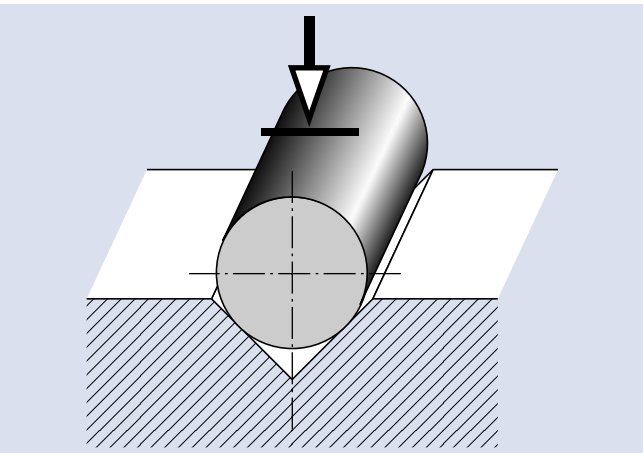
Backlash-free safety couplings

Product information

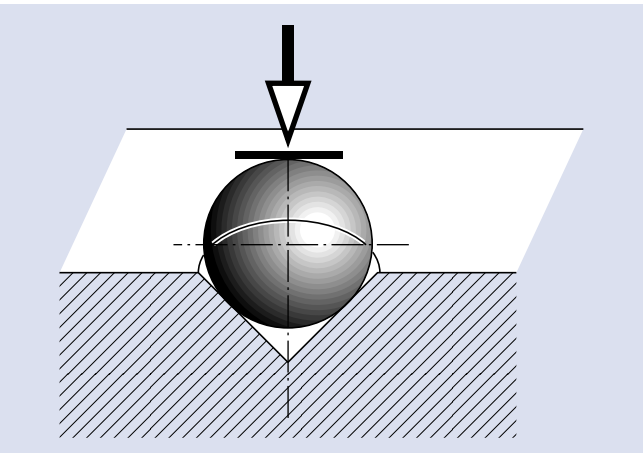
Optimal safety has a name:

Backlash-free safety couplings

Guaranteed by two systems:



Locking element - cylinder roller
for low, medium and high dynamic loads

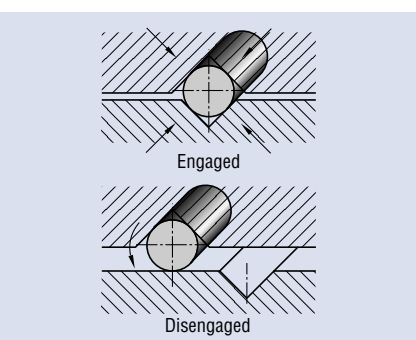


Locking element - ball
for low and medium dynamic loads

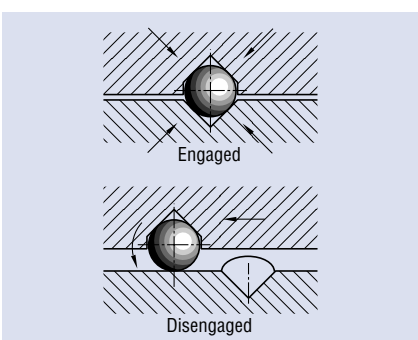
GERWAH® Backlash-free safety couplings are delivered ready for installation. They are partly protected by an environment-friendly protective coating. The standard backlash-free safety couplings have borings according to ISO-H7 fitting. We recommend a transition fitting, e.g. H7/j6, for the shafts. If other shaft fittings are used, the fitting tolerance may not exceed a maximum of 0,03 mm.

Power is transmitted between the coupling hub and shaft by compression and friction between the contact surfaces. Special attention must therefore be paid to the tightening torque, the retaining screws, and the perfect condition of the contact surfaces. The contact surfaces must be free of oil and grease.

The disengaging torque specified in the technical data can only be safely transmitted if all these points are followed. If they are not, a reduction in performance must be accepted.



Roller principle

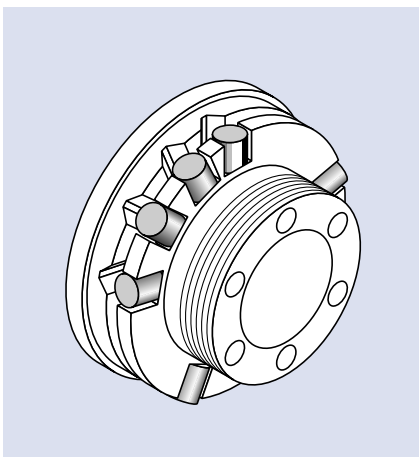


Ball principle

Backlash-free safety couplings

Product information

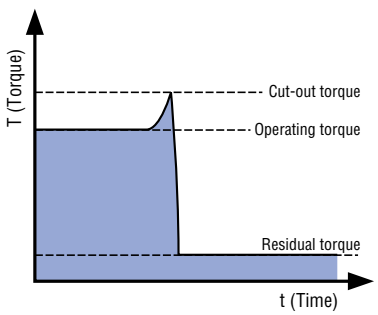
Backlash-free safety couplings are precision torque limiters with different functional systems for overloads.



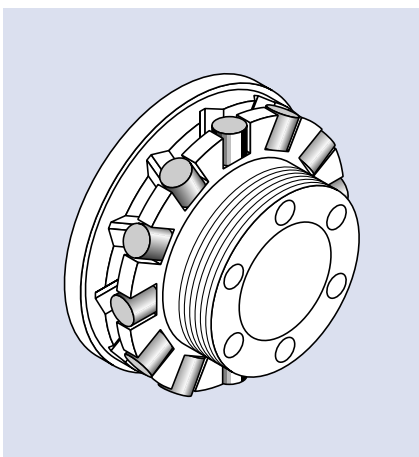
Functional system, synchronizing engagement:

The special indentation geometry for the cylinder rollers or balls only allows the coupling to resume operation after an overload in a particular position, e.g. after 360°. This system is used wherever synchronization after an overload is essential.

e.g. in feeding equipment
in transfer stations
in automation systems



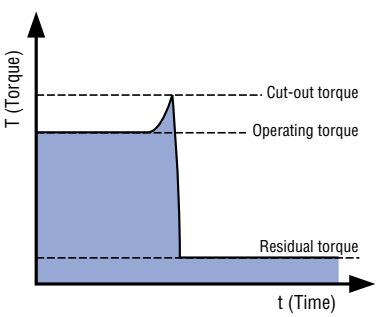
Switching characteristic



Functional system, continuous engagement

till size 30 → 45°
from size 60 → 60°

The indentation geometry for the cylinder rollers or balls is continuous. After an overload the safety coupling can resume operation in various positions. This system is used wherever synchronization after an overload is of no importance.



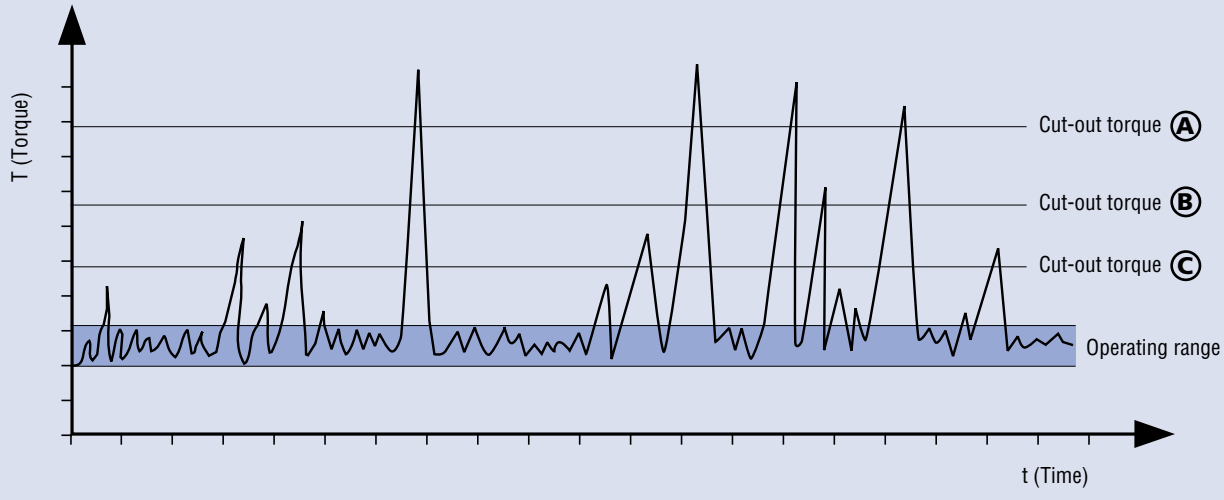
Switching characteristic

Backlash-free safety couplings

Dimensioning

The load limits of our backlash-free safety couplings were determined in extensive series of tests. Two torque ranges are specified for every size. Optimal dimensioning from a technical and price point of view is therefore possible.

In determining the size of coupling, the cut-out torque defined by the user should lie approximately in the middle of the coupling's specified torque range. This makes correction of the cut-out torque possible, e.g. during commissioning.



Ⓐ Cut-out torque very high, only extreme load peaks are to be rendered ineffectual. Few cut-outs.

Ⓑ Medium cut-out torque, load peaks strongly reduced. More frequent cut-outs.

Locking element used:  **or** 

Ⓒ Low cut-out torque, virtually no overloads permitted. Many cut-outs.

Locking element used: 

Dimensioning can also be based on the calculation example on pages 26 and 27.

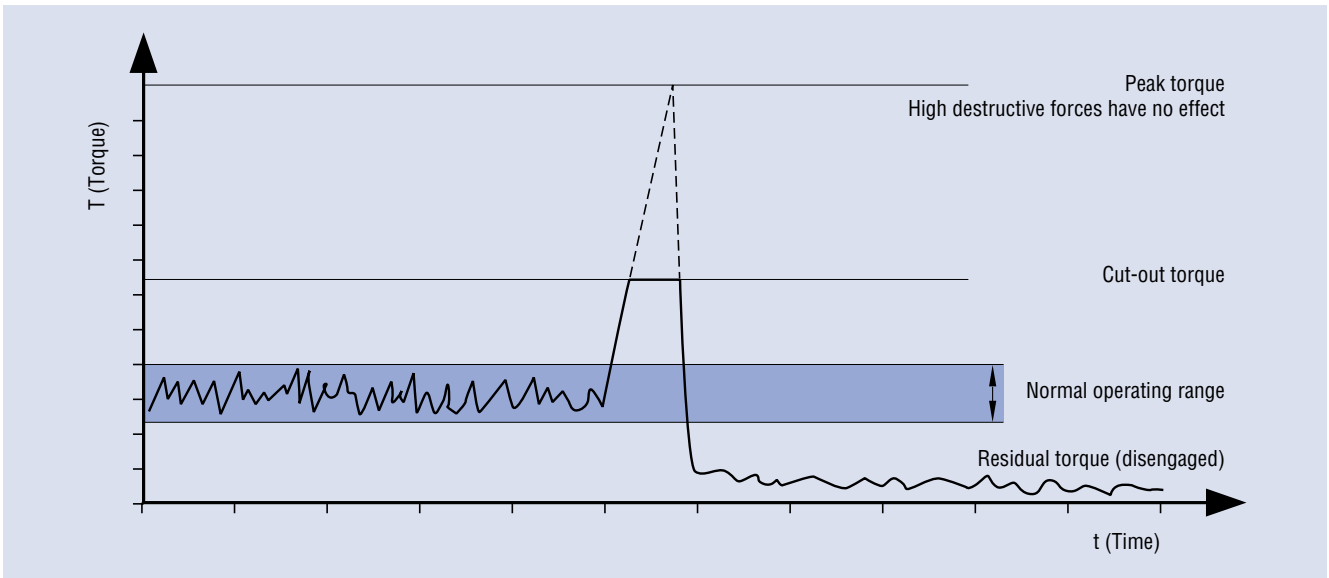
Our engineering specialists will gladly advise you in the selection and application of couplings. Please contact us for help.

Backlash-free safety couplings

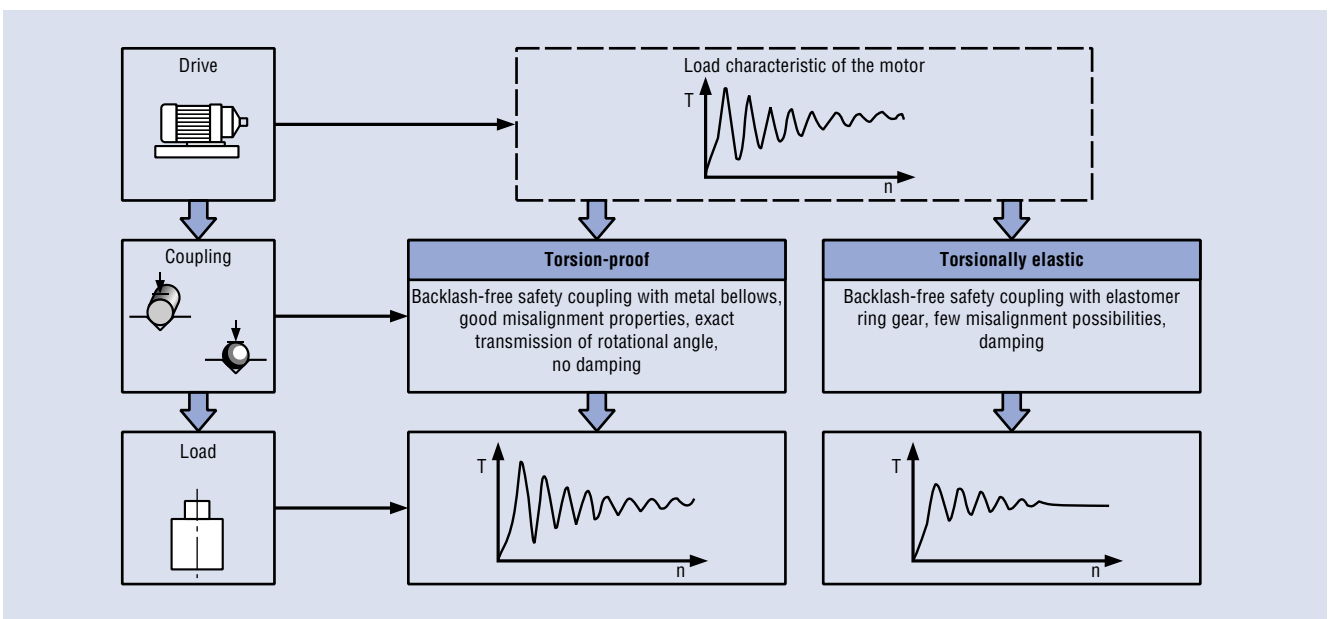
Product information / Customer's advantage

A good concept offers many possibilities

1. Large destructive forces have no effect.



2. In combination with backlash-free servo insert couplings the load characteristic of the motor for the machine can be influenced favourably.

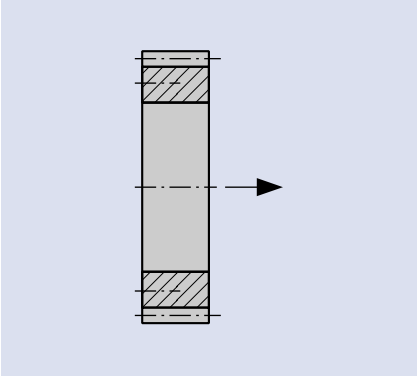


Backlash-free safety couplings

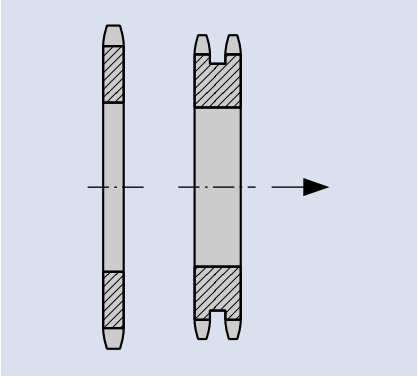
Product information / Customer's advantage

3. What type of machine part do you want to attach?

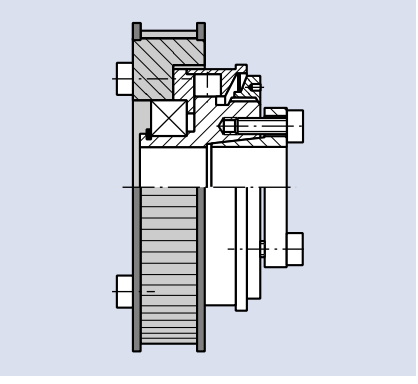
Spur wheel



Chain wheel, etc.



Toothed-belt pulley

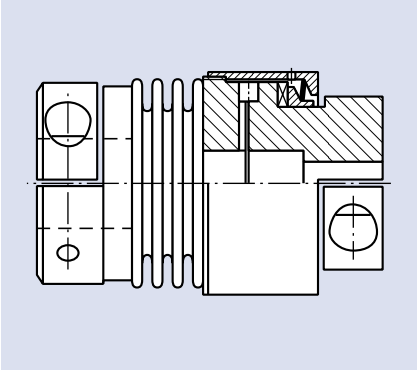


Series DMK/L

4. How do you want to connect the two shafts without backlash?

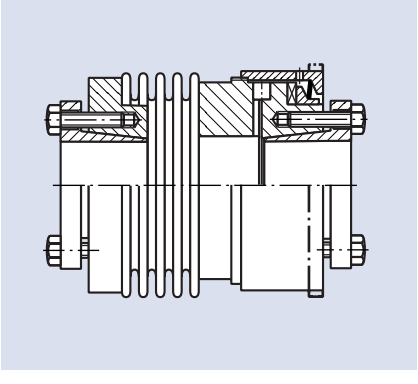
Safety coupling in combination with:

Torsion-proof metal bellows



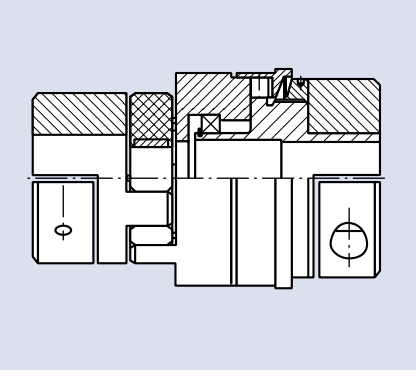
Series DBK/DK

Torsion-proof metal bellows



Series DBK/B

Torsion-proof elastomer gear ring



Series DMK/DS

Our coupling systems offer an inexpensive and technically optimal solution for almost every application. Please see overleaf (page 12 and 13) for a quick overview of our series.

Backlash-free safety couplings

Product information

GERWAH® backlash-free safety couplings work as spring-loaded positive couplings. The special roller or ball guides guarantee a totally backlash-free transmission of the torque in both directions of rotation. The couplings are therefore especially suitable for use in speed and directioncontrolled drives in conjunction with a closed control loop. Uniform loading of the rollers and balls guarantees high system stiffness, which is important especially for modern servo drives. The roller or ball guides simultaneously guarantee high reliability and switching frequencies when used with high dynamic servo drives.

In the event of an overload the rollers or balls move out of the guides. This results in an axial movement, which activates a proximity switch or limit switch that immediately makes contact to switch off the drive. To avoid damage to the safety coupling, the drive must be switched off immediately after an overload.
GERWAH® backlash-free safety couplings were developed for especially dynamic drives operated under constantly changing directions of rotation and under high acceleration. The safety couplings work exclusively with specially selected disk springs with a pronounced degressive characteristic (see figures 6 and 7). This advantage guarantees shortest switching times (2-4 msec) and a low residual torque, less than 5% in a disengaged state. The coupling disengages immediately when the cut-out torque is exceeded. The torque drops immediately to a small residual value, typically 2 to 5%. The switching work required of our couplings corresponds to only a fraction of that of conventional safety couplings with progressive characteristic (see figure 7). This is a decisive advantage because even ultrashort surges in speed are rendered harmless by the safety coupling.

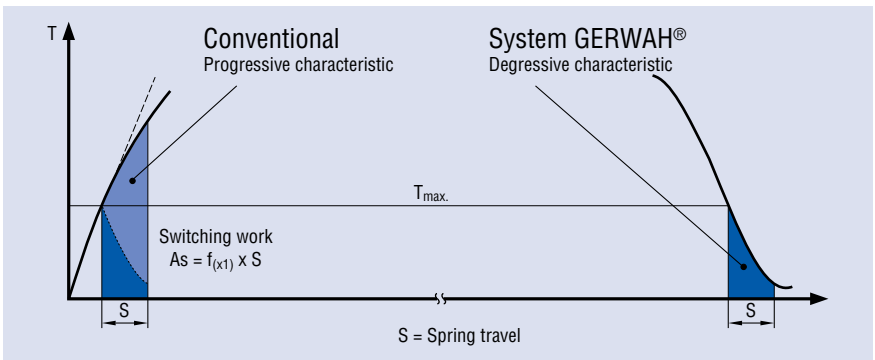


Figure 7: Advantage of System Gerwah®

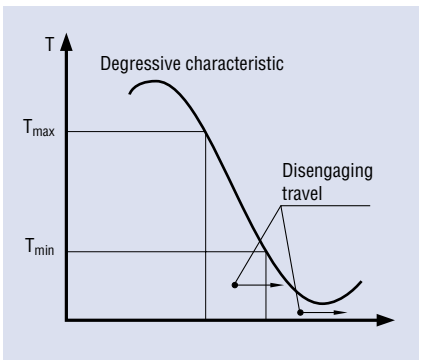


Figure 6: Spring characteristic System GERWAH®

Adjustment of the cut-out torque

GERWAH® backlash-free safety couplings are delivered with set cut-out torque. There are two possibilities for this, namely:

1) The user/operator names the cut-out torque in his order.
2) The coupling is set on the lowest cut-out torque in its torque range.

Since the handling of disk springs with degressive characteristic regularly causes problems, we would like to explain the adjustment of the cut-out torque in detail.

Figure 8 shows the spring travel we use for our safety couplings.

Point (A) stands for the highest spring force = highest cut-out torque.

Point (B) stands for the lowest spring force = lowest cut-out torque.

Note! The spring travel corresponds approximately to three-quarters of a revolution of the set collar. Every required cut-out torque is progressively adjustable.
Due to the degressive characteristic of System GERWAH®, the cut-out torque is reduced when the set collar is turned in a clockwise direction (towards min.) and raised when turned in an anti-clockwise direction (towards max.).
Note! The set collar may only be turned between min. and max.!

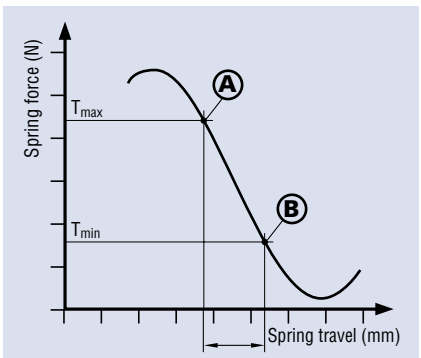


Figure 8

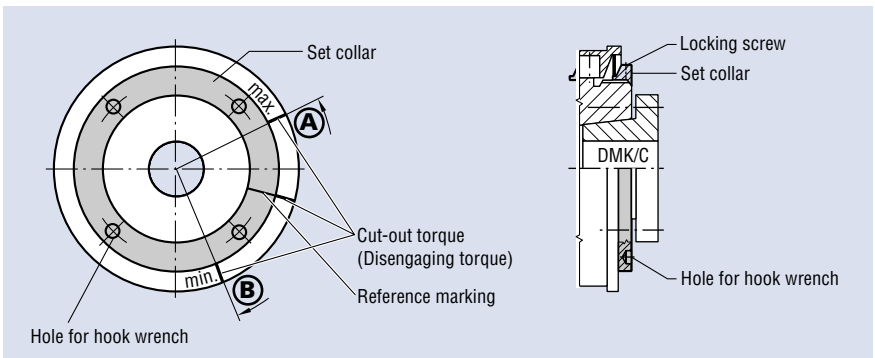


Figure 9

Backlash-free safety couplings

Switches

GERWAH® backlash-free safety couplings produce an axial movement (= disengaging travel) of the outer cover or the ring in the event of an overload (see figures 1 and 2). This disengaging motion allows a proximity switch or a mechanical limit switch to be activated. This switching signal can be used to switch off the drive and simultaneously emit an acoustic or optical signal. The switches recommended by us are shown on page 25.

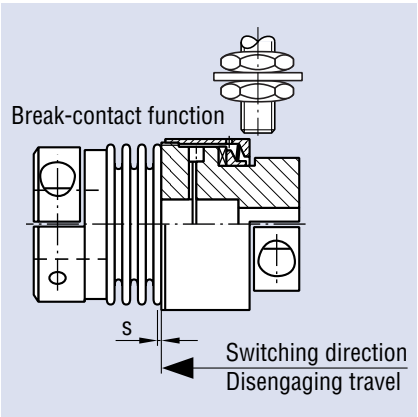


Figure 1: Disengaging travel series DBK/...

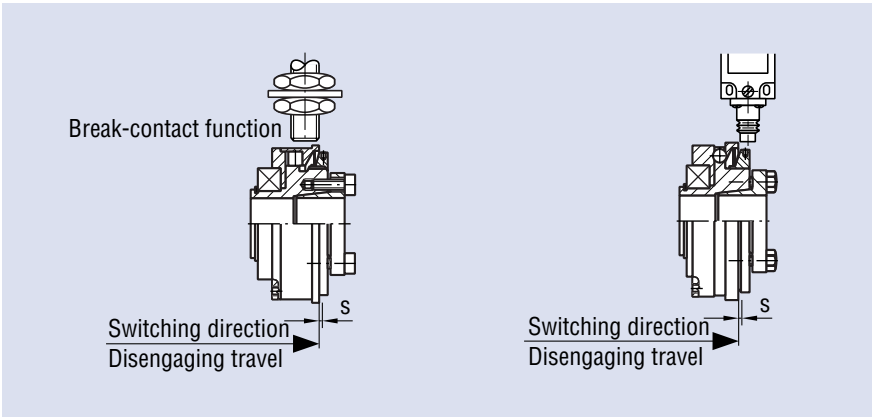


Figure 2: Disengaging travel series DMK/... and DXK/...

Backlash-free safety couplings of the series DBK are delivered up to size 200 with an aluminum outer cover. We recommend a steel ring for the switching signal of a proximity switch, see figure 3.

Backlash-free safety couplings of the series DMK/... and DXK/... are designed to allow direct mounting of a non-contact proximity switch or mechanical limit switch.

Additional steel ring for couplings of the series DBK/...

If required, this additional steel ring is delivered with the safety coupling. It is mounted on the coupling by the manufacturer.

Dimensions

Coupling type	E	Da	b
DBK 7/10	40	50	5
DBK 30	60	65	5
DBK 60	70	80	6
DBK 80/150	92	100	6
DBK 200	100	110	6
DBK 300	110	120	8
DBK 500	128	140	10

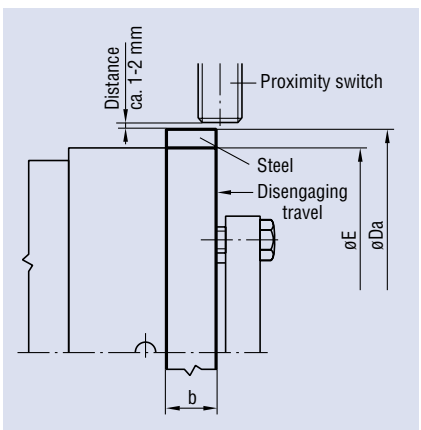


Figure 3: Radially mounted steel ring

Order data

Example: Coupling type

DBK/DK 80 - 32^{H7} - 35^{H7} - 60 Nm - b - SR

SR: Steel ring

Backlash-free safety couplings

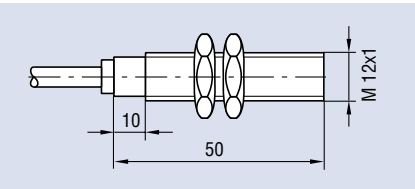
Switches / Proximity and Mechanical

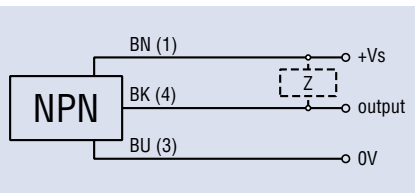
Proximity switches

Order data

Proximity switch type:
No. A28-3718-4 – break contact

Dimensions





Technical data

Supply voltage: U = 10 – 30 V DC
Max. switching current: J = 200 mA
Operating temperature:
-25 °C to +75 °C
Cable connection: 2 m
System of protection: IP 67
Switching distance: ca. 1 – 2 mm

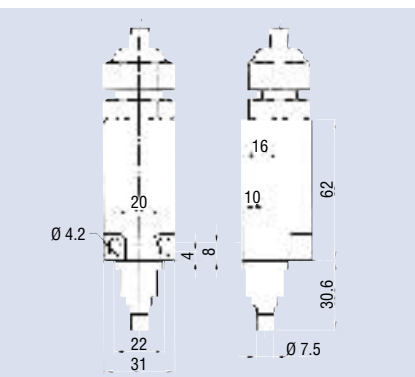
Mechanical limit switches

Note: Mechanical limit switches of the type shown below can only be used for safety couplings with a disengaging travel „S“ greater than 1.2 mm.

Order data

Mechanical limit switch type:
No. A28-3796-4

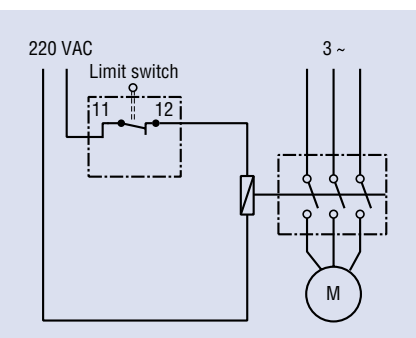
Dimensions



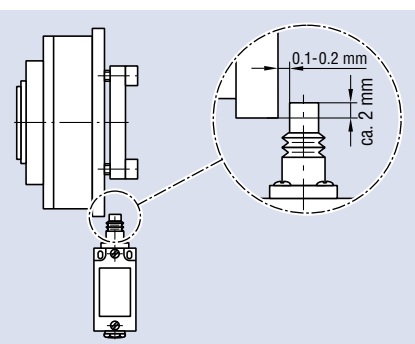
Technical data

Maximum voltage: 500 V AC
Maximum constant current: 10 A
System of protection:
IP 65 according to DIN 40050
Switching frequency: 6,000/h
Operating temperature:
-30 °C to +80 °C
Type of contact:
1 break contact
Mechanical life:
10^7 switching operations
Housing: Al plastic
Cover: Al plastic

Limit switch circuit diagram



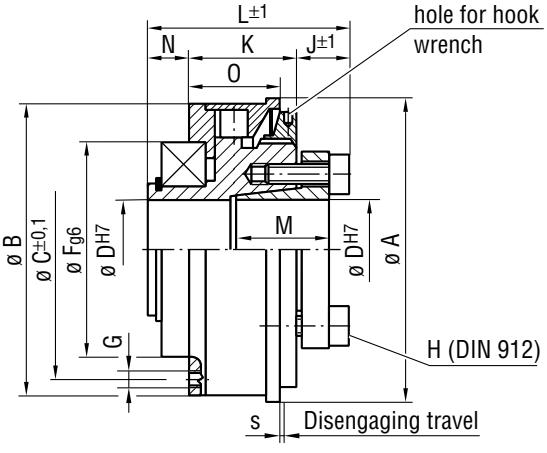
Limit switch mounting



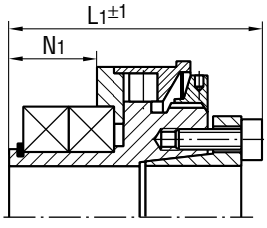
Backlash-free safety couplings

Series DMK/L and DMK/L-L with inner conical hubs

DMK/L



DMK/L-L



1) Continuous engagement version is possible.
Stainless steel version is possible.

Technical data – series DMK/L and DMK/L-L

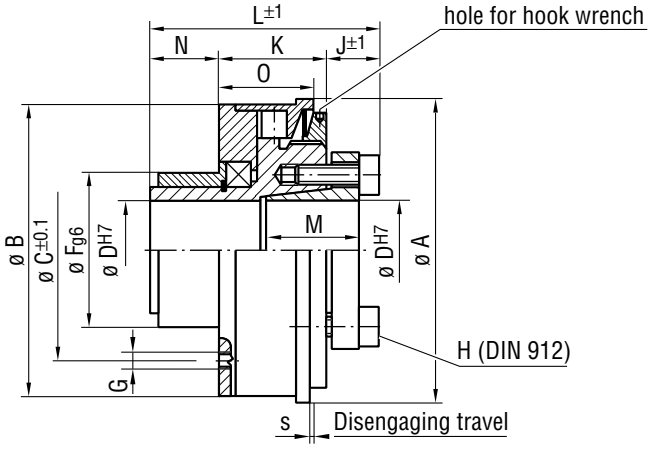
TYPE			30	60	150	200	300	500	800	1200	1600
Disengaging torque adjustable	(Nm)	T_{KN} Version a	5 – 20	12 – 35	25 – 75	50 – 120	30 – 140	140 – 350	260 – 600	400 – 900	500 – 1000
		T_{KN} Version b	15 – 35	20 – 70	65 – 150	80 – 200	100 – 300	250 – 500	500 – 1000	800 – 1400	900 – 1600
Moment of inertia	(10^{-3} Kgm²)	J Hub side	0.2	0.4	1.1	1.8	2.6	6.94	22.7	22.7	26.7
		J Flange side	0.1	0.2	0.6	0.9	1.1	1.3	5.1	5.1	5.8
Weight	(appr. kg)	m	0.45	0.8	1.4	1.7	2.5	3.8	11	11	15.2
Tightening torque of retaining screws	(Nm)	M_A	6	8.5	14	14	18	26	45	80	90
Max. rotational speed	(rpm)	n_{max}	9240	8185	6230	5620	5210	4585	3470	3470	3015
Disengaging travel	(mm)	s	1.2	1.2	2	2	2	2	2	2	2

Dimensions (mm) – series DMK/L and DMK/L-L

TYPE		30	60	150	200	300	500	800	1200	1600
Ø A		65	75	95	105	115	129	169	169	195
Ø B		62	70	92	102	110	125	165	165	190
Ø C		46	55	78	86	90	110	125	125	168
Ø D	min. – max.	12 – 20	15 – 25	20 – 35	20 – 40	30 – 46	35 – 50	40 – 60	40 – 60	60 – 90
Ø F		37	42	68	75	80	95	110	110	150
G	6 x thread / depth (mm)	M5/6	M6/6	M6/9	M6/10	M8/12	M8/12	M12/15	M12/15	M12/16
H	6 x DIN 912	M4	M6	M6	M6	M6	M8	M16	M16	M12
J		14	16	17	17	21	21	36	36	35
K		29	30	33	35.5	40	42	62	62	78
L		50	53	63	66	75	73	113	113	132
M		20	25	30	30	35	38	60	60	60
N		7	7	13	14	14	10	15	15	19
L_1		58	61.5	80	84	93	93.5	136	136	159
N_1		15	15.5	30	32	32	30.5	38	38	46
O		25	25	26	30.5	31	34	47.5	47.5	59.5

Backlash-free safety couplings

Series DMK/C with inner conical hubs



1) Continuous engagement version is possible.
Stainless steel version is possible.

Technical data – series DMK/C

TYPE				30	60	150	200	300	500	800	1200	1600
Disengaging torque adjustable	(Nm)	T_{KN}	Version a	5 – 15	12 – 35	25 – 75	50 – 120	30 – 140	140 – 350	260 – 600	400 – 900	500 – 1000
		T_{KN}	Version b	15 – 35	20 – 70	65 – 150	80 – 200	100 – 300	250 – 500	500 – 1000	800 – 1400	900 – 1600
Moment of inertia	(10^{-3} Kgm²)	J	Hub side	0.2	0.4	1.1	1.8	2.6	6.9	22.7	22.7	26.7
		J	Flange side	0.1	0.2	0.6	0.9	1.3	3.5	11.3	11.3	13.3
Weight	(appr. kg)	m		0.6	1	1.7	1.9	3	4.3	11.8	11.8	16
Tightening torque of retaining screws	(Nm)	M_A		6	8.5	14	14	18	26	45	80	90
Max. rotational speed	(rpm)	n_{max}		9240	8185	6230	5620	5210	4585	3470	3470	3015
Disengaging travel	(mm)	s		1.2	1.2	2	2	2	2	2	2	2

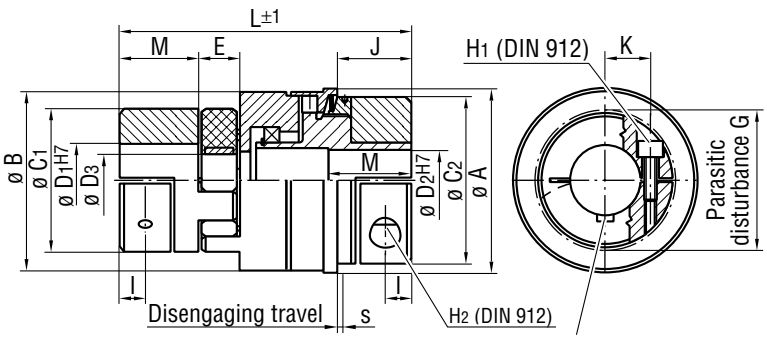
Dimensions (mm) – series DMK/C

TYPE		30	60	150	200	300	500	800	1200	1600
Ø A		65	75	95	105	115	129	169	169	195
Ø B		62	70	92	102	110	125	165	165	190
Ø C		46	50	65	70	76	110	125	125	168
Ø D	min. – max.	12 – 20	15 – 25	20 – 35	20 – 40	30 – 46	35 – 50	40 – 60	40 – 60	60 – 90
Ø F		30	36	48	52	58	66	90	90	130
G	6 x thread / depth (mm)	M4/6	M6/7	M6/9	M6/10	M8/12	M8/12	M12/16	M12/16	M12/16
H	6 x DIN 912	M4	M6	M6	M6	M8	M8	M16	M16	M12
J		13	15	17	17	21	21	36	36	35
K		29	30	33	35.5	40	58	71	71	78
L		51	61	72	77	92	112	140	140	159
M		20	25	30	30	35	38	60	60	60
N		9	16	22	25	31	33	33	33	46
O		25	25	26	30.5	31	50	58.5	58.5	59.5

Backlash-free safety couplings

Series DMK/DS with clamping hubs

Axial elastomer servo-insert gear rim



Keyway according to DIN 6885 on request

1) Continuous engagement version is possible.
Stainless steel version is possible.

Technical data – series DMK/DS

TYPE			10	18	30	60	150	300	500
Disengaging torque adjustable	(Nm)	T_{KN} Version a	2 – 5	5 – 12	5 – 20	12 – 35	25 – 75	30 – 140	140 – 350
		T_{KN} Version b	5 – 10	12 – 20	15 – 35	20 – 70	65 – 150	50 – 300	250 – 500
Moment of inertia	(10^{-3} Kgm²)	J Hub side	0.05	0.1	0.17	0.32	0.8	3	5
		J Elastomer side	0.09	0.2	0.36	0.65	1.5	5	10
Weight	(appr. kg)	m	0.33	0.5	0.68	1.4	2.8	4.6	7.5
Tightening torque of retaining screws	(Nm)	M_A	5	10	10	18	43	84	145
Max. permissible misalignment									
- radial	(mm)	ΔK_r	0.06	0.06	0.08	0.1	0.11	0.12	0.16
- axial	(mm)	ΔK_a	1.2	1.2	1.3	1.4	1.5	1.8	2.1
- angular	(degrees)	ΔK_w	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Dynamic torsional stiffness	(Nm/rad)	$C_{T\,dyn}$	513	2580	4380	6189	10314	21486	55925
Radial spring stiffness	(N/mm)	C_r	604	2010	2290	2560	3200	4400	5930
Max. rotational speed	(rpm)	n_{max}	11450	8950	8810	7630	6030	4980	4440
Disengaging travel	(mm)	s	0.7	1.2	1.2	1.2	2	2	2

Dimensions (mm) – series DMK/DS

TYPE		10	18	30	60	150	300	500
Ø A		50	65	65	75	95	115	129
Ø B		49	60	60	70	92	110	128
Ø C_1		30	40	45	55	65	80	105
Ø C_2		45	56	56	55	76	96	110
Ø D_1	min.–max.	9 – 14	10 – 20	12 – 24	20 – 28	24 – 35	32 – 44	40 – 60
Ø D_2	min.–max.	8 – 14	12 – 20	12 – 20	20 – 25	24 – 35	32 – 40	40 – 50
Ø D_3		—	12	16	20	24	27	39
E		13	15	17	18	20	24	28
G	Disengaging travel	34	45	47	57	70	89	111
I		5	6	7.5	10	11	18	20
J		20	22	22	28	42	38	56
K		10.5	15	17	20	24	30	40
L		75	96	100	124	142	160	185
M		11	25.5	26.5	30	35	45	56
H_1	DIN 912	M4	M5	M5	M6	M8	M10	M12
H_2	DIN 912	M5	M6	M6	M8	M10	M12	M12

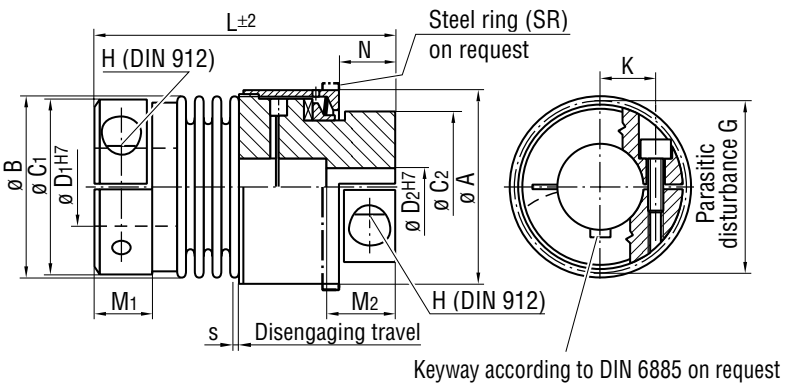
- Temperature range: -30 °C to +90 °C
- Ring gear made of polyurethane Sh 98 A. Other shore hardnesses Sh 92 A / Sh 64 D

D_1 Elastomer side: hubs 10 to 300 made of aluminium hub 500 made of steel

D_2 Hub side: 10 to 500 made of steel
Clamping hub: 10 to 60 made of aluminium 150 to 500 made of steel

Backlash-free safety couplings

Series DBK/DK with clamping hubs



Technical data – series DBK/DK

TYPE			7	10	30	60	80	150	200	300	500
Disengaging torque adjustable		T_{KN} Version a	0,4 – 2	3 – 7	5 – 15	12 – 35	15 – 40	50 – 130	30 – 90	60 – 200	80 – 250
		T_{KN} Version b	3 – 7	5 – 10	10 – 30	20 – 60	30 – 80	65 – 150	60 – 200	100 – 300	200 – 500
Moment of inertia	(10^{-3} Kgm²)	J Hub side	0.035	0.035	0.16	0.4	0.95	1.5	1.65	3.25	3.78
		J Metal bellows side	0.035	0.035	0.16	0.4	0.95	1.5	1.65	3.25	3.78
Weight	(appr. kg)	m	0.25	0.25	0.7	1.4	2.3	2.4	3.0	5.3	6.2
Tightening torque of retaining screws	(Nm)	M_A	3	3	15/12	40/30	60/55/50	80/70/50	100/80	110/90	145
Max. permissible misalignment											
- radial	(mm)	ΔK_r	0.15	0.15	0.1/0.2	0.1/0.2	0.2/0.2	0.2/0.2	0.2/0.2	0.2/0.2	0.2/0.2
- axial	(mm)	ΔK_a	0.4	0.4	0.4/0.5	0.4/0.5	0.4/0.5	0.4/0.5	0.4/0.5	0.4/0.5	0.5/1.0
- angular	(degrees)	ΔK_w	1.2	1.2	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5
Dynamic torsional stiffness	(10^3 Nm/rad)	$C_{T\,dyn}$	5.4	8.0	36/26	73/49	126/74	151/101	173/116	499/280	680/310
Radial spring stiffness	(N/mm)	C_r	90	154	718/222	1125/333	1218/403	2030/601	1531/450	6328/1470	8800/972
Axial spring stiffness	(N/mm)	C_a	14	28	48/27	91/53	84/53	147/86	147/85	284/153	105/86
Max. rotational speed	(rpm)	n_{max}	11690	11690	9540	8180	6220	6220	5720	5200	4470
Disengaging travel	(mm)	s	0.7	0.7	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Dimensions (mm) – series DBK/DK

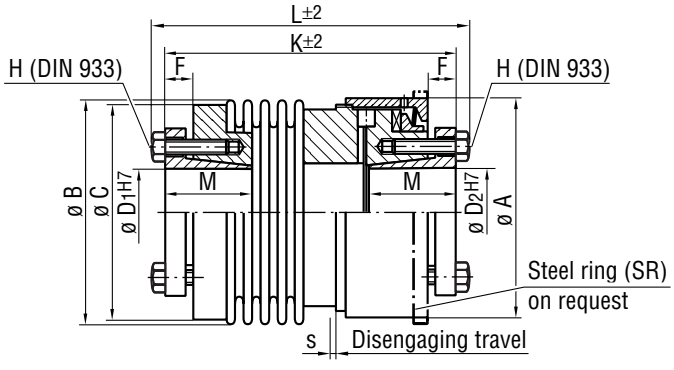
TYPE		7	10	30	60	80	150	200	300	500
Ø A		49	49	60	70	92	92	100	110	128
Ø B		40	40	56	66	82	82	90	110	122
Ø C_1		40	40	47/56	57/66	68/80/84	68/80/84	80/90	91/96	110
Ø C_2		40	40	44	55	77	77	80	89	92
Ø D_1	Min. Max.	6 – 19	6 – 25	10/20 20/25	14/23 23/35	20/28/35 28/35/40	20/28/35 28/35/40	25/32 32/42	32/40 40/50	40 – 60
Ø D_2	min. – max.	6 – 19	6 – 19	10 – 23	14 – 25	20 – 35	20 – 38	25 – 35	32 – 50	35 – 50
H		M4	M4	M6	M8	M10	M10	M12	M12	M12
L	2)	66/77	66/77	85/93	105/116	113/124	113/124	124/137	140/151	158/169
M_1		16	16	24	29	31	31	38	37	41
M_2		17	17	24	29	34	34	34	39	40
N		10	10	15	18	20	20	20	23	26
K		15.5	15.5	16/20	20/23	24/27/28	24/27/28	26/31	32/35	40
G	Parasitic disturbance	41.5	41.5	56	68	84	84	93	102	111

- Temperature range: -30 °C to +100 °C
- Higher temperatures on request

2) Two metal bellows versions with different dynamic torsional stiffnesses are available. The length L therefore varies.

Backlash-free safety couplings

Series DBK/B with inner conical hubs



Technical data – series DBK/B

TYPE				30	60	150	200	300	500	800	1200	1600
Disengaging torque adjustable		T_{KN}	Version a	5 – 15	12 – 35	30 – 80	30 – 90	60 – 200	80 – 250	240 – 600	360 – 1000	360 – 1000
		T_{KN}	Version b	10 – 30	20 – 60	65 – 150	60 – 200	100 – 300	200 – 500	500 – 800	900 – 1400	900 – 1600
Moment of inertia	(10^{-3} Kgm²)	J	Hub side	0.21	0.53	1.3	2.1	4.3	11.3	36	36	40
		J	Metal bellows side	0.11	0.27	0.7	1.1	2.2	5.7	18	18	20
Weight	(appr. kg)	m		0.7	1.5	2.5	3.2	5.5	7.1	19	20	22
Tightening torque of retaining screws	(Nm)	M_A		5	7	14	14	18	26	45	80	90
Max. permissible misalignment												
- radial	(mm)	ΔK_r		0.1 / 0.2	0.1 / 0.2	0.2 / 0.2	0.2 / 0.2	0.2 / 0.2	0.2 / 0.2	0.2	0.2	0.2
- axial	(mm)	ΔK_a		0.4 / 0.5	0.4 / 0.5	0.4 / 0.5	0.4 / 0.5	0.4 / 0.5	0.5 / 1.0	0.5	0.5	0.5
- angular	(degrees)	ΔK_w		1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0	1.0	1.0
Dynamic torsional stiffness	(10^3 Nm/rad)	$C_{T\,dyn}$		36 / 26	73 / 49	151 / 101	173 / 116	499 / 280	680 / 310	758	1266	2800
Radial spring stiffness	(N/mm)	C_r		718 / 222	1125 / 333	2030 / 601	1531 / 450	6328 / 1470	8800 / 972	512	706	2950
Axial spring stiffness	(N/mm)	C_a		48 / 27	91 / 53	147 / 86	147 / 85	284 / 153	105 / 86	186	278	310
Max. rotational speed	(rpm)	n_{max}		9550	8180	6220	5720	5200	4475	3390	3390	2935
Disengaging travel	(mm)	s		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Dimensions (mm) – series DBK/B

TYPE		30	60	150	200	300	500	800	1200	1600
Ø A		60	70	92	100	110	128	169	169	195
Ø B		56	66	82	90	110	122	157	157	157
Ø C		52	63	80	86	110	122	140	140	152
Ø D_1	min. – max.	12 – 20	15 – 25	20 – 35	20 – 40	30 – 50	35 – 55	40 – 70	40 – 70	70 – 90
Ø D_2	min. – max.	12 – 20	15 – 25	20 – 35	20 – 40	30 – 46	35 – 50	40 – 60	40 – 60	70 – 90
F		8	9	11	11	13	13	20	20	20
H	DIN 933	M5	M6	M6	M6	M8	M8	M16	M16	M12
M		20	25	31	31	33	38	60	60	60
K	2)	75 / 83	91 / 102	108 / 120	114 / 127	124 / 135	139 / 150	215	215	235
L	2)	82 / 90	99 / 110	116 / 128	122 / 135	135 / 146	150 / 161	235	235	250

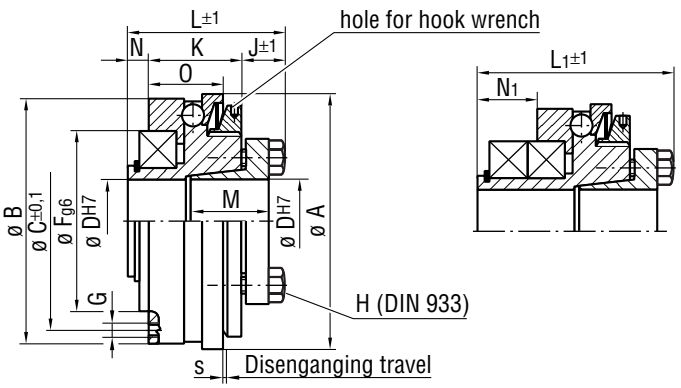
- Temperature range: -30 °C to +100 °C
- Higher temperatures on request

2) Two metal bellows versions with different dynamic torsional stiffnesses are available. The lengths L and K therefore vary.

Backlash-free safety couplings

Series DXK/M and DXK/M-L with inner conical hubs

DXK/M **DXK/M-L**



Technical data – series DXK/M and DXK/M-L

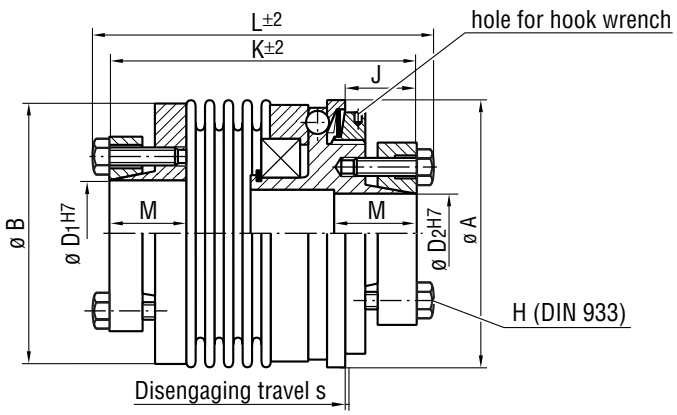
TYPE			5	10	30	60	150	200	300	500	800	1200	1600
Disengaging torque adjustable	T_{KN}	Version a	0.8–3	2–5	5–15	15–35	25–75	50–140	70–160	90–250	260–600	400–900	500–1000
	T_{KN}	Version b	3–5	5–10	10–30	30–70	65–150	100–200	150–300	200–500	500–1000	800–1400	900–1600
Moment of inertia (10^{-3} Kgm²)	J	Hub side	0.045	0.064	0.23	0.88	1.52	3.34	5.41	7.84	27.2	27.2	32
	J	Flange side	0.01	0.016	0.06	0.22	0.38	0.83	1.35	1.96	6.8	6.8	8
Weight (appr. kg)	m		0.2	0.28	0.58	1.1	1.7	2.8	3.7	4.4	12	12	16.5
Tightening torque of retaining screws (Nm)	M_A		1.5	3	6	8.5	14	14	18	26	45	80	90
Max. rotational speed (rpm)	n_{max}		15000	12000	9300	7500	6300	5400	4900	4580	3500	3500	3000
Disengaging travel (mm)	s		0.6	0.7	1.2	1.2	2	2	2	2	2	2	2

Dimensions (mm) – series DXK/M and DXK/M-L

TYPE		5	10	30	60	150	200	300	500	800	1200	1600
Ø A		42	50	65	80	95	110	120	130	169	169	195
Ø B		38	47	61	76	90	105	115	125	164	164	190
Ø C		33	42	53	69	80	90	102	112	125	125	168
Ø D	min. – max.	5–10	8–16	9–20	12–25	15–35	20–40	30–46	35–50	40–60	40–60	60–90
Ø F		28	37	47	62	68	80	90	100	110	110	150
G	6 x thread / depth (mm)	M3/5	M3/5	M4/7	M5/8	M6/8	M6/10	M8/12	M8/12	M12/15	M12/15	M12/16
H	6 x DIN 933	M3	M4	M5	M6	M6	M6	M8	M8	M16	M16	M12
J		8	10	11.5	13	15	15	18.5	18.5	30	30	32
O		12	15	18.5	25	26	29	32	32	50	50	59
L		32	36	43	58	60	66	74	74	110	110	125
N		5	5	6	8	10	10	10	10	15	15	19
N_1		14	15	20	26	27	28	31	31	38	38	47
M		12	17	20	25	30	30	35	38	60	60	60
L_1		41	46	59	76	77	84	95	95	133	133	153
K		19	21	25.5	37	35	41	45.5	45.5	65	65	74

Backlash-free safety couplings

Series DXK/SB with outer conical hubs – self-releasing during dismantling



1) Continuous engagement version is possible.
Stainless steel version is possible.

Technical data – series DXK/SB

TYPE			10	18	30	60	150	300	500	800	1200	1600
Disengaging torque adjustable		T_{KN} Version a	2–5	3–9	10–30	12–35	45–110	40–120	90–250	260–600	400–900	500–1000
		T_{KN} Version b	5–10	9–18	—	20–70	90–180	80–250	200–500	500–1000	800–1400	900–1600
Moment of inertia	(10^{-3} Kgm²)	J Hub side	0.09	0.2	0.36	0.65	1.5	3	11.6	27	27	60
		J Metal bellows side	0.05	0.1	0.17	0.32	0.8	2.5	5.3	16	16	30
Weight	(appr. kg)	m	0.33	0.5	0.68	1.4	2.15	4.6	8.5	14	14	22.5
Tightening torque of retaining screws	(Nm)	M_A	1.9	4	5.9	5.9	15	15	36	125	125	110
Max. permissible misalignment												
- radial	(mm)	ΔK_r	0.1	0.2	0.1/0.2	0.1/0.2	0.2/0.2	0.2/0.2	0.2/0.2	0.2	0.2	0.2
- axial	(mm)	ΔK_a	0.4	0.5	0.4/0.5	0.4/0.5	0.4/0.5	0.4/0.5	0.5/1.0	0.5	0.5	0.5
- angular	(degrees)	ΔK_w	1.0	1.5	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	1.0	1.0	1.0
Dynamic torsional stiffness	(10^3 Nm/rad)	$C_{T\,dyn}$	5.4	8/6	36/26	73/49	151/101	173/116	680/310	758	1266	2800
Radial spring stiffness	(N/mm)	C_r	90	204/86	718/222	1125/333	2030/601	2531/450	8800/972	512	706	2950
Axial spring stiffness	(N/mm)	C_a	14	52/39	48/27	91/53	147/86	147/85	105/86	186	278	310
Max. rotational speed	(rpm)	n_{max}	11450	8950	8420	7250	5840	4850	4400	3390	3390	2950
Disengaging travel	(mm)	s	0.6	0.7	1.2	1.2	2	2	2	2	2	2

Dimensions (mm) – series DXK/SB

TYPE		10	18	30	60	150	300	500	800	1200	1600
Ø A		50	64	68	79	98	118	130	169	169	194
Ø B		40	56	56	66	90	90	122	157	157	157
Ø D_1	min. – max.	10–14	10–19	19–24	20–32	25–42	30–42	35–55	40–70	40–70	70–90
Ø D_2	min. – max.	8–14	8–16	12–18	20–25	25–38	30–38	35–50	40–60	40–60	50–70
H	6 x DIN 933	M4	M4	M5	M5	M6	M6	M8	M12	M12	M12
J		17	19	22	30	30	30	45	50	50	51
K	2)	70	90/98	92/100	115/125	117/130	117/130	148/159	220	220	220
L	2)	76	96/104	99/107	123/133	123/138	123/138	159/170	236	236	266
M		15	18	18	26	33	33	40	50	50	65

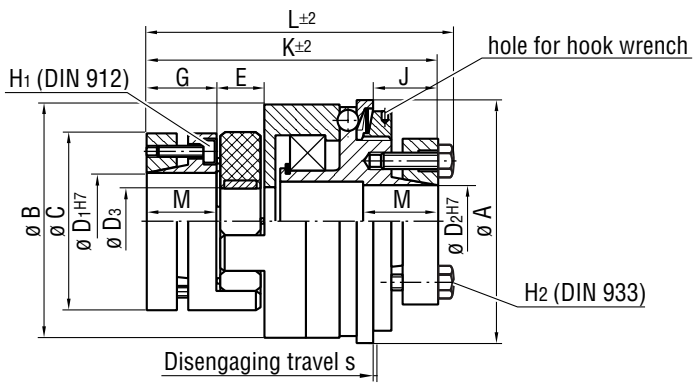
- Temperature range: -30 °C to +100 °C
- Higher temperatures on request

2) Two metal bellows versions with different dynamic torsional stiffnesses are available. The lengths L and K therefore vary.

Backlash-free safety couplings

Series DXK/SS with outer conical hubs – self-releasing during dismantling

Axial plug-type with elastomer gear ring



Technical data – series DXK/SS

TYPE			10	18	30	60	150	300	500
Disengaging torque adjustable	(Nm)	T_{KN} Version a	2 – 5	3 – 9	10 – 30	12 – 35	45 – 110	70 – 160	90 – 250
		T_{KN} Version b	5 – 10	9 – 18	—	20 – 70	90 – 180	150 – 300	200 – 500
Moment of inertia	(10^{-3} Kgm²)	J Hub side	0.05	0.1	0.17	0.32	0.8	3	5
		J Elastomer side	0.09	0.2	0.36	0.65	1.5	5	10
Weight	(appr. kg)	m	0.33	0.5	0.68	1.4	2.15	4.6	7.5
Tightening torque of retaining screws	(Nm)	M_A	1.9	4	5	18	10	14	35
Max. permissible misalignment									
- radial	(mm)	ΔK_r	0.06	0.06	0.08	0.1	0.11	0.12	0.16
- axial	(mm)	ΔK_a	1.0	1.2	1.3	1.4	1.5	1.8	2.1
- angular	(degrees)	ΔK_w	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Dynamic torsional stiffness	(Nm/rad)	$C_{T\,dyn}$	513	2580	4380	6189	10314	21486	55925
Radial spring stiffness	(N/mm)	C_r	604	2010	2290	2560	3200	4400	5930
Max. rotational speed	(rpm)	n_{max}	11450	8950	8420	7250	5840	4850	4407
Disengaging travel	(mm)	s	0.6	0.7	1.2	1.2	2	2	2

Dimensions (mm) – series DXK/SS

TYPE		10	18	30	60	150	300	500
Ø A		50	64	68	79	98	119	130
Ø B		49	59	60	75	92	119	125
Ø C		30	40	45	55	65	80	105
Ø D_1	min. – max.	10 – 14	10 – 19	12 – 20	15 – 25	19 – 38	24 – 40	35 – 48
Ø D_2	min. – max.	8 – 14	8 – 16	12 – 18	20 – 25	25 – 38	30 – 40	35 – 45
Ø D_3		—	12	16	20	24	27	39
E		13	16	17	18	20	24	28
G		18.5	25	26.5	30	35	45	48
H_1	DIN 912	4 x M3	6 x M4	6 x M4	4 x M5	8 x M5	8 x M6	4 x M10
H_2	DIN 933	6 x M3	6 x M4	6 x M5	6 x M5	6 x M6	6 x M6	6 x M8
J		17	19	22	30	30	35	37
K		72	92	100	125	130	154	168
L		74	95	104	129	134	159	173
M		18.5	25	18	26	33	33	44

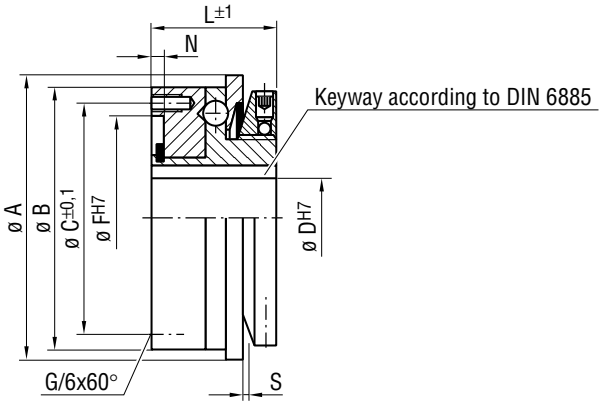
- Temperature range: -30 °C to +90 °C
- Ring gear made of polyurethane Sh 98 A. Other shore hardnesses Sh 92 A / Sh 64 D

D_1 Elastomer side: hubs 10 to 300 made of aluminium, hub 500 made of steel

D_2 Hub side: 10 to 500 made of steel
Clamping ring: 10 to 500 made of steel

Backlash-free safety couplings

Series DXK/LO with keyway



Technical data – series DXK/LO

TYPE			5	10	30	60	150	200	300	500
Disengaging torque adjustable	T_{KN}	Version a	0.8–3	2–5	5–15	15–35	40–100	50–140	70–160	30–250
	T_{KN}	Version b	3–5	5–10	10–30	20–70	70–150	100–200	150–300	200–500
Moment of inertia (10^{-3} Kgm²)	J	Hub side	0.04	0.07	0.2	0.5	1.2	2.8	4.5	6.5
	J	Flange side	0.01	0.03	0.1	0.3	0.7	1.4	2.3	3.3
Weight (appr. kg)	m		0.12	0.17	0.35	0.7	1.1	1.7	2.2	2.7
Max. rotational speed (rpm)	n_{max}		15070	11450	9540	7530	6360	5450	4980	4580
Disengaging travel (mm)	s		0.6	0.7	1.2	1.2	2	2	2	2

Dimensions (mm) – series DXK/LO

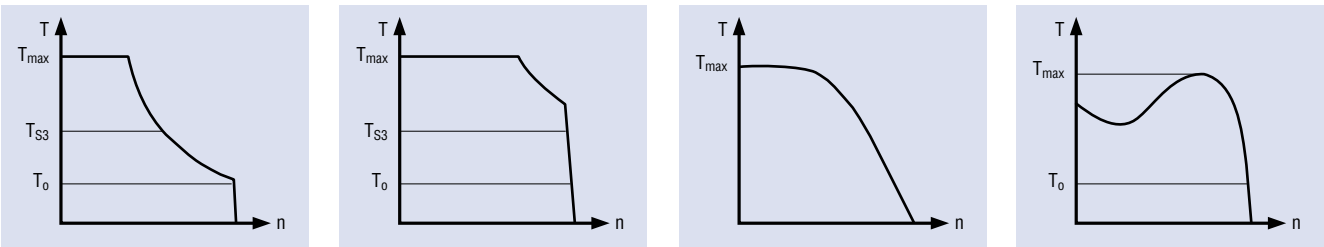
TYPE	5	10	30	60	150	200	300	500
Ø A	42	50	65	74	90	110	120	130
Ø B	40	47	60	76	90	105	115	125
Ø C	33	42	53	69	80	90	102	112
Ø D	5–8	8–13	9–18	12–21	21–30	20–38	30–42	35–50
Ø F	28	37	47	62	68	80	90	100
Ø G 6 x thread / depth (mm)	M3/5	M3/5	M4/7	M5/8	M6/8	M6/10	M8/12	M8/12
L	19	22	28	36	38	42	47	47
N	2	2.5	3	4	4	4	5	5

Backlash-free safety couplings

Calculation example

When determining the cut-out torque, brief torque peaks by the drive unit and the machine must be taken into consideration because safety couplings by System GERWAH® were developed for high-speed cut-out. Particular attention must be paid to the characteristic curves of the maximum acceleration torques of the motors (figure 10).

Figure 10: Characteristic curves of various driving motors



DC Servo drive | *AC Servo drive* | *Step motor drive* | *Asynchronous motors*

In the case of dynamic drives (servo motors), e.g. in machine tools, we recommend that the relationships between the moments of inertia are also considered. Since the acceleration torque in both positive and negative direction is usually much higher than the nominal moment, dimensioning should always be based on the maximum acceleration torque.

The following dimensioning values have proven to be reliable in practice for couplings on high dynamic drives:

In general the following relationship applies:

$$T_A = K \times T_{max} \times \frac{J_{mach}}{J_{mot} + J_{mach}} = [Nm]$$

J_{mot} = Moment of inertia of motor
J_{mach} = Moment of inertia of machine
T_{max} = Max. acceleration torque
T_A = Cut-out torque (disengaging torque) of the coupling

K = Load factor, impact factor
K = 1.5 (regular movements)
K = 2 (irregular movements)
K = 2.5 – 4 (jerky movements)

A load/impact factor of K = 1.5 – 2 should be used for servo drives in machine tools. A greater load/impact factor K should be used for extreme applications.

Checking of resonance frequency

Although the complete coupling construction of a safety coupling in combination with a metal bellows or servo insert coupling is totally backlash-free, it should not be forgotten that the coupling links two rotating masses. We recommend that the resonance frequency should be checked by the following formula:

$$f_{res} = \frac{1}{2\pi} \sqrt{C_{T\,dyn} \times \frac{J_{mot} + J_{mach}}{J_{mot} \times J_{mach}}} = [Hz]$$

$C_{T\,dyn}$ = Dynamic torsional stiffness of coupling [Nm/rad]
J_{mot} = Moment of inertia of motor [kgm²]
J_{mach} = Moment of inertia of machine [kgm²]

In practice the resonance frequency calculated arithmetically should be twice as large as the excitation frequency of the drive. The excitation frequencies of servo drives usually range between 150 and 300 Hz.

In special cases the couplings can also be dimensioned on the basis of other criteria, e.g. shaft diameter, cutting force, etc.

Backlash-free safety couplings

Calculation example

This calculation example is for a safety coupling of the series DBK/DK on a machine tool drive (figure 11).

A safety coupling is to be selected from the DBK/DK series using the design data on the machine tool.

The motor is coupled directly to the ball screw (direct drive): the moment of inertia of the coupling is disregarded.

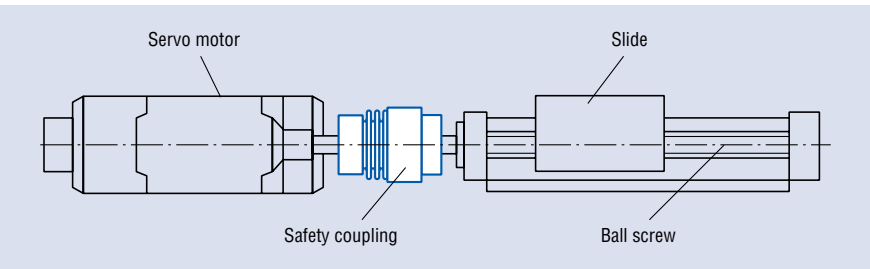


Figure 11: Direct drive protected with safety coupling from the series DBK/DK

Data: e.g. Motor type 1 FT 5104

Tmax = 160 Nm

TS3 = 52 Nm

TO = 37 Nm

Drive data

1. Linearly moved masses referred to the ball screw (h = 10 mm) . . . . . J_l = 2.6 x 10^{-3} kgm²
2. Ball screw (Ø 63; L = 1200 mm) . . . . . J_{sp} = 14.4 x 10^{-3} kgm²
3. Motor 1 FT 5104 . . . . . J_{mot} = 18.3 x 10^{-3} kgm²
4. Machine . . . . . J_{mach} = J_{Sp} + J_l = 17 x 10^{-3} kgm²

Calculation of the cut-out torque T_A

$$T_A = K \times T_{max} \times \frac{J_{mach}}{J_{mot} + J_{mach}} = [Nm]$$

$$T_A = 1.5 \times 160\ Nm \times \frac{17 \times 10^{-3}\ kgm^2}{18.3 \times 10^{-3}\ kgm^2 + 17 \times 10^{-3}\ kgm^2} = 116\ Nm$$

Selection: Safety coupling DBK/DK 150 (cut-out torque setting 116 Nm)

Dynamic torsional stiffness . . . . . $C_{T\,dyn}$ = 151 x 10^3 Nm/rad

Checking of resonance frequency

$$f_{res} = \frac{1}{2\pi} \sqrt{C_{T\,dyn} \times \frac{J_{mot} + J_{mach}}{J_{mot} \times J_{mach}}} = [Hz]$$

$$f_{res} = \frac{1}{2\pi} \sqrt{151000\ Nm/rad \times \frac{0.0183\ kgm^2 + 0.017\ kgm^2}{0.0183\ kgm^2 \times 0.017\ kgm^2}} = 659\ Hz$$

The resonance frequency calculated arithmetically is much higher than the likely resonance frequency. The coupling is adequately dimensioned.