Assembly and maintenance manual

Type FSO, FSO-GR, FS, HPI

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General safety instructions

	**WARNING**	**Risk of injury due to moving components!** Rotating driven components can cause the most severe injuries. Therefore, during operation: ➢ It is strictly forbidden for persons to loiter in the danger zone or in its immediate vicinity. ➢ Do not disable, render unusable or circumvent safety equipment and / or safety functions. Prior to entering the danger zone: ➢ Switch off the power supply and secure it against being switched on again. ➢ Wait for lagging components to come to a standstill.

	**DANGER!**	**Danger due to improper operation!** ➢ Modifications to the clutch coupling are not permitted and may impair safety. ➢ All tasks may only be performed by personnel with the requisite training and expertise. ➢ Repairs and maintenance tasks may only be performed when the machine is at a standstill. To this end, the machine is to be secured against a restart.

	**WARNING**	**Risk of injury due to the clutch coupling falling down or tipping over!** The weight of the clutch coupling can injure people and cause severe crushing. Therefore: ➢ Use a suitable lifting gear for lifting (slings, etc.) which is able to support the weight of the clutch coupling.

	**WARNING**	**Risk of injury due to incorrect assembly!** Faulty installation and maintenance can cause severe property damage and personal injury. Installation, maintenance and repair work may only be performed by personnel with the requisite training and expertise.

	**WARNING**	**Risk of injury for insufficiently qualified personnel!** Improper handling can cause significant personal injury and property damage. Therefore: ➢ Only ever have tasks performed by those persons to whom the tasks have been assigned.

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1 General

1.1 Information relating to the assembly and maintenance manual

This assembly and maintenance manual provides important information regarding the installation and commissioning of the clutch coupling of type FSO, FSO-GR, FS, HPI.

Prerequisite for safe operation is compliance with all of the stated safety and handling instructions.

Moreover, the relevant local accident protection guidelines and general safety provisions for the field of application of the clutch coupling are to be complied with.

Read the assembly and maintenance manual carefully prior to installation and commissioning. It is a product component and must be kept in the immediate vicinity of the installation site and be accessible to personnel at all times. Furthermore, all safety instructions stated in the assembly and maintenance manual are to be observed.

1.2 Explanation of symbols

Warnings are marked throughout this assembly and maintenance manual by symbols. These warning symbols are introduced by signal words which indicate the extent of the danger. Comply with these warning symbols under all circumstances and act with due care and attention to avoid accidents, personal injury and property damage.

	**Danger!**	...indicates an imminently dangerous situation which can be fatal or cause severe injuries if it is not averted.
	**WARNING**	...indicates a potentially dangerous situation which can be fatal or cause severe injuries if it is not averted.
	**ATTENTION**	...indicates a potentially dangerous situation which can cause minor or light injuries if it is not averted.
	**CAUTION**	...indicates a potentially dangerous situation which can cause property damage if it is not averted.
	**NOTE**	… highlights helpful tips and recommendations as well as information for efficient and fault-free operation.

1.3 Manufacturer

STIEBER GmbH, D-69126 Heidelberg, Hatschekstr. 36, Germany
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1.4 Labeling

Front face of the outer race

- Manufacturer's name
- Type designation
- Date of manufacture (coded)

1.5 Environmental protection

Energy: The clutch coupling does not use any electrical energy

Materials: Steel, brass, elastomer (RWDR)

Recycling: Steel parts are up to 100% recyclable

2 Safety

2.1 Intended use

Clutch couplings of type FSO, FSO-GR, FS, HPI are directional clutches, engaged and disengaged automatically.

They can be used as overrunning clutches, backstops or indexing clutches in machinery and equipment.

Clutch couplings may only be operated within the limitations of use outlined in section 2.5.

All of the specifications stated in the assembly and maintenance manual must be strictly adhered to.

Any claims due to damage arising from improper use are excluded. The operator carries sole liability for all damage arising from improper use.

Driving operation of an overrunning clutch:

When operating in torque transmission mode the driving machine element and the driven member are connected in a force-locking manner. In this operating state, power will be transferred.

Overrunning operation of an overrunning clutch:

The overrunning clutch disengages automatically when the driven member achieves a higher rotation speed than the driving member.

Lockout mode of a backstop:

When operating in the locking direction of the clutch coupling, the machine shaft and the torque bracing to the machine element are connected in a force-locking manner.

In this operating state, torque will be transferred.

Overrunning mode of a backstop:

The clutch coupling disengages automatically the force-locked connection between the machine shaft and the torque bracing to the machine element, when the machine shaft runs in clutch coupling direction.

Driving operation of an indexing clutch:

When operating in torque transmission mode the driving machine element and the driven member are connected in a force-locking manner. In this operating state, power will be transferred.

Overrunning operation of an indexing clutch:

The clutch coupling disengages automatically when the machine shaft is idling.

2.2 Responsibility of the operator

The operator of the machine, in which the clutch coupling is installed, is subject to the legal obligations concerning occupational safety.

The valid provisions for the site of operation as well as the safety and accident prevention regulations of the trade associations are to be observed. This, in particular, means that the operator:

- is aware of the valid occupational safety provisions.
- implements the necessary behavioral requirements for operation of the machine, in which the clutch coupling is installed, at the site of operation.
- clearly defines responsibilities for installation, operation, maintenance and cleaning of the machine in which the clutch coupling clutch is installed.
- ensures that all staff members, who work at or with the machine in which the clutch coupling is installed, are employed and have read and understood the operating manual. Moreover, he must, at regular intervals, provide training for personnel on how to handle the machine, in which the clutch coupling is installed, and inform them of the potential dangers. In addition, the operator is responsible for ensuring that the machine in which the clutch coupling is installed:
    - is always in perfect technical condition.
    - is maintained in accordance with the specified maintenance intervals.
    - has all its safety equipment checked regularly for completeness and functionality.

2.3 Assembly and maintenance personnel

	**WARNING**	**Risk of injury for insufficiently qualified personnel!** Improper handling can cause significant personal injury and property damage. Therefore: ➢ Only ever have tasks performed by those persons to whom the tasks have been assigned.

Qualified personnel are those persons who, owing to their training, experience and instruction as well as their knowledge of relevant standards, provisions, accident prevention regulations and operating conditions, have been authorized by the person responsible for the safety of the plant to perform the requisite tasks and are able to recognize and avoid potential dangers in doing so. Knowledge of first-aid measures and on-site emergency equipment must also be included.

2.4 Personal protective equipment

It is necessary to wear personal protective equipment when handling the machine, in which the clutch coupling is installed, to minimize health risks.

The necessary protective equipment such as work shoes, gloves, safety goggles etc. is to be put on prior to all tasks and kept on during the task.

2.5 Limitations of use

- Maximum allowable overrunning speeds and maximum torque capacity (oil quantities):

Type/ Size	max. Torque Capacity	Overrunning Speeds							Lubricant Quantity			
FSO FSO-GR FS HPI		FSO/FSO-GR/ HPI		FSO-GR with labyrinth seals		FS		Bore	FSO [ÖL]	FSO-GR [Fett]	HPI [Öl]	FS [Öl]
	T_{max} [Nm]	n_i max Inner Race [rpm]	n_i max Outer Race [rpm]	n_i max Inner Race [rpm]	n_i max Außenring [min-1]	n_i max Inner Race [rpm]	n_i max Outer Race [rpm]	min-max	[ml]	[ml]	[ml]	[ml]
300	561	3000	900	3600	900			12... 19	7	10	14	
400	612	2800	850	3600	850			12... 22	10	20	20	
500	2397	2500	800	3000	800			19... 33	22	35	35	
600	4590	2200	750	2400	750			24... 57	52	84	84	
700	10200	1600	450	2000	450			48... 82	168	280	280	
750	14280	1000	650	1800	650	1000	650	57... 87	222	20	384	207
800	2397	850	525	1500	525	850	525	66... 112	222	35	444	251
900	4590	700	500	1350	500	700	500	92... 138	532	84	473	340
1027	10200	500	375	1100	375	500	375	125... 177	651	280	946	473

Table 1 Specifiication

- Limits for ambient temperature: from -25°C to +50°C
- Maximum operating temperature: 90°C
- Required machine shaft tolerance: d = h6 or j6
- Oil lubrication: approved oils as per Stieber product catalog / WN900
- Grease lubrication: approved greases as per Stieber product catalog / WN900

3 Structure and function

3.1 Structure

Item 1	Outer race
Item 2	Inner race
Item 3	Grease fittings
Item 4	WDR
Item 5	Retaining ring
Item 6	Ball bearing
Item 7	Cylinder screw
Item 8	Sealing
Item 10	RWDR
Item 11	Plug
Item 12	Cage
Item 13	Sprag
Item 14	Spring
Item 23	Threaded pin
Item 24	Sealing sleeve

Table 2 Parts list

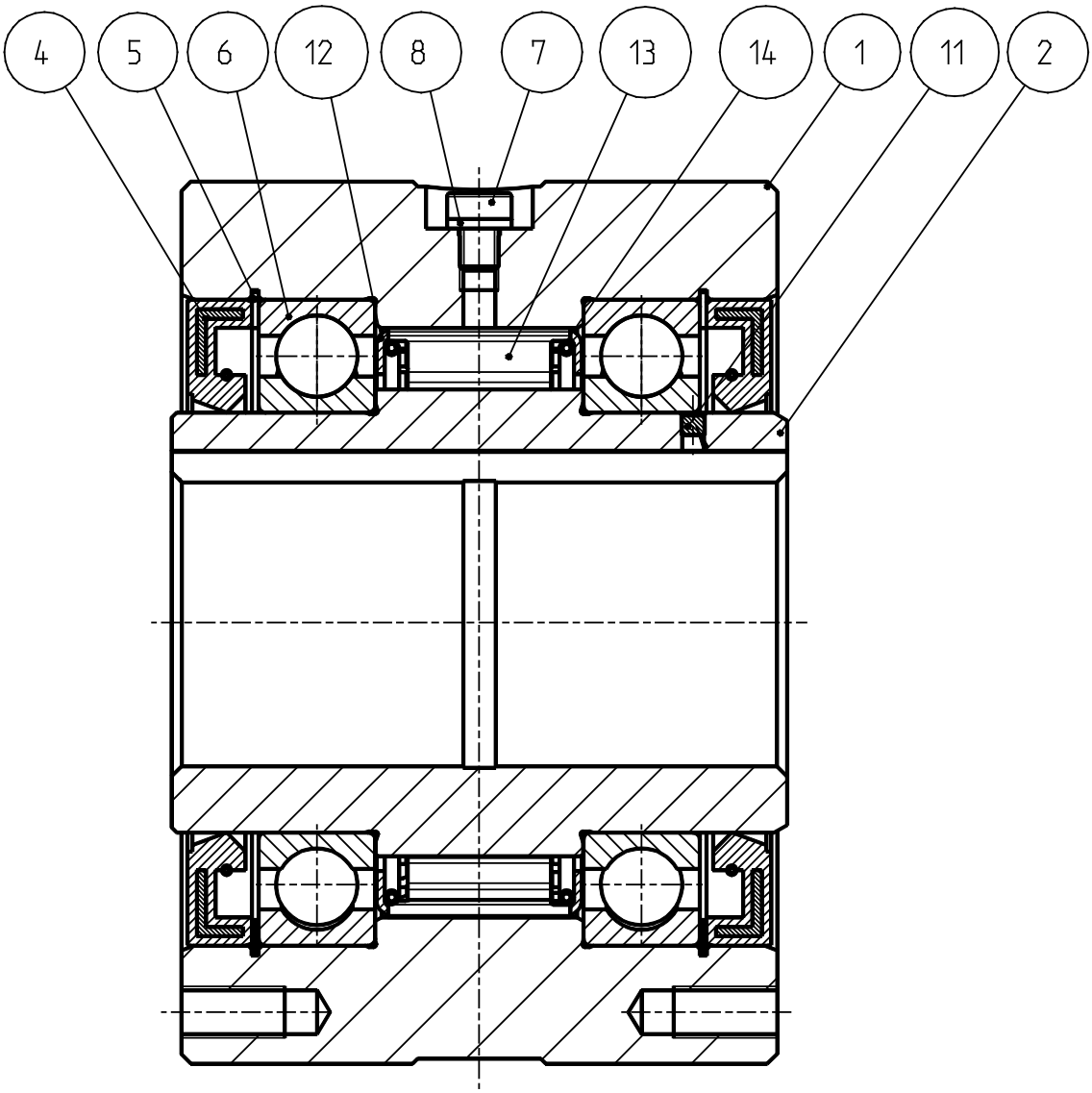

Fig.1a Structure FSO/ HPI

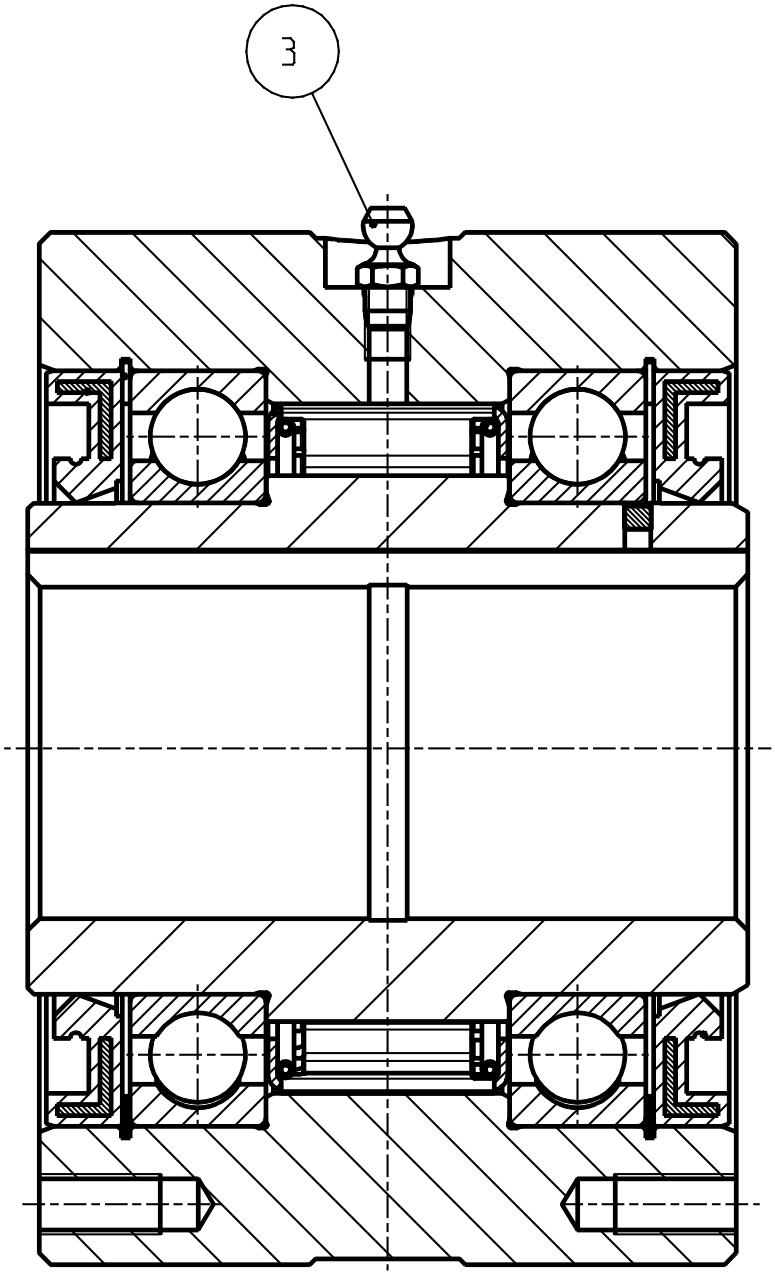

Fig.1b Structure FSO-GR

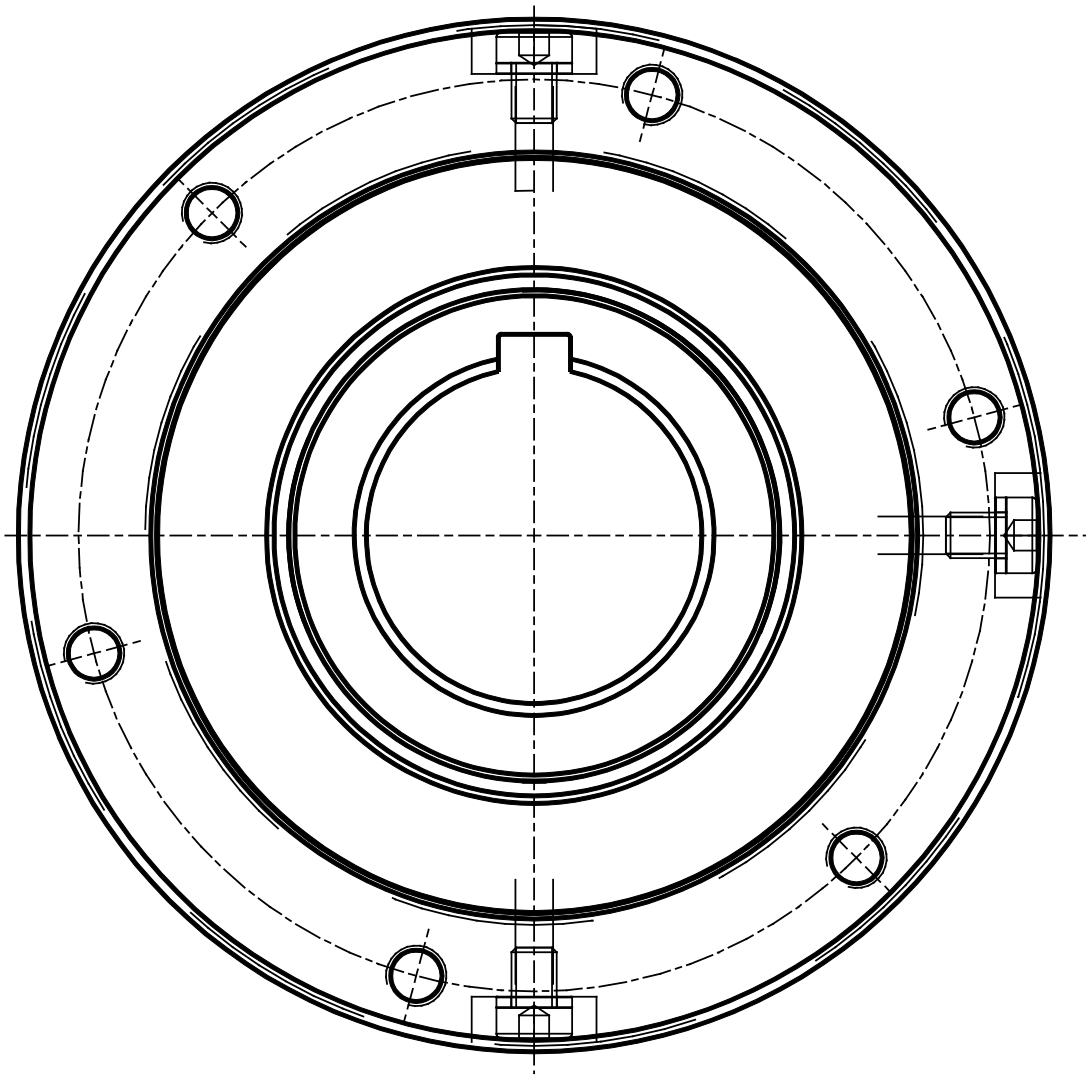

Fig.1c Structure FSO/ HPI

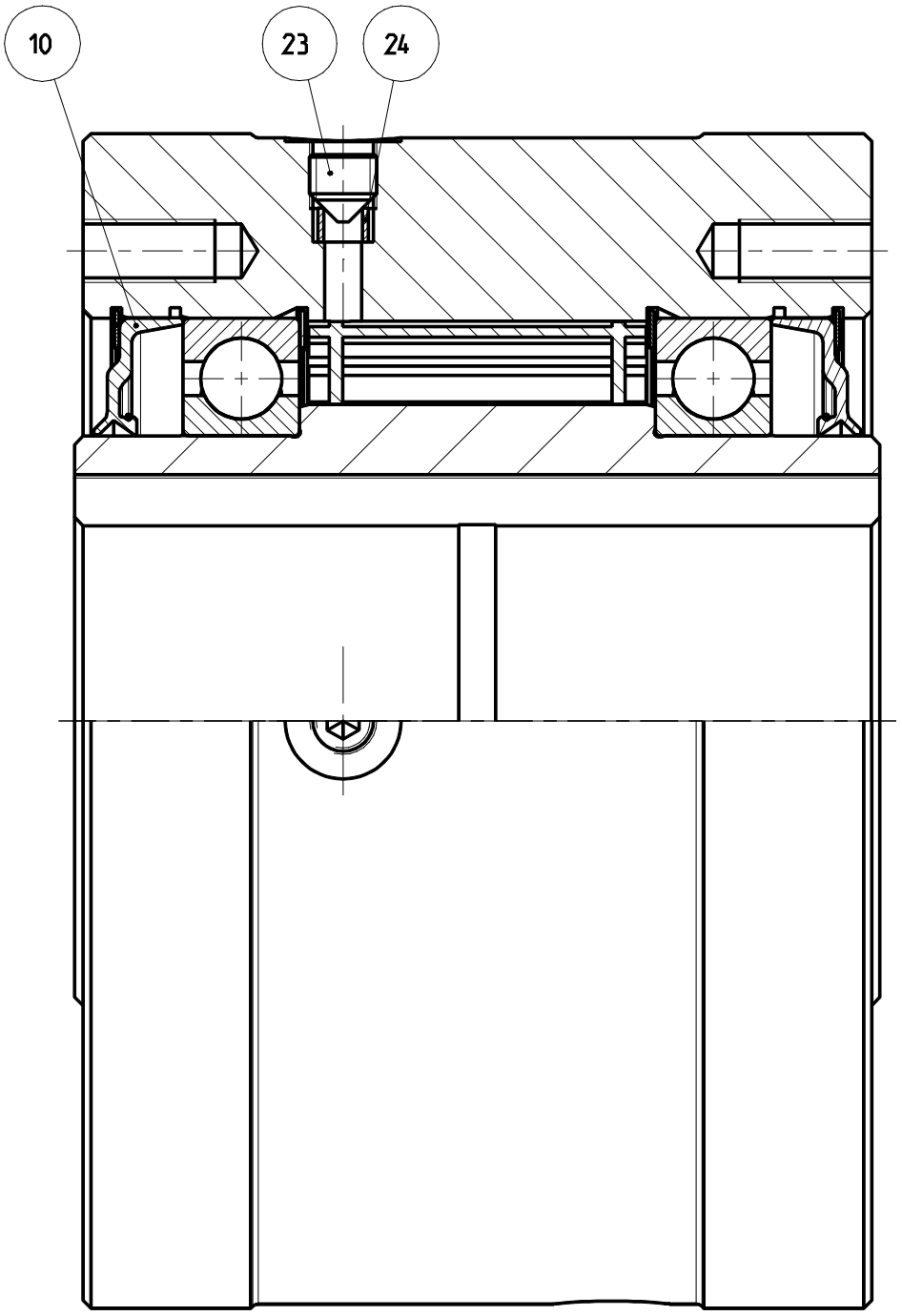

Fig.1d Structure FS

3.2 Function

Clutch couplings of type FSO, FSO-GR, FS, HPI are fitted with Formchrome, PCE sprags.

When turning the inner or outer clutch race (see Fig. 2) in the pulling direction, the sprags create a frictional connection between the inner and outer race so that a torque or output can be transmitted.

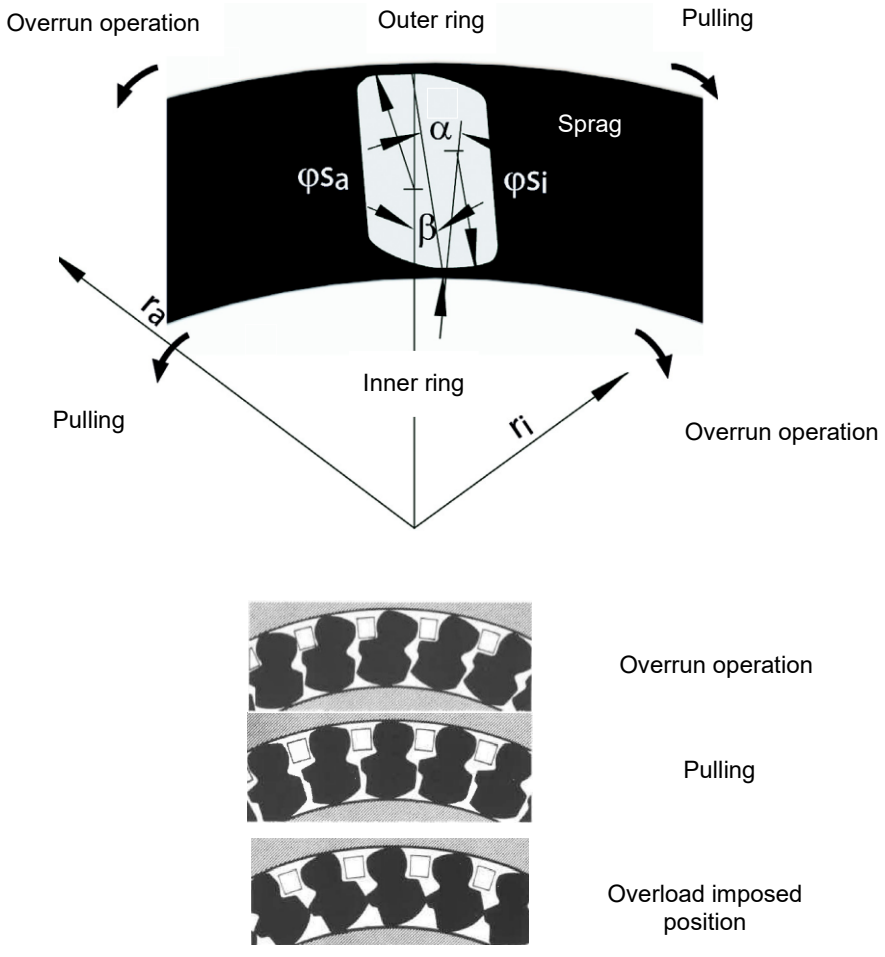

Fig. 2 Pulling/overrun operation

Overrun operation is carried out if the inner race or outer race is turned in the overrun direction. This interrupts the frictional connection (see Fig. 2) between the inner and outer race. In overrun operation the speeds of the inner race and outer race are different.

Under extreme overload conditions, the proven PCE sprag retainer configuration results in positive sprag-to-sprag abutment, which prevents excessive clutch windup and tilting.

4 Transport and packaging

ⓘ	**NOTICE**	The local provisions regarding the disposal of transport and packaging materials are to be observed.

One-way clutches of Type FSO, FSO-GR, FS, HPI are packed in air cushion foils.

The one-way clutch is shipped in a box or on a pallet.

Transport damage to the packaging and/or the one-way clutch is to be reported to the respective transit company without delay.

The one-way clutches must be unpacked in a clean and dry environment.

5 Storage

5.1 Short-term storage

The type FSO, FSO-GR, FS, HPI is packed in VCI bubble wrap. The VCI bubble wrap is to be checked at regular intervals. The frequency of these intervals is dependent on the environmental conditions (temperature, moisture, salt content of the air, etc.) at the storage site.

The maximum storage period (short-term storage) is 6 months. Moreover, the backstop must have long-term storage corrosion protection applied to it.

Store packages under the following conditions:

- Do not keep outdoors
- Keep dry and free from dust
- Do not expose to aggressive media
- Keep away from direct sunlight
- Avoid mechanical shocks and vibrations
- Storage temperature: −10 to +60°C
- Relative humidity: max. 95%, non-condensing

5.2 Long-term storage

For long-term storage, the one-way clutch must be shrink-wrapped with a desiccant and provided with a hygroscope. The corrosion protection must be checked after a period not exceeding one year or else depending on the environmental conditions (temperature, moisture, salt content of the air, etc.) at the storage site.

Store packages under the following conditions:

- Do not keep outdoors
- Keep dry and free from dust
- Do not expose to aggressive media
- Keep away from direct sunlight
- Avoid mechanical shocks and vibrations
- Storage temperature: −10 to +60°C
- Relative humidity: max. 95%, non-condensing

6 Installation

6.1 Checking the direction of rotation

⚠	**WARNING**	**Risk of injury due to incorrect assembly!** Faulty installation and maintenance can cause severe property damage and personal injury! Installation, maintenance and repair work may only be performed by personnel with the requisite training and expertise!

⚠	**WARNING**	**Risk of injury due to moving components!** Rotating driven components can cause the most severe injuries. Therefore, during operation: ➢ It is strictly forbidden for persons to loiter in the danger zone or in its immediate vicinity. ➢ Do not disable, render unusable or circumvent safety equipment and / or safety functions. Prior to entering the danger zone: ➢ Switch off the power supply and secure it against being switched on again. ➢ Wait for lagging components to come to a standstill.

⚠	**WARNING**	**Risk of injury due to the clutch coupling falling down or tipping over!** The weight of the clutch coupling can injure people and cause severe crushing. Therefore: ➢ Use a suitable lifting gear for lifting (slings, etc.) which is able to support the weight of the clutch coupling.

	**WARNING**	**Risk of injury for insufficiently qualified personnel!** Improper handling can cause significant personal injury and property damage. Therefore: ➢ Only ever have tasks performed by those persons to whom the tasks have been assigned.

The direction of rotation must be checked prior to installation.

6.2 Changing the direction of rotation

Changing of the direction of rotation is achieved by turning around.

6.3 Lubrication

Clutch couplings FSO-GR are factory-filled with grease and are ready for operation.

The outer race is fitted on the circumference with three (four) grease fittings.

Clutch couplings FSO HPI and FS are factory-filled with oil (see Chapter 2.5 Limitations of use).

6.4 Assembly

	**WARNING**	**Risk of injury due to incorrect assembly!** Faulty installation and maintenance can cause severe property damage and personal injury. Installation, maintenance and repair work may only be performed by personnel with the requisite training and expertise.

	**WARNING**	**Risk of injury due to moving components!** Rotating driven components can cause the most severe injuries. Therefore, during operation: ➢ It is strictly forbidden for persons to loiter in the danger zone or in its immediate vicinity. ➢ Do not disable, render unusable or circumvent safety equipment and / or safety functions. Prior to entering the danger zone: ➢ Switch off the power supply and secure it against being switched on again. ➢ Wait for lagging components to come to a standstill.

	**WARNING**	**Risk of injury due to falling down components!** Falling down components can cause serious injuries! Prevent the clutch coupling from falling down!

⚠	**WARNING**	**Risk of injury for insufficiently qualified personnel!** Improper handling can cause significant personal injury and property damage. Therefore: ➢ Only ever have tasks performed by those persons to whom the tasks have been assigned.

Procedural steps:

- Insert the supporting fitting key according to DIN 6885 Sheet 1 over the entire length of the one-way clutch in the shaft.
- Push the one-way clutch onto the oiled machine shaft, attaching suitable lifting equipment if necessary.

ⓘ	**NOTE**	Apply pressure to the inner race only when pressing the clutch coupling onto the shaft, since otherwise the ball bearings can be damaged!

- Tighten the machine element with the outer race. To do so, use fastening screws (e.g. as per standard DIN EN ISO 4762 and with screw quality 10.9)

Clutch size	Size	Strength class 10.9	Oil filling plugs
300 to 600	M8	40.1	9
700	M10	79.0	15
750 to 800	M12	137.0	25
900 to 1027	M16	338.0	28

Table 3 Tightening torques in [Nm]

- Fasten the inner race axially.
- Check overrunning. The one-way clutch must be easy to turn in the overrun direction of rotation.

7 Operation

	**WARNING**	**Risk of injury due to moving components!** Rotating, driven components can cause severe injuries. Therefore, during operation: ➢ It is strictly forbidden for persons to loiter in the hazard area or in its immediate vicinity. ➢ Do not disable, render unusable, or circumvent safety equipment and/or safety functions. Prior to entering the hazard area: ➢ Switch off the power supply and secure it against being switched on again. ➢ Wait for still moving components to come to a standstill.

FSO, FSO-GR, FS, HPI series should be checked for damage at regular intervals.

FSO-GR series are grease lubricated and will need to be re-lubricated every three months, under very dirty conditions monthly.

For this to happen, the grease fittings need to be made clean and new grease must be pressed into the fittings until the grease escapes out from the seals.

Only lubricants in line with our recommendation or equivalent product from other manufacturers are to be used (see Chapter 2.5 Limitations of use).

	**NOTE**	Oils including graphite, molybdenum or similar are not to be used!

8 Maintenance

	**WARNING**	**Risk of injury due to moving components!** Rotating, driven components can cause severe injuries. Therefore, during operation: ➢ It is strictly forbidden for persons to loiter in the hazard area or in its immediate vicinity. ➢ Do not disable, render unusable, or circumvent safety equipment and/or safety functions. Prior to entering the hazard area: ➢ Switch off the power supply and secure it against being switched on again. ➢ Wait for still moving components to come to a standstill.

⚠	**WARNING**	**Risk of injury due to incorrect assembly!** Incorrect assembly and maintenance can cause severe property damage and personal injury. Assembly, maintenance, and repair work may only be performed by personnel with the requisite training and expertise.

⚠	**WARNING**	**Risk of injury due to falling components!** Falling components can lead to serious injuries to persons. Secure the one-way clutch against falling down.

⚠	**WARNING**	**Risk of injury for insufficiently qualified personnel!** Improper handling can cause significant personal injury and property damage. Therefore: ➢ Only ever have tasks performed by those persons to whom the tasks have been assigned.

⚠	**WARNING**	**Danger of scalding due to hot surfaces!** There is a risk of burns and danger of scalding during operation due to hot surfaces. Therefore: ➢ Do not touch one-way clutches during operation.

After 10 years of operation, the one-way clutches have to be maintained and repaired by Stieber!

8.1 Oil change when operating with FSO, FS HPI types

An oil change is required after approx. 9,000 operating hours or after one year at the latest. In very dirty environments, the interval is reduced to 5,000 operating hours or every half year.

Procedural steps:

- To check the oil level, the oil filling plugs on the perimeter of the outer race must be in the following position:
  One of the plugs at the top, the other at the side below the center (see Fig.3)

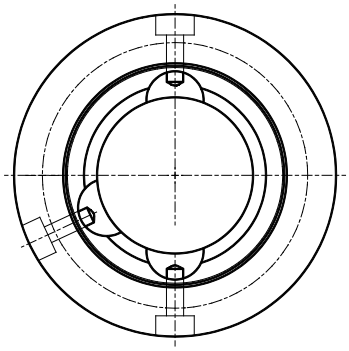

Fig. 3 Position of oil filling plugs

- Unfasten both oil filling plugs with the seal and drain the oil. To do so, place a suitable drip pan with an appropriate capacity beneath it.

	NOTICE	The local provisions regarding the disposal of waste oil must be observed.

- Screw the oil filling plug with the seal into the bottom hole and tighten with the tightening torque (see Table 6 Tightening torques in Section 6.4).
- Fill the one-way clutches with the prescribed oil quantity (see Section 2.5 Specifications) or until oil emerges on the side.
- Tighten the upper oil filling plug with the seal with the tightening torque (see Table 3 Tightening torques in Section 6.4).

	NOTICE	Check the oil filling plug and the oil drain plug for firm seating and leak tightness. If leaks occur at the plugs during operation, new seals must be installed.

9 Disassembly

⚠	**WARNING**	**Risk of injury due to incorrect assembly!** Incorrect assembly and maintenance can cause severe property damage and personal injury. Assembly, maintenance, and repair work may only be performed by personnel with the requisite training and expertise.

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⚠	**WARNING**	**Danger of scalding due to hot surfaces!** There is a risk of burns and danger of scalding during operation due to hot surfaces. Therefore: ➢ Do not touch one-way clutches during operation!

⚠	**WARNING**	**Risk of injury due to falling components!** Falling components can lead to serious injuries to persons. Secure the one-way clutch against falling down.

Procedural steps:

- Remove the axial fastening of the inner race.
- Loosen the fastening screws from the outer race and from driven machine elements.
- Pull the one-way clutch from the machine shaft using suitable lifting equipment, if required.

10 Disposal

	**NOTICE**	The local provisions regarding the disposal of metallic components and any lubricants present are to be observed.

The one-way clutch is comprised of metallic materials that are coated with grease or oil. Metallic materials are fully recyclable. Lubricants and anticorrosive agents are to be disposed of separately. The local disposal provisions are to be observed in this regard.

11 Faults

The manufacturer is to be contacted immediately should any faults arise.

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