

Please read these Operational Instructions carefully and follow them accordingly!

Ignoring these Instructions may lead to malfunctions or to coupling failure, resulting in damage to other parts.

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Safety and Guideline Signs

CAUTION



Danger of injury to personnel and damage to machines.



Please Observe!
Guidelines on important points.

Safety Regulations

These Installation and Operational Instructions (I + O) are part of the coupling delivery. Please keep them handy and near to the coupling at all times.



It is forbidden to start initial operation of the product until you have ensured that all applicable EU directives and directives for the machine or system, into which the product has been installed, have been fulfilled. At the time these Installation and Operational Instructions go to print, the smartflex® couplings accord with the known technical specifications and are operationally safe at the time of delivery. Without a conformity evaluation, this product is not suitable for use in areas where there is a high risk of explosion. This statement is based on the ATEX directive.

CAUTION



- If the smartflex® couplings are modified.
- The relevant standards for safety and / or installation conditions are ignored.

User-implemented Protective Measures

- Cover all moving parts to protect against seizure, dust or foreign body impact.

To prevent injury or damage, only specialist personnel are allowed to work on the components. They must be familiar with the dimensioning, transport, installation, initial operation, maintenance and disposal according to the relevant standards and regulations.

Please read the Installation and Operational Instructions carefully prior to installation and initial operation of the device.

These Safety Regulations are user hints only and may not be complete!

Parts List

Only use mayr® original parts

Item	Name
1	Steel bellows
2	Clamping ring
3	Holding spring
4	Cap screw
5	Reducing bushing
6	Reducing bushing with tapered bore
7	Washer

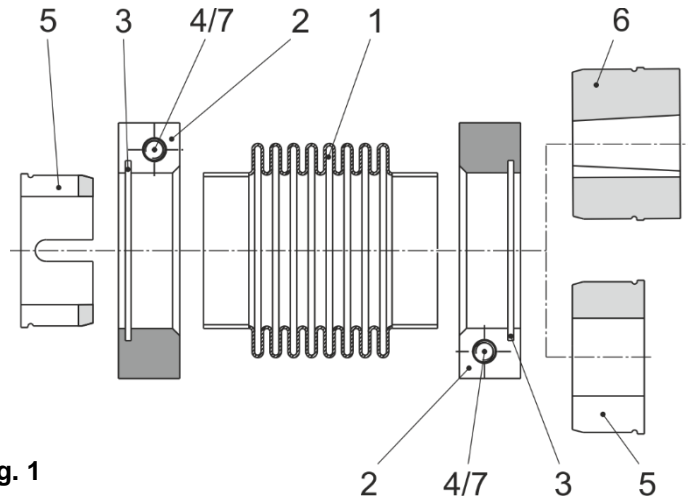


Fig. 1

Table 1: Technical Data

smartflex® Size		0	1	2	3	4	5
Bore reducing bushing (Item 5) from – to	[mm]	8 – 19	11 – 25	16 – 36	18 – 50	30 – 62	40 – 85
Tapered bore (Item 6)	[mm]	---	16	16	---	---	---
Coupling nominal torque T_{KN}	[Nm]	16	40	100	200	400	700
Max. speed n_{max}	[rpm]	10000	8000	6000	4000	3000	2500
Tightening torque clamping screw (Item 4)	[Nm]	10 ±5%	14 ±5%	17 ±5%	41 ±5%	77 ±5%	133 ±5%
Axial displacement ΔK_a on Type 932.3_3	[mm]	±0.4	±0.6	±0.8	±0.8	±0.8	±0.6
Axial displacement ΔK_a on Type 932.433	[mm]	---	±0.3	±0.4	±0.4	±0.6	±0.6
Radial misalignment ΔK_r for Type 932.3_3	[mm]	0.3	0.4	0.5	0.5	0.5	0.5
Radial misalignment ΔK_r for Type 932.433	[mm]	---	0.1	0.1	0.1	0.1	0.1
Angular misalignment ΔK_w on Type 932.3_3	[°]	3	3	3	3	1.5	1.0
Angular misalignment ΔK_w on Type 932.433	[°]	---	1.5	1.5	1.5	1.2	1.0

Table 2: Clamping Connection Bores and Respective Transmittable Torques T_R [Nm]

Sizes	Ø 8	Ø 9	Ø 11	Ø 12	Ø 14	Ø 16	Ø 18	Ø 19	Ø 20	Ø 22	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 36	Ø 38	Ø 40	Ø 42	Ø 45	Ø 48	Ø 50	Ø 55	Ø 60	Ø 62	Ø 65	Ø 70	Ø 75	Ø 80	Ø 85
0	9.6	11	14	16	16	16	16	16																						
1			24	26	31	35	39	40	40	40	40																			
2						60	68	72	75	84	100	100	100	100	100	100														
3							120	127	133	147	167	187	200	200	200	200	200	200	200	200	200	200								
4													240	256	280	290	305	320	340	360	390	400	400	400	400					
5																		420	440	475	510	530	580	640	660	690	700	700	700	700

Table 3: Preferred Bores

Sizes	Preferred bores $\varnothing d^{H7}$
0	8, 9, 10, 11, 12, 14, 15, 16, 18, 19
1	11, 12, 13, 14, 15, 16, 18, 19, 20, 22, 24, 25
2	16, 17, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 35, 36
3	19, 20, 22, 24, 25, 28, 30, 32, 35, 36, 38, 40, 42, 45, 48, 50
4	30, 32, 35, 36, 38, 40, 42, 45, 48, 50, 55, 60, 62
5	40, 42, 45, 48, 50, 55, 60, 62, 65, 70, 75, 80, 85

Design

smartflex® couplings are designed as insertable steel bellows couplings for the connection of two shafts.

Function

smartflex® couplings transmit the torque backlash-free and compensate for radial, axial and angular shaft misalignments.

State of Delivery

- Packed individually in folding boxes or
- plugged together and secured with cable ties.
- Bores in the reducing bushings (5 and 6) have H7 tolerances.

Installation Guidelines for Shaft Ends

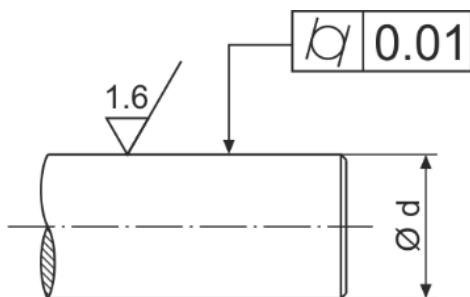


Fig. 2

Surface quality and run-out accuracy are valid for conical shafts.

Adapting to the Shaft Diameter

The reducing bushing (5) can be pressed out of the clamping ring (2) and replaced using axial pressure (manually or on a small hand press).



Due to the shoulder (see Fig. 4), the reducing bushing (5) can be pressed out of the clamping ring (2) only in one direction.

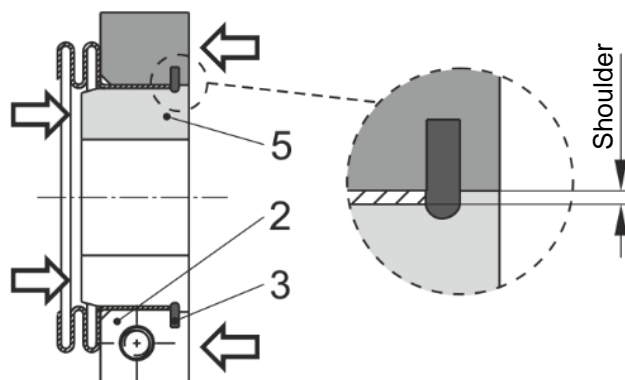


Fig. 4

Shaft Requirements

- Surface quality: $R_a = 1.6 \mu\text{m}$
- Run-out accuracy: 0.01 mm
- Minimum tensile strength: 500 N/mm²
- Tolerance : h6

For other tolerances, please contact the manufacturer.

Temperature Resistance:

Permanent temperature up to +120 °C
(For higher operating temperatures, please contact the manufacturer.)

Installation Position: Can be defined by the user.

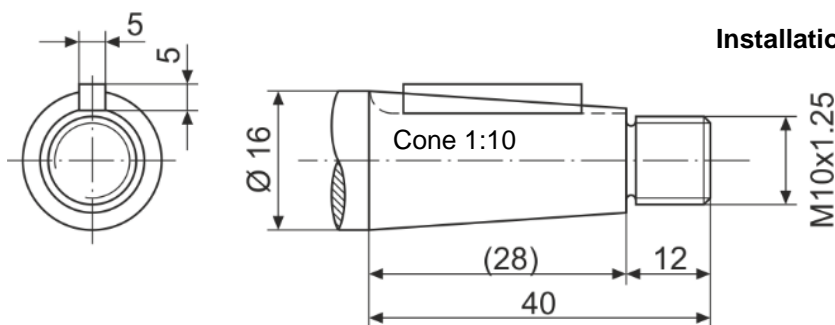


Fig. 3

Coupling Installation

Important Installation Guidelines

- ❑ Wash off the conserving layer in the bores with paraffin, white spirit, cleaner solvent or similar.
- ❑ The bores and shafts must be grease and oil-free.
- ❑ The permitted shaft misalignments (see Table 1) must not be exceeded.
- ❑ Avoid damage to the steel bellows (1) before and during installation.
- ❑ The clamping ring (2) with the holding spring (3) must be engaged in the reducing bushing (5) or the reducing bushing with tapered bore (6).
- ❑ If a reducing bushing is dismantled or re-installed more than 5 times, the snap ring groove may deform, meaning that its use is no longer permitted.
- ❑ In order to transfer the defined torques in Table 2 on page 2 correctly, the slots in the steel bellows (1), clamping ring (2) and reducing bushing (5) must be aligned (see Fig. 5).

Coupling Installation Types 932.333 / 932.433 (Fig. 5)

1. Please ensure that the coupling can be easily pushed onto both shafts.
2. Push the entire coupling over the whole length of the reducing bushing (5) onto a shaft.
3. Make sure that the steel bellows (1) is pushed between the clamping ring (2) and the reducing bushing (5) up to its limit, and that the slots in the steel bellows (1), clamping ring (2) and reducing bushing (5) are aligned (see Fig. 5).
4. Tighten the cap screw (4). The screw tightening torques (see Table 1) must be observed.
5. Push the second shaft over the entire length of the reducing bushing (5) into the coupling.
6. Make sure that the steel bellows (1) is pushed between the clamping ring (2) and the reducing bushing (5) up to its limit, and that the slots in the steel bellows (1), clamping ring (2) and reducing bushing (5) are aligned (see Fig. 5).
7. Tighten the cap screw (4). The screw tightening torques (see Table 1) must be observed.

Coupling Installation Type 932.343 (Fig. 7)

1. Remove the clamping ring (2) with the protruding reducing bushing with tapered bore (6) from the coupling.
2. If necessary, insert the key into the conical shaft.
3. Push the reducing bushing with tapered bore (6) onto the conical shaft.
4. Secure the reducing bushing with tapered bore (6) using a nut or a screw with press cover.
5. Push the rest of the coupling with the open steel bellows side up to its limit between the clamping ring (2) and the reducing bushing with tapered bore (6).
6. Tighten the cap screw (4). The screw tightening torques (see Table 1) must be observed.
7. Push the second shaft over the entire length of the reducing bushing (5) into the coupling.
8. Make sure that the steel bellows (1) is pushed between the clamping ring (2) and the reducing bushing (5) up to its limit, and that the slots in the steel bellows (1), clamping ring (2) and reducing bushing (5) are aligned (see Fig. 5).
9. Tighten the cap screw (4). The screw tightening torques (see Table 1) must be observed.



The slots in the steel bellows (1), clamping ring (2) and reducing bushing (5) must be aligned. On the reducing bushing with 4 slots, one of the 4 slots must align with the slots in the clamping ring (2) and steel bellows (1).

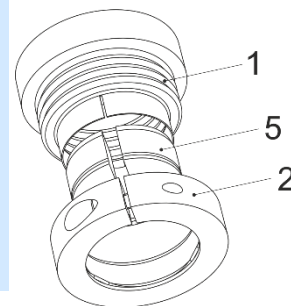
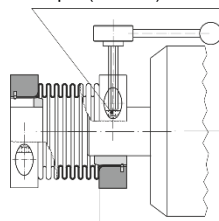


Fig. 5

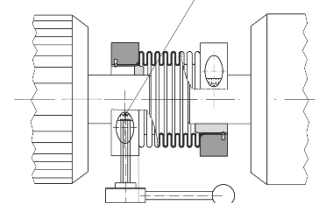
Coupling Installation Types 932.333 / 932.433 onto Cylindrical Shaft

Cap screw (4)
Please observe the tightening torque (Table 1)!



Steel bellows (1) and clamping ring (2) up to limit

Cap screw (4)
Please observe the tightening torque (Table 1)!

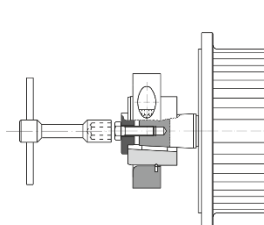


Steel bellows (1) and clamping ring (2) up to limit

Fig. 6

Coupling Installation Type 932.343 onto Conical Shaft

Cap screw (4)
Please observe the tightening torque (Table 1)!



Steel bellows (1) and clamping ring (2) up to limit

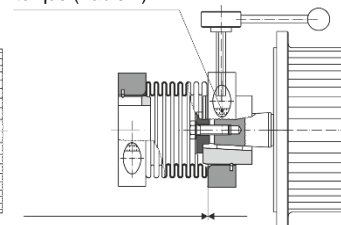


Fig. 7

Coupling Installation into a Bell-Type Housing

Apply the tool carefully, the clamping ring (2) is not secured against turning.

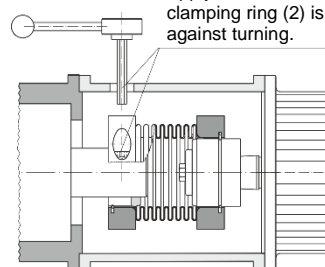


Fig. 8

Coupling Dimensioning

Please carry out dimensioning using Diagram 1 (Sizes 0 to 2) or Diagram 2 (Sizes 3 to 5) with "Torque M [Nm]" and "Misalignment [%]":

Diagram 1 (Sizes 0 to 2)

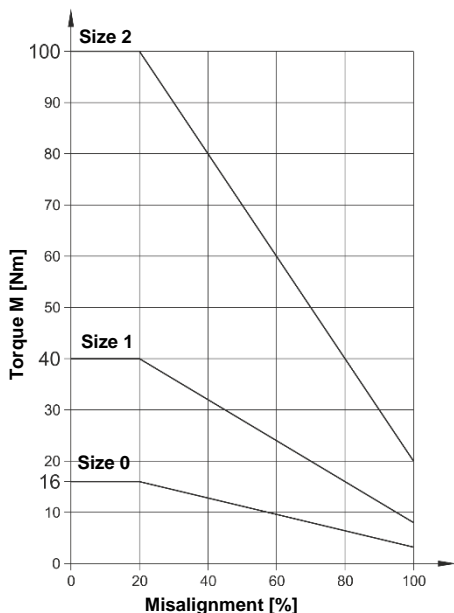
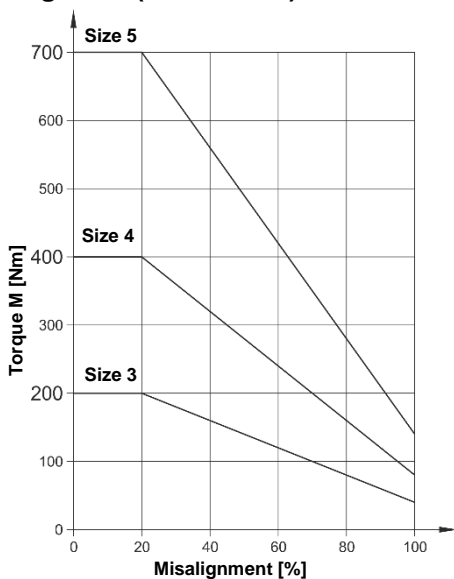


Diagram 2 (Sizes 3 to 5)



Determining the coordinates "Torque M [Nm]":

1. Determine the maximum operating torque.
2. Multiply the operating torque with the values from Table 4 (temperature factor) and the service factor applicable for you, see below (interpolate the interim values).

Service factor f_B :

- $f_B = 1.5$ with even load.
- $f_B = 2$ with uneven load.
- $f_B = 2.5 - 4$ with impact load.

For drives in machine tools (servomotors), we recommend the f_B values of 1.5.

Determining the coordinate "Misalignment [%]":

1. Determine the individual shaft misalignments in percent, measured using the permitted shaft misalignments for the intended coupling size (see Technical Data).
Example for Size 2, Type 932.3_3: 0.2 mm axial displacement equals 25 % of the permitted maximum value 0.8 mm.
2. Add up the individual percent values.
The sum total must be smaller than 100 percent (see also section "Permitted Shaft Misalignments").

Enter both defined coordinate values into the respective diagram.

The point of intersection must lie below the characteristic curve of the intended coupling size.

If the point of intersection lies above the characteristic curve,

- choose a larger coupling,
- reduce the shaft misalignments or
- contact the manufacturer.

Table 4: Temperature Factors

Temperature [°C]	50	80	100	120
Temperature factor [-]	1	1.1	1.2	1.3

Permitted Shaft Misalignments

The smartflex® coupling compensate for angular, axial and radial shaft misalignments (Fig. 9) without losing its backlash-free function. However, the permitted shaft misalignments indicated in Table 1 must not simultaneously reach their maximum value. If more than one kind of misalignment takes place simultaneously, they influence each other. This means that the permitted misalignment values are dependent on one another (Fig. 10). The sum total of the actual misalignments in percent of the maximum value must not exceed 100 %.

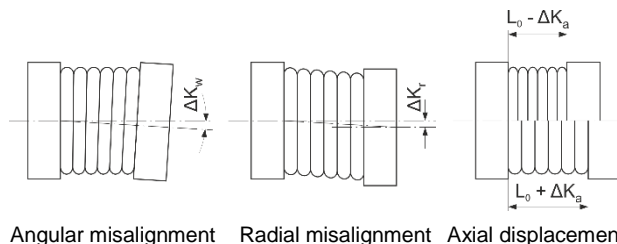


Fig. 9

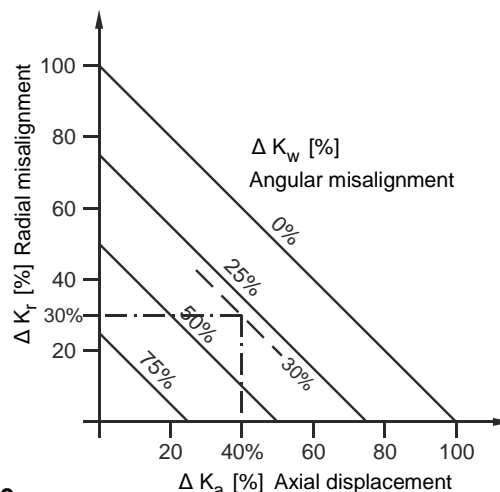


Fig. 10

Maintenance

smartflex® couplings are maintenance-free. Special maintenance work may only be necessary in extreme coupling ambient or operating conditions (in this case, please contact the manufacturer).

Disposal

All steel components:

Steel scrap (Code No. 160117)

All aluminium components:

Non-ferrous metals (Code No. 160118)

Malfunctions / Breakdowns

Malfunction	Possible Causes	Solutions
Bellows breakage	Incorrect alignment	<ol style="list-style-type: none"> 1) Set the system out of operation 2) Replace the entire coupling 3) Check the alignment
	Bellows have already been damaged in transport or during installation	<ol style="list-style-type: none"> 1) Set the system out of operation 2) Replace the entire coupling 3) Check the alignment
	Operating parameters are not appropriate for the coupling performance	<ol style="list-style-type: none"> 1) Set the system out of operation 2) Check the operating parameters and select a suitable coupling (observe installation space) 3) Install a new coupling 4) Check the alignment
	Bellows is energised in natural frequency; resonance	<ol style="list-style-type: none"> 1) Set the system out of operation 2) Re-align the line characteristics 3) Replace the entire coupling 4) Check the alignment
Changes in running noise and vibration occurrence	Loosened screws, resonances, insufficient coupling securement	<ol style="list-style-type: none"> 1) Set the system out of operation 2) Check the screw tightening torques 3) Check the line characteristics 4) Check the coupling parts and replace if damaged



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