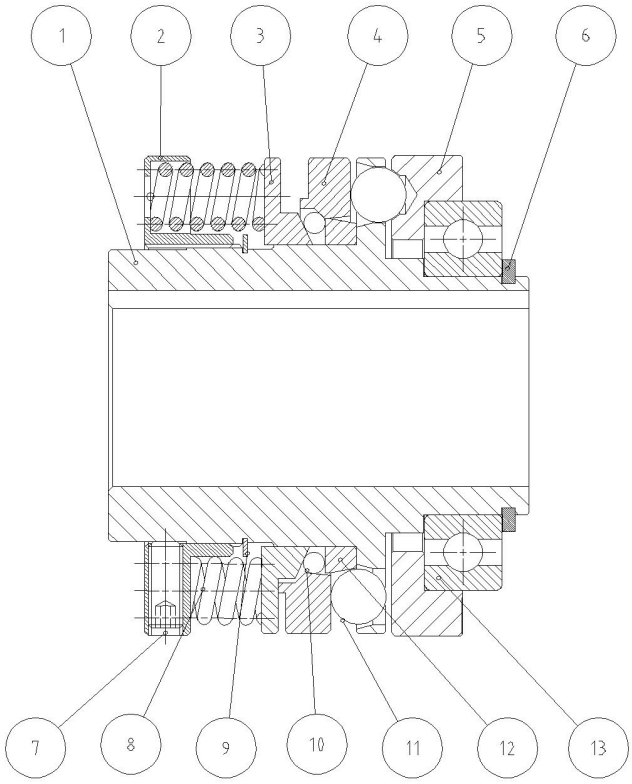
AUTOGARD 320MR SERIES TORQUE LIMITER INSTALLATION AND ASSEMBLY



Part	Description	Part	Description
1	Hub	**8**	Compression Spring
2	Adjustment Nut	**9**	Adjustment Stop
3	Spring Plate	**10**	Control Balls
4	Pressure Plate	**11**	Drive Balls
5	Drive Plate	**12**	Control Ball Ring
6	Circlip / Snap Ring	**13**	Deep Groove Ball Bearing
7	Nut Locking Screw		

PRINCIPLE OF OPERATION

In the normal drive condition, torque is transmitted via the drive balls (11) which are located in ports in the flange of hub (1) and detents in the drive plate (5). The drive balls are held in the detents under load from springs (8). The level of torque which can be transmitted is determined by the compression of the springs. The compression of the springs can be adjusted to give the desired torque setting using adjusting nut (2).

When an overload condition occurs, the drive balls roll out of their seats, forcing the pressure plate (4) to move axially towards the springs and to ride over the control balls (10). The pressure plate then stays in this position and the drive can freewheel on bearing (13). The movement of the pressure plate can be sensed using a proximity sensor (or optionally a mechanical limit switch) to indicate that disengagement has occurred.

Re-engagement is effected by prying between the spring plate (3) and pressure plate (4). This is most conveniently achieved using a flat bladed screw driver. The detents in drive plate (5) are arranged so that the drive balls (11) automatically re-engage into the nearest available position. There is no need to re-align the drive before re-engagement.

The series 320 MR standard design gives Random Re-set (RR) positions, dependent upon where the drive stops. Synchronous Re-set (SR) designs are also available and must be specified at the time of order. SR models must be aligned in the synchronous position prior to activating the re-set mechanism. The 320MR may be supplied with either a keyless shaft clamping sleeve or standard bore and key.

INSTALLATION

General

Prior to installation, ensure that the bore is clean and free of debris. For clamp sleeve versions, ensure that the clamp screws are loose. The clamp sleeve bore and the mating shaft must be free from oil and grease. The clamp screws should be lightly oiled. DO NOT use grease or any lubricant containing molybdenum disulphide or high-pressure additives. With the torque limiter completely assembled (but excluding any coupling hub supplied), carefully slide the hub onto the shaft. The standard clearance bore should permit the hub to be pushed into place on the shaft. When required, it is recommended that a jacking arrangement is used to draw the 320MR onto the shaft (Threaded rod, nut and an end plate) DO NOT strike with heavy hammer blows.

Bored and Keyed Hubs

Where a key is used and an extended hub with set screws has been supplied, the 320MR unit may be clamped in place by tightening the set screws provided which are normally positioned over the key and at 90 degrees.

Clamp Sleeve Hubs

For clamp sleeve versions, tighten the clamp screws progressively in a diagonal (criss-cross) sequence to the specified torque. (See Table 1)

Table 1

Series 320 Size	Clamp Bolts		Tightening Torque	
	Number	Size	(Nm)	(in-lbs)
01	6	M4	3.3 *	29.2
0	8	M5	5.5	48.7
1	8	M6	9.6	85.0
2	8	M6	12.0	106
3	8	M6	15.0	133
4	8	M8	28.0	248

* Max transmissible torque 40 Nm (354 in-lbs) for shaft sizes under 12.7 mm (0.5 in) diameter

After tightening the clamp sleeve, the adjusting nut locking screws must be tightened to engage centrally with the anti-rotation detents in the clamp sleeve flange.

Units with Couplings

For shaft to shaft installations, the couplings supplied as standard are the Autogard Autoflex membrane coupling or the Autogard Samiflex elastomeric coupling. Mount the coupling hub and ensure that the shafts are aligned within the permitted tolerances. (See Table 2)

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Table 2

Series 320 Size	Autoflex (Figure1)		Samiflex (Figure 1a)		
	Axial mm / in	Angular (º)	Axial mm / in	Radial mm / in	Angular (º)
01	0.66 / 0.025	0.5	+0.5 / +0.02	0.10 / 0.004	2.0
0	0.66 / 0.025	0.5	+0.5 / +0.02	0.10 / 0.004	2.0
1	0.76 / 0.030	0.5	+0.7 / +0.03	0.15 / 0.006	2.0
2	0.97 / 0.038	0.5	+0.7 / +0.03	0.15 / 0.006	2.0
3	1.12 / 0.044	0.5	+0.8 / +0.03	0.20 / 0.008	1.3
4	1.47 / 0.058	0.5	+1.0 / +0.04	0.20 / 0.008	1.3

Autoflex Coupling Hubs

Coupling hubs are supplied with the membrane pack assembled to the hub. A set of bolts and washers is supplied for connection to the torque limiter. When the hubs are aligned and in position, insert the bolts with the thick and thin washers positioned as shown in Figure 1, either side of the membrane pack and tighten evenly to the specified torque. (See Table 3). Ensure that the rounded faces of the washers face the membrane pack.

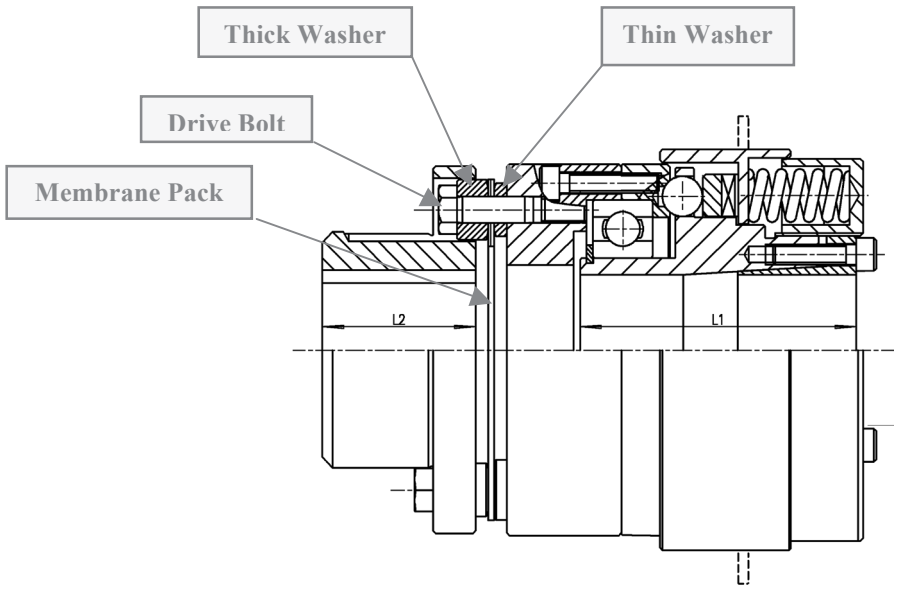

Figure 1

Table 3

Series 320 Size	Autoflex Coupling	Thread Size	Bolt Tightening Torque	
			(Nm – dry)	(in-lbs – dry)
01	8 HV	M6	11	97
0	8 HV	M6	11	97
1	15 HVII	M6	11	97
2	35 HVII	M8	24	212
3	70 HVII	M8	24	212
4	150 HVII	M12	71	628

Units with Drive Media

If a drive medium (pulley, sprocket, gear, sheave etc.) is to be fitted by the customer, it must be bored and drilled to suit the torque limiter with reference to Figures 2 / 2a and Table 4. Short hub units as shown in figure 2 are suitable for drive media where the side load can be reacted on the integral deep groove ball bearing. The best fit on the bearing will depend on the application but if no fit is specified, we recommend H7 for the drive media bore. (Shown as M2 in table 4.) Where the load is overhung, a long hub unit as shown in figure 2a is used and the customer must supply suitable bearings mounted on the hub extension diameter 'K'.

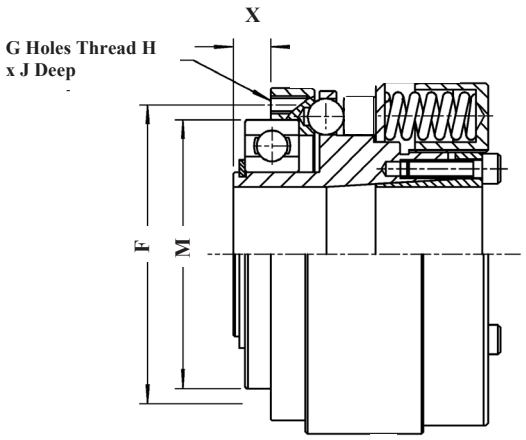

Figure 2

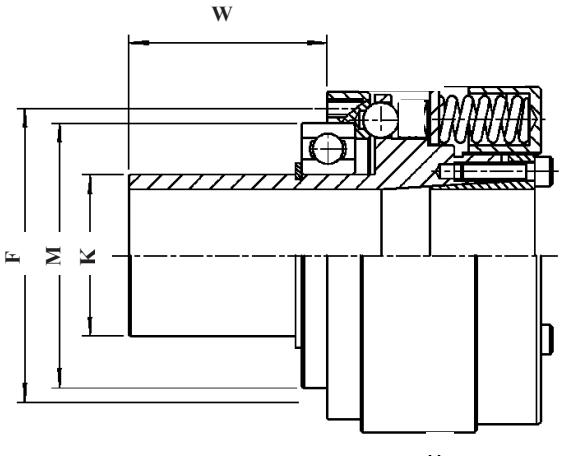

Figure 2a

Table 4

Series 320 Size	G	H	J mm (in)	F mm (in)	K h6 mm (in)	M h6 mm (in)	M2 H7 mm (in)	W mm (in)	X mm (in)
01	8	M4	6 (0.24)	56 (2.20)	30 (1.1811)	47 (1.8503)	47.000 / 47.025 (1.8504 / 1.8513)	33 (1.30)	5 (0.20)
0	8	M5	8 (0.31)	75 (2.95)	40 (1.5748)	62 (2.4409)	62.000 / 62.030 (2.4409 / 2.4420)	43 (1.69)	7 (0.28)
1	8	M6	10 (0.39)	85 (3.35)	45 (1.7716)	75 (2.9527)	75.000 / 75.080 (2.9528 / 2.9539)	55 (2.17)	7 (0.28)
2	8	M6	12 (0.47)	100 (3.94)	55 (2.1654)	90 (3.5433)	90.000 / 90.035 (3.5433 / 3.5447)	67 (2.64)	8 (0.31)
3	8	M8	12 (0.47)	116 (4.57)	65 (2.5590)	100 (3.9370)	100.000 / 100.035 (3.9370 / 3.9383)	73 (2.87)	8 (0.31)
4	8	M10	18 (0.71)	144 (5.67)	75 (2.9528)	115 (4.5276)	115.000 / 115.035 (4.5276 / 4.5289)	91 (3.58)	8 (0.31)

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DISENGAGEMENT SENSORS

General

The Series 320MR is designed to run continuously in a disengaged condition. However, it is recommended that a shut-off switch is incorporated to avoid unnecessary wear.

Proximity Sensors

Inductive proximity sensors may be used with standard 320MR units to detect the axial movement of the pressure plate which occurs on disengagement. A fail-safe switching arrangement is recommended.

Limit Switches

If the unit has been supplied with a limit switch plate attached to the pressure plate, a mechanical limit switch may be used to detect the axial movement. The limit switch plate can also be used as a proximity sensor target

Table 5 — Axial Movement of Pressure Plate on Break

Series 320MR Size	01	0	1	2	3	4
Movement on Break Min/Max	2.2/2.7 mm	2.5/3.3 mm	3.0/4.0 mm	3.6/4.7 mm	4.0/5.3 mm	4.9/6.5 mm
	0.087/0.11 in	0.098/0.13 in	0.12/0.16 in	0.14/0.18 in	0.16/0.21 in	0.19/0.25 in
Switch Plate Diameter	100 mm	115 mm	130 mm	150 mm	165 mm	200 mm
	3.94 in	4.53 in	5.12 in	5.91 in	6.50 in	7.87 in

TORQUE SETTING

General

The 320MR may be supplied with the torque pre-set at the factory according to the order specification, or otherwise as an unset unit. The torque at which the 320MR unit will disengage is determined by the position of the adjusting nut. The maximum torque achievable will depend on the number of springs fitted. A full complement of springs gives the catalogue maximum values. See Table 6.

Table 6

Series 320 Size:		01	0	1	2	3	4
No. of Springs	Torque Range						
2	(Nm)	6-12	10-20	20-40	40-80	80-160	160-320
	(in-lbs)	53-106	89-177	177-354	354-708	708-1416	1416-2832
4	(Nm)	12-30	20-40	40-80	80-160	160-330	320-640
	(in-lbs)	106-265	177-354	354-708	708-1416	1416-2920	2832-5664
8	(Nm)	25-60	40-80	80-150	160-330	320-530	640-1200
	(in-lbs)	221-531	354-708	708-1327	1416-2920	2832-4690	5664-10620
12	(Nm)	...	60-130	120-220	240-500	480-800	960-1800
	(in-lbs)	...	531-1150	1062-1947	2124-4425	4248-7080	8496-15930

Factory set units

Units which have been ordered to a factory pre-set torque, will have been adjusted to the specified value within +/- 10%. Normally, a full set of springs will be fitted but fewer than the maximum may be fitted for low torque settings.

The nut will be locked in position with a 2 set screws position at 90° to each other on the periphery of the adjusting nut.

WARNING: *The locking screws must be released before any change of setting and re-locked after adjustment.*

Torque Adjustment

If it is necessary to re-adjust the torque, release the locking screws and turn the nut clockwise to increase torque. Use a suitable adjustment tool which engages securely with the barring holes in the periphery of the nut. When the desired setting is reached, apply a maintainable thread locking agent (e.g. Loctite 242, 243) to the locking screws and tighten them down.

WARNING: *It is important that the nut is not screwed down too far, as there may then be insufficient internal clearance for the springs to deflect. In this condition, the unit may be prevented from disengaging on overload and is likely to suffer damage.*

If fewer than the maximum number of springs is fitted, higher torques may be obtained by fitting extra springs. Springs may also be removed to achieve lower torque settings. The remaining springs should be evenly spaced and a minimum of 2 used.

WARNING: *If the spring pressure is released completely, the control balls may come out of their location. It is therefore advisable to remove the torque limiter from the machine to a clean workbench area, and work on the unit with the nut uppermost. The adjustment nut can then be backed off and withdrawn from the unit to permit the fitting or removal of springs. Pockets within the nut locate the springs. Ensure that all springs fitted remain properly seated. It may be convenient to apply some general-purpose grease to the end of each spring to hold it in position during assembly.*

Un-set Units

If the unit has been supplied “un-set” the nut will be positioned near the minimum torque setting and the locking screws loosely fitted. A full set of springs will have been provided. If the required torque is known, then the unit may be adjusted as above.

For low torques, it is recommended that springs are removed so that the required setting is reached with the minimum number of springs fitted. They should be equi-spaced with a minimum of 2 being used.

If the required torque setting is not known with sufficient accuracy, it may be determined by trial adjustment. With the torque set at a low value, start the drive. If the unit does not disengage, the setting may be too high. Set to a lower torque or reduce the number of springs if possible. If the unit trips, repeat the procedure at progressively higher torque settings until the drive will start and run without tripping. DO NOT over-tighten. See warning under “Torque Adjustment”. Higher torque setting will only be possible if extra springs can be fitted.

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MAINTENANCE

Periodic maintenance will help extend the operating life of the torque limiter. As a matter of good practice, it is advisable to check the security of fasteners, the fitting of the hub to the shaft, the position of the adjusting nut and any external damage to the unit in conjunction with other planned maintenance.

If the unit is dismantled for any reason, parts should be cleaned and inspected for wear. If parts are to be re-used, a general purpose grease such as Shell Alvania R3, BP Energrease LS3 or Power Up Thixogrease (NGLI #2) should be applied to the ball seats, the ball retaining holes in the hub flange and the needle thrust bearing.

On re-assembly, apply a bearing retaining adhesive (e.g.Loctite 603,641) to the outer diameter of the bearing before fitting the drive plate. Slide the bearing assembly on to the hub and fit the circlip (refer to the picture on the front page). Align the ball seats with the holes in the hub. Insert the balls into the holes in the hub. Note that the original balls are a matched set. If they are to be replaced, only use close fitting balls from a single “lot”. (Precision bearing balls are normally packed in “lots” of the same gauge interval). Fit the thrust bearing ensuring that the bearing is fitted with the thick washer facing the balls, apply a small amount of grease to the thin washer and locate it in the matching cover recess. Fit the cover with the deeper recess over the thrust bearing and balls. Use some general purpose grease to retain the springs in the pockets in the adjusting nut and screw the nut onto the hub until the torque scale minimum value is aligned with the edge of the cover. Refer to the torque setting section for details on setting the torque to the required value.

Adverse Conditions

Under adverse operating conditions (e.g. high speed, high temperature, dust, dirt or abrasive contamination, wet or humid environments), units may require periodic maintenance or replacement. Use only authorized Autogard replacement parts.

PRIOR TO START-UP

- Guarding must be provided in accordance with local and national regulations.
- Ensure all fasteners have been properly installed and tightened.
- Check that the torque limiter is engaged with the balls fully seated.
- Ensure that all drive elements are properly aligned.

If in any doubt, consult Autogard.