

# Backlash-free Line Shafts

You Can Rely On Us!

GERWAH



# GERWAH The Company

GERWAH GmbH was founded in 1980. The idea of new, innovative products has made GERWAH a recognized partner in the machine tool industry. We are a dynamic, spirited and fast growing company with clear goals and open mind that is reflected in the architecture of our new headquarters.

## Our Goals

- To add value for our customers by providing innovative product solutions
- To develop solutions in cooperation with our customers
- Satisfied customers

## Our Advantages

- Know-how, innovative designs and cutting edge manufacturing plants
- Customer oriented employees
- Technical assistance and service, both locally and internationally
- Qualified sales force
- Economic stability
- Worldwide presence with subsidiaries and dealers



*Our new headquarters in Grosswallstadt, Germany*



**GERWAH - You Can Rely On Us!**

*We are certified according to DIN EN ISO 9001 (Cert.-No. 0063-D)*

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# Backlash-free Line Shafts Series

Torsionally stiff and flexible line shafts are used in applications involving high torque values and rotational motion combined with the highest possible angular precision or

considerable distances between shafts. The application range of line shafts covers almost all technical areas, where mechanical power transmission and stiffness are

important:

- Pumps with axial and vertical drives
- Highly dynamic portal drives
- Gantry systems
- Linear modules

- Packaging machines
- Machine tools
- Special purpose machinery

Clamping hub variations in half shell construction are optionally

## Torsionally flexible line shafts with elastomeric spider

- Absolutely backlash-free
- Installation length up to 6 m possible
- Compensation of axial, radial and angular misalignment
- Cost-effective, simple assembly
- Maintenance free
- Variable length of the intermediate (or line) tube of steel
- Double-sided standard hubs
- Backlash free elastomeric spider
- Excellent transmission of torque and seating of misalignment
- High transmission accuracy
- Temperature range -30° to 120° C / -22 F to 248 F

## Torsion proofed line shafts with metal bellows

- Absolutely backlash-free
- Installation length up to 6 m possible
- Compensation of axial, radial and angular misalignment
- Aluminum lightweight construction up to size 200, optional with CFK-tube
- Maintenance free, no wear
- Universal joint tube version available
- Special stainless steel bellow
- Excellent power transmission
- High torsional stiffness and misalignment compensation
- Optimum moment of inertia
- Additional balancing holes for better cyclic running
- Temperature range -30° to 100° C / -22 F to 212 F.
- High precision of rotation angle



ADS-ZW  
Servo-insert coupling with clamping style hubs  
[Technical data Page 4](#)



ADS/B-ZW  
Servo-insert coupling with clamping style hubs and tension ring hub  
[Technical data Page 5](#)



ASS/A-ZW (special design)  
Servo-insert coupling with clamping style hubs  
[Technical data Page 6](#)



ASS/B-ZW  
Servo-insert coupling with tension rings, outside mounting  
[Technical data Page 7](#)



ADS/H-ZW (special design)  
Servo-insert coupling with clamping style hubs in half shell construction  
[Technical data Page 8](#)



AKN-ZW  
Metal bellow coupling with clamping style hubs in flange construction  
[Technical data Page 9](#)

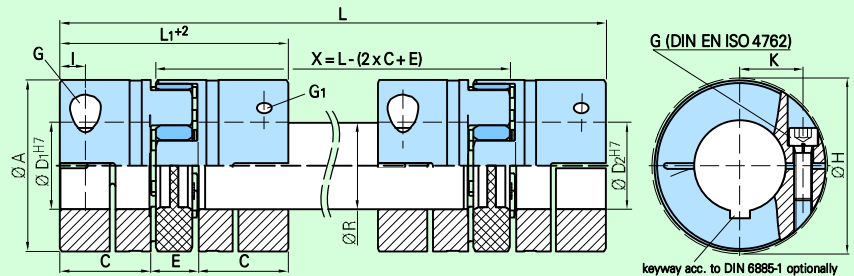
The details in this catalogue describe the products and do not represent guaranteed qualities. The user is responsible for checking

and defining the technical characteristics of his particular application. We reserve the right to make alterations at any time. We

cannot be held responsible for any omissions or printing errors. Deliveries are based on individual detailed contractual agreements.

# Backlash-free Servo-insert Coupling Series ADS-ZW

## type Line Shaft



### Technical Data Series ADS-ZW

Type		14	19	24	28	38	42	48
Nominal torque (Nm)	TKN (98ShA)	12,5	17	60	160	325	450	525
Tightening torque of screws (Nm)	MA	5	10	18	43	84	84	145
Torsional stiffness (tube) (Nm/rad)	C per m	70	130	950	1.800	5.200	11.800	17.500
Max. speed (min <sup>-1</sup> )	n <sub>max</sub>	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Standard shore hardness		98 SH A (red)						
Misalignment		see page 10						

### Dimensions (mm) Series ADS-ZW

Type		14	19	24	28	38	42	48
L	(max.)	3.000	3.000	3.000	3.000	3.000	3.000	3.000
L <sub>1</sub>		35	66	78	90	114	126	140
A		30	40	55	65	80	95	105
I		5	6	10	11	13	14	15
C		11	25	30	35	45	50	56
Ø D <sub>1</sub> H <sup>7</sup> / Ø D <sub>2</sub> H <sup>7</sup>	min. - max.	10-14	10-20	20-28	24-35	32-44	35-50	40-60
K		10,5	15	20	24	30	35	40
E		13	16	18	20	24	26	28
R (steel precision tube)		10 x 2,0	12 x 2,0	20 x 3,0	25 x 2,5	32 x 3,5	40 x 4,0	45 x 4,0
G/G <sub>1</sub> (DIN 912)		M4	M5	M6	M8	M10	M10	M12
H (clearance diameter)		34	45	57	70	89	96	110
Hub material		Al	Al	Al	Al	Al	St	St

**More length dimensions upon request!** Please ask for technical advice if you require higher speeds, bigger fitting lengths or if you install the coupling in a vertical way. To facilitate the assembly we recommend to keep the distance dimension X of the shaft. A tube with a shift fit is also available. For more information see the catalogue Backlash-free Servo-insert Couplings.

### Bore range D1/D2 and corresponding transmissible torque values (Nm) of the coupling

Type	Ø 10	Ø 11	Ø 13	Ø 14	Ø 16	Ø 18	Ø 19	Ø 20	Ø 24	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 44	Ø 48	Ø 50	Ø 60
14	12,5	12,5	12,5	12,5	12,5																
19	17	17	17	17	17	17	17	17													
24								60	60	60	60										
28									160	160	160	160									
38													325	325	325	325	325	325			
42														415	427	435	443	450	450	450	
48																525	525	525	525	525	525

### Ordering data

**ADS-ZW 14/80 - 4H7 - 10H7 - xxxxx**

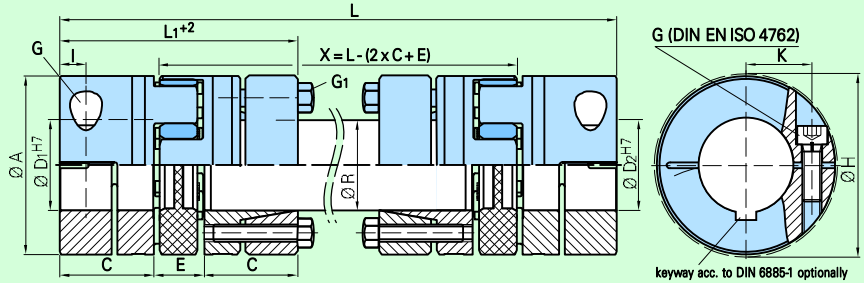
Type/total length  
 Bore size D<sub>1</sub>  
 Bore size D<sub>2</sub>  
 Additional details, e.g. different shore hardness, keyway

- Cost-efficient design
- Installation-friendly
- Electrically isolating, vibration damping
- Backlash-free
- Fail-safe design

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# Backlash-free Servo-insert Coupling Series ADS/B-ZW

## type Line Shaft



### Technical Data Series ADS/B-ZW

Type			14	19	24	28	38	42	48
Nominal torque	(Nm)	T <sub>KN</sub> (98ShA)	12,5	17	60	160	325	450	525
Tightening torque of screws	(Nm)	MA G	5	10	18	43	84	84	145
		G <sub>1</sub>	1,8	3	6	6	10	35	69
Torsional stiffness (tube)	(Nm/rad)	C per m	70	130	950	1.800	5.200	11.800	17.500
Max. speed	(min <sup>-1</sup> )	n <sub>max</sub>	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Standard shore hardness			98 SH A (red)						
Misalignment			see page 10						

### Dimensions (mm) Series ADS/B-ZW

Type		14	19	24	28	38	42	48
L	(max.)	3.000	3.000	3.000	3.000	3.000	3.000	3.000
L <sub>1</sub>		35	66	78	90	114	126	140
A		30	40	55	65	80	95	105
I		5	6	10	11	13	14	15
C		11	25	30	35	45	50	56
Ø D <sub>1</sub> <sup>H7</sup> / Ø D <sub>2</sub> <sup>H7</sup>	min. - max.	10-14	10-20	20-28	24-35	32-44	35-50	40-60
K		10,5	15	20	24	30	35	40
E		13	16	18	20	24	26	28
R (steel precision tube)		10 x 2,0	12 x 2,0	20 x 3,0	25 x 2,5	32 x 3,5	40 x 4,0	45 x 4,0
G (DIN 912)		M4	M5	M6	M8	M10	M10	M12
G <sub>1</sub> (DIN 931)		M3	M4	M5	M5	M6	M8	M10
H (clearance diameter)		34	45	57	70	89	96	110
Hub/tension ring material		Al/St	Al/St	Al/St	Al/St	Al/St	St/St	St/St

**More length dimensions upon request!** Please ask for technical advice if you require higher speeds, bigger fitting lengths or if you install the coupling in a vertical way. To facilitate the assembly we recommend to keep the distance dimension X of the shaft. A tube with a shift fit is also available. For more information see the catalogue Backlash-free Servo-insert Couplings.

### Bore range D1/D2 and corresponding transmissible torque values (Nm) of the coupling

Type	Ø 10	Ø 11	Ø 13	Ø 14	Ø 16	Ø 18	Ø 19	Ø 20	Ø 24	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 44	Ø 48	Ø 50	Ø 60
14	12,5	12,5	12,5	12,5	12,5																
19	17	17	17	17	17	17	17	17													
24								60	60	60	60										
28									160	160	160	160									
38													325	325	325	325	325	325			
42														415	427	435	443	450	450	450	
48																525	525	525	525	525	525

### Ordering data

ADS/B-ZW 14/80 - 4H7 - 10H7 - xxxxx  
 Type/total length  
 Bore size D<sub>1</sub>  
 Bore size D<sub>2</sub>  
 Additional details, e.g. different shore hardness, keyway

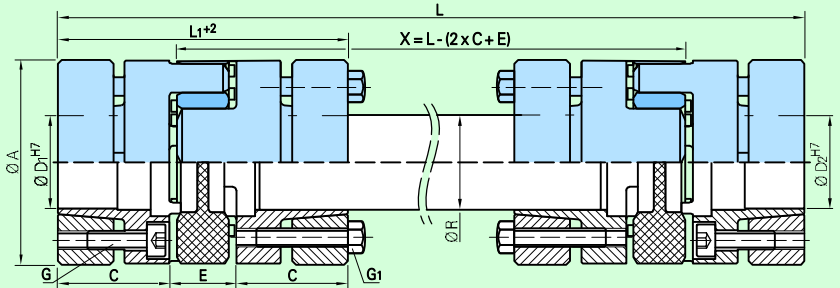
- Cost-efficient design
- Installation-friendly
- Electrically isolating, vibration damping
- Backlash-free, fail-safe design
- For higher torque transmission

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# Backlash-free Servo-insert Coupling Series ASS/A-ZW

## type Line Shaft

This picture shows a special design:  
in combination with a safety coupling



### Technical Data Series ASS/A-ZW

Type			14	19	24	28	38	42	48
Nominal torque	(Nm)	TKN (98ShA)	12,5	17	60	160	325	450	525
Tightening torque of screws	(Nm)	MA G/G1	1,8	3	6	6	10	35	69
Torsional stiffness (tube)	(Nm/rad)	C per m	70	130	950	1.800	5.200	11.800	17.500
Max. speed	(min <sup>-1</sup> )	n <sub>max</sub>	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Standard shore hardness			98 SH A (red)						
Misalignment			see page 10						

### Dimensions (mm) Series ASS/A-ZW

Type		14	19	24	28	38	42	48
L	(max.)	3.000	3.000	3.000	3.000	3.000	3.000	3.000
L <sub>1</sub>		50	66	78	90	114	126	140
A		32	40	55	65	80	95	105
C		18,5	25	30	35	45	50	56
Ø D <sub>1</sub> H <sup>7</sup> / Ø D <sub>2</sub> H <sup>7</sup>	min. - max.	6-14	10-20	11-25	15-36	20-41	27-50	30-55
E		13	16	18	20	24	26	28
R (steel precision tube)		10 x 2,0	12 x 2,0	20 x 3,0	25 x 2,5	32 x 3,5	40 x 4,0	45 x 4,0
G (DIN 912)		M3	M4	M5	M5	M6	M8	M10
G <sub>1</sub> (DIN 931)		M3	M4	M5	M5	M6	M8	M10
Hub material		Al	Al	Al	Al	Al	St	St

**More length dimensions upon request!** Please ask for technical advice if you require higher speeds, bigger fitting lengths or if you install the coupling in a vertical way. To facilitate the assembly we recommend to keep the distance dimension X of the shaft. A tube with a shift fit is also available. For more information see the catalogue Backlash-free Servo-insert Couplings.

### Bore range D1/D2 and corresponding transmissible torque values (Nm) of the coupling

Type	Ø 6	Ø 10	Ø 11	Ø 13	Ø 14	Ø 15	Ø 17	Ø 19	Ø 20	Ø 24	Ø 25	Ø 27	Ø 30	Ø 32	Ø 36	Ø 38	Ø 41	Ø 42	Ø 44	Ø 48	Ø 50	Ø 55
14	3,6	12,5	12,5	12,5	12,5																	
19		17	17	17	17	17	17	17	17													
24			22	37	46	56	60	60	60	60	60											
28						56	68	114	134	160	160	160	160	160								
38									134	230	261	325	325	325	325	325	325					
42												329	450	450	450	450	459	450	450	450	450	
48													450	525	525	525	525	525	525	525	525	525

### Ordering data

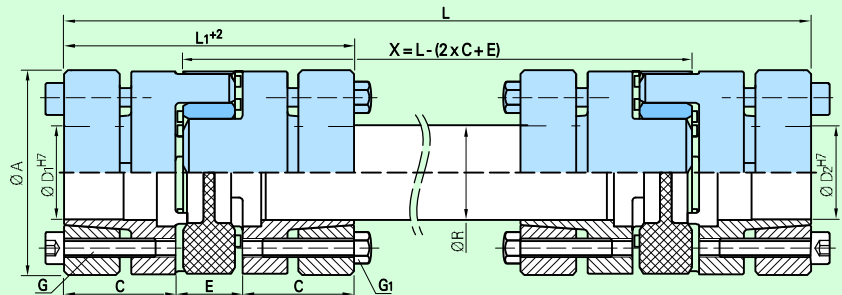
ASS/A-ZW 14/80 - 4H7 - 10H7 - xxxxx
Type/total length
Bore size D <sub>1</sub>
Bore size D <sub>2</sub>
Additional details, e.g. different shore hardness, keyway

- For higher torque transmission
- Well suited for alternating loads
- Electrically isolating, vibration damping
- Backlash-free
- Fail-safe design

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# Backlash-free Servo-insert Coupling Series ASS/B-ZW

## type Line Shaft



### Technical Data Series ASS/B-ZW

Type			14	19	24	28	38	42	48
Nominal torque	(Nm)	TKN (98ShA)	12,5	17	60	160	325	450	525
Tightening torque of screws	(Nm)	MA G/G1	1,8	3	6	6	10	35	69
Torsional stiffness (tube)	(Nm/rad)	C per m	70	130	950	1.800	5.200	11.800	17.500
Max. speed	(min <sup>-1</sup> )	n <sub>max</sub>	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Standard shore hardness			98 SH A (red)						
Misalignment			see page 10						

### Dimensions (mm) Series ASS/B-ZW

Type		14	19	24	28	38	42	48
L	(max.)	3.000	3.000	3.000	3.000	3.000	3.000	3.000
L <sub>1</sub>		50	66	78	90	114	126	140
A		32	40	55	65	80	95	105
C		18,5	25	30	35	45	50	56
Ø D <sub>1</sub> <sup>H7</sup> / Ø D <sub>2</sub> <sup>H7</sup>	min. - max.	6-14	10-20	11-25	15-36	20-41	27-50	30-55
E		13	16	18	20	24	26	28
R (steel precision tube)		10 x 2,0	12 x 2,0	20 x 3,0	25 x 2,5	32 x 3,5	40 x 4,0	45 x 4,0
G (DIN 912)		M3	M4	M5	M5	M6	M8	M10
G <sub>1</sub> (DIN 931)		M3	M4	M5	M5	M6	M8	M10
Hub material		Al	Al	Al	Al	Al	St	St

**More length dimensions upon request! Please ask for technical advice if you require higher speeds, bigger fitting lengths or if you install the coupling in a vertical way. To facilitate the assembly we recommend to keep the distance dimension X of the shaft. A tube with a shift fit is also available. For more information see the catalogue Backlash-free Servo-insert Couplings.**

### Bore range D1/D2 and corresponding transmissible torque values (Nm) of the coupling

Type	Ø 6	Ø 10	Ø 11	Ø 13	Ø 14	Ø 15	Ø 17	Ø 19	Ø 20	Ø 24	Ø 25	Ø 27	Ø 30	Ø 32	Ø 36	Ø 38	Ø 41	Ø 42	Ø 44	Ø 48	Ø 50	Ø 55
14	3,6	12,5	12,5	12,5	12,5																	
19		17	17	17	17	17	17	17	17													
24			22	37	46	56	60	60	60	60	60											
28						56	68	114	134	160	160	160	160	160	160							
38									134	230	261	325	325	325	325	325	325					
42												329	450	450	450	450	459	450	450	450	450	450
48													450	525	525	525	525	525	525	525	525	525

### Ordering data

ASS/B-ZW 14/80	-	4H7	-	10H7	-	xxxxx
Type/total length						
Bore size D <sub>1</sub>						
Bore size D <sub>2</sub>						
Additional details, e.g. different shore hardness, keyway						

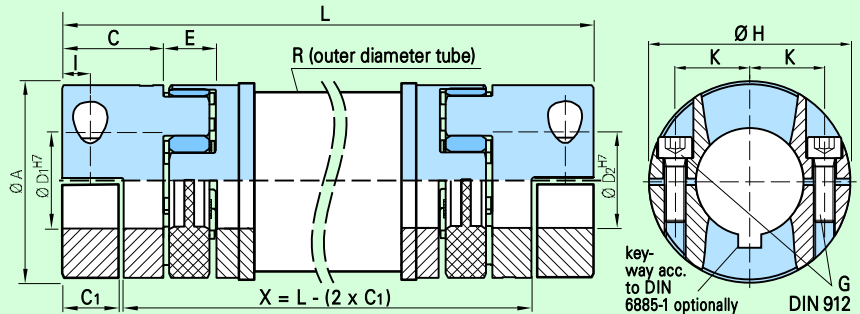
- For higher torque transmission
- Well suited for alternating loads
- Electrically isolating, vibration damping
- Backlash-free
- Fail-safe design

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# Backlash-free Servo-insert Coupling Series ADS/H-ZW

## type Line Shaft (half shell design)

This picture shows a special design of the ADS/H-ZW: one side with metal bellow and the other side with an elastomeric spider



### Technical Data Series ADS/H-ZW

Type	14	19	24	28	38	42	48
Nominal torque (Nm) T <sub>KN</sub>	12,5	17	60	160	325	450	525
Tightening torque of screws (Nm) G	5	10	18	43	84	84	145
Torsional stiffness (tube) (Nm/rad) C per m	700	1.610	7.120	12.700	22.350	73.000	251.000
Max. speed (min <sup>-1</sup> ) n <sub>max</sub>	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Misalignment	see page 10						

### Dimensions (mm) Series ADS/H-ZW

Type	14	19	24	28	38	42	48
L (max.)	3.000	3.000	3.000	3.000	3.000	3.000	3.000
C	11	25,5	30	35	45	50	57,5
C <sub>1</sub>	8	11,5	19,5	21,5	25,5	25,5	29,5
A	30	40	55	65	80	95	105
I	5	6	10	11	13	14	15
Ø D <sub>1</sub> <sup>H7</sup> / Ø D <sub>2</sub> <sup>H7</sup> min. - max.	10-14	10-20	20-28	24-35	32-44	35-50	40-60
K	10,5	15	20	24	30	35	40
E	13	16	18	20	24	26	28
R (precision tube)	28	35	50	60	75	90	100
G/G <sub>1</sub> (2 x DIN 912)	M4	M5	M6	M8	M10	M10	M12
H (clearance diameter)	34	45	57	70	89	96	110
Tube/hub material	Al	Al	Al	Al	Al	St	St

**More length dimensions upon request!** Please ask for technical advice if you require higher speeds, bigger fitting lengths or if you install the coupling in a vertical way. To facilitate the assembly we recommend to keep the distance dimension X of the shaft. For more information see the catalogue Backlash-free Servo-insert Couplings. Metal bellow version available optionally.

### Bore range D1/D2 and corresponding transmissible torque values (Nm) of the coupling

Type	Ø 10	Ø 11	Ø 13	Ø 14	Ø 16	Ø 18	Ø 19	Ø 20	Ø 24	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 44	Ø 48	Ø 50	Ø 60
14	12,5	12,5	12,5	12,5	12,5																
19	17	17	17	17	17	17	17	17													
24								60	60	60	60										
28									160	160	160	160	160	160							
38													325	325	325	325	325	325			
42													415	427	435	443	450	450	450		
48															525	525	525	525	525	525	525

### Ordering data

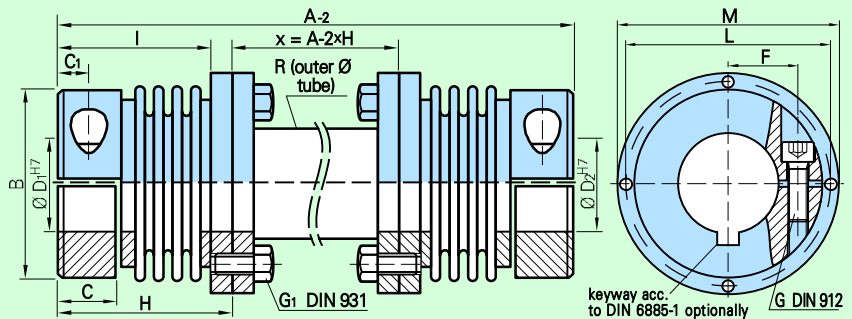
ADS/H-ZW 14/80	-	4H7	-	10H7	-	xxxxx
Type/total length						
Bore size D <sub>1</sub>						
Bore size D <sub>2</sub>						
Additional details, e.g. stainless steel keyway, CFK-tube						

- Cost-efficient design
- Installation-friendly
- Electrically isolating, vibration damping
- Backlash-free, fail-safe design
- For higher torque transmission

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# Backlash-free Metal Bellow Coupling Series AKN-ZW

## type Line Shaft (flange design)



### Technical Data Series AKN-ZW

Type			18	30	60	150	200	300	500
Nominal torque	(Nm)	T <sub>KN</sub>	18	30	60	150	200	300	500
Tightening torque of screws	(Nm)	G	6	15	30	70	80	90	145
Tightening torque of flange screws (Nm)		G <sub>1</sub>	3	4	7	10	12	30	30
Torsional stiffness (tube)	(Nm/rad)	C per m	1.610	7.120	12.700	22.350	72.000	251.000	337.000
Max. speed	(min <sup>-1</sup> )	n <sub>max</sub>	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Misalignment			see page 10						

### Dimensions (mm) Series AKN-ZW

Type		18	30	60	150	200	300	500
A	(max.)	3.000	3.000	3.000	3.000	3.000	3.000	3.000
H		44,5	57,5	71	78	86	94	110
B		45	56	66	80	90	96	110
I		39	51	61	69	76	81	96
C		12	15	19,5	21,5	25,5	26	29,5
Ø D <sub>1</sub> <sup>H7</sup> / Ø D <sub>2</sub> <sup>H7</sup>	min. - max.	10-25	20-25	23-35	28-35	32-42	40-45	40-60
R (outer diameter tube)		35	50	60	75	90	100	110
G (DIN 912)		M5	M6	M8	M10	M12	M12	M12
C <sub>1</sub>		5	7,5	9,5	11	12,5	13	17
G <sub>1</sub> (DIN 931)		4 x M4	6 x M4	6 x M5	8 x M6	8 x M6	8 x M8	8 x M8
L		45	62	72	88	100	120	132
F		17,5	20	24	27	31	35	40
M		52	70	80	98	110	135	148
Tube/hub material		Al/Al	Al/Al	Al/Al	Al/St	Al/St	St/St	St/St

**More length dimensions upon request!** Please ask for technical advice if you require higher speeds, bigger fitting lengths or if you install the coupling in a vertical way. To facilitate the assembly we recommend to keep the distance dimension X of the shaft. For more information see the catalogue Backlash-free Metal Bellow Couplings.

**For higher torque transmission of this coupling a conical hub design is available as an alternative to the clamping hub design.**

### Ordering data

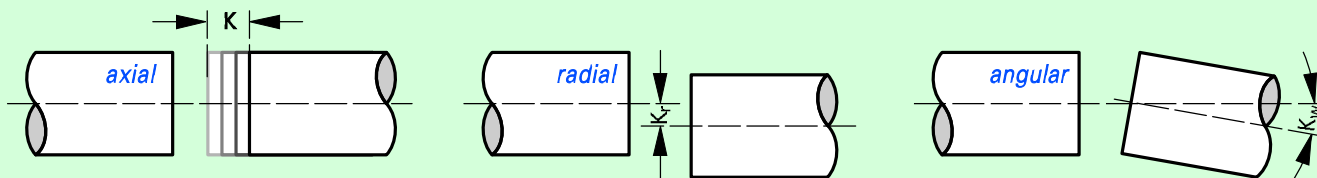
<b>AKN-ZW 18/500</b>	-	<b>10<sup>H7</sup></b>	-	<b>25<sup>H7</sup></b>	-	<b>xxxxx</b>
Type/total length						
Bore size D <sub>1</sub>						
Bore size D <sub>2</sub>						
Additional details, e.g. stainless steel keyway, CFK-tube						

- Absolutely backlash free
- Installation length up to 6 m
- Simplest assembly
- Universal joint tube CFK (optional)

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# GERWAH Line Shafts Assembly Instructions

## Types of misalignment



### Alignment of the shafts:

The picture above shows the types of misalignment. It's necessary to adjust the shafts before assembly. The more accurate the initial alignment, the better the shaft can absorb additional misalignment during operation, thereby assuring optimum lifetime and quiet running conditions. If all (3) types of misalignment occur simultaneously, each type must not reach the maximum allowable value and they have to be aligned. GERWAH can assist you with the correct adjustment of the combined misalignment.

### Installation:

Clean and degrease the hubs of the line shafts and re-check the tolerances.

**The maximal diametrical clearance between hub and shaft must not exceed 0,03 mm**

(not valid at shift fits).

According to the principle of construction slide a coupling hub onto each shaft and proceed to torque the tightening screws after

checking axial dimensions. Refer to the technical data to assure correct screw tightening torque.

The dimension of the shaft distance X should be kept.

### Removal:

Remove the locking screws of the hubs. If necessary, the push-off threads can be used to remove the backlash-free line shaft connections. In case the hub connection doesn't come off autonomously, the connection can be removed by lightly applying a rubber hammer.

**Please ask for detailed assembly instructions or find information on [www.gerwah.com](http://www.gerwah.com)!**

## Misalignments

Size	Misalignments		
	mm radial* $\Delta K_r$	mm axial $\Delta K_a$	scale angular $\Delta K_w$
14	5 mm per m	$\pm 1$ mm	1,5°
19	5 mm per m	$\pm 1$ mm	1,5°
24	5 mm per m	$\pm 1$ mm	1,5°
28	5 mm per m	$\pm 1$ mm	1,5°
38	5 mm per m	$\pm 1$ mm	1,5°
42	5 mm per m	$\pm 1$ mm	1,5°
48	5 mm per m	$\pm 1$ mm	1,5°

\* Radial/parallel misalignment depends on the length of the tube.

# Checklist for Your Couplings Inquiry

For your convenience just copy, fill out and fax back to us!

company	name
street	dpt.
ZIP/town	eMail
phone	fax

**Please ask for personalized technical assistance!**

**1. Application:** How is the coupling supposed to be used? (machine, machine group or system)

**2. Type of connection**  clamping ring  shrink disc hub  flange connection  half shell hub  
 outer cone  spec. customer drawing

**3. Dimensions** Length  mm distance of shafts  mm

**4. Misalignment of shafts** axial  mm radial  mm angular  °

**5. Drive**

5.1 Drive output  $P_{AN} =$   kW

5.2 Drive speed  $n =$   1/min

5.3 Nominal torque of drive  $Mt_{nenn} =$   Nm

5.4 Peak torque of drive  $Mt_{max} =$   Nm

5.5 Shaft diameter drive side =  mm keyway  yes  no  
 driven side =  mm keyway  yes  no

**6. Mass moment of inertia**

6.1 Drive side  $J_A =$   Nm

6.2 Driven side  $J_L =$   Nm

**7. Special influences**

7.1 Ambient temperature surrounding the coupling?  $T =$   °C

7.2 Are there any shock loads?  light  medium  heavy

7.3 Special materials (e.g. stainless steel)

7.4 Special influences

**8. Planned quantities**  production  prototype  repair yearly:  quantity

**9. Target price**  €/piece

Sales Representative