WEAR- AND MAINTENANCE-FREE.

ZA

LINE SHAFTS

SERIES ZA / ZAE | 10 – 4000 Nm

R+W®
COUPLING TECHNOLOGY

THE ULTIMATE COUPLING FROM 10 – 4000 Nm

www.rwcouplings.com

optional stainless steel

TORSIONAL STIFF LINE SHAFTS

MODEL **PROPERTIES** **APPLICATION EXAMPLES**

Application Examples:

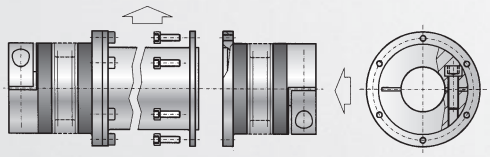
Spanning of larger axial distances

- Palletizers
- Screw jack systems
- Multi-axis linear modules
- Printing machines
- Paper pulp machines
- Packaging machines
- Conveyor systems
- Textile machinery
- Crane gantry systems
- Automated assembly systems
- Woodworking machines
- Food processing machines

ZA

from 10 – 800 Nm

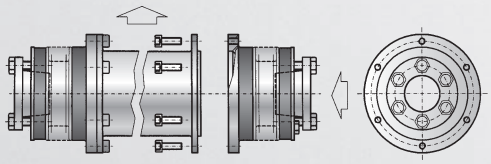
- Mounting + dismounting without moving the aligned machines
- Standard lengths up to 6 m (19.68 ft.)
- No intermediate support bearing required



ZA

from 1500 – 4000 Nm

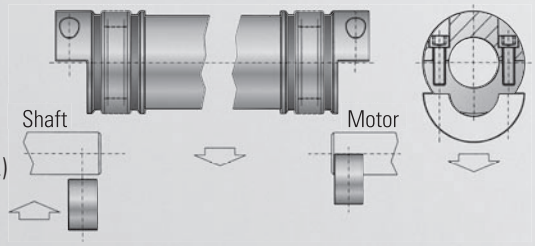
- Mounting + dismounting without moving the aligned machines
- Standard lengths up to 3 m (9.84 ft.)
- No intermediate support bearing required



ZAE

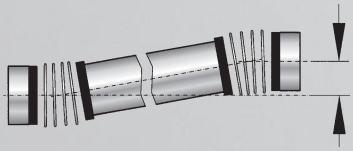
from 10 – 800 Nm

- Coupling radially removable
- easy mounting and dismounting by split hubs
- Standard lengths up to 6 m (19.68 ft.)
- No intermediate support bearing required



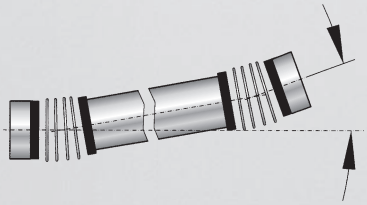
Possible misalignments

max. permissible values page 6



Lateral misalignment △ Kr

Axial misalignment △ Ka

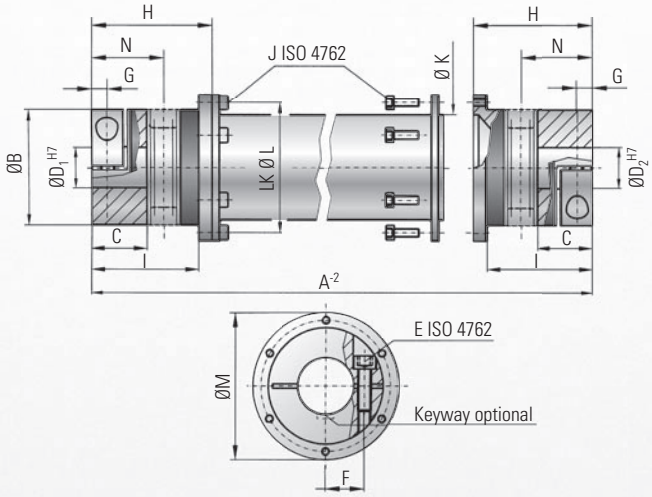


Angular misalignment △ Kw

optional stainless steel

MODEL **ZA 10-800 Nm**

TECHNICAL SPECIFICATIONS



Properties:

- Compensation of misalignments
- Backlash-free and torsionally stiff
- Able to span long distances
- Standard lengths up to 6 m (19.68 ft)
- No intermediate support bearing required
- Intermediate tube removable for easy mounting

Material:

- Bellows made of flexible high grade stainless steel
- Aluminum intermediate tube section through size 200, size 300 and up steel
  Optional composite CFK tube
- Clamping hubs through size 60 Aluminum, size 150 and up steel

Design:

- Balanced clamping hubs with one radial screw ISO 4762
- Intermediate tube section supported by gimbals within the clamping hub
- Mounting and dismounting accomplished through the removal of the intermediate tube section

Temperature range: -30 to +120° C (-3,6 to 270 F)

Speed: Depending on length A, please contact R+W

Service life: These couplings have an infinite life and are maintenance-free if the technical limits are not exceeded.

Backlash: Absolutely backlash-free due to frictional clamp connection

Fit tolerance: Shaft/hub connection 0.01 to 0.05 mm

Ordering example

ZA / 10 / 1551 / 18 / 19 / XX

- Model
- Series/rated torque
- Overall length
- Ø D1 H7
- Ø D2 H7
- Non-Standard e.g. carbon tube

Model ZA 10 - 800 Nm			Series							
			10	30	60	150	200	300	500	800
Rated torque	(Nm)	T_{KN}	10	30	60	150	200	300	500	800
Overall length min. to max.	(mm)	A^{-2}	110 to 6000	140 to 6000	170 to 6000	190 to 6000	210 to 6000	250 to 6000	260 to 6000	260 to 6000
Outer diameter clamping hub	(mm)	B	40	55	66	81	90	110	123	134
Fit length	(mm)	C	16	27	31	35.5	40.5	43	50	48
Inner diamter from Ø to Ø H7	(mm)	$D_{1/2}$	5 to 20	10 to 28	12 to 32	19 to 42	22 to 45	30 to 60	35 to 60	40 to 72
With keyway max. Ø H7	(mm)	$D_{1/2}$	17	23	29	36	45	60	60	66
ISO 4762 clamping screw		E	M4	M6	M8	M10	M12	M12	M16	2x M16
Tightening torque	(Nm)		5	15	40	70	110	130	200	250
	(mm)	F	15	19	23	27	31	39	41	48
	(mm)	G	5	7.5	9.5	11	12.5	13	17	18
Length bellows body	(mm)	H	44.5	57.5	71	78	86	94	110	101
	(mm)	I	38.5	51	61	69	75.5	81	96	89
ISO 4762 screw		J	4x M4	6x M4	6x M5	8x M6	8x M6	8x M8	8x M8	10x M8
Tightening torque of the assembly screws	(Nm)		3	4	7	10	12	30	30	40
Outer diamter tube section	(mm)	K	35	50	60	76	90	100	110	120
Bolt hole circle Ø	(mm)	L	45	62.5	71.5	88	100	120	132	138
Outer diamter flange	(mm)	M	52	70	80	98	110	135	148	153
Shaft average value	(mm)	N	25	34	41	47	52	56	66	64

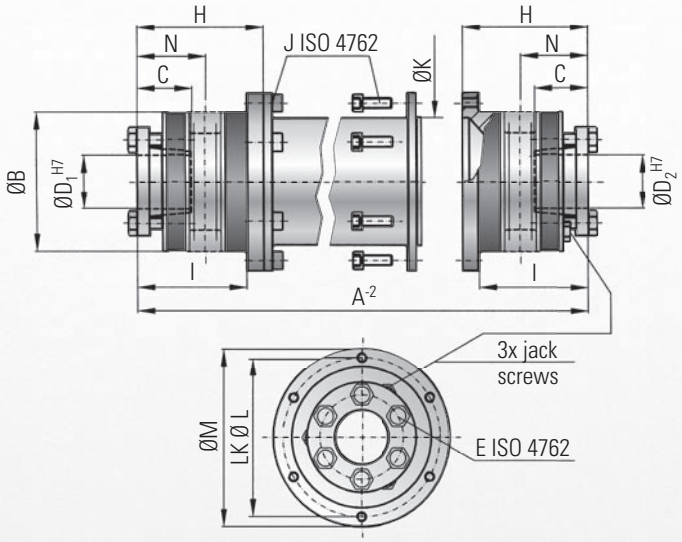
1Nm = 8.85 in lbs

max. permissible misalignment page 6

optional stainless steel

MODEL **ZA 1500-4000 Nm**

TECHNICAL SPECIFICATIONS



Properties:
- Compensation of misalignments
- Backlash-free and torsionally stiff
- Able to span longer distances
- Standard lengths up to 3 m (9.84 ft)
- No intermediate support bearing required
- Intermediate tube removable for easy mounting

Material:
- Bellows made of flexible high grade stainless steel
- Intermediate tube section: steel, **optional composite CFK tube**
- Clamping hubs: steel

Design:
- With tapered conical sleeves and captive jack screws
- Intermediate tube section support by gimbals within the clamping hub.
- Lateral mounting and dismounting accomplished due to the removal of the intermediate tube section.

Temperature range: -30 to +120° C (-22 to 250° F)

Speed: Depending on length A, please contact R+W

Service life: These couplings have an infinite life and are maintenance-free if the technical limits are not exceeded

Backlash: Absolutely backlash-free due to frictional clamp connection

Fit tolerance: Shaft/hub connection 0.01 to 0.05 mm

Ordering example

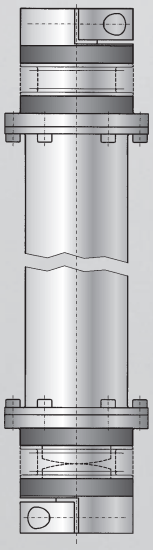
ZA / 1500 / 2551 / 65 / 70 / XX

- Model
- Series/rated torque
- Overall length
- Ø D1 H7
- Ø D2 H7
- Non-Standard e.g. carbon tube

Model ZA 1500 - 4000 Nm			Series 1500	Series 4000
rated torque	(Nm)	T_{KN}	1500	4000
Overall length min. to max.	(mm)	A^{-2}	240 to 3000	280 to 3000
Outer diameter	(mm)	B	157	200
Fit length	(mm)	C	61	80,5
Inner diameter from Ø to Ø H7	(mm)	$D_{1/2}$	35 to 70	40 to 100
ISO 4017 clamping screws	6x	E	M12	M16
Tightening torque	(Nm)		70	120
Length bellows body	(mm)	H	98	103,5
	(mm)	I	82	84
ISO 4762 screw		J	10x M10	12x M12
Tightening torque of the assembly screws	(Nm)		70	120
Outer diameter tube section	(mm)	K	150	160
Bolt hole circle Ø	(mm)	L	168	193
Outer diameter flange	(mm)	M	184	213
Shaft average value	(mm)	N	56	61

max. permissible misalignments page 6

Vertical installation ZA/ZAE

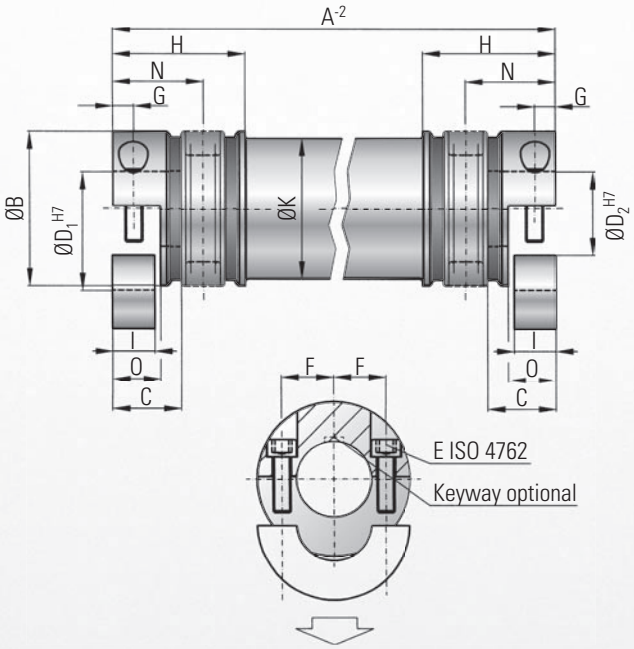


- While vertical mounting an additional supporting of the lower bellows body is necessary.
- A special bellows body for vertical mounting is available upon request.
- Please note „vertical mounting" when ordering.

optional stainless steel

MODEL **ZAE 10-800 Nm**

TECHNICAL SPECIFICATIONS



Properties:
- Compensation of misalignments
- Backlash-free and torsionally stiff
- Able to span longer distances
- Standard lengths up to 6 m (19.68 ft)
- No intermediate support bearing required
- Split hubs for easy mounting and dismounting

Material:
- Bellows made of flexible high grade stainless steel
- Aluminum intermediate tube section through size 150, size 300 and up steel
  optional composite CFK tube
- Clamping hubs through size 60 Aluminum, size 150 and up steel

Design:
- Balanced split clamping hubs with two radial clamping screws ISO 4762
- Intermediate tube section supported by gimbals within the clamping hub
- Lateral mounting and dismounting accomplished due to split hubs

Temperature range: -30 to +120° C (-3,6 to 270 F)

Speed: Depending on length A, please contact R+W

Service life: These couplings have an infinite life and are maintenance-free if the technical limits are not exceeded.

Backlash: Absolutely backlash-free through frictional clamp connection

Fit tolerance: Shaft/hub connection 0.01 to 0.05 mm

Ordering example

ZAE / 10 / 1551 / 18 / 19 / XX

- Model
- Series/rated torque
- Overall length
- Ø D1 H7
- Ø D2 H7
- Non-Standard e.g. carbon tube

Model ZAE 10 - 800 Nm			Series						
			10	30	60	150	300	500	800
Rated torque	(Nm)	T_{KN}	10	30	60	150	300	500	800
Overall length min. to max.	(mm)	A^{-2}	100 to 6000	130 to 6000	160 to 6000	180 to 6000	240 to 6000	250 to 6000	250 to 6000
Outer diameter clamping hub	(mm)	B	40	55	66	81	110	123	133
Fit length	(mm)	C	16	27	31	34.5	42	50	47
Inner diamter from Ø to Ø H7	(mm)	$D_{1/2}$	5 to 20	10 to 28	12 to 32	19 to 42	30 to 60	35 to 60	40 to 72
Max.inner diameter clamping hub	(mm)	D_{max}	24	30	32	42	60	60	75
with keyway - max Ø H7	(mm)	$D_{1/2}$	17	23	29	36	60	60	66
ISO 4762 clamping screws		E	M4	M6	M8	M10	M12	M16	M16
Tightening torque	(Nm)		5	15	40	70	130	200	250
	(mm)	F	15	19	23	27	39	41	48
	(mm)	G	5	7.5	9.5	12	14	17	19
Length bellows body	(mm)	H	39.5	52	64	72	83	96	95
Clamping length	(mm)	I	10	15	19	22	28	33.5	37.5
Outer diameter tube section	(mm)	K	35	50	60	75	100	110	120
	(mm)	O	11.5	17	21	24	30	35	40
Shaft average value	(mm)	N	25	34	41	47	56	66	65

1Nm = 8.85 in lbs

max. permissible misalignments page 6

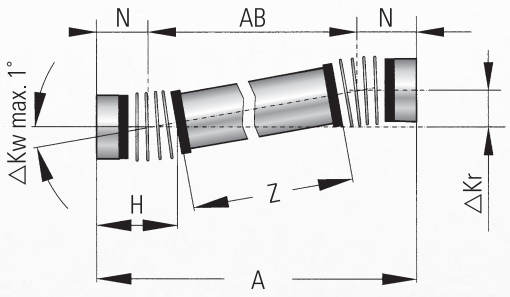
optional stainless steel

NOTES

SELECTION PROCESS FOR LINE SHAFTS MODELS ZA / ZAE

Series T_{KN} (Nm)	Torsional stiffness of both bellows bodies C_T^B (Nm/rad)	Torsional stiffness per 1m tube C_T^{ZWR} (Nm²/rad)	Length of bellows body ZA H (mm)	Length of bellows body ZAE H (mm)	Distance between center lines N (mm)	max. axial misalignment △ Ka (mm)
10	4,525	1,530	44.5	39.5	25	2
30	19,500	6,632	57.5	52	34	2
60	38,000	11,810	71	64	41	3
150	87,500	20,230	78	72	47	4
200	95,500	65,340	86	–	52	4
300	250,500	222,700	94	83	56	4
500	255,000	292,800	110	96	66	5
800	475,00	392,800	101	89	64	6
1500	1,400,000	728,800	92	–	56	4
4000	4,850,000	1,171,000	102	–	61	4

Table 1



A	Overall length ZA	m
AB	AB = (A – 2xN)	m
Z	Tube length Z = (A – 2xH)	m
H	Length of the bellows body	mm
N	Distance between center lines	mm
M_{max}	Max. torque	Nm
φ	Angle of twist	degree
C_T^B	Torsional stiffness of both bellows bodys	Nm/rad
C_T^{ZWR}	Torsional stiffness of tube per meter	Nm/rad
C_T^{ZA}	Torsional stiffness of entire coupling	Nm/rad

Torsional stiffness:

$$(C_T^{ZA}) = \frac{C_T^B \times (C_T^{ZWR}/Z)}{C_T^B + (C_T^{ZWR}/Z)} \text{ [Nm/rad]}$$

Angle of twist:

$$\varphi = \frac{180 \times M_{max}}{\pi \times C_T^{ZA}} \text{ [degree]}$$

Example: Line shaft ZA 150 T_{KN} = 150 Nm
Wanted: Angle of twist at max. rated torque T_{KN}

Length (A) of the shaft = 1.5 m
Length (Z) of the tube = A – (2xH) = 1.344m

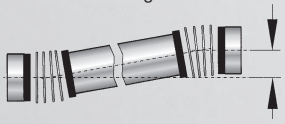
$$(C_T^{ZA}) = \frac{87.500 \text{ Nm/rad} \times (20.230 \text{ Nm/rad} / 1{,}344 \text{ m})}{87.500 \text{ Nm/rad} + (20.230 \text{ Nm/rad} / 1{,}344 \text{ m})} = 12.842{,}8 \text{ [Nm/rad]}$$

$$\varphi = \frac{180 \times 150 \text{ Nm}}{\pi \times 12.842{,}8 \text{ Nm/rad}} = 0{,}669°$$

The result with a max. torque of 150 Nm is an angle of twist of 0.669°.

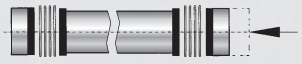
Max. possible misalignment

Lateral misalignment △ Kr



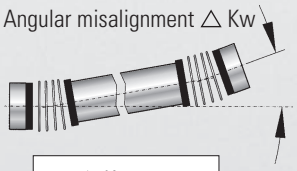
△ Kr = tan x AB
AB = A – 2 x N

Axial misalignment △ Ka



see Table 1

Angular misalignment △ Kw



△ Kw = 2°
max.

R+W calculation programm for critical resonant speeds

With specially developed software R+W can calculate the critical resonant speeds for each application. The critical speed can be altered by changing the tube material and/or other parameters.
Results of a calculation are shown on the right

Critical resonant speed	n_k	=	1/min.
Torsional stiffness tube ZA/ZAE	C_T^{ZWR}	=	Nm/rad
Total stiffness ZA/ZAE	C_T^{ZA}	=	Nm/rad
Angle of twist	φ	=	degree-min-sec
Weight of total axes	m	=	kg
Mass moment of inertia	J	=	kgm²
Permissible lateral misalignment	△ Kr	=	mm

optional stainless steel

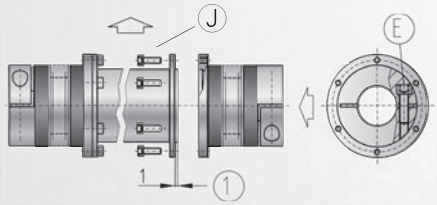
ASSEMBLY INSTRUCTIONS

Alignment

R+W ZA and ZAE line shaft couplings are available in lengths up to 6 meters (19.7 feet) without intermediate support bearings. To insure maximum life a proper alignment is necessary. We recommend laser alignment whenever possible. Other alignment techniques are also appropriate as long as the maximum permissible misalignment values listed on page 6 are not exceeded.

Clamping hub

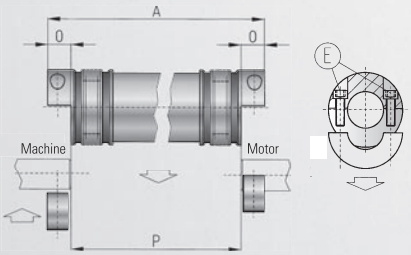
Model ZA (series 10 - 800 Nm)



Mounting: Loosen Screw E and slide the metal bellows coupling segments onto each shaft end. Now insert the intermediate tube and assemble onto both metal bellows coupling segments using the assembly screws J. Tighten the assembly screws J to the correct torque indicated in the specification table. Center the entire line shaft coupling onto the shaft ends and tighten screw E by using a torque wrench to ensure the correct torque as indicated in the specification table.

Dismounting: Loosen Screw E on one end of the line shaft coupling. Remove assembly screws J on both ends of the line shaft coupling and remove the intermediate tube. Be sure to support the intermediate tube during removal. Depending on length this may require two people. Loosen Screw E on the second metal bellows couling segment and slide both segments off.

Model ZAE (series 10 - 800 Nm)



Mounting: First ensure that the distance between shaft ends exceeds the dimension P.

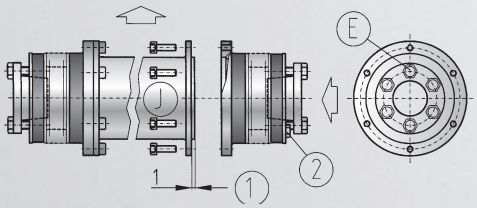
Length P = length A - 2 x 0 [mm]

Insert the line shaft coupling and assemble the split hubs with assembly scews E. Using a torque wrench to tighten screws E to the correct torque indicated in the specification table.

Dismounting: Remove the split hubs by removing the assembly screws E. Lift the line shaft coupling off the shaft ends.

Conical sleeve

Model ZA (series 1500 - 4000 Nm)



Mounting: Loosen Screws E (Do not remove!) and slide the metal bellows coupling segments onto each shaft end. Now insert the intermediate tube and assemble onto both metal bellows coupling segments by using the assembly screws J. Tighten the assembly screws J to the correct torque which is indicated in the specification table. Center the entire line shaft coupling onto the shaft ends and evenly tighten screws E while using a torque wrench. Ensure the correct torque as indicated in the specification table. Even tightening of screws E is critical to ensure that the shaft and metal bellows coupling segment are parallel.

CAUTION! An over tightening of the screws E may destroy the tapered bushing connection. Do not exceed the tightening torque as specified in the specification table.

Dismounting: Loosen the scews E on one side of the line shaft coupling. Using the three jack screws F to loosen the tapered segment so that it slides freely on the shaft. Remove the assembly screws J from both sides of the coupling and remove the intermediate tube. Be careful to support the tube during removal. Depending on the length of the tube this may require two people. Repeat the earlier procedure to remove the second metal bellows coupling segment.

CAUTION! Be sure to lower the jack screws F before reassembly.

Maintenence

R+W line shafts are maintenance free. During routine inspections the line shafts should be visitly controlled.

R+W®
COUPLING TECHNOLOGY

Experience and Know-how for your special requirements.

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according to ISO 9001-200

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Single piece or press-fit design

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Rated torque 1 Ncm
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353/11/04/3000