AUMA worm gearboxes and primary reduction gearings are high-quality mechanical products. Possible damages can be avoided by observing the following points.

1. Transport and storage

- Transport to place of installation in sturdy packing.
- Store in well-ventilated, dry rooms.
- Protect against floor dampness by storage on shelves, on wooden pallet or similar storage devices.
- Cover to protect against dust and dirt etc.
- Protect bright surfaces by suitable long-term corrosion protection agent (e.g. acid-free grease).
- For long-term storage, please consult us.

2. Operating conditions

AUMA worm gearboxes GS can be used in the following ambient temperatures:

GS	-25 °C to	+80 °C
GS - H	0 °C to	+120 °C
GS - L	-40 °C to	+60 °C
GS - EL	-60 °C to	+60 °C

AUMA worm gearboxes GS and primary reduction gearings GZ can be operated in any mounting position.

3. Mounting to valve

- Thoroughly degrease faces at mounting flange and valve.
- If not ordered finish machined from our factory, the coupling has to be provided with bore and keyways suitable for the valve shaft. (For the gearbox sizes GS 400 and GS 500 each coupling is matched to a worm wheel and therefore to a gearbox. The correlation is indicated by a four digit number. This number is stamped on a plate next to the name plate, on the mounting flange and on the coupling. When mounting the gearbox to the valve it must be ensured that the numbers on gearbox and coupling correspond.)
- Place coupling onto the valve shaft (see figure 1), ensure that dimensions X and Z max. (see table 1) are observed.
- Secure coupling against axial movements on the shaft, either by using a radial grub screw or by tightening with bolt and washer against the shoulder on the shaft (see figure 1).
- Mount gearbox. If required, turn gearbox slightly until the toothing of the coupling gets engaged. Ensure correct alignment and complete contact of the gearbox (observe spigot on the mounting face).
- Fasten with bolts of minimum quality 8.8 using lock washers, fasten bolts crosswise to the appropriate torque according to table 2.

Note: Experience showed that it is very difficult to fasten bolts or nuts of M30 or larger with the defined torques. The worm gearbox may move radially against the valve flange. To improve adhesion of valve and gearbox, we recommend to apply a thin layer of Loctite 243 (or similar products) on mounting faces.

Figure 1

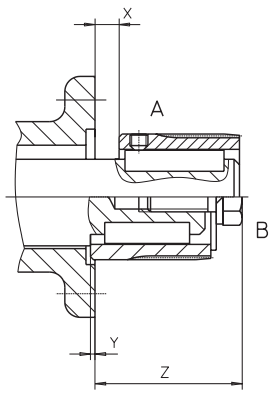


Table 1

Type	X max	Y max	Z max
GS 160	12	0	125
GS 200	22	0	165
GS 250	22	0	200
GS 315	26	0	280
GS 400	36	0	285
GS 500	40	0	375

Table 2

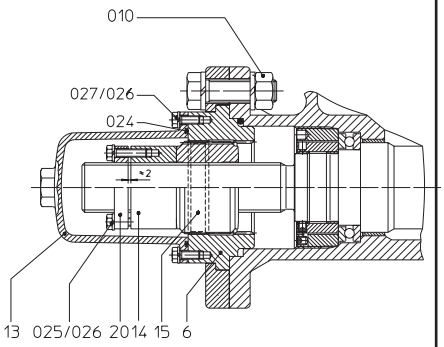
Type	8.8	T_A (Nm)
GS 160	M16	220
GS 200	M20	430
GS 250	M30	1,500
GS 315	M36	2,500
GS 400	M36	2,500
GS 500	M42	4,000

4. Setting of the end stops for manual operation

Notes:
- The end stops are set to 92° swing angle in the factory, unless ordered otherwise.
- If worm gearboxes GS are supplied on a valve the end stops have already been set by the valve manufacturer.

Attention: For ball valves the end stop OPEN has to be set first!

Figure 2



End stop CLOSED (figure 2)
- Loosen all nuts (figure 2 / 010) on the flange.
- Turn valve manually to end position CLOSED.
- Turn end stop guide (figure 2/ 6) with protective cap (figure 2/ 13) clockwise to move the travelling nut (figure 2 /15) up to the shoulder.
- Fasten all nuts (figure 2 / 010) evenly crosswise with the torque shown in table 3.
- Loosen the nuts (figure 3 / 09) on the pointer cover (figure 3 / 8), turn the pointer cover until the arrow coincides with the CLOSED mark, and tighten nuts (figure 3 / 09) once again. (For versions with lid for buried service, this setting is not required.)

Table 3

Type	8.8	T_A (Nm)
GS 160	M16	210
GS 200	M20	410
GS 250	M16	210
GS 315	M20	410
GS 400	M30	1,500
GS 500	M36	2,500

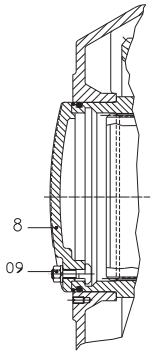
End position OPEN
The end stop need not be set since the required swing angle has been set in the factory.

5. Setting of the end stops with mounted actuator

Notes:
- The end stops are set to 92° swing angle in the factory unless ordered otherwise.
- If worm gearboxes GS and multi-turn actuator are supplied on a valve the end stops, limit and torque switching have already been set by the valve manufacturer.

Attention:
- The valve manufacturer has to determine whether the valve is to be limit or torque seated.
- For ball valves the end position OPEN has to be set first!

Figure 3



- Determine overrun of the actuator for both directions, i. e. how much does the valve move after the motor has been switched off?

End position CLOSED (figures 2 and 3)
- Loosen all nuts (figure 2 / 010) on the flange.
- Engage manual drive at the actuator and move the valve manually to the end position CLOSED.
- Turn end stop guide (figure 2/ 6) with protective cap (figure 2/ 13) clockwise to move the travelling nut (figure 2 /15) up to the shoulder.
- Turn end stop guide (figure 2 / 6) counter- clockwise by a quarter to half a turn to ensure the end stop is not approached during electric operation.
- Fasten all nuts (figure 2 / 010) evenly crosswise with the torque shown in table 3.
- Loosen the nuts (figure 3 / 09) on the pointer cover (figure 3 / 8), turn the pointer cover until the arrow coincides with the CLOSED mark, and tighten nuts (figure 3 / 09) once again. (For versions with lid for buried service, this setting is not required).

Limit seating in end position CLOSED

- Turn back the valve from the end position by an amount equal to the overrun. Set limit switching according to the operation instructions SA 07.1 - SA 48.1.

Torque seating in end position CLOSED

- Turn handwheel counter-clockwise by approx. 2 turns to move the valve out of the end position. Then turn handwheel approx. 1 turn clockwise so that the end position CLOSED has nearly been reached, but the seat not yet.
- Set limit switching of multi-turn actuator for the end position CLOSED according to the operation instructions SA 07.1 - SA 48.1 (used for signalisation).
- Check setting of torque switch CLOSED and, if required, set it to the required value (according to valve manufacturer's data).

End stop OPEN (figure 2)

- Move gearbox to the end stop OPEN.
  Attention: The last part of the travel has to be made manually.
- Check the setting of the end stop for the position OPEN. If re-setting is required, proceed as follows:
- Remove all bolts (figure 2 / 027) as well as the protective cap (figure 2 / 13).
- Loosen all hex. bolts (figure 2 / 025) on the adjusting nut (figure 2 / 20).
- If the set angle has to be enlarged, turn back the end stop nut (figure 2 / 14) counter-clockwise. If the end stop nut 14 can only be turned with great difficulties, remove two opposing bolts (figure 2 / 025) entirely and use a pin wrench to turn the end stop nut (figure 2 / 14).
- Move valve into the desired end position OPEN.
- Turn end stop nut (figure 2/ 14) with adjusting nut (figure 2 / 20) clockwise until it is tight up to the travelling nut (figure 2 / 15).
- Tighten hex. bolts (figure 2 / 025) evenly to secure the end stop nut against further turning.
- Move valve several times in manual operation out of the end position OPEN and back against the end stop nut.
- Tighten all hex. bolts (figure 2 / 025) once again.
- Place protective cap (figure 2 / 13) and ensure that the O ring (figure 2 / 024) fits properly. Fasten the cap using hex. bolts and lock washers (figure 2 / 026 / 027).
- Turn back the gearbox manually by the amount of the overrun from the end position (a quarter to half turn on the handwheel for actuators mounted directly, approx. 1 to 2 turns with mounted primary reduction gearing GZ.)
- Set limit switching in actuator for the end position OPEN according to the operation instructions SA 07.1 - SA 48.1.

6. Maintenance

Attention: After commissioning of gearbox/ actuator, check for damages to paint finish, caused by transport or installation. Do necessary touch-up to prevent corrosion.
Original paint in small quantities can be supplied by AUMA.
Under normal service, AUMA worm gearboxes and AUMA primary reduction gearings require only little maintenance.

We recommend:

- If operated seldom, perform a test run every 6 months. This ensures that gearbox/actuator is always ready to operate.
- Check the bolts between the multi-turn actuator, gearbox and valve for tightness approximately six months after commissioning and every year thereafter.

7. Lubrication

Each gearbox is filled with lubricant in the factory. This filling lasts for several years of service. Detailed maintenance instructions can be sent if required.