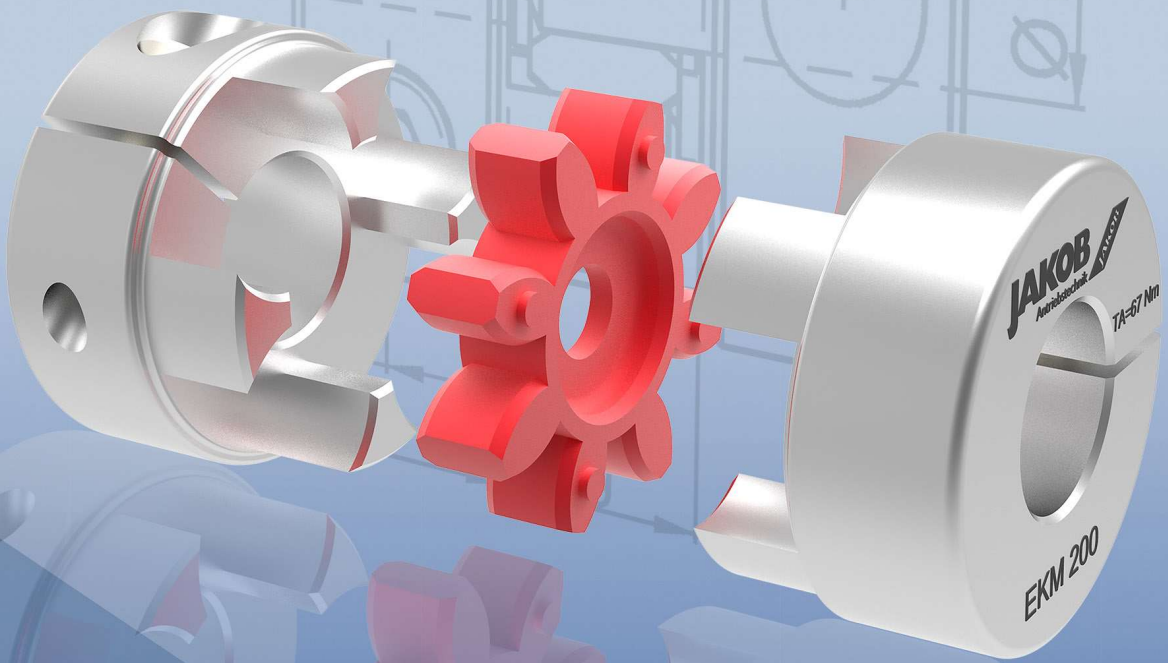
JAKOB Antriebstechnik

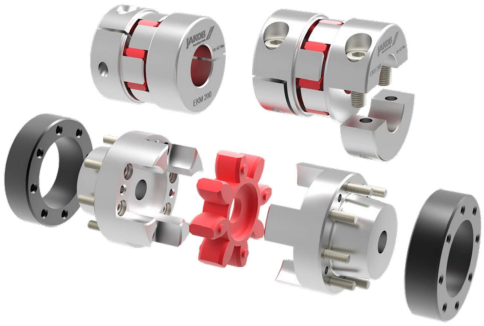
Elastomer couplings



Elastomer Couplings I General

Definition – Elastomer Couplings:

Elastomer couplings can be plugged in, are backlash-free, flexible shaft couplings for small to medium torques. An elastomer spider serves as connection and compensating element with involute teeth and a high shore hardness. This is inserted in form-fit, with slight preload between two high-precision machined hubs with involutely shaped jaws. The elastomer spider can compensate slight shaft misalignments, is electrically insulating and has good oscillation dampening characteristics. Two variations with backlash-free, frictional shaft-hub connection are available as standard which ensure safe torque transfer even without keyways.



Characteristics – JAKOB Elastomer Couplings:

- plug-in
- backlash-free
- flexible
- compact
- oscillation dampening
- different shore hardnesses
- low moment of inertia
- high speeds
- electrically insulating
- temperatures up to 120°C

Coupling dimensioning:

The main layout criteria are the required drive torque, the necessary torsional stiffness, the running speeds, the dampening characteristics of the coupling, and the moment of inertia. Additionally, the minimum or maximum possible shaft diameter, the admissible temperature range, operating factors, and the existing shaft misalignment (particularly the lateral misalignment) must be taken into consideration.

Approximation of required torque:

Roughly, the required coupling torque T_K can be calculated as for the following formula:

$$T_K = T_A \bullet f_D \bullet f_T \bullet f_B < T_{KN}$$

T_A = drive torque [Nm]
f_D = torsional stiffness factor
f_T = temperature factor
f_B = operating factor

The calculated coupling torque T_K should not exceed the nominal torque of the selected coupling size. Short term overload up to twice the value of the nominal torque is admissible. The drive torque results from product information of drive motor or can be calculated via motor output P_A.

$$T_A = \frac{9550 \bullet P_A}{n_B}$$

T_A = drive torque [Nm]
P_A = motor output [KW]
n_B = motor speed [min^{-1}]

Temperature factor f_T:

Admissible temperature range for continuous operation
PUR 98 Sh - A: -30°C up to +90°C
PUR 72 Sh - D: -20°C up to +120°C

operating temperature	+30°C -30°C	+50°C	+70°C	+90°C	+110°C
factor f_T	1	1,3	1,6	1,8	2

Torsional stiffness factor f_D:

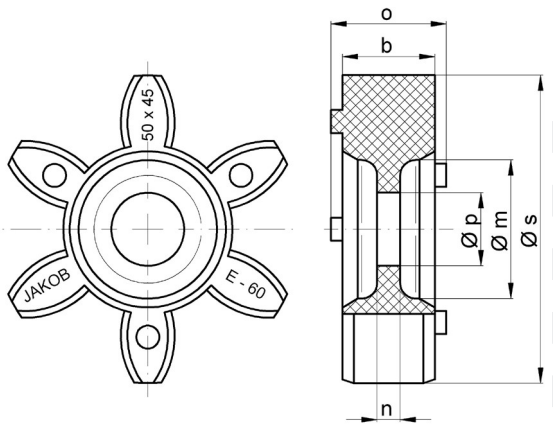
If an exact, accurate transfer of the torque is required, as for instance with servo drives or measuring systems, a high torsional stiffness is absolutely necessary. Here the required drive torque should be multiplied with a operating factor of at least 3 when selecting the size, or a torsionally stiff metal bellows coupling selected from the extensive coupling range in this catalogue.

Operating factor f_B:

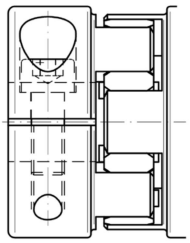
Due to operating factor f_B application specific peculiarities, such as shock loading, are taken into consideration.

Dimensions - elastomer spider [mm]:

Size	øs	øm	n	b	o	øp$^{+0,5}$
8/10	32	10,5	2	10	13	8,5
15/17/20/25	40	18	3	12	15	9,5
30/43/45/50	50	27	3	14	17	12,5
60/90	55	27	3	14	17	12,5
150/200	65	30	4	18	18	16,5
300/320/400	80	38	4	18	22	16,5
500	100	47	5	22	26	20,5
700/1000	120	58	6	25	30	22,5
2000	160	77	7	32	38	60

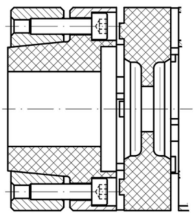


Hub types:



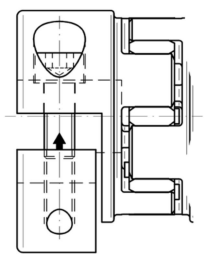
EKM - lateral clamping hub

Admissible seat clearance shaft hub: **min. 0,01mm / max. 0,04mm.**
Very simple fitting by tightening only one laterally arranged clamping screw (DIN 912). The value for the relevant tightening torques can be found in the data sheets. One hole in the housing is sufficient to tighten the clamping screw (see EASY-clamp sytem).



ESM-A - conical hub / conical ring hub

Allowable clearance shaft hub: max.0,02mm. For the ESM-A coupling type, an axial plug-in installation is generally required. For this purpose, both hub parts are previously fastened on the drive and output shaft, the star is inserted into a claw hub, and finally the other claw hub is pushed onto the star by means of an axial mounting force. The conical clamping ring is fastened from “inside” by tightening the fastening screws with hexagon socket crosswise. The hub clearance dimension “g” must be observed and checked. Several release threads are provided for releasing the cone hub.



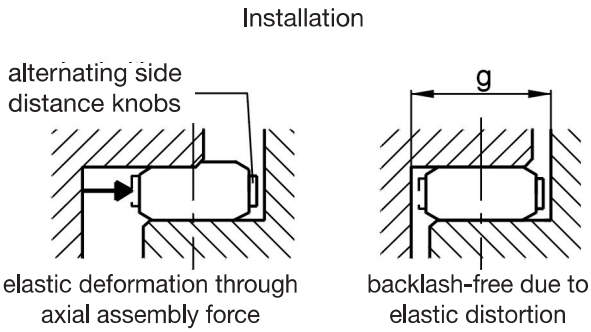
EKH - split-hub

Admissible seat clearance shaft-hub: **min. 0,01mm /max. 0,04mm.**
Two lateral clamping screws (DIN 912) are arranged oppositely. The hubs or couplings are split and consist of two loose halves. One of the split-hubs can be put onto the aligned shaft. Tighten clamping screws evenly, alternating between both sides (note specified tightening torques). A larger opening must be provided in the housing for easy installation.

further hub types on request

Elastomer Couplings I Installation Instructions

Installation:



The design of the ESM-A couplings requires mounting of the two hub halves on the shaft ends before the actual plug-in assembly. It is important that the mounting screws are tightened crosswise to prevent surface distortion of the conical clamping ring. Couplings of the EKM series on the other hand, can be assembled completely before hub mounting. For mounting the EKM hub, only a laterally arranged clamping screw must be tightened. In the case of the EKH series, the fixed hub halves can be placed on the shaft pegs for easy assembly and fixed by means of two clamping screws with the loose half-shell pieces. Chamfered edges at the face enable the blind assembly with both versions. Due to the obligatory preclamping of the elastomer, an axial assembly force must be applied while sliding together the coupling spider and the jaws. This assembly force can be minimized by slight oiling the spider. For disassembly of the ESM conical hub, draw-off threads are provided for releasing the clamping ring. The relevant tightening torques of the retaining screws can be found in the technical data sheets.

tolerable seat clearance shaft / hub: Series ESM-A: max 0,02 mm
Series EKM/EKH: min 0,01 mm / max 0,04 mm *(see installation instructions page)*

materials: hubs EKM / EKH / ESM-A: high-tensile aluminum
conical ring / taper ring ESM-A / expanding cone EKZ: tempered steel
elastomer spider: polyurethane (98 Shore A / 72 Shore D / others available on request)

Notes:

- The dampening capability of the elastomer spider protects the drive to a high extent from dynamic overload. Both coupling halves are always forced to move (min. $3xT_N$) because of the jaw construction, even if the spider should break down entirely.
- Because of the deformation of the elastomer spider under operation conditions, the housing (bell) should be approximately 5 % bigger than the outer diameter of the coupling itself.
- To ensure satisfactory function, dimension ‘g’ should be complied with as exactly as possible. The distance of the two shaft ends can be smaller than ‘g’ under consideration of measurements ‘m’ and ‘n’ of the spider.
- If required by the application or requested by the customer, diameter ‘p’ of the spider can be expanded up to øm - 2mm
- For smaller shaft diameters, the conical hub of ESM-couplings is slotted additionally.

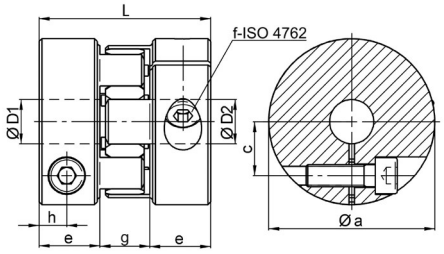
Elastomer Coupling I Series EKM

with clamping hub on both sides · plug-in · backlash-free · cost-effective standard series

technical data:

EKM size	T_N [Nm]	hardness [shore]	moment of inertia [10-^{3}kgm^2]	torsional stiffness (stat. 0,5 x T_N) [Nm/arcmin]	max. shaft misalignment (mm) axial ±	lateral	lateral spring rate [N/mm]	hubs Ø D 1/2 prebored	nmax [upm]
8	8	98 Sh-A	0,01	0,09	0,5	0,10	600	Ø 5	29000
15	15	98 Sh-A	0,03	0,24	0,5	0,10	2100	Ø 6,1	23000
20	20	72 Sh-D	0,03	0,46	0,5	0,10	2900	Ø 6,1	23000
30	30	98 Sh-A	0,09	0,7	0,5	0,10	2500	Ø 8,5	19000
45	45	72 Sh-D	0,09	1,1	0,5	0,10	3600	Ø 8,5	19000
60	60	98 Sh-A	0,18	1,0	0,5	0,10	2600	Ø 12	17000
90	90	72 Sh-D	0,18	2,0	0,5	0,10	3700	Ø 12	17000
150	150	98 Sh-A	0,38	1,2	1	0,10	3300	Ø 15	15000
200	200	72 Sh-D	0,38	2,3	1	0,07	4600	Ø 15	15000
300	300	98 Sh-A	1,0	3,6	1	0,12	4500	Ø 18	12000
400	400	72 Sh-D	1,0	7,0	1	0,10	6500	Ø 18	12000
500	500	98 Sh-A	2,2	4,5	1	0,15	5900	Ø 20	9500
700	700	98 Sh-A	5,2	8,0	1	0,15	7000	Ø 24	8000
1000	1000	72 Sh-D	5,2	12	1	0,10	9600	Ø 24	8000
2000	2000	98 Sh-A	50	21	1	0,15	9000	Ø 30	6000

material:
elastomer spider: polyurethane
hubs: high-tensile strength aluminum
(size 2000: tempered steel)
screws: ISO 4762 / 12.9



Dimensions [mm]: length dimensions according to DIN ISO 2768 cH

EKM	Ø a	c	e	g	h	L	f-TA	mass ~ [kg]	Ø D 1/2 min	Ø D 1/2 max	Ø D ** max
8	32	10,5	13,5	13	6	40	M 4 - 4 Nm	0,06	8	15	-
15	40	13	17	16	8	50	M 5 - 8 Nm	0,12	8	20	-
20	40	13	17	16	8	50	M 5 - 8 Nm	0,12	10	20	-
30	50	16,5	20	18	9	58	M 6 - 14 Nm	0,21	10	25	Ø 30
45	50	16,5	20	18	9	58	M 6 -14 Nm	0,21	15	25	Ø 30
60	60	19,5	22	18	10	62	M 8 - 35 Nm	0,32	13	28	Ø 32
90	60	19,5	22	18	10	62	M 8 - 35 Nm	0,32	16	28	Ø 32
150	70	23	26,5	20	12	73	M 10 - 65 (50)* Nm	0,52	18	27 (32)*	Ø 38
200	70	23	26,5	20	12	73	M 10 - 65 (50)* Nm	0,52	20	27 (32)*	Ø 38
300	85	29	31	24	14	86	M 12 - 115 (90)* Nm	0,9	20	34 (40)*	Ø 48
400	85	29	31	24	14	86	M 12 - 115 (90)* Nm	0,9	24	34 (40)*	Ø 48
500	100	36	33	28	16	94	M 12 - 115 (90)* Nm	1,5	28	48 (56)*	-
700	120	44	38	33	18	109	M 14 - 180 (140)* Nm	2,5	32	60 (70)*	-
1000	120	44	38	33	18	109	M 14 - 180 (140)* Nm	2,5	42	60 (70)*	-
2000	160	55,5	42	40	21	124	M 16 - 290 Nm	14	50	90	-

note:
(*) reduced tightening torque for bigger hub bore diameter - see also Ø D 1/2max f!
(**) largest possible hub bore diameter with smaller clamping screw thread optionally available.

order example: EKM 90 D1 = 24 ^{G7} D2 = 28 ^{G6}
EKM 150 M8 / M8 - D1 = 35 ^{G7} D2 = 38 ^{H6}

Elastomer Coupling I Series EKM-VA

stainless steel design - easy to assemble clamping hub backlash-free
plug-in compact vibration-damping

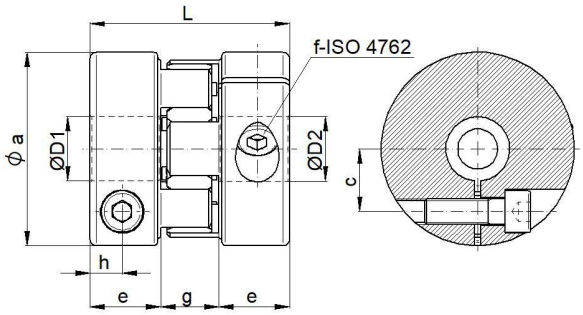
stainless steel

technical data:

EKM-VA size	nominal torque [Nm]	hard-ness [shore]	moment of inertia [10-3kgm2]	torsional stiffness (stat. 0,5 x T_N) [Nm/arcmin]	max. shaft mis-alignment (mm) axial ±	lateral	lateral spring rate [N/mm]	max. speed [Upm]	mass ca. [kg]
6	6	98 Sh-A	0,26	0,09	0,5	0,1	600	29000	0,2
12	12	98 Sh-A	0,08	0,24	0,5	0,1	2100	23000	0,4
16	16	72 Sh-D	0,08	0,46	0,5	0,1	2900	23000	0,4
50	50	98 Sh-A	0,48	1	0,5	0,1	2600	17000	1
70	70	72 Sh-D	0,48	2	0,5	0,1	3700	17000	1
100	100	98 Sh-A	1	1,2	1	0,1	3300	15000	1,6
140	140	72 Sh-D	1	2,3	1	0,07	4600	15000	1,6
220	220	98 Sh-A	2,7	3,6	1	0,12	4500	12000	2,8
350	350	98 Sh-A	7	4,5	1	0,15	5900	9500	5
480	480	98 Sh-A	14	8	1	0,15	7000	8000	7
650	650	72 Sh-D	14	12	1	0,1	9600	8000	7

temperature range: -30°C up to +90°C or -20°C up to +120°C

material:
hubs: stainless steel 1.4305
elastomer spider:
Polyurethan
screws: ISO 4762
stainless steel A4-80



Dimensions [mm]: length dimensions according to DIN ISO 2768 cH

EKM-VA	Ø a	c	e	g	h	L	f-T_S	Ø D 1/2 min	Ø D 1/2 max	Ø D 1/2 prebored
6	33	11	13,5	13	6	40	M4 - 2,5 Nm	7	16	5
12	41	13	17	16	8	50	M5 - 5 Nm	10	20	6,1
16	41	13	17	16	8	50	M5 - 5 Nm	13	20	6,1
50	64	20,5	22	18	10	62	M8 - 24 Nm	14	30	12
70	64	20,5	22	18	10	62	M8 - 24 Nm	19	30	12
100	73	23	26,5	20	12	73	M10 – 45 Nm	18	32	15
140	73	23	26,5	20	12	73	M10 – 45 Nm	24	32	15
220	87	29	31	24	14	86	M12 – 80 Nm	25	42	18
350	107	36	35	28	17	98	M14 – 110 Nm	30	55	20
480	121	44	38	33	18	109	M14 – 110 Nm	38	70	24
650	121	44	38	33	18	109	M14 – 110 Nm	52	70	24

note: Øa: interfering edge - screw head

order example: EKM-VA 220 - D1 = 32 G6 D2=38 G6

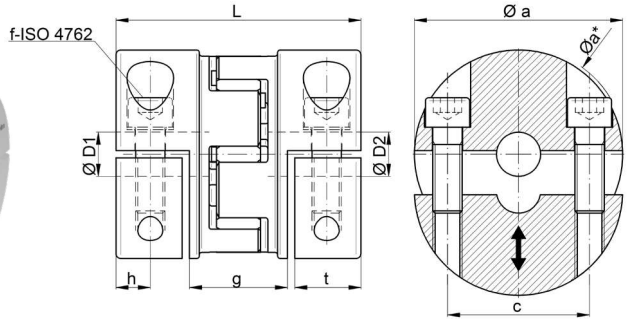
Elastomer Coupling I Series EKH

with split-hub design · plug-in · backlash-free · stainless

technical data:

EKH size	T_N [Nm]	hard-ness [shore]	moment of inertia [10-³kgm²]	torsional stiffness (stat. 0,5 x T_N) [Nm/arcmin]	max. shaft misalignment (mm) axial ±	lateral	lateral spring rate [N/mm]	tightening torque screw "f" [Nm]	nmax [upm]
15	15	98 Sh-A	0,03	0,24	0,5	0,10	2100	8	19000
20	20	72 Sh-D	0,03	0,46	0,5	0,07	2900	8	19000
30	30	98 Sh-A	0,09	0,7	0,5	0,10	2500	14	15000
45	45	72 Sh-D	0,09	1,1	0,5	0,07	3600	14	15000
60	60	98 Sh-A	0,2	1,0	0,5	0,10	2600	35	14000
90	90	72 Sh-D	0,2	2,0	0,5	0,07	3700	35	14000
150	150	98 Sh-A	0,4	1,2	1	0,10	3300	65	12000
200	200	72 Sh-D	0,4	2,3	1	0,07	4600	65	12000
300	300	98 Sh-A	1,0	3,6	1	0,12	4500	115	10000
400	400	72 Sh-D	1,0	7,0	1	0,10	6500	115	10000
700	700	98 Sh-A	6,0	8,0	1	0,15	7000	180	6500
1000	1000	72 Sh-D	6,0	12	1	0,10	9600	180	6500
2000	2000	98 Sh-A	62	21	1	0,15	9000	290	5000

material:
elastomer spider: polyurethane
split-hubs: high tensile aluminum
(size 2000 heat treated steel)
screws: ISO 4762 / 12.9 - coated



Dimensions [mm]: length dimensions according to DIN ISO 2768 cH

EKH	Ø a	Ø a*	c	g	h	t	L	f	mass ~ [kg]	Ø D 1/2 min	Ø D 1/2 max	Ø D 1/2 prebored
15	40	42	27	26	8,5	16	62	M5	0,17	8	20	8
20	40	42	27	26	8,5	16	62	M5	0,17	10	20	8
30	50	52	34	30	10	18	72	M6	0,3	10	26	10
45	50	52	34	30	10	18	72	M6	0,3	15	26	10
60	60	63	41	30	11,5	22	78	M8	0,5	13	30	12
90	60	63	41	30	11,5	22	78	M8	0,5	16	30	12
150	70	76	48	32	14	26	89	M10	0,75	18	35	16
200	70	76	48	32	14	26	89	M10	0,75	20	35	16
300	85	91	58	40	15	28	102	M12	1,3	20	42	19
400	85	91	58	40	15	28	102	M12	1,3	24	42	19
700	120	125	90	53	18	34	127	M14	3,2	32	70	24
1000	120	125	90	53	18	34	127	M14	3,2	42	70	24
2000	160	165	122	64	24	43	156	M16	18,5	48	100	32

Installation Instructions:
The split-hub design allows a backlash-free, force-fitted clamping connection with simple operation. Misalignment errors between the input and output shafts can thus be easily controlled and corrected. For easy assembly, the fixed hub halves can be placed on the shaft pegs and the loose hub pieces can be screwed on. In the case of service, the complicated di-sassembly of the drive and output units isn't necessary. The distance between the drive shaft and the output shaft must be greater than the dimension „g".

order example: EKH 200 - D1 = 26 ^{G6} D2 = 32 ^{H6}

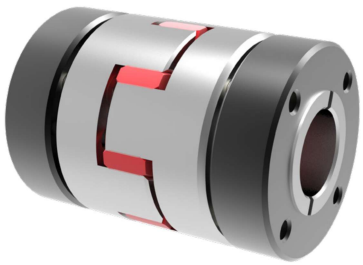
Elastomer Coupling I Series ESM-A

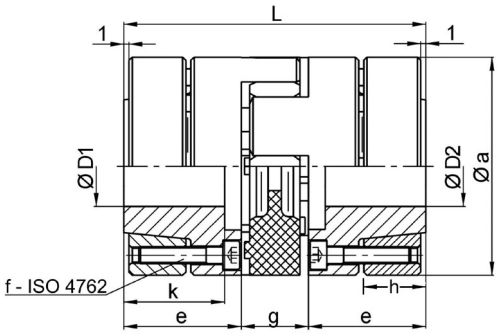
with conical hub and clamping ring / plug-in / backlash-free
/ rotational symmetry / high speeds

technical data:

ESM-A size	nominal torque [Nm]	hard-ness [shore]	moment of inertia [10-^{3}kgm^2]	torsional stiffness (stat. 0,5 x T_N) [Nm/arcmin]	max. shaft misalignment [mm] axial ±	lateral	lateral spring rate [N/mm]	tightening torque of screws "f" [Nm]	nmax [upm]
10	10	98Sh-A	0,015	0,09	0,5	0,1	600	2	35000
17	17	98Sh-A	0,05	0,24	0,5	0,1	2100	3	28000
25	25	72Sh-D	0,06	0,46	0,5	0,07	2900	3	28000
43	43	98Sh-A	0,19	0,7	0,5	0,1	2500	6	23000
50	50	72Sh-D	0,19	1,1	0,5	0,07	3600	6	23000
60	60	98Sh-A	0,28	1,0	0,5	0,1	2600	6	21000
90	90	72Sh-D	0,28	2,0	0,5	0,07	3700	6	21000
150	150	98Sh-A	0,65	1,2	1	0,1	3300	6	18000
200	200	72Sh-D	0,65	2,3	1	0,07	4600	6	18000
320	320	98Sh-A	2	3,6	1	0,12	4500	30	14000
400	400	72Sh-D	2	7,0	1	0,1	6500	30	14000
500	500	98Sh-A	5,6	4,5	1	0,15	5900	50	11000
700	700	98Sh-A	13	8	1	0,15	7000	100	9500
1000	1000	72Sh-D	13	12	1	0,1	9600	100	9500
2000	2000	98Sh-A	75	21	1	0,15	9000	100	7000

material:
elastomer spider: polyurethane
(size 2000: tempered steel)
screws: ISO 4762 / 12.9
conical hub: high-tensile
aluminum clamping ring:
heat treated steel - burnished





Dimensions [mm]: length dimensions according to DIN ISO 2768 cH

ESM-A	Ø a	e	f	g	h	k	L	mass ~ [kg]	Ø D 1/2 min	Ø D 1/2 max	Ø D 1/2 prebored
10	32	18,5	4x M 3	13	12	15,5	50	0,11	6	14	5
17	40	25	6x M 4	16	12	21	66	0,28	9	19	9
25	40	25	6x M 4	16	12	21	66	0,28	10	19	9
43	50	30	4x M 5	18	14	25	78	0,4	12	24	10
50	50	30	4x M 5	18	14	25	78	0,4	15	24	10
60	55	30	4x M 5	18	14	25	78	0,6	13	26	12
90	55	30	4x M 5	18	14	25	78	0,6	17	26	12
150	65	35	8x M 5	20	17	30	90	0,9	17	36	12
200	65	35	8x M 5	20	17	30	90	0,9	19	36	12
320	80	45	4x M 8	24	22	40	114	1,9	20	40	18
400	80	45	4x M 8	24	22	40	114	1,9	25	40	18
500	100	55	4x M 10	28	26	49	138	4,5	22	48	20
700	120	61	4x M 12	33	31	54	155	7	25	60	24
1000	120	61	4x M 12	33	31	54	155	7	25	60	24
2000	160	73	8x M 12	40	40	66	186	20,4	35	85	34

order example: ESM-A 150 - D1 = 17 ^{G7} D2 = 22 ^{H6}

Elastomer Coupling I Series EKS

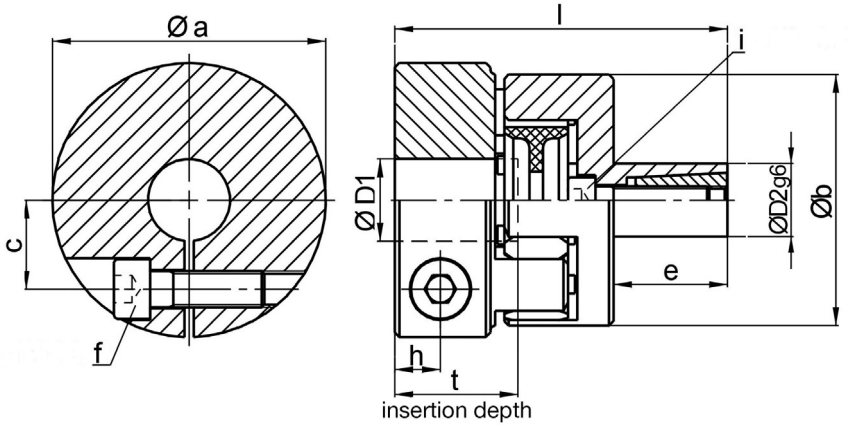
- pluggable, backlash-free, vibration-damping
- Expanding cone hub - radial clamping hub
- minimal space requirement with short overall length thanks to integrated attachment

technical data:

EKS size	nominal torque [Nm]	moment of inertia [10-^{3}kgm^2]	torsional stiffness (stat. 0,5 x T_N) [Nm/arcmin]	max. shaft misalignment (mm) axial ±	lateral	lateral spring rate [N/mm]	tightening torque of screws "f" [Nm] Exp. hub i:	Clamp. hub f:	nmax [upm]
8	8	0,01	0,04	0,5	0,1	600	4	4	29000
15	15	0,03	0,23	0,5	0,1	2100	8	8	23000
50	50	0,16	0,60	0,5	0,1	2600	14	35	17000
100	100	0,38	1,0	1	0,1	3300	35	65	15000
200	200	0,9	2,0	1	0,12	4500	65	115	12000
400	400	2,2	5,8	1	0,15	5900	115	115	9500
600	600	5,0	8,0	1	0,15	7000	180	180	6000

temperature range: -30°C bis +90°C

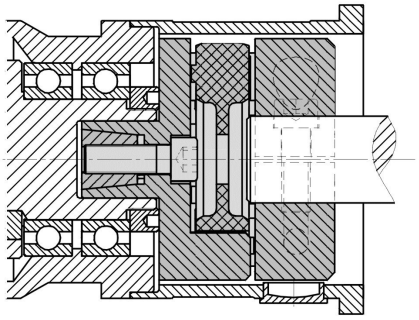
material:
clamping hubs: high-strength aluminum
expansion cone hub: heat treated steel
elastomer spider: polyurethane 98 Sh-A
screws: ISO 4762 12.9 - coated



Dimensions [mm]: length dimensions according to DIN ISO 2768 cH

EKS	Ø a	Ø b	c	e	f	h	i	l	tmin	tmax	mass ~ [kg]	Ø D 1 min	Ø D 1 max	Ø D 2 min	Ø D 2 max
8	32	32	10,5	12	M 4	6	M 4	45	12	19	0,06	8	15	10	16
15	40	40	13	20	M 5	8	M 5	59	16	23	0,2	10	19	14	20
50	60	55	19,5	23	M 8	10	M 6	71	21	29	0,4	15	29	16	24
100	70	65	23	26	M 10	12	M 8	81,5	25	34	0,7	22	33	20	28
200	85	80	29	30	M 12	14	M 10	93	30	41	1,2	30	42	24	35
400	100	100	36	32	M 12	16	M 12	101	32	44	1,7	38	56	32	42
600	120	120	44	42	M 14	18	M 14	122	37	51	3	40	70	35	48

note: The corresponding shaft hole for the Expansion cone spigot >> ØD2 << with manufacturing tolerance H7.



application example:
EKS coupling integrated on the output side to a gear unit

order example: EKS 50 - D1 = Ø 18 ^{G7} D2 = Ø 20 ^{g6}