SYNTEX®
# Backlash-free overload systems

- Backlash-free, torsionally rigid overload protection up to 400 Nm, suitable for reversing operation
- Disconnection of the drive in case of overload
- Reduction of torque peaks
- High response accuracy, even after a long operating period
- Easy integration of customers components
- Compact design, low mass moment of inertia
- Variable due to modular system
- Special disk springs available for special applications

- Low-cost protection even for simple applications
- Easy assembly and torque setting
- Maintenance-free
- Insensitive to oil and grease
- Long service life due to small internal loads
- Backlash-free shaft-hub-connections
- Any or synchronous re-engagement
- Automatically operative

Torque flow
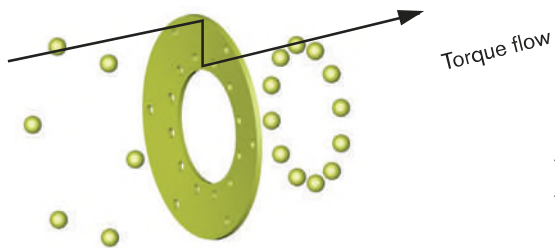
SYNTEX® is an overload system with positive locking operation. The punched disk spring is a component serving for transmitting the torque.

SYNTEX®
Overload system with mounting flange
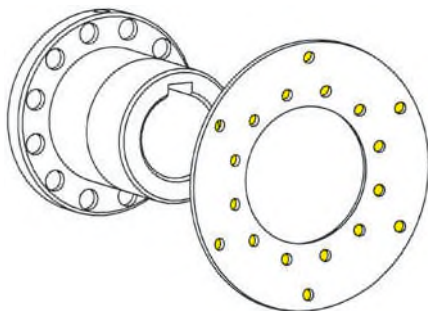
SYNTEX®
Overload system with sprocket

SYNTEX®
Overload system with ROTEX® GS

SYNTEX®
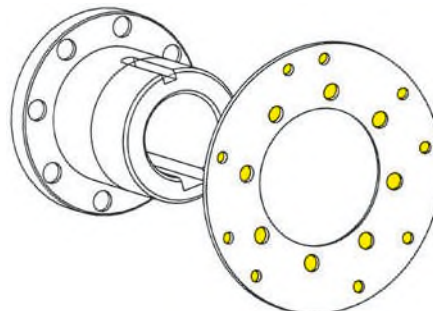# Backlash-free overload systems

Operating principles

Ratchet design DK

Synchronous design SK

If the torque set is exceeded, a relative movement is generated between the driving and driven side. The transmittable torque is reduced to a minimum.

The balls leave the indentations of the disk springs. After eliminating the overload, the balls engage automatically with the next following ball indentation of the disk springs.

If the torque set is exceeded, a relative movement is generated between the driving and driven side. The transmittable torque is reduced to a minimum.

The balls leave the indentations of the disk springs. After eliminating the overload, the balls re-engage automatically with the disk springs after a rotation of 360° subject to their special pitch. Driving and driven side are always placed in the same position to each other (ther degrees of re-engagement, for example 180°, are also possible).

Signal by limit switch or sensor in case of overload

Sensor

Shifting ring

Shifting ring

● Shifting ring displaces axially
● (Stroke H=2 mm)
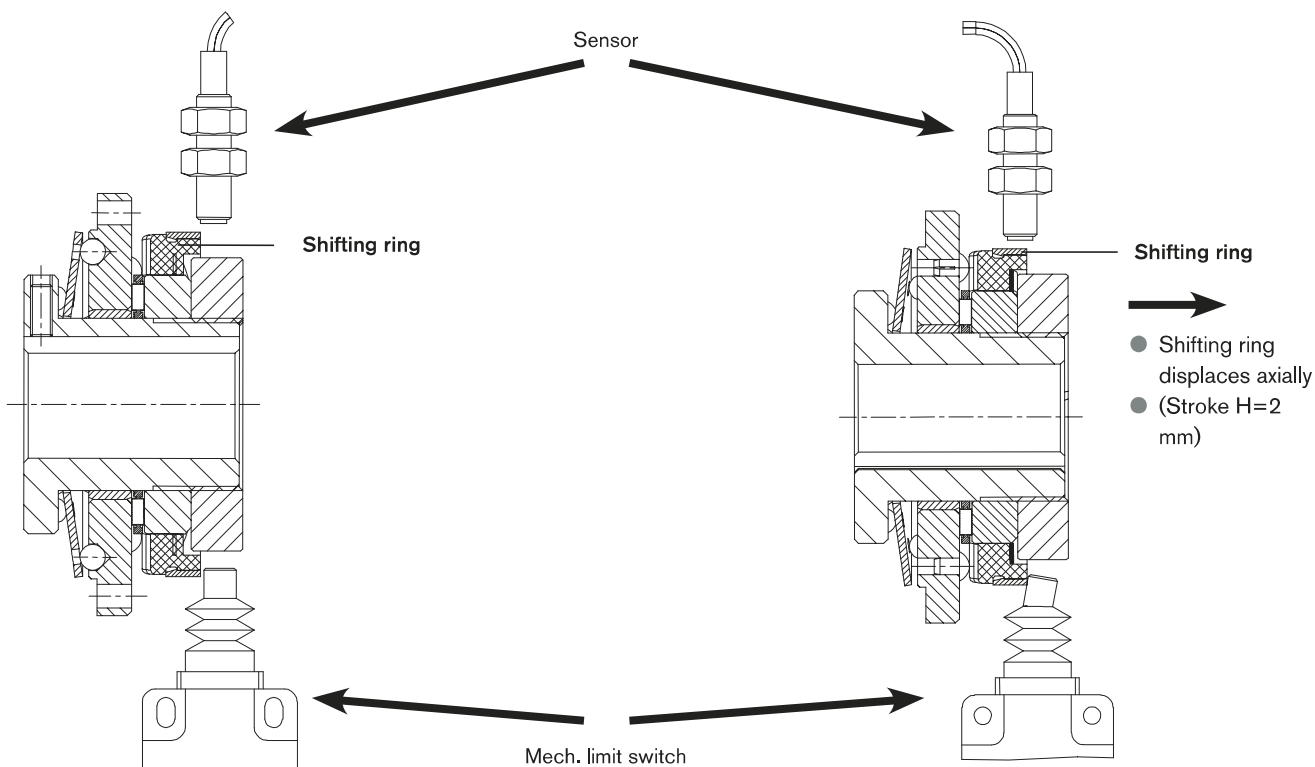
Mech. limit switch

Normal operation:
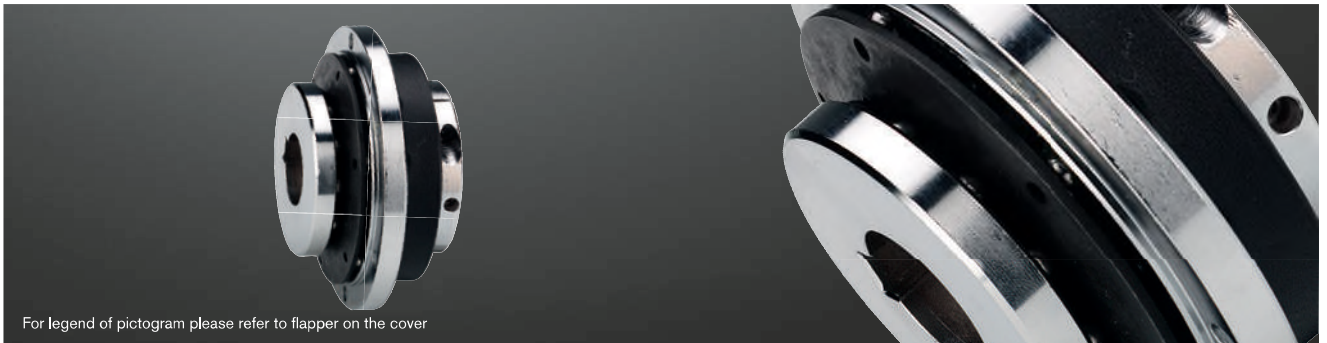No signal by sensor or mechanical limit switch.

In case of overload:
The axial motion of the shifting ring activates the sensor or mechanical limit switch, respectively. The resulting signal can be used for control operation (e. g. motor stop).

Flange type

For legend of pictogram please refer to flapper on the cover

Technical data – dimensions																						
Size	Torques [Nm]				Max. speed [1)] [rpm]	Max. bore	Dimensions [mm]															
	Ratchet design DK		Synchronous design SK																			
	DK_1	DK_2	SK_1	SK_2		d	D	D_1	D_2	D_3	D_4	D_A	l_1	l_2	l_3	l_4	l_5	d_L	L	z	H=stroke
20	6-20	15-30	10-20	20-65	1500	20	48	54	61.5	65	71	80	8	2	16	6	35	4.5	45	8	2
25	20-60	45-90	25-65	40-100	1500	25	60	68	80	81	89	98	8	2	17	8	39	5.5	50	8	2
35	25-80	75-150	30-100	70-180	1000	35	75	78	91	102	110	120	10	2	21	10	42	5.5	60	12	2
50	60-180	175-300	80-280	160-400	1000	50	105	108	121	142	152	162	12	2	25	13	56	6.6	70	12	2

Dimensions – Hub design 4.5								
Size	Dimensions [mm]							Tightening torque T_A [Nm]
	$d_{1\,max.}$	l_6	l_7	l_8	L_1	s	Clamping screws	
20	20	9	3.5	23	54	3	4 x M5	8.5
25	25	11	4.0	28	61	4	4 x M6	14
35	35	10	4.0	31	70	4	4 x M6	14
50	50	12	4.0	37	82	6	4 x M6	14

| Transmittable friction torques T_R [Nm] (fitting tolerance H7/h6) of hub design 4.5																						
Size	Ø12	Ø14	Ø15	Ø16	Ø17	Ø18	Ø19	Ø20	Ø22	Ø23	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50
20	45	62	71	81	92	103	115	127														
25		72	83	95	107	120	133	148	179	196	213	231										
35									127	139	152	165	207	237	270	323						
50																238	281	311	343	394	448	486

1) See comments on page 239

max. ⌀35 H7
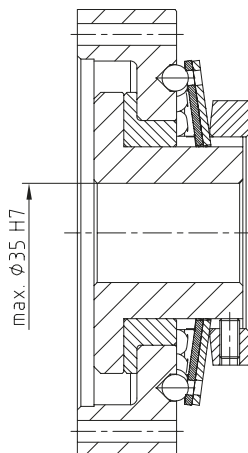
Special type:

● SYNTEX 35 spec. with integrated flange
● Performance range up to 360 Nm
● Adjustment of flange to ambient components possible

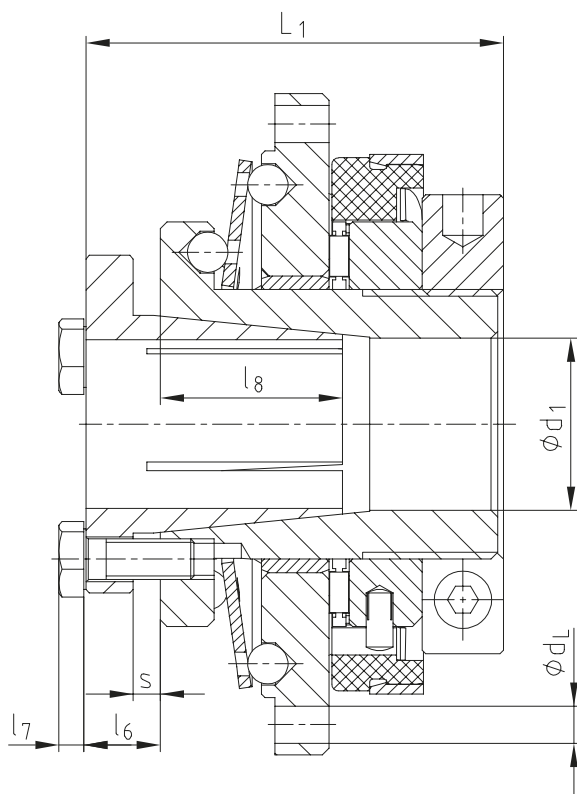| Ordering example:	SYNTEX® 25	d Ø20	DK1	1.0	45 Nm
	Type/size	Bore	Type (DK/SK)	Hub design	Torque set
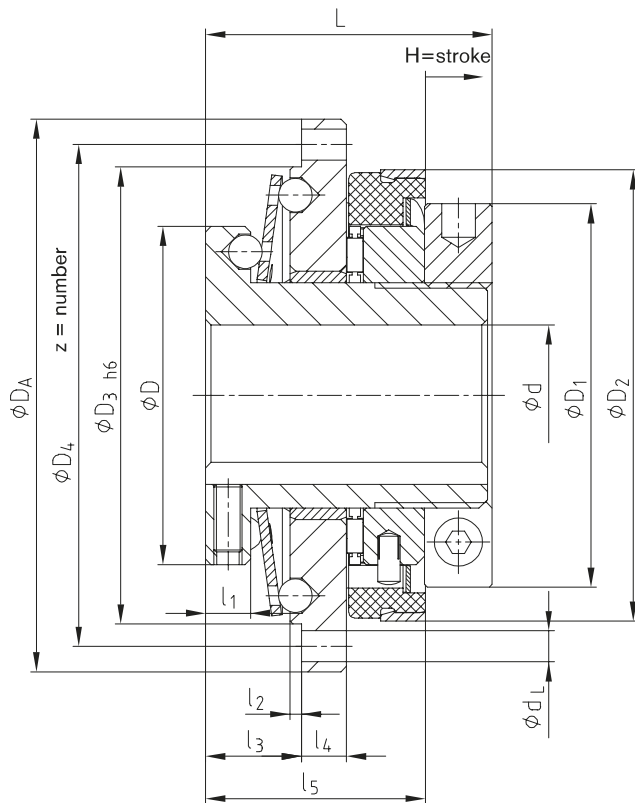
RUFLEX®

KTR-SI

SYNTEX®

SYNTEX®-NC

KTR-SI Compact

Torque
limiters

Hub design 1.0

Hub design 4.5

SYNTEX®
Backlash-free overload systems

For legend of pictogram please refer to flapper on the cover

Technical data – dimensions

Size	Torque [Nm]				Max. speed [2] [rpm]	Max. bore	Dimensions [mm]								
	Ratchet design DK		Synchronous design SK												
	DK1	DK2	SK1	SK2		d	Standard sprocket [1]	D	D_1	D_2	l_1	l_3	l_5	L	H=stroke
20	6-20	15-30	10-20	20-65	1500	20	06 B-1 ($3/8$ x $7/32$) z = 25	48	54	61.5	8	14	33	45	2
25	20-60	45-90	25-65	40-100	1500	25	08 B-1 ($1/2$ x $5/16$) z = 24	60	68	80	8	15	37	50	2
35	25-80	75-150	30-100	70-180	1000	35	08 B-1 ($1/2$ x $5/16$) z = 29	75	78	91	10	19	41	60	2
50	60-180	175-300	80-280	160-400	1000	50	12 B-1 ($3/4$ x $7/16$) z = 27	105	108	121	12	23	52	70	2

Dimensions – Hub design 4.5

Size	Dimensions [mm]							Tightening torque T_A [Nm]
	$d_{1\ max.}$	l_6	l_7	l_8	L_1	s	Clamping screws	
20	20	9	3.5	23	54	3	4 x M5	8.5
25	25	11	4.0	28	61	4	4 x M6	14
35	35	10	4.0	31	70	4	4 x M6	14
50	50	12	4.0	37	82	6	4 x M6	14

Transmittable friction torques T_R [Nm] (fitting tolerance H7/h6) of hub design 4.5

Size	Ø12	Ø14	Ø15	Ø16	Ø17	Ø18	Ø19	Ø20	Ø22	Ø23	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50
20	45	62	71	81	92	103	115	127														
25		72	83	95	107	120	133	148	179	196	213	231										
35									127	139	152	165	207	237	270	323						
50																238	281	311	343	394	448	486

[1] z = min. number of teeth required / Other sprockets available on request
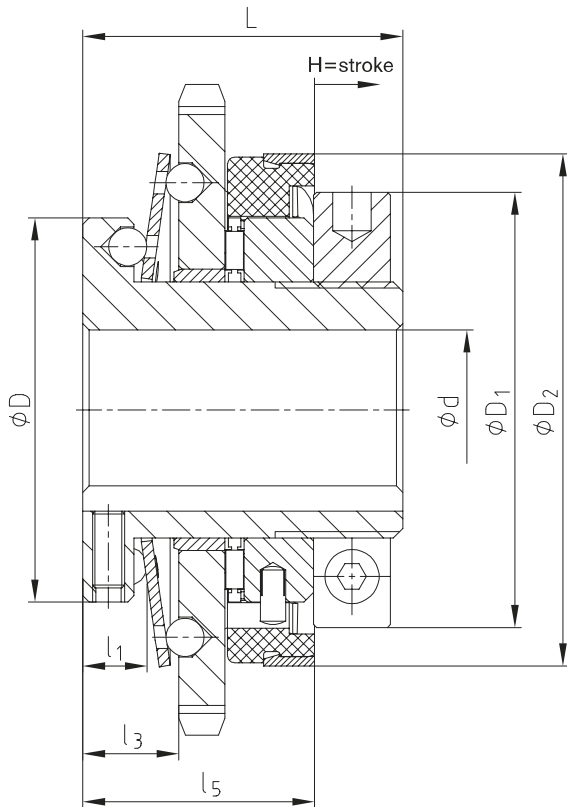[2] See comments on page 239
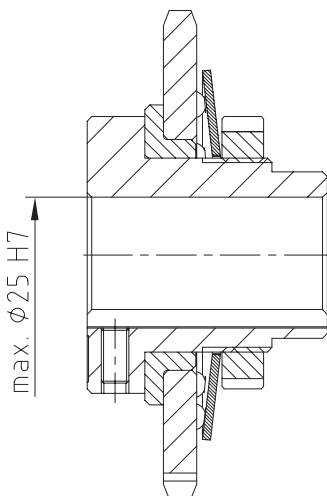
Special type:

- Standard SYNTEX® with integrated belt drive or sprocket
- Available ready for assembly with the torque set
- Reduction of components by integration of components
- Available both as a ratchet and synchronous design
- Torque setting possible while in place
- Finish bore according to ISO fit H7, feather keyway according to DIN 6885, sheet 1 [JS9]
- Also available with a frictionally engaged shaft-hub-connection (hub design 4.5)

Ordering example:	SYNTEX® 25	DK1	1.0	d Ø20	08 B-1 ($1/2$ x $5/16$), z = 29	45 Nm
	Type/size	Type (DK/SK)	Hub design	Bore	Sprocket	Torque set
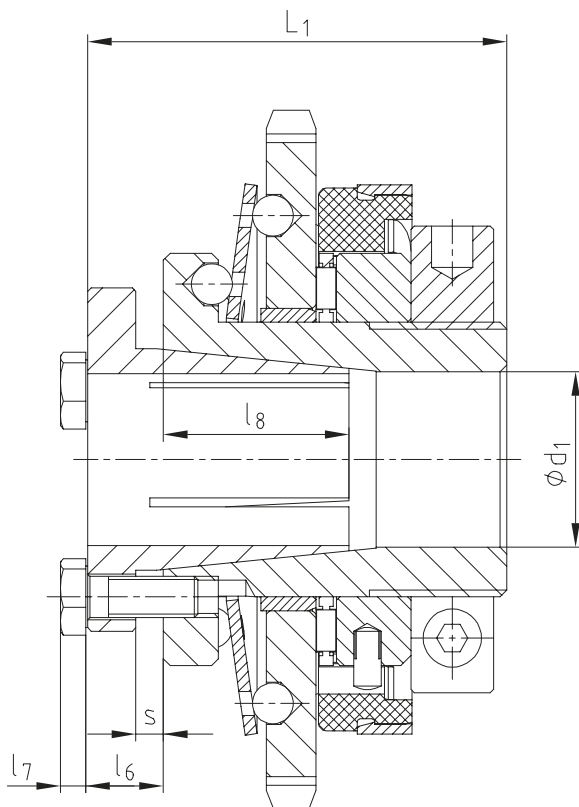
For continuously updated data please refer to our online catalogue at www.ktr.com

Hub design 1.0

Hub design 4.5

RUFLEX®

KTR-SI

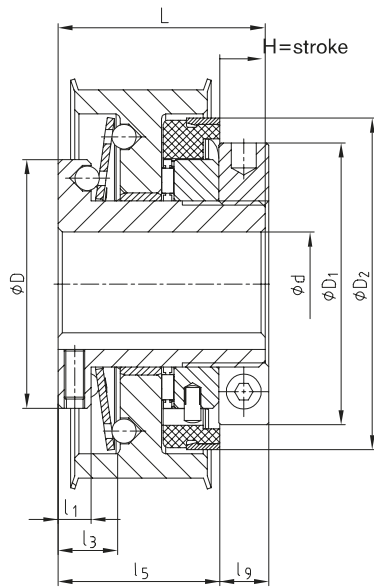SYNTEX®

SYNTEX®-NC

KTR-SI Compact
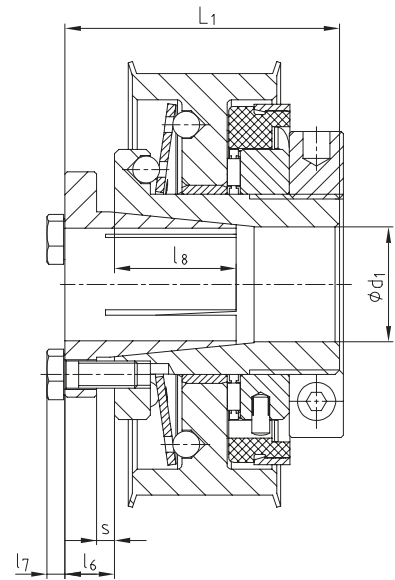
Torque
limiters

With toothed belt pulley

For legend of pictogram please refer to flapper on the cover

Hub design 1.0

Hub design 4.5

Technical data – dimensions

Size	Torques [Nm]				Max. speed [2] [rpm]	Dimensions [mm]										
	Ratchet design DK		Synchronous design SK			Max. bore	Toothed belt pulley									
	DK1	DK2	SK1	SK2		d	T10 [1]	AT10 [1]	D	D_1	D_2	l_1	l_3	l_5	L	H=stroke
20	6-20	15-30	10-20	20-65	1500	20	T10, z = 24	AT10, z = 24	48	54	61.5	8	14	35	45	2
25	20-60	45-90	25-65	40-100	1500	25	T10, z = 30	AT10, z = 30	60	68	80	8	15	39	50	2
35	25-80	75-150	30-100	70-180	1000	35	T10, z = 36	AT10, z = 36	75	78	91	10	19	42	60	2
50	60-180	175-300	80-280	160-400	1000	50	T10, z = 48 [3]	AT10, z = 48 [3]	105	108	121	12	23	56	70	2

Dimensions – Hub design 4.5

Size	Max. bore	Dimensions [mm]							Tightening torque T_A [Nm]
	d_1	l_6	l_7	l_8	l_9	L_1	s	Clamping screws	
20	20	9	3.5	23	10	54	3	4 x M5	8.5
25	25	11	4.0	28	11	61	4	4 x M6	14
35	35	10	4.0	31	13	70	4	4 x M6	14
50	50	12	4.0	37	14	82	6	4 x M6	14

Transmittable friction torques T_R [Nm] (fitting tolerance H7/h6) of hub design 4.5

Size	Ø12	Ø14	Ø15	Ø16	Ø17	Ø18	Ø19	Ø20	Ø22	Ø23	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50
20	45	62	71	81	92	103	115	127														
25		72	83	95	107	120	133	148	179	196	213	231										
35									127	139	152	165	207	237	270	323						
50																238	281	311	343	394	448	486

[1] z = min. number of teeth required / Other sizes available on request
[2] See comments on page 239
[3] Without flanged wheel

Ordering example:	SYNTEX® 25	DK1	1.0	d Ø20	AT10, z = 24	32	45 Nm
	Type/size	Type (DK/SK)	Hub design	Bore	Toothed belt pulley	Width of toothed belt pulley	Torque set

RUFLEX®

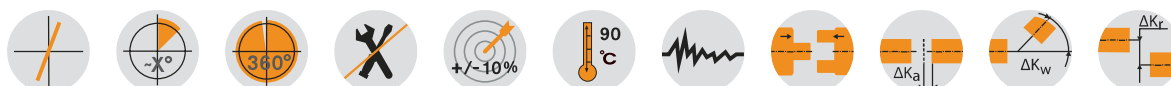KTR-SI

SYNTEX®

SYNTEX®-NC

Torque limiters

KTR-SI Compact

SYNTEX®
Backlash-free overload systems

With backlash-free ROTEX® GS

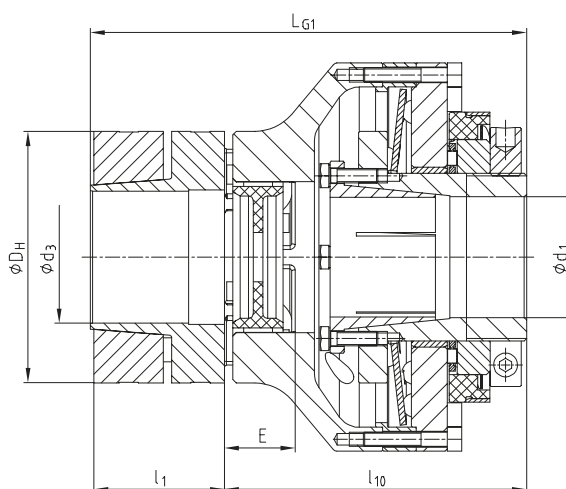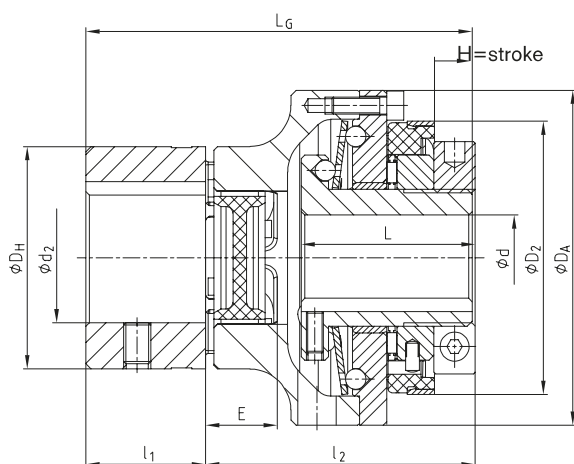For legend of pictogram please refer to flapper on the cover

90 °C +/-10% ΔK$_a$ ΔK$_w$ ΔK$_r$

Hub design 1.0   Hub design 1.0   Hub design 6.0   Hub design 4.5

Technical data – dimensions																					
SYNTEX® size	ROTEX® GS size	Torques [Nm]						Max. speed [2] [rpm]	Dimensions [mm]												
		Ratchet design DK		Synchronous design SK		ROTEX® GS [1] 98 ShA-GS			Max. bore												H= stroke
		DK1	DK2	SK1	SK2	T$_{KN}$	T$_{K\,max}$		d	d$_1$	d$_2$	d$_3$	D$_2$	D$_H$	D$_A$	l$_1$	l$_2$	l$_{10}$	E	L	L$_G$	L$_{G1}$	
20	24	6-20	15-30	10-20	20-65	60	120	1500	20	20	28	28 [3]	61.5	55	80	30	70	83	18	45	100	113	2
25	28	20-60	45-90	25-65	40-100	160	320	1500	25	25	38	38 [3]	80	65	98	35	78	91	20	50	113	126	2
35	38	25-80	75-150	30-100	70-180	325	650	1000	35	35	45	48 [3]	91	80	120	45	91	105.5	24	60	136	150.5	2
50	48	60-180	175-300	80-280	160-400	525	1050	1000	50	50	62	55 [3]	121	105	162	56	111	126	28	70	167	182	2

Transmittable friction torques T$_R$ [Nm] (fitting tolerance H7/h6) of hub design 4.5																					
Size	Ø12	Ø14	Ø15	Ø16	Ø17	Ø18	Ø19	Ø20	Ø22	Ø23	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50
20	45	62	71	81	92	103	115	127														
25		72	83	95	107	120	133	148	179	196	213	231										
35									127	139	152	165	207	237	270	323						
50													238	281	311	343	394	448	486			

[1] See selection of ROTEX® GS couplings on page 18 et seqq.
[2] See comments on page 239
[3] For transmittable friction torques T$_R$ [Nm] of ROTEX® GS hub type 2.8 or 6.0 refer to mounting instructions of ROTEX® GS

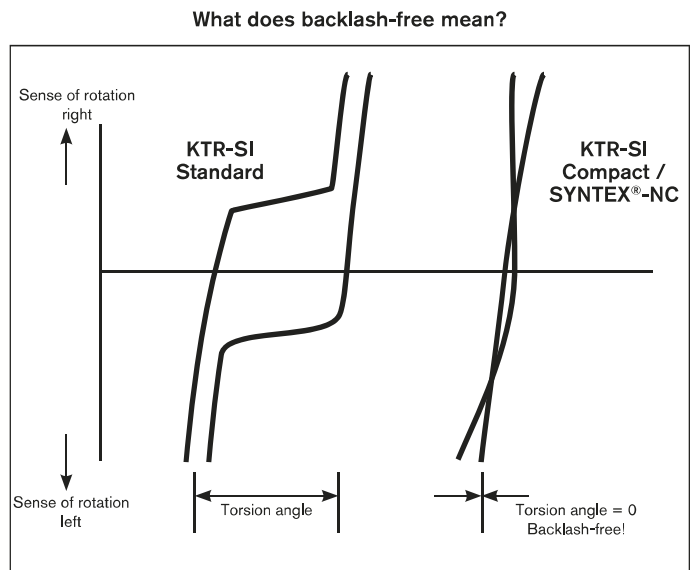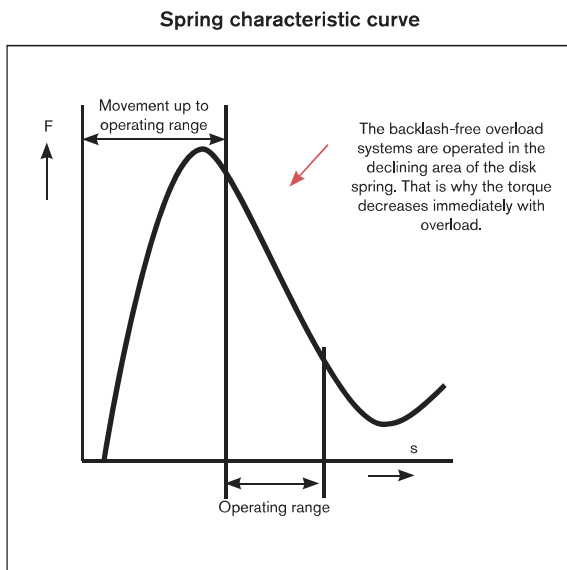| Ordering example:	SYNTEX® 25	DK1	1.0	d Ø20	ROTEX® GS 28	98 ShA-GS	1.0	d$_2$ Ø25	50 Nm
	Type/size	Type	Hub design	Bore	Type/size	Spider	Hub design	ROTEX® GS bore	Torque set

SYNTEX®-NC / KTR-SI Compact
Backlash-free overload systems

The design of the backlash-free overload systems SYNTEX®-NC and KTR-SI Compact is based on a spring-preloaded and positive-locking ball-ratchet-principle allowing for a high repeating accuracy and short reaction times. Moreover, an integrated groove ball bearing provides for the option of direct assembly of toothed belt pulleys, special flanges or other components. Main applications are latest machine tools, control and positioning technology as well as packaging machines and special purpose machinery.

Both systems make use of disk springs with a declining spring characteristic curve the preset prestress of which drops during the disengaging process. As a result driving and driven end are separated reliably from each other within some milliseconds with the wear on the components being reduced to a minimum simultaneously.

Spring characteristic curve

Movement up to operating range

F

The backlash-free overload systems are operated in the declining area of the disk spring. That is why the torque decreases immediately with overload.

s

Operating range

What does backlash-free mean?

Sense of rotation right

KTR-SI Standard

KTR-SI Compact / SYNTEX®-NC

Sense of rotation left

Torsion angle

Torsion angle = 0 Backlash-free!

Ratchet design DK
Any engagement after an overload. After eliminating the overload, the balls engage automatically with the next following ball indentation.

Synchronous design SK
Synchronous engagement after an overload. After eliminating the overload, the balls re-engage automatically with the disk springs after a rotation of 360°. Driving and driven side are always placed in the same position to each other. Other degrees of re-engagement, for example 180°, are also possible.

⬤ = The core of the backlash-free overload systems

9 8 2 7 1 3 4 5 6
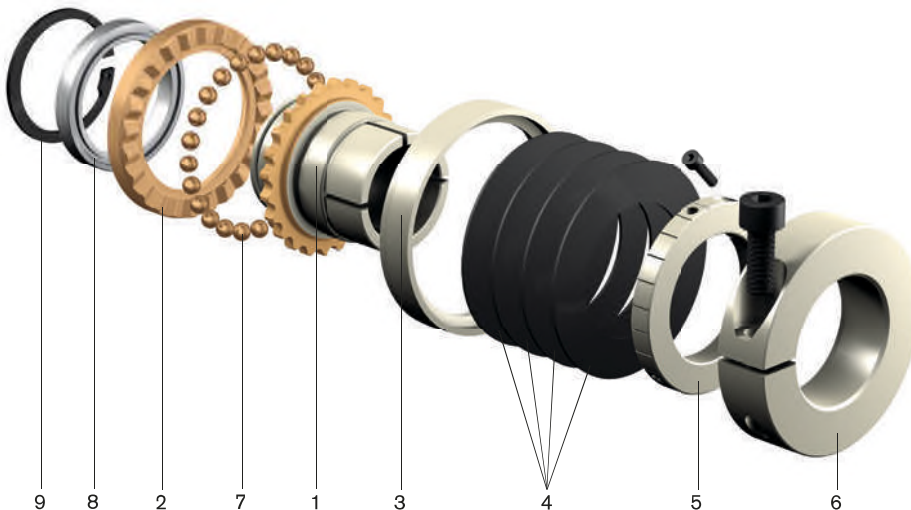
List of components:
1. Hub with keyway to DIN (type 1.0) or with clamping ring (type 6.1)
2. Flange ring
3. Shifting ring
4. Disk spring
5. Setting nut
6. Clamping ring
7. Balls
8. Groove ball bearing
9. Circlip

SYNTEX®-NC / KTR-SI Compact
Backlash-free overload systems

Operating principle

- Overload protection up to 550 Nm
- Backlash-free torque transmission
- Light-weight design
- Declining spring characteristic
- Lower mass moment of inertia
- Large bore diameters
- Short reaction times
- High power density
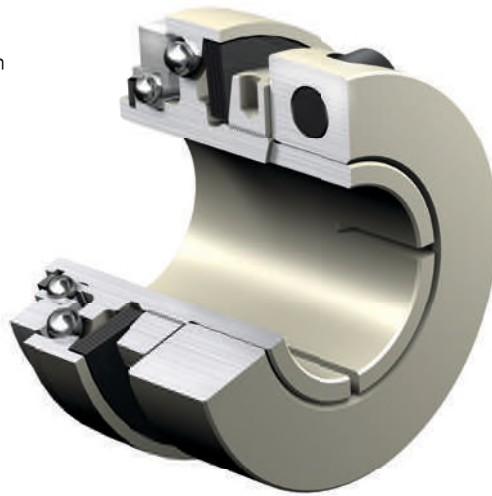
- Clamping ring design easy to assemble
- Available both as a ratchet (DK) and synchronous design (SK)
- Backlash-free shaft-hub-connection
- In combination with the backlash-free ROTEX® GS or backlash-free, torsionally rigid TOOLFLEX®
- Direct assembly of toothed belt pulley, as an example, possible (integrated groove ball bearing)

- Overload protection up to 3,100 Nm
- Backlash-free overload system with a declining spring characteristic
- Solid design
- Accurate disengagement with high repeating accuracy
- Accurate backlash-free torque transmission even in case of wear
- Shifting ring with setting scale for accurate torque setting

- Easy torque setting by torque scale on the coupling
- Connection flange with ball bearing
- Hardened ratchet surfaces for a long service life
- Backlash-free shaft-hub-connection via taper bush
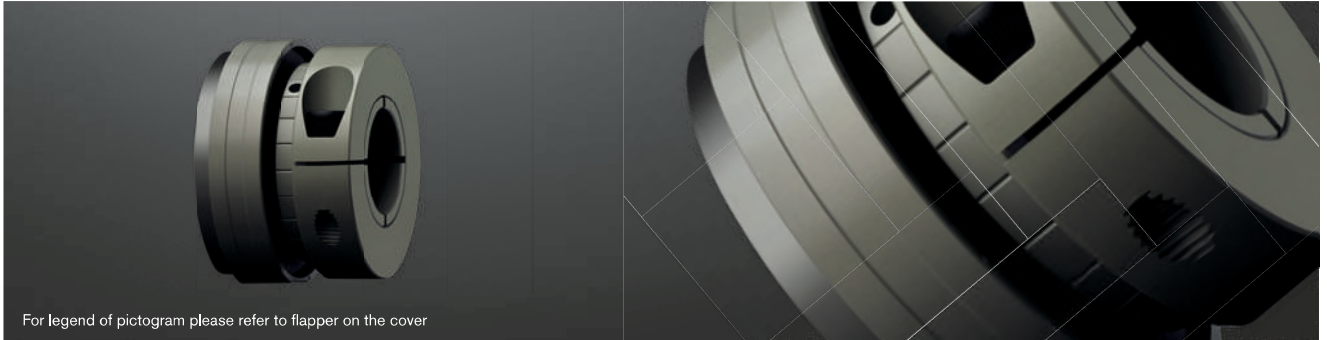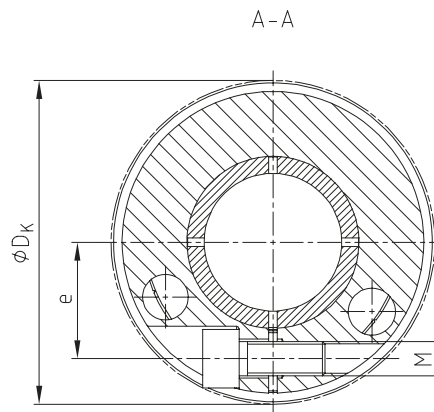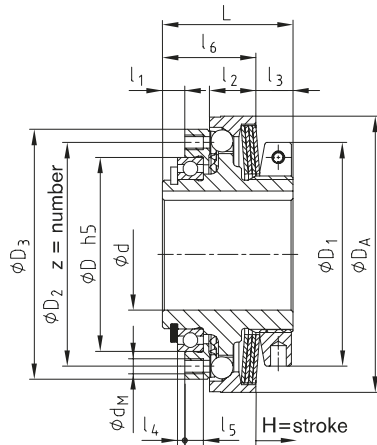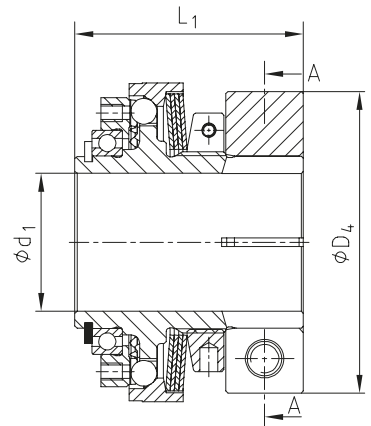- Can be used with the proven ROTEX® GS as a shaft-to-shaft connection

Hub design

For legend of pictogram please refer to flapper on the cover

Hub design 1.0 (keyway acc. to DIN 6885)

Hub design 6.1 (clamping ring)

Technical data – dimensions

Size	Max. speed [3) [rpm]	Torques [Nm]			Max. bore d	Dimensions [mm]													
		T1	T2	T3		D_{h5}	D_1	D_2	D_3	D_A	l_1	l_2	l_3	l_4	l_5	l_6	L	z x d_M	H=stroke
15	3500	2-3.5	3.5-7	7-14	12	32	33	37	42	42	5.0	7.0	9.2	2	4	18.8	28	12xM3	0.8
25	3000	9-15	20-35	40-65	19 (22) [1)	42	50	48	56	61	5.5	11.5	9.1	2	5	23.9	33	8xM4	1.2
32	3000	25-38	50-75	100-150	27 (30) [1)	52	60	60	67	74	6	12.5	9.9	2	5	25.1	35	8xM4	1.5
42	2500	30-65	60-135	120-265	36 (38) [1)	65	72	75	83	90	7	16	11.2	2	6	31.8	43	8xM5	1.5
60 [4)	2000	70-140	120-180	220-550	50	90	96	100	113	116	8	21	11.8	2	7	38.2	52	12xM6	1.8

NEW (Size 15), NEW (Size 60)

Dimensions – Hub design 6.1

Size	Bore d_1		Dimensions [mm]						Weight with max. bore [kg]	Mass moment of inertia [2) J_{total} [kgm²]
	Pilot bore	Max.	D_4	D_K	L_1	e	M	T_A [Nm]		
15	7.5	15	40	43	38	15	M4	1.7	0.124	0.029 x 10⁻³
25	9.5	25	55	–	45	21	M6	14	0.282	0.14 x 10⁻³
32	13.5	32	70	-	53	27	M8	34	0.471	0.35 x 10⁻³
42	18.5	42	86	91.2	63	33	M10	67	0.815	0.95 x 10⁻³
60 [4)	24	60	112	119.4	75	45	M12	115	3.04	5.9 x 10⁻³

NEW (Size 15), NEW (Size 60)

Transmittable friction torques T_R [Nm] (fitting tolerance H7/h6) of hub design 6.1

Size	Ø8	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø36	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55	Ø60
15	8	12	14	16	22	24																				
25		30	35	42	55	62	69	48	53	58	69	80	86													
32						74	83	104	114	125	148	116	125	153	172	192										
42										149	178	209	225	275	310	264	309	324	356	389	422					
60 [4)													247	310	356	405	485	513	571	633	394	452	514	558	675	803

NEW (Size 15), NEW (Size 60)

[1) The figure in brackets specifies the max. bore with keyway to DIN 6885 sheet 3 (low-rise design)
[2) With max. bore
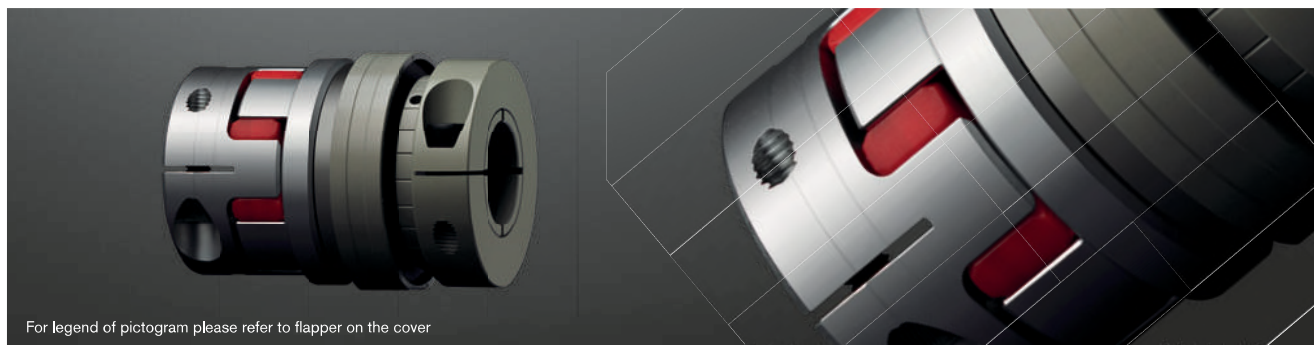[3) See comments on page 239
[4) Material steel

Ordering example:	SYNTEX®-NC 32	SK	6.1	T3	d_1 Ø25	120
	Type/size	Type (DK/SK)	Hub design	Disk springs	Bore	Torque set

SYNTEX®-NC
Backlash-free overload systems

With backlash-free ROTEX® GS

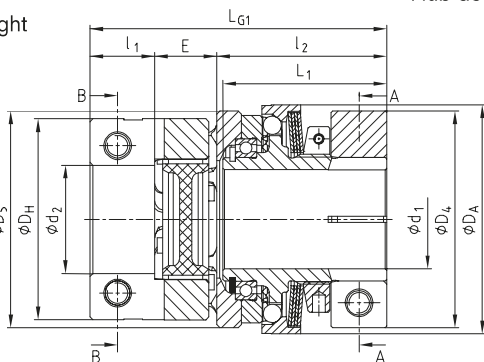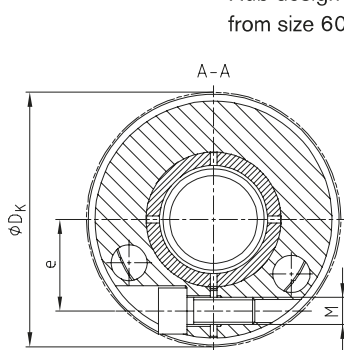For legend of pictogram please refer to flapper on the cover
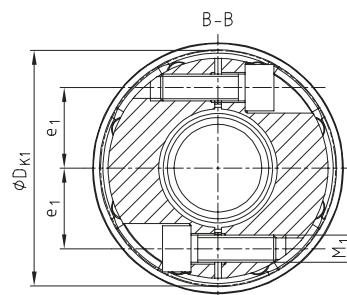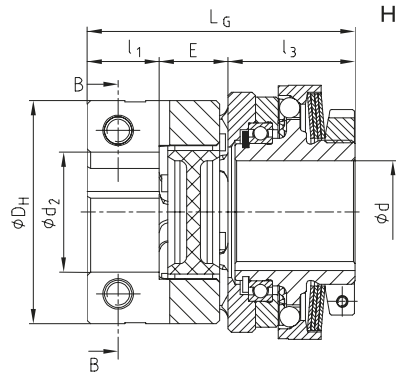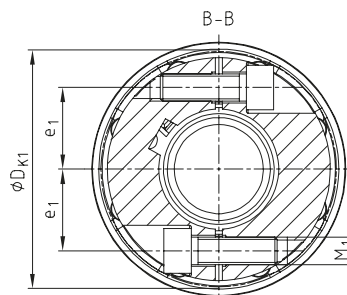
Hub design 2.8
from size 60 6.0 light

Hub design 6.1

Hub design 2.9
from size 60 1.0

Hub design 1.0

Technical data – dimensions

Size	ROTEX® GS size [1]	Torques [Nm]			Max. speed [2] [rpm]	Max. bore			Dimensions [mm]																	TA [Nm]	M1	TA1 [Nm]
		T1	T2	T3		d	d1	d2	D5	DH	DK	DK1	DA	l1	l2	l3	E	e	e1	LG	L1	LG1	M			
15	19	2-3.5	3.5-7	7-14	3500	12	15	24 [3]	45	40	-	46.7	42	17	40	40	16	15	15.5	63	38	73	M4	1.7	M5	6
25	24	9-15	20-35	40-65	3000	19 (22) [4]	25	32 [3]	58	55	-	57.5	61	18	47.5	35.5	18	21	20	71.5	45	83.5	M6	14	M6	10
32	28	25-38	50-75	100-150	3000	27 (30) [4]	32	35 [3]	70	65	-	69	74	21	55	37	20	27	23.8	78	53	96	M8	34	M8	25
42	38	30-65	60-135	120-265	2500	36 (38) [4]	42	45 [3]	88	80	91.2	86	90	26	66	46	24	33	30.5	96	63	116	M10	67	M10	49
60 [5]	48	70-140	120-280	220-550	2000	50	60	55 [3]	113	105	119.4	-	116	56	83	60	28	45	-	144	75	167	M12	115	M10	49

NEW (size 15), NEW (size 60)

Transmittable friction torques TR [Nm] (fitting tolerance H7/h6) of hub design 6.1

Size	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø36	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55	Ø60
15	8	12	14	16	22	24																			
25		30	35	42	55	62	69	48	53	58	69	80	86												
32				74	83	104	114	125	148	116	125	153	172	192											
42								149	178	209	225	275	310	264	309	324	356	389	422						
60 [5]												247	310	356	405	485	513	571	633	394	452	514	558	675	803

NEW (size 15), NEW (size 60)

[1] See selection of ROTEX® GS couplings on page 18 et seqq.
[2] See comments on page 239
[3] For transmittable friction torques TR [Nm] of ROTEX® GS hub type 2.8 or 6.0 refer to mounting instructions of ROTEX® GS
[4] The figure in brackets specifies the max. bore with keyway to DIN 6885 sheet 3 (low-rise design)
[5] Material steel

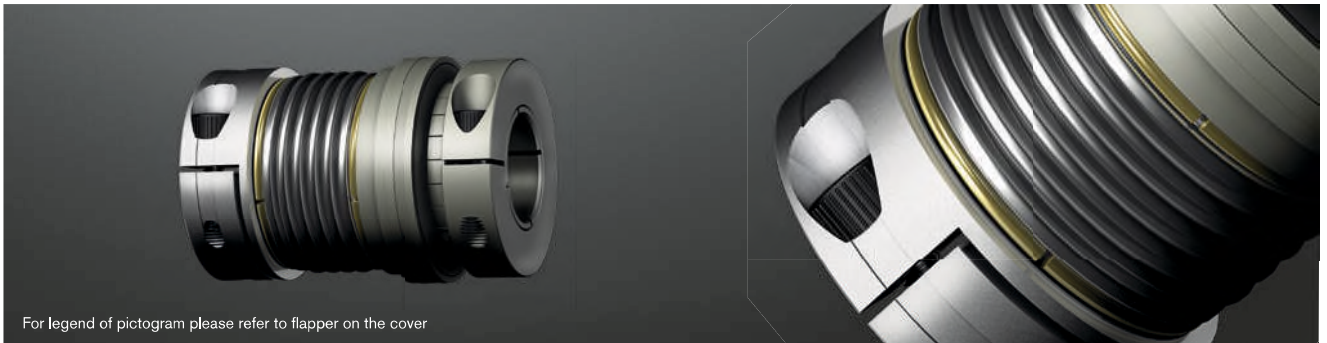| Ordering example:	SYNTEX®-NC 32	SK	6.1	T3	d1 Ø25	28	2.8	d2 Ø20	120
	Type/size	Type	Hub design	Disk springs	SYNTEX®-NC bore	ROTEX® GS size	Hub design	ROTEX® GS bore	Torque set

With torsionally rigid TOOLFLEX® S

For legend of pictogram please refer to flapper on the cover
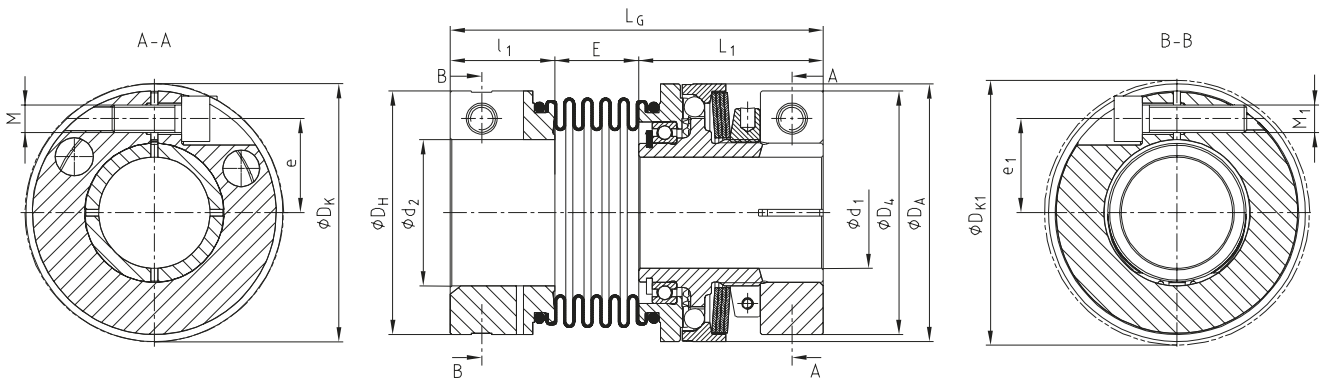
Technical data – dimensions																								
Size	TOOLFLEX® size [1]	Torques [Nm]			Speed [2] [rpm]	Max. bore		Dimensions [mm]																
		T1	T2	T3		d_1	d_2	D_4	D_H	D_A	D_K	D_{K1}	l_1	L_1	E	e	e_1	L_G	M	T_A [Nm]	M_1	T_{A1} [Nm]	
15	20	2-3.5	3.5-7	7-14	3500	15	20 [3]	40	40	52	43	43.5	21.5	38	16.5	15	14.5	76	M4	1.7	M5	6	
25	38	9-15	20-35	40-65	3000	25	38 [3]	55	65	61	-	72.6	25.5	45	18	21	25	88	M6	14	M8	25	
32	42	25-38	50-75	100-150	3000	32	42 [3]	70	70	74	-	76.1	30	53	24	27	27	107	M8	34	M8	25	
42	45	30-65	60-135	120-265	2500	42	45 [3]	86	83	90	91.2	89	32	63	22.5	33	30	114	M10	67	M10	49	
60 [4]	65	70-140	120-280	220-550	2000	60	65 [3]	112	125	140	119.4	127.1	45	84	36	45	45	165	M12	115	M14	185	

Transmittable friction torques T_R [Nm] (fitting tolerance H7/h6) of hub design 6.1																									
Size	Ø8	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø36	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55	Ø60
15	8	12	14	16	22	24																				
25		30	35	42	55	62	69	48	53	58	69	80	86													
32						74	83	104	114	125	148	116	125	153	172	192										
42										149	178	209	225	275	310	264	309	324	356	389	422					
60 [4]													247	310	356	405	485	513	571	633	394	452	514	558	675	803

[1] See selection of TOOLFLEX® couplings on page 18 et seqq.
[2] See comments on page 239
[3] For transmittable friction torques T_R [Nm] of TOOLFLEX® hub type 2.5 refer to mounting instructions of TOOLFLEX®
[4] Material steel
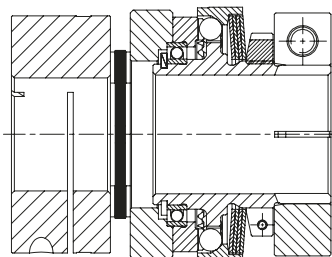
Special type:

● SYNTEX®-NC with RADEX®-NC

Ordering example:	SYNTEX®-NC 32	SK	6.1	T3	d_1 Ø25	42-S	2.5	d_2 Ø20	120
	Type/size	Type	Hub design	Disk springs	SYNTEX®-NC bore	TOOLFLEX® size	Hub design	TOOLFLEX® bore	Torque set

For continuously updated data please refer to our online catalogue at www.ktr.com