

FLENDER COUPLINGS

SIPEX

Operating Instructions 3800en
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SNN, SGG, SGG-A, SHH, SKK, SII, SGS, SHH-W

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.

 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.

 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Flender products

Note the following:

 WARNING
Flender products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Flender. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Flender GmbH. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 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.

1.2 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.

Note

A note is an important item of information about the product, the handling of the product or the relevant section of the instructions. The note provides you with help or further suggestions/ ideas.

1.3 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 39)).

Safety instructions

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 components and accessories that increase performance and safety while maintaining the essential features.

Symbols

ISO	ANSI	Warning
		Warning - hazardous electrical voltage
	---	Warning - entanglement hazard
	---	Warning - hot surfaces
	---	Warning - substances that are harmful to health or are irritants
	---	Warning - corrosive substances

2.2 Intended use

ISO	ANSI	Warning
	---	Warning - suspended load
	---	Warning - hand injuries

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.

Protective clothing

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

Using the coupling

The relevant work 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 lifting gear or load suspension 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.

Secure the drive unit against being switched on accidentally. Attach a notice to the 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 owner of the machine or plant 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 spare parts from Flender. Flender only accepts liability for original spare parts from Flender.
Other spare parts are not tested and approved by Flender. Non-approved spare 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 spare parts. The same applies to any accessories that were not supplied by Flender.

If you have any queries, please contact our customer service (see Service and support (Page 39)).

2.3 General warning notices



WARNING

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.

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



WARNING

Danger from hot coupling parts

Risk of injury due to hot surfaces.

- Wear suitable protective equipment (gloves, safety goggles).



WARNING

Risk of chemical burns due to chemical substances

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

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



CAUTION

Physical injury

Risk of injury due to falling coupling parts.

- Secure the coupling parts to prevent them from falling.

Description

The SIPEX couplings described here are torsionally flexible metal bellows couplings that are free of torsional backlash and are available in various types and sizes. They are characterised by a very compact design and high torsional stiffness.

These instructions describe the assembly and operation of a SIPEX coupling arranged horizontally with a shaft-hub connection made by a cylindrical or conical bore with a parallel key or by various clamping connections. Please consult Flender if you want to use a different type of installation.

Application

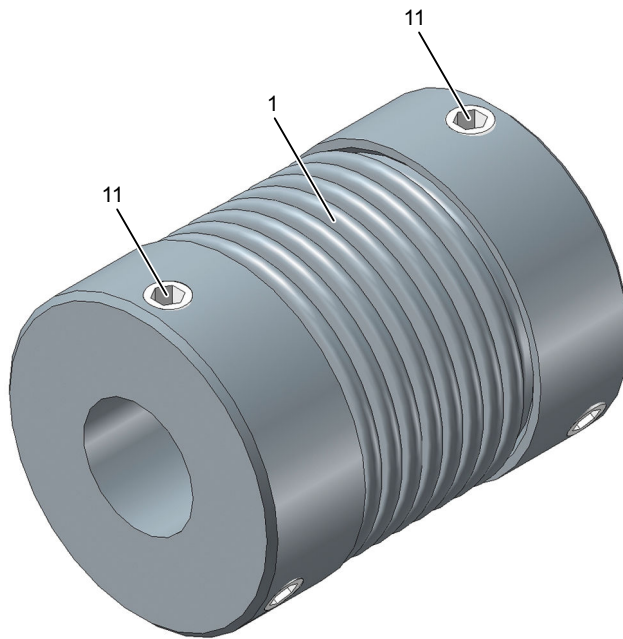
SIPEX couplings are designed for use in all kinds of machines. They are primarily used in drive units with torque transmission without any backlash and only low misalignment.

Design

A SIPEX coupling consists of two hub parts that are connected to one another by a metal bellows. The connection between the hubs and the metal bellows cannot be separated.

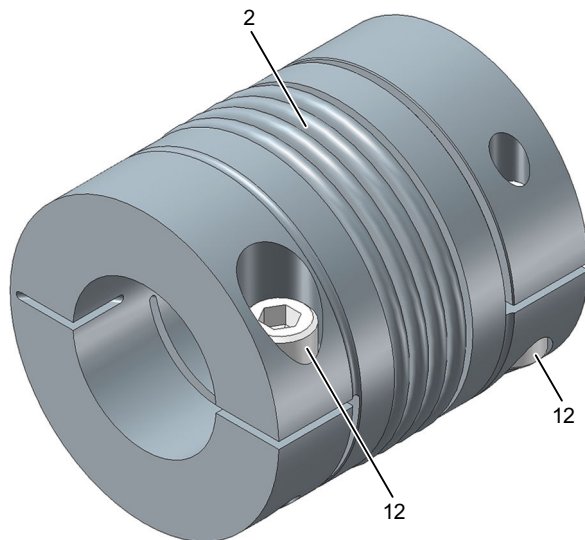
The hub parts are joined to the shaft by finished bores with a parallel key, set screws or various clamping connections.

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



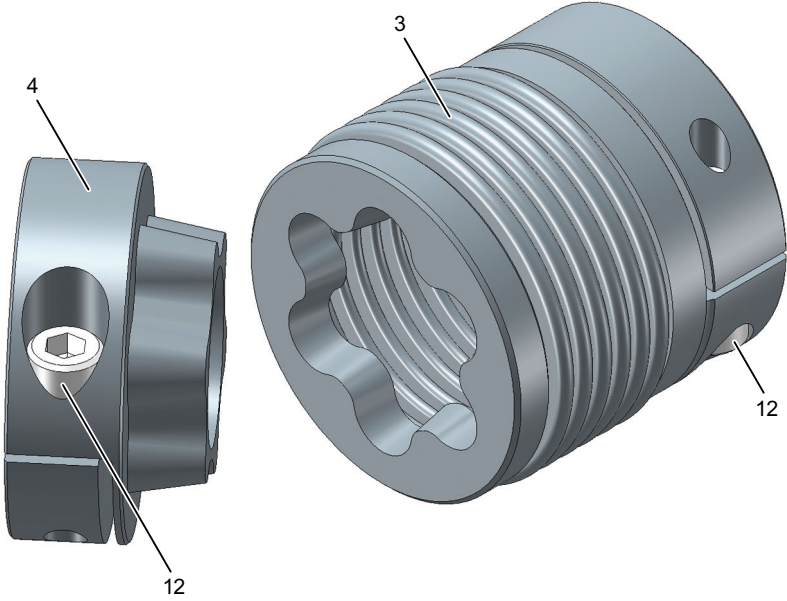
- 1 Metal bellows with 2 coupling parts N
- 11 Set screw

Figure 3-1 Type SNN



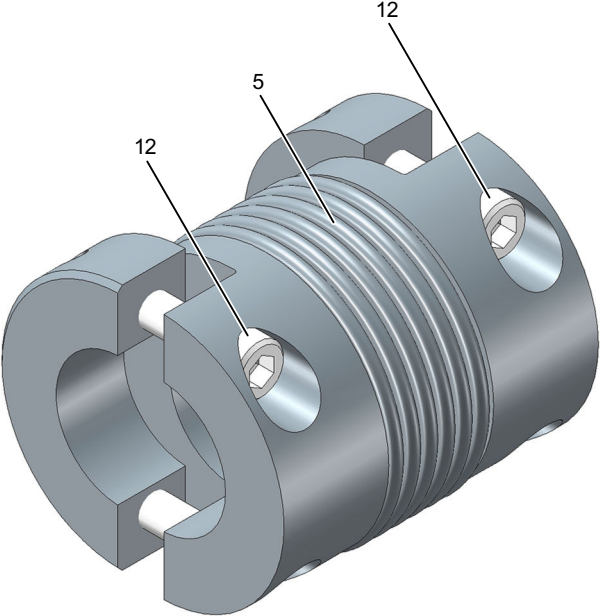
- 2 Metal bellows with 2 coupling parts G
- 12 Cylinder-head screw

Figure 3-2 Type SGG



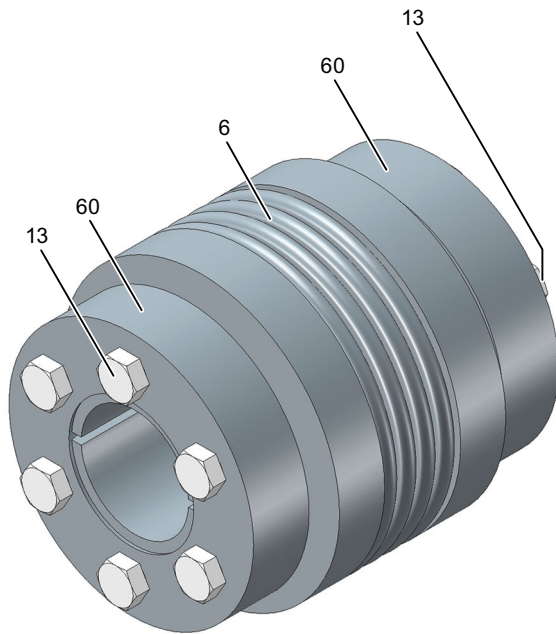
- 3 Metal bellows with a coupling part G and a plug connection
- 4 Coupling part G-A
- 12 Cylinder-head screw

Figure 3-3 Type SGG-A



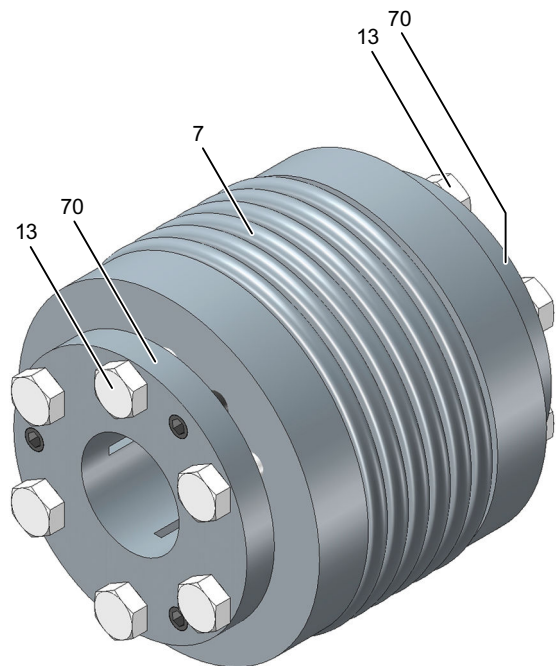
- 5 Metal bellows with 2 coupling parts H
- 12 Cylinder-head screw

Figure 3-4 Type SHH



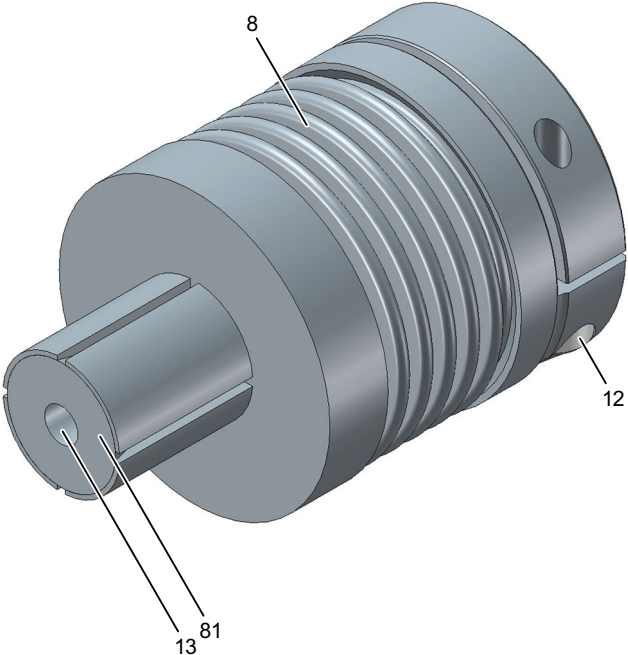
- 6 Metal bellows with 2 coupling parts K
- 13 Hexagon head screw
- 60 Clamping ring

Figure 3-5 Type SKK



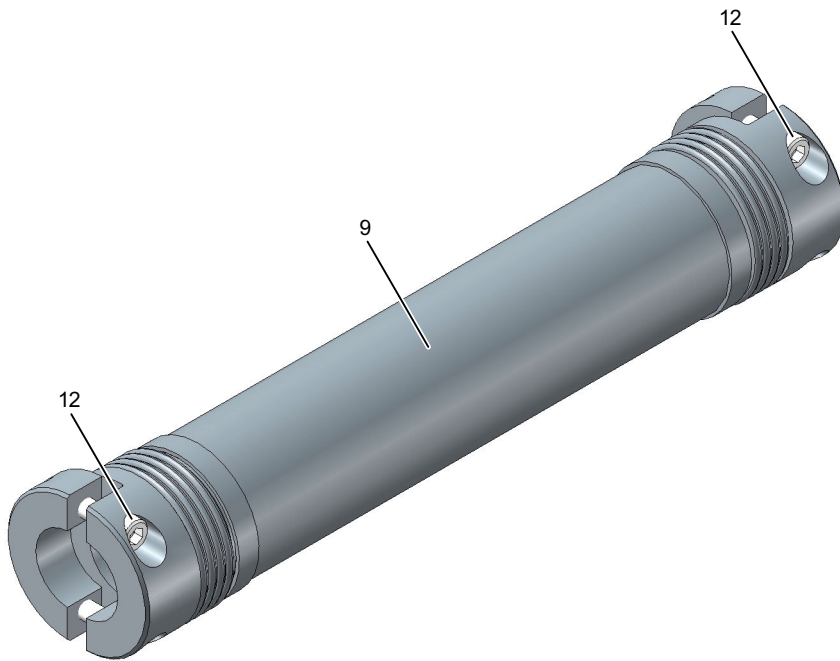
- 7 Metal bellows with inner cone
- 13 Hexagon head screw
- 70 Coupling part I

Figure 3-6 Type SII



- 8 Metal bellows with coupling part G and coupling part S
- 12 Cylinder-head screw
- 13 Cylinder-head screw
- 81 Clamping taper

Figure 3-7 Type SGS



- 9 Spacer W with metal bellows with 2 coupling parts H
- 12 Cylinder-head screw

Figure 3-8 Type SHH-W

Application planning

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

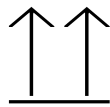
The coupling is delivered in individual parts and preassembled groups. Preassembled groups may not be dismantled.

4.1 Transport of the coupling



<p>! WARNING</p> <p>Severe personal injury due to improper transport</p> <p>Severe personal injury due to falling components or due to crushing. Damage to coupling parts possible due to use of unsuitable transport means.</p> <ul style="list-style-type: none"> • Only use lifting gear and load suspension devices with sufficient load bearing capacity for transport. • Please observe the symbols applied on the packaging.

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



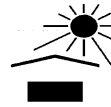
This way up



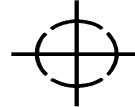
Fragile



Keep dry



Keep dry



Centre of gravity



Do not use hand hook



Attach here

Figure 4-1 Transport symbols

4.2 Storage of the coupling

<p>NOTICE</p> <p>Property damage due to improper storage</p> <p>Negative changes to the physical properties of the coupling and/or coupling damage.</p> <ul style="list-style-type: none"> • Please observe the information about storing the coupling.
--

4.2 Storage of the coupling

The coupling, unless not specifically ordered otherwise, is supplied with preservation and can be stored for up to 3 months.

Note

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.
<ul style="list-style-type: none"> • Note the handling instructions 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.


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

Preservative agents	Features	Indoor storage	Outdoor storage
Oil spray	Anti-corrosion agent	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

Assembly

Assembly of the coupling comprises the following steps:

- Preparatory work (Page 23)
- Assembling the coupling (Page 23)
- Aligning the coupling (Page 27)

 WARNING
<p>Danger of injury due to bursting of the coupling</p> <p>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.</p> <ul style="list-style-type: none"> • Please observe all the stipulations concerning assembly.

Note

Information about the assembly of the coupling

- Only use undamaged components for the assembly of 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

No preparatory work is required, since the coupling is supplied finish bored, grooved and balanced.

Balancing is performed to customer specifications or according to the half-parallel key agreement (DIN ISO 21940-32) to balancing quality G16 (DIN ISO 21940).

5.2 Assembling the coupling

NOTICE
<p>Property damage</p> <p>Damage to the shaft end, the coupling parts and/or the parallel key.</p> <ul style="list-style-type: none"> • Note the handling instructions regarding assembly of the coupling parts.

NOTICE

Property damage

Damage to the metal bellows due to impermissible deformation

- During assembly, deform the metal bellows to a maximum of 1.5 times the permissible misalignments (see Shaft misalignment values during operation (Page 63)).

The assembly procedure depends on which type you wish to assemble.

- Installing type SNN (Page 24)
- Installing type SGG (Page 24)
- Installing type SGG-A (Page 25)
- Installing type SHH (Page 25)
- Installing type SKK (Page 26)
- Installing type SII (Page 26)
- Installing type SGS (Page 27)
- Installing type SHH-W (Page 27)

5.2.1 Installing type SNN

Procedure

1. Unscrew the set screw until it is no longer possible for there to be a collision with the parallel key (if there is one) or the shaft.
2. Clean the bores and shaft ends.
3. Put the coupling SNN (1) on the shaft and hold or support the coupling.
4. Tighten the set screws (11) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part N.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the set screws (11) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

5.2.2 Installing type SGG

Procedure

1. Undo the cylinder-head screws (12).
2. Clean the bores and shaft ends.

3. Put the coupling SGG (2) on the shaft and hold or support the coupling.
4. Tighten the cylinder-head screw (12) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part G.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the cylinder-head screw (12) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

5.2.3 Installing type SGG-A

For backlash-free torque transmission, determine the dimension LG before assembly. Do this by putting the coupling together free of backlash. Measure the dimension LG without applying an additional axial force.

Procedure

1. Undo the cylinder-head screws (12).
2. Clean the bores and shaft ends.
3. Put the metal bellows with the coupling part G (3) on the shaft and hold or support the coupling.
4. Tighten the cylinder-head screw (12) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Put the coupling part G-A (4) on the shaft.
6. Push the coupling part G-A (4) into the metal bellows (3) until the previously determined dimension LG reduced by the preloading s (see Type SGG-A (Page 56)) is reached.
7. Align the coupling in accordance with Aligning the coupling (Page 27).
8. Tighten the cylinder-head screw (12) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

Note

Backlash-free torque transmission can only be achieved if the preloading s is taken into consideration during assembly.

5.2.4 Installing type SHH

Procedure

1. Undo the cylinder-head screws (12).
2. Clean the bores and shaft ends.

5.2 Assembling the coupling

3. Put the coupling SHH (5) on the shaft and hold or support the coupling.
4. Tighten the cylinder-head screws (12) alternately with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part H.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the cylinder-head screws (12) alternately with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

5.2.5 Installing type SKK

Procedure

1. Undo the hexagon head screws (13) and pull the clamping ring (60) slightly away from the hub part.
2. Clean the bores and shaft ends.
3. Put the coupling SKK (6) on the shaft and hold or support the coupling.
4. Tighten the hexagon head screws (13) in crisscross rotation in several stages up to the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part K.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the hexagon head screws (13) in crisscross rotation in several stages up to the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

5.2.6 Installing type SII

Procedure

1. Undo the hexagon head screws (13) and pull the coupling hubs (70) slightly away from the bellows with the inner cone (7).
2. Clean the bores and shaft ends.
3. Put the coupling SII (6) on the shaft and hold or support the coupling.
4. Tighten the cylinder-head screws (12) in crisscross rotation in several stages with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part I.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the hexagon head screws (13) in crisscross rotation in several stages up to the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

5.2.7 Installing type SGS

Procedure

1. Undo the cylinder-head screw (13) and the clamping taper (81).
2. Clean the bores and shaft ends.
3. Push the coupling SGS (8) with the clamping taper (81) and the cylinder-head screw (13) into the hollow shaft and hold or support the coupling.
4. Tighten the cylinder-head screw (13) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part G.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the cylinder-head screw (12) with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

5.2.8 Installing type SHH-W

Procedure

1. Undo the cylinder-head screws (12).
2. Clean the bores and shaft ends.
3. Put the coupling SHH-W (9) on the shaft and hold or support the coupling.
4. Tighten the cylinder-head screws (12) alternately with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).
5. Push the shaft into the coupling part H.
6. Align the coupling in accordance with Aligning the coupling (Page 27).
7. Tighten the cylinder-head screws (12) alternately with the specified tightening torque T_A (see Tightening torques and widths A/F (Page 65)).

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.

Misalignment in the coupling leads to restoring forces that can stress adjacent machine parts (e.g. the bearings) to an unacceptable extent.

5.3 Aligning the coupling

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

You can find the maximum permitted shaft misalignment values during operation in Shaft misalignment values during operation (Page 63).

5.3.2 Possible misalignment

The following types of misalignment can occur:

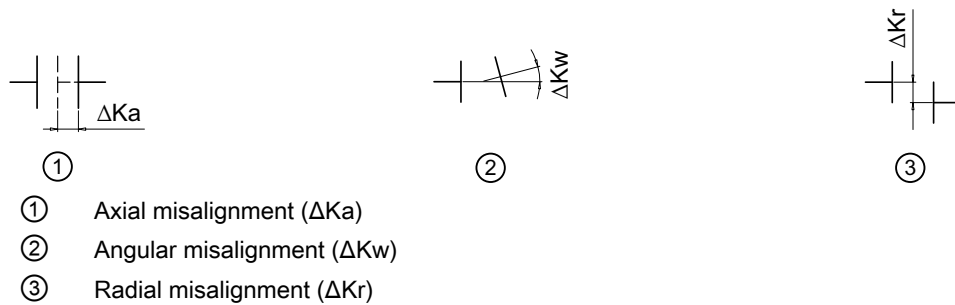



Figure 5-1 Possible misalignment

NOTICE
Property damage
The specified permissible values for axial, angular and/or radial misalignment may not appear simultaneously.
<ul style="list-style-type: none">• Halve the values for Table A-13 Maximum permissible shaft misalignment values during operation for the miniature series (Page 63) or Table A-14 Maximum permissible shaft misalignment values during operation for the standard series (Page 64) for axial, angular and/or radial misalignment if they appear simultaneously.

Commissioning

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

Testing before commissioning

 WARNING
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. <ul style="list-style-type: none">• 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 65).
2. Check the tightening torques of the foundation bolts of the coupled machines.
3. Check whether suitable enclosures (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

7.1 Normal operation of the coupling

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


7.2 Faults - causes and rectification

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

7.2.1 Procedure in the event of malfunctions

 WARNING
<p>Danger due to bursting of the coupling</p> <p>There is a risk of fatal injury from flying fragments.</p> <ul style="list-style-type: none"> • Switch off the unit at once if any malfunctions occur. • Note during the maintenance work the possible causes of faults and the notes on rectifying them.

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

1. De-energise the drive 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.



	<p>WARNING</p> <p>Physical injury</p> <p>Injury from rotating parts.</p> <ul style="list-style-type: none"> • Only carry out work on the coupling when it is not moving. • Secure the drive unit against being operated accidentally. • Attach a notice to the 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 12).

7.2.2.1 Possible faults

Table 7-1 Table of faults

Fault	Cause	Rectification
Sudden changes in the noise level and/or sudden occurrences of shocks	Changed alignment	Follow the instructions given in section Correcting the changed alignment (Page 34).
	Coupling not suitable for the operating conditions. Check the possible causes given in section Unsuitable coupling (Page 33).	Use a coupling that is suitable for the operating conditions.
	Incorrect assembly of the coupling. Check the possible causes given in sections Assembly-related causes (Page 33) and Specific installation-related and maintenance-related causes (Page 34).	Reassemble the coupling in accordance with these instructions. Please observe all the stipulations and requirements given in chapter Assembly (Page 23).
	Incorrect maintenance of the coupling. Check the possible causes given in sections Maintenance-related causes (Page 34) and Specific installation-related and maintenance-related causes (Page 34).	Please observe all the stipulations and requirements given in chapter Maintenance (Page 35).

Fault	Cause	Rectification
Presence of vibration	Coupling not suitable for the operating conditions. Check the possible causes given in section Unsuitable coupling (Page 33).	Use a coupling that is suitable for the operating conditions.
	Incorrect assembly of the coupling. Check the possible causes given in sections Assembly-related causes (Page 33) and Specific installation-related and maintenance-related causes (Page 34).	Reassemble the coupling in accordance with these instructions. Please observe all the stipulations and requirements given in chapter Assembly (Page 23).
	Incorrect maintenance of the coupling. Check the possible causes given in sections Maintenance-related causes (Page 34) and Specific installation-related and maintenance-related causes (Page 34).	Please observe all the stipulations and requirements given in chapter Maintenance (Page 35).

7.2.2.2 Possible causes

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.

Assembly-related causes

- Damaged parts 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.

Maintenance-related causes

- Stipulated maintenance intervals not adhered to.
- Spare parts that were used were not original spare parts from Flender.
- Flender spare 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.

Specific installation-related and maintenance-related causes

- Metal bellows excessively deformed during assembly.

7.2.3 Correcting faults

7.2.3.1 Correcting the changed alignment


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


Procedure


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

Maintenance

8.1 Maintenance intervals

 WARNING
Danger of injury 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.
<ul style="list-style-type: none"> • Please observe all the stipulations concerning maintenance of the coupling in this section.

 WARNING
Danger of injury due to bursting of the coupling
The coupling can burst if the maximum permitted torsional backlash is exceeded. There is a risk of fatal injury from flying fragments.
<ul style="list-style-type: none"> • Note also the actual wear of the elastomer components.

 WARNING
Physical injury
Injury from rotating parts.
<ul style="list-style-type: none"> • Only carry out work on the coupling when it is not moving. • Secure the drive unit against being operated accidentally. • Attach a notice to the 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.

Make a visual inspection. If any damage or cracks are found, then replace the coupling.

Table 8-1 Maintenance intervals

Type	Initial maintenance	Follow-up maintenance
All types	3 months after commissioning	Every 12 months

8.2 Removing type SNN, SGG, SGG-A, SHH and SHH-W

Procedure

1. Secure the coupling to prevent it from falling.
2. Undo the axial locking elements (set screw (11) or cylinder-head screw (12)).

8.3 Removing type SKK

3. Move the coupled machines apart.
4. Remove the coupling.

When reinstalling the coupling please observe the information in chapters Assembly (Page 23) and Commissioning (Page 29).

8.3 Removing type SKK

Procedure

1. Secure the coupling to prevent it from falling.
2. Undo the hexagon head screws (13) and pull the clamping ring (60) slightly away from the hub part.
3. Move the coupled machines apart.
4. Remove the coupling.

When reinstalling the coupling please observe the information in chapters Assembly (Page 23) and Commissioning (Page 29).

8.4 Removing type SII

Procedure

1. Secure the coupling to prevent it from falling.
2. Undo the hexagon head screws (13) and pull the coupling part I slightly away from the metal bellows.
3. Move the coupled machines apart.
4. Remove the coupling.

When reinstalling the coupling please observe the information in chapters Assembly (Page 23) and Commissioning (Page 29).

8.5 Removing type SGS

Procedure

1. Secure the coupling to prevent it from falling.
2. Undo the cylinder-head screw (12).
3. Move the coupled machines apart and at the same time also pull the drive shaft out of the coupling part G.

4. Undo the cylinder-head screw (13).

5. Remove the coupling.

When reinstalling the coupling please observe the information in chapters Assembly (Page 23) and Commissioning (Page 29).

Service and support

9.1 Contact

Contact

When ordering spare parts, requesting a customer service technician or in the case of technical queries, please 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

Disposal

Disposal of the coupling

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

Spare parts

11.1 Ordering spare parts

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

Note

Original spare parts

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

Other spare parts are not tested and approved by Flender. Non-approved spare 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 spare parts. The same applies to any accessories that were not supplied by Flender.

You can find the available spare parts for the coupling described here at Spare parts drawing and spare parts list (Page 44).

You will find our contact data for ordering spare parts in Service and support (Page 39).

Information required when ordering spare 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 44))
- Dimensions of the spare part, for example:
 - Bore
 - Bore tolerance
 - Parallel keyway and balancing
- Special dimensions, for example, flange connection dimensions, intermediate sleeve length or brake drum dimensions

11.2 Spare parts drawing and spare parts list

- Any special properties of the spare 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

SIPEX couplings can only be replaced as a complete unit, since the metal bellows cannot be removed from the coupling parts.

11.2.1 Type SNN

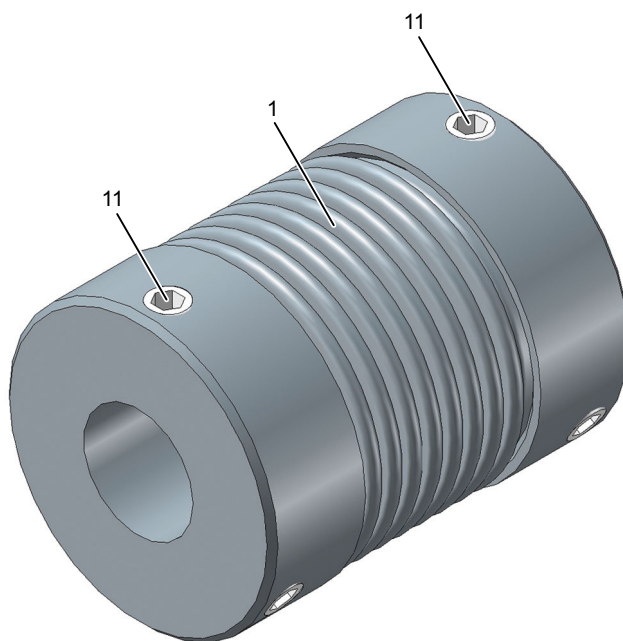


Figure 11-1 Spare parts drawing for type SNN

Table 11-1 Spare parts list for type SNN

Part number	Designation
1	Metal bellows with 2 coupling parts N
11	Set screw

11.2.2 Type SGG

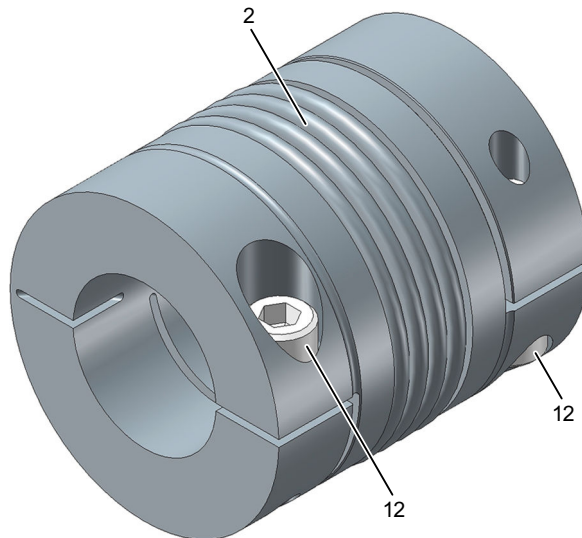


Figure 11-2 Spare parts drawing for type SGG

Table 11-2 Spare parts list for type SGG

Part number	Designation
2	Metal bellows with 2 coupling parts G
12	Cylinder-head screw

11.2.3 Type SGG-A

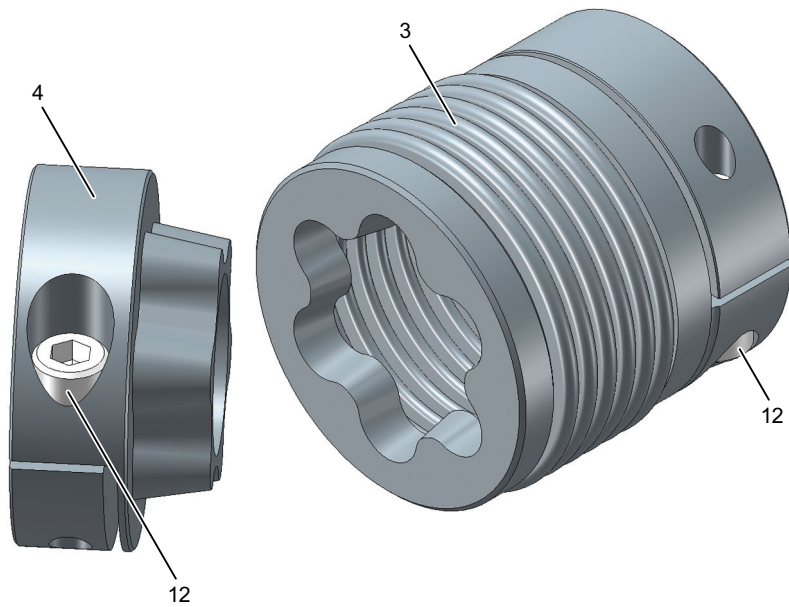


Figure 11-3 Spare parts drawing for type SGG-A

Table 11-3 Spare parts list for type SGG-A

Part number	Designation
3	Metal bellows with a coupling part G and a plug connection
4	Coupling part G-A
12	Cylinder-head screw

11.2.4 Type SHH

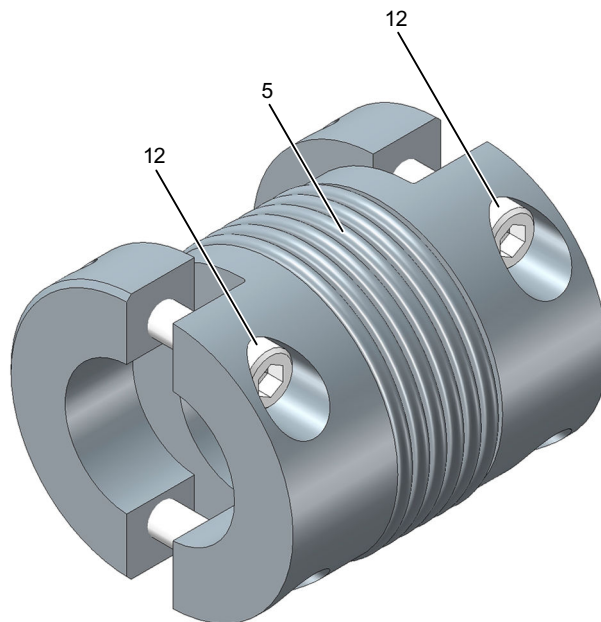


Figure 11-4 Spare parts drawing for type SHH

Table 11-4 Spare parts list for type SHH

Part number	Designation
5	Metal bellows with 2 coupling parts H
12	Cylinder-head screw

11.2.5 Type SKK

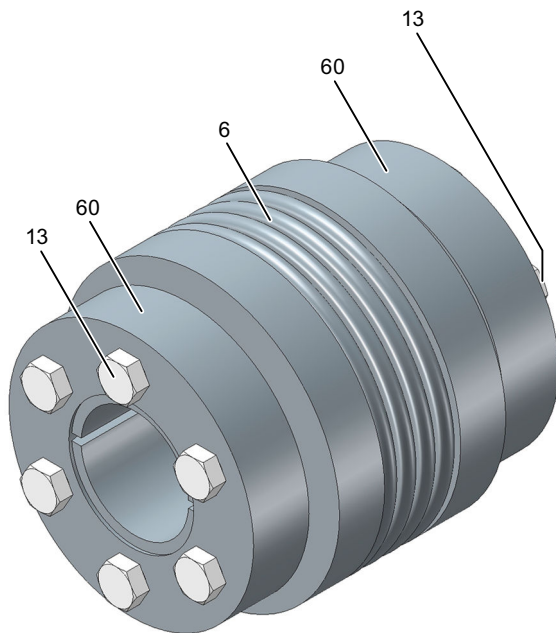


Figure 11-5 Spare parts drawing for type SKK

Table 11-5 Spare parts list for type SKK

Part number	Designation
6	Metal bellows with 2 coupling parts K
13	Hexagon head screw
60	Clamping ring

11.2.6 Type SII

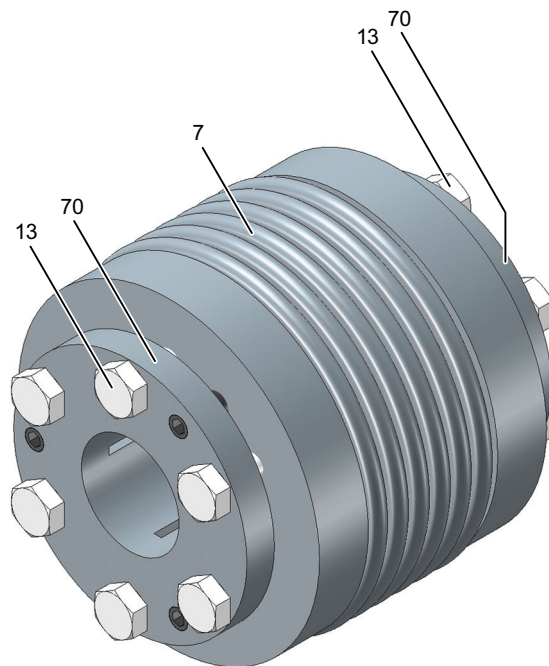


Figure 11-6 Spare parts drawing for type SII

Table 11-6 Spare parts list for type SII

Part number	Designation
7	Metal bellows with inner cone
13	Hexagon head screw
70	Coupling part I

11.2.7 Type SGS

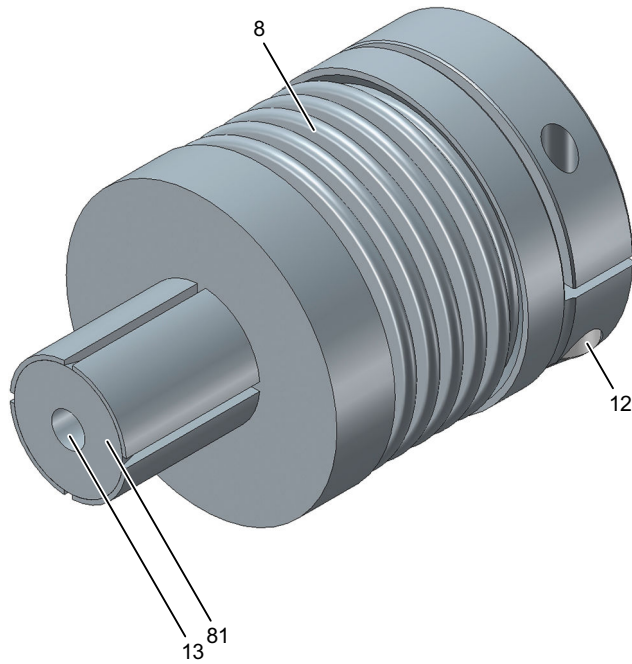


Figure 11-7 Spare parts drawing for type SGS

Table 11-7 Spare parts list for type SGS

Part number	Designation
8	Metal bellows with coupling part G and coupling part S
12	Cylinder-head screw
13	Cylinder-head screw
81	Clamping taper

11.2.8 Type SHH-W

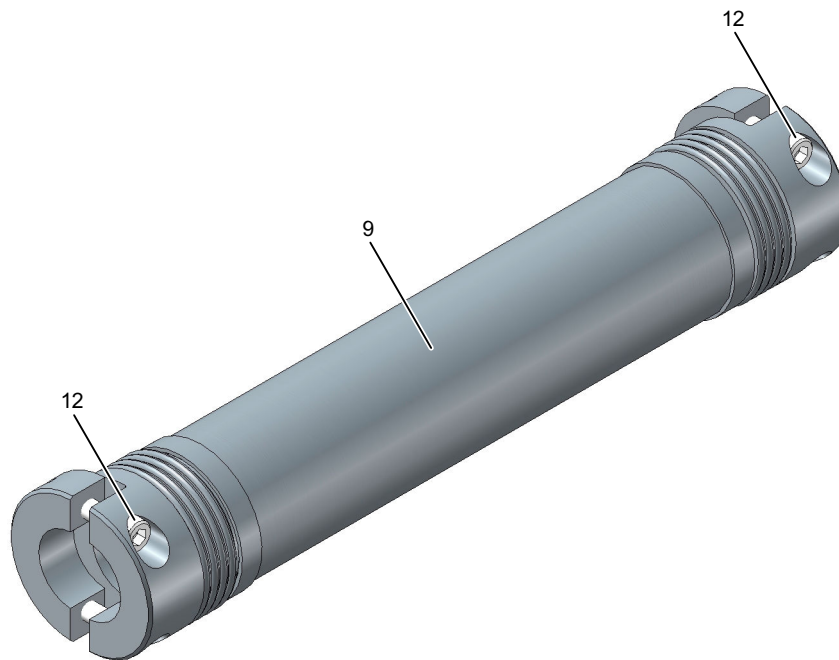


Figure 11-8 Spare parts drawing for type SHH-W

Table 11-8 Spare parts list for type SHH-W

Part number	Designation
9	Spacer W with metal bellows with 2 coupling parts H
12	Cylinder-head screw

Spare parts

11.2 Spare parts drawing and spare parts list

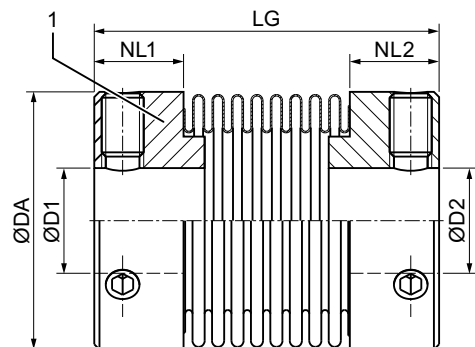
Technical data

A.1 Geometry data and weights

In this section you can find dimensional drawings and technical data for SIPEX couplings of the following types:

- Type SNN (Page 53)
- Type SGG (Page 54)
- Type SGG-A (Page 56)
- Type SHH (Page 57)
- Type SKK (Page 59)
- Type SII (Page 60)
- Type SGS (Page 61)
- Type SHH-W (Page 62)

A.1.1 Type SNN



1 Metal bellows with 2 coupling parts N

Figure A-1 Type SNN

Table A-1 Geometry data and weights of miniature series

Size	DA mm	D1 / D2 max. ¹⁾ mm	NL1 / NL2 mm	LG ±1 mm mm	Weight ²⁾ m kg
1	10	5	4.2	22	3
5	15	8	6	19	5.6
				23	6
				27	6.5

Technical data

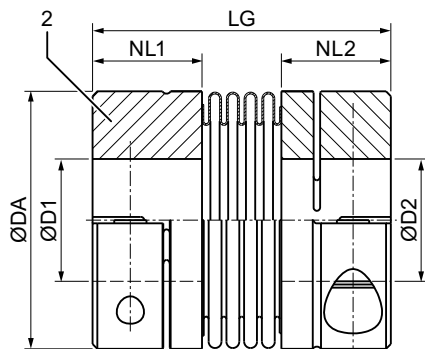
A.1 Geometry data and weights

Size	DA	D1 / D2 max. ¹⁾	NL1 / NL2	LG	Weight ²⁾
	mm			mm	
10	15	8	6	21	7
				25	7.5
				29	8
15	20.5	12	8	26	13
				30	13.9
20	24.5	14	8.5	27	20.3
				33	23.8
				37	26.5
45	32	18	12.3	40	51
				48	68
100	40	24	12.5	45	74
				55	109

¹⁾ Maximum bore for parallel keyway in accordance with DIN 6885/1.

²⁾ Weight applies to one coupling with maximum bore.

A.1.2 Type SGG



2 Metal bellows with 2 coupling parts G

Figure A-2 Type SGG

Table A-2 Geometry data and weights of miniature series

Size	DA	D1 / D2 max.	NL1 / NL2	LG	Weight ¹⁾
	mm			mm	
5	15.5	7	6.8	21	6.6
				25	7
				28	7.5

A.1 Geometry data and weights

Size	DA mm	D1 / D2 max. mm	NL1 / NL2 mm	LG	
				±1 mm mm	Weight ¹⁾ m g
10	15.5	7	6.8	23	7.9
				27	8.5
				31	9
15	20	10	8.5	27	12.5
				31	13.3
20	25	12.5	11	32	25
				38	28
				42	31
45	32.5	16	13	42	49
				50	66
100	40	22	14	48	74
				57	110

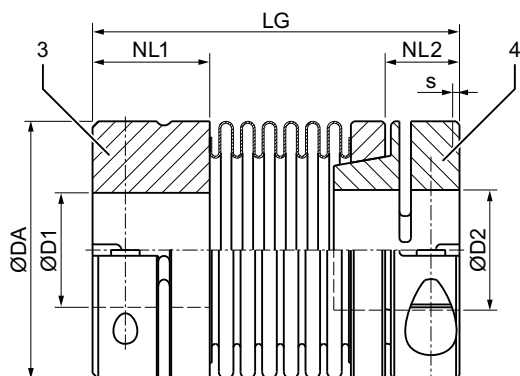
¹⁾ Weight applies to one coupling with maximum bore

Table A-3 Geometry data and weights of standard series

Size	DA mm	D1 / D2 max. mm	NL1 / NL2 mm	LG	
				±2 mm mm	Weight ¹⁾ m kg
18	45	25	20.5	63	0.14
				72	0.15
30	54	30	24.5	65	0.23
				74	0.25
60	65	35	29	79	0.44
				89	0.45
80	79	42	34	92	0.74
				103	0.79
150	79	42	34	92	0.74
				103	0.79
200	90	43	38	101	1.1
				113	1.17
300	109	50	38	103	1.7
				116	1.75
500	119	60	41.5	111	1.99
				123	2.05

¹⁾ Weight applies to one coupling with maximum bore

A.1.3 Type SGG-A



- 3 Metal bellows with a coupling part G and a plug connection
- 4 Coupling part G-A

Figure A-3 Type SGG-A

Table A-4 Geometry data and weights of miniature series

Size	DA mm	D1 max. mm	D2 max. mm	NL1 mm	NL2 mm	Preloading s mm	LG ±1 mm mm	Weight ¹⁾ m g
45	32.5	16	14	13	13	0.7	48	58
							56	68
100	40	22	18	14	13	1	54	90
							64	120

¹⁾ Weight applies to one coupling with maximum bore

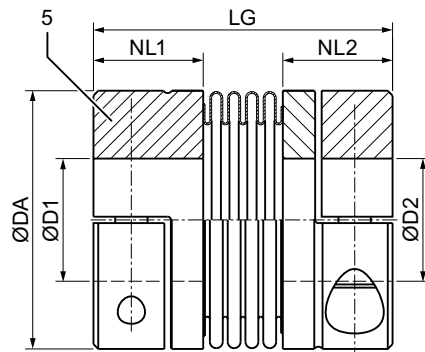
Table A-5 Geometry data and weights of standard series

Size	DA mm	D1 max. mm	D2 max. mm	NL1 mm	NL2 mm	Preloading s mm	LG ±2 mm mm	Weight ¹⁾ m kg
18	45	25	21	20.5	13	0.5 to 1.0	62	0.12
							69	0.15
30	54	30	23	24.5	19.5	0.5 to 1.0	70	0.27
							78	0.28
60	65	35	30	29	25.5	0.5 to 1.5	84	0.50
							94	0.52
80	79	42	38	34	26	0.5 to 1.5	95	0.79
							105	0.83
150	79	42	38	34	24	0.5 to 1.5	95	0.79
							105	0.96

Size	DA mm	D1 max. mm	D2 max. mm	NL1 mm	NL2 mm	Preloading s mm	LG ±2 mm mm	Weight ¹⁾ m kg
200	90	45	40	38	31.5	0.5 to 1.5	105	1.16
							117	1.25
300	109	50	45	38	32	0.5 to 1.5	110	1.8
							121	1.85
500	119	60	60	41.5	39	0.5 to 2.0	126	2.25
							137	2.3

¹⁾ Weight applies to one coupling with maximum bore

A.1.4 Type SHH



5 Metal bellows with 2 coupling parts H

Figure A-4 Type SHH

Table A-6 Geometry data and weights of miniature series

Size	DA mm	D1 / D2 max. mm	NL1 / NL2 mm	LG ±1 mm mm	Weight ¹⁾ m g
5	15.5	7	6.8	21	4
				25	7.3
				28	7.7
10	15.5	7	6.8	23	8.2
				27	8.8
				31	9.3
15	20	10	8.5	27	13.7
				31	13.8
20	25	12.5	11	32	25
				38	29
				42	32

Technical data

A.1 Geometry data and weights

Size	DA	D1 / D2	NL1 / NL2	LG	Weight ¹⁾
	mm	max. mm	mm	±1 mm mm	m g
45	32.5	16	13	42	50
				50	68
100	40	22	14	48	75
				57	111

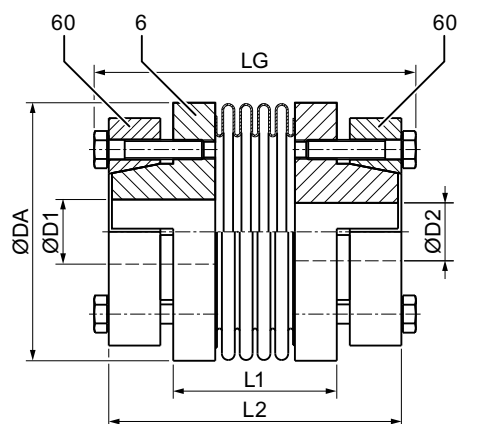
¹⁾ Weight applies to one coupling with maximum bore

Table A-7 Geometry data and weights of standard series

Size	DA	D1 / D2	NL1 / NL2	LG	Weight ¹⁾
	mm	max. mm	mm	±2 mm mm	m kg
18	45	25	20.5	63	0.15
				72	0.16
30	54	30	24.5	65	0.23
				74	0.25
60	65	35	29	79	0.46
				89	0.49
80	79	42	34	91	0.81
				102	0.85
150	79	42	34	91	0.81
				102	0.85
200	90	45	38	101	1.14
				113	1.21
300	109	50	38	103	1.69
				116	1.73
500	119	60	41.5	111	2.05
				123	2.11

¹⁾ Weight applies to one coupling with maximum bore

A.1.5 Type SKK



- 6 Metal bellows with 2 coupling parts K
- 60 Clamping ring

Figure A-5 Type SKK

Table A-8 Geometry data and weights of miniature series

Size	DA mm	D1 / D2 max. mm	L1 mm	L2 mm	LG ±1 mm mm	Weight ¹⁾ m g
45	32	10	25	37	42	49
					50	65
100	40	14	33	45	48	77
					57	113

¹⁾ Weight applies to one coupling with maximum bore

Table A-9 Geometry data and weights of standard series

Size	DA mm	D1 / D2 max. mm	L1 mm	L2 mm	LG ±2 mm mm	Weight ¹⁾ m kg
18	47	15	37	57	65	0.30
			45	65	73	0.31
30	56	20	30	52	60	0.43
			38	60	68	0.44
60	64	32	34	70	79	0.89
			44	80	89	0.90
80	82	35	48	88	97	1.63
			60	100	109	1.66
150	82	35	48	88	97	1.63
			60	100	109	1.66

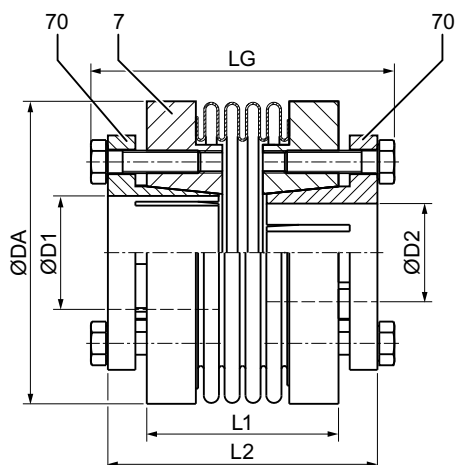
Technical data

A.1 Geometry data and weights

Size	DA	D1 / D2 max.	L1	L2	LG ±2 mm	Weight ¹⁾ m kg
	mm	mm	mm	mm	mm	
200	90	42	50	89	98	1.80
			62	101	110	1.85
300	110	50	55	99	110	3.05
			65	109	120	3.09
500	122	55	60	113	125	4.39
			70	123	135	4.45
800	157	70	92	166	182	10.9
1400	157	70	92	166	182	10.9
3000	157	75	92	166	182	10.9
5000	210	90	140	219	240	30.4

¹⁾ Weight applies to one coupling with maximum bore

A.1.6 Type SII



- 7 Metal bellows with inner cone
- 70 Coupling part I

Figure A-6 Type SII

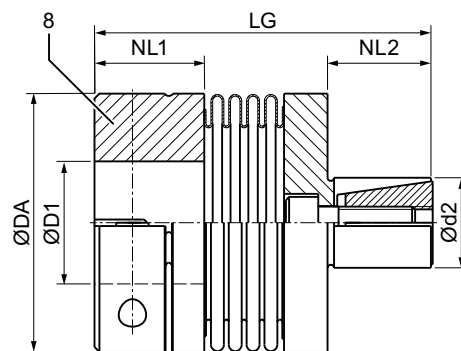
Table A-10 Geometry data and weights of standard series

Size	DA	D1 / D2 max.	L1	L2	LG ±2 mm	Weight ¹⁾ m kg
	mm	mm	mm	mm	mm	
18	47	17	42	57	62	0.20
			50	64	70	0.21

Size	DA mm	D1 / D2 max. mm	L1 mm	L2 mm	LG ±2 mm mm	Weight ¹⁾ m kg
30	56	20	34	47	53	0.24
			42	55	61	0.27
60	64	25	34	53	62	0.46
			45	64	73	0.48
80	82	35	50	70	79	0.82
			60	81	90	0.87
150	82	35	50	70	79	0.82
			60	81	90	0.87
200	90	40	50	70	79	0.92
			63	84	92	0.94
300	110	50	53	78	90	1.82
			65	91	103	1.86
500	122	55	65	91	103	2.34
			71	101	113	2.40
800	157	70	108	148	170	9.69
1400	157	70	108	148	170	9.69
3000	150	75	108	148	170	10.2
5000	210	90	140	180	202	20.9

¹⁾ Weight applies to one coupling with maximum bore

A.1.7 Type SGS



8 Metal bellows with coupling part G and coupling part S

Figure A-7 Type SGS

Technical data

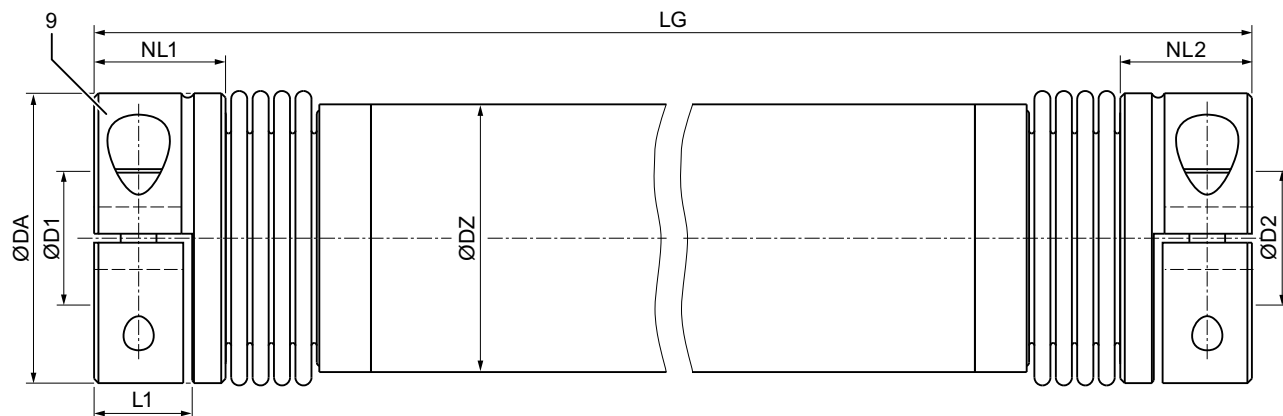
A.1 Geometry data and weights

Table A-11 Geometry data and weights of miniature series

Size	DA mm	D1 max. mm	d2 max. mm	NL1 mm	NL2 mm	LG ± 1 mm mm	Weight ¹⁾ m g
5	15.5	7	8	6.8	8	28	9.3
						32	9.7
						36	10.1
10	15.5	7	8	6.8	8	30	10.6
						34	11
						38	11.8
15	20.5	10	10	8.5	12	37	18.5
						41	19.3
20	25.5	12.5	10	11	12	41	27.8
						46	31.3
						50	34.8
45	32.5	16	14	13	16	52	57
						60	74
100	40.5	22	16	14	20	61	81
						71	117

¹⁾ Weight applies to one coupling with maximum bore

A.1.8 Type SHH-W



9 Spacer W with metal bellows with 2 coupling parts H

Figure A-8 Type SHH-W

Table A-12 Geometry data and weights of standard series

Size	DA mm	D1 / D2 max. mm	NL1 / NL2 mm	L1 mm	DZ mm	LG		Weight ¹⁾ m kg
						min. mm	max. mm	
18	45	25	20.5	13.5	40	132	3000	1.63
30	54	30	24.5	17	50	130	3000	2.29
60	65	35	29	22	60	165	3000	3.34
150	79	42	34	24	75	196	3000	5.1
200	90	42	38	28	90	218	3000	5.9
300	109	45	38	28	100	220	3000	7.1
500	119	60	41.5	31.5	110	250	3000	7.3

¹⁾ Weight applies to one coupling with maximum bore and shaft spacing 1000 mm

A.2 Shaft misalignment values during operation

Note

The specified permissible values for axial, angular and/or radial misalignment must not appear simultaneously. Halve the values given in the tables if axial, angular and/or radial misalignment appear simultaneously.

Table A-13 Maximum permissible shaft misalignment values during operation for the miniature series

Size	Permissible shaft misalignment		
	ΔK_a mm	ΔK_r mm	ΔK_w Degrees
1	0.2	0.1	1.5
5	0.2	0.1	1.5
	0.3	0.2	1.5
	0.4	0.2	2
10	0.2	0.1	1.5
	0.3	0.2	1.5
	0.4	0.2	2
15	0.3	0.1	1.5
	0.4	0.2	2
20	0.3	0.2	1.5
	0.4	0.2	1.5
	0.5	0.3	2

Technical data

A.2 Shaft misalignment values during operation

Size	Permissible shaft misalignment		
	ΔK_a mm	ΔK_r mm	ΔK_w Degrees
45	0.3	0.1	1.5
	0.5	0.2	2
100	0.4	0.2	1.5
	0.6	0.3	2

Table A-14 Maximum permissible shaft misalignment values during operation for the standard series

Size	Permissible shaft misalignment		
	ΔK_a mm	ΔK_r mm	ΔK_w Degrees
18	0.5	0.2	1.5
	0.5	0.2	2.0
30	0.5	0.2	1.5
	0.8	0.2	2.0
60	0.5	0.2	1.5
	0.8	0.2	2.0
80	0.5	0.2	1.5
	0.7	0.2	2.0
150	0.5	0.2	1.5
	0.6	0.2	2.0
200	0.5	0.2	1.5
	0.7	0.2	2.0
300	0.5	0.2	1.5
	0.7	0.2	2.0
500	0.5	0.2	1.5
	0.8	0.2	2.0
800	0.8	0.2	1.8
1400	0.8	0.2	1.8
3000	0.8	0.2	1.5
5000	0.8	0.2	1.5

A.3 Tightening torques and widths A/F

Table A-15 Tightening torques T_A and widths A/F SW for parts 11, 12 and 13 of the miniature series

Size	Type SNN		Type SGG		Type SGG-A		Type SHH		Type SKK		Type SGS			
	Part 11 ¹⁾		Part 12 ²⁾		Part 12 ²⁾		Part 12 ²⁾		Part 13 ³⁾		Part 12 ²⁾		Part 13 ²⁾	
	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm
1	0.5	1.5	-	-	-	-	-	-	-	-	-	-	-	-
5	0.5	1.5	0.3	1.5	-	-	0.5	1.5	-	-	0.43	1.5	1	2.5
10	0.5	1.5	0.3	1.5	-	-	0.5	1.5	-	-	0.43	1.5	1	2.5
15	1.5	2	0.8	2	-	-	0.9	2	-	-	0.85	2	3	3
20	1.5	2	1.5	2.5	-	-	2	2.5	-	-	2	2.5	3	3
45	3	3	3	3	3.5	3	3.5	3	1.3	5.5	3.5	3	5.9	4
100	3	3	3	3	4.5	3	4.5	3	1.3	5.5	3.5	3	10	5

¹⁾ Set screw ISO 4029

²⁾ Hexagon socket cap screw DIN EN ISO 4762

³⁾ Hexagon head screw DIN EN ISO 4017

Apply the recommended tightening torques in accordance with the stipulations in section Tightening procedure (Page 66).

Table A-16 Tightening torques T_A and widths A/F SW for parts 11 and 12 of the standard series

Size	Type SGG		Type SGG-A		Type SHH		Type SKK		Type SII		Type SHH-W	
	Part 12 ²⁾		Part 12 ²⁾		Part 12 ²⁾		Part 13 ³⁾		Part 13 ³⁾		Part 12 ²⁾	
	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm	T_A Nm	SW mm	TA Nm	SW mm	TA Nm	SW mm
18	8	4	8	4	8	4	5.9	8	4	7	8	4
30	15	5	15	5	15	5	5.9	8	4.5	7	15	5
60	40	6	40	6	40	6	8.7	10	8.5	10	40	6
80	72	8	72	8	72	8	15	10	10	10	-	-
150	84	8	84	8	84	8	15	10	15	10	84	8
200	125	10	125	10	125	10	15	10	15	10	125	10
300	145	10	145	10	145	10	25	13	17	13	145	10
500	190	12	190	12	190	12	36	13	25	13	190	12
800	-	-	-	-	-	-	85	18	45	24	-	-
1400	-	-	-	-	-	-	115	18	80	24	-	-
3000	-	-	-	-	-	-	125	18	115	24	-	-
5000	-	-	-	-	-	-	210	24	210	24	-	-

¹⁾ Set screw ISO 4029

²⁾ Hexagon socket cap screw DIN EN ISO 4762

³⁾ Hexagon head screw DIN EN ISO 4017

A.4 Tightening procedure

Apply the recommended tightening torques in accordance with the stipulations in section Tightening procedure (Page 66).

A.4 Tightening procedure

Tighten fastening screws to the specified tightening torque in accordance with the following table:

Table A-17 Tightening procedure

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 %	<ul style="list-style-type: none">• 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

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.

FLENDER COUPLINGS

SIPEX

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