SCHMIDT-KUPPLUNG GmbH

Schmidt-Kupplung®



About us

In the early 1960s Richard Schmidt developed of propulsion systems for rockets in a zero-gravity environment. Among the possible solutions, rotating discs with mass points positioned along their circumference were investigated.
To power these discs, Richard Schmidt has the idea of using rotating slider cranks. Because these are always parallel to each other, they are later referred to as parallel arms, or simply linkage. The resulting system guarantees a completely true angle of rotation at all times. Because the pushing and pulling forces alternate and overlap in a sinusoidal pattern, this arrangement does not generate any net external forces. To compensate for the changing distance between shafts, two of these linkages had to be combined. A model of this combined parallel linkage system consist of two coupling end discs and a new intermediate disc guided by the linkage groups. The Schmidt-Kupplung was born.
1963 the patent was applied for that new system "coupling for precise angular transmission of rotational motion" – at the Munich patent office in Munich.



BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

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Patentschrift stimmt mit der Auslegeschrift überein

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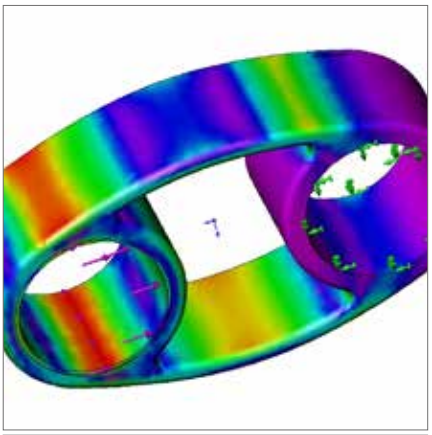
Die Erfindung betrifft eine Kupplung zur drehwinkelgetreuen Übertragung von Drehbewegungen zwischen parallelen Wellen mit veränderlichem Wellenversatz mit einem Zwischenglied, das mit den beiden Kupplungshälften über je ein Getriebe von wenigstens drei zueinander parallelen Lenkern ver-

Kupplung zur drehwinkelgetreuen Übertragung von Drehbewegungen

Patentiert für:
Richard Schmidt, Madison, Ala. (V. St. A.)

- 50 years of experience
- Trust and partnership
- Precision couplings
- Understanding applications, solving problems
- Ongoing development







Technique

Large offset with absolute angle synchronisation

The Schmidt-Kupplung coupling is a compactly built coupling for precise torque transmission of extremely radially offset shafts. The shaft offset can be changed both at rest and while running under load, to any value within the required permissible swivel range. In this process, permanent angle-synchronous transmission is ensured regardless of the shaft offset height. From one drive to the other, they operate permanently in synchronisation, with no phase shift.

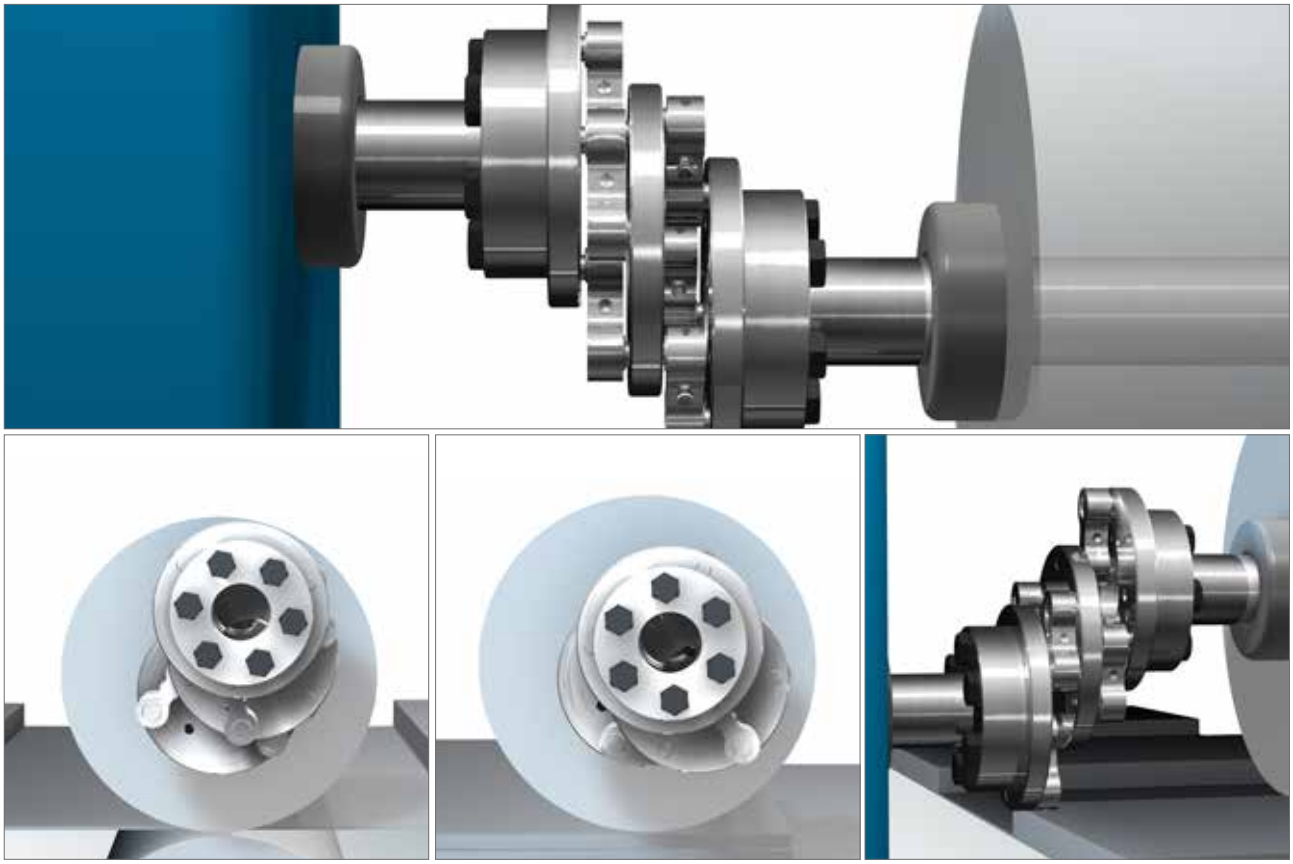


Figure 1.2: Application for roller drives such as coating rollers; various material thicknesses are processed. The Schmidt-Kupplung coupling allows variable functional shaft offset in the machining process during operation while in continuous synchronisation. Picture 3: Turning the roller without stopping the machine. The roller can be replaced during operation. This eliminates any cost-intensive start-up for the machine.

Precise and compact

The coupling runs with three discs and two link levels. This ensures compactness and torsionally stiff work. The additional use of precision needle bearings in the coupling links ensures very low rotational play and thus ensures precise torque transmission.

High torsional stiffness, no restoring forces

The components of the Schmidt-Kupplung coupling are made of high-quality steel with high tensile strength and tempered steel.
It offers high torsional stiffness as an all-metal coupling and is designed for high torque transmission.

The Schmidt-Kupplung coupling compensates shaft offset without any restoring forces and thus bearing loads.

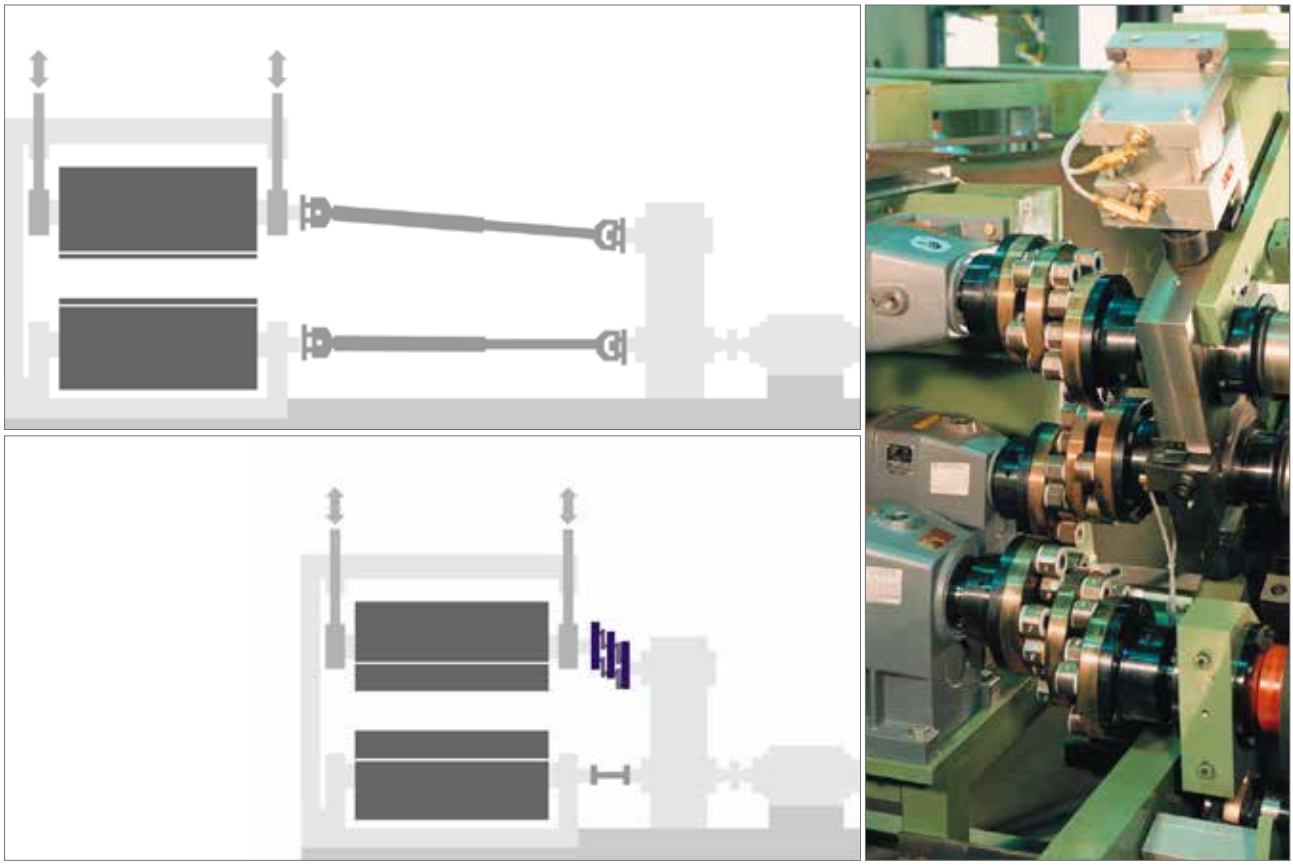


Figure: The space-saving and precision choice for roll-forming machines

Comparing to cardan-shafts the Schmidt-Kupplung builds significantly more compact for modern space-saving applications. Additionally the coupling has a higher torsional stiffness, less backlash and works more precisely. The Schmidt-Kupplung coupling is a dynamically balanced system. Radial vibration is absorbed by the coupling.

The optimal solution for every application

Packaging machines
Cartoner moduls
Box folding machines
Thermoforming machines

Printing machines
Paint rollers
Duct rollers
Tampon printing machines

Forming industry
Metal sheet transport
Edge trimming shears
Embossing rollers

Wood working industry
Lamination machines
Deburrers
Edge processing

Paper machines
Breast rollers
Paper cutters
Rotary cutter systems

And much more

Radial offset

The Schmidt-Kupplung coupling can be radially offset within the relevant pivoting range. Please note the limits specified in the tables of values for maximum allowable offset, maximum displacement and minimum required offset. Compliance with these values ensures that the shafts of the coupling do not run in an inadmissible alignment or in extended position.

Minimal radial offset $\Delta K_{r\,min}$

The coupling may not operate in alignment position K_r=0. In alignment position, the centre disc would have no definite position in space but would be stimulated to its own movement.
Therefore, a minimal required radial offset $\Delta K_{r\,min}$ must be provided for both shafts to be connected.
To this end, the output shaft must be moved horizontally (Figure 1) or vertically to achieve this minimum offset.
The figure below illustrates the installation position of the coupling when selecting ΔK_r min in the lateral, horizontal direction. The centre disc can be located above (Figure 2a) or below (Figure 2b).
For the relevant value of the minimum required radial offset ΔK_r min for a coupling size, please refer to the technical data.

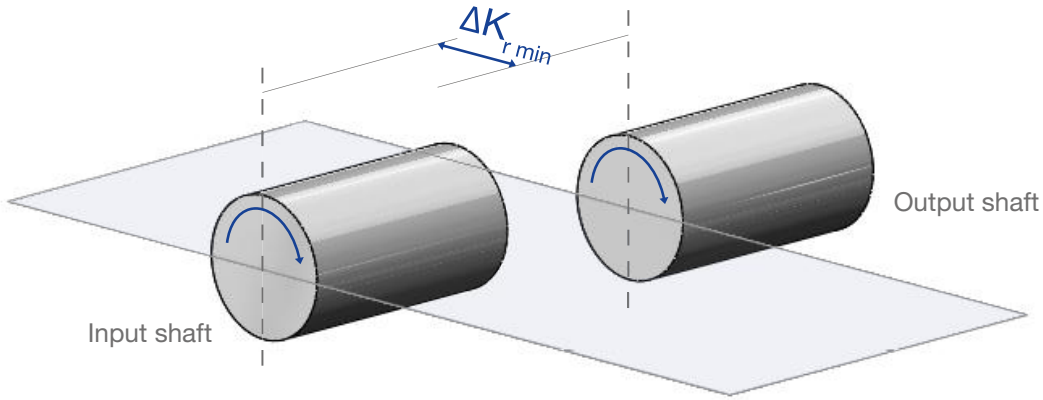


Figure 1 - Output shaft moved in the lateral, horizontal direction to achieve the minimum required radial offset

Alternative location of the center disc when selecting $\Delta K_{r\,min}$ in horizontal direction

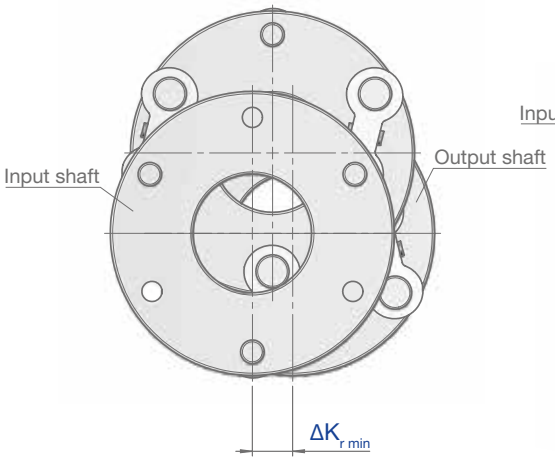


Figure 2a

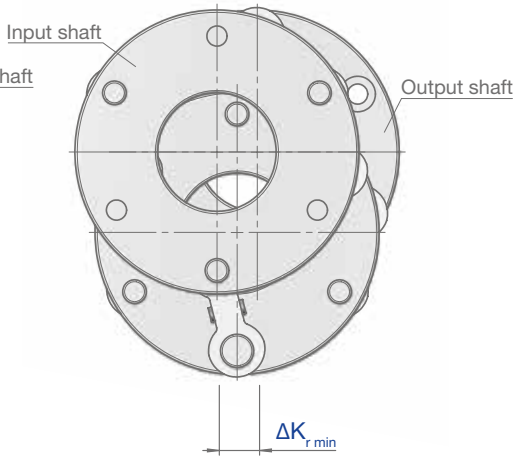


Figure 2b

Maximum radial offset ΔK_r

The Schmidt-Kupplung coupling is a compactly built coupling for precise torque transmission of extremely radially offset shafts. The height of the maximum permissible radial displacement is dependent on the length/depth gauge of the coupling elements used for the relevant coupling size.
The maximum permissible radial offset results from the sum ΔK_r min and the adjustment range (Figure 3).
For the relevant value of the maximum permissible radial offset ΔK_r for a coupling size, please refer to the technical data.

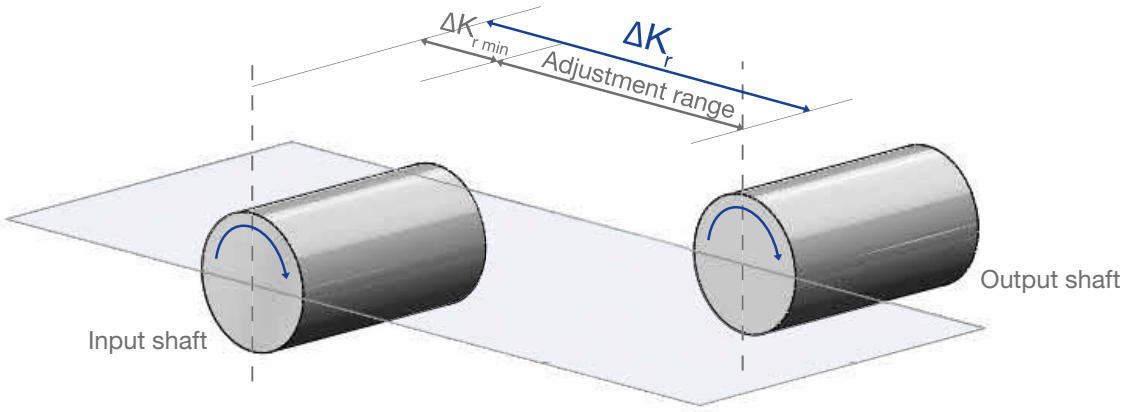


Figure 3

Figure 4 shows the path of the centre disc of the Schmidt-Kupplung coupling with adjusting movements starting at $\Delta K_{r\,min}$ to ΔK_r. Here, the centre disc moves on a circular portion defined by the length/pitches of the coupling elements and thus always has a definite position.

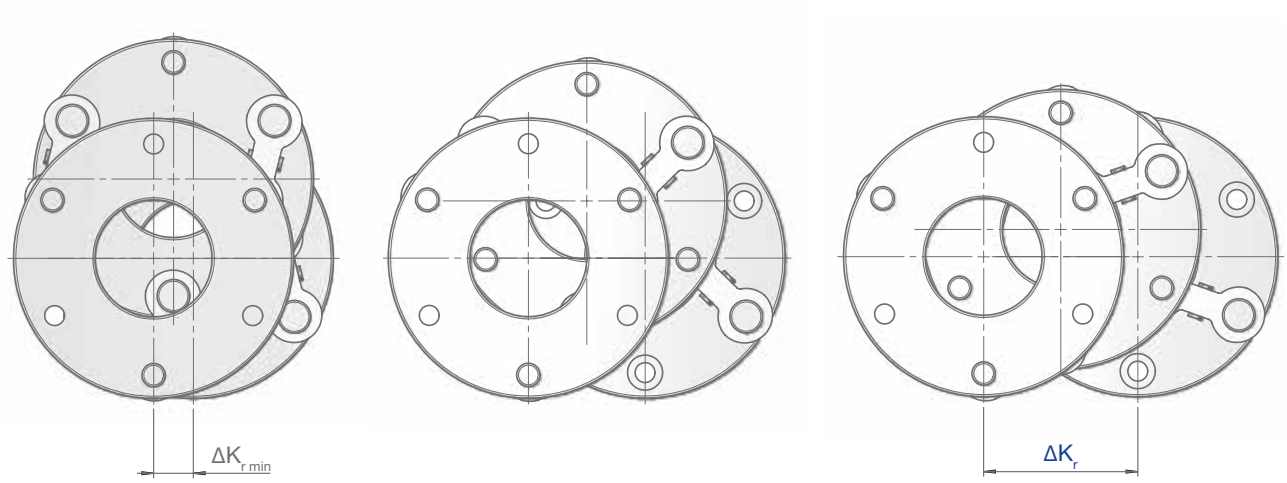
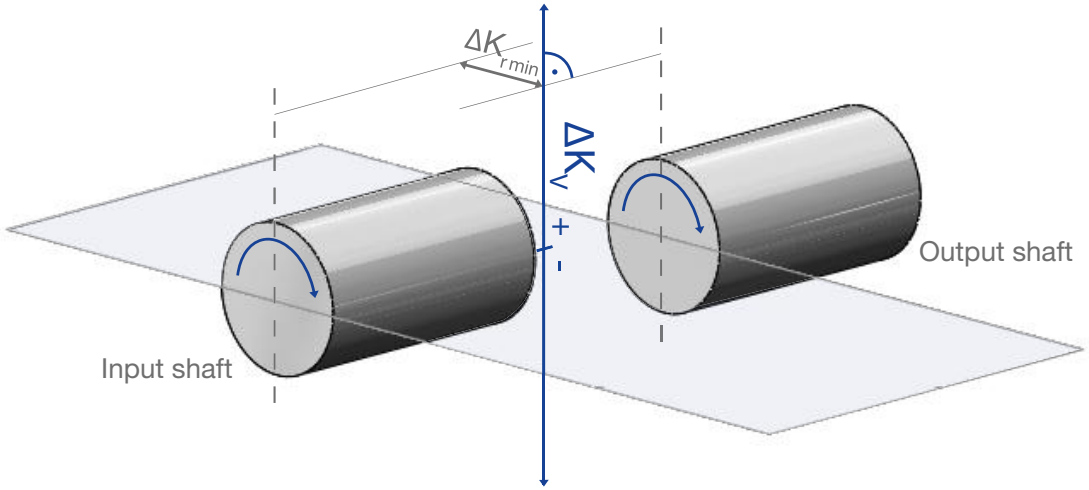


Figure 4

To determine the exact position of the center disc for required installation space our application engineers will be pleased to assist you.

Maximum linear range of the coupling ΔK_v



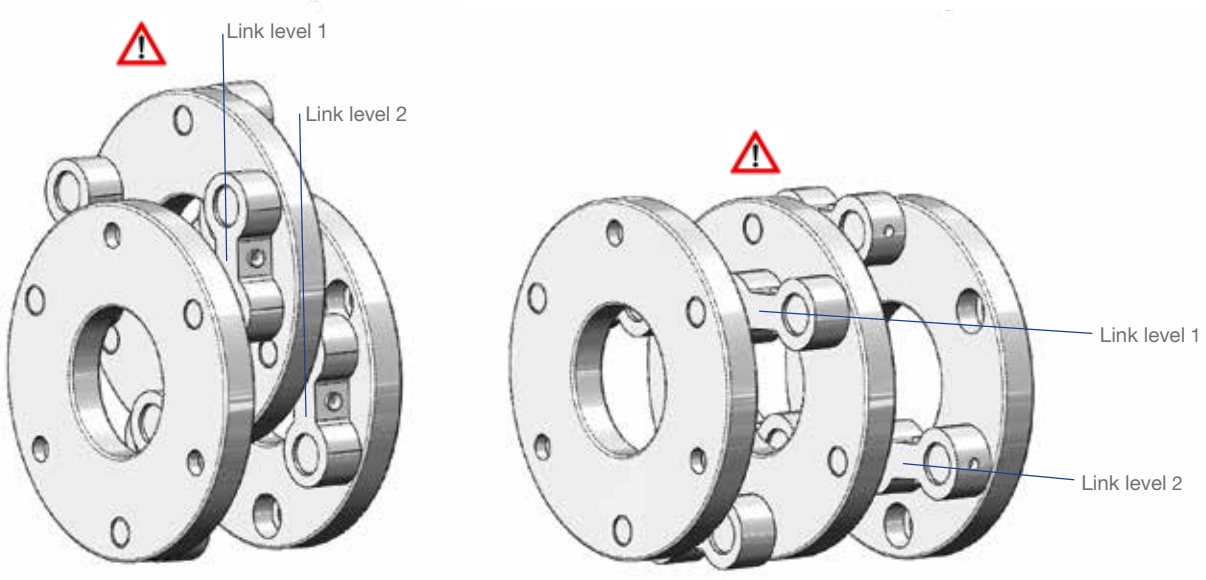
Two installation situations are not permitted

Inadmissible alignment

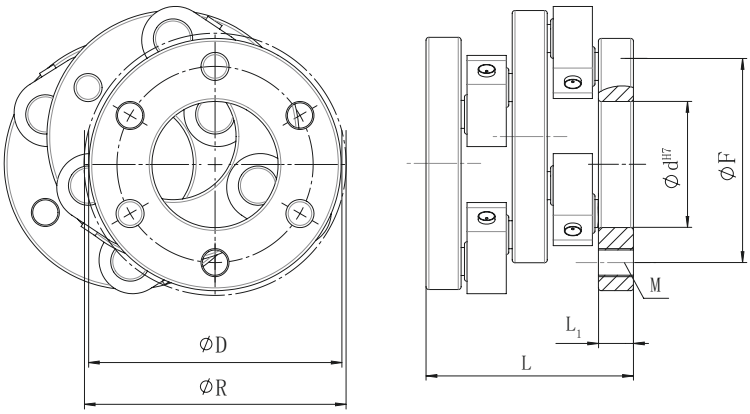
The coupling may not operate in alignment position K_r=0 (recognisable in that the coupling elements of link level 1 are parallel to the coupling elements in level 2). In alignment position, the centre disc would have no definite position in space but would be stimulated to its own movement. For this reason, the aforementioned minimum required radial offset must be provided for every Schmidt-Kupplung coupling (see comments on page 11).

Inadmissible extended position

The coupling may not operate in extended position (recognisable in that the coupling elements of link level 1 are parallel to the coupling elements in level 2).



Technical data



Ordering example

SK 10.5.12/3

- Numbers of links
- ØD
- Offset
- Length L

Specifications

Size	Performance							C_T	Dimensions								
	$\Delta K_{r\,min}$	ΔK_r	ΔK_V	ΔK_w	T_{KN}	T_{Kmax}	min^{-1}	kNm/rad	D	R	J	m	L	L_1	F	d	M
	mm	mm	mm	°	Nm	Nm			mm	mm	kg cm^2	kg	mm	mm	mm	mm	
SK 4.2.6/3	6	23	45	0,8	45	85	2.800	10	60	62	2,8	0,5	44	8	45	25	3xM6
SK 4.2.8/5				0,5	110	210	1.800	24	82	84	8,9	0,8			67	40	5xM6
SK 4.5.6/3	13	50	95	0,8	45	85	1.900	10	60	62	3,1	0,6			45	25	3xM6
SK 4.5.8/5				0,5	110	210	1.600	24	82	84	9,1	1,1			67	40	5xM6
SK 7.3.7/3	9	34	64	0,8	110	210	3.500	24	70	74	7,5	1,1	74	12,5	48	25	3xM10
SK 7.3.9/3					150	290	3.100	33	90	94	21,5	1,7			70	45	3xM10
SK 7.7.9/3	17	66	126	0,8	150	290	2.200	33	90	94	24	1,9			70	45	3xM10
SK 7.7.12/4				0,5	280	550	1.900	63	120	124	63	3			98	50	4xM10
SK 10.5.12/3	14	53	100	0,5	360	710	2.300	81	120	120	95	4,5	101	17	90	50	3xM12
SK 10.5.12/4					480	945	2.300	108	120	120	105	5			90	50	4xM12
SK 10.9.12/3	22	85	162	0,5	360	710	1.700	81	120	120	107	5,1			90	50	3xM12
SK 10.9.14/4					590	1.155	1.800	132	140	140	187	6,8			110	50	4xM12
SK 13.6.14/3	17	64	122	0,5	630	1.240	1.700	142	140	143	275	9,8	134	26	100	55	3xM16
SK 13.6.16/4					1.010	1.980	1.600	227	158	164	475	13			120	60	4xM16
SK 13.9.14/3	22	85	162	0,5	630	1.240	1.500	142	140	143	285	10			100	55	3xM16
SK 13.9.16/4					1.010	1.980	1.400	227	158	164	480	13,2			120	60	4xM16
SK 16.7.16/3	18	68	129	0,5	1.130	2.200	1.500	252	158	164	550	15	155	31	115	60	3xM16
SK 16.7.18/4					1.760	3.440	1.400	395	180	184	680	17			135	70	4xM16
SK 16.10.16/3	25	95	180	0,5	1.130	2.200	1.200	252	158	164	585	16			115	60	3xM16
SK 16.10.18/4					1.760	3.440	1.200	395	180	180	910	20			135	70	4xM16
SK 20.9.20/3	22	85	162	0,3	2.160	4.220	1.200	484	200	202	1.500	26	196	33	150	80	3xM20
SK 20.9.25/4					3.830	7.500	1.000	860	250	252	3.700	41			200	100	4xM20
SK 20.15.20/3	37	142	270	0,3	2.160	4.220	900	484	200	202	1.850	32			150	80	3xM20
SK 20.15.25/4					3.830	7.500	800	860	250	252	4.100	44			200	100	4xM20

T_{KN}= Nominal torque, T_{Kmax}= Maximum torque capacity, min^{-1}= Max. rpm, ΔK_V= Maximum linear range of the coupling, ΔK_r= Maximum radial offset capacity, $\Delta K_{r\,min}$= Min. required radial offset, ΔK_a= Max. axial misalignment capacity, ΔK_w= Max. angular misalignment capacity, C_T= Torsional stiffness

Size SK 4.2.6/3 – SK 16.10.18/4 allows an axial misalignment up to 1 mm; Size SK 20.9.20/3 – SK 20.15.25/4 up to 2 mm

J= Moment of inertia, m= Mass, L= Coupling length, M= Numbers of threaded bores x bolt size, F= Bolt circle diameter

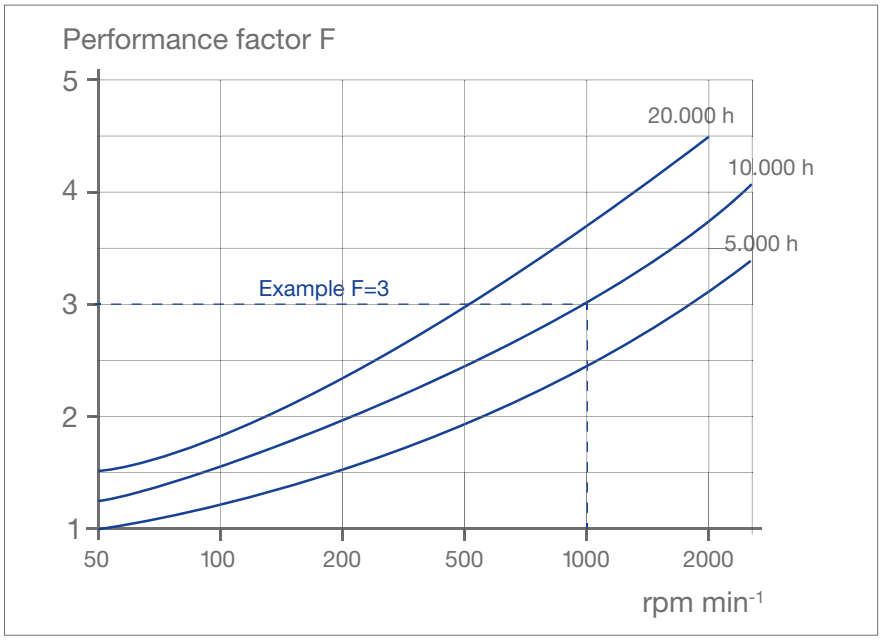
Selection sequence

The selection of the Schmidt coupling is determined by the various performance parameters. These include torque, speed and occurring displacement. The influences of these parameters are described below:

Selection according to torque

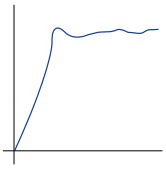
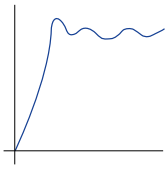
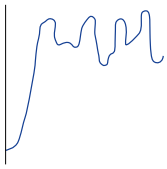
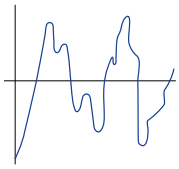
To calculate the dimensioning moment T_D, please multiply your drive torque T_A with the corresponding performance factor F and the expected load factor K.

$T_D = T_A \times F \times K$



Select the anticipated operating speed of your application combined with the desired service life in h*.

Example:
Anticipated operating speed:
1.000 rpm
Desired service life in h: 10.000 h
Performance factor F: 3

Load factor K			
Uniform	Light shocks	Medium shocks	Heavy shocks
			
1,0	1,25	1,75	2,25

Select a coupling whose rated torque T_{KN} is larger than the calculated dimensioning torque T_D:

$T_{KN} > T_D$

Make sure that the maximum torque of coupling T_{Kmax} is not exceeded.
*Nominal life - the service life recommendation for the coupling needle bearing, expressed in the number of operating hours which a bearing can complete before the first signs of material fatigue occur.

Selection example

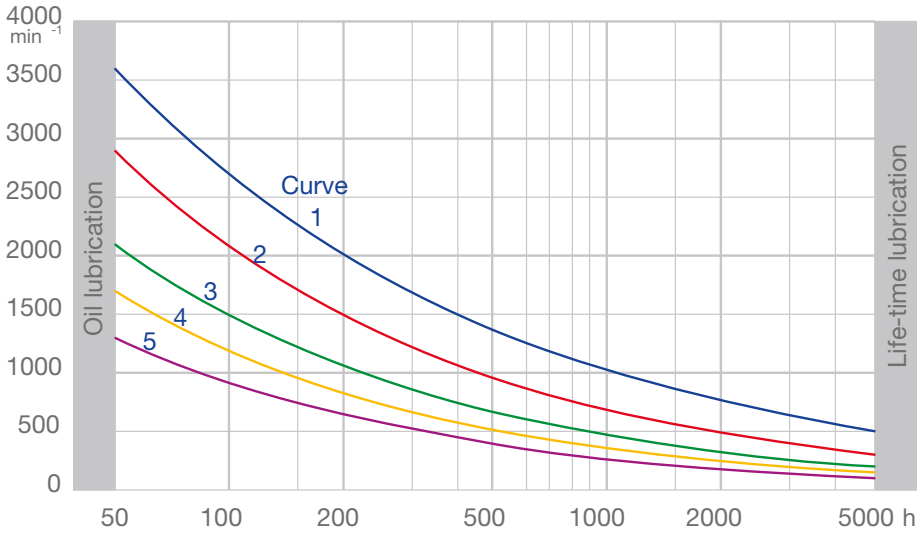
Application:
Roller drive in automatic lamination machine

Requested maximum radial offset ΔK_r: 40 mm
Drive torque T_A: 50 Nm
Operating speed: 200 min^{-1}
Desired service life in h: 10.000 h
Performance factor F: 2
Expected load factor K: 1,25 (light shocks)

Dimensional torque T_D= 50 Nm x 2 x 1,25
= 125 Nm

Select a coupling whose rated torque T_{KN} is larger than the calculated dimensioning torque 125 Nm
Appropriate size: SK 7.7.9/3
T_{KN}: 150 Nm
T_{Kmax}: 290 Nm

Lubrication period

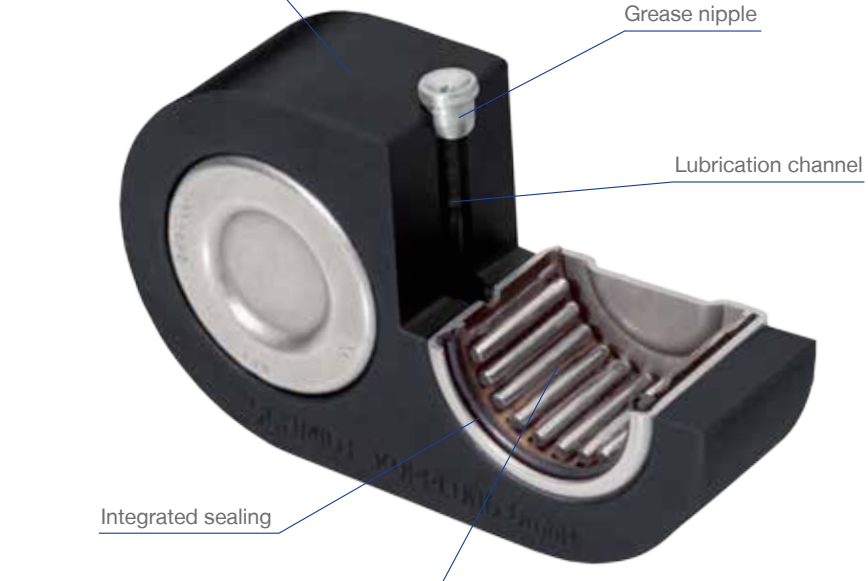


Standard				
Curve 1	Curve 2	Curve 3	Curve 4	Curve 5
SK 7.3.7/3	SK 10.5.12/3	SK 13.6.14/3	SK 16.7.16/3	SK 20.9.20/3
SK 7.3.9/3	SK 10.5.12/4	SK 13.6.16/4	SK 16.10.16/3	SK 20.15.20/3
SK 7.7.9/3	SK 10.9.12/3	SK 13.9.14/3	SK 16.7.18/4	SK 20.9.25/4
SK 7.7.12/4	SK 10.9.14/4	SK 13.9.16/4	SK 16.10.18/4	SK 20.15.25/4

The Schmidt-Kupplung, except for size SK 4.2.6/3, SK 4.2.8/5, SK 4.5.6/3 and SK 4.5.8/5, has a lubrication fitting for regreasing. Adequate lubrication is required for full operating life. The Schmidt-Kupplung, should be regreased exclusively with Klüber Staburags NBU 12-300 KP. Mixing lubrication is not recommended and will reduce coupling operating life.

Material





Needle bearings: High-quality needle roller bearing
- High load ratings
- High nominal rating life

Grease: Staburags NBU12 with excellent wear protection

SCHMIDT-KUPPLUNG GmbH

SCHMIDT-KUPPLUNG GmbH
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