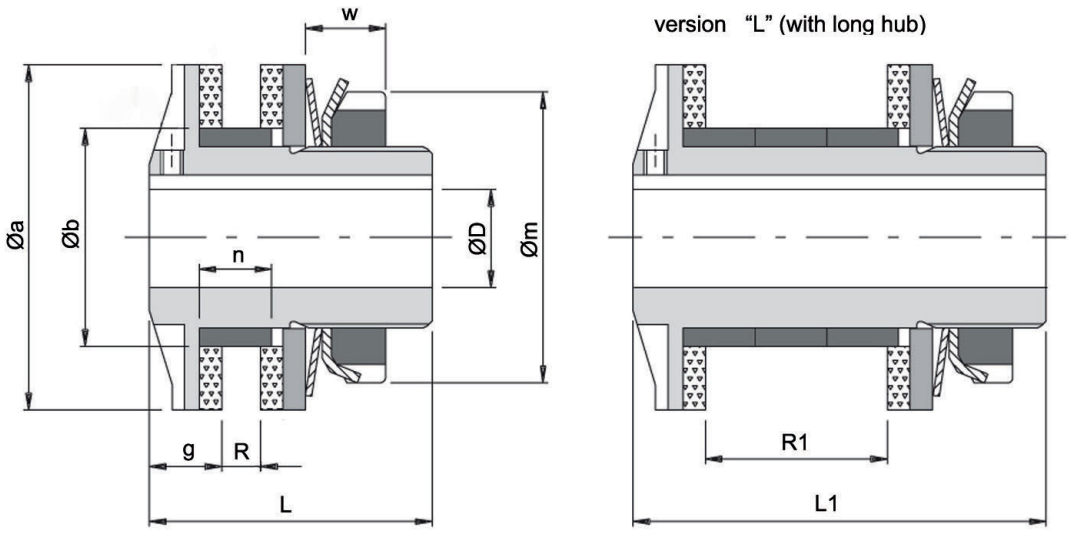
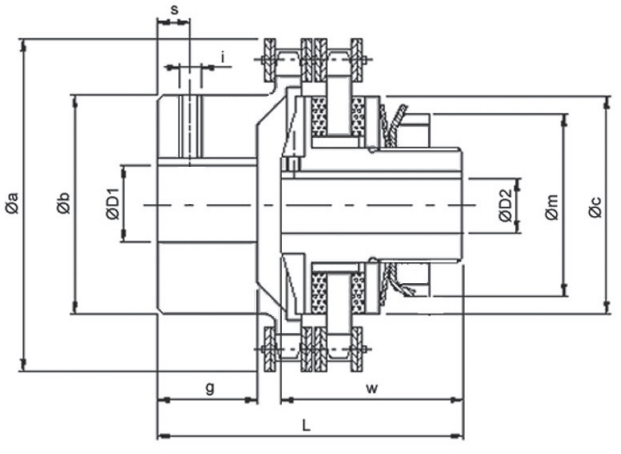
Operating Manual Slip Clutches
ECS and ECSK

Contents

1. Assembly drawings



Slip clutch ECS for indirect drives
left with short hub / right with long hub



Slip clutch ECSK for direct drives

ENEMAC slip clutches ARE NO safety devices to protect PERSONS from mobile parts!

2. Construction and Function

2.1 Construction

The slip clutch is a mechanical device. A drive element which is beeing pressed between two friction pads transfers torques from driving shaft to output shaft.

2.2 Function

In the case of an overload the transmission element slips and therefore separates the torque transmission.

3. Dimensioning of the slip clutch

3.1 Choosing the right type

3.1.1 Indirect drive

The slip clutch ECS can be equipped with several driving elements like sprockets and crown gears to transfer torques.

3.1.2 Direct drive

The slip clutch ECSK is meant for direct drives, it consists of the slip clutch ECS and an additional chain couplings extension.

3.2 Dimensioning of the torque

$$T_K\ (Nm) = \frac{9550 \times P \times K\ (kW)}{n\ (min^{-1})}$$

Explanations:

P = engine output
n = engine speed
K = coefficient of impact
T_K = torque of coupling
T_A = disengagement torque of coupling

3.3 Dimensioning of the bore sizes

The fitting between hub and shaft should be chosen as snug fit, at which the bore of the hub has an H7 fitting.

Keyways acc. to DIN 6885 Blatt 1.

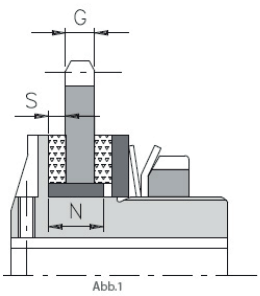
3.4 Dimensioning of the sprocket

The force transmission elements used (sprockets, gears, pulleys, etc.) have to feature certain properties in order to ensure a backlash-free torque transmission in normal operation and overload protection in case of failure (e. g. surface roughness Ra = 0.8 / 1.6). They must also be compatible with the dimensions of the torque limiter.

The table below shows a small selection of usable sprockets. When using other sprockets a minimum distance of 3 mm in diameter between the chain inner diameter „Øv“ and the outer diameter of the clutch „ØA“ has to be maintained to prevent an intervention of the chain on the torque limiter (fig. 3)

Besides the width of the chain „G“ and the width of the bushing „N“ followed has to be considered (fig. 1) **Nmin = S + G + 1**

For wider sprockets, we recommend an undercut (fig. 2). **Øfrei = ØA + 1; x = N - Nstd.**



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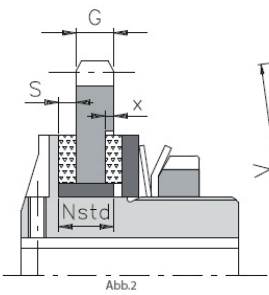

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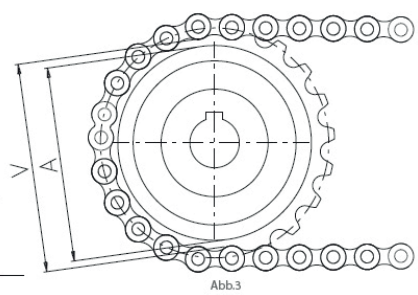


Abb.3

3.4.1 Fitting sprockets

This is just a small selection of fitting sprockets, many further combinations are also possible on request:

Size	pitch p [“]	no. of teeth z	G [mm]	S [mm]	N_{std} [mm]	ØA [mm]	ØV [mm]	Ordering no.
20	3/8	12	5,1	2	5,5	25	28	580419851P05
34	3/8	16	5,1	2,5	8	38	41	580406900P05
100	3/8	20	5,1	3	10	50	53	580406400P05
		22						580406500P05
210	1/2x5/16	22	7,0	4	15	70	73	580403700P05
	5/8	19	8,9					580404200P05
450	1/2x5/16	26	7,0	4	17	90	94	580404700P05
	3/4	18	10,9					580440100P05
950	3/4	23	10,9	4	21	115	119	580404900P05
	1	17	16,0					580440200P05
1200	3/4	28	10,9	5	25	140	144	580405500P05
	1	20	16,0					580440300P05
2600	1	24	16,0	5	28	170	175	580440400P05
	1 1/4	20	18,3					580417200P05
4800	1 1/4	26	18,3	5	32	205	210	580406200P05
8000	1 1/4	28	18,3	5	35	240	245	580406300P05
14000	1 1/2	28	23,8	6	40	300	306	580407000P05
18000	1 1/2	32	23,8	6	40	340	355	580407100P05
23000	1 1/2	36	23,8	6	42	400	403	580407200P05

4. Precautionary Measures

Before installation, always make sure that the features and specifications of the coupling are appropriate and suitable for the intended use. Sufficient space for the installation and maintenance in the future has to be provided. Make sure that the device can not cause dangerous situations for people and / or property and is always working under the current safety regulations.

The slip clutch is surface-treated with phosphate for corrossion protection. However, we recommend storing in a dry place.

Referring to the current EU machinery directive our product is not a machine. Therefore, the operation is subject to compliance with all requirements of the machine, in which the device is installed. If the instructions are executed incorrectly, the liability goes from the manufacturer to the customer.

ENEMAC slip clutches protect - in case of sudden overloads during canonical usage - mechanical elements and final goods from damages.

If you‘ve got any questions which can not be anwered by this manual, or details to special applications, please contact always directly ENEMAC GmbH.

5. Usage and installation

5.1 Preparations for the installation

If you have opted for finished bored version, note point 3.3

The output element has to be placed between the friction pads and must be compatible with the dimension of the selected product. (fig. 3.1 to 3.4), also the plane surfaces of the transmission element should have a surface roughness of Ra = 0.8 / 1.6.

When the hub is delivered with pilot bore the product must be demounted. Therefore firstly remove the adjustment nut. It should be ensured that the items must be installed in reverse order.

When removing the coupling for replacement of parts, the parts which get in contact with the friction pads have to be degreasing agent and the surface conditions have to be restored.

The product can be axially fixed with a screw and a washer or radial with a grub screw. In addition, there is also the possibility of a clamping hub or a shrink disk mounting.

To tighten the screws, use the data given in the table of tightening torques, in relation to the type and class of the screw.

This is not a self-supporting device and it‘s important that the shafts on which they are mounted, are supported with bearings. Working process shall not be done over the max. misalignements mentioned in catalogue.

5.2 Usage

The standart hub is, if not mentioned otherwise, the hub with keyway acc. to DIN 6885/1.

5.3 Dimensioning of the discs

The setting of the torque is formed by one or more springs in various combinations:

Size	A1S1)	A2S2))	A3S3)))	A1M1)	A1G1)	A2G2))	A3G3)))	ST	SQ
20	1 - 8	2 - 12	5 - 20						
34	1 - 14	4 - 22	15 - 34						
100	2 - 12				9 - 42	25 - 70	46 - 90	4,5 - 11	
210	4 - 20				15 - 80	30 - 150	80 - 230	2 - 34	2 - 60
450				12 - 85	55 - 160	95 - 290	175 - 450	5 - 56	3 - 70
950				65 - 265	130 - 380	200 - 700	290 - 950	10 - 130	25 - 160
1200					95 - 700	200 - 1300	280 - 1650		
2600					100 - 850	600 - 1900	800 - 2800		

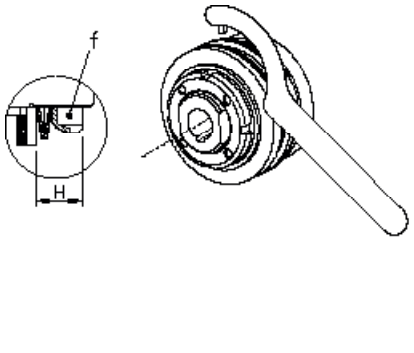
Size	A4M1 ()()	A4G1 ()()	A4G2 (())
4800	300 - 1200	500 - 2400	1000 - 4800
8000	500 - 2000	1000 - 4000	2000 - 8000
14000	800 - 3500	1500 - 7000	3000 - 14000
18000	1000 - 4500	2000 - 9000	4000 - 18000
23000	1500 - 5000	3000 - 11000	5000 - 23000

5.4 Dimensioning of the disengagement torque

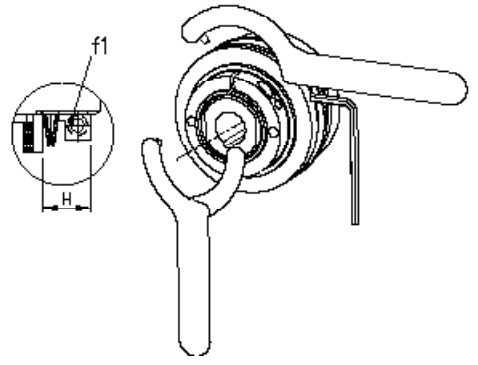
Check the disengagement torque before starting the machine.

In order to facilitate adjustment of the torque, the dimension „H“ is beeing introduced. The following explains how to regulate the dimension „H:“.

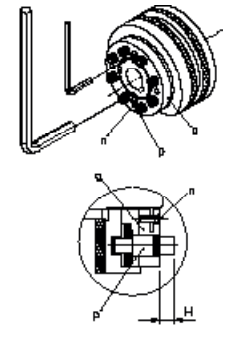
- Select the nearest torque value of the correct size and configuration of the springs of the setting table.
- Choose the needed dimension „H“ value.
- Turn the adjustment nut to obtain the value on the list.
- Secure the nut after the particular hub type.



Hub with keyway



Hub with radial locking



Hub with adjustment bolts

5.4.1 Hub with keyway (see left picture)

5.4.2 Hub with radial locking

Secure the nut by tightening the radial screw (see centrical picture)

5.4.3 Hub with adjustment bolts (see right picture)

See explanations on the next page.

- Unscrew all screws (p) as far from the hub until they barely touch the adjustment nut. **DO NOT COMPLETELY UNSCREW, NEVER REMOVE THEM.**
- Select three screws with equal distance to each other and screw those in until the dimension ‚H' is reached.
- Loosen the two locking screws (n), on the outside of the adjustment nut as far enough to be able to turn it. Now turn the adjustment nut so it gets slight contact witht the discs. **NO GREAT FORCE EFFECT NEEDED**. Thereafter screw the two locking in again, so that the adjustement nut is secured against undesired twisting.
- Tigthen up the adjustment bolts until the surface of the screw head is plain with the adjustment nut. Begin with the setting on the three bolts which have already been set on dimension ‚H' in the second step (see above). After that, the three bolts which lie 180° remote from these three. Finally, tighten the rest in the same way.

For initial operation or after extended inactivity of the coupling, we recommend to let the unit slip some time to adapt the friction pads surface on the output element.

5.5 The dimension ‚H'

In order to facilitate the adjustment of the disengagement torque the dimension ‚H' is beeing introduced, which can be read in the following tables.(see fig. in section 5.4)

5.5.1 Dimension ‚H' with axial discs

Size 20

H (mm)	A1S1	A2S2	A3S3
6	8		
6,1	7		
6,2	5		
6,3	4		
6,4	1		
7		12	
7,1		10	
7,2		7	
7,3		5	
7,4		2	
7,9			20
8			16
8,1			12
8,2			9
8,3			5

Size 34

H (mm)	A1S1	A2S2	A3S3
7,8	14		
8	13		
8,2	12		
8,4	11		
8,6	8		
8,8	5	22	
9	1	21	
9,2		17	
9,4		13	
9,6		8	34
9,8		4	33
10		2	29
10,2			23
10,4			15

Size 100

H (mm)	A1S1	A1G1	A2G2	A3G3
8	12			
8,2	10			
8,4	7	40		
8,6	4	38		
8,8	2	32		
9		25		
9,2		15		
9,4		4		
10			70	
10,2			57	
10,4			39	
10,6			17	
11,2				100
11,4				84
11,6				56
11,8				23

Size 450

H (mm)	A1M1	A1G1	A2G2	A3G3
11	105			
11,4	99	140		
11,8	89	124		
12,2	74	101		
12,6	49	74		
13	13	40		
13,4			280	
13,8			256	
14,2			213	
14,6			158	
15			90	
15,4				450
15,8				415
16,2				353
16,6				276
17				185

Size 210

H (mm)	A1S1	A1G1	A2G2	A3G3
9,4	18			
9,6	15			
9,8	12			
10	9	60		
10,2	6	56		
10,4		51		
10,6		45		
10,8		37		
11		29		
11,2		19		
11,8			120	
12			111	
12,2			96	
12,4			75	
12,6			54	
12,8			34	
13,2				210
13,4				199
13,6				176
13,8				150
14				122
14,2				91
14,4				60

Size 950

H (mm)	A1S1	A1M1	A1G1	A2G2	A3G3
13,6	100				
14	99	280	360		
14,4	87	277	348		
14,8	63	263	324		
15,2	26	234	289		
15,6	12	192	243		
16		135	186		
16,4		65	120		
17,2				700	
17,6				635	
18				558	
18,4				461	
18,8				344	
19,2				207	
20,4					950
20,8					842
21,2					672
21,6					462
22					210

Size 1200

H (mm)	A1S2	A1M1	A1G1	A2G2	A3G3
15,5	140				
16	135	240			
16,5	130	200	550		
17	120	150	485		
17,5	95	100	420		
18	80		360		
18,5			300		
19			240		
19,5			180		
20,5				950	
21				900	
21,5				830	
22				750	
22,5				660	
23				550	
23,5				420	
24				260	
25					1200
25,5					1100
26					1000
26,5					820
27					630
27,5					390

Size 2600

H (mm)	A1G1	A2G2	A3G3
17	700		
18	640		
19	550		
20,5	410		
21,5	270		
22	240		
22,5	160		
23,5		1450	
24,5		1300	
25,5		1000	
26		800	2600
26,5		580	2500
27		300	2400
27,5			2350
28,5			2100
29,5			1675
30			1400
30,5			1000

5.5.2) Dimension ‚H' with helical screws

Size 100	
H (mm)	ST
25	9
26	8
27	7
28	6
29	5,5
30	4,5
31	3,5
32	3
33	2
34	1,5

Size 210		
H (mm)	ST	SQ
30,5	34	
31,5	29	
33	24	
34,5	21	
36	17	60
37,5	14	52
39	11	42
40,5	8	33
42	6	24
43,5	4	16
45	2	8
46,5		2

Size 450		
H (mm)	ST	SQ
35		70
38		62
41	56	54
44	45	46
47	36	38
50	27	30
53	20	23
56	12	16
59	5	9
62		3

Size 950		
H (mm)	ST	SQ
50	130	
53	108	160
56	88	135
59	70	112
62	52	89
65	36	67
68	22	46
71	10	25

5.5.3) Dimension ‚H' with adjustment bolts

Size 4800			
H (mm)	A4M1	A4G1	A4G2
0,5			1000
1	300	500	2200
2	500	1200	4800
3	750	1800	
4	900	2400	
5	1200		

Size 8000			
H (mm)	A4M1	A4G1	A4G2
0,5			2000
1	500	1000	4000
2	800	2000	8000
3	1200	3000	
4	1600	4000	
5	2000		

Size 14.000			
H (mm)	A4M1	A4G1	A4G2
0,5		1500	3000
1	800	2000	7000
2	1400	3600	14000
3	2100	5000	
4	2800	7000	
5	3500		

Size 18.000			
H (mm)	A4M1	A4G1	A4G2
0,5			4000
1	1000	2000	9000
2	1800	4500	18000
3	2700	6500	
4	3600	9000	
5	4500		

Size 23.000			
H (mm)	A4M1	A4G1	A4G2
0,5			5000
1	1500	3000	11000
2	2200	5500	23000
3	3000	8000	
4	4000	11000	
5	5000		

5.5.4) Dimension ‚H' with radial locking

Size	Dimensioning
34	H + 2,7 [mm]
100	H + 1,5 [mm]
210	H + 7 [mm]
450	H + 7 [mm]
950	H + 5 [mm]
1200	H + 5 [mm]
2600	H + 5 [mm]

The torque values in the tables refer to static tests under normal conditions. These values can change depending on the operating parameters:
Quantity and frequency of slip processes, characteristic of the spring load and environmental conditions.

6. Maintenance

Maintenance work on the slip clutch is required to resore the disengagement torque of the clutch, as the friction pads wear off by the constant slippage. For this purpose, readjust by turning the adjustment nut.
The friction pads have to be replaced before the pressure flange touches the bearing.
It should be noted that various factors can effect the life period of a slip clutch:

- Exceed the maximum torque
- The frequence and length of overload situations
- Temperatures
- Speed
- Working environment

6.1 Warning:

Independend from the rotary speed the process has to be stopped as soon as possible when the slip clutch intervenes an overload. This can happen through a proximity switch or an electronic switch.

7. Supplements

7.1 Warranty

The warranty period is 12 months starting with date of delivery when used in the intended one-shift operation. The warranty does not cover damage caused by improper operation. Any warranty claims are determined by repair or intervention, carried out by unauthorized persons and the use of utilities and spare parts, which aren‘t matching our slip clutch.

7.2 Safety regulations

Regardless of the instructions listed in this manual, the german statutory safety and accident prevention regulations are valid. Any person who is responsible for the operation, maintenance and repair of the friction coupling must have read and understood the operating instructions before commissioning. Repairer of the friction coupling are basically responsible for workplace safety. Following all valid safety and regulatory instructions is an requirement to prevent damages to persons and the product during maintenance and repair work. Proper repair of ENEMAC products asumes accordingly trained staff. The duty of training is up to the operator or repairer. It is to ensure that the operator and future repairer are properly trained for the product

7.3 Copy right

7.4 Spare Parts

Only spare parts, which correspond to the requierements specified by ENEMAC GmbH or supplier are allowed. This is always guaranteed with original spare parts. Improper repairs, as well as incorrect spare parts lead to the exclusion of product liability or warranty. When ordering spare parts it is essential to specify type, size and order confirmation no. of the slip clutch to avoid incorrect deliveries.

7.5 Provisio

We reserve the right for technical changes. Changes, errors and misprints shall not justify any titles of indemnity.