



SP⁺ The New Generation
MF Version (oil-lubricated)
for use in area with explosion hazards

Operating manual and information on explosion protection



alpha

MOTOR TECHNOLOGY LTD
MOTEC HOUSE, CHADKIRK BUSINESS PARK,
STOCKPORT, CHESHIRE SK6 3NE
ENGLAND

TEL: +44 (0)161 217 7100
FAX: +44 (0)161 217 7101
eMAIL: [info @ controlinmotion.com](mailto:info@controlinmotion.com)
WEB: www.controlinmotion.com



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1.1 Service contact

Please contact our technical service department
if you have any technical questions:

Tel.: +49 (0) 79 31 / 493-900

Fax: +49 (0) 79 31 / 493-903

E-Mail: service@alphagetriebe.de

Address:

alpha getriebebau GmbH

Walter-Wittenstein-Str. 1

97999 Igersheim, Germany

2 General Information

2.1 Description, designations

The low-backlash planetary gear reducer SP⁺ (subsequently termed gear reducer) is constructed in the "M" (motor-mounted) version as standard.

Please observe all instructions pertaining to explosion protection (see [3.3.1](#))!

2.2 Whom is this manual addressing?

This manual addresses all persons who install, operate, or maintain this gear reducer for areas with explosion hazards.

They may only carry out work on the gear reducer if they have read and understood this operating manual. Please pass the safety instructions on to other persons as well.

2.3 Which signs and symbols are referred to in this manual?

➔ An "action instruction" requires you to carry out an action.

▽ With a "check" you can determine whether the device is ready for the next work stage.

☺ A "usage tip" shows you an option for facilitating or improving operations.

The safety instructions symbols are described in the [3 "Safety"](#) section.

2.4 Exclusion of liability

The manufacturer does not accept liability for damage or injury ensuing from improper handling of the gear reducer.

2.5 Modifications, reconstructions

Modifications or reconstructions of the gear reducer may only be carried out with the express written authorisation of **alpha getriebebau**.

2.6 EC directive for devices and protective systems in areas with explosion hazards

Within terms of the EC machinery directive 94/9 EC, the gear reducer is not considered as an autonomous machine, but as a component to install in machines.

You will find a written certificate of this gear reducer's conformity in the appendix.

Operation is prohibited within the area of validity of the EC directive until it has been determined that the machine in which this product is installed corresponds to the regulations within this directive.

2.7 Technical modifications

alpha getriebebau reserves the right of carrying out technical modifications to improve the product.

2.8 Copyright

© 2004, **alpha getriebebau** GmbH

3 Safety

3.1 Intended use

The gear reducer is designed for industrial applications. Its purpose is the transmission and conversion of speeds and torques. The gear reducer is designed to be used in industrial systems. The gear reducer can be used in areas with explosion hazard group II, zones 1 and 2, and zones 22 and 21, thus in the device categories 2 and 3. The gear reducers can be operated in a gas atmosphere in temperature class T3 (>200 °C). In dust atmosphere, a maximum surface temperature of 150 °C is possible. The instructions on the identification plate and the systems must be observed in terms of the written certificate of conformity.

The gear reducer is manufactured and declared applying EN 13463-1 standards and the 94/9/EC directive for use in an area with explosion hazard.

- It is imperative that you observe the restrictions of speeds and torques (see [Table 4.3](#)).
- Please consult our technical service department (see [1.1](#)) if you have any questions or need explanations.

3.2 Improper use

Any use transgressing the above-named restrictions (especially ignoring the regulations on explosion protection, higher torques and speeds) is not compliant with the regulations, and thus prohibited.

The operation of the gear reducer is prohibited if:

- it was not mounted according to regulations (e.g., securing the motor),
- it was not installed according to regulations (e.g., fastening bolts),
- the gear reducer is very soiled,
- it is operated without lubricant,
- the temperature class of the gear reducer specified on the rating plate lies above the ignition temperature of the occurring combustible gases and dust-air mixtures,
- leakage or unusual running noises occur.

3.3 Safety Instructions

The following symbols are used in this operating manual to warn you of hazards:



DANGER!

This symbol warns you of danger of injury to yourself and others.



Attention

This symbol warns you of the risk of damage to the gear reducer.



Environment

This symbol warns of environmental pollution risk.

3.3.1 General safety instructions

Working on the gear reducer



DANGER!

Improperly executed work can lead to injury and damage.

- Make sure that the gear reducer is only installed, maintained, and dismantled by trained technicians.



DANGER!

Impurities spinning through the air can cause grave injury.

- Before putting the gear reducer into operation, check that there are no impurities or tools near the gear reducer



Attention

Loose or overloaded screw connections can cause damage.

- Tighten and check all screwed connections for which a tightening torque is specified, on principle with a calibrated torque wrench.
- **Never** use the gear reducer or the motor as a step, climbing aid, or fastening point.

Operation**DANGER!**

Touching hot surfaces can lead to burns.

- ➔ Do not touch the gear reducers if their operating temperatures are too high, or use suitable safety equipment (e.g. gloves).

**DANGER!**

Moving machinery may lead to injury. There is danger of being trapped or pulled in!

- ➔ Keep a sufficient distance to moving machinery.

Maintenance**DANGER!**

An unintentional start of the machine during maintenance work can lead to serious accidents.

- ➔ Ensure that no one can start the machine while you are working on it.

**DANGER!**

Even only briefly running the machine during maintenance work can lead to accidents if the safety devices are not operating.

- ➔ Check that all safety devices are mounted and activated.

Lubricants**Environment**

Lubricants (oils and greases) are hazardous substances that can contaminate soil and water.

- ➔ Collect drained lubricant into suitable receptacles and dispose of it according to the valid national guidelines.

Explosion protection**DANGER!**

Ignoring the explosion protection regulations may lead to serious accidents.

- ➔ Make sure that the gear reducer is only used in those areas for which it is permitted according to the identification plate:
 - temperature class,
 - group,
 - device category and
 - max. speed and torque.

**DANGER!**

Only inspected, original parts can guarantee protection against explosions.

- ➔ Only use parts that are subject to wear and replacement parts from **alpha getriebebau**.

3.4 In case of fire

The gear reducer itself is non-flammable. However, there is usually synthetic gear oil (polyglycol) inside.

- ➔ Please observe the following instructions if the gear reducer is situated in a burning environment.

3.4.1 Suitable extinguishing agents, safety equipment

Powder, foam, fog, in certain cases carbon dioxide

**DANGER!**

High temperatures produce irritating steam.

☞ Use a protective breathing apparatus.

3.4.2 Unsuitable extinguishing agents

Do not spray with water!

3.4.3 Additional Information**Environment**

☞ Prevent the penetration of the lubricant into drains, sewers, and water resources.

☺ For additional information on TRIBOL 800/220 gear unit oil, refer to:

Castrol Industrie GmbH, Mönchengladbach

Tel.: +49 (0) 2161 / 909-30

4 Technical Specifications**4.1 Design**

The gear reducers are constructed as one- or two-stage planetary gear reducers.

The gear reducer is supplied in the “M” motor-mounted version as standard.

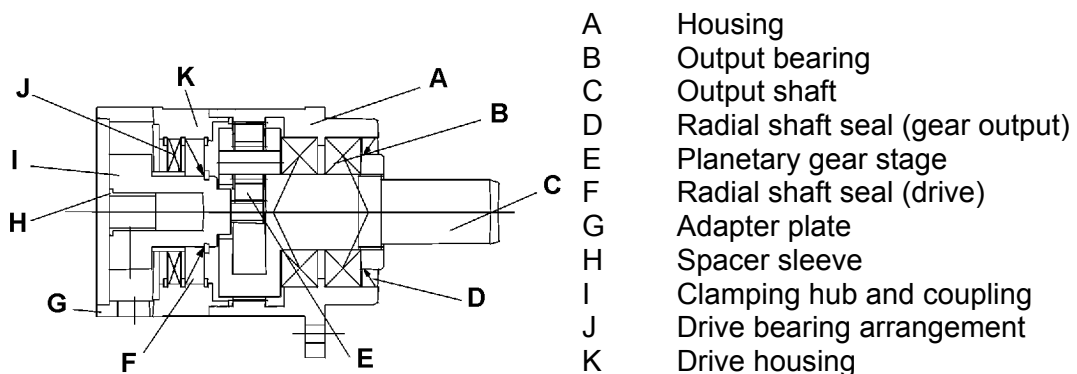
4.1.1 “M” motor-mounted

Fig. 4.1

The output shaft bearing is designed to receive high external tilting moments and axial forces. The “M” version gear reducers are factory-filled with lubricant; gear input and output sides are sealed with radial shaft sealing rings.

The clamping hub enables a quick and easy mounting of the motor. Motor centring is performed:

- by means of the clamping hub / coupling for gear reducers up to construction size SP⁺100 and up to motor shaft diameter of 24 mm,
- and in addition by means of the centring collar of the motor for larger gear reducers and motor shaft diameters.

The motor can thus be mounted without radial distortion.

4.2 Weight

You will find the weights of the standard gear reducers with medium-sized adapter plate in Table 4.1. If another adapter plate is mounted, the actual weights can deviate by up to 10%.

Weight [kg]					
Gear re-ducer size SP ⁺	060	075	100	140	180
Stages					
1	1.9	3.9	7.7	17.2	34
2	2.0	3.6	7.9	17.0	36.4

Table 4.1

4.3 Lubricant quantity and types



Attention

Lubricant change must be performed according to the maintenance schedule.

- ☞ Release the fastening bolts of the adapter plate **only** for lubricant change. These bolts also hold the housing together.

All gear reducers are filled by the manufacturer with synthetic gear oil (polyglycols). The filled lubricant (standard TRIBOL 800/220) and the required lubricant quantities are specified in the Table 4.2 and also on the type plate.

Filling quantity [ccm]															
Ratio	03	04	05	07	10	16	20	25	28	35	40	50	70	100	
SP ⁺ 060	21					46									
SP ⁺ 075						85									
SP ⁺ 100	95					160						155			
SP ⁺ 140	280	270			450	440		430		420					
SP ⁺ 180	560			500		1000									

Table 4.2

Divergent operating conditions may make different lubricant quantities and different lubricants necessary.

- ☺ In these cases, please consult our technical service department (see [1.1](#)).

4.4 Performance statistics

Based on test results, all maximum torques (T_{2B}) and all speeds are reduced in relation to the SP+ standard. The medium torque is maintained. The shaft loads are also reduced in relation to the standard SP+ gear reducer. See Table 4.3.

Gear reducer size SP+		060	075	100	140	180
T_{2B} [Nm]	remaining	$0.8 \times T_{2B}$	$0.8 \times T_{2B}$	$0.8 \times T_{2B}$	$0.8 \times T_{2B}$	$0.8 \times T_{2B}$
	3/10/100	$0.7 \times T_{2B}$	$0.7 \times T_{2B}$	$0.7 \times T_{2B}$	$0.7 \times T_{2B}$	$0.7 \times T_{2B}$
T_{2N} [Nm]	remaining	26	75	170	360	550
	3/10/100	17	47	110	215	550
n_{1max} [1/min]	1 stage	4500	3400	2900	2500	2000
	2 stage					2300
$n_{1N}^*)$ [1/min]	3	1800	1600	1350	1150	800
	4	1850	1650	1400	1200	850
	5	1900	1700	1450	1200	850
	7	2450	1900	1700	1600	1400
	10	2600	2000	1800	1700	1500
	16-40	2900	2300	2000	1900	1750
	50	3100	2500	2300	2100	1900
	70	3600	3000	2700	2100	2100
	100	3600	3000	2700	2500	2100
M_{2KMax} [Nm]		98	165	340	660	1120
F_{2RMax} [N]		1890	2800	4400	6600	10290
F_{2AMax} [N]		1680	2350	3950	6900	9900

Table 4.3

*) Reduce the medium speed n_{1N} by 20% for the mounting position V1 (see Fig. 4.2).

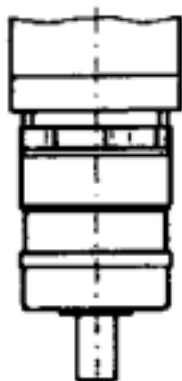


Fig. 4.2

➔ If values are divergent, please consult our technical service department (see [1.1](#)).



DANGER!

When technical specifications have been changed, operation in an area with explosion hazard is prohibited without consulting the department!

4.5 Identification plate, ordering key

Type Plate

The identification or type plate is located on the gear reducer housing.

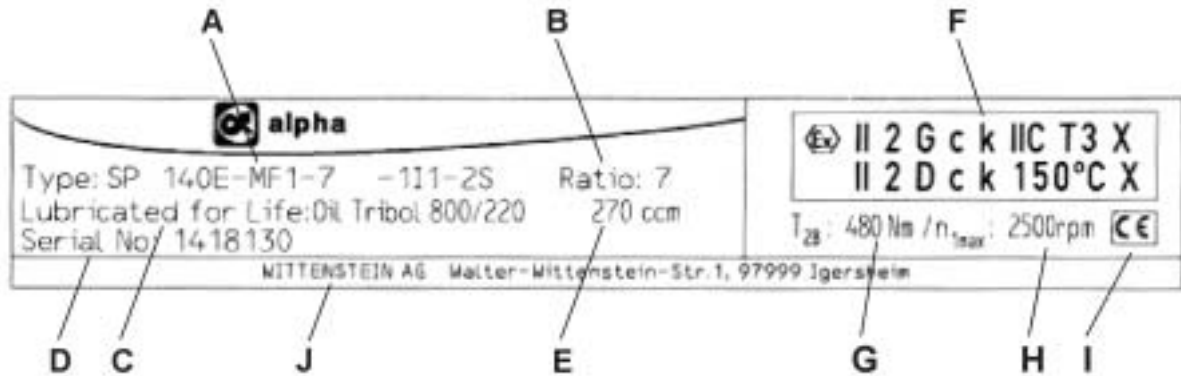
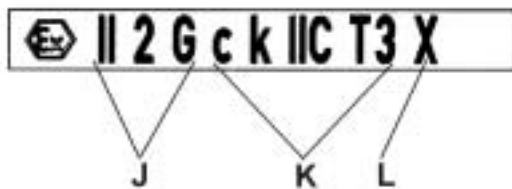


Fig. 4.3

The following specifications can be found on the type plate:

- A Ordering key
- B Ratio (e.g.: 7)
- C Lubricant (e.g. Tribol 800/220)
- D Serial number (e.g.: 1418130)
- E Lubricant quantity: (e.g. 270 ccm)
- F Atex identification
- G Maximum permitted gear output torque T_{2B} (e.g. 480 Nm)
- H Maximum permitted drive speed n_{1max} (e.g. 2500 rpm)
- I CE identification
- J Name and address of manufacturer

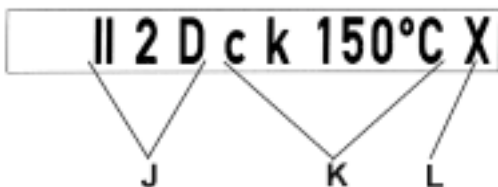
Atex identification in gas atmospheres with explosion hazard



- J Group, category: II 2 G
- K Type of ignition protection, explosion group, temperature class: e.g. c k IIC T3
- L Ambient temperature: X ($0\text{ °C} \leq T_a \leq +40\text{ °C}$)

Fig. 4.4

Atex identification in dust-air atmosphere with explosion hazard



- J Group, category: II 2 D
- K Type of ignition protection, max. surface temperature: e.g. c k 150 °C
- L Ambient temperature: X ($0\text{ °C} \leq T_a \leq +40\text{ °C}$)

Fig. 4.5

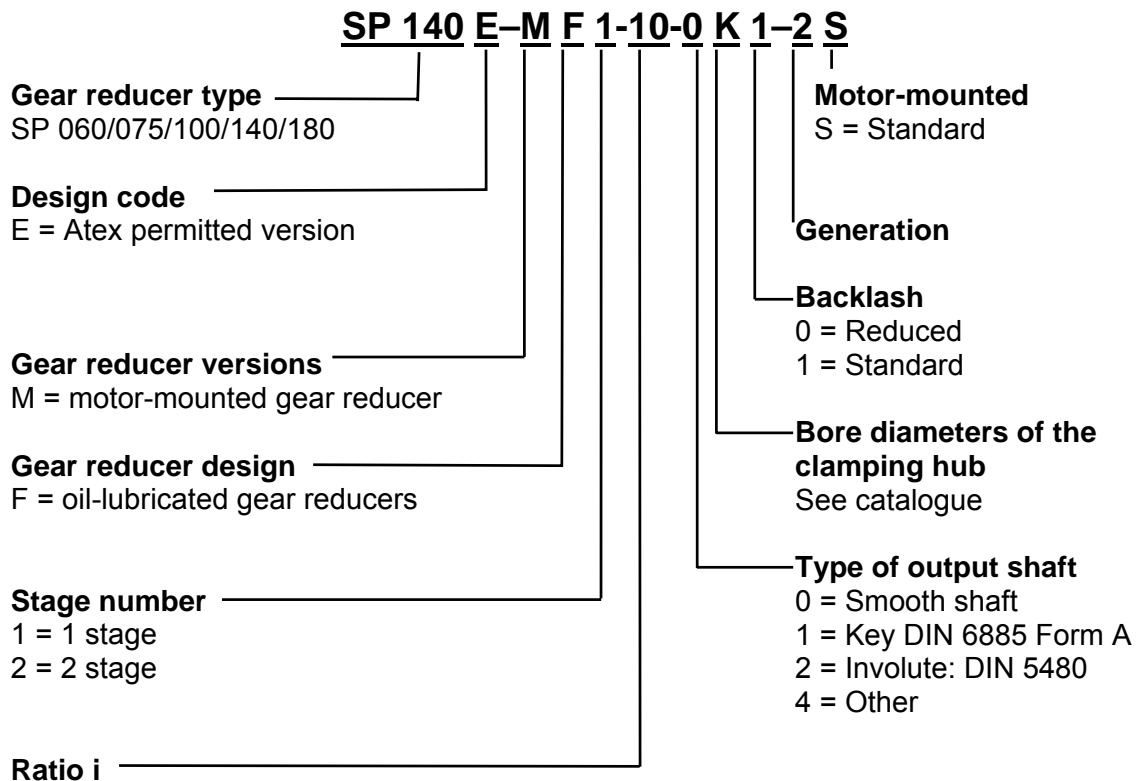
Ordering key

Fig. 4.6: Ordering key

4.6 Dimensioning**DANGER!**

Erroneous dimensioning and inspection may lead to loss of explosion protection.

☞ Please observe all instructions in this chapter

- ☞ Adopt the construction according to specifications in the “Technical Basics” catalogue or consult **alpha getriebebau** GmbH.
- ☞ When dimensioning for a cycle duty operation, check the medium torque and the medium speed **extra** according to the dimensioning criteria for continuous duty operation.
- ☞ Note the reduced output specifications in construction according to [Table 4.3](#).
- ☞ Please consult our technical service department if you have any queries (see [1.1](#)).
- ☞ Note the instructions in chapter [8.3.7 “Replacing gear reducer”](#), if the calculated **storage life is under 20,000 h**.
- ☞ Prevent gear reducer overloading through the motor by limiting motor current and motor speed.
- ☞ Clarify the chemical stability of the gear reducer for every individual operation so as to avoid a premature failure of a shaft seal or corrosion on the gear reducer.

Inspection

The following protection classes (according to DIN 40050) are required between the connection of motor and gear reducer:

- in dust atmosphere IP6x,
- in gas atmosphere IP2x and
- in gas atmosphere in moist surroundings IP54.

5 Delivery Status, Transport, Storage

5.1 Delivery status

The gear reducers are packed in film and boxes. The film and boxes can be recycled. All gear reducers are treated with an anti-corrosion agent at the gear input and output. All gear reducers are filled with lubricant during manufacture.

5.2 Transport

No special direction or position is prescribed to transport the gear reducer. The weight of the gear reducer ranges from 1.9 to 36.4 kg. You can find an assignment to the gear reducer sizes in [Table 4.1](#) in Chapter [4.2 "Weight"](#).

5.2.1 Transport using hoisting equipment



DANGER!

Falling loads or breakage of sling equipment (e.g. ropes, chains, cables) may cause injury.

- ➔ Do not stand under suspended loads.
- ➔ Keep as safe a distance as possible from sling equipment.



Attention

Falling or hard dropping can damage the gear reducer.

- ➔ Only use hoisting and securing equipment (e.g. ropes, chains, cables) which is permitted for the size / weight of your gear reducer.
- ➔ Ensure that the load is slowly and carefully handled and placed.

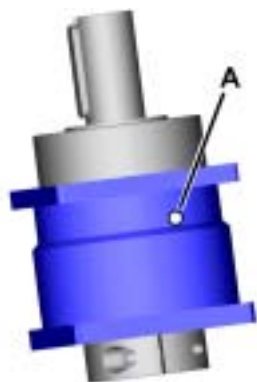


Fig. 5.1

Gear reducers from the SP⁺180 size upwards have support bores (A) for ring screws (e.g. according to DIN 580) in the gear unit housing (Fig. 5.1).

Gear reducer size SP ⁺	Thread diameter x depth [mm]
180	M8 x 14

Table 5.1

5.3 Storage

The gear reducer can be stored dry and in a horizontal position in the original packing for a maximum of 2 years at a temperature between 0 °C and +30 °C. For storage logistics, we recommend the "first in - first out"-principle".

6 Mounting, Start-up

- ➔ Please observe the instructions in Chapter [3.3.1 “General safety instructions”](#).

6.1 Preparing mounting

All gear reducers are treated with an anti-corrosion agent at the gear input and output.

- ➔ Before mounting the gear reducer, remove any trace of anti-corrosion agent. Use a clean cloth moistened with a suitable cleaning agent (fat dissolving but non-aggressive).



Attention

Pressurised air can damage the gear reducer seals, and thus lead to leakage.

- ➔ Do not blow out the flanges with pressurised air when cleaning.

Four through-holes are available in the gear reducer housing for mounting it onto your machine ([Table 6.1](#)).

- ➔ Do **not** use washers (e.g. plain washers, tooth lock washers).

Through-holes in gear reducer housing				
Gear reducer size SP ⁺	Bore Ø	Quantity x Diameter	For bolt size / property class	Tightening torque
	[mm]	[] x [mm]		[Nm]
060	68	4 x 5.5	M5 / 12.9	9.7
075	85	4 x 6.6	M6 / 12.9	16.5
100	120	4 x 9.0	M8 / 12.9	40
140	165	4 x 11.0	M10 / 12.9	81
180	215	4 x 13.0	M12 / 12.9	140

Table 6.1

6.2 Installation conditions

- ➔ Provide a metallic frame for connection of the gear reducer.

6.3 Earth

- ➔ Provide an electro-static earth in the areas of the motor gear and gear-gear connection, so as to prevent any static charge that may arise.

6.4 Motor-mounted

The motor must show at least the same temperature class as the gear reducer. We recommend temperature class T4 and higher, because the gear reducer may not be allowed to heat up to over 90 °C in normal conditions. The gear reducer can be heated additionally through heat connection of the motor, and thus reach a higher housing temperature than 90 °C. The operation of our gear reducer in explosion-risk areas would therefore no longer be guaranteed.

6.4.1 General Information on motor mounting

If the gear reducer is not delivered with an attached motor, it is to be motor-mounted.

The motor to be mounted must:

- correspond to the B5 design,
- have a radial and axial runout tolerance of “N” according to DIN 42955 and
- if possible, have a smooth shaft.



Attention

Distortion can damage the motor and the gear reducer.

- ➔ Ensure that the motor is mounted in a vertical position.

6.4.2 Tools for tightening the clamping hub

The clamping bolts M4 to M8 can be tightened through the mounting bore of the adapter plate using a square ¼ inch socket spanner.

For clamping bolt M10, a ⅜ inch square socket spanner must be used, for M12 and M16, a ½ inch square socket spanner. In addition, calibrated torque wrenches are needed for the respective torque range (Table 6.2).

6.4.3 Mounting the motor

➔ If the motor shaft has a feather key, remove the feather key. If recommended by the motor manufacturer, apply a half wedge.

A clamping hub connects the motor shaft and the gear input shaft. A slotted spacer sleeve is used extra for certain motor shaft diameters and applications (see Fig. 6.1).

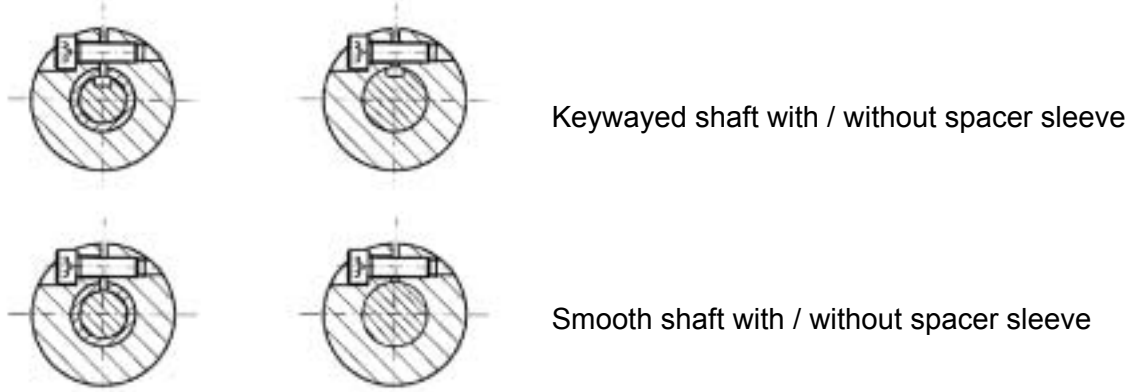


Fig. 6.1

- ➔ Remove the plug from the mounting bore in the adapter plate.
- ➔ Clean the plane fitting surfaces of the motor and gear reducer with a clean cloth.
- ∇ Check the separating surfaces for impurities and damage.
- ➔ Do not put any devices into operation that show evidence of damage.
- ➔ Clean the motor shaft, the clamping hub bore hole, and, if required, the spacer sleeve with a clean cloth.
- ∇ Take care that the slot of the spacer sleeve is positioned coincident to the slot of the clamping hub.
- ➔ Turn the clamping hub so that the clamping screw is positioned coincident to the mounting hole in the adapter plate.



Attention

Excessively high axial forces may damage the motor and gear reducer.

- ➔ Ensure that the axial forces that occur are not higher than the values specified in [Table 6.2](#).
- ➔ Note that different axial forces are at work with the “coupling” option ([Table 6.2](#)) than with the standard “clamping hub” application. When mounting the motor, never support it on the front surface of the coupling.

Specifications for the “M” version

Gear reducer size SP ⁺	Clamping hub interior Ø “x” [mm]	Clamping screw DIN 912-12.9	Width across flats [mm]	Tightening torque [Nm]	max. axial force [N]		
					Clamping hub	Coupling	
060	1 stage	x ≤ 11	M4	3	4,95	80	10
		11 < x ≤ 14	M5	4	9,7		
		14 < x ≤ 19	M6	5	16,5		
060	2 stage	x ≤ 11	M4	3	4,95	80)* ¹
		11 < x ≤ 14	M5	4	9,7		
075	1 stage	x ≤ 14	M5	4	9,7	100	20
		14 < x ≤ 19	M6	5	16,5		
		19 < x ≤ 24	M8	6	40		
075	2 stage	x ≤ 11	M4	3	4,95	100	10
		11 < x ≤ 14	M5	4	9,7		
		14 < x ≤ 19	M6	5	16,5		
100	1 stage	x ≤ 19	M6	5	16,5	100	30
		19 < x ≤ 24	M8	6	40		
		24 < x ≤ 38	M10	8	81		
100	2 stage	x ≤ 14	M5	4	9,7	100	20
		14 < x ≤ 19	M6	5	16,5		
		19 < x ≤ 24	M8	6	40		
140	1 stage	x ≤ 24	M8	6	40	150	50
		24 < x ≤ 38	M10	8	81		
		38 < x ≤ 48	M12	10	140		
140	2 stage	x ≤ 19	M6	5	16,5	150	30
		19 < x ≤ 24	M8	6	40		
		24 < x ≤ 38	M10	8	81		
180	1 stage	x ≤ 38	M10	8	81	190	190
		38 < x ≤ 48	M12	10	140		
180	2 stage	x ≤ 24	M8	6	40	190	50
		24 < x ≤ 38	M10	8	81		

)*¹ = on demand

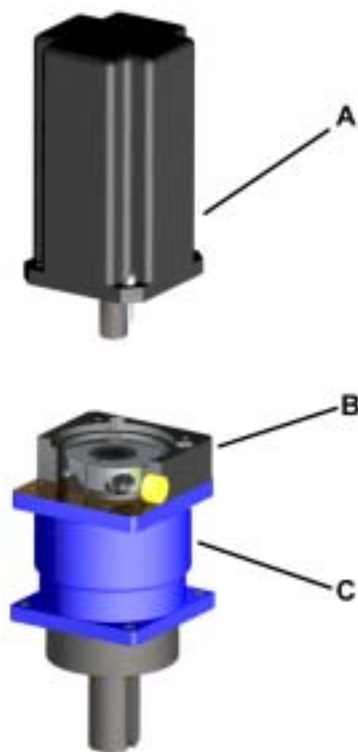
Table 6.2



Attention

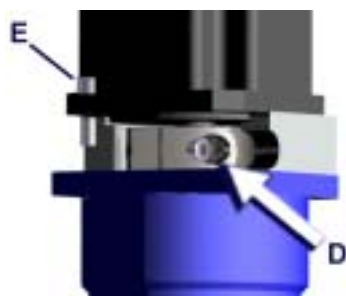
Motors with

- shaft shoulder,
 - distinctive chamfer radius, or
 - longer shafts than are permitted for the gear in question lead to distortions in mounting, which damage the motor and the gear reducer.
- ➔ Check the interfering edges by measuring, or by a measurement check based on our catalogue specifications and the information of the motor manufacturer.
- ➔ Please consult our service department to obtain a wider adapter plate or an intermediary flange.



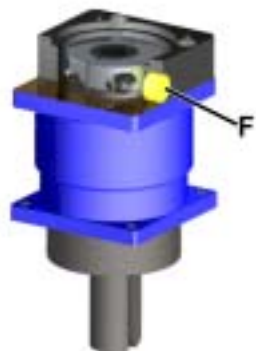
- ➔ Position the motor so that the plane surfaces fit together (Fig. 6.2).
- ▽ Ensure that the motor allows itself to be moved into position “easily”.
- ▽ There is to be no gap between the motor (A), adapter plate (B), and gear reducer (C).

Fig. 6.2



- ➔ Coat the bolts (E) with screw-bonding agent (e.g. Loctite 243), and screw the motor to the adapter plate.
- ➔ Turn screw (D) in the clamping hub to the tightening torque ([Table 6.2](#)).

Fig. 6.3



- ➔ Screw plug (F) into the mounting bores of the adapter plate ([Table 6.3](#)). Take care to use the prescribed tightening torque.

Width across flats [mm]	5	8	10
Tightening torque [Nm]	10	35	50

Table 6.3

Fig. 6.4

6.5 Mountings on the output side

- ➔ Thoroughly clean the output shaft, centring, and fitting surface with a clean cloth.

6.5.1 Mountings on the output shaft



Attention

Distortions during mounting operations can damage the gear reducer.

- ➔ Mount gearwheels and toothed belt pulleys onto the output shaft without forcing.
- ➔ Do not on any account attempt an assembly by force or hammering.
- ➔ Only use suitable tools and equipment.
- ➔ When shrink-fitting or pulling on a gear onto the output shaft: ensure that the maximum static axial forces of the output bearing ([Table 6.4](#)) are not exceeded.

Gear reducer size SP ⁺	060	075	100	140	180
F _{amax} [N]	9250	10750	18500	31250	49750

$$s_0 = 1.8 \quad F_r = 0$$

Table 6.4

6.6 Mounting the gear reducer onto your machine

- ☺ Mount the gear reducer in such a way that the type plate remains legible.
- ➔ Coat the four screws with screw-bonding agent (e.g. Loctite 243), and screw the gear unit housing and your machine together.
- ☺ You can find the prescribed screw sizes and tightening torques in [Table 6.1](#).

6.7 Startup

- ➔ Before initial operation, check that the identification type of the gear reducer corresponds to the actual conditions of usage:
 - temperature class and surface temperature,
 - group,
 - device category and
 - max. speed and torque.
- ➔ Check the gear reducer for possible damage, especially the radial shaft seal on drive and output.



DANGER!

Damaged devices cannot guarantee explosion protection!

- ➔ **Never** operate damaged or abnormally running or sounding gear reducers in an area of explosion hazard.

- ➔ Please observe the instructions in Chapter [3.3.1 “General safety instructions”](#)

6.8 Running-in behaviour

- ➔ After 4 running hours, check the gear reducer in max. operating conditions for leakage between gear and motor and on the output shaft seal.
- ➔ Measure the surface temperature on the drive flange (A) and on the housing (B) ([Fig. 6.5](#)). Consult our technical service department (see [1.1](#)), if the temperature exceeds +90 °C.

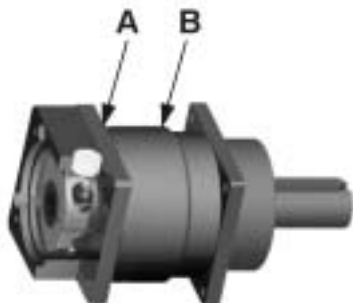


Fig. 6.5

Increased running noises may be caused by faulty motor mounting.

- ➔ If so, mount onto motor again according to the operating instructions, or consult our technical service department (see [1.1](#)).

7 Operation

7.1 Operating conditions

The ambient temperature may not be under 0 °C and not over +40 °C.

The surface temperature on the housing may not exceed +90 °C during normal operation.

Motor

For safety reasons, we recommend switching off the drive power if the temperature lies 10K above the usual operating temperature when monitoring the motor temperature.

- ➔ If this so, check the drive chain for possible faults.
- ➔ Please observe the instructions in Chapter [3.3.1 “General safety instructions”](#).

Gear reducer

The gear reducer must be installed in a clean and dry environment. Coarse dust and liquids of all kinds impair its function.

- ➔ In these cases, please consult our technical service department (see [1.1](#)).

8 Maintenance

8.1 Shutdown, preparation

- Please observe the instructions in Chapter [3.3.1 “General safety instructions”](#).
- Shut down the machine that contains the gear reducer.
- Disconnect the machine from the mains before starting maintenance work.

8.2 Inspection schedule

Maintenance work / see Chapter	Maintenance periods			
	At start-up	After running-in (4 hours)	After every 500 operating hours or 3 months	Every 10,000 oper- ating hours
Visual inspection / Chapter 8.3.1	X	X	X	-
Checking the tighten- ing torques / Chapter 8.3.2	X	X	X	-
Temperature meas- urement on housing / Chapter 6.8	-	X	-	-
Checking for leakage / Chapter 8.3.3	-	-	X	-
Exchanging the radial shaft seal on drive ^{1) 2)} Chapter 8.3.4	-	-	-	X
Changing drive unit Chapter 8.3.4	-	-	-	X
Exchanging the radial shaft seal on gear output Chapter 8.3.5	-	-	-	X
Performing oil change Chapter 8.3.6	-	-	-	X
Gear reducer replacement after reaching 90% of the calculated nominal storage life, but at the latest after 20,000 operating hours! (see Chapter 8.3.5)				

Table 8.1

¹⁾ When ratio is $i = 3$, the entire drive unit must be replaced.

²⁾ For use in continuous duty operation S1 - consult **alpha getriebebau**.

Dust atmosphere



DANGER!

When opening up the Ermeto coupling, dust could collect on the adapter plate and catch fire during later operation.

- Please ensure that **no** explosive dust-air mixture is present before opening the Ermeto coupling or dismantling the motor.

8.3 Maintenance work

8.3.1 Visual inspection / dusting off

- ➔ Check the entire gear reducer by carrying out a thorough visual inspection for exterior damage.
- ➔ Dust off the housing. Make sure that the deposit of dust layers on the housing does not exceed a layer thickness of 5 mm.
- ➔ Check the gear reducer for unusual running noises during operation.
- ☺ Please contact our technical service department if you have any technical questions (see [1.1](#)).

8.3.2 Checking the tightening torques

- ➔ Check the tightening torque of the fastening bolts on the gear unit housing.
- ☺ You can find the prescribed tightening torques in [Table 6.1](#).
- ➔ Check the tightening torque of the clamping bolt on the motor mounting ([Table 6.2](#)).

8.3.3 Checking for leakage

- ➔ Check the gear output radial shaft seal for leakage.
- ➔ Look for external emission of oil from the drive.



DANGER!

When opening up the Ermeto coupling, dust could collect on the adapter plate and catch fire during later operation.

- ➔ Please ensure that **no** explosive dust-air mixture is present before opening the Ermeto coupling or dismantling the motor.
- ➔ Open up the Ermeto coupling in the adapter plate and check for any oil emission inside the adapter plate.
- ➔ If you notice leakage, stop the drive and replace the shaft sealing rings.
- ☺ You can obtain further general information on radial shaft seals from our partner www.simrit.com.

8.3.4 Exchanging the radial shaft seal / drive unit

If the ratio is $i = 3$ (see [Fig. 4.3](#) "Ratio" identification plate), you always have to replace the complete drive unit.



Environment

Lubricants (oils and greases) are hazardous substances, which can contaminate soil and water.

- ➔ Collect drained lubricant into suitable receptacles and dispose of it according to the valid national guidelines.

Required spare parts

- ➔ Note the type and serial number on the identification plate of your gear reducer.
- ➔ With this data you can order the correct radial shaft seal and the complete drive unit from our technical customer service (see [1.1](#)).

Dismantling drive unit

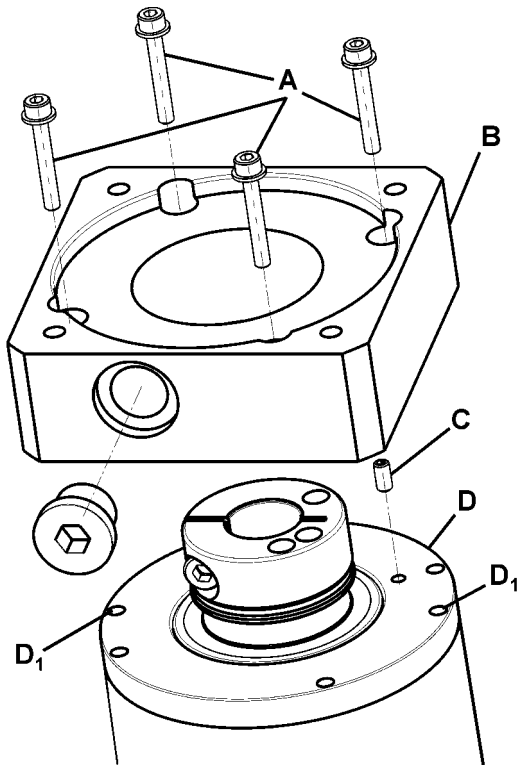


Fig. 8.1

- Have a container for catching lubricant at hand.
- Clamp the gear reducer vertically (with the output shaft at the bottom).
- Loosen the fastening bolts (A) in the adapter plate (B) and remove the adapter plate.
- Open the plug (C) in the input flange (D), to ventilate the gear reducer.

Depending on the design, there might also be fastening bolts in the input flange.

- Loosen these bolts as well.
- There are two extraction threads in the output flange (D₁).
- Screw bolts into these extraction threads to loosen the input flange from the housing.
 - Empty out the lubricant by letting as much of it as possible flow into the container.
 - If you wish to replace the entire drive unit, jump the work steps "Removing radial shaft seal" and "Installing radial shaft seal". Continue with the ["Installing drive unit"](#) work step.

Removing the radial shaft seal

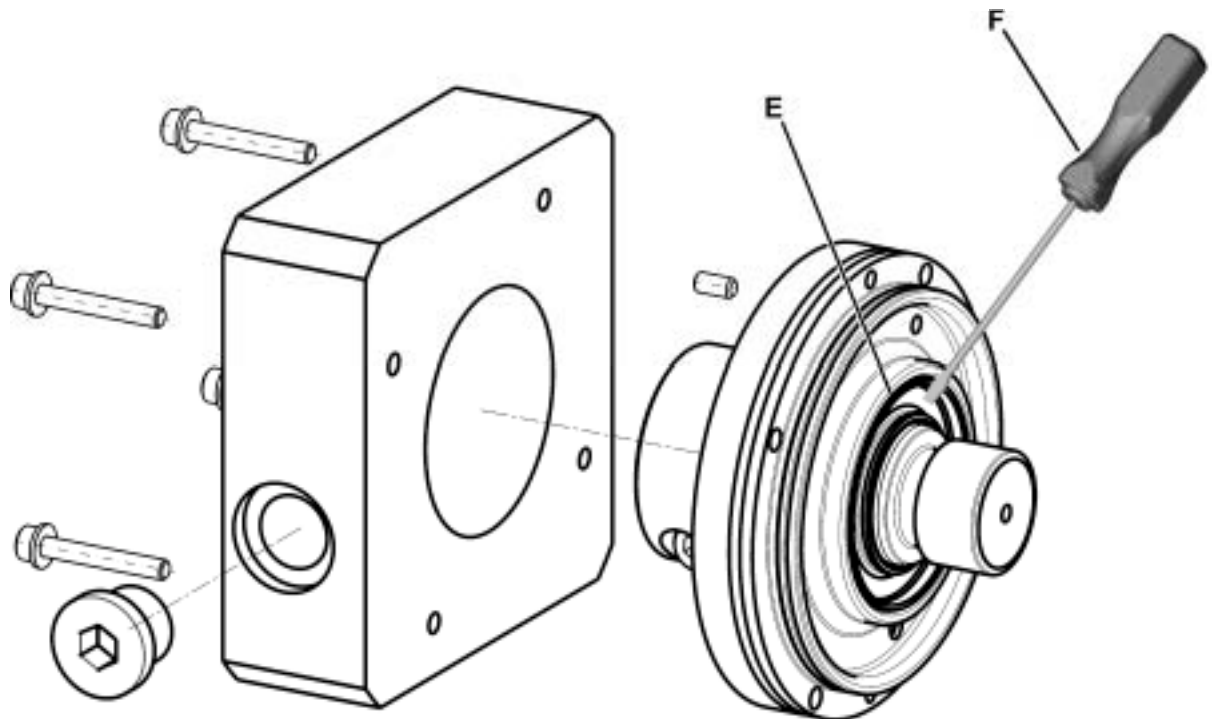


Fig. 8.2



Attention

Damaged seal surfaces can increase the wear at the radial shaft seal.

- Take care not to scratch the running surface.

- Stick a screwdriver (F) into the middle of the radial shaft seal (E).
- Lever out the radial shaft seal.

Installing the radial shaft seal

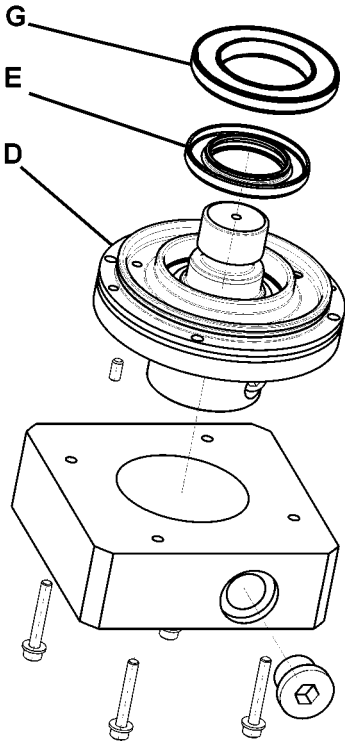


Fig. 8.3

- ➔ Prior to installation, check the seal surfaces for damage.
- ➔ If you notice any damage, contact our technical service department (see [1.1](#)).
- ➔ De-grease the seal surfaces.
- ➔ Make an assembly unit (G) that corresponds to [Fig. 8.3](#).
 $D_{\text{outside}} = \text{RSS}_{\text{outside}} \varnothing + 6\text{mm}$
 $D_{\text{inside}} = \text{RSS}_{\text{inside}} \varnothing + 1\text{mm}$
 Furthermore, you need a sleeve of sufficient height.
- ➔ Smear the outer diameter of the radial shaft seal with a surface bonding agent (for example Loctite 573 or 574).
- ➔ Wet the sealing lip of the radial shaft seal and the running surface thinly with oil (Tribol 800/220).
- ➔ Insert the radial shaft seal (E), with the assembly unit, into the input flange (D), facing downwards.
- ☺ Please perform these steps with the above-mentioned sleeve under a toggle press or column drill.

Installing drive unit

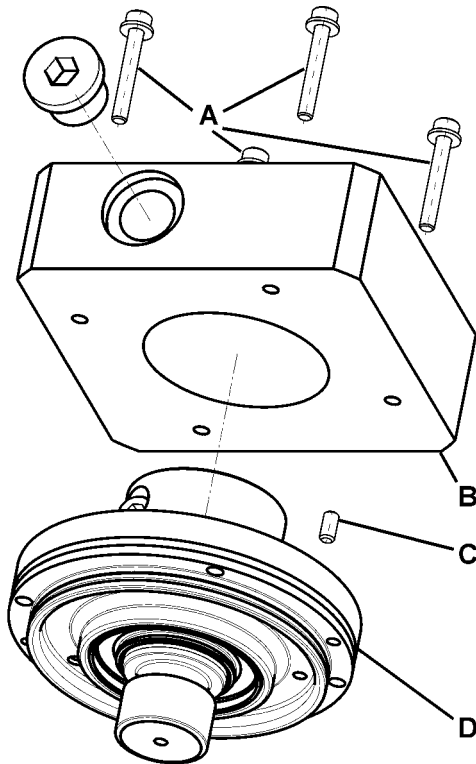


Fig. 8.4

- ➔ Fill the housing with the corresponding lubricant (see [Table 4.2](#)).
- ➔ Position the input flange (D) onto the housing by fitting the bore holes onto each other.
- ▽ Make sure that the gear teeth smoothly interlink.
- ➔ Press the input flange onto the housing.
- ➔ De-grease the plug (C), and coat it with a surface bonding agent (e.g. Loctite 573 or 574).
- ➔ **Hand-tighten** the plug.
- ➔ Position the adapter plate (B) on the input flange (D).
- ➔ Smear screw-bonding agent (for example Loctite 243) onto the fastening bolts (A).
- ☺ Screw in the fastening bolts and tighten them in diagonal order by means of a torque wrench (see [Table 6.1](#)).

8.3.5 Replacing radial shaft sealon gear output

Removing the radial shaft seal



Attention

Damaged seal surfaces can increase the wear at the radial shaft seal.

- Take care not to scratch the running surface.

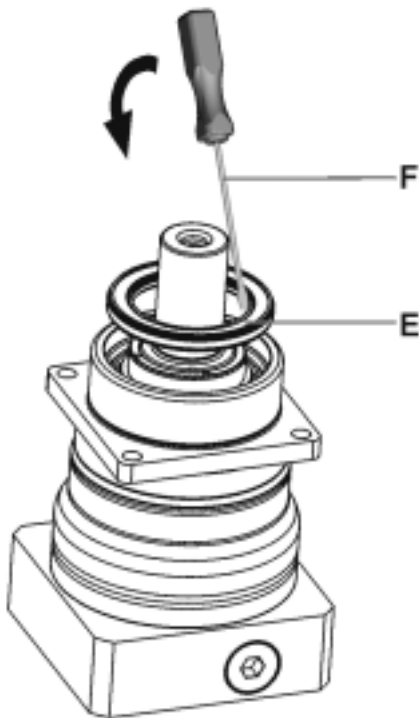


Fig. 8.5

- Clamp the gear reducer vertically (with the output shaft at the bottom).
- Push a screwdriver (F) from outside between shaft nut and sealing lip of the radial shaft seal ring (E).
- Actuate a tilting moment in the direction of the shaft and lever the radial shaft seal out of the housing.

Installing the radial shaft seal

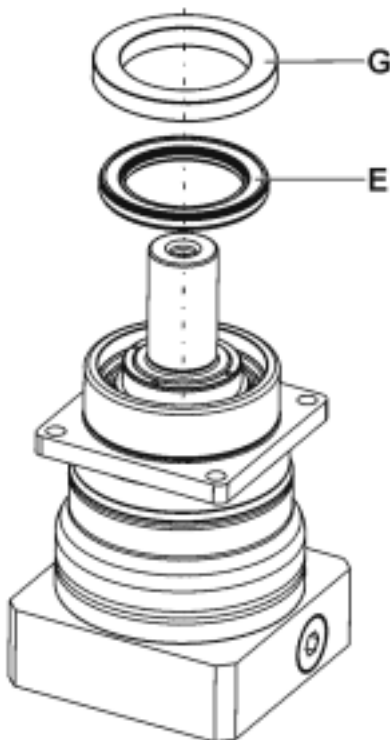


Fig. 8.6

- Prior to installation, check the seal surfaces for damage.
- If you notice any damage, contact our technical service department (see [1.1](#)).
- De-grease the seal surfaces.
- Make an assembly unit (G) that corresponds to Fig. 8.6.
- $D_{\text{outside}} = \text{RSS}_{\text{outside}} \varnothing + 5\text{mm}$
- $D_{\text{inside}} = \text{RSS}_{\text{inside}} \varnothing + 2\text{mm}$,
Furthermore, you need a sleeve of sufficient height.
- Grease the space between dust guard and sealing lip of the radial shaft seal (E) to 30% (Optimol compound CTS X).
- Smear the outer diameter of the radial shaft seal with a surface bonding agent (for example Loctite 573 or 574).
- Wet the sealing lip of the radial shaft seal and the running surface thinly with oil (Tribol 800/220).

- Place the radial shaft seal into the housing parallel by hand.
- Place the assembly unit onto the radial shaft seal.
- Press in the radial shaft seal with the aforementioned sleeve under a toggle press or column drill until this fits level in the housing.

8.3.6 Lubricant change

Oil changes are performed at the same time as changing the radial shaft seal, respectively the drive unit on the drive side. Corresponding oil type and filling amounts are described in Chapter 4.3. Moreover, these specifications are written on the identification plate.

8.3.7 Replacing gear reducer

- ➔ Replace the gear reducer:
 - When the calculated life of the gear output bearing has been reached (see “Technical Basics” catalogue).
 - At the latest after a total of 20,000 operating hours.
 - Alternatively, the gear reducer can be checked by **alpha getriebebau** and if necessary released for further operation.

8.4 Startup after maintenance work

- ➔ Clean the outside of the gear reducer.
- ➔ Assemble all safety devices.
- ➔ Do a test run before re-releasing the machine for operation.

8.5 Malfunction list (troubleshooting)

- ➔ Seek an immediate solution if you notice lubricant loss, increased noise during operation or higher operating temperatures.

Malfunction	Possible cause	Solution
Higher operating temperature	Dimensioning insufficient	Check the technical specifications.
	Motor is heating the gear reducer	Check the wiring of the motor, replace the motor or provide adequate cooling
	Ambient temperature too high	Ensure adequate cooling.
Increased noise during operation	Distortion in motor mounting	Please consult our technical service department.
	Damaged bearings	
	Damaged gear teeth	
Loss of lubricant	Lubricant quantity too high	Wipe off discharged lubricant and continue to watch the gear reducer. Lubricant discharge must stop after a short time.
	Seals not tight	Please consult our technical service department.

Table 8.2

9 Supplementary information

- ☺ If you should need supplementary information (e.g. disassembly, or disposal), please contact our technical service department (Chapter 1.1).

10 Appendix

10.1 Tightening torques

Property class	Tightening torque [Nm] for threads...													
	M 3	M 3.5	M 4	M 5	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20	M 22	M 24
8.8	1.28	1.96	2.9	5.75	9.9	24	48	83	132	200	275	390	530	675
10.9	1.8	2.75	4.1	8.1	14	34	67	117	185	285	390	550	745	950
12.9	2.15	3.3	4.95	9.7	16.5	40	81	140	220	340	470	660	890	1140

Table 10.1

10.2 Declaration of conformity**alpha getriebe**

EG-Konformitätserklärung

EC-Declaration of Conformity

Wir / We, **alpha getriebebau GmbH**
 Anschrift / Address **Walter-Wittenstein-Strasse 1**
D-97999 Igersheim
Germany
 Tel: +49 (0)700 - 493 10020
 Fax: +49 (0)7931 - 493-200
 e-mail: info@alphagetriebe.de

erklären hiermit in alleiniger Verantwortung, daß die Erzeugnisse
hereby declare under our sole responsibility, that the products

Bezeichnung: **SP⁺ Spielarme Planetengetriebe mit ein- und zweistufiger Übersetzung**
*Designation: **SP⁺ Low-Backlash Planetary Gear Reducer with one- and two-stage ratio***

Baugröße / Size: **SP⁺ 060, SP⁺ 075, SP⁺ 100, SP⁺ 140, SP⁺ 180**

Ausführung: **MF-Version (Ölschmierung, für Zyklusbetrieb)**
*Performance: **MF-Version (Oil lubrication, for Cycle Operation)***

mit den wesentlichen Anforderungen der folgenden EN-Normen
comply with the principle demands of the following EN standards

DIN EN 13463-1:2002	Nichtelektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 1: Grundlagen und Anforderungen
<i>DIN EN 13463-1:2002</i>	<i>Non-electrical equipment for potentially explosive atmospheres Part 1: Basic method and requirements</i>
DIN EN 13463-5:2004	Nichtelektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 5: Schutz durch sichere Bauweise
<i>DIN EN 13463-5:2004</i>	<i>Non-electrical equipment for potentially explosive atmospheres Part 5: Protection by constructional safety</i>
DIN EN 13463-8:2004	Nichtelektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 8: Schutz durch Flüssigkeitsüberwachung „k“
<i>DIN EN 13463-8:2004</i>	<i>Non-electrical equipment for potentially explosive atmospheres Part 8: Protection by liquid immersion „k“</i>

und den Prüfdokumenten übereinstimmt. Die Planetengetriebe in der explosionsgeschützten Ausführung sind Geräte im Sinne des Artikels 1 (3) a) der EG-Richtlinie 94/9/EG und erfüllen die grundlegenden Sicherheits- und Gesundheitsanforderungen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der RL 94/9/EG.

and agree with the test documents. Planetary gear reducers in highly explosive versions are devices in terms of Article 1 (3) a) of the EU directive 94/9/EC and fulfil the basic safety and health requirements for use according to regulations in explosive areas in accordance with supplement II of directive 94/9/EC.

Kennzeichnung / Marking:  II 2G c k IIC T3 X und / and
 II 2D c k 150 °C X

Die explosionsgeschützt ausgeführten Planetengetriebe tragen das CE-Zeichen.
The explosion-proof versions of planetary gear reducers carry the CE symbol.



Die zugehörige Betriebsanleitung (Dok.-Nr. 2022-D014984) enthält wichtige sicherheitstechnische Hinweise und Vorschriften für die Inbetriebnahme, Umgang und Wartung der SP⁺ - Getriebe.

The respective operating manual (Document No. 2022-D014984) contains important safety-related information and regulations for start-up, handling and maintenance of the SP⁺ gear reducer.

Das Verfahren der Konformitätsbewertung wurde gemäß Artikel 8 (1) b ii) der EG-Richtlinie 94/9/EG durchgeführt. Die technischen Unterlagen gemäß Anhang VIII Nummer 3 der EG-Richtlinie sind bei der benannten Stelle hinterlegt:

The procedure of the conformity assessment was carried out according to Article 8 (1) b ii) of the EU-guideline 94/9/EC. The technical documents according to Attachment VIII, No. 3 of the EU-guideline have been deposited at the appointed location:

Anschrift / Address

Physikalisch-Technische Bundesanstalt
Fachbereich 3.3
Bundesallee 100
D-38116 Braunschweig

Igersheim, 30.07.2004

Ort und Datum der Ausstellung
Place and Date of Issue

Franz Eisele
Konstruktionsleiter / Design Manager

Hartmut Kampa
Leiter Qualitätsmanagement / Quality Manager

MOTOR TECHNOLOGY LTD
MOTEC HOUSE, CHADKIRK BUSINESS PARK,
STOCKPORT, CHESHIRE SK6 3NE
ENGLAND

TEL: +44 (0)161 217 7100
FAX: +44 (0)161 217 7101
eMAIL: info@controlinmotion.com
WEB: www.controlinmotion.com

