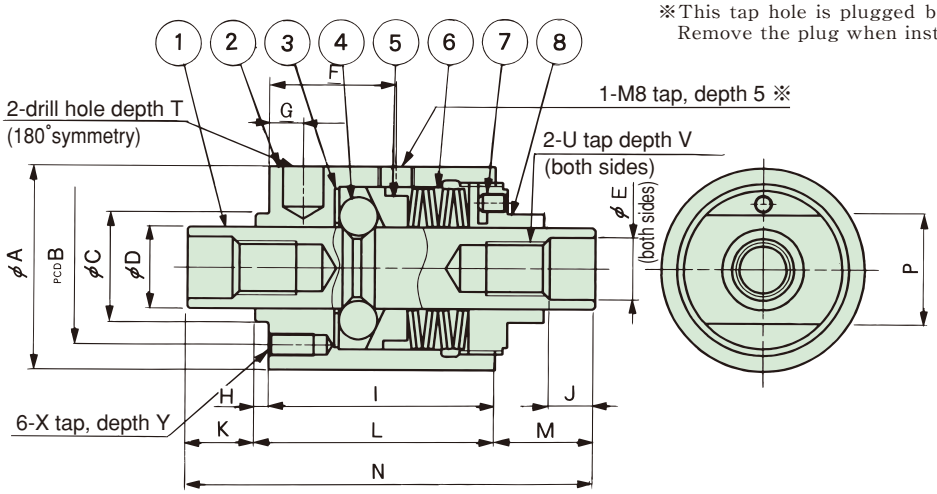
The machining center's gripper

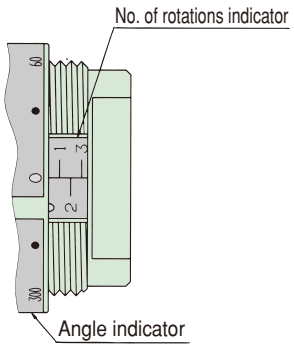


When a tool is being changed, the gripper portion is driven in the axial direction by the cam mechanism. When a tool gets caught up or the gripper hits the obstacle, the Axial Guard trips, thus protecting the cam and gripper from damage.

Transmissible capacity/dimensions

※This tap hole is plugged by plug bolt before shipment.
Remove the plug when installing the sensor.





This diagram displays the min. load (O point).

①Slide shaft ⑤Plate
②Case ⑥Disk spring
③Side plate ⑦Hexagon socket head set screw (TGA65 is M3X5, TGA 150-350 is M4X8)
④Ball ⑧Adjustable screw

Model No.

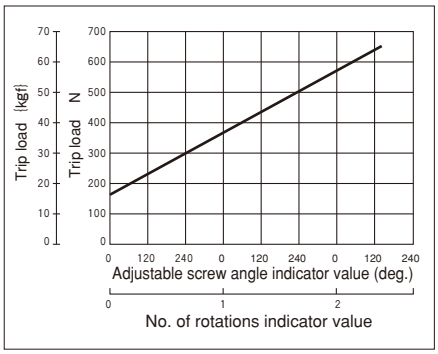
TGA 65

Max. set load(kgf): 65, 150, 250, 350 (4 types)
Series name

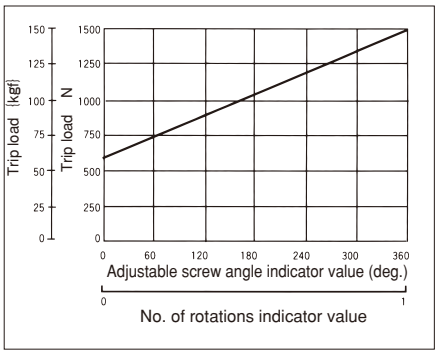
Unit : mm

Model No.	Trip load set range N {kgf}	A	B	C h7	D	E H7	F	G	H	I	J	K	L	M	N	P	S	T	U	V	X	Y	Mass kg
TGA65	147～ 637{ 15～65 }	33	23	14	10	7	22.5	5	2	40	5	5	42	11	58	16	5	7.5	M 6	7	M3	6	0.2
TGA150	588～1470{ 60～150}	38	28	18	14	10	24	6	2	43	7	8	45	19	72	21	7	8	M 8	10	M4	8	0.4
TGA250	735～2450{ 75～250}	45	34	24	18	14	28	7.5	3	50	10	15	53	22	90	24	8	9	M12	14	M5	10	0.7
TGA350	980～3430{100～350}	56	44	28	22	16	34	9	3	63	10	20	66	24	110	30	10	12	M14	15	M6	10	1.2

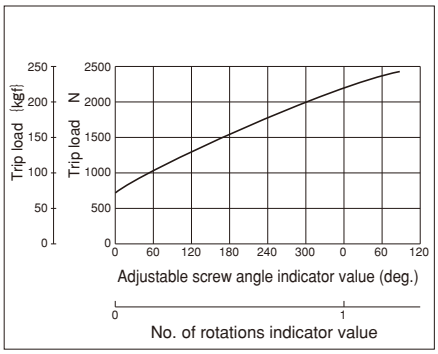
Load Curve (Tightening Amount-Load Correlation Diagram)



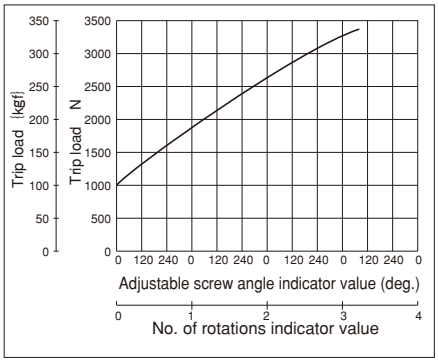
TGA65



TGA150



TGA250



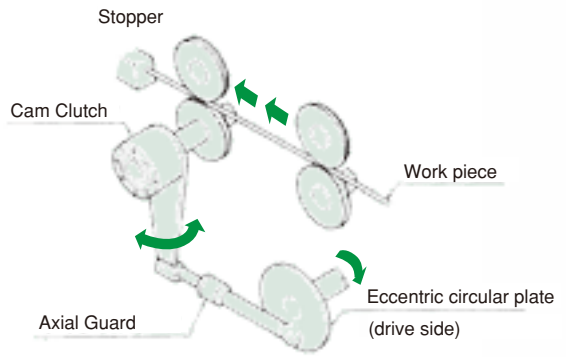
TGA350

Guide to calculating load

In order for the Axial Guard to be most effective as a safety protection device, install it on the driven side in the area where overload is most likely to occur.

Determining trip load

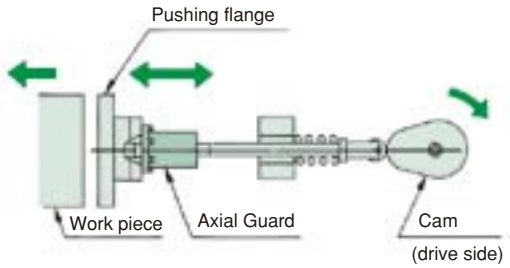
From the machine's strength and load, as well as other information, set the trip load at the point where it should not go any higher. When the limit value is not clear, it is decided by the load calculation (refer to the example below). As the low load on the equipment gradually increases, determine the appropriate set load.



This is an example of the combination of the crank and Cam Clutch motion sending the wire rod intermittently.
The following is a checklist of items for calculating load:

- The generated load due to the acceleration velocity of the drive side's crank motion.
- The impact load when hitting the work piece
- The load when machining the work piece
- Friction between each part

In addition, after checking the strength of each part, carry out a working load estimation for the Axial Guard.



This is an example of pusher actuation by the cam mechanism.

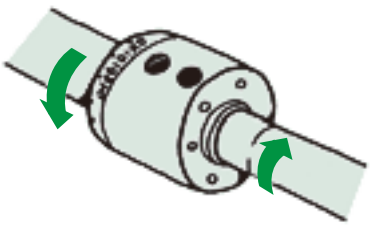
- The generated load is due to drive side cam acceleration velocity
- The impact load when hitting the work piece
- The generated load when pushing the work piece
- The friction when pushing the work piece

In addition, after checking if the work piece has been deformed and verifying the strength of each part, carry out a working load estimation for the Axial Guard.

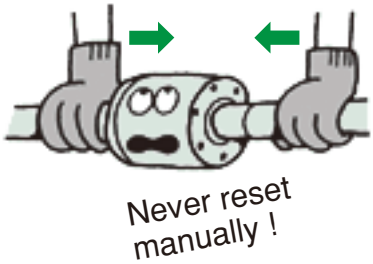
Caution

1 For most situations, avoid using the Axial Guard with human transportation or lifting devices. If you decide to use an Axial Guard with these devices, take the necessary precautions on the equipment side to avoid serious injury or death from falling objects.

2 For the Axial Guard, the case and slide shaft can rotate independently based on each shaft center. In the case that the prevention of independent rotation during operation is required, refer to page 73.

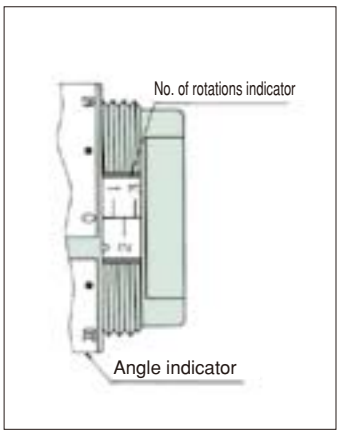


3 When resetting, the slide shaft or case rapidly/suddenly-moves in the shaft direction, causing mechanical shock. Therefore, do not reset the Axial Guard by hand or touch it directly.



How to set the trip load

1 All Axial Guards are shipped with the load set at the minimum point (min. load). Confirm that the number of rotations indicator and angle indicator are set at "0". (Refer to the diagram on the right)



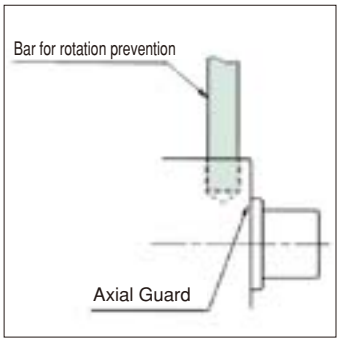
The No. of rotations indicator displays how many times the adjustable screw has rotated from the minimum load. If the end face of case is between 0 and 1, it indicates less than 1 rotation (less than 360°). As well, the angle indicator indicates how many degrees the adjustable screw has turned. The degree amount is indicated by the No. of rotations indicator indicator's centerline. The total of the adjustable screw's number of rotations (1 rotation=360°) and angle indicator is the rotation angle of the adjustable screw.
(Example)
If the No. of rotations indicator is between 0 and 1, and the angle indicator shows 180° , the adjustable screw is turned to 180° position from minimum torque.

2 Loosen the hexagon socket head set screw to prevent loosing of adjustable screw.

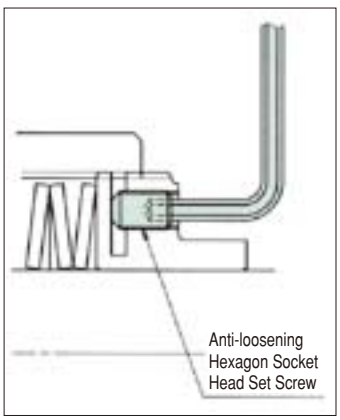
3 From the information in the "Tightening Amount - Load Correlation Chart" on page 70, find the tightening angle of an equivalent adjustable screw for the predetermined trip load. Tighten to 60° less than the predetermined angle.

4 Next, carry out a load trip test. Gradually tighten to optimal trip load and set.

5 When the load has been set, tighten the hexagon socket head set screw to prevent loosing of adjustable screw portion, and verify that the set screw is locked. (Refer to the diagram on the right)



When turning the adjustable screw, to prevent the Axial Guard from turning together with the adjustable screw, insert the bar into the drilled hole at the outer diameter of the cover.

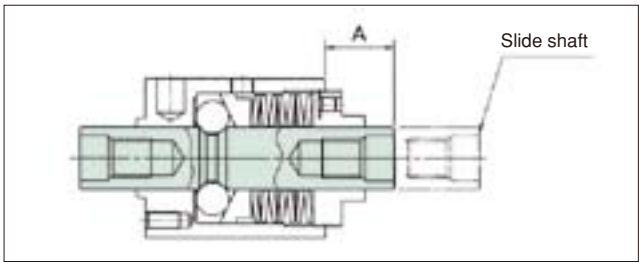


Reset

1 Before resetting, stop the machine and remove the cause of overload.
2 It is reset automatically when restarting the drive side (motor) to reverse load direction of trip direction. Turn the input (motor) using low rpm or inching. The axial load that is necessary for resetting is listed in the chart on the right.
3 When the Axial Guard resets, it makes a distinct "click" sound. To check whether the Axial Guard has reset, refer to dimension A in the diagram on the right.

Model No.	＊Axial direction load for reset	Dimension A when resetting
TGA 65	83 N{8.5 kgf}	11
TGA150	196 N{20 kgf}	19
TGA250	343 N{35 kgf}	22
TGA350	490 N{50 kgf}	24

＊At Max. load

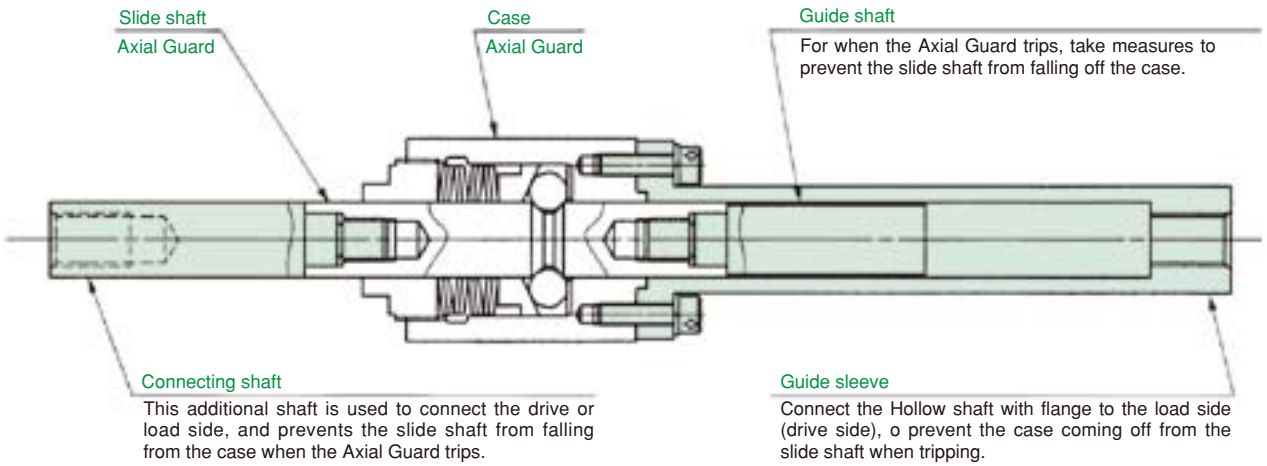


Caution

When resetting, the slide shaft or cover rapidly moves in the axial direction, causing mechanical shock. Therefore, do not reset by hand or directly touch the Axial Guard.

Auxiliary parts

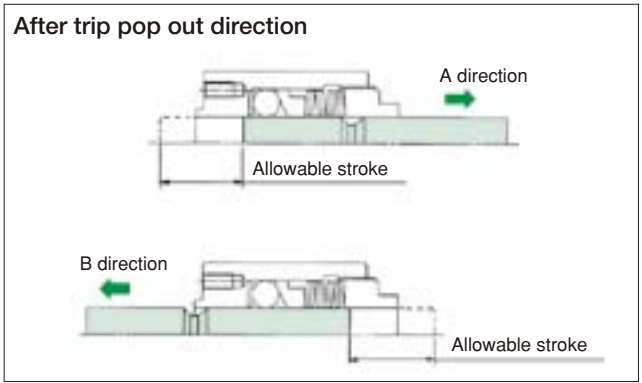
By incorporating the auxiliary parts in the below diagram, it is easier to use the Axial Guard.

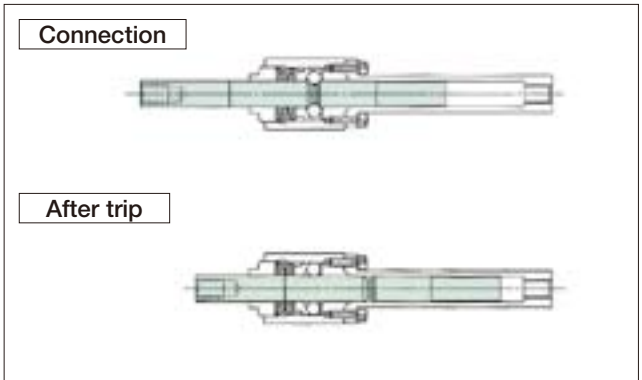


Axial Guard allowable stroke (Axial Guard unit only)

If the Axial Guard exceeds the stroke limits from the table below, the slide shaft will come out. In this case, the ball will fall out and the Axial Guard's functions will be lost. If after tripping the stroke is more than what is listed in the below table, connect the connecting and guide shafts.

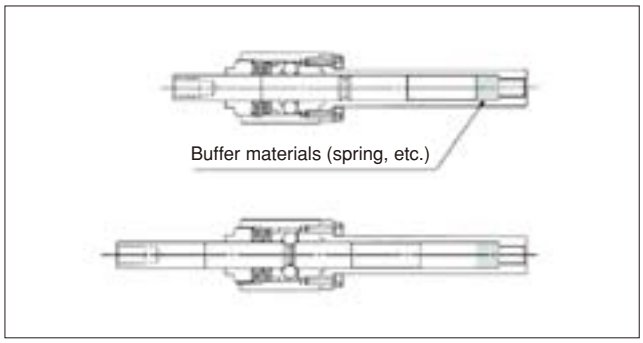
Model No.	TGA65	TGA150	TGA250	TGA350
A direction allowable stroke	14	20	30	38
B direction allowable stroke	14	22	24	26





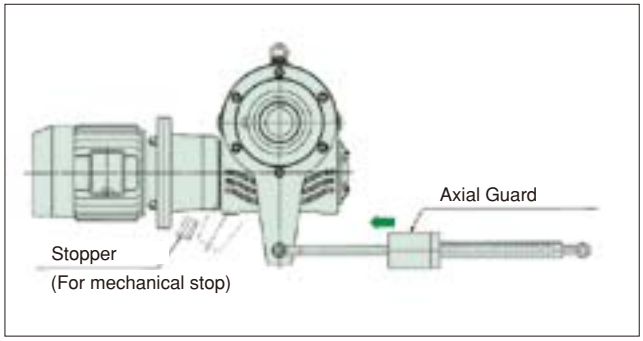
1. The mechanical stop limits stroke after trip

In the case of stopping the stroke at a certain position by sensor detection when tripping, it will become necessary to use a backup mechanism for stopping. Install a spring or other such buffer material to absorb the stroke.



2. When installing at shaft-mounted reducer tie rod

This is an example of the application being used for shaft-mounted reducer torque arm as an overload protection device. Load direction is rotational direction, and the reducer rotates when tripping. Because of the reducer rotation, after the sensor detects overload and stops the motor, it stops mechanically at a certain position. For possible applications and model numbers, contact TEM.

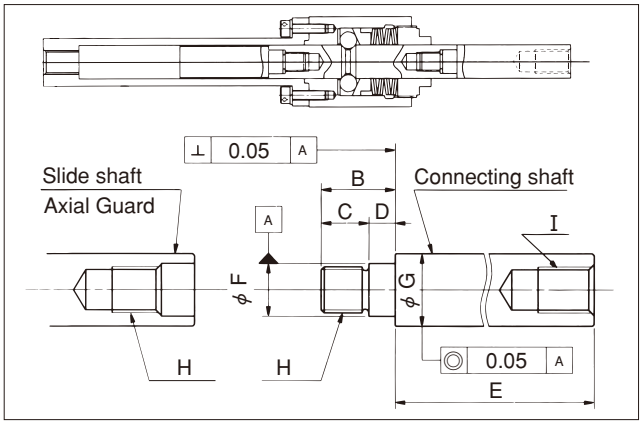


Recommended manufacturing dimensions for auxiliary devices

When installing a connecting shaft, guide shaft, guide sleeve or bolt to an Axial Guard, apply an adhesive for metal to the threaded portion to prevent loosening. (Loctite, etc.) (TEM recommends Loctite 262.)

1. Guide shaft, connecting shaft

Use the tap hole at the end face of the slide shaft to connect the guide and connecting shafts. The recommended dimensions of the connecting portion are in the diagram below.

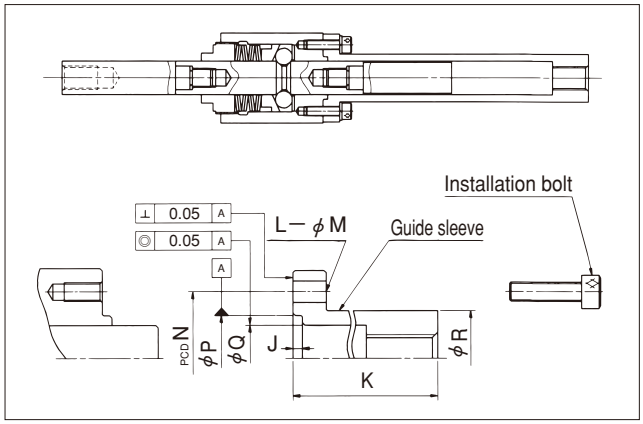


Model No.	B $\binom{0}{-0.2}$	C $\binom{0}{-0.2}$	D	E	F (h7)	G (h9)	H screw size	I* screw size
TGA65	10	6	4	Select by installation length, stroke, etc.	7	10	M6×P1.0	M6×P1.0
TGA150	15	9	6		10	14	M8×P1.25	M8×P1.25
TGA250	22	13	9		14	18	M12×P1.75	M12×P1.75
TGA350	23	14	9		16	22	M14×P2.0	M14×P2.0

* Not necessary for guide shaft

2. Guide sleeve

Use the tap holes at the end face of the case to connect the case and guide sleeve. The recommended dimensions of the connecting portion are in the diagram below.



Model No.	J $\binom{+0.2}{0}$	K	L	M	N	P (H7)	J $\binom{+0.2}{0}$	C $\binom{0}{-0.2}$
TGA65	10	Select by installation length, stroke, etc.	6	3.4	23	14	10.5	16
TGA150	15		6	4.5	28	18	14.5	20
TGA250	22		6	5.5	34	24	18.5	24.5
TGA350	23		6	6.6	44	28	22.5	31

Installation

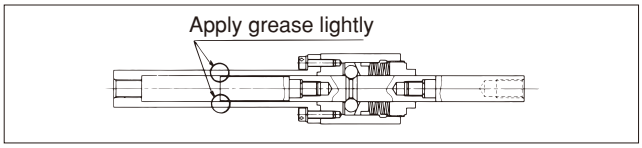
1. Installing to the machine

(1) Before installing the Axial Guard to the machine, completely wipe off any dust or dirt from the slide shaft, the spigot facing of the case and taps.

(2) Next, connect the slide shaft and the case tap portion. TEM recommends an adhesive for metals be applied to the tap portion or the bolt outer diameter to prevent any loosening. (Loctite 262 recommended)

(3) Make sure not to fix both the Axial Guard slide shaft side and the case side when installing the Axial Guard. The Axial Guard has no coupling function, so if it is installed too rigidly it will not properly function, potentially causing a malfunction or machine damage.

(4) When the guide sleeve and guide shaft are connected to the Axial Guard there is a possibility that the inner diameter of the guide sleeve and the outer diameter of the guide shaft end face may interfere. Just in case, apply grease to the portion on the diagram below. (Refer to the maintenance section on page 74 for information about grease brands.)

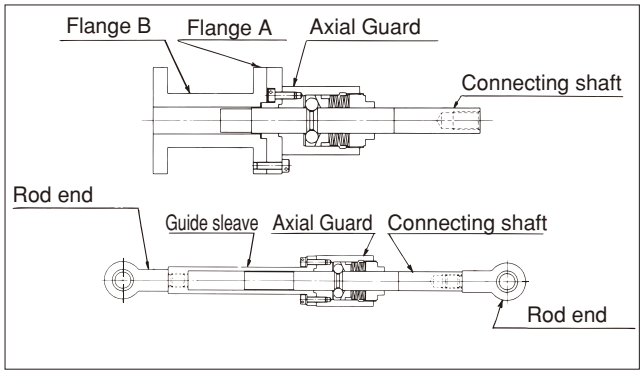


* When the Axial Guard is installed vertically, (lengthwise direction) grease may leak through the gap between the slide shaft and case or the adjustable screw. To avoid any problems, make sure to replenish grease at frequent intervals. (Refer to page 74 for maintenance information)
* Do not use the Axial Guard if there is a possibility that a falling accident of the drive or load side may occur when tripping. Such an accident may lead to serious injury or machine damage.

2. Overload detection

When using the Axial Guard, make sure to combine it with the sensor mechanism to ensure that overload can be properly detected. (Refer to page 75 for overload detection information)

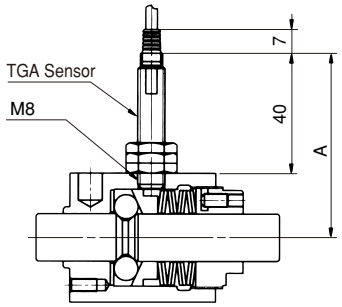
Installation example



Overload detection

When using the Axial Guard make sure to use the TGA sensor to detect trip during overload.

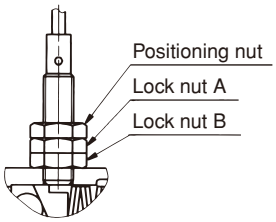
TGA Sensor installation example



Unit : mm

Model No.	A	Thread depth
TGA65	52	4.5
TGA150	54.5	
TGA250	58	
TGA350	63.5	

※This tap hole is plugged by plug bolt before shipment. Remove the plug when installing the sensor.



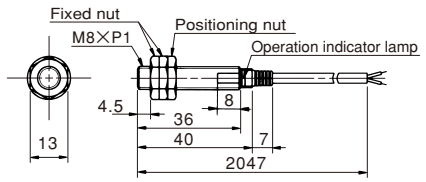
Fix the TGA Sensor to the case by screwing it into the tap holes. After fixing the sensor to the case, screw on lock nut A last to make it lock in place (double nut).
(The positioning nut is glued with an adhesive, so do not forcibly rotate it.)

■TGA Sensor Specifications

		AC type	DC type
Model No.		TGA－S8	TGA－S8D
Power supply voltage	Rating	AC24～240V	DC12～24V
	Possible use range	AC20～264V(50/60Hz)	DC10～30V
Current consumption		Less than 1.7mA(at AC200V)	Less than 13mA
Control output (open, close capacity)		5～100mA	Max. 200mA
Indicator lamp		Operation indicator	
Ambient operating temperature		－5～＋70℃ (no condensation)	
Ambient operating humidity		35～95%RH	
Output form		NC (Output open/close condition when not detecting sensor plate)	
Operation form		—	NPN
Insulation resistance		More than 500M (at DC50V mega) Charge portion - Case	
Mass		Approx. 45g (with 2m cord)	
Residual voltage		Refer to characteristic data	Less than 2.0V (Load current 200mA, 2m cord length)

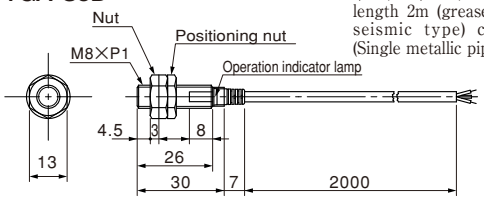
■Measurement Diagram

●AC type　TGA-S8



＊Plastic insulation circle type cord φ4 (60/φ0.08) 2 cores, standard length 2m (grease resistant, anti-seismic type) cord extension (Single metallic piping) max. 200m

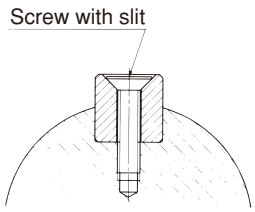
●TGA-S8D



＊Plastic insulation circle type cord φ4 (60/φ0.08) 3 cores, standard length 2m (grease resistant, anti-seismic type) cord extension (Single metallic piping) max. 200m

When using the TGA Sensor it is necessary to stop the slide shaft side and case side rotation. As in the diagram below, stop rotation by putting the slide key between the guide sleeve and the guide shaft. For other methods, contact TEM for more information.

Reference drawing



Like the diagram on the left, fix the slide key to the shaft with a slotted head countersunk screw (JISB1101). Screw sizes are listed below.

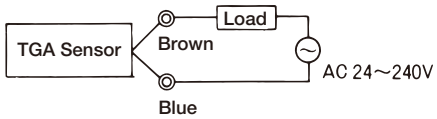
Model No.	Screw size
TGA65	M2
TGA150	M2
TGA250	M2
TGA350	M3

■TGA Sensor handling

Refrain from striking, swinging or putting excessive force on the detecting portion.

AC type　TGA-S8

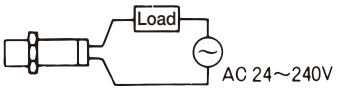
■Circuit diagram



Not necessary to consider TGA Sensor's polarity (brown, blue)

■Precautions for wiring

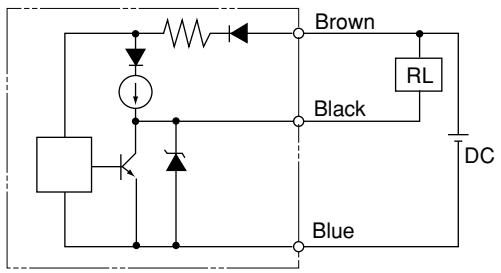
- Make sure to connect the load at first, then turn on the power. If the power is turned on without connecting the load, it will be damaged.



- In order to prevent malfunction or damage due to surge or noise, insert the TGA sensor code in a individual piping when it runs close to the power cable.

DC type　TGA-S8D

■Circuit diagram



■About choosing load and wiring

•Connecting to the power source

Make sure to connect to the power source through load. A direct connection will break the elements inside.

•Metal piping

In order to prevent malfunction or damage, insert the proximity switch code inside a metal pipe when it runs close to the power cable.

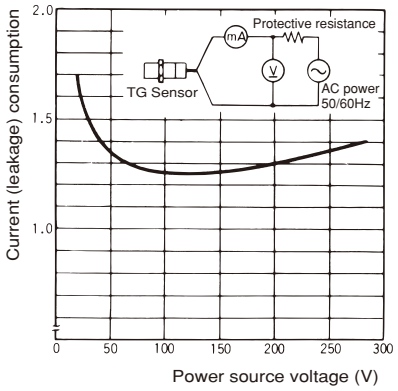
•Surge protection

In the case where the TGA Sensor is near a device that generates a large surge (motor, welding machine, etc.), the TG Sensor contains a surge absorption circuit, but also insert a varistor to the source.

•The effect of current consumption (leakage)

Even when the TGA Sensor is OFF a small amount of current continues to flow to keep the circuit running. (Refer to the "Current Consumption (leakage) Graph".) Because of this, a small voltage occurs in the load that can sometimes lead to reset malfunction. Therefore, confirm that the voltage of the load is less than the reset voltage before use. As well, if using the relay as load, depending on the construction of the relay, a resonance may occur due to the current leaks when the sensor is OFF.

Current (leakage) Consumption Characteristics



•When power voltage is low

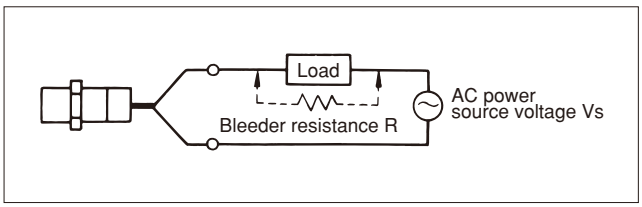
When power source voltage is lower than AC48V and load current is less than 10mA, the output residual voltage when the TGA Sensor is ON becomes large. When it is OFF, the residual voltage of load becomes large. (Refer to "Residual Voltage Characteristics of Load".) Take caution when using the load such as a relay operated by voltage.

•When load current is small

When load current is smaller than 5mA, residual voltage of load becomes large in the TGA Sensor. (Refer to "Residual Voltage Characteristics of Load".) In this case, connect the breeder resistance with load parallel, apply load current at more than 5mA, and set the residual voltage less than return voltage of load. Calculate the breeder resistance and allowable power using the following calculations. TEM recommends to use 20kΩ at AC100V and more than 1.5W (3W), and 39kΩ at AC200V and more than 3W (5W) for safe. (If heat generation becomes a problem, use the Wattage shown in ( ).

$$R \leqq \frac{Vs}{5-i}\ (k\Omega) \qquad P \geqq \frac{Vs^2}{5-i}\ (mW)$$

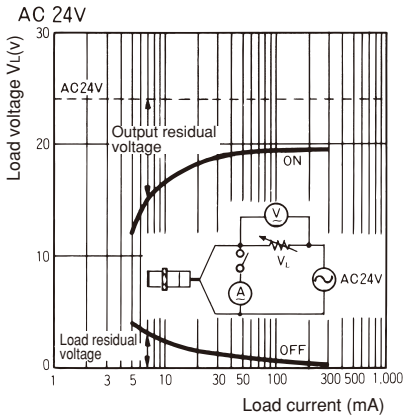
P : Wattage of breeder resistance
i : Current applied to the load (mA)

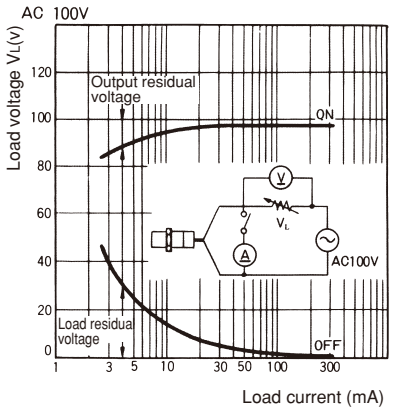


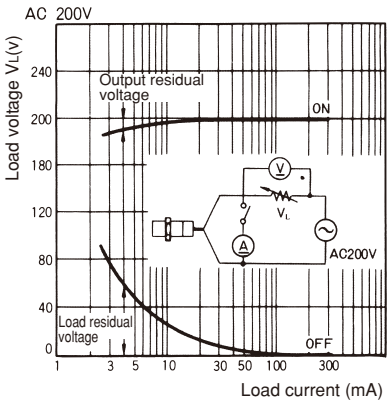
•Load with large inrush current

As for the load with large inrush current (1.8A and above) such as a lamp or motor, the opening and closing element can be deteriorated or be broken. In this case, use along with a relay.

Residual Voltage Characteristics







Maintenance

The Axial Guard is packed in grease for shipment. Add the grease shown in the right table once a year or every 100 trips.

Kyodo Oil	Sumitomo Lubricant	Dow Corning	STT
Grease HD	Low temp grease	Molykote 44MA Grease	Solvest 832

MEMO

SAFCON

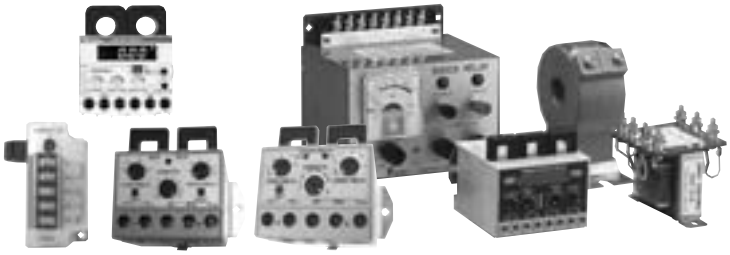
Safety Devices

Electronic
Shock Relay

Shock Relay

Swiftly detects equipment overload!

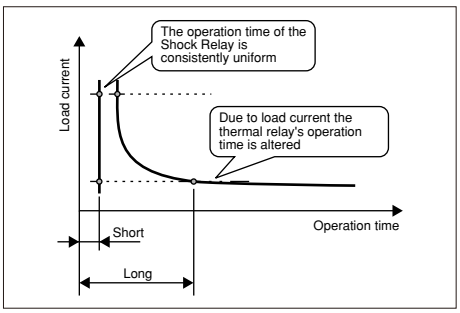
The Shock Relay is a current monitoring device that quickly detects motor overload, thus protecting your equipment from costly damage.



Features

1. Instantly detects overcurrent

When the motor current exceeds the predetermined current value, the relay contact signal can be output after a preset time.
For example, when a foreign object gets caught up in the conveyor, the Shock Relay sends a signal causing an emergency stop, thus minimizing equipment damage.



It's not a thermal relay

The purpose of the thermal relay is to protect the motor from burnout.
When the motor current continually exceeds the rated value for a certain period of time, an abnormal signal is sent to protect the motor from burnout.
Generally, it takes a long time for operation to begin, so it is not suitable for equipment/machine protection.

	Operation time	Protected object
Shock Relay	Short	Equipment
Thermal Relay	※Long	Motor

※If the motor current slightly exceeds the preset value, the thermal relay will not work. Even if it does work, it will do so slowly.

2. Easy to install on existing equipment

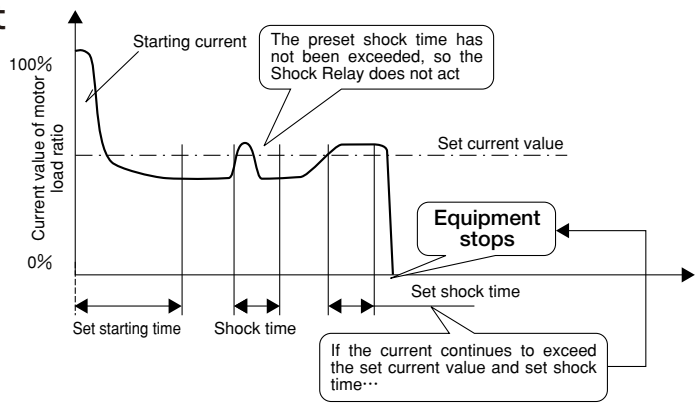
The Shock Relay is an electrical protection device.
In the case that the Shock Relay is added to existing equipment, it is not necessary to make major modifications to the device as in the case of the mechanical type.
Because the Shock Relay is installed inside the control panel, it can function outdoors or in harsh environments.

	Existing equipment	Environment
Electrical	Easy to install later	Built inside the panel
Mechanical	Difficult to install later	Necessary environmental precautions

3. The abnormal signal is only output under abnormal conditions

The Shock Relay sends an abnormal signal when overcurrent continues to exceed the preset period of time.
Sometimes during normal operation conveyors will experience insignificant short time current overloads due to reasons such as the current pulsation of the equipment, or when packages are put on the conveyor.
By using the shock time function these small overloads will not be recognized as overloads, therefore avoiding nuisance stoppages.

Operation Time Chart



Product Applications

ED Series

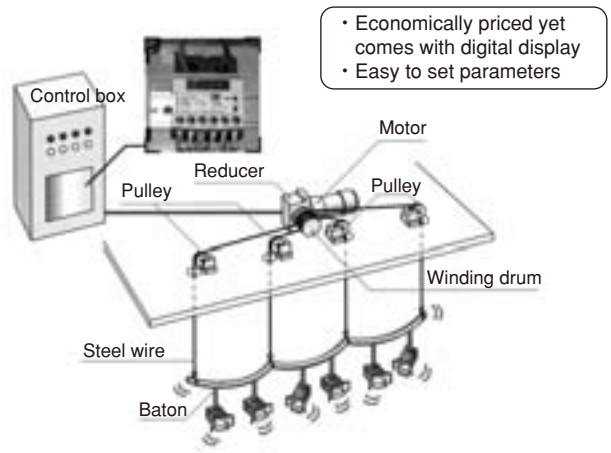
Lifting device for illumination and screens

Operation

1. Due to over-installation of the lighting system, when the total weight of the baton exceeds the permissible load, the lifting device will be automatically shut down.
2. When the lifting device becomes overloaded during operation it automatically shuts down.

Key Points

During operation the motor current is displayed digitally, and allowable load and stopping due to overload can be set as a digital numeric value.



SA Series

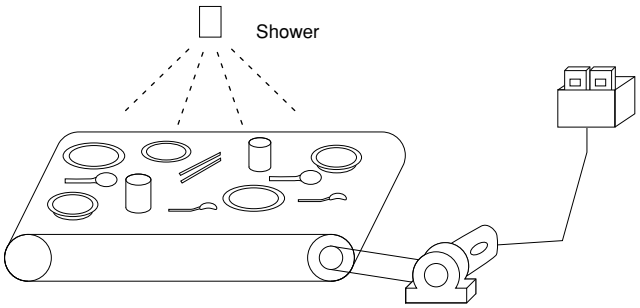
Dishwasher

Operation

Protects dishwashers from damage due to cutlery getting caught in the net conveyor.

Key Points

Inexpensive



- Ideal for the price-conscious customer
- Amount of torque value does not change price
- Easy to install to existing equipment
- Performs well outdoors or in harsh environments

SS Series

Chip Conveyor

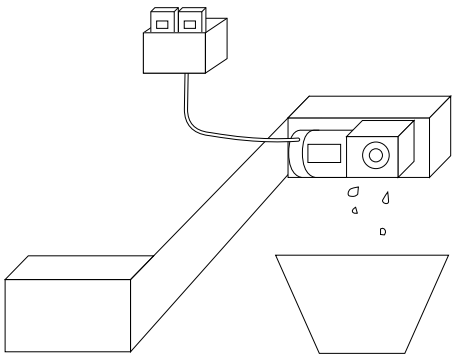
Operation

Protects the conveyor from damage when a tool gets caught in its belt.

Key Points

The driver has been made more compact and less expensive.

※A built-in Shock Relay in the motor terminal box type is available.



- Ideal for the hollow type reducer (for applications where it is difficult to install a mechanical safety device)
- Easy to change settings
- Even with large torque the SS Series retains its compact size

Series Specifications

Series name		ED Series		SD Series		150 Series		SS Series		SA Series		50 Series		SM Series
Model No.		TSB020ED-1, -2~TSB550ED-1, -2		TSBSD10, 60		TSB151, 152		TSBSS05～300		TSBSA05～300		TSB50		TSBSM02
Features		Digital display, economical, selectable self-holding/automatic reset type		Digital display, selectable self-holding/automatic reset type		Analog display, self-holding type		Economical, self-holding type		Economical, automatic reset type		Economical, automatic reset type		Economical, automatic reset type
Motor	(kW) 132 90 75 22 11 3.7 0.2 0.1 Combined with external CT													
	Power source (V)	200/220	400/440	200/220	400/440	200/220	400/440	200/220	400/440	200/220	400/440	200/220	400/440	200/220
Operation setting level		Ampere (A)		Ampere (A)		The ratio of motor-rated current value (%)		Ampere (A)		Ampere (A)		The ratio of motor-rated current value (%)		Ampere (A)
Start time setting range		0.2～10.0s adjustable		0.3～12s adjustable		0.2～20s adjustable		0.2～30s adjustable		0.2～10s adjustable		3s (fixed)		1.5s (fixed)
Shock time setting range		0.2～5.0s adjustable		0.3～3s adjustable		0.2～3s adjustable		0.3～10s adjustable		0.2～5s adjustable		0.3～3s adjustable		1s (fixed)
Operation power source		100～120V or 200～240V		※1AC85～250V DC85～250V		AC100/110V or AC200/220V 50/60Hz		※1AC90～250V		※1AC90～250V		AC100/110V or AC200/220V 50/60Hz		※1AC90～250V
Condition of output relay after activation		Selectable; self-holding or automatic reset		Selectable; self-holding or automatic reset		Self-holding		Self-holding		Automatic reset		Automatic reset		Automatic reset
Test function		○		○		○		○		○		×		×
Operation display		LED digital display		LED digital display		LED light		LED light		LED light		×		×
※2 Open phase、reverse phase、phase unbalance detection		×		○		×		×		×		×		×
Alarm output		×		○		△		×		×		×		×
DIN rail installed		○		○		×		○		○		×		×
Display meter		Digital meter current value display		Digital meter current value display		Analog meter % display		×		×		×		×
CT (current transformer)		Built-in		Built-in (for large capcity motors, external CT is used together.)		External CT separate		Built-in (for large capcity motors, external CT is used together.)		Built-in (for large capcity motors, external CT is used together.)		External CT separate		Built-in
Special models ※4	Impact load detection	×		×		△		×		×		×		Please consult TEM
	1A input	×		×		△		×		×		×		
	Lower and upper limit detection	×		×		△		×		×		×		
	For DC motor	×		×		△		×		×		×		
Additional specifications ※4	UL approved	×		×		△		○		×		×		×
	CSA/CUL approved	×		×		×		○		×		×		×
	CE marking	○		△		×		○		×		×		×
	CCC certification	○		×		×		○		○		×		×
	Subtropical specifications	×		×		△		×		×		△		Please consult TEM
	Special operation power source voltage	※3 ×		※3 ×		△		※3 ×		※3 ×		△		
	Panel installation	×		×		△		×		×		×		
	Start time modification	×		×		△		×		×		△		
	Shock time modification	×		×		△		×		×		△		
	Automatic reset	○		○		△		×		○		○		○

○…Standard specs △…Special MTO ×…Not available

Notes: ※1. This is the added voltage fluctuation range of use in regard to nominal voltage.
※2. Open phase ……the motor lacks 1 phase.
Phase reversal ……the phase of the power supply to the motor becomes inverted.
Phase unbalance ……the phase current becomes unbalanced. The maximum value of the phase current is detected when it is greater than or equal to 2 x the minimum value.
※3. Even the voltage for operation is not standard, it is possible to use the standard units if the voltage fluctuation is taken into consideration and the voltage is within the above range.
※4. For more information, refer to page 82.

Selecting a Shock Relay

1. When used with human transportation equipment or lifting devices, install a suitable protection device on that equipment/device for safety purposes. Otherwise an accident resulting in death, serious injury or damage to equipment may occur.

2. CT (current transformer)

The CT is essential for current detection (150 Series, 50 Series only). For more information about the appropriate CT, refer to the page of each series.

3. Model Selection for Special Capacity and/or Motor Voltage.

Normally a Shock Relay can be selected by motor capacity, but when the motor capacity and/or motor voltage is special (a standard Shock Relay can be used up to a maximum of 600V), select a Shock Relay based on the rated motor current value (set current range).

4. Operation Power Source

The operation power source described in the chart is the standard. For operation power voltages other than the standard, the SS, SA, SD and SM Series have flexible power supplies. The 150 Series with a special operation power source is available as a special MTO product.

5. Output Relay Operation

The output relay operation consists of two modes: The activation type and the reverting type when overcurrent is detected.
In the event of a power outage, make sure to switch off the machine as the sudden activation of the output relay may cause an accident or equipment damage.

1) Activation type when overcurrent is detected

The output relay is activated (contact inverts) only when overcurrent is detected.

Corresponding Models: ED Series, SA Series,SM Series, 150 Series, 50 Series

2) Reverting type when overcurrent is detected

When the power source for the Shock Relay is ON, the output relay is activated (contact inverts). When overcurrent is detected, the output relay reverts to its original state.

Corresponding Model: SS Series

3) Activation type/ Reverting type

It is possible to switch between these two modes.

Corresponding Model: SD Series

6. Self-holding and Automatic Resetting

The methods used for output relay resetting are the self-hold and automatic resetting types.

1) Self-holding type

Even after overcurrent has stopped, the self-holding mode continues to function. In order to return it to normal operation, push the RESET button or cut the operation power supply.

Corresponding Models: SS Series, 150 Series

2) Automatic Reset Type

The output relay automatically resets after overcurrent is gone.

Corresponding Models: SA Series, SM Series, 50 Series

3) Self-holding Type/ Automatic Resetting Type

It is possible to switch between the above two modes.

Corresponding Models: ED Series, SD Series

7. Inverter Drive Applicability

1) Detection accuracy decreases but generally if it is in within the 30 - 60Hz range, it should be insignificant.
2) Even within the 30 - 60Hz range, when the inverter accelerates and decelerates, and the current increases or decreases, the Shock Relay can sometimes cause an unnecessary trip. Slowly accelerate and decelerate or set it so that there is some leeway in load current within the allowable range.
3) Connect the CT to the secondary side of the inverter, but make sure to connect the Shock Relay operation power source to a commercial power source (never connect it to the secondary side of the inverter).

8. Note

When the inertia of the equipment/ machine is large or the speed reduction ratio from the motor is large, the Shock Relay may sometimes not work.
Conduct a trial test first before putting it into regular use.

⚠ Refer to the manual for further details.

Outline of Special Models and Additional Specifications (refer to pages 91 and 100)

Special models	Outline of specifications	Special unit model
Impact load detection	Separately from the usual overload, abnormally large current is instantly detected and outputted. Impact load settings can be set from 30%-300%. Impact load shock time is within 0.05s. Other functions and outline dimensions conform to product standards.	TSB151M TSB152M
1A input	When the secondary side of CT is 1A, it can input directly to the Shock Relay. (It's not necessary to consider motor capacity.) Other specifications and outline dimensions conform to product standards.	TSB152C
Upper-lower limit detection	Detects both overload and under-loads; however, because there is 1 output relay, it cannot distinguish between upper and lower limits.	TSB151W TSB152W
DC motor	For detecting DC motor current overload, a shunt is used instead of a current transformer (refer to page 89 for more details) . When selecting a shunt, let TEM know the DC motor's rated current.	Main unit : TSB152D (Shunt : SE□A)

Additional specifications	Outline of specifications	Order symbol
UL approved	Shock Relays are UL approved. Operation power source: AC115V 50/60Hz, AC230V 50/60Hz	UL
CE marking	Shock Relays have the CE marking.	CE
Subtropical specifications	Can be used when ambient humidity is 90% RH and below. Other specifications conform to standard products.	S
Special power source voltage	Power source voltage: AC230V, AC240V, AC115V, AC120V (please contact us for more information on other voltages)	V
Panel installation	It can be mounted on the control panel surface and operated.	P
Start time modification	The integral multiple can be extended for a maximum of 60 seconds. The front panel scale becomes an integral multiple (x2, x3・・・). Other specifications conform to standard products.	T1
Shock time modification	The integral multiple can be extended for a maximum of 60 seconds. The front panel scale becomes an integral multiple (x2, x3・・・). Other specifications conform to standard products.	T2
Automatic reset	For the 150 Series only, the self-holding output relay can be changed to automatic reset.	H

Shock Relay ED Series

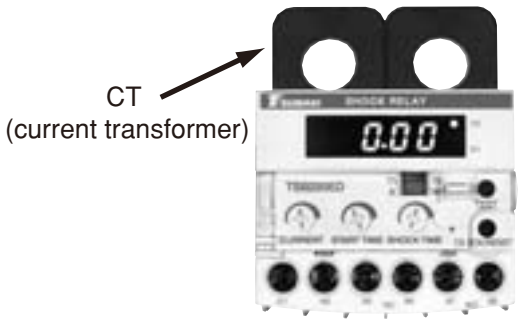
Features

- Displays both the motor current and each setting value digitally
- Economically priced
- CT included in one compact unit
- Works with inverter※

  Current can be precisely detected when inverter is operating between 20 - 200Hz.
- Choose between self-holding output relay and automatic reset
- Conforms to CE standards
- CCC certification

※To prevent an unnecessary trip due to an increase of amperage when accelerating and decelerating, slowly accelerate and decelerate or allow some leeway for set current.

CT all-in-one model



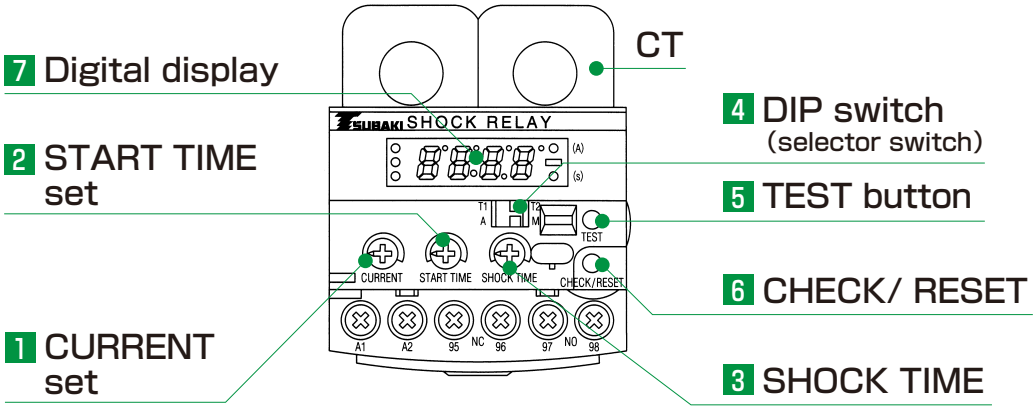
TSB020ED-1 TSB220ED-1
TSB020ED-2 TSB220ED-2
TSB075ED-1 TSB550ED-1
TSB075ED-2 TSB550ED-2

Standard Specifications

Model			Operating power supply 100～120V		TSB020ED–1	TSB075ED–1	TSB220ED–1	TSB550ED–1
			Operating power supply 200～240V		TSB020ED–2	TSB075ED–2	TSB220ED–2	TSB550ED–2
Motor	Applicable motors ※1	200V class	No. of wires that pass through the CT hole, DIP switch	T2	0.1kW	0.4kW	1.5kW	3.7kW
				T1	0.2kW	0.75kW	2.2kW	5.5kW
		400V class	No. of wires that pass through the CT hole, DIP switch	T2	0.1, 0.2kW	—	2.2, 3.7kW	7.5kW
				T1	0.4, 0.75kW	1.5kW	5.5kW	11kW
	Frequency of motor current				20～200Hz			
	Maximum motor circuit voltage				AC600V 50/60Hz			
Operating power supply			1		100～120VAC±10%, 50/60Hz			
			2		200～240VAC±10%, 50/60Hz			
Protection functions	Overload	Current setting range ※3	No. of wires that pass through the CT hole, DIP switch	T2	0.20～1.20A (0.01A increments)	1.20～3.20A (0.02A increments)	3.00～10.0A (0.1A increments)	6.00～26.0A (0.2A increments)
				T1	0.40～2.40A (0.02A increments)	1.80～5.80A (0.04A increments)	4.00～14.0A (0.1A increments)	9.00～34.0A (0.25A increments)※2
		Start time※3			0.2～10.0s (0.2s increments)			
		Shock time※3			0.2～5.0s (0.2s increments)			
	Accuracy	Current detection accuracy			±5% ±1 digit or less (except, when combined with the inverter, ±10% ±1 digit or less)			
		Temporal accuracy			±5% ±1 digit or less			
	Locked rotor start				It will trip if the set current value exceeds 200% when starting, after the set start time +0.2s has elapsed			
Output relay	Rated load				3A, 250VAC（cos ϕ =1）			
	Minimum allowable load				DC24V, 4mA			
	Life span				100,000 times at rated load			
	Contact constitution				1a1b			
	Operation				Energization/normal operation: no excitation; at the time of trip: excitation			
	Reset		Trip reset, DIP switch	A	After resetting to normal current value, it takes 1s to automatically reset			
				M	Can be manually reset by pressing the "RESET" button			
Insulation resistance	Between case and circuit				DC500V, 10MΩ			
Withstand voltage	Between case and circuit				2000VAC 60Hz: 1 minute			
	Relay contact electrodes				1000VAC 60Hz: 1 minute			
Work environment	Location				Indoors, where it will not get wet			
	Ambient temperature				−20～+50℃			
	Ambient humidity				30～85%RH (no condensation)			
	Altitude				1000m or less			
Power consumption					2.0W or less			
Mass					0.25kg or less			

※1. The applicable motors are just a rough indication for reference. Make your selection based upon actual electrical current value. Select by electrical current value for single-phase motors as well.
※2. Set values 10A and higher are displayed as described on the right due to a maximum number of display digits. 10.0A→10.2A→10.5A→10.7A→11.0A
※3. A ±1 digit error can occur with the current and the set time in the range indicated.

Part Names and Functions



1 Current Setting (CURRENT)

Sets current at the value at which trip occurs.

2 Start Time Setting (START TIME)

Sets start time (start compensating time). When the motor starts, there is a possibility that the motor current will exceed the set current value, but during the start time period it will not trip.

3 Shock Time Setting (SHOCK TIME)

Sets shock time (output delay time). When the motor current exceeds the set current value the count begins, and when shock time has elapsed, it will trip.

4 DIP Switch (selector switch)

Setting	Purpose	■□		□■	
No. of motor leads that pass through the CT T1/ T2	Current value set range selection	T1	No. of passes through the CT:1	T2	No. of passes through the CT:2
Trip reset A / M	Output relay reset selection	A	It automatically returns from the trip state 1 second after current value returns below the current setting value.	M	Trip state is maintained until the check/ reset button is pressed. It then resets.

5 TEST button (TEST)

When the LED displays current value, pressing the TEST button will carry out an operation test.

6 CHECK/ RESET Button (CHECK/ RESET)

[During normal operation]
By pressing the CHECK/ RESET button when the LED displays current value, it switches to the setting screen.
[During trip]
When the CHECK/ RESET button is pressed, trip is cleared and the display switches to the current value.
[During set-up]
When the LED display is at the setting screen, pressing the CHECK/RESET button will switch between the current, start time, and shock time settings, in this order.

7 LED Display

Current value and set current are displayed when (A) is indicated on the display screen (to the left of the A). (A = ampere)

Current value　Current set up

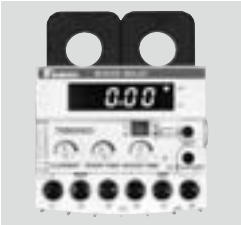
Start time and shock time set up are displayed when (s) is indicated on the display screen (to the left of the s). (s = second)

Start time set up　Shock time set up

Shock Relay

The ED Series has the following features,
which the Meter Relay (analog type) does not include:

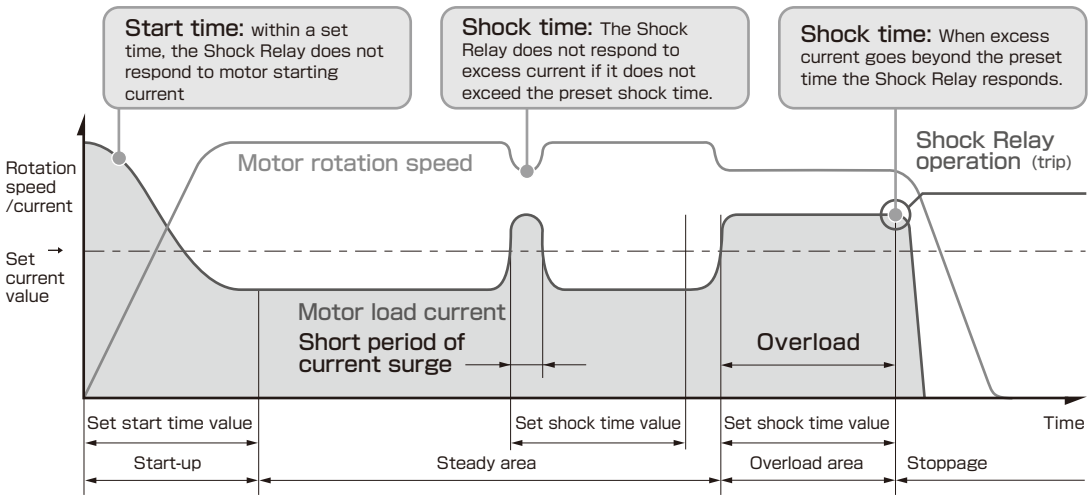
- ■Start time (starting compensation) function
- ■Shock time (output delay) function
- ■Compact design, includes CT
- ■Works with inverter driving
- ■Choose between self-holding output relay and automatic resetting
- ■Includes test function
- ■Detection of locked rotor start



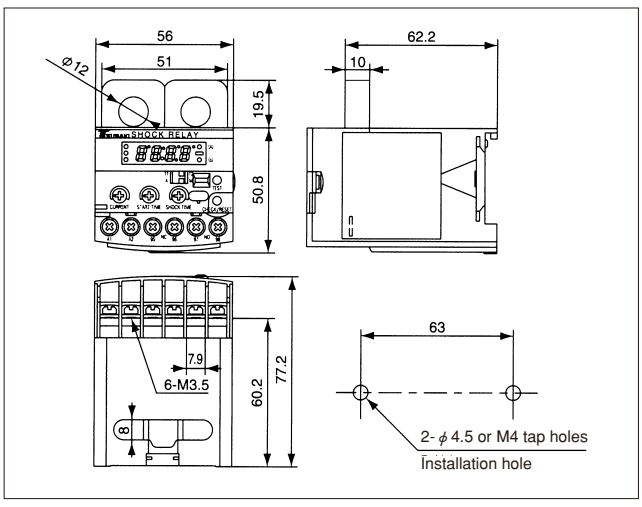
ED Series

Meter Relay (analog type)

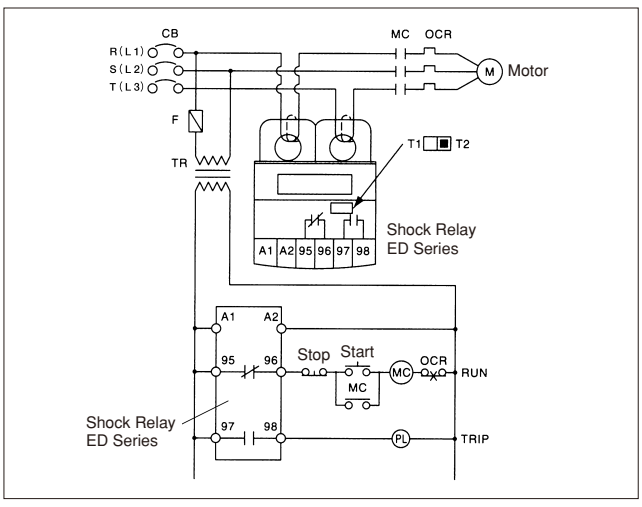
Operation Mode



Dimensional outline drawing



Basic diagram



Model No.

TSB020ED－1

- SHOCK RELAY
- Maximum applicable motor capacity (200V class)
  020…0.2kW　075…0.75kW
  220…2.2kW　550…5.5kW
- ED Series
- Operation power supply
  1…AC100V～120V　2…AC200V～240V

Shock Relay SD Series

Features

Motor current is displayed digitally during equipment operation

Compact design, includes CT (current transformer)

(Up to 200V 11kW, 400V 22kW)

Attachable DIN rail (35mm)

Multifunctional

・Open phase, phase reversal and unbalanced current detection
・Alarm output function

Self-holding and automatic reset options available

CT all-in-one unit

TSBSD10
TSBSD60

CE※

※CE marking for additional specifications available

Standard Specifications

Function \ Model				TSBSD10	TSBSD60
Standard	Load current (set current range)※3			0.5～10A	5～60A
	Motor	200V class		0.1※1～2.2kW	3.7～11kW
		400V class		0.2※1～3.7kW	5.5～22kW
	Operating environment	Ambient temperature		−10℃～50℃	
		Relative humidity		45-85% with no condensation	
		Vibration		Less than 5.9m/s²	
		Height		Less than 1000m	
		Ambient atmosphere		No corrosive gas or dust	
	Current setting accuracy			±10% (full scale)	
Main unit parts	Set time range	Start time※3		0.3～12.0s	
		Shock time※3		0.3～3.0s	
	Power supply voltage (A1-A2)			AC85-250V, 50/60Hz or DC85V-250V	
	Maximum motor circuit voltage			AC600V, 50/60Hz	
	Current detecting system			3 phase CT system	
	Protection functions (not including overload)	Reverse phase		Trips 0.1s after phase reversal detected	
		Open phase		Trips 3s after open phase detected	
		Phase unbalance		Trips 8s after phase unbalance (maximum value 2x minimum value) current detected	
	Trip output relay	Contact capacity		1a1b contact, AC250V 3A (in case of resistance load)	
		Minimum application load※2		DC24V, 4mA	
		Relay operation: Operational mode at time of trip	Normal state	Relay is not excited (no operation)	
			At the time of trip	Relay is excited (operation)	
		Relay operation: Non-operational mode at time of trip	Normal state	After start-up there is a 0.5s delay; then relay is excited (operation)	
			At the time of trip	Relay is not excited (no operation)	
		Trip status		Self-holding/automatic resetting selectable	
		Reset method	Self-holding	RESET button is on or power is off	
			Automatic reset	Resets 1s after tripping	
	Alarm output relay	Set level		50-100% of set load current value	
		Contact capacity		1a contact, AC250V 3A (in the case of resistance load)	
		Minimum application load※2		DC24V, 4mA	
		Operation		When the alarm level is exceeded for more than 1s, it will switch from close to flicker or from open to close .	
	Output relay life	Mechanical		10,000,000 times	
		Electrical		100,000 times	
	Test functions			Operation check of shock time and output relay	
	Withstand voltage	Between the circuit and case		AC2000V, 60Hz, 1 minute (power supply circuits and contact circuits)	
		Between contacts		AC1000V, 60Hz, 1 minute	
		Between circuit		AC2000V, 60Hz, 1 minute (power supply circuits and contact circuits)	
	Mass			0.2kg	
	Power consumption			Less than 4.0VA (less than 3.0W)	
	Attachable DIN rail			Available	

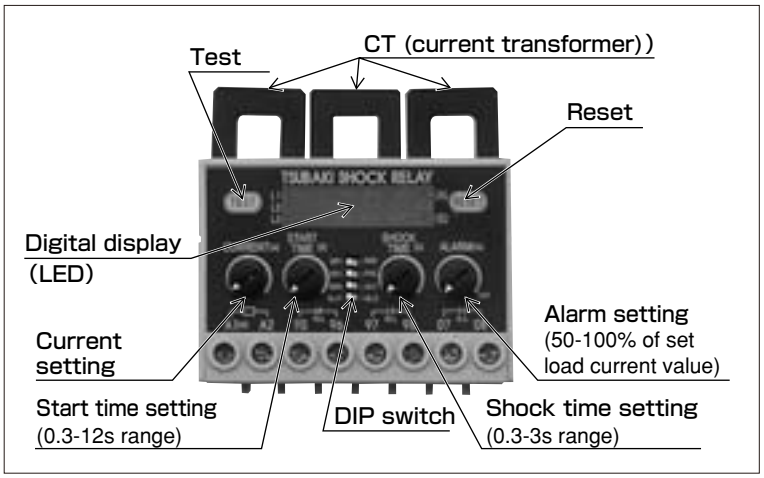
Notes: ※1. For more information on motor capacity, refer to "Notes on use", page 87.
※2. When directly inputting output relay contact points into the programmable controller (PLC), be aware that a minute electric current can cause contact failure. Inputting to the PLC is done by the Shock Relay's signal relay. A relay coil for minute electric current is driven, and inputting these relay contact points to the PLC is reccomended.
※3. The current and time setting range are in the set time range indicated; a ±1 digit error can occur.

External CT…When the current setting range exceeds 60A, use it at a setting of TSBSD10.

	Model		TSB3CT100	TSB3CT200	TSB3CT300
CT External	Rated primary current		100A	200A	300A
	Rated secondary current		5A		
	Rated load		5VA		
	Mass		0.9kg		
Reference	Combined unit model		TSBSD10		
	Motor	200V class	15～18.5kW	22～37kW	45～75kW
		400V class	30～45kW	55～90kW	110～132kW

Note:The list price is the manufacturer's reccomended price (tax not included) . For more information please contact your local Shock Relay dealer.

Functions



(1) The TSBSD Series is a 3-phase detection system Shock Relay. (By switching the DIP switch, it can also be used with a 1 phase detector)

(2) Digital display (LED display)

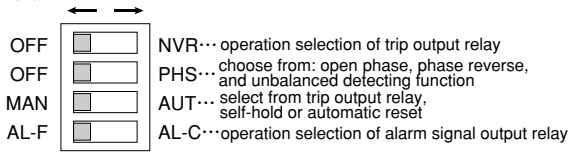
①Actual current value display

The normal motor operation actual current value is digitally displayed in the RST phase order (L1, L2, L3).

②Changing set value display

By turning each dial, you can easily and precisely set values and make variations on the digital display.

(3) DIP switch selection

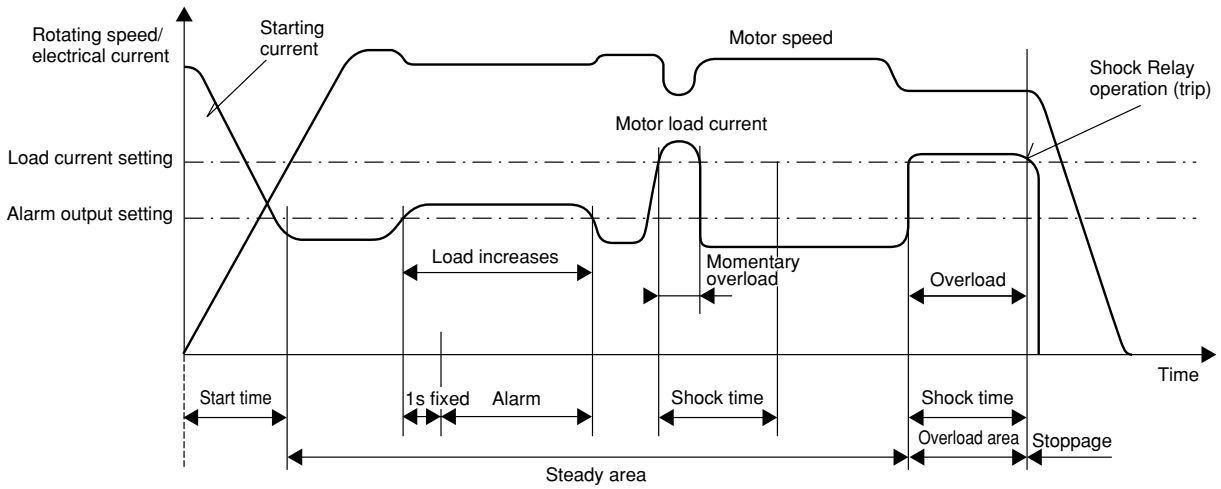


Settings				
Operation of trip output OFF/NVR	Normal time No operation	95-96 (b conact): close 97-98 (a contact): open	Normal time No operation	95-96 (b conact): open 97-98 (a contact): close
	At the time of trip Operation	95-96 (b conact): open 97-98 (a contact): close	At the time of trip Operation	95-96 (b conact): close 97-98 (a contact): open
OFF／PHS	Without reverse phase detecting function		With reverse phase detecting function	
	Without open phase detecting function		With open phase detecting function	
	Without phase unbalance detecting function		With phase unbalance detecting function	
Trip reset MAN/AUT	Overload Reverse phase Open phase Phase unbalance	Hold trip condition until RESET button is pushed.	Overload	Automatically resets 1second after the current returns below the trip level.
			Reverse phase Open phase Phase unbalance	Hold trip condition until RESET button is pushed.
Alarm output operation AL-F/AL-C	AL 07-08 (a contact)		AL 07-08 (a contact)	
	Energization only	Open	Energization only	Open
	Motor operation	Close	Motor operation	Open
	Alarm emittance	Flickers after 1s (1 time/s)	Alarm emittance	Closes after 1s
	Alarm clearance	Closes after 1s (automatic reset)	Alarm clearance	Opens after 1s (automatic reset)
	During trip	Flicker (2 times/s)		

Notes on usage

1. Use the TSBSD10 with a 200V class, 0.1kW, or 400V class, 0.2kW motor, and if the load is very small and the operating current is less than 0.5A, the following procedures are necessary:
[Phenomenon] ①Current value display is 0.00A②Because operating current is extremely small, the motor will be misidentified as not running. When overload occurs, relay output comes after start time and shock time, delaying output.③If the alarm output setting is less than 0.5A, it will not work.
[Procedures] Loop through the CT through holes twice. In this case, double the current volume value setting. As well, the current value display will double, so convert it to 1/2 when reading.

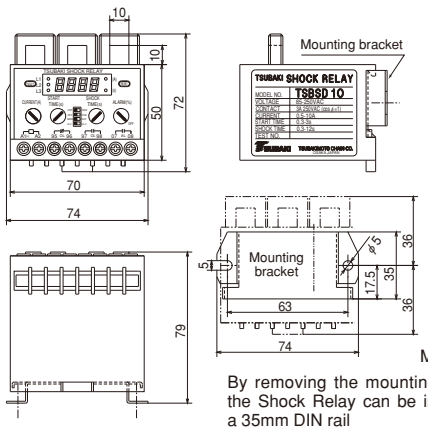
Operating Mode



Outline dimensions

Main unit

TSBSD10
TSBSD60



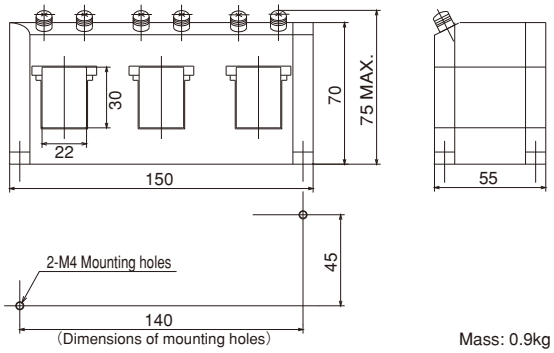
Mass:0.2kg

By removing the mounting bracket, the Shock Relay can be installed to a 35mm DIN rail

External CT (current transforner)

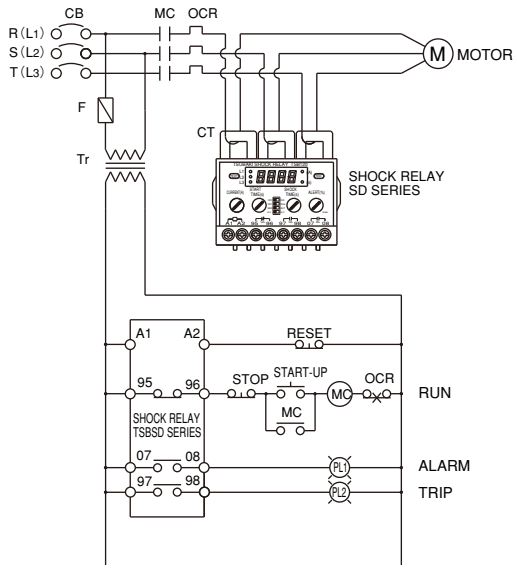
If the set current range exceeds 60A, use as a set with TSBSD10.

TSB3CT100
TSB3CT200
TSB3CT300



Mass: 0.9kg

Base electrical schematic



Notes:
1. If the main circuit voltage exceeds 250VAC, install a step-down transformer (Tr).
2. TSBSD's contact output, 55-56, during normal state is "closed",while during trip it is "open". When the output contact 95-96 opens and closes the electromagnetic contactor (MC), the coil capacity of MC should be less than 100VA when activating, and be less than 10VA when holding respectively.
3. All 3 phases of motor wire pass through the CT through holes in the same direction.
4. The following diagram is an example how to set the DIP switch below.

DIP switch

5. The CT can work with the less than 0.1kW motor by increasing the number of wires passing through the CT holes.

Model No.

TSBSD10

- TSBSD10 — Shock Relay
- SD Series
- Load current (Max. current setting): 10···10A, 60···60A

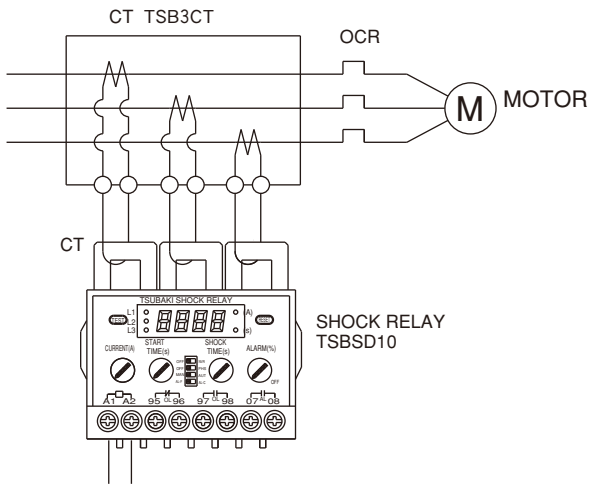
■External CT (current transforner)

TSB3CT100

- TSB3CT100 — Shock Relay
- 3-phase CT
- Rated input current: 100···100A, 200···200A, 300···300A

Note: If the current setting range exceeds 60A, use an External CT with TSBSD10 as a set.

External CT & TSBSD10 electrical schematic diagram



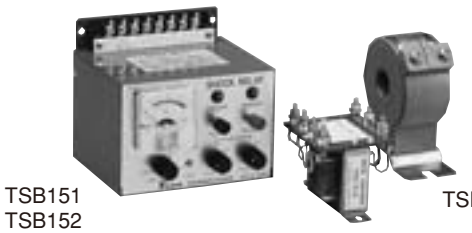
Shock Relay 150 Series

Features

1. Analog meter

2. Self-holding type

3. Special MTO models and additional specifications are available



TSB151
TSB152

TSB□AT

TSBCOM

Standard Specifications

Function			Model: TSB151-COM	Model: TSB152, TSB□AT※2
Motor Specs.	Motor	200V class	0.2～3.7kW※1	5.5～90kW
		400V class	0.2～3.7kW	5.5～90kW
	Work environment	Ambient temperature	－10℃～50℃	
		Relative humidity	45-85% RH; there is no condensation	
		Vibration	Less than 5.9m/s^2	
		Height	Less than 1000m	
		Ambient atmosphere	No corrosive gas, dust	
Main Unit	Main unit model		TSB151	TSB152
	Load current (current range)※4		30～130%（100%＝5mA）	30～130%（100%＝5A）
	Current accuracy setting		±10% (full-scale)	
	Time setting range	Start time※4	0.2～20s	
		Shock time※4	0.2～3s	
	Rated operating power source voltage		AC100/110V or AC200/220V 50/60Hz ±10%	
	Max. motor circuit voltage		AC600V, 50/60Hz	
	Current detecting system		1 phase CT system	
	Output relay	Self-holding	Self-holding available	
		Normal state	Output relay deenergization	
		Abnormal case	Output relay energization	
		Contact rating	1c contact, AC250V 0.2A (inductive load cos ϕ =0.4)	
		Minimum applicable load※3	DC24V, 4mA	
	Output relay life-span	Mechanical	10,000,000 times	
		Electric	100,000 times	
	Test function		Included	
	Withstand voltage	Gap between circuit and housing	AC1500V, 60Hz, 1 minute (power supply circuit and contact circuit)	
		Contact gap	AC1,000V, 60Hz, 1 minute	
		Circuit gap	AC1500V, 60Hz, 1 minute (power supply circuit and contact circuit)	
	Mass		1.0kg	1.2kg
	Consumed power		1.2VA	
CT	External accessory CT model		TSB COM	TSB□AT（□…Rated input current value）
	Rated input current		0.75A, 1.5A, 1.75A, 2.0A, 2.5A, 3.3A, 4.0A, 5.3A, 7.0A, 9.0A, 10.0A, 16.0A	100A, 120A, 150A, 200A, 250A, 300A
	Rated output current		5mA	5A
	Rated load		0.5VA	5VA
	Mass		0.5kg	0.6kg

Notes: ※1. If the TSBCOM-A (small capacity type CT) is used, it is possible to use a less than 0.1kW motor.
※2. TSB152 and TSB□AT (CT) have different model numbers.
※3. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.
As for the input to PLC, it is recommended to drive the relay coil for minute current by relay signal of Shock Relay at first, then input this relay contact to PLC.
※4. Current and time setting ranges can be set within the warranty range, but not the upper or lower level of setting volume.

Part Names and Functions

% Display Meter
The meter displays the percentage of the motor rated current vs. the motor current in operation. (The rated current here is based upon the Motor Rated Current CT selection table on page 92.)

LOAD CURRENT volume
Can be set to stop the motor at the desired level when overload occurs. When the motor current exceeds the preset CURRENT value (at the same time, overload time continues to exceed the preset SHOCK TIME), the Shock Relay activates and stops the motor.

% Adjust Volume
If the input from CT is 5mA (TSB151) or 5A (TSB152), the meter can be modified in the 95 --- 130% range. Also, after adjusting the % adjuster, the meter scale indicator and load current set scale are the same.

START TIME volume
When the motor starts there is a possibility that the motor current will exceed the set current value.
To prevent the Shock Relay from tripping due to the spike in start current, start time is set a little bit longer than the period of motor start up to ignore the spike.

Terminal
The terminal is located on the upper portion of the Shock Relay, making wiring easy.

POWER indicator
The POWER indicator lights when Shock Relay is turned on.

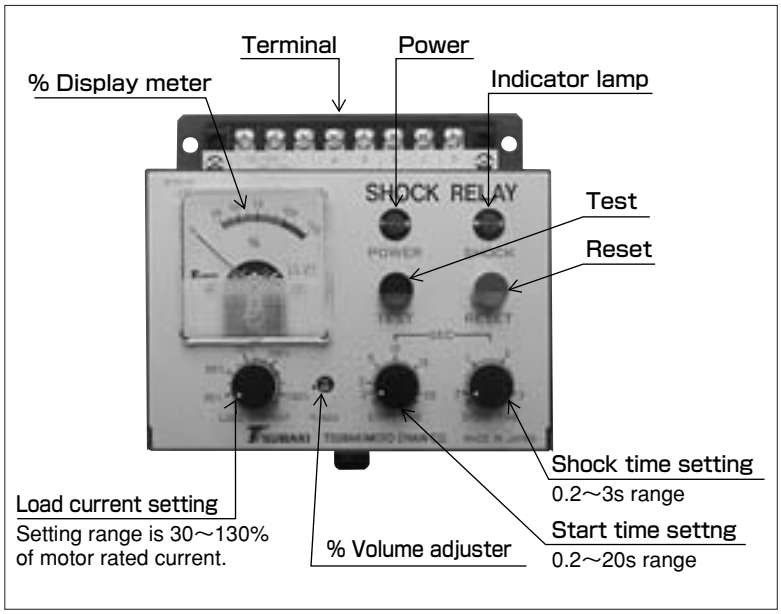
Activation (SHOCK) indicator
The activation (SHOCK) indicator lights when the Shock Relay operates.

TEST button
Shock Relay operation can be tested stand-alone or during motor operation.

(When testing the Shock Relay, continue to press and hold the TEST button longer than the set START TIME or SHOCK TIME, whichever is longer.)

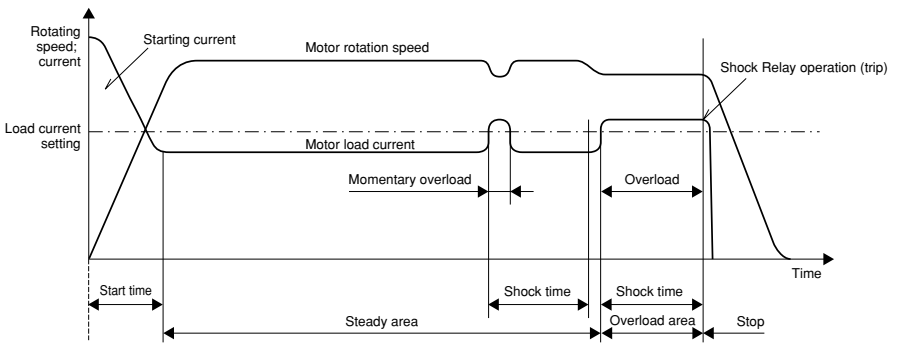
RESET button
After the Shock Relay activates, the RESET button is used to cancel the self-holding of the output contact.

SHOCK TIME volume
Shock time is the amount of time set until the Shock Relay will activate when overload occurs. Within the set time, the Shock Relay will not activate, even if it is overloaded.



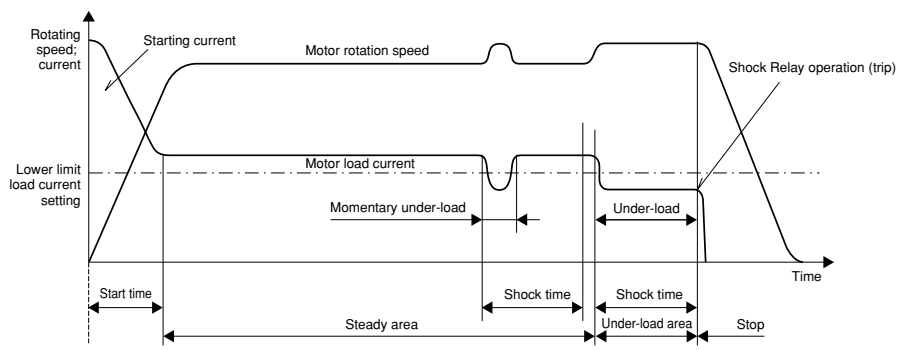
Operating mode

■Overload operating mode



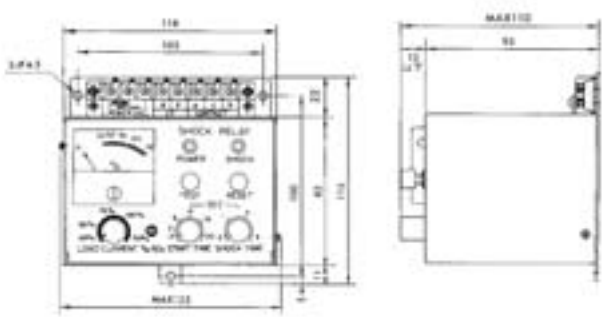
■Light-load operating mode
TSB151W, 152W
(Lower/upper limit detector specifications)

Note: Because there is only one output relay, it is not possible to distinguish between overload operation and light-load operation.



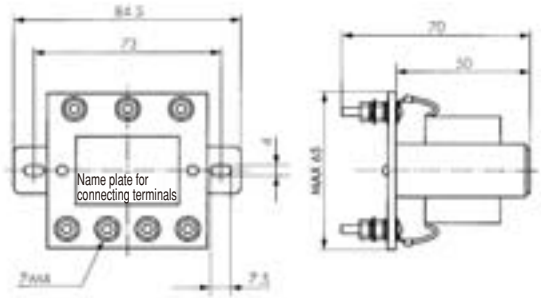
Outline dimensions

Main unit TSB151/TSB152

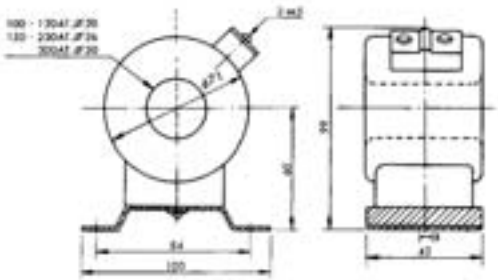


CT (current transformer)

■Common CT TSB151
TSB COM/TSB COM-A



■Through hole CT TSB151
TSB □ AT



The hatching mounting bracket's mounting location can be changed 90 degrees, so match up the holes when you change it.

Model No.

■Motor for 3.7kW and less

TSB151 □ - □

- Additional specifications: UL, S, V, P, T1, T2, H
- 150 Series
  - Standard model …151
  - Special model …151M, 151W
- Shock Relay
- Standard type CT (current transformer)
- COM…for 0.2~3.7kW
- COM-A…for 0.1kW and less

■Motor for more than 5.5kW

Main unit

TSB152 □

- Additional specifications: UL, S, V, P, T1, T2, H
- 150 Series
  - Standard model …152
  - Special model …152M, 152C, 152W, 152D
- Shock Relay

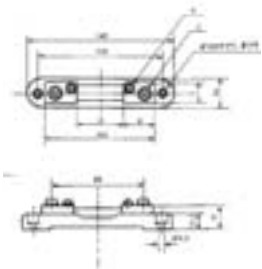
Through hole CT

TSB □ AT

- CT size

Note: Use the main unit and CT as a set.

■DC motor shunt



■Specifications

Model No.	SE□□□A
Rated current	1, 1.5, 2, 3, 5, 7.5, 10, 15, 20, 30 40, 50A, 60, 75, 120, 150, 200A
Rated voltage	60mV
Class	0.5 class

■Dimensions

Rated current \ Dimensions	A	B	C	D	E	F
1~30A	19.5	M4	M5	45	30	19
40, 50A	21.5	M4	M6	45	30	20
60, 75,100A	21.5	M4	M8	45	30	20
150, 200A	28.5	M5	M8	35	35	20

Note 1) Use with TSB152D as a set.
2) Select from motor rated current.

Standard model and special model additional specifications chart

Model \ Additional specifications		UL approved	Subtropical spec.	Operating power voltage modification	Panel mounting	Start time modification	Shock time modification	Auto-reset
		UL	S	V	P	T1	T2	H
Standard	151/152	●	◎	◎	◎	◎	◎	◎
Impact load detection	151M/152M	×	◎	◎	◎	◎	◎	◎
1A input (motor capacity is not necessary to consider)	152C	×	◎	◎	◎	◎	◎	◎
Upper/lower limit detection	151W	●	◎	◎	◎	◎	◎	◎
	152W	×	◎	◎	◎	◎	◎	◎
DC motor (shunt is required)	152D	×	◎	◎	◎	◎	◎	◎

Notes: 1. Refer to page 82 for detailed specifications
2. Refer to the above for shunts for DC motors
3. For additional specifications V, specify operation power source
4. For additional specifications T1 and T2, indicate the start time and shock time modification time.

◎: Multiple specifications available
●: Single specification available
×: Not available

CT (current transformer)

■Common CT: for motors up to and including 3.7kw

- TSB COM (standard type) can be used with 0.2 - 3.7kW motors.
- TSB COM-A (small capacity type) can be used with motors up to and including 0.1kW.
- In the case that motor voltage is higher than 600V, please consult with TEM as it is possible to use a CT with high voltages.

■TSB COM (standard type)

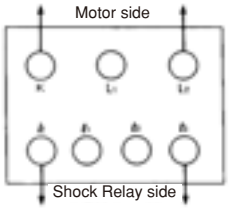
Motors (kW)	Power supply: AC200/ 220V			Power supply: AC400/ 440V		
	Motor rated current (A)	Connecting terminal		Motor rated current (A)	Connecting terminal	
		Motor side	Shock Relay side		Motor side	Shock Relay side
0.2	1.75	K-L2	k-ℓ1	0.75	K-L2	ℓ1-ℓ2
0.4	2.5	K-L2	k-ℓ2	1.5	K-L2	ℓ2-ℓ3
0.75	4.0	K-L2	k-ℓ3	2.0	L1-L2	ℓ2-ℓ3
1.5	7.0	K-L1	k-ℓ1	3.3	L1-L2	k-ℓ2
2.2	10.0	K-L1	k-ℓ2	5.3	L1-L2	k-ℓ3
3.7	16.0	K-L1	k-ℓ3	9.0	K-L1	ℓ1-ℓ3

Note: Common type CT, motor side L1-L2; Shock Relay side l1-l2 combination, 1A output CT can be combined.

■TSB COM-A (small capacity type)

Motor rated current (A)	Connecting terminal	
	Motor side	Shock Relay side
0.15	K-L2	k-ℓ1
0.25	K-L2	k-ℓ2
0.4	K-L2	k-ℓ3
0.6	K-L1	k-ℓ1
1.0	K-L1	k-ℓ2
1.6	K-L1	k-ℓ3

Note: Select by current value



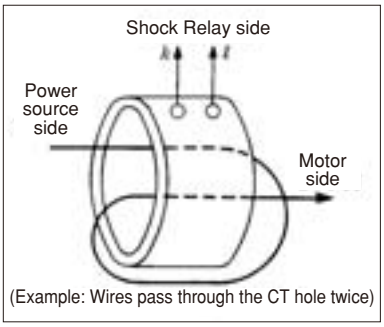
■Through-type CT for motors 5.5kW and above

- Select a CT size applicable to motor capacity. In the case that motor voltage is higher than 600V, please consult with TEM as it is possible to use a CT with high voltages.

Motor (kW)	Power supply: AC200/ 220V			Power supply: AC400/ 440V		
	Motor rated current (A)	CT size	Number of wires that pass through the CT hole (T)	Motor rated current (A)	CT size	Number of wires that pass through the CT hole (T)
5.5	25	100AT	4	14	100AT	7
7.5	30	120AT	4	20	100AT	5
11	50	100AT	2	25	100AT	4
15	60	120AT	2	30	120AT	4
19	75	150AT	2	37	150AT	4
22	100	100AT	1	50	100AT	2
30	120	120AT	1	60	120AT	2
37	150	150AT	1	75	150AT	2
45	170	200AT	1	85	100AT	1
55	200	200AT	1	100	100AT	1
75	250	250AT	1	130	150AT	1
90	300	300AT	1	150	150AT	1

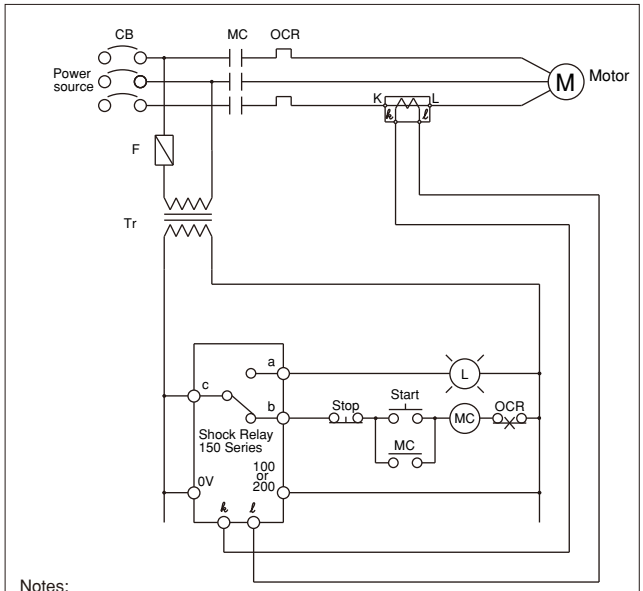
In the case the single-phase motor or motor capacity is not on the selection chart, use the following calculation to make your selection:

CT size ≧ motor rated current x number of wire(s) passing through the CT hole



(Example: Wires pass through the CT hole twice)

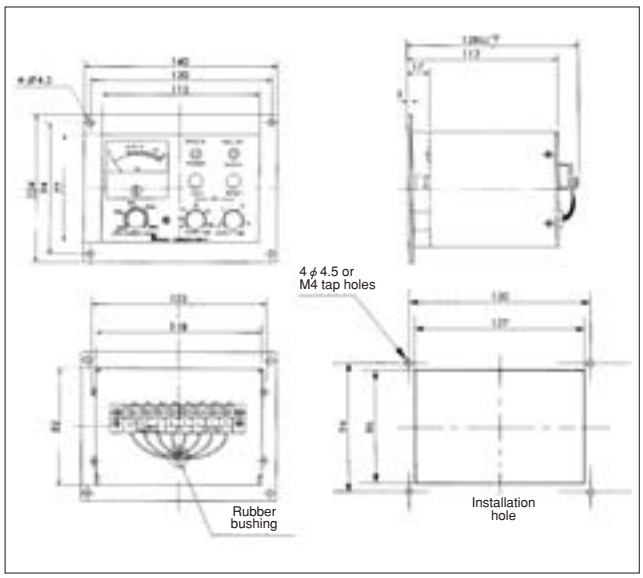
Basic connection diagram



Notes:
1. If the voltage of the main circuit exceeds 250VAC, install a step-down transformer Tr. As well, do not improperly wire the power source wires (AC100V or AC200V).
2. If the CT's secondary side is left open while the primary side is energized, it will cause damage to the CT. When the Shock Relay is not connected, short-circuit the CT's secondary side.
3. Coil capacity of the electromagnetic contactor MC which TSB150 output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding..

Special models and additional specifications

■TSB151P, TSB152P (panel mounted type) outline dimensions



■Notes on CT (current transformer) selection

The load current meter of the Shock Relay shows 100% at the time of the motor rated current value in the chart.
When the actual motor rated current value is not on the chart, use a CT on which the load current meter shows an 80~90% range when rated current flows.

Shock Relay SS Series

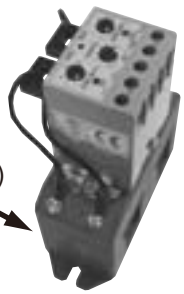
Features

- Output relay self-holding type
- Output relay return type when detecting over-current (fail-safe)
- Economically priced
- Broad current setting range
- High repeating accuracy
- Includes TEST/ RESET buttons
- All-in-one unit with CT (current transformer)
- Conforms to CUL standards
- Conforms to CE standards
- DIN rail (35mm) mountable
- Can be used with a single-phase motor
- CCC certification

All-in-one unit with CT

TSBSS05
TSBSS30
TSBSS60

Externally mounted CT type



TSBSS100 (TSBSS05+TSB2CT100)
TSBSS200 (TSBSS05+TSB2CT200)
TSBSS300 (TSBSS05+TSB2CT300)

CE

Standard Specifications

Items \ Model No.			TSBSS05	TSBSS30	TSBSS60	TSBSS100	TSBSS200	TSBSS300
Standard usage	Load current (current setting range)※3		0.5～5A	3～30A	5～60A	10～100A	20～200A	30～300A
	Applicable motor capacity	200V class	0.1～0.75kW	1.5～5.5kW	7.5～11kW	15～18.5kW	22～37kW	45～75kW
		400V class	0.2～2.2kW	3.7～11kW	15～22kW	30～45kW	55～90kW	110～132kW
	Work environment	Ambient temperature	−20℃～60℃					
		Ambient humidity	45-85%RH; no condensation					
		Vibration	Less than 5.9m/s^2					
		Altitude	Less than 1000m					
		Ambient atmosphere	No corrosive gas, dust					
	Unit model No.		TSBSS05	TSBSS30	TSBSS60	TSBSS05	TSBSS05	TSBSS05
	Current setting accuracy		±10% (full scale)					
Unit Parts	Set time range	Start time※3	0.2～30s					
		Shock time※3	0.2～10s					
	Operation power source (L1 - L2)		AC90～250V, 50/60Hz					
	Maximum motor circuit voltage		AC600V, 50/60Hz					
	Current detection system		Two-phase CT system					
	Output relay ※1	Self-holding	Includes self-holding					
		Normal state	At start up there is a 0.5s delay, then the output relay excites					
		At the time of trip	When it trips or the power is shut off, the output relay is not excited					
		Contact capacity	1c contact, AC250V 3A (in the case of a resistance load)					
		Minimum applicable load※2	DC10V, 10mA					
		Reset method	Press the RESET button or cut the operation power					
	Output relay life-span	Mechanical	100,000,000 times					
		Electrical	100,000 times					
	Test functions		Internal circuit and output relay operation check					
	Withstand voltage	Between the circuit and case	AC2000V, 60Hz, 1 minute (power supply circuit and contact circuit)					
		Between contacts	AC1000V, 60Hz, 1 minute					
		Between circuit	AC2000V, 60Hz, 1 minute (power supply circuit and contact circuit)					
	Gross mass		0.2kg (not including external CT)					
	Power consumption	When AC110V	2.7VA (0.35W)					
		When AC200V	11.0VA (1.2W)					
	DIN rail mounting		○			×		
	cUL		○			×		
	CE		○			×		
External CT Portion	External CT Model No.		Not needed			TSB2CT100	TSB2CT200	TSB2CT300
	Rated primary current		—			100A	200A	300A
	Rated secondary current		—			5A		
	Rated load		—			5VA		
	Mass		—			0.5kg		

Notes: ※1. During normal operation the output relay is ON, and when the Shock Relay operates it is OFF (refer to page 82).
※2. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.
As for the input to PLC, it is recommended to drive the relay coil for minute current by relay signal of Shock Relay at first, then input this relay contact to PLC.
※3. Current and time setting ranges can be set within the warranty range, but not the upper or lower level of setting volume.

Part Names and Functions

LOAD CURRENT volume (A)

Load current can be set to stop the motor at the desired level when overload occurs. When the motor current exceeds the preset CURRENT value (at the same time, overload time continues to exceed the preset SHOCK TIME), the Shock Relay activates and stops the motor.

START TIME volume (s)

When the motor starts there is a possibility that the motor current will exceed the set current value. To prevent the Shock Relay from tripping due to the spike in start current, start time is set a little bit longer than the period of motor start up to ignore the spike.

TEST button

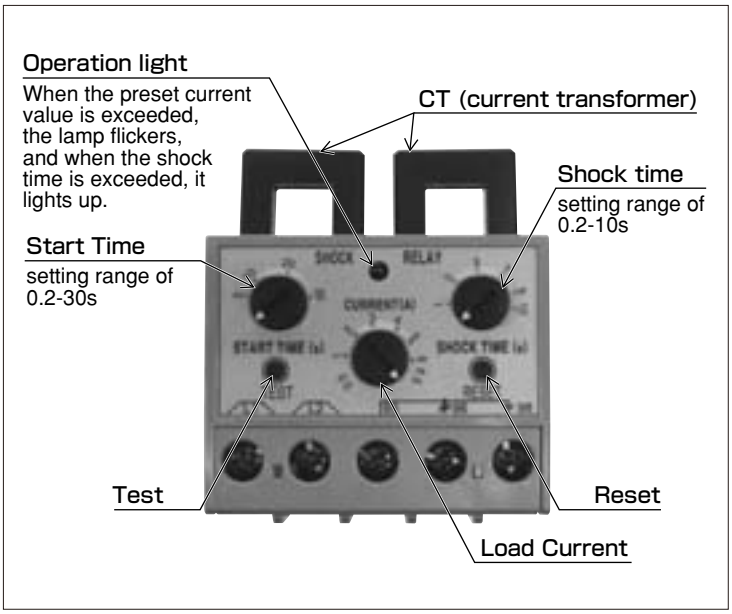
Shock Relay operation can be tested stand-alone or during motor operation.
(When testing the Shock Relay, continue to press and hold the TEST button longer than the set START TIME or SHOCK TIME, whichever is longer.)

RESET button

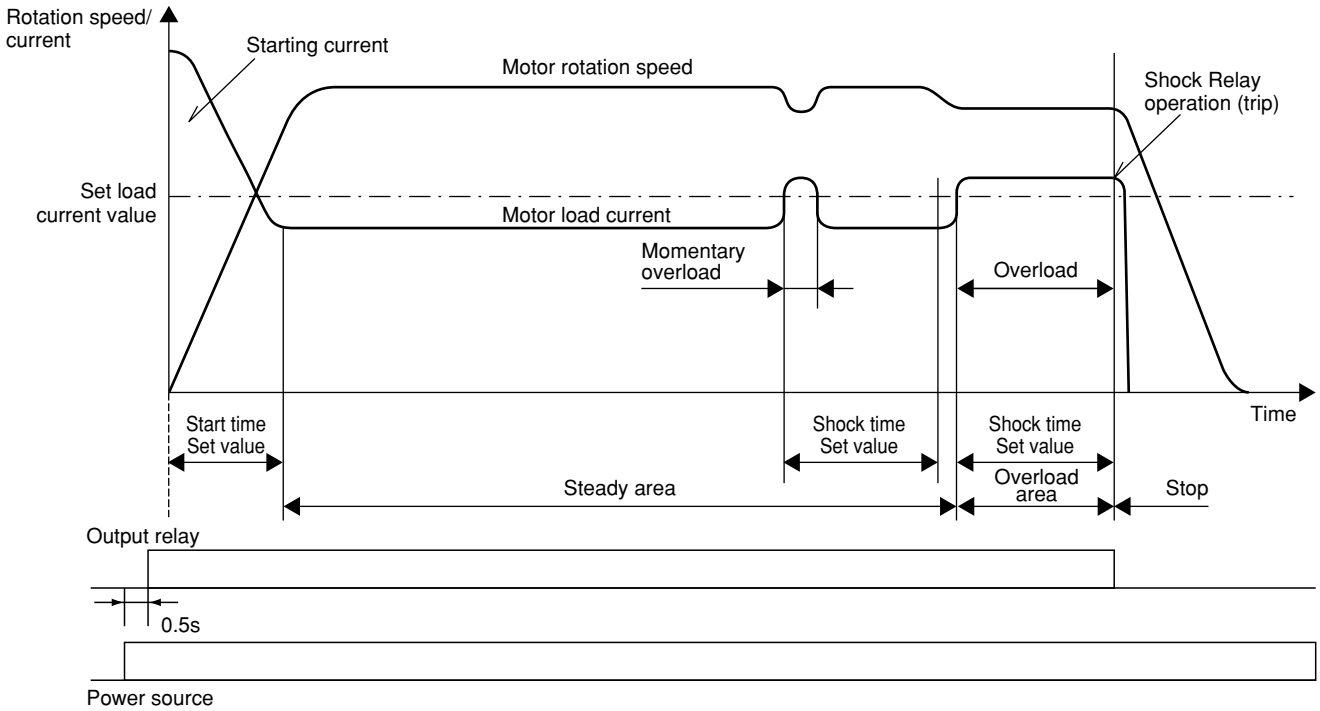
After the Shock Relay activates, the RESET button is used to cancel the self-holding of the output contact.

SHOCK TIME volume (s)

Shock time is the amount of time set until the Shock Relay will activate when overload occurs. Within the set time, the Shock Relay will not activate, even if it is overloaded.

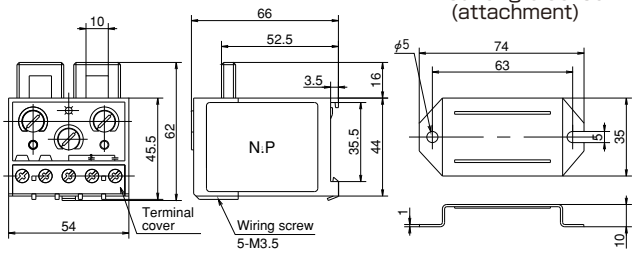


Operational Mode



Outline dimensions

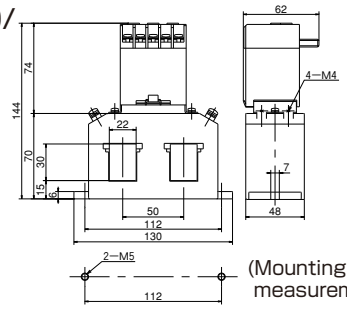
CT unit TSBSS05/TSBSS30/TSBSS60



When installing the mounting bracket, a height size of 65 becomes 73.

Mass: 0.2kg

CT externally mounted type TSBBSS100/ TSBSS200/ TSBSS300

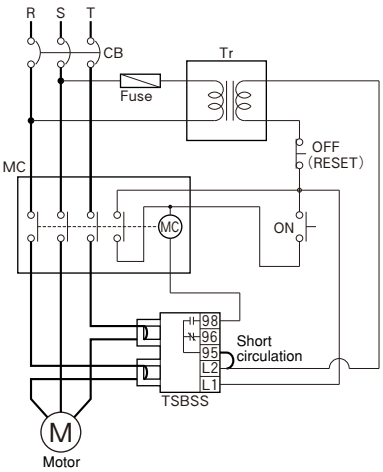


(Mounting hole machining measurements)

The external CT (current transformer) is wired before delivery.

Mass: 0.7kg

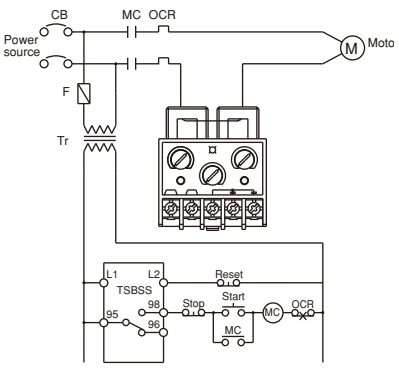
Basic connection diagram



CB : Circuit breaker
MC : Magnetic contactor
ON : Start switch
OFF : Stop switch
Fuse : Fuse
Tr : Transformer

Notes:
1. Set the transformer depending on the voltage of the Shock Relay and MC. Set the insulation transformer if there is a high-harmonic noise generator such as an inverter.
2. When it's running normally, the contact points 95-98 of the TSBSS are "closed" (95-96 is "open"), and when tripping, 95-98 are "open" (95-96 is "closed"). Coil capacity of the electromagnetic contactor MC which output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding.
3. Pass two wires out of three phases of the motor through the Shock Relay's CT in the same direction.

Single-phase motor reference schematic for when using the motor



Notes:
1. Set the transformer depending on the voltage of the Shock Relay and MC. Set the insulation transformer if there is a high-harmonic noise generator such as an inverter.
2. When it's running normally, the contact points 95-98 of the TSBSS are "closed" (95-96 are "open"), and when tripping, 95-98 are "open" (95-96 are "closed"). Coil capacity of the electromagnetic contactor MC which output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding.
3. Pass one phase through the Shock Relay's CT in the same direction.

As for the split-phase start and capacitor run motor, connect CT to the main coil side.

Notes on usage

1. During normal operation, the output relay is excited (ON). When overload is detected and the Shock Relay activates or the power supply is cut, the output relay is de-excited (OFF).
2. Pass the motor wire(s) through the CT hole the number of times referenced in the chart below. In order to increase the current setting accuracy, the number of wires that pass through the CT hole is 2 times or more for small motor currents.
   When the motor load factor is low, increase the number of wires that pass through the CT hole as necessary.
   Furthermore, when the number of the wires that pass through the CT hole is more than 2, it is necessary to convert the current scale value of current volume.
   (Ex.) When a wire passes two times through the CT, the value on the current scale should be at half value.

AC200V class motor			AC400V class motor		
Capacity (kW)	Shock Relay Model No.	No. of wires that pass through the CT hole	Capacity (kW)	Shock Relay Model No.	No. of wires that pass through the CT hole
0.1	TSBSS05	4	—	—	—
0.2	TSBSS05	3	0.2	TSBSS05	4
0.4	TSBSS05	2	0.4	TSBSS05	3
0.75	TSBSS05	1	0.75	TSBSS05	2
1.5	TSBSS30	3	1.5	TSBSS05	1
2.2	TSBSS30	2	2.2	TSBSS05	1
3.7	TSBSS30	1	3.7	TSBSS30	3
5.5	TSBSS30	1	5.5	TSBSS30	2
7.5	TSBSS60	1	7.5	TSBSS30	1
11	TSBSS60	1	11	TSBSS30	1
—	—	—	15	TSBSS60	1
—	—	—	18.5	TSBSS60	1
—	—	—	22	TSBSS60	1

3. Because products conforming to CE markings have been electro-magnetically tested for compatibility based on industrial environmental standards, they are not for household, commercial or light industrial use.

Model No.

CT Unit Type - External Mounted CT Type

TSBSS05

- TSBSS: Shock Relay
- SS: SS Series
- 05: Load current (maximum current setting)

05…5A
30…30A
60…60A
100…100A
200…200A
300…300A

Shock Relay SA Series

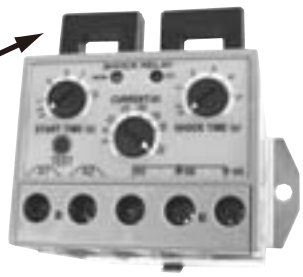
Features

- Output relay automatic return type
- Output relay activating type when detecting over-current
- Economically priced
- Accurate current setting
- High repeatability
- Test function
- All-in-one unit with CT (current transformer)
- Can be mounted on a DIN rail (35mm)
- Can be used with a single-phase motor
- CCC certification

All-in-one unit with CT

CT
(current transformer)

TSBSA05
TSBSA10
TSBSA30
TSBSA60



Externally mounted CT type

External CT
(current transformer)

TSBSA100 (TSBSA05+TSB2CT100)
TSBSA200 (TSBSA05+TSB2CT200)
TSBSA300 (TSBSA05+TSB2CT300)

Standard specifications

Function / Model			TSBSA05	TSBSA10	TSBSA30	TSBSA60	TSBSA100	TSBSA200	TSBSA300
Common	Load current (current setting range)※3		0.5～5A	1～10A	3～30A	5～60A	10～100A	20～200A	30～300A
	Motor capacity	200V class	0.1～0.75kW	1.5～2.2kW	3.7～5.5kW	7.5～11kW	15～18.5kW	22～37kW	45～75kW
		400V class	0.2～2.2kW	3.7kW	5.5～11kW	15～22kW	30～45kW	55～90kW	110～132kW
	Work environment	Ambient temperature	−20℃～60℃						
		Ambient humidity	45-85%RH: no condensation						
		Vibration	Less than 5.9m/s^2						
		Altitude	Less than 1000m						
		Atmosphere	No corrosive gas or dust						
Main Unit	Unit model		TSBSA05	TSBSA10	TSBSA30	TSBSA60	TSBSA05	TSBSA05	TSBSA05
	Current setting accuracy		±10% (full-scale)						
	Time setting range	Start time※3	0.2～10s						
		Shock time※3	0.2～5s						
	Operation power source (A1−A2)		AC90～250V, 50/60Hz						
	Maximum motor circuit voltage		AC600V, 50/60Hz						
	Current detection system		2 phase CT system						
	Output relay※1	Self-holding	No self-holding (automatically returns after 1s)						
		Normal state	Output relay is not excited						
		At the time of trip	Output relay is excited						
		Contact capacity	0.2A AC250V cos ϕ =0.4						
		Minimum applicable load※2	DC10V, 10mA						
	Output relay life span	Mechanical	10,000,000 times						
		Electrical	100,000 times						
	Test functions		Internal circuit and output relay operation verification						
	Withstand voltage	Between the circuit and case	AC2000V, 60Hz, 1 minute (power supply circuit and contact circuit)						
		Between contacts	AC 1000V, 60Hz, 1 minute						
		Between circuits	AC2000V, 60Hz, 1 minute (power supply circuit and contact circuit)						
	Mass		0.2kg (excluding external CT)						
	Power consumption	When AC110V	2.7VA (0.35W)						
		When AC200V	11.0VA (1.2W)						
	DIN rail mounting		○				×		
External CT	External CT Model No.		Not needed				TSB2CT100	TSB2CT200	TSB2CT300
	Rated primary current		—				100A	200A	300A
	Rated secondary current		—				5A		
	Rated load		—				5VA		
	Mass		—				0.5kg		

Notes: ※1. The operation of the TSBSA Series is the complete opposite of the TSBSS Series.
※2. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.
As for the input to PLC, it is recommended to drive the relay coil for minute current by relay signal of Shock Relay at first, then input this relay contact to PLC.
※3. Current and time setting ranges can be set within the warranty range, but not the upper or lower level of setting volume.

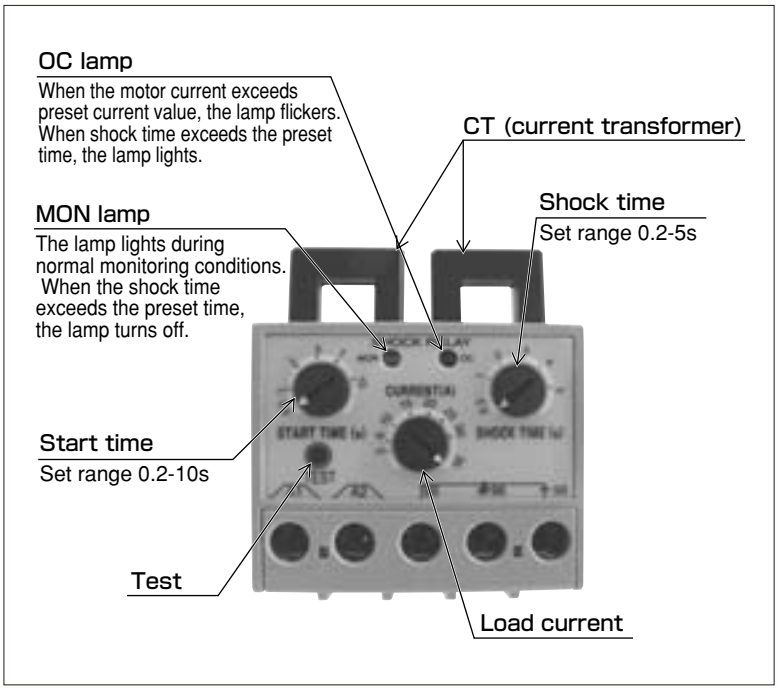
Part Names and Functions

LOAD CURRENT setting
Load current can be set to stop the motor at the desired level when overload occurs. When the motor current exceeds the preset CURRENT value (at the same time, overload time continues to exceed the preset SHOCK TIME), the Shock Relay activates and stops the motor.

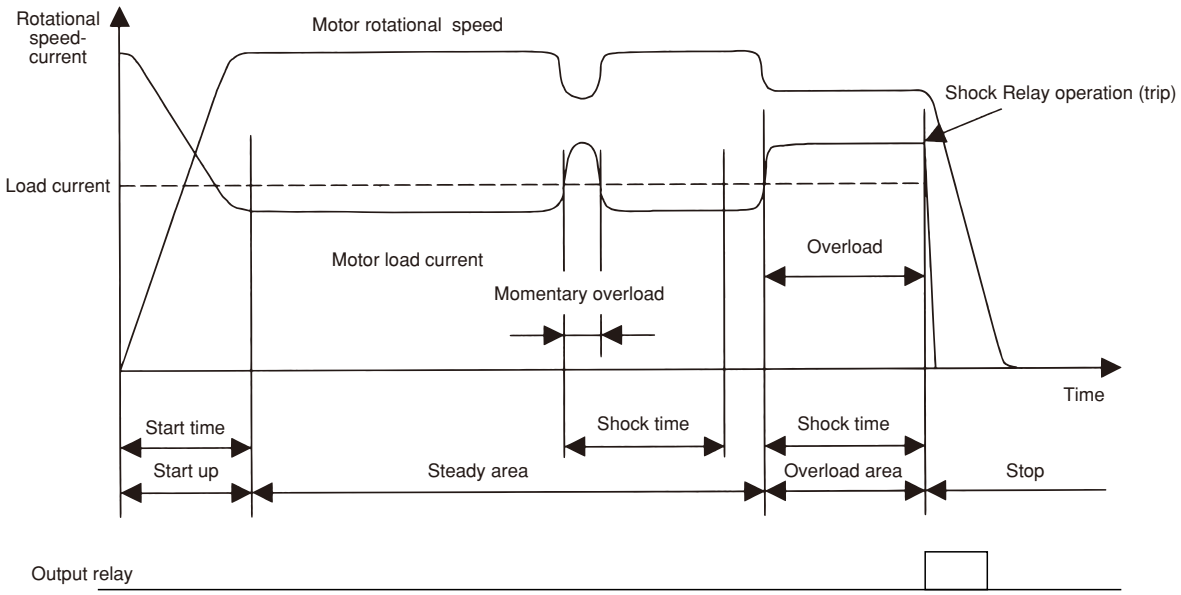
START TIME setting
When the motor starts there is a possibility that the motor current will exceed the set current value. To prevent the Shock Relay from tripping due to the spike in start current, start time is set a little bit longer than the period of motor start up to ignore the spike.

TEST function
Shock Relay operation can be tested stand-alone or during motor operation.
(When testing the Shock Relay, continue to press and hold the TEST button longer than the set START TIME or SHOCK TIME, whichever is longer.)

SHOCK TIME setting
Shock time is the amount of time set until the Shock Relay will activate when overload occurs. Within the set time, the Shock Relay will not activate, even if it is overloaded.

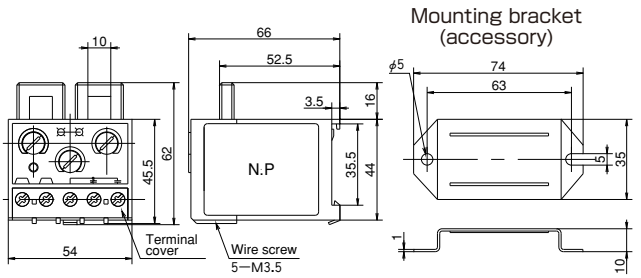


Operational Mode



Outline dimensions

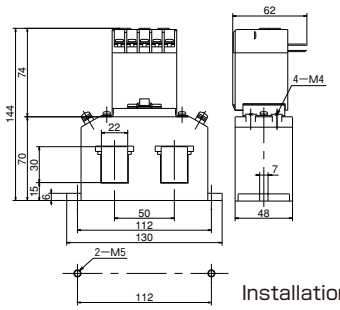
CT unit type TSBSA05/TSBSA10/TSBSA30/TSBSA60



When attaching the mounting bracket, a height of 65 becomes 73.

Mass: 0.2kg

CT external mounting type TSBSA100/ TSBSA200/ TSBSA300

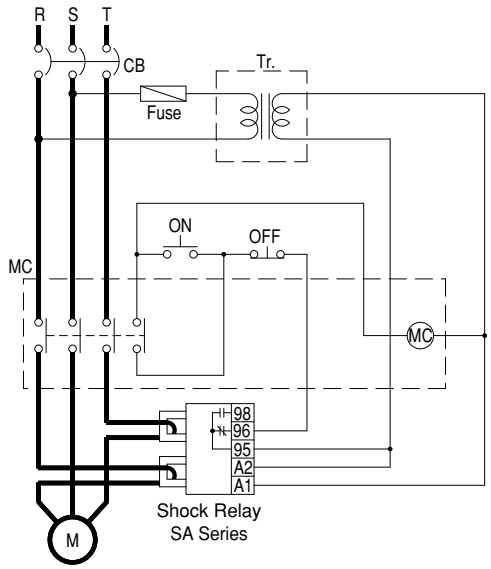


Installation hole size

The external CT (current transformer) is wired before shipment.

Mass: 0.7kg

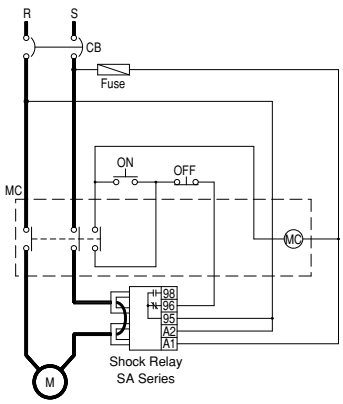
Basic connection diagram



CB : Circuit breaker
MC : Magnetic contactor
ON : Start switch
OFF : Stop switch
Fuse : Fuse
Tr : Step-down transformer/ Insulation transformer

Notes:
1. Set the transformer depending on the voltage of the Shock Relay and MC. Set the insulation transformer if there is a high-harmonic noise generator such as an inverter.
2. The TSBSA contact output 95-98 is "open" during normal state (95-96 is "closed"), when tripping 95-98 is "closed" (95-96 is "open"). Coil capacity of the electromagnetic contactor MC which output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding.
3. Two wires out of three phases of the motor are passed through the Shock Relay's CT in the same direction.

Single-phase reference connection diagram



Notes:
1. Set the transformer depending on the voltage of the Shock Relay and MC. Set the insulation transformer if there is a high-harmonic noise generator such as an inverter.
2. The TSBSA contact output 95-98 is "open" during normal state (95-96 is "closed"), when tripping 95-98 is "closed" (95-96 is "open"). Coil capacity of the electromagnetic contactor MC which output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding.
3. 1 phase of the motor is passed through the Shock Relay's CT in the same direction. For when the split-phase or condensor start, connect the CT to the phase of the main coil side.

Model No.

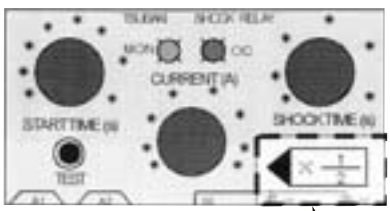
TSBSA05

- TSBSA — Shock Relay
- SA — SA Series
- 05 — Load current

Maximum preset current value
05···5A
10···10A
30···30A
60···60A
100···100A
200···200A
300···300A

Number of wire(s) to pass through the CT hole

Depending on motor capacity, use the chart on the right to select the applicable Shock Relay model and number of wire(s) to pass through the CT hole.
When passing the wires through CT holes more than two times, attach a multiplication rate sticker to the empty space at the bottom right-hand side of the Shock Relay surface panel.



Multiplication rate sticker

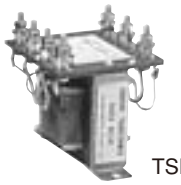
AC200V class motor			AC400V class motor		
Capacity (kW)	Shock Relay Model No.	No. of wires that pass through the CT hole	Capacity (kW)	Shock Relay Model No.	No. of wires that pass through the CT hole
0.1	TSBSA05	4	—	—	—
0.2	TSBSA05	3	0.2	TSBSA05	4
0.4	TSBSA05	2	0.4	TSBSA05	3
0.75	TSBSA05	1	0.75	TSBSA05	2
1.5	TSBSA10	1	1.5	TSBSA05	1
2.2	TSBSA10	1	2.2	TSBSA05	1
3.7	TSBSA30	1	3.7	TSBSA10	1
5.5	TSBSA30	1	5.5	TSBSA30	1
7.5	TSBSA60	1	7.5	TSBSA30	1
11	TSBSA60	1	11	TSBSA30	1
—	—	—	15	TSBSA60	1
—	—	—	18.5	TSBSA60	1
—	—	—	22	TSBSA60	1

Shock Relay 50 Series

Features

1. Economically priced
2. Automatic reset
3. Additional specifications available

TSB50



TSBCOM
current transformes

Standard specifications

	Function		Model: TSB50-COM
Common	Motor	200V class	0.2～3.7kW
		400V class	0.2～3.7kW
	Work environment	Ambient temperature	−10℃～50℃
		Ambient humidity	45-85%RH: no condensation
		Vibration	Less than 5.9m/s²
		Altitude	Less than 1000m
		Atmosphere	No corrosive gas, dust
Main Unit	Unit Model No.		TSB50
	Load current (current setting range)		50～130%(100%=5mA)
	Current setting accuracy		±10% (full-scale)
	Time setting range	Start time	Fixed at 3s
		Shock time	0.3～3s
	Rated power source voltage		AC100/110V or AC200/220V 50/60Hz
	Maximum motor circuit voltage		AC600V、50/60Hz
	Current detecting system		Single-phase CT system
	Output relay	Self-holding	No self-holding (automatic return)
		Normal operation	Output relay is not excited
		At the time of trip	Output relay is excited
		Contact capacity	1s contact, AC250V 0.1A (inductive load cos ϕ =0.4)
		Minimum applicable load	DC10V、10mA
	Output relay life span	Mechanical	10,000,000 times
		Electrical	100,000 times
	Test functions		Not available
	Withstand voltage	Space between circuit and housing	AC1500V, 60Hz, 1minute (power supply circuit and contact circuit)
		Contact spacing	AC500V, 60Hz, 1minute
		Circuit spacing	AC1500V, 60Hz, 1minute (power supply circuit and contact circuit)
	Mass		0.3kg (not including external CT)
	Electricity consumption		0.5VA
External CT	Attached External CT		TSB COM
	Rated primary current		0.75A、1.5A、1.75A、2.0A、2.5A、3.3A、4.0A、5.3A、7.0A、9.0A、10.0A、16.0A
	Rated secondary current		5mA
	Rated load		0.5VA
	Mass		0.5kg

Notes:
1. If TSBCOM-A (small capacity type CT) is used, it can be used for less than 0.1kW motors.
2. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.
   As for the input to PLC, it is recommended to drive the relay coil for minute current by relay signal of Shock Relay at first, then input this relay contact to PLC.
3. Current and time setting ranges can be set within the warranty range, but not the upper or lower level of setting volume.

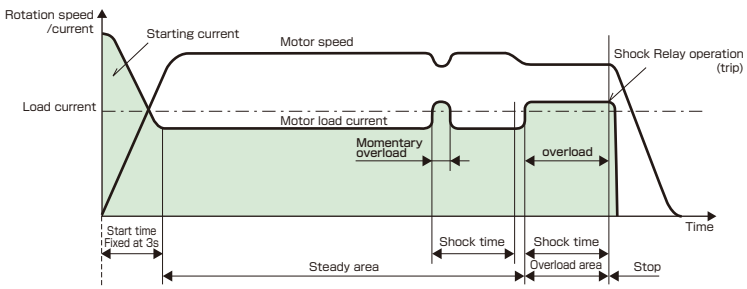
Each Part and Function

Load current setting:
Set range motor rated current,
50% --- 130%

Shock time:
Set range 0.3 --- 3s

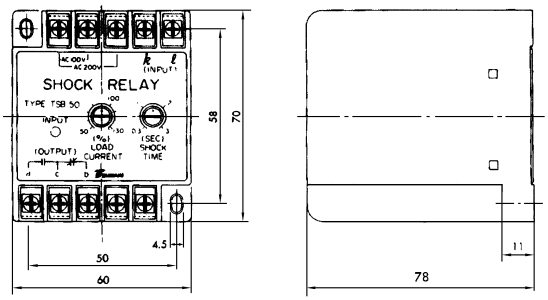
Power indicator lamp:
Lamp lights when operating normally,
and turns off during Shock Relay activation

Operational Mode

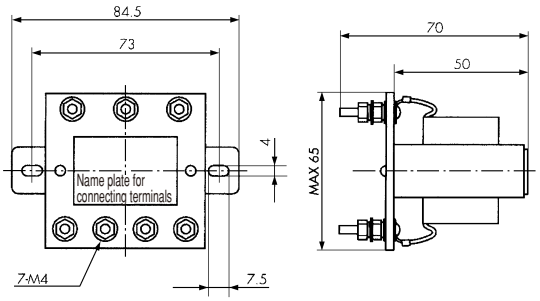


Outline dimensions

Main unit TSB50



Common type CT (current transformer) TSB COM/TSB COM-A



Model No.

Additional specifications S, V, T1, T2

TSB 50 □ -COM & COM-A

- TSB: Shock Relay
- 50: 50 Series
- □: Common type CT (current transformer)
  - COM···for 0.2 --- 3.7kW
  - COM-A···for 0.1kW and less

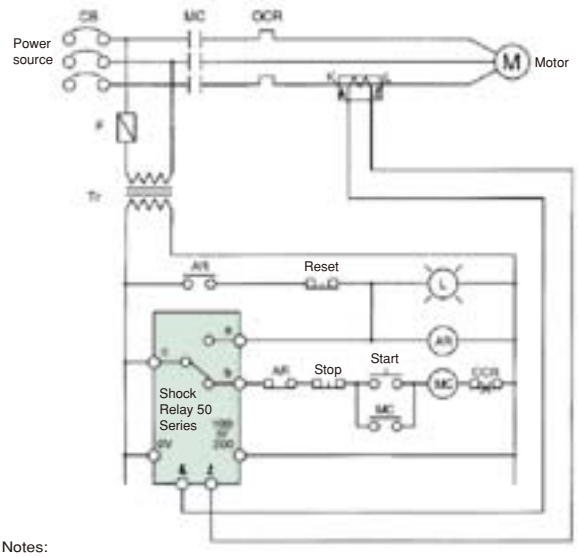
Note) Use main unit with CT as a set.

■CT (current transformer) Selection Notes

The load current meter of the Shock Relay shows 100% at the time of the motor rated current value in the chart.

When the actual motor rated current value is not on the chart, use a CT on which the load current meter shows 80%-100% range when rated current flows.

Basic connection diagram



Notes:
1. When the main circuit's voltage exceeds 220VAC, install a step down transformer. As well, take care not to make a mistake with the power source (AC100V or AC200V) wiring.
2. If the CT's secondary side is left open while the primary side is energized, it will cause damage to the CT.
   When the Shock Relay is not connected, short-circuit the CT's secondary side.
3. Coil capacity of the electromagnetic contactor MC which output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding.

Common CT (current transformer)

- TSB COM (standard type) can be used with a 0.2-3.7kW motor.
- TSB COM-A (small capacity type) can be used with a 0.1kW and smaller motor.
- When motor voltage is higher than 600V, a CT for a high voltage motor can be used.

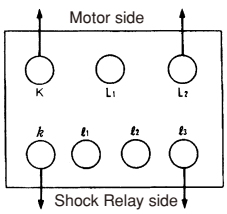
■TSB COM (standard type)

Motor (kW)	Motor voltage AC200/220V			Motor voltage AC400/440V		
	Motor rated current (A)	Connecting terminal		Motor rated current (A)	Connecting terminal	
		Motor side	Shock Relay side		Motor side	Shock Relay side
0.2	1.75	K-L2	k- ℓ1	0.75	K-L2	ℓ1- ℓ2
0.4	2.5	K-L2	k- ℓ2	1.5	K-L2	ℓ2- ℓ3
0.75	4.0	K-L2	k- ℓ3	2.0	L1-L2	ℓ2- ℓ3
1.5	7.0	K-L1	k- ℓ1	3.3	L1-L2	k- ℓ2
2.2	10.0	K-L1	k- ℓ2	5.3	L1-L2	k- ℓ3
3.7	16.0	K-L1	k- ℓ3	9.0	K-L1	ℓ1- ℓ3

Note:
Common type CT, motor side L1-L2; Shock Relay side l1-l2 combination, 1A output CT can be combined.

■TSB COM-A (small capacity type)

Motor rated current (A)	Connecting terminal	
	Motor side	Shock Relay side
0.15	K-L2	k- ℓ1
0.25	K-L2	k- ℓ2
0.4	K-L2	k- ℓ3
0.6	K-L1	k- ℓ1
1.0	K-L1	k- ℓ2
1.6	K-L1	k- ℓ3



Note:
Select by current value

Additional specifications chart

Additional specs. / Model	Subtropical specifications	Power source voltage modification	Start time modification	Shock time modification
	S	V	T1	T2
TSB50	◎	◎	◎	◎

◎: Multiple specifications available

Notes:
1. Refer to page 82 for detailed specifications.
2. Specify operational power source voltage for the Shock Relay in the case of additional specification V.
3. Specify required start time and shock time in the case of additional specifications T1 and T2.

Shock Relay SM Series

Features

It protects the machines and equipment that are driven by small capacity motors from damage due to overload.
The Shock Relay monitors the current of the driving motor, and when there is an abnormal amount of current, it outputs the relay signal and stops the motor.

Compact

Current setting range of 0.5-2A

Applicable motor capacities:

Three-phase 200V 60 --- 200W
Single-phase 200V 60 --- 200W　Single-phase 100V 25 --- 90W

All-in-one unit with CT (current transformer)

Economically priced

Special specification models based on the standard model are available. Please consult TEM.

Special specifications example

- No case type
  Only a Shock Relay printed-circuit board.
- Motor capacity variation
  Responds with motor capacities other than the standard
- START TIME/ SHOCK TIME modification
  It can be modified from standard specifications
- Non-contact output type
  When inputting the Shock Relay output into the programmable controller (sequencer), this is the optimum output.
- Self-holding type
  The standard automatic reset type can be changed to the self-holding type.
- Includes reverse driving function type
  If the motor is overloaded, it will automatically repeat forward/reverse drive.
- Includes dual output signals type
  Other than an output signal to stop the motor, an alarm signal is available.
- Includes soft start function type
  Includes a function to soften the shock that occurs when the motor starts.

Number of wire(s) to pass through the CT hole

Referring to the basic connection diagram and the chart below, pass the motor's power line through the CT (current transformer).

Rated motor current	No. of times wire passes through the CT	Current reading convert indicator
More than 0.3A, less than 0.5A	3 times	3 times one third
More than 0.5A, less than 1.0A	2 times	2 times one half
More than 1.0, up to 2.0A	1 times	unnecessary

Notes:
1. In the case the number of times the wire passes through the CT is 3 or 2 times, read the indicator scale one third or one half respectively.
2. The CT through hole diameter is 6.5 mm. Use the wire which can pass the CT with necessary turns.

Notes on usage:

1. The output relay is excited (ON) when the Shock Relay detects overload and is operated.

Model No.

TSBSM02

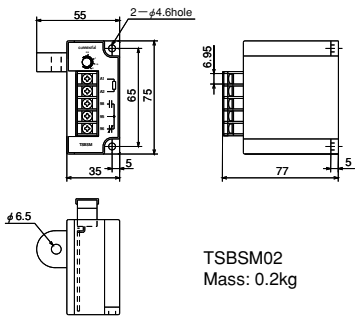
- TSBSM02 — Shock Relay
- SM — SM Series
- 02 — Load current (maximum set current value) 02…2A

Standard specifcations

Function \ Model		TSBSM02
Motor capacity ※1	Three phase 200V	60～200W
	Single phase 200V	60～200W
	Single phase 100V	25～90W
Load current setting※3		0.5～2.0A
Start time		1.5s (fixed)
Shock time		1.0s (fixed)
Current detection system		One phase conversion type
Output relay	Contact capacity	1c contact 3A AC250V cos ϕ =1 Minimum applicable load DC10V, 10mA ※2
	Operation	Automatic reset
	Operation timing	Output when operating
	Life span	100,000 times
Operation power		AC90～250V　50/60Hz
Ambient operating temperature		−10～50℃

Notes:
1. Motor capacity is just for reference. Select with the actual load current value.
2. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.
   As for the input to PLC, it is recommended to drive the relay coil for minute current by relay signal of Shock Relay at first, then input this relay contact to PLC.
3. Current and time setting ranges can be set within the warranty range, but not the upper or lower level of setting volume.

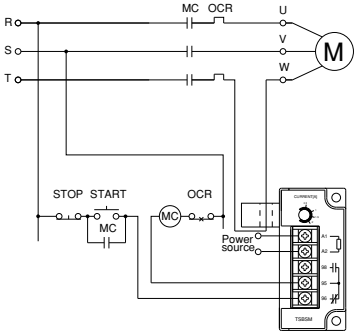
Outline dimensions for reference



TSBSM02
Mass: 0.2kg

The above dimensions are subject to change without notice, so please contact Tsubaki Emerson to confirm the dimensions before designing.

Basic connecting diagram



SAFCON

Control Devices

Mechanical

Torque Keeper, Mini Keeper

Torque Keeper

Features

The friction facings of the slipping clutch and brake are made with special fine chemical fibers.

Ministry of Economy, Trade and Industry picks for Good Design Award product

Long life

Special fine chemicals are used for friction facings, so much longer life can be expected when compared to other types of brake lining.

Slipping torque stability

Torque fluctuation is very small, so stable torque can be transmitted.

Constant torque repeatability

Even with high frequent repeated slippage, stable torque is transmitted consistently.

Lightweight

Due to the aluminum AF flange, the Torque Keeper is light in weight.

Compact

Its special design makes for significant space savings. The Torque Keeper is more compact than other braking devices.

Wide torque range

Each size has a wide torque range.

Easy torque setting

Torque indicators make torque setting easy.

Ease of operation

Operation is easy due to the easy to use adjusting nut.

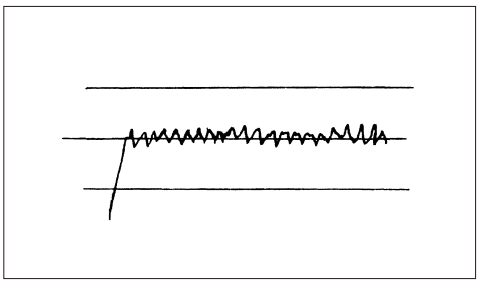
Greasing unnecessary

Grease and cooling are not needed.

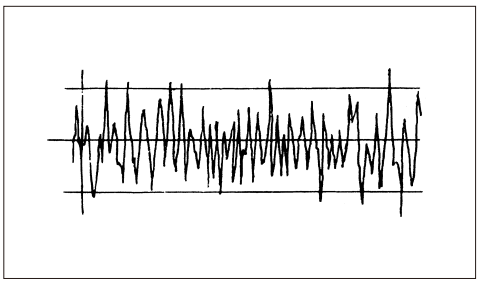
Quick finished bore delivery

Finished bores can be made for quick delivery.
(Refer to page 109 for details)

Torque Keeper

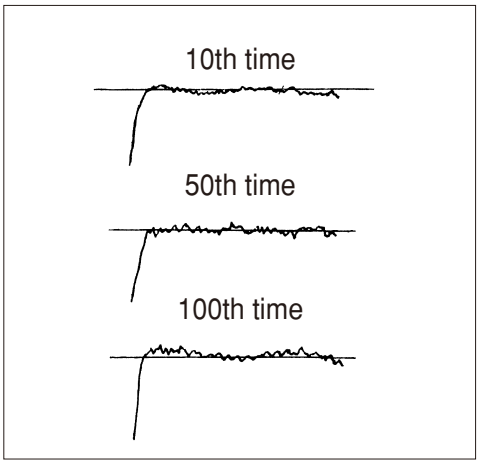


Standard brake



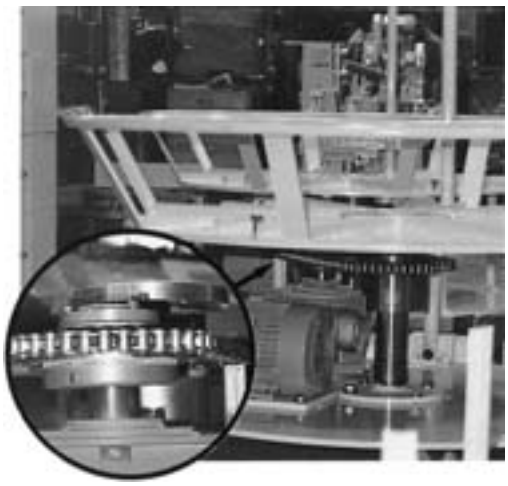
Compared to our ordinary products

Intermittent slip



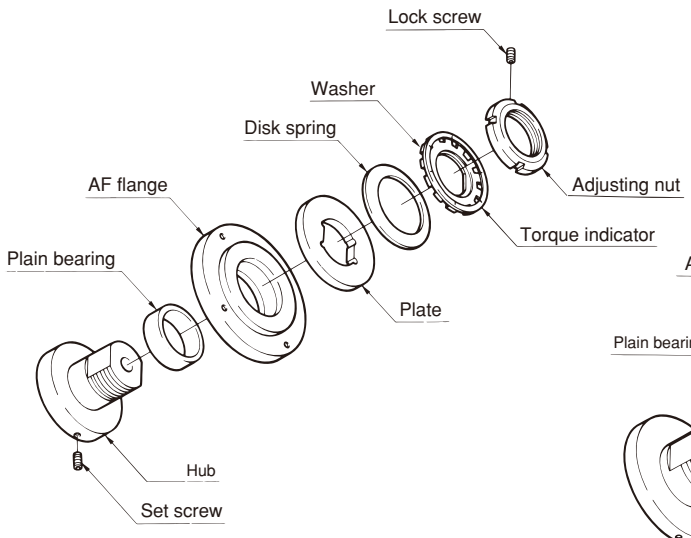
Long life/ Stable/ Easy to operate!

Our brakes have embarked on a new era of the fine chemical fiber. By using these fine chemical fibers, the Tsubaki Emerson Torque Keeper can achieve a longer product life than that of the conventional type of brake lining. This brand new type of Torque Keeper brake has been designed with an abrasion resistance, the use of a torque indicator, weight savings and other aspects that make it easy to use. For the driving of each conveyor's accumulation and brakes for automatic machineries as well as others, we recommend Tsubaki Emerson's Torque Keeper for all industrial equipment brake mechanisms.

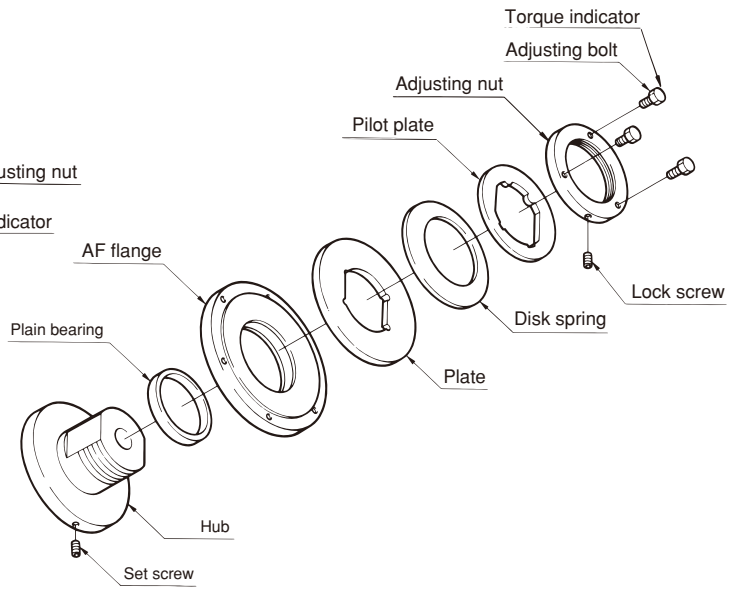


Construction

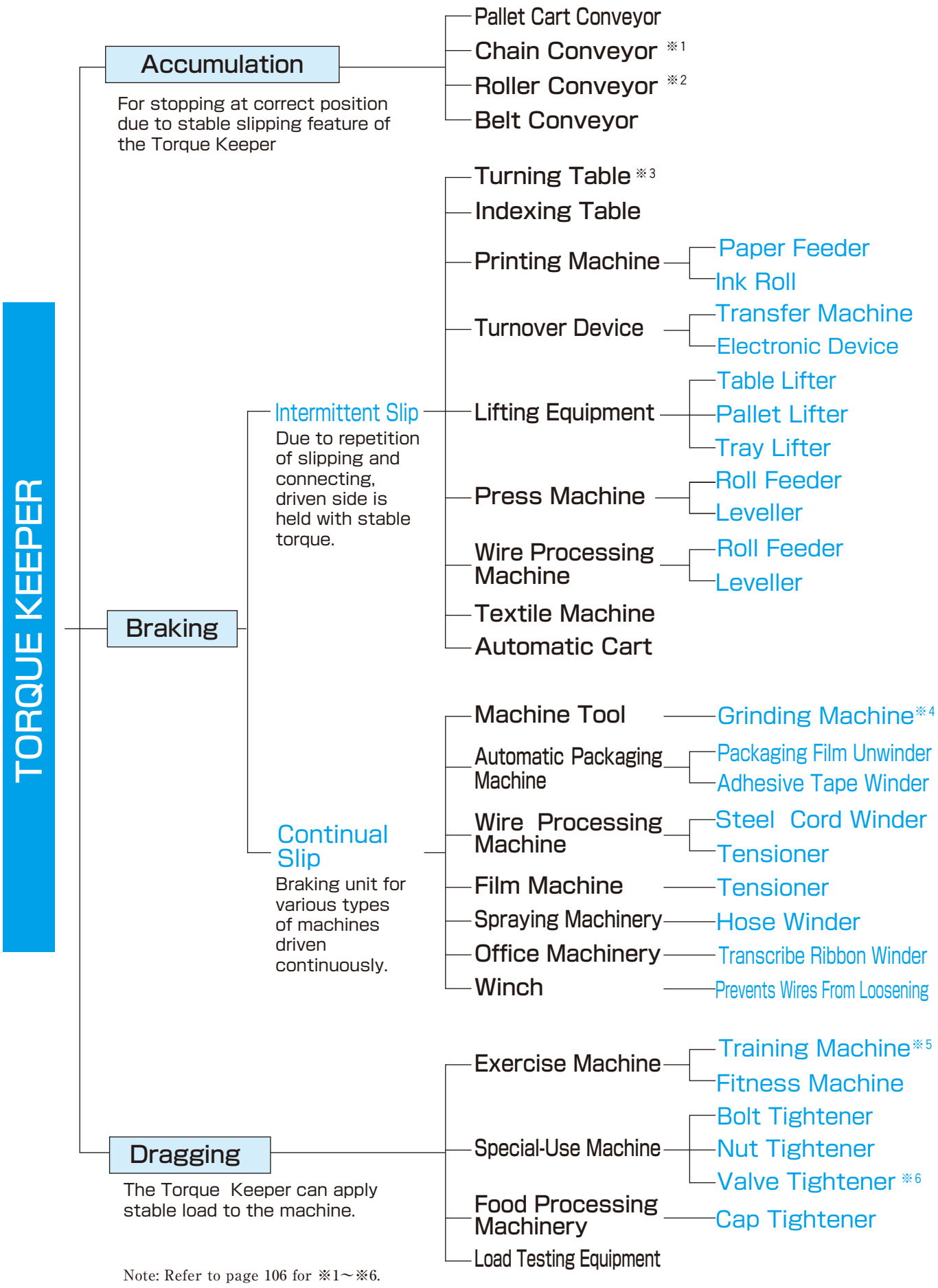
TFK20 • 25 • 35



TFK50 • 70



Purpose and Machine Type

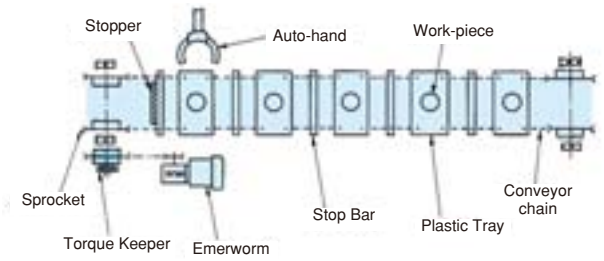


Note: Refer to page 106 for ※1～※6.

Applications

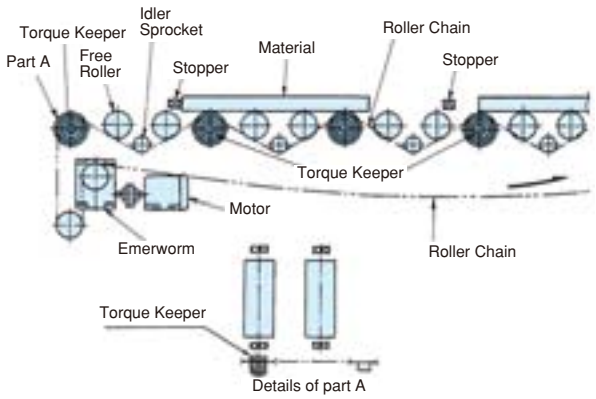
—Accumulation—

(FOR LOADING/UNLOADING) ※1



Chain Conveyor
When the stop bar contacts the stopper, the Torque Keeper slips and the conveyor stops.
When the stopper is unset, the Torque Keeper connects and the conveyor resumes operation.

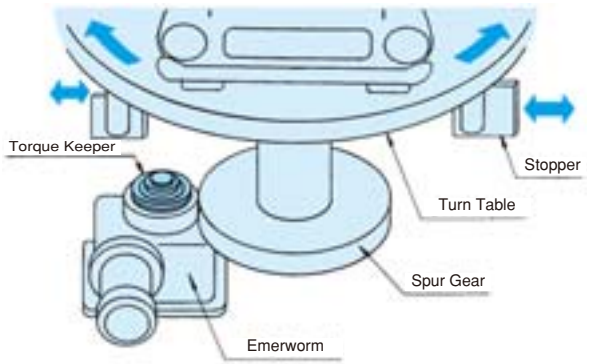
(FOR INTERMITTENT SLIP) ※2



Roller Conveyor
When the roller chain is moving, if the material contacts the stopper, the nearby Torque Keeper slips and the material will be stopped.
After releasing the stopper, the Torque Keeper will be connected and the material will continue moving.

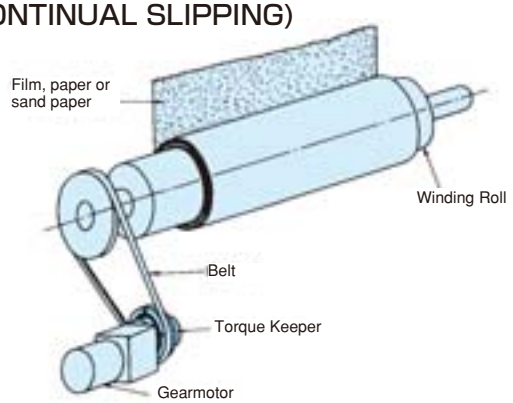
—Braking—

(INDEXING SLIPPING) ※3



Turn Table for Parking System
At the parking station the car is rotated in the exit direction on the turn table. When the turn table comes to the correct position, it will be stopped by the stopper. The slipping of the Torque Keeper protects the drive unit from damage.

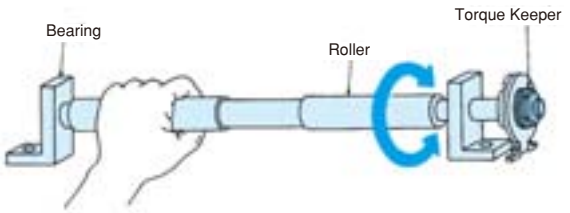
(CONTINUAL SLIPPING) ※4



Winding of Film, Paper or Sandpaper
The gear motor winds the film, paper or sand paper through the Torque Keeper. In this case, the Torque Keeper is slipping under low rpm, so it can apply stable tension.

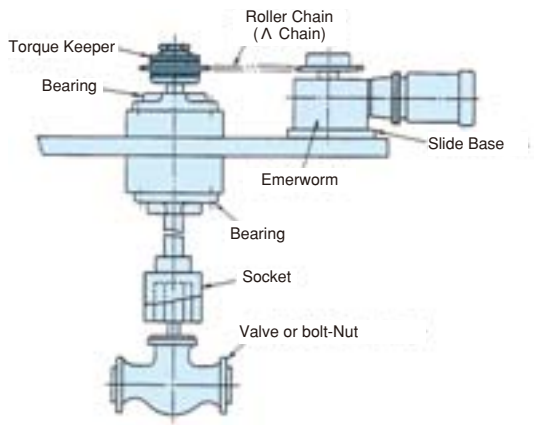
—Dragging—

(FOR LOAD) ※5



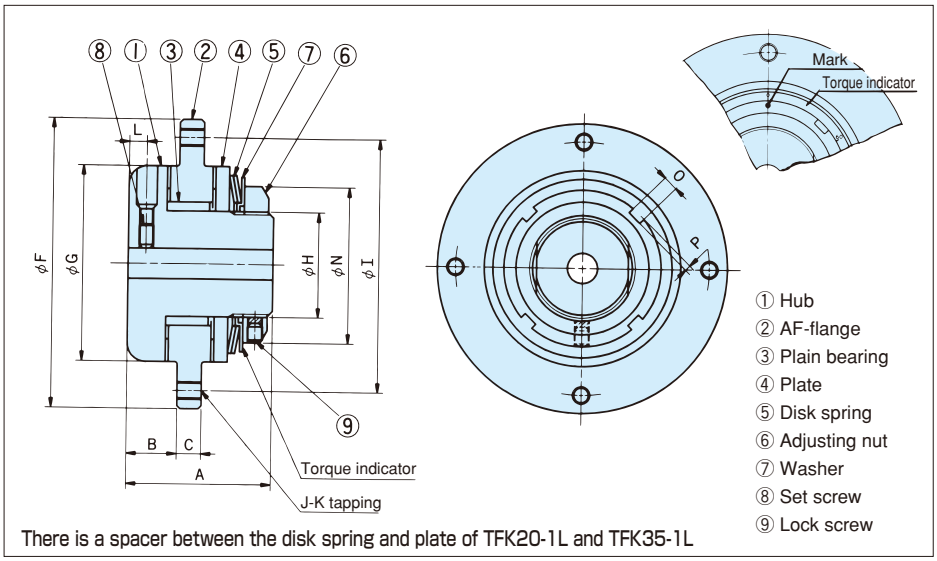
Wrist Exerciser
The wrist can be exercised by the rotating roller. The Torque Keeper applies the load to the roller through the stable slipping torque.

(FOR TIGHTENING) ※6



Tightening Machine
The bolt, nut and valve are tightened by the stable torque of the Torque Keeper.

TFK20·25·35



There is a spacer between the disk spring and plate of TFK20-1L and TFK35-1L

Unit : mm

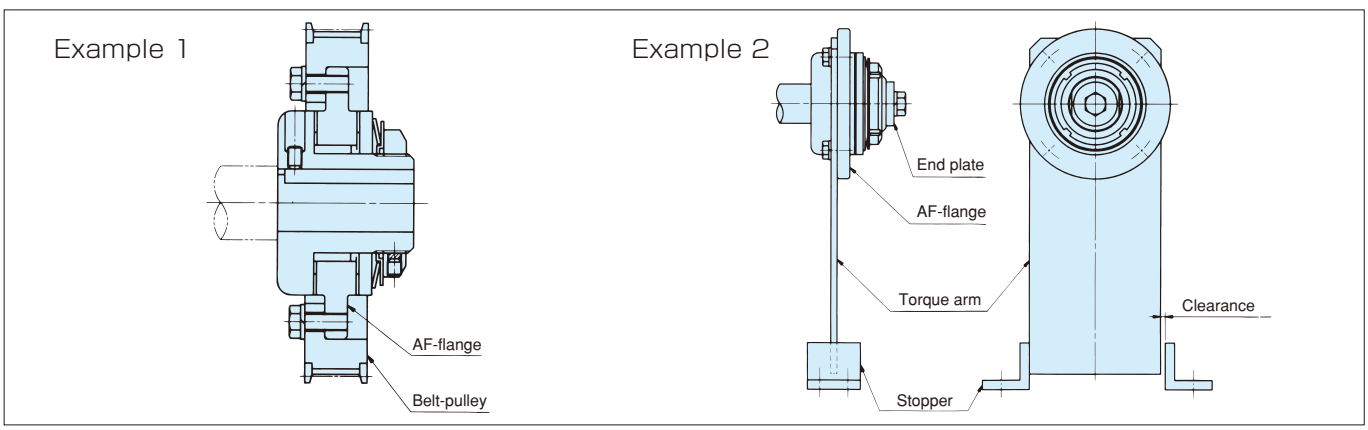
Model No.	Setting torque range N·m {kgf·m}	Rough bore dia.	Max. bore dia.	Dimensions														Weight
				A	B	C	F (h7)	G	H	I PCD	J-K No.-dia.	L	N	O	P	Adjusting nut dia. × pitch	Set screw	kg
TFK20-1L	0.59～1.18 {0.06～0.12}	7	14	37	13.3	7	84	50	24	70	4-M6	5	38	5	2	M24×1.0	M5	0.56
TFK20-1	1.76～5.88 {0.18～0.6}																	
TFK20-2	3.92～11.8 {0.4～1.2}																	
TFK25-1L	1.18～4.12 {0.18～0.42}	10	22	48	16.8	8	96	65	35	84	4-M6	6	52	5	2	M35×1.5	M5	0.76
TFK25-1	3.92～16.7 {0.4～1.7}																	
TFK25-2	7.84～32.3 {0.8～3.3}																	
TFK35-1L	5.88～11.8 {0.6～1.2}	17	25	62	19.8	8	120	89	42	108	4-M6	7	65	6	2.5	M42×1.5	M6	1.5
TFK35-1	11.8～44.1 {1.2～4.5}																	
TFK35-2	20.6～89.2 {2.1～9.1}																	

Note: 1. All rough bore types are in stock.
2. A Lock screw is supplied with the Torque Keeper.

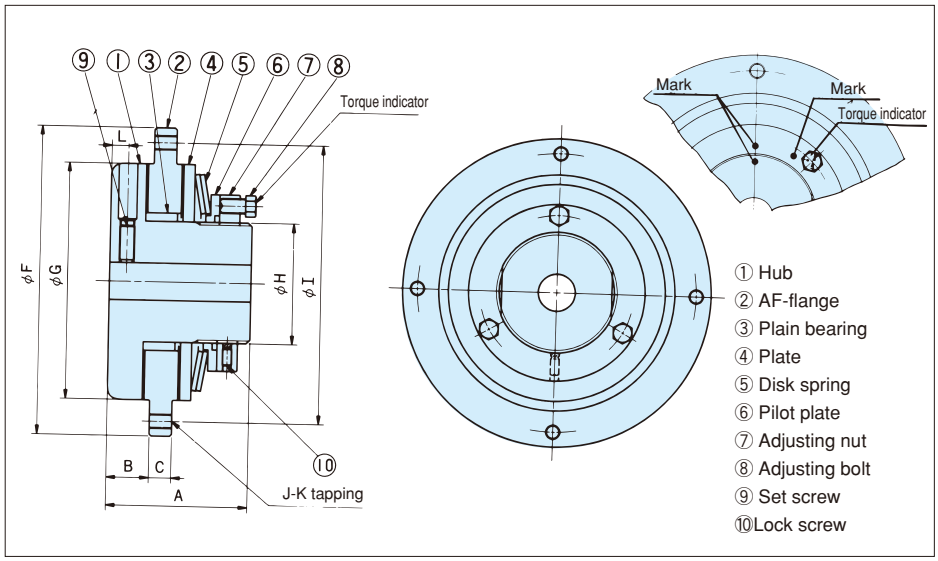
Installation

1. When installing the belt-pulley, sprockets etc, fix the outside diameter (dimension F) of the AF-flange and spigot facing with a bolt tightly. (Example 1)
The sprocket minimum number of teeth to be shown is on page 108.
The recommended tolerance of the spigot facing is H7 or H8.

2. When installing the torque arm, fix it to the AF flange with bolts tightly.
Also, the tip of the torque arm should be supported in the rotational direction only.
There should be sufficient free movement for axial direction. (Example 2)



TFK50・70



Unit : mm

Model No.	Setting torque range N·m {kgf·m}	Rough bore dia.	Max. bore dia.	Dimensions												Weight
				A	B	C	F (h7)	G	H	I PCD	J-K No.-dia.	L	Adjusting nut dia. × pitch	Adjusting bolt dia. X pitch	Set screw	kg
TFK50-1L	11.8～29.4 {1.2～3.0}	20	42	76	22.8	12	166	127	65	150	4-M8	9	M65×1.5	M8×1	M8	4.0
TFK50-1	28.4～125 {2.9～12.8}															
TFK50-2	52.9～252 {5.4～25.7}															
TFK70-1L	29.4～51.8 {3.0～7.2}	30	64	98	24.8	12	216	178	95	200	6-M8	10	M95×1.5	M10×1.25	M10	9.4
TFK70-1	69.6～341 {7.1～34.8}															
TFK70-2	134～650 {13.7～66.3}															

Note: 1. All rough bore types are in stock.
2. A Lock screw is supplied with the Torque Keeper.

Minimum number of sprocket teeth

Model.No	Sprocket						
	RS35	RS40	RS50	RS60	RS80	RS100	RS120
TFK20	32	25					
TFK25	35	28	23	20	16		
TFK35		△33 (34)	28	24	19	16	14
TFK50		45	△37 (38)	△31 (32)	24	20	18
TFK70			△47 (48)	△39 (40)	△31 (32)	25	22

Note: 1.The roller chain which does not require lubricating oil is recommended.
2.△ denotes non-standard A-type sprocket needs a space.In case of using standard sprockets, please use the sprocket in ( ).

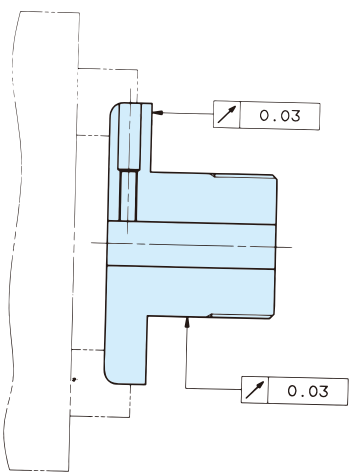
Model No.

TFK35-1-25J-2.5

- Size
- No. of disk springs
  - 1…1pc
  - 2…2pcs
  - 1L…weak spring
- Bore diameter (No symbol if there is no finished bore)
- Keyway type (J: New JIS normal type, E: Old JIS 2nd grade , No symbol: special keyway)
- Set torque (Unit: kgf.m, No symbol if there is no torque setting)

Bore Finishing

When bore finishing, chuck the outside diameter of the hub as per the following instructions and align the centering.
If the centering is bad, there is a possibility of not stable slipping torque due to abnormal run out of friction facing.



The finished bore Torque Keeper TFK

Finished bore products can be made for quick delivery

■Finished bore and keyway

The finished bores of TFK20～TFK70 have been standardized

■Finished bore sizes chart

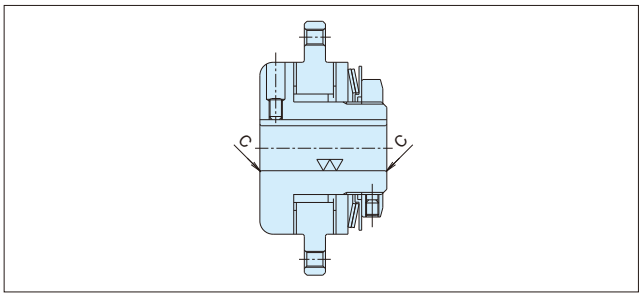
Unit : mm

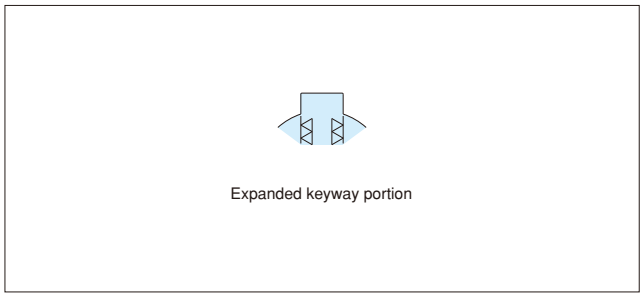
Torque Keeper Model No.	Finished bore size
TFK20-1L	10,11,12,14
TFK20-1	
TFK20-2	
TFK25-1L	12,14,15,16,17,18,19,20,22
TFK25-1	
TFK25-2	
TFK35-1L	19,20,22,24,25
TFK35-1	
TFK35-2	
TFK50-1L	22,24,25,28,29,30,32,33,35,36,38,40,42
TFK50-1	
TFK50-2	
TFK70-1L	32,33,35,36,38,40,42,43,45,46,48,50,52,55,56,57,60,63
TFK70-1	
TFK70-2	
Delivery	Ex.-Japan 4weeks by sea

Model No.

TFK35 - 1 - 25J

- TFK35 — Size
- 1 — No. of disk springs
  - 1…1pc
  - 2…2pcs
  - 1L…weak spring
- 25 — Shaft bore
- J — New JIS keyway normal type





■Chamfering and finishing

Shaft bore diameter	Chamfering size
ϕ 25 and less	C0.5
ϕ 50 and less	C1
Above ϕ 51	C1.5

■Shaft bore diameter and keyway specifications

- Shaft bore diameter tolerance is H7
- The keyway is new JIS (JIS B 1301-1996) "normal type"
- Set screws come delivered with the product

Selection

When using the Torque Keeper with a human transport device or a lifting device, install a suitable protection device on that equipment for safety purposes.
Otherwise an accident resulting in death, serious injury or damage to the equipment may occur due to a falling accident.

1. Decide the conditions from the table below in accordance with your application (see page105). Determine the size from the T-N curve graphs on the next page.

Application	Conditions	Size
Accumulation	Determine the following for the Torque Keeper of each conveyor: ① Slip torque ② Slip rpm ③ Slip time (conveyor stop time) ④ Connection time (conveyor drive time) ⑤Operating time per day	Determine a size for which the slip torque and rpm is within the allowable range (below the curve) on the T-N curve graph. When the slip time is longer than the connection time, and the time used per day exceeds eight hours, we recommend that it be operated within the ▭ area of the T-N curve graph.
Braking	Determine the following for the Torque Keeper of each machine: ① Brake torque ② Slip rpm ③ Slip time (brake operating time) ④ Connection time (time when brake not operated) ⑤ Operating time per day Note: Items ③ and ④ are not necessary in case of continual slipping.	Determine a size for which the brake torque and rpm is within the allowable range (below the curve) on the T-N curve graph. When the slip time is longer than the connection time, and the operating time per day exceeds eight hours, we recommend that it be operated within the ▭ area of the T-N curve graph.
Dragging	Determine the following for the Torque Keeper of each machine: ① Slip torque ② Slip rpm ③ Slip time ④ Connection time ⑤ Operating time per day	Determine a size for which the slip torque and rpm is within the allowable range (below the curve) on the T-N curve graph. When the slip time is longer than the connection time, and the operating time per day exceeds eight hours, we recommend that it be operated within the ▭ area of the T-N curve graph.

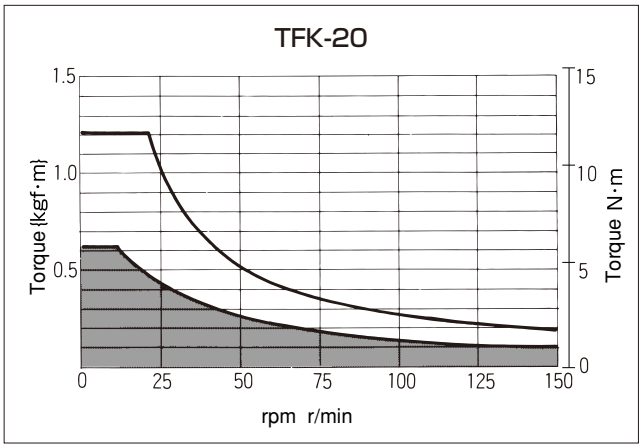
2. Verify that the shaft bore range of the chosen Torque Keeper conforms with the shaft diameter to be installed.
3. Setting the slip torque:
   Each Torque Keeper is set at a value that is 50% of the maximum set torque range (see pages 107, 108). The torque curve will be included with the unit when it is delivered. This 50% torque is called the "zero point" and it is the basis for setting the slip torque.
   For details, see the section, "Handling Part 2" on page 112.

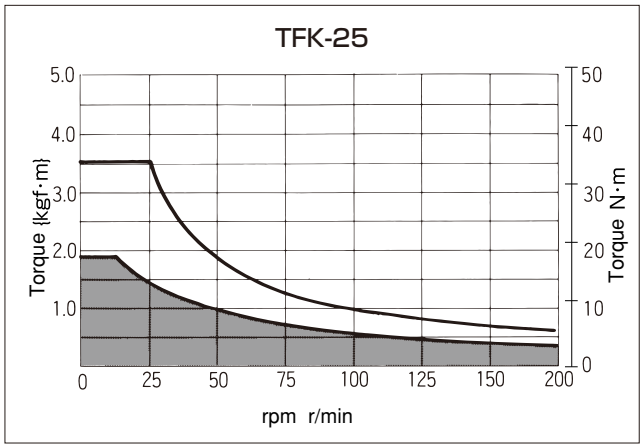
Points of caution regarding selection

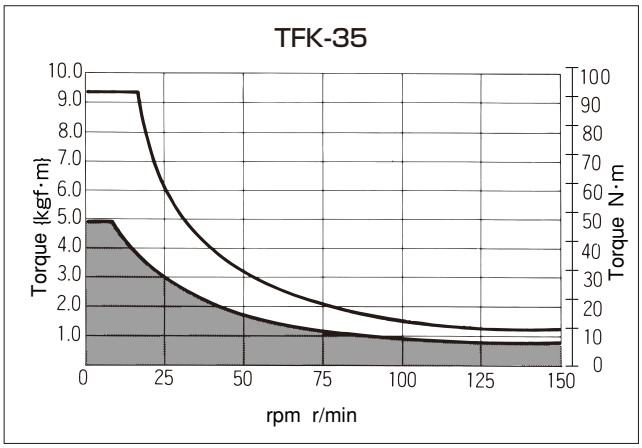
1. Do not allow water or oil to get onto the friction surface. This will cause the torque to drop and unstable slip torque will result.
2. The T-N curve graph is intended for use when the ambient temperature is below 40℃. Please contact TEM when the ambient temperature is higher than this.
3. Please contact TEM when the slip torque for the shaft diameter to be used is smaller than the setting torque range of the Torque Keeper.

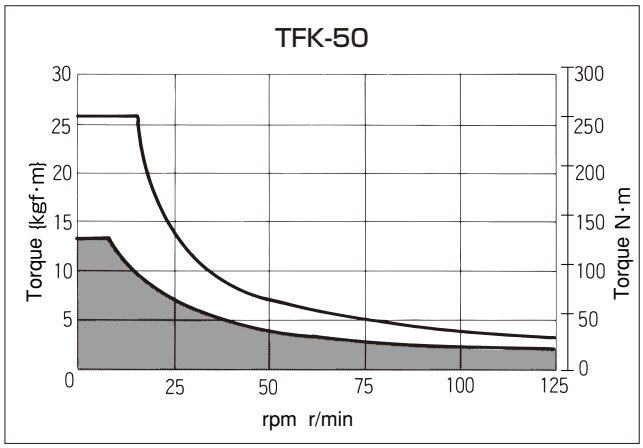
T-N Curve

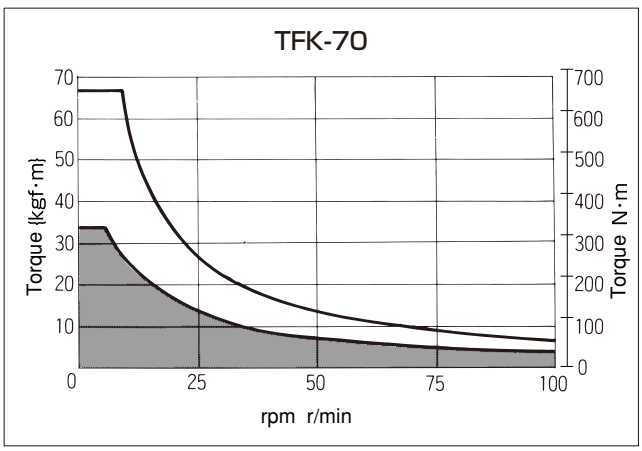
{ } for reference











Note: The T-N curve graph is based on the allowable temperature range of the Torque Keeper. If a more stable slipping torque is necessary, we recommend that it be operated within the ▭ area.

Handling Part 1

1. All Torque Keeper units are shipped with rough bores.
   Finish a shaft bore in the hub after disassembly.
   Refer to page 108 regarding shaft bore finish.
2. Be careful not to mix up parts when disassembling two or more Torque Keepers. When assembling, be sure to use the original parts. If parts are mixed up, the slip torque will not match the torque curve delivered with the unit.
3. Be sure that any toothed belts or roller chains, etc., are not over-tensioned when using the Torque Keeper. Unstable slip torque will result if more than the required tension is applied.

Handling Part 2

Each Torque Keeper is set at a value that is 50% of the maximum set torque range (see pages 107, 108). The torque curve will be included with the unit when it is delivered. This 50% torque is called the "zero point" and it is the basis for setting the slip torque.

To set the slip torque of TFK 20, 25 and 35, tighten the adjustment nut with a hook spanner wrench. To set the slip torque of TFK 50 and 70, tighten the three adjustment bolts with a wrench. Refer to page 113 to determine the zero point.

Setting the slip torque

TFK 20, 25 and 35

(1)When the required slip torque is over the zero point, tighten the adjustment nut to the angle required in accordance with the attached torque curve. This operation is facilitated by the torque indicator (which shows the angle) and match marks.

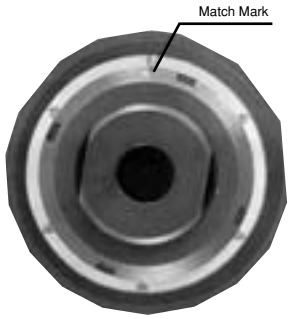
(2)When the required slip torque is below the zero point, loosen the adjustment nut beyond the point required and then tighten it to the desired angle, in accordance with the attached torque curve.

Example: Set to a slip torque −30° from the zero point.

①Loosen the adjustment nut to −60° from the zero point.

②Tighten the adjustment nut from −60° to −30°

TFK20・25・35 Torque indicator



TFK 50 and 70

(1)When the required slip torque is over the zero point, tighten the three adjustment bolts to the angle required in accordance with the attached torque curve. This operation is facilitated by the torque indicator (which shows the angle) and match marks.

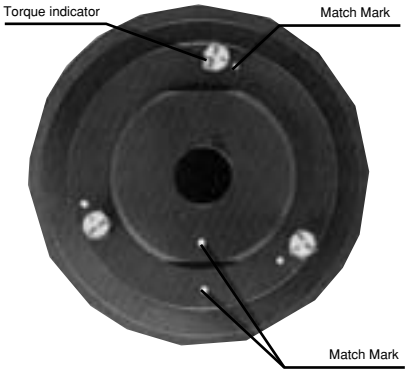
(2)When the required slip torque is below the zero point, loosen the three adjustment bolts beyond the point required and then tighten them to the desired angle, in accordance with the attached torque curve.

Example: Set to a slip torque −60° from the zero point.

①Loosen the adjustment bolts to −90° from the zero point.

②Tighten the adjustment bolts from −90° to −60°

TFK50・70 Torque indicator



(Caution) When initially setting the Torque Keeper or when changing the setting during operation, we recommend running the machine for two or three minutes to run in before normal operation. This will allow you to obtain a more stable slip torque. Break-in as follows in accordance with the slip torque setting.

(1)When the slip torque is below the zero point:

①Run in the machine at zero point torque for two to three minutes.

②Set the slip torque as explained above and then enter normal operation.

(2)When the slip torque is above the zero point:

①Set the slip torque as explained above.

②Run in the machine for two to three minutes.

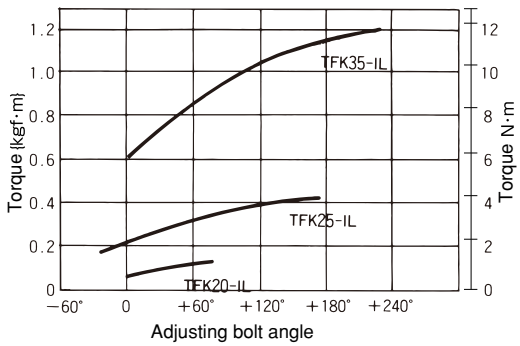
③Return the adjustment nut or bolts to the zero point.

④Set the slip torque again and then begin normal operation.

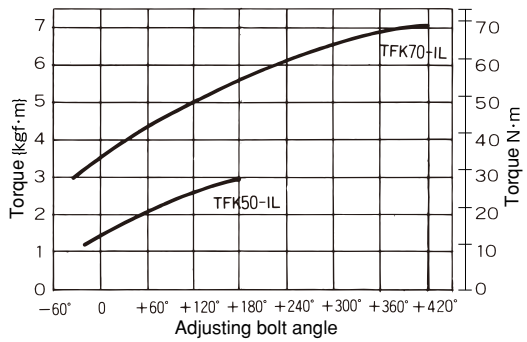
Torque Curve

Weak Spring Type

TFK20-IL・TFK25-IL・TFK35-IL

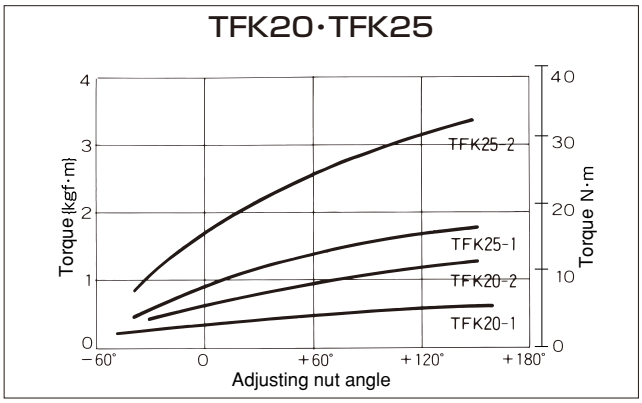


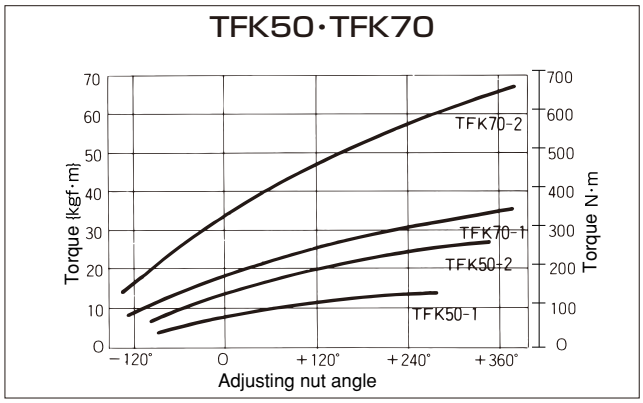
TFK50 - IL・TFK70 - IL

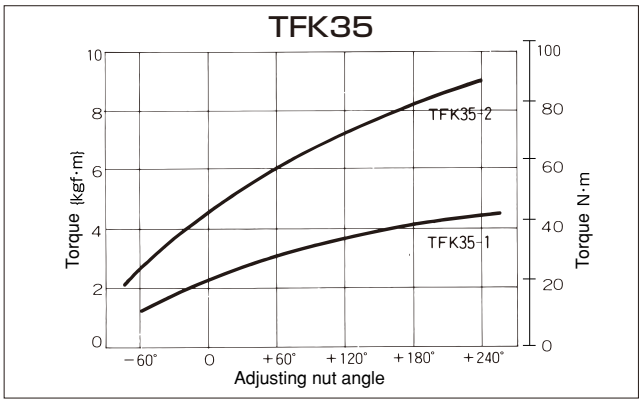


Torque Curve

Standard Spring Type { } for reference







Note: 1. Indicator 0 on torque curve shows 50% of maximum torque.
2. Each torque curve is an example. Refer to the attached torque curve of the actual unit.

Finding the zero point

After finishing the shaft bore and re-assembling the unit, determine the zero point as explained below:

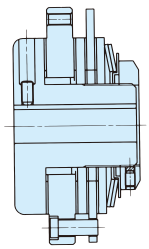
TFK 20, 25 and 35

1. During re-assembly, match the "0" on the torque indicator with the position of the set screw on the hub (part ⑧ on page 107). (Do not allow it to be positioned 180° in the opposite direction.)
2. Hand-tighten the adjustment nut and then use a hook spanner wrench to further tighten it until the match mark reaches the "0" position on the torque indicator.

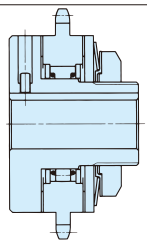
TFK 50 and 70

1. Tighten the adjustment nut and align it with the match mark on the hub.
2. Hand-tighten the bolts and then use a wrench to further tighten them until the "0"position on the indicators align with the match marks.

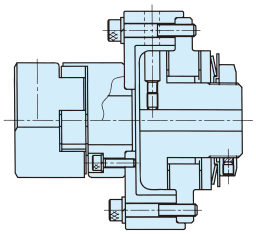
Special Type Torque Keeper



Model: TFK35W-2
(multiple disc type Torque Keeper)
Specifications: Bore dia. Φ25
Setting torque range 45～196N·m{4.6～20kgf·m}



Model: TFK35LD-1
(Built-in Cam Clutch type Torque Keeper)
Specifications: Max. bore dia. Φ25
Setting torque range
11～43N·m{1.1kgf·m～4.4kgf·m}
Main applications: Machines in which it is necessary to loosen bolts, nuts, or valves, etc., after tightening them with a fixed torque.



Model: TFK25-1C
(coupling type Torque Keeper)
Specifications: Max. bore dia. Torque Keeper side Φ22
Coupling side Φ29
Setting torque range 3.92～16.7N·m
{0.4～1.7kgf·m}

Note: contact Tsubaki Emerson for more information on the special type.

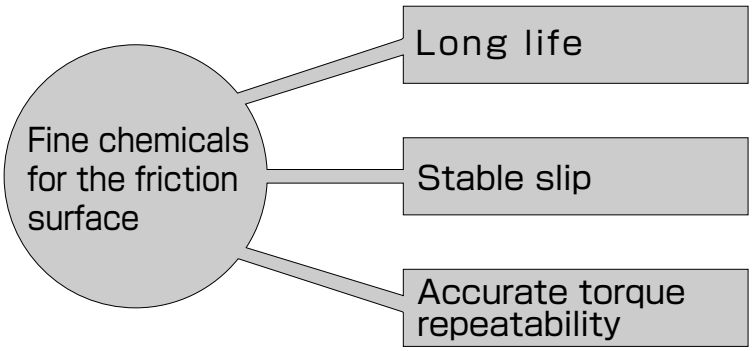
MEMO

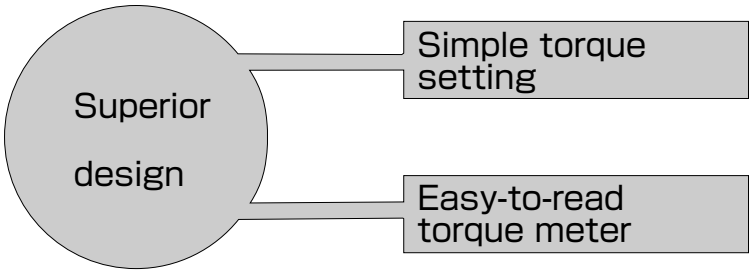
MINI-KEEPER

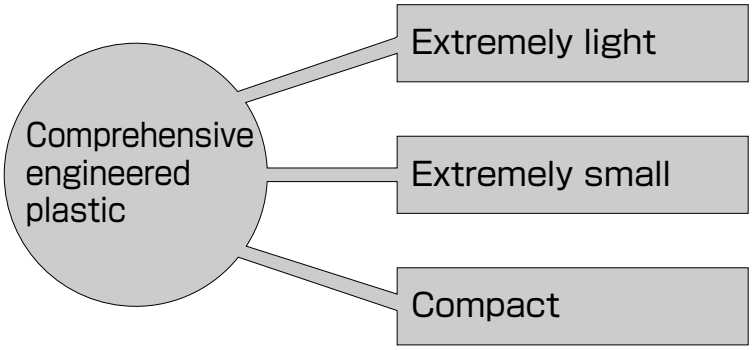
Features

Highly accurate, light and super-compact slipping clutch and brake

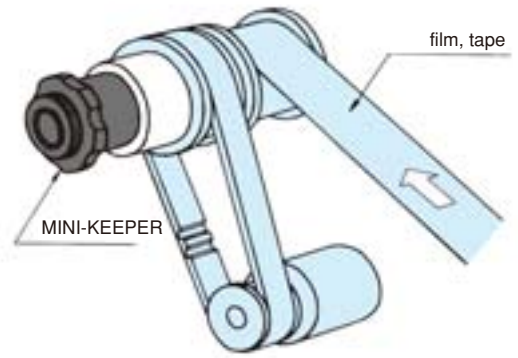
The Tsubaki Emerson MINI-KEEPER is a super-compact slipping clutch and brake, constructed from fine chemicals and engineering plastic. With the MINI-KEEPER we have achieved supreme levels of lightness, compactness, and accuracy among similar devices. The MINI-KEEPER is ideal for braking, accumulating, and dragging applications in OA equipment and precision machinery.



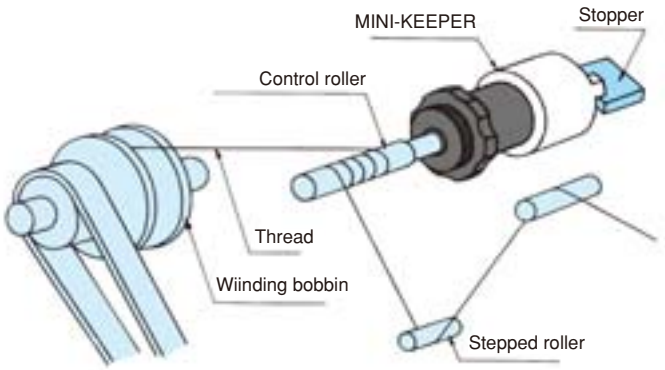




Application Examples



The MINI-KEEPER slips and maintains constant tension on the tape (or film, etc.).
It is ideal for braking in the winding and unwinding.



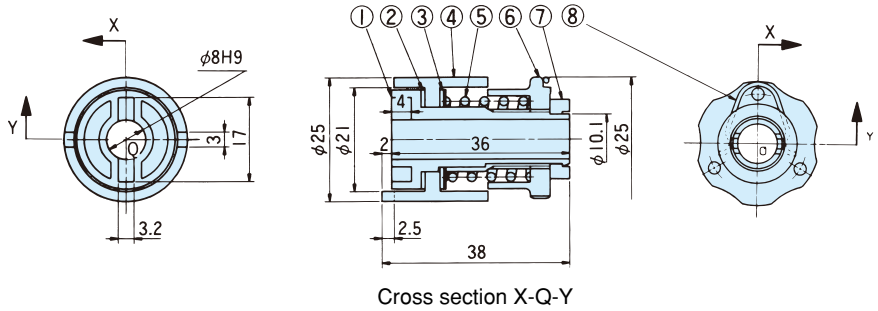
The MINI-KEEPER is installed on the tension controller in previous stage of the winding roll.
It provides stable slip torque and maintains stable tension on the thread.

<Other potential applications>

Thermal printer
Paper feeder
Plotter
Copier
Textile machine
Wire cutter
Film processing equipment
Accumulation conveyor
Automatic packaging machine
Coil winding machine
Labeler
Barcode printer
Electronic device manufacturing equipment
Various robots
Ribbon printer
Facsimile

Dimensions

MK-08



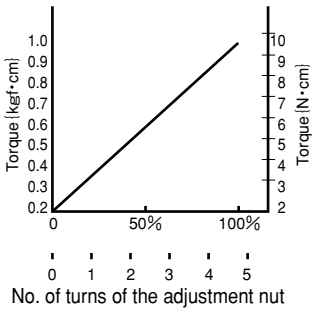
Cross section X-Q-Y

Setting torque range
1.96～9.80N·cm
{0.2～1.0kgf·cm}
Maximum slip rpm
Refer to "T-N Curve" on the next page

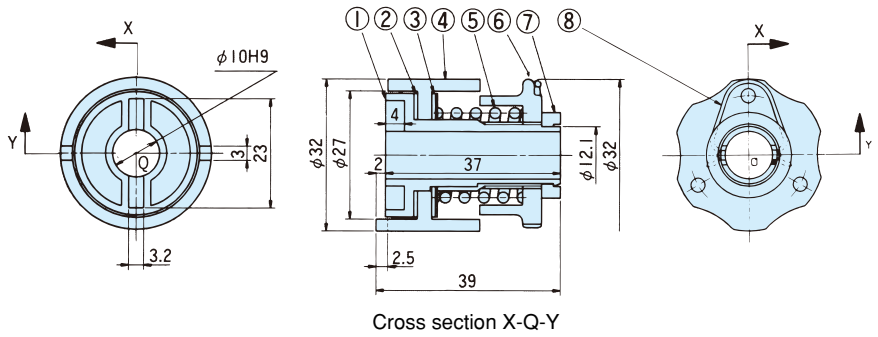
① Hub
② Friction facing A
③ Friction facing B
④ Flange
⑤ Coil spring
⑥ Adjustment nut
⑦ Stop collar
⑧ Anti-rotation clip

Torque Curves

The percentage axis indicates the percentage of maximum torque.



MK-10

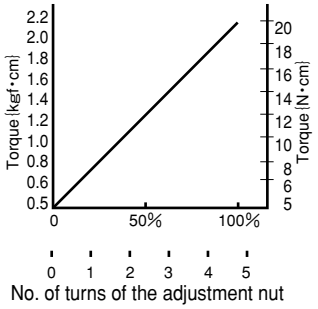


Cross section X-Q-Y

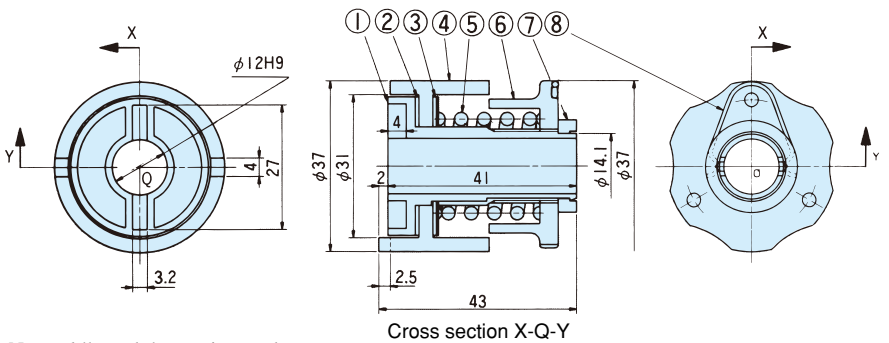
Setting torque range
4.90～19.6N·cm
{0.5～2.0kgf·cm}
Maximum slip rpm
Refer to "T-N Curve" on the next page

① Hub
② Friction facing A
③ Friction facing B
④ Flange
⑤ Coil spring
⑥ Adjustment nut
⑦ Stop collar
⑧ Anti-rotation clip

The percentage axis indicates the percentage of maximum torque.



MK-12



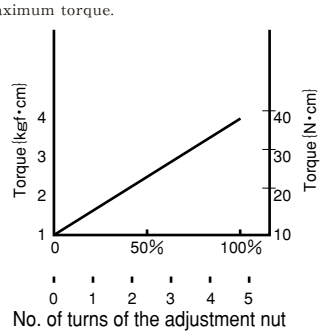
Cross section X-Q-Y

Note: All models are in stock.

Setting torque range
10.8～39.2N·cm
{1.1～4.0kgf·cm}
Maximum slip rpm
Refer to "T-N Curve" on the next page

① Hub
② Friction facing A
③ Friction facing B
④ Flange
⑤ Coil spring
⑥ Adjustment nut
⑦ Stop collar
⑧ Anti-rotation clip

The percentage axis indicates the percentage of maximum torque.



Selection

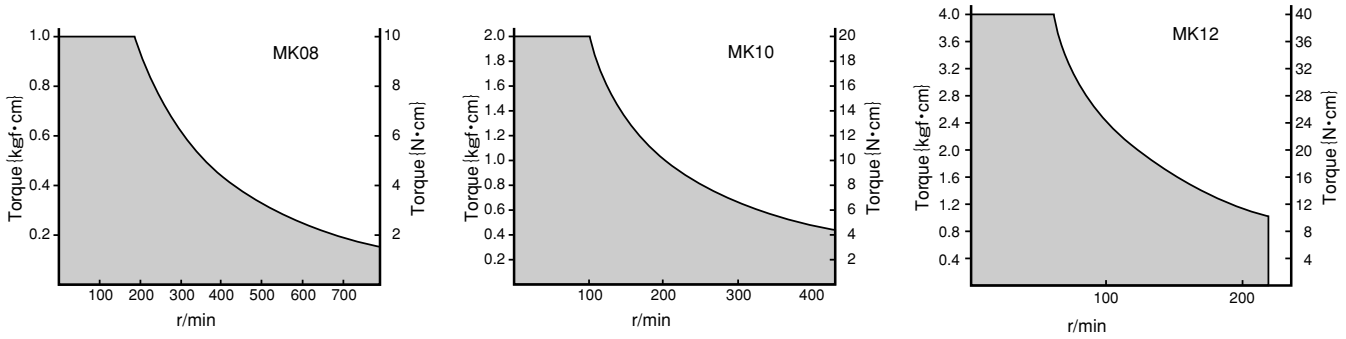
When using the MINI-KEEPER with a human transport device or a lifting device, install a suitable protection device on that equipment for safety purposes. Otherwise an accident resulting in death, serious injury or damage to the equipment may occur due to human disaster and an accidental falling.

Choose set torque and slip rpm from the ▭ part of the T-N curve graphs below.

※The T-N curve graph displays the limit value reached by heat generation during continual slip. When the slip time per one operation is short and the interval is long, it is possible to use the MINI-KEEPER in excess of the T-N value. In this case, please contact TEM for a consultation.

※Contact TEM for non-standard specifications.

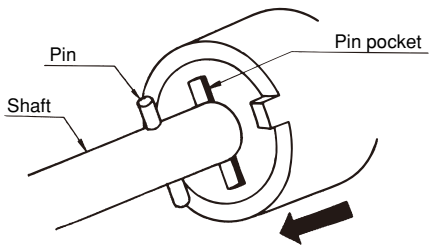
T-N Curve



Handling

Installation onto a shaft

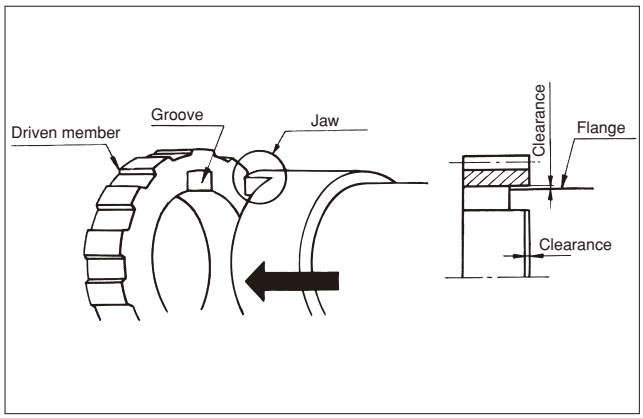
1. The MINI-KEEPER's shaft bore is already finished. We recommend a tolerance for the installation shaft dia. of h7 or h8.
2. Use the pin pocket (groove) on the end face of the hub to connect the MINI-KEEPER to the shaft. Insert the pin into the shaft, and then set them to the pin pocket as shown in the diagram below. The clearance should be about 0.5mm.



Make sure to set a clearance between pin end face, side and pin pocket.
Pin bore machining is different depending on the sort of pin.

Installation onto a driven member

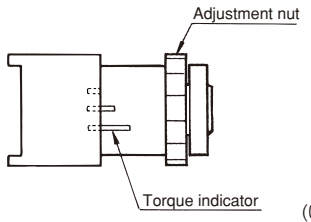
1. Use a jaw at flange to install the MINI-KEEPER onto a driven member (gear, pulley, etc.).



Cut a groove into the end face of the driven member, and slide the jaw into it. At this time, be sure to allow a clearance so that thrust and radial loads do not act on the flange end face including the jaw. The clearance should be about 0.5mm.

Torque setting

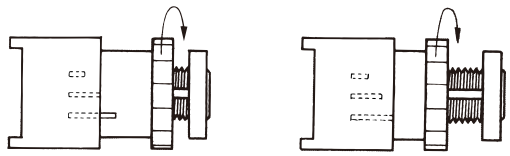
1. All MINI-KEEPERs are set at the zero point (minimum torque) before shipment. When in this condition, the scale above the periphery of the adjustment nut is as shown in the diagram below. Verify this.



(0 point, min. torque)

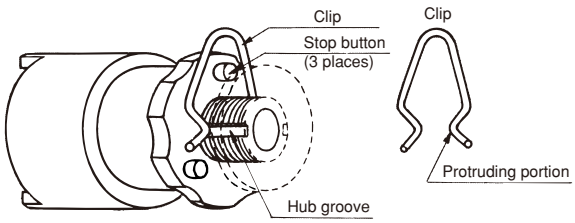
2. Set the torque by tightening the adjustment nut. Refer to the torque curve on page 117. Use the torque indicator as a guide for the torque setting illustrated below.

Make sure to verify the setting torque is appropriate with the actual unit.



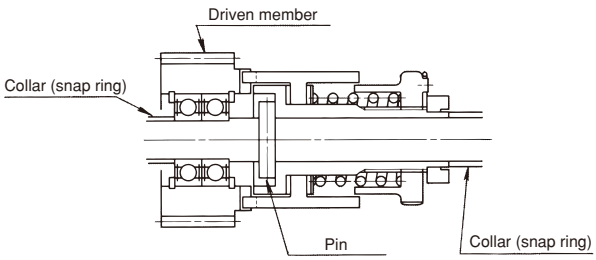
(50% of maximum torque) (100% of maximum torque)

3. After setting the torque, fix the adjustment nut to stop it from rotating. Do this by inserting the accessory clip for anti-rotating between the adjustment nut and the stop collar as shown below.
Make sure to verify the protruding portion of the clip for anti-rotating is inserted at the hub groove (both sides). Anti-rotation is made by the clip for anti-rotating hitting the stop button (convex portion) of the adjustment nut.



Note: 1. If oil or water gets into the friction facings, it will result in abnormal torque and unstable slipping torque.
2. The standard highest operating ambient temperature for the MINI-KEEPER is 40℃ max. If this will be exceeded, contact TEM.

Installation example



SAFCON

Control Devices

Electrical

Shock Monitor

Shock Monitor

(Industrial Property Right Patent No. 2796775 and others)

Features

The Shock Monitor is a power monitoring safety and control device that can detect even the minimal variations in load by monitoring input power.

1. Ideal for monitoring light loads

For a standard motor there are only minute current variations in the light load zone. Load monitoring of the device used in the light load zone is ideal for monitoring electric power variations in the proportional load.

2. Almost completely unaffected by source voltage variation

Even with a constant load, if the power supply fluctuates then current will fluctuate largely, thus making accurate load detection impossible. While the Shock Monitor is monitoring machine power it is almost completely unaffected by voltage fluctuation, so stable load detection is possible.

3. Can be used with a wide range of frequencies (5-120Hz)

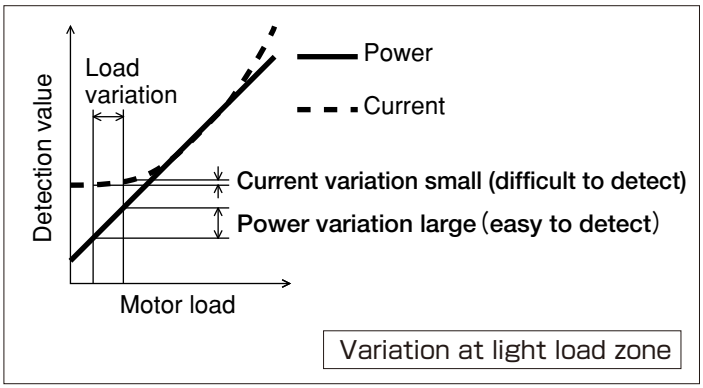
Can be used with an inverter and a servomotor drive.
(The inverter's electronic thermal is for burnout protection. Not suitable for device protection.)
※If the power source frequency exceeds 120Hz such as servo motor for machine tool main spindle, consult TEM.

4. Quick response

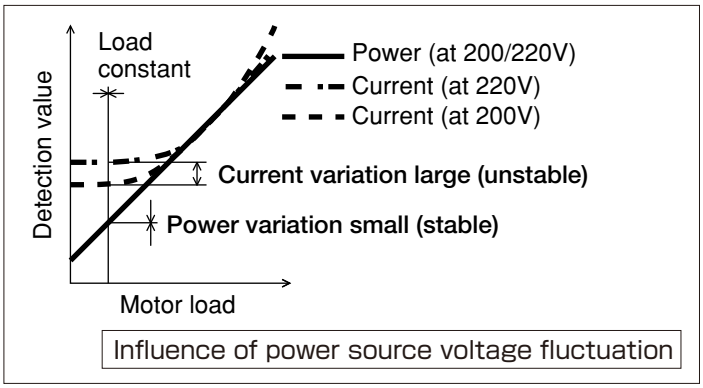
Input power is measured every 0.02s. Right after trouble happens, the signal outputs is a minimum of 0.03s.

5. Record of load state (Analog output DC0-3.0V)

The direct current voltage that is proportionate to motor input power is output, so the load condition can be recorded on the recorder.
※Only the [Basic type] TSM3000 analog output signal is DC2V±1.5V.



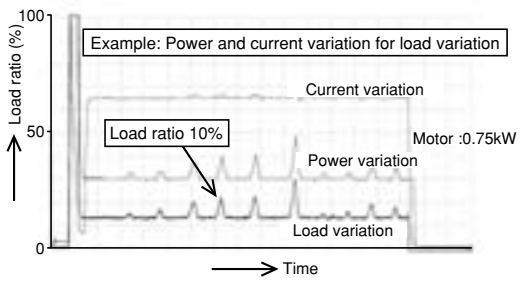
Variation at light load zone

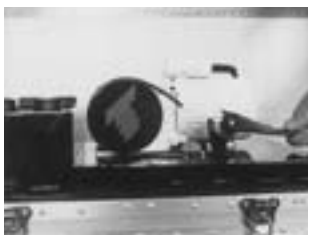


Influence of power source voltage fluctuation

Example: Power and current variation for load variation

(1) The power variation that is proportional to load variation is emerged.
(2) From the chart below we can see that with a load variation of about 10%, there is almost no change in current, while power makes remarkable change.





↑ Test equipment

New and unique applications for the Shock Monitor

Each application type has been added to the [Basic model] TSM3000 type

Our line-up of Shock Monitors fit perfectly with all kinds of applications.

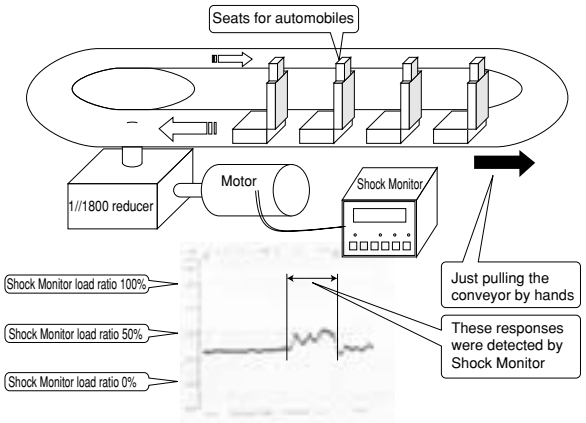
Application examples and basic operations of each type

1. [Basic type] TSM3000 type ·····
   [Economical type] TSM3000H1 type ·····For general industrial machines

The economical type has fewer functions than the basic type.
Refer to the below charts for a comparison of Shock Monitor functions.

■Damage prevention

Low speed conveyor overload protection



Key point

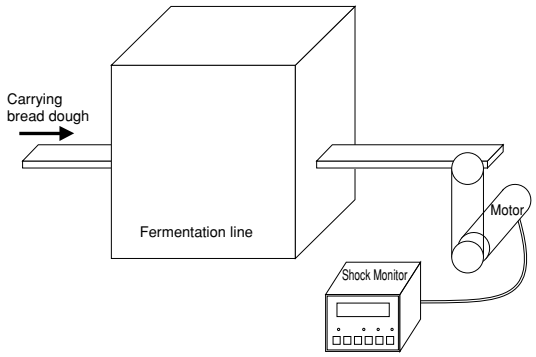
There is little current variation due to a high gear ratio, making it difficult for the Shock Relay to detect the overload, so a power detecting type Shock Monitor is the best option.

Applications

Assembly conveyor, water and sewage treatment, garbage disposal equipment conveyors, etc.

■Preventive maintenance

Bread making line lubrication maintenance



Key point

Shock Monitor detects even minute load rise due to the lack of lubrication for the chain. It then sends an alarm signal to operate the automatic lubricator.

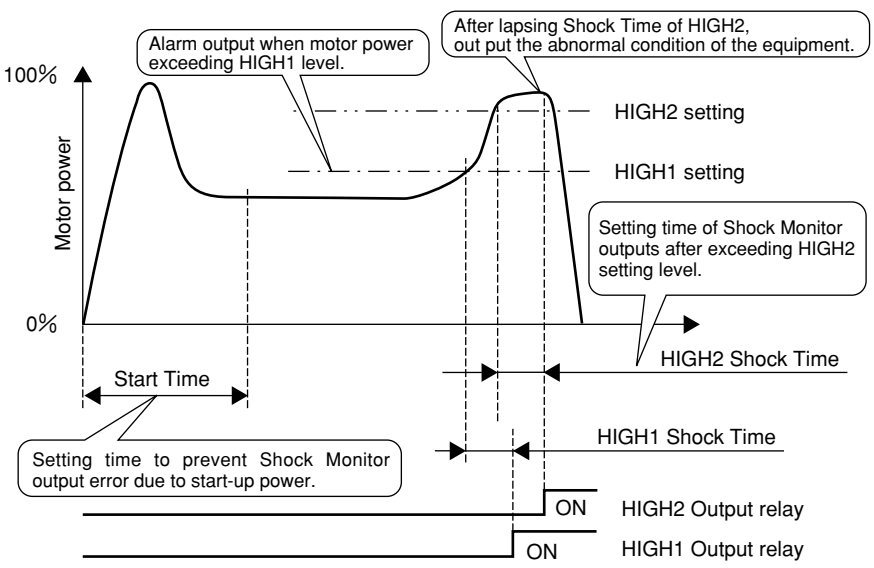
Applications

Food processing machines that operate 24 hours a day, etc.

Basic operations of the TSM3000H1

●Minute load detection is possible by electric power: Economical

Simplified setting type with fewer functions



[Features]

1) Simplified functions means easy setting.
2) Relay output has two outputs. It can be used as an alarm signal (HIGH1) and an abnormal level output (HIGH2).
3) As a set, HIGH1 and HIGH2 can be switched from the external for a maximum of 4 types. It is useful to change the setting depending on the work-piece being carried.
4) It comes with an efficient torque ※ monitoring function (20～12Hz) for when using the inverter.

※Refer to page 127, Note: ※2

Comparison on function [Basic model] and [Economical model]

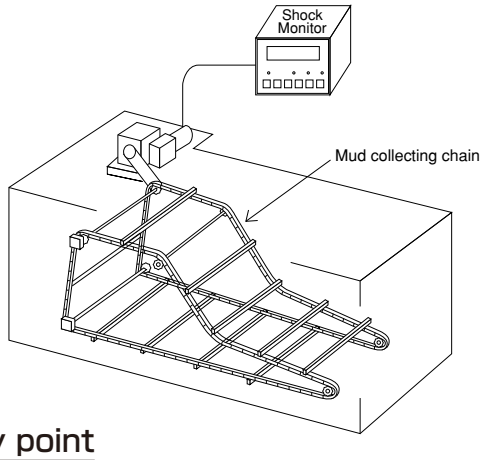
Function		Basic model	Economical model
Load detection	HIGH1	○	○
	HIGH2	○	○
	LOW	○	×
Torque monitoring function		○	○
No. of selection of detection level (No. of process to monitor)		8	4
Monitoring negative torque		○	×

Application examples and basic operations of each type

2.[Load following type] TSM3000H2 Type…For general industrial machines

■Protection for equipment which vary in efficiency

●Equipment driven by worm reducer



Key point

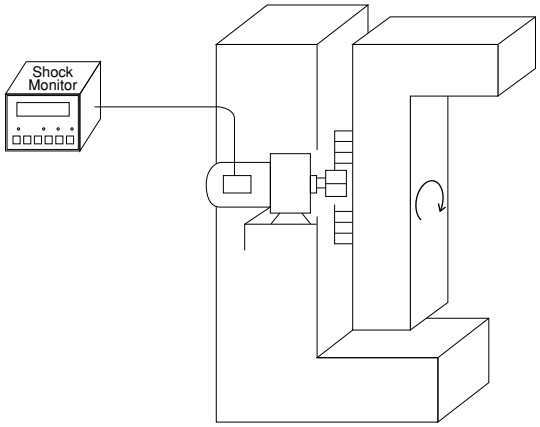
The efficiency of the reducer varies together with operating time. As well, even for equipment where the load ratio varies, it is possible to detect abnormal condition due to the load following function.

Applications

Water treatment equipment, etc.

■Protection for equipment which periodically varies in load.

●Swivel



Key point

Even if the load of the equipment varies during 1 rotation, it is possible to detect abnormal conditions due to the load following function.

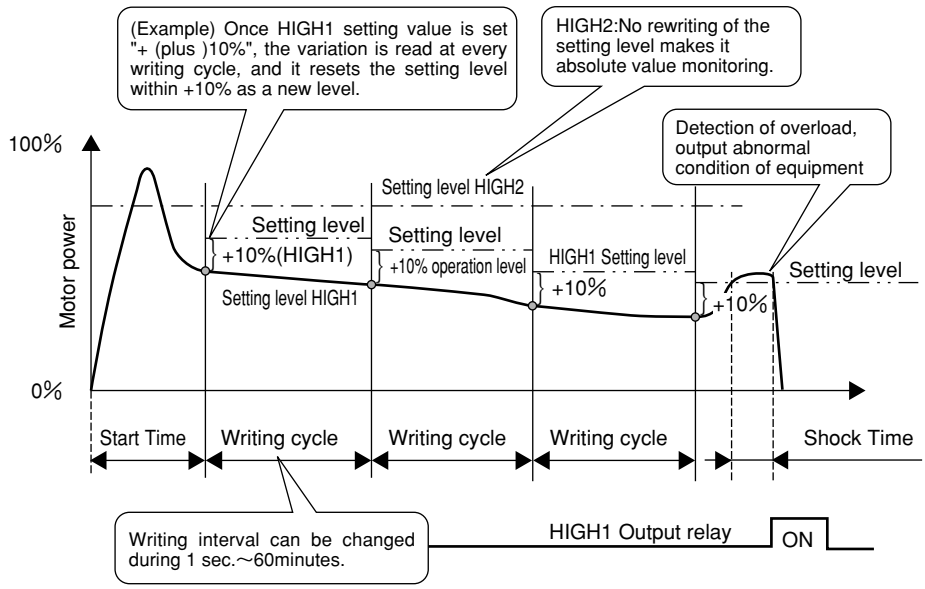
Applications

Medical equipment, etc.

Basic operations of TSM3000H2

●The set value automatically varies and follows the variation of load: load following

Because variation in machine efficiency does not affect the Shock Monitor, it makes the ideal overload protection device.



[Features]

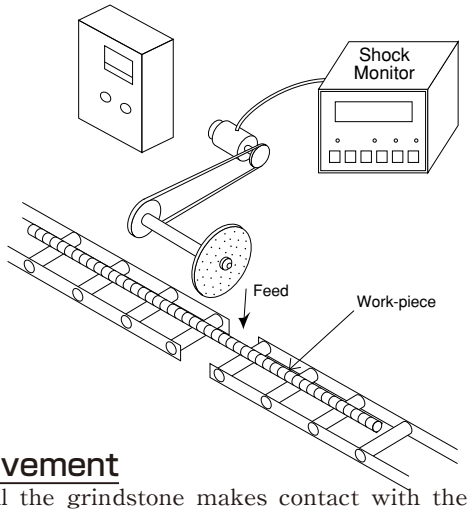
1) For equipment where mechanical efficiency varies by periodically following the operational level and minimizing the efficiency variation effect, the practical overload state can be detected.
2) The writing cycle can be changed to meet the fluctuations of the efficiency change.
3) While the operational level of HIGH2 is constant and has no variation, absolute value monitoring can be done by HIGH2.

Application examples and basic operations of each type

3.[Contact detector type] TSM3000M1 Type····.For machine tools (Industrial Property Right Patent No.: 3108798)

■ Tool and work-piece contact detection (Feed speed control, etc.)

●Grindstone contact detection



Movement

Until the grindstone makes contact with the work-piece the feed speed is high. After the Shock Monitor has detected contact with the work-piece, the TSM3000M1 immediately switches to a low feed speed. (shortening the working time)

Key point

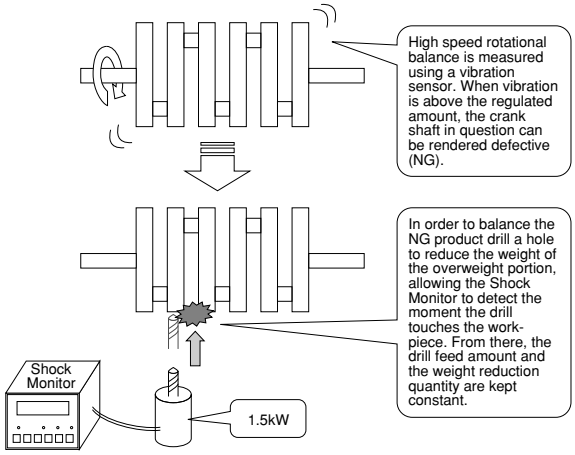
The instant a minute load contacts the work-piece, it is quickly and accurately detected. Consequently, a substantial decrease in the finishing cycle time is realized.

Applications

Metalworking, machine tools, etc.

■ Tool and work piece contact detection

●Rotational balance corrector for auto parts (crank shaft)



Movement

When drilling the hole, if the drill touches the work-piece, it will be detected and the Shock Monitor will immediately output. From there, by keeping feed time constant, the drilled quantity is managed uniformly.

Key point

The Shock Monitor ignores common changes to idling power. Because it can only detect work volume, it can securely judge the moment contact is made with the drill (0.03s).

Applications

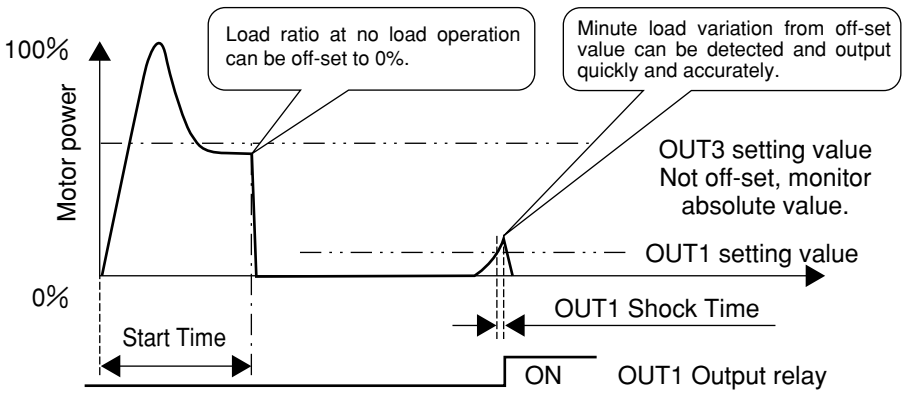
Machine tools (drilling machine, grinding machine, etc.)

Note: If the power source frequency exceeds 120Hz, such as a servo motor for a machine tool's main spindle, consult TEM.

Basic operations of SM3000M1

●Rapidly detects work-piece contact: contact detection

The idling position is automatically offset to a 0% load ratio, and the Shock Monitor can only detect work volume.



[Features]

1) Because the TSM30001 automatically offsets power during idling to 0%, the minute power change during tool and work-piece contact can be detected with high precision. (There are two types of output: OUT1 and OUT2.)
2) OUT3 is not an off set value, and absolute value can be monitored.
3) In regard to a detection level, as a set, OUT1, OUT2, OUT3 and OUT4 can be switched from the external for a maximum of 8 types, it can deal with the change of grindstone and work-piece.

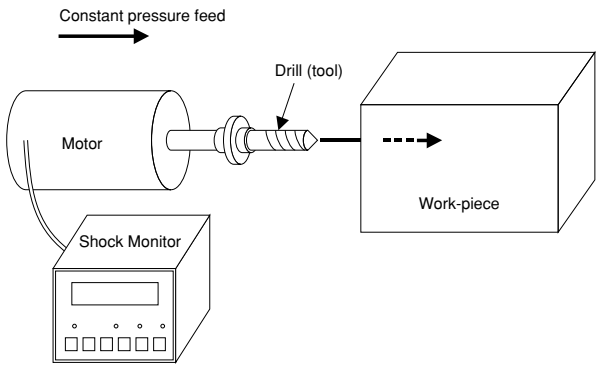
Application examples and basic operations of each type

4.[Integrated power model] TSM3000M2 Type For machine tools

By integrating 1 cycle of power from the manufacturing process, tool wear condition and breakage, as well as overload can be detected.

■Estimated tool service life

●Drill piece wear detection



Key point

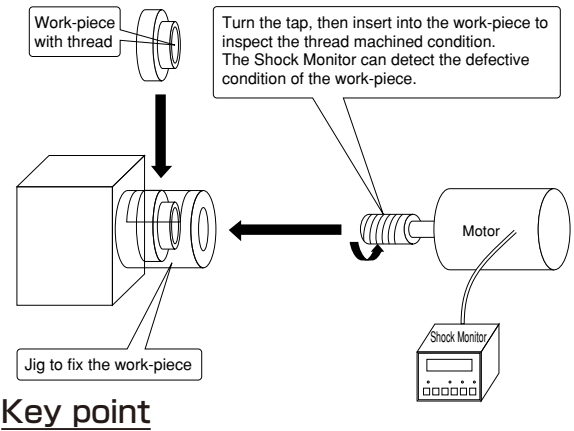
In regard to a constant pressure finishing machine, even the tool wears but the load variation is small. By taking advantage of the increase in machining time, high precision wear detection with the integrated power model is attained.

Applications

Machine tools, etc.

■Check the product quality

●Screw thread quality inspection



Key point

Like when checking the quality of a tap hole, instantaneous power is unstable and the integrated power model is ideal for applications where setting the detection level is difficult.

Applications

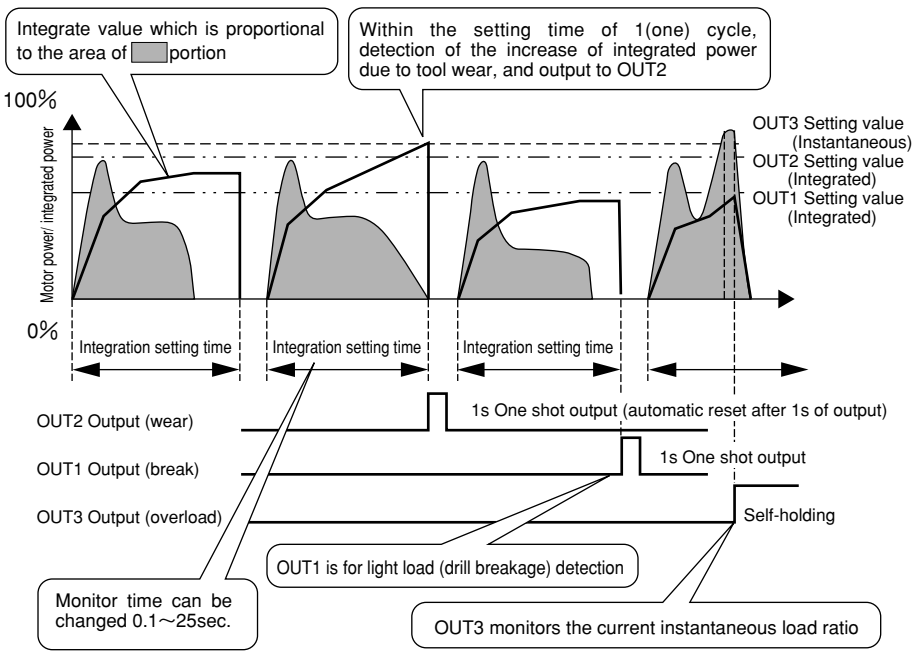
Inspection equipment etc.

Note: If the power source frequency exceeds 120Hz such as a servo motor for a machine tool main spindle, consult TEM.

Basic operations of TSM3000M2

●With the sum total of 1 cycle, machine tool wear, breakage and overload can be detected: integrated power

Machine tool wear can be detected by integrated power, and outputting the abnormal condition.



[Features]

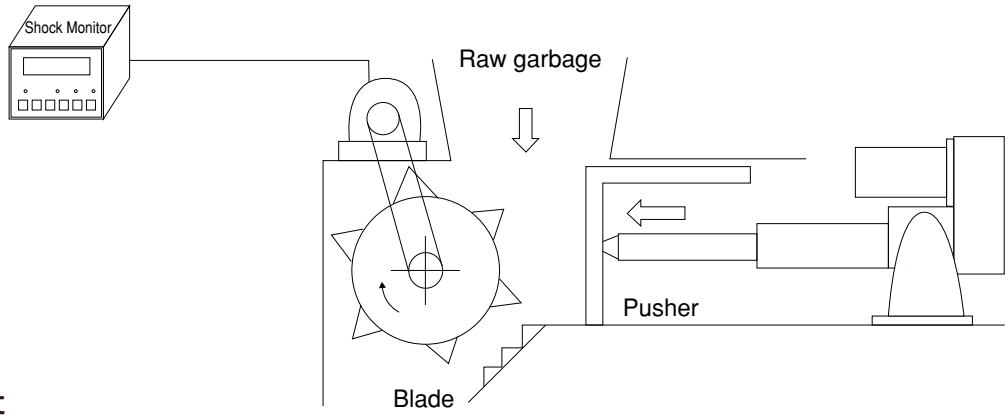
1) In regard to a constant pressure finishing machine, even the tool wears but the load ratio does not increase while the machining time increases. For this application it is monitored by power consumption (area).
2) After machining is completed, the drill wear is detected by the upper limit of power integration (OUT2), while the drill breakage can be detected by the lower limit (OUT1).
3) With the instantaneous value of OUT3, overload due to jam is monitored with absolute value.
4) As a set, there are a maximum of 8 types that OUT1, OUT2 and OUT3 can be switched between from the external. It works with the change of tools and work-pieces.
5) The elapsed time setting can be changed easily.

Application examples and basic operations of each type

5.For the forward and reverse sequence program built-in type: TSM3000C1 Type……For crushers

■Crusher blade protection and forward/reverse control

●Crusher



Movement

Precisely detects load on crusher blades. When a jam occurs, the machine automatically detects overload → the machine stops → moves into reverse → stops → moves forward repeatedly until the machine becomes un-jammed.

Key point

Blade life span increases significantly. The sequence program necessary for forward and reverse movement is built-in, so it is easy to control the crusher.

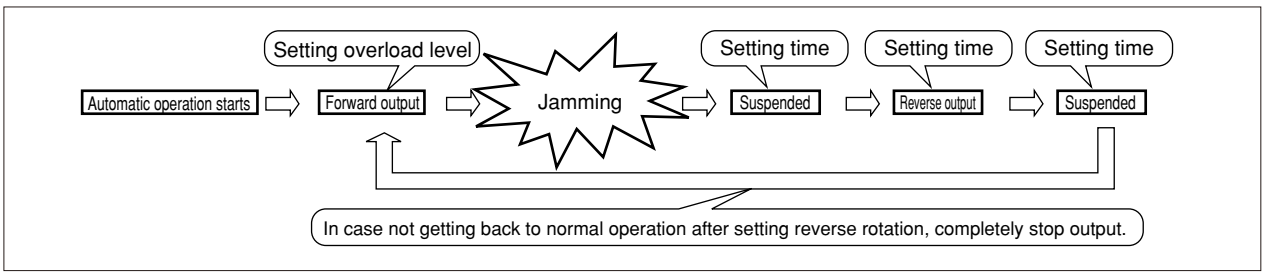
Industry

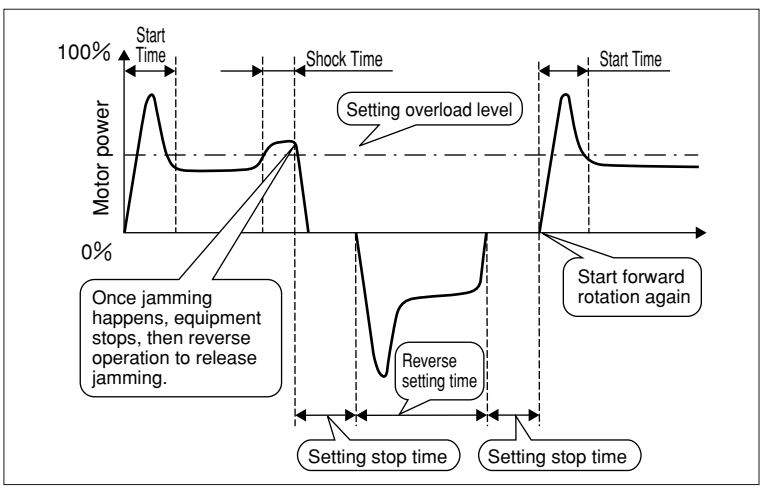
Crusher for waste disposal, reducer, screw conveyor, etc.

Basic operations of TSM3000C1

●When overload occurs the machine is automatically run in reverse: The sequence program for forward and reverse rotation is built-in.

The sequence control program for the crusher is built-in.





[Features]

1) Just by inputting the starting (forward movement) signal, stopping, reverse movement and restarting during overload can be controlled without an external sequencing program.
2) Even if the preset reverse setting time has past, when the machine does not return to normal operation, the stop signal is output and the device can be completely stopped.
3) The setting of overload level, stop time, and reverse running time can be easily done in the field.
4) To save energy it is possible to automatically stop when there is no load.

Series Specifications

Item \ Model No.			TSM3000 ※1※2 Basic type	TSM3000H1 ※2 Economy type	TSM3000H2 load slaved tracking type	TSM3000M1 Contact detection type	TSM3000M2 Integral power type	TSM3000C1 Built-in forward/reverse sequencer type
Applied motor	Capacity		0.1～110kW					
	※3 Power source voltage		AC200/220V, AC400/440V					
	Frequency		5～120Hz					
Power source voltage			AC90～250 V50/60Hz, DC90～250V Nonpolar					
Input	※3 Motor voltage		AC250V, MAX					
	Current sensor		DC2.5V					
	Control input		X1, X2, X3, IH	X1, X2, RES	X1, RES	X1, X2, X3, X4, X5	X1, X2, X3, X4, X5	X1, X2
Output	No. of contact		3c	2c	2c	2a, 1c	2a, 1c	3a, 1b
	Relay contact output		AC250V, 0.5A (Inductive load $\cos\phi = 0.4$) DC30V, 0.4A (Inductive load) DC110V, 0.2A (Inductive load) Minimum load applicable DC24V, 4mA					
	Output relay life	Mechanical	10,000,000 activations					
		Electrical	100,000 activations					
	Analog output relay		DC2V±1.5V	DC0～3.0V				
Setting	Load setting level	Output 1	High1 －200～200%	HIGH1 5～200%	HIGH1 1～99%	OUT1 1～99%	OUT1 0～99%	Overload 5～200%
		Output 2	High2 －200～200%	HIGH2 5～200%	HIGH2 5～200%	OUT2 1～99%	OUT2 5～200%	No load 5～200%
		Output 3	Low －99～99%	―――	―――	OUT3 5～200%	OUT3 5～200%	―――
	Start time setting range		0.1～20.0s					1～300s
	Shock time setting range		「MIN」or 0.1～10.0s In case motor power souce frequency is 50Hz and higher, shock time at 「MIN」 is approximately 30ms.					
	Reponse		Set by number of moving average	QUICK (Average no. 1 time), NORMAL (Average no. 5 times), SLOW (Average no. 20 times)				
Function	※4 Inhibit function		Manual/auto switching	Autoinhibit		Manual/auto switching		Autoinhibit
	Relay self-holding		Self-hold/auto reset selectable				Only OU3 is selectable	Sequencer function
	Switching detection level		8 steps	4 steps	None	8 steps		None
	Test function		Relay output test					
	Peak-hold function		When the load ratio exceeds the pre-set level (or falls below it), shows the maximum value within shock time. Only when the output is set as self-hold, it is peak hold.					
Display	% Power display range		－200～200%	0～200%				
	Voltage display range		0～500V					
	Current display range		0.01～999A					
	Frequency display range		5～120Hz					
Power consumption			10VA (Inrush current 5A within 5ms)					
Approximate mass			1.0kg					
Work environment	Ambient temperature		0～50℃					
	Reative humidity		45～85% RH; there is no condensation					
	Altitude		1000m and less					
	Ambient atomosphere		No corrosive gas, dust					

Note: ※1. Basic type can monitor not only positive (plus) torque but also negative (minus) torque.
※2. Basic type and Economy type can monitor power or torque.(Negative torque can not be monitored by the Economy type.)
In case of torque monitoring, torque is calculated by the monitored power, and displayed. In this case, rated torque (100%) is that at 60Hz.
In case the frequency is 20Hz and below, errors become larger due to motor efficiency. In this case, use for power monitoring.
※3. In case Shock Monitor is used at AC400/440V, a 400V class resister "TSM-PR2" is necessary.
※4. This is the function to stop the power monitoring of Shock Monitor.Basic, M1 and M2 types can inhibit manually,
and between inhibit input terminal (refer to page 130, 133, 134) and CM are ON within setting time, or during ON, load tratio 「1%」 flashing and do not monitor power.
In addition, if the frequency changes 4Hz/1s of motor voltage, monitoring is automatically stopped. (Auto inhibit)

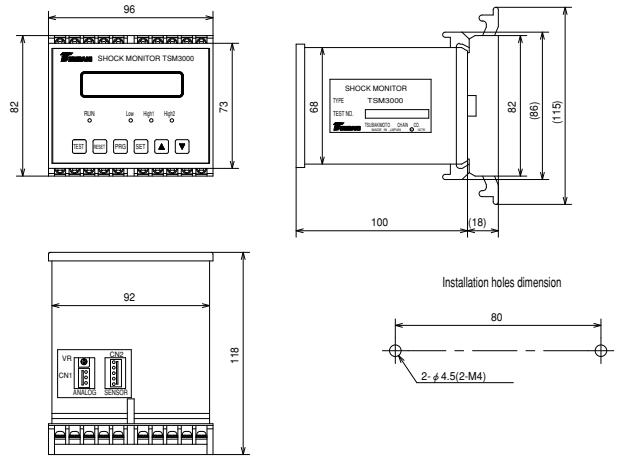
⚠ Warning When using the Shock Monitor with a human transport device or a lifting device, install a suitable protection device on that equipment for safety purposes.
Otherwise an accident resulting in death, serious injury or damage to the equipment may occur due to a falling accident.

●Model No.

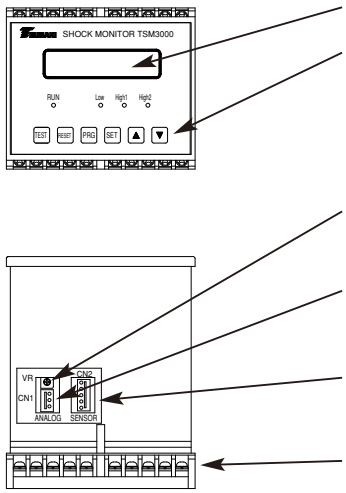
TSM3000H1−□□□□

- Shock Monitor main unit
- Current Sensor (Example: U010)
- Type
  - Blank: Basic type
  - H1: Economy type
  - H2: Load following type
  - M1: Contact detection type
  - M2: Integrated power type
  - C1: Built-in forward/reverse sequence

●Outline dimensions



●Part names and functions



①**Liquid crystal display** ···Load ratio, set value of display or parameter contents is displayed

②**Operation key** ·····The operation key toggles the display mode, changes parameters, etc.

- Program mode: Internal setting value can be changed to meet conditions of use.
- Monitor mode: Displays the present load ratio (%), detection level selection No. (process No.) and operational set points.
- Test mode: Can verify motor current, voltage, frequency display, and output operation.

③**Brightness control** ···LCD contrast can be adjusted. (making the display too dark will shorten the life of the display.)

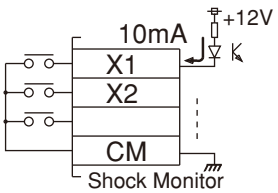
④**Analog output connector** ···Outputs load ratio as DC voltage. It can be connected with a recorder or a meter. (Use the input impedance at more than 100kΩ.)

⑤**Sensor cable connector** ···Connect the current sensor signal by sensor cable. Do not connect with anything else.

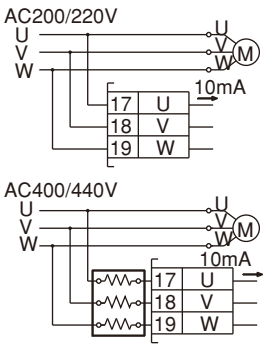
⑥**Terminal block for wires** ···An electric terminal for connecting operation power, motor voltage, relay output, control input, etc. When attaching wires, be sure to remove the Shock Monitor housing first.

●I/O specifications (Refer to page 130 for external connection information)

·Control input

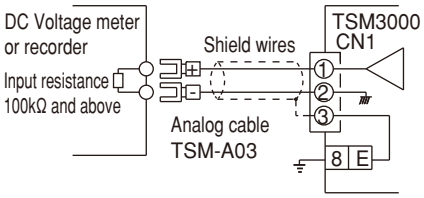


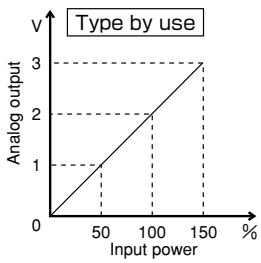
·Motor voltage input

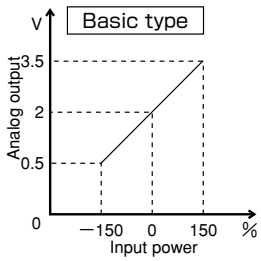


·Analog output

Load resistance 100kΩ and above







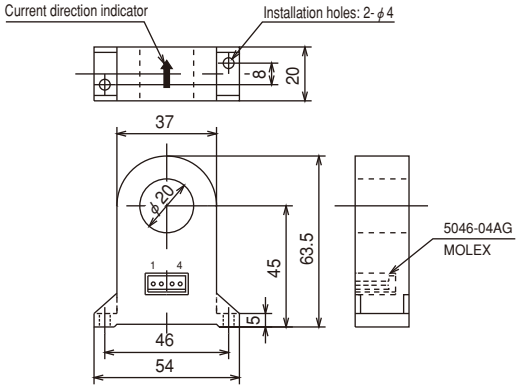
Option

■Current sensor (attachment)

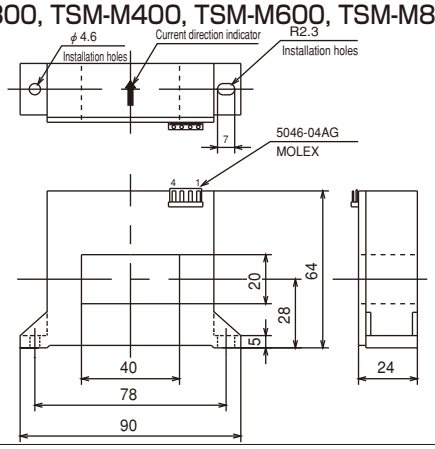
The current sensor brings motor current into the Shock Monitor unit.
Select a model from the chart below depending on the motor capacity and voltage.

Motor capacity (kW)	AC 200/220V motor		AC 400/440V motor	
	Sensor Model No.	Number of motor leads that pass through	Sensor Model No.	Number of motor leads that pass through
0.1	TSM-U010	6	TSM-U010	12
0.2	TSM-U010	3	TSM-U010	6
0.4	TSM-U010	2	TSM-U010	3
0.75	TSM-U050	6	TSM-U010	2
1.5	TSM-U050	3	TSM-U050	6
2.2	TSM-U050	2	TSM-U050	5
3.7	TSM-U050	1	TSM-U050	3
5.5	TSM-U050	1	TSM-U050	2
7.5	TSM-U100	1	TSM-U050	1
11	TSM-U100	1	TSM-U050	1
15	TSM-U150	1	TSM-U100	1
18.5	TSM-U150	1	TSM-U100	1
22	TSM-U200	1	TSM-U100	1
30	TSM-M300	1	TSM-U150	1
37	TSM-M300	1	TSM-U150	1
45	TSM-M400	1	TSM-U200	1
55	TSM-M600	1	TSM-M300	1
75	TSM-M600	1	TSM-M300	1
90	TSM-M800	1	TSM-M400	1
110	TSM-M800	1	TSM-M400	1

Sensor Model No.
TSM-U010, TSM-U050, TSM-U100, TSM-U150, TSM-U200



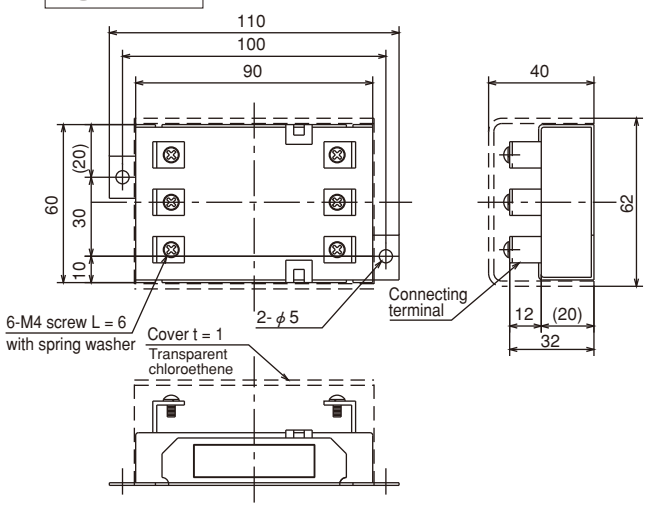
Sensor Model No.
TSM-M300, TSM-M400, TSM-M600, TSM-M800



■400V class resister

It is necessary in case the motor voltage is 400/ 440V. Please order separately.

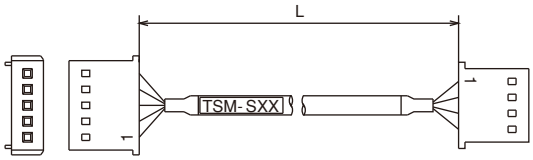
TSM-PR2



■Sensor cable

A 1 m length sensor cable (TSM-S01) comes standard to connect the Shock Monitor and the current sensor.
In case a different cable is required, order the cable with the connector below separately.

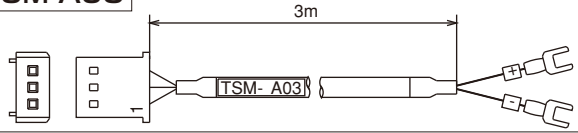
Model No.	Cable length (L)
TSM-S01 (attached)	1m
TSM-S03	3m
TSM-S05	5m
TSM-S10	10m
TSM-S20	20m
TSM-S30	30m



■Analog cable

Specialized cable with connector for analog output .

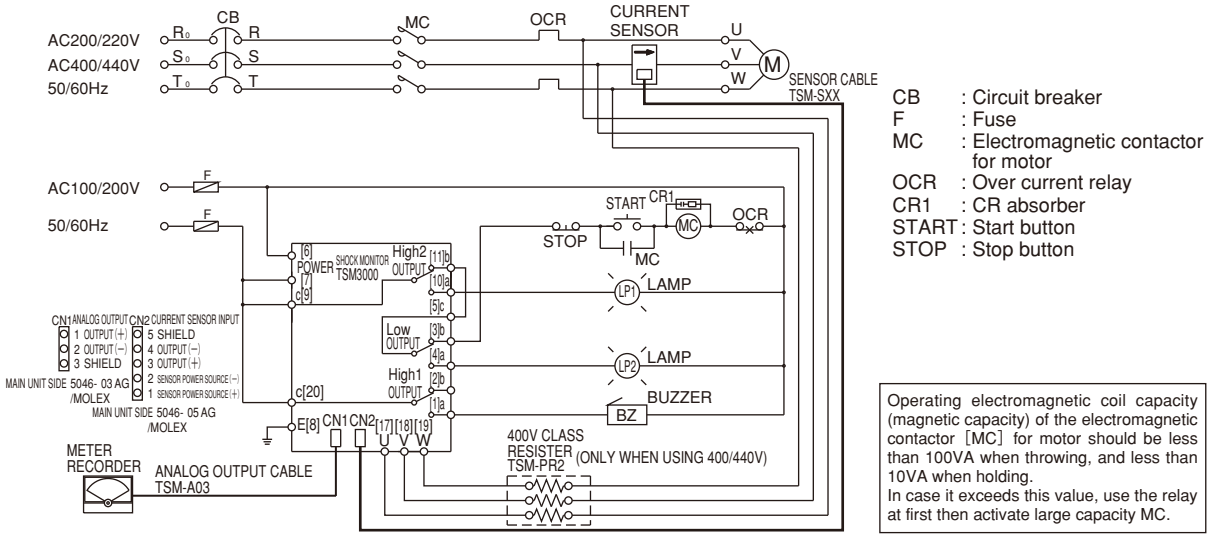
TSM-A03



External connection/ parameter settings/ terminal functions

1. Basic type TSM3000

■External connection

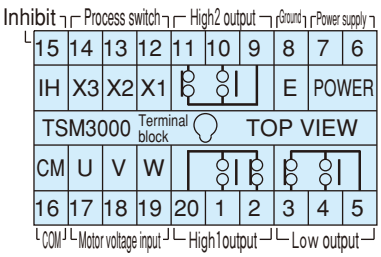


CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Over current relay
CR1 : CR absorber
START : Start button
STOP : Stop button

Operating electromagnetic coil capacity (magnetic capacity) of the electromagnetic contactor [MC] for motor should be less than 100VA when throwing, and less than 10VA when holding.
In case it exceeds this value, use the relay at first then activate large capacity MC.

Note: 1. Select the current sensor from the Current Sensor Selection table based on motor capacity and voltage. Use the specified number of pass through and current direction.
2. Make sure to insert the current sensor into the "phase V", and use sensor cable TSM-SXX to connect with Shock Monitor.
3. If using a 400/ 440V motor, use 400V class resister TSM-PR2 shown in dashed line .
4. Connect motor voltage terminal of Shock Monitor U [17], V [18], W [19] with the phase of [U], [V], [W] respectively.
5. Use relay for minute electric current for [X1], [X2], [X3], [IH].
◎ In case of a wrong connection, load can not be detected correctly and the Shock Monitor will not work properly.

■Function of terminals



Name	Symbol	IN/ OUT	Pin No.	Explanation
Power source	POWER	IN	6	Connection of power source
			7	
Ground	E	—	8	Ground terminal
Process switch	X1	IN	12	Process switch terminal
	X2	IN	13	
	X3	IN	14	
Inhibit	IH	IN	15	Inhibit terminal
Common	CM	IN	16	X1, X2, X3, IH common terminal
Motor voltage	U	IN	17	Motor voltage input terminal
	V	IN	18	
	W	IN	19	
Low output	c	OUT	5	Relay contact output when the lower limit output is activated
	a	OUT	4	
	b	OUT	3	
High1 output	c	OUT	20	Relay contact output when the higher limit 1 output is activated
	a	OUT	1	
	b	OUT	2	
High2 output	c	OUT	9	Relay contact output when the higher limit 2 output is activated
	a	OUT	10	
	b	OUT	11	

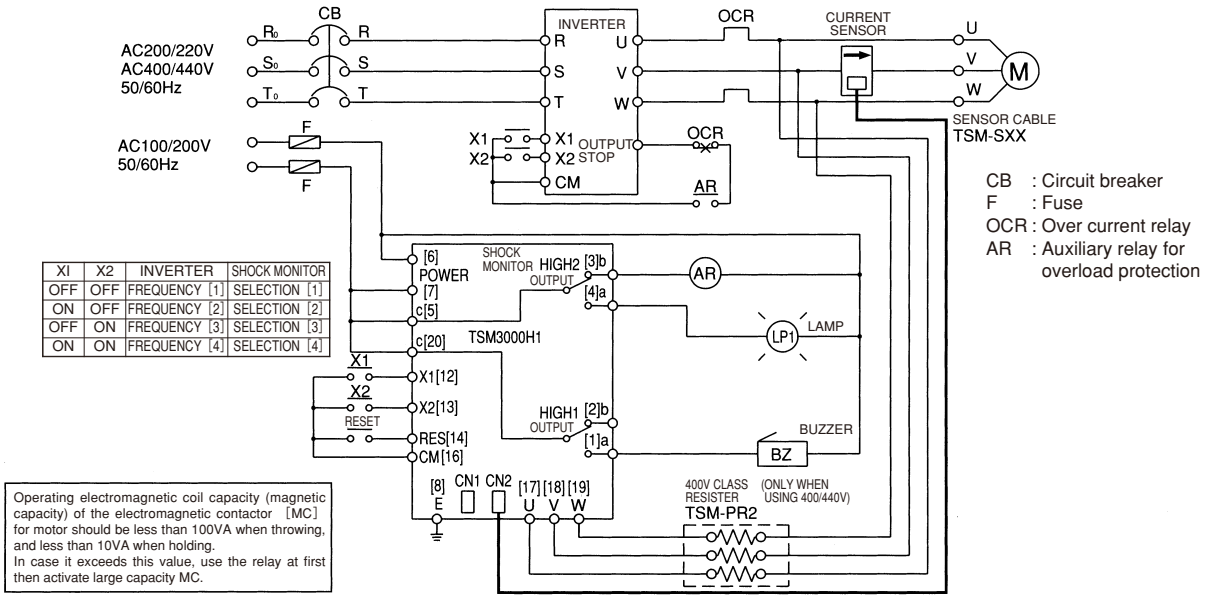
■Parameter setting

No.	Parameter	Data	Data when shipment	Contents
1	Parameter lock	(1) Unlock	(1)	Can change parameter settings
		(2) Lock		Can not change parameter settings unless in an unlocked condition
2	Monitor	(1) Power	(1)	Monitor with motor input power
		(2) Torque		Monitor with the torque calculated by the power
3	Motor voltage	(1) 200／220V	(1)	Motor voltage 3 phase 200V class
		(2) 400／440V		Motor voltage 3 phase 400V class
4	Motor kW	0.1～110kW	0.75	Setting motor capacity
5	Motor pole	2, 4, 6, 8	4	Number of motor pole
6	Output relay	(1) H2 self-hold	(3)	Selection of output activation mode (upper 2, lower)
		(2) L self-hold		
		(3) L, H2 self-hold		
		(4) Auto-reset		
7	Start time	0.1～20.0s	3.0	Setting the start time
8	Shock time Low	MIN,0.1～10.0s	2.0	Lower shock time
9	Shock time High1	MIN,0.1～10.0s	2.0	Higher 1 shock time
10	Shock time High2	MIN,0.1～10.0s	2.0	Higher 2 shock time
11	Inhibit time	IH,0.1～10.0s	4.0	Inhibit time
12	Process	1～8	1	Number of process
13	Low level	−99～0～99%	0	Lower level of process 1
14	High1 level	−200～5%	80	Higher 1 level of process 1
		5～200%		
15	High2 level	−200～5%	100	Higher 2 level of process 1
		5～200%		
16	Offset	0～99%	0	Compensation for no-load loss
17	Gain	10～200%	100	Display magnification
18	Sampling data	1～50	5	Number of moving average
19	Trip test	(1) YES	(1)	Selecton of test mode during motor operation
		(2) NO		

External connection/ parameter settings/ terminal functions

2. Economy type TSM3000H1 …… for general industrial machinery

■External connection



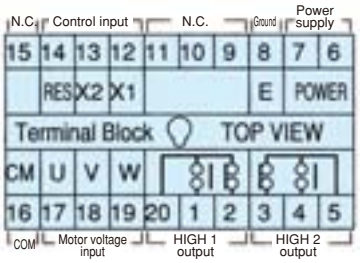
XI	X2	INVERTER	SHOCK MONITOR
OFF	OFF	FREQUENCY [1]	SELECTION [1]
ON	OFF	FREQUENCY [2]	SELECTION [2]
OFF	ON	FREQUENCY [3]	SELECTION [3]
ON	ON	FREQUENCY [4]	SELECTION [4]

CB : Circuit breaker
F : Fuse
OCR : Over current relay
AR : Auxiliary relay for overload protection

Operating electromagnetic coil capacity (magnetic capacity) of the electromagnetic contactor [MC] for motor should be less than 100VA when throwing, and less than 10VA when holding.
In case it exceeds this value, use the relay at first then activate large capacity MC.

Note: 1. Select the current sensor from the Current Sensor Selection table based on motor capacity and voltage. Use the specified number of passes through and current direction.
2. Make sure to insert the current sensor into the "phase V", and use the sensor cable TSM-SXX to connect with the Shock Monitor.
3. If using a 400/ 440V motor, use the 400V class resister TSM-PR2 shown in dashed line.
4. Connect the motor voltage terminal of the Shock Monitor U [17], V [18], W [19] with the phase of [U], [V], [W] respectively.
5. Use relay for minute electric current for [X1], [X2], [RES].
◎ In case of a wrong connection, load can not be detected correctly and the Shock Monitor will not work properly.

■Function of terminals



Name	Symbol	IN/ OUT	Pin No.	Explanation
Power source	POWER	IN	6	Connection of power source
			7	
Ground	E	—	8	Ground terminal
Control input	X1	IN	12	Selection of detection level
	X2	IN	13	
	RES	IN	14	Reset terminal
	CM	IN	16	Control input common
Motor voltage	U	IN	17	Motor voltage input terminal
	V	IN	18	
	W	IN	19	
HIGH 1 output	a	OUT	1	Higher limit output 1
	b	OUT	2	
	c	OUT	20	
HIGH 2 output	a	OUT	4	Higher limit output 2
	b	OUT	3	
	c	OUT	5	
No connection	—	N.C.	9	Do not connect anything
		N.C.	10	
		N.C.	11	
		N.C.	15	

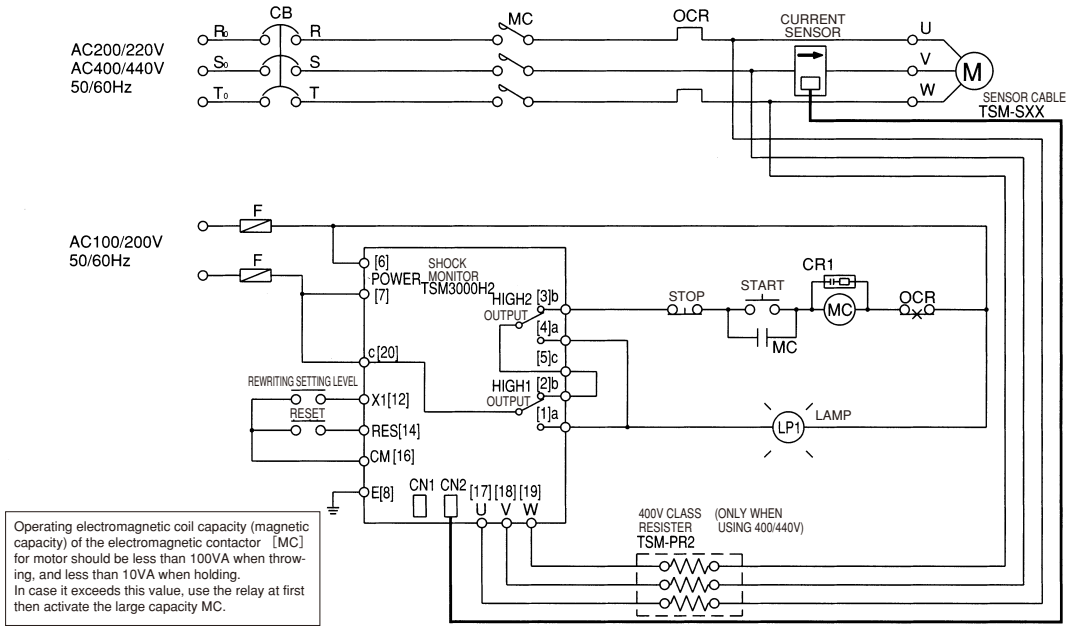
■Parameter setting

No.	Parameter	Data	Data when shipment	Contents
1	Monitor	(1) Power	(1)	Monitor with motor input power
		(2) Torque		Monitor with the torque calculated by the power
2	Motor voltage	(1) 200／220V	(1)	Motor voltage 3 phase 200V class
		(2) 400／440V		Motor voltage 3 phase 400V class
3	Motor kW	0.1～110kW	0.75	Setting motor capacity
4	Relay HIGH1	(1) Self-hold	(2)	HIGH 1 output relay self-hold
		(2) Auto reset		HIGH 1 output relay auto reset
	Relay HIGH2	(1) Self-hold	(2)	HIGH 2 output relay self-hold
		(2) Auto reset		HIGH 2 output relay auto reset
5	Start time	0.1～20.0s	3.0	Setting the start time
6	Shock time HIGH1	MIN,0.1～10.0s	2.0	Setting HIGH 1 shock time
7	Shock time HIGH2	MIN,0.1～10.0s	2.0	Setting HIGH 2 shock time
8	Process	1～4	1	Setting the number of detection level selection
9	HIGH1 level	5～200%	80	Setting HIGH 1 level
10	HIGH2 level	5～200%	100	Setting HIGH 2 level
11	Response	(1) QUICK	(2)	Response for power detection
		(2) NORMAL		
		(3) SLOW		

External connection/ parameter settings/ terminal functions

3. Load following type TSM3000H2 ····· for general industrial machinery

■External connection

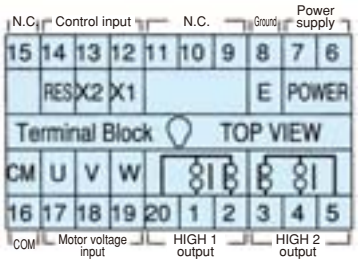


CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Over current relay
CR1 : CR absorber
START : Start button
STOP : Stop button

Operating electromagnetic coil capacity (magnetic capacity) of the electromagnetic contactor [MC] for motor should be less than 100VA when throwing, and less than 10VA when holding.
In case it exceeds this value, use the relay at first then activate the large capacity MC.

Note: 1. Select the current sensor from the Current Sensor Selection table based on motor capacity and voltage. Use the specified number of passes through and current direction.
2. Make sure to insert the current sensor into the "phase V", and use the sensor cable TSM-SXX to connect with Shock Monitor.
3. If using a 400/ 440V motor, use the 400V class resister TSM-PR2 shown in dashed line.
4. Connect the motor voltage terminal of the Shock Monitor U[17],V[18],W[19] with the phase of [U], [V], [W] respectively.
5. Use relay for minute electric current for [X1], [RES].
◎ In case of a wrong connection, load can not be detected correctly and the Shock Monitor will not work properly.

■Function of terminals



Name	Symbol	IN/ OUT	Pin No.	Explanation
Power source	POWER	IN	6	Connection of power source
			7	
Ground	E		8	Ground terminal
Control input	X1	IN	12	Rewriting setting level
	RES	IN	14	Reset terminal
	X2	N.C.	13	Do not connect anything
	—	N.C.	15	
	CM	IN	16	Control input common
Motor voltage	U	IN	17	Motor voltage input terminal
	V	IN	18	
	W	IN	19	
HIGH 1 output	a	OUT	1	Relative value higher limit output 1
	b	OUT	2	
	c	OUT	20	
HIGH 2 output	a	OUT	4	Absolute value higher limit output 2
	b	OUT	3	
	c	OUT	20	
No connection	—	N.C.	9	Do not connect anything
		N.C.	10	
		N.C.	11	

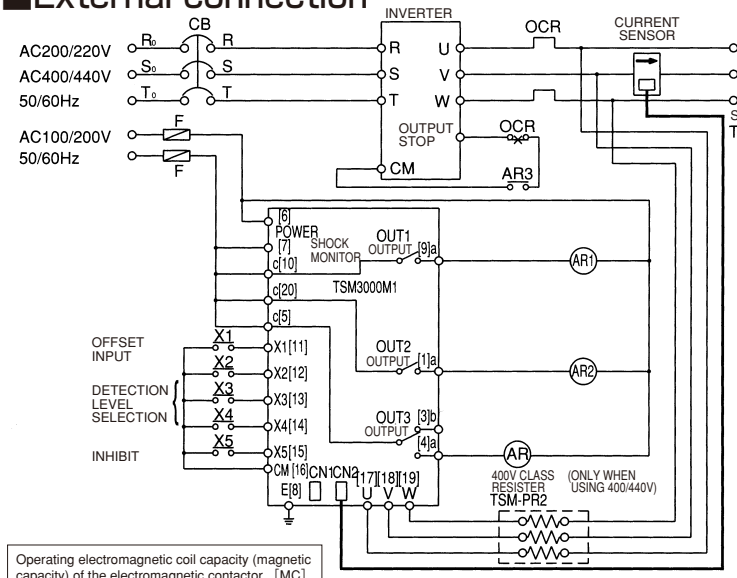
■Parameter setting

No.	Parameter	Data	Data when shipment	Contents
1	Motor voltage	(1) 200／220V	(1)	Motor voltage 3 phase 200V class
		(2) 400／440V		Motor voltage 3 phase 400V class
2	Motor kW	0.1～110kW	0.75	Setting motor capacity
3	Relay HIGH1	(1) Self-hold	(2)	HIGH 1 output relay self-hold
		(2) Auto reset		HIGH 1 output relay auto reset
	Relay HIGH2	(1) Self-hold	(2)	HIGH 2 output relay self-hold
		(2) Auto reset		HIGH 2 output relay auto reset
4	Start time	0.1～20.0s	3.0	Setting the start time
5	Shock time HIGH 1	MIN,0.1～10.0s	2.0	Setting HIGH 1 shock time
6	Shock time HIGH 2	MIN,0.1～10.0s	2.0	Setting HIGH 2 shock time
7	HIGH 1level	1～99	10	Setting HIGH 1 level (after rewriting setting level, relative value)
8	HIGH 2level	5～200	100	Setting HIGH 2 level (is not influenced by rewriting setting level, absolute value)
9	Response	(1) QUICK (2) NORMAL (3) SLOW	(2)	Response for power detection
10	Basic writing	(1) Interval (2) X1	(2)	Writing when the start time ends, or each interval Writing when the start time ends, or X1 is input
11	Interval time	1～60s 1.1～60.0min	50s	Writing cycle

External connection/ parameter settings/ terminal functions

4. Contact detection type TSM3000M1 ····· for machine tools

■External connection



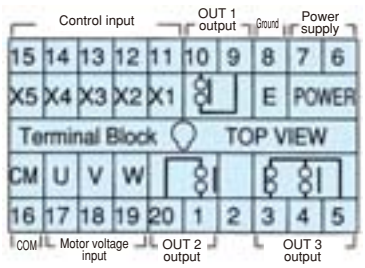
CB : Circuit breaker
F : Fuse
OCR : Over current relay
AR : Auxiliary relay for overload protection
AR1, AR2 : Auxiliary relay to control additional equipment

X2	X3	X4	SHOCK MONITOR
OFF	OFF	OFF	SELECTION [1]
ON	OFF	OFF	SELECTION [2]
OFF	ON	OFF	SELECTION [3]
ON	ON	OFF	SELECTION [4]
OFF	OFF	ON	SELECTION [5]
ON	OFF	ON	SELECTION [6]
OFF	ON	ON	SELECTION [7]
ON	ON	ON	SELECTION [8]

Note: 1. Select the current sensor from Current Sensor Selection table based on motor capacity and voltage. Use the specified number of passes through and current direction.
2. Make sure to insert the current sensor into the "phase V", and use the sensor cable TSM-SXX to connect with the Shock Monitor.
3. If using a 400/ 440V motor, use the 400V class resister TSM-PR2 shown in the dashed line .
4. Connect motor voltage terminal of Shock Monitor U [17] ,V [18] ,W [19] with the phase of [U] , [V] , [W] respectively.
5. Use relay for minute electric current for [X1] , [X2] , [X3] , [X4] , [X5] .
◎ In case of a wrong connection, load can not be detected correctly and the Shock Monitor will not work properly.

Operating electromagnetic coil capacity (magnetic capacity) of the electromagnetic contactor [MC] for motor should be less than 100VA when throwing, and less than 10VA when holding.
In case it exceeds this value, use the relay at first then activate large capacity MC.

■Function of terminals



Name	Symbol	IN/ OUT	Pin No.	Explanation
Power source	POWER	IN	6	Connection of power source
			7	
Ground	E	—	8	Ground terminal
Control input	X1	IN	11	Offset 0 input
	X2	IN	12	Selection of detection level
	X3	IN	13	
	X4	IN	14	
	X5	IN	15	Inhibit input
	CM	IN	16	Control input common terminal
Motor voltage	U	IN	17	Motor voltage input terminal
	V	IN	18	
	W	IN	19	
OUT 1 output	c	OUT	9	Relative value higher limit output 1 after offset
	a	OUT	10	
OUT 2 output	a	OUT	1	Relative value higher limit output 2 after offset
	c	OUT	20	
OUT 3 output	a	OUT	4	Non-offset absolute value higher limit
	b	OUT	3	
	c	OUT	5	
No connection	—	N.C.	2	Do not connect anything

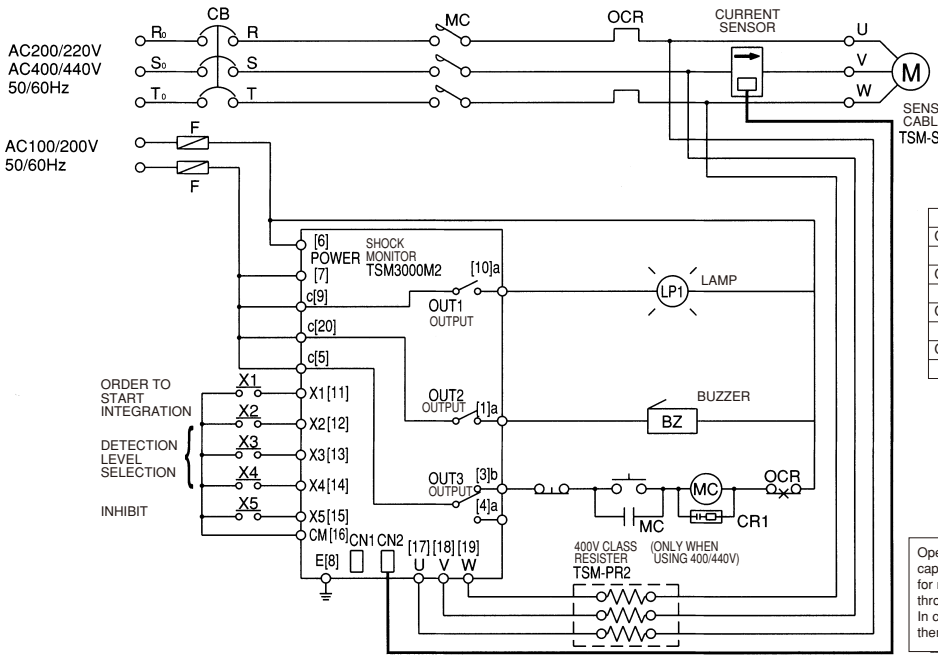
■Parameter setting

No.	Parameter	Data	Data when shipment	Contents
1	Parameter lock	(1) Unlock	(1)	Can change parameter setting
		(2) Lock		Can not change parameter setting unless in an unlocked condition
2	Motor voltage	(1) 200／220V	(1)	Motor voltage 3 phase 200V class
		(2) 400／440V		Motor voltage 3 phase 400V class
3	Motor kW	0.1～110kW	0.75	Setting motor capacity
4	Relay OUT1	(1) Self-hold	(2)	Output OUT 1 self-hold
		(2) Auto reset		Output OUT 1 auto reset
	Relay OUT2	(2) Self-hold	(2)	Output OUT 2 self-hold
		(3) Auto reset		Output OUT 2 auto reset
	Relay OUT3	(3) Self-hold	(2)	Output OUT 3 self-hold
		(4) Auto reset		Output OUT 3 auto reset
5	Start time	0.1～20.0s	3.0	Setting the start time
6	Shock time OUT1	MIN,0.1～10.0s	0.1	Setting shock time OUT 1
7	Shock time OUT2	MIN,0.1～10.0s	0.2	Setting shock time OUT 2
8	Shock time OUT3	MIN,0.1～10.0s	2.0	Setting shock time OUT 3
9	Inhibit time	IH,0.1～10.0s	IH	Setting inhibit time (stopping detection time)
10	Process	1～8	1	Setting the number of detection level selection
11	OUT1 level	1～99%	10	Setting OUT 1 level
12	OUT2 level	1～99%	15	Setting OUT 2 level
13	OUT3 level	5～200	80	Setting OUT 3 level
14	Response	(1) QUICK	(2)	Response for power detection
		(2) NORMAL		
		(3) SLOW		

External connection/ parameter settings/ terminal functions

5. Integral power type TSM3000M2…… for machine tools

■External connection



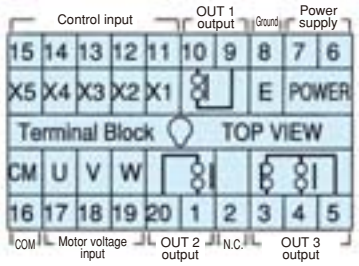
CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Over current relay
CR1 : CR absorber
START : Start button
STOP : Stop button

X2	X3	X4	SHOCK MONITOR
OFF	OFF	OFF	SELECTION [1]
ON	OFF	OFF	SELECTION [2]
OFF	ON	OFF	SELECTION [3]
ON	ON	OFF	SELECTION [4]
OFF	OFF	ON	SELECTION [5]
ON	OFF	ON	SELECTION [6]
OFF	ON	ON	SELECTION [7]
ON	ON	ON	SELECTION [8]

Operating electromagnetic coil capacity (magnetic capacity) of the electromagnetic contactor [MC] for motors should be less than 100VA when throwing, and less than 10VA when holding. In case it exceeds this value, use the relay at first then activate large capacity MC.

Note: 1. Select the current sensor from Current Sensor Selection table based on motor capacity and voltage. Use the specified number of passes through and current direction.
2. Make sure to insert the current sensor into the "phase V", and use sensor cable TSM-SXX to connect with Shock Monitor.
3. If using a 400/ 440V motor, use the 400V class resister TSM-PR2 shown in the dashed line.
4. Connect the motor voltage terminal of the Shock Monitor U [17], V [18], W [19] with the phase of [U], [V], [W] respectively.
5. Use relay for minute electric current for [X1], [X2], [X3], [X4], [X5].
◎ In case of a wrong connection, load can not be detected correctly and the Shock Monitor will not work properly.

■Function of terminals



Name	Symbol	IN/ OUT	Pin No.	Explanation
Power source	POWER	IN	6	Connection of power source
			7	
Ground	E	—	8	Ground terminal
Control input	X1	IN	11	Order to start integration
	X2	IN	12	Selection of detection level
	X3	IN	13	
	X4	IN	14	
	X5	IN	15	Inhibit input
	CM	IN	16	Control input common terminal
Motor voltage	U	IN	17	Motor voltage input terminal
	V	IN	18	
	W	IN	19	
OUT 1 output	c	OUT	9	Lower limit output after integration
	a	OUT	10	
OUT 2 output	a	OUT	1	Higher limit output after integration
	c	OUT	20	
OUT 3 output	a	OUT	4	Higher limit output at instantaneous electric power
	b	OUT	3	
	c	OUT	5	
No connection	—	N.C.	2	Do not connect anything

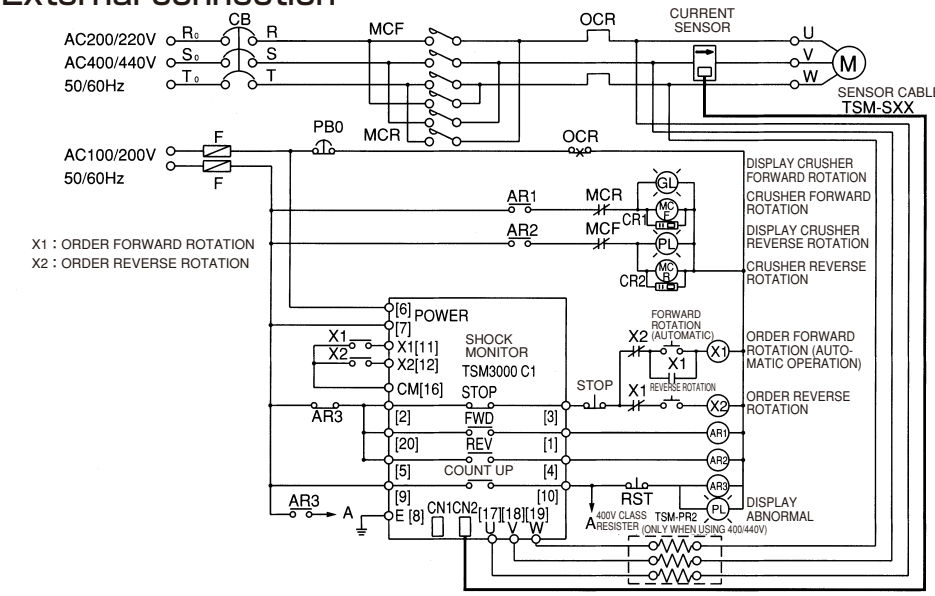
■Parameter setting

No.	Parameter	Data	Data when shipment	Contents
1	Parameter lock	(1) Unlock	(1)	Can change parameter setting
		(2) Lock		Can not change parameter setting unless in an unlocked condition
2a	Basic time	0.1～25s	2.5	Time setting of rated value of integrated power
2b	Integrated time	X1,0.1～25s	5.0	Setting of integrated time of power value
3	Motor voltage	(1) 200／220V	(1)	Motor voltage 3 phase 200V class
		(2) 400／440V		Motor voltage 3 phase 400V class
4	Motor kW	0.1～110kW	0.75	Setting motor capacity
5	Relay OUT 3	(1) Self-hold	(2)	Output OUT 3 self-hold
		(2) Auto reset		Output OUT 3 auto reset
6	Start time	0.1～20.0s	3.0	Setting the start time
7	Shock time OUT 3	MIN,0.1～10.0s	2.0	Setting shock time OUT 3
8	Inhibit time	IH,0.1～10.0s	IH	Setting inhibit time (stopping detection time)
9	Process	1～8	1	Setting the number of detection level selection
10	OUT 1 level	0～99%	0	Setting integrated power lower limit level
11	OUT 2 level	5～200%	80	Setting integrated power higher limit level
12	OUT 3 level	5～200%	100	Setting instantaneous power higher limit level
13	Response	(1) QUICK	(2)	Response for power detection
		(2) NORMAL		
		(3) SLOW		

External connection/ parameter settings/ terminal functions

6. Built-in forward/ reverse sequencer type TSM3000C1…… for crushers

■External connection

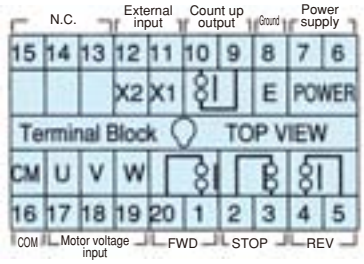


CB : Circuit breaker
F : Fuse
MCF : Electromagnetic contactor for motor to forward rotation
MCR : Electromagnetic contactor for motor to reverse rotation
OCR : Over current relay
AR1 : Auxiliary relay for forward output
AR2 : Auxiliary relay for reverse output
AR3 : Auxiliary relay to light alarm lamp
CR1, 2 : CR absorber
PB0 : Emergency stop button
RST : Alarm display reset

Operating electromagnetic coil capacity (magnetic capacity) of the electromagnetic contactor [MC] for motors should be less than 100VA when throwing, and less than 10VA when holding.
In case it exceeds this value, use the relay at first then activate large capacity MC.

Note: 1. Select the current sensor from Current Sensor Selection table based on motor capacity and voltage. Use the specified number of passes through and current direction.
2. Make sure to insert the current sensor into the "phase V", and use the sensor cable TSM-SXX to connect with the Shock Monitor.
3. If using a 400/ the 440V motor, use the 400V class resister TSM-PR2 shown in the dashed line.
4. Connect the motor voltage terminal of the Shock Monitor U [17] ,V [18] ,W [19] with the phase of [U] , [V] , [W] respectively.
5. Use relay for minute electric current for [X1] , [RES] .
◎ In case of a wrong connection, load can not be detected correctly and the Shock Monitor will not work properly.

■Function of terminals



Name	Symbol	IN/ OUT	Pin No.	Explanation
Power source	POWER	IN	6	Connection of power source
			7	
Ground	E	—	8	Ground terminal
Count up output	c	OUT	9	Crush error output (1s shot)
	a	OUT	10	
External input	X1	IN	11	Order of automatic operation (forward rotation)
	X2	IN	12	(Manual) Order of reverse rotation
	—	N.C.	13	Do not connect anything
		N.C.	14	
		N.C.	15	
	CM	IN	16	External input common terminal
Motor voltage	U	IN	17	Motor voltage input terminal
	V	IN	18	
	W	IN	19	
FWD	c	OUT	20	Order of forward rotation
	a	OUT	1	
STOP	c	OUT	2	Order of stop (1s shot)
	b	OUT	3	
REV	a	OUT	4	Order of reverse rotation
	c	OUT	5	

■Parameter setting

No.	Parameter	Data	Data when shipment	Contents
1	Parameter lock	(1) Unlock	(1)	Can change parameter setting
		(2) Lock		Can not change parameter setting unless in an unlocked condition
2	Motor voltage	(1) 200／220V	(1)	Motor voltage 3 phase 200V class
		(2) 400／440V		Motor voltage 3 phase 400V class
3	Motor kW	0.1～110kW	0.75	Setting 200V class motor capacity
		0.1～200kW		Setting 400V class motor capacity
4	No load level	Unused 5～200%	Unused	Prevention of idle running
5	Overload level	5～200%	100	Overload detection level
6	Start time	1～300s	5	Setting the start time
7	No load continuing level	0.1～60min	15	Time between after under-running no load level until COUNTUP output
8	Shock time	MIN,0.1～10.0s	1.0	Shock time when overload occurs
9	Pause time (1)	1～600s	10	Pause time during switching from forward to reverse rotation
10	Reverse time	1～600s	5	Reverse running time
11	Pause time (2)	1～600s	10	Pause time during switching from reverse to forward rotation
12	No. of reverse rotation	1～10 times	5	No. of reverse rotation until COUNTUP output
13	Reverse rotation count time	Plus 1～600s	100	Time to count the no. of reverse rotation. Add to 1 cycle time
14	Response	(1) QUICK (2) NORMAL (3) SLOW	(2)	Response for power detection

Safety Guide and Warranty

⚠ WARNING Death or serious injury may result from product misuse due to not following the instructions.

"Mechanical type Safety and Control devices"
- Begin inspection and maintenance after verifying that no load or rotational force is being applied to the equipment.
- Check the operation of the device periodically so that it can be sure to function properly when overload occurs.

"Electrical type Safety and Control devices"
- When carrying out an operation test or making a periodic inspection, make sure to verify that it functions properly as a protection device.
- Follow the instruction manual when carrying out megger testing because most electrical devices have certain requirements for megger testing.
- Check the operation of the device periodically so that it can be sure to function properly when overloaded occurs.

"Common"
- Comply with the 2-1-1 General Standard of "Ordinance on Labor Safety and Hygiene".
- When performing maintenance or inspections:
  1) Wear proper work clothes and protective equipment (safety devices, gloves, shoes, etc.). To avoid an accident, make sure to perform maintenance and inspections in an appropriate environment.
  2) Make sure the power is switched off, and the machine has stopped completely before carrying out maintenance and inspections. Take the necessary measures to ensure the power is not turned back on.
  3) Follow the instruction manual.
  4) Wire according to the technical standards of Electrical Installation and company regulations. Take note of the cautions in this manual which explain installation direction, clearance and environmental conditions. Make sure to ground the device to prevent electrical shock and to improve noise resistance.
- When using with lifting equipment, install a suitable protection device for safety purposes, otherwise an accident resulting in death, serious injury or damage to the equipment may occur due to a falling accident.

⚠ CAUTION Minor or moderate injury, as well as damage to the product may result from product misuse due to not following the instructions.

"Mechanical type Safety and Control devices"
- The strength of the equipment should be designed to withstand the load or rotational force when the device is activated due to overload.
- Wear damage may occur depending on the number and frequency of activations. Following the manual, check the functions and operations periodically. If something is not functioning properly, contact the distributor for repair.

"Electrical type Safety and Control devices"
- Consumable parts (tantalum electrolytic capacitors, relays, etc.) are built-in the products. Using the manual, periodically check the functions and operation of the device. If it is not functioning properly, contact the distributor for repair.
- Do not use the device in a corrosive gas environment. Sulphidizing gases (SO2, H2S) can especially corrode the copper and copper alloy used on PCBs and parts, and cause a malfunction.

"Common"
- Read the instruction manual carefully, and use the product properly. In case the instruction manual is not available, request one from the distributor where you purchased the product, or our sales office with the product name and model number.
- Deliver this instruction manual to the final customer who uses the Tsubaki Emerson product.

Warranty: Tsubaki Emerson Co.: hereinafter referred to as "Seller" Customer: hereinafter referred to as "Buyer" Goods sold or supplied by Seller to Buyer: hereinafter referred to as "Goods"

1. Warranty period without charge
Effective 18 months from the date of shipment or 12 months from the first use of Goods, including the installation of the Goods to the Buyer¹s equipment or machine - whichever comes first.

2. Warranty coverage
Should any damage or problem with the Goods arise within the warranty period, given that the Goods were operated and maintained according to the instructions provided in the manual, the Seller will repair and replace at no charge once the Goods are returned to the Seller.
This warranty does not include the following:
1) Any costs related to removal of Goods from the Buyer's equipment or machine to repair or replace parts.
2) Cost to transport Buyer's equipment or machines to the Buyer's repair shop.
3) Costs to reimburse any profit loss due to any repair or damage and consequential losses caused by the Buyer.

3. Warranty with charge
Seller will charge for any investigation and repair of Goods caused by:
1) Improper installation by failing to follow the instruction manual.
2) Insufficient maintenance or improper operation by the Buyer.
3) Incorrect installation of the Goods to other equipment or machines.
4) Any modifications or alterations of Goods by the Buyer.
5) Any repair by engineers other than the Seller or those designated by the Seller.
6) Operation in an environment not specified in the manual
7) Force Majeure or forces beyond the Seller's control such as natural disasters and injustices inflicted by a third party.
8) Secondary damage or problems incurred by the Buyer's equipment or machines.
9) Defective parts supplied or specified by the Buyer.
10) Incorrect wiring or parameter settings by the Buyer.
11) The end of life cycle of the Goods under normal usage.
12) Losses or damages not liable to the Seller.

4. Dispatch service
The service to dispatch a Seller¹s engineer to investigate, adjust or trial test the Seller's Goods is at the Buyer's expense.

5. Disclaimer
1) In our constant efforts to improve, Tsubaki Emerson may make changes to this document or the product described herein without notice.
2) Considerable effort has been made to ensure that the contents of this document are free from technical inaccuracies and errors. However, any such inaccuracies or errors reported will be gladly examined and amended as necessary.

⚠ CAUTION
The contents of this catalog are mainly to aid in product selection.
Read the instruction manual thoroughly before using the product in order to use it properly.

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