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**GREGOR:  
DOME AND TELESCOPE  
MAINTENANCE**

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Signatures & Approval

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## 1 SCOPE

This document shows the procedure concerning the dome and the telescope maintenance, which shall be programmed every year or every two as much, except for the screw jack spindles from the clamping mechanism, which might require a service with a periodicity even shorter than yearly (See section 3.2.1).

The maintenance here shown refers only to mechanical maintenance, i.e., lubrication of the mechanisms. For those parts to be service with a greasing gun, two or three shots are enough.

**Only the sections highlighted in yellow require maintenance.** The rest of the points are mentioned here for completeness of the report, as they contain valuable information concerning the mechanisms and the commercial references for the standard components.

Two people are needed to perform the task, and it can take between half or a full day as much. Good weather is needed for at least some of the operations, which require having the dome opened.

A printable checklist can be found on the last section of the report.

## 2 MATERIAL NEEDED

Almost everything which is needed to do the maintenance (grease, brushes, grease pump guns, paper, gloves, etc.) can be found at the telescope basement (metallic cabinet shown). A toolbox from the optics lab will be also needed.



*Fig. 1: Material location at Gregor basement.*

There are two grease pumps guns: One is used for the dome and other for the telescope, attending to the greasing point shape.



Fig. 2: Grease pump guns at Gregor basement.

The greasing point connector can be exchanged from one gun to the other.

### 3 DOME MAINTENANCE

#### 3.1 Main Frame Mechanism (Bows)

##### 3.1.1 Spindles



Component type: Screw jack spindle (x4)

Grease: **Molykote P40**. Applied with a **brush**.

Procedure: Open the dome. Remove the dust protector from the upper and the lower side of the spindle. For the lower side, the motor transparent covers have to be removed. Take the chance when the covers are out to also do section 2.2.7.

Once finished, close and open the dome a few times to spread the grease along the spindle.



Fig. 3: Spindles with dust protector removed. Left and central left: Protector removed from the upper side. Right and central right: Protector removed from the lower side.

### 3.1.2 Fork head central bushes

Component type: Spherical plain bearing bushes.



*Fig. 4: Fork head central bushes images (right) and location (left).*

Manufacturer - Type: SKF GE 50 TE-2RS [Maintenance-free spherical plain bearing with sliding contact surface combination steel/PTFE fabric]

Grease: Self Lubricating.

### 3.1.3 Fork head lateral bushes

Component type: Plain bearing bushes



Manufacturer - Type: SKF PCM 556030 M [Composite dry sliding bushing]

Grease: Self Lubricating

*Fig. 5: Fork head lateral bushes image (right) and location (left).*

### 3.1.4 Swivel flange bush

Component type: Plain bearing bush.



Manufacturer - Type: SKF PCM 505540 M  
[Composite dry sliding bushing]  
Grease: Self Lubricating



*Fig. 6: Swivel flange bushes. Location (left). Image (right).*

### 3.1.5 Swivel flange washer

Component type: Lateral guide washer



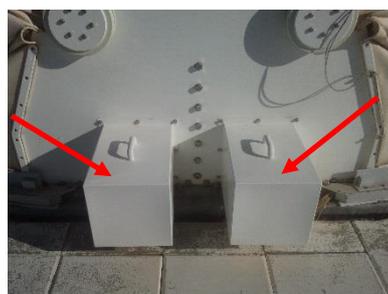
*Fig. 7: Swivel flange washer. Location (left). Image (right).*

Manufacturer – Type: SKF PCMW 527802 M [Composite dry sliding thrust washers]

Grease: Self-Lubricating.

### 3.1.6 Motors and Gearboxes

Component type: Main drives motors and gearboxes (x4)



*Fig. 8: Dome main drive motors and gear locations under the housing.*

*North side (x2) and south side (x2).*

Manufacturer: ABM G112F/4D100Lc-4 (3kW, 145 rpm) [Gearbox: 2 stages helical box; Drive: 4 pole & 3 phases]

Grease: This kind of motors are lubricated for the first 10.000 operating hours for the case of gear oil model, and for 8.000 operating hours for the grease model. Given the high numbers compared to the low running effective time at the telescope, no greasing/oiling is needed unless because of ageing.

### 3.1.7 Worm gear

Component type: Worm gear (x4)



*Fig. 9: Grease nipple and location.*

Manufacturer: Power Jacks / Duff N.;  $i=8:1$ ; Pitch:12 mm; Typ: TE 1820-800

Grease: What Manufacturer recommends is:

“For normal operation, the screw jacks should be lubricated about once a month, using one of the following extreme pressure greases, or their equivalent:

Shell: Gadus S2V22OAC2 (Alvania WR2)

BP: Energol LC2

Castrol: Spherol EPL2

Mobil: Mobilux EP2”

Note: Isoflex TOPAS NB 52, Klüber, has been used since 2021 campaign. According to Klüber, it has good load-carrying capacity.

Products & Service

ISOFLEX TOPAS NB 52

Article-No: 004131

Synthetic rolling and plain bearing greases

ISOFLEX TOPAS NB 52 and ISOFLEX TOPAS NB 152 are rolling and plain bearing greases based on a synthetic hydrocarbon oil and a barium complex soap. The special barium-soap thickener used in the ISOFLEX TOPAS NB 52 and 152 greases offers [good load-carrying capacity](#) as well as resistance to water and ambient media unlike other soap-based thickeners. Both products show good protection against corrosion as well as oxidation and ageing stability. The Klüber barium complex soap is ELINGS-registered and approved by GASG (Global Automotive Stakeholders Group).

ISOFLEX TOPAS NB 152 can be used in a wide service temperature range from -40 °C to 150 °C. ISOFLEX TOPAS NB 52 is suitable for temperatures between -50 °C to 120 °C and short peak temperatures up to 150 °C depending on the application, e.g. [enclosed gears](#), car seat adjustment mechanisms.



**Procedure:** Open the plastic covers to be able to access the greasing point.

### 3.1.8 Opening bearings

**Component type:** Spherical plain bearing



Fig. 10: Grease nipple location and type of grease

**Manufacturer:** SKF GE 120 ES [Radial spherical plain bearings requiring maintenance]

**Material:** Steel-on-steel

**Grease:** SKF grease LGHB 2 (Recommended by SKF).

**SKF LGHB 2/0.4 High Load, High Temperature, High Viscosity Grease**

- High load, high temperature, high viscosity grease, 420 ml cartridge
- Excellent load capacity, anti-oxidation and corrosion protection even with large water ingress
  - Withstands peak temperatures of 200 °C (390 °F)
  - **Typical applications:**
    - [Radial spherical plain bearings](#)
    - Paper and paper-making machines
    - Asphalt vibrating screens
    - Continuous casting machines
    - Sealed spherical roller bearings operating up to 150 °C (300 °F)
    - Work roll bearings in steel industry
    - Mast rollers of fork lift trucks



**Note:** Isoflex TOPAS NB 52 from Klüber was used in 2021 campaign.

### 3.1.9 Bearing between the sheets or panels

Component type: Spherical plain radial bearing.



*Fig. 11: Grease nipple location (left) and type of grease (right).*

Manufacturer: SKF GE120 ES [Radial spherical plain bearings requiring maintenance]

Material: Steel-on-steel

Grease: SKF grease LGHB 2 (Recommended by SKF).

Note: Isoflex TOPAS NB 52 from Klüber was used from 2021 campaign on.

### 3.1.10 Rod end between the sheets or panels

Component type: Rod end



*Fig. 12: Grease nipple location and type of grease.*

Manufacturer: SKF SC 40 ES [Rod end requiring maintenance, steel on steel, welding shank]

Material: Steel-on-steel

Grease: SKF grease LGMT 3 (Recommended by SKF).

## LGMT 3



General purpose industrial and automotive NLGI 3 grease  
SKF LGMT 3 is mineral oil based, lithium soap thickened grease. This premium quality, general purpose grease is suitable for a wide range of industrial and automotive applications requiring stiff grease

[FIND A DISTRIBUTOR](#)

### FEATURES AND BENEFITS

- Excellent rust inhibiting properties
- High oxidation stability within its recommended temperature range

### TYPICAL APPLICATIONS

- Bearings >100 mm (3.9 in.) shaft size
- Outer bearing ring rotation
- Vertical shaft applications
- Continuous high ambient temperatures >35 °C (95 °F)
- Propeller shafts
- Agricultural equipment
- Car, truck and trailer wheel bearings
- Large electric motors

Note: Isoflex TOPAS NB 52 from Klüber was used from 2021 campaign on.

## 3.2 Clamping mechanism (Jaws)

### 3.2.1 Spindles

Component type: Screw jack spindle (x2)



*Fig. 13: Screw jack spindle for the clamping mechanism.*

Grease: **Molykote DX.**

Note: In the past, it was serviced with Molykote P40, like with the bows spindles, but after replacing the original textile, perhaps they are now smaller in size or

have different mechanical properties, for this reason the mechanical tension is higher and as a result of it, the spindle was returning once the dome was closed. Molykote DX has better properties in this case and the spindle doesn't come back when it is applied. Whenever the spindle shows this behavior, please open and apply DX on them.

Procedure: Open the dome. As the mechanism is fully opened when the dome is folded down, do the lower side from the spindle by removing the lower dust protection and apply the grease with a brush. Close the protection and manually move the mechanism (close and open) several times (See procedure below on how to operate the mechanism manually).

Repeat the process for the upper side of the spindle. In this case, the starting point from the mechanism should be closed, so that the upper dust protection can be removed.

Procedure to move the Jaw's spindle manually:

- Open the dome control box at the dome side (Box where the HHP to operate the dome is hanged to). The default setup is shown below:



*Fig. 14: Dome control box. Default configuration.*

- To move the jaw's spindle: Turn the key to manual mode, normal to S/J, Jaw's knob to the desired side, so as to move one spindle each time, stand-alone from the bottom right knob and, lastly, move speed voltage to active. Then, press the open or close bottom from the HHP.



Fig. 15: Dome control box. Configuration setup for moving the jaws spindles manually.

### 3.2.2 Guiding rollers

Component type: Rollers

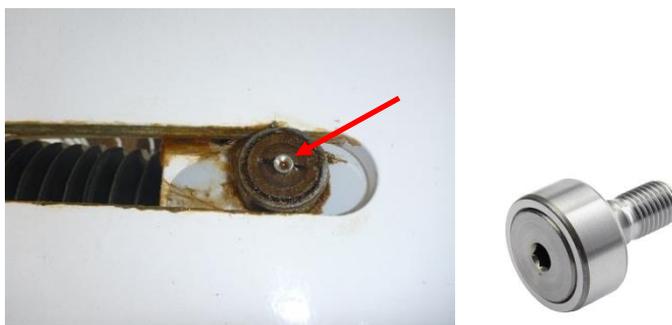


Fig. 16: Grease nipple location (left) and type of grease (right).

Manufacturer: SKF A2NIP KRV 35 PP (with the axis 18 mm wide, M16x1.5, protective cover) [Cam Follower]

Grease: SKF grease LGWA 2 (Recommended by SKF).

#### LGWA 2

High load, extreme pressure, wide temperature range

SKF LGWA 2 is a premium quality mineral oil based, lithium complex grease with extreme pressure (EP) performance. LGWA 2 is recommended for general industrial and automotive applications, when loads or temperatures exceed the range of general purpose greases.

##### FIND A DISTRIBUTOR

##### FEATURES & BENEFITS

- Excellent lubrication at peak temperatures up to 220 °C (430 °F) for short periods
- Protection of wheel bearings operating under severe conditions
- Effective lubrication in wet conditions
- Good water and corrosion resistance
- Excellent lubrication under high loads and low speeds

##### TYPICAL APPLICATIONS

- Wheel bearings in cars, trailers and trucks
- Mining machines
- Fan and electric motors



Until 2025 they haven't been serviced, due to the low running time in comparison to other industrial applications. Molykote P40 could be compatible. KIS will procure a proper greasing gung or accessory for this kind of nipples.

### 3.2.3 Gearmotor

Component type: Gearmotor (x2)

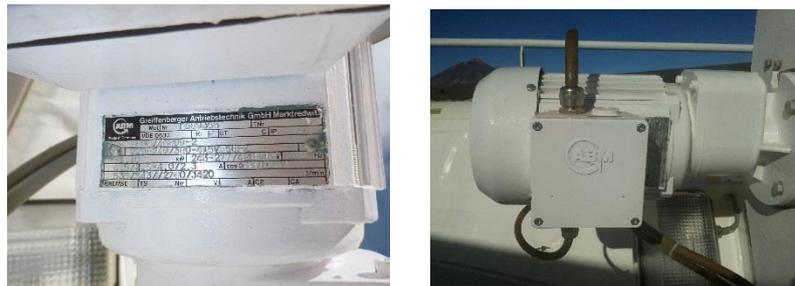


Fig. 17: Gearmotor. Note that these gearmotors were completely renovated by two new equivalent units in 2024.

Manufacturer: ABM G80F/4D80b-2 (1.1 kW, 536 rpm) [Gearbox: 2 stages helical box; Drive: 2 pole & 3 phases]

Grease: This kind of motors are lubricated for the first 10.000 operating hours for the case of gear oil model, and for 8.000 operating hours for the grease model. Unless because of ageing, there is no reason for doing maintenance.

### 3.2.4 Worm gear

Component type: Worm gear.

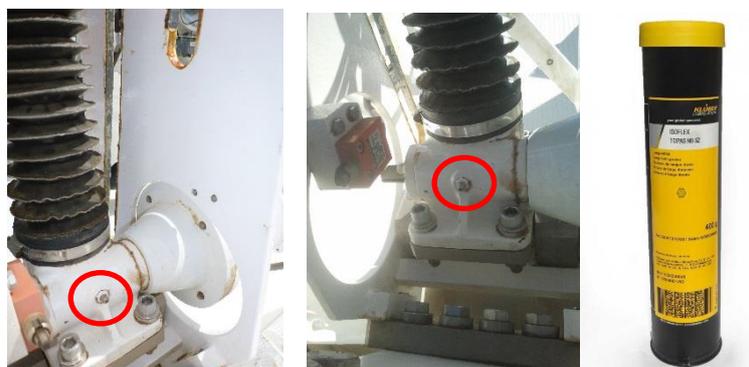


Fig. 18: Worm gear. Grease nipple location (left) and type of grease (right).

Manufacturer: Power Jacks / Duff Norton, i=6:1, Typ: UE 1803-920 (UM 1803 has .250 pitch)

Grease: What Manufacturer recommends is:

“For normal operation, the screw jacks should be lubricated about once a month, using one of the following extreme pressure greases or their equivalent:

Shell: Gadus S2V22OAC2 (Alvania WR2)

BP: Energrease LC2

Castrol: Spheerol EPL2

Mobil: Mobilux EP2”

Note: Isoflex TOPAS NB 52 from Klüber was used from 2021 campaign on.

### 3.2.5 Mechanism guideways

Component type: Guideway



Fig. 19: Guideways (left) and type of grease (right).

Grease: Molykote P40. Apply it with a brush or finger (using gloves). Only a tiny bit, remove the excess from the sides.

### 3.2.6 Spindle nut bushings

Component type: Dry sliding flanged bushings



*Fig. 20: Spindle nut bushings locations*

Manufacturer: SKF PCMF 202321.5 B [Composite dry sliding flanged bushing]

Grease: Self-Lubricating

### 3.2.7 Swivel flange bushings

Component type: Dry sliding bushing



*Fig. 21: Swivel flanges bushings location.*

Manufacturer: SKF PCM 252830 M [Composite dry bushing]

Grease: Self-Lubricating

### 3.2.8 Swivel flange washers

Component type: Dry sliding washer



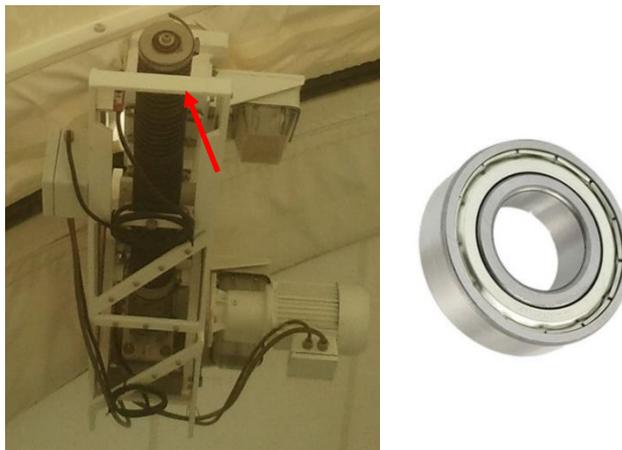
*Fig. 22: Swivel flanges washers location.*

Manufacturer: SKF PCMW 264401.5 M [Composite dry sliding thrust washer]

Grease: Self-Lubricating

### 3.2.9 Ball bearing at the spindle end

Component type: Ball bearing holding the dust cover at the spindle end regardless the rotation.



*Fig. 23: Ball bearing at spindle end. Location (left) and image (right).*

Manufacturer: SKF 3204 A-2Z [Angular contact ball bearing, double row]

Grease: Not maintenance specified by the manufacturer.

### 3.2.10 Bushes for worm gear swivel

Component type: Dry sliding bushing



*Fig. 24: Bushes for worm gear swivel location.*

Manufacturer: SKF PCM 404420 M [Composite dry sliding bushing]

Grease: No grease needed

## 4 TELESCOPE MAINTENANCE

### 4.1 Azimuth (AZ)

#### 4.1.1 Crown Gear

Component type: Crown gear

Grease: Klüberplex AG 11-462 from Klüber. Applied with a brush.



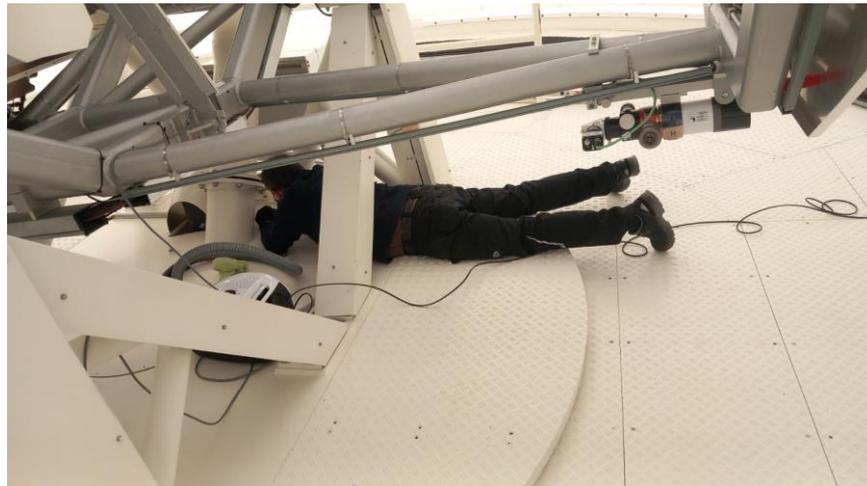
Procedure: There are two covers located on the AZ platform giving direct access to the teeth. Open both of them. Take care to clean with a vacuum machine before opening to avoid dust falling on the teeth.



*Fig. 25: AZ crown. There are two access on the AZ platform.*

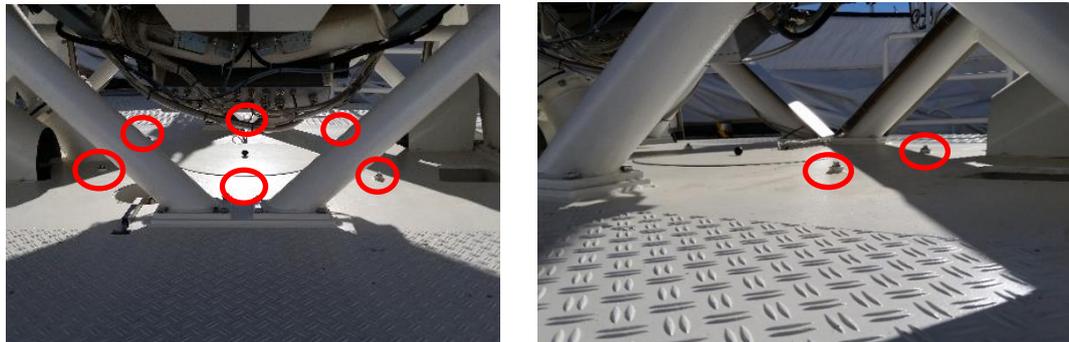
Take the grease and the brush to apply it. A second person can move manually the telescope along the crown. The telescope shall be moved 180° (a few degrees more), then move yourself to the second access and take the telescope back to the parking position. Then the entire crown would be covered.

Please, position yourself as shown below to avoid any danger in case the telescope is moved accidentally in elevation. A good practice could be to also put the EL stow pin in.



*Fig. 26: Positioning for the person applying the grease, which is secure in case the telescope is accidentally move in EL. If possible, insert also the EL stow pin for more security.*

#### 4.1.2 Bearings



*Fig. 27: AZ bearings. Greasing points (x6).*

MAN Drawing number: 163453-3122-01-00

Drawing comments: "Clean well and fill with grease Klüber isoflex NB 52"

Manufacturer - Type: SKF

Grease: Klüber isoflex NB 52

#### 4.1.3 Drives (x2)

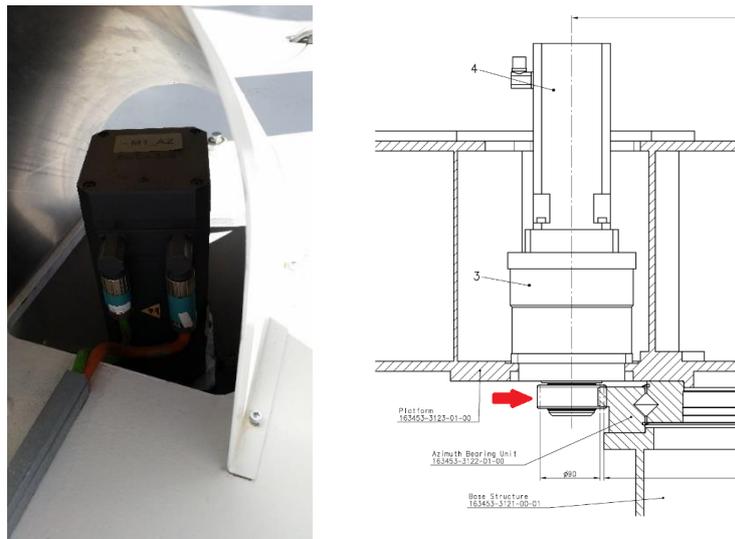


Fig. 28: AZ Drives location and drawing section view.

MAN Drawing number: 163453-3122-02-00

Drawing comments: "Gear to be coated with dry lubricant Klüber Unimoly C220 5...15µm"

Manufacturer - Type:

- Servo: 1FT6062-6AC7-EL5 (Siemens)
- Gearbox: SP180-MC-16-261-000 (Alpha)
- Gear: Unknown

Grease:

- Servo & Gearbox: Lifetime lubrication
- Gear: Klüber Unimoly C220 5...15µm

#### 4.1.4 End switch

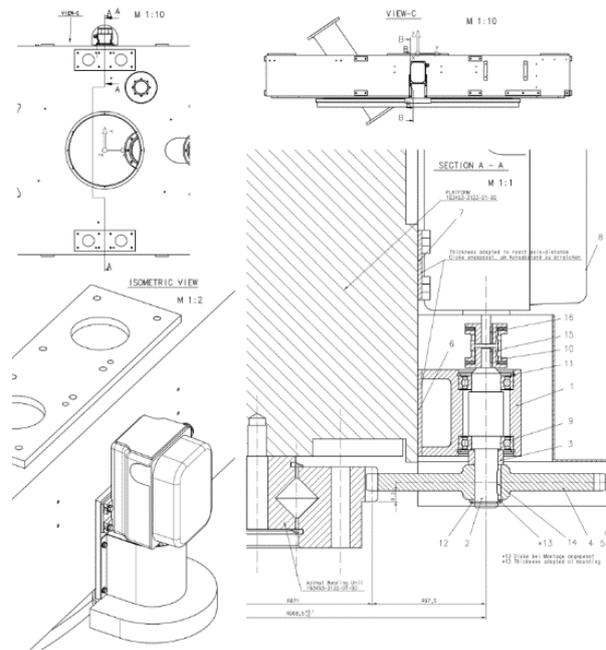


Fig. 29: End switch drawing details.

MAN Drawing number: 163453-3122-04-00

Drawing comments: "Gear to be coated with dry lubricant Molykote 3402C"

Manufacturer - Type:

- Internal bearing: 6005 2RSR FAG
- Gear: Unknown

Grease:

- Internal bearing: Lifetime lubrication
- Gear: Molykote 3402C

## 4.2 Elevation (EL)

### 4.2.1 Crown Gear

Component type: Crown gear

Grease: Klüberplex AG 11-462 from Klüber.

Procedure: The teeth are accessible from the lateral side of the telescope. Apply the grease with a brush.





Fig. 30: EL crown location.

#### 4.2.2 Bearings



Fig. 31: EL bearings. Greasing points (x4).

MAN Drawing number: 163453-3124-01-00

Drawing comments: “Clean well and fill with grease **Klüber isoflex NB 52 G 395** before assembling”

Manufacturer - Type: SKF

Grease: Klüber isoflex NB 52 G 395

#### 4.2.3 Drives (x2)

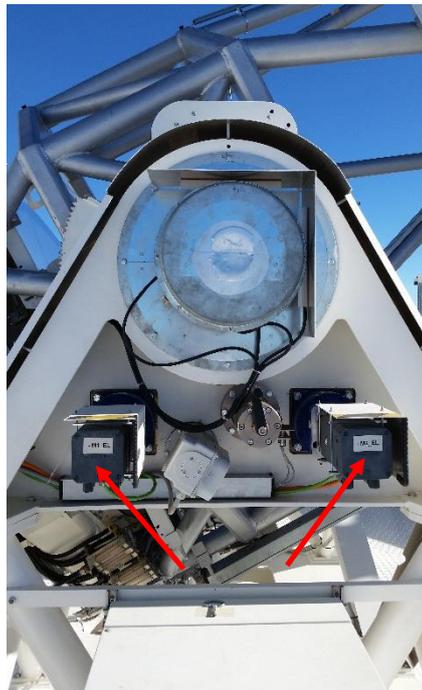


Fig. 32: EL Drives location on a lateral side from the telescope.

MAN Drawing number: 163453-3124-02-00

Drawing comments: “Gear to be coated with dry lubricant Molykote 3402 C”

Manufacturer - Type:

- Servo: 1FT6062-6AC7-EL5 (Siemens)
- Gearbox: SP180-MC-16-261-000 (Alpha)
- Gear: Unknown

Grease:

- Servo & Gearbox: Lifetime lubrication
- Gear: Molykote 3402 C

#### 4.2.4 End switch

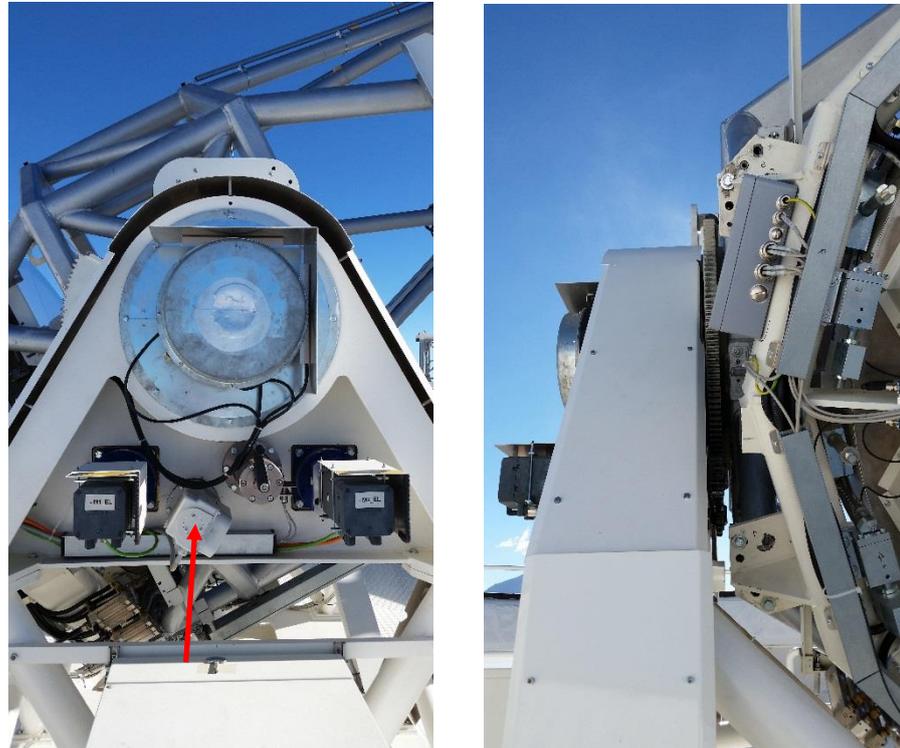


Fig. 33: *EL End switch.*

MAN Drawing number: 163453-3124-05-00

Drawing comments: “*Gear to be coated with dry lubricant Molykote 3402C*”

Manufacturer - Type:

- Internal bearing: 6005 2RSR FAG
- Gear: Unknown

Grease:

- Internal bearing: Lifetime lubrication
- Gear: Molykote 3402C

## 5 Miscelaneous

### 5.1 Azimuth and Elevation Locking pin units

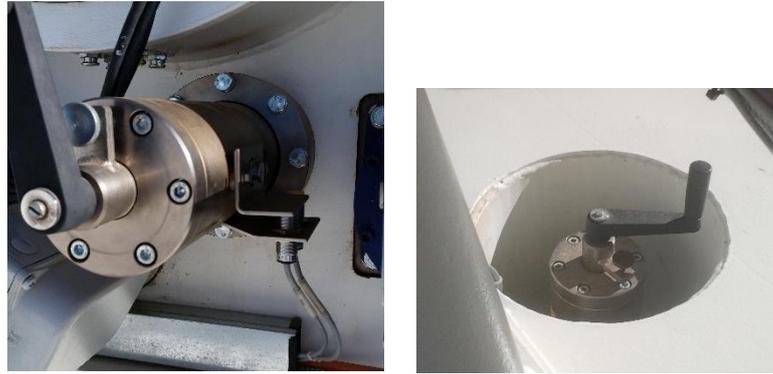


Fig. 34: Elevation (left) and azimuth (right) locking pin units.

MAN Drawing number: 163453 -3122-03-00 & -3124-03-00

Manufacturer - Type:

- Internal bearing: QJ205-MPA FAG

Manufacturer comments: "Lubrication: They are not greased but can be lubricated with grease or oil if desired"

## 5.2 Coude entrance cover



Fig. 35: Coude entrance cover mechanism.

MAN Drawing number: 163453 -3125-03-00

Manufacturer - Type:

- Motor: Lenze – SSN31 1PHAR -045C21
- Gearbox: Lenze – SSN31 1FHAR -0415

Manufacturer comments: No information about lubrication. Other similar motors & gearboxes from Lenze are lubricated for lifetime

### 5.3 M1 cover



Fig. 36: M1 cover.

MAN Drawing number: 163453 -3115-01-00

Manufacturer - Type:

- Motor: Walther Flender AS.MOT 7AAJB 63M-04
- Gearbox: Walther Flender I40FP 100/1

Manufacturer comments:

- Motor: "The motors of the construction group 56 to 160 are equipped with closed bearing and therefore cannot be re-lubricated. For this reason, these bearings must be replaced after the fatigue service life or grease service life expires".
- Gearbox: Lifetime lubricated

Grease: No greasing expected

## 6 Checklist

**TELESCOPE AND DOME MAINTENANCE  
QUICK CHECKLIST**

SYSTEM	COMPONENT		GREASE	DONE?	COMMENTS
DOME	BOWS	Spindles	 Molykote P40		
		Worm gear	 Isoflex TOPAS NB 52		
		Opening bearings	 Isoflex TOPAS NB 52		
		Bearing between the sheets or panels	 Isoflex TOPAS NB 52		
		Rod end between the sheets or panels	 Isoflex TOPAS NB 52		
	JAWS	Spindles	 Molykote P40		
		Guiding rollers	 Molykote P40		
		Worm gear	 Isoflex TOPAS NB 52		
		Mechanism guideways	 Molykote P40		
	TELESCOPE	AZ	Crown Gear	 Klüberplex AG 11-462	
Bearings			 Isoflex TOPAS NB 52		
EL		Crown Gear	 Klüberplex AG 11-462		
		Bearings	 Isoflex TOPAS NB 52		