



TL Torque Limiters

alpha Couplings



BC Bellow Couplings

EC Economic Class



TL – Single-position / Multi-position / Load holding / Free wheeling
BC/EC – Torsionally stiff metal bellow couplings



Torque Limiters

Single-position / Multi-position /
Load holding / Free-wheeling

Possible versions

- Single position re-engagement
- Multi position
- Load holding
- Free-wheeling

Areas of application

- Machine tools
- NC milling machines
- Woodworking machines
- Automated plant
- Textile machinery
- Industrial robots
- Sheet metal processing machines
- Printing machinery

Features

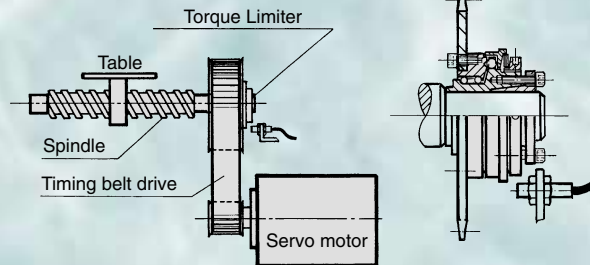
- Absolutely backlash-free and torsionally stiff
- Compact, uncomplicated design
- Disengagement detection achieved through high indexing ring movement
- Low residual friction following disengagement
- Low moment of inertia
- Disengagement within 1–3 msec.
- Self-adjusting

Models

Possible applications

Features

TL 1 2–1,500 Nm

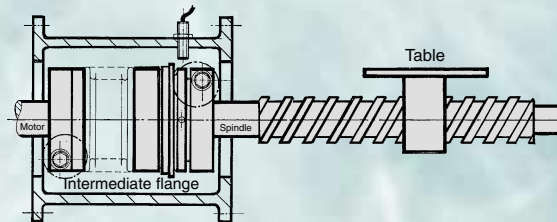


see page 8–9

For timing belt and sprocket gear applications

- Integral bearings for timing belt pulley or sprocket gear
- Compact, simple design
- Adjustable settings

TL 2 2–500 Nm

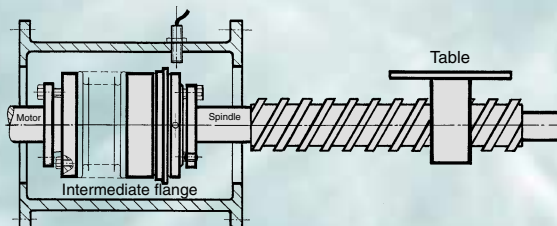


see page 10

With clamping hub for direct drives

- Easy assembly
- Low moment of inertia
- Small installation space
- Allows for shaft misalignment
- Adjustable settings

TL 3 15–1,500 Nm



see page 11

With conical clamp connection for direct drives

- High clamping forces
- High degree of operating dependability
- Allows for shaft misalignment
- Adjustable settings

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Bellow Couplings

Torsionally stiff metal bellow couplings

Areas of application

- Servo drives
- NC axes
- Robotic axes
- Manipulators
- Linear units
- Printing machines
- Packaging machines
- Woodworking machines
- Textile machinery
- Metal cutting machines

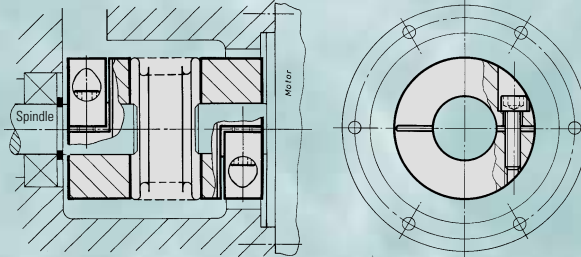
Models

Possible applications

Features

BC 2

15–1,500 Nm

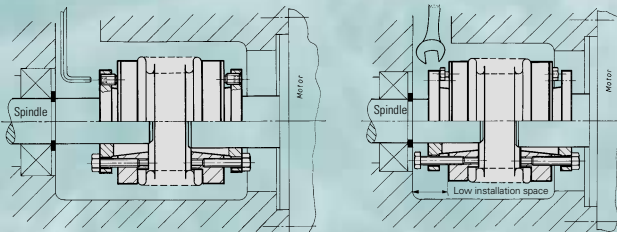
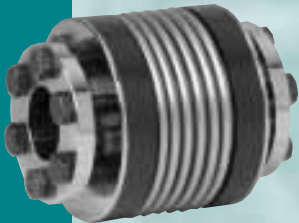


see page 12–13

- Easy to mount
- Suited for space restricted installations
- Low moment of inertia
- Finely balanced up to 40,000 rpm

BC 3

15–10,000 Nm

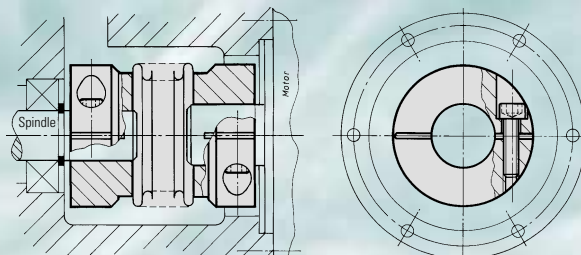
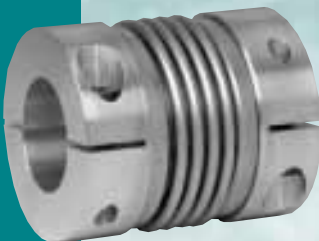


see page 14

- High clamping forces
- High degree of operating dependability
- New draw off device suited for space restricted installations

EC 2

2–500 Nm



see page 15

- Low cost version

PATENTED BACKLASH-FREE Torque Limiters

Single-position / Multi-position / Load holding / Free-wheeling

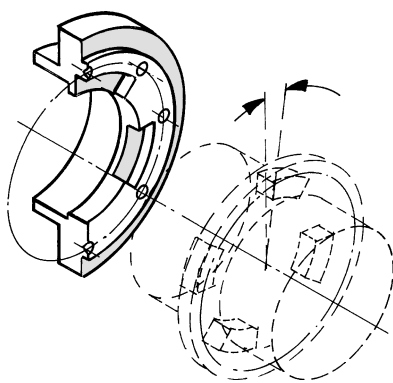
OVERVIEW OF POSSIBLE FUNCTION SYSTEMS

Single-position re-engagement



Standard version

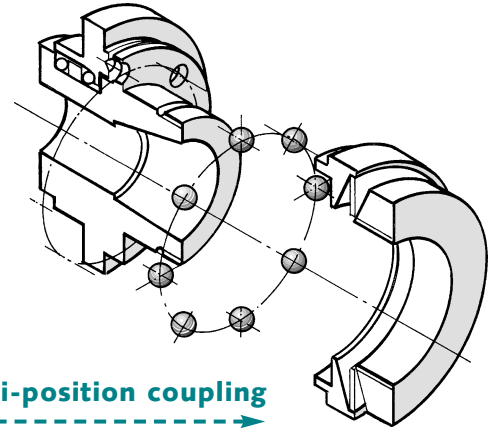
- After the overload has been removed, the coupling can be re-engaged precisely 360° from the original disengagement position.
- Signal at overload
- Suitable for use, in machine tools, packing machines and automation systems and other applications requiring precise timing.



Load holding Version

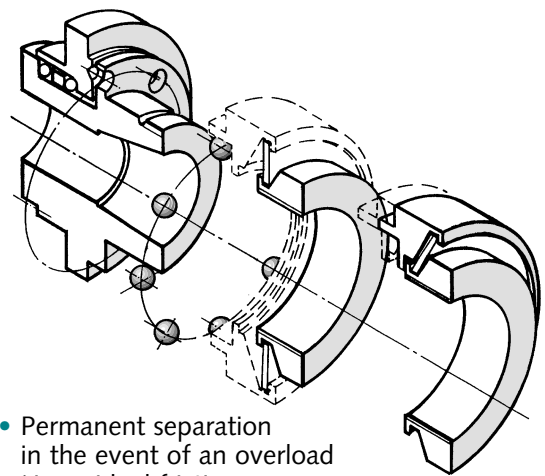
- In the event of an overload, the drive and the driven face are not separated or are only allowed limited rotation.
- Guarantee of load safety.
- Automatic engagement after the torque level has dropped.
- Signal at overload
- Suitable for use, on presses or load lifting equipment and where the motor and load cannot be separated.

Multi-position coupling



- Coupling re-engages in the very next position.
- The torque limiter is ready for operation again at a number of points.
- Immediate availability of the machine or plant as soon as the overload has been removed.
- Signal at overload
- Standard engagement after 60°
- Engagement after 15, 30, 45, 90 and 120 degrees optional.

Free-wheeling version



- Permanent separation in the event of an overload
- No residual friction
- Signal at overload
- Rotating elements slow down freely
- Coupling can be re-engaged manually
- Suitable for applications with high speeds
- Coupling can be disengaged manually (must specify on order)

Assembly Instructions

Series Torque Limiters & Bellow Couplings

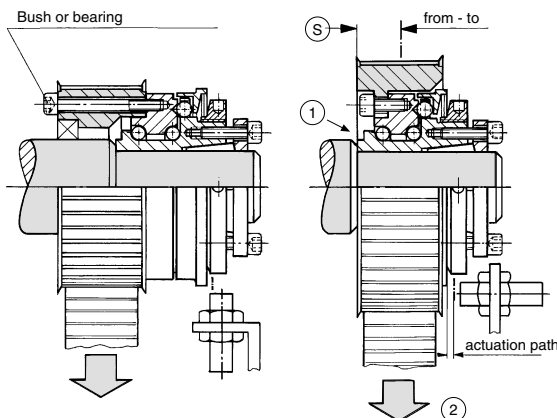
- During installation and removal be sure that the metal bellows are neither bent nor damaged.
- Torques and shaft misalignments may exceed 2.5-times of their rated values during installation only.
- The axial and lateral misalignments quoted in the brochures may not be exceeded in continuous operation. The couplings have virtually unlimited life, if the maximum misalignment values are not exceeded.
- A maximum of 0.04 mm clearance is allowed between the shaft and coupling.

Please consider the lateral misalignment.
(→ see values in table) approx. 0.1–0.25 mm



Model TL 1

Model TL1 has an integrated bearing ① for support of the attached component (for example a pulley or sprocket wheel). Pay attention to the maximum radial force ② (see table). By centering the load between the dimension ⑤, no separate bearings are required.

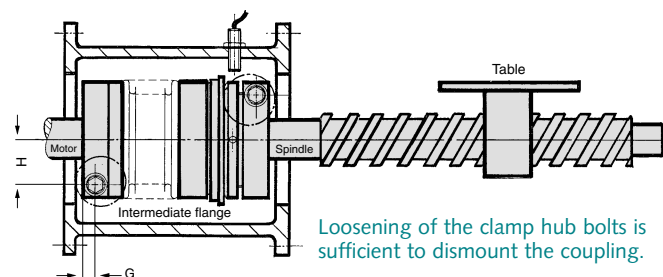


For offset mounting, additional bearings are required. This is recommended, for example, if the attached component has a very small diameter or the drive element has a very large width. Depending on the installation situation, ball bearings, needle bearings or bushings may be used.

Series max. (N)	2	4.5	10	15	20/30	40/60	80/150	200	300	500	800	1500
Radial load capacity, max. (N)	100	200	500	1400	1800	2300	3000	3500	4500	5600	8000	12000
⑤ from - to	5 - 8	6 - 10	6 - 12	7 - 14	8 - 18	8 - 18	12 - 20	12 - 22	12 - 23	12 - 25	14 - 34	20 - 42

Series TL 2 / BC 2 / EC 2

In order to ensure dependable clamping of the hubs, tighten bolts according to the torque values stated in the technical information. Additional locking of the bolt is unnecessary. The „G“ and „H“ dimensions are provided in the technical information, where flange access holes are required.



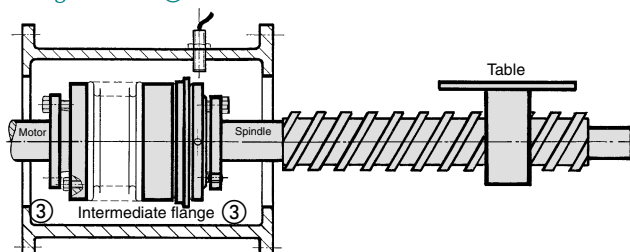
Series TL 3 / BC 3

It is absolutely essential that the fastening bolts be tightened evenly. Tighten the fastening bolts diagonally.

CAUTION!

If the bolts are repeatedly tightened diagonally distortion of the tapered bushings is still possible. It is absolutely essential to avoid this as destruction of the clamped connection may be the result.

Removing the tapered bushing is achieved using the 3 captive hexagonal bolts ③.



When dismounting ensure that the three hexagonal bolts ③ are unscrewed evenly and synchronously during this procedure.

The Selection of Torque Limiters

→ According to disengagement torque

As a rule torque limiters are rated according to the required disengagement torque, which must be greater than the torque that is necessary for regular machine operation.

The disengagement torque of the torque limiters is determined as a rule in accordance with the drive specifications. The following calculation has proven itself as a rule of thumb solution:

$$M_N \geq 1,5 \cdot M_{Max} \text{ [Nm]}$$

M_N = rated torque of coupling [Nm]
 M_{Max} = peak torque of motor [Nm]

or

$$M_N = 9550 \cdot \frac{P}{n} \text{ [Nm]}$$

M_N = rated torque of coupling [Nm]
 P = drive power [kW]
 n = speed of drive [rpm]

→ Adjustment of the disengagement Torque

The disengagement torque is infinitely adjustable within the adjustment range through pretensioning of the disc springs. The couplings are preset to the desired disengagement torque. After loosening the set screws the coupling can be finely readjusted on the machine by turning the adjustment nut. After adjustment, the nut is secured by retightening the set screws. Incorrect operation is prevented by a positive stop.

Speed:

Although the torque limiters are designed for speeds of up to 10,000 rpm, the service life of the coupling is essentially determined by the number of rotations after disengagement.

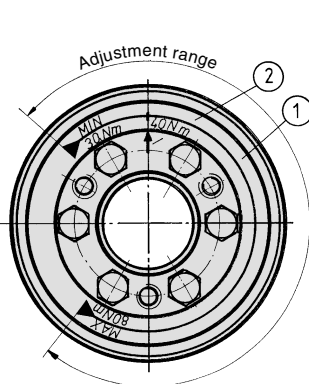
Wear:

No wear occurs during engaged operating condition. In the event of an overload the drive should be stopped through a mechanical limit switch or proximity switch, since the degressive disc springs may lose 10 % of their preset value after approximately 3000 successive disengagements (rotations). If the spring-loaded positive connection is in a constant disconnect/ ratcheting position, we will be unable to guarantee continuous backlash-free transmission. Prior technical approval is suggested, for applications using our products other than specified.

Maintenance:

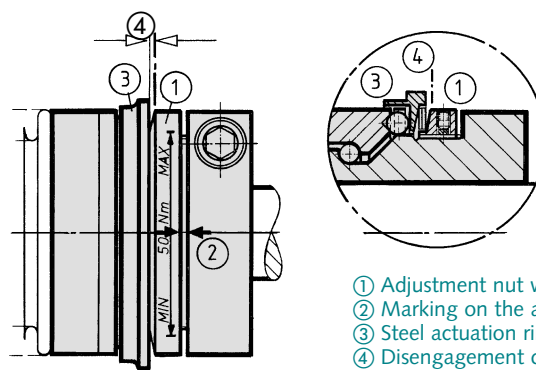
When properly engaged, the torque limiters are wear free, and therefore require no maintenance. The positive connections are permanently lubricated.

MODEL TL1 + TL3

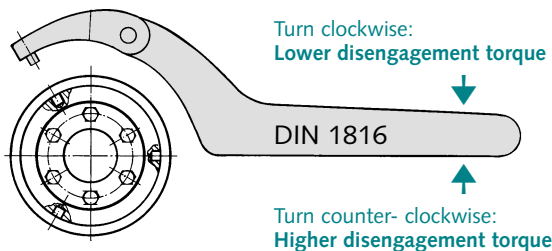


Set torque 40 Nm

MODEL TL2 + TL5



Set torque 50 Nm



The adjustment range (min./max.) may not be exceeded. A very low degree of residual friction on the coupling is achieved due to the degressive spring characteristic. This is approx. 2–5 % of the preset value.

---> According to acceleration torque (start-up at no load)

$$M_N = \alpha \cdot J_L = \frac{J_L}{J_A + J_L} \cdot M_{Max} \cdot K \text{ [Nm]}$$

K = shock or load factor
 K = 1 (uniform load)
 K = 2 (non-uniform load)
 K = 3 (shock load)

Values for K = 2–3 are usual for servo drives on machine-tools.

M_N = rated torque of coupling [Nm]

α = angular acceleration [1/sec²]

$$\alpha = \frac{\omega}{t} = \frac{\pi \cdot n}{t \cdot 30}$$

t = acceleration time [sec]

ω = angular speed [1/sec]

n = speed of drive [rpm]

J_L = moment of inertia on load side [kgm²]

J_A = moment of inertia on driving side [kgm²]

M_{Max} = peak torque of motor [Nm]

---> According to acceleration and load torque

$$M_N = \alpha \cdot J_L + M_L = \left[\frac{J_L}{J_A + J_L} \cdot (M_{max} - M_L) + M_L \right] \cdot K$$

K = shock or load factor
 K = 1 (uniform load)
 K = 2 (non-uniform load)
 K = 3–4 (shock load)

Values for K = 2–3 are usual for servo drives on machine-tools.

M_N = rated torque of coupling [Nm]

α = angular acceleration [1/sec²]

$$\alpha = \frac{\omega}{t} = \frac{\pi \cdot n}{t \cdot 30}$$

t = acceleration time [sec]

ω = angular speed [1/sec]

n = speed of drive [rpm]

J_L = moment of inertia on load side [kgm²]

M_L = load torque [Nm]

J_A = moment of inertia on driving side [kgm²]

M_{Max} = peak torque of motor [Nm]

---> According to feed force

Spindle drive

$$M_L = \frac{s \cdot F_V}{2000 \cdot \pi \cdot \eta} \text{ [Nm]}$$

Timing belt drive

$$M_L = \frac{d_o \cdot F_V}{2000} \text{ [Nm]}$$

M_L = load torque [Nm]

s = spindle pitch [mm]

F_V = feed force [N]

η = spindle efficiency

M_L = load torque [Nm]

d_o = pinion dia. (toothed belt wheel) [mm]

F_V = feed force [N]

Note: must add acceleration torque to these load torque calculations!

---> According to resonant frequency (TL 2 / TL 3)

Usually high resonant frequencies of the couplings are required in order to make high acceleration values possible and avoid any vibration excitation.

For the purpose of calculation the drive is reduced to a 2 mass system.

$$f_{res} = \frac{1}{2 \cdot \pi} \sqrt{C_t \cdot \frac{J_{Mach} + J_{Mot}}{J_{Mach} \cdot J_{Mot}}} \text{ [Hz]}$$

C_t = torsional stiffness of the coupling [Nm/rad]

J_{Mach} = moment of inertia of machine [kgm²]

= (spindle + slide + workpiece + half of coupling)

J_{Mot} = moment of inertia of motor [kgm²]

= (motor's rotor + half of coupling)

---> According to torsional stiffness (TL 2 / TL 3)

Transmission errors due to a torsional stress on the metal bellows:

$$\varphi = \frac{180}{\pi} \cdot \frac{M_{Max}}{C_t} \text{ [degrees]}$$

φ = angle of turn [degrees]

C_t = torsional stiffness of coupling [Nm/rad]

M_{Max} = peak torque of motor [Nm]

---> According to the function system

Load holding version: On TL1 models the load holding version has a quadruple load safety margin. Ensure that models with bellows (TL 2 / TL 3) are of adequate size. The blocking load in this case should not exceed the nominal torque of the coupling.

Model TL 1

Torque Limiter

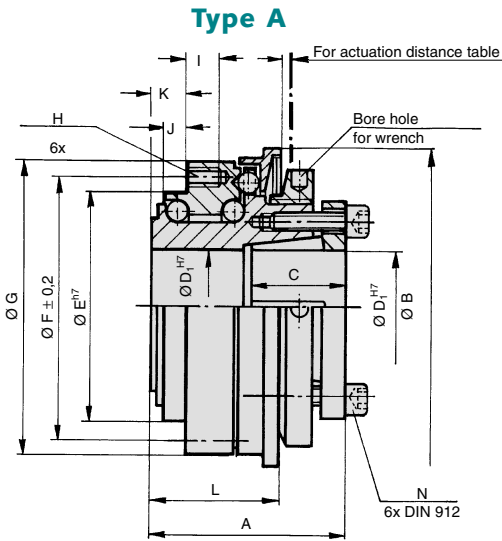
for timing belt and sprocket wheel applications

Material

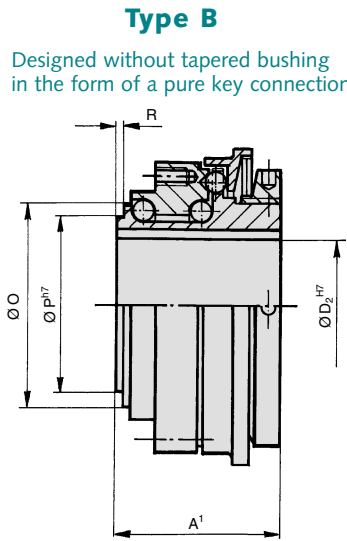
High-strength steel

Structure

With split tapered bushing



Version of inner diameter
ONLY SMOOTH



Version of inner diameter
ONLY WITH KEYWAY

Temperature range: -30 °C to +120 °C

Temperature peaks up to +150 °C

Operating speed: up to 20 000 rpm

Speed after disengagement: Dependent on set disengagement torque
Play: Absolutely backlash-free as a result of the frictional clamp connection and the patented principle

Service life: These couplings are permanent and maintenance-free, if the technical instructions are complied with.

Optional clamping hub available upon request

TECHNICAL INFORMATION

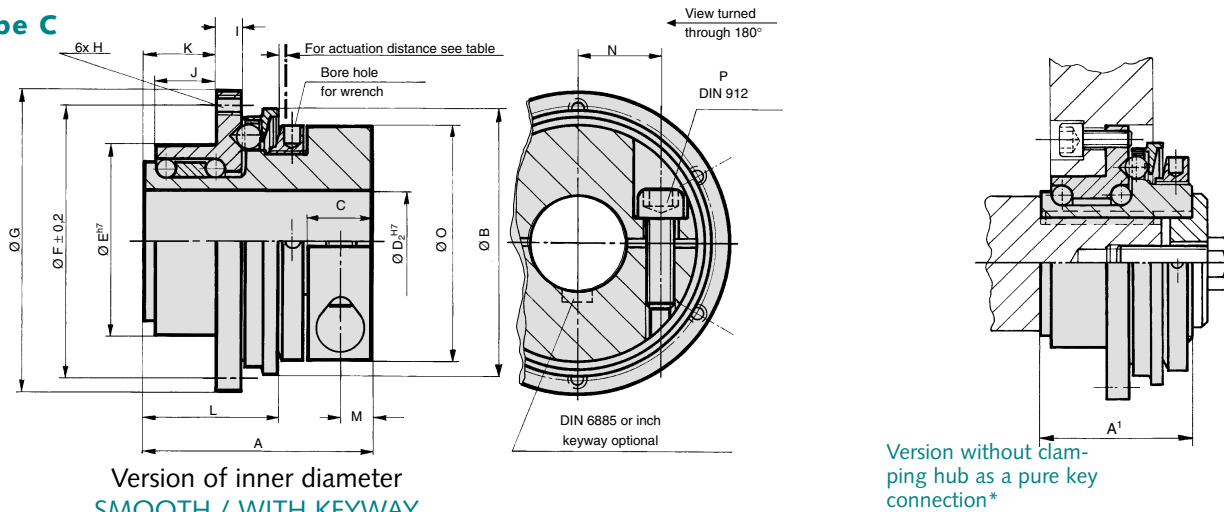
Single-position / Multi-position / Load holding

Free-wheeling see supplementary technical information, see page 9

Series	Rated torque [Nm]		Overall length without screw heads [mm]	Overall length [mm]	Outer diameter of actuation ring [mm]	A	A'	B	C	D ₁	D ₂	E	F	G	H	I	J	K	L	N	O	P	R
			Outer diameter of actuation ring [mm]	Length of taper [mm]	Inner diameter from \varnothing to \varnothing H7 [mm]	Type A: $D_2 \geq D_1$	Type B: $D_2 = D_1$	Centering diameter ± 0.2 [mm]	bolt diameter h7 [mm]	Flange diameter ± 0.2 [mm]	6 x thread	Thread depth + 1 [mm]	Centering length - 0.2 [mm]	Centering length + 1 [mm]	6 x screws DIN 912	Tightening torque [Nm]	Adjustable range [Nm]		Moment of inertia [10 ⁻³ kgm ²]		Approx. weight [kg]		Actuation path [mm]
15	A 40	A 34	55	19	8-22	20	40	47	53	M4	6	3	8	27	M4	4	35	27	2.5	A 5-20	0.15	0.4	1.5
20	A 50	A 43	65	22	12-23	22	47	54	63	M5	8	5	11	35	M5	4	42	32	2.5	A 10-25	0.25	0.7	1.5
30	A 50	A 43	65	22	12-23	22	47	54	63	M5	8	5	11	35	M5	4	42	32	2.5	A 10-25 or B 15-35	0.25	0.7	1.5
40	A 54	A 46	73	25	12-29	30	55	63	72	M5	9	5	11	37	M5	6	49	39	2.5	A 10-30 or B 20-45	0.50	1.0	1.7
60	A 54	A 46	73	25	12-29	30	55	63	72	M5	9	5	11	37	M5	7	49	39	2.5	A 20-65	0.50	1.0	1.7
80	A 58	A 49	92	32	15-37	38	68	78	87	M6	10	5	12	39	M6	10	62	50	2.5	A 15-70 or B 30-90	1.60	1.3	1.9
150	A 58	A 49	92	32	15-37	38	68	78	87	M6	10	5	12	39	M6	12	62	50	2.5	A 30-150	1.60	1.3	1.9
200	A 63	A 53	98	32	20-44	44	75	85	98	M6	10	5	12	44	M6	14	67	55	3	A 30-90 B 60-160 C 80-210	2.70	2.0	2.2
300	A 70	A 57,5	120	41	25-56	52	82	98	112	M8	10	6	15	47	M8	18	75	65	3	A 100-200 B 150-240 C 200-310	5.20	3.0	2.2
500	A 84	A 71	135	41	25-56	58	90	110	128	M8	12	9	21	59	M8	25	84	72	4	A 80-200 B 200-350 C 300-550	8.60	4.0	2.2
800	A 95	A 80	152	49	30-60	62	100	120	140	M10	15	10	19	67	M10	36	91	75	4	A 400-650 or B 500-800	20	5.5	2.2
1500	A 109	A 93	174	61	35-70	73	125	148	165	M12	16	12	25	82	M12	80	112	92	4.5	A 600-800 B 700-1200 C 1000-1500	31.5	8.8	3.0

Torque Limiter in miniature design (from 0.2–12 Nm)

Type C



Version of inner diameter
SMOOTH / WITH KEYWAY

Version without clamping hub as a pure key connection*

Single-position / Multi-position / Load holding

Free-wheeling see supplementary technical information

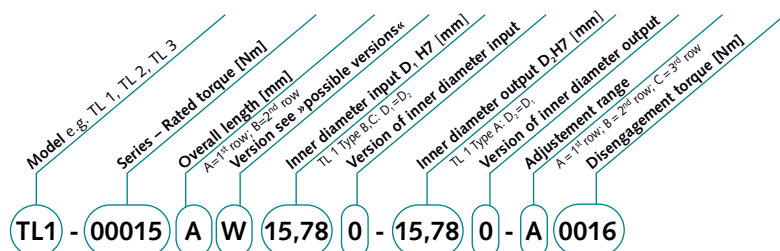
Series - Rated torque [Nm]	A	A'	B	C	D ₂	E	F	G	H	I	J	K	L	M	N	O	P					
Overall length [mm]	Overall length [mm]	Outer diameter of actuation ring [mm]	Inner diameter up to Ø H7 [mm] Type C: D ₂ = D ₃	Centering diameter h7 [mm]	Hole circle diameter ± 0.2 [mm]	Flange diameter [mm]	Thread	Thread length [mm]	Centering length - 0.2 [mm]	Centering [mm]	Distance between centers [mm]	1 x screw DIN 912	Tightening torque [Nm]	Adjustable range [Nm] possible from-to (approx. values)	Moment of inertia [10 ³ kgm ²]	Approx. weight [g]	Actuation path [mm]					
2	A 28	A 20	29	8	4-12 *4-10	22	28	32	4x M2.5	4	3.5	6	15	4	8	25	M3	2	A 0.2-1.5 or B 0.5-2	0.02	65	0.8
4.5	A 32	A 22	35	11	5-14 *5-12	25	35	40	6x M2.5	4	5	8	17	5	10	32	M4	2.5	A 1-3 or B 2-4.5	0.05	120	0.8
10	A 39	A 28	45	11	6-20 *6-16	34	43	50	6x M3	5	8	11	22	5	15	40	M4	4.5	A 2-6 or B 4-12	0.07	220	1.2

Supplementary technical information for free-wheeling version

Please note the following changes to dimensions and adjustment ranges for this version

Dimension	Series	2	4.5	10	15	20	30	40	60	80	150	200	300	500	800	1500	
A ^F (free-wheeling)		28	32	39	40	50		54		58		63	73	88			
B ^F (free-wheeling)		32	42	51	62	70		83		98		117	132	155			
L ^F (free-wheeling)		16	18	23	27	37		39		41		42	49	62	upon request		
Adjustment range from-to (Nm)		A 0.5-2	A 2.5-4.5	A 4-10	A 7-15	A 8-20	A 16-30	A 10-30 or B 20-40	A 20-40 or B 30-60	A 20-60 or B 40-80	A 80-150	A 80-140 or B 130-200	A 120-200 or B 160-300	A 50-150 or B 100-300	C 250-500		

Ordering specifications:



Example:
TL1-00015 AW 08,00 0-08,00 0-A 0016=Type A
TL1-00015 AW 19,75 1-19,75 1-A 0020=Type B
TL2-00500 BW 035,00 0-060,00 1-C 0400
TL3-01500 AW 070,00 0-070,00 0-B 1120

Possible versions

- W = Single-position engagement (standard)
- D = Multi-position engagement (on request)
- G = Load holding (on request)
- F = Free-wheeling (on request)
- X = Special version (on request)

Version of inner diameter input/output

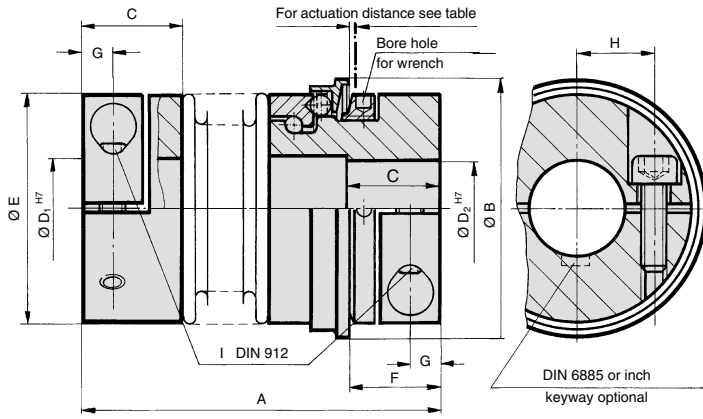
- 0 = Smooth
- 1 = With keyway as DIN 6885 Form A
- 2 = Involute DIN 5480
- 4 = Other (specify key size)
- 5 = Pure key connection (only TL 1 type C)

For the maximum permissible radial load capacity for all TL 1 models, see installation instructions on page 5

Model TL 2

Torque Limiter

with clamping hub for direct drives



Version of inner diameter
SMOOTH / WITH KEYWAY

Material

Bellows made of highly elastic stainless steel
Safety section: High strength steel
Hub material: up to series 80 aluminium
from series 150 steel

Design

With a lateral clamping screw DIN 912

Temperature range: -30 °C to +120 °C

Temperature peaks up to + 150 °C

Operating speed: up to 10 000 rpm

Speed after disengagement: Dependent on set disengagement torque

Backlash: Absolutely backlash free as a result of the frictional clamp connection and the patented principle

Service life: These couplings are permanent and maintenance-free, if the technical instructions are complied with.

TECHNICAL INFORMATION Single-position / Multi-position / Load holding / Free-wheeling

Series	Rated torque [Nm]		Overall length [mm]	Outer diameter of actuation ring [mm]	Fit length [mm]	Inner diameter from Ø to Ø H7 [mm]	Outer diameter of coupling [mm]	Distance between centers [mm]	DIN 912 screws	Tightening torque [Nm]	Adjustable range [Nm] possible from-to	Adjustable range [Nm] possible from-to (approx. values)	Approx. weight [kg]	Moment of inertia [10 ³ kgm ²]	Torsional stiffness [10 ³ Nm/rad]	Lateral misalignment [mm]	Angular misalignment [degrees]	Lateral spring stiffness [N/mm]	Actuation path [mm]			
	A	A ^F																				
2	A 46 B 51	A 46 B 51	29	32	13	4-12	25	13	12	4	8	M3	2	A 0.2-1.5 B 0.5-2	A 0.5-2	0.07	0.01	2.8 2,1	0.15 0.20	1 1.5	40 30	0.8
4,5	A 57 B 65	A 57 B 65	35	42	16	5-14	32	15	14	5.0	10	M4	2,5	A 1-3 B 2-4.5	A 2,5-4,5	0.2	0.02	7 5	0.20 0.25	1.5 2	290 45	0.8
10	A 65 B 74	A 65 B 74	45	51	16	6-20	40	17	16	5.0	15	M4	4	A 2-6 B 4-10	A 4-10	0.3	0.06 0.07	9 9	0.20 0.30	1.5 2	280 145	1.2
15	A 75 B 82	A 75 B 82	55	62	22	10-26	49	19	19	6.5	17	M5	8	A 5-15	A 7-15	0.4	0.10 0.15	20 15	0.15 0.20	1 1.5	315 108	1.5
20	A 87 B 95	A 87 B 95	65	70	27	12-30	55	24	22	7.5	19	M6	12	A 10-20	A 8-20	0.6	0.25 0.30	22 18	0.20 0.25	1 1.5	720 220	1.5
30	A 87 B 95	A 87 B 95	65	70	27	12-30	55	24	22	7.5	19	M6	15	A 10-25 B 15-30	A 8-20 B 16-30	0.6	0.27 0.32	39 28	0.20 0.25	1 1.5	730 230	1.5
40	A 99 B 109	A 99 B 109	73	83	31	15-32	66	30	29	9.5	23	M8	25	A 10-30 B 20-40	A 10-30 B 20-40	1.0	0.70 0.75	61 42	0.20 0.25	1 1.5	720 210	1.7
60	A 100 B 110	A 100 B 110	73	83	31	15-32	66	30	29	9.5	23	M8	32	A 20-60	A 20-40 B 30-60	1.0	0.75 0.80	76 55	0.20 0.25	1 1.5	1200 380	1.7
80	A 115 B 127	A 117 B 129	92	98	35	19-42	81	31	29	11.0	27	M10	50	A 15-70 B 20-80	A 20-60 B 40-80	2.0	1.80 1.90	129 85	0.20 0.25	1 1.5	920 255	1.9
150	A 116 B 128	A 118 B 130	92	98	35	19-42	81	31	29	11.0	27	M10	70	A 30-150	A 80-150	2.4	2.50 2.80	175 110	0.20 0.25	1 1.5	1550 435	1.9
200	A 128 B 140	A 131 B 143	98	117	40	24-45	90	35	33	12.5	31	M12	110	A 30-90 B 60-160 C 80-200	A 80-140 B 130-200	3.0	3.30 3.50	191 140	0.25 0.30	1.5 2	2040 610	2.2
300	A 139 B 153	A 142 B 156	120	132	42	30-60	110	35	35	13.0	39	M12	130	A 100-200 B 150-240 C 200-300	A 120-200 B 160-300	4.0	6.50 7.00	501 295	0.25 0.30	1.5 2	3750 1050	2.2
500	A 163 B 177	A 167 B 181	135	155	51	35-60	123	45	43	17.0	41	M16	200	A 80-200 B 200-350 C 300-500	A 60-150 B 100-300 C 250-500	8.5	13.0 17.0	510 500	0.30 0.35	2 2.5	1200 640	2.2

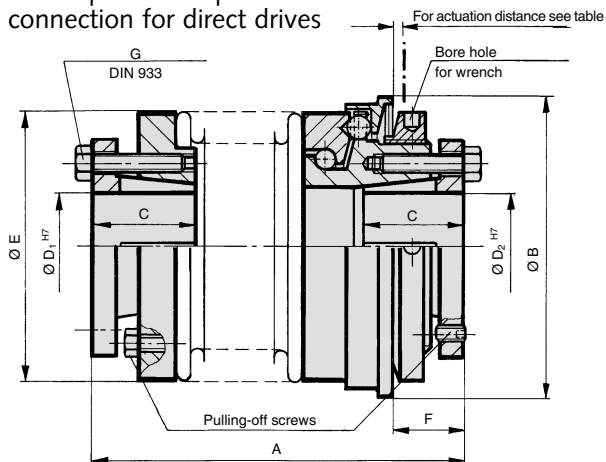
Ordering specifications: see page 9

A^F, B^F, F^F = free-wheeling

Model TL 3

Torque Limiter

with tapered clamp connection for direct drives



Version of inner diameter
ONLY SMOOTH

Material

Bellows made of highly elastic stainless steel
Safety section: High strength steel.
Hub material: Steel

Structure

With split tapered clamping hubs and removal jack screws

Temperature range: -30 °C to +120 °C

Temperature peaks up to + 150 °C

Operating speed: up to 10 000 rpm

Speed after disengagement: Dependent on set disengagement torque

Backlash: Absolutely backlash free as a result of the frictional clamp connection and the patented principle

Service life: These couplings are permanent and maintenance-free, if the technical instructions are complied with.

TECHNICAL INFORMATION Single-position / Multi-position / Load holding / Free-wheeling

	Series – Rated torque [Nm]		Overall length [mm]		Outer diameter of actuation ring [mm] (free-wheeling) A ^F		Outer diameter of actuation ring [mm] (free-wheeling) B ^F		Fit length [mm]		Inner diameter from Ø to Ø H7 [mm]		Outer diameter of coupling [mm]		6 x DIN 933 screws		Tightening torque [Nm]		Adjustable range [Nm] possible from-to (approx. values)		Adjustable range [Nm] possible from-to (approx. values)		Approx. weight [kg]		Moment of inertia [10 ⁻³ kgm ²]		Torsional stiffness [10 ³ Nm/rad]		Lateral misalignment [mm]		Angular misalignment [degrees]		Lateral spring stiffness [N/mm]		Actuation path [mm]										
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B											
15	A 62 B 69	A 62 B 69	55	62	19	10–22	49	13	13	M4	4	A 5–15 B 7–15	A 7–15	0.3	0.10 0.15	20 15	0.15 0.20	1 1.5	315 108	1.5																									
20	A 72 B 80	A 72 B 80	65	70	22	12–23	55	16	14	M5	4	A 10–20 B 8–20	A 8–20	0.4	0.20 0.25	22 18	0.20 0.25	1 1.5	720 220	1.5																									
30	A 72 B 80	A 72 B 80	65	70	22	12–23	55	16	14	M5	4	A 10–25 or B 15–30	A 8–20 or B 16–30	0.4	0.28 0.30	39 28	0.20 0.25	1 1.5	730 230	1.5																									
40	A 81 B 91	A 81 B 91	73	83	27	12–29	66	18	17	M5	6	A 10–30 or B 20–40	A 10–30 or B 20–40	1.2	0.70 0.80	61 42	0.20 0.25	1 1.5	720 210	1.7																									
60	A 82 B 92	A 82 B 92	73	83	27	12–29	66	18	17	M5	7	A 20–60 or B 30–60	A 20–40 or B 30–60	1.2	0.75 0.80	76 55	0.20 0.25	1 1.5	1200 380	1.7																									
80	A 92 B 104	A 92 B 104	92	98	32	15–37	81	20	18	M6	10	A 15–70 or B 30–80	A 20–60 or B 40–80	2.3	1.80 1.90	129 85	0.20 0.25	1 1.5	920 255	1.9																									
150	A 93 B 105	A 93 B 105	92	98	32	15–37	81	20	18	M6	12	A 30–150 B 80–150	A 80–150	2.3	1.90 2.00	175 110	0.20 0.25	1 1.5	1550 435	1.9																									
200	A 99 B 111	A 102 B 114	98	117	32	20–44	90	19	17	M6	14	A 30–90 B 60–160 C 80–200	A 80–140 or B 130–200	3.0	2.80 3.00	191 140	0.25 0.30	1.5 2	2040 610	2.2																									
300	A 114 B 128	A 117 B 131	120	132	41	25–56	110	23	20	M8	18	A 100–200 B 150–240 C 200–300	A 120–200 or B 160–300	5.0	5.50 6.00	501 295	0.25 0.30	1.5 2	3750 1050	2.2																									
500	A 123 B 136	A 127 B 140	135	155	41	25–60	123	25	22	M8	25	A 80–200 B 200–350 C 300–500	A 60–150 B 100–300 C 250–500	6.5	11.00 12.80	510 500	0.30 0.35	2 2.5	1200 640	2.2																									
800	A 151	upon request	152	upon request	49	30–60	133	31	upon request	M10	36	A 400–650 or B 500–800	upon request	9.0	20	780	0.35	2.5	620	2.2																									
1500	A 175	upon request	174	upon request	61	35–70	157	30	upon request	M12	70	A 600–800 B 700–1200 C 1000–1500	upon request	16.3	42	1304	0.35	2.5	650	3																									

A^F, B^F, F^F = free-wheeling

Ordering specifications: see page 9

The Selection process of Bellow Couplings

Areas of application

for high dynamic servo drives

- Machine tools
- NC milling / grinding machines
- Woodworking machines
- Assembly machines
- Automated plants
- Textile machines
- Industrial robots
- Processing machines
- Printing machinery
- Packaging machines

Properties

- high degree of torsional stiffness
- compensates for axial, lateral and angular misalignment combined with quiet, smooth operation
- exact angular and torque transmission
- infinite life
- optimized against resonance frequencies

The selection process for torsionally stiff metal bellows couplings

According to torque

In most cases rate couplings according to the maximum peak torque to be regularly transmitted.

The peak torque may not exceed the rated torque of the coupling.

By rated torque we mean: the torque that is continuously transmittable within the specified acceptable speed and misalignment ranges.

The following calculation has proven itself to be a good rule of thumb:

$$M_N \geq 1,5 \cdot M_{Max} \quad [Nm]$$

M_N = rated torque of coupling [Nm]

M_{Max} = peak torque of motor [Nm]

[Nm]

[Nm]

According to acceleration torques

For precise rating, the acceleration torque and moments of inertia of the entire machine or plant have to be taken into consideration.

In the case of servo motors ensure that their acceleration or deceleration torque is greater than their torque by a multiple.

$$M_N = M_{Max} \cdot K \cdot \frac{J_{Mach}}{J_{Mot} + J_{Mach}} \quad [Nm]$$

M_N = rated torque of coupling [Nm]

M_{Max} = max. acceleration torque on the drive face [Nm]

= max. deceleration torque on the drive face [Nm]

[Nm]

[Nm]

[Nm]

K = shock or load factor

K = 1 (uniform load)

K = 2 (non-uniform load)

K = 3-4 (shock load)

J_{Mach} = machine's moment of inertia [kgm²]

(Spindle + slide + workpiece + half of coupling)

J_{Mot} = motor's moment of inertia [kgm²]

[kgm²]

[kgm²]

[kgm²]

Values for K = 2-3 are usual for servo drives on machine-tools.

According to resonance frequency

For the mechanical substitutional model of the 2-mass-system is valid:

$$f_{res} = \frac{1}{2 \cdot \pi} \sqrt{C_t \cdot \frac{J_{Mach} + J_{Mot}}{J_{Mach} \cdot J_{Mot}}} \quad [Hz]$$

As a value of practice is valid: $f_{res} \geq 2x f_E$

C_t = torsional stiffness of coupling [Nm / rad]

f_{res} = resonance frequency of the 2-mass-system

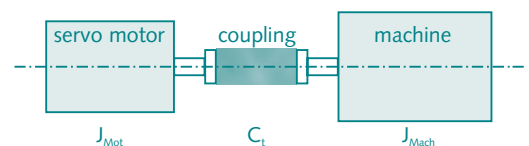
f_E = frequency of the drive

[Nm / rad]

[Hz]

[Hz]

2-mass-system



According to torsional stiffness

Transmission errors due to the torsional load on the metal bellows:

$$\varphi = \frac{180}{\pi} \cdot \frac{M_{Max}}{C_t} \quad [degrees]$$

φ = angle of turn [degrees]

C_t = torsional stiffness of coupling [Nm / rad]

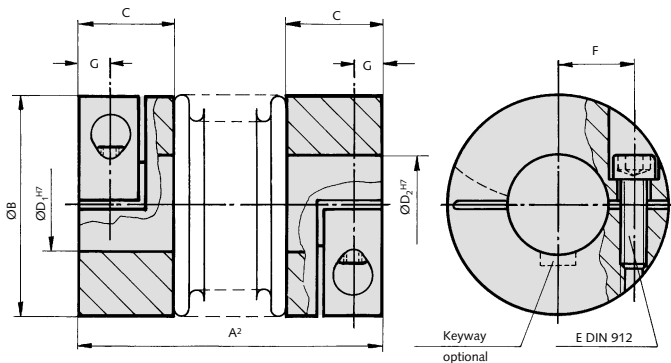
M_{Max} = max. torque [Nm]

[degrees]

[Nm / rad]

[Nm]

Model BC 2



Version of inner diameter
SMOOTH / WITH KEYWAY

- easy to mount
- suited for space restricted installations
- low moment of inertia

Material

Bellows made of highly flexible high-grade stainless steel.

Hub material: see in the table

Design

With a single radial clamping screw per hub DIN 912.

Any imbalance of the clamping hubs single screw design, is compensated for with balancing bores located on the inside of the hub.

Series	Rated torque [Nm]	Overall length [mm]	Outer diameter [mm]	Fit length [mm]	Inner diameter from Ø to Ø H7 [mm]	DIN 912 fastening screw [Nm]	Tightening torque of the fastening screw [Nm]	Distance between centers [mm]	Moment of inertia [10 ⁻⁴ kgm ²]	Hub material (standard)	Approx. weight [kg]	Torsional stiffness [10 ³ Nm/rad]	axial [mm]	lateral [mm]	axial spring stiffness [N/mm]	lateral spring stiffness [N/mm]	Max. values
15	A 59 B 66	49	23	8–28	M5	8	17	6.5	0.07 0.08	Al	0.15	20 15	1 2	0.15 0.2	20 12	315 108	
20	A 69 B 77	55	27	10–30	M6	12	19	7.5	0.12 0.14	Al	0.3	22 18	1 2	0.2 0.25	40 20	720 220	
30	A 69 B 77	55	27	10–30	M6	15	19	7.5	0.14 0.15	Al	0.3	39 28	1 2	0.2 0.25	50 30	730 230	
40	A 82 B 92	66	32	12–32	M8	30	23	9.5	0.22 0.23	Al	0.4	61 42	1.5 2	0.2 0.25	40 25	720 210	
60	A 83 B 93	66	32	12–32	M8	40	23	9.5	0.23 0.26	Al	0.4	76 55	1.5 2	0.2 0.25	72 48	1200 380	
80	A 94 B 106	81	36	14–42	M10	50	27	11	0.65 0.67	Al	0.8	129 85	2 3	0.2 0.25	48 32	920 255	
150	A 95 B 107	81	36	19–42	M10	70	27	11	2.20 2.40	steel	1.7	175 110	2 3	0.2 0.25	82 52	1550 435	
200	A 105 B 117	90	41	22–45	M12	120	31	12.5	2.5 3.8	steel	2.5	191 140	2 3	0.25 0.3	58 56	2040 610	
300	A 111 B 125	110	43	30–60	M12	130	39	13	5 5.8	steel	4	501 295	2.5 3.5	0.25 0.3	105 71	3750 1050	
500	A 133 B 146	123	51	35–60	M16	200	41	16.5	6.5 8.2	steel	6	510 500	2.5 3.5	0.3 0.35	43 48	960 580	
800	A 140	135	49	40–70	2xM16	250	2x48	18	10.4	steel	7	780	3.5	0.35	45	620	
1500	A 166	157	55	50–80	2xM20	470	2x55	23	47	steel	12	1304	3.5	0.35	80	650	

Ordering specifications: see page 15

Product description for model series BC 2 / 3

Temperature range: -30 °C to +120 °C

Speeds: up to 10000 rpm, in excess of 10000 rpm with finely balanced version

Backlash: Absolutely backlash free due to frictional clamped connection

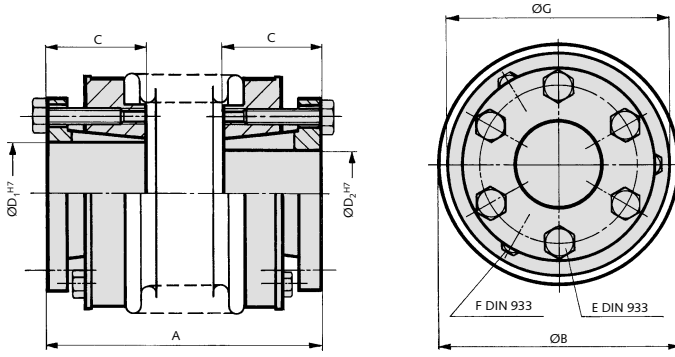
Brief overloads: Acceptable up to 1.5 times the value specified

Clearance: On the hub/shaft connection 0.01 to 0.05 mm

Service life: These couplings are maintenance-free, if the technical instructions are followed explicitly.

Non-standard design applications: To include varied tolerances, keyways, non-standard material and bellows are possible on short notice.

Model BC 3



Version of inner diameter
ONLY SMOOTH

- high clamping forces
- high degree of operating dependability
- new draw off device suited for space restricted installations

Material

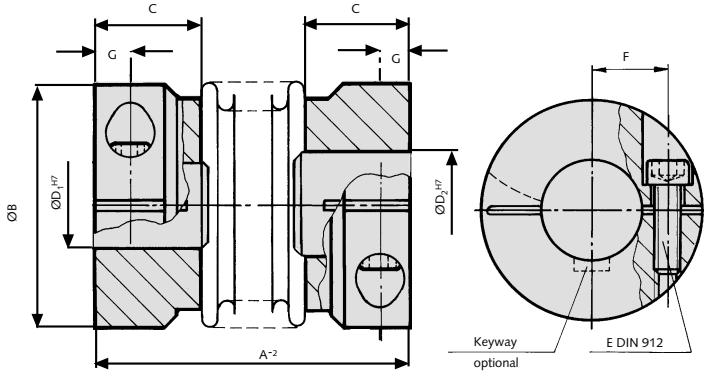
Bellows made of highly flexible high-grade stainless steel, the hub material of steel.

Design

With slitted tapered conical sleeves and strong, captive DIN 933 draw-off screws.

	Series - Rated torque [Nm]	A	B	C	D	E	F	G	Max. values						
	Overall length [mm]	Outer diameter of bellows [mm]	Fit length [mm]	Inner diameter from Ø to Ø H7 [mm]	Fastening screws	Tightening torque of the fastening screws [Nm]	DIN 933 press-off screw	Outer diameter of hub [mm]	Moment of inertia [10 ³ kgm ²]	Approx. weight [kg]	Torsional stiffness [10 ³ Nm/rad]	axial [mm]	lateral [mm]	axial spring stiffness [N/mm]	lateral spring stiffness [N/mm]
15	A 48 B 55	49	19	10-22	M4	3	M4	49	0.10 0.12	0.25	20 15	1 2	0.15 0.2	20 12	315 108
20	A 56 B 64	55	22	12-23	M5	4	M4	55	0.17 0.18	0.4	22 18	1 2	0.2 0.25	40 20	720 220
30	A 57 B 65	55	22	12-23	M5	6	M4	55	0.18 0.19	0.4	39 28	1 2	0.2 0.25	50 30	730 230
40	A 65 B 75	66	27	12-29	M5	7	M5	66	0.30 0.32	0.8	61 42	1.5 2	0.2 0.25	40 25	720 210
60	A 66 B 76	66	27	12-29	M5	8	M5	66	0.32 0.34	0.8	76 55	1.5 2	0.2 0.25	72 48	1200 380
80	A 74 B 86	81	32	15-38	M6	10	M5	81	0.80 0.82	1.2	129 85	2 3	0.2 0.25	48 32	920 255
150	A 75 B 87	81	32	15-38	M6	12	M5	81	0.87 0.89	1.2	175 110	2 3	0.2 0.25	82 52	1500 435
200	A 78 B 90	90	32	15-44	M6	14	M6	90	0.91 0.93	1.8	191 140	2 3	0.25 0.3	58 56	2040 610
300	A 89 B 103	110	41	24-56	M8	18	M6	110	2.72 2.75	3	501 295	2.5 3.5	0.25 0.3	105 71	3750 1050
500	A 97 B 110	123	41	24-60	M8	23	M6	122	5.6 5.8	4.2	510 500	2.5 3.5	0.3 0.35	43 48	960 580
800	A 114	133	50	30-60	M10	40	M6	120	9.8	5.6	780	3.5	0.35	45	620
1500	A 141	157	60	35-70	M12	70	M8	145	22	8.2	1304	3.5	0.35	80	650
4000	A 195	200	80	50-100	M16	120	M10	186	112	30	3400	3.5	0.4	180	1800
6000	A 210	253	85	60-140	M16	150	M10	246	303	32.6	5700	3	0.4	950	1580
10 000	A 217	303	92	70-180	8xM16	180	4xM10	295	637	45.5	10 950	3	0.4	920	17 500

Model EC 2



Version of inner diameter
SMOOTH / WITH KEYWAY

- easy to mount
- suited for space restricted installations
- low moment of inertia
- economically priced

Material

Bellows made of highly flexible high-grade stainless steel.

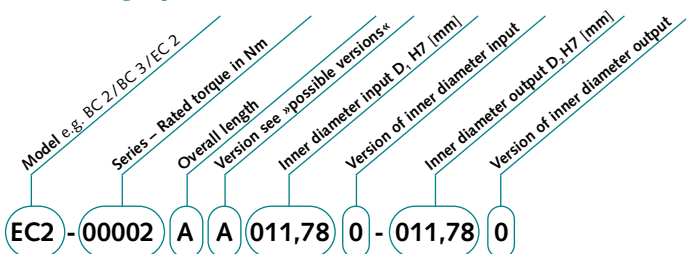
Hub material: see technical specifications table

Design

With a single radial clamping screw per hub
DIN 912.

	max. speed UpM	Series - Rated torque [Nm]	Overall length -2 [mm]	Outer diameter [mm]	Fit length [mm]	Inner diameter from Ø to Ø H7 [mm]	DIN 912 fastening torque of Ø to Ø H7 [mm]	Tightening torque	Distance between centers [mm]	Moment of inertia [Nm]	Hub material [10 ³ kgm ²]	Approx. weight [kg]	Torsional stiffness [10 ³ Nm/rad]	axial [mm]	lateral [mm]	axial spring stiffness [N/mm]	lateral spring stiffness [N/mm]	Max. values
8.000	2	A 30	25	10	4-13	M3	1.5	8	4	0.002	Al	0.02	1.5	0.5	0.15	8	50	
	4.5	A 40	32	13	6-16	M4	4	11	5	0.01	Al	0.05	7	1	0.15	35	350	
	10	A 44	40	13	6-24	M4	4.5	14	5	0.02	Al	0.08	9	1	0.15	30	320	
	15	A 58	49	16.5	8-28	M5	9	17	6.5	0.05	Al	0.13	23	1	0.15	30	315	
6.000	30	A 68	56	19	12-32	M6	14	20	7.5	0.09	Al	0.3	31	1	0.15	50	366	
	60	A 79	66	23.5	14-35	M8	40	23	9.5	0.18	Al	0.4	72	1.5	0.15	67	679	
	80	A 92	82	23	16-42	M10	70	27	11	0.54	Al	0.7	80	2	0.15	44	590	
4.000	150	A 92	82	28	19-42	M10	85	27	11	1.8 0.65	Steel optional Al	1.6 0.8	141	2	0.15	77	960	
	300	A 109	110	35	24-60	M12	120	39	13	7.5 2.68	Steel Al	3.8 1.7	157	2	0.15	124	2940	
	500	A 114	123	35	35-62	M16	200	41	17	9.0 4.85	Steel Al	4.8 2.2	290	2.5	0.20	35	1450	

Ordering specifications:



Example:
BC2-00015 AA 010,50 1-028,00 1
BC3-10000 AA 070,00 0-175,65 0

EC2-00500 AA 035,75 0-062,00 1
EC2-00080 AA 016,00 1-042,00 1

BC 2 / BC 3 / EC 2: Possible versions

A = Standard
X = Special version (on request)

Version of inner diameter input/output

0 = Smooth
1 = With keyway as DIN 6885 Form A
2 = Involute DIN 5480
4 = Other (specify key size)



Couplings 11/01 (US) Technical modifications reserved.

For further information call:

847-439-0700

or **888-534-1222**



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