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Installation, Operation and Maintenance

INSTRUCTIONS

Bevel Gearbox Manual

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Product Overview

1 Overview

When selecting ACTUGEAR bevel gear box, customer can consult the ACTUGEAR catalogue or ask ACTUGEAR to select the gear models.
ACTUGEAR bevel gear box is designed according to the valve open and close characteristics, suitable for gate valve, globe valve, and other multi-turn equipment. The products are widely used in various harsh environments, climate areas, and special temperature industrial sites. ACTUGEAR gear boxes offer reliable driving stability and long-term maintenance-free guarantee.
Remark: For harsh environments, climates, and special working conditions, this should be clearly explained when ordering.

2 Protection Grade

Standard gear boxes meet IP66 protection grade as specified in GB 4208 / IEC 60529 standards.
Additional protection measures shall be used in the bevel gear box according to different user application requirements, such as higher anti-corrosion protection. If a higher IP grade is required, it shall be stated in the order.
Remark: This instruction manual does not include the subsea worm gear box.

3 Ambient Temperature

- **Standard Type (A):** $-20°C \sim 80°C$ — Applicable to normal environmental conditions.
- **High Temperature Type (B):** $-20°C \sim 180°C$ — Suitable for high-temperature working conditions. High-temperature grease and seals are required.
- **Low Temperature Type (C):** $-40°C \sim 80°C$ — Suitable for low-temperature areas. Low-temperature body, grease, and seals are required.
- **Ultra-Low Temperature (D):** $-60°C \sim 80°C$ — Suitable for ultra-low temperature areas. Low-temperature body, grease, and seals are required.

Product Structure

See Fig. 1 for the typical bevel gear box.

Storage and Transport

Do not allow collisions when handling or moving the worm gear. Ensure that the connecting surface, input shaft, and surface paint are not damaged.
If the worm gear is not installed and must be stored outdoors for a short time, it shall be protected against collision, sunlight, rain, and corrosion.
If not installed, and temporarily placed indoors, the gear body, indicator, and input shaft surfaces shall be protected. Collision, scratches, and oil contamination are strictly prohibited.
For long-term storage, the gear should be stored in an indoor warehouse. During storage, the outer surface shall be rust-proofed every 6 months. Keep the area clean, dry, ventilated, and organized — no stacking or mutual pressing. ACTUGEAR worm gears are pre-treated with rust protection and can be stored indoors for up to 6 months.

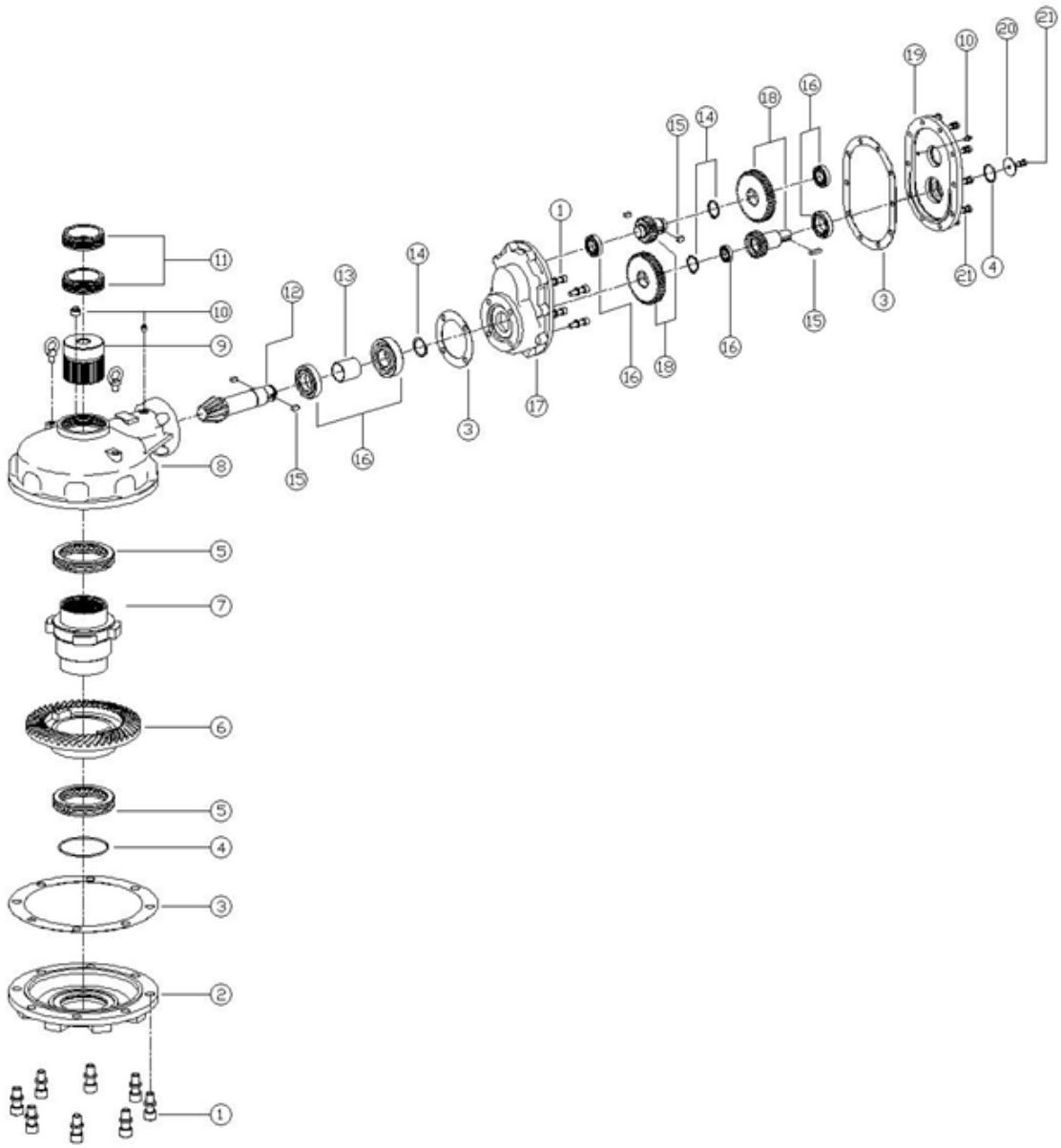

Figure 1: *Typical Bevel Gear Box structure*

1 — bolts 2 — base 3 — sealing gasket 4 — O-ring 5 — thrust bearing 6 — bevel gear 7 — drive sleeve 8 — body
9 — stem bush 10 — grease nipple 11 — lock nut 12 — pinion gear 13 — collar 14 — snap ring
15 — key 16 — bearing 17 — reduction gear body 18 — reduction gear
19 — reduction gear cover 20 — handwheel indicator 21 — bolts

Installation

1 Mounting Flange Compatibility

The input and output mounting flange size of ACTUGEAR bevel gear are designed and manufactured in accordance with ISO 5210, JB 2920 and ISO 5211. F20 is the standard given by ACTUGEAR. Please refer to ACTUGEAR specification.
Remark: When ordering, the buyer's requirements and ISO 5211 regulations can be followed. If no special requirements on the stem bush, customers need to machine the inner thread to match the valve stem by themselves. The stem bush supplied will reserve small central bores. The stem bush is also suitable for single key connection, double key or four key connection, right angle square head or diagonal square head, flat head connection, to meet the shear and extrusion stress of the valve stem connection key or the structural requirements of the connected product.

2 Lifting and Handling

For the gear box with weights greater than or equal to 50 kg, lifting rings are provided. During installation, the gear box should be lifted in the fully open position to prevent collision damage. Use appropriate lifting ropes (such as steel wire ropes, chains, etc.). Comply with the relevant national safety regulations for lifting operations. The lifting ring can only bear the weight of the gear box itself and not the weight of valves or actuators connected to the gear box.
Warning: It is strictly prohibited for people to be under the lifted object during lifting or hoisting process. Attention should be paid to ensuring safety.

3 Electric Actuator Compatibility

If the bevel gear needs to be used with an electric actuator, it is recommended to first install the gear onto the valve before installing the electric actuator. The maximum output torque of the optional electrical actuator should not exceed the maximum input torque of the bevel gear box.

4 Connection Face Requirements

During installation, the connection face of the valve and bevel gear should be kept clean, free from scratches and rust, to ensure correct installation. ACTUGEAR provides the minimum effective thread length for connecting bolt holes according to ISO 5211.

5 Installation Steps

a) Screw the bolts into the connecting holes of bevel gear box and spiral them to the bottom.

b) Small sizes can be directly installed, and for sizes greater than 50 kg, lifting should be done according to subsection 4.2.

   Warning: It is strictly prohibited to place hands between the bevel gear and the flange of the valve during installation to prevent injury.

c) Screw on the nut, and the pre tightening of the bolt should be symmetrical and evenly tightened in multiple steps.

Note: Uneven bolt preload may not reach the torque transmitted by the control valve, and bolts may loosen after prolonged operation.

Operation

The maximum torque for manual or electric input should not exceed the max. input torque value of gear box.

1 Manual operation

All bevel gears of ACTUGEAR are operated according to the opening and closing requirements of the valves, with the input shaft turning clockwise to close the valve and counterclockwise to open the valve. And will supply the hand wheel indicator for "opening and closing signs" as shown in Figure 2.

Figure 2: *Hand wheel indicator for opening and closing signs*

2 Motor operation

Operated according to the instruction of electric actuator.

Maintain

All ACTUGEAR bevel gears have been lubricated according to their usage conditions. Room temperature (standard type), using GB/T 7324 universal lithium based grease No. 3. For Low temperature and high temperature types are also available according to customer requirements.

Points for attention

a) Please do not open the bevel gearbox cover for inspection or maintenance outdoors in adverse weather conditions (rain, snow).

b) After maintenance and debugging, all sealing parts should be installed and tightened, and do not lose the sealing rings.

c) Don’t use a sleeve, stick, or rod on the handwheel to increase force arm to forcefully open or close.

d) It is recommended to regularly open and close the bevel gear to inspect when the valve is rarely used.

Causes analysis and removal

See below table.

No.	Causes	Reason		Solutions	
1	The input shaft rotates but the bevel gear does not rotate	The overloaded gear is completely cut off	Overloaded flat key is cut off	Change the gear	Change the key
2	Slipping or pausing during operation	Serious gear wear		Change the gear	
3	With noise during open and close	No grease,or grease not suitable for the ambient temperature		Fill in suitable grease	
4	With blockage in the operation	Flooded with water or lack of grease		Change sealing parts or fill in grease	
5	Grease leakage	Sealing failure caused by low or high temperature		Change sealing parts and fill in greaset	

Table 1: *Causes analysis and removal*