

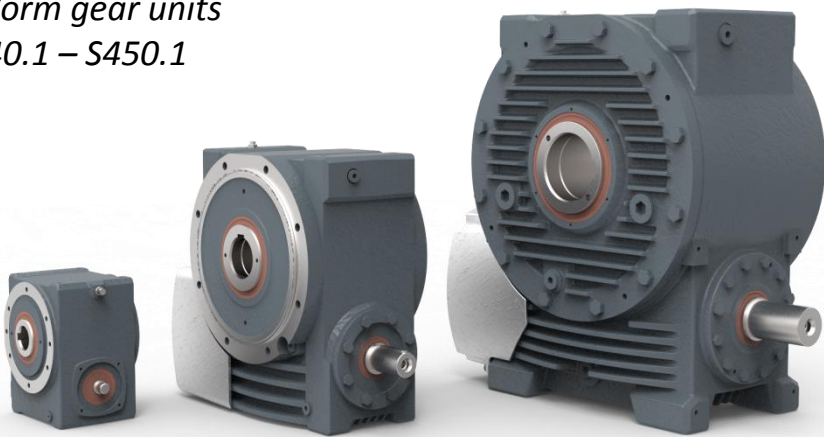
Drives

Translation of the

Original operation instructions

Worm gear units

S40.1 – S450.1



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1. Introduction

The present operation instructions are part of the scope of supply and should be stored, if possible, near the gear unit where it can easily be accessed. Installation, commissioning and maintenance work may only be performed by qualified personnel who have both read and understood these operation instructions. AUMA Drives shall not be held liable for any damage or failure incurred by non-observance of these instructions.

AUMA Drives worm gear units have been designed in accordance with recognised standards, directives and safety regulations and correspond to the technical status at the time of printing of these operation instructions. We reserve the right to perform technical alterations on the products.

The copyright of these operation instructions remains with AUMA Drives GmbH, hereinafter called "AUMA Drives". The operation instructions shall neither be used complete nor in parts without authorisation nor be made available to third parties without our prior consent.

In case of questions and to request further information, please contact the AUMA Drives Service department.

AUMA Drives Service

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2. Safety instructions

2.1. Intended use

AUMA Drives worm gear units have been designed and developed in accordance with recognised standards, directives and safety regulations and are supplied ready to operate. Machinery Directive 2006/42/EC applies to AUMA Drives worm gear units. They are partly completed machinery which are to be installed into a machine. The required Declaration of Incorporation of Partly Completed Machinery is included in section 12 of these operation instructions. The machine manufacturer or the machine operator must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, commissioning and operation are met at the place of installation.

Installation, commissioning and maintenance work must be exclusively performed by qualified personnel. Qualified personnel are persons, who, because of their training, experiences and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions, are authorised by the person responsible for the safety of the equipment to perform the required duties and are therefore aware of, and can report, possible hazards. (Definition of qualified employees according to IEC 364)

AUMA Drives worm gear units may only be operated within the limits and conditions defined in the delivery contract.

Intended use includes observance of the operation instructions or observance of the instructions and specifications included. Furthermore, fulfilment of the legal provisions on occupational health and safety and the prevention of accidents, as well as heeding of safety instructions and warning signs attached to the product to avoid both personal injuries and property damage.

2.2. Inappropriate or unintended use

Any uses other than those indicated in section 2.1 are either inappropriate or unintended. AUMA Drives shall not assume any liability for personal injuries or property damage incurred from this use.

Inappropriate or unintended used includes among others:

- Use in potentially explosive atmosphere
- Use outside technically and contractually agreed limits (output speeds, power, torques, ambient conditions)

Improper use furthermore includes:

- Operation without oil filling or with lubricants other than those specified
- Opening the gear unit when installed. During the warranty period, gear units may only be opened with prior consent of the manufacturer, otherwise any warranty claim will be void.
- Any modifications on the gear unit and in particular those impairing operational safety and reliability

2.3. Warnings and notes, symbols and their signification

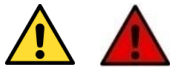


| Symbol | Signification |
|---|--|
|  | Indicates safety instructions which have to be observed to avoid personal injuries (injuries death). |
|  | Indicates safety instructions which have to be observed to avoid damage at the gear unit. |
|  | General instructions, hints. |

Table 2.3: Warnings and symbols

2.4. Important instructions, basic duties, warranty and liability

- The machine manufacturer/operator have to ensure that the all specifications and instructions have been read, understood and heeded to:
 - avert threats to life or physical condition
 - ensure operational safety of the gear unit and
 - avoid both installation downtimes and damage to the environment
- The manufacturer of the equipment is obliged to include these operation instructions in the operation instructions of the equipment.
- The machine manufacturer/operation shall be held liable for expert installation (assembly), maintenance and operation of the AUMA Drives worm gear unit. This work may only be performed by qualified and trained personnel.
- Work always has to be performed while the gear unit is switched off and protected against accidental start-up (key switch, sign).
- In case of detected defects as well as for malfunctions such as increased noise levels, oil leakage, rising operating temperature, etc., the gear unit must be shut down immediately. All defects must be remedied before restarting the equipment.
- During the warranty period the gears may only be opened with AUMA Drives' consent.

- Spare parts must generally be ordered with AUMA Drives.
- Prior to using the gear unit, the data on the name plate has to be checked against that of the accompanying documents (delivery note, order acknowledgement, test report, etc.) for compliance.
- Welding at the gear unit is not permitted and the gear unit must not be used for protective earth connection.
- Revolving and rotating parts must be protected against accidental contact.
- The plant manufacturer or plant operator are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.
- Under certain operation conditions, the surface temperature of the gear unit may rise up to 110°C. Danger of burns!
- Danger of burns due to hot oil when changing oil.
- Cleaning with a high pressure cleaner is not permitted.

Failure to observe the specifications indicated entails complete exclusion of liability and warranty expires. Consequential damage of inappropriate use can include property damage and personal injuries and even death.

3. Technical description

AUMA Drives gear units of the S.1 series are single-stage worm gear units. AUMA Drives gear units of the S.1 series are single-stage worm gear units, characterised by extremely low noise, high efficiency, utmost reliability and long service life.



AUMA Drives worm gear units are generally not self-locking.

Self-locking exists, if the start of the worm shaft is not possible in spite of the driving worm wheel. Internal impacts such as vibration may limit and under certain conditions even cancel the self-locking effect. Among others, self-locking depends on the transmission ratio (or the pitch angle of the splines), the lubricant as well as the operating and ambient temperatures. For actuation applications for which the self-locking effect is required, it should always be verified whether the installation of a return block or a brake is the more practical solution. An automatic self-locking gear unit cannot replace a brake. If self-locking is required, please contact AUMA Drives.

Section 3.1 provides a schematic description of the AUMA Drives worm gear unit design. Major sub-assemblies are designated.

3.1. Design

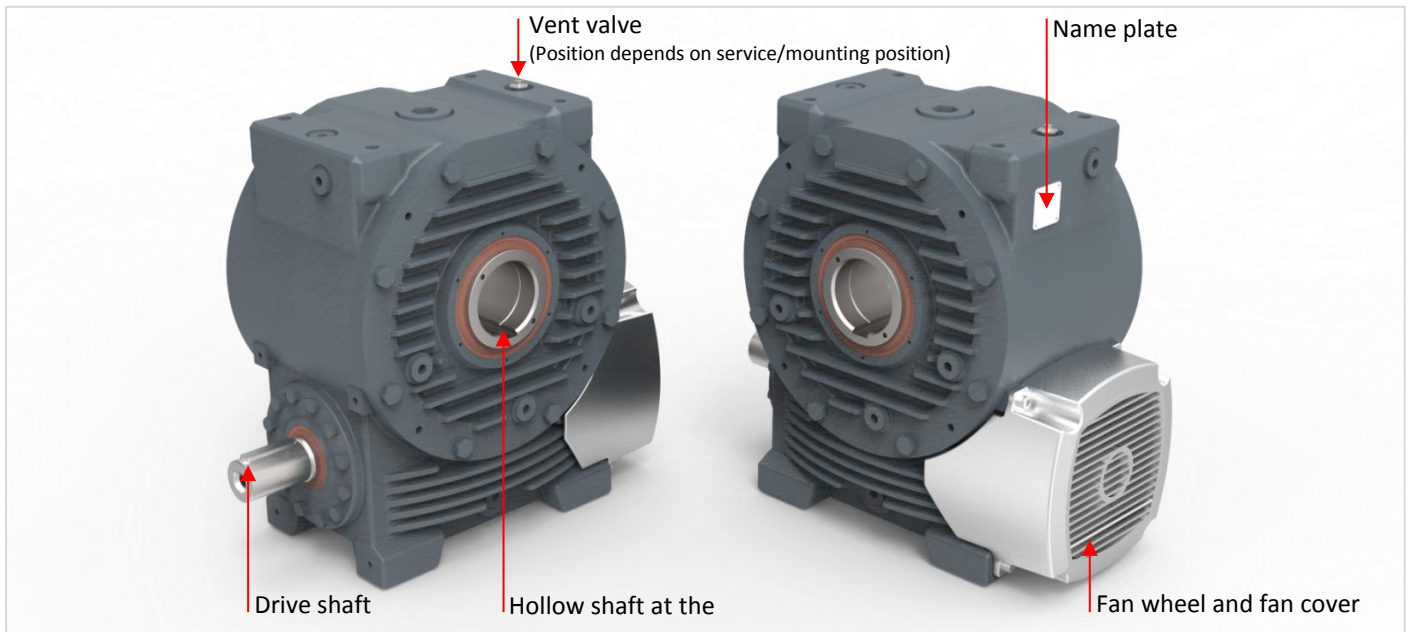


Fig. 3.1-1: Design of basic version (shaft at input, hollow shaft at output), using the example of S250.1 in service position B3



In addition to the basic versions, specific equipment for the plants such as flanges, output drive shafts, torque reaction levers, etc. are available as an option.

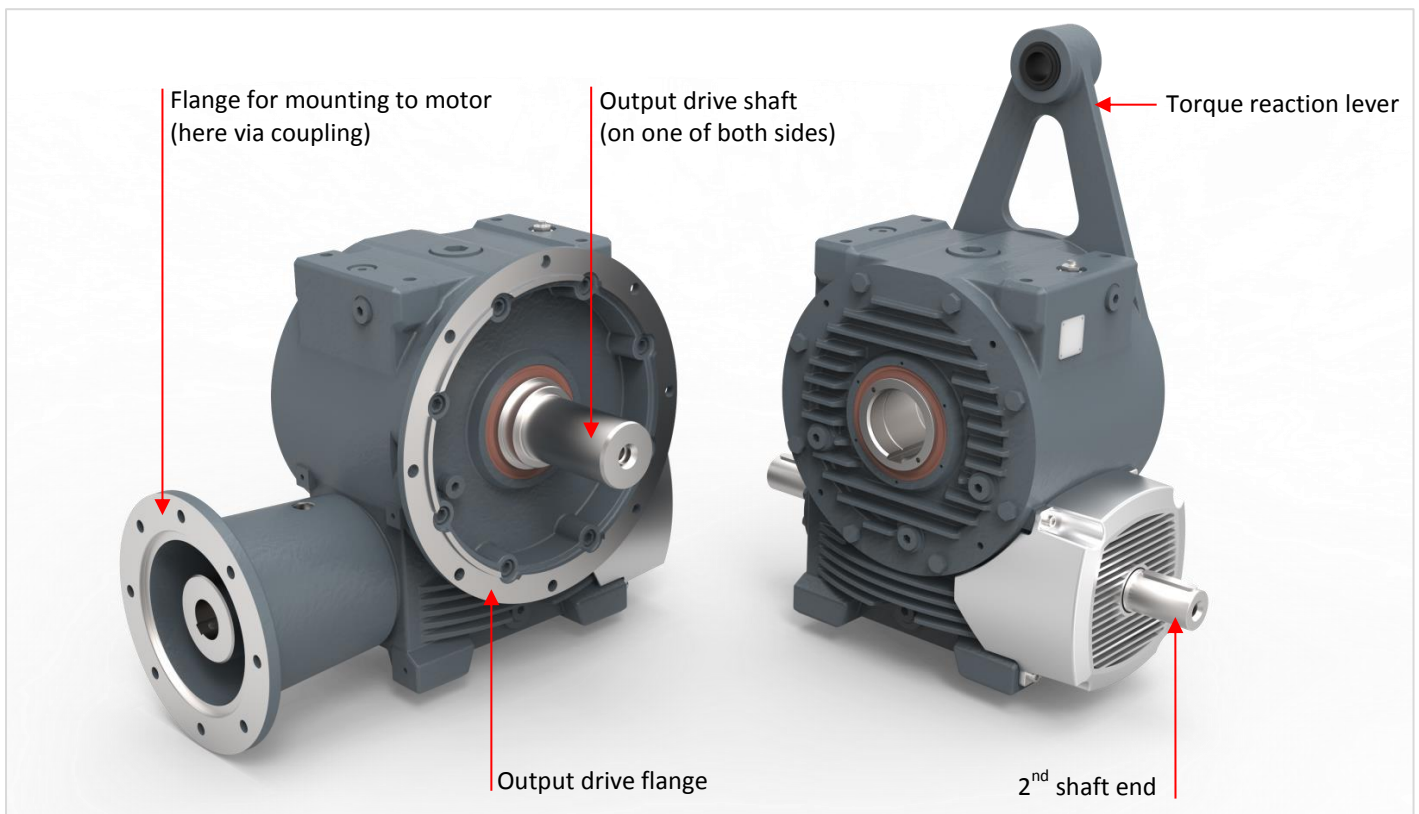


Fig. 3.1-2: Mounting options (extract), using the example of S250.1

Operation instructions

Worm gear units

S40.1 – S450.1

3.2. Name plate

The following data is provided on the name plate attached to the gear unit.

| auma | | AUMA Drives GmbH, D-01640 Coswig | |
|----------------------|------------------------------|----------------------------------|--------------|
| Type/Size | Type: _____ | Service position | _____ |
| Serial number | No: _____ CO _____ | AUMA Drives order number | _____ |
| Delivery date [WWYY] | T _{2max} = _____ Nm | Ratio | _____ |
| Max. output torque | n ₂ = _____ 1/min | Ambient temperature | Temp.: _____ |
| Output speed | Lub.: _____ | Lubricant quantity | _____ |
| Lubricant | Item No.: _____ | Mass/Weight | m = _____ kg |
| Customer item number | Miscellaneous | Insulation class | _____ |
| Made in Germany | | | |

| auma | | AUMA Drives GmbH, D-01640 Coswig | |
|----------------------|------------------------------|----------------------------------|--------------|
| Type/Size | Type: _____ | Service position | _____ |
| Serial number | No: _____ CO _____ | AUMA Drives order number | _____ |
| Delivery date [WWYY] | T ₂ = _____ Nm | Ratio | _____ |
| Rated output torque | n ₁ = _____ 1/min | Ambient temperature | Temp.: _____ |
| Input speed | Lub.: _____ | Lubricant quantity | _____ |
| Lubricant | Item No.: _____ | Mass/Weight | m = _____ kg |
| Customer item number | Miscellaneous | Insulation class | _____ |
| Made in Germany | | | |

| auma | | AUMA Drives GmbH D-01640 Coswig | |
|----------------------|------------------------------|-------------------------------------|--------------|
| Type/Size | Type: _____ | Service position _ insulation class | _____ |
| Serial number | No: _____ CO _____ | AUMA Drives order number | _____ |
| Delivery date [WWYY] | T ₂ = _____ Nm | Ratio | _____ |
| Rated output torque | n ₁ = _____ 1/min | Ambient temperature | Temp.: _____ |
| Input speed | Lub.: _____ | Lubricant quantity | _____ |
| Lubricant | Item No.: _____ | Mass/Weight | m = _____ kg |
| Miscellaneous | _____ | | |

3.3. Technical data

3.3.1. Service positions S40.1 – S80.1

The illustrations below show possible service positions and the pertaining positions of the vent valve and the oil draining screw plug. For the lubricant quantities required refer to table 3.3.5-2.

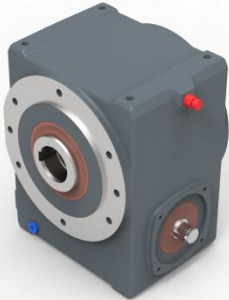
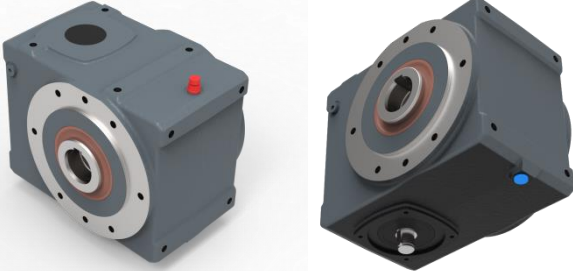
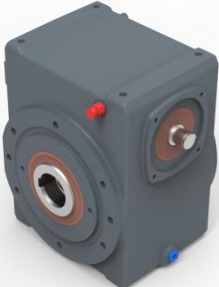
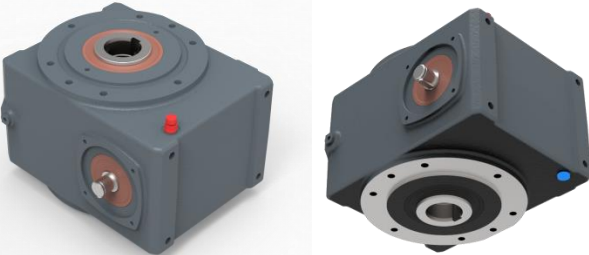
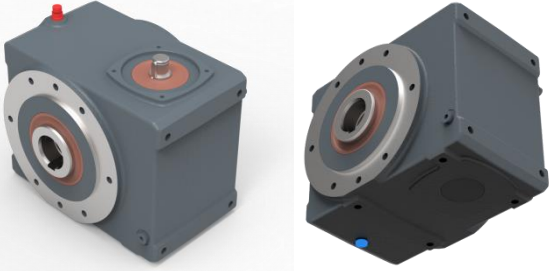
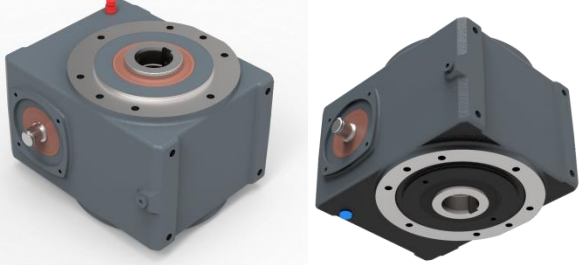
| | | | |
|--|--|------|--|
| B3 | <p>Horizontal output drive shaft Horizontal drive shaft - bottom</p>  | B6 | <p>Horizontal output drive shaft Vertical drive shaft - bottom</p>  |
| B8 | <p>Horizontal output drive shaft Horizontal drive shaft - top</p>  | V5 | <p>Vertical output drive shaft - bottom Horizontal drive shaft</p>  |
| B3I | <p>Horizontal output drive shaft Vertical drive shaft - top</p>  | V5II | <p>Vertical output drive shaft - top Horizontal drive shaft</p>  |
| <p style="text-align: center;">● Vent valve and oil filling ● Oil drain</p> | | | |

Figure 3.3.1: Service positions S40.1-S80.1

Operation instructions

Worm gear units

S40.1 – S450.1

3.3.2. Service positions S100.1 – S160.1

The illustrations below show possible service positions and the pertaining positions of the vent valve, as well as the oil level checking and the oil draining screw plug. In some cases, an oil dipstick at the vent valve will take over the function of the oil level checking screw plug. For the lubricant quantities required refer to table 3.3.5-2.

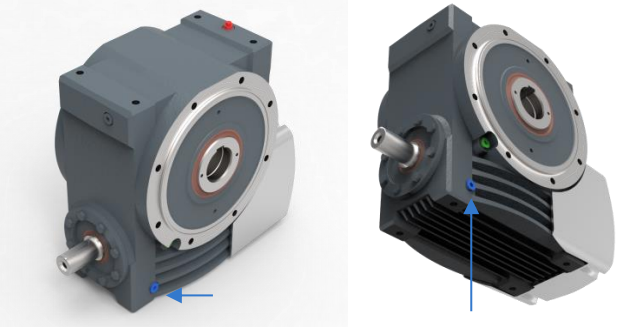
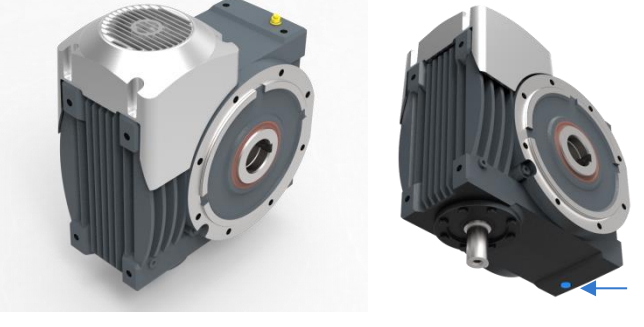
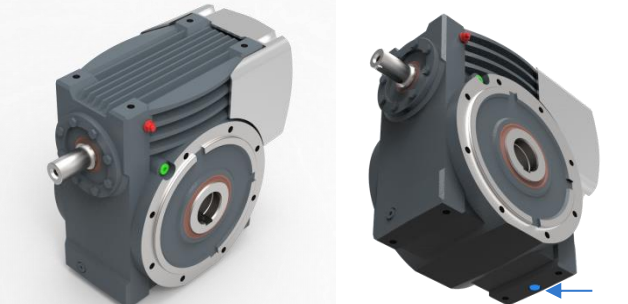
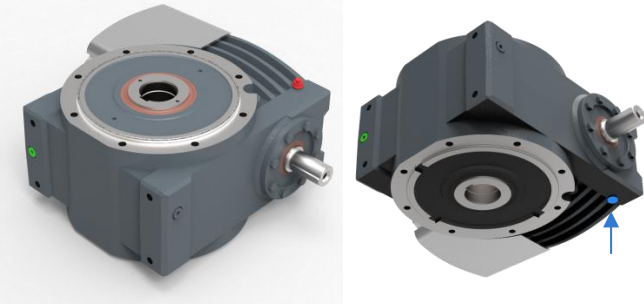
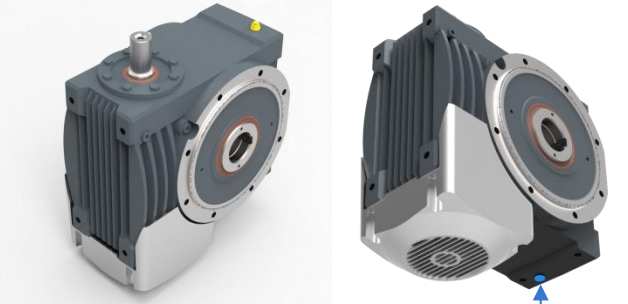
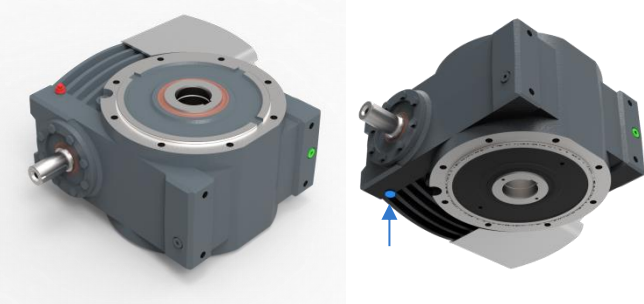
| | | | |
|---|---|------|--|
| B3 | <p>Horizontal output drive shaft Horizontal drive shaft -bottom</p>  | B6 | <p>Horizontal output drive shaft Vertical drive shaft - bottom</p>  |
| B8 | <p>Horizontal output drive shaft Horizontal drive shaft -top</p>  | V5 | <p>Vertical output drive shaft - bottom Horizontal drive shaft</p>  |
| B3I | <p>Horizontal output drive shaft Vertical drive shaft - top</p>  | V5II | <p>Vertical output drive shaft - top Horizontal drive shaft</p>  |
| <p>● Vent valve and oil filling ● Oil level ● Oil drain ● Oil filling and vent valve with oil dipstick</p> | | | |

Fig. 3.3.2: Service positions S100.1-S160.1

CAUTION!

Depending on application and service conditions, an oil quantity or oil level different from the indications of these operation instructions may be required. For the pertaining information, refer to the contractual documents as well as to the name plate. In these cases, the position of the oil filling screw plug and the oil level checking screw plug may differ from this representation.

Operation instructions

Worm gear units

S40.1 – S450.1

3.3.3. Service positions S200.1 – S450.1

The illustrations below show possible service positions and the pertaining positions of the vent valve, as well as the oil level checking and the oil draining screw plug. For the lubricant quantities required refer to table 3.3.5-2.

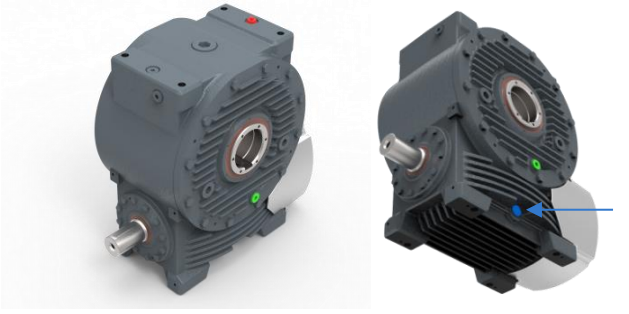

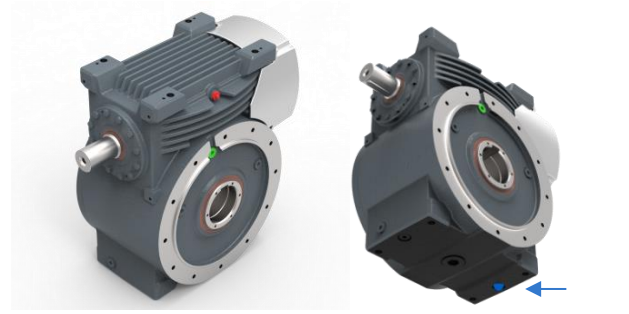
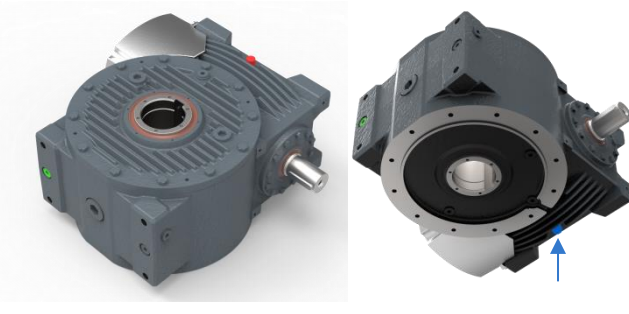

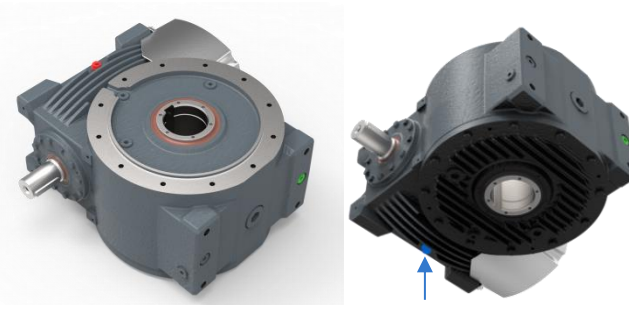
| | | | |
|---|---|------|--|
| B3 | <p>Horizontal output drive shaft Horizontal drive shaft -bottom</p>  | B6 | <p>Horizontal output drive shaft Vertical drive shaft - bottom</p>  |
| B8 | <p>Horizontal output drive shaft Horizontal drive shaft -top</p>  | V5 | <p>Vertical output drive shaft - bottom Horizontal drive shaft</p>  |
| B3I | <p>Horizontal output drive shaft Vertical drive shaft - top</p>  | V5II | <p>Vertical output drive shaft - top Horizontal drive shaft</p>  |
| <p>● Vent valve and oil filling ● Oil level ● Oil drain</p> | | | |

Figure 3.3.3: Service positions S200.1-S450.1

CAUTION!

Depending on application and service conditions, an oil quantity or oil level different from the specifications of these operation instructions may be required. For the pertaining information, refer to the contractual documents (for example drawings) as well as to the name plate. In these cases, the position of the oil filling screw plug and the oil level checking screw plug may differ from this representation.

3.3.4. Gear unit weight

The weights below does not include oil filling and are reference values. Casting tolerances as well as different transmission ratios and equipment variants result in different weights. Due to the large number of variants, complete representation of all equipment is not possible. For the weight of the configuration delivered, refer to the name plate (including oil).

| Size | SVA basic version without oil [kg] |
|--------|---------------------------------------|
| S40.1 | 5.2 |
| S50.1 | 11.0 |
| S63.1 | 14.5 |
| S80.1 | 26 |
| S100.1 | 46 ¹⁾ |
| S125.1 | 84 ¹⁾ |
| S160.1 | 157 ¹⁾ |
| S200.1 | 210 ¹⁾ |

Table 3.3.4: Gear unit weights
valve

| Size | SVA basic version without oil [kg] |
|--------|---------------------------------------|
| S225.1 | 336 ¹⁾ |
| S250.1 | 380 ¹⁾ |
| S280.1 | 525 ¹⁾ |
| S315.1 | 700 ¹⁾ |
| S355.1 | 960 ¹⁾ |
| S400.1 | 1,300 ¹⁾ |
| S450.1 | 1,710 ¹⁾ |

1) incl. vent

3.3.5. Lubricant

The splines of the AUMA Drives worm gear units are lubricated by splash lubrication. Unless agreed otherwise, the gear units are supplied with oil filling when leaving the factory. We use CLP-PG oils (according to DIN 51517-part 3) as standard. These fully synthetic oils (polyglycoles) have outstanding temperature-viscosity behaviour and excellent characteristics with regard to corrosion protection, resistance to ageing and wear reduction. For ambient temperatures between –10 °C and +40 °C, oils of ISO viscosity class VG460 must be used. For other ambient conditions, a suitable lubricant has to be selected by AUMA Drives. The table below lists lubricants by different manufacturers. The lubricant used is indicated on the name plate. Gear units without grease filling in the factory have a DIN compliant indication relating to the lubricant to be used and the required viscosity class.

| Marking according to DIN 51517-3 and DIN 51519 | Klüber | ARAL | Shell | Mobile | Bechem | Castrol |
|---|--|-----------------|--------------------|--------------------|---------------------|-------------------|
| CLP PG / ISO VG 460 | Klübersynth GH 6-460 ⁽¹⁾ | Degol GS 460 | Omala S4 WE 460 | Glygoyle HE 460 | Berusynth EP 460 | Optiflex A 460 |

Table 3.3.5-1: Lubricants

1) Standard lubricants used in the factory

CAUTION!

AUMA Drives can assume no warranty for the perfect suitability of all listed lubricants.



For certain applications, different lubricants (mineral oils, lubrication greases) can be used. Refer to the name plate or the contractual documents (e.g. drawings), for the actually used lubricant.



Mixing oils of various classes, types and manufacturers is not permissible. Refer to the name plate for the lubricant actually used.

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CAUTION!

The table below shows the required oil quantities. These values are reference values. The filling level (of the cooled down oil) within the gear unit, defined by oil level screw plugs or markings (max. and min.) on the oil dipstick, is relevant - refer to sections 3.3.1 to 3.3.3

| Size | Service position | | | | | |
|--------|------------------|--------|--------|--------|--------|--------|
| | B3 | B8 | B3I | B6 | V5 | V5II |
| S40.1 | 0.18 | 0.28 | 0.30 | 0.30 | 0.20 | 0.20 |
| S50.1 | 0.45 | 0.75 | 0.65 | 0.65 | 0.55 | 0.55 |
| S63.1 | 0.63 | 1.10 | 1.00 | 1.00 | 0.75 | 0.75 |
| S80.1 | 1.30 | 2.50 | 2.00 | 2.00 | 1.50 | 1.50 |
| S100.1 | 1.70 | 3.80 | 3.00 | 3.00 | 3.00 | 3.00 |
| S125.1 | 2.00 | 6.50 | 4.00 | 4.00 | 4.00 | 4.00 |
| S160.1 | 4.20 | 12.30 | 8.50 | 8.50 | 7.70 | 7.70 |
| S200.1 | 8.00 | 22.00 | 15.00 | 15.00 | 13.50 | 13.50 |
| S225.1 | 11.00 | 26.00 | 19.00 | 19.00 | 19.50 | 19.50 |
| S250.1 | 14.00 | 42.50 | 29.00 | 29.00 | 29.00 | 29.00 |
| S280.1 | 18.50 | 58.00 | 41.00 | 41.00 | 39.50 | 39.50 |
| S315.1 | 27.00 | 75.00 | 53.00 | 53.00 | 53.00 | 53.00 |
| S355.1 | 36.00 | 110.00 | 75.00 | 75.00 | 75.00 | 75.00 |
| S400.1 | 44.00 | 148.00 | 98.00 | 98.00 | 98.00 | 98.00 |
| S450.1 | 68.00 | 219.00 | 141.00 | 141.00 | 144.00 | 144.00 |

Table 3.3.5-2: Lubricant quantity

CAUTION!

Depending on application and service conditions, an oil quantity or oil level different from the specifications of these operation instructions may be required. For the pertaining information refer to the contractual documents and the name plate.

4. Delivery, transport, handling & storage protection

4.1. Delivery, transport, handling

Prior to delivery, all AUMA Drives worm gear units are subjected to final inspection and leave AUMA Drives in perfect condition and suitable packaged according to their destination. Upon receipt, the delivery has to be inspected for completeness and possible transport damage. Advise the forwarding company or the customer service of AUMA Drives of any possible defects. Commissioning the gear unit might not be permitted.

CAUTION!

All AUMA Drives worm gear units are supplied with screwed in vent valve. For some versions, the gear unit must always be stored and transported in service position (refer to Notes in sections 3.3.1 to 3.3.3). In this case, the gear units are marked with special notice signs.



Only use lifting appliances and load suspension equipment with sufficient bearing capacity for transport!

For the overall weight of the gear unit, refer to the name plate. Reference values can also be found in section 3.3.4. **The load is borne by two suitable eye bolts. Ensure that they have been firmly screwed to the housing. Fig. 4.1 shows the example of using the ring bolts for transport in service position B3. For other service positions, further threaded holes have been cut into the housing.**

CAUTION!

The gear unit must not be handled via the threaded holes in the drive shafts and output drive shafts on the face side or the fan housing. Handle and transport with care to prevent damage. Hits and blows to the shaft ends might cause damage within the gear unit.



Figure 4.1: Anchor points

| Size | Thread size for transport eyebolts |
|---------------|------------------------------------|
| S40.1 | M6 |
| S50.1-S63.1 | M8 |
| S80.1 | M10 |
| S100.1 | M12 |
| S125.1-S160.1 | M16 |

| Size | Thread size for transport eyebolts |
|---------------|------------------------------------|
| S200.1 | M20 |
| S225.1-S250.1 | M24 |
| S280.1-S315.1 | M30 |
| S355.1-S450.1 | M36 |
| | |

Table 4.1: Thread sizes for transport eyebolts

4.2. Storage and protection

The storage or protection periods start immediately after delivery of the gear unit.

Unless agreed otherwise, AUMA Drives worm gear units are supplied with oil filling when leaving the factory. All inside parts are protected for 24 months. Inside parts of gear units supplied without oil filled are provided with corrosion protection sufficient for 12 months. Outer parts with metallic uncoated surface such as shaft ends, hollow shafts and mounting surfaces of flanges have been treated with corrosion protection, providing protection for six months. Once the period has expired, the corrosion protection has to be renewed.

CAUTION!

Prior to assembly or installation remove corrosion protection agent from the outer parts using commercial cleaning agents. The cleaning agent must not come into contact with radial seals.



Ensure sufficient ventilation while removing the corrosion protection agent. Due to potentially explosive atmosphere, open fire is not permitted.

The standard outer coating (finish coating based on polyurethane) provided in the factory is resistant to weak chemicals such as oils, resistant to mechanical impacts and temperature resistant up to 150 °C. Damage to the coating layers leads to failure of the corrosion protection and has to be touched up immediately. Sand blasting of the gear unit is not permitted.

The gear units should only be stored in closed and dry rooms. The impact of solvents, solvent vapours, fuels, acids, rubber solvents and other solvents should be avoided as well as exposure to direct sunlight, relative humidity >70% and major temperature fluctuations. The use of plastic film containing plasticizers is not recommendable.



Gear units must be stored on levelled base plates, protected against vibration, and must not be stacked on top of each other.



Should the storage locations or room be subject to major temperature fluctuations, should the relative humidity exceed 70% or gear units be stored for a longer period (>24 months), we recommend the following measures:

- Fill gear unit completely with oil (refer to table 3.3.5-1)
- Check oil quality (water contents) on a regular basis
- Seal gear units hermetically using VCI film and enclose water absorbing desiccants.
- Regular visual inspection of gear unit with regard to corrosion on the outer metallic uncoated parts
- Regular check of gear units for leakage on radial seals

CAUTION!

After longer storage periods, the lubricant quality (refer to section 8.1.1) and the condition of the radial seals are to be checked prior to commissioning, and be replaced if required. Prevent any damage to the sealing ring seat on the shaft. Furthermore, the oil level must be checked (refer to section 8.1.1) and possibly be adjusted to the required filling level (refer also to table 3.3.5-2). When using other corrosion protection oils than those specified (table 3.3.5-2) for protection, thoroughly rinse gear unit prior to lubricant filling.

5. Assembly

5.1. Gear unit assembly



The safety instructions in section 2 must be observed.

The following conditions must be met for installing the worm gear unit:

- These operation instructions were completely read and understood by the assembly personnel.
- Suitable lifting devices are available in sufficient quantity.
- The data on the name plate and the application must correspond to the contractually agreed values (transmission ratio, output speed, etc.)
- The gear unit must not be damaged
- Unless agreed otherwise, the ambient temperature must be between -10 °C and $+40\text{ °C}$.
- The environment of the installation site must be free of chemicals, acids, gases, etc. unless stipulated otherwise in the contractual documents.
- The gear unit must not be exposed to heat accumulation and waste heat from other devices.
- Vent valve (including oil dipstick) and oil draining screw plug must be freely accessible for maintenance work
- The corrosion protection agent must be removed from shaft ends and mounting faces (flanges).
- Machine frame:

The machine frame must be designed to support the specified weights and torques so that no additional loads resulting from distortion or twisting can act on the gear unit. Ensure that all mounting faces are flush on the machine frame. Non-observance might cause damage on and within the gear unit.

Welding at the gear unit is not permitted and the gear unit must not be used for protective earth connection!



Should any questions or problems arise during installation, please contact the AUMA Drives service (for contact details refer to cover page of these operation instructions).

5.1.1. Gear unit with free shaft ends (at drive or output drive)

CAUTION!

Gear units with free shaft end have to be placed on a suitable basis together with the drive. **The shafts must be aligned very carefully to ensure safe working conditions and low-noise operation. Avoid housing and shaft jamming. As an alternative, we recommend the use of elastic couplings and universal joints.**

Gear units with output drive flange can directly be connected to the driven machine. However, mounting the gear unit to a solid basis at the same time is not possible.

Use screws according to property class 8.8 to fasten the gear unit. All screws have to be fitted applying the required torque (refer to table 9.1).

When mounting couplings, observe the pertaining operation and mounting instructions of the coupling manufacturer. We recommend the use of flexible couplings to compensate for small inaccuracies in assembly. Couplings require static balancing at peripheral speeds of up to 20 m/s and dynamic balancing at peripheral speeds exceeding 20 m/s.

CAUTION!

Consideration must be given to the permissible radial forces at the input shaft and output shaft ends when using rigid coupling units and elements which generate radial force, such as pulleys, toothed wheels, etc. The drive and output elements can be mounted by means of a fitting tool (refer to fig. 5.1.1) or by heating ($\leq 120^{\circ}\text{C}$; wear heat-resistant gloves!) the appropriate part. **Do not under any circumstances attempt to mount by striking with a hammer as this would cause damage to the tooth profiles, roller bearings, housing, and shaft.** Prior to assembly, thoroughly clean gear shaft and holes of the drive or output drive element.



We recommend applying a corrosion protection agent (e.g. Gleitmo800 by Fuchs) to the shaft(s) of the gear unit to prevent tribocorrosion.

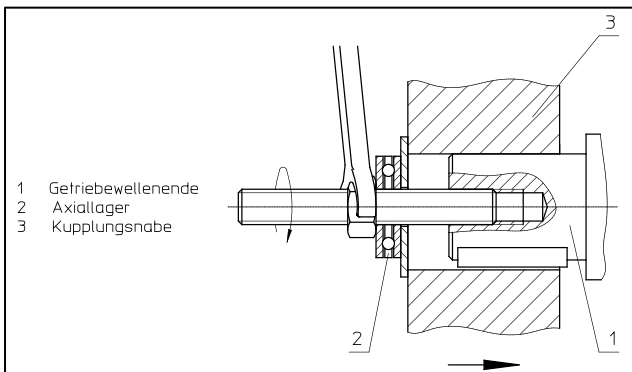


Figure 5.1.1: Fitting tool

5.1.2. Gear unit with hollow shaft at output drive (slip-on gear)

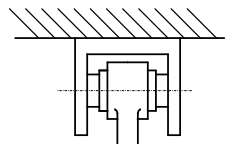
Gear unit with hollow shaft at the output drive can be placed directly on the shaft of the driven machine and be axially secured.

CAUTION!

For gear units fastened and axially secured via output drive flange, ensure that the machine side mounting face is perpendicular to the drive shaft to avoid distortion of gear unit and driven machine as well as resulting additional bearing loads. Use screws according to property class 8.8 to fasten the gear unit. All screws have to be fitted with the required torque (refer to table 9.1). Fastening the gear unit to the base plate while the machine shaft is located near the gear unit should by all means be avoided.

CAUTION!

For gear units whose reaction torque is not absorbed by flange but a torque reaction lever, we recommend installing the torque reaction lever on the driven machine side to avoid additional bending stress. Use screws according to property class 8.8 to fasten the torque reaction lever to the gear unit housing. All screws have to be fitted with the required torque (refer to table 9.1). We recommend using elastic sockets to protect against torque impulses and distortion. The fastening bolt should be fixed on both sides.



Axial securing of the gear unit on the shaft of the driven machine is either done via circlip and/or end disc with screw. Furthermore, shrink discs can also be used for axial positioning. Clamping screws may not be tightened without an inserted shaft as this can lead to plastic

CAUTION!

deformation in the hollow shaft. Heed the fitting instructions of the shrink disc manufacturer and observe the steps below:

Mounting the shrink disc:

1. Remove spacers between the outer rings (if available)
2. Manually tighten screws slightly, so that the inner ring can still be turned.
3. Slightly grease the seat of the hub section for the shrink disc.
4. Carefully remove the grease from the hollow shaft hole and the driven machine shaft in the press section.
5. Fit shaft or slip-on gear on the driven machine shaft while fully using the shrink connection section.
6. Tighten clamping screws one after the other in clockwise direction but not crosswise. Several turns are required before reaching the required screw tightening torque.
7. The position between the solid shaft of the driven machine and the hollow shaft of the gear unit has to be marked to be able to detect a possible racing effect.

Dismounting the shrink disc:

1. Loosen clamping screws evenly one after the other to prevent the inner ring from jamming.
2. Loosen the flanges from the cone of the inner ring.
3. Dismount the shaft or pull off the slip-on gear from the driven machine.



We recommend applying a corrosion protection agent (e.g. Gleitmo800 by Fuchs) to the shaft of the driven machine to prevent tribocorrosion.

5.2. Mounting the motor

CAUTION!

The motor is mounted using motor flange and coupling. We recommend using flexible couplings to compensate for small inaccuracies in assembly. When mounting couplings, observe the pertaining operation and mounting instructions of the coupling manufacturer. Use screws according to property class 8.8 to fasten the motor to the gear unit. All screws have to be fitted applying the required torque (refer to table 9.1).

CAUTION!

When mounting the motor via a hollow gear drive shaft, ensure that the motor shaft and the mounting faces of the motor flange are perpendicular to avoid distortion and the resulting bearing load. For this reason, AUMA Drives recommend motors whose design and position tolerance are reduced by 50 % in accordance with table 3 of EN 50347:2001. Prior to assembly, both motor shaft and hollow bore of the gear input shaft must be thoroughly cleaned. Use suitable anti-seizing compound (e.g. Gleitmo800 by Fuchs) to prevent friction corrosion. Use screws according to property class 8.8 to fasten the motor to the gear unit. All screws have to be fitted applying the required torque (refer to table 9.1).

CAUTION!

Do not apply hammer blows for assembly. This might damage the splines, roller bearings and the shafts.



Heed operation instructions of the motor manufacturer for electrical connection!

6. Commissioning



The safety instructions in section 2 must be observed.



Commissioning of the gear unit is only permitted once the machine manufacturer/operator have integrated the gear unit in the machine, when complying with product specific Europeans directives by affixing the CE mark on the machine and after confirming the safety of the system put on the market.

CAUTION!

Prior to and during commissioning, the following steps have to be performed:

- In compliance with statutory requirements, revolving and rotating parts must be protected against accidental contact.
- Check vent valve for clogging or contamination, e.g. by paint residues. During operation, insufficient or insecure ventilation generates increased internal pressure and finally results in leakage.
- Check oil filling level → section 8.1.1
- Check oil quality → section 8.1.1
- Check radial seal
- Check tightening torques of the fastening screws
Screws that can no longer be used have to be replaced by new ones of the same property class and type.
- During test run, check for unusual noise and vibration, formation of smoke or vapour as well as to the service temperature (gear unit surface up to approx. 70 °C).



AUMA Drives worm gear units achieve their full performance and optimum efficiency in well run-in condition and at service temperature. We recommend running in each gear unit with no load for some time first and then at approx. 50% of the rated load for several hours. If operation at partial load is not possible, the gear should be repeatedly stopped and cooled down once an oil temperature of approx. 80 – 90°C is reached. During running in, check for unusual noise and vibration, formation of smoke or vapour as well as to the service temperature (gear unit surface up to approx. 70 °C). Gear units to be operated in both directions should be run in in both directions of rotation. After running in, check gear unit for leakage.

7. Operation, malfunctions, causes, troubleshooting

Gear units must be monitored during operation. Special attention should be paid to unusual running noise, increased service temperatures and possible oil leakage.

CAUTION!

In case of irregularities and when eliminating malfunctions, the gear unit must be shut down immediately and the safety instructions of section 2.4 have to be observed. The equipment has to be protected against accidental start-up.



During the warranty period, maintenance work may exclusively be carried out by AUMA Drives. If malfunctions occurring at a later date cannot be located or the effort required for repair would be excessive, please contact the AUMA Drives service technicians.

| Fault | Possible causes | Remedy |
|--------------------------------------|---|---|
| Unusual running noise/vibration | <ul style="list-style-type: none"> • Damage to splines or bearing • Changed bearing backlash • Oil level too low | <ul style="list-style-type: none"> • Please contact AUMA Drives service • Please contact AUMA Drives service • Refill oil and check gear unit for leakage |
| Unusual blows/vibration | <ul style="list-style-type: none"> • Defective motor coupling • Gear support worked loose | <ul style="list-style-type: none"> • Replace coupling • Tighten fastening screws according to section 5.1 |
| Increased service temperature | <ul style="list-style-type: none"> • Heat accumulation and /or waste heat from other devices • Oil level too low • Outdated/contaminated oil • Impaired passive cooling | <ul style="list-style-type: none"> • Please contact AUMA Drives service • Check oil level at room temperature and check in accordance with section 3.3.5, if applicable • Change oil • Clean both housing surface and fan cover |
| Oil leaks at gear unit | <ul style="list-style-type: none"> • Damaged radial seals • Clogged vent valve | <ul style="list-style-type: none"> • Contact AUMA Drives service and replace radial seal • Clean vent valve (refer to table 8) Vent valve are pressure relief valves. They open to the outside at approx. 0.3 bar and protect the gear unit against excessive internal pressure and possible leakage. |
| Oil leaks at vent valve (oil infeed) | <ul style="list-style-type: none"> • Incorrect service position • Oil level too high • Wrong lubricant (foam formation) | <ul style="list-style-type: none"> • Correct service position in accordance with section 3.3 • Check oil level at room temperature and check in accordance with section 3.3.5, if applicable • Change oil, refer to section 8.1.2 |
| Oil leaks at screw plugs (oil drain) | <ul style="list-style-type: none"> • Screw plugs not properly fastened | <ul style="list-style-type: none"> • Check radial seals and tighten screw plugs according to table 8.1.1 |

Table 7: Malfunctions- causes-remedy

Operation instructions

Worm gear units
S40.1 – S450.1

8. Servicing and maintenance

AUMA Drives gear units will reliably operate for several years in nominal operation. However, regular checks, cleaning and maintenance are recommended after commissioning.



The stipulated inspection intervals (table 8) mentioned above are part of the conditions of warranty.

All service work may only be performed by qualified and trained personnel.



Work on the gear unit always has to be performed while the gear unit is switched off and protected against accidental start-up (key switch, sign).

CAUTION!

Only use original AUMA Drives spare parts for repair and maintenance tasks; otherwise a safe function of the gear unit cannot be guaranteed. All warranty and liability claims are void if the maintenance work has not been carried out correctly or if unapproved spare parts have been used.

| Measure | Maintenance interval | Remarks/notes |
|--------------------------------------|---|--|
| Check gear temperature | Every 3 months | Max. permissible temperature at housing: 110°C In case of higher temperatures, refer to section 7. |
| Check running noise | Every 3 months | In case of changes, refer to section 7. |
| Check oil level | Every 3 months | Refer to sections 8.1.1 and 3.3.5 |
| Check oil quality | Every 3 months | Refer to sections 8.1.1 and 3.3.5 |
| Check gear unit for tightness | Every 3 months | |
| Visual inspection of painting | Every 3 months | Damage to the coating of the outer gear unit parts leads to failure of the corrosion protection and has to be touched up immediately. |
| Clean vent valve | Every 3 months | Clean unscrewed vent valve with petroleum ether and dry or blow with compressed air. Ensure sufficient ventilation (explosion hazard)! |
| First oil change | After 2,000 operation hours | Refer to section 8.1.2 |
| Further oil changes | After further 15,000 operating hours or 60 months | Refer to section 8.1.2 |
| Clean gear unit | Every 12 months | Excessive water pressure and concentrated cleaning agents are not permitted for eliminating possible contamination. |
| Check fastening screws for tight fit | Every 12 months | Refer to section 5 |

Table 8: Corrective action and intervals

CAUTION!

The indications on oil change intervals only apply to polyglycoles according to section 3.3.5. Depending on the application and the service conditions, other lubricants with different maintenance intervals can be used in some cases. For information, refer to contractual documents (e.g. drawings) or contact AUMA Drives service.

8.1. Description of maintenance work

8.1.1. Oil level and status monitoring



Oil and oil filling level may only be checked once gear unit has cooled down and is at standstill.

Checking the lubricant status:

Open screw plug at oil drain (for position, refer to section 3.1) and drain a small quantity. Once the lubricant has been drained, seal oil drain according to specified tightening torque (table 8.1.1) (Caution: Fit sealing ring again!). Check oil quality with regard to colour and for the quality of solid particles or contamination contained.



If required, an external service or laboratory shall perform the quality checks. Lubricant manufacturers also offer these tests. If required, change oil (refer to section 8.1.2).

Oil level monitoring:

Remove vent valve with oil dipstick (refer to section 3.1), unscrew and wipe remaining oil of the oil dipstick. The oil can only be read off again, once the vent valve has been completely screwed in and removed again (refer to section 3.3.5). Check oil level in case of deviations.



Exclusively use lubricant of the same type (refer to name plate!) for refilling. Mixing oils of various types and manufacturers is not permissible (for selection, refer to table 3.3.5-1). Mineral oils in particular must not be used without prior explicit approval by AUMA Drives.

Finally, the vent valve has to be screwed in again, refer to tables 8.1.1 and 9.2 for the required tightening torque. Replace damaged sealing rings.

| Size | Width across flats of the vent valve (oil infeed) [mm] | Tightening torque of the vent valve (oil infeed) [Nm] | Width of hexagon socket of the screw plug at the oil drain [mm] | Tightening torque of screw plug at the oil drain [Nm] |
|---------------|--|---|---|---|
| S40.1-S80.1 | 12 | 10 | 5 | 10 |
| S100.1-S125.1 | 13 | 20 | 6 | 20 |
| S160.1 | 17 | 34 | 8 | 34 |
| S200.1-S355.1 | 24 | 85 | 12 | 85 |
| S200.1-S450.1 | 27 | 130 | 17 | 130 |

Table 8.1.1: Tightening torques of screw plugs and vent valve

8.1.2. Oil change

Oil change has to be performed shortly after shut-down while still **at service temperature** (housing surface is hand warm). Otherwise complete draining cannot be ensured due to lack of viscosity.



Heat resistant gloves must imperatively be worn to avoid burns due to hot draining oil!

1. Place collecting basin underneath the oil draining screw plug.
2. Unscrew oil draining screw plug and vent valve.

3. Drain oil completely. If required, rinse gear unit with low-viscosity (and compatible) oil.
Possible bronze flakes are uncritical.
4. Seal oil drain: Tighten oil drain screw plug and sealing ring with tightening torque according to tables 8.1.1 and 9.2 .
5. Refill new oil (refer to section 3.3.5) via threaded hole of vent valve up to required filling level (refer to section 8.1.1 "Oil level monitoring").
6. Screw in vent valve including oil dipstick (for tightening torque, refer to table 8.1.1 and 9.2)
7. Contain spilled oil using a suitable agent and dispose of used oil according to national regulations.

9. Screw tightening torques

9.1. Standard screw thread

| Fastening screw | Tightening torque [Nm] | | |
|-----------------|------------------------|------|------|
| | 8.8 | 10.9 | 12.9 |
| M4 | 3.1 | 4.5 | 5.25 |
| M5 | 6.1 | 9 | 10.4 |
| M6 | 11 | 15 | 18 |
| M8 | 25 | 37 | 43 |
| M10 | 51 | 75 | 87 |
| M12 | 87 | 128 | 150 |
| M16 | 214 | 314 | 365 |
| M20 | 431 | 615 | 710 |
| M24 | 742 | 1057 | 1220 |
| M30 | 1489 | 2121 | 2450 |
| M36 | 2594 | 3695 | 4280 |

Table 9.1: Tightening torques for standard thread screws

9.2. Screw plugs

| Screw plug | | Tightening torque [Nm] | Screw plug | | Tightening torque [Nm] |
|--|--|------------------------|--|--|------------------------|
| St | | | St | | |
| Metric fine thread in accordance with DIN 13 | Pipe threads in accordance with EN ISO 228 | | Metric fine thread in accordance with DIN 13 | Pipe threads in accordance with EN ISO 228 | |
| M10 x 1.0 | - | 10 | - | G 1/2 | 60 |
| - | G 1/8 A | 10 | M22 x1.5 | - | 60 |
| M12 x 1.5 | - | 20 | M26 x 1.5 | - | 70 |
| - | G 1/4 A | 26 | M27 x 2.0 | - | 85 |
| M14 x 1.5 | - | 30 | - | G 3/4 A | 85 |
| M16 x 1.5 | - | 34 | M33 x 2.0 | - | 130 |
| - | G 3/8 A | 34 | - | G 1 A | 130 |
| M18 x 1,5 | - | 42 | M48 x 1.5 | G 1 1/2 A | 150 |
| M20 x 1.5 | - | 50 | M60 x 2.0 | G 2 A | 170 |

Table 9.2: Tightening torques for screw plugs

10. Spare parts

CAUTION!

Only use original spare parts by AUMA Drives for maintenance work! AUMA Drives will not assume any liability or warranty for damage incurred when using non-AUMA Drives spare parts. Furthermore, use of such products might impair the both characteristics and operational reliability and safety of the gear unit.

10.1. Spare parts for sizes S40.1 - S80.1

The spare parts indicated below are only valid for the basic version with shaft at drive, hollow shaft at output drive, passive fan and service position B3. Deviating versions, service conditions and gear units for special application and ambient conditions require other components. Please indicate the order number or serial number of the gear unit (refer to name plate) when ordering spare parts.

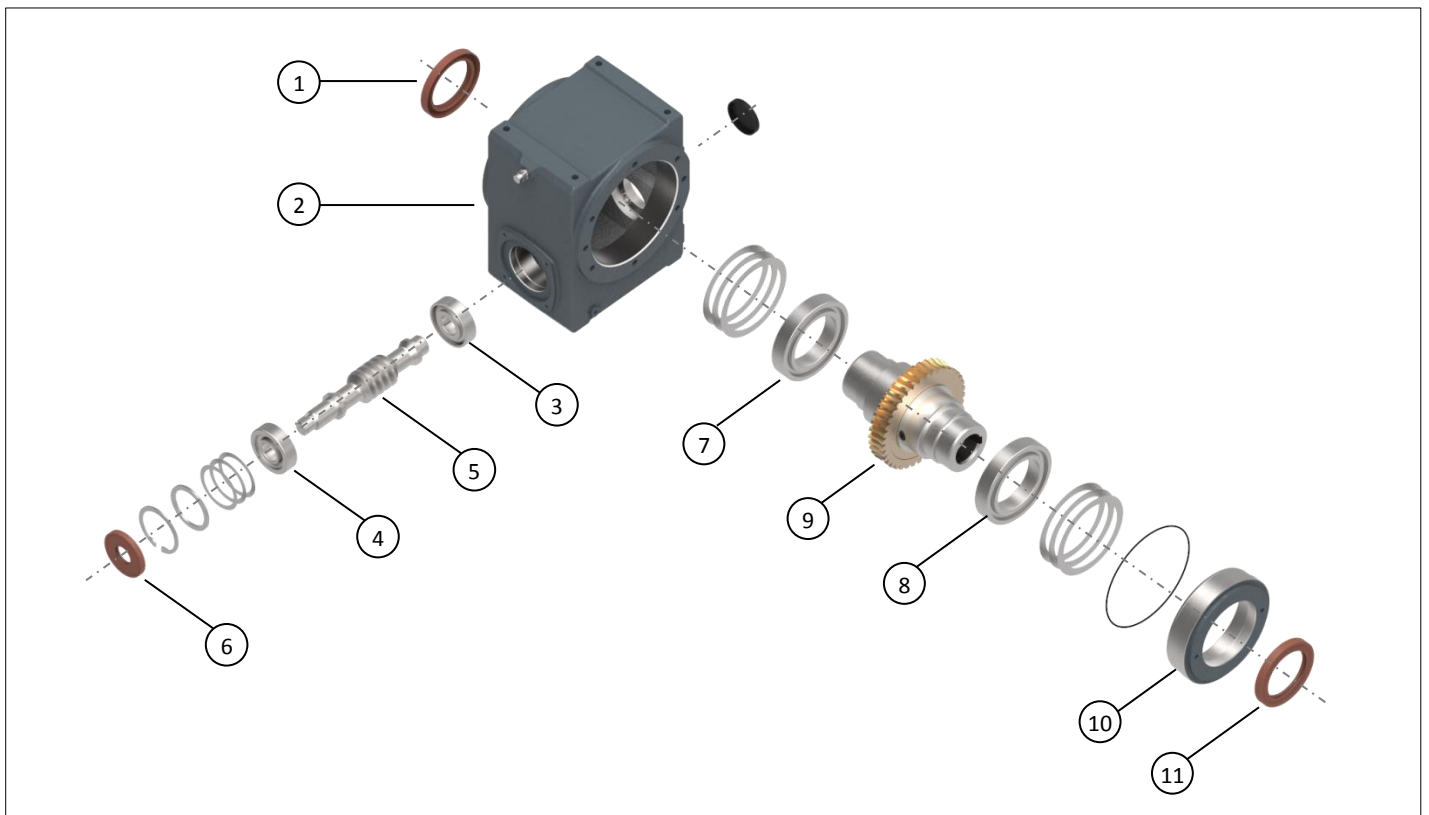


Fig. 10.1: Exploded view of sizes S63.1 and S80.1 (deviating design without bearing cover SR for sizes S40.1 and S50.1!)

| No. | Spare part designation | S40.1 | S50.1 | S63.1 | S80.1 |
|-----|----------------------------------|-----------------|---|---|---|
| 1 | Radial seal DIN3760- | AS35x52x7-FPG | AS50x72x8-FPG | AS50x72x8-FPG | AS65x90x10-FPG |
| 2 | Housing | | | | |
| 3 | Ball bearing | DIN720-32004X-J | DIN720-32005X-J ⁽¹⁾ DIN628-7204-B-TN ⁽²⁾ | DIN720-30205X-J ⁽¹⁾ DIN628-7304-B-TN ⁽²⁾ | DIN720-31305X-J ⁽¹⁾ DIN628-7305-B-TN ⁽²⁾ |
| 4 | Ball bearing | DIN720-30203-J | DIN720-32005X-J DIN628-7204-B-TN | DIN720-30205X-J DIN628-7304-B-TN | DIN720-31305X-J DIN628-7305-B-TN |
| 5 | Worm shaft | | | | |
| 6 | Radial seal DIN3760- | AS20x42x7-FPG | AS20x47x7-FPG | AS20x52x8-FPG | AS25x62x7-FPG |
| 7 | Deep groove ball bearing DIN625- | 16007-J | 6010-J | 6011-J | 6014-J |
| 8 | Deep groove ball bearing DIN625- | 16008-J | 6011-J | 6011-J | 6014-J |
| 9 | Worm wheel | | | | |
| 10 | Bearing cover SR | n/a | n/a | | |
| 11 | Radial seal DIN3760- | AS40x68x8-FPG | AS50x90x10-FPG | AS50x72x8-FPG | AS65x90x10-FPG |

Table 10.1: Wear parts S40.1-S80.1

⁽¹⁾ for i=12.75 (13); 25 (25.5); 51 (53); 61 (62); 82 (83)

⁽²⁾ for i=5 (4.83); 7.5 (7.25); 10 (9.5 & 9.75); 15 (14.5); 20 (19 & 19.5); 30 (29); 40 (38 & 39)

10.2. Spare parts for sizes S100.1 – S160.1

The spare parts indicated below are only valid for the basic version with shaft at drive, hollow shaft at output drive, passive fan and service position B3. Deviating versions, service conditions and gear units for special application and ambient conditions require other components. Please indicate the order number or serial number of the gear unit (refer to name plate) when ordering spare parts.

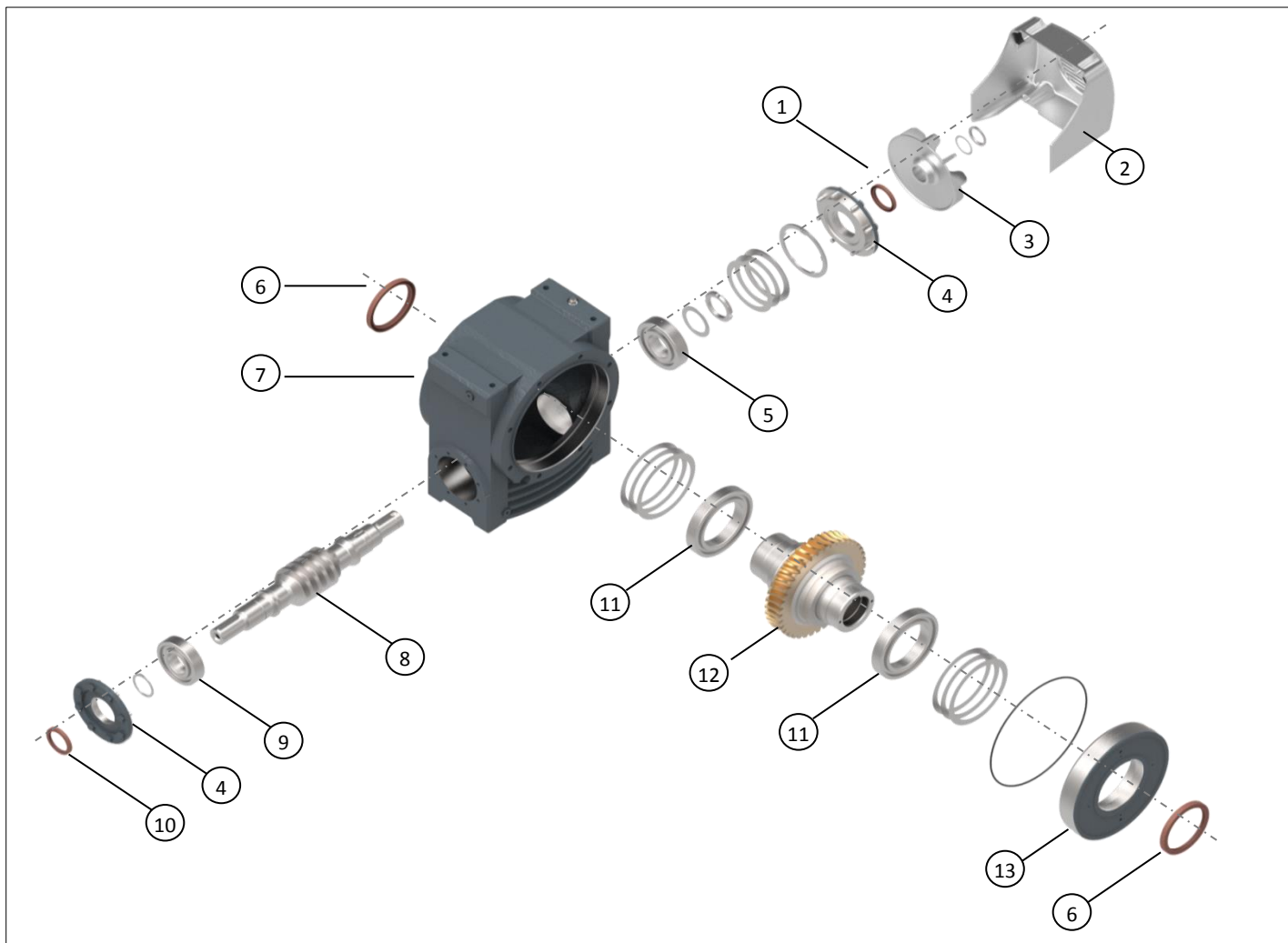


Fig. 10.2: Exploded view of sizes S100.1 – S160.1

| No. | Spare part designation | S100.1 | S125.1 | S160.1 |
|-----|----------------------------------|-----------------------|-------------------|-------------------|
| 1 | Radial seal DIN3760- | AS35x62x12-70...80FPM | AS42x72x8-FKM-G | AS55x72x8-FP-G |
| 2 | Fan cover | | | |
| 3 | Fan wheel | | | |
| 4 | Bearing cover SW | | | |
| 5 | Angular ball bearing DIN628- | QJ 308-TN | QJ 309-TN | QJ 312-PHAS |
| 6 | Radial seal DIN3760- | AS85x110x12—FP-G | AS95x120x10-FPM-G | AS115x140x12-FP-G |
| 7 | Housing | | | |
| 8 | Worm shaft | | | |
| 9 | Deep groove ball bearing DIN625- | 6308-J | 6309-J | 6311-J |
| 10 | Radial seal DIN3760- | AS35x62x12-70...80FPM | AS45x72x8-FKM-G | AS55x72x8-FP-G |
| 11 | Deep groove ball bearing DIN625- | 6017-J | 6020-J | 6024-J |
| 12 | Worm wheel | | | |
| 13 | Bearing cover SR | | | |

Table 10.2: Wear parts S100.1-S160.1

10.3. Spare parts for sizes S200.1 - S450.1

The spare parts indicated below are only valid for the basic version with shaft at drive, hollow shaft at output drive, passive fan and service position B3. Deviating versions, service conditions and gear units for special application and ambient conditions require other components. Please indicate the order number or serial number of the gear unit (refer to name plate) when ordering spare parts.

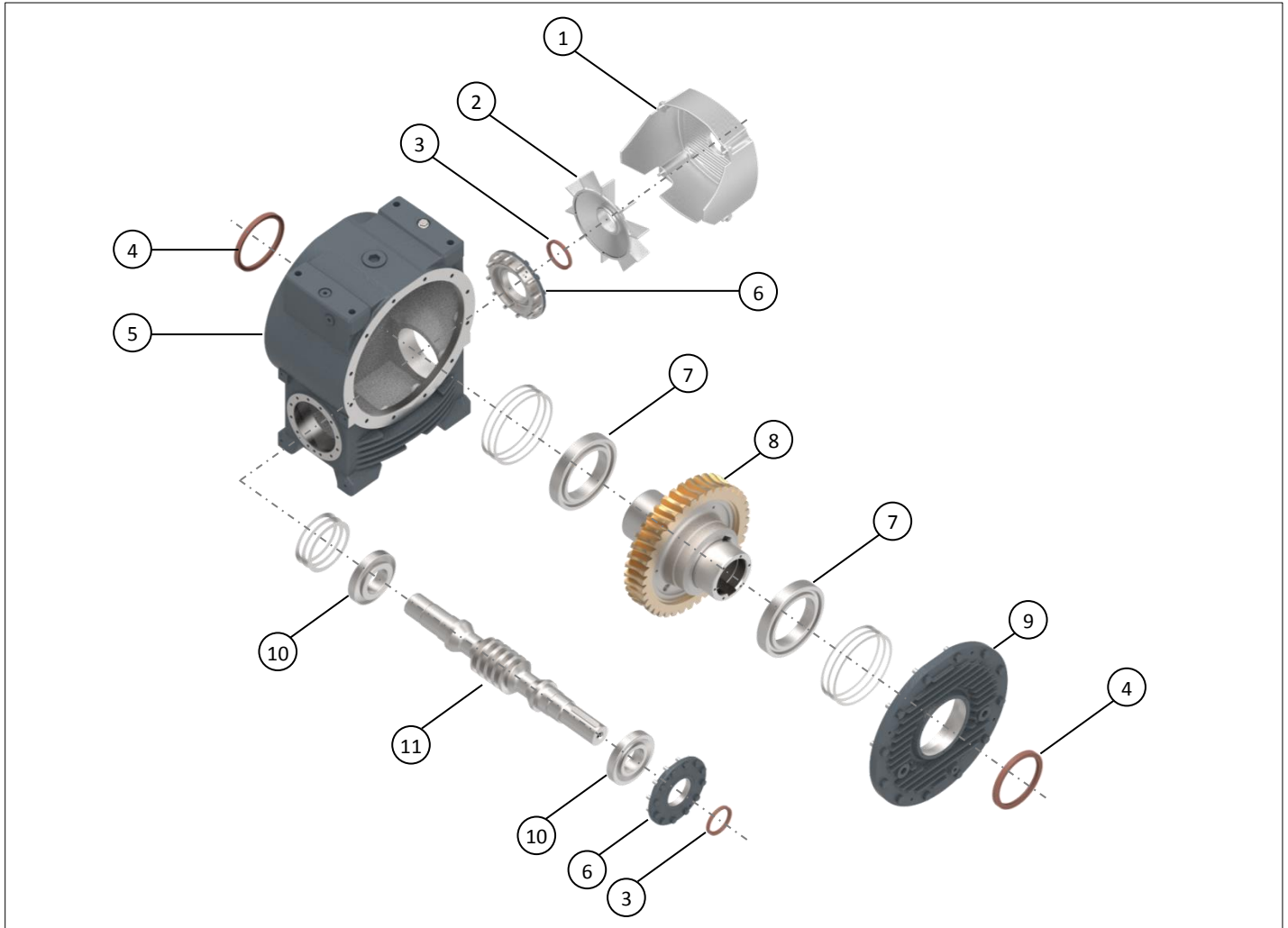


Fig. 10.3: Exploded view of sizes S200.1 - S450.1

| No. | Spare part designation | S200.1 | S225.1 | S250.1 | S280.1 | S315.1 | S355.1 | S400.1 | S450.1 |
|-----|--|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| 1 | Fan cover | | | | | | | | |
| 2 | Fan wheel | | | | | | | | |
| 3 | Radial seal DIN3760- | AS60x85x8- FKM-G | AS75x95x10- FKM-G | AS75x95x10- FKM-G | AS85x120x12- FKM-G | AS95x120x12- FKM-G | AS95x120x12- FKM-G | AS105x140x 12-FKM-G | AS115x140x 12-FKM-G |
| 4 | Radial seal DIN3760- | AS130x160x 12-FKM-G | AS160x190x 15-FKM-G | AS160x190x 15-FKM-G | AS180x210x 15-FKM-G | AS200x230x 15-FKM-G | AS220x250x 15-FKM-G | AS260x300x 20-FKM-G | AS280x320x 20-FKM-G |
| 5 | Housing | | | | | | | | |
| 6 | Bearing cover SW | | | | | | | | |
| 7 | Deep groove ball bearing DIN625- | 6026-J | 6032-J | 6032-J | 6036 | 6040-J | 6044-M | 6052-M | 6056-M |
| 8 | Worm wheel | | | | | | | | |
| 9 | Bearing cover SR | | | | | | | | |
| 10 | Tapered roller bearings DIN720- | 31313-J | 31316-J | 31316-J | 31320X-J | 31320X-J | 31320X-J | 31322X-J | 31324X-J |
| 11 | Worm shaft | | | | | | | | |

Table 10.3: Wear parts S200.1-S450.1

11. Disposal

Our gear units have a long service life. However, they have to be replaced at one point in time. Individual components have to be disposed of as follows:



- Housing parts, worm shaft, shafts and roller bearings are to be disposed of as scrap steel
- Parts made of cast iron are also to be handled as scrap steel, in case there is no separate collection.
- Worm wheels made of bronze have to be disposed of separately.
- Greases and oils are hazardous to water and must not be released into the environment. They have to be collected and disposed of according to the relevant environmental provisions (national regulations for waste disposal and directives, e.g. ISO 14001).

Operation instructions

Worm gear units

S40.1 – S450.1

12. Appendix I: Declaration of Incorporation



Drives

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EC Declaration of Incorporation

according to EC machinery directive 2006/42/EC dated 17 May 2006, appendix II B

The manufacturer

AUMA Drives GmbH
Grenzstraße 5
D-01640 Coswig/ Germany

declare herewith that the above mentioned gear units comply in their conception and design as well as in the versions distributed with the basic requirements for safety and health of the EC Directive 2006/42/EC, considering particularly appendix 1, paragraphs 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.7, 1.7.1., 1.7.3, 1.7.4.

With regard to the partly finished machine, the manufacturer commits to submitting the documents to the competent national authority via electronic transmission upon reasonable request. The relevant technical documentation pertaining to the partly completed machinery described in Annex VII, part B has been prepared.

The partly finished machine must not be put into service until the machinery into which the AUMA Drives unit is to be incorporated has been declared in conformity with the provisions of the EC Directive (2006/42/EC).

Description of the partly finished machinery:

Worm gear units
Spur gear units
Worm-spur gear units
Spur-worm gear units
Double worm gear units
Slewing gear units
Screw jacks
Cross-helical gears
Bevel gearboxes
Planetary gear

Applied harmonised standards:

DIN EN ISO 12100:2011 Safety of machinery
General principles for design - Risk assessment and risk reduction

Authorised person for technical documentation:

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Coswig 2015-10-01
Ort Date


Jürgen Riester, Managing Director

Y050.082/EN

This declaration does not contain any guarantees. The safety instructions in product documentation supplied with the devices must be observed. Non-concerted modification of the device components voids this declaration.

| Plant/place of installation: | | | |
|-------------------------------------|---------------------|---------|-----------|
| Gear unit serial number: | | | |
| Date | Performed action(s) | Comment | Signature |
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