Technical information about shaft couplings

Shaft couplings connect two shafts and transmit rotary movements and torques from a driving shaft to a driven shaft. The shafts are joined via a rigid or a flexible shaft coupling.

Various different types of shaft couplings are used in a wide variety of fields: from simple drives in machine tools, packaging and textile machines to complex positioning drives in control and automation technology. They are divided into two functional areas. On the one hand, these are applications in which the transmission of torque and power is of primary importance, e.g. in pumps, conveyor systems and agitators. On the other hand, there are applications for position and motion control that need to transmit rotary movements precisely and with positional accuracy, e.g. in servo and stepper motors for linear shafts.

Shaft couplings are almost maintenance-free. Only in the case of elastomer dog couplings where the coupling spiders are made of polyurethane and are subject to wear due to ageing and load. However, the coupling spiders can be easily replaced without having to replace the entire coupling. Here, the coupling types with detachable clamp hubs prove to be particularly service-friendly.

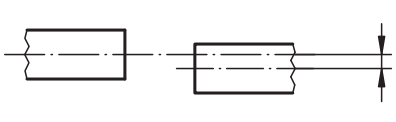
A non-positive shaft-hub connection guarantees reliable, zero backlash torque transmission even without an additional keyway. Low moments of inertia and exact balancing guarantee outstanding dynamic performance, even at high speeds.

Shaft displacement

The shafts to be connected are usually subject to manufacturing and assembly tolerances, which can lead to misalignments between the shafts. If these misalignments are not taken into account, premature bearing or shaft damage can occur and cause loud running noises.

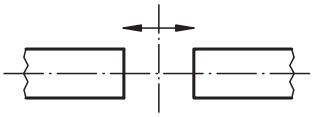
The shaft couplings from norelem are able to compensate for axial and radial shaft misalignment as well as angular misalignment within defined limits. This does not affect the backlash-free operation of the couplings and only low restoring forces occur on the bearing points.

Offset types



Axial offset
(lateral)

Δa



Radial offset

Δr

Angular offset

Δw

The offset types may only be used individually or, if they occur simultaneously, only proportionally.

$$\sum\left[\frac{\Delta r}{\Delta r_n} * 100\% * \frac{\Delta a}{\Delta a_n} * 100\% + \frac{\Delta w}{\Delta w_n} * 100\%\right] < 100\%$$

Δa	Axial offset (installed condition)	Δan	Maximum permissible axial offset (for value see data sheet)
Δr	Radial offset (installed condition)	Δrn	Maximum permissible radial offset (for value see data sheet)
Δw	Angular offset (installed condition)	Δwn	Maximum permissible angular offset (for value see data sheet)

With rigid couplings, compensation of misalignments is not possible. They should therefore only be used with precisely aligned shafts. Shocks and vibrations are transmitted undamped.

Dimensioning and torque specifications

When selecting a coupling, the highest torque to be transmitted (maximum torque) and the maximum possible speed must be taken into account. The torque specifications are given either as maximum torque or as nominal torque, depending on the type of coupling. The coupling must be dimensioned so that the maximum torque is not exceeded in any operating condition.

The nominal torque is the value for the permissible continuous load which can be transmitted in continuous operation under optimum conditions (e.g. with flexible couplings). These values may be exceeded briefly up to the maximum permissible torque. This is especially true for servo motors where the acceleration and deceleration torques can be considerably higher than the nominal torque. In borderline cases, a coupling designed for a higher torque should always be selected.

In most cases, the couplings are designed according to the highest peak torque to be transmitted on a regular basis. The maximum torque of the motor (Mmax) serves as the basis for calculation.

$M_N \geq 1{,}5 * M_{max.}$ [Nm]	Mn ≙ Nominal torque of the coupling [Nm]
	Mmax ≙ Maximum torque of the motor [Nm]

For accurate dimensioning, reduction factors for impact loads (1.0 - 2.5), start-up frequency (1.0 - 1.6) and temperature influence (1.0 - 2.2), among others, must be taken into account.

Fitting clearance

The couplings have an H7 fit as standard. The recommended clearance between shaft journal and coupling bore should be 0.02 mm - 0.05 mm (e.g. H7/j6).

Other tolerances and keyways according to DIN 6885 are available on request.

Oldham-type couplings are pre-bored.

Rigid couplings have a bore with a tolerance of +0.05 mm.

Assembly

Multi-part couplings are supplied in the individual parts. Before installation, check all shaft connection dimensions and the shaft misalignment. The values must lay within the specified table values. During installation, the permissible shaft misalignment values may be exceeded by a factor of 3.

Clean the parts being joined. After cleaning, lightly lubricate the bores of the coupling and shaft journals (oils and greases with molybdenum disulphide or other high-pressure additives, as well as anti-friction grease pastes must not be used).

By couplings with a clamping taper, the clamping screws must be tightened to the specified tightening torque evenly and diagonally in several stages.For couplings with clamping hubs, detachable clamping hubs and grub screws, the clamping screws are first tightened on one side to the specified tightening torque. Once one side is fastened, the coupling is rotated a few turns so that the still loose side aligns without additional axial forces. Then the second side is tightened.

Overview

				
	Metal bellows couplings	**Beam couplings**	**Elastomer dog couplings**	**Oldham-type couplings**
Features	- Absolutely backlash-free - Very high torsional stiffness - Precise angle of rotation transmission - Low moment of inertia - All-metal design - Minimum restoring forces on bearing points	- Absolutely backlash-free - Compact design - Highest torsional stiffness - Precise angle of rotation transmission - High temperature resistance - Absolute synchronisation - All-metal design	- Backlash-free due to spring loading in the coupling spider - Vibration absorption - Push-on (blind assembly possible)	- Backlash-free due to pre-tensioning in the centre disc - Low moment of inertia - Large axial offset compensation - Push-on (blind assembly possible)
Connection or compensating elements	- Stainless steel metal bellows	- All-metal design with slit structure	- Polyurethane coupling spider in various Shore hardness grades	- Polyacetal centre disc
Hub materials	- Aluminium - Stainless steel	- Aluminium - Stainless steel	- Aluminium - Stainless steel	- Aluminium
Hub clamping	- Clamp hub - Detachable clamp hub - Grub screw	- Clamp hub - Detachable clamp hub	- Clamp hub - Detachable clamp hub - Grub screw - Clamp taper	- Clamp hub - Grub screw
Temperature range	-30 °C to +120 °C	-50 °C to +150 °C	-50 °C to +90 °C	-40 °C to +90 °C
Max. speed range	15,000 1/min	10,000 1/min	47,500 1/min	8,000 1/min

Metal bellows couplings										
Group	**Image**	**Hub materials**	**Hub clamping**	**Nominal torque Nm**	**Shaft Ø (mm)**	**Max, speed (1/min)**	**free of play**	**Shaft offset**		
								axial	Radial	Angular
23001 **Metal bellows couplings**		Aluminium	Clamp hubs	18 - 500	10 - 70	12.800	✓	✓	✓	✓
23001-01 **Metal bellows couplings**		Stainless steel	Clamp hubs	18 - 500	10 - 70	12.800	✓	✓	✓	✓
23001-03 **Metal bellows couplings short type**		Aluminium	Clamp hubs	18 - 500	10 - 70	12.800	✓	✓	✓	✓
23001-04 **Metal bellows couplings short type for high torques**		Aluminium	Clamp hubs	10 - 1.500	6 - 70	15.000	✓	✓	✓	✓
23001-05 **Metal bellows couplings**		Aluminium	Detachable clamp hub	18 - 500	10 - 70	12.800	✓	✓	✓	✓
23001-08 **Metal bellows couplings short type**		Aluminium	Detachable clamp hub	18 - 500	10 - 70	12.800	✓	✓	✓	✓
23003 **Metal bellows couplings mini**		Aluminium	grub screw	0,5 - 10	3 - 24	15.000	✓	✓	✓	✓
23003-05 **Metal bellows couplings mini**		Aluminium	Clamp hubs	0,5 - 10	3 - 25	15.000	✓	✓	✓	✓
23006-06 **Metal bellows couplings mini**		Stainless steel	Clamp hubs	0,5 - 10	3 - 25	15.000	✓	✓	✓	✓
23006-08 **Metal bellows couplings mini**		Aluminium	Detachable clamp hub	0,5 - 10	3 - 25	15.000	✓	✓	✓	✓

Beam couplings										
Group	**Image**	**Hub materials**	**Hub clamping**	**Nominal torque Nm**	**Shaft Ø (mm)**	**Max, speed (1/min)**	**free of play**	**Shaft offset**		
								axial	Radial	Angular
23010-01 **Beam couplings**		Aluminium	Clamp hubs	3 -130	3 -35	10.000	✓	✓	✓	✓
23010-05 **Beam couplings**		Stainless steel	Clamp hubs	6 - 190	3 - 35	10.000	✓	✓	✓	✓
23012-01 **Beam couplings**		Aluminium	Detachable clamp hub	7 - 130	6 - 35	8000	✓	✓	✓	✓
23012-05 **Beam couplings**		Aluminium	Detachable clamp hub	16 - 190	26 - 35	8.000	✓	✓	✓	✓

Elastomer dog couplings										
Group	**Image**	**Hub materials**	**Hub clamping**	**Nominal torque Nm**	**Shaft Ø (mm)**	**Max, speed (1/min)**	**free of play**	**Shaft offset**		
								axial	Radial	Angular
23021-10 **Elastomer dog couplings**		Aluminium	Clamp taper	8 - 1050	6 - 60	25.000	✓	✓	✓	✓
23022-10 **Elastomer dog couplings**		Aluminium	Clamp hubs	0,7 - 525	4 - 57	27.000	✓	✓	✓	✓
23022-11 **Elastomer dog couplings**		Stainless steel	Clamp hubs	4 - 450	4 - 50	13.000	✓	✓	✓	✓
23022-15 **Elastomer dog couplings short type**		Aluminium	Clamp hubs	0,7 - 525	3 - 57	27.000	✓	✓	✓	✓
23022-20 **Elastomer dog couplings**		Aluminium	Detachable clamp hub	4 - 525	4 - 57	13.000	✓	✓	✓	✓
23022-25 **Elastomer dog couplings short type**		Aluminium	Detachable clamp hub	4 - 525	4 - 57	13.000	✓	✓	✓	✓
23023-10 **Elastomer dog couplings**		Aluminium	grub screw	0,7 - 525	2 - 60	47.500	✓	✓	✓	✓
23023-11 **Elastomer dog couplings**		Stainless steel	grub screw	4 - 450	6 - 55	16.000	✓	✓	✓	✓

Oldham-type couplings										
Group	**Image**	**Hub materials**	**Hub clamping**	**Nominal torque Nm**	**Shaft Ø (mm)**	**Max, speed (1/min)**	**free of play**	**Shaft offset**		
								axial	Radial	Angular
23030 **Oldham-type couplings**		Aluminium	Clamp hubs	1 - 7	3 - 14	8.000	✓	✓		✓
23032 **Oldham-type couplings**		Aluminium	grub screw	1 - 7	4 - 14	8.000	✓	✓		✓

Rigid couplings										
Group	**Image**	**Hub materials**	**Hub clamping**	**Nominal torque Nm**	**Shaft Ø (mm)**	**Max, speed (1/min)**	**free of play**	**Shaft offset**		
								axial	Radial	Angular
23050 **Rigid couplings**		Steel	Slitted	50 - 2.250	8 - 50	4.000	✓			
23050 **Rigid couplings**		Stainless steel	Slitted	16 - 688	8 - 50	4.000	✓			
23052 **Rigid couplings**		Steel	Two-piece	50 - 2250	8 - 50	4.000	✓			
23052 **Rigid couplings**		Stainless steel	Two-piece	16 - 688	8 - 50	4000	✓			