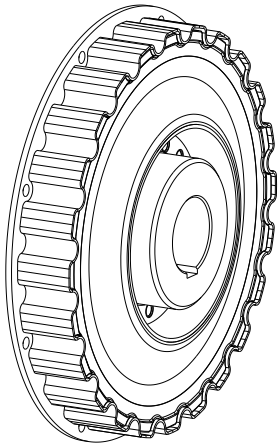
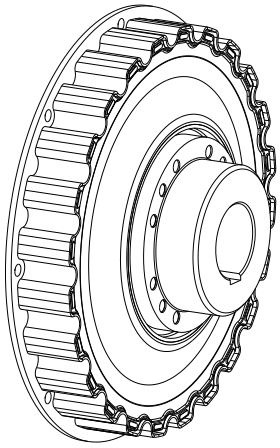
SINULASTIC®

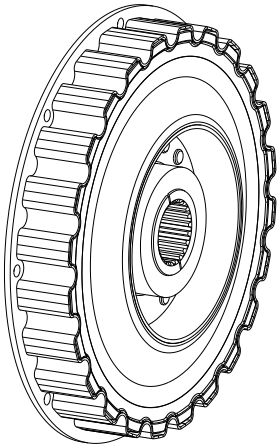
highly flexible flange coupling type
A, T and their combinations



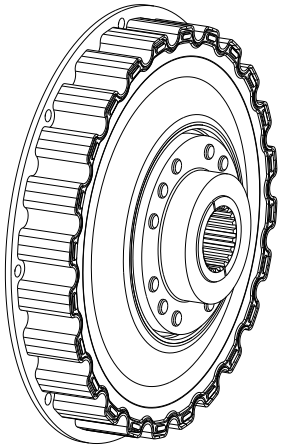
Type AK



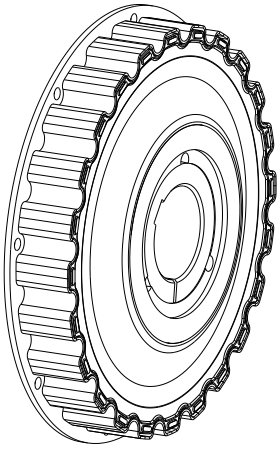
Type AL



Type AKC



Type ALC



Type T

SINULASTIC® type A and T is a highly torsionally flexible flange coupling easy to plug in axially with a linear torsional stiffness characteristic curve. It dampens torsional vibrations and compensates for axial, radial and angular shaft displacements. The **SINULASTIC®** coupling has an overload function protecting the drive against impermissibly high torques.

Table of contents

1 Technical data

1.1 Coupling dimensions and technical data

Type AK and AL

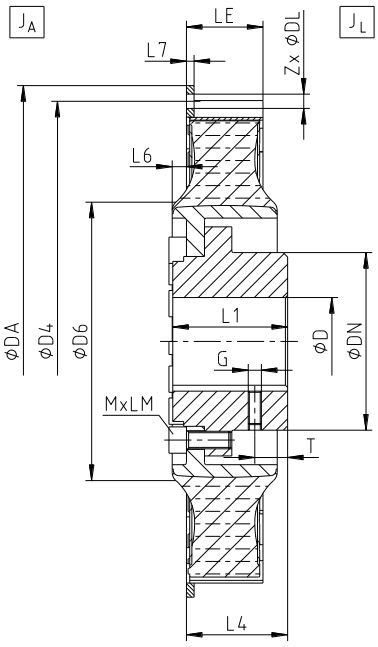


Illustration 1: SINULASTIC® type AK

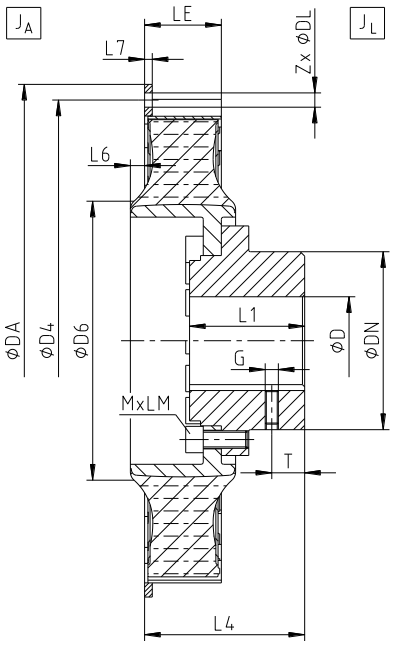


Illustration 2: SINULASTIC® type AL

Table 1: Dimensions - type AK and AL

Size	Finish bore D in mm		Flange connection acc. to SAE - J620 / diameter [1]	Dimensions [3] in mm								Cap screws DIN EN ISO 4762	
	Pilot bored	Max.		DN	D6	LE	L1	L4 AK	L4 AL	L6	L7	MxLM	T_A in Nm
20	-	80	11.5“ 14“	112	164	65	75	90.5 +3.5/-4.5	127.5 +3.5/-4.5	5.5	41.0 13.6	M12x30	120
28	-	115	14“ 18“ Ø475 [2]	162	244	44	90	93.5 ±3	109 ±3	7.0	7.0	M16x40	300
38	-	115	14“ 18“ Ø475 [2]	162	244	58	100	93.5 ±3	123 ±3	7.0	7.0	M16x40	300
53	-	115	14“ 18“ Ø475 [2]	162	247	70	105	92.5 ±3	146 ±3	13.0	7.0	M16x40	300
96	-	175	18“ 21“ 24“	248	352	84	150	129 ±4	192 ±4	1.0	11.0	M20x50	590
114	-	175	18“ 21“ 24“	248	352	98	150	129 ±4	206 ±4	1.0	11.0	M20x50	590
140	-	175	21“ 24“	248	431	94	200	200 ±3.5	280 ±3.5	3.0	14.0	M20x60	590
180	-	175	21“ 24“	248	431	114	200	200 ±3.5	300 ±3.5	3.0	14.0	M20x60	590

1) For dimensions of flange connection see table 7.
2) Flange connection differing from SAE standard, dimensions in mm.
3) For dimensions G and T see table 10.

In case if a dimensional drawing was prepared for the coupling, the dimensions specified have to be primarily observed.

1 Technical data

1.1 Coupling dimensions and technical data

Table 2: Technical data - type AK and AL

Size	Flange connection acc. to SAE - J620 / diameter [1]	Total weight with maximum bore of coupling in kg	Mass moment of inertia with maximum bore of coupling in kgm²	
			J_A	J_L
20	11.5“	13.70	0.0947	0.0533
	14“	14.79	0.1353	
28	14“	21.89	0.1873	0.1667
	18“	26.54	0.4968	
	Ø475 [2]	22.15	0.2013	
38	14“	25.53	0.2444	0.1994
	18“	30.18	0.5539	
	Ø475 [2]	25.79	0.2584	
53	14“	29.44	0.2906	0.2378
	18“	34.09	0.6000	
	Ø475 [2]	29.70	0.3046	
96	18“	63.86	0.7310	1.0321
	21“	72.34	1.5407	
	24“	77.90	2.2186	
114	18“	68.00	0.8367	1.1212
	21“	76.48	1.6464	
	24“	82.05	2.3243	
140	21“	101.52	1.6664	2.1577
	24“	108.59	2.5280	
180	21“	109.82	1.9539	2.4188
	24“	116.90	2.8167	

1) For dimensions of flange connection see table 7.
2) Flange connection differing from SAE standard, dimensions in mm.

1 Technical data

1.1 Coupling dimensions and technical data

Type AKC and ALC

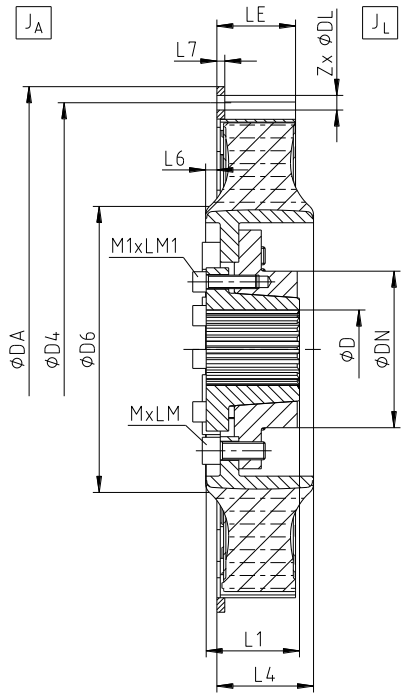


Illustration 3: SINULASTIC® type AKC

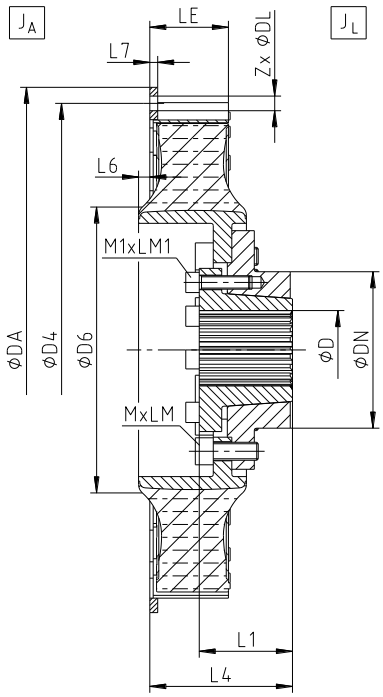


Illustration 4: SINULASTIC® type ALC

Table 3: Dimensions - type AKC and ALC

Size [1]	Finish bore D in mm		Flange connection acc. to SAE - J620 / diameter [2]	Dimensions [4] [5] in mm								Cap screws DIN EN ISO 4762	
	Pilot bored	Max.		DN	D6	LE	L1	L4 AKC	L4 ALC	L6	L7	MxLM	T_A in Nm
20	30	50	11.5“	109	164	65	57	70.5 +3.5/-4.5	95.5 +3.5/-4.5	5.5	41.0	M12x30	120
			14“								13.6		
28	46	65	14“	139	244	44	63	56.5 ±3	72 ±3	7.0	7.0	M16x40	300
			18“										
			Ø475 [3]										
38	46	80	14“	139	244	58	69	65 ±3	92 ±3	7.0	7.0	M16x40	300
			18“										
			Ø475 [3]										
53	46	80	14“	139	247	70	83	83 ±3	124 ±3	13.0	7.0	M16x40	300
			18“										
			Ø475 [3]										

1) Other sizes on request.
2) For dimensions of flange connection see table 7.
3) Flange connection differing from SAE standard, dimensions in mm.
4) For dimensions G and T see table 10.
5) For dimensions M1 and LM1 see table 11.

In case if a dimensional drawing was prepared for the coupling, the dimensions specified have to be primarily observed.

1 Technical data

1.1 Coupling dimensions and technical data

Table 4: Technical data - type AKC and ALC

Size [1]	Flange connection acc. to SAE - J620 / diameter [2]	Total weight with maximum bore of coupling in kg	Mass moment of inertia with maximum bore of coupling in kgm²	
			J_A	J_L
20	11.5“	13.93	0.0947	0.0520
	14“	15.02	0.1353	
28	14“	21.15	0.1873	0.1525
	18“	25.79	0.4968	
	Ø475 [3]	21.40	0.2013	
38	14“	24.05	0.2444	0.1837
	18“	28.70	0.5539	
	Ø475 [3]	24.31	0.2584	
53	14“	28.72	0.2906	0.2240
	18“	33.37	0.6000	
	Ø475 [3]	28.98	0.3046	

1) Other sizes on request.
2) For dimensions of flange connection see table 7.
3) Flange connection differing from SAE standard, dimensions in mm.

1 Technical data

1.1 Coupling dimensions and technical data

Type T

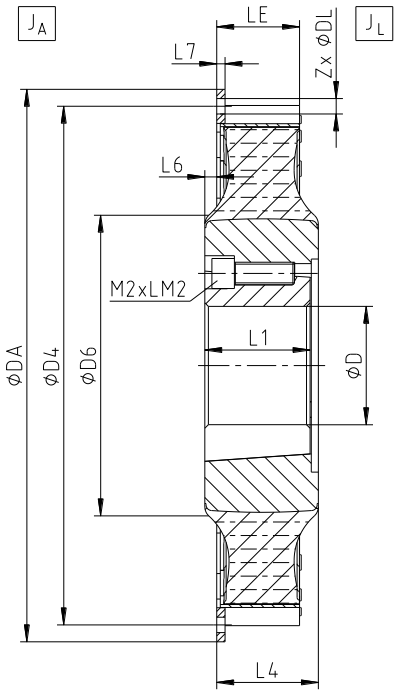


Illustration 5: SINULASTIC® type T

Table 5: Dimensions - type T

Size	Finish bore D in mm		Flange connection acc. to SAE - J620 / diameter [1]	Dimensions [3] in mm						Taper clamping sleeve
	min.	Max.		D6	LE	L1	L4	L6	L7	
20	35	90	11.5“	164	60	63.5	70.5 +3.5/-4.5	5.5	41.0	3525
			14“						13.6	
28	35	90	14“	244	44	63.5	57.0 ±3	7.0	7.0	3525
			18“							
			Ø475 [2]							
38	40	110	14“	244	58	76.2	70 ±3	7.0	7.0	4030
			18“							
			Ø475 [2]							
53	55	125	14“	247	70	89.0	83 ±3	13.0	7.0	4535
			18“							
			Ø475 [2]							

1) For dimensions of flange connection see table 7.
2) Flange connection differing from SAE standard, dimensions in mm.
3) For dimensions M2 and LM2 see table 12.

In case if a dimensional drawing was prepared for the coupling, the dimensions specified have to be primarily observed.

1 Technical data

1.2 General dimensions and torques

Table 6: Technical data - type T

Size	Flange connection acc. to SAE - J620 / diameter [1]	Total weight with maximum bore of coupling in kg	Mass moment of inertia with maximum bore of coupling in kgm^2	
			J_A	J_L
20	11.5“	13.75	0.0947	0.0568
	14“	14.83	0.1353	
28	14“	24.37	0.1873	0.1919
	18“	29.02	0.4968	
	Ø475 [3]	24.63	0.2013	
38	14“	28.68	0.2444	0.2404
	18“	33.33	0.5539	
	Ø475 [1]	28.93	0.2584	
53	14“	33.72	0.2906	0.2993
	18“	38.36	0.6000	
	Ø475 [1]	33.97	0.3046	

1) For dimensions of flange connection see table 7.
2) Flange connection differing from SAE standard, dimensions in mm.

Table 7: Flange dimensions according to SAE J 620

Nominal size	Flange dimensions [mm]					
	11.5“	14“	18“	21“	24“	Ø475 [1]
Dimension DA	352.42	466.72	571.50	673.10	733.42	475.00
Dimension D4	333.37	438.15	542.90	641.35	692.15	450.00
Number Z	8	8	6	12	12	12
Dimension DL	11	13	17	17	21	11

1) Flange connection differing from SAE standard, dimensions in mm.

1 Technical data

1.2 General dimensions and torques

Table 8: Torques

Size	Elastomer type	Torque in Nm									Operating speed in rpm	
		Natural rubber (NR) and synthetical rubber (EPDM)				Silicone rubber (SI) torque with an ambient temperature of +80 °C						
		T_{KN}	$T_{K\,max}$	$T_{K\,max1}$	with 10 Hz T_{KW}	T_{KN} RT [2]	T_{KN}	$T_{K\,max}$	$T_{K\,max1}$	with 10 Hz T_{KW}	n	$n_{max.}$
20	S	1800	2700	3600	720	1800	1385	2077	2769	554	2700	3000
	M	2000	3000	4000	800	2000	1538	2308	3077	615		
	H	2500	3750	5000	1000	-	-	-	-	-	3240	3600
	U	2850	4275	8550	1140	-	-	-	-	-		
28	W [1]	2000 [1]	3000 [1]	4000 [1]	800 [1]	-	-	-	-	-	2340	2600
	S	2200	3300	4400	880	2200	1692	2538	3385	677		
	M	2800	4200	5600	1120	2800	2154	3231	4308	862		
	H	3400	5100	10200	1360	-	-	-	-	-	2520	2800
	U	3750	5625	11250	1500	-	-	-	-	-		
38	S	3100	4650	6200	1240	3100	2385	3577	4769	954	2520	2800
	M	3800	5700	7600	1520	3800	2923	4385	5846	1169		
	H	4600	6900	13800	1840	-	-	-	-	-	2880	3200
	U	5100	7650	15300	2040	-	-	-	-	-		
53	S	4200	6300	8400	1680	4200	3231	4846	6462	1292	2340	2600
	M	5300	7950	10600	2120	5300	4077	6115	8154	1631		
	H	6200	9300	18600	2480	-	-	-	-	-	2700	3000
	U	7000	10500	21000	2800	-	-	-	-	-		
96	S	8100	12150	16200	3240	8100	6231	9346	12462	2492	2070	2300
	M	10000	15000	20000	4000	10000	7385	11077	14769	2954		
	H	11200	16800	33600	4480	-	-	-	-	-	2250	2500
	U	13200	19800	39600	5280	-	-	-	-	-		
114	S	10000	15000	20000	4000	10000	7077	10615	14154	2831	2070	2300
	M	11400	17100	22800	4560	11400	8769	13154	17538	3508		
	H	13400	20100	40200	5360	-	-	-	-	-	2250	2500
	U	15600	23400	46800	6240	-	-	-	-	-		
140	S	13000	19500	26000	5200	13000	9615	14423	19231	3846	1890	2100
	M	14000	21000	28000	5600	14000	10769	16154	21538	4308		
	H	16200	24300	48600	6480	-	-	-	-	-	2070	2300
	U	19000	28500	57000	7600	-	-	-	-	-		
180	S	16000	24000	32000	6400	16000	12308	18462	24615	4923	1890	2100
	M	18000	27000	36000	7200	18000	13846	20769	27692	4800		
	H	22000	33000	66000	8800	-	-	-	-	-	2070	2300
	U	25000	37500	75000	10000	-	-	-	-	-		

1) Elastomer part available in the material natural rubber (NR) only.
2) Reference value with an ambient temperature of +20 °C

Maximum torque of coupling $T_{K\,max}$ = rated torque of coupling T_{KN} x 1.5.
The maximum torque $T_{K\,max}$ signifies short-term torque peaks (e.g. when passing through the resonance). $T_{K\,max}$ may arise at the maximum 50,000 times as vibratory torque or 100,000 times as pulsating torque.

2 Advice

2.1 General advice

Read carefully through these operating/assembly instructions before you start up the coupling.
Pay special attention to the safety instructions!
The operating/assembly instructions are part of your product. Please store them carefully and close to the coupling. The copyright for these operating/assembly instructions remains with KTR.

2.2 Safety and advice symbols

	**Warning of personal injury**	This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death.
	**Warning of product damages**	This symbol indicates notes which may contribute to preventing material or machine damage.
	**General advice**	This symbol indicates notes which may contribute to preventing adverse results or conditions.
	**Warning of hot surfaces**	This symbol indicates notes which may contribute to preventing burns with hot surfaces resulting in light to serious bodily injuries.

2.3 General hazard warnings

With assembly, operation and maintenance of the coupling it has to be made sure that the entire drive train is secured against accidental switch-on. You may be seriously hurt by rotating parts. Make absolutely sure to read through and observe the following safety indications.

- All operations on and with the coupling have to be performed taking into account "safety first".
- Make sure to switch off the power pack before you perform your work on the coupling.
- Secure the power pack against accidental switch-on, e. g. by providing warning signs at the place of switch-on or removing the fuse for current supply.
- Do not reach into the operating area of the coupling as long as it is in operation.
- Secure the coupling against accidental contact. Provide for the necessary protection devices and covers.

2 Advice

2.4 Proper use

You may only assemble, operate and maintain the coupling if you

- have carefully read through the operating/assembly instructions and understood them
- are technically qualified and specifically trained (e. g. safety, environment, logistics)
- are authorized by your company

The coupling may only be used in accordance with the technical data (see chapter 1). Unauthorized modifications on the coupling design are not admissible. We will not assume liability for any damage that may arise. In the interest of further development we reserve the right for technical modifications.
The **SINULASTIC®** described in here corresponds to the state of the art at the time of printing of these operating/assembly instructions.

2.5 Coupling selection

For a permanent and failure-free operation of the coupling it must be selected according to the selection instructions (according to DIN 740 part 2) for the particular application (see catalogue drive technology "SINULASTIC®").
If the operating conditions (performance, speed, modifications on engine and machine) change, the coupling selection must be reviewed.
Make sure that the technical data regarding torque refer to the elastomer part only. The transmittable torque of the shaft-hub-connection must be reviewed by the customer and is subject to his responsibility.

For drives subjected to torsional vibrations (drives with cyclic stress due to torsional vibrations) it is necessary to perform a torsional vibration calculation to ensure a reliable selection. Typical drives subjected to torsional vibrations are e. g. drives with diesel engines, piston pumps, piston compressors etc. If requested, KTR will perform the coupling selection and the torsional vibration calculation.

2.6 Reference to EC Machinery Directive 2006/42/EC

The couplings supplied by KTR should be considered as components, not machines or partly completed machines according to EC Machinery Directive 2006/42/EC. Consequently KTR does not have to issue a declaration of incorporation. For details about safe assembly, start-up and safe operation refer to the present operating/assembly instructions considering the warnings.

3 Storage, transport and packaging

3.1 Storage

The coupling hubs are supplied in preserved condition and can be stored in a dry and roofed place for 6 - 9 months.
With favourable storage conditions the properties of the elastomer part remain unchanged for up to 5 years.

The storage rooms must not include any ozone-generating devices like e. g. fluorescent light sources, mercury-vapour lamps or electrical high-voltage appliances.
Humid storage rooms are not suitable.
Make sure that condensation is not generated. The best relative air humidity is less than 65 %.

Please bear in mind that the elastomer part may be stored horizontally only.

3.2 Transport and packaging

In order to avoid any injuries and any kind of damage always make use of proper transport and lifting equipment.

The couplings are packed differently each depending on size, number and kind of transport. Unless otherwise contractually agreed, packaging will follow the in-house packaging specifications of KTR.

4 Assembly

The coupling is supplied in the following subassemblies and single parts. Before assembly the coupling has to be inspected for completeness.

4.1 Components of the couplings

Components of type AK and AL

Component	Quantity	Description
1	1	Elastomer part
2.1	1	Connection flange made of steel
2.2	1	Connection flange made of cast aluminium
3	1	Hub
6	see table 9	Cap screw DIN EN ISO 4762 - 12.9
7	1	Setscrew DIN EN ISO 4029
8	see table 9	Disk DIN EN ISO 7092

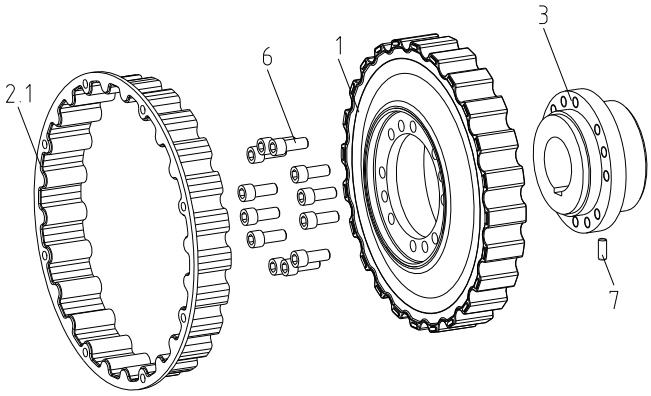


Illustration 6: SINULASTIC® type AK

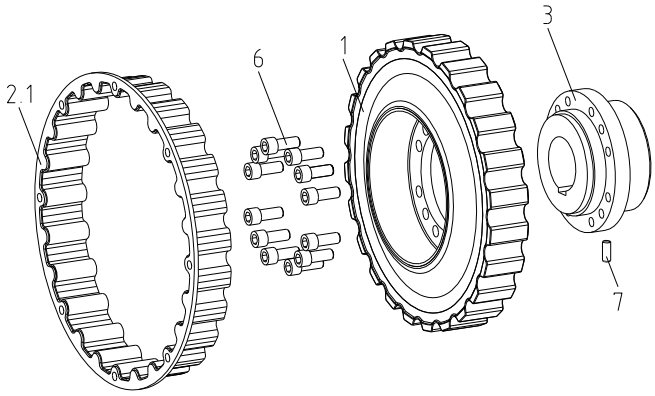


Illustration 7: SINULASTIC® type AL

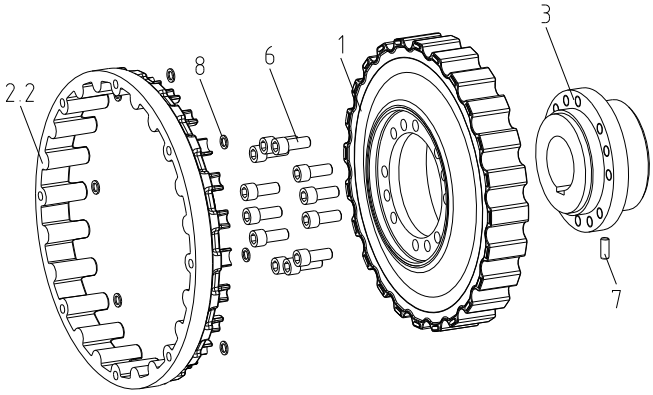


Illustration 8: SINULASTIC® type AK

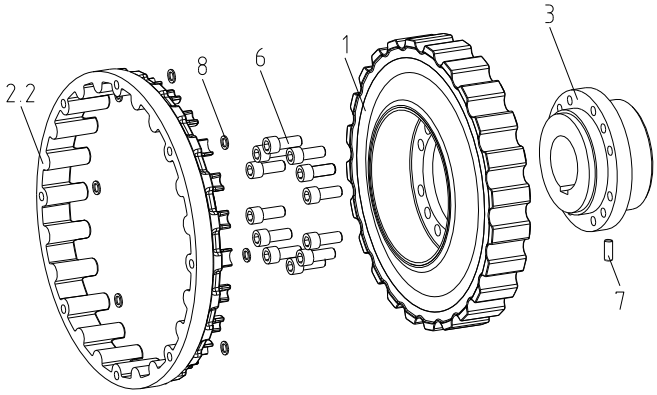


Illustration 9: SINULASTIC® type AL

4 Assembly

4.1 Components of the couplings

Components of type AKC and ALC

Component	Quantity	Description
1	1	Elastomer part
2.1	1	Connection flange made of steel
2.2	1	Connection flange made of cast aluminium
4	1	Clamping ring hub complete
(4.1)	1	Clamping ring
(4.2)	1	Clamping ring hub
(4.3)	see table 9	Cap screw DIN EN ISO 4762 - 12.9
6	see table 9	Cap screw DIN EN ISO 4762 - 12.9
8	see table 9	Disk DIN EN ISO 7092

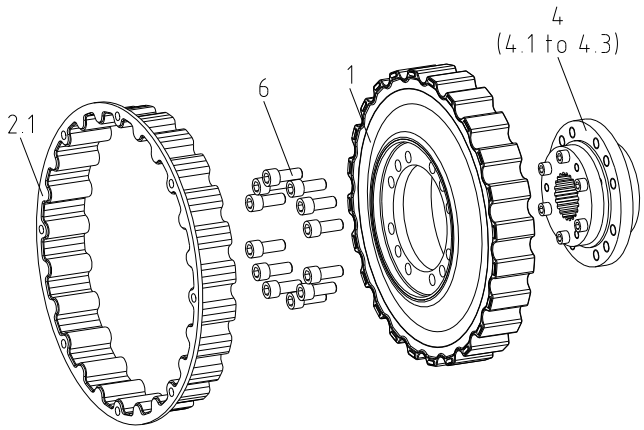


Illustration 10: SINULASTIC® type AKC

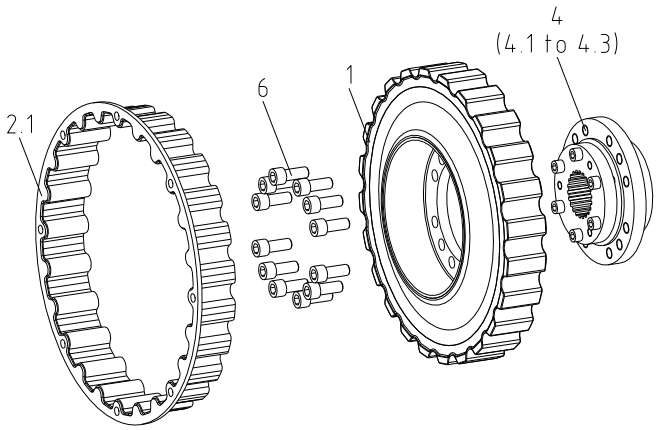


Illustration 11: SINULASTIC® type ALC

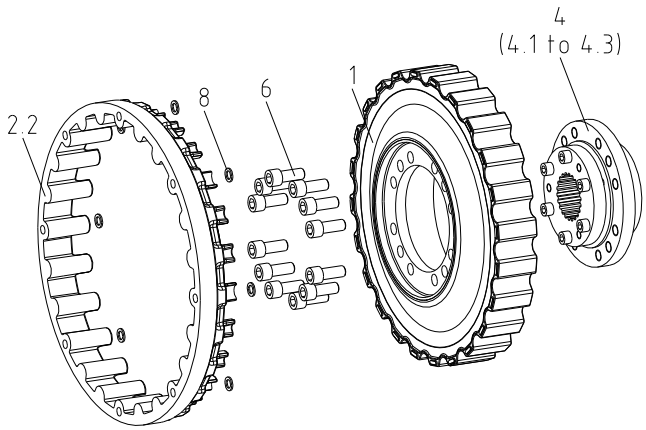


Illustration 12: SINULASTIC® type AKC

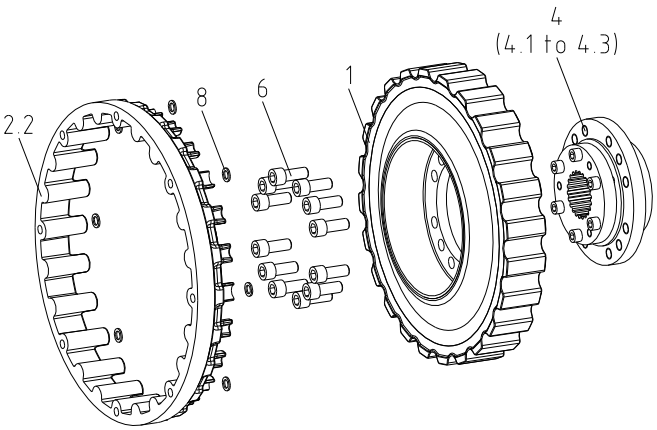


Illustration 13: SINULASTIC® type ALC

4 Assembly

4.1 Components of the couplings

Components of type T

Component	Quantity	Description
1	1	Elastomer part
2.1	1	Connection flange made of steel
2.2	1	Connection flange made of cast aluminium
5	1	Taper clamping sleeve complete
(5.1)	1	Taper clamping sleeve
(5.2)	see table 9	Cap screw DIN EN ISO 4762 - 12.9
8	see table 9	Disk DIN EN ISO 7092

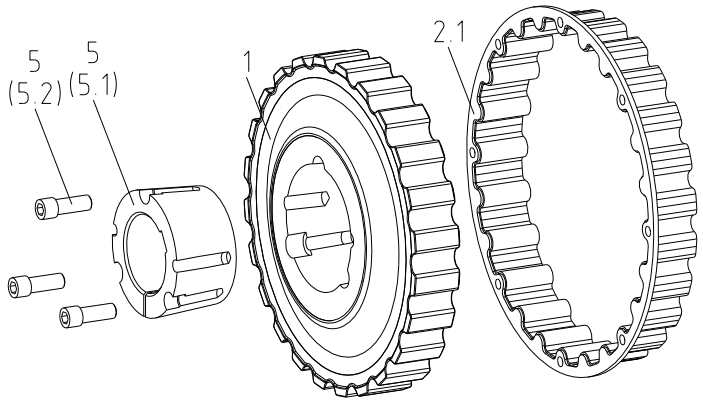


Illustration 14: SINULASTIC® type T

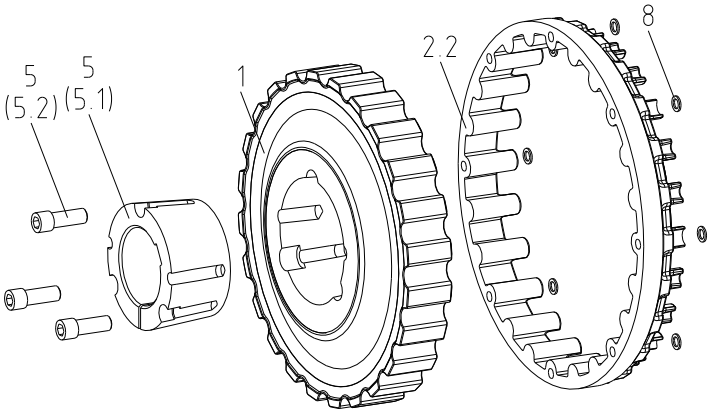


Illustration 15: SINULASTIC® type T

Table 9: Number of cap screws of type A and T

Size	20	28	38	53	96	114	140	180
Number of cap screws (component 4.3)	6	6	8 [1)]	8 [1)]	-	-	-	-
Number of cap screws (component 5.2)	3	3	3	3	-	-	-	-
Number of cap screws (component 6)	14	8	8	12	12	12	24	24
Number of disks (component 8)	8	-	-	8	-	-	-	-

1) up to finish bore Ø65 mm = number of pieces 6; from finish bore Ø65 mm = number of pieces 8

4 Assembly

4.2 Advice for finish bore

The maximum permissible bore diameters D (see chapter 1 - technical data) must not be exceeded. If these figures are disregarded, the coupling may tear. Rotating particles may cause danger to life.

- Hub bores machined by the customer have to observe concentricity resp. axial runout (see illustration 16).
- Make absolutely sure to observe the figures for $ØD_{max.}$.
- Carefully align the hubs when the finish bores are drilled.
- Provide for a setscrew according to DIN EN ISO 4029 with a cup point or an end plate to fasten the hubs axially.

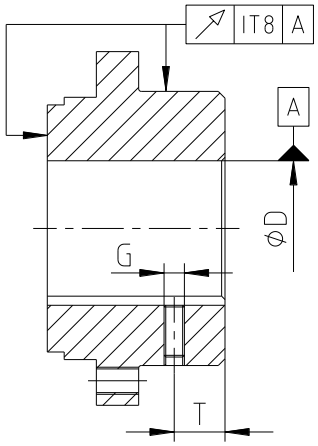


Illustration 16: Concentricity and axial runout

The customer bears the sole responsibility for all machining processes performed subsequently on unbored or pilot bored as well as finish machined coupling components and spare parts. KTR does not assume any warranty claims resulting from insufficient remachining.

Table 10: Setscrew DIN EN ISO 4029

Size	20	28	38	53	96	114	140	180
Dimension G	M10	M12	M12	M12	M16	M16	M16	M16
Dimension T	30	35	35	40	40	40	35	35
Tightening torque T_A [Nm]	17	40	40	40	80	80	80	80

4.3 General advice for assembly

The SINULASTIC® coupling may only be assembled in the order described below.

In case if a dimensional drawing was prepared for the coupling, the dimensions specified have to be primarily observed.

We recommend to inspect bores, shaft, keyway and feather key for dimensional accuracy before assembly.

Heating the hubs lightly (approx. 80 °C) allows for an easier mounting on the shaft.

Touching the heated hubs causes burns.
Please wear safety gloves.

We recommend to secure all screw connections against working loose additionally, e. g. applying Loctite screw adhesive (average strength), while the elastomer parts must <u>not</u> come into contact with any type of adhesive.

4 Assembly

4.4 Assembly of hub (type AK and AL)

- Mount the hub on the shaft of the driven machine.
- Fasten the hub by tightening the setscrew DIN EN ISO 4029 with a cup point (tightening torque T_A see table 10) or an end plate.

4.5 Assembly/Disassembly of clamping ring hub (type AKC and ALC)

4.5.1 Assembly of clamping ring hub (type AKC and ALC)

The power transmission of **SINULASTIC®** clamping hubs is made frictionally engaged. The necessary surface pressure is transmitted via the clamping ring with internal taper to the taper hub and consequently to the shaft.

- Clean and degrease the hub bore, clamping ring hub, clamping ring and the shaft. Afterwards they have to be inspected for dimensional accuracy.
- Lightly unscrew the clamping screws (component 4.3) and pull the clamping ring (component 4.1) from the clamping ring hub (component 4.2) only marginally to make sure the clamping ring is fitted loosely.
- Push the clamping ring hub onto the shaft against a stop.
- Tighten the clamping screws evenly crosswise gradually at the tightening torque specified in table 11. Repeat this process until all clamping screws have reached the tightening torque.

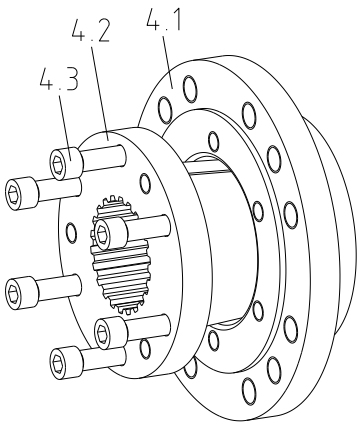


Illustration 17: Assembly of clamping ring hub with clamping ring

Table 11: Cap screws DIN EN ISO 4762 - 12.9 (component 4.3)

Size	20	28	38	53	96	114	140	180
Screw size M1	M10	M10	M10	M12	-	-	-	-
Screw length LM1	30	40	40	45	-	-	-	-
Tightening torque T_{A1} [Nm]	71	71	71	123	-	-	-	-

If the clamping screws are not tightened at the correct tightening torque, there is the risk of
a) a fracture of the hub and plastic deformation with a too high tightening torque T_{A1}
b) early slippling, untightening of the screws with a too low tightening torque T_{A1}

4 Assembly

4.5 Assembly/Disassembly of clamping ring hub (type AKC and ALC)

4.5.2 Disassembly of clamping ring hub (type AKC and ALC)

Unscrew the clamping screws (component 4.3) evenly one after another. During each revolution every screw may only be unscrewed by half a turn. Unscrew all clamping screws by 3 - 4 pitches.

Remove the screws located next to the extraction threads and screw them into the intended extraction threads until they fit (see illustration 18).

The clamping ring is released by tightening the screws in the extraction threads evenly gradually and crosswise.

Pull the clamping ring hub (component 4.2) with the clamping ring (component 4.1) from the shaft.

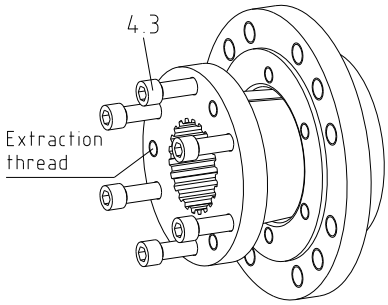


Illustration 18: Disassembly of clamping ring hub with clamping ring

If these hints are not observed, the operation of the coupling may be affected.

For reassembly the bores of the hub and the shaft have to be cleaned and degreased. The same applies for the taper surfaces of clamping ring hub and clamping ring.

Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.

4.6 Assembly/Disassembly of taper clamping sleeve (type T)

4.6.1 Assembly of taper clamping sleeve (type T)

Clean and degrease the contact surfaces of the taper clamping sleeves (component 5.1) as well as shaft and elastomer part (component 1). The taper clamping sleeves have axially parallel, cylindrical and smooth tapped blind holes. Only half of these holes are located in the material of the sleeve. The other half located in the elastomer part has got threads.
Fit the elastomer part and taper clamping sleeve with one another, make sure the bores cover each other and loosely screw in the cap screws (component 5.2) lightly lubricated or oiled and lightly tighten afterwards. Fit the elastomer part with the taper clamping sleeve onto the shaft. Push on the taper clamping sleeve until the mounting position LX (see illustration 20) is reached. Tighten the cap screws evenly to the tightening torque specified in table 12. Light blows with a soft hammer (e. g. made of nylon, rubber, etc.) on the taper clamping sleeve deplete settlements in the taper clamping connection which allows to retighten the screws. We recommend to repeat this process at least once until retightening the screws is no longer possible.
Axial fastening of the Taper Lock hub (elastomer part with taper clamping sleeve) is obtained by proper assembly only.

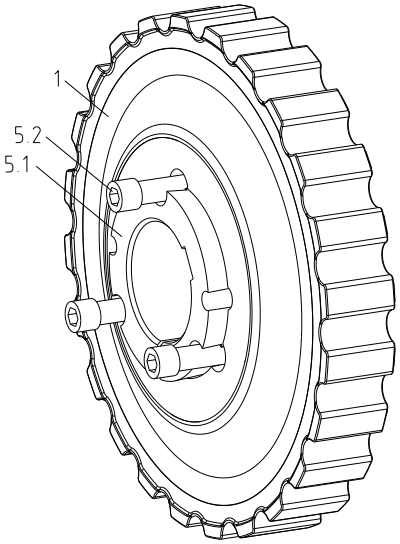


Illustration 19: Assembly of taper clamping sleeve

4 Assembly

4.6 Assembly/Disassembly of taper clamping sleeve (type T)

4.6.1 Assembly of taper clamping sleeve (type T)

Make sure with assembly that the taper clamping sleeve is in the right mounting position LX (see illustration 20).

We recommend to secure all screw connections against working loose additionally, e. g. applying Loctite screw adhesive (average strength), while the elastomer parts must not come into contact with any type of adhesive.

Oils and greases with molybdenum disulphide or high-pressure additives, additives of Teflon and silicone as well as internal lubricants reducing the coefficient of friction significantly must not be used.

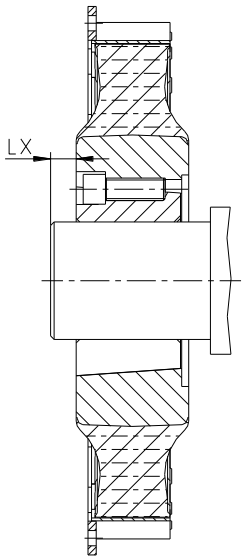


Illustration 20: Mounting position of taper clamping sleeve to the shaft end

Table 12: Cap screws (component 5.2)

Taper clamping sleeve	Screw dimensions [mm]				Quantity (component 5.2)
	M2	LM2	SW2	T_{A2} [Nm]	
3525	1/2“	38	10	115	3
4030	5/8“	44	12	170	3
4535	3/4“	50	14	190	3

4.6.2 Disassembly of taper clamping sleeve (type T)

The taper clamping sleeve is untightened by removing the cap screws (component 5.2). Afterwards two of the cap screws serving as forcing screws are screwed in the thread of the sleeve and tightened.
The elastomer part untightened in this way can be manually pulled from the shaft with the taper clamping sleeve.

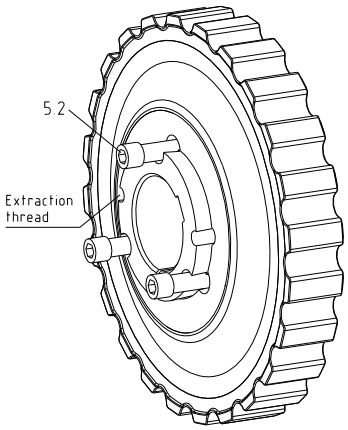


Illustration 21: Disassembly of clamping ring hub with clamping ring

4 Assembly

4.7 Assembly/Disassembly of elastomer part resp. connection flange

4.7.1 Assembly of connection flange (component 2.1 or 2.2)

- Insert the connection flange (component 2.1 or 2.2) into the centering of the flywheel.
- Align the through holes of the connection flange to the threads of the flywheel.
- **Only valid with assembly of the connection flange made of steel (component 2.1):**
  Hand-tighten the components via suitable screws (not part of the scope of delivery) first.
- **Only valid with assembly of the connection flange made of cast aluminium (component 2.2):**
  Hand-tighten the components via the suitable screws (not part of the scope of delivery) and the disks (component 8) first.
- Tighten the screws at the tightening torques T_A specified in table 13 by means of a suitable torque key.

We recommend to secure all screw connections against working loose additionally, e. g. applying Loctite screw adhesive (average strength), while the elastomer parts must not come into contact with any type of adhesive.

Table 13: Screw tightening torques for screwing the external flange to the engine flywheel

Size of flywheel acc. to SAE - J620 [1]	11 ½“	14“	18“	21“	24“	Ø475 [2]
Screw size	M10	M12	M16			M10
Tightening torque [Nm]	49	120	295			49
Minimum screw strength	8.8	10.9				8.8
Inch screw	3/8 - 16	1/2 - 13		5/8 - 11		3/8 - 16
Tightening torque [Nm]	42	150		286		42
Minimum screw strength	5	8				5

1) For dimensions of flange connection see table 7.
2) Flange connection differing from SAE standard, dimensions in mm see table 7.

4.7.2 Assembly of elastomer part (component 1) with hub resp. clamping ring hub (only valid with type AK, AL, AKC and ALC)

Make sure with assembly that the elastomer part has the right position to the hub resp. clamping ring hub after screwing. Otherwise it is not assured in the further process of assembly that both splines cover completely. Disregarding this advice may cause damage to the coupling.

- Insert the elastomer part on the centering of the hub resp. clamping ring hub.
- Align the through holes of the elastomer part to the threads of the hub resp. clamping ring hub.
- Hand-tighten the components first.
- Tighten the cap screws (component 6) by a suitable torque key to the tightening torques T_A specified in table 14.

We recommend to secure all screw connections against working loose additionally, e. g. applying Loctite screw adhesive (average strength), while the elastomer parts must not come into contact with any type of adhesive.

4 Assembly

4.7 Assembly/Disassembly of elastomer part resp. connection flange

4.7.2 Assembly of elastomer part (component 1) with hub resp. clamping ring hub (only valid with type AK, AL, AKC and ALC)

Table 14: Cap screws DIN EN ISO 4762 - 12.9 (component 6)

Size	20	28	38	53	96	114	140	180
Screw size M	M12	M16	M16	M16	M20	M20	M20	M20
Screw length LM	30	40	40	40	50	50	60	60
Tightening torque T_A [Nm]	120	300	300	300	590	590	590	590

4.7.3 Assembly of elastomer part with connection flange

- Rotate the elastomer part so that the internal spline of the elastomer part can be pushed into the external spline of the connection flange.
- Shift the power pack of the driven side in axial direction until the mounting dimension L4 is achieved.

Make sure with assembly that the dimension L4 (see chapter 1) is observed to make sure the external spline of the connection flange is fully covered by the internal spline of the elastomer part. Disregarding this advice may cause damage to the coupling.

Make sure with assembly that the splines of the elastomer part resp. connection flange are free of oil and grease. If necessary, talcum powder or a soap solution can be used to facilitate the assembly.

4.7.4 Disassembly of connection flange (component 2.1 or 2.2)

- Push the driven side so far apart from the connection flange (component 2.1 or 2.2) that the spline is completely separated both from the connection flange and the elastomer part.
- Unscrew and remove the screws of the connection between connection flange and the flywheel.
- **Only valid with assembly of the connection flange made of steel (component 2.1):**
  Unscrew and remove the screws of the connection from the connection flange to the flywheel.
- **Only valid with assembly of the connection flange made of cast aluminium (component 2.2):**
  Unscrew and remove the screws with the disks of the connection from the connection flange to the flywheel.
- Pull the connection flange from the centering and remove it.

4.7.5 Disassembly of elastomer part (component 1) from the hub resp. clamping ring hub (only valid with type AK, AL, AKC and ALC)

- Unscrew and remove the cap screws (component 6) on the elastomer part.
- Pull the elastomer part from the centering of the hub resp. clamping ring hub and remove it.

4 Assembly

4.8 Displacements - alignment of the couplings

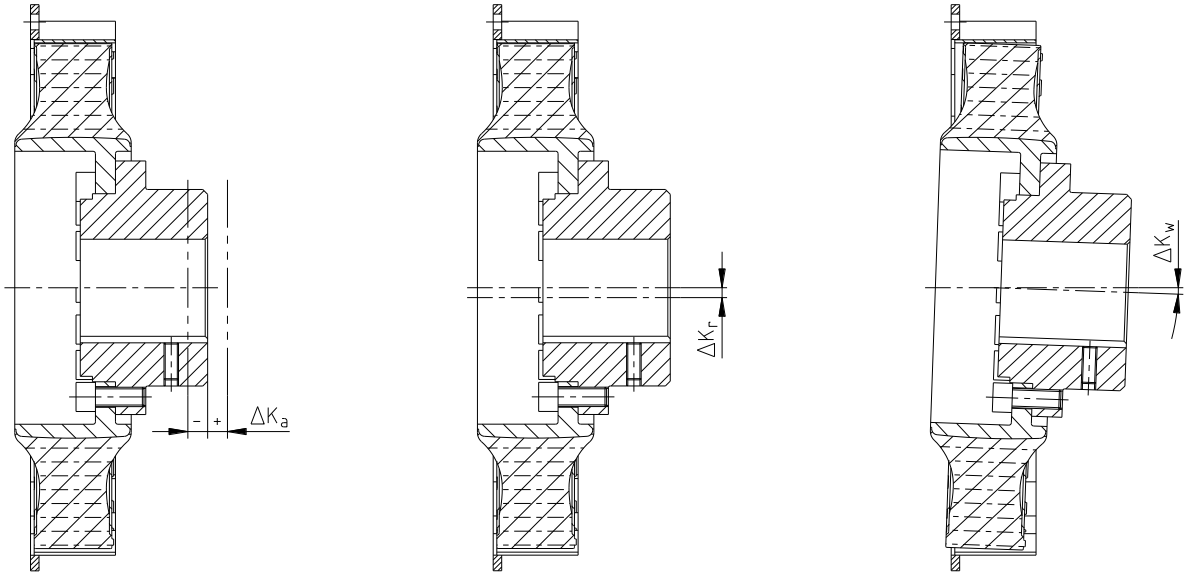
The **SINULASTIC®** flange couplings compensate for position deviations of the machine components to be connected up to the data specified in table 15.
With alignment, the radial and angular displacement should be kept as small as possible, because the service life is increased in this way under otherwise identical operating conditions.

The **SINULASTIC®** flange coupling has to be aligned from the coupling hub on the shaft side to one of the machined surfaces of the flywheel or machine.

In order to ensure a long service life of the coupling, the shaft ends have to be accurately aligned. Please absolutely observe the displacement figures specified (see table 15). If the figures are exceeded, the coupling will be damaged.
The more accurate the alignment of the coupling, the longer is its service life.

Please note:

- The displacement figures specified in table 15 are maximum figures which must not arise in parallel. If radial and angular displacements arise simultaneously, the permissible displacement figures may only be used proportionally (see illustration 23).
- The displacement figures specified are general standard figures that apply up to an ambient temperature of 80 °C, ensuring a sufficient service life of the **SINULASTIC®** coupling.
  Displacement figures between the speeds specified have to be interpolated accordingly. If necessary, ask about the displacement for the corresponding coupling type.
- Inspect with a dial gauge, ruler or feeler gauge whether the permissible displacement figures specified in table 15 can be observed.



Axial displacement | Radial displacement | Angular displacement

Illustration 22: Displacements

4 Assembly

4.8 Displacements - alignment of the couplings

Examples of the displacement combinations specified in illustration 23:

Example 1:
ΔK_r = 30 %
ΔK_w = 70 %

Example 2:
ΔK_r = 60 %
ΔK_w = 40 %

$$\Delta K_{total} = \Delta K_r + \Delta K_w \leq 100\ \%$$

Illustration 23:
Combinations of displacement

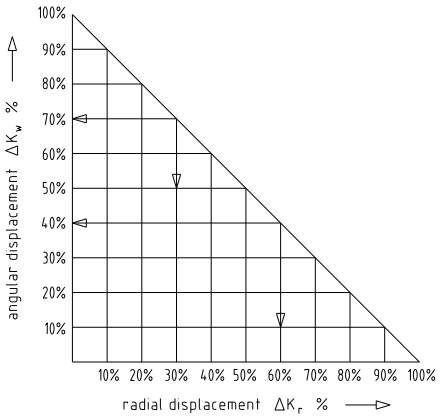


Table 15: Displacement figures

Displacement figures		Size							
		20	28	38	53	96	114	140	180
Perm. axial displacement ΔK_a [mm] 2)		±2.0	±3.0	±3.0	±3.0	±3.0	±3.0	±3.0	±3.0
Perm. radial displacement ΔK_r [mm] with n=	1500 rpm	0.8	1.1	1.1	1.1	1.25	1.25	1.5	1.5
	Max.	0.6	0.8	0.8	0.8	0.9	0.9	1.1	1.1
Max. radial displacement ΔK_r [mm] 1)		1.6	2.2	2.2	2.2	2.5	2.5	3.0	3.0
Perm. angular displacement ΔK_w [degree] with n=	1500 rpm	0.7	0.6	0.6	0.6	0.5	0.5	0.4	0.4
	Max.	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Max. angular displacement ΔK_w [degree] 1)		1.1	0.9	0.9	0.9	0.8	0.8	0.6	0.6

1) for short-term start-up operation
2) Plug-in spline connection must fully bear

5 Start-up

Before start-up of the coupling, inspect the alignment and the distance dimension L4 and adjust, if necessary, and also inspect all screw connections for the tightening torques specified.

Finally the coupling protection against accidental contact must be fitted. It is required in accordance with DIN EN ISO 12100 (Safety of Machinery) and must protect against

- access with a little finger
- falling down of solid foreign objects.

The coupling protection is not part of KTR's scope of delivery and is the customer's responsibility. It must have sufficient distance to the rotating components to avoid contact safely. We recommend a minimum distance of 15 mm from the outside diameter DA of the coupling.

Please check if a proper enclosure (ignition protection, coupling protection, contact protection) has been mounted and the operation of the coupling is not affected by the enclosure. The same applies for test runs and rotational direction inspections.

The cover may provide for openings intended for necessary heat dissipation. These openings have to comply with DIN EN ISO 13857.

5 Start-up

During operation of the coupling, please pay attention to

- different operating noise
- vibrations occurring.

If you note any irregularities with the coupling during operation, the drive unit must be switched off immediately. The cause of the breakdown must be specified by means of the table „Breakdowns“ and, if possible, be eliminated according to the proposals. The potential breakdowns specified can be hints only. To find out the cause all operating factors and machine components must be considered.

6 Breakdowns, causes and elimination

The below-mentioned failures can lead to improper use of the **SINULASTIC®** coupling. In addition to the specifications given in these operating/assembly instructions make sure to avoid such failures.
The errors listed can only be clues to search for the failures. When searching for the failure the adjacent components must generally be considered.

General failures with improper use:

- Important data for the coupling selection are not forwarded.
- The calculation of the shaft-hub-connection is not considered.
- Coupling components with damage occurred during transport are assembled.
- If the heated hub is assembled, the permissible temperature is exceeded.
- The clearance of the components to be assembled is not coordinated with one another.
- Tightening torques are fallen below/exceeded.
- Components are mixed up by mistake/assembled incorrectly.
- No original **KTR** components (purchased parts) are used.
- Old/already worn out elastomer parts or those stored for too long are used.
- Maintenance intervals are not observed.

Breakdowns	Causes	Elimination
Different operating noise and/or vibrations occuring	Micro friction by faulty alignment on the spline of the elastomer part	1) Set the unit out of operation 2) Eliminate the reason for the misalignment (e. g. loose foundation bolts, fracture of the engine mount, heat expansion of unit components, modification of the installation dimension L4 of the coupling) 3) For visual inspection/inspection of wear see chapter 8 *Maintenance*
	Axial fastening of hub working loose	1) Set the unit out of operation 2) Inspect alignment of coupling 3) For visual inspection/inspection of wear see chapter 8 *Maintenance* 4) Secure the hubs axially and against working loose

6 Breakdowns, causes and elimination

Breakdowns	Causes	Elimination
Fracture of elastomer part	Fracture of elastomer part/high dynamic energy/overload	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Find out the reason for overload
	Operating parameters do not meet with the performance of the coupling	1) Set the unit out of operation 2) Review the operating parameters and select a bigger coupling (consider mounting space) 3) Assemble new coupling size 4) Inspect alignment
	Operating error of the unit	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Instruct and train the service staff
Excessive wear on the spline of the elastomer part, fracture of elastomer	Vibrations of drive	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Find out the reason for vibrations
	Ambient/contact temperatures which are too high for the elastomer part, max. permissible -30 °C/+80 °C	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Inspect and adjust ambient/contact temperature
	E. g. contact with aggressive liquids/oils, influence by ozone, too high ambient temperature etc. causing a physical change of the elastomer part	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the elastomer part 3) Inspect coupling components and replace coupling components that are damaged 4) Insert elastomer part, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Make sure that other physical modifications of the elastomer part are excluded

7 Disposal

In respect of environmental protection we would ask you to dispose of the packaging resp. products on termination of their service life in accordance with the legal regulations resp. standards that apply.

- **Metal**
  Any metal components have to be cleaned and disposed of by scrap metal.
- **Nylon materials**
  Nylon materials have to be collected and disposed of by a waste disposal company.

8 Maintenance and service

We recommend to perform a visual inspection on the coupling **at least once a year**. Pay special attention to the condition of the elastomer part of the coupling.

- Remove loose dirt from the coupling.
- Inspect the coupling for spalling or missing components, if necessary. Inspect the elastomer part in particular for cracks.
- Defective components must be replaced immediately resp. missing components must be replaced immediately.
- Inspect the tightening torques of all screw connections and correct, if necessary.
- Since the flexible machine bearings of the driving and driven side settle during the course of load, inspect the alignment of the coupling and re-align the coupling, if necessary.

Please perform visual inspection as follows:

- Inspect adhesion ① of elastomer part to the inner part (metal).
- Inspect the elastomer part for cracks in the areas marked with ②, ③ and ④ in illustration 24.
  If the depth of cracks achieve the limit of 3.0 mm or exceed it in the area marked with ④, the elastomer part must be replaced.
- A wear of spline of 3.0 - 4.0 mm is permissible on the load side of the elastomer part (see illustration 24 marked with ③).
- During downtime of the coupling a radial distance of 1.0 - 2.0 mm between connection flange and elastomer part (see illustration 25) is permissible.

Elastomer parts that are damaged or worn off have to be replaced, with the maintenance interval of the engine at the latest.

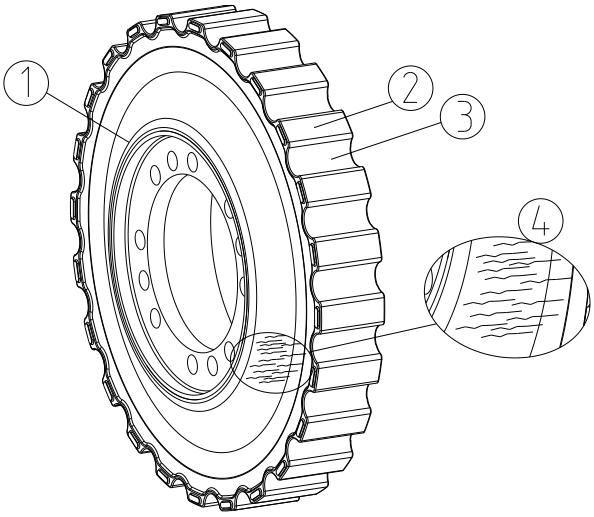


Illustration 24: Visual inspection

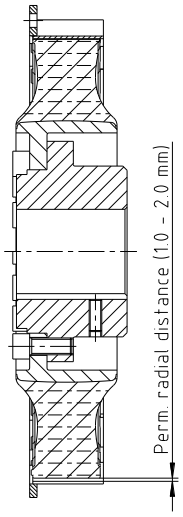


Illustration 25: Inspection of wear

9 Spares inventory, customer service addresses

We recommend to store major spare parts on site to ensure the readiness for use of the machine in case if a coupling fails.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage at www.ktr.com.

☞ **KTR does not assume any liability or warranty for the use of spare parts and accessories which are not provided by KTR and for the damages which may incur as a result.**

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