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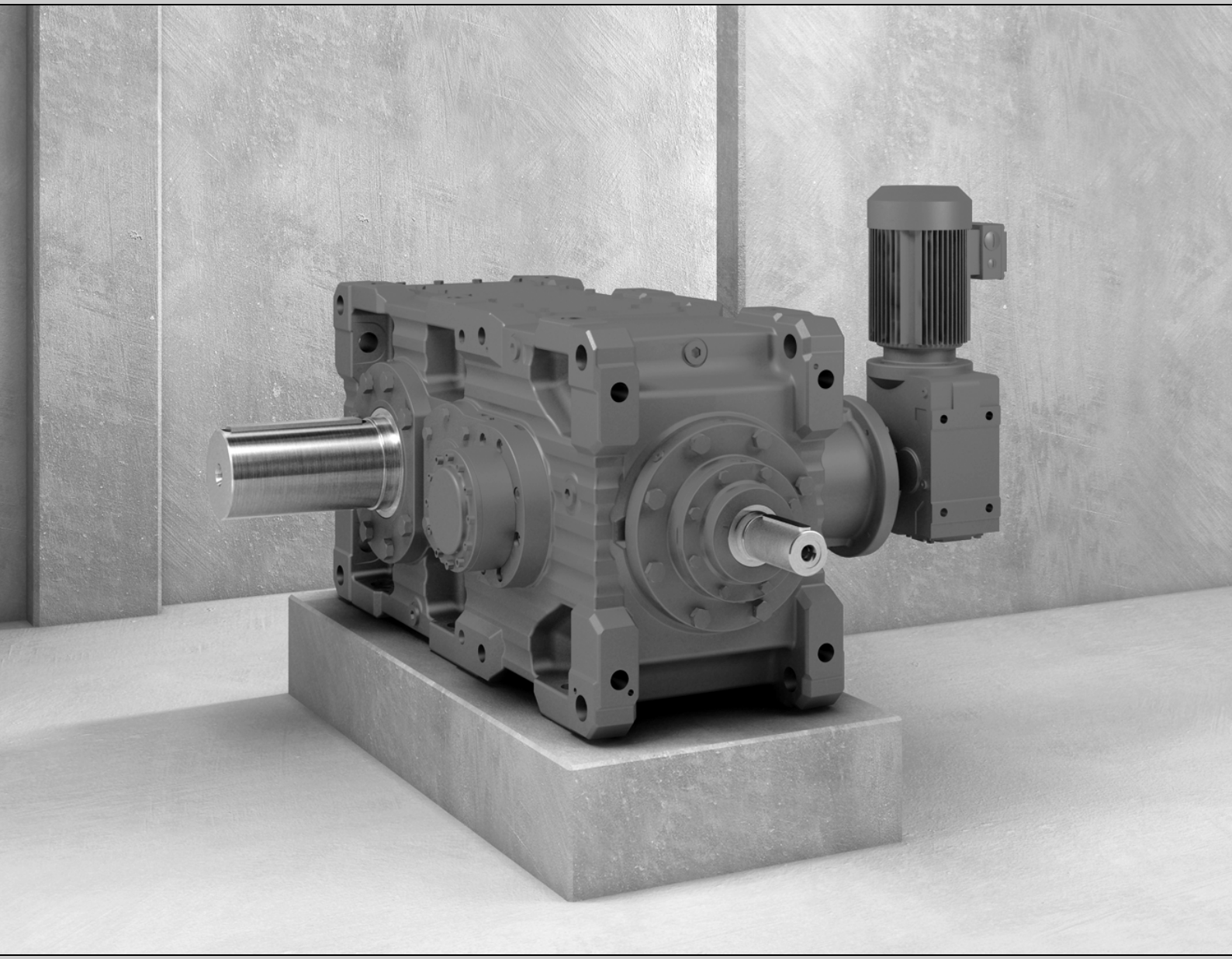
Addendum to the Operating Instructions



Industrial Gear Units

Changing the Direction of Rotation
Backstops and Freewheeling Clutches

Edition 07/2013

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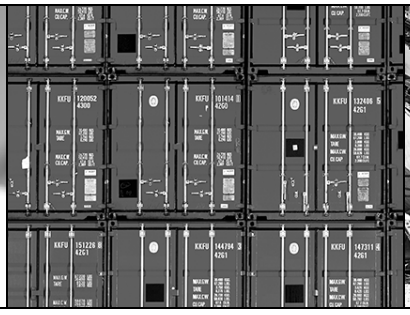



Contents

1 Important Notes

INFORMATION

This addendum describes amendments to the following operating instructions:

- Industrial Gear Units – Helical and Bevel-Helical Gear Units – X.. Series
- Industrial Gear Units – Bevel-Helical Gear Units – X.. Series Bucket Elevator Drives

This document does not replace the respective detailed operating instructions.

2 Structure and Function

The following sections illustrate the structure and the function of backstops and freewheeling clutches.

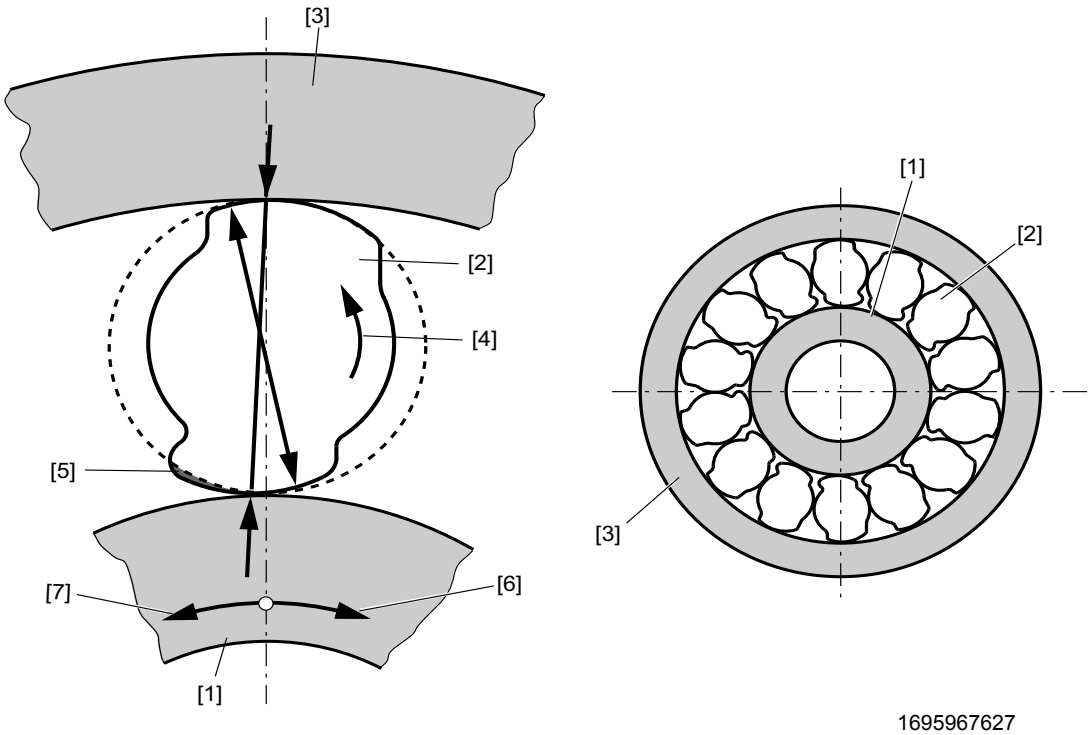
2.1 Structure and function of backstops and freewheeling clutches

Backstops and freewheeling clutches are used wherever you want or must provide for only one direction of rotation.

They are usually installed between a shaft and a housing. The shaft can only be rotated in the specified direction. The backstop prevents the shaft from rotating in the reverse direction.

A backstop is referred to as a freewheeling (or overrunning) clutch if it is installed between 2 shafts using an additional connecting coupling. Torque transmission between the two shafts is then only possible in one direction.

Backstops and freewheeling clutches consist of three main elements. The inner ring [1] connects the backstop and the shaft. A cage guides and positions the sprags [2] between the inner and the outer ring. The outer ring [3] connects the backstop and the housing or the connecting coupling.



[1] Inner ring
[2] Sprags
[3] Outer ring
[4] Spring force (spring torque)
[5] Wedge
[6] Blocking direction
[7] Free-wheeling direction

The blocking effect results from the sprags [2] wedging between the inner and the outer ring. The sprags [2] are designed to block only in one direction. A spring force [4] provides for enough contact pressure to initialize the wedging effect in the event of operation in blocking direction [6].

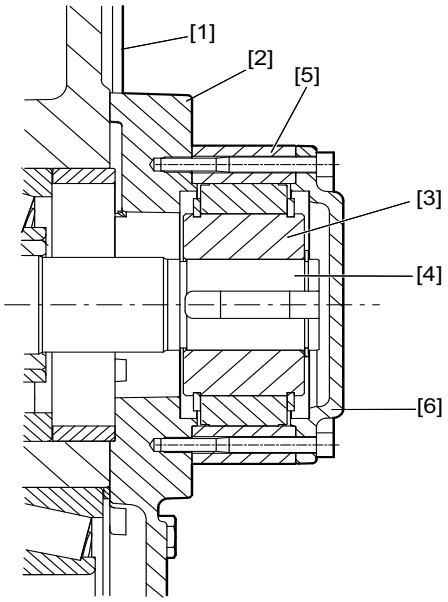
The sprags [2] are designed to lift off from the races due to the centrifugal force as of a certain speed level in freewheeling direction. Above this lift-off speed, the backstop is wear-free. Operating the backstop below the lift-off speed over longer periods may result in wear and reduces the service life. The backstop is usually lubricated with gear unit oil to reduce friction and wear.

You can switch the free-wheeling direction and the blocking direction of the backstop by turning the inner ring and the cage with the sprags by 180°.

2.2 Drives with external backstop

Drives with external backstop have the backstop installed outside the gear unit housing [1].

The inner ring [3] of the backstop is located on a pinion shaft going out of the gear unit. The shaft [4] and the inner ring [3] are connected by a keyed connection. The outer ring [5] of the backstop is connected to the bearing cover [2] together with a closing cover [2].



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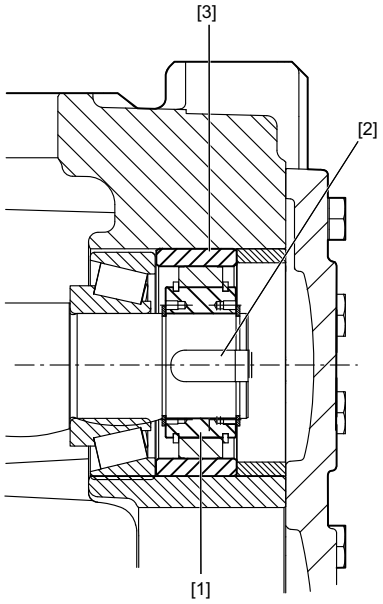
[1] Gear unit housing
[2] Bearing cover
[3] Inner ring
[4] Shaft
[5] Outer ring
[6] Closing cover

2.3 Drives with internal backstop

Drives with external backstop have the backstop installed inside the gear unit housing.

The inner ring [1] of the backstop is located on an extension of the pinion shaft [2] directly after the pinion shaft bearing. The shaft [2] and the inner ring [1] are connected by a keyed connection. The outer ring [3] of the backstop is pressed in the housing bore.



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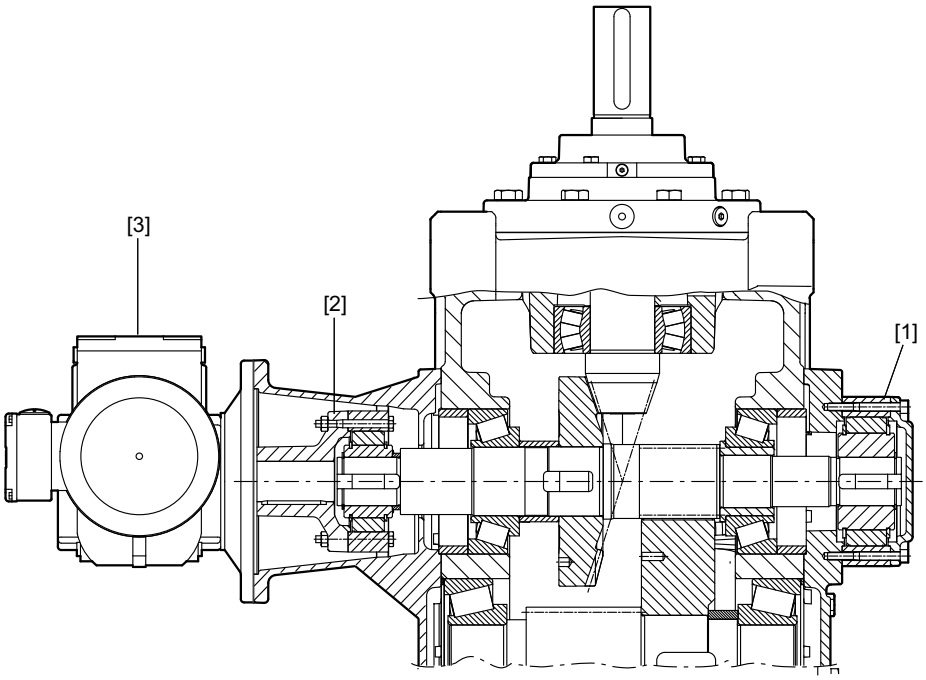
[1] Inner ring
[2] Shaft
[3] Outer ring

2.4 Drives with backstop, auxiliary drive and freewheeling clutch

For drives with backstop and auxiliary drive, you usually use an external or internal backstop [1] in conjunction with a freewheeling clutch. The backstop and the freewheeling clutch are usually located on the same pinion shaft on both sides of the drive.

The backstop [1] prevents the shaft from rotating against the operating direction. The freewheeling clutch [2] disengages the auxiliary drive [3] during operation via the main drive, thus preventing the auxiliary drive [3] from rotating. During operation via auxiliary drive [3], the freewheeling clutch [2] blocks, thus driving the pinion shaft of the gear unit.

The directions of rotation of the backstop [1] and the freewheeling clutch [2] must be adjusted to each other, otherwise the entire system may not function properly.



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[1] Backstop
[2] Freewheeling clutch
[3] Auxiliary drive

3 Position of the Backstops

3.1 X.F..

Fig. A
External backstop

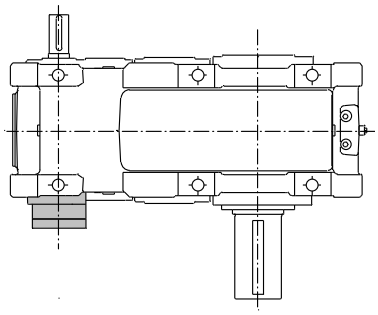
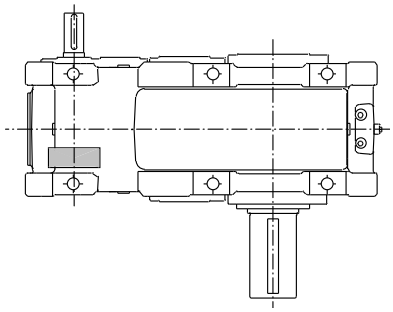


Fig. B
Internal backstop



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Position of the Backstops
X.F..

X2F..	i_{tot}	Fig.
X2F.100	6.3 - 20	A
X2F.110	8 - 22.4	A
X2F.120	6.3 - 18	A
X2F.130	8 - 22.4	A
X2F.140	6.3 - 18	A
X2F.150	8 - 22.4	A
X2F.160	6.3 - 18	A
X2F.170	8 - 22.4	A
X2F.180	6.3 - 18	A
X2F.190	7.1 - 20	A
X2F.200	6.3 - 18	A
X2F.210	7.1 - 20	A
X2F.220	6.3 - 18	A
X2F.230	7.1 - 20	A
X2F.240	6.3 - 18	A
X2F.250	7.1 - 20	A
X2F.260	6.3 -18	A
X2F.270	7.1 - 20	A
X2F.280	8 - 22.5	A
X2F.290	6.3 - 18	A
X2F.300	7.1 - 20	A
X2F.310	6.3 - 18	A
X2F.320	7.1 - 20	A

X3F..	i_{tot}	Fig.
X3F.100	20 - 90	A
X3F.110	25 - 112	A
X3F.120	20 - 25	A
	28 - 90	B
X3F.130	25 - 31.5	A
	40 - 112	B
X3F.140	20 - 28	A
	31.5 - 90	B
X3F.150	25- 33.5	A
	40 - 112	B
X3F.160	20 - 28	A
	31.5 - 90	B
X3F.170	25 - 35.5	A
	40 - 112	B
X3F.180	20 - 35.5	A
	40 - 90	B
X3F.190	22.4 - 40	A
	45 - 100	B
X3F.200	20 - 35.5	A
	40 - 90	B
X3F.210	22.4 - 40	A
	45 - 100	B
X3F.220	20 - 90	A
X3F.230	22.4 - 100	A
X3F.240	20 - 90	A
X3F.250	22.4 - 100	A
X3F.260	20 - 90	A
X3F.270	22.4 - 100	A
X3F.280	25 - 112	A
X3F.290	20 - 90	A
X3F.300	22.5 - 100	A
X3F.310	20 - 90	A
X3F.320	22.5 - 100	A

X4F..	i_{tot}	Fig.
X4F.120	100 - 355	A
X4F.130	125 - 450	A
X4F.140	100 - 355	A
X4F.150	125 - 450	A
X4F.160	100 - 355	B
X4F.170	125 - 450	B
X4F.180	100 - 355	B
X4F.190	112 - 400	B
X4F.200	100 - 355	B
X4F.210	112 - 400	B
X4F.220	100 - 355	B
X4F.230	112 - 400	B
X4F.240	100 - 355	B
X4F.250	100 - 400	B
X4F.260	100 - 355	B
X4F.270	112 - 400	B
X4F.280	125 - 450	B
X4F.290	100 - 355	B
X4F.300	112 - 400	B
X4F.310	100 - 355	B
X4F.320	112 - 400	B

3.2 X.K..

Fig. A
External backstop

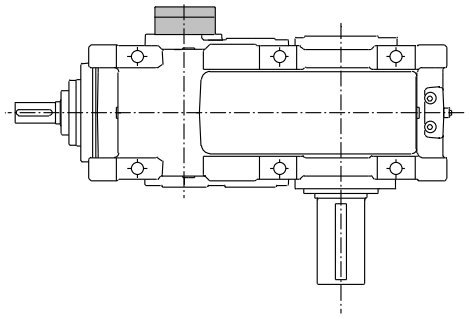
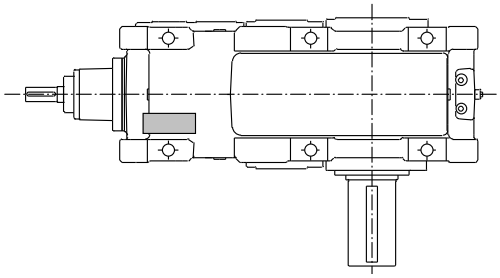


Fig. C
Internal backstop



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Position of the Backstops
X.K..

X2K..	i_{tot}	Fig.
X2K.100	7.1 - 12.5	A
X2K.110	8 - 14	A
X2K.120	6.3 - 11.2	A
X2K.130	8 - 14	A
X2K.140	6.3 - 11.2	A
X2K.150	7.1 - 14	A
X2K.160	6.3 - 11.2	A
X2K.170	8 - 14	A
X2K.180	6.3 - 11.2	A
X2K.190	7.1 - 12.5	A
X2K.200	6.3 - 11.2	A
X2K.210	7.1 - 12.5	A
X2K.220	6.3 - 11.2	A
X2K.230	7.1 - 12.5	A
X2K.240	6.3 - 11.2	A
X2K.250	7.1 - 12.5	A

X3K..	i_{tot}	Fig.
X3K.100	14 - 80	A
X3K.110	16 - 90	A
X3K.120	12.5 - 71	A
X3K.130	16 - 90	A
X3K.140	12.5 -71	A
X3K.150	16 - 90	A
X3K.160	12.5 - 71	A
X3K.170	16 - 90	A
X3K.180	12.5 -71	A
X3K.190	14 - 80	A
X3K.200	12.5 - 71	A
X3K.210	14 - 80	A
X3K.220	12.5 - 71	A
X3K.230	14 - 80	A
X3K.240	12.5 - 71	A
X3K.250	14 - 80	A
X3K.260	12.5 - 71	A
X3K.270	14 - 80	A
X3K.280	16 - 90	A
X3K.290	12.5 - 71	A
X3K.300	14 - 80	A
X3K.310	12.5 - 71	A
X3K.320	14 - 80	A

X4K..	i_{tot}	Fig.
X4K.120	100 - 355	C
X4K.130	125 - 400	C
X4K.140	100 - 355	C
X4K.150	125 - 400	C
X4K.160	100 - 355	C
X4K.170	125 - 400	C
X4K.180	80 - 355	C
X4K.190	90 - 400	C
X4K.200	80 - 355	C
X4K.210	90 - 400	C
X4K.220	80 - 355	A
X4K.230	90 - 400	A
X4K.240	80 - 355	A
X4K.250	90 - 400	A
X4K.260	80 - 355	A
X4K.270	90 - 400	A
X4K.280	100 - 450	A
X4K.290	80 - 355	A
X4K.300	90 - 400	A
X4K.310	80 - 355	A
X4K.320	90 - 400	A

3.3 X.T..

Fig. A
External backstop

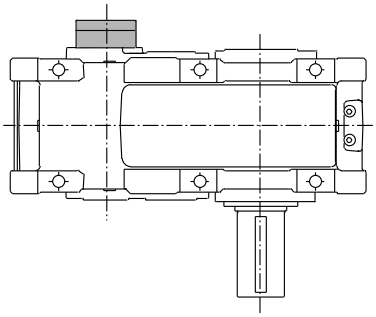
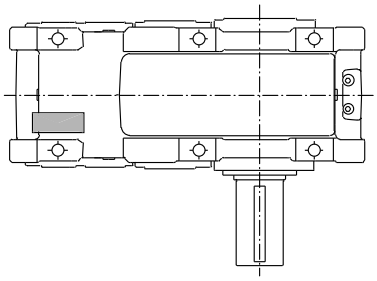


Fig. B
Internal backstop



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X3T..	i_{tot}	Fig.
X3T.100	14 - 80	A
X3T.100	16 - 90	A
X3T.120	12.5 - 71	A
X3T.130	16 - 90	A
X3T.140	12.5 - 71	A
X3T.150	16 - 90	A
X3T.160	12.5 - 71	A
X3T.170	16 - 90	A
X3T.180	12.5 - 80	A
X3T.190	14 - 80	A
X3T.200	12.5 - 71	A
X3T.210	14 - 80	A
X3T.220	12.5 - 71	A
X3T.230	14 - 80	A
X3T.240	12.5 - 71	A
X3T.250	14 - 80	A

X4T..	i_{tot}	Fig.
X4T.120	100 - 355	C
X4T.130	125 - 450	C
X4T.140	100 - 355	C
X4T.150	125 - 450	C
X4T.160	100 - 355	C
X4T.170	125 - 450	C
X4T.180	80 - 355	C
X4T.190	90 - 400	C
X4T.200	80 - 355	C
X4T.210	90 - 400	A
X4T.220	80 - 355	A
X4T.230	90 - 400	A
X4T.240	80 - 355	A
X4T.250	90 - 400	A

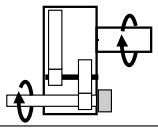
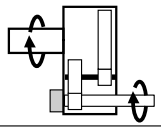
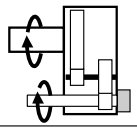
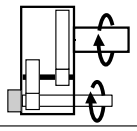
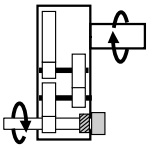
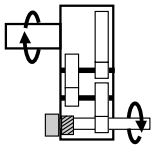
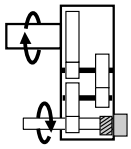
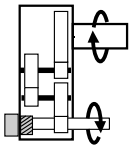
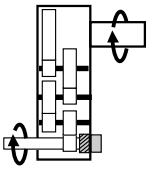
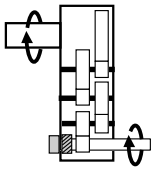
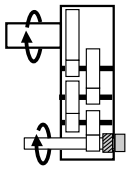
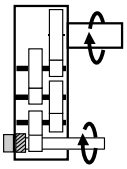
4 Directions of Rotation Dependencies

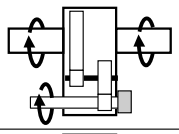
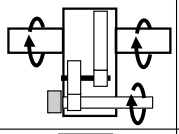
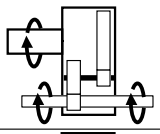
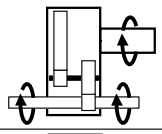
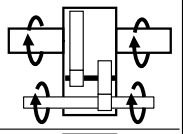
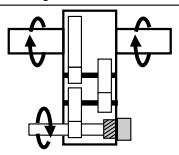
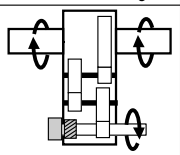
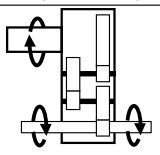
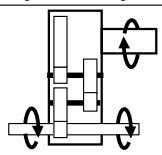
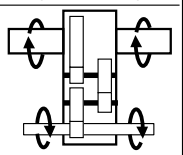
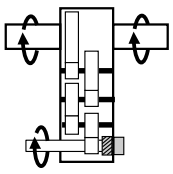
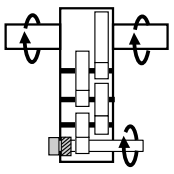
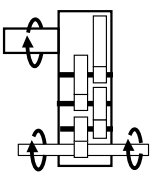
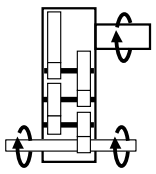
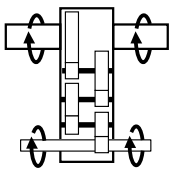
INFORMATION

The gear unit can be operated in both directions of rotation. An exception are gear units with backstop.

The following tables show the direction of rotation dependencies between input and output shafts. The gear unit as well as the position of the backstop are schematically shown as the solid shaft version.

4.1 X.F.

Shaft position	14	23	13 [1]	24 [1]
End gear position	3	4	3	4
X2F...				
X3F...				
X4F...				

Shaft position	134 [1]	243 [1]	213 *	124 *	1234 * [1]
End gear position	3	4	4	3	3
X2F...					
X3F...					
X4F...					

= Position of the backstop

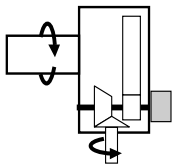
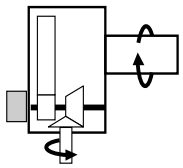
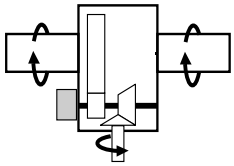
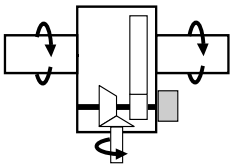
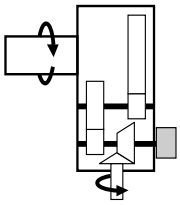
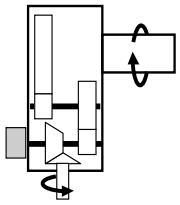
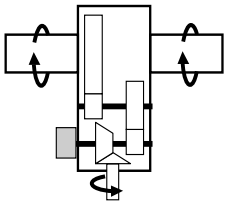
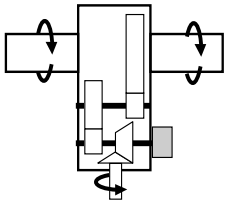
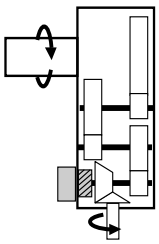
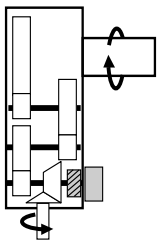
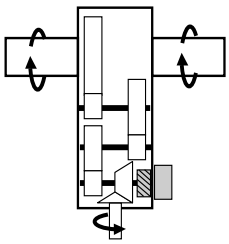
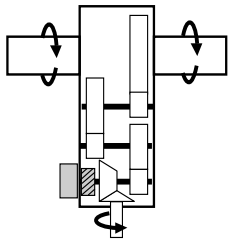
= Alternative backstop position (depending on size and gear ratio)

* = Consult SEW-EURODRIVE when using a backstop

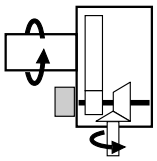
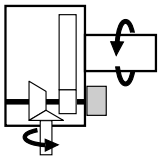
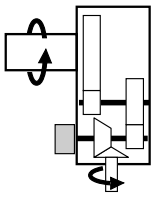
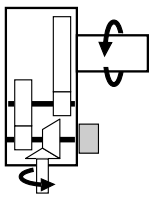
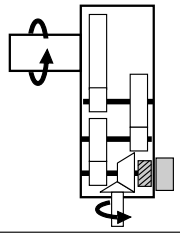
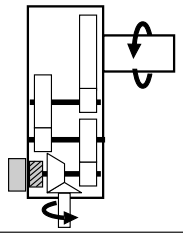
1) Note the restrictions regarding external forces on the LSS

4.2 X.K...

4.2.1 Standard

Shaft position	03	04	034 [1]	043 [1]
End gear pos.	4	3	3	4
X2K...				
X3K...				
X4K...				

4.2.2 Direction of rotation reversal

Shaft position	03 [1]	04 [1]
End gear position	3	4
X2K...		
X3K...		
X4K...		

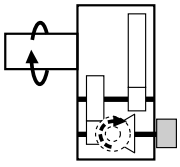
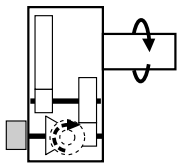
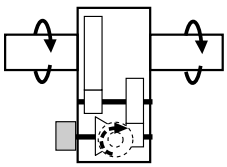
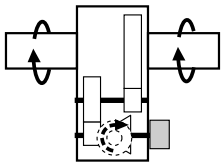
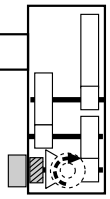
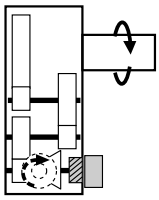
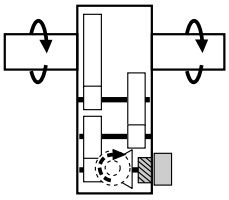
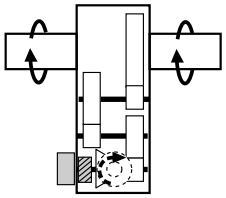
▯ = Position of the backstop

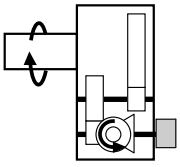
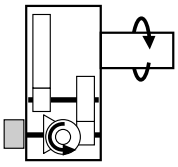
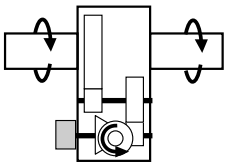
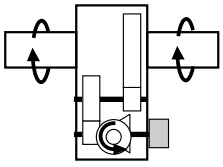
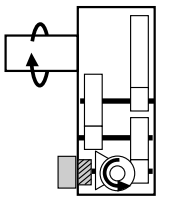
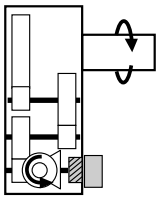
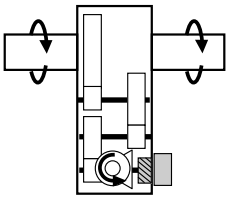
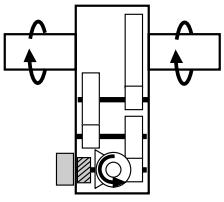
▨ = Alternative backstop position (depending on size and gear ratio)

1) Note the restrictions regarding external forces on the LSS

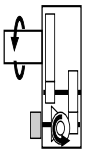
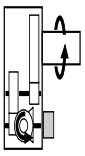
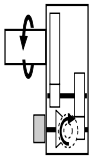
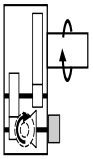
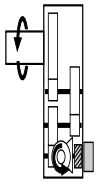
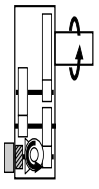
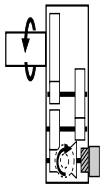
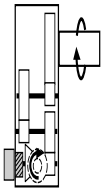
4.3 X.T...

4.3.1 Standard

Shaft pos.	63	64	634 [1]	643 [1]
End gear pos.	4	3	3	4
X3T...				
X4T...				

Shaft pos.	53	54	534 [1]	543 [1]
End gear pos.	4	3	3	4
X3T...				
X4T...				

4.3.2 Direction of rotation reversal

Shaft position	53 [1]	54 [1]	63 [1]	64 [1]
End gear pos.	3	4	3	4
X3T...				
X4T...				

= Position of the backstop

= Alternative backstop position (depending on size and gear ratio)

1) Note the restrictions regarding external forces on the LSS

5 Changing the Direction of Rotation

5.1 Notes on installation

⚠ WARNING

Risk of crushing if the drive starts up unintentionally and the shafts or the drive train are under load.

Severe or fatal injuries.

- De-energize the motor before you start working on the unit.
- Secure the motor against unintended power-up.
- Before releasing shaft connections, be sure that there are no active torsional moments present.

⚠ WARNING

Danger of burns due to hot gear unit and hot gear unit oil.

Severe injuries.

- Let the gear unit cool down before you start working on it.

⚠ NOTICE

Selecting and filling improper lubricants may damage the gear unit.

Possible damage to property

- After the direction of rotation has been changed, fill the gear unit with oil via the oil fill plug up to the oil level marking. Use the same type of oil that has been used before. Mixing oils of different grades and/or manufacturers is not permitted.

INFORMATION

- For changing the direction of rotation of drives with auxiliary drive and overrunning clutch, you will have to change the direction of rotation of the backstop as well as of the overrunning clutch.
- Use a surface sealing agent, such as Loctite® 5208, when installing the mount-on components on the gear unit housing.

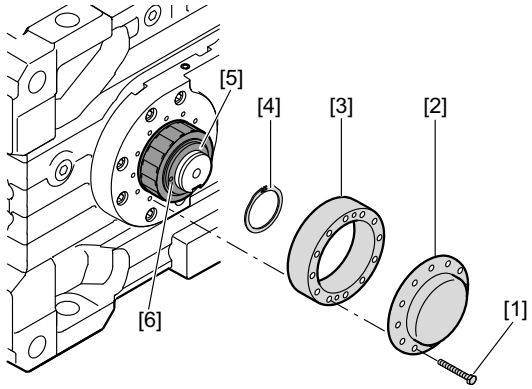
5.2 Tightening torques

Observe the following tightening torques.

Bolt size	Tightening torque [Nm] Strength classes 8.8
M5	6
M6	10
M8	25
M10	48
M12	84
M16	206
M20	402
M24	696
M30	1420

5.3 Drives with external backstop

1. Drain the oil from the gear unit until the oil level is under the bearing bore of the backstop. Observe chapter "Notes on installation" (page 17) .
2. Remove the retaining screws [1] of the backstop and remove the closing cover [2].



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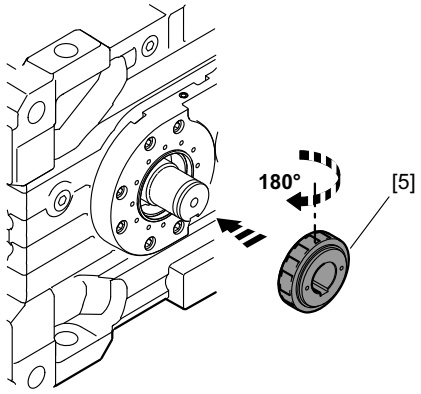
3. Remove the outer ring [3]. To facilitate dismounting, slightly turn the outer ring [3] in freewheeling direction.
4. Remove the retaining ring [4] and the inner ring [5] with cage and sprags. When removing the backstop, do not apply pressure to the cage with the sprags but to the inner ring [5] only. Use the tapped holes [6] on the inner ring [5] of the backstop.
5. Turn the inner ring [5] with the sprags by 180° and reinstall it.



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6. Secure the inner ring [5] on the shaft with the retaining ring [4].
7. Reinstall the outer ring [3] and the closing cover [2] using the retaining screws [1]. Slightly turn the outer ring [3] in the free-wheeling direction. This will make it easier to slide it over the sprags. Thoroughly seal the parting line between the bearing cover and the outer ring [3] of the backstop as well as the closing cover [2].

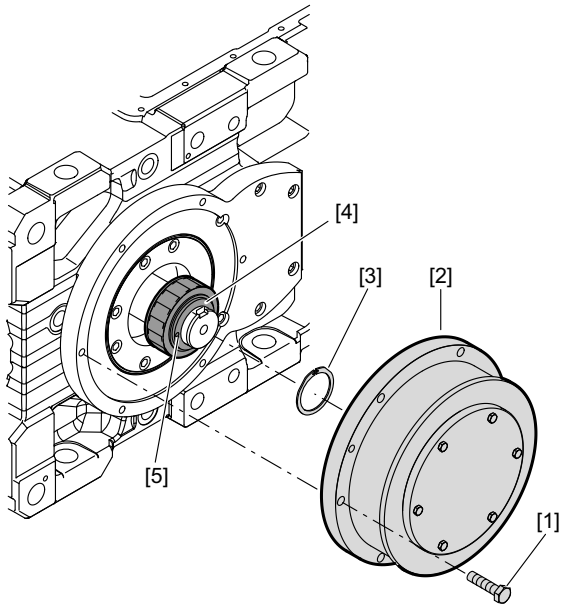
INFORMATION

In order to facilitate the process, you may fixate the sprags with a rubber band or a cable tie. This will make it easier to slide the outer ring over the sprags.

8. Alter the direction arrow on the gear unit housing.
9. Fill the gear unit with oil and check the oil level.
10. After assembly, check that the backstop runs smoothly.

5.4 Drives with external backstop and torque limitation

1. Drain the oil from the gear unit until the oil level is under the bearing bore of the backstop. Observe chapter "Notes on installation (page 17)". Also adhere to the operating instructions of the backstop manufacturer.
2. Remove the retaining screws [1] of the backstop and remove the cover [2]. To facilitate dismounting, slightly turn the cover [2] in freewheeling direction.



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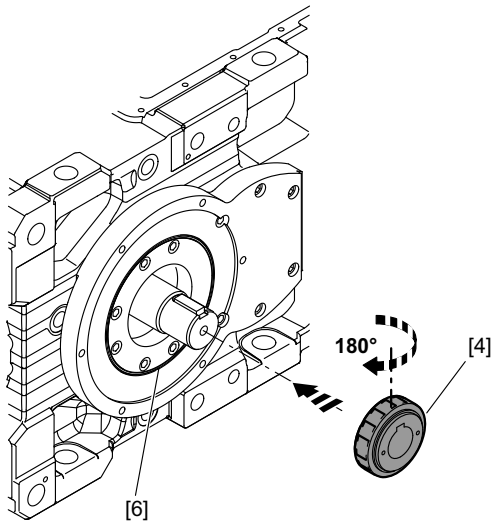
3. Remove the retaining ring [3] and the inner ring [4] with cage and sprags. When removing the backstop, do not apply pressure to the cage with the sprags but only to the inner ring [4]. Use the tapped holes [5] on the inner ring [4] of the backstop.
4. Turn the inner ring [4] with the sprags by 180° and reinstall it.



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5. Secure the inner ring [4] on the shaft using the retaining ring [3].

6. Check to make sure that the sealing ring [6] is seated properly in the groove. Reinstall the cover [2] using the retaining screws [1]. When installing the cover [2], slightly turn it in the freewheeling direction. Doing so will make it easier to slide it over the sprags.

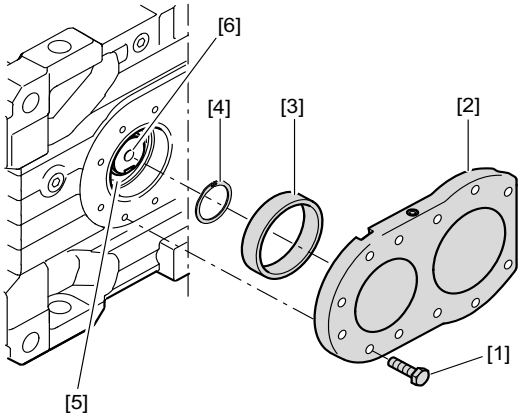
INFORMATION

In order to facilitate the process, you may fixate the sprags with a rubber band or a cable tie. This will make it easier to slide the outer ring over the sprags.

7. Alter the direction arrow on the gear unit housing.
8. Fill the gear unit with oil and check the oil level.
9. After assembly, check that the backstop runs smoothly.

5.5 Drives with internal backstop

1. Drain the oil from the gear unit until the oil level is under the bearing bores of the respective bearing cover. Observe chapter "Notes on installation (page 17)".
2. Loosen the retaining screws [1] of the backstop bearing cover [2]. Remove the bearing cover [2] and the spacer tube [3].



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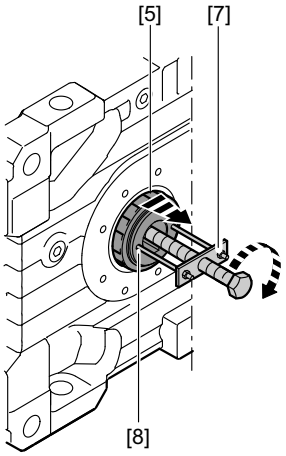
3. Remove the retaining ring [4] that holds the inner ring [5] of the backstop on the shaft [6].
4. Remove the inner ring [5] with cage and sprags from the shaft [6] using a suitable pulling device [7]. Use the tapped holes [8] on the inner ring [5] of the backstop.



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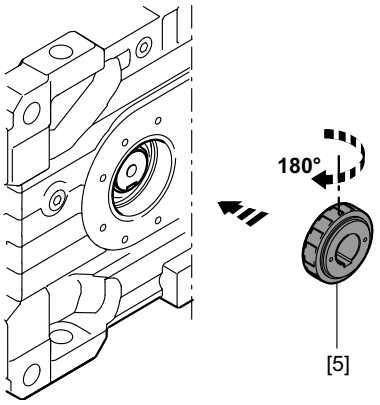
5. Turn the inner ring [5] with cage and sprags by 180° and reinstall it. When installing the backstop, do not apply pressure to the cage with the sprags but only to the inner ring [5].



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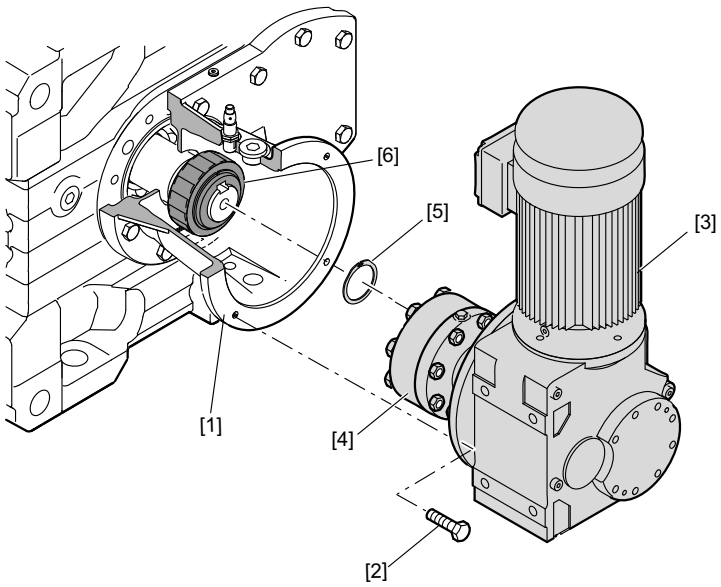
6. When reinstalling the backstop, slightly turn it in freewheeling direction so that the sprags slide into the outer ring more easily.

INFORMATION

In order to facilitate the process, you may fixate the sprags with a rubber band or a cable tie. This will make it easier to slide the inner ring with cage and sprags into the outer ring.

7. Secure the inner ring [5] on the shaft [6] using the the retaining ring [4].
8. Install the spacer tube [3] and the bearing cover [2] in reverse order. Thoroughly seal the parting line between the bearing cover [2] and the gear unit housing.
9. Alter the direction arrow on the gear unit housing.
10. Fill the gear unit with oil and check the oil level.
11. After assembly, check that the backstop runs smoothly.

5.6 Drives with freewheeling clutch



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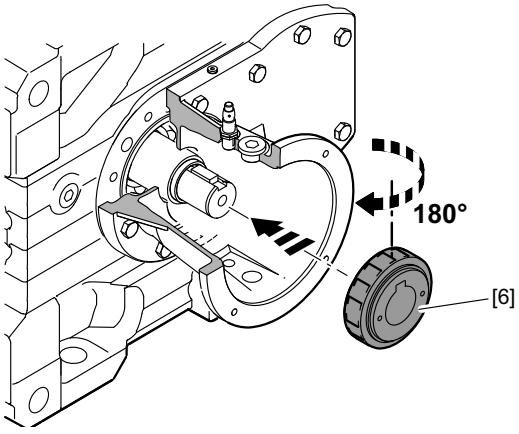
1. Drain the oil from the auxiliary drive adapter. Observe section "Notes on installation (page 17)".
2. Loosen the connection screws [2] between auxiliary drive [3] and auxiliary drive adapter [1] and remove the auxiliary drive [3] with the freewheeling clutch [4].
3. Remove retaining ring [5], and inner ring [6] with cage and sprags. When removing the backstop, do not apply pressure to the cage with the sprags but only to the inner ring [6]. Use the tapped holes on the inner ring [6] of the backstop.
4. Turn the inner ring [6] with the sprags 180° and reinstall it.



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5. Secure the inner ring [6] on the shaft with the retaining ring [5].
6. Install the auxiliary drive [3] on the auxiliary drive adapter [1] using the retaining screws [2]. If possible, slightly turn the auxiliary drive [3] in the freewheeling direction. This will make it easier to slide the outer ring of the freewheeling clutch [4] over the sprags. In order to prevent damage to the freewheeling clutch [4], make sure not to tilt the auxiliary drive [3] during assembly. Seal the parting line between the auxiliary drive [3] and the auxiliary drive adapter [1].
7. Alter the direction arrow on the auxiliary drive [3].
8. Fill the auxiliary drive adapter [1] with oil and check the oil level of the gear unit.
9. After assembly, check that the freewheeling clutch runs smoothly.

6 Startup

6.1 Startup for drives with backstop

⚠ NOTICE

Improper startup may result in damage to the gear unit.

Possible damage to property

- Before startup, check that the oil level is correct. Refer to the unit's nameplate for lubricant fill quantities.

⚠ NOTICE

Operating the motor in the blocking direction might destroy the backstop.

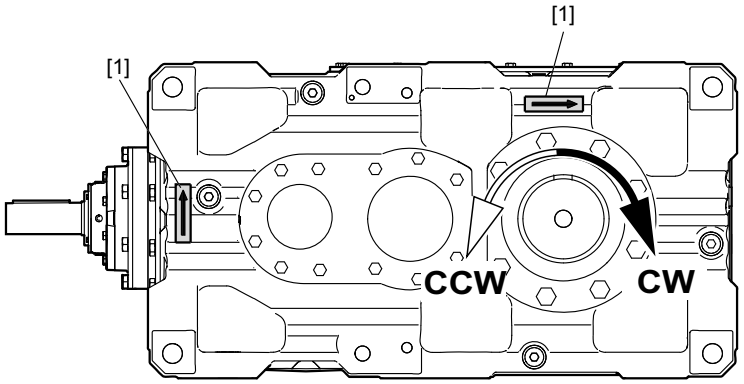
Possible damage to property

- The motor may not be operated in blocking direction. Ensure a correct voltage supply to the motor, so that it rotates in the required direction. Operating the motor in blocking direction might destroy the backstop.
- Observe the "Addendum to the operating instructions" when you change the blocking direction.

The direction of rotation is specified as viewed onto the output shaft (LSS):

- Clockwise (CW)
- Counterclockwise (CCW)

The permitted direction of rotation [1] is indicated on the housing.



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6.2 Startup for drives with backstop, auxiliary drive and freewheeling clutch

6.2.1 Notes

⚠ WARNING

Overspeed may destroy the auxiliary drive

Severe or fatal injuries.

- Consult SEW-EURODRIVE if you want to change the direction of rotation.

- Check the correct direction of rotation of the bevel-helical gear unit and make sure that the auxiliary drive does not rotate in operating direction.
- Before connecting the main drive and the auxiliary drive, determine the rotating field of the three-phase mains using a phase-sequence indicator. Check as to whether both drives are connected according to the direction of rotation.
- Make sure that it is not possible to operate the main drive against the blocking direction of the bevel-helical gear unit. Observe the direction arrow on the bevel-helical gear unit.
- Interlock the main drive and the auxiliary drive so that only one of the two motors can be switched on.
- Check the disconnection function of the speed control.
- Make sure that the auxiliary drive is not overloaded. The auxiliary drive may only be operated with the output torque rates indicated in the order documents.
- Make sure that the rotary motion of the input shaft of the bevel-helical gear unit is not obstructed during auxiliary drive operation (e.g. maintenance). A brake on the input side of the main drive must be released for auxiliary drive operation.

6.2.2 Startup sequence

Adhere to the following startup sequence:

1. Startup of the auxiliary drive
2. Startup of the speed monitor
3. Startup of the main drive

INFORMATION

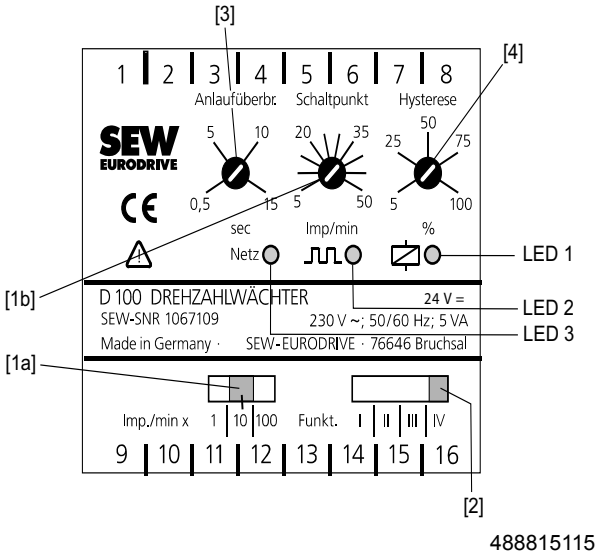
Always adhere to the startup sequence as this is a prerequisite for safe startup.

6.2.3 Starting up the auxiliary drive

Make sure that the rotary motion of the input shaft of the bevel-helical is not obstructed during auxiliary drive operation. A brake on the input side of the main drive must be released for auxiliary drive operation.

6.2.4 Starting up the speed monitor

Setting the functions



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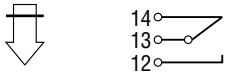
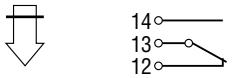
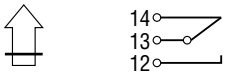
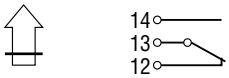
[1a] [1b] Switching speed
[2] Switching function
[3] Starting lag
[4] Hysteresis

LED 1 = lights up when relay has picked up
LED 2 = signals input pulse
LED 3 = shows correct operating voltage

Function	Description	Setting
Switching speed [1a] [1b]	Allows to exactly set the desired value • Rough adjustment with step switch (1, 10, 100) • Fine adjustment with potentiometer (5 ... 50)	Step switch [1a] **"10"** Potentiometer setting [1b] **"7"** Switching speed = 10 x 7 = **70 pulses/min**
Switching function [2]	Definition of the switching function: • Overrun or underrun of the switching speed • Relay setting for an overrun or underrun	Switching function **IV**
Starting lag [3]	Possibility to bypass signal evaluation during start (irrelevant for switching function IV)	Set to lowest value (= **0.5 s**)
Hysteresis [4]	Difference between the switch-on and switch-off point of the relay.	Set to lowest value (= **5%**)

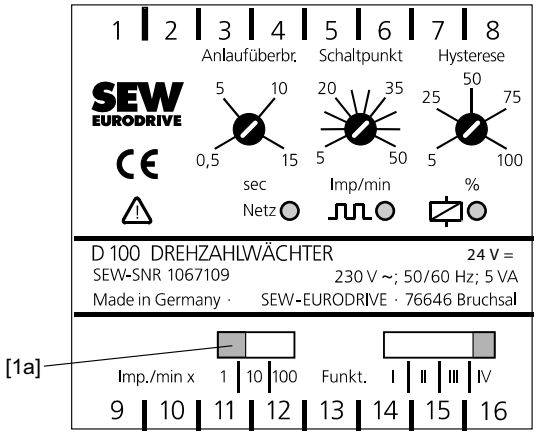
Overview of possible switching functions:

Switching function [2]	Relay position		
	when speed is		for normal operation and start bypass
	exceeded	too low	
I			
II			
III			
IV			

INFORMATION

Integrate the speed monitor into the system circuitry so that the power supply to main drive and auxiliary drive is interrupted if the preset switching speed is overrun.

Operational check of the speed monitor



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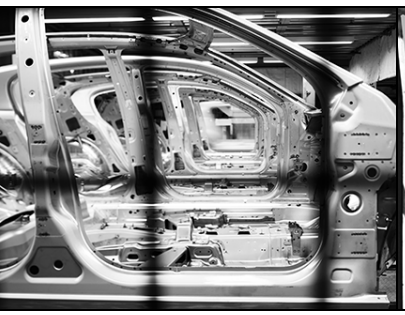
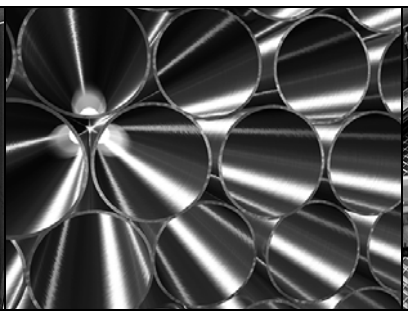
1. Switch on the auxiliary drive of the bucket elevator drive.
2. Set the step switch for setting the switching speed [1a] from "10" to "1" for a short time (the switching frequency is reduced from 70 to 7 pulses/min).
3. The speed monitor recognizes a speed overrun, the output relay picks up → the operational check is successful if the power supply to the main drive and the auxiliary drive is interrupted.
4. After a successful operational check, set the step switch for setting the switching speed [1a] back to "10" (the switching frequency is increased from 7 to 70 pulses/min).

6.2.5 Starting up the main drive

Before starting up the main drive, determine the rotating field of the three-phase mains using a phase-sequence indicator. Make sure, that it is not possible to operate the main drive against the blocking direction of the bevel-helical gear unit. Observe the direction arrow on the bevel-helical gear unit.



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