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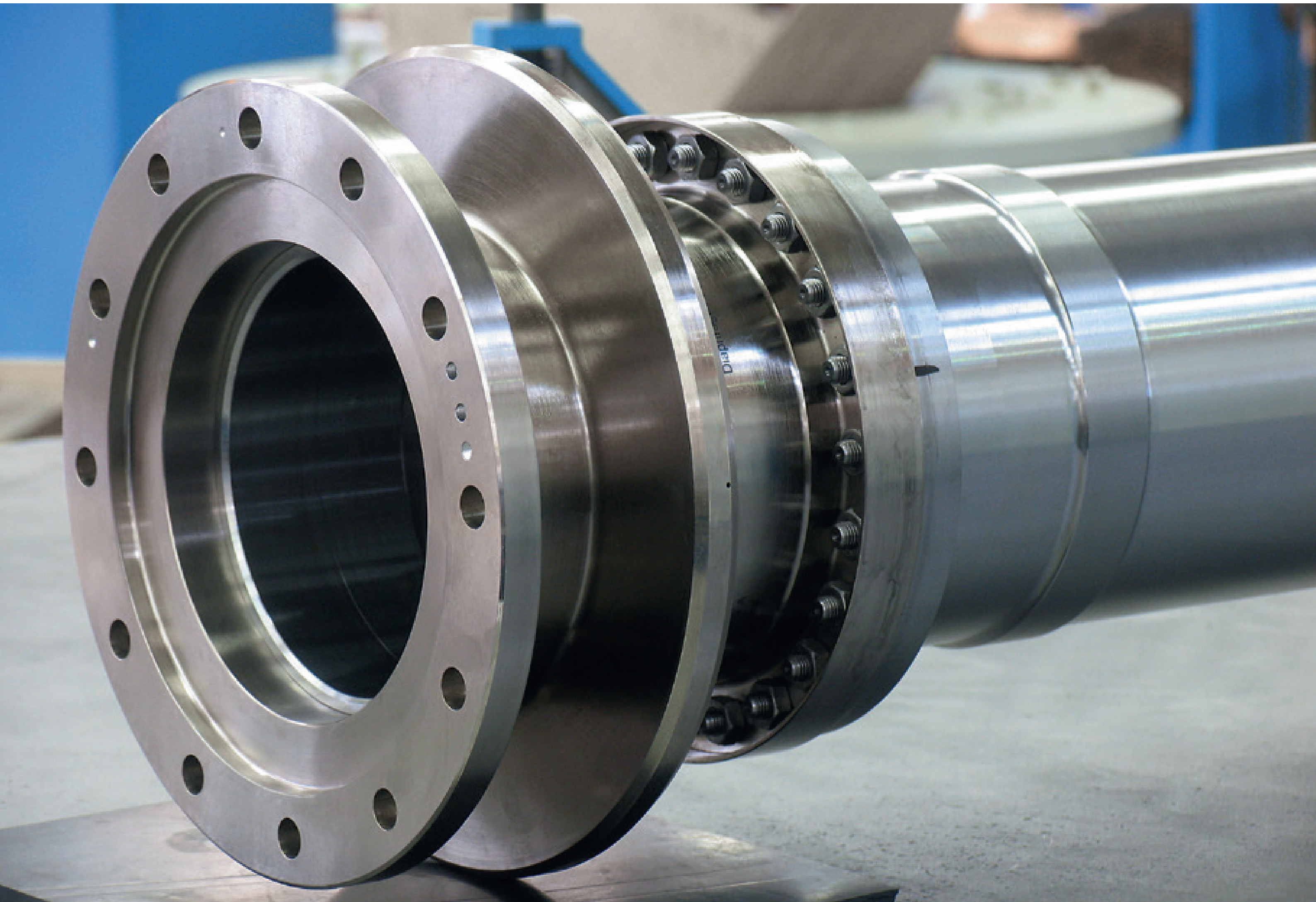
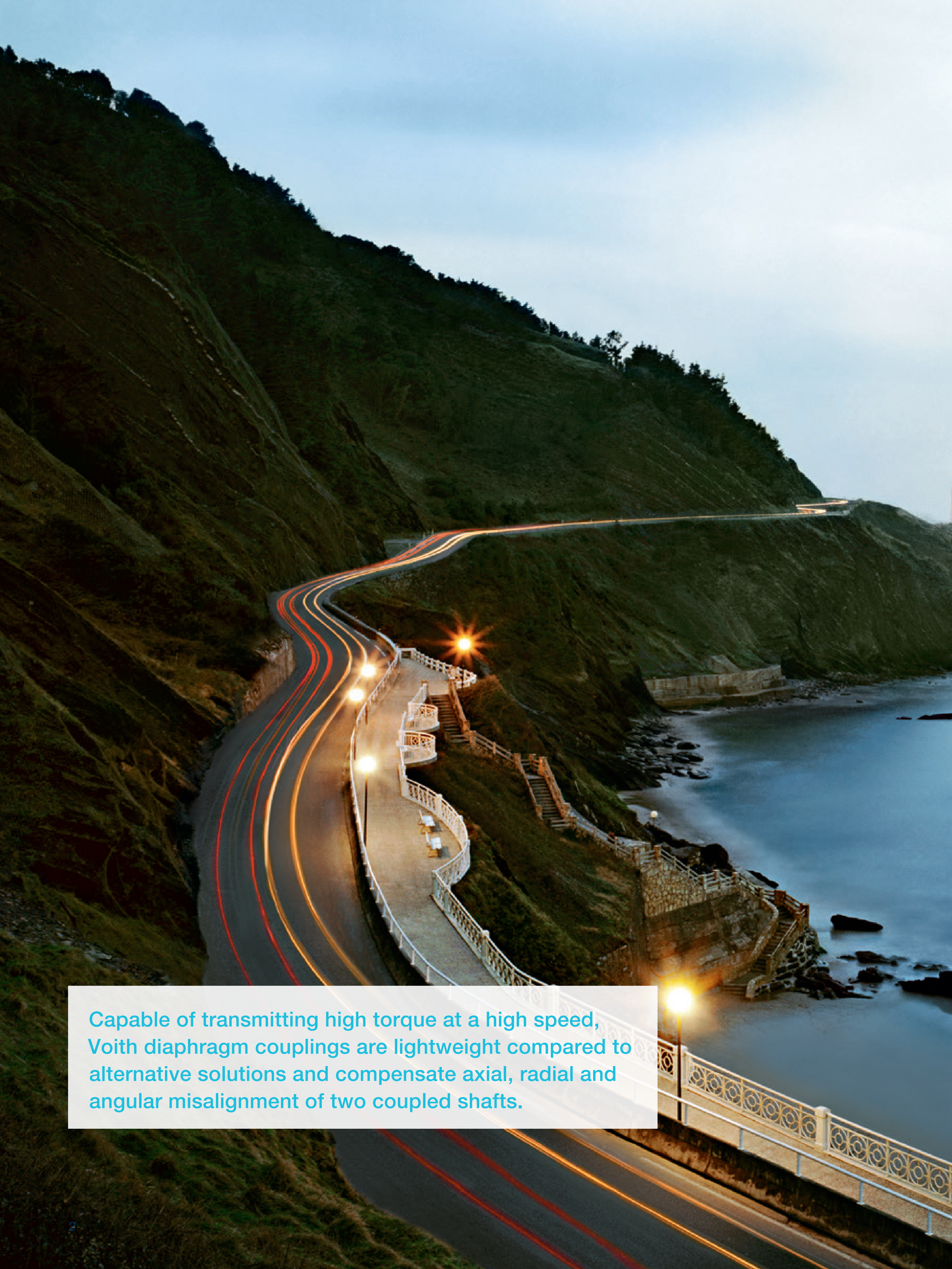
VOITH

Outstanding performance with a low life-cycle cost
TwinTors diaphragm couplings





Capable of transmitting high torque at a high speed, Voith diaphragm couplings are lightweight compared to alternative solutions and compensate axial, radial and angular misalignment of two coupled shafts.

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TwinTors diaphragm couplings

These high performance, zero-backlash double diaphragm couplings have torque capacities of up to 1.5 million Nm with speeds of up to 80,000 rpm. Compensating for axial, radial and angular shaft misalignment, these compact and lower weight couplings are ideal for a wide variety of applications.

Features

- Customized and modular design facilitates flexible interfaces
- Light weight with a low overhung moment and high balancing grades
- Vibration free coupling with high torsional damping capabilities
- Backlash-free and robust metal coupling design
- Wear-free and corrosion resistant
- Maintenance free
- Fatigue coupling testing verification provided with a typical lifespan of 20 years
- Constant coupling characteristics over the entire lifespan
- Coupling designs meet API 671, ISO 10441 and ISO 14691 requirements

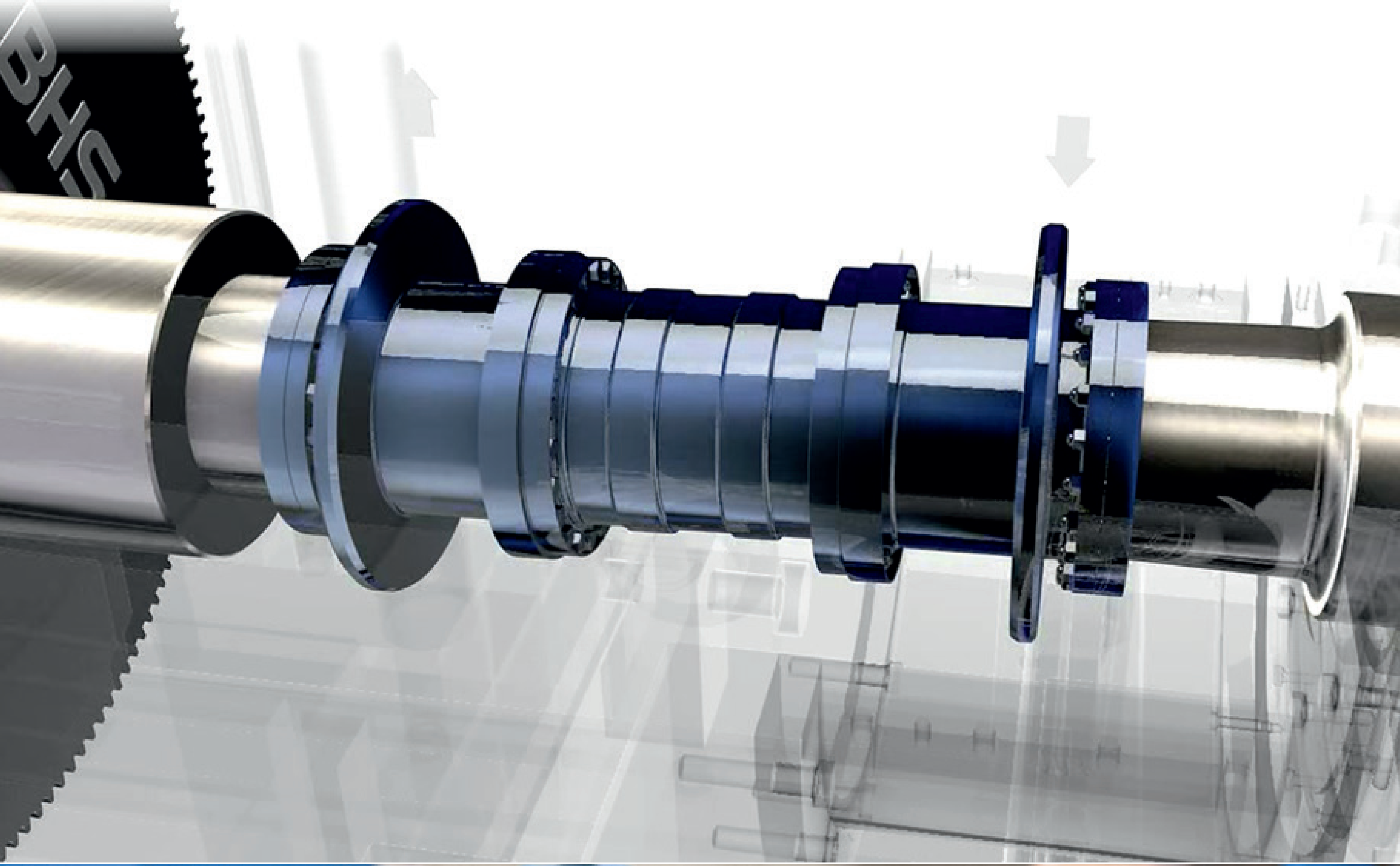
Advantages

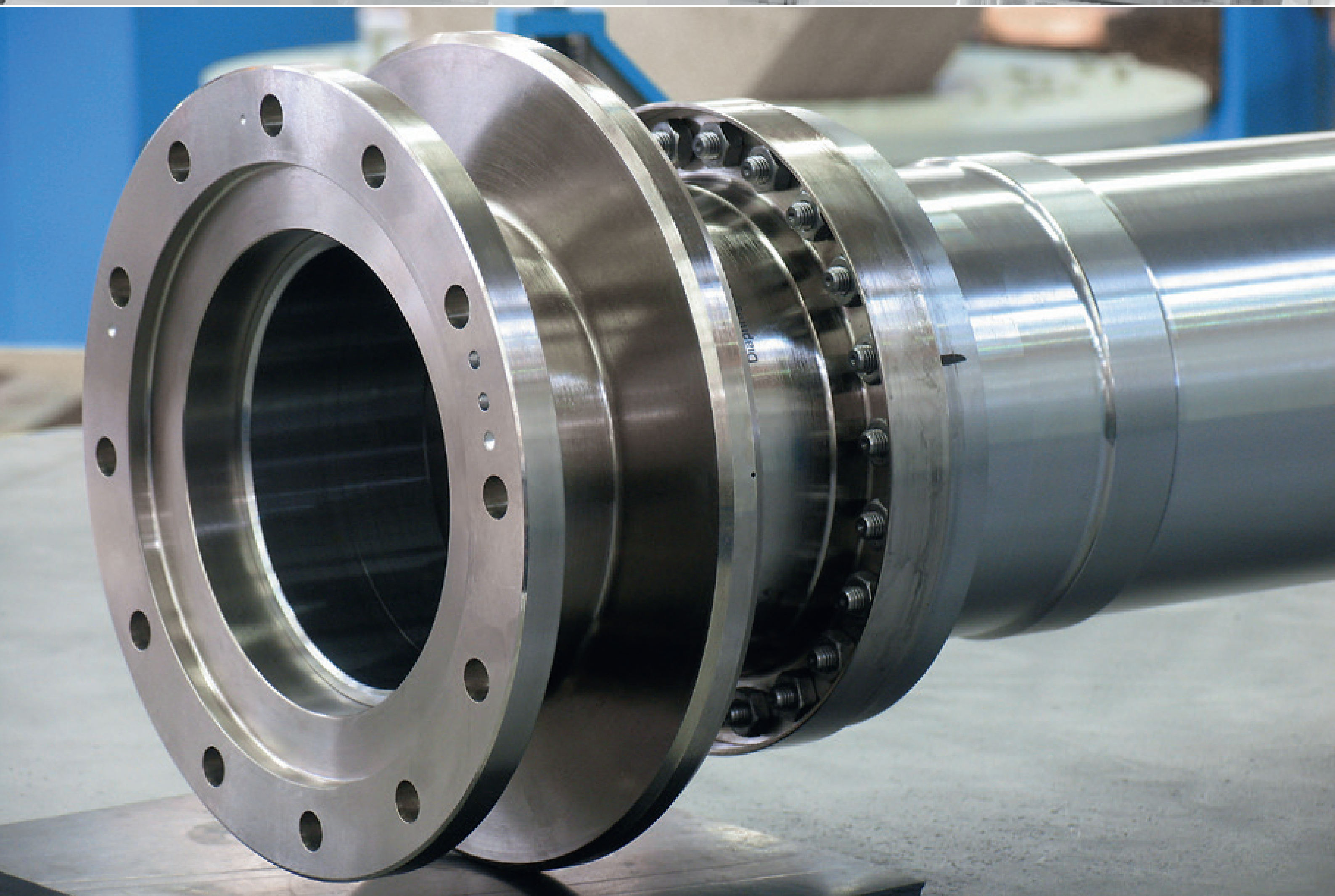
- Best rotor dynamics
- Extremely smooth operation
- Robust and reliable
- Low operational expenses
- Covers a wide range of applications

TwinTors diaphragm couplings

Benefits

+ Time and cost savings
+ Increased productivity and availability
+ Long service lifespan of the coupling
+ Improves component lifespan within the drivetrain


BHS



Engineering design and basics explained

Definitions and terminology

Design principle

Double diaphragms compensate for shaft misalignment – a definite advantage compared to couplings with a single diaphragm design. Double diaphragms allow twice the shaft misalignment. Therefore, with shaft misalignment, the deflection of the individual diaphragm and the restoring force are only half of the deflection and restoring force of a conventional diaphragm coupling.

Electron-beam welding allows relatively thin wall welded joint thicknesses. Thanks to the radial elasticity of the thin-walled outer ring, the material stress in the diaphragm created by compensating radial and axial shaft misalignment is considerably reduced compared to single diaphragm designs. The special profile of the diaphragm area is optimized to provide the highest structural strength and elasticity by means of FEM calculation methods.

Electron-beam welding

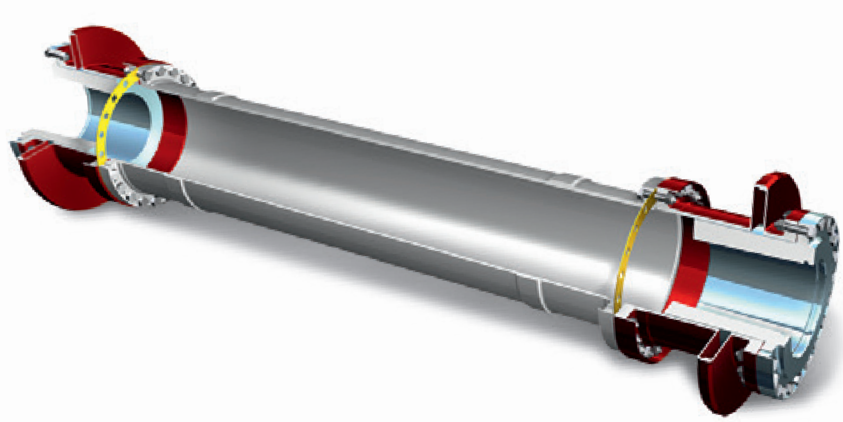
This modern and superior-quality welding method provides maximum operational safety. The specific design of the diaphragm coupling allows for the complete ultrasonic inspection of welded sections. The welding quality is governed by DIN 8563 for electron-beam welded joints.

Coupling hubs

The double diaphragm elements may be used with separate hubs or with integrated flanges. All common shaft / hub connections can be used to transmit the torque. The outer diameters of the hubs are designed to optimize weight.

In most cases, the lightest and most cost-effective coupling arrangement occurs when the shaft of the machine is of flanged design and is connected to the flange of the diaphragm elements directly (hubs are not required).

Cutaway drawing of TwinTors diaphragm couplings



The double diaphragm design enables the use of reduced moment hubs.

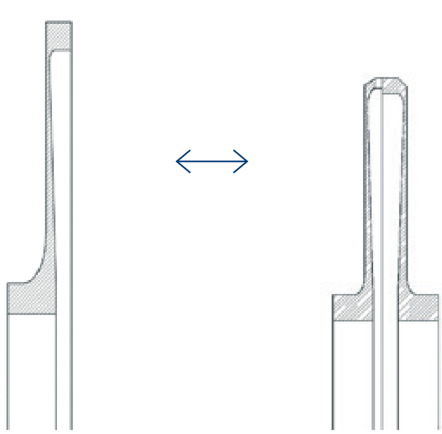
Connecting bolts
Fitted bolts and nuts of equal weight are used for the flange connections. This allows repeated coupling assembly without rebalancing.

Complete balancing
In assembled condition, the diaphragm coupling does not have any radial clearance and can therefore be dynamically balanced as a unit.

The special design principle allows for an exceptionally high balance quality level. Complete balancing is made to customer specifications according to, e.g., VDI 2060, DIN ISO 1940/1, ISO 10441, ISO 14691 and API 671.

For rebalancing at the customer's facility, threaded holes can be provided in the attaching flange of the double diaphragm element, or other rebalancing provisions (e.g., circumferential groove with balancing weights at the shaft hubs) can be provided based upon customer requirements.

Design Principle



Single diaphragm (conventional design)

Double diaphragm (superior Voith design)

Protection against corrosion
The double diaphragm elements are protected internally and externally against the most severe environmental conditions by means of a special permanent corrosion protection. All other parts have a standard long-term rust preservative applied prior to delivery and installation.

Power loss and coupling noise
Minimal levels of noise and power loss from windage, as a result of minimized bolt circle diameters and the smooth surfaces, is achieved with this coupling.

Coupling guards
During operation, the coupling must be protected against accidental contact by means of stationary guards. For couplings with very high peripheral velocity, such guards must have an adequate distance from the coupling in order to prevent excessive heating due to air windage. Sometimes oil must be sprayed into the coupling guard for cooling purposes.

The small diaphragm and bolt circle diameters of the diaphragm coupling, together with its aerodynamic shape, facilitate smaller coupling guards and a simpler design.

Diaphragm types

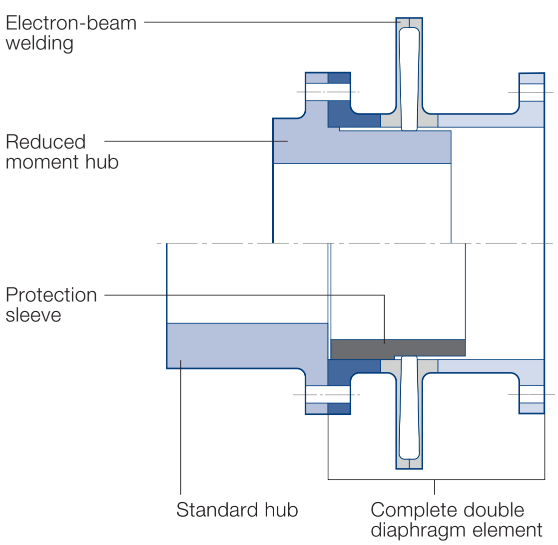
For the compensation of axial and angular misalignment, one double diaphragm element is sufficient. For parallel (radial) shaft misalignment, two double diaphragm elements are required. A spacer between the two elements can be supplied in various lengths to adjust the overall length of the coupling.

The double diaphragm elements are available with a flanged spacer. Or, as a special version, the diaphragms and spacer can be delivered as a welded assembly. An adapter or a coupling hub may be used as an interface to the machine shaft.

Double diaphragm elements are equipped with protection sleeves *unless* the coupling is furnished with a reduced moment hub. The protection sleeve or reduced moment hub prevent parts from detaching from the coupling in the event of a diaphragm failure.

Double diaphram means higher compensation capabilities (in terms of misalignment) but even with smaller diameter and lower weight than single diaphragms designs.

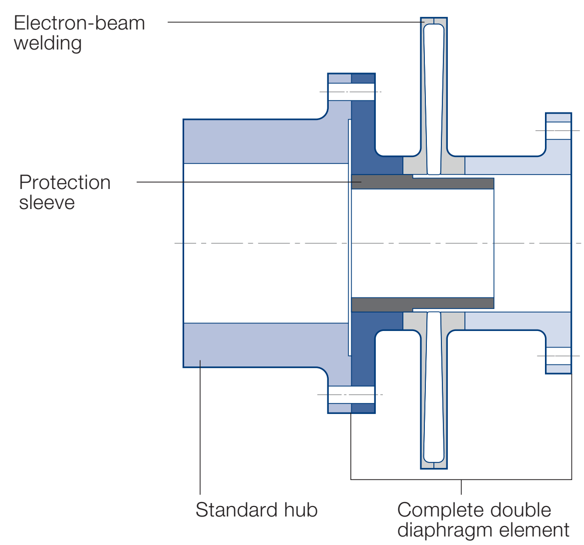
Diaphragm type: MKB
Standard design (0.25° angular misalignment)



Characteristics:

- **Favorable location of center of gravity**
- **Feasibility of short version without spacer**
- **Higher stiffness**

Diaphragm type: MKA
Standard design (0.5° angular misalignment)



Characteristics:

- **Very high flexibility due to large diaphragm area**

Coupling parameters

	For normal length with normal couplings hubs*	For length extension (+ Δl) or length reduction (– Δl) in [mm] compared to standard length*
Weight	$= G$	$= G + \frac{\Delta l}{100} \cdot G_{100}$
Mass moment of inertia	$= I$	$= I + \frac{\Delta l}{100} \cdot I_{100}$
Torsional spring stiffness	$= C_t$	$= \frac{100 \cdot C_t \cdot C_{t\,100}}{100 \cdot C_{t\,100} + \Delta l \cdot C_t}$
Center of gravity	$= X$	$= \frac{X_1 \cdot (G_1 + \frac{\Delta l}{200} \cdot G_{100}) + X_2 \cdot G_2 + X_3 \cdot G_3}{G_1 + G_2 + G_3 + \frac{\Delta l}{200} \cdot G_{100}}$
Admissible radial misalignment (depending upon diaphragm type)	MKB … : $\Delta K_p = 0.00436 \cdot L_6$ MKA … : $\Delta K_p = 0.00873 \cdot L_6$	$\Delta K_p = 0.00436 \cdot (L_6 + \Delta l)$ $\Delta K_p = 0.00873 \cdot (L_6 + \Delta l)$
Axial natural frequency	Diagrams pages 23, 27, 34, 38, 42	Diagrams pages 23, 27, 34, 38, 42
Lateral natural frequency	Diagrams pages 10-11	Diagrams pages 10-11

*Note

In the left-hand column, the parameters of the “normal coupling” are determined, i.e., the freely choosable dimensions (hub dimensions and length of coupling) have been assumed as “normal dimensions” (indexed with “norm” in the dimensional tables).

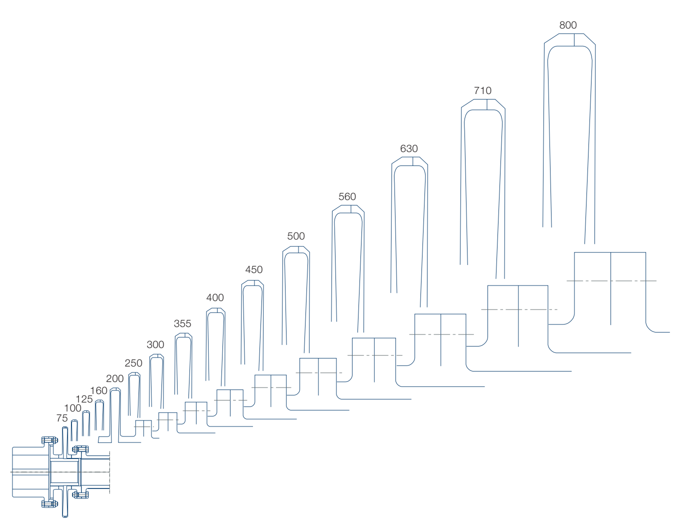
In the right-hand column, the parameters of the entire coupling are determined, including length adjustment.

The variables given in the formulas are sometimes marked “cyl” or “cone”. The appropriate value depends upon the shaft/hub connection chosen (conical with shaft nut or cylindrical “cyl”). Depending upon the selection of the shaft / hub connections (cylindrical or conical), the appropriate value is inserted.

+ Δl is inserted in the formula if the requested coupling length (Lges, DBSE, L4, L8) is larger than the values indicated in the tables.

– Δl is inserted in the formula if the coupling is to be reduced with regard to “normal dimensions” (check disassembly).

Proportional display of coupling sizes

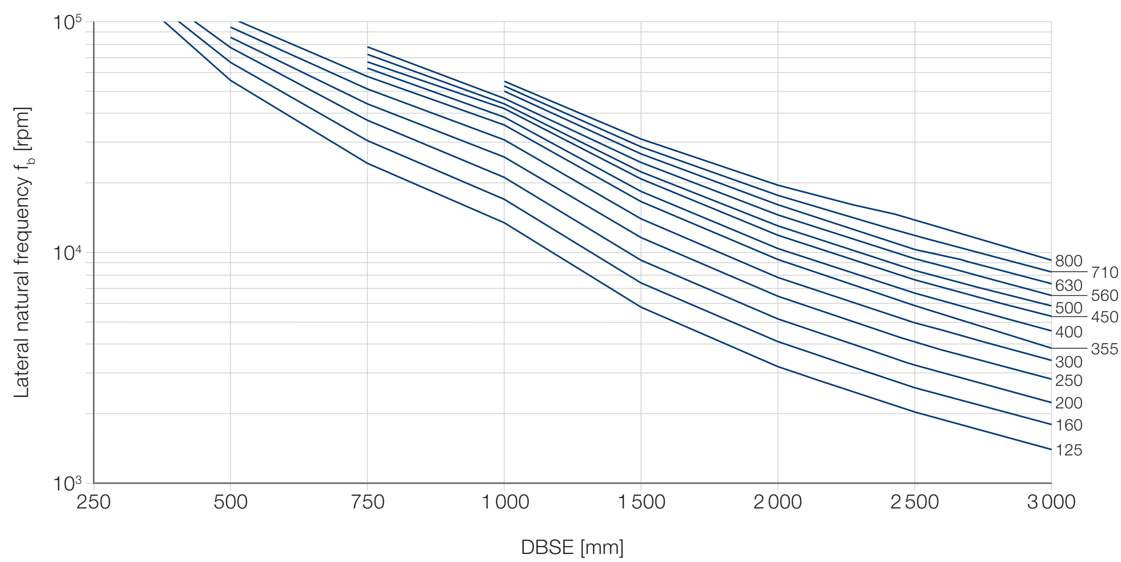


Lateral natural frequency explained

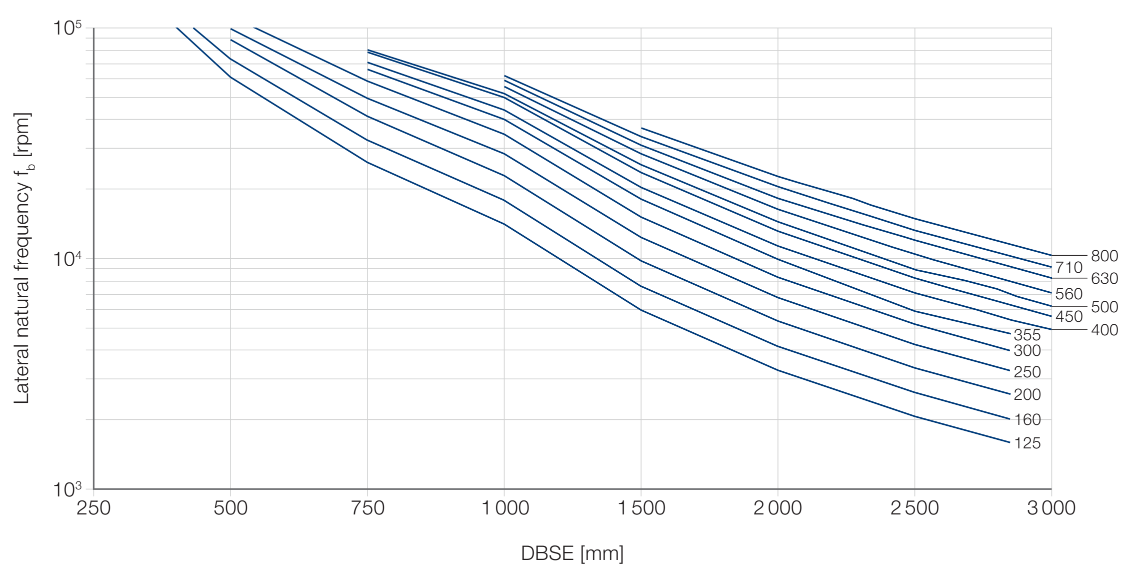
The lateral natural frequency is the value for the lateral natural vibration of long spacers between the two double diaphragm elements. In very long couplings, this frequency may approach the operating speed range. If the lateral natural frequency is less than 170 % of the operating speed, a rotor dynamic study will be required. The diameter of the spacer will then possibly have to be increased. The lateral natural frequency of a coupling can be determined by plotting the distance between shaft ends (DBSE) on the natural frequency curve for the appropriate size coupling.

Lateral natural frequency f_b converted to rpm for the following standard designs

MKB xxx-AAS

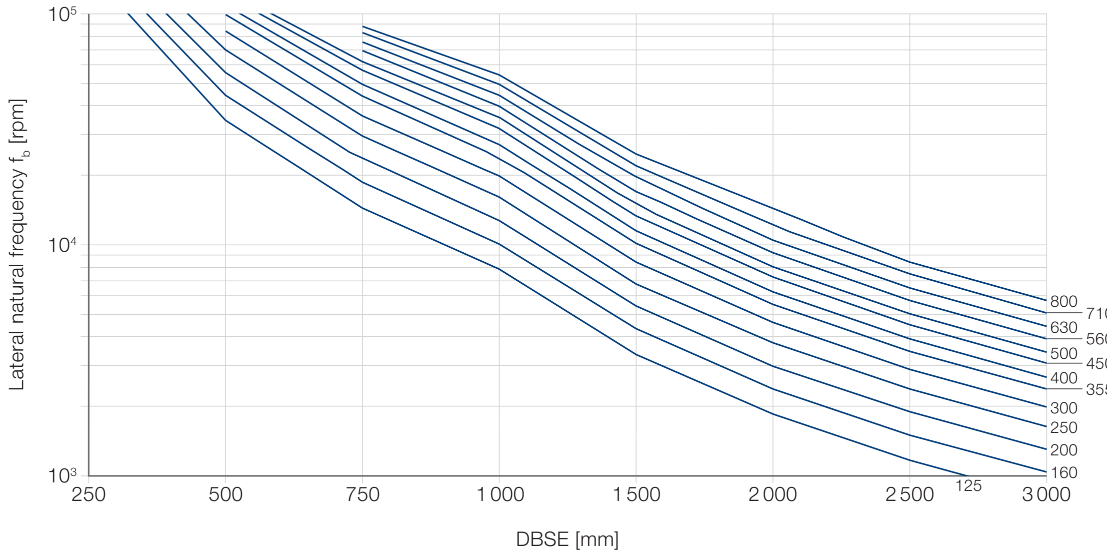


MKB xxx-IIS

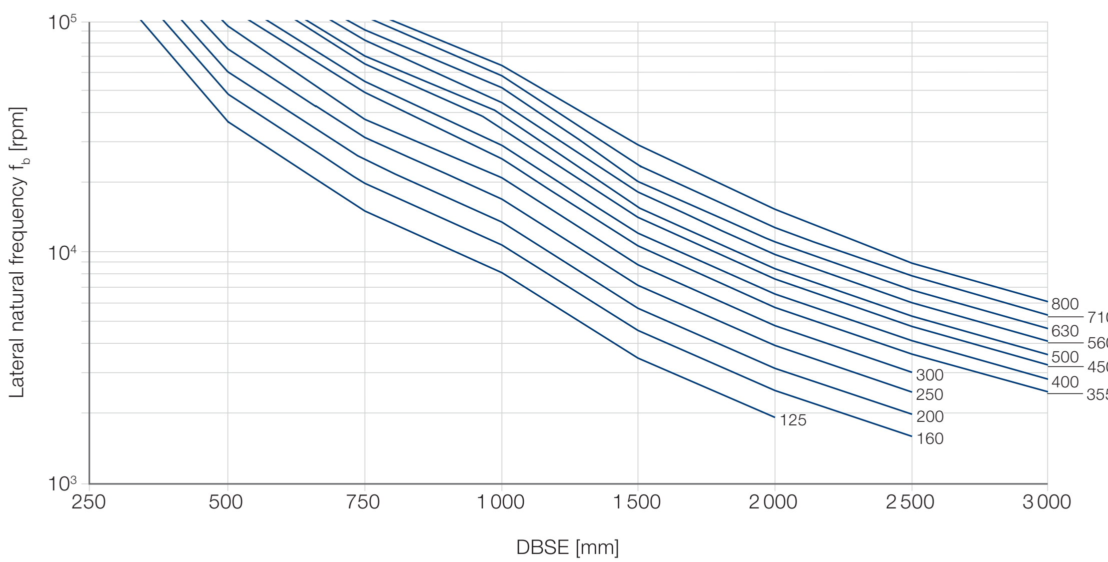


Lateral natural frequency f_b converted to rpm for the following special designs

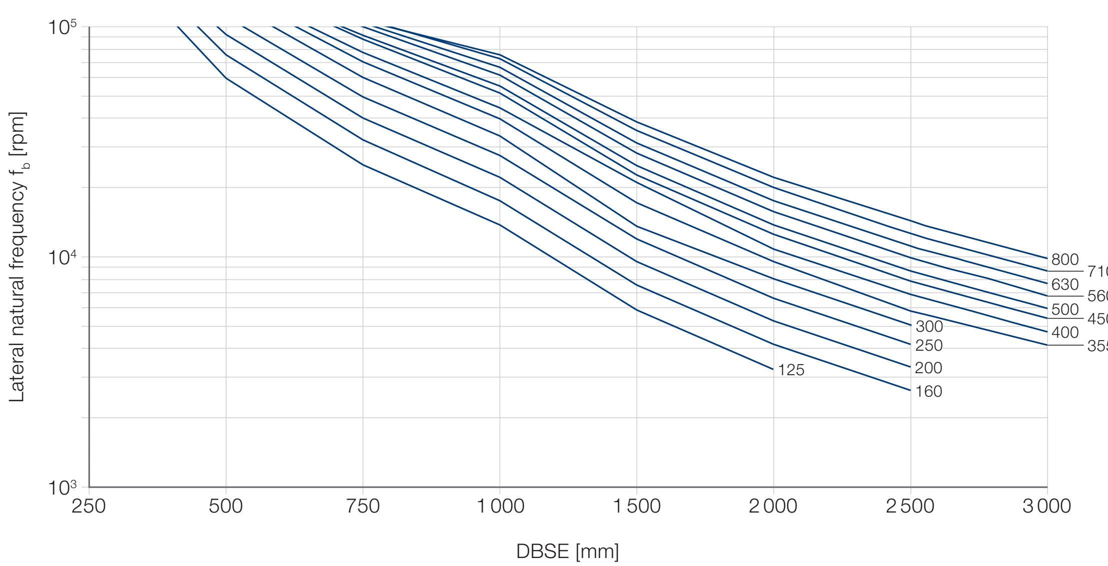
MKA xxx-AAS



MKA xxx-AAE

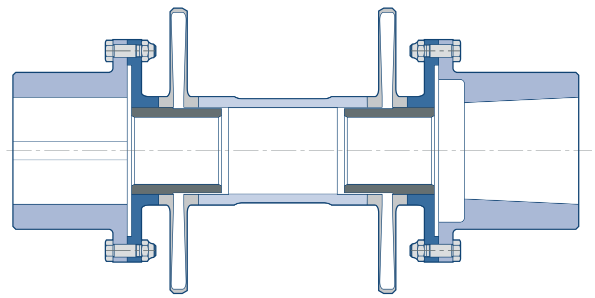
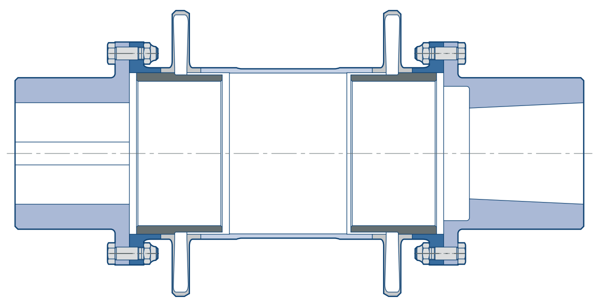


MKB xxx-AAE

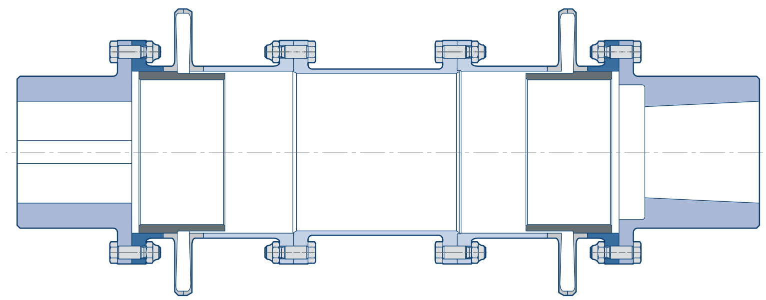
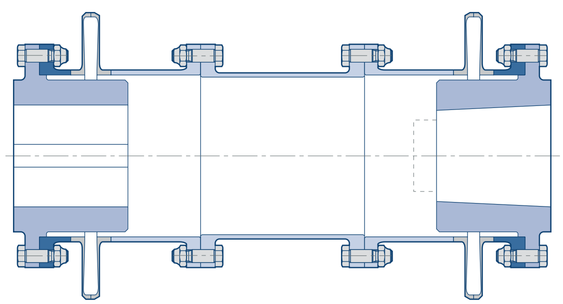
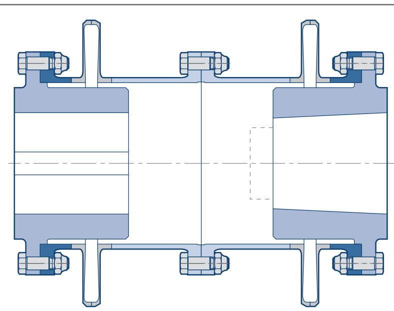
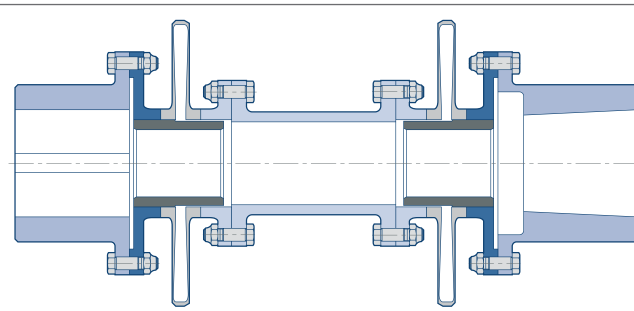


Design types

Welded designs

Design type	Sectional drawing	Features
MKA xxx-AAE • Diaphragm type A • Standard hub • Welded-in-spacer • Protection sleeve		• Dismantling subassembly: welded-in-spacer with diaphragm element • Special designs for higher angular and axial misalignment capabilities and lower weight
MKB xxx-AAE • Diaphragm type B • Standard hub • Welded-in-spacer • Protection sleeve		• Dismantling subassembly: welded-in-spacer with diaphragm elements

Bolted designs

Design type	Sectional drawing	Features
MKB xxx-AAS • Diaphragm type B • Standard hub • Flange-mounted spacer • Protection sleeve		• Dismantling subassembly: spacer – diaphragm elements • Low weight • High lateral natural frequency • Large shaft diameter capacity • Customized spacer
MKB xxx-IIS • Diaphragm type B • Reduced moment hub • Flange-mounted spacer		• Dismantling subassembly: spacer • Low weight • Favorable location of center of gravity • High lateral natural frequency • Customized spacer
MKB xxx-IIK • Diaphragm type B • Reduced moment hub • Without spacer		• Mounting of diaphragm element / coupling hub subassembly onto machine shafts prior to installation on machines • Lowest weight • Highest lateral natural frequency • Shortest overall length
MKA xxx-AAS • Diaphragm type A • Standard hub • Flange-mounted spacer		• Dismantling subassembly: spacer – diaphragm elements • highest angular and axial misalignment capability • Large shaft diameter capacity • Customized spacer

Coupling selection

The determination of the coupling size is based upon the torque requirement of the application. Any peak torques occurring during machine operation must not exceed the admissible torque values of the coupling. Additionally, the admissible axial and angular misalignment of the selected coupling should not be exceeded.

Step 1: Checking of rated torque T_{KN}

$T_{KN} > T_N \cdot K_A \cdot K_E$ with: $T_N = 9550 \cdot P/n$ [Nm]

The nominal torque of the coupling TKN must be higher than the rated torque of the machine TN by the factor KA · KE. The application factor KA is determined from the operational characteristics of the application; the operation factor KE can be set to KE = 1.1.

P	[kW]	Rated power of machine
n	[rpm]	Rated speed of machine
T_N	[Nm]	Rated torque of machine
T_{KN}	[Nm]	Nominal torque of coupling for infinite number of load cycles
K_A		Application factor or experience factor 1.75 (API 671) is in general covered by KA
K_E		Operation factor (for compensation of misalignments)

Step 2: Checking of peak torque T_{KS}

$T_{KS} > T_{max} \cdot \sqrt{K_S \cdot K_E}$

The coupling is able to transmit higher torques for a limited number of load cycles. In case of optimum conditions, the peak coupling torque TKS is allowable. The rating must meet the following requirement.

T_{max}	[Nm]	Maximum shock torque of machine
T_{KS}	[Nm]	Peak torque of coupling for limited number of load cycles
K_E		Operation factor
K_S		Shock increment factor

Step 3: Further detailed checks follow:

3.1 Axial natural frequency

When the coupling size and length (DBSE = distance between shaft ends) has been determined, the coupling is checked with regard to its axial natural frequency. The rotary frequency must be outside the ±10 % band surrounding the axial natural frequency that can be read from the diagrams.

3.2 Lateral natural frequency

With extra long couplings it is important to check the coupling with regard to its lateral natural frequency.

3.3 Detailed project specific data sheets

Our project department can provide a data sheet in which all parameters are exactly determined by computer analysis. (Sizes < 125 and > 800 on request).

Example:

$P = 8\,300$ kW; $n = 12\,000$ rpm ($T_N = 6\,605$ Nm)

$T_{max} = 6 \cdot T_N = 39\,630$ Nm

$K_A = 1.75$ Installation between turbine and generator (see table 1)

Step 1: Checking of rated torque T_{KN}

$K_E = 1.1$

$T_{KN} > T_N \cdot K_A \cdot K_E$

$T_{KN} > 6\,605 \text{ Nm} \cdot 1.75 \cdot 1.1 = 12\,715 \text{ Nm}$

Pre-selected MKB type coupling size acc. to table on page 25: MKB 300

38 100 Nm > 12 715 Nm ✓

Requirement met (for MKB 300, $T_{KN} = 38\,100$ Nm)

Step 2: Checking of peak torque T_{KS}

$K_S = 1.43$ for diaphragm type B at 10^3 load cycles

$T_{KS} > T_{max} \cdot \sqrt{K_S \cdot K_E}$

$T_{KS} > 39\,630 \cdot \sqrt{1.43 \cdot 1.1} = 49\,704 \text{ Nm}$

65 800 Nm > 49 704 Nm ✓

Requirement met (for MKB 300, $T_{KS} = 65\,800$ Nm)

Table 1: Typical application factor KA

	Load characteristic of working machine		
Driving machine	**G** constant torque	**M** slight torque fluctuations	**S** substantial torque fluctuations
Electric motors, turbines, hydraulic motors	1.5 or 1.75	2.20	3.00
Piston engine 4-6 cylinders	2.20	2.60	3.50
Piston engine 1-3 cylinders	2.60	3.50	4.00

Table 2: Excerpt from the load characteristics of machines

Application	G	M	S
Oil and gas		Pipeline pumps	
Blowers and fans	Blowers (axial and radial)		
Generators and converters	Generators		
Pumps	Centrifugal pumps (mobile liquids)	Centrifugal pumps (viscous liquids)	
Compressors	Turbocompressors (axial and radial)		Piston compressors

Table 3: Shock factor K_S

Diaphragm type	Load cycles 10^3	Load cycles 10^4	Load cycles 10^5
B	1.43	1.85	2.53
A	1.18	1.43	1.77

Shaft misalignment

Diaphragm couplings are available in two designs, which allow different diaphragm deflections:

- Diaphragm type B
  Permissible angular misalignment $\Delta K_W = 0.25°$
- Diaphragm type A
  Permissible angular misalignment $\Delta K_W = 0.5°$

The permissible shaft misalignments vary with the diaphragm types and coupling sizes:

- The values for the max. permissible axial misalignment ΔK_a can be determined from pages 21, 25, 29, 33, 37, 41.
- The parallel misalignment ΔK_p can be converted into an angle α by the formula:

$$\alpha = \frac{\Delta K_p}{L_6 + \Delta l} \cdot \frac{180°}{\pi} \text{[deg]}$$

If parallel misalignment a and axis crossing b occur simultaneously, then the two angles must be taken into consideration by the formula:

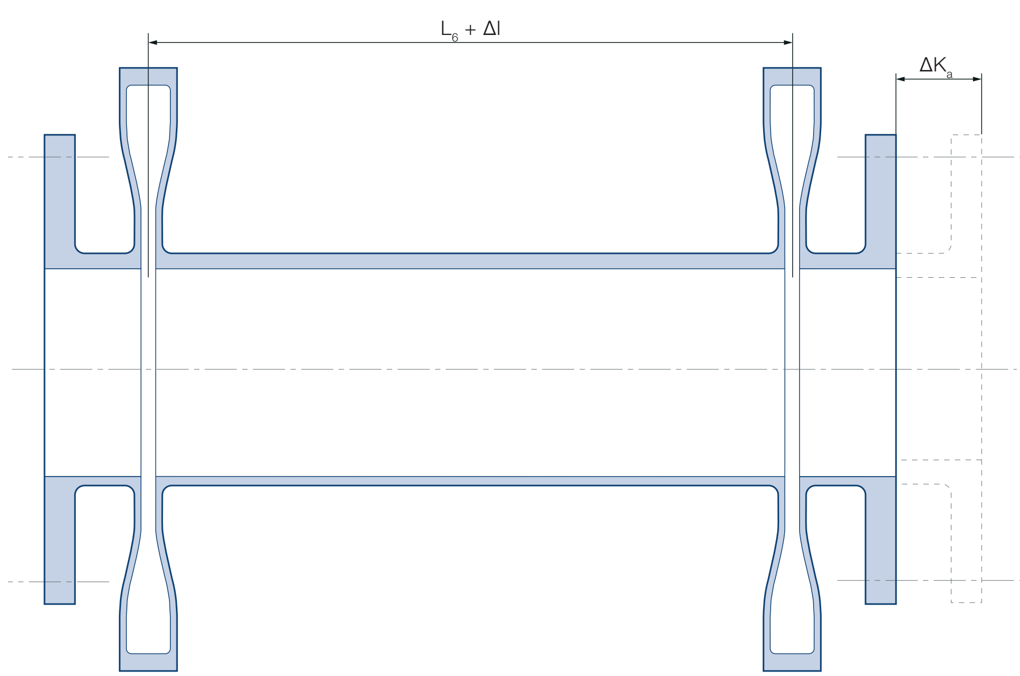
Angular misalignment $\Delta K_w = \alpha + \beta$

- The values for angular misalignment ΔK_w can be determined from pages 21, 25, 29, 33, 37, 41.

If axial or parallel misalignment is expected in one direction only (e.g., thermal expansion), the load of the coupling can be considerably reduced by installing the coupling under prestress. The transmittable torque is increased (see also operation factor KE, page 18).

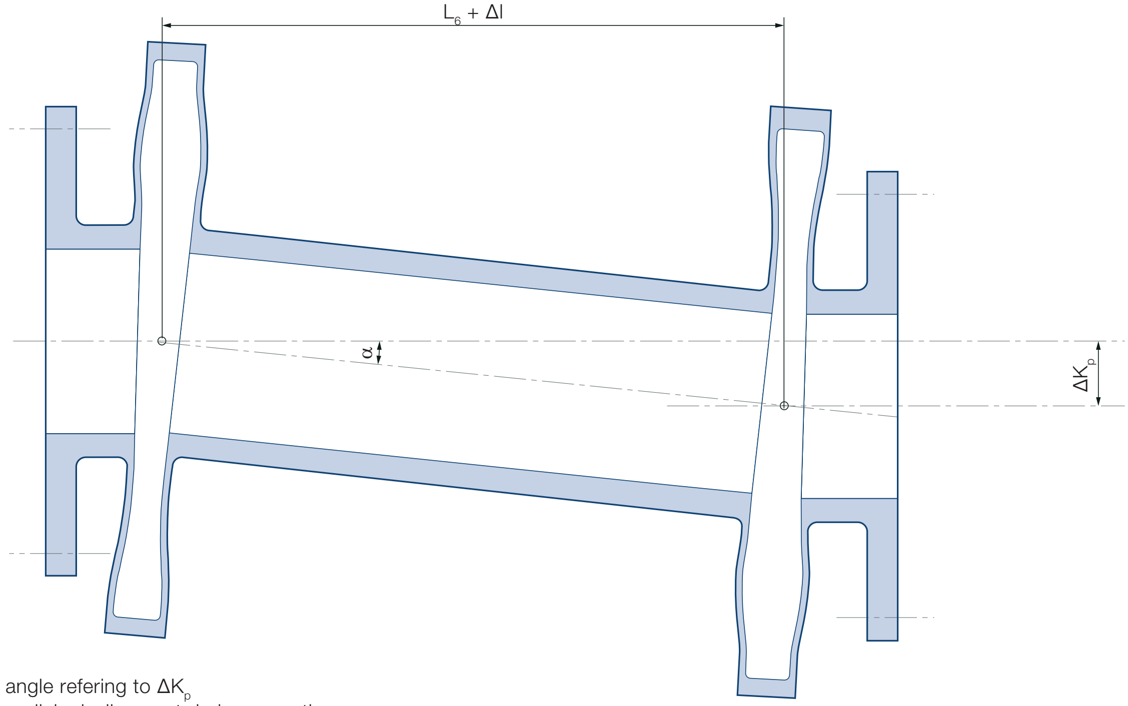
If the admissible values for axial and angular misalignment are not sufficient for your application, please contact us for further assistance.

Axial misalignment ΔKa



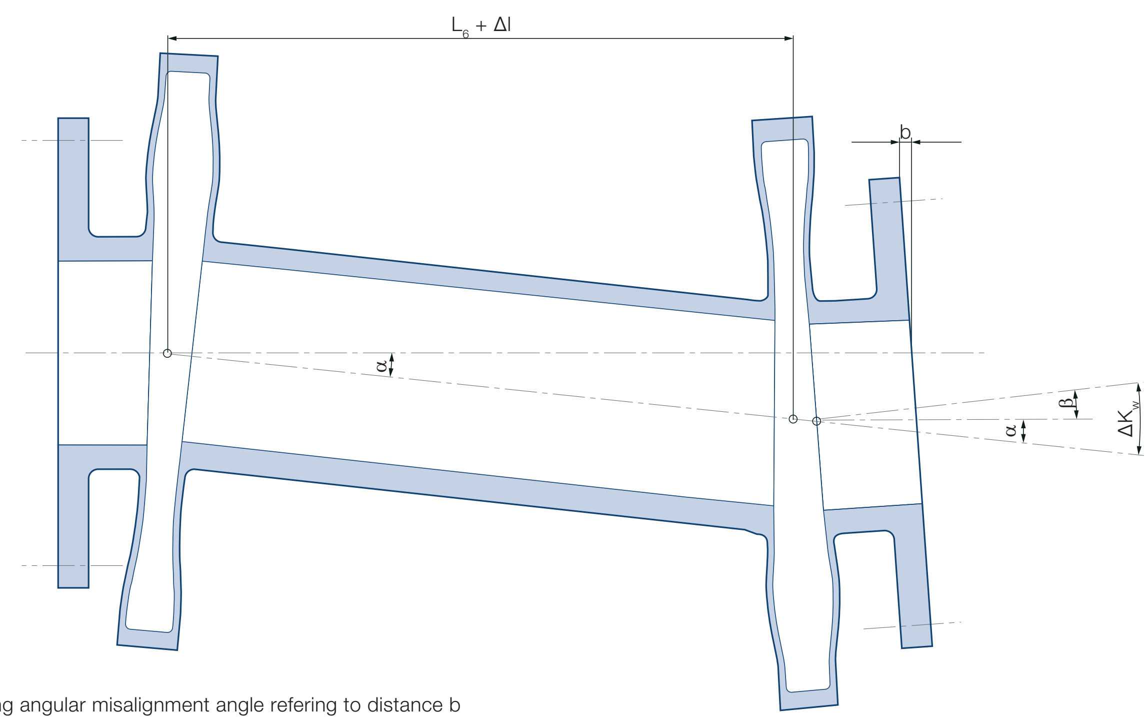
Definitions:
L_6 = distance between the diaphragms
Δl = max. expansion & movement during operation
Check: ΔK_a coupling > ΔK_a during operation

Parallel misalignment ΔKp



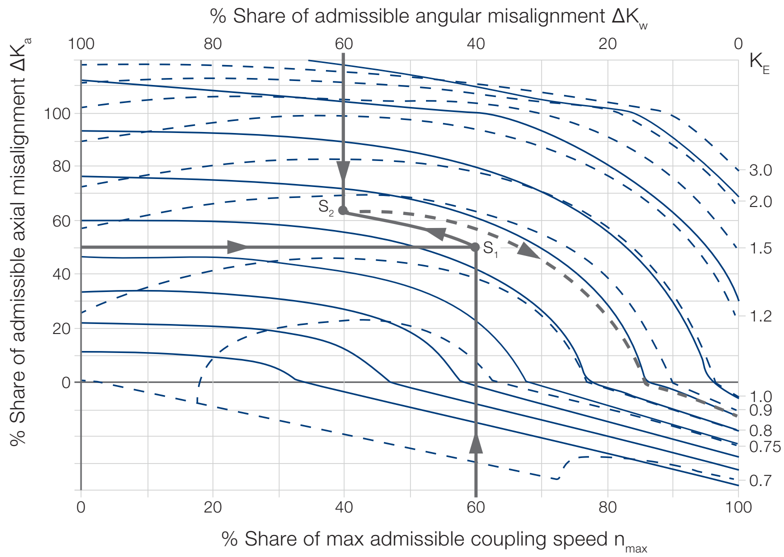
Definitions:
α = resulting angle refering to ΔK_p
ΔK_p = max. parallel misalignment during operation
Check: α < Permissible angular misalignment ΔK_w coupling

Total combined misalignment angle = parallel misalignment ΔKp + angular misalignment ΔKw



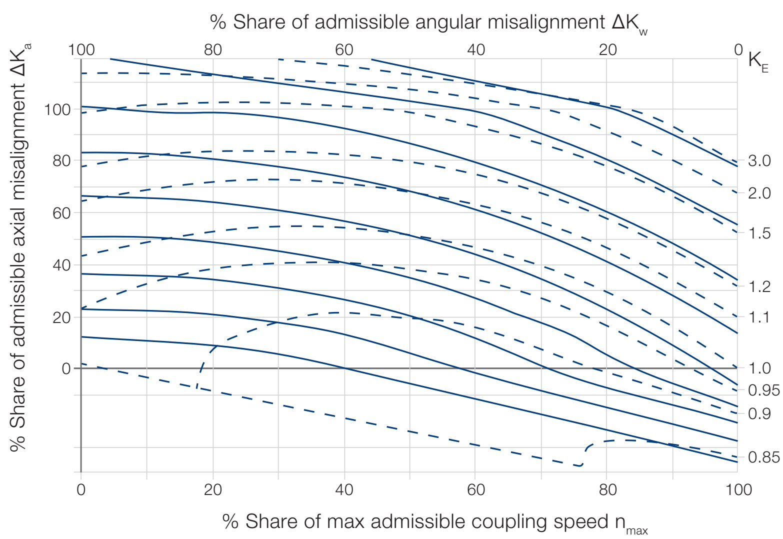
Definitions:
β = resulting angular misalignment angle refering to distance b
Check: Permissible angular misalignment ΔK_w coupling > α + b

Operation factor K_E diaphragm type B



In case of axial and/or angular misalignment values are not yet known set $K_E = 1.1$ (common procedure for a "preliminary coupling selection")

Operation factor K_E diaphragm type A



In case of axial and/or angular misalignment values are not yet known set $K_E = 1.1$ (common procedure for a "preliminary coupling selection")

Our project department can provide a data sheet in which all parameters are exactly determined by computer analysis.
(Sizes < 125 and > 800 on request).

Procedure for determining K_E factor

(Refer to the first diagram on this page for a sample calculation)

- Determine the maximum coupling operational values for axial misalignment, angular misalignment and speed as a percentage of the maximum admissible values for the selected size and type of coupling.
- Locate the percentage of allowable axial misalignment on the left vertical axis and draw a line horizontally across the diagram. Locate the percentage of admissible speed on the lower horizontal axis and draw a vertical line upward, to intersect the horizontal line at point S_1.
- Locate the percentage of admissible angular misalignment on the upper horizontal axis and draw a vertical line downward. From point S_1 draw a curved line parallel to the nearest solid curved line, to intersect the vertical line at point S_2.
- From point S_2, draw a curved line parallel to the nearest point dashed line, to the right vertical axis, and read the resulting value for K_E factor (refer to the first diagram the selected factor K_E = 0.88).

Type designations

Example MK A 200 F F S

Diaphragm coupling — MK

Diaphragm type — A

- B 0.25° angular misalignment ΔK_w per double diaphragm
- A 0.5° angular misalignment ΔK_w per double diaphragm
- Z special diaphragm

Size — 200

Outside diameter of diaphragm in mm

Hub arrangement prime mover side — F

- A Standard hub
- I Reduced moment hub (diaphragm type B only)
- F Flange

Hub arrangement machine side — F

- A Standard hub
- I Reduced moment hub (diaphragm type B only)
- F Flange

Design — S

- S Flange-mounted-spacer
- K Short version without spacer (hub arrangement only)
- E Welded-in-spacer
- T Torsional shaft
- R Electrically insulated
- X High axial forces transmitable
- SO Special design upon request

Technical data

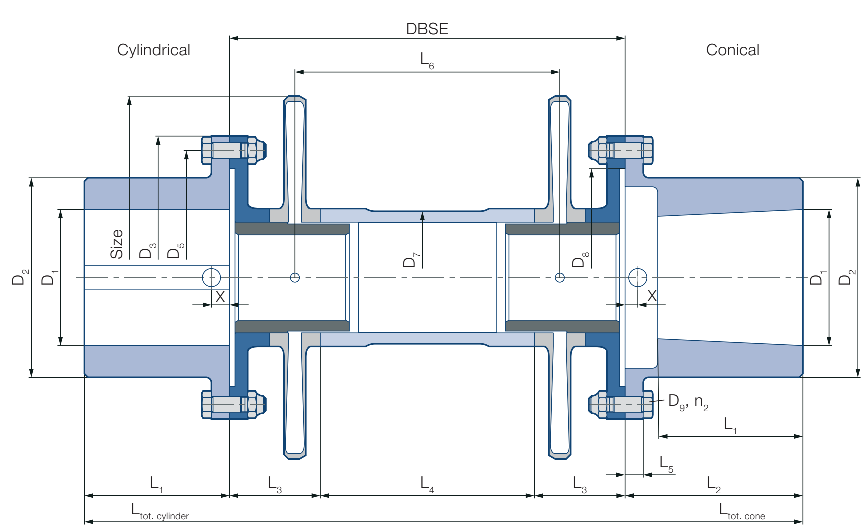
Welded design: MKA xxx-AAE

TwinTors diaphragm couplings type A

- ΔK_W = 0.5° angular misalignment
- Standard coupling hub
- Welded spacer
- Protection sleeve

Dimensions

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
D_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
D_1 max [mm]	56	71	89	111	133	158	178	200	222	249	280	316	356
D_2 norm [mm]**	60	75	95	115	140	165	185	210	230	260	295	330	370
D_2 max [mm]	75	96	120	150	180	213	240	270	300	336	378	426	480
D_3 [mm]	102	131	156	191	230	270	300	342	377	430	470	540	590
D_5 [mm]	90	115	140	175	210	245	275	310	345	390	430	490	545
D_7 [mm]**	45	59	73	91	109	129	146	164	182	205	230	259	293
D_8 [mm]	75	96	120	150	180	213	240	270	300	336	378	426	480
D_9 [mm]	6	8	8	8	10	12	12	16	16	20	20	24	24
L_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
L_2 norm [mm]**	57	71	85	103	127	148	167	192	209	233	265	297	335
L_3 [mm]	39	44	50	58	71	82	90	110	115	134	145	167	180
L_4 norm [mm]**	123	156	189	250	280	351	392	426	492	546	615	681	756
L_4 min [mm]	0	0	0	0	0	0	0	0	0	0	0	0	0
L_5 [mm]	6.0	9.0	8.5	11.5	15.5	17.5	18.0	24.0	24.0	28.5	33.5	36.5	41.5
L_6 norm [mm]**	141	179	217	285	322	400	448	489	562	625	703	781	868
$L_{tot.}$ norm. cone** [mm]	315	386	458	573	676	811	906	1 029	1 139	1 278	1 435	1 608	1 786
$L_{tot.}$ norm. cyl** [mm]	285	350	423	530	622	751	836	946	1 052	1 183	1 325	1 486	1 646
n_1 / n_2	12	12	16	20	18	18	24	16	20	18	18	18	20
DBSE norm [mm]**	201	244	289	366	422	515	572	646	722	813	905	1 014	1 116



Power data

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Power factor P/n [kWmin]	0.227	0.475	0.929	1.812	3.13	5.19	7.43	10.58	14.55	20.4	29.0	41.6	59.5
Nominal torque T_{KN} [Nm]	2 170	4 540	8 870	17 300	29 900	49 600	71 000	101 000	139 000	195 000	277 000	397 000	568 000
Peak torque T_{KS} [Nm]	2 880	6 040	11 800	23 000	39 800	66 000	94 400	134 000	184 000	259 000	369 000	528 000	755 000
Maximum speed n_{max} [rpm]	32 000	30 000	27 100	24 000	20 000	16 900	15 000	13 300	12 000	10 700	9 500	8 500	7 500
Axial misalignment* ΔK_a [mm]	± 2.5	± 3.2	± 4.0	± 5.0	± 6.0	± 7.1	± 8.0	± 9.0	± 10.0	± 11.2	± 12.6	± 14.2	± 16.0
Angular misalignment* ΔK_w [°]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Axial stiffness* C_a [N/mm]	313	387	487	612	737	868	974	1 100	1 222	1 373	1 530	1 725	1 925
Angular stiffness C_w [Nm/rad]	793	1 647	3 216	6 300	10 886	18 038	25 804	36 930	50 657	71 169	101 330	145 000	207 500

Weight*** in kg

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling G cone	3.87	7.77	14.2	26.0	46.4	74.1	105	159	206	295	415	595	821
Complete coupling G cyl	3.74	7.50	13.8	25.2	45.1	72.0	101.6	154	200	287	403	578	796
Per 100 mm DI G100	0.38	0.70	1.03	1.64	2.33	3.20	4.12	5.18	6.46	8.20	10.2	13.0	16.7
1 coupling hub con G_3 cone	0.79	1.59	3.0	5.4	9.9	15.5	22.1	33.5	42.9	61.7	87.9	125	174
1 coupling hub cyl G_3 cyl	0.73	1.45	2.8	5.0	9.2	14.5	20.6	31.2	39.9	57.6	82.0	117	161
1/2 element G_2	0.75	1.48	2.6	4.5	8.3	12.9	18.0	28.7	35.8	52.1	71.6	104	141
1/2 spacer G_1	0.39	0.82	1.51	3.08	5.08	8.60	12.2	17.1	24.1	34.0	48.1	68.1	96.2

Mass moment of inertia*** in kgm²

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling I	0.0041	0.0140	0.0386	0.107	0.280	0.613	1.09	2.13	3.36	6.10	10.6	19.6	33.0
Per 100 mm D_l I_{100}	0.0002	0.0005	0.0012	0.0029	0.0058	0.0112	0.0185	0.0294	0.0450	0.0725	0.114	0.184	0.301
1 coupling hub con I_3	0.0008	0.0027	0.0075	0.0200	0.0547	0.116	0.207	0.417	0.634	1.16	2.05	3.80	6.40

Torsional stiffness [x 106]*** in Nm/rad

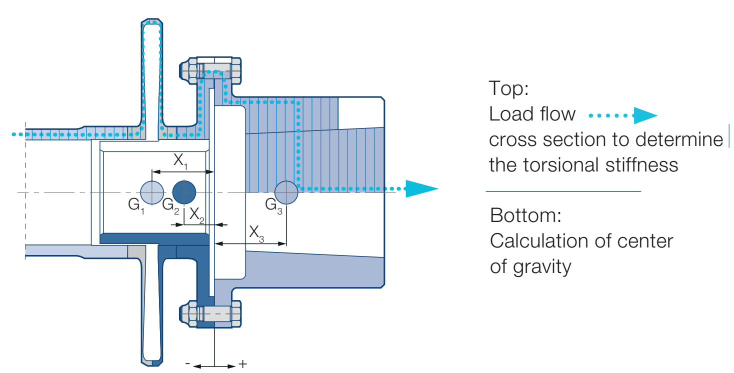
Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling Ct	0.085	0.181	0.353	0.647	1.17	1.85	2.68	3.93	5.22	7.47	10.5	15.2	21.9
Per 100 mm D_l Ct_{100}	0.167	0.517	1.18	2.90	5.93	11.5	18.9	29.9	45.9	73.9	116	187	307
1 coupling hub cone C_{t3}	0.894	1.84	4.01	7.01	12.2	20.7	29.7	41.5	57.7	80.4	113	156	225

Center of gravity*** in mm

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling X cone	-1.9	-0.9	0.9	0.9	2.2	2.3	3.9	1.9	2.8	1.8	6.2	4.4	8.5
Complete coupling X cyl	-6.0	-5.7	-4.1	-5.0	-5.2	-6.1	-5.9	-9.4	-9.1	-11.5	-9.6	-12.7	-11.5
1 coupling hub con X_3 cone	23.2	27.8	33.9	40.7	49.7	59.1	66.8	75.0	82.2	92.2	107.8	118.3	135.6
1 coupling hub cyl X_3 cyl	14.8	18.2	24.0	29.0	35.0	42.3	47.3	52.5	58.4	65.7	76.3	84.1	96.1
1/2 element X_2	-13.7	-14.3	-16.1	-18.3	-22.4	-26.1	-28.4	-35.5	-36.5	-43.0	-46.5	-53.3	-57.7
1/2 spacer X_1	-30.0	-32.5	-36.0	-40.5	-50.0	-57.5	-62.0	-78.5	-80.0	-94.0	-101.0	-116.5	-124.0

Calculation of center of gravity

Half coupling values: weight 1/2 G cone or cyl and center of gravity X:
$X = (X_1{*}G_1 + X_2{*}G_2 + X_3{*}G_3) : G_{1+2+3}$
1/2 G cone or cyl = $G_1 + G_2 + G_3$



* Data related to complete coupling

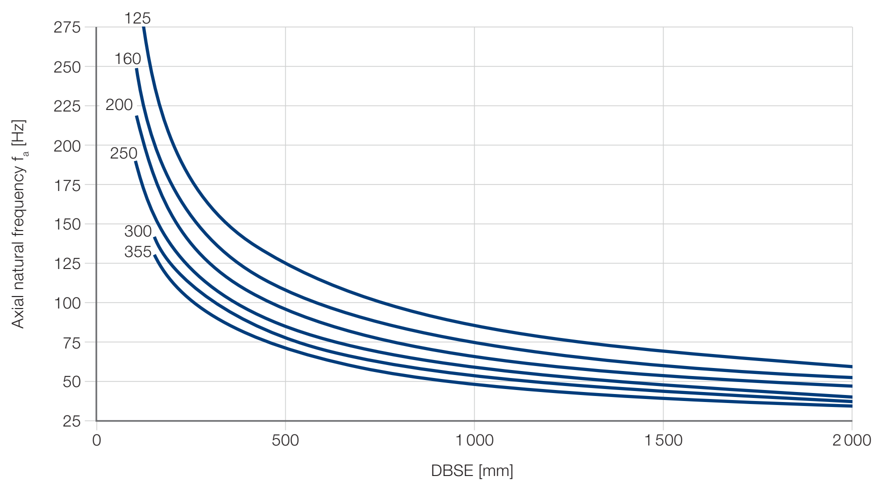
** Dimensions freely selectable as coupling hubs and spacer are custom-made

*** Data calculated for “normal coupling”, i.e., the “norm” dimension (e.g., D_{1norm}) has been assumed for the freely selectable dimensions (**)

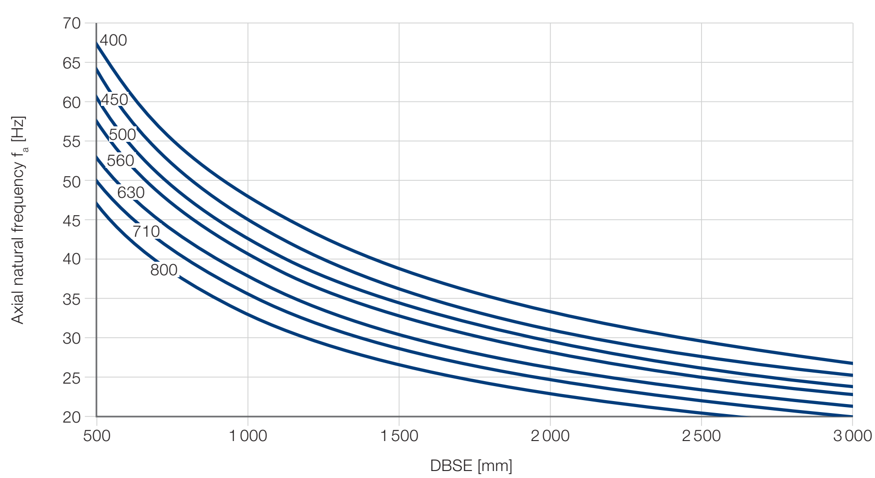
Coupling sizes < 125 and > 800 on request

Axial natural frequency f_a

MKA 125 – 355



MKA 400 – 800



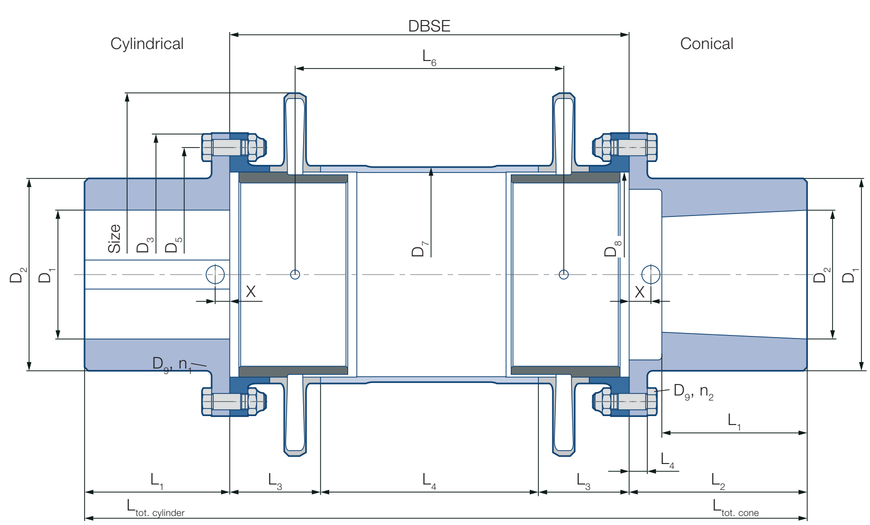
Welded design: MKB xxx-AAE

TwinTors diaphragm couplings type B

- ΔK_W = 0.25° angular misalignment
- Standard coupling hub
- Welded-in-spacer
- Protection sleeve

Dimensions

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
D_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
D_1 max [mm]	56	71	89	111	133	158	178	200	222	249	280	316	356
D_2 norm [mm]**	60	75	95	115	140	165	185	210	230	260	295	330	370
D_2 max [mm]	75	96	120	150	180	213	240	270	300	336	378	426	480
D_3 [mm]	102	131	156	191	230	270	300	342	377	430	470	540	590
D_5 [mm]	90	115	140	175	210	245	275	310	345	390	430	490	545
D_7 [mm]**	75	95	120	149	179	212	239	269	299	335	377	425	479
D_8 [mm]	71	90	113	141	169	200	226	254	282	316	356	401	452
D_9 [mm]	6	8	8	8	10	12	12	16	16	20	20	24	24
L_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
L_2 norm [mm]**	57	71	85	103	127	148	167	192	209	233	265	297	335
L_3 [mm]	39	44	50	58	71	82	90	110	115	134	145	167	180
L_4 norm [mm]**	123	156	189	250	280	351	392	426	492	546	615	681	756
L_4 min [mm]	0	0	0	0	0	0	0	0	0	0	0	0	0
L_5 [mm]	6.0	9.0	8.5	11.5	15.5	17.5	18.0	24.0	24.0	28.5	33.5	36.5	41.5
L_6 norm [mm]**	141	179	217	285	322	400	448	489	562	625	703	781	868
$L_{tot.}$ norm. cone** [mm]	315	386	458	573	676	811	906	1 029	1 139	1 278	1 435	1 608	1 786
$L_{tot.}$ norm. cyl** [mm]	285	350	423	530	622	751	836	946	1 052	1 183	1 325	1 486	1 646
n_1 / n_2	10	10	12	18	18	18	22	18	22	18	22	20	26
DBSE norm [mm]**	201	244	289	366	422	515	572	646	722	813	905	1 014	1 116



Power data

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Power factor P/n [kWmin]	0.293	0.607	1.183	2.314	3.99	6.62	9.47	13.51	18.53	26.0	37.0	53.0	75.7
Nominal torque T_{KN} [Nm]	2 800	5 800	11 300	22 100	38 100	63 200	90 400	129 000	177 000	248 000	353 000	506 000	723 000
Peak torque T_{KS} [Nm]	4 800	10 000	19 500	38 100	65 800	109 000	156 000	222 000	305 000	428 000	609 000	872 000	1 248 000
Maximum speed n_{max} [rpm]	32 000	30 000	27 100	24 000	20 000	16 900	15 000	13 300	12 000	10 700	9 500	8 500	7 500
Axial misalignment* ΔK_a [mm]	± 1.4	± 1.8	± 2.2	± 2.8	± 3.3	± 3.9	± 4.4	± 5.0	± 5.5	± 6.2	± 6.9	± 7.8	± 8.8
Angular misalignment* ΔK_w [°]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Axial stiffness* C_a [N / mm]	813	1 002	1 251	1 557	1 864	2 183	2 502	2 826	3 140	3 531	3 910	4 407	4 887
Angular stiffness C_w [Nm / rad]	2 167	4 407	8 608	16 935	29 263	48 490	69 356	99 130	135 980	191 045	266 280	381 150	545 240

Weight*** in kg

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling G cone	3.46	7.01	12.3	22.6	40.5	65.8	90.2	137	179	262	365	524	718
Complete coupling G cyl	3.59	7.28	12.6	23.4	41.9	68.0	93.4	142	186	271	377	541	744
Per 100 mm DI G100	0.45	0.63	1.08	1.52	2.25	3.17	3.87	4.99	6.26	7.82	9.71	12.5	15.8
1 coupling hub con G_3 cone	0.79	1.69	2.9	5.3	9.8	15.7	21.5	33.2	42.5	62.9	89.3	127	176
1 coupling hub cyl G_3 cyl	0.73	1.56	2.7	4.9	9.1	14.6	19.9	30.8	39.3	58.7	83.2	119	163
1/2 element G_2	0.66	1.27	2.1	3.8	6.9	10.9	15.0	23.4	29.7	43.8	59.1	86.2	116
1/2 spacer G_1	0.34	0.68	1.32	2.56	4.30	7.43	10.21	14.44	20.58	28.65	40.03	57.05	80.42

Mass moment of inertia*** in kgm²

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling I	0.0049	0.0165	0.0426	0.122	0.314	0.709	1.22	2.38	3.81	7.06	12.2	22.5	38.6
Per 100 mm D_l I_{100}	0.0006	0.0013	0.0036	0.0080	0.0170	0.0336	0.0522	0.0853	0.132	0.207	0.326	0.532	0.854
1 coupling hub con I_3	0.0008	0.0030	0.0070	0.0199	0.0545	0.120	0.200	0.413	0.630	1.22	2.12	3.91	6.59

Torsional stiffness [x 106]*** in Nm/rad

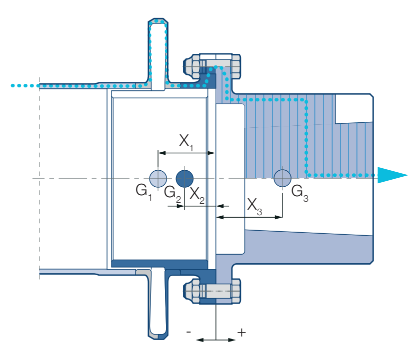
Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling Ct	0.143	0.298	0.615	1.15	2.07	3.37	4.73	6.89	9.33	13.2	18.8	27.0	38.8
Per 100 mm D_l Ct_{100}	0.60	1.36	3.71	8.11	17.32	34.24	53.18	86.90	134.55	210.97	332.12	541.70	870.80
1 coupling hub cone C_{t3}	0.851	1.79	3.7	6.9	12.3	20.5	28.2	41.5	55.2	79.9	116	164	232

Center of gravity*** in mm

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling X cone	-1.2	0.5	1.9	2.2	3.9	4.0	5.8	4.9	5.2	5.1	10.4	9.0	13.2
Complete coupling X cyl	-5.6	-4.5	-3.8	-4.5	-4.6	-5.5	-5.5	-8.2	-8.5	-9.7	-7.5	-10.3	-9.5
1 coupling hub con X_3 cone	23.2	26.6	35.4	41.5	50.6	59.3	68.9	76.5	83.8	91.9	107.9	118.3	135.7
1 coupling hub cyl X_3 cyl	14.8	17.5	24.7	29.2	35.2	42.0	48.2	52.9	58.8	65.0	75.7	83.4	95.4
1/2 element X_2	-15.4	-16.6	-19.8	-23.9	-29.0	-34.0	-38.2	-45.2	-48.1	-54.7	-61.4	-69.0	-77.6
1/2 spacer X_1	-30.0	-32.5	-36.0	-40.5	-50.0	-57.5	-62.0	-78.5	-80.0	-94.0	-101.0	-116.5	-124.0

Calculation of center of gravity

Half coupling values: weight 1/2 G cone or cyl and center of gravity X:
$X = (X_1{*}G_1 + X_2{*}G_2 + X_3{*}G_3) : G_{1+2+3}$
1/2 G cone or cyl = $G_1 + G_2 + G_3$



Top:
Load flow
cross section to determine the torsional stiffness

Bottom:
Calculation of center of gravity

* Data related to complete coupling

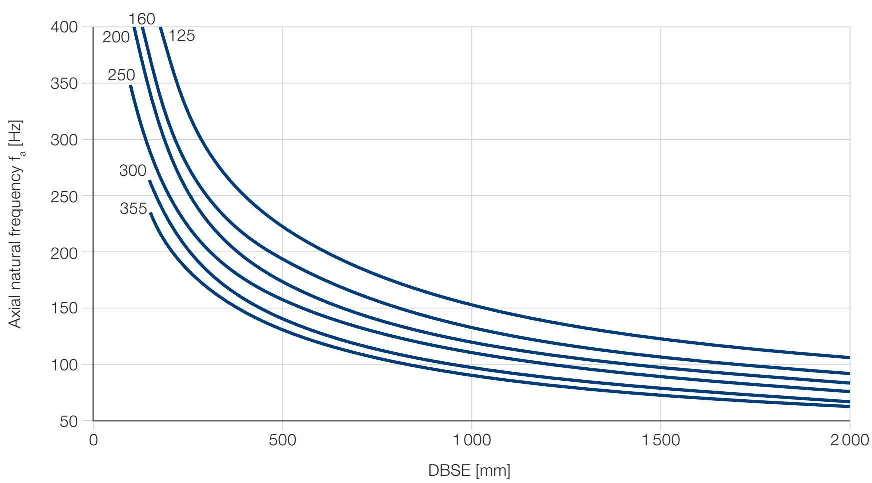
** Dimensions freely selectable as coupling hubs and spacer are custom-made

*** Data calculated for "normal coupling", i.e., the "norm" dimension (e.g., D_{1norm}) has been assumed for the freely selectable dimensions (**)

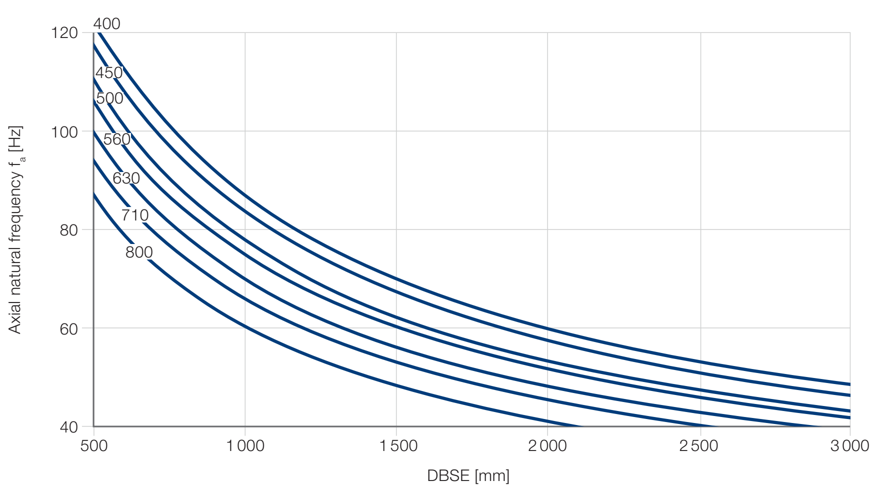
Coupling sizes < 125 and > 800 on request

Axial natural frequency f_a

MKB 125 – 355



MKB 400 – 800



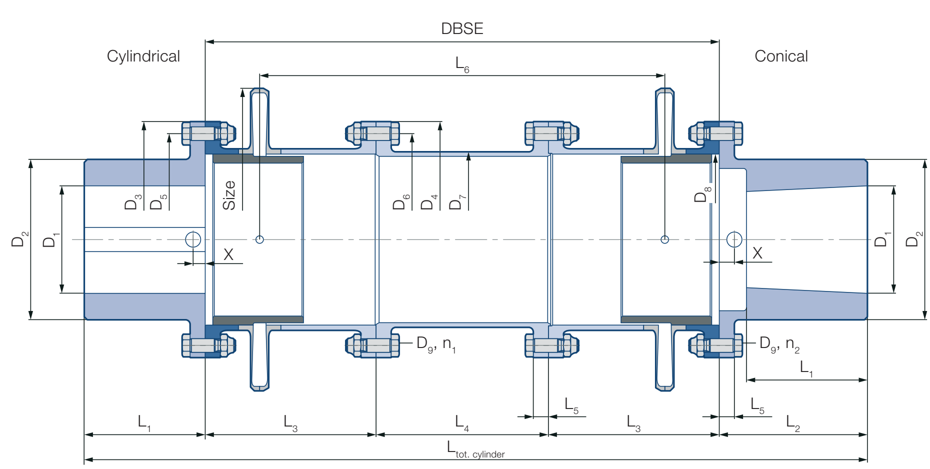
Bolted design: MKB xxx-AAS

TwinTors diaphragm couplings type B

- ΔK_W = 0.25° angular misalignment
- Standard coupling hub
- Flange-mounted spacer
- Protection sleeve

Dimensions

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
D_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
D_1 max [mm]	56	71	89	111	133	158	178	200	222	249	280	316	356
D_2 norm [mm]**	60	75	95	115	140	165	185	210	230	260	295	330	370
D_2 max [mm]	75	96	120	150	180	213	240	270	300	336	378	426	480
D_3 / D_4 [mm]	102	131	156	191	230	270	300	342	377	430	470	540	590
D_5 / D_6 [mm]	90	115	140	175	210	245	275	310	345	390	430	490	545
D_7 [mm]**	74	94	118	147	176	208	235	264	293	328	369	416	469
D_8 [mm]	71	90	113	141	169	200	226	254	282	316	356	401	452
D_9 [mm]	6	8	8	8	10	12	12	16	16	20	20	24	24
L_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
L_2 norm [mm]**	57	71	85	103	127	148	167	192	209	233	265	297	335
L_3 [mm]	80	96	113	147	165	207	230	252	290	326	362	406	447
L_4 norm [mm]**	41	53	63	72	92	101	112	142	142	161	181	202	222
L_4 min [mm]	41	53	63	72	92	101	112	142	142	161	181	202	222
L_5 [mm]	6.0	9.0	8.5	11.5	15.5	17.5	18.0	24.0	24.0	28.5	33.5	36.5	41.5
L_6 norm [mm]**	141	179	217	285	322	400	448	489	562	625	703	781	868
$L_{tot.}$ norm. cone** [mm]	315	386	459	573	676	811	906	1 029	1 139	1 278	1 435	1 608	1 786
$L_{tot.}$ norm. cyl** [mm]	285	350	423	530	622	751	836	946	1 052	1 183	1 325	1 486	1 646
n_1 / n_2	10	10	12	18	18	18	24	16	22	18	18	20	26
DBSE norm [mm]**	201	244	289	366	422	515	572	646	722	813	905	1 014	1 116



Power data

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Power factor P/n [kWmin]	0.293	0.607	1.183	2.314	3.99	6.62	9.47	13.51	18.53	26.0	37.0	53.0	75.7
Nominal torque T_{KN} [Nm]	2 800	5 800	11 300	22 100	38 100	63 200	90 400	129 000	177 000	248 000	353 000	506 000	723 000
Peak torque T_{KS} [Nm]	4 800	10 000	19 500	38 100	65 800	109 000	156 000	222 000	305 000	428 000	609 000	872 000	1 248 000
Maximum speed n_{max} [rpm]	32 000	30 000	27 100	24 000	20 000	16 900	15 000	13 300	12 000	10 700	9 500	8 500	7 500
Axial misalignment* ΔK_a [mm]	± 1.4	± 1.8	± 2.2	± 2.8	± 3.3	± 3.9	± 4.4	± 5.0	± 5.5	± 6.2	± 6.9	± 7.8	± 8.8
Angular misalignment* ΔK_w [°]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Axial stiffness* C_a [N / mm]	813	1 002	1 251	1557	1 864	2 183	2 502	2 826	3 140	3 531	3 910	4 407	4 887
Angular stiffness C_w [Nm / rad]	2 167	4 407	8 608	16 935	29 263	48 490	69 356	99 130	135 980	191 045	266 280	381 150	545 240

Weight*** in kg

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling G cone	4.45	9.39	15.4	28.4	51.1	82.3	112	173	223	328	452	654	883
Complete coupling G cyl	4.33	9.12	15.0	27.6	49.8	80.2	108	168	216	320	440	637	858
Per 100 mm DI G100	0.44	0.67	1.12	1.58	2.31	3.23	4.21	5.05	6.30	7.84	10.1	12.9	16.3
1 coupling hub con G_3 cone	0.79	1.69	2.9	5.3	9.8	15.7	21.4	33.1	42.4	62.8	89.1	127	176
1 coupling hub cyl G_3 cyl	0.73	1.56	2.7	4.9	9.1	14.6	19.9	30.8	39.3	58.7	83.2	119	163
1/2 element G_2	0.66	1.27	2.1	3.8	6.9	10.9	15.0	23.4	29.7	43.8	59.1	86.4	116
1/2 spacer G_1	0.78	1.73	2.7	5.1	8.9	14.6	19.4	29.9	39.2	57.7	77.9	114	150

Mass moment of inertia*** in kgm^2

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling I	0.0066	0.0230	0.0554	0.157	0.411	0.913	1.55	3.10	4.86	9.15	15.5	29.0	48.4
Per 100 mm D_l I_{100}	0.0006	0.0014	0.0037	0.0080	0.0168	0.0328	0.0545	0.0828	0.127	0.198	0.324	0.525	0.840
1 coupling hub con I_3	0.0008	0.0030	0.0070	0.0198	0.0544	0.120	0.199	0.412	0.629	1.21	2.12	3.91	6.58

Torsional stiffness [x 10^6]*** in Nm/rad

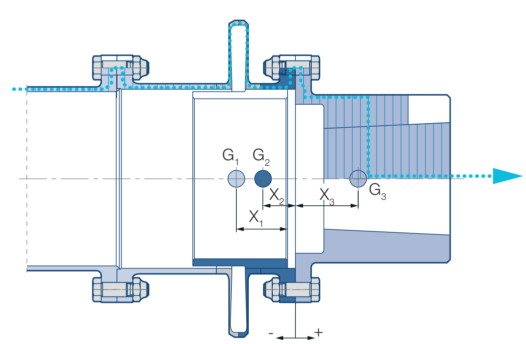
Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling Ct	0.148	0.320	0.644	1.23	2.23	3.59	5.06	7.37	9.9	14.0	20.1	28.7	41.3
Per 100 mm D_l Ct_{100}	0.575	1.42	3.73	8.19	17.1	33.4	55.5	84.4	130	202	330	535	856
1 coupling hub cone C_{t3}	0.851	1.79	3.73	6.92	12.5	20.7	28.47	41.9	55.8	80.6	117	165	233

Center of gravity*** in mm

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling X cone	-6.8	-6.9	-5.1	-5.5	-6.1	-7.0	-5.5	-10.4	-9.4	-12.8	-8.7	-13.3	-9.1
Complete coupling X cyl	-10.5	-11.0	-9.8	-11.0	-13.1	-14.9	-15.0	-21.1	-20.8	-25.0	-23.6	-29.2	-28.1
1 coupling hub con X_3 cone	23.2	26.6	35.1	41.1	50.1	58.8	68.3	75.7	83.0	91.1	106.8	117.2	134.6
1 coupling hub cyl X_3 cyl	14.8	17.5	24.7	29.2	35.2	42.0	48.2	52.9	56.8	65.0	75.7	83.4	95.4
1/2 element X_2	-15.4	-16.6	-19.8	-23.9	-29.0	-34.0	-38.2	-45.2	-48.1	-54.7	-61.4	-69.0	-77.6
1/2 spacer X_1	-30.0	-32.5	-36.0	-40.5	-50.0	-57.5	-62.0	-78.5	-80.0	-94.0	-101.0	-116.5	-124.0

Calculation of center of gravity

Half coupling values: weight 1/2 G cone or cyl and center of gravity X:
$X = (X_1{*}G_1 + X_2{*}G_2 + X_3{*}G_3) : G_{1+2+3}$
1/2 G cone or cyl = $G_1 + G_2 + G_3$



Top:
Load flow
cross section to determine the torsional stiffness

Bottom:
Calculation of center of gravity

* Data related to complete coupling

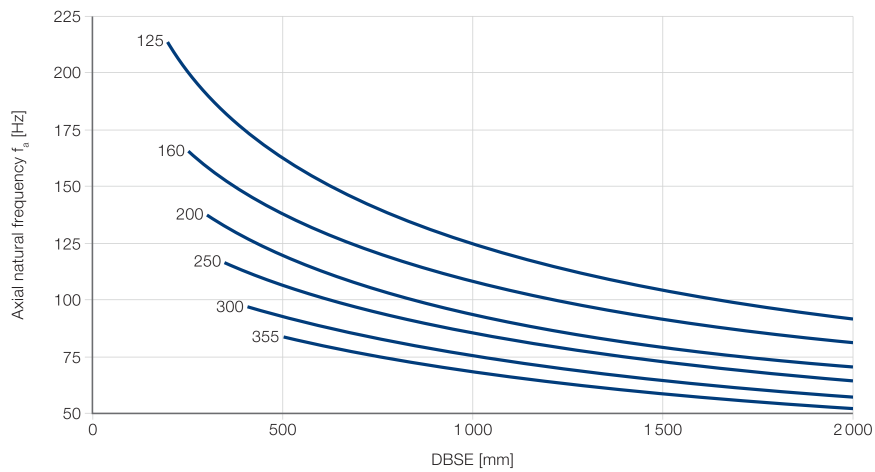
** Dimensions freely selectable as coupling hubs and spacer are custom-made

*** Data calculated for “normal coupling”, i.e., the “norm” dimension (e.g., D_{1norm}) has been assumed for the freely selectable dimensions (**)

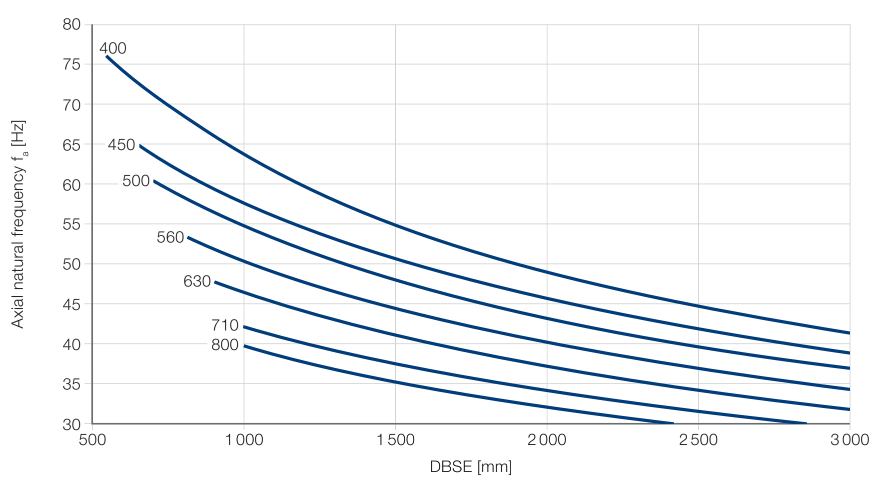
Coupling sizes < 125 and > 800 on request

Axial natural frequency f_a

MKB 125 – 355



MKB 400 – 800



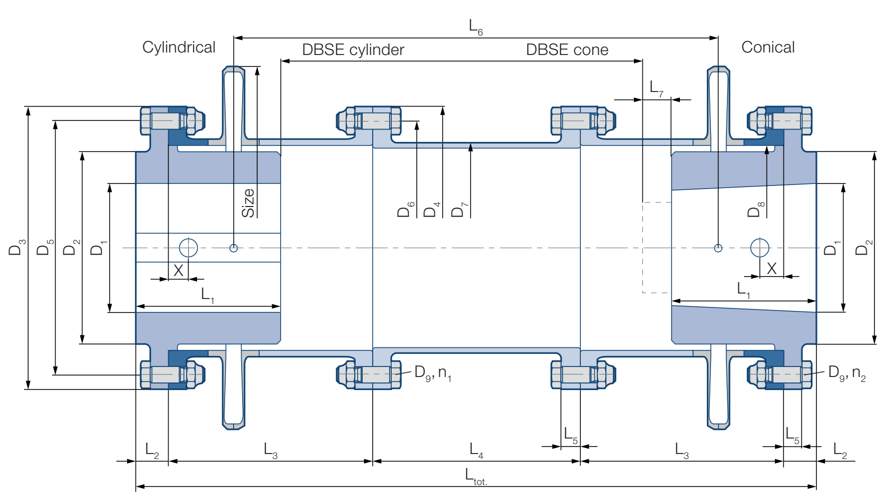
Bolted design: MKB xxx-IIS

TwinTors diaphragm couplings type B

- ΔK_W = 0.25° angular misalignment
- Reduced moment hub
- Flange-mounted spacer

Dimensions

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
D_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
D_1 max [mm]	51	65	81	102	122	145	163	184	204	228	257	290	326
D_2 norm [mm]**	60	75	95	115	140	165	185	210	230	260	295	330	370
D_2 max [mm]	69	88	110	138	165	196	220	248	275	308	347	391	440
D_3 / D_4 [mm]	102	131	156	191	230	270	300	342	377	430	470	540	590
D_5 / D_6 [mm]	90	115	140	175	210	245	275	310	345	390	430	490	545
D_7 [mm]**	74	94	118	147	176	208	235	264	293	328	369	416	469
D_8 [mm]	71	90	113	141	169	200	226	254	282	316	356	401	452
D_9 [mm]	6	8	8	8	10	12	12	16	16	20	20	24	24
L_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
L_2 norm [mm]**	12	15.5	18	20	25	28	31	40	40	45	50	57	62
L_3 [mm]	80	96	113	147	165	207	230	252	290	326	362	406	447
L_4 norm [mm]**	101	128	161	196	242	281	314	362	392	441	501	560	628
L_4 min [mm]	41	53	63	72	92	101	112	142	142	161	181	202	222
L_5 [mm]	6.0	9.0	8.5	11.5	15.5	17.5	18.0	24.0	24.0	28.5	33.5	36.5	41.5
L_6 norm [mm]**	201	254	315	409	472	580	650	709	812	905	1023	1139	1274
L_7 norm [mm]**	15	18	18	18	20	25	32	32	40	40	40	50	50
$L_{tot.}$ norm** [mm]	285	350	423	530	622	751	836	946	1 052	1 183	1 325	1 486	1 646
n_1 / n_2	10	10	12	18	18	18	22	18	22	18	22	20	26
DBSE cone [mm]**	171	208	253	330	382	465	508	582	642	733	825	914	1 016
DBSE cyl [mm]**	201	244	289	366	422	515	572	646	722	813	905	1 014	1 116



Power data

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Power factor P/n [kWmin]	0.293	0.607	1.183	2.314	3.99	6.62	9.47	13.51	18.53	26.0	37.0	53.0	75.7
Nominal torque T_{KN} [Nm]	2800	5800	11300	22100	38100	63200	90400	129000	177000	248000	353000	506000	723000
Peak torque T_{KS} [Nm]	4800	10000	19500	38100	65800	109000	156000	222000	305000	428000	609000	872000	1248000
Maximum speed n_{max} [rpm]	32000	30000	27100	24000	20000	16900	15000	13300	12000	10700	9500	8500	7500
Axial misalignment* ΔK_a [mm]	± 1.4	± 1.8	± 2.2	± 2.8	± 3.3	± 3.9	± 4.4	± 5.0	± 5.5	± 6.2	± 6.9	± 7.8	± 8.8
Angular misalignment* ΔK_w [°]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Axial stiffness* C_a [N/mm]	813	1002	1251	1557	1864	2183	2502	2826	3140	3531	3910	4407	4887
Angular stiffness C_w [Nm/rad]	2167	4407	8608	16935	29263	48490	69356	99130	135980	191045	266280	381150	545240

Weight*** in kg

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling G	4.1	8.8	14.7	27.0	48.7	78.5	106	164	212	312	431	623	841
Per 100 mm DI G100	0.44	0.67	1.12	1.58	2.31	3.23	4.21	5.05	6.30	7.84	10.1	12.9	16.3
1 coupling hub G_3	0.75	1.62	2.8	5.2	9.5	15.3	20.9	32.4	41.5	61.5	87.1	124	171
1/2 element G_2	0.39	0.80	1.3	2.3	4.1	6.4	8.7	14.0	17.4	25.7	34.1	50.6	66.0
1/2 spacer G_1	0.91	1.98	3.26	6.03	10.7	17.5	23.6	35.4	47.1	68.6	94.1	137	183

Mass moment of inertia*** in kgm²

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling I	0.0064	0.0224	0.0544	0.154	0.403	0.896	1.52	3.02	4.76	8.94	15.2	28.4	47.5
Per 100 mm D_l I_{100}	0.0006	0.0014	0.0037	0.0080	0.0168	0.0328	0.0545	0.0828	0.127	0.198	0.324	0.525	0.840
1 coupling hub I_3	0.0008	0.0028	0.0066	0.0187	0.0515	0.113	0.187	0.389	0.592	1.15	2.01	3.70	6.19

Torsional stiffness [x 10⁶]*** in Nm/rad

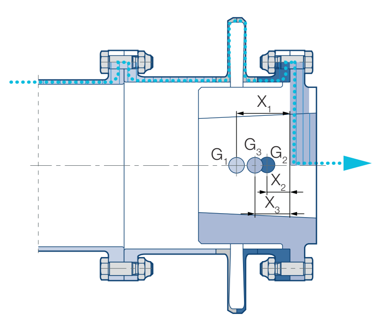
Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling Ct	0.175	0.373	0.748	1.43	2.56	4.09	5.90	8.43	11.4	15.9	22.8	32.8	47.5
Per 100 mm D_l Ct_{100}	0.57	1.42	3.73	8.19	17.1	33.4	55.5	84.4	130	202	330	535	856
1 coupling hub C_{t3}	7.57	14.1	35.9	77.5	147	234	367	448	656	878	1 396	1 863	2 878

Center of gravity*** in mm

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling X	16.9	18.2	21.7	25.1	30.2	35.7	39.4	46.0	49.6	56.9	62.4	71.1	77.4
1 coupling hub X_3	4.7	4.5	9.3	11.6	13.1	17.0	20.5	17.9	23.3	25.0	30.1	32.4	38.8
1/2 element X_2	9.8	10.2	12.4	14.9	18.2	21.0	23.5	28.8	30.0	34.2	38.2	43.2	48.4
1/2 spacer X_1	30.0	32.5	36.0	40.5	50.0	57.5	62.0	78.5	80.0	94.0	101.0	116.5	124.0

Calculation of center of gravity

Half coupling values: weight 1/2 G cone or cyl and center of gravity X:
$X = (X_1{*}G_1 + X_2{*}G_2 + X_3{*}G_3) : G_{1+2+3}$
1/2 G cone or cyl $= G_1 + G_2 + G_3$



Top:
Load flow
cross section to determine the torsional stiffness

Bottom:
Calculation of center of gravity

* Data related to complete coupling

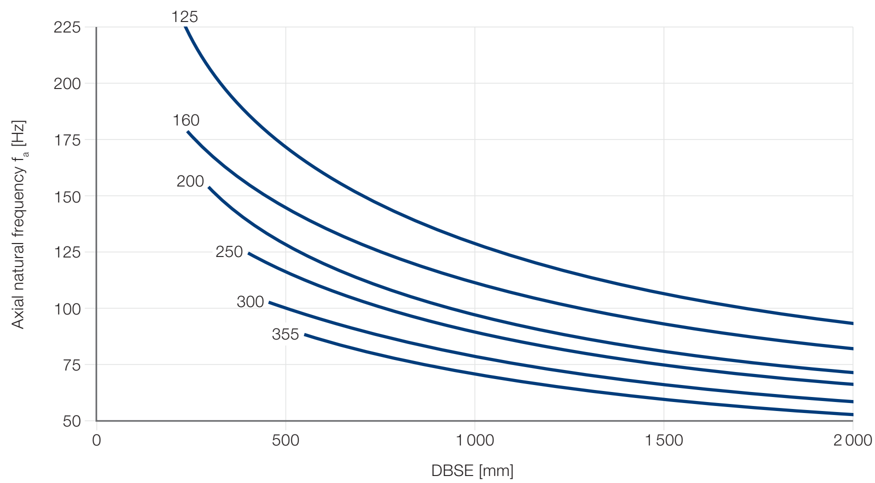
** Dimensions freely selectable as coupling hubs and spacer are custom-made

*** Data calculated for “normal coupling”, i.e., the “norm” dimension (e.g., D_{1norm}) has been assumed for the freely selectable dimensions (**)

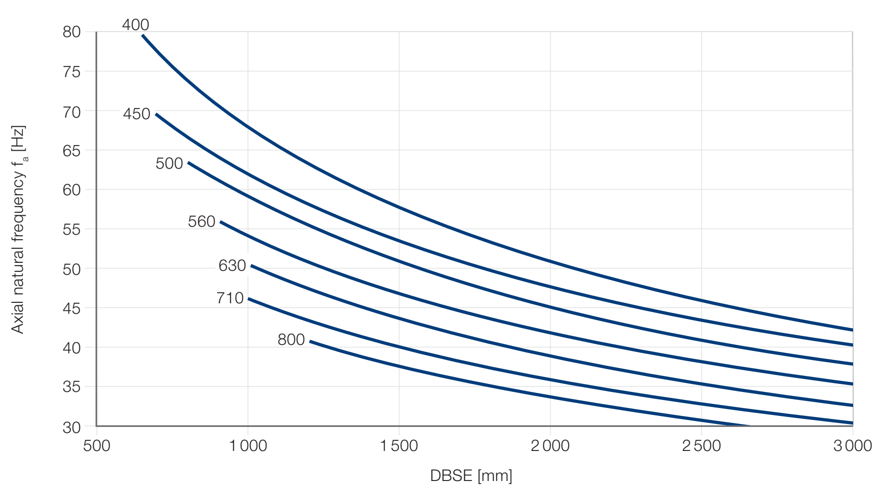
Coupling sizes < 125 and > 800 on request

Axial natural frequency f_a

MKB 125 – 355



MKB 400 – 800



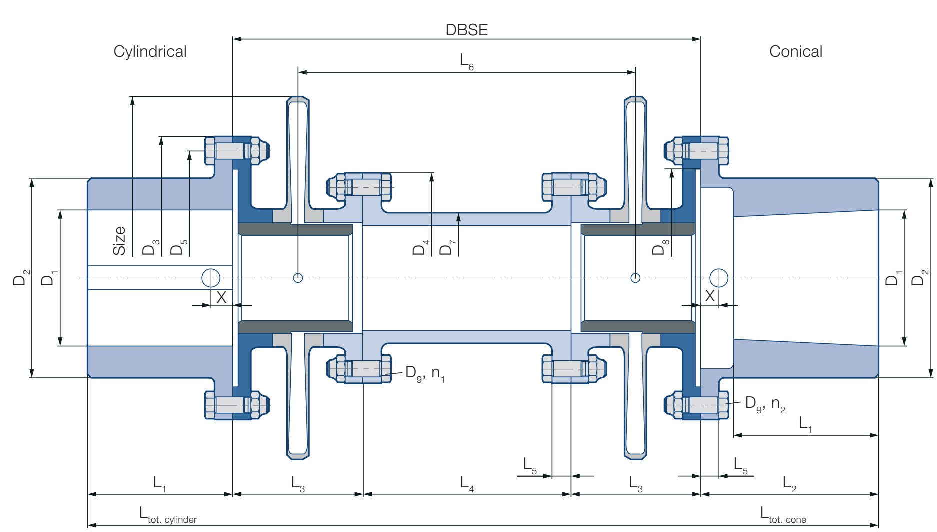
Bolted design: MKA xxx-AAS

TwinTors diaphragm couplings type A

- ΔK_W = 0.5° angular misalignment
- Standard coupling hub
- Range-mounted spacer
- Protection sleeve

Dimensions

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
D_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
D_1 max [mm]	56	71	89	111	133	158	178	200	222	249	280	316	356
D_2 norm [mm]**	60	75	95	115	140	165	185	210	230	260	295	330	370
D_2 max [mm]	75	96	120	150	180	213	240	270	300	336	378	426	480
D_3 [mm]	102	131	156	191	230	270	300	342	377	430	470	540	590
D_4 [mm]	77	101	116	136	165	194	214	247	272	310	340	388	428
D_5 [mm]	90	115	140	175	210	245	275	310	345	390	430	490	545
D_7 [mm]**	45	58	72	90	108	128	144	162	180	202	227	256	288
D_8 [mm]	75	96	120	150	180	213	240	270	300	336	378	426	480
D_9 [mm]	6	8	8	8	10	12	12	16	16	20	20	24	24
L_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
L_2 norm [mm]**	57	71	85	103	127	148	167	192	209	233	265	297	335
L_3 [mm]	60	65	72	81	100	115	124	157	160	188	202	233	248
L_4 norm [mm]**	81	114	145	204	222	285	324	332	402	437	501	548	620
L_4 min [mm]	41	53	63	72	92	101	112	142	142	161	181	202	222
L_5 [mm]	6.0	9.0	8.5	11.5	15.5	17.5	18.0	24.0	24.0	28.5	33.5	36.5	41.5
L_6 norm [mm]**	141	179	217	285	322	400	448	489	562	625	703	781	868
$L_{tot.}$ norm. cone** [mm]	315	386	458	573	676	811	906	1 029	1 139	1 278	1 435	1 608	1 786
$L_{tot.}$ norm. cyl** [mm]	285	350	423	530	622	751	836	946	1 052	1 183	1 325	1 486	1 646
n_1 / n_2	10	10	12	16	12	16	16	12	16	12	16	12	16
DBSE norm [mm]**	201	244	289	366	422	515	572	646	722	813	905	1 014	1 116



Power data

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Power factor P/n [kWmin]	0.227	0.475	0.929	1.81	3.13	5.19	7.43	10.6	14.6	20.4	29.0	41.6	59.5
Nominal torque T_{KN} [Nm]	2 170	4 540	8 870	17 300	29 900	49 600	71 000	101 000	139 000	195 000	277 000	397 000	568 000
Peak torque T_{KS} [Nm]	2 880	6 040	11 800	23 000	39 800	66 000	94 400	134 000	184 000	259 000	369 000	528 000	755 000
Maximum speed n_{max} [rpm]	32 000	30 000	27 100	24 000	20 000	16 900	15 000	13 300	12 000	10 700	9 500	8 500	7 500
Axial misalignment* ΔK_a [mm]	± 2.5	± 3.2	± 4.0	± 5.0	± 6.0	± 7.1	± 8.0	± 9.0	± 10.0	± 11.2	± 12.6	± 14.2	± 16.0
Angular misalignment* ΔK_w [°]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Axial stiffness* C_a [N / mm]	313	387	487	612	737	868	974	1 100	1 222	1 373	1 530	1 725	1 925
Angular stiffness C_w [Nm / rad]	793	1 647	3 216	6 300	10 886	18 038	25 804	36 930	50 657	71 169	101 330	145 000	207 500

Weight*** in kg

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling G cone	4.66	9.89	16.4	29.8	53.6	86.0	118	183	235	345	480	691	945
Complete coupling G cyl	4.53	9.62	16.1	29.0	52.3	83.9	115	179	229	337	468	674	920
Per 100 mm DI G100	0.45	0.77	1.12	1.80	2.52	3.56	4.49	5.76	7.01	8.78	11.1	14.2	18.0
1 coupling hub con G_3 cone	0.79	1.7	2.9	5.3	9.8	15.7	21.4	33.1	42.4	62.8	89.1	127	176
1 coupling hub cyl G_3 cyl	0.73	1.6	2.7	4.9	9.1	14.6	19.9	30.8	39.3	58.7	83.2	119	163
1/2 element G_2	0.75	1.48	2.6	4.5	8.3	12.9	18.0	28.7	35.8	52.1	71.6	104	141
1/2 spacer G_1	0.78	1.71	2.86	5.07	8.82	14.3	20.0	30.1	39.7	57.2	78.5	113	155

Mass moment of inertia*** in kgm^2

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling I	0.0049	0.0175	0.0423	0.117	0.310	0.683	1.17	2.35	3.67	6.88	11.9	22.0	37.3
Per 100 mm D_l I_{100}	0.0002	0.0005	0.0012	0.0030	0.0061	0.0120	0.0192	0.0311	0.0468	0.0739	0.118	0.192	0.307
1 coupling hub con I_3	0.0008	0.0030	0.0070	0.0198	0.0544	0.120	0.199	0.412	0.629	1.21	2.12	3.91	6.58

Torsional stiffness [x 106]*** in Nm/rad

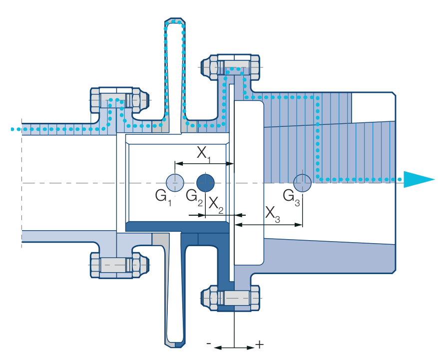
Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling Ct	0.0753	0.164	0.320	0.611	1.11	1.77	2.52	3.70	4.93	6.98	10.1	14.5	20.8
Per 100 mm D_l Ct_{100}	0.190	0.537	1.22	3.04	6.19	12.2	19.6	31.7	47.7	75.3	120	196	313
1 coupling hub cone C_{t3}	0.851	1.79	3.7	6.9	12.5	20.7	28.4	41.9	55.8	80.6	117	165	233

Center of gravity*** in mm

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling X cone	-6.7	-6.8	-5.0	-4.6	-5.0	-5.7	-4.6	-9.4	-8.0	-11.3	-7.5	-11.7	-8.2
Complete coupling X cyl	-10.2	-10.8	-9.3	-9.8	-11.6	-13.2	-13.4	-19.4	-18.7	-23.0	-21.5	-26.8	-25.9
1 coupling hub con X_3 cone	23.2	26.6	35.1	41.1	50.1	58.8	68.3	75.7	83.0	91.1	106.8	117.2	134.6
1 coupling hub cyl X_3 cyl	14.8	17.5	24.7	29.2	35.2	42.0	48.2	52.9	58.8	65.0	75.7	83.4	95.4
1/2 element X_2	-13.7	-14.3	-16.1	-18.3	-22.4	-26.1	-28.4	-35.5	-36.5	-43.0	-46.5	-53.3	-57.7
1/2 spacer X_1	-30.0	-32.5	-36.0	-40.5	-50.0	-57.5	-62.0	-78.5	-80.0	-94.0	-101.0	-116.5	-124.0

Calculation of center of gravity

Half coupling values: weight 1/2 G cone or cyl and center of gravity X:
$X = (X_1 * G_1 + X_2 * G_2 + X_3 * G_3) : G_{1+2+3}$
1/2 G cone or cyl = $G_1 + G_2 + G_3$



Top:
Load flow
cross section to determine
the torsional stiffness

Bottom:
Calculation of center
of gravity

* Data related to complete coupling

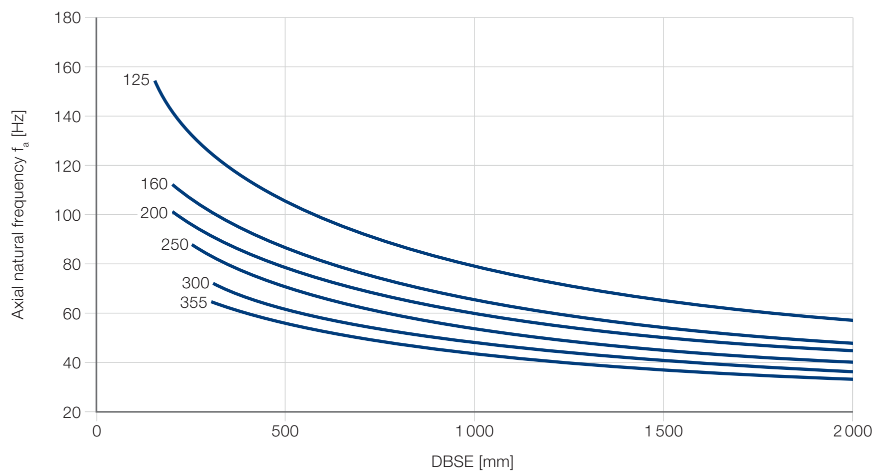
** Dimensions freely selectable as coupling hubs and spacer are custom-made

*** Data calculated for "normal coupling", i.e., the "norm" dimension (e.g., D_{1norm}) has been assumed for the freely selectable dimensions (**)

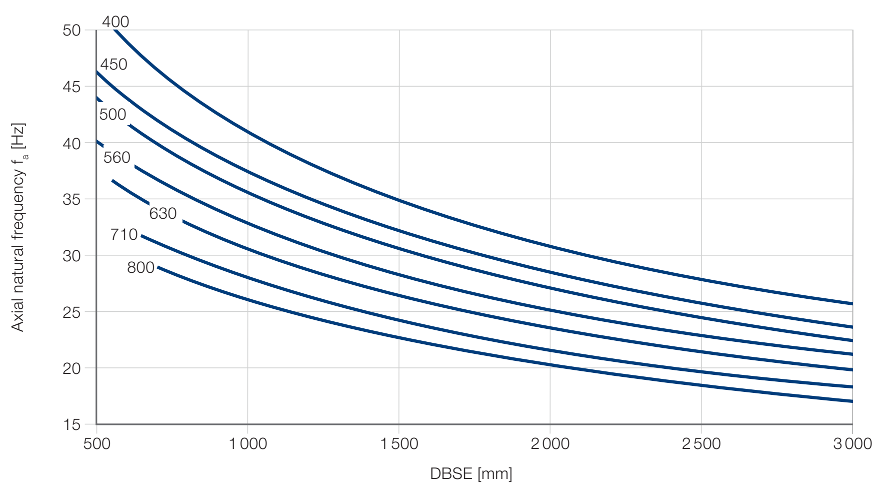
Coupling sizes < 125 and > 800 on request

Axial natural frequency f_a

MKA 125 – 355



MKA 400 – 800



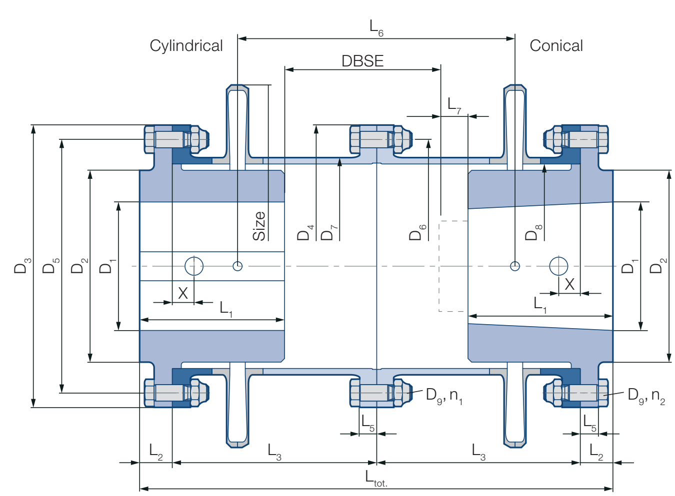
Bolted design: MKB xxx-IIK

TwinTors diaphragm couplings type B

- ΔK_W = 0.25° angular misalignment
- Reduced moment hub
- Without spacer

Dimensions

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
D_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
D_1 max [mm]	51	65	81	102	122	145	163	184	204	228	257	290	326
D_2 norm [mm]**	60	75	95	115	140	165	185	210	230	260	295	330	370
D_2 max [mm]	69	88	110	138	165	196	220	248	275	308	347	391	440
D_3/D_4 [mm]	102	131	156	191	230	270	300	342	377	430	470	540	590
D_5/D_6 [mm]	90	115	140	175	210	245	275	310	345	390	430	490	545
D_7 [mm]**	75	96	120	150	180	213	240	270	300	336	378	426	480
D_8 [mm]	71	90	113	141	169	200	226	254	282	316	356	401	452
D_9 [mm]	6	8	8	8	10	12	12	16	16	20	20	24	24
L_1 norm [mm]**	42	53	67	82	100	118	132	150	165	185	210	236	265
L_2 norm [mm]**	12	15.5	18	20	25	28	31	40	40	45	50	57	62
L_3 [mm]	80	96	113	147	165	207	230	252	290	326	362	406	447
L_5 [mm]	6.0	9.0	8.5	11.5	15.5	17.5	18.0	24.0	24.0	28.5	33.5	36.5	41.5
L_6 norm [mm]**	100	126	154	213	230	299	336	347	420	464	522	579	646
L_7 norm [mm]**	15	18	18	18	20	25	32	32	40	40	40	50	50
$L_{tot.}$norm** [mm]	184	222	262	334	380	470	522	584	660	742	824	926	1 018
n_1/n_2	10	10	12	18	18	18	22	18	22	18	22	20	26
DBSE cone [mm]**	70	80	92	134	140	184	194	220	250	292	324	354	388
DBSE cyl [mm]**	100	116	128	170	180	234	258	284	330	372	404	454	488



Power data

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Power factor P/n [kWmin]	0.293	0.607	1.18	2.31	3.99	6.62	9.47	13.51	18.53	26.0	37.0	53.0	75.7
Nominal torque T_{KN} [Nm]	2 800	5 800	11 300	22 100	38 100	63 200	90 400	129 000	177 000	248 000	353 000	506 000	723 000
Peak torque T_{KS} [Nm]	4 800	10 000	19 500	38 100	65 800	109 000	156 000	222 000	305 000	428 000	609 000	872 000	1 248 000
Maximum speed n_{max} [rpm]	32 000	30 000	27 100	24 000	20 000	16 900	15 000	13 300	12 000	10 700	9 500	8 500	7 500
Axial misalignment* ΔK_a [mm]	± 1.4	± 1.8	± 2.2	± 2.8	± 3.3	± 3.9	± 4.4	± 5.0	± 5.5	± 6.2	± 6.9	± 7.8	± 8.8
Angular misalignment* ΔK_w [°]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Parallel misalignment ΔK_p [± mm]	0.44	0.55	0.67	0.93	1.00	1.30	1.47	1.51	1.83	2.02	2.28	2.53	2.82
Axial stiffness* C_a [N / mm]	813	1002	1251	1557	1864	2183	2502	2826	3140	3531	3910	4407	4887
Angular stiffness C_w [Nm / rad]	2 167	4 407	8 608	16 935	29 263	48 490	69 356	99 130	135 980	191 045	266 280	381 150	545 240
Lateral critical frequency f_b [1/min]	382 330	307 985	265 276	205 803	187 849	149 105	134 393	125 479	107 928	95 988	87 204	77 734	71 926
Axial critical frequency f_a [Hz]	298	226	194	155	130	109	100	88	79	70	64	56	51

Weight*** in kg

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling G	3.22	6.6	11.6	21.4	38.4	62.1	84	130	169	247	341	492	667
1 coupling hub G_3	0.75	1.6	2.8	5.2	9.5	15.3	20.9	32.4	41.5	61.5	87.1	124	171
1/2 element G_2	0.39	0.80	1.3	2.3	4.1	6.4	8.7	14.0	17.4	25.7	34.1	50.6	66.0
1/2 spacer G_1	0.46	0.99	1.69	3.27	5.56	9.30	12.67	18.57	25.38	36.18	49.08	71.29	96.02

Mass moment of inertia*** in kgm²

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling I	0.0047	0.0166	0.0409	0.116	0.303	0.675	1.14	2.29	3.60	6.72	11.4	21.3	35.5
1 coupling hub I_3	0.0008	0.0028	0.0066	0.0187	0.0515	0.113	0.187	0.389	0.592	1.15	2.01	3.70	6.19

Torsional stiffness [x 106]*** in Nm/rad

Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling Ct	0.242	0.531	1.06	2.07	3.79	5.92	8.48	12.5	16.6	23.1	33.0	47.3	69.0
1 coupling hub C_{t3}	7.57	14.1	35.9	77.5	147	234	367	448	656	878	1 396	1 863	2 878

Center of gravity*** in mm

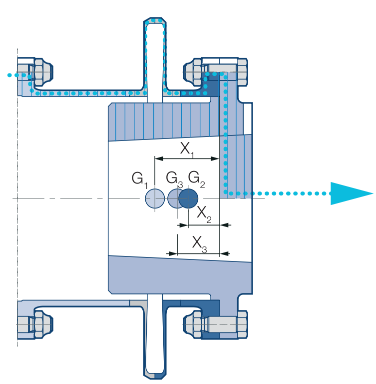
Size	125	160	200	250	300	355	400	450	500	560	630	710	800
Complete coupling X	13.2	14.0	17.8	21.1	24.9	30.0	33.6	37.6	41.8	47.1	52.2	59.0	65.2
1 coupling hub X_3	4.7	4.5	9.3	11.6	13.1	17.0	20.5	17.9	23.3	25.0	30.1	32.4	38.8
1/2 element X_2	9.8	10.2	12.4	14.9	18.2	21.0	23.5	28.8	30.0	34.2	38.2	43.2	48.4
1/2 spacer X_1	30.0	32.5	36.0	40.5	50.0	57.5	62.0	78.5	80.0	94.0	101.0	116.5	124.0

Calculation of center of gravity

Half coupling values: weight 1/2 G cone or cyl and center of gravity X:

$X = (X_1{*}G_1 + X_2{*}G_2 + X_3{*}G_3) : G_{1+2+3}$

1/2 G cone or cyl $= G_1 + G_2 + G_3$



Top:
Load flow
cross section to determine the torsional stiffness

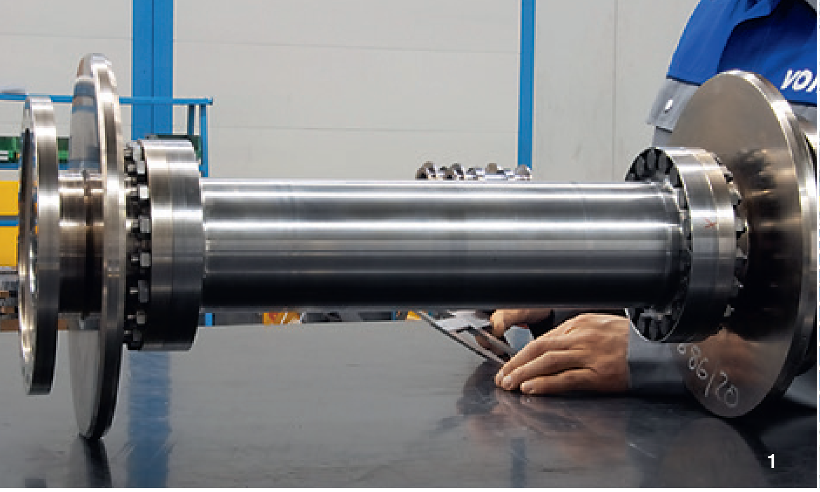
Bottom:
Calculation of center of gravity

* Data related to complete coupling

** Dimensions freely selectable as coupling hubs and spacer are custom-made

*** Data calculated for "normal coupling", i.e., the "norm" dimension (e.g., D_{1norm}) has been assumed for the freely selectable dimensions (**)

Coupling sizes < 125 and > 800 on request



Applications

Diaphragm couplings connect:

- Steam and gas turbines
- Radial and axial compressors
- Centrifugal pumps
- Test articles
- Fans and ventilators

Typical industries include:

- Power
- Oil and gas (upstream, midstream, downstream)
- Petrochemical
- Chemical
- Steel
- Test beds

Photo 1

Coupling type: MKA300-FFS

Connection between a gearbox and a steam turbine, light-weight design with bolted flanges on both sides.

- **Power:** **6,600 kW**
- **Speed:** **8,015 rpm**
- **Max. torque:** **35,745 Nm**
- **Coupling design acc. to API671 – 4th Edition**

Photo 2

Coupling type: MKB355-AAT

Connection between a motor and a gearbox, quillshaft design with low torsional stiffness.

- **Power:** **2,000 kW**
- **Speed:** **1,500 rpm**
- **Max. torque:** **76,398 Nm**
- **Coupling design acc. to API671 – 4th Edition**

VT2398, en, vvk, 2020-04. All data and information without obligation. Subject to change.

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