ServoFlex – shaft coupling Type 318

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Drive elements are our world.

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ServoFlex – shaft coupling Type 318

## Characteristics and features

- torque transmission is free of backlash and torsionally stiff
- wear-free and maintenance-free
- high misalignment values
- high strength and bending elasticy stainless steel disc pack
- membrane shape is optimized with finite element design methods
- small resultant restoring forces
- transmitted torque up to 500 Nm, depending on the angular misalignment
- higher torque possible for special designs
- recommended temperature range: -35 °C to 150 °C
  use outside of this spectrum on request
- single and double joint designs
- spacer made of CFK/GFK or stainless steel on request
- spacer also possible in use case-related lengths
- on request with ATEX-approval ⟨Ex⟩ II 2GD c IIC X / I M2 c   (hub design 1 or 2)
  or ⟨Ex⟩ II 3GD c IIC X   (hub design 4)

Mönninghoff power transmission represents an infinite variant diversity that is applied by all areas of modern mechanical engineering.

Our technologies are mostly designed to operate under extreme conditions. We offer high precision products for medical robotics, fail-proof security for aerospace technology or synchronization soultions for the packaging or printing industry.

We thus address customers who have the highest standards for their own machines or systems. To them, we can offer highly complex, application-specific solutions.
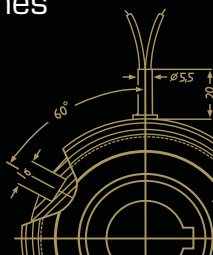
Match code

Mönninghoff shaft couplings are indicated by the following match code:
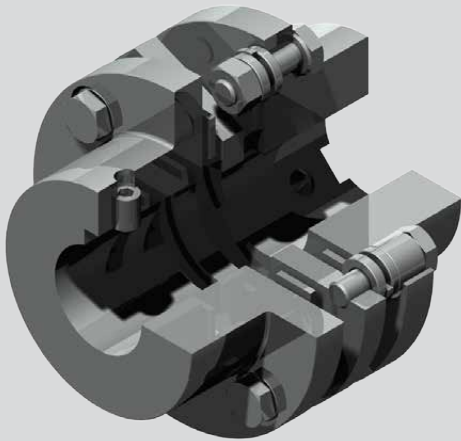
318 . A . B . C

A coupling size
B design
C options of mounting and integrating

other individual characteristics:

- bore size with keyways

According to these characteristics, we design individual solutions concerning transmitted torque, engaging behavior or rotation speed.

Our engineers can assist with finding an application-specific coupling at any time. Together, we can develop individual and innovative solutions for extreme operating conditions.

Ordering example

Mönninghoff ServoFlex - Coupling
Type 318.38.2.2

Bore size d	20 mm H7, clamping set type 354
Bore size d_1	25 mm H7, keyway acc. to DIN 6885/1
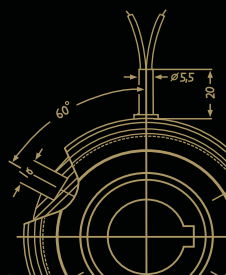
Coupling size

When dimensioning a Mönninghoff ServoFlex coupling, several technical preconditions should be considered:

- Membrane coupling transmit torque without virtually any dampening. Therefore the size must be determined so that a possible peak torque - caused by drive or load - does not exceed the specified nominal torque T_{KN}. We recommend that the torque which have been determined theoretically are corrected with the appropriate safety or operating factor.

$$T_{KN} > T \cdot K_B \text{ oder } T_{KN} > T \cdot K_S$$

- As misalignment reduces the transmitted torque of the coupling, the values specified for T_{KN} in the table must be taken into consideration depending on the angle of displacement. In the case of alternating operation and the demand for backlash free torque transmission, the alternating torque may not be exceeded.

$$T_{KW} > T \cdot K_B \text{ oder } T_{KW} > T \cdot K_S$$

- In the case of servo-drives and inverter controlled drives, possible maximum torque must be taken into consideration due to the interaction between motor and controller.

$$T_{Motor} = \frac{9550 \cdot P_{Motor}}{n}$$

- If clamping hubs or clamping elements are used, the max. torque which can be transmitted by the clamping connection must be taken into consideration.

|	
T = torque	T_{Motor} = torque of the motor
T_{KN} = nominal torque	P_{Motor} = power of the motor [kW]
T_{Kw} = alternating torque	n = max. speed [min^{-1}]
K_B = operating factor	
K_S = shock factor	
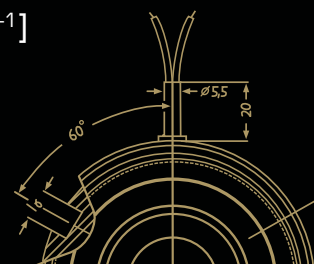
Coupling size - starting factor

If the starting factor is bigger than 2 times of the coupling torque, or if there are more than 50 starts/stops per hour, please consult our engineers.
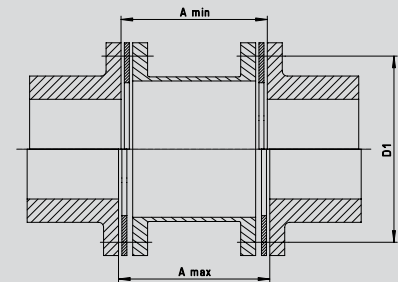
Coupling size - angular misalignment factor

When calculating the angular misalignment factor, the radial and axial misalignment must also be taken into account.
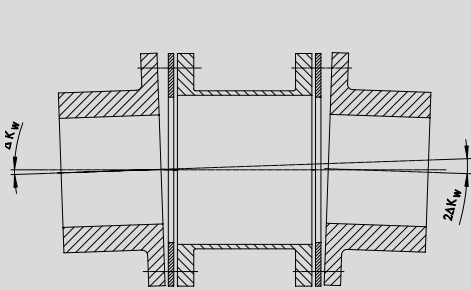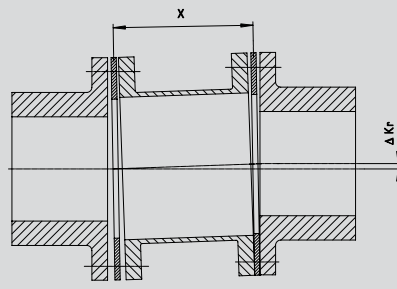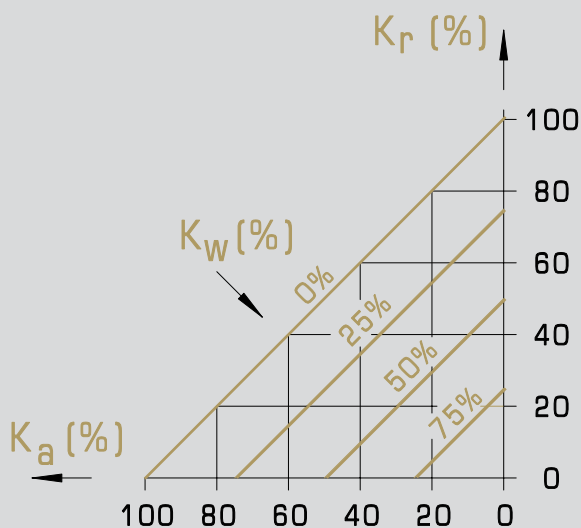
angular misalignment	radial misalignment	axial misalignment

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

modification of ΔK_a [mm] and ΔK_r [mm] in ΔK_{wa} [°] an ΔK_{wr} [°]

$$\Delta K_{wa} = arcsin \ \frac{\Delta K_a}{0,75 \cdot D_1} \ [°]$$

$$\Delta K_{wr} = arcsin \ \frac{\Delta K_r}{x} \ [°]$$

$$\Delta K_{wg} = \Delta K_w + \Delta K_{wa} + \Delta K_{wr} \ [°]$$

K_r (%)

K_w (%)

K_a (%)

0% 25% 50% 75%

100 80 60 40 20 0

100 80 60 40 20 0

X	= distance of membrane	K_{wa}	= angular misalignment axial
K_{wg}	= total angular misalignment	K_{wr}	= angular misalignment radial

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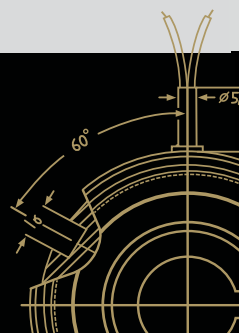
Design

The Mönninghoff ServoFlex - coupling is offered in different designs

- equalisation of axial and angular misalignment with simple universal joint design
- additional equalisation of radial misalignement with double universal joint design
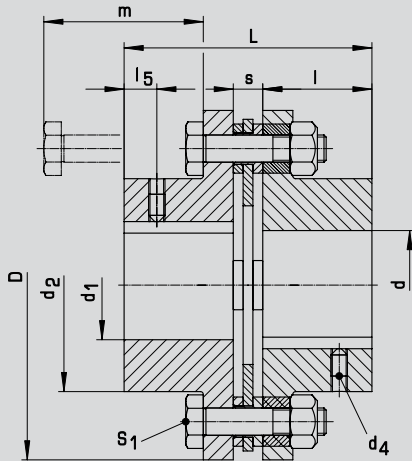
Design 1: single joint
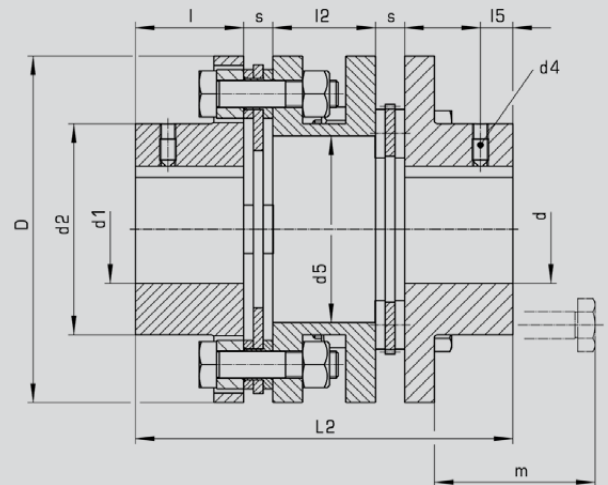
Design 2: double joint with standard spacer
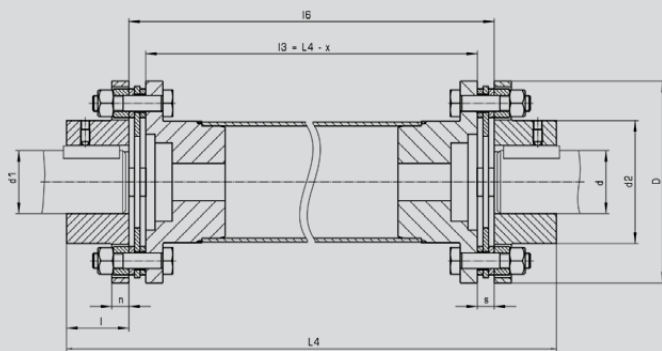
Design 3: double joint with variable spacer
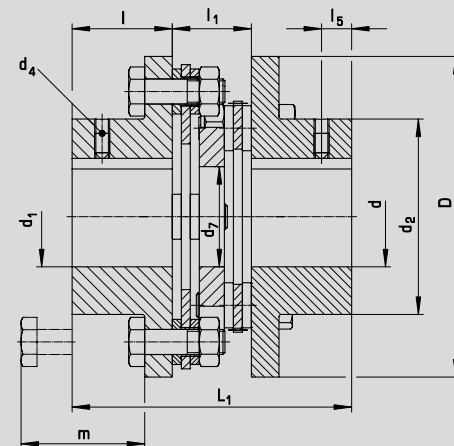
Design 4: double joint with small spacer

Vertical assembling
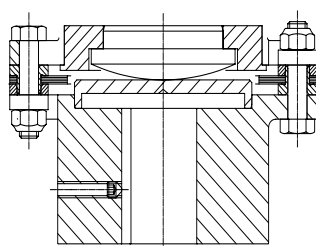
- when vertical assembling is required, an additional support has to be used between the lower hub and the spacer
- please specificly order: for vertical assembling

Operating speed design 3

The critical speed of the shaft coupling changes according to the length of the spacer.

coupling size

critical speed [min^{-1}]

length of pipe [mm]

pipe dimensions [mm]

Ø 76,2 x 2,4
Ø 63,6 x 2,4
Ø 52 x 3,5
Ø 36 x 1,5
Ø 28 x 1,5
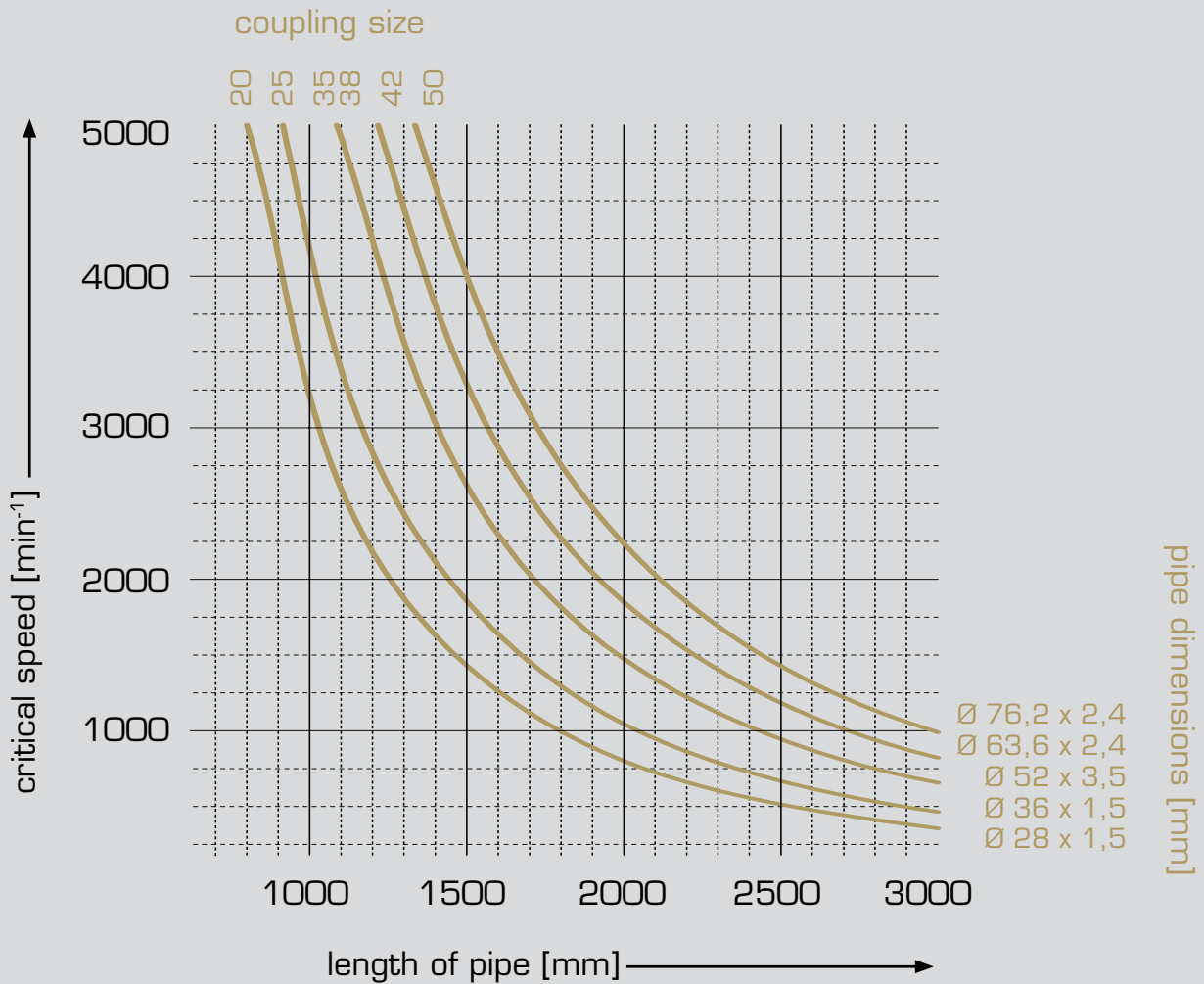
Disc pack
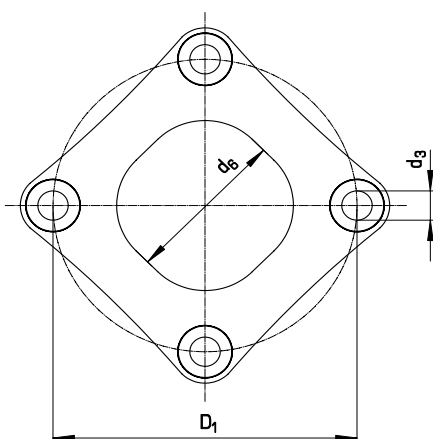
Membrane shape of the ServoFlex - shaft coupling is characterized by the following technical properties:

- stainless steel
- connected via fitting screws
- optimized with FEM-method

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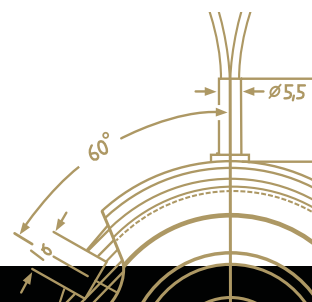
Technical data

Size				20	25	35	38	42	50
torque at angular		0,50°	[Nm]	35	60	150	200	300	500
misalignment per	T_{KN}	0,75°		25	40	100	120	160	200
membrane pack		1,00°		10	25	50	70	—	—
type 4._	T_{KMax}		[Nm]	25	45	55	120	135	250
alternating torque	T_{KW}		[Nm]	18	40	55	120	135	250
max. misalignment	angular	type 1._	[°]	1	1	1	1	1	1
		type 2._,4._		2	2	2	2	2	2
	axial	type 1._	[mm]	0,6	0,8	1	1,2	1,4	1,6
		type 2._, 4._		1,2	1,6	2	2,4	2,8	3,2
	offset	type 2._	[mm]	0,5	0,5	0,5	0,6	0,6	0,8
		type 4._		0,1	0,2	0,2	0,3	0,3	0,4
max. speed	type 1.1, 2.1, 4.1		n [min⁻¹]	20000	16000	13000	12000	10000	8000
	type _.2, _.4			5000	5000	5000	5000	5000	5000
inertia	type 1._		I [10⁻³kg m²]	0,11	0,30	0,87	1,6	2,6	6,5
	type 2._			0,20	0,55	1,5	2,9	4,6	11,8
	type 4._			0,15	0,42	1,1	2,2	3,6	9,2
weight	type 1._		[kg]	0,3	0,6	1,0	1,4	2,1	3,4
	type 2._			0,5	1,1	1,7	2,4	3,3	5,8
	type 4._			0,4	0,7	1,2	1,8	2,5	4,6
torsional stiffness	type 1._	C_T [106 Nm/rad]		16	29	83	170	250	430
	type 2._, 4._	C_K [106 Nm/rad]		8	14	41	85	125	215
axial stiffness	type 1._		[Nm/mm]	43	45	60	122	160	197
	type 2._, 4._			21	22	30	61	80	98
Screw S1	size		[Nm]	M 5	M6	M6	M 8	M 8	M 10
	tightening torque			5,5	13	13	33	33	65
Screw S2	size		[Nm]	—	M6	M6	M6	M6 / M8	M6 / M8
	tightening torque			—	12	12	12	12 / 29	12 / 29
Screw S3	size		[Nm]	M4	M6	M6	M8	M10	M12
	tightening torque			5	10	17	33	75	95
bore d, d_1 H7	type _.1	min.	[mm]	7	7	12	12	20	19
		max.		20	25	35	38	42	55
	type _.2	min.		—	12	16	20	25	25
		max.		—	16	25	30	36	45
	type _.4	min.		12	12	19	20	30	32
		max.		17	22	32	32	35	40
dimensions		D	[mm]	56	68	82	94	104	128
		D_1		44	53	67	75	85	100
		d_2		32	40	54	58	68	78
		d_3 H8		5	6	6	8	8	10
		d_4		M5	M5	M6	M6	M6	M6
		d_5		27	35	48	50	60	50
		d_6		24	30	38	42	48	54
		d_7		20	24	28	32	34	40
		L		45	56	66	68	80	91
		L_1		55	68	78	86	98	112
		L_2		74	88	98	106	118	140
		l		20	25	30	30	35	40
		l_1		15	18	18	26	28	32
		l_2		24	26	26	30	28	38
		l_4		1500	1500	2000	2000	3000	3000
		l_5		6	8	8	8	10	12
		S		5	6	6	8	10	11
		m type 1._, 2._	min.	27	31	35	44	44	57
		m type 4._	min.	20	24	26	35	35	44
		n		5	6	8	9	9	11
		s_1		—	16	16	16	18	19
		x		50	62	72	76	90	102

Spacer coupling design 3

The double joint design has some additional properties of the spacer to consider.

- stainless steel or CFK/GFK possible
- length changes through temperature variations
- limitation of spacer length to 2900 mm is due to the manufacturing process
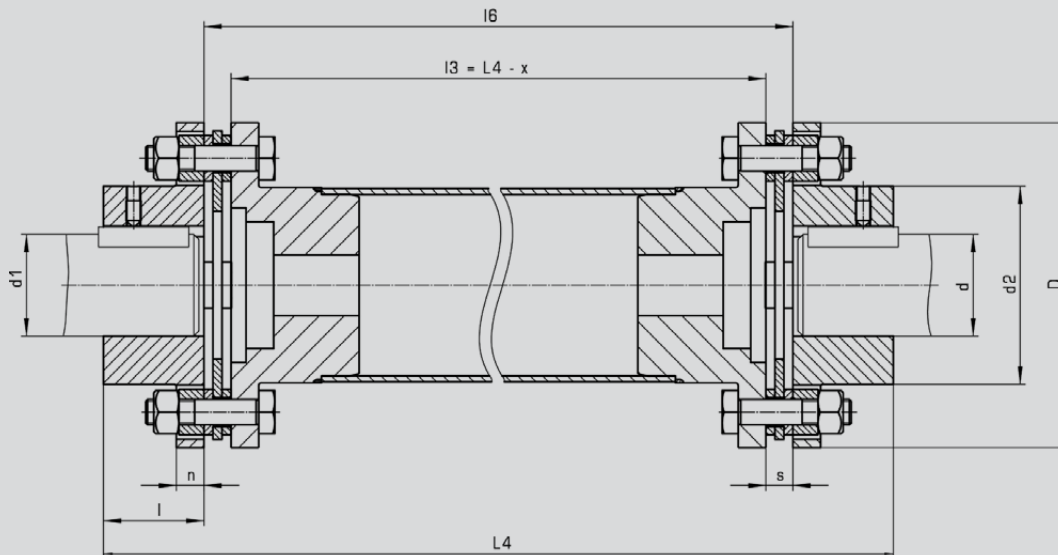- further limitation of the spacer length is due to critical speed
- when vertical assembling is required, an additional support has to be used

Technical data

| Size			20	25	35	38	42	50
torque			see previous page					
max. speed		[min⁻¹]	see diagramm „critical speed for design 3"					
inertia	by l_3 = 1000 mm	[10⁻³ kg m²]	0,41	1.060	3.123	5.543	8,26	16,41
	per 100 mm		0,0172	38	150	248	340	0,6
weight	by l_3 = 1000 mm	[kg]	1,54	2,42	4,31	6,77	7,52	13,7
	per 100 mm		98	128	252	418	362	436
torsional stiffness, pipe		[10⁶ Nm/rad]	1,76: l3	3,88 : l3	25,2:l3	25,2 : l3	34,6 : l3	60,7 : l3
axial stiffness		[Nm/mm]	21	22	30	61	80	98
max. misalignment	angular	[°]	2	2	2	2	2	2
	axial	[mm]	1,2	1,6	2	2,4	2,8	3,2
	offset	[mm]	0,0175 (l3 + s)					
dimensions	l_3 max.	[mm]	1500	1500	2000	2000	2000	2000
	l_6		distance between shaft ends					
	m min.		27	31	35	44	44	57
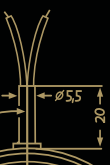
Mounting and connection options

Every combination of hub with keyway, clamping set, shrinking disc or clamping hub is possible for installation of the Mönninghoff ServoFlex - coupling.
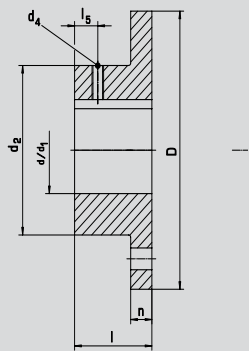
hub with keyway
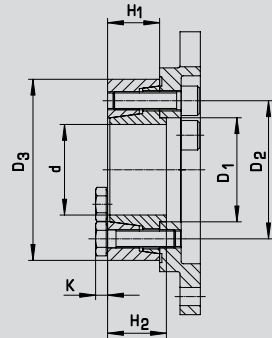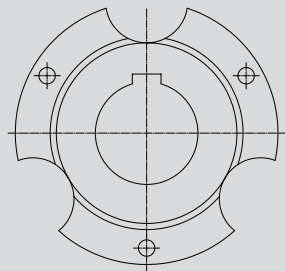
clamping set
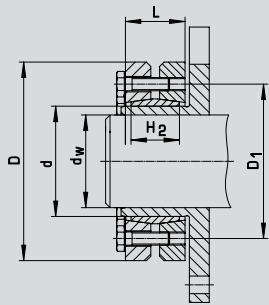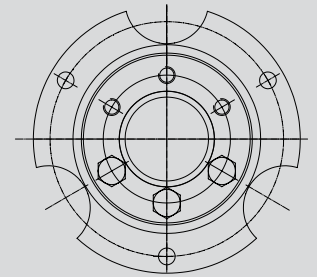
shrink disc

clamping hub

These following common Hub combinations are considered in the Mönninghoff type code for orders

(1) hub with keyway / hub with keyway

(2) clamping set / clamping set

(3) shrink disc / shrink disc

(4) clamping hub / clamping hub

(5) hub with keyway / clamping set

(6) hub with keyway / clamping hub

(7) clamping set / clamping hub

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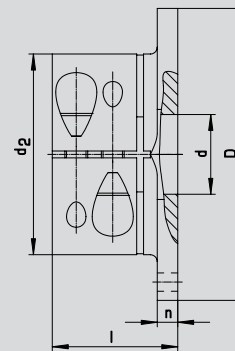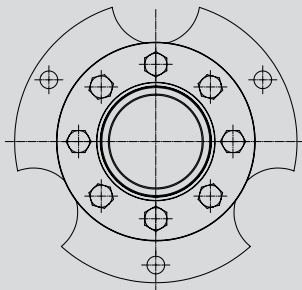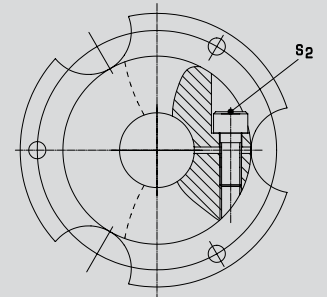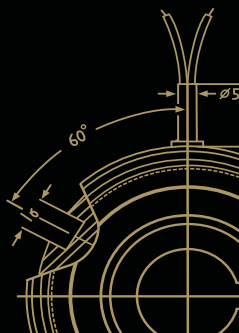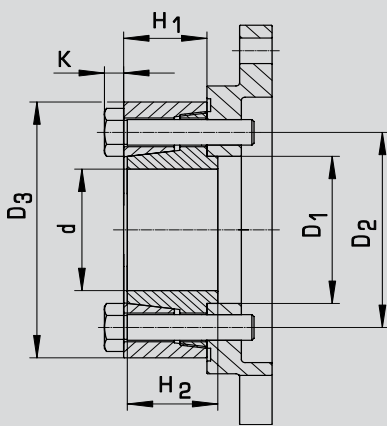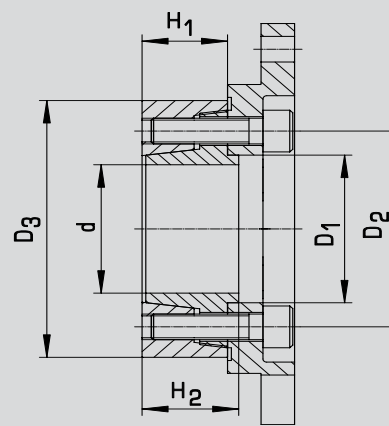
Clamping-set dimensions

It is recommendet to use a ArcOgrip clamping-set for a backlash-free shaft-hub connection

- Type 354 is mounted from the outside via a hexagon head bolt
- Type 356 is mounted from the inside via a socket head screw
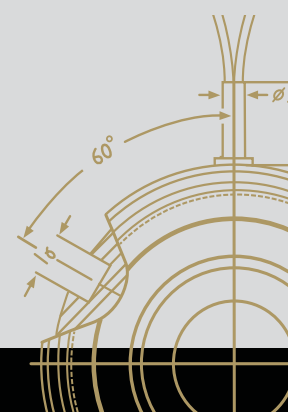

Type ._.2:
Clamping-set
Type 354

Type ._.2:
Clamping-set
Type 356

d [mm]	D_1 [mm]	D_2 [mm]	D_3 [mm]	H_1 [mm]	H_2 [mm]	K	T_{kmax} [Nm]	Screws	T_A [Nm]	Weight [kg]
12	12	24	35	11	11,5	4	50	3 x M6	12	0,1
14	14	26	36	12	11,5	4	70	3 x M6	12	0,1
15	15	28	41	15	16	4	80	3 x M6	12	0,1
16	16	28	41	15	16	4	80	3 x M6	12	0,1
18	18	30	44	15	16	4	130	4 x M6	12	0,1
19	19	32	47	15	16	4	140	4 x M6	12	0,2
20	20	32	47	15	16	4	140	4 x M6	12	0,2
22	22	36	50	19	20	4	200	5 x M6	12	0,2
24	24	36	50	19	20	4	200	5 x M6	12	0,2
25	25	36	50	19	20	4	200	5 x M6	12	0,2
26	32	44	60	19	21	4	300	6 x M6	12	0,3
28	32	44	60	19	21	4	300	6 x M6	12	0,3
30	32	44	60	19	21	4	300	6 x M6	12	0,3
32	38	52	72	21	23	5,5	450	5 x M8	29	0,5
35	38	52	72	21	23	5,5	500	5 x M8	29	0,5
36	38	52	72	21	23	5,5	500	5 x M8	29	0,5
38	46	61	80	23	25	5,5	720	6 x M8	29	0,6
40	46	61	80	23	25	5,5	750	6 x M8	29	0,9
42	46	61	80	23	25	5,5	750	6 x M8	29	0,6
44	53	68	90	25	27	5,5	1300	8 x M8	29	0,9
45	53	68	90	25	27	5,5	1300	8 x M8	29	0,9
48	53	68	90	25	27	5,5	1300	8 x M8	29	0,9
50	53	88	90	25	27	5,5	1300	8 x M8	29	0,9
52	58	72	100	27	29	5,5	1600	8 x M8	29	1,2
55	58	72	100	27	29	5,5	1600	8 x M8	29	1,2
60	63	80	110	27	29	5,5	2000	8 x M8	29	1,4
62	74	86	115	27	30	5,5	2100	9 x M8	29	1,4
65	74	86	115	27	30	5,5	2100	9 x M8	29	1,4
70	74	86	115	27	30	5,5	2100	9 x M8	29	1,4
75	84	100	138	29	32	7	4000	10 x M10	58	2,2
80	84	100	138	29	32	7	4000	10 x M10	58	2,2
85	94	114	155	35	38	7	5700	12 x M10	58	3,4
90	94	114	155	35	38	7	5700	12 x M10	58	3,4
95	104	124	170	40	43	8	8400	12 x M12	100	5
100	104	124	170	40	43	8	8400	12 x M12	100	5

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Estimated operating factors for torsionally rigid shaft couplings

|	Operating factor KB			shock factor K_s
	elektric motors turbines hydraulic motors	piston engines with more than 2 zylinders	piston engines with 1 or 2 zylinders	
building construction machines	2,1	2,5	3	4
chemical industry				
agitators (semi-liquid material)	1,7	2,1	2,6	3,5
agitators (liquid material)	1	1,4	1,7	2,5
centrifuges	1,35	1,75	2,2	2,5
pipeline pumps	1,7	2,1	2,6	4
conveyors and lifts				
goods lifts	1,7	2,1	2,6	4
passenger lifts	1,7	2,1	2,6	3,5
belt conveyors	1,7	2,1	2,6	3,5
blowers, ventilators	1,35	1,75	2,2	2,5
generators, transformers	1	1,4	1,7	3
wood-plastic industry machinery				
planing machines	1,7	2,1	2,6	4
woodworking machines	1	1,4	1,7	4
mixers	1,7	2,1	2,6	3
extruders	1,7	2,1	2,6	4
cranes	1,7	2,1	2,6	4
metal working machines				
presses	2,4	2,8	3,3	5
machine tools	1,7	2,1	2,6	3
food industry machinery				
kneading machines	1,7	2,1	2,6	3
mills	2,4	2,8	3,3	4,5
packaging machines	1	1,4	1,7	2
paper machines				
pulp grinders	2,4	2,8	3,3	4
shredder	2,4	2,8	3,3	4
presses, rolls	2,4	2,8	3,3	4
calenders	1,7	2,1	2,6	3,5
pumps				
piston pumps	2,4	2,8	3,3	4,5
centrifugal pumps	1,35	1,75	2,2	3
stone and clay working machines				
mills, breakers	2,4	2,8	3,3	6
rotary ovens	2,4	2,8	3,3	4
textile machines				
looms	1,7	2,1	2,6	3
winders	1,7	2,1	2,6	3
compressors				
pistons compressors	2,4	2,8	3,3	4
turbo compressors	1,7	2,1	2,6	2,5
metal rolling mills				
shears	2,4	2,8	3,3	5,5
plate-mill lines	2,4	2,8	3,3	5
cold rolling mills	2,4	2,8	3,3	5
rolling mill adjusters	1,7	2,1	2,6	4
winding machines	1,7	2,1	2,6	4
continous casting plant	2,4	2,8	3,3	5
laundries	1,7	2,1	2,6	2,5

Mönninghoff

ServoFlex – shaft coupling Type 318

You need more?

Mönninghoff couplings can be combined with a variety of many other power transmission elements. Such complex high-tech systems can solve any application-specific tasks and can fulfill any customer-specific wishes.
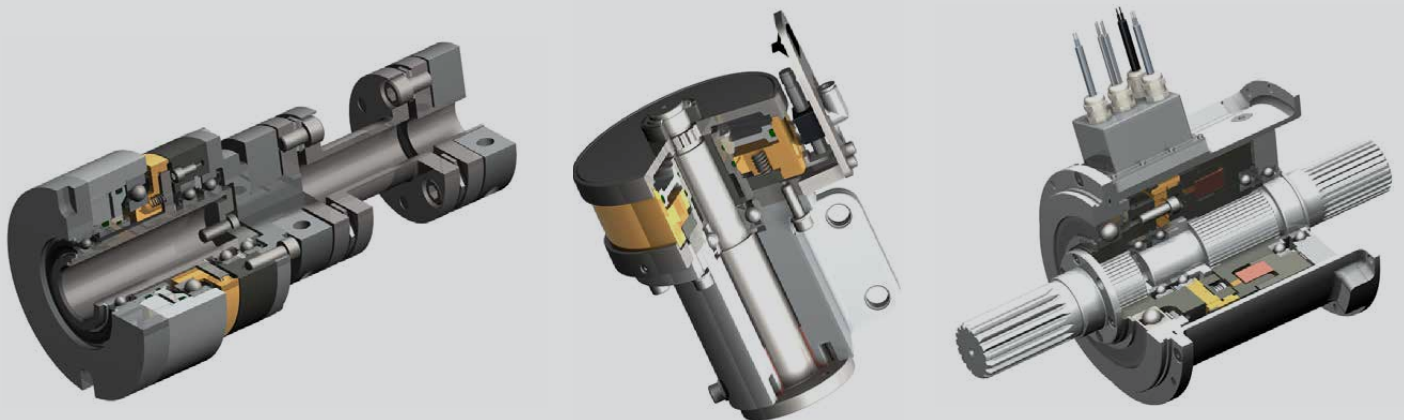
In many cases, a combination of different drive elements is needed to solve the applications particular problems and difficulties. Being not just supplier but technological partner to our customers, our extensive engineering is part of extraordinary and challenging power transmission projects.
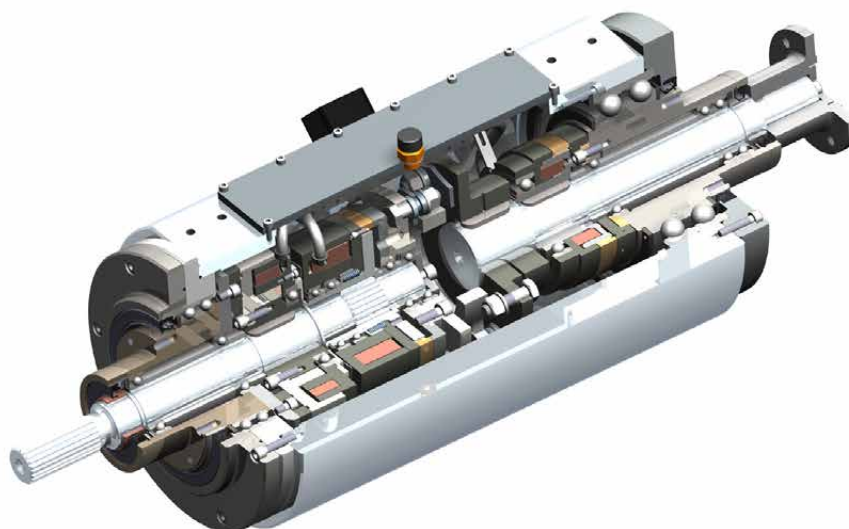
Our product is the know-how,
with hardware as an added bonus.