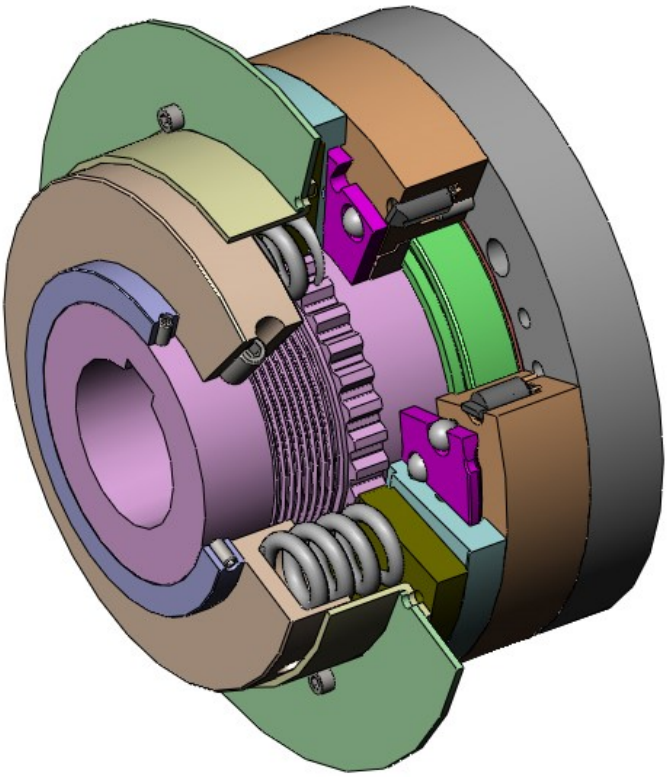
Rathi Transpower Pvt. Ltd.

Installation and Maintenance

Instructions shall be read before starting to install and use the torque limiter.

Important note

Don’t use if there is an unclear point. Consult your supplier for further information



Edition 1
RATHI TRANSPOWER PVT. LTD., Gaia Apex, S.No.33/2D, Viman Nagar, PUNE – 411 014 (INDIA)

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1. Technical Data

1.1 Standard parts (Figure 1)

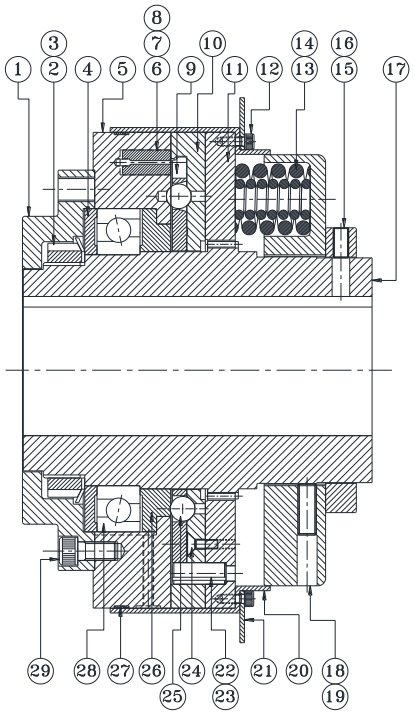


Figure 1. Base model

Part Number	Description	Spares Code	Part Number	Description	Spares Code
1	Adapter Plate	C	16	Clamping Collar	C
2	Lock Nut	B	17	Hub	B
3	Lock Washer	B	18	Set Screw-Adjustment Nut	A
4	Cover Plate	C	19	Adjustment Nut	C
5	Drive Plate	B	20	Dust Cover	B
6	Plunger Spring	A	21	Switch Plate	B
7	Plunger	B	22	Slotted Dowel Pin-1 (Inner)	B
8	Dowel Pin	C	23	Slotted Dowel Pin-2 (Outer)	B
9	Cage Plate	B	24	Counter Sunk Screw	A
10	Wear Plate	B	25	Ball	A
11	Slide plate	C	26	Strut Plate	B
12	Allen Head Bolt	A	27	Wear Strip	A
13	Inner Spring	C	28	Angular Ball Bearing	A
14	Outer Spring	C	29	Allen Head Bolt-Adapter Plate	A
15	Set screw-Clamping Collar	A			

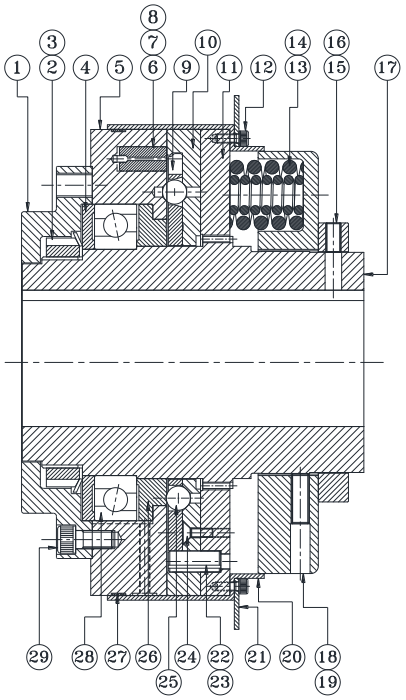
General spare parts list, details for individual size and model will be on the assembly drawing which is part of the supply.

Spares Codes:
A = Standard service item – spares stock is recommended
B = Potential service item – spares stock is recommended in critical applications
C= Spares stock is not normally required

For details of specifications, part number and quantities required for specific sizes and models, please contact **M/s RATHI**.

2. Technical description

2.1 General description



A torque limiter is an overload protection coupling which protects motors, gear units and machines from overload and destruction due to excessive torque and automatically interrupts the power train when the torque setting is exceeded.

The actuating torque is directly dependent on the spring force which can be continuously adjusted by means of adjusting nut (19).

Synchronous reset is standard on all sizes and models, allowing balancing and avoiding irritation on processes.

Reengagement is effected automatically by reversing the direction of rotation, manually or by motor, or by driving the output side forward. When automatic reset is used the max. Speed for resetting shall not exceed 100 rpm.

The reengagement angle is a maximum of 360 degrees. Torque limiters of this type will reengage in every case in the same angular shaft position, hence the term synchronous reset.

Caution **When disengagement has occurred, investigate the cause and rectify before re-engagement. In the case of motor-operated reengagement, it is essential to ensure a low reengagement speed (<100 rpm).**

2.2 Torque Transmission

The torque is transmitted by means of balls (25) which are located in conical recesses between two plates pressed together by spring pressure (drive plate-5 and wear plate-10).
A second set of balls (25) on a smaller pitch circle lies in seats in the wear plate (10) and is unloaded when the coupling is engaged. The cage plate (9) retains the balls in position in relation to one another after disengagement of the coupling. Thus, it assumes a function similar to that of the cage of a ball bearing.

2.3 Disengagement process

When the running torque reaches a value which exceeds the set torque, the balls (25) of the outer pitch circle roll under load out of their working seats and will be moved from the cage plate into parking seats. The disengagement process is now commenced and the drive path between input and output sides of the drive is completely interrupted.

At the same time, the balls of the inner pitch circle are also rolled out of their in this case parking seats by the cage plate (9) into a working position. Now, the wear plate (10) and the drive plate (5) rotate in relation to one another until the outer balls (25) engage in the parking seats which are only present in the wear plate.
The balls (25) of the inner pitch circle are now positioned to lead the full load generated by the springs (14) against the strut plate (26), which is supported by the angular contact ball bearing (28).

They maintain the wear plate (10) and the drive plate (5) at a distance by resting against the strut plate (26). The balls on the outer pitch circle, previously responsible for torque transmission, are at this moment unable to transmit torque. A pin (23) in the wear plate (10) prevents any further rotation of the wear plate in relation to the cage plate (9). Reengagement of the outer balls in their parking seats is prevented and as a result the drive plate (5) can rotate freely on the hub. As a result of the disengagement of the torque limiter, the wear plate (10) moves axially and with it, the limit switch plate (21). This axial movement (X) should be monitored with a mechanical or an electronic proximity switch.

Caution **The Torque limiters should be monitored with a limit switch or a proximity switch in order to prevent unnecessary wear. Although these clutches can run for some time in the disengaged state, periods exceeding several minutes should be avoided (particularly with high-speed drive units).**

2.4 Reengagement

Re-engagement takes place automatically as a result of reversing the direction of rotation of the drive unit or of the output drive continuing to rotate with the drive motor stationary. When this happens, one of the spring-loaded plungers (7) extends by following a ramp on the wear plate (10) into a cut out in the cage plate (9) and turns the latter back until the balls (25) align with their original seats in the drive plate. At this point, the plunger is forced back into its hole in the drive plate (5) by a second ramp on the wear plate (10). The wear plate then continues to rotate relative to the cage and drive plates until the wear plate seats are aligned with the balls. The mechanism then snaps back into re-engagement.

Caution **Resetting must be done at low speed (<100rpm) to permit the engaging mechanism to function properly in either direction and to prevent potential damage. It needs motor speed control or should be done manually. Other methods are possible but it is essential to ensure slow differential speed between input and output during re-setting.**

3. Installation

3.1 Finish bores

The Torque Limiters are normally supplied with finish bore and keyway. Couplings without bore and keyway cannot be set to an actuating torque.

3.2 Securing axially on the shaft.

The coupling halves are secured on the shafts by means of setscrews.

3.3 Balancing

The Torque Limiters are generally supplied without balancing. If a special application (for example high rpm and large coupling size) requires balancing or it is required by the customer, this balancing can be carried out. Balance grade of G6.3 to ISO 1940 can be reached, higher grades are not reachable.

3.4 General installation notes

Installation should be carried out with extreme care by specialist personnel. Ensure right at the planning stage that there is adequate space available for installation and subsequent care and maintenance. Adequate hoists must be available when installation is commenced.

3.5 Mounting Torque Limiter on the Shaft

Before commencing installation, the shaft ends and the torque limiter bores should be carefully cleaned. Avoid oil and grease being washed out of the interior of the torque limiter; this will require complete disassembly and re-lubrication.

3.6 Mounting a pulley (RFAP)

If not supplied with the unit, a pulley may be mounted by bolting to the adapter. Mounting dimensions are given in Technical Data Sheet.

Caution **It is essential that fixing bolts or pins do not protrude through the adapter and interfere with the internal mechanism of the torque limiter.**
Please select all bolts and pin lengths carefully.

Caution **Do not strike with heavy hammer blows on the hub. On no account must direct heat be applied to the torque limiter.**

Once on the shaft, the torque limiter should be moved axially to obtain proper alignment of the pulley. Once in position, tighten the set screws.

3.7 Models with flexible couplings (RFAD, RFAH & RFAN)

Mount the torque limiter on one shaft as described in 3.5. Mount the in-line coupling hub to the other shaft in a similar manner. Bring the shafts together and assemble the coupling, observing the shaft alignment requirements given in Technical Data Sheet.

3.8 Model with Adapter (RFAM)

For the base model, the driven member is supplied by the customer. If used for an offset drive, the pulley must be mounted on its own bearing. If a coupling hub is fitted, follow the manufacturer's recommendations for alignment.

△ **Non observance of these notes can lead to torque limiter damage and in extreme cases break up of parts. Flying fragments are a serious hazard and must be prevented.**

4. Start-up

4.1 Before start up, the tightness of the setscrews should be checked and the coupling guard fitted.

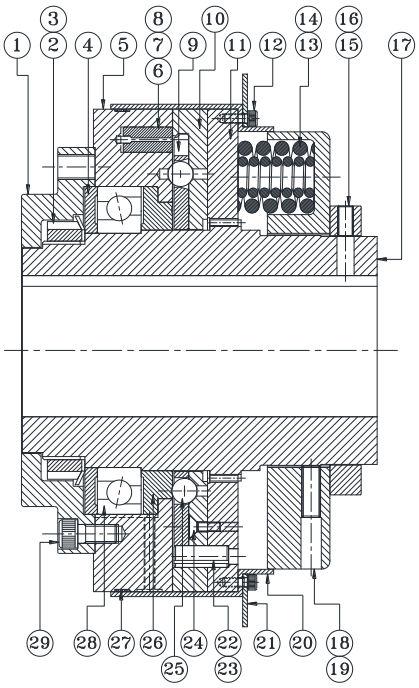
4.2 Torque adjustment

The supplied torque limiters are set to a fixed torque value in accordance with the customer's requirements if specified at time of order, otherwise it will be set near minimum trip torque. If the exact actuating torque cannot be determined beforehand, an actuating torque range can also be stated.

To set experimentally, start up the drive at a low torque setting. If the torque limiter disengages before normal operating load is reached, progressively increase the torque setting until the drive will start and run without tripping, under normal conditions.

Caution **Response of the torque limiter should never be interpreted as a malfunction, but as an indication of the fact that higher torque values are occurring in practical operation than were previously determined theoretically. In this case the cause should be determined and the torque setting increased only if the reason for disengagement is fully understood.**

4.2.1 Actuating torque adjustment



Caution **Replacement of springs with a stronger or weaker set is ONLY permissible with the approval of authorized personal of the machine manufacturer.**

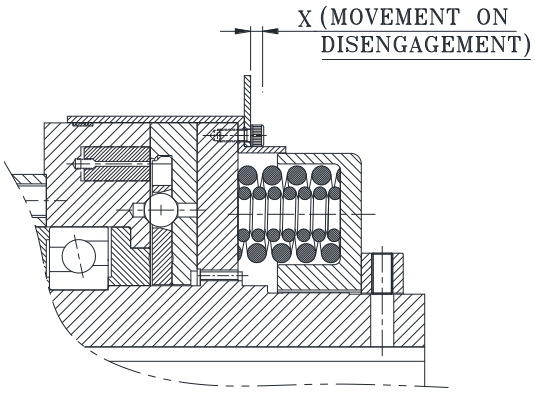
- First of all, the locking screws of the adjustment nut (19) should be loosened. These locking screws prevent accidental rotation of the adjustment nut during operation.
- **Increasing the set torque;**
  - The torque is increased by turning the adjustment nut (19) clockwise.

△ **When increasing the set torque, it is ESSENTIAL to make certain that the torque may only be increased to the extent that even the weakest component in the drive train is still adequately protected.**

- **Reducing the set torque**
  - The set torque is reduced by turning the adjustment nut (19) anticlockwise. When reducing the torque, a minimum actuating torque should be observed which must be maintained, as otherwise proper actuation of the torque limiter cannot be ensured.

- After carrying out the torque adjustment, the locking screws should be cleaned and applied with Loctite solution and then retightened on adjustment nut.
- Report the setting in the data sheet which was supplied with the torque limiter or in another appropriate form, to make sure that the history of the torque setting is available at a later time. Measure also the gap between slide plate and adjusting nut and add this value to the report.

Torque Limiter Sizes	Trip Torque (Nm)		Spring Qty. (Nos.)		Movement `X' (mm)
	Min.	Max.	Inner	Outer	
1	20	226	-	8	2.8
2	60	678	6	6	3.3
3	75	1130	8	8	3.3
4	225	2540	-	8	3.9
5	1100	5650	9	9	5.2
6	1500	11300	12	12	6.5
7	3500	24860	12	12	7.8



5. Operation

5.1 General data

During operation, the coupling should be checked for changes in running conditions.

Caution

If irregularities are detected during operation, the drive unit should be shut off at once. The cause of the fault should be located with the aid of the Troubleshooting Table (Section 6). The Troubleshooting Table lists possible malfunctions, their causes and suggestions for remedying them. If the cause cannot be established or it is not possible to remedy it with in-house equipment, we recommend that you contact **RATHI** for assistance.

6 Troubleshooting

6.1 General

The items listed below can only serve as a guide to troubleshooting, in relation to the torque limiter. With a complex system, all other components must also be included in any investigation. In particular, if there are unusual noises, other equipment should be examined even if the sound seems to be coming from the torque limiter. Our experience is that such noises can be emitted from the torque limiter even though it is not the source of the problem.

6.2 Normal Operation

The torque limiter should run silently and without vibration in normal operation.
In the event of an overload, the torque limiter will disengage when the set torque is exceeded. During disengagement, a sharp snapping action may be heard which occurs when the spring load transfers from the outer drive balls (25) to the inner strut balls. When running disengaged, a clicking noise will be heard which is caused by the plungers (7) running on the wear / cage plate assembly (10/9). On resetting, a noise will be heard as the balls (25) re-engage in their seats.

Any other behaviour should be investigated and remedied at once to avoid damage to the torque limiter and other equipment.

Caution

Frequent disengagements of the torque limiter should be investigated, as otherwise premature wear may occur.

△

Before carrying out maintenance, repairs or other work, the operator has to ensure that the entire drive train is stationary. In particular, the drive motors should be secured to prevent accidental start up. In addition, we would draw attention to the Health and Safety Regulations applicable on site.

6.3 Troubleshooting Guide

Problem	Possible Cause	Remedy
Torque Limiter disengages unexpectedly	Initial torque setting too low	Adjust torque setting (section 4.2)
	Change in running conditions	Check the system for increased loading, loss of lubricant, bearing failure, etc. & remedy as required.
	Worn ball seats in torque Limiter	Replace worn parts (section 7)
	Adjusting nut has moved	Re-adjust torque setting (section 4.2) & ensure nut locking screws are tightened.
Torque limiter fails to disengage on overload.	Initial torque setting too high	Adjust torque setting (section 4.2)
	Loss of lubricant	Re-lubricate (section 7)
	Increase friction in drive seats, splines or angular ball bearing due to fretting corrosion.	Check the system for vibrations & remedy. Replace damage parts (section 7). Re-lubrication of seats & splines may be sufficient if damage is slight.
	Adjusting nut has moved	Re-adjust torque setting (section 4.2) & ensure nut locking screws are tightened.
	Model with taper bushes on adapter - Bushes over tightened & has locked adapter to hub	Loosen clamp screws & re-torque according to the bushing suppliers instructions.
Change in noise level during normal operation.	Alignment of equipment is disturbed.	Remedy reasons for change in alignment (check mounting bolts, bearing housings etc.)
Change in noise level after disengaging.	Bearing(s) damaged	Dismantle the unit, clean & check. Replace damaged parts (section 7).
	Faulty disengagement due to:	
	a) Jammed cage plate	Dismantle & replace parts or re-lubricate as required.
	b) Torque setting too low	Examine parts & check for damage – replace as necessary. Reduce number of springs & reset torque.
	c) Adjustment nut over-tightened so that wear plate cannot move properly on trip	Examine parts & check for damage – replace as necessary. Add springs if possible & re-set, or reduce torque setting.
Torque limiter cannot be re-engaged or rotation cannot be reversed	Plungers are jammed.	Spray light (penetrating) oil around plungers & tap OD of drive plate. If plungers do not pop out, dismantle & replace damaged parts (section 7).
	Cage plate jammed in disengaged position due to wear caused by prolonged disengaged running.	Dismantle & replace damaged parts (section 7).
	Plungers jammed on raised slotted dowel pin instead of engaging with cage plate.	Dismantle & replace damaged/faulty parts (section 7).

7. Maintenance and servicing

7.1 General

Maintenance and servicing may ONLY be carried out by trained personnel.
If suitable specialist personnel are not available, the torque limiter may be returned to **RATHI** to ensure proper workmanship.

RATHI torque limiters can be used as standard in ambient temperatures of –30 C to +80 C. Outside this temperature range, special greases and oils should be used. Please consult **RATHI** for other temperature ranges.

Dependent upon environment and number of trips, the torque limiter should be inspected and serviced every 2000 hrs. Lubrication is recommended to reduce the risk of fretting corrosion.

Under adverse conditions in dirty environments and with frequent trips a shorter service interval is recommended. In any event, when a machine is subjected to a major overhaul, the torque limiter should be checked at the same time.

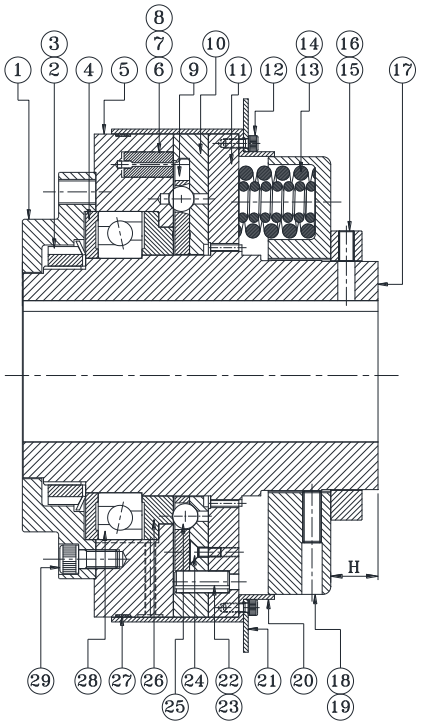
It should be checked that all components are firmly attached to one another and that all components locate firmly on the coupling hub.

Lubricants described under section 7.4 or equivalent should be used.

7.2 Disassembly

If any attachment, adapter, pulley or coupling is fitted, we recommend firstly to remove this along with its fasteners.

The torque limiter should be placed on a suitable clean work table.



Caution

Before the torque limiter is disassembled the dimension `H' must be measured and recorded. Also match mark the position of the adjustment nut and hub to permit the torque to be reset again after re-assembly.
All the components of the torque limiter should be kept in a safe place to ensure that it is not lost.

Disassembly should be carried out in the following sequence:

- After unscrewing the two setscrews, remove the clamping collar (16).
- Loosen the set screws of the adjustment nut (19) and unscrew the adjustment nut with the torque springs (14) from the hub (17).
- Remove the Allen Head bolts (12), switch plate (21) and, if present, the dust cover (20) from the slide plate (11). Remove the wear strip (27) from the groove of drive plate.
- Remove the lock nut (2) & lock washer (3).
- Remove the cover plate (4), angular ball bearing (28), drive plate (5) and strut plate (26). Little tapping on drive plate may be required.
- Remove the plungers (7) & Plunger springs (6) from its holes.
- Remove the balls (25) from their seats in the drive plate (5) and from the strut plate (26) if they have not stuck in the cage plate.
    - Remove the assembly of cage/wear/slide plate (9/10/11) from the hub. It is not required to dismantle this assembly any further.
      Note: If required, replace the damaged components, bolts, screws and pins by new ones of the same strength, class and type.

7.3 Assembly

Before assembly of torque limiter, ensure that all components to be assembled are clean and in satisfactory condition. ONLY original components may be used, otherwise any form of warranty will be voided.

Assembly should be carried out in reverse order to disassembly as described under item 7.2

- If the assembly of wear plate (10) & slide plate (11) is dismantled, reassemble it using the CSK screws (24).
- If the cage plate (9) has been removed from the wear plate (10), it should be refitted. A bayonet design is used for cage plate retention. There are cut-outs in wear plate to facilitate initial insertion of the cage plate, which is then rotated to engage the bayonet features.

Caution

The correct angular position of the cage plate (9) relative to the wear plate (10) is most important. All the inner and outer ball seats should be visible through the cage plate holes and the ramped recesses in the wear plate must be aligned with cut-outs in the cage plate.

- Apply oil to the plate faces and ball seats. Fit the cage plate and rotate to the correct position as above. Insert the outer & inner slotted dowel pins (22/23) in the hole provided in wear/slide plate (10/11) assembly. The split line on the outer pin must face outwards. Inner pin is inserted with its split line opposite to the split line of the outer pin. Check that the cage plate can rotate freely between the slotted pins.

- Apply grease to holes of cage plate (9) and place the balls (25) in these holes. Apply grease to the hub splines. Mount the assembly of cage/wear/slide plate over the hub and rest against the splines.

- Apply grease to the plunger springs (6) and insert in the plungers (7). The plungers and the plunger springs should then be inserted in the holes of the drive plate (5). If necessary, apply grease to plunger holes. Check that the plungers can move freely in the holes. They should extend freely under spring pressure alone.

- Mount the drive plate on the hub. The hub should be held in position and turn the drive plate until the balls gets engaged in their seats. Mount the strut plate (26), Angular Contact Ball bearing (28) and cover plate (4) as shown in the figure of Torque Limiter.

Caution

The drive plate (5) must rotate freely on the hub (17). In the same way, the strut plate (26) must rotate freely between drive plate and hub.

- Insert the torque springs (14) in the adjustment nut (19) with grease to hold them in place. Ensure that the springs are uniformly distributed. Before the adjustment nut is screwed onto the hub, the threads on both components should be applied with grease.
  The wear plate must be held down against the plunger springs while the adjustment nut (with the torque springs) is tightened.

- Mount the Lock Washer (3) & Lock Nut (2) over the hub and tightened it.

- Insert the wear strip (27) in the groove provided in the drive plate. The switch plate (21) (if provided) and the dust cover (20) should be bolted to the slide plate with the Allen head bolts (12). After cleaning, the Allen bolts should be applied with Loctite solution and fully tightened.

- If the coupling is being reassembled after a service, ensure that the adjustment nut (19) is positioned exactly as before disassembly, in order to ensure the same actuating torque is achieved (Section 7.2: Disassembly). The adjustment nut (19) should now be locked in position by tightening the locking set screws. The locking screws should be cleaned, applied with Loctite solution and fully tightened.

- Mount the clamping collar (16) on the hub and tighten the setscrews (15).

- When assembling the torque limiter on the shaft, the hub should be located on the shaft with the clamping collar & adjustment nut fitted on it.

7.4 Lubricants

For general purpose application, use

- Rathi Special Grease (RSG)
- ADDINOL Wear Protect RS2
- RS 2 MO
  Or any other equivalents.