FLENDER COUPLINGS

ZAPEX

Assembly and operating instructions M3560-01en
Edition 09/2022

ZNN, ZNNA, ZNNV, ZNZS, ZNZA, ZNZV

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Original assembly and operating instructions

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1.1 Legal information

Warning system

These instructions contain information you must observe for your own personal safety as well as to avoid damage to property and persons. The information regarding your personal safety is highlighted with a warning triangle. Information exclusively regarding property damage alone is not marked with a warning triangle. Depending on the hazard class, the warnings shall be depicted as follows, in descending order.

⚠ DANGER

means that death or severe physical injury **will** occur if the relevant precautionary measures are not taken.

⚠ WARNING

means that death or severe physical injury **may** occur if the relevant precautionary measures are not taken.

⚠ CAUTION

means that mild physical injury may occur if the relevant precautionary measures are not taken.

NOTICE

means that damage to property may occur if the relevant precautionary measures are not taken.

If multiple hazard classes come into play, the warning for the highest level in question shall always be used. If a warning containing the warning triangle warns of harm to individuals, the same warning may also include a warning regarding damage to property.

Information

Information

Information offers additional notes, assistance and tips for handling the product.

Qualified personnel

The product/system associated with this documentation may only be used by **qualified personnel** trained to perform the relevant tasks, taking into account the associated documentation for the relevant tasks, particularly the safety information and warnings included therein. Due to their qualification and experience, qualified personnel are capable of detecting risks and avoiding potential hazards when dealing with these products/systems.

Intended use of Flender products

Please note the following:

⚠ WARNING

Flender products are only suitable for the uses set out in the catalogue and associated technical documentation. If third-party products and components are used, these must be recommended and/or authorised by Flender. Safe and flawless operation of the products requires proper transport, proper storage, setup, assembly, installation, commissioning, operation and maintenance. The permissible environmental conditions must be adhered to. Instructions in the associated documentation must be followed.

Trademarks

All designations marked with the trademark symbol ® are registered trademarks of Flender GmbH. Other designations in this document may be trademarks whose use by third parties for their own purposes may violate the rights of the owner.

Liability disclaimer

We have assessed the contents of these instructions for compliance with the hardware and software described. However, deviations cannot be ruled out, so we are unable to accept liability for full compliance. The details in these instructions are regularly reviewed and necessary corrections are contained in subsequent editions.

1.2 About these instructions

These instructions describe the coupling and provide information about its handling - from assembly to maintenance. Please keep these instructions for later use.

Please read these instructions prior to handling the coupling and follow the information in them.

1.3 Text attributes

The warning notice system is explained on the back of the inner cover. Always follow the safety information and notices in these instructions.

In addition to the warning notices, which have to be observed without fail, you will find the following text attributes in these instructions:

1. Procedural instructions are shown as a numbered list. Always perform the steps in the order given.

- Lists are formatted as bulleted lists.
  - The dash is used for lists at the second level.

(1) Numbers in brackets are part numbers.

1.4 Copyright

The copyright of these instructions is held by Flender.

These instructions must not be used wholly or in parts without our authorisation or be given to third parties.

If you have any technical queries, please contact our factory or one of our service outlets (refer to Service and support (Page 53)).

Safety information

2

2.1 General information

Instructions

These instructions are part of the delivery. Always keep these instructions close to the coupling.

Please make sure that every person who is commissioned to work on the coupling has read and understood these instructions prior to handling the coupling and observes all of the points.

Only the knowledge of these instructions can avoid faults on the coupling and ensure fault-free and safe operation. Non-adherence to the instructions can cause product or property damage or personal injury. Flender does not accept any liability for damage or operating failures that are due to non-adherence to these instructions.

State of the art

The coupling described here has been designed in consideration of the latest findings for demanding technical requirements. This coupling is state-of-the-art at the time of printing these instructions.

In the interest of further development, Flender reserves the right to make such changes to the individual assembly units and accessories that increase performance and safety while maintaining the essential features.

Symbols

ISO	ANSI	Warning
		Warning – hazardous electrical voltage
		Warning – explosive substances
	---	Warning – entanglement hazard
	---	Warning – hot surfaces
	---	Warning – corrosive substances
	---	Warning – suspended load

ISO	ANSI	Warning
	---	Warning – hand injuries
		Explosion protection approval

Table 2-1: General warnings

Explanation regarding Machinery Directive 2006/42/EC

The couplings described here are “components” in accordance with the Machinery Directive and do not require a Declaration of Incorporation.

Explosion Protection Directive

The term “Explosion Protection Directive” used in these instructions refers to the harmonization legislation of the European Union relating to equipment and protective systems intended for use in potentially explosive atmospheres complied with in accordance with the co-applicable EU Declaration of Conformity.

Protective clothing

In addition to the generally prescribed personal protective equipment (safety shoes, overalls, helmet, etc.), also wear suitable protective gloves and safety glasses when handling the coupling.

Using the coupling

The relevant occupational safety and environmental protection regulations must be complied with at all times during transport, assembly, installation, dismantling, operation and maintenance of the coupling.

Only qualified personnel may operate, assemble, maintain and repair the coupling. Information about qualified personnel can be found in the legal notes at the beginning of these instructions.

If hoisting gear or load lifting devices are used for transporting, these have to be suitable for the weight of the coupling.

If the coupling has visible damage, it may not be assembled or put into operation.

The coupling may only be operated in a suitable housing or with touch protection according to applicable standards. This also applies to test runs and rotational direction checks.

Work on the coupling

Only carry out work on the coupling when it is not in operation and is not under load.

Take measures to prevent the accidental restarting of the drive aggregate. Attach an information notice to the start switch stating clearly that work is being carried out on the coupling. Ensure that the entire unit is not under load.

2.2 Intended use

Only use the coupling according to the conditions specified in the service and delivery contract and the technical data in the annex. Deviating operating conditions are considered improper use. The user or operator of the machine or system is solely liable for any resulting damage.

When using the coupling please specifically observe the following:

- Do not make any modifications to the coupling that go beyond the permissible machining described in these instructions. This also applies to touch protection facilities.
- Use only original replacement parts from Flender. Flender only accepts liability for original replacement parts from Flender.
  Other replacement parts are not tested and approved by Flender. Non-approved replacement parts may possibly change the design characteristics of the coupling and thus impact active and/or passive safety.
  Flender will accept no liability or warranty whatsoever for damage occurring as a result of the use of non-approved replacement parts. The same applies to any accessories that were not supplied by Flender.

If you have any queries, please contact our customer service organisation (see Service and support (Page 53)).

2.3 Safety information for a coupling when used in potentially explosive atmospheres

Information

Declaration of conformity

A declaration of conformity required according to the respective Explosion Protection Directive can be found in chapter Declaration of conformity (Page 71)

2.3.1 Marking

You can find a description of the coupling parts in chapter Description (Page 21).

A coupling designed in accordance with the Explosion Protection Directive has a marking on the coupling parts.

The following marking is visible on the outer diameter of a coupling part (e.g. the flanged sleeve):

Flender GmbH	CE	II 2G Ex h IIC T6 ... T5 Gb X
D 46393 Bocholt		II 2D Ex h IIIC T85 °C ... 100 °C Db X
ZAPEX	<Year of manufacture>	I M2 Ex h Mb X

2.3.2 Conditions of use

Note also the material-dependent permissible ambient temperature of the O-ring (12) according to chapter O-rings (Page 69).

A coupling designed in accordance with the Explosion Protection Directive is suitable for the following conditions of use:

- Equipment group I
  - Category M2
- Equipment group II
  - Category 2 and 3
  - Group of substances G, zone 1 and 2
  - Group of substances D, zone 21 and 22
  - Explosion group IIA, IIB and IIC

1. Gases, vapours or mists

Check the ambient temperature for use of the coupling in the relevant temperature class.

The maximum surface temperature of the coupling for a potentially explosive atmosphere as a result of gas/vapour/mist mixtures is obtained from the maximum ambient temperature and/or the maximum temperature of the adjacent components. The self-heating of the coupling is minor. In normal atmospheric conditions for explosion protection applications, a maximum surface temperature <85 °C can be expected.

Max. ambient temperature	Temperature class	Max. surface temperature
-45 °C to +80 °C	T4	<135 °C
-45 °C to +60 °C	T5	<100 °C
-45 °C to +45 °C	T6	<85 °C

Table 2-2: Temperature classes for explosive atmospheres as a result of gases, vapours or mists

2. Dust/air mixtures

Check the ambient temperature.

The maximum surface temperature of the coupling for a potentially explosive atmosphere as a result of dust/air mixtures is obtained from the maximum ambient temperature and/or the maximum temperature of the adjacent components. The self-heating of the coupling is minor. In normal atmospheric conditions for explosion protection applications, a maximum surface temperature <85 °C can be expected.

Notes concerning operation of the coupling in potentially explosive atmospheres

- Only use the coupling in potentially explosive atmospheres together with drive motors that can be switched off in the event of the formation of an explosive atmosphere.
- Earth machines that are connected via the coupling with a leakage resistance of less than 10^6 Ω.

- If you want to use a coated coupling in potentially explosive atmospheres, please note the requirements concerning the conductivity of the paint and the limitation on the paint layer thickness applied in accordance with EN 80079-36. No build-up of electrostatic charges is to be expected with a paint layer thickness of less than 200 µm.

2.4 General warning notices

⚠ DANGER

Danger due to bursting of the coupling

The coupling may burst if it is not used properly. There is a risk of fatal injury from flying fragments. Personal injury, property damage and fire damage caused by sparks may occur. If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Use the coupling for the purpose for which it is intended.

⚠ DANGER

Risk of explosion when using coupling parts without Ex marking

Coupling parts without Ex marking have not been approved for use in potentially explosive atmospheres. These coupling parts can lead to an explosion during operation.

- Only use couplings with Ex marking in potentially explosive atmospheres.

⚠ DANGER

Danger

Risk of injury due to the use of unsuitable and/or damaged components. The use of unsuitable and/or damaged components can lead to an explosion in potentially explosive atmospheres.

- Observe the information regarding conditions of use.

⚠ DANGER

Danger of explosion

Improper operation of the coupling can lead to an explosion in potentially explosive atmospheres.

- Please observe the notes concerning operation of the coupling in potentially explosive atmospheres.

⚠ DANGER

Danger from hot coupling parts

Risk of injury due to hot surfaces. Hot coupling parts can lead to an explosion in potentially explosive atmospheres.

- Wear suitable protective equipment (gloves, safety glasses).
- Ensure that the area is not at risk of explosion.

⚠ WARNING

Risk of chemical burns from chemical substances

There is a risk of chemical burns when handling aggressive cleaning agents.

- Please observe the manufacturer’s instructions on how to handle cleaning agents and solvents.
- Wear suitable protective equipment (gloves, safety glasses).

⚠ CAUTION

Physical injury

Risk of injury due to falling coupling parts.

- Secure the coupling parts to prevent them from falling.

Description

3

The ZAPEX couplings described here are universally applicable, torsionally rigid gear couplings that are available in various types and sizes. The couplings can be used in accordance with the Explosion Protection Directive in potentially explosive atmospheres if they have a corresponding marking.

These instructions describe the assembly and operation of a ZAPEX coupling arranged horizontally with a shaft-hub connection made by a cylindrical or conical bore with parallel key or by a pressurised oil interference fit. Please consult Flender if you want to use a different type of installation. The ZNNV and ZNZV types are arranged vertically.

Application

ZAPEX couplings are designed for use in all kinds of machines. They are designed to withstand high torques and harsh operating conditions.

Structure

The ZAPEX coupling consists of the two hub parts (1) and (2) with external teeth, which are fitted onto the machine shafts. The external teeth engage in a flanged sleeve (5) in each case, which has corresponding internal teeth. The flanged sleeves (5) are bolted together with fitting bolts (8) and nuts (9) or with fitting bolts (8), nuts (9) and a spacer (4). The external teeth of the hub parts (1), (2) are not arranged in the centre of the hub. Depending on the mounting position, this results in the A, B or AB variants with the different shaft distance dimensions S.

The gear is lubricated using grease. O-rings (12) are used to seal the grease spaces externally. The parallel keyways must be sealed against lubricant leakage during assembly.

For the ZNNA type, the axial backlash is restricted by the retaining ring (51), for the ZNZA type by the plate pullies (20).

The spare parts drawings and spare parts list can be found at Spare parts drawing and spare parts list (Page 58).

The diagrams show the various types with their constituent parts and their part numbers.

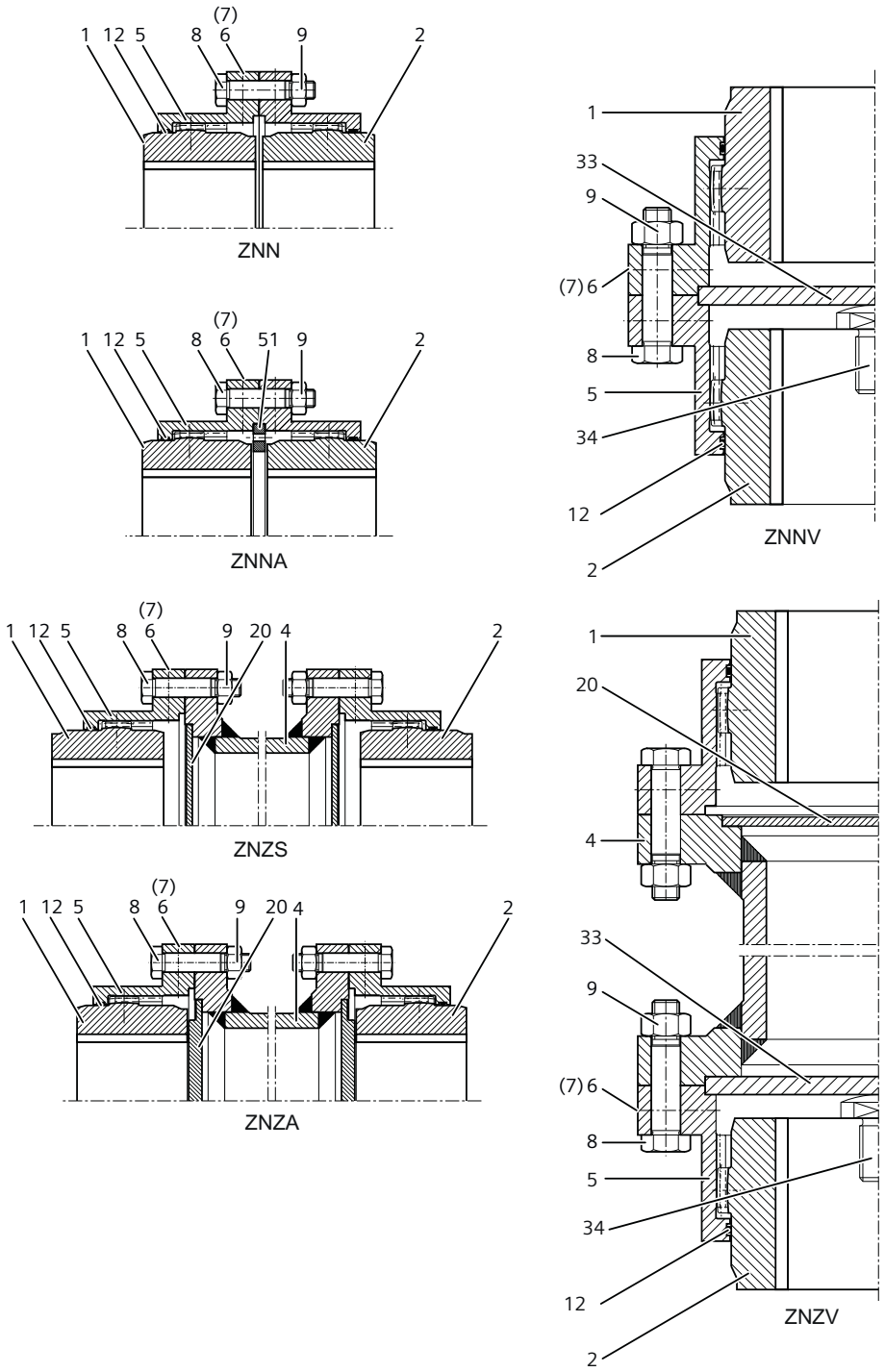


Figure 3-1: ZNN, ZNNA, ZNZS, ZNZA, ZNNV and ZNZV types

1	Coupling part 1/2	2	Coupling part 1/2
4	Spacer	5	Flanged sleeve
6	Screw plug	7	Sealing ring in size 83
8	Fitting bolt	9	Hexagon nut
12	O-rings	20	Plate pulley
22	Screw plug	33	Support ring
34	Thrust element	51	Retaining ring

Application planning 4

Check the delivery for damage and for completeness. Report any damage and/or missing parts to Flender immediately.

The coupling is delivered in individual parts and preassembled groups.

4.1 Transport of the coupling

⚠ WARNING

Severe personal injury due to improper transport

Severe personal injury due to falling components or due to crushing. Damage to coupling parts possible due to use of unsuitable means of transport.

- Only use hoisting gear and load lifting devices with sufficient load bearing capacity for transport.
- The symbols which appear on the packaging must be observed.

If not specifically contractually agreed otherwise, the packaging complies with the HPE Packaging Directive.

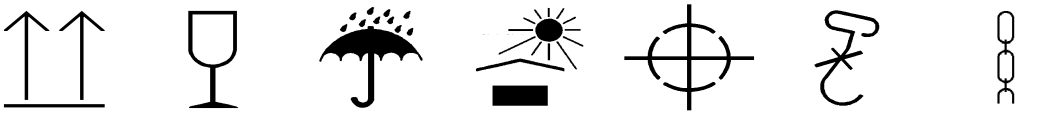


Figure 4-1: Transport symbols

4.2 Storage of the coupling

NOTICE

Property damage due to improper storage

Negative changes to the physical properties of the coupling and/or coupling damage.

- Please observe the procedure for storing the coupling.

The coupling, unless specifically ordered otherwise, is supplied with preservation and can be stored for up to 3 months.

Information about storing the coupling

- Ensure that the storage room is dry (relative humidity < 65 %) and free of dust.
- Ensure that there is no condensation.
- Do not store the coupling together with corrosive chemicals, acids, caustic solutions, etc.

- If the coupling contains elastomer components, ensure that there are no devices in the storage room that produce ozone, such as fluorescent lights, mercury vapour lamps or high-voltage electrical equipment.
- Store the coupling on suitable supports or in suitable containers.

Long-term storage

NOTICE

Property damage due to improper long-term storage

Negative changes to the physical properties of the coupling and/or coupling damage.

- Carefully observe the specifications for long-term storage.

1. You can find the required type of preservative agent in the following table (types of preservative agents for long-term storage).
2. Remove the elastomer components. These must not come into contact with cleaning agents and long-term preservative agents.
3. Clean the coupling parts.
4. Apply the stipulated preservative agent.
5. Store the coupling parts and the elastomer components separately.

Preservative agent	Features	Indoor storage	Outdoor storage
Oil spray	Corrosion protection	Up to 12 months	Up to 4 months
Tectyl 846 or similar	Long-term preservative agent on wax basis	Up to 36 months	Up to 12 months
Emulsion cleaner + VCI foil	Active system, reusable	Up to 5 years	Up to 5 years

Table 4-1: Types of preservative agents for long-term storage

Assembly 5

Assembly of the coupling comprises the following steps:

- Preparatory work (Page 25)
- Mounting the coupling (Page 30)
- Aligning the coupling (Page 33)
- Fill with lubricant (Page 36)

⚠ DANGER

Danger due to bursting of the coupling

If you do not observe the information stipulated here regarding assembly, this can lead to bursting of the coupling during operation. There is a risk of fatal injury from flying fragments. If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Carefully observe all of the specifications relating to assembly.

Notes regarding assembly of the coupling

- Only use undamaged components when assembling the coupling.
- Follow the assembly sequence.
- Please ensure that there is sufficient space at the assembly location and that the location is tidy and clean in order to be able to assemble and maintain the coupling without any risk.
- If a dimension drawing has been created for the coupling, please observe the information it contains as a matter of priority.

5.1 Preparatory work

Please consult Flender if you want to machine a conical finished bore.

Carry out the following steps if the coupling does not have a finished bore:

- Mill the finished bore (Page 26)
- Mill the parallel keyway (Page 27)
- Machining an axial locking mechanism (Page 27)
- Balancing the coupling (Page 30)

Information

The customer is responsible for execution of the finishing work on the coupling. Flender shall have no liability whatsoever for claims under warranty arising from finishing work that has not been carried out adequately.

5.1.1 Mill the finished bore

The diameter of the finished bore depends on the shaft used.

Recommended assigned fits

In the following table you can find the recommended assigned fits for bores with a parallel key connection.

Description	Interference fit					
Shaft tolerance	h6	k6	m6	n6	p6	s6
Bore tolerance	P7	M7	K7	J7	H7	F7

Table 5-1: Recommended assigned fits for bores with parallel key connection

Bore diameter

⚠ WARNING

Danger due to bursting of the coupling

If you exceed the maximum diameter of the finished bore, then this can cause the coupling to burst in operation. There is a risk of fatal injury from flying fragments. If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Adhere to the maximum diameters specified.

The maximum diameters are listed in Section Speeds, geometry data and weights (Page 61)

Procedure

1. Remove the preservation and clean the coupling parts 1 (1) and/or 2 (2) to be machined.
2. Clamp the coupling according to the following figure.

NOTICE

Damage to the functional surface due to incorrect clamping

Never clamp the coupling part at the sealing surface of the O-rings.

3. Machine the finished bore D according to the following figure.

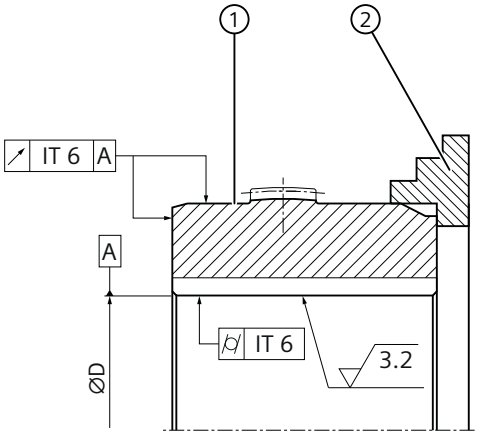


Figure 5-1: Tolerances for the finished bore in coupling part 1 (1) or 2 (2)

① Sealing surface
② Clamping chuck

5.1.2 Mill the parallel keyway

Applicable standards

- For one parallel keyway, machine it according to DIN 6885/1 ISO P9.
- For two parallel keyways, machine them according to DIN 6885/1 ISO JS9.
- If you want to mill a parallel keyway that does not correspond to DIN 6885/1, please consult Flender.

5.1.3 Machining an axial locking mechanism

The coupling part 1/2 (1 or 2) is secured by a set screw or an end plate to prevent axial movements.

Please consult Flender if you want to use an end plate.

Note the following when using a set screw:

- Diameter and axial position of the threaded hole in the hub
- Position of the threaded hole with respect to the parallel keyway
- Selection of the set screw

Diameter and axial position of the threaded hole in the hub

The following diagram shows the axial position of the threaded hole.

When arranging the threaded hole, note the difference between the A or B variant of the coupling part 1 (1) or 2 (2).

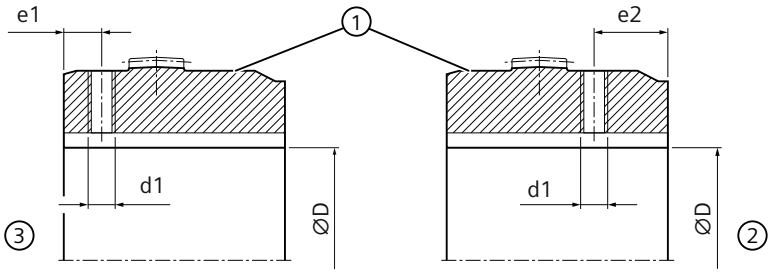


Figure 5-2: Diameter and axial position of the threaded hole in the hub

① Sealing surface
② Coupling part 1 or 2, A variant
③ Coupling part 1 or 2, B variant

The following table contains the values for the diameter of the threaded hole depending on the coupling size and the finished bore D and the axial position of the threaded hole on the hub.

Coupling size	Finished bore D		Threaded hole d1	Tightening torque TA	Width A/F internal hexagon	e1	e2
	Over	Up to					
	mm	mm		Nm	mm	mm	mm
83	10	17	M5	3	2.5	7	16
	17	50	M6	4	3		
107	10	17	M5	3	2.5	10	16
	17	65	M6	4	3		
130	10	17	M5	3	2.5	10	24
	17	38	M6	4	3		
	38	82	M8	8	4		
156	10	17	M5	3	2.5	15	27
	17	22	M6	4	3		
	22	100	M8	8	4		
181	10	17	M5	3	2.5	16	30
	17	22	M6	4	3		
	22	30	M8	8	4		
	30	65	M10	15	5		
	65	116	M12	25	6		
211	10	17	M5	3	2.5	18	35
	17	22	M6	4	3		
	22	30	M8	8	4		
	30	38	M10	15	5		
	38	137	M12	25	6		

Coupling size	Finished bore D		Threaded hole d1	Tightening torque TA	Width A/F internal hexagon	e1	e2
	Over	Up to					
	mm	mm		Nm	mm	mm	mm
250	10	17	M5	3	2.5	22	40
	17	22	M6	4	3		
	22	30	M8	8	4		
	30	38	M10	15	5		
	38	50	M12	25	6		
	50	164	M16	70	8		
274	80	178	M16	70	8	25	46
307	90	198	M16	70	8	30	54
333	100	216	M16	70	8	30	61
364	120	242	M20	130	10	30	50
424	150	288	M24	230	12	30	50

Table 5-2: Diameter and axial position of the threaded hole, tightening torque and width A/F

Apply the specified tightening torques as listed in Section Tightening procedure (Page 69).

Position of the threaded hole with respect to the parallel keyway

Position the threaded hole for the set screw on the parallel keyway.

Selection of the set screw

⚠ CAUTION

Physical injury

Risk of injury from protruding set screw.

- Please observe the information about selecting the set screw.

Use set screws in accordance with ISO 4029 with a toothed cup point. The size of the set screw is determined by the bore made. The set screw should fill out the threaded hole as much as possible and must not protrude beyond the hub.

5.1.4 Balancing the coupling

Notes on balancing

NOTICE

Property damage to coupling part 1 (1) or 2 (2)

If you damage the gear or the sealing surface for the O-ring (12) on coupling part 1 (1) or 2 (2), the coupling part 1 (1) or 2 (2) is no longer allowed to be used for operation.

- Please observe the stipulations about machining the balancing bore.

- Select the balancing quality according to the application (but at least G16 in accordance with DIN ISO 21940).
- Observe the balancing specification according to DIN ISO 21940-32.
- Machine the balancing bore on a large radius with adequate clearance to the outer circumference.

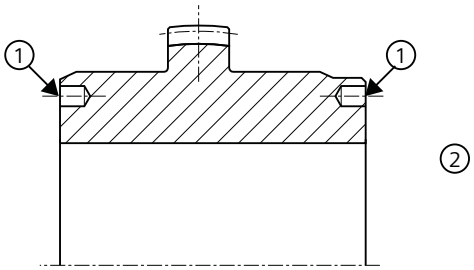


Figure 5-3: Position of the balancing bore for two-plane balancing

① Balancing bore
② Coupling part 1/2

5.2 Mounting the coupling

NOTICE

Coupling damage, damage to further components

Damage to the bore and the sealing surface of the sealing ring is possible.

- Ensure that the bore and the sealing surface of the sealing ring are not damaged by hoisting gear or similar equipment.

NOTICE

Damage to property

Risk of damage to sealing rings from cleaning agents.

- Ensure that the sealing rings do not come into contact with cleaning agents.

NOTICE

Damage to property

Damage to the shaft end, the coupling parts and/or the parallel key.

- Note the handling instructions regarding assembly of the coupling parts.

Assembly of the coupling comprises the following steps:

- Assembling coupling parts with shaft-hub connection using a parallel key (Page 31)
- Assembling coupling parts with shaft-hub connection using a pressurised oil interference fit (Page 32)
- Assembling the coupling (Page 33)

5.2.1 Assembling coupling parts with shaft-hub connection using a parallel key

Procedure

1. Unscrew the set screw until a collision with the parallel key or the shaft is no longer possible.
2. Clean the bores and shaft ends.
3. Lubricate the cleaned flanged sleeve keyway and then insert the O-rings (12).
4. Lubricate the gear of the flanged sleeves (5).
5. Place the flanged sleeve (5) onto the shaft before mounting the coupling parts 1 (1) and 2 (2).
6. Coat the bores of coupling parts 1 (1) and 2 (2) and the shafts with MoS_2 assembly paste (e.g. Microgleit LP 405).
7. Smear the parallel keyway in the area of the set screw using sealing compound (50).
8. Mount coupling parts 1 (1) and 2 (2) on the shaft.

⚠ WARNING

Danger due to bursting of the coupling

If you do not observe the information stipulated here when assembling coupling parts with a tapered bore, then this can cause the coupling to burst in operation. There is a risk of fatal injury from flying fragments. If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Mount coupling parts 1 (1) and 2 (2) with conical bore and parallel keyway on the shaft in cold condition. Apply sealing compound (50) to the front of the hub on the shaft face. Secure the coupling parts 1 (1) and 2 (2) with suitable end plates without pulling the coupling parts 1 (1) and 2 (2) further onto the taper (fitting dimension = 0) or according to the dimension drawing provided.

Information

Coupling parts with cylindrical bore

To make assembly easier, you can heat coupling parts 1 (1) and 2 (2) with cylindrical bore up to a maximum of 80 °C if required.

9. Secure the coupling parts using a set screw or an end plate. When securing with a set screw, the shaft must not protrude or be set back from the inner side of the hub.
   After cooling to room temperature, fill the threaded hole for the set screw 2/3 full with sealing compound (50) to prevent the lubricant from escaping through the parallel keyway. When securing with an end plate, smear the hub face on the shaft face with sealing compound (50) and bolt on the end plate.
10. Tighten up the set screw or the screw to attach the end plate to the specified tightening torque T_A (for the set screw please see Section Machining an axial locking mechanism (Page 27)).

5.2.2 Assembling coupling parts with shaft-hub connection using a pressurised oil interference fit

Procedure

1. Remove the screw plugs (22) from the coupling parts 1 (1) and 2 (2).
2. Clean, degrease, de-oil and dry the bores and shaft ends.
3. Clean and dry the oil channels and the oil circulation grooves.
4. Lubricate the cleaned flanged sleeve keyway and then insert the O-rings (12).
5. Smear the gear of the flanged sleeve (5) with a lubricant coating (e.g. Castrol Opticoating N) to minimise running-in wear.
   After the lubricant coating has dried, lubricate the gear of the flanged sleeve (5) with lubricant (50).
6. Place the flanged sleeve (5) onto the shaft before mounting the coupling parts 1 (1) and 2 (2).
7. Protect adjacent components against damage and heating to temperatures above 80 °C.
8. Heat up the coupling parts 1 (1) and 2 (2) to the temperature specified in the dimension drawing.
   Make sure that no dirt or contaminants can soil the bores again during the heating process.
9. Mount the coupling parts 1 (1) and 2 (2) quickly on the shaft according to the instructions in the dimension drawing.
10. Secure the coupling parts 1 (1) and 2 (2) to stop them from moving until they have cooled down.
11. Allow the coupling parts 1 (1) and 2 (2) to cool down to the ambient temperature.
12. Use an end plate to secure the coupling parts 1 (1) and 2 (2) that have a non-self-locking, tapered pressurised oil interference fit.
13. In order to protect the oil channels of the coupling parts 1 (1) and 2 (2) against corrosion, fill them with a suitable pressurised oil and seal the oil channels with the screw plugs (22).

5.2.3 Assembling the coupling

Procedure

1. Smear the gear of the coupling part 1 (1) and 2 (2) with a lubricant coating (e.g. Castrol Opticoating N) to minimise running-in wear.
2. Oil the sealing surfaces on the hub circumference of coupling parts 1 (1) and 2 (2).
3. For ZNNV and ZNZV types, screw the thrust element (34) into the lower machine shaft.
4. Push the flanged sleeves (5) onto the gear of coupling parts 1 (1) and 2 (2). Hold the flanged sleeves (5) or support them.
5. For the ZNNA type, position the axial backlash limitation (51) in the flanged sleeve (5).
6. For ZNNV and ZNZV types, place the support ring (33) in the flanged sleeve (5) and on the thrust element (34).
7. Move the machines to be coupled close to one another. Observe the clearance S (see Clearance S (Page 66))
8. Align the coupling (see chapter Aligning the coupling (Page 33)).
9. Smear the sealing surfaces of the flanged sleeve (5) and, if fitted, of the spacer (4), with liquid plastic (50).
10. Align the fitting holes of the flanges. Observe any markings that might be provided.
11. Insert the fitting bolts (8) and tighten the nuts (9) to the specified tightening torque T_A (see chapter Tightening torques and widths A/F (Page 68)).

5.3 Aligning the coupling

5.3.1 Purpose of alignment

The shafts that are joined by the coupling are never on an ideal precise axis but have a certain amount of misalignment.

The misalignment values in operation result from the following:

- Misalignment due to assembly
  Incorrect position due to a lack of precision when aligning
- Misalignment due to operation
  Example: Load-related deformation, thermal expansion

You can minimise misalignment by aligning after assembly. A lower misalignment in the coupling has the following advantages:

- Reduced wear
- Reduced restoring forces
- Misalignment reserves for operation of the coupling

To achieve the longest possible coupling service life, Flender recommends running the coupling with 20% of the possible misalignments during operation (see Possible misalignment (Page 34)).

The recommended alignment values are specified as numerical values in Distances between teeth VA and recommended alignment values for angular and radial misalignment (Page 67) . Do not align the coupling more accurately than this, as the lubrication film formation will then be compromised.

5.3.2 Possible misalignment

The following types of misalignment can occur:

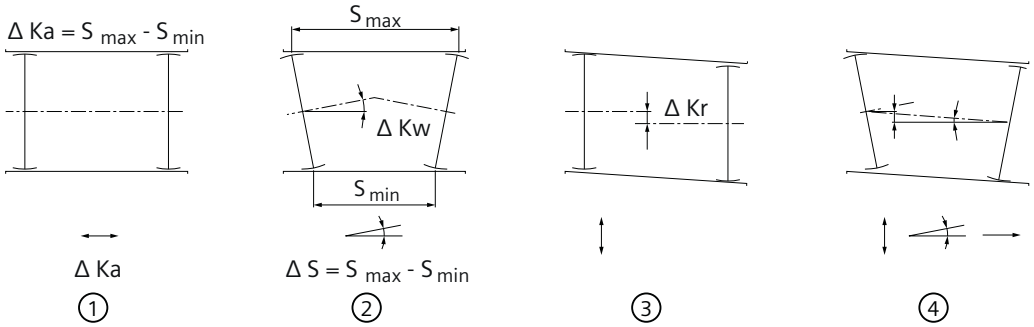


Figure 5-4: Possible misalignment

① Axial misalignment (ΔKa)
② Angular misalignment (ΔKw)
③ Radial misalignment (ΔKr)
④ Axial, angular and radial misalignment

5.3.2.1 Axial misalignment

Set the axial misalignment ΔKa to a value within the permissible tolerance range for the S clearance.

The values for the S clearance are to be considered as the maximum permissible increase in the hub distance of the coupling.

You can find the values for clearance S under Clearance S (Page 66).

5.3.2.2 Angular misalignment

The ZNN, ZNNV, ZNZS and ZNZV types compensate for positional deviations of the shaft ends to be connected up to a maximum angular misalignment of ΔKw = 0.5 °.

The ZNNA and ZNZA types compensate for positional deviations of the shaft ends to be connected up to a maximum angular misalignment of ΔKw = 0.2 °.

Determine the value ΔS ($\Delta S = S_{max} - S_{min}$).

ZNN, ZNNV, ZNZS, ZNZV types:

$\Delta S = S_{max} - S_{min} \leq ND \times \tan 0.5\,° \approx ND / 100$

ZNNA, ZNZA types:

$\Delta S = S_{max} - S_{min} \leq ND \times \tan 0.2\,° \approx ND / 300$

For ND, the smallest hub diameter of ND1 or ND2 is to be used. ND1 or ND2 in mm see Speeds, geometry data and weights (Page 61)

The alignment value for ΔS can be found in Section Distances between teeth VA and recommended alignment values for angular and radial misalignment (Page 67).

5.3.2.3 Radial misalignment

For the ZNN, ZNNV, ZNZS and ZNZV types, the maximum possible radial misalignment ΔKr_{max} corresponds to a maximum angular deviation for each coupling half of ΔKw_{max} = 0.5 °.

For the ZNNA and ZNZA types, the maximum possible radial misalignment ΔKr_{max} corresponds to a maximum angular deviation for each coupling half of ΔKw_{max} = 0.2 °.

Determine the value ΔKr.

ZNN, ZNNV, ZNZS, ZNZV types:
$\Delta Kr \leq VA \cdot \tan 0.5° \approx VA / 100$

ZNNA, ZNZA types:
$\Delta Kr \leq VA \cdot \tan 0.2° \approx VA / 300$

The values for VA and the alignment value for ΔKr can be found in Section Distances between teeth VA and recommended alignment values for angular and radial misalignment (Page 67).

5.3.2.4 Angular and radial misalignment

Angular and radial misalignment can occur at the same time. Comply with the following condition:

ZNN, ZNNV, ZNZS and ZNZV types:
$\arctan (\Delta Kr / VA) + \Delta Kw \leq 0{,}5°$

ZNNA and ZNZA types:
$\arctan (\Delta Kr / VA) + \Delta Kw \leq 0.2°$

You can find the values for VA in Distances between teeth VA and recommended alignment values for angular and radial misalignment (Page 67).

5.4 Fill with lubricant

5.4.1 Lubricant

⚠ DANGER

Risk of explosion due to an unsuitable lubricant

Using a lubricant that is not approved for use in potentially explosive atmospheres will cause an explosion.

- Use a lubricant that is approved for use in potentially explosive atmospheres.
- Observe country-specific regulations.
- Observe the manufacturer's instructions on handling the lubricant.
- Observe all lubricant specifications.

NOTICE

Coupling damage due to impairment of the lubricant characteristics

Do not mix different lubricants.

If you still want to mix different lubricants, ask the manufacturer about how compatible the lubricants are with each other. Contact the supplier of the new lubricant to confirm the compatibility of the new lubricant with the old one in writing.

Lubricant requirements

For ZAPEX couplings, only greases which contain active substances for improving corrosion protection and resistance to ageing as well as reducing wear in the mixed friction area are permitted.

- Only use greases that are suitable for sealing rings made of elastomer materials NBR, FKM and FPM.
- Only use greases that are suitable for liquid seals made of Loctite5910 or Loctite5922.

Special grease requirements:

- Greases must be produced using mineral oil.
- Use greases of viscosity class NLGI 00 or NLGI 0 according to DIN 51818.
- Use greases of viscosity class NLGI 00 or NLGI 0 at an ambient temperature of -10 °C to +80 °C.

List of lubricants

To make it easier for users to select lubricants, Flender recommends products which have been properly tested and that satisfy Flender requirements.

The recommended lubricants are available on the following link:

https://www.flender.com/de/approvedlubricants

- The list of greases with viscosity class NLGI 00 or NLGI 0 according to DIN 51818 can be found in the document “K SEMI-FLUID GREASES”.

An excerpt from the table can be found here:

Lubricant recommendation – greases

Manufacturer	Ambient temperature -10 °C to +80 °C
	Type
ARAL	Aralub FDP 00
BP	Energrease LS-EP 00
Castrol	Tribol GR 100 - 00 PD
Flender	Flender high-performance grease
Fuchs	Renolit SO-GFB
	Grafloscon C-SG 500 Plus
ExxonMobil	Mobilux EP004
Shell	Gadus S2 V220 00
TotalEnergies	Multis EP 00

NOTICE

The quality and purity of the lubricant dictate the service life of the sealing rings.

5.4.2 Filling quantity

⚠ WARNING

Severe personal injury due to flying fragments

Severe personal injury due to flying fragments and/or damage to coupling possible.

If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Observe the prescribed filling quantities.

Information

Refer to the dimension drawings for the grease filling quantities for the ZNNV and ZNZV types.

The following table lists the grease filling quantities for the ZNN, ZNNA, ZNZS and ZNZA types.

	Coupling size											
	83	**107**	**130**	**156**	**181**	**211**	**250**	**274**	**307**	**333**	**364**	**424**
Grease filling quantity ZNN, ZNNA dm³	0.04	0.08	0.16	0.2	0.33	0.42	0.7	0.9	1.4	1.8	2.3	3.0
Grease filling quantity ZNZS, ZNZA[1] dm³	0.02	0.04	0.08	0.1	0.17	0.21	0.35	0.45	0.7	0.9	1.15	1.5

Table 5-3: Grease filling quantity

[1] For the ZNZS and ZNZA types, the grease filling quantities apply for one coupling side

5.4.3 Fill with lubricant

NOTICE

Risk of injury and danger to the environment from lubricant

Collect spilled lubricant and dispose of it according to the valid regulations.

Procedure

1. Rotate the coupling until it reaches the position of the screw plugs (6) according to the illustration.
2. Remove both screw plugs (6) located on the sides.
3. Measure the correct quantity of lubricant.
4. Fill the lubricant into one of the holes for the screw plugs (6). Use a grease gun for this, if required.
5. Screw the screw plugs (6) with the underlaid/integrated sealing ring back in.

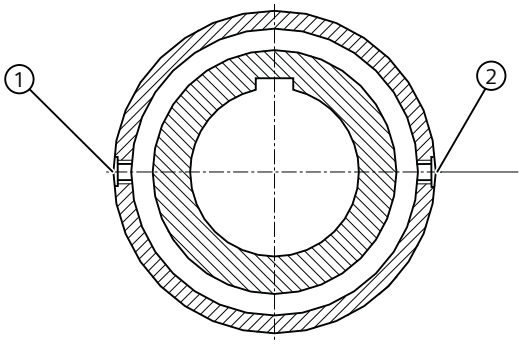


Figure 5-5: Fill with lubricant

① Filling hole
② Venting hole

Commissioning 6

DANGER

Danger due to igniting deposits

During use in potentially explosive atmospheres deposits from heavy metal oxides (rust) can ignite due to friction, impact or friction sparks and lead to an explosion.

- Ensure through the use of an enclosure or other suitable measures that heavy metal oxide (rust) deposits on the coupling are not possible.

In order to ensure safe commissioning, carry out various tests prior to commissioning.

Testing before commissioning

DANGER

Danger

Overload conditions can occur during the commissioning of the coupling. The coupling can burst and metal parts can be flung out. There is a risk of fatal injury from flying fragments. Bursting of the coupling can lead to an explosion in potentially explosive atmospheres.

- Carry out the tests prior to commissioning.
- Do not touch the rotating coupling.

1. Check the tightening torques of the screws of the coupling in accordance with section Tightening torques and widths A/F (Page 68).
2. Check the tightening torques of the foundation bolts of the coupled machines.
3. Check whether the enclosures (ignition protection, coupling guard, touch protection) have been installed and that the function of the coupling has not been adversely affected by the enclosure. This also applies to test runs and rotational direction checks.

Operation 7

7.1 Normal operation of the coupling

The coupling runs quietly and shock-free during normal operation.

7.2 Fault – causes and correction

A form of behaviour which is different to normal operation is classed as a fault and has to be rectified immediately.

Look out specifically for the following faults during coupling operation:

- Unusual coupling noise
- Sudden occurrence of shocks
- Lubricant leakage

7.2.1 Procedure in the event of faults

⚠ DANGER

Danger due to bursting of the coupling

There is a risk of fatal injury from flying fragments. Bursting of the coupling can lead to an explosion in potentially explosive atmospheres.

- Switch off the unit at once if any faults occur.
- Note during the repair work the possible causes of faults and the notes on rectifying them.

Proceed as described below if there is a fault of the coupling during operation:

1. Turn the drive off immediately.
2. Initiate the required action for repair taking into consideration the applicable safety regulations.

If you cannot determine the cause or if you cannot carry out repair work with your own means, request one of our customer service technicians.

7.2.2 Identifying the fault cause

Faults occur frequently due to application errors or they occur due to operational circumstances such as wear of wearing parts or changes to the system.

The faults and fault causes listed below only serve as an indication for troubleshooting. In the case of a complex system be sure to include all the system components in the search for the fault.

⚠ WARNING

Physical injury

Injury from rotating parts.

- Only carry out work on the coupling when it is at a standstill.
- Secure the drive aggregate against unintentional startup.
- Attach an information notice to the start switch stating clearly that work is being carried out on the coupling.
- Before starting any work, make sure that the unit is free from loads.

Intended use

The coupling is only approved for the applications specified in these instructions. Please observe all the stipulations in Section Intended use (Page 17).

7.2.2.1 Possible faults

Fault	Cause	Rectification
Sudden changes in the noise level and/ or sudden occurrences of shocks	Lubricant shortage	Follow the instructions given in Section Fill with lubricant (Page 36).
	Alignment changes	Follow the instructions given in Section Correcting the changed alignment (Page 45).
	Coupling not suitable for the operating conditions. Check the possible causes given in section Unsuitable coupling (Page 43).	Use a coupling that is suitable for the operating conditions.
	Incorrect coupling assembly. Check the possible causes given in sections Assembly-related causes (Page 43) and Specific assembly-related and maintenance-related causes (Page 44).	Reassemble the coupling in compliance with these instructions. Please observe all the stipulations and requirements given in chapter Assembly (Page 25).
	Incorrect maintenance of the coupling. Check the possible causes given in sections Maintenance-related causes (Page 44) and Specific assembly-related and maintenance-related causes (Page 44).	Please observe all the stipulations and requirements given in chapter Maintenance (Page 47).
Presence of vibrations	Coupling not suitable for the operating conditions. Check the possible causes given in section Unsuitable coupling (Page 43).	Use a coupling that is suitable for the operating conditions.

Fault	Cause	Rectification
Presence of vibrations	Incorrect coupling assembly. Check the possible causes given in sections Assembly-related causes (Page 43) and Specific assembly-related and maintenance-related causes (Page 44).	Reassemble the coupling in compliance with these instructions. Please observe all the stipulations and requirements given in chapter Assembly (Page 25).
	Incorrect maintenance of the coupling. Check the possible causes given in sections Maintenance-related causes (Page 44) and Specific assembly-related and maintenance-related causes (Page 44).	Please observe all the stipulations and requirements given in chapter Maintenance (Page 47).

Table 7-1: Table of faults

7.2.2.2 Possible causes

7.2.2.2.1 Unsuitable coupling

- Important information on the description of the drive unit and the environment were not available when the coupling was chosen.
- System torque too high and/or torque dynamics not permissible.
- System speed too high.
- Application factor not selected correctly.
- Chemically aggressive environment not taken into consideration.
- Coupling not suitable for the ambient temperature.
- Diameter and/or assigned fit of the finished bore not permissible.
- Width across corners of the parallel keyways greater than the width across corners of the parallel keyways in accordance with DIN 6885/1 for the maximum permissible bore.
- Shaft-hub connection incorrectly sized.
- Maximum permissible load conditions not taken into consideration.
- Maximum permissible overload conditions not taken into consideration.
- Dynamic load conditions not taken into consideration.
- Coupling and the machine and/or drive train form a critical torsional, axial or bending vibration system.

7.2.2.2.2 Assembly-related causes

- Damaged component installed.
- Shaft diameter outside the stipulated tolerance range.
- Coupling parts interchanged and hence not assigned to the specified shaft.
- Stipulated locking elements to prevent axial movements not installed.
- Stipulated tightening torques not adhered to.
- Bolts inserted dry or greased.

- Flange surfaces of screwed connections not cleaned.
- Alignment and/or shaft misalignment values not set in accordance with the instructions.
- Coupled machines were not correctly connected to the foundation so that a shifting of the machines leads to an impermissible displacement of the coupling parts.
- Coupled machines not earthed adequately.
- Coupling guard used is not suitable.

7.2.2.2.3 Maintenance-related causes

- Stipulated maintenance intervals not adhered to.
- Replacement parts that were used were not original replacement parts from Flender.
- Flender replacement parts that were used were old or damaged.
- Leak in the area of the coupling not detected so that chemically aggressive substances damage the coupling.
- Indications of faults, such as noise or vibration, were not heeded.
- Stipulated tightening torques not adhered to.
- Alignment and/or shaft misalignment values not set in accordance with the instructions.

7.2.2.2.4 Specific assembly-related and maintenance-related causes

- O-rings (12) not fitted.
- O-rings (12) heated up excessively when applying heat to the coupling parts.
- Sealing surfaces smeared or damaged.
- Lubricant not applied correctly.
- Missing sealing compound (50) in the set screw hole.

7.2.3 Resolving faults

7.2.3.1 Resolving lubricant shortage

Lubricant shortage is caused by the coupling leaking or overaged lubricant.

Procedure

1. Drain the lubricant in accordance with Lubricant replacement (Page 47).
2. Correct the cause of the leakage.
3. Carry out a visual inspection of the gears and the seals for damage.
4. Check the locking elements that prevent axial movements and correct these as required.
5. Realign the coupling.
6. Fill with new lubricant according to Fill with lubricant (Page 36).

7.2.3.2 Correcting the changed alignment

A changed alignment of the coupling during operation often occurs when the coupled machines shift compared to one another. A cause of this can be loose foundation bolts.

Procedure

1. Correct the cause for the change in alignment.
2. Carry out a visual inspection of the coupling for damage.
3. Check the locking elements that prevent axial movements and correct these as required.
4. Realign the coupling.

Maintenance 8

8.1 Maintenance intervals

⚠ DANGER

Danger due to bursting of the coupling

The coupling can burst if the maintenance intervals are not adhered to. There is a risk of fatal injury from flying fragments. Bursting of the coupling can lead to an explosion in potentially explosive atmospheres.

- Please observe all the stipulations concerning maintenance of the coupling in this section.

⚠ DANGER

Danger due to sparking or bursting of the coupling

If the lubricant quantity does not correspond to the quantity stipulated, then the coupling becomes an ignition source. Lubricant shortage can lead to sparking. Sparks can lead to an explosion in potentially explosive atmospheres.

- Carefully observe the specified lubricant quantity.

⚠ WARNING

Physical injury

Injury from rotating parts.

- Only carry out work on the coupling when it is at a standstill.
- Secure the drive aggregate against unintentional startup.
- Attach an information notice to the start switch stating clearly that work is being carried out on the coupling.
- Before starting any work, make sure that the unit is free from loads.

Check the coupling every 3 months for any for leakage, heating and change in noise level.

8.2 Lubricant replacement

Replace the lubricant at the specified maintenance intervals.

Operating temperature/ Special measures	Maximum operating hours	Maximum years of use
to 70 °C	8,000	2
above 70 °C	3,000	1

Table 8-1: Operating temperatures, operating hours and years of use

Information

- When replacing the lubricant, keep the amount of remaining lubricant in the coupling as low as possible.
- It's easier to change the grease if you add low-viscosity oil to the old grease. Contact the manufacturer to confirm the compatibility of the oil with the grease in writing.

Procedure

1. Rotate the coupling to the position according to the illustration.

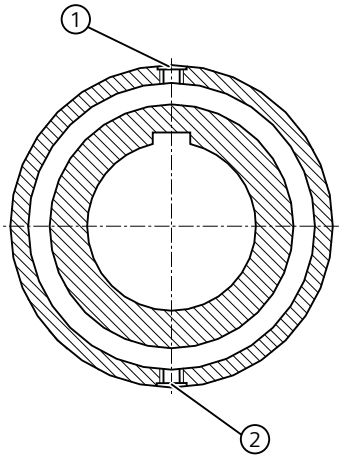


Figure 8-1: Draining the lubricant

① Venting hole
② Drainage hole

2. Place a suitable container under the drainage hole.
3. Unscrew all of the screw plugs (6).
4. Make sure you capture all of the lubricant.
5. Disposal of the lubricant. When doing this, carefully observe applicable regulations.
6. Fill with lubricant according to Section Fill with lubricant (Page 38).

8.3 Replacing O-rings

NOTICE

Damage to property

Risk of damage to sealing rings from cleaning agents.

- Ensure that the sealing rings do not come into contact with cleaning agents.

Information

If dimensions Q and P from Section Speeds, geometry data and weights (Page 61) are complied with, you can replace the O-rings (12) with cut O-rings (12) without having to move the coupling apart.

1. Drain the grease according to Section Lubricant replacement (Page 48).
2. Loosen the bolt connection (8; 9) of the flanged sleeves (5) and/or the spacer (4).
3. Slide the flanged sleeve (5) off the gear teeth and off the hub until you can remove the O-ring (12). Prop up the spacer (4) at the same time.
4. Clean the sealing compound (50) from the flanged sleeve (5) and the spacer (4).
5. Cut the new O-ring (12) radially at one point.
6. Smear the cut ends evenly with adhesive (e.g. Loctite 401).
7. Lay the O-ring (12) cut end into the keyway.
8. Starting from the cut end, insert the O-ring (12) into the keyway on both sides.
9. Smear the sealing surfaces of the flanged sleeve (5) and/or the spacer (4) with sealing compound (50).
10. Align the fitting holes of the flanges. Observe any markings that might be provided.
11. Insert the fitting bolts (8) and tighten the nuts (9) to the specified tightening torque T_A (see Section Tightening torques and widths A/F (Page 68)).
12. Fill with grease according to Section Fill with lubricant (Page 38).

8.4 Dismantling the coupling

Procedure

1. Drain the lubricant in accordance with Section Lubricant replacement (Page 47).
2. Prop up the flanged sleeves (5) and, if fitted, the spacer (4).
3. Loosen the fitting bolt connection (8, 9).
4. Move the coupled machines apart.
5. Remove the spacer (4), the axial backlash limitation (51 or 52), the flanged sleeve (5), and the support ring (33), if fitted.
6. Unscrew the thrust element (34), if fitted.
7. Check the gear, sealing surfaces, hub bore and shaft for damage and protect them against corrosion.
8. Replace damaged parts.

8.4.1 Dismantling coupling part 1 (1) or 2 (2) with shaft-hub connection using a parallel key

⚠ WARNING

Danger from burners and hot coupling parts

Risk of injury due to burners and hot surfaces. Burners or hot coupling parts can lead to an explosion in potentially explosive atmospheres.

- Wear suitable protective equipment (gloves, safety glasses).
- Ensure that the area is not at risk of explosion.

Procedure

1. Secure the coupling parts to prevent them from falling.
2. Remove the axial locking element (set screw, end plate).
3. Use a suitable pulling fixture.
4. Heat up the coupling part 1 (1) and/or 2 (2) using a burner above the parallel key along its length to maximum 80 °C.
5. Pull off the coupling part 1 (1) and/or 2 (2). Use suitable lifting gear when doing this.
6. Check the gear, the sealing surfaces, hub bore and shaft for damage and protect them against corrosion.
7. Replace damaged parts.

When reinstalling the coupling parts, please observe the information in Chapters Assembly (Page 25) and Commissioning (Page 39).

8.4.2 Dismantling coupling part 1 (1) or 2 (2) with shaft-hub connection using pressurised oil interference fit

⚠ DANGER

Oil pressure in excess of maximum permissible value

The coupling could burst if the maximum pressure indicated in the dimension drawing is exceeded. There is a risk of fatal injury from flying fragments. If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Do not exceed the maximum oil pressure specified in the dimension drawing.
- Keep the oil pressure constant in all oil channels during the entire procedure.

⚠ DANGER

Danger as a result of improper handling of fixtures and pumps

Failure to handle fixtures and pumps properly can result in injuries. The coupling can burst. There is a risk of fatal injury from flying fragments. If a coupling bursts in an area at risk of explosion, then this can result in an explosion.

- Please observe the manufacturer's instructions on handling the following tools:
  - ⇨ Pulling fixtures
  - ⇨ Pumps

⚠ WARNING

Risk of injury as a result of coupling parts or the pulling fixture working loose.

Coupling parts or pulling fixtures can work loose and fall when dismantling work is in progress.

- Use suitable hoisting gear to hold the coupling part 1 (1) or 2 (2) and the pulling fixture in position.
- Attach an axial locking element if the pressurised oil interference fit is tapered.

NOTICE

Risk of injury and danger to the environment from escaping oil.

- Catch any oil which escapes.
- Dispose of the oil according to the valid regulations.

Tools required

- One oil pump with pressure gauge (at least 2500 bar) per oil channel.
  Or: One motor-driven oil pump. One connection that can be closed independently is required for each oil channel.
  Refer to the dimension drawing for the number of oil channels.
- With a stepped bore:
  A motor-driven oil pump at the oil channel located at the point of transition from the smaller to the larger bore. A large quantity of oil per unit of time is needed here.
- Suitable connections and pipes.
- Suitable pulling fixture.
  Or: Retaining plate with retaining screws or threaded spindles with nuts. Material of the screws and spindles must have at least strength class 10.9; material of the nuts depending on the material of the screws or spindles.
- Hydraulic cylinder with oil pump. Note displacement and pressure of the hydraulic cylinder. Refer to the dimension drawing for the required axial force.

Procedure

1. Use a suitable pulling fixture.
2. Secure the coupling part 1 (1) or 2 (2) and the pulling fixture in position to prevent them from falling.
3. Remove the screw plugs (22) from the oil ducts.
4. Deaerate an oil pump and connect it to the oil channel in the centre.
5. Pressurise the oil pump to the pressure specified in the dimension drawing until oil starts to escape from the adjacent connections or the front faces. Keep the pressure constant.
6. Deaerate the next oil pump and connect it to the adjacent oil channel.
7. Repeat steps 5 and 6 for the remaining oil ducts.
8. If so much oil escapes when pressure is applied that the pump cannot maintain the pressure, use a higher-viscosity oil.
9. Pressurise the hydraulic cylinder if oil escapes from both front faces as a closed oil ring. Make sure that the coupling part 1 (1) or 2 (2) is pulled immediately off the shaft in a swift, smooth movement.

NOTICE

Removal in several strokes

If several strokes of the hydraulic cylinder are required to remove the part, make sure that the shaft end is positioned between two oil channels at the end of the stroke.

10. Dismantle the oil pumps and the pulling fixture from the coupling part 1 (1) or 2 (2).

11. Check the gear, sealing surfaces, hub bore and shaft for damage and protect them against corrosion.
12. Replace damaged parts.

When reinstalling the coupling parts, please observe the information in chapters Assembly (Page 25) and Commissioning (Page 39).

Service and support 9

9.1 Contact

When ordering replacement parts, requesting a customer service technician or if you have any technical queries, contact our factory or one of our Customer Service addresses:

Flender GmbH

Schlavenhorst 100

46395 Bocholt

Germany

Tel.: +49 (0)2871/92-0

Fax.: +49 (0)2871/92-2596

Flender GmbH (http://www.flender.com/)

More information

Further information about service and support can be found on the Internet:

Service & Support (https://www.flender.com/service)

Disposal

10

Disposal of the coupling

Dispose of the coupling parts according to applicable national regulations or recycle them.

Replacement parts 11

11.1 Ordering replacement parts

By stocking the most important replacement parts at the installation site you can ensure that the coupling is ready for use at any time.

Use only original replacement parts from Flender. Flender only accepts liability for original replacement parts from Flender.

You can find the available replacement parts for the coupling described here at Spare parts drawing and spare parts list (Page 58).

You can find our contact data for ordering replacement parts at Service and support (Page 53).

Information required when ordering replacement parts

- Flender order number with item
- Flender drawing number
- Coupling type and size
- Part number (refer to Spare parts drawing and spare parts list (Page 58))
- Dimensions of the replacement part, for example:
  - Bore
  - Bore tolerance
  - Parallel keyway and balancing
- Special dimensions, for example, flange connection dimensions, intermediate sleeve length or brake drum dimensions
- Any special properties of the replacement part, such as, for example:
  - Temperature resistance
  - Electrical insulation
  - Operating fluid
  - Use in potentially explosive atmospheres
- Quantity

11.2 Spare parts drawing and spare parts list

11.2.1 Spare parts list

Part number	Designation	ZNN	ZNNA	ZNNV	ZNZS	ZNZA	ZNZV
1	Coupling part 1/2	x	x	x	x	x	x
2	Coupling part 1/2	x	x	x	x	x	x
4	Spacer				x	x	x
5	Flanged sleeve	x	x	x	x	x	x
6	Screw plug	x	x	x	x	x	x
7	Sealing ring [1]	x	x	x	x	x	x
8	Fitting bolt	x	x	x	x	x	x
9	Hexagon nut	x	x	x	x	x	x
12	O-ring	x	x	x	x	x	x
20	Plate pulley [2]				x	x	x
22	Screw plug [3]						
33	Support ring			x			x
34	Thrust element			x			x
50	Sealing compound (Liquid plastic Loctite 5922)	x	x	x	x	x	x
51	Retaining ring		x				

Table 11-1: Spare parts list for ZNN, ZNNA, ZNNV, ZNZS, ZNZA and ZNZV types

[1] Sealing ring (7) is only available for size 83. For the other sizes, the sealing ring is incorporated into the screw plug (6).

[2] The plate pulley (20) is flanged into the spacer (4). As a replacement, Flender only supplies the complete spacer (4) with plate pullies (20). For the ZNZS type with spacer lengths LZ ≤ 200, the spacer (4) is designed without plate pullies (20).

[3] Screw plugs (22) are only used in combination with hydraulic interference fit.

You can find a description of the screw plug (22) in Section Screw plug (Page 60).

11.2.2 Spare parts drawing for ZNN, ZNNA, ZNNV, ZNZS, ZNZA and ZNZV types

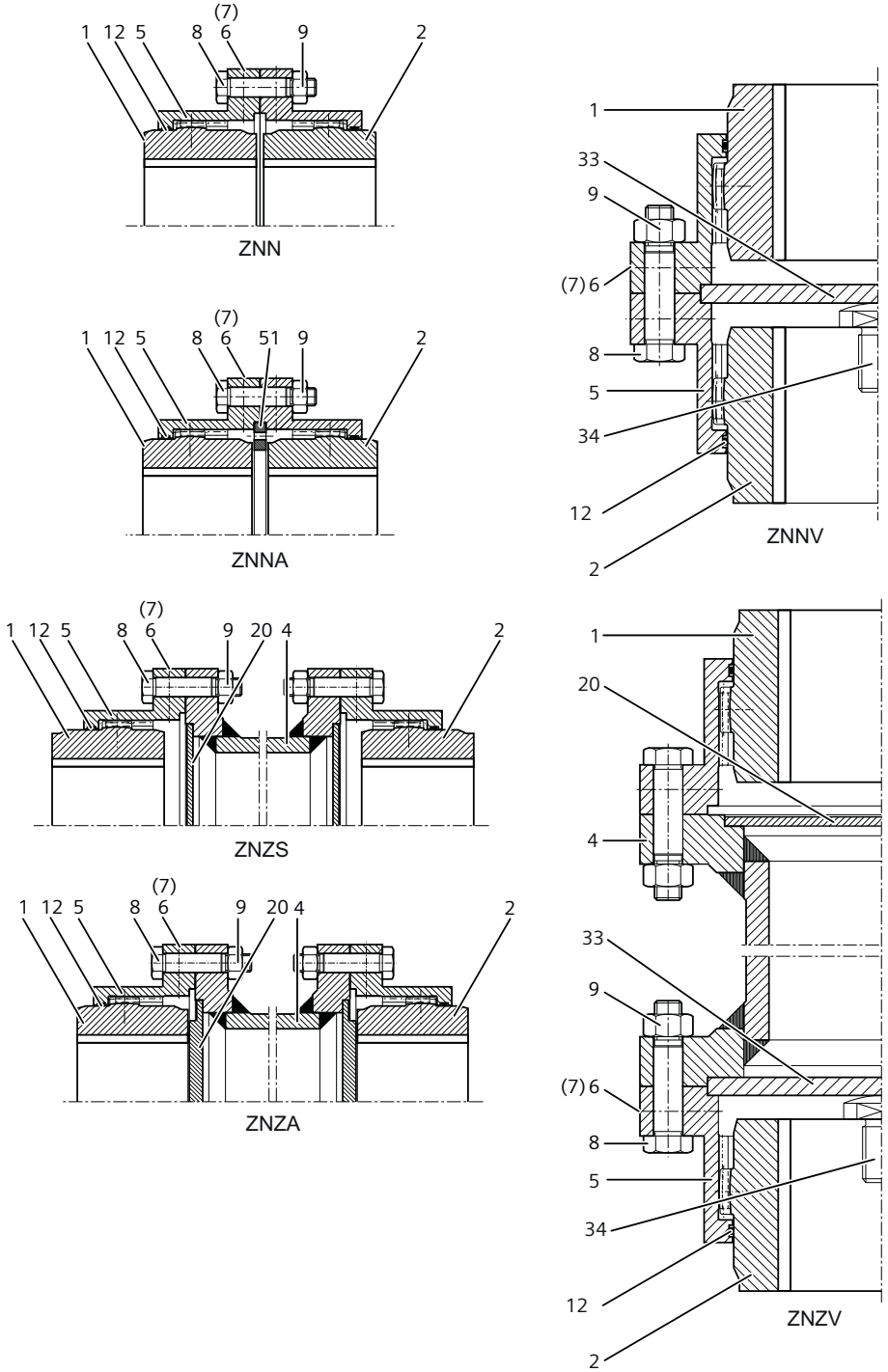


Figure 11-1: Spare parts drawing for ZNN, ZNNA, ZNNV, ZNZS, ZNZA and ZNZV types

11.2.3 Screw plug

The diagram below shows the screw plug (22):

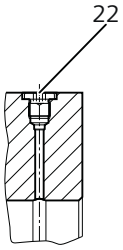


Figure 11-2: Screw plug (22)

Technical specifications

A

A.1 Speeds, geometry data and weights

In this chapter you can find dimension drawings and technical data for ZAPEX couplings of the following types:

- Dimension drawing for ZNN and ZNNA (Page 61) type
- Dimension drawing for ZNZS and ZNZA (Page 62) type
- Dimension drawing for ZNNV (Page 63) type
- Dimension drawing for ZNZV (Page 64) type
- Dimension table (Page 66)

A.1.1 Dimension drawing for ZNN and ZNNA types

The ZNNA type is only produced in variant A (S16). For clearance S1, S2, S3 and S16, refer to Chapter Clearance S (Page 66).

You can find the dimension table in Chapter Dimension table (Page 66).

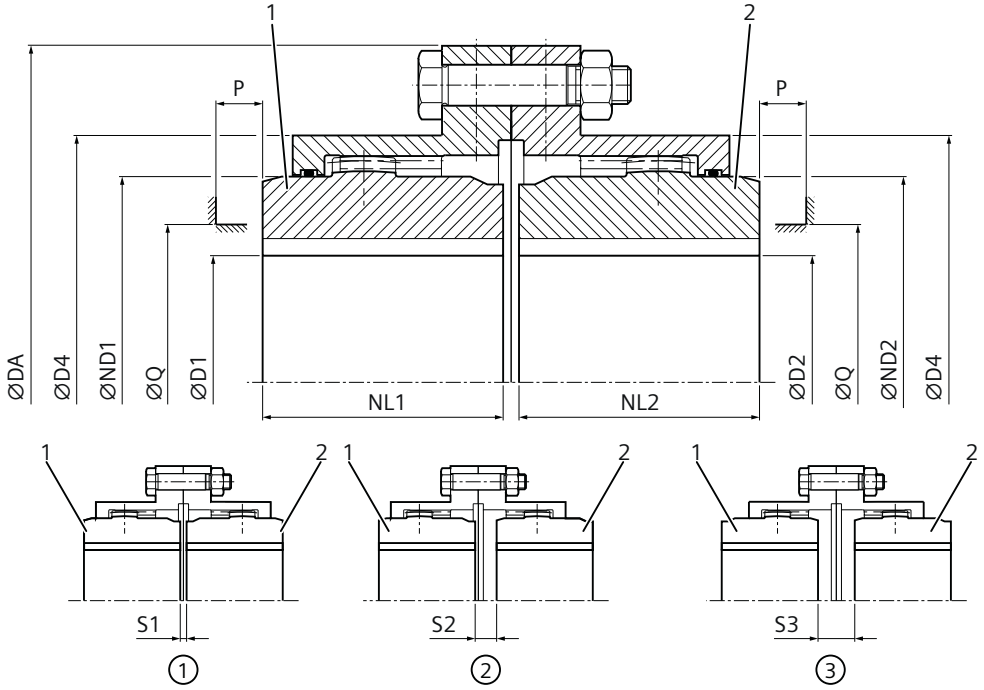


Figure A-1: Dimension drawing for ZNN types

① Variant A
② Variant AB
③ Variant B

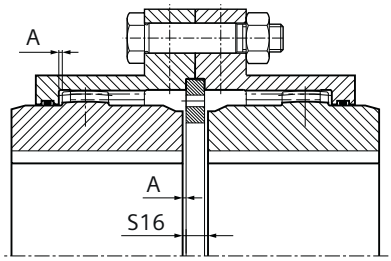


Figure A-2: Dimension drawing for ZNNA types

A.1.2 Dimension drawing for ZNZS and ZNZA types

The ZNZA type is only produced in variant A (S17). For clearance S8,S9, and S17, refer to Chapter Clearance S (Page 66).

S - Dimensions according to the orderer's specifications.

LZ - Dimensions ≤ 200 are delivered without part 20 (LA = LZ + 2 x S8/9), but with part 20 for ZNZA type.

You can find the dimension table in Chapter Dimension table (Page 66).

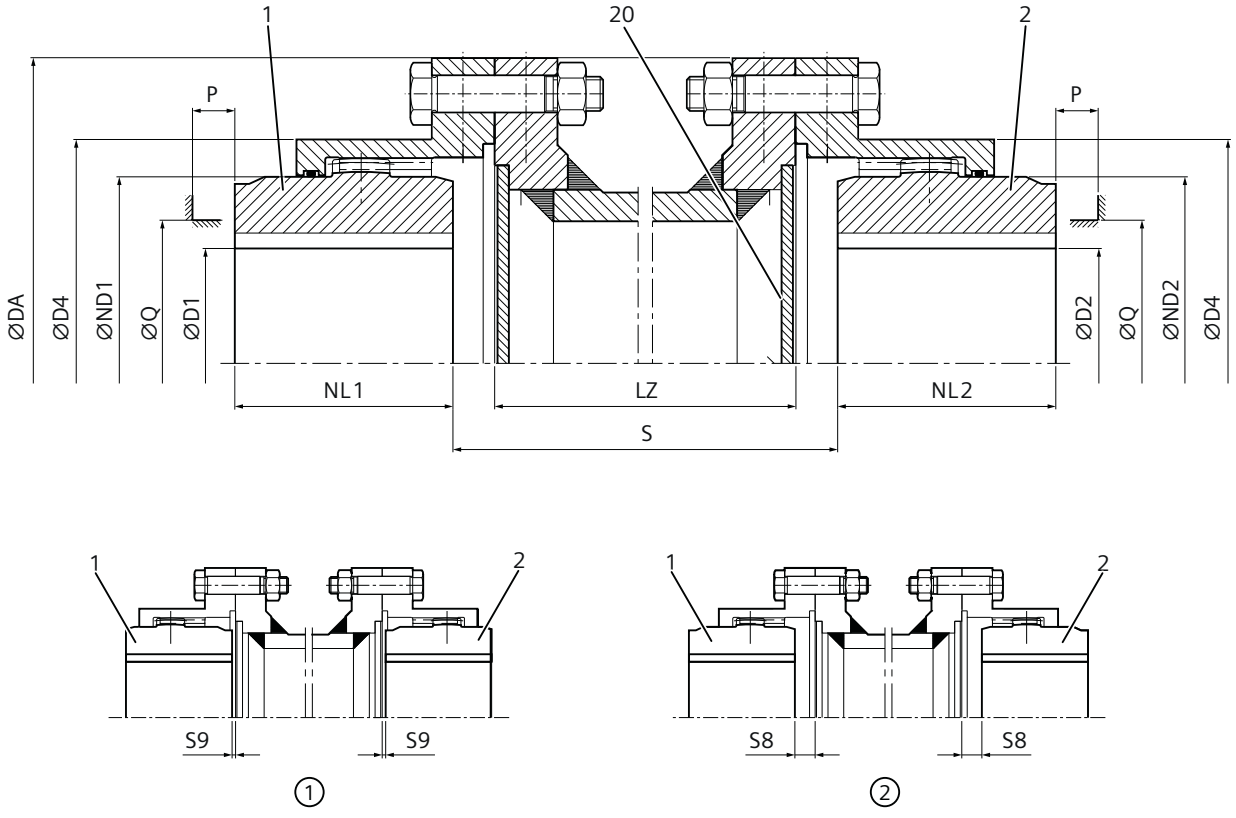


Figure A-3: Dimension drawing for ZNZS types

① Variant A
② Variant B

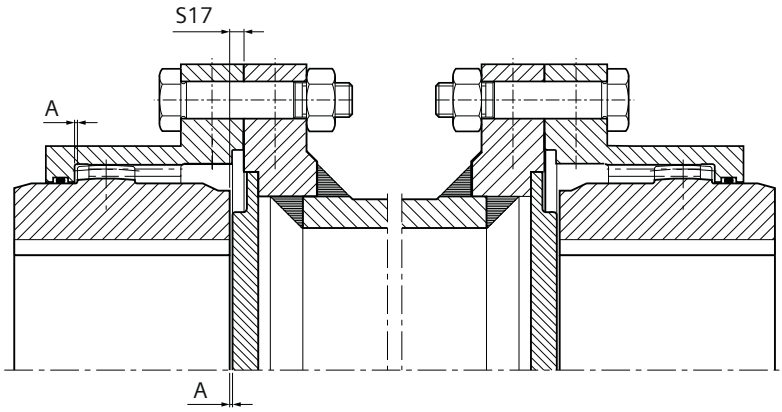


Figure A-4: General ZNZA illustration

A.1.3 Dimension drawing for ZNNV types

For clearance S11 and S12, refer to Chapter Clearance S (Page 66).

You can find the dimension table in Chapter Dimension table (Page 66).

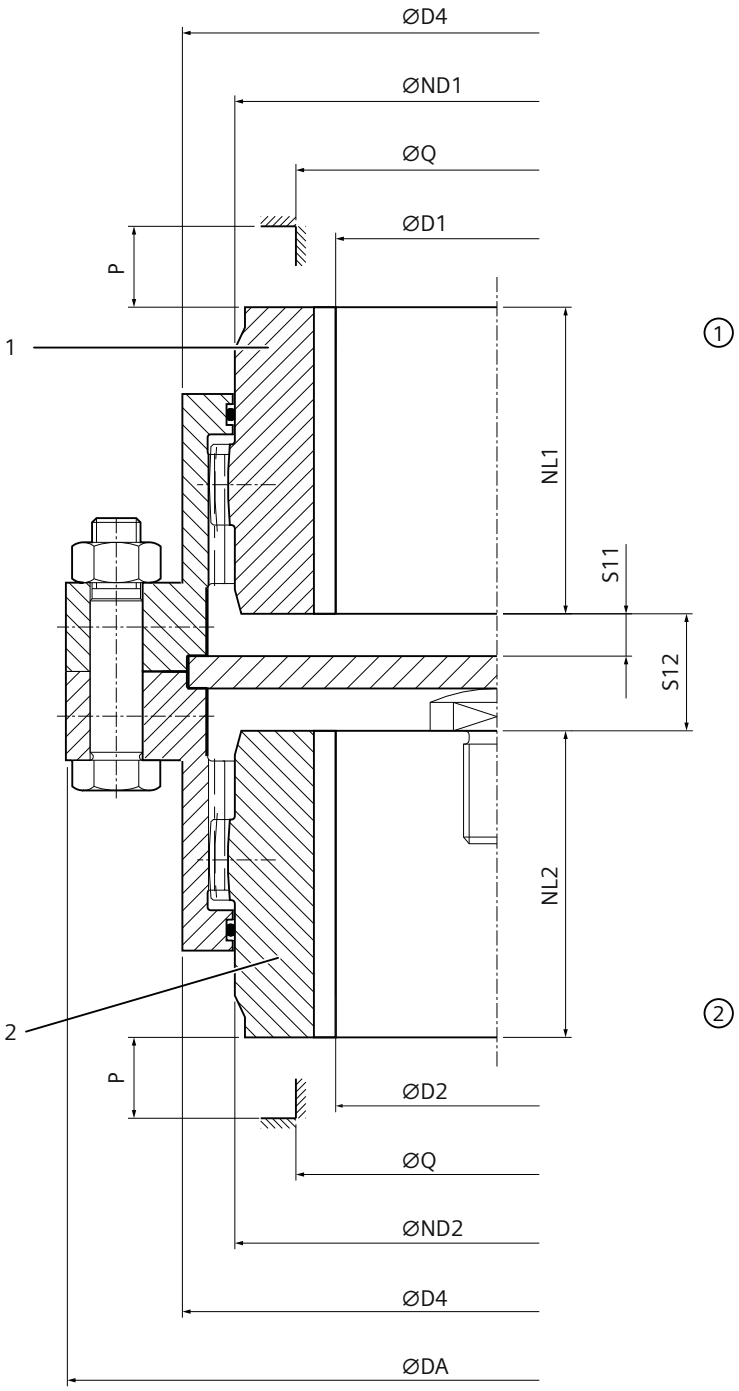


Figure A-5: ZNNV type

① top
② bottom

A.1.4 Dimension drawing for ZNZV types

For clearance S8 and S13, refer to Chapter Clearance S (Page 66).

S - Dimensions according to the orderer's specifications.

You can find the dimension table in Chapter Dimension table (Page 66).

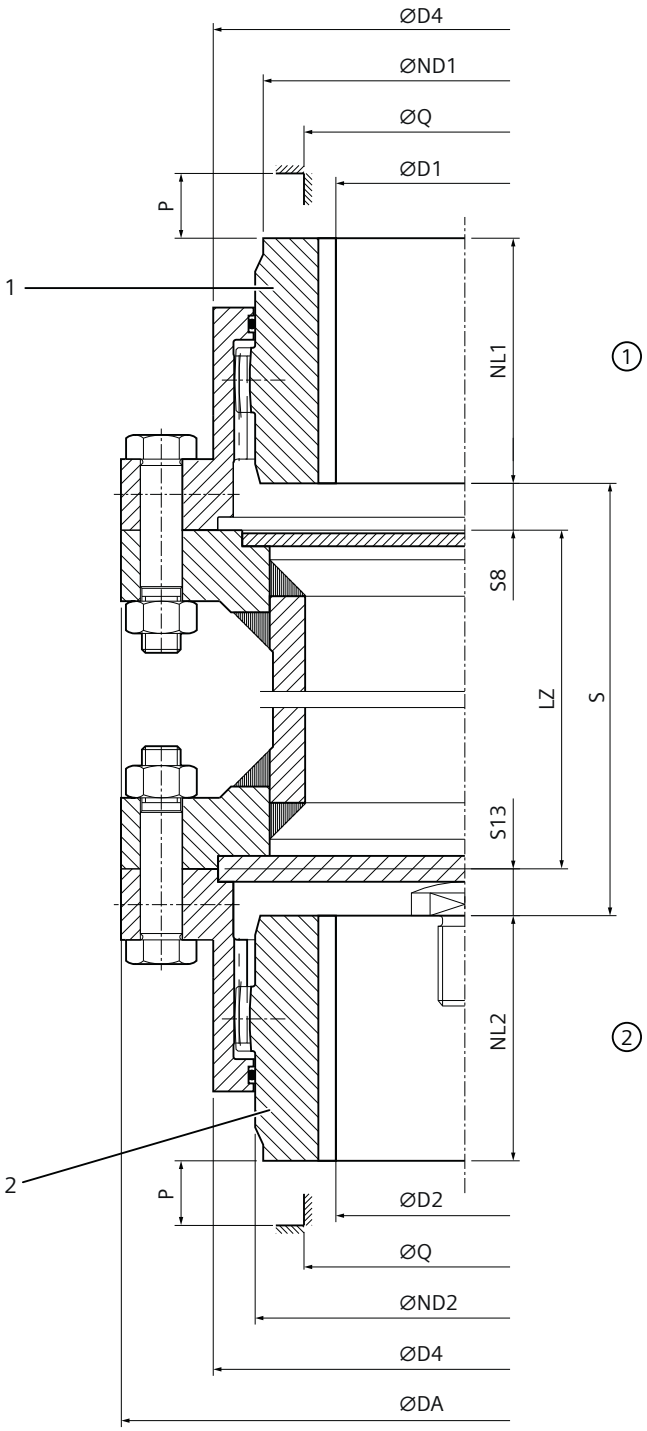


Figure A-6: ZNZV type

① top
② bottom

A.1.5 Dimension table

Size	Rated torque T_N	Speed n_{max}	Bore D1, D2		DA	ND1 ND2	NL1 NL2	D4	Axial back-lash A	Q [2]	P [2]	LZ min.	Weight [3] m
			from	up to [1]									
	Nm	rpm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
83	1020	8500	0	50	117	67	43	83	0.5	52	31	75	3.2
107	2210	7700	0	65	152	87	50	107	0.5	68	34	85	6.5
130	4020	6900	0	82	178	108	62	129.5	0.5	85	42	95	9.8
156	6600	6200	0	100	213	130	76	156	0.5	110	47	110	17.5
181	11000	5800	0	116	240	153	90	181	0.5	130	58	110	25.5
211	19200	5100	0	137	280	180	105	211	0.5	150	67	125	43
250	30680	4500	0	164	318	214	120	249.5	1.0	175	72	125	60
274	43550	4000	80	178	347	233	135	274	1.0	190	81	125	82
307	61750	3750	90	198	390	260	150	307	1.0	220	91	145	115
333	87100	3550	100	216	425.5	283	175	332.5	1.0	250	104	145	155
364	117000	3400	120	242	457	312	190	364	1.0	265	126	145	180
424	162500	3200	150	288	527	371	220	423.5	1.0	300	140	145	275

Table A-1: Speeds, geometry data and weights for coupling sizes 83 to 424

[1] Maximum bore for parallel keyway in accordance with DIN 6885/1

[2] Space required for aligning the coupling parts and replacing the sealing rings (12) and tightening the set screws.

[3] Weight applies to one coupling type ZNN with maximum bore.

A.2 Clearance S

The following table lists the clearances S for types ZNN (S1, S2, S3), ZNNA (S16), ZNZA (S17), ZNZS (S8, S9), ZNNV (S11, S12) and ZNZV (S8, S13).

You can find a description of the types in Section Speeds, geometry data and weights (Page 61).

NOTICE

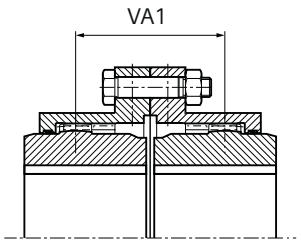
Property damage due to non-compliance with the S clearance and the permitted deviations

For types ZNNA (S16) and types ZNZA (S17) deviations in the Sclearance of ±0.1 mm are permitted due to the axial backlash limitation.

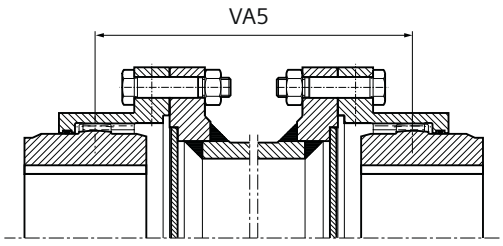
Size	S1	S2	S3	perm Deviation S1, S2, S3	S8	S9	S11	S12	perm Deviation S8, S9, S11, S12	S13	S16	S17
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
83	3	12	21	+1	10.5	1.5	8	21	+0.5	10.5	5	2.5
107	3	9	15	+1	7.5	1.5	4.5	15	+0.5	7.5	6	3
130	3	17	31	+1	15.5	1.5	12.5	31	+0.5	15.5	6	3
156	5	17	29	+1	14.5	2.5	10.5	29	+0.5	14.5	9	4.5
181	5	19	33	+1	16.5	2.5	12.5	33	+0.5	16.5	9	4.5
211	6	23	40	+1	20	3	15	40	+0.5	20	11	5.5
250	6	24	42	+1	21	3	17	42	+0.5	21	10	5
274	8	29	50	+1.5	25	4	19.5	50	+0.75	25	13	6.5
307	8	32	56	+1.5	28	4	22	56	+0.75	28	14	7
333	8	39	70	+1.5	35	4	29	70	+0.75	35	14	7
364	8	46	84	+1.5	42	4	36	84	+0.75	42	14	7
424	10	43	76	+1.5	38	5	30	76	+0.75	38	18	9

Table A-2: Clearance S

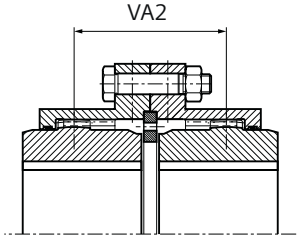
A.3 Distances between teeth VA and recommended alignment values for angular and radial misalignment



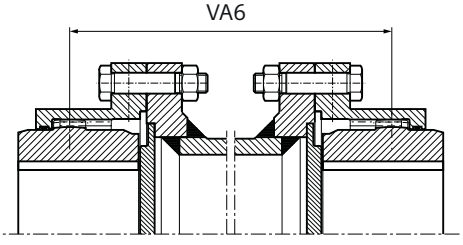
ZNN, ZNNV



ZNZS, ZNZV



ZNNA



ZNZA

The following table contains the distances between teeth VA and recommended alignment values for angular and radial misalignment:

NOTICE

As a result of the limited axial clearance, halve the alignment values forZNNA and ZNZA types.

Size	Distance between teeth				Alignment values for radial misalignment ΔKr			Alignment values for angular misalignment
	VA1 mm	VA5 mm	VA2 mm	VA6 mm	for VA1 mm	for VA2 mm	for VA5 or VA6 mm	ΔS mm
83	55	VA1 + LZ	57	VA2 + LZ	0.09	0.1	ΔKr = VA5 × tan 0.1°	0.11
107	59		62		0.1	0.1	ΔKr = VA6 × tan 0.1°	0.15
130	79		82		0.13	0.14		0.18
156	93		97		0.16	0.17		0.22
181	109		113		0.19	0.19		0.26
211	128		133		0.22	0.23		0.31
250	144		148		0.25	0.25		0.37
274	164		169		0.28	0.29		0.40
307	182		188		0.31	0.32		0.45
333	214		220		0.37	0.38		0.49
364	236		242		0.41	0.42		0.54
424	263		271		0.45	0.47		0.64

Table A-3: Distances between teeth VA and recommended alignment values for radial and angular misalignment

A.4 Tightening torques and widths A/F

Use bolts of strength class 8.8.

Size	Tightening torque TA Part no.		Width A/F SW Part no.	
	6 Nm	9 Nm	6 [1] mm	9 [2] mm
83	2	25	3	13
107	13	49	5	17
130	13	49	5	17
156	13	86	5	19
181	13	86	5	19
211	13	210	5	24
250	13	210	5	24

Size	Tightening torque TA Part no.		Width A/F SW Part no.	
	6 Nm	9 Nm	6 [1] mm	9 [2] mm
274	13	210	5	24
307	13	410	5	30
333	13	410	5	30
364	13	410	5	30
424	13	710	5	36

Table A-4: Tightening torques and widths A/F

[1] Hexagon socket

[2] Hexagon head

Apply the specified tightening torques as listed in Section Tightening procedure (Page 69).

A.5 Tightening procedure

Tightening torques must be observed taking into account the following table:

Scatter of the torque applied at the tool	Tightening procedure (As a rule, the tightening procedures listed are within the specified tool torque scatter.)
±5 %	• Hydraulic tightening with mechanical screwdriver • Torque-controlled tightening with a torque wrench or a torque wrench that gives a signal • Tightening with a precision mechanical screwdriver with dynamic torque measurement

Table A-5: Tightening procedure

The tightening torques apply to screws/bolts with untreated surfaces that are not oiled or are only lightly oiled, and for screws/bolts that are used with a liquid screw locking agent in accordance with these instructions. Use with lubricant paint or lubricant is not permitted.

A.6 O-rings

A.6.1 Use and storage of the O-rings (12)

Note the following concerning the use and storage of the O-rings (12):

- Storage possible for up to 5 years
- Protect against direct sunlight, artificial light with a high UV-content and extreme temperatures

- Avoid contact with aggressive media
- Protect the O-rings (12) from becoming deformed during storage
- Do **not** mount the O-rings (12) for storage onto the coupling part (1/2)

A.6.2 O-rings

Material	Hardness	Comment	Marking	Ambient temperature	Approved for explosion group
72NBR871	72 Shore A	Standard	black	-30 °C … +80 °C	IIA, IIB, IIC
Viton (85 FKM)	85 Shore A	Special higher temperatures	black	-20 °C to +150 °C	not approved
85NBR891	85 Shore A	Special for lower temperatures	black	-45 °C to +80 °C	IIA, IIB, IIC

Table A-6: O-rings

Declaration of conformity

B

EU Declaration of Conformity

Product:

FLENDER ZAPEX® couplings
ZNN, ZNNA, ZNNV, ZNZS, ZNZA, ZNZV types

Name and address of the manufacturer:

Flender GmbH
Schlavenhorst 100
46395 Bocholt
Germany

This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

This declaration refers to the product mentioned above.

The object of the declaration described above is in conformity with the relevant EU harmonisation legislation:
– Directive 2014/34/EU, Official Journal L 96, 29 March 2014, Pages 309-356

Harmonised standards or other technical specifications on which the Declaration of Conformity is based:

EN 1127-1	: 2019
EN 1127-2	: 2014
EN ISO 80079-36	: 2016
EN ISO 80079-37	: 2016
EN ISO/IEC 80079-38	: 2016

Notified Body, DEKRA Testing and Certification GmbH (0158) has received the technical documentation.

Signed for and on behalf of:

Flender GmbH

Bocholt, 2022-09-01

Dr Dennis Geers, President, Business Line Couplings

FLENDER COUPLINGS

ZAPEX
Assembly and operating instructions M3560-01en
Edition 09/2022

Flender GmbH
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Germany

FLENDER