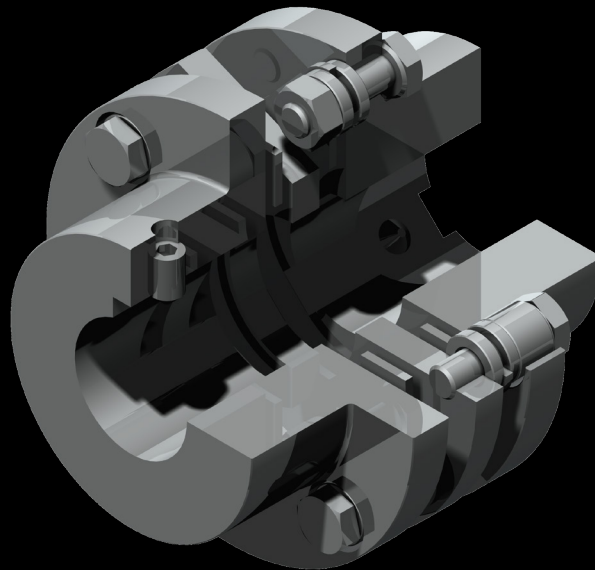


Mönninghoff

ServoFlex Type 318



CHAIN & DRIVES[®]
COMPLETE BEARINGS
& POWER TRANSMISSION

POWER > SPEED > TORQUE

ServoFlex - Type 318

Characteristics and features

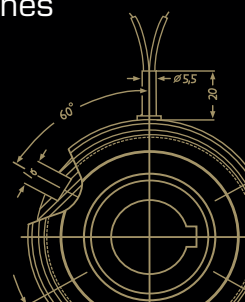
- torque transmission is free of backlash and torsionally stiff
- wear-free and maintenance-free
- high misalignment values
- high strength and bending elasticity stainless steel disc pack
- membrane shape is optimized with finite element design methods
- small resultant restoring forces
- transmitted 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 solutions for the packaging or printing industry.

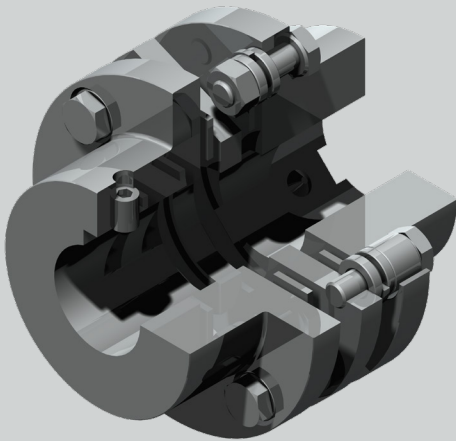
We thus address customers who have the highest standards for their own machines or systems. To them, we can offer highly complex, application-specific solutions.



ServoFlex - Type 318

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

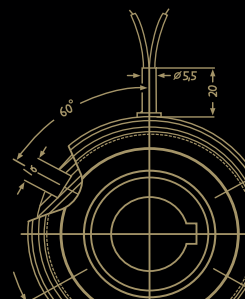
According to these characteristics, we design individual solutions concerning transmitted torque, engaging behavior or rotation speed.

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 - 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



ServoFlex - Type 318

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_{KN} = nominal torque

T_{KW} = alternating torque

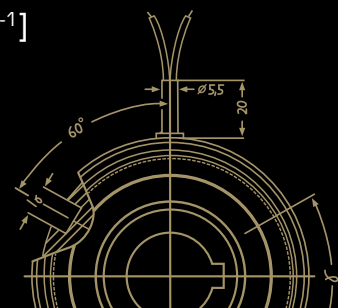
K_B = operating factor

K_S = shock factor

T_{Motor} = torque of the motor

P_{Motor} = power of the motor [kW]

n = max. speed [min^{-1}]



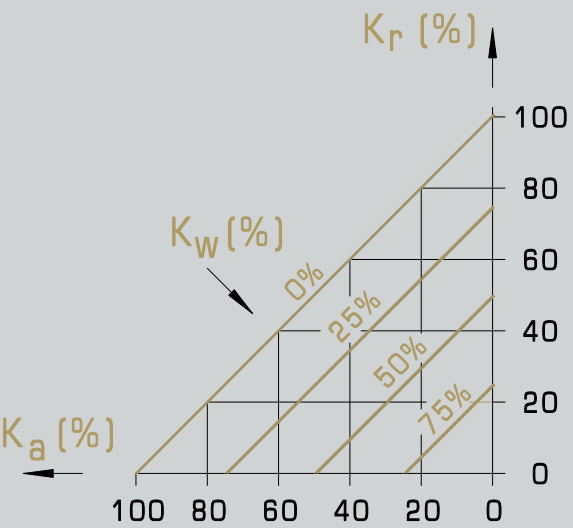
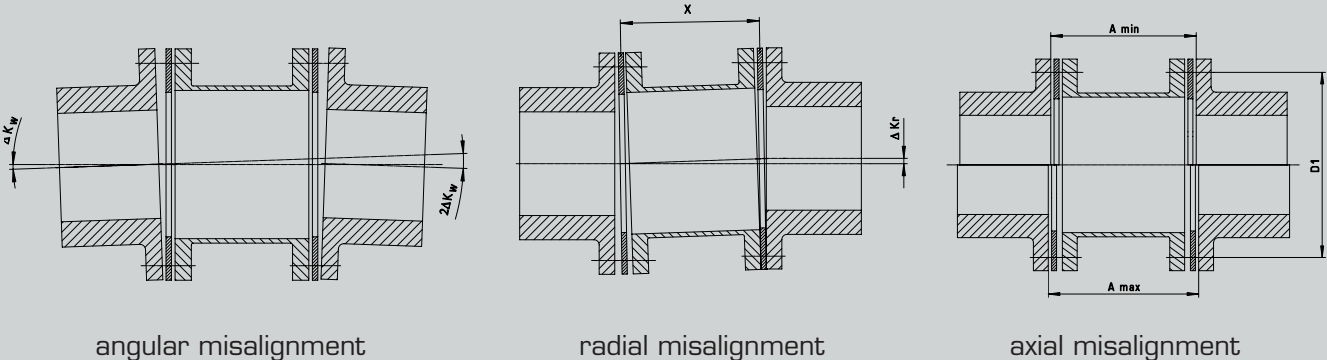
ServoFlex - Type 318

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.



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

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

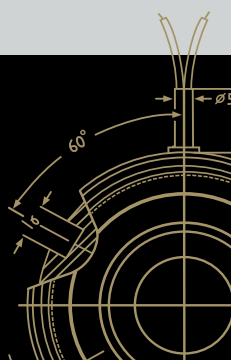
$$\Delta K_{wa} = \arcsin \frac{\Delta K_a}{0,75 \cdot D_1} [^\circ]$$

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

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

- X = distance of membrane
- K_{wg} = total angular misalignment

- K_{wa} = angular misalignment axial
- K_{wr} = angular misalignment radial

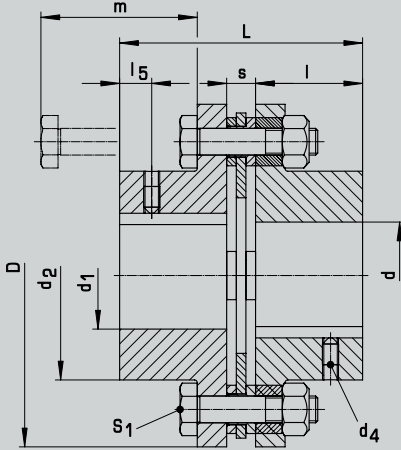


ServoFlex - Type 318

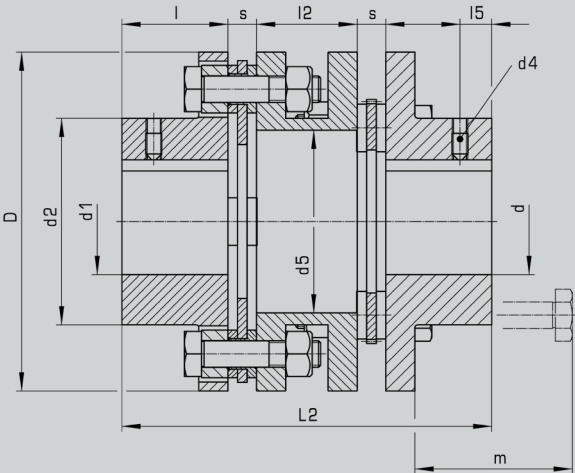
Design

The Mönninghoff ServoFlex - coupling is offered in different designs

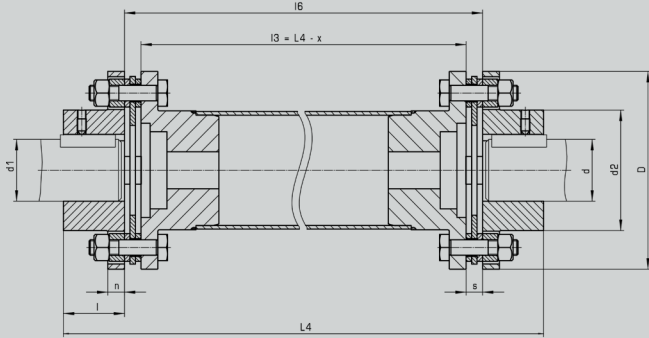
- equalisation of axial and angular misalignment with simple universal joint design
- additional equalisation of radial misalignment with double universal joint design



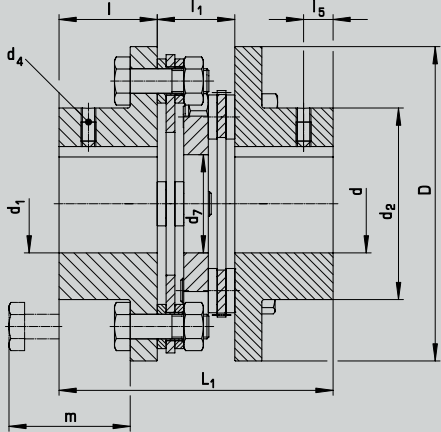
Design 1: single joint



Design 2: double joint with standard spacer

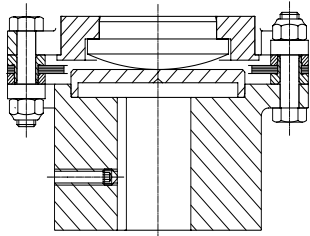


Design 3: double joint with variable spacer



Design 4: double joint with small spacer

Vertical assembling

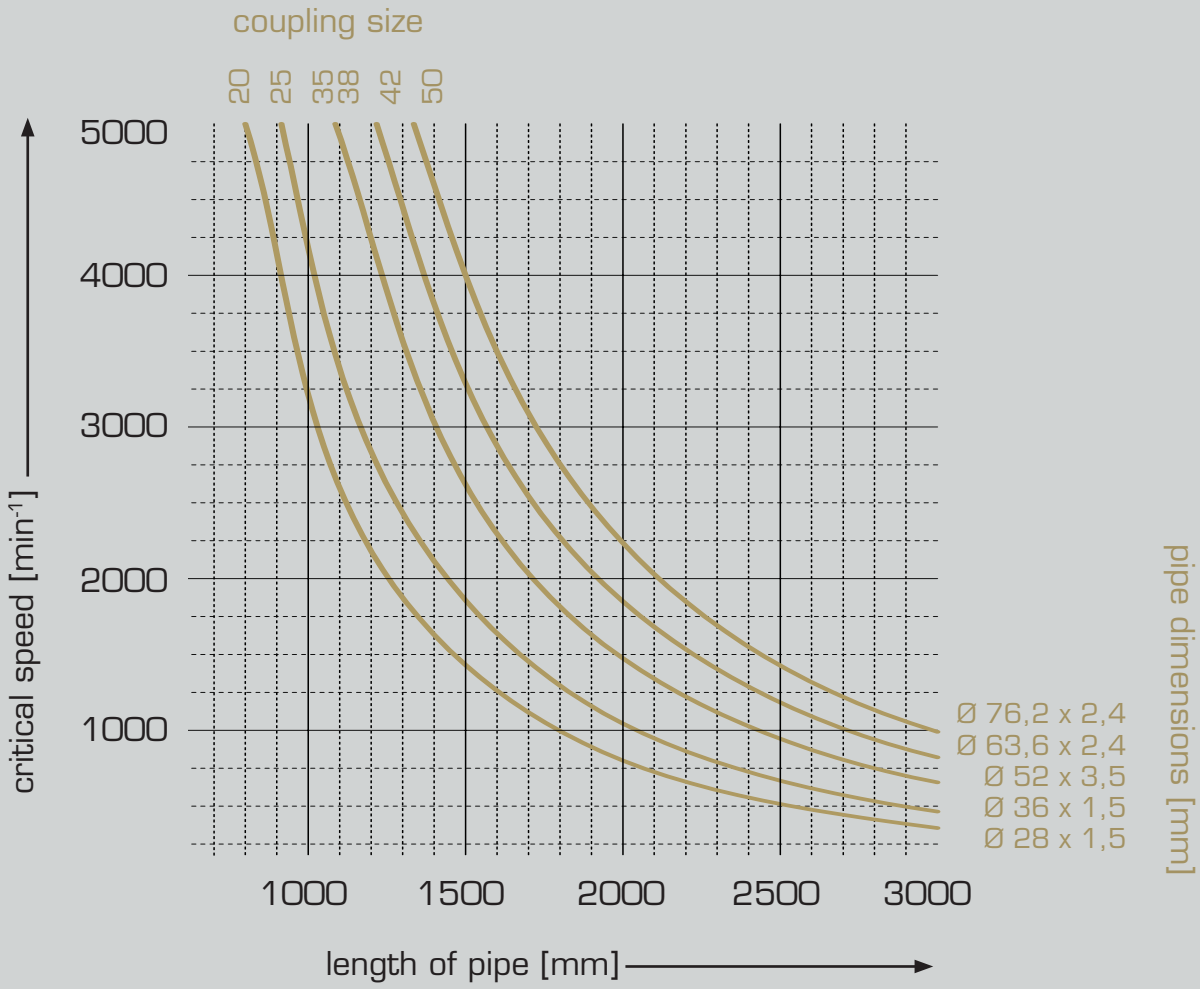


- when vertical assembling is required, an additional support has to be used between the lower hub and the spacer
- please specifically order: for vertical assembling

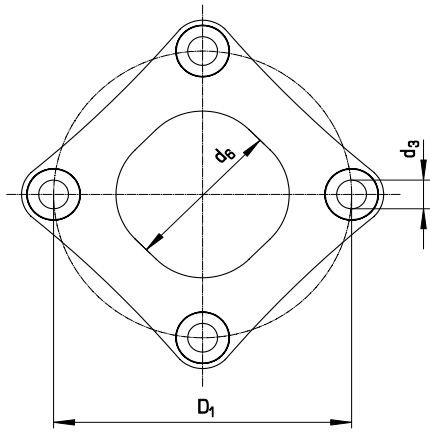
ServoFlex - Type 318

Operating speed design 3

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

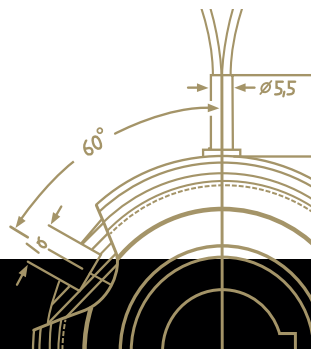


Disc pack



Membrane shape of the ServoFlex - shaft coupling is characterized by the following technical properties:

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



ServoFlex - Type 318

Technical data

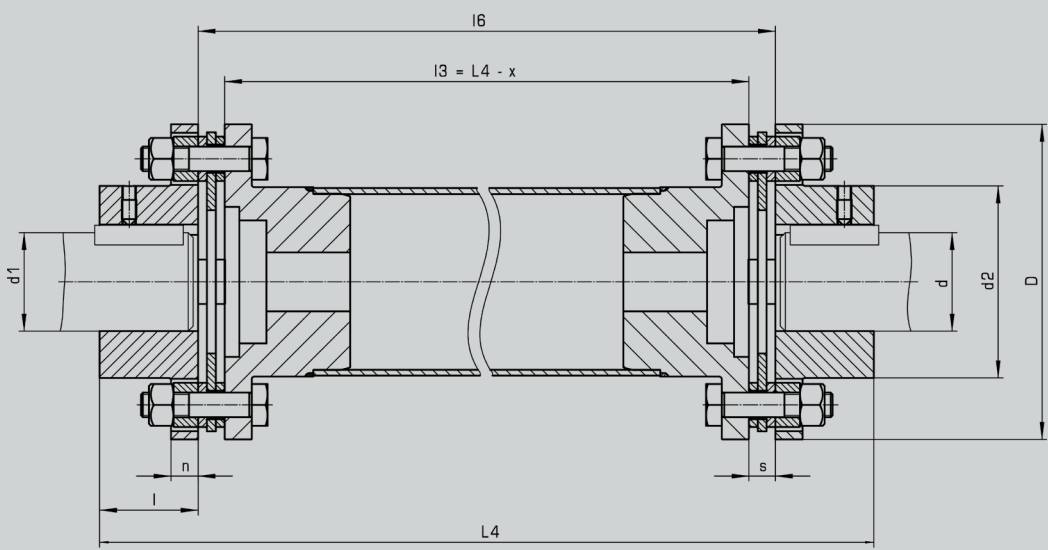
Size			25	35	38	42	50	
torque at angular	0,50°	[Nm]	60	150	200	300	500	
misalignment per membrane pack	T_{KN} 0,75°		40	100	120	160	200	
	1,00°		25	50	70	—	—	
type 4_	T_{KMav}	[Nm]	45	55	120	135	250	
alternating torque	T_{KW}	[Nm]	40	55	120	135	250	
max. misalignment	angular	type 1_	1	1	1	1	1	
		type 2_ 4_	2	2	2	2	2	
	axial	type 1_	[mm]	0,8	1	1,2	1,4	1,6
		type 2_ 4_	1,6	2	2,4	2,8	3,2	
	offset	type 2_	[mm]	0,5	0,5	0,6	0,6	0,8
		type 4_	0,2	0,2	0,3	0,3	0,4	
max. speed	type 1.1, 2.1, 4.1	n [min ⁻¹]	16000	13000	12000	10000	8000	
	type _2_ 4_	5000	5000	5000	5000	5000		
inertia	type 1_	I [10 ⁻³ kg m ²]	0,30	0,87	1,6	2,6	6,5	
	type 2_	0,55	1,5	2,9	4,6	11,8		
	type 4_	0,42	1,1	2,2	3,6	9,2		
weight	type 1_	[kg]	0,6	1,0	1,4	2,1	3,4	
	type 2_	1,1	1,7	2,4	3,3	5,8		
	type 4_	0,7	1,2	1,8	2,5	4,6		
torsional stiffness	type 1_	C_t [10 ⁶ Nm/rad]	29	83	170	250	430	
	type 2_ 4_	C_x [10 ⁶ Nm/rad]	14	41	85	125	215	
axial stiffness	type 1_	[Nm/mm]	45	60	122	160	197	
	type 2_ 4_	22	30	61	80	98		
Screw S1	size	[Nm]	M6	M6	M 8	M 8	M 10	
	tightening torque	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]	M6	M6	M8	M10	M12	
	tightening torque	10	17	33	75	95		
bore d, d ₁ H7	type _1	min.	7	12	12	20	19	
		max.	25	35	38	42	55	
	type _2	min.	12	16	20	25	25	
		max.	16	25	30	36	45	
	type _4	min.	12	19	20	30	32	
		max.	22	32	32	35	40	
dimensions	D	[mm]	68	82	94	104	128	
	D ₁	53	67	75	85	100		
	d ₂	40	54	58	68	78		
	d ₂ H8	6	6	8	8	10		
	d ₄	M5	M6	M6	M6	M6		
	d ₅	35	48	50	60	50		
	d ₆	30	38	42	48	54		
	d ₇	24	28	32	34	40		
	L	56	66	68	80	91		
	L ₁	68	78	86	98	112		
	L ₂	88	98	106	118	140		
	l	25	30	30	35	40		
	l ₁	18	18	26	28	32		
	l ₂	26	26	30	28	38		
	l ₄	1500	2000	2000	3000	3000		
	l ₅	8	8	8	10	12		
S	6	6	8	10	11			
m type 1_ 2_	min.	31	35	44	44	57		
m type 4_	min.	24	26	35	35	44		
n	6	8	9	9	11			
s ₁	16	16	16	18	19			
x	62	72	76	90	102			



ServoFlex - Type 318

Spacer coupling design 3

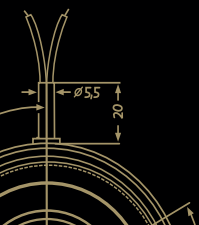
The double joint design has some additional properties of the spacer to consider.



- 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

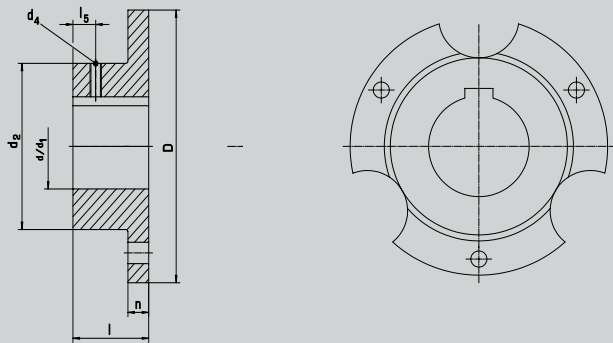
Size		25	35	38	42	50
torque		see previous page				
max. speed	[min ⁻¹]	see diagramm „critical speed for design 3“				
inertia	by l ₃ = 1000 mm	1.060	3.123	5.543	8,26	16,41
	per 100 mm	38	150	248	340	0,6
weight	by l ₃ = 1000 mm	2,42	4,31	6,77	7,52	13,7
	per 100 mm	128	252	418	362	436
torsional stiffness,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



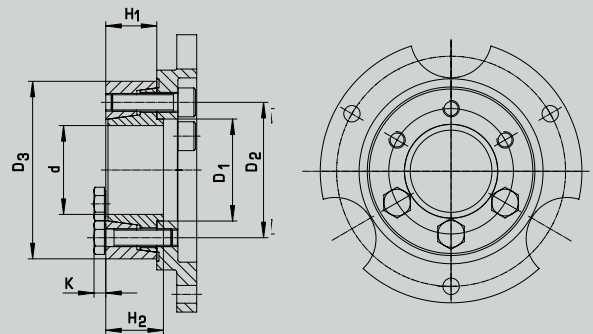
ServoFlex - Type 318

Mounting and connection options

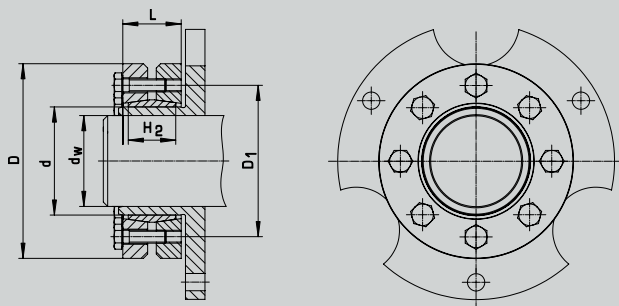
Every combination of hub with keyway, clamping set, shrinking disc or clamping hub is possible for installation of the Mönninghoff ServoFlex - coupling.



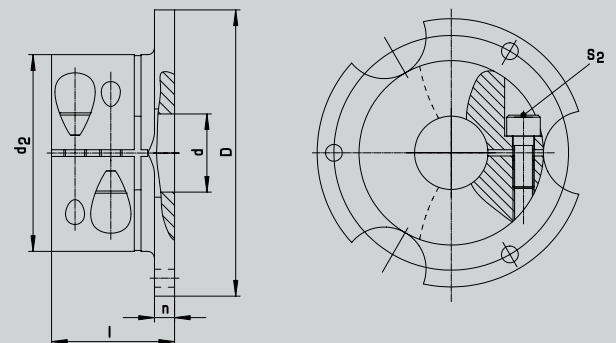
hub with keyway



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

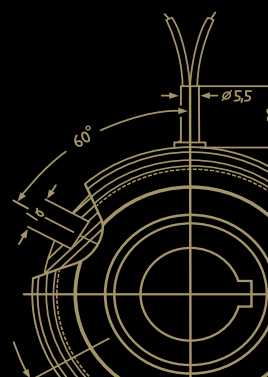
(3) shrink disc / shrink disc

(4) clamping hub / clamping hub

(5) hub with keyway / clamping set

(6) hub with keyway / clamping hub

(7) clamping set / clamping hub

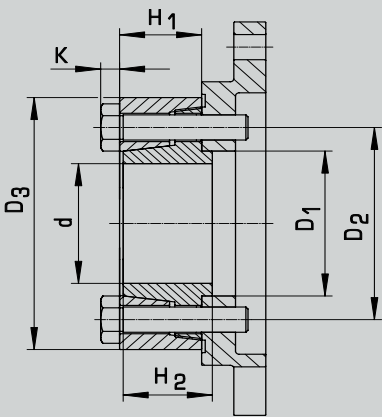


ServoFlex - Type 318

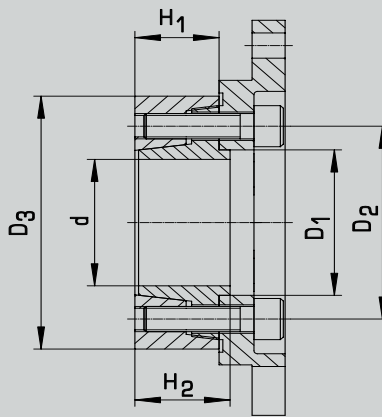
Clamping-set dimensions

It is recommended 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



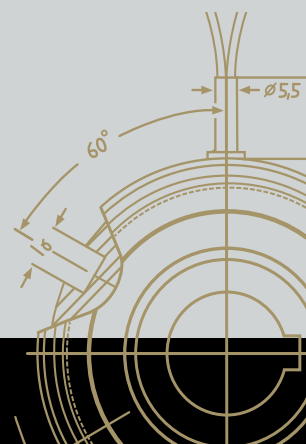
Type ...2:
Clamping-set
Type 356

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	0,6
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

ServoFlex - Type 318

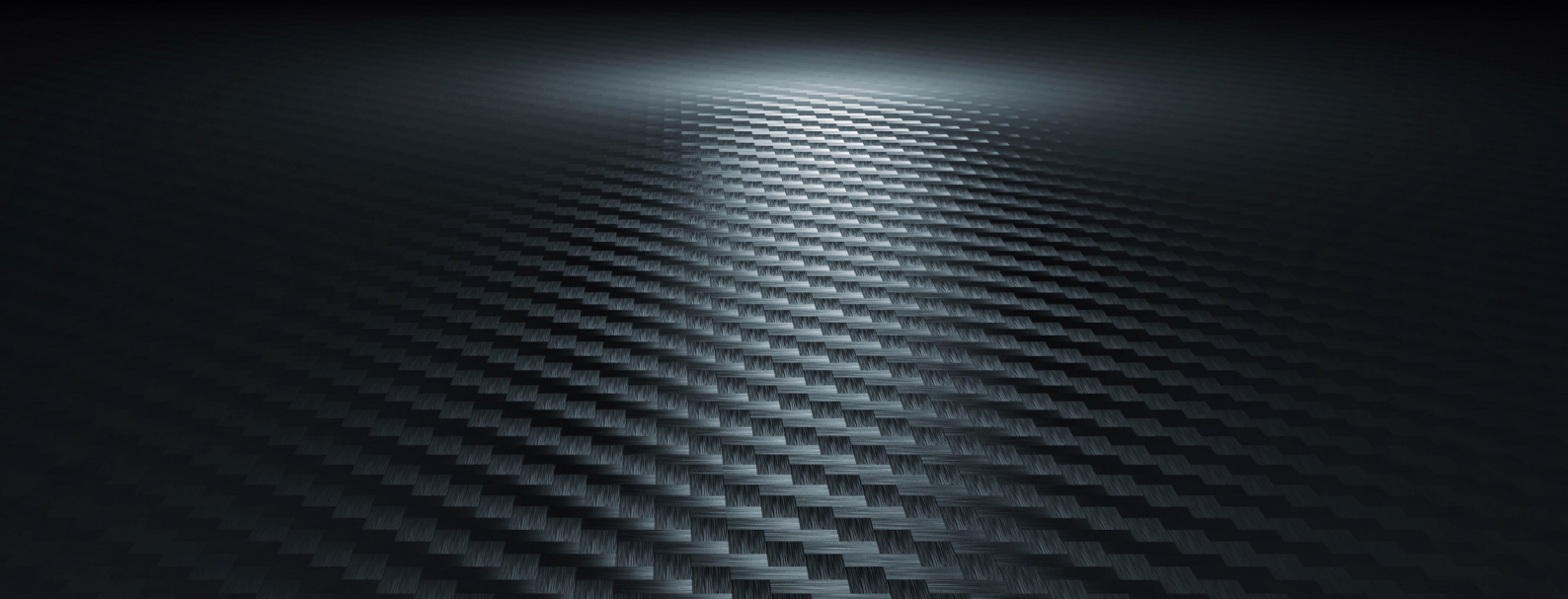
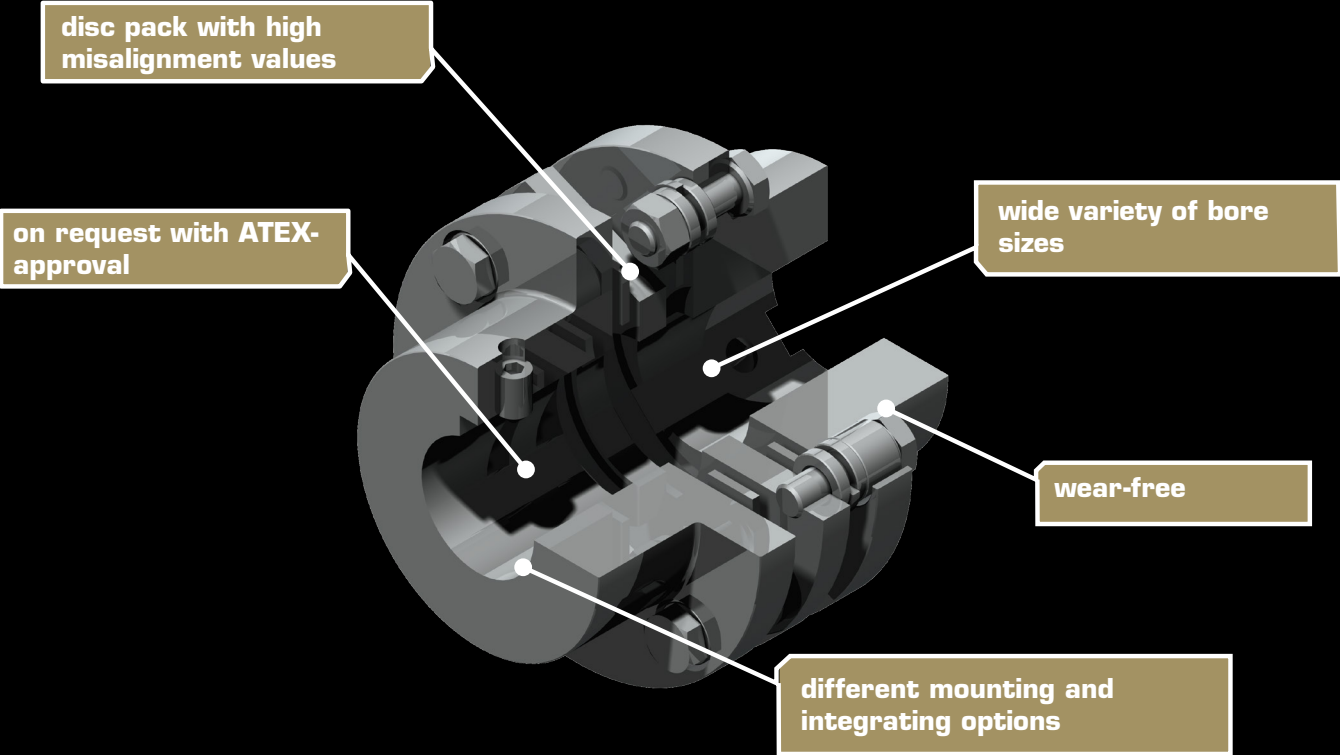
Estimated operating factors for torsionally rigid shaft couplings

	Operating factor KB			shock factor K_s
	electric 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
continuous casting plant	2,4	2,8	3,3	5
laundries	1,7	2,1	2,6	2,5



ServoFlex - Type 318

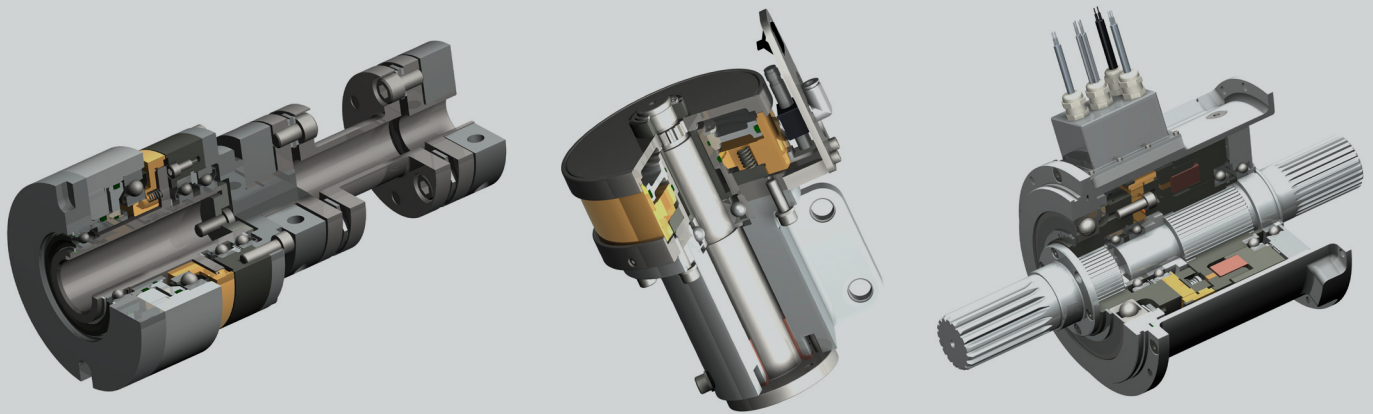
At a glance



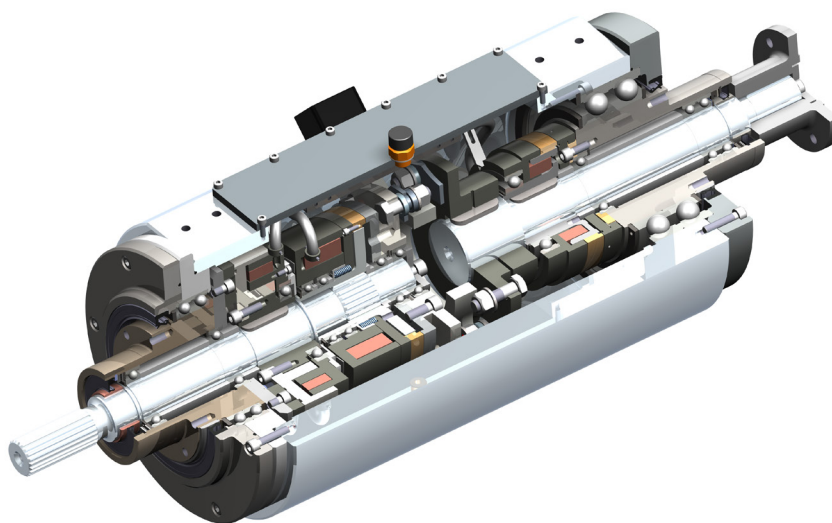
System solutions

You need more?

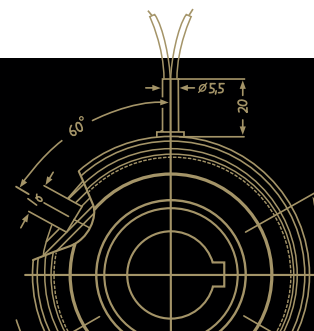
Mönninghoff clutches can be combined with a variety of many other power transmission elements. Such complex high-tech systems can solve any application-specific tasks and can fulfill any customer-specific wishes.



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.**



Driven by excellence

Why Mönninghoff

- intensive dialog with our customers' engineers
- decades of experience and competence
- deep understanding for all areas of mechanical engineering
- highly modern and flexible machine park
- enthusiasm for quality
- flexibility, inventiveness and communication skills of our employees
- commitment to Germany and Bochum as industrial location



Helps you find a customer-specific power transmission solution for extraordinary circumstances.



For the competent processing and smooth handling of your orders and delivery dates.



Feels committed to protect and preserve the high value of your machine and to secure its availability.



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