

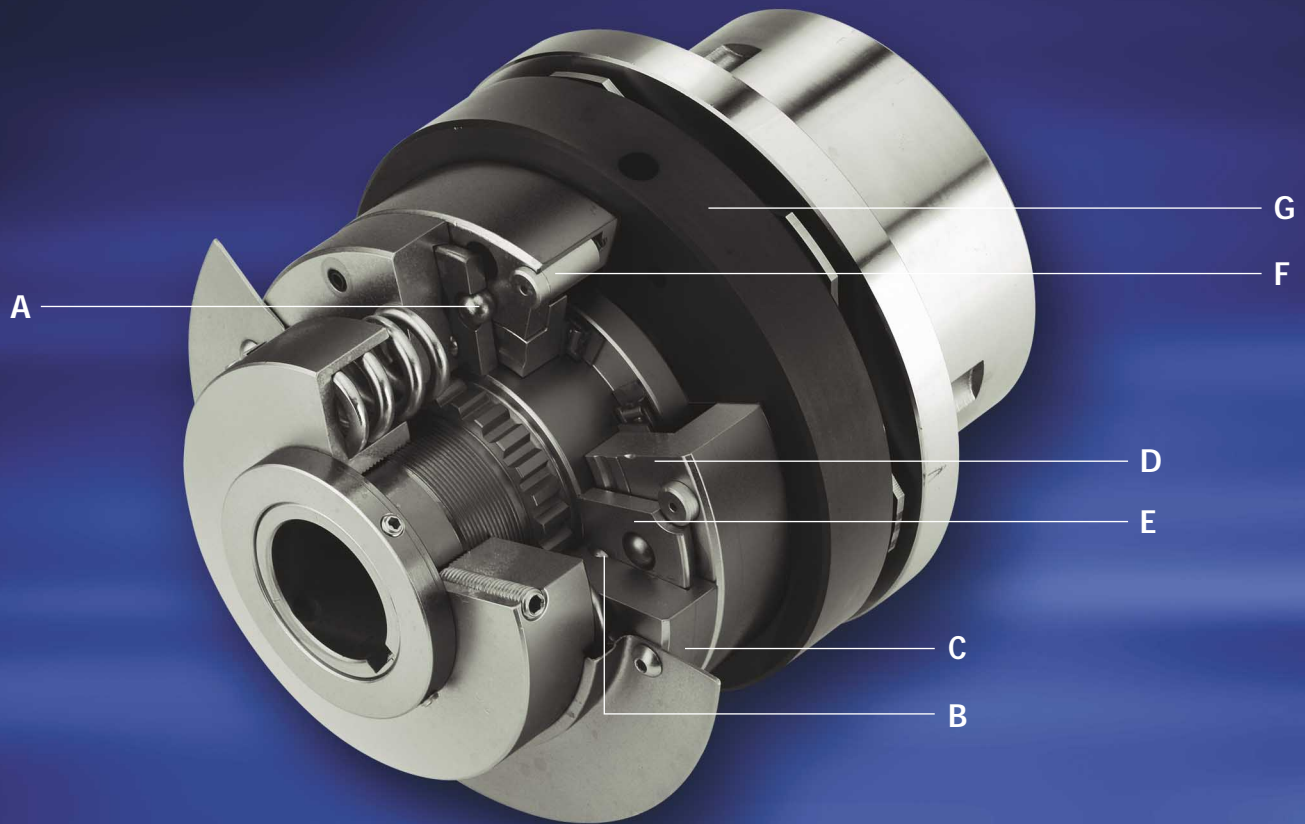
TORQUE LIMITER

SERIES 400



TORQUE LIMITER SERIES 400

Quality and Autogard are synonymous with overload protection. The company's reputation for high quality products is derived from over 35 years of design innovation and production. Autogard products are manufactured to meet ISO 9001 using the latest machine tools and high quality materials.



The Series 400 has been designed to meet the emerging need for a high and low speed, free wheeling Torque Limiter. The Series 400 differs from previous ball detent designs by using two sets of balls on concentric pitch circles.

In the normal drive condition, torque is transmitted through the drive balls 'A'. The inner strut balls 'B' are designed to carry no load during this time.

Disengagement on overload

When an overload condition occurs, the drive balls roll out of their seats forcing the slide plate 'C' and drive plate 'D' apart. The cage plate 'E', strut balls and drive balls all rotate until the cage plate hits a stop located in the slide plate. At this point the spring pressure has been transferred from the drive balls to the strut balls. The strut balls prevent the drive balls from re-engaging the drive plate. The coupling or driven media attached to adapter 'G' is now completely free to rotate. Although the series 400 has been designed to run freely after disengagement, it is recommended that a shut-down switch is incorporated to avoid wear.

Re-engagement

Re-engagement occurs when either the driving side is reversed, or the driven side is advanced. Pawl 'F' engages the cage plate 'E' and rotates it until the drive balls are re-seated. Resetting must be done at low speed to permit the engaging mechanism to function properly in either direction and to prevent potential damage.


The resetting can be done manually or automatically by slowly inching the motor in reverse.

The Series 400 comes standard as a Rapid Reset (RR) style Torque Limiter. This gives the following maximum angles of rotation to re-engage:

Size	Max rotation to re-set
1	60°
2	67.5°
3	30°
4	30°
5	30°
6	25.7°

Synchronous Reset (SR) designs are also available and must be specified at the time of ordering. These reset in a constant angular position.

TORQUE LIMITER SERIES 400



Multiple coil springs provide improved adjustment

Multiple coil springs provide improved servability

Features and Benefits:

- Proven design with thousands of units successfully in operation
- Accurate torque limitation prevents costly down time
- Standard designs can accommodate large torque ranges.
- Instantaneous disengagement protects equipment from damaging inertias.
- Bi-direction protection
- Series 400 is designed to operate at High or Low speeds.
- Automatic or manual re-engagement by reversing the unit.
- Series 400 is offered in a large number of styles ensuring the right solution is available for all applications. e.g.
 - Timing, HTD & V-Belt drives
 - Chain and sprocket drives
 - Gear drives
 - Flexible or rigid couplings
 - Flywheel or large gear mounts etc.
- Springs can be inspected and changed without removing the clutch from the drive train.

Selection:

Data required for torque limiter selection.

- Kilowatt or Horsepower and rpm of the driver.
- Shaft details of the driving and driven equipment.

(1) Calculate the nominal torque.

Torque (Nm) = Kilowatt (Kw) x 9550 / rpm or

Torque (lbf-ins) = Horsepower (HP) x 63025 / rpm

Consideration should then be given to start torque or other special circumstances depending on the position chosen in the drive system. Choose a set torque with a suitable margin over nominal. Select the torque limiter which has a higher torque rating.

(2) Check limiting conditions:

- (a) Check hub bore capacity.
- (b) Check the torque limiter dimensions such as the overall length and outside diameter.

(3) Select and specify the appropriate drive medium or coupling.

All Autogard Series 400 units may be supplied from the factory at a pre-set torque and with the required drive medium assembled to the unit.

Ordering the 400 series Torque Limiter

When ordering please provide the following designation
Model & Type / Size / Feature / S1 Bore / S2 Bore

Feature: RR – Rapid Reset (standard)
SR – Synchronous Reset (optional)

S1 Bore & S2 Bore – Please specify metric or imperial.
Standard bore tolerance = H8 + normal Fit key.

Example: 402 / 3 / SR / S1 40 mm

Refers to a type 402 size 3 torque limiter designed for synchronous reset.

Bore S1 = 40 mm

Also specify:

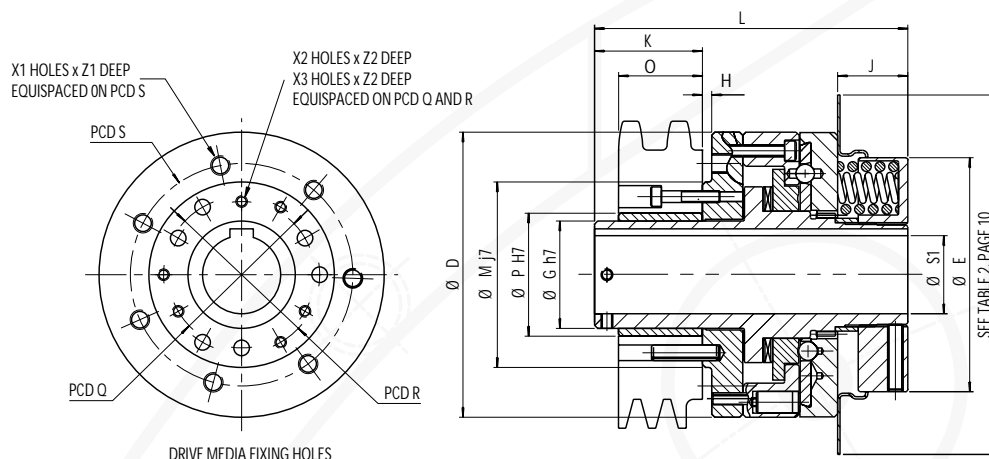
- Torque setting or torque range required.
- Pulley or sprocket details where required.

The specifications contained within this brochure are correct at the time of going to print. Autogard are continually reviewing and updating the specifications on all its product range and therefore reserve the right to change any detail.

AUTOGARD SERIES 400

MODEL 402

For use with sprockets, pulleys or gears. Supplied complete with bearing and a choice of mounting holes.



Technical Data

Size		1	2	3	4	5	6
Torque Nm ^③	Max	28	226	678	1130	2540	5650
	Min	3	20	60	75	225	1100
Speed rpm ^①	Max	3600	3600	3600	2000	2000	1800
Weight kg ^②		1.0	5.2	10.1	14.8	36.4	55
Mass Moment of Inertia kgm ² ^②	Hub Side	0.0002	0.0036	0.013	0.024	0.118	0.266
	Flange Side	0.0002	0.0041	0.013	0.024	0.090	0.170

1) Higher speeds may be allowed under certain conditions. Please consult Autogard.

2) Weights and moments of inertia apply to max (S1) bores and full hub length (L).

3) For higher torque applications - consult Autogard.

Dimensional Data - mm

Size		1	2	3	4	5	6
Max Bore S1 ^④		16	28	40	50	75	100
D		62	112	146	168	222	260
E		55	90	120	136	190	235
G		25	40	55	65	100	140 (h6)
H ^⑤		0	0	4.76	4.76	6.35	
K max		33.5	57	55	100	134	181
J ^⑥		14	37	35	36	56	25
L max ^⑦		83	148	160	212	284	373
M		30.2	75	95	122	155	
O max		25	44.5	43	84	116	
P		30	46	63	72	107.95	
Q		35	52	75	85	120	
R		38	61	80	90	125	
S		-	-	114	144	184	
X1		-	-	7 x M10	8 x M12	8 x M16	
Z1		-	-	15	15	23	
X2		3 x M3	3 x M4	3 x M6	3 x M8	4 x M8	
X3		3 x Ø4	3 x Ø5	3 x Ø8	3 x Ø10	4 x Ø10	
Z2		6	9	11	11	11	

Smallest Sprocket (No. of teeth) See note 8)	3/8" pitch	19	27	34	-	-	
	1/2" pitch	15	21	27	30	38	
	5/8" pitch	13	17	22	24	31	
	3/4" pitch	-	15	19	21	27	
	1" pitch	-	12	15	17	21	
Smallest Pulley Diameter ^⑨		46	70	92	104	139	

4) For max. bores greater than 25mm use rectangular parallel keys.

5) For size 6, the drive medium must be fitted with suitable bearings and fixings. Please specify or consult Autogard for assistance.

6) For size 6, clearance is required for torque adjustment. See Table 1 page 9.

7) Hub can be shortened to suit narrower drive media - please specify with order.

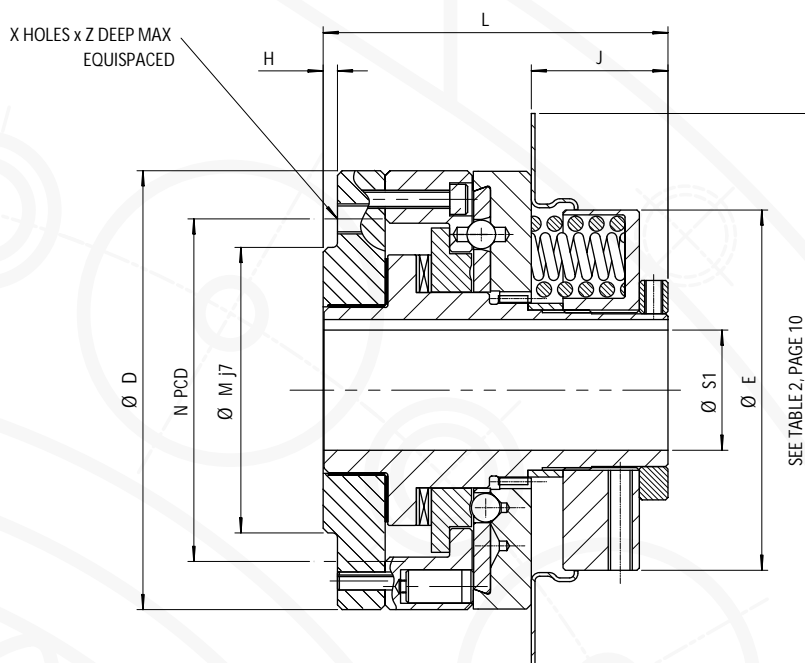
8) Use fixings on pcd "R". Smaller drive media may be possible using pcd "Q" if a tape bearing is used - consult Autogard.

9) The diameter quoted is to the bottom of a V pulley groove or the ID of the flange on a timing pulley.

AUTOGARD SERIES 400

MODEL 403

General purpose design. For use with self-supporting drive media and couplings.



Technical Data

Size		1	2	3	4	5	6	7	8	9
Torque Nm ③	Max	28	226	678	1130	2540	5650	11300	24860	56500
	Min	3	20	60	75	225	1100			
Speed rpm ①	Max	3600	3600	3600	2000	2000	1800			
Weight kg ②		0.9	5.0	9.8	13	32	47			
Mass Moment of Inertia kgm² ②	Hub side	0.0002	0.0035	0.013	0.023	0.108	0.258			
	Flange side	0.0002	0.0041	0.013	0.024	0.090	0.150			

1) Higher speeds may be allowed under certain conditions. Please consult Autogard.

2) Weights and moments of inertia apply to max (S1) bores.

3) For higher torque applications - consult Autogard.

4) For sizes 7+ designs may vary. Please consult Autogard for full technical details.

Dimensional Data - mm

Size		1	2	3	4	5	6	7	8	9
Max Bore S1 ⑤		16	28	40	50	75	100	127	152	178
D		62	112	146	168	222	260	311	385	457
E		55	90	120	136	190	235	283	362	451
H		1.59	4.76	4.76	4.76	6.35				
J	⑥	22	45	45	46	69	25	26	36	
L		59	108	114	121	164	218	245	300	410
M		30.2	75	95	122	155				
N		41.275	92	114	144	184				
X		5 x M4	6 x M8	7 x M10	8 x M12	8 x M16				
Z		8	14	15	15	23				

5) For max. bores greater than 25mm use rectangular parallel keys.

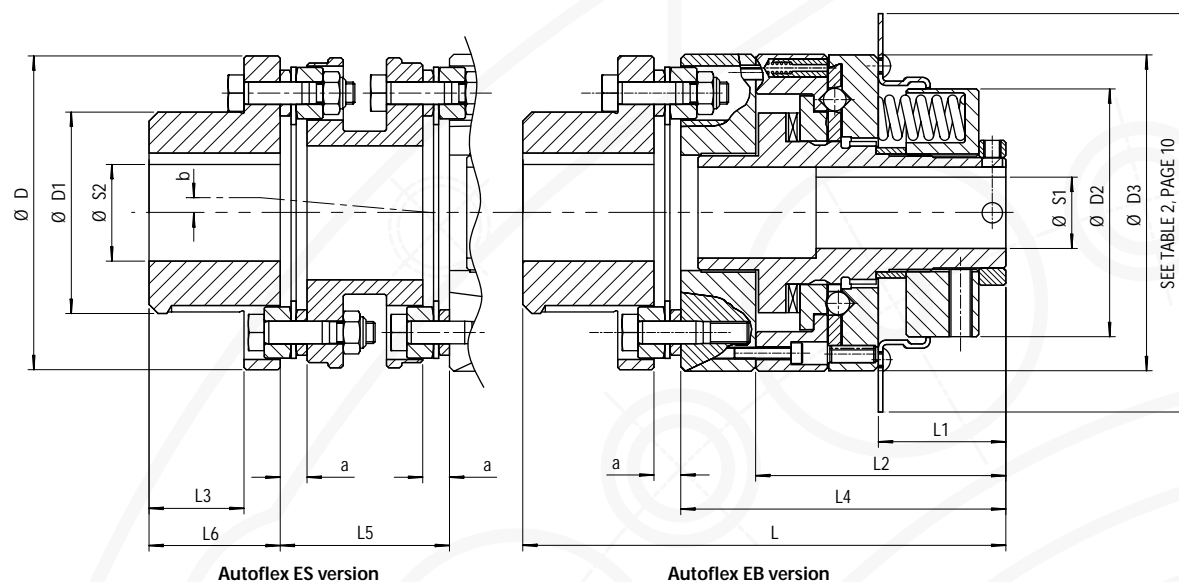
6) For sizes 6 and above, clearance is required for adjustment. See Table 1 page 9.

7) For sizes 6 and above, mounting details may vary. Please specify or consult Autogard for assistance.

AUTOGARD SERIES 400

MODEL 405

The model 405 includes the Autoflex EB torsionally rigid metal membrane coupling for angular misalignment. The Autoflex ES can also be supplied which accomodates angular and parallel offset misalignment.



Technical Data

Size			405-1/8HVII	405-2/35HVII	405-3/150HVII	405-4/150HVII	405-5/480HVII	405-6/880HVII
Torque	Nm ③	Max	28	226	678	1130	2540	5650
		Min	3	20	60	75	225	1100
Speed	rpm ①	Max	3600	3600	3600	2000	2000	1800
Weight	kg ②		1.5	7.1	16	20	50	91
Mass Moment of Inertia	kgm² ②	S1 Side	0.0002	0.0035	0.013	0.023	0.108	0.258
		S2 Side	0.0012	0.0116	0.073	0.086	0.211	0.649
Max Misalignment	④	Δ a (mm)	0.7	1.0	1.5	1.5	2.0	2.5
Parallel Offset	⑤	b (mm)	0.4	0.5	0.6	0.6	0.8	0.9

1) Higher speeds may be allowed under certain conditions. Please consult Autogard.

2) Weights and moments of inertia apply to max S1 and S2 bores, with EB type couplings.

3) For higher torque applications - consult Autogard.

4) Δ a is the max allowable variation in the gap between flanges measured between points around the periphery. This corresponds to 1/2° of pure angular misalignment. The total deviation from nominal due to axial and angular misalignment must not exceed Δ a.

5) Dimension 'b' corresponds to 1/2° angular misalignment per coupling disc pack with min spacer length. For longer spacers - consult Autogard.

Dimensional Data - mm

Size		405-1/8HVII	405-2/35HVII	405-3/150HVII	405-4/150HVII	405-5/480HVII	405-6/880HVII
Max Bore S1	⑥	16	28	40	50	75	100
Max Bore S2		30	50	90	90	110	137
a (nominal gap)		7.4	9.4	8.9	8.9	15	16.5
D		80	110	170	170	230	282
D1		44	70	123	123	150	188
D2		55	90	120	136	190	235
D3		62	112	146	168	222	260
L		107	169	203	210	284	370
L1	⑦	22	44	45	46	69	25
L2		48	88	94	100	131	156
L3		23	33	59	59	75	96
L4		68	123.4	120	127	189	234
L5	⑧	48	58	66.5	66.5	109	128
L6		32.5	46	73.5	73.5	95	120

6) For max bores greater than 25mm use rectangular parallel keys.

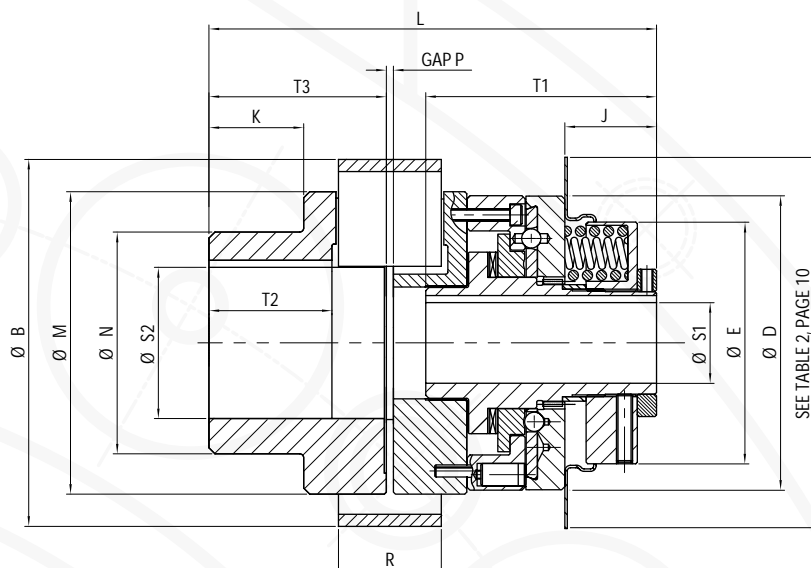
7) For size 6, clearance is required for adjusting bolt. See Table 1 page 9.

8) L5 dimension is the minimum length. Longer spacers are available on request - consult Autogard.

AUTOGARD SERIES 400

MODEL 406S

Design including the Autogard Samiflex torsionally soft flexible coupling for parallel and angular misalignment.



Technical Data

Size		1/A1	2/A3	3/A4	4/A5	5/A6	6/A7
Torque Nm ①	Max	28	226	678	1130	2540	5650
	Min	3	20	60	75	225	1100
Speed rpm ①	Max	3600	3600	3600	2000	2000	1800
Weight kg ②		2.2	10.1	19.7	35.6	63.2	103
Mass Moment of Inertia kgm ² ②	S1 Side	0.0002	0.0035	0.013	0.023	0.108	0.258
	S2 Side	0.0011	0.0181	0.069	0.198	0.427	0.818
Max coupling misalignments	Axial (mm)	+0.5	+0.7	+0.8	+1.0	+1.0	+1.0
	Parallel (mm)	0.3	0.5	0.7	0.7	0.8	1.0
	Angular (°)	2.0	2.0	1.3	1.3	1.3	1.0

1) Higher speeds may be allowed under certain conditions. Please consult Autogard.

2) Weights and moments of inertia apply to max bores (S1, S2).

3) For higher torque applications - consult Autogard.

Dimensional Data - mm

Size	1/A1	2/A3	3/A4	4/A5	5/A6	6/A7
Max Bore S1 ④	16	28	40	50	75	100
Max Bore S2 ⑤	41	54	70	85	114	140
B	83	144	182	225	265	306
D	62	112	146	168	222	260
E	55	90	120	136	190	235
J ⑥	22	45	45	46	62	25
K	-	45	47	57	70	88
L	116	195	222	259	316	421
M	65	116	150	190	233	267
N	65	85	110	140	180	205
P (nominal gap)	1.5	2.5	3.5	3.5	3.5	4
R	22	42	51	59	67	75
T1	58.9	108	114.4	121.2	163.5	217.5
T2	34	56	63	77	95	116
T3	44.8	76.8	88.0	106.3	128.3	153

4) For max. bores greater than 25mm use rectangular parallel keys.

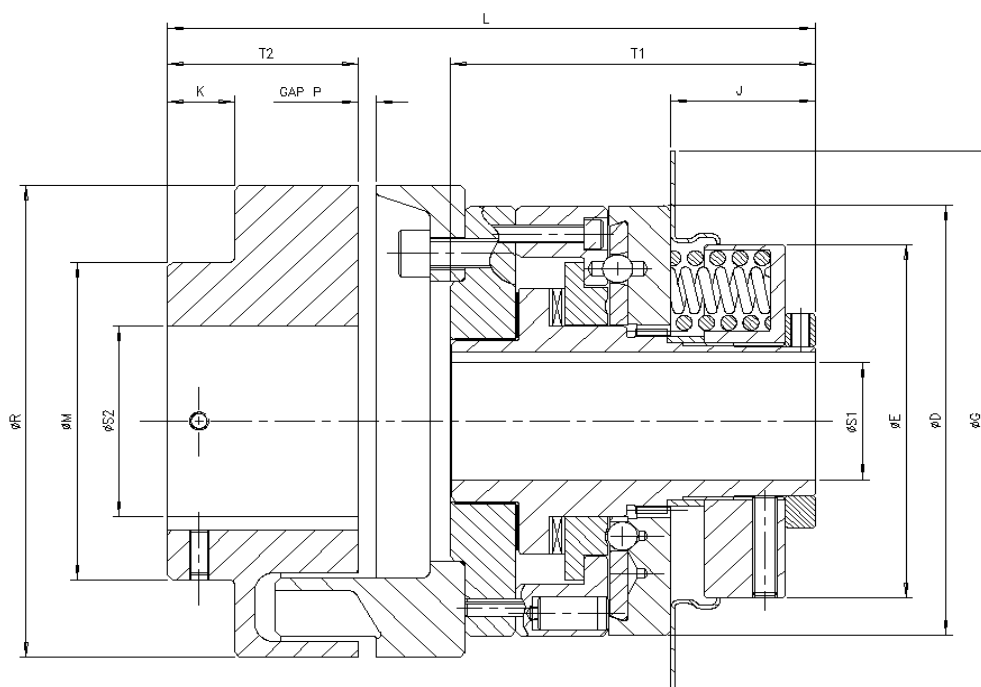
5) Larger S2 bores are available for sizes 2,3 and 4 using a large boss, "B" style hub - consult Autogard for details.

6) For size 6, clearance is required for adjustment. See Table 1 page 9.

AUTOGARD SERIES 400

MODEL 406N

Design including a torsionally soft flexible coupling for parallel and angular misalignment



Technical Data

Size			1/68	2/125	3/160	4/200	5/250	6/315
Torque Nm ①	Max		28	226	678	1130	2540	5650
	Min		3	20	60	75	225	1100
Speed rpm ②	Max		3600	3600	3000	2000	2000	1800
Weight Kg ③			1.4	9.8	16.4	27.2	54	92
Mass Moment of Inertia Kgm ² ④	S1 Side		0.0002	0.0035	0.0126	0.0230	0.1080	0.2581
	S2 Side		0.0005	0.0136	0.0343	0.0910	0.2781	0.7203
Max Coupling Misalignments	Axial (mm)		3	3	4	4	5	5
	Parallel (mm)		0.11	0.21	0.27	0.34	0.42	0.52
	Angular (°)		0.1	0.1	0.1	0.1	0.1	0.1

- 1) For higher torque applications please consult Autogard.
- 2) Higher speeds may be allowed under certain conditions. Please consult Autogard
- 3) Weights apply to maximum bores (S1, S2).
- 4) Moments of inertia apply to maximum bores (S1, S2) in disengaged condition

Dimensional Data - mm

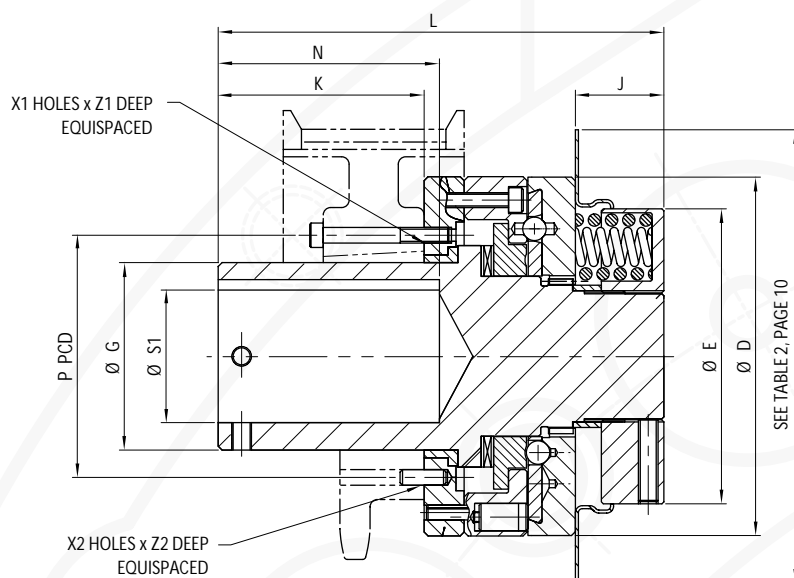
Size	1/68	2/125	3/160	4/200	5/250	6/315
Max. Bore S1 ⑤	16	28	40	50	75	100
Max. Bore S2	24	55	65	85	100	120
D	62	112	146	168	222	260
E	55	90	120	136	190	235
G	110	140	184	203	279	305
J ⑥	22	44	45	46	69	25
K	0	19	21	33	40	55
L	88	179	204	232	305	357
M	-	90	108	140	165	200
P (nominal gap)	3	3	4	4	5	5
R	68	125	160	200	250	315
T1	59	108	114	121	164	218
T2	20	50	60	80	100	125

- 5) For maximum bores greater than 25 mm use rectangular parallel keys.
- 6) For size 6, clearance is required for adjustment. See Table 1 page 9 of Series 400 catalogue

AUTOGARD SERIES 400

MODEL 409 SB

For use with, pulleys, sprockets and gears in applications requiring a large blind bore.



Technical Data

Size			1	2	3	4	5
Torque	Nm ③	Max	28	226	678	1130	2540
		Min	3	20	60	75	225
Speed	rpm ①	Max	3600	3600	3600	2000	2000
Weight	kg ②		1.1	5.5	11.4	15.9	36.4
Mass Moment of Inertia	Hub Side		0.0002	0.0039	0.015	0.026	0.118
	Flange Side		0.0002	0.0035	0.011	0.023	0.076

1) Higher speeds may be allowed under certain conditions. Please consult Autogard.

2) Weights and moments of inertia apply to max (S1) bores.

3) For higher torque applications - consult Autogard.

Dimensional Data - mm

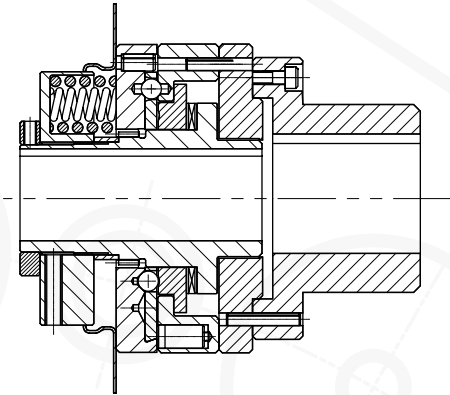
Size		1	2	3	4	5
Max Bore S1		28.6	41.3	54.0	79.4	102
D		62	112	146	168	222
E		55	90	120	136	190
G		38.1	57.2	76.2	104.8	139.7
K		43.9	57.2	84.1	125.5	164.3
J		14	37	35	36	56
L		94	148	181	232	303
N		51	65	90	127	165
P		49.213	76.2	98.425	127.0	165.1
X1	④	3 x 8 - 32 UNC	3 x 10 - 24 UNC	3 x 1/4 - 20 UNC	3 x 5/16 - 18 UNC	3 x 3/8 - 16 UNC
Z1		7.9	9.5	11	12.7	14.3
X2	④	3 x 4.75	6 x 4.75	6 x 6.35	6 x 7.94	6 x 9.525
Z2		7.1	9.5	9.5	12.7	12.7

4) For size 1, the pin and screw holes are equispaced in a pattern of 6.

For sizes 2 to 5, the 3 x screw holes are positioned at 30° to the 6 x pin holes.

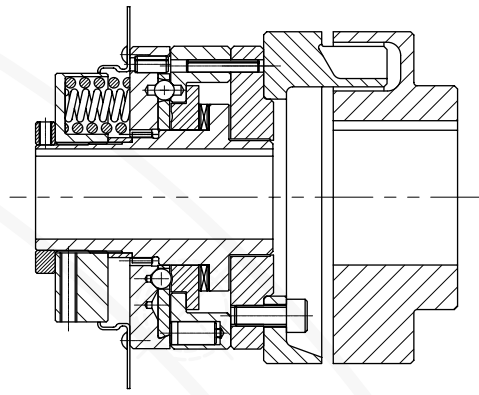
AUTOGARD SERIES 400

ADDITIONAL MODELS



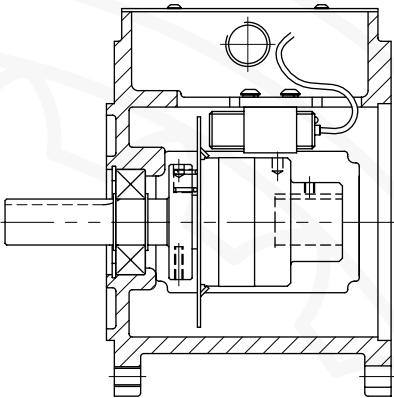
Model 404

A rigid coupling style used when the attached unit is self aligning



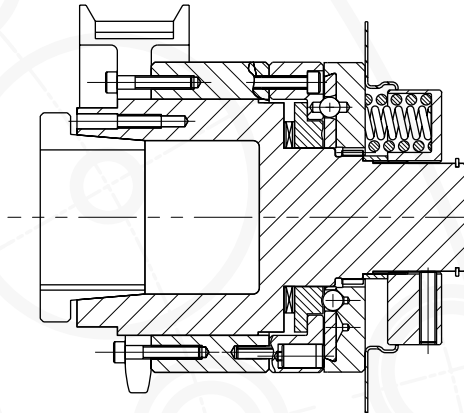
Model 406N

A torsionally soft flexible coupling



Model 408

An interposed style designed to fit between a standard motor & gearbox

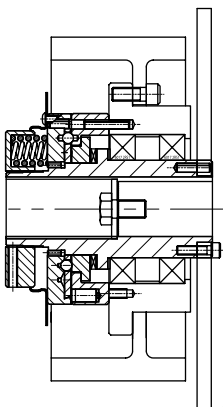


Model 409 QD

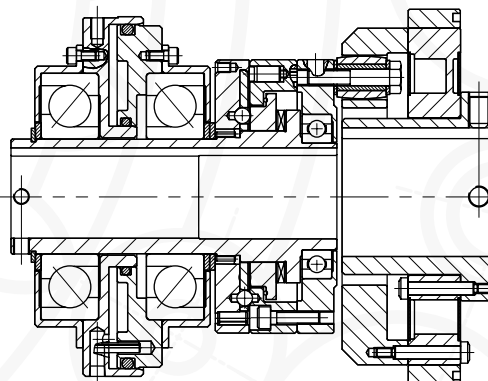
Standard 409 bored to suit standard industrial bushings

AUTOGARD SERIES 400

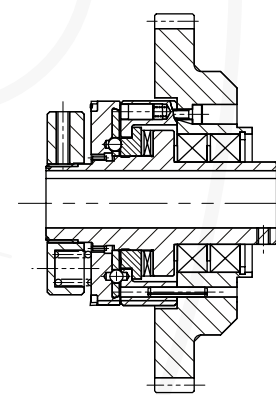
SPECIAL DESIGNS



Model 409 c/w large pulley and brake



Air actuated Model 403 c/w a flexible coupling and a Monitorq torque monitoring system.



Model 402 c/w a custom gear

AUTOGARD SERIES 400

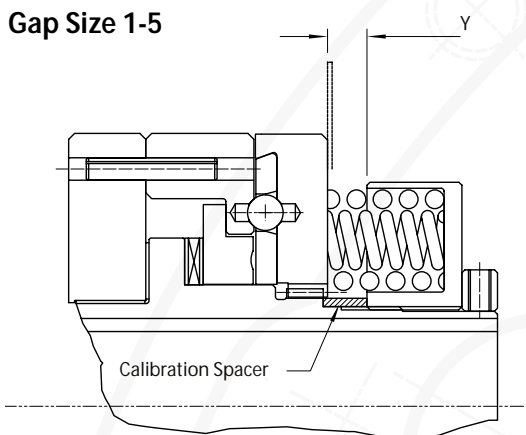
TORQUE LIMITER ACCESSORIES

Standard Springs

The torque carrying capacity of the series 400 Torque Limiter can be varied by the position of the adjusting nut and the number and configuration of the springs supplied.

Coil springs are offered on sizes 1 to 5, the number and length of which can be varied to provide an optimum range of torque settings. The larger size Torque Limiters utilise disc spring stacks which can be varied in thickness to provide a range of torque settings. The actual torque setting of a unit is directly related to the gap 'Y' - refer to table 1. Consult Autogard Engineering for details on quantities and configurations for the spring assemblies offered on each size.

Gap Size 1-5



Gap Size 6+

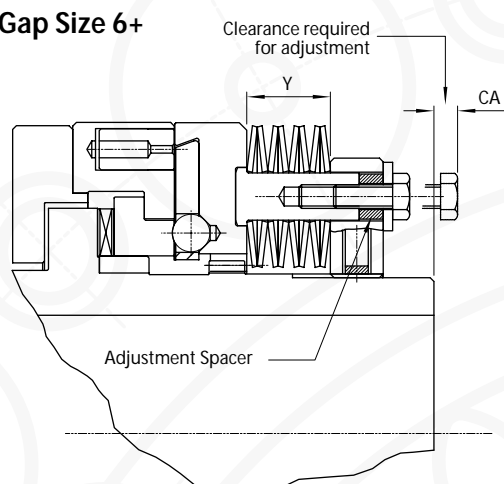


Table 1

Size		1	2	3	4	5	6	7	8	9
Min Gap 'Y'	(in)	.075	.20	.20	.20	.40	1.05	1.15	2.05	3.23
	(mm)	1.9	5.1	5.1	5.1	10.2	26.7	29.2	52.1	82.0
Clearance 'CA'	(in)	-	-	-	-	-	3/8	1/2	1	1-1/2
	(mm)	-	-	-	-	-	9.5	12.7	25.4	38.1

Torque Adjustment

The series 400 Torque Limiter can be shipped from the factory with the torque setting specified at the time of the order or furnished unset for adjustment at the time of installation. It should be noted that in the event that the torque ranges are not specified, Autogard will supply the torque limiter with a spring arrangement to provide the maximum rating for the size ordered.

Sizes 1 to 5 are furnished with a calibration spacer that prevents adjustment beyond the maximum torque rating of the unit. If factory setting is required, a spacer can be furnished to prevent adjustment to a higher value than that set at the factory. Standard units are not supplied with the spacer, which must be requested at the time the order is placed. The spacer must be removed to allow tightening of the adjustment nut to achieve a higher torque value. On sizes 6 and larger, positioning spacers are provided to prevent torque adjustment. If removed to make an adjustment, they must be replaced to assure proper operation.

In some cases the exact torque setting requirements are difficult to calculate with a reasonable degree of accuracy, therefore the recommended installation procedure would be to try to start the drive with a low torque setting, progressively tightening the adjusting nut until the unit will start and drive the mechanism without disengaging under normal conditions. Before attempting to turn the adjusting nut, ensure that the locking set screw is loosened and for sizes 6+, the locking key is removed. Replace keys and tighten setscrew after final adjustment.

Caution

DO NOT TIGHTEN THE ADJUSTING NUT SO THAT THE SPRINGS ARE COMPRESSED BEYOND THEIR MINIMUM OPERATING LENGTH, dimension Y, Table 1, or the springs will not allow sufficient movement of the slide plate to let the balls leave their seats during an overload. Damage to the machinery or to the Autogard Torque Limiter will result.

It is important that our product is used in the correct manner and that adjustments and setting in relation to a particular function follow recommended procedures.

AUTOGARD SERIES 400

TORQUE LIMITER ENGINEERING INFORMATION

Covers

Covers are not usually required for reasonably clean factory installations.

For protection against moderately dusty or dirty atmospheres the Autogard unit can be furnished with a dust resistant cover as shown in Figure 1 and Table 2. The dust cover incorporates a limit switch plate as shown.

Table 2

Size	Dimensions						Material
	Dc		Ec		Fc		
	(in)	(mm)	(in)	(mm)	(in)	(mm)	
1	2.9	74	2.5	64	3.25	83	Steel
2	4.7	120	3.7	94	5.5	140	Steel
3	6.1	155	5.1	130	7.25	184	Steel
4	6.9	175	5.7	145	8.00	203	Steel
5	9.1	230	7.8	198	11.0	279	Steel

Covers for exceptional applications such as high pressure wash down are available upon request – Consult Autogard.

Limit Switch Plates

The Autogard Series 400 has been designed to run for prolonged periods (dependant upon the conditions) in the disengaged position. However, it is preferable to use the slide plate movement on disengagement to operate a limit switch, which switches off the main drive and/or sounds an alarm.

The limit switch may be operated by a limit switch operating plate fitted to the slide plate or by the cover. In some circumstances a limit switch may be operated directly by the slide plate.

Table 3 and figure 2 gives details of the limit switch plate and the movement on disengagement.

Protective Finish

The standard protective finish applied to Autogard Torque Limiters is manganese phosphate plus oil dip. This treatment provides a high level of protection with good corrosion resistance and is suitable for most environments. Other finishes can be applied for situations where exceptional environments necessitate high levels of protection – Consult Autogard.

Installation Data

Maintenance

The Autogard Series 400 Torque Limiter normally uses needle thrust bearings and self-lubricating journal bearings. Both needle bearings and drive balls are packed with grease at assembly. Under reasonably clean conditions, or with the appropriate type of cover, the unit should operate properly with an annual inspection and re-greasing. The amount of maintenance required is dependent upon the operating conditions and should be maintained at least as frequently as the adjacent drive components. In adverse conditions – consult Autogard.

General Safety

The Autogard Torque Limiter is a reliable unit, built to high standards of workmanship. Similar to all mechanical devices, each application must be considered on its own merits with reference to safety (i.e. lifting equipment, explosive conditions, etc.) As a rotating component, adequate guarding must be provided, in accordance with local codes. Autogard staff are always available to discuss particular applications.

Figure 1

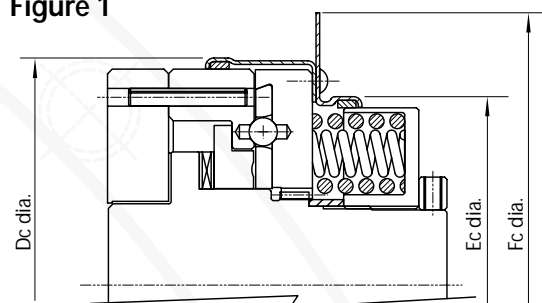


Figure 2

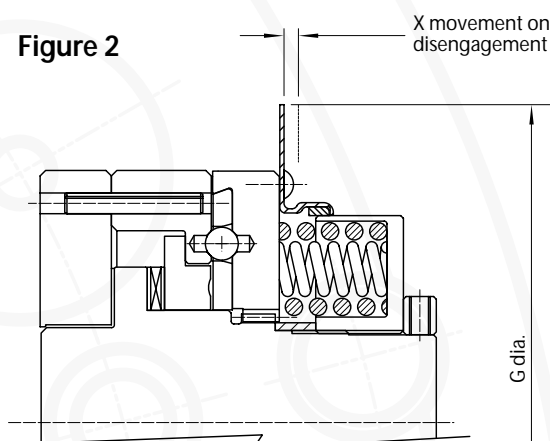


Table 3

Size		1	2	3	4	5	6
X	(in)	.059	.112	.137	.137	.173	.210
	(mm)	1.5	2.84	3.48	3.48	4.39	5.33
G	(in)	4.33	5.50	7.25	8.00	11.00	12.00
	(mm)	110	140	184	203	279	305

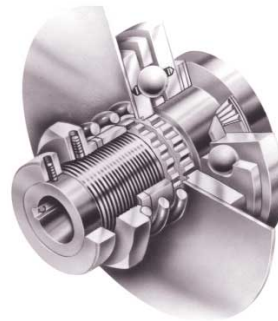
OTHER AUTOGARD PRODUCTS



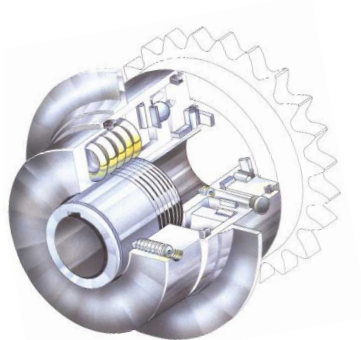
SamiFlex Elastic Couplings



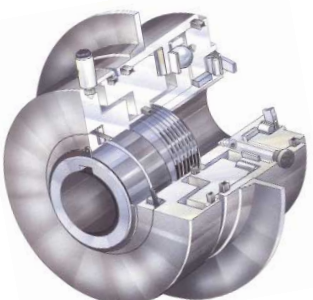
Autoflex Couplings



Autogard Series 200 Torque Limiters



Autogard Series 300 Torque Limiters



Autogard Series 600 Torque Limiters



Autogard Series 800 Torque Limiter



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