	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 13/50

5.1 RAIL

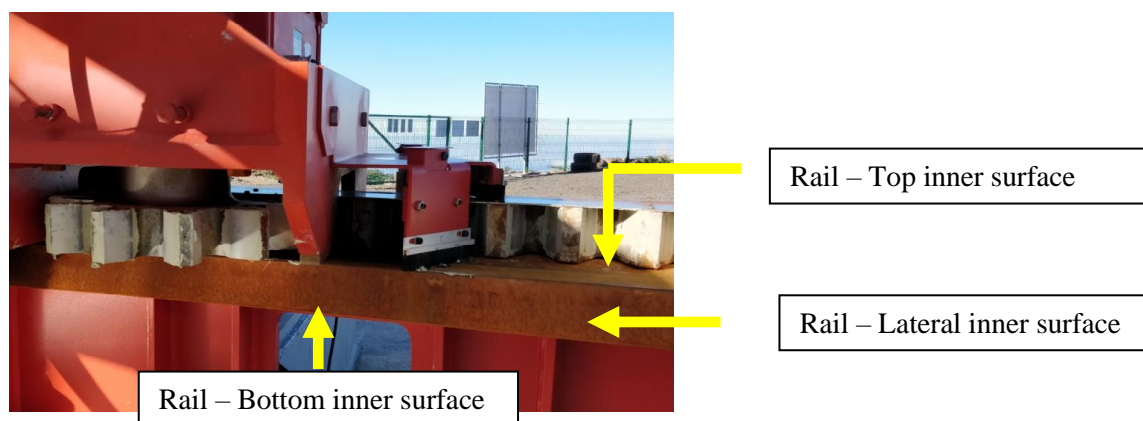
Although the Rail is not IFAE's responsibility, the Rail must be in good condition so that Bogies and the rest of LST-1 parts are not affected.



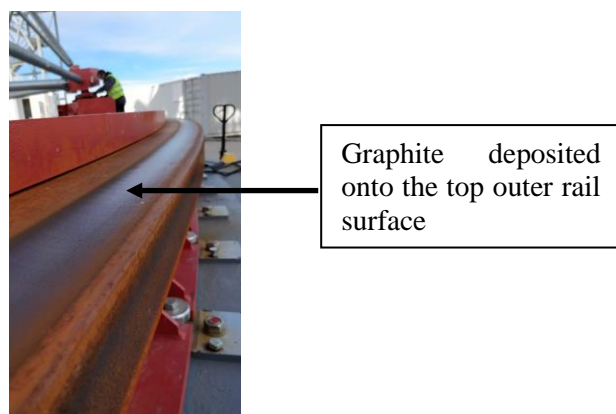
ATTENTION!
TO MINIMIZE THE MAINTENANCE TIME, IT IS HIGHLY ADVISABLE THAT RAIL, BOGIES & ALS MAINTENANCE TASKS ARE PLANNED TOGETHER.


The following inspections/tasks must be carried out:

- a) Running surfaces defects visual inspection every 6 months to verify there are not scratches, pitting signs or other type of defect on the Rail, either in the top inner/outer, lateral inner/outer or bottom inner/outer surfaces. If so, take pictures and report immediately to MPI/IFAE.



- b) Oil/grease spots visual inspection every 6 months to verify that the top inner/outer running surfaces are free of oil/grease. If so, take pictures, find the leak source (probably the Gearbox, unlikely the Spherical Roller Bearings) report immediately to IFAE
- c) Dry lubrication visual inspection every 6 months to verify that the top inner/outer rail surface is covered by graphite. In case there is no sign of graphite, see § 5.5 b).

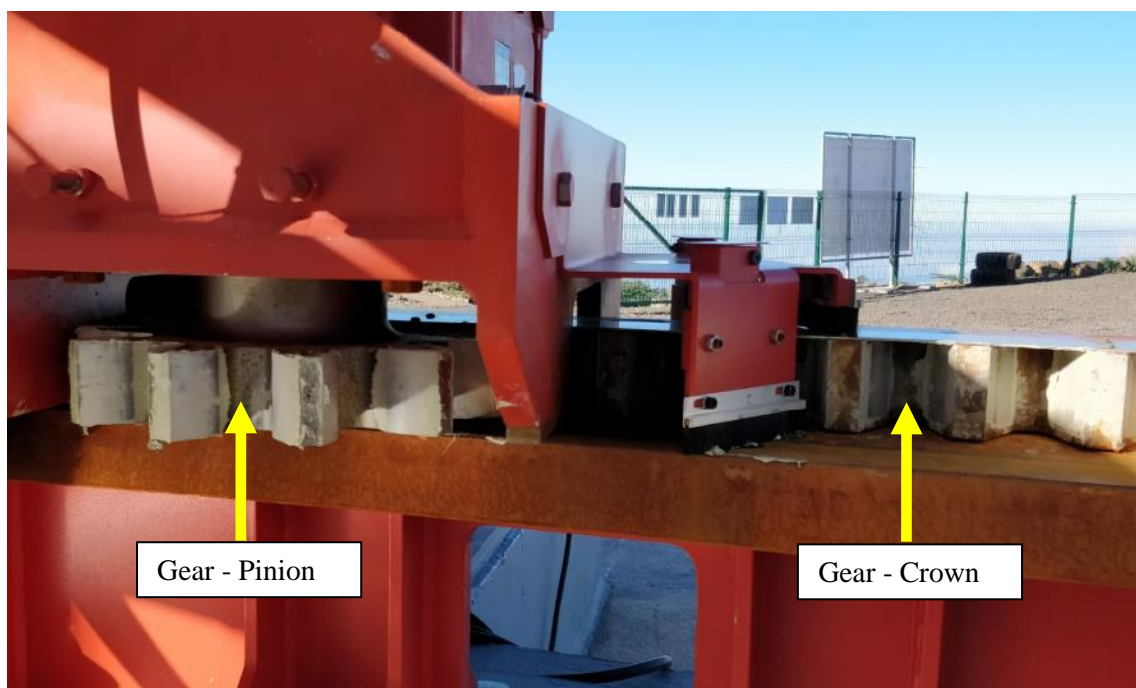


	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 14/50

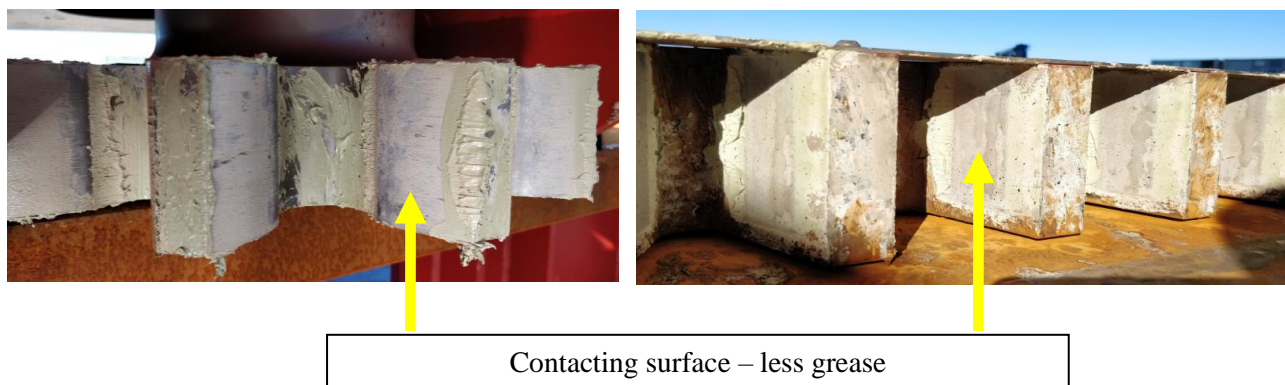
5.2 GEAR (CROWN-PINION)


The following inspections/tasks must be carried out:

- Pinions / Crown visual inspection every 6 months or every time mean wind exceeds 50 km/h to ensure that no foreign objects (rocks, bolts, washers, nuts, etc.) are placed between the gear teeth. If so, take a picture, inspect the surrounding gear contact surface and remove the foreign object/s.

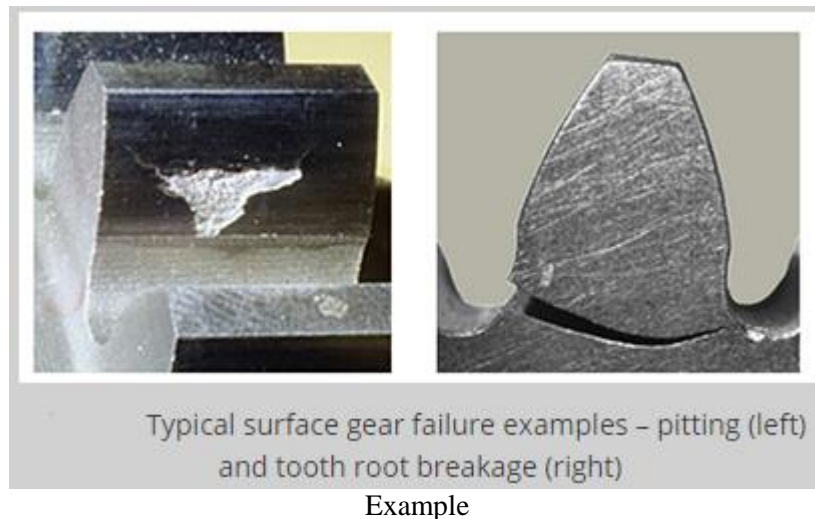


- Pinions / Crown tooth contact visual inspection every 6 months. Report if the contact pattern is not correct for all the pinion – crown teeth (see picture below).



	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 15/50

- c) Pinions / Crown visual inspection every 6 months to verify that there are not visible defects. Although the grease and the crown protection covers complicate this inspection, please it is important carry out this inspection with care. **Annex I** is provided to ease the defects detection. If defects are spotted, take pictures and report immediately to IF AE.




- d) Pinions top surface visual inspection every 6 months to verify there are not oil/grease spots. If so, take pictures and report immediately to IF AE.
- e) After carrying out a, b & c, Grease the Pinions (x4) & the Crown with *Klüberplex AG 11-462* (article number: 039091), consult **Annex II**.

For further information:

- [Klüberplex AG 11 462 Product info_en](#)
- [Klüberplex AG 11 462 Safety datasheet_es](#)



	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 16/50

5.3 BOLTS

All the bolts have been properly tightened by IFAE.

To ease the visual inspection of bolts tightening, some of these bolts have been distinctively marked with paint or light colored indelible marker, to indicate the bolt is properly tensioned.



ATTENTION!

ALTHOUGH UNLIKELY, A BOLTED JOINT MAY SUFFER THE LOSS OF PRELOAD AND KEEP THE POSITION/MARK DUE TO THE SETTLEMENT EFFECT. FOR THIS REASON, A GENERAL TIGHTENING EVERY 5 YEARS MIGHT BE AVISABLE.

The following bolted connections must be visual inspected every 6 months, if any bolted connections is loosen, please write down/indicate the bogie & position, take a picture and tight to torque according to *Annex III*.



(x12/bogie) M16

(x18/bogie) M20

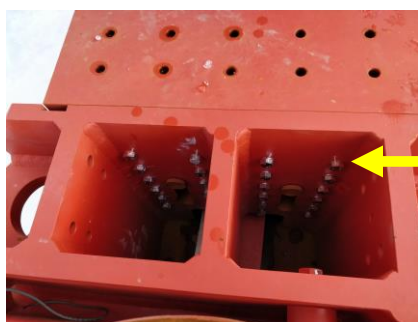


(x8/bogie) M16


(x64/bogie) M16

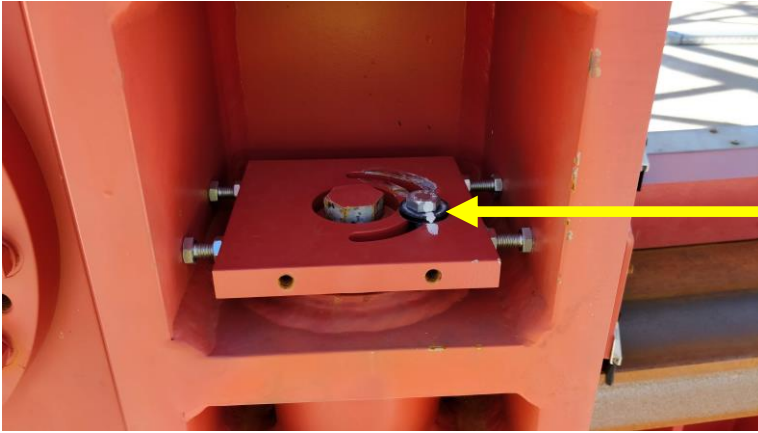
(x64/bogie) M6

(x64/bogie) M16 nut



(x48/bogie) M12

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 17/50



(x2/Bogie) M10 (only the outer Guiding Wheels)



(x8/Driving bogie) M20 Bolted connection between the Guiding & Driving Frame and the Gearbox




(x4/bogie) M16

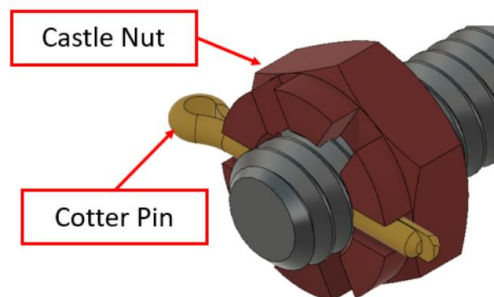
(x4/bogie) M6

(x8/bogie) M8

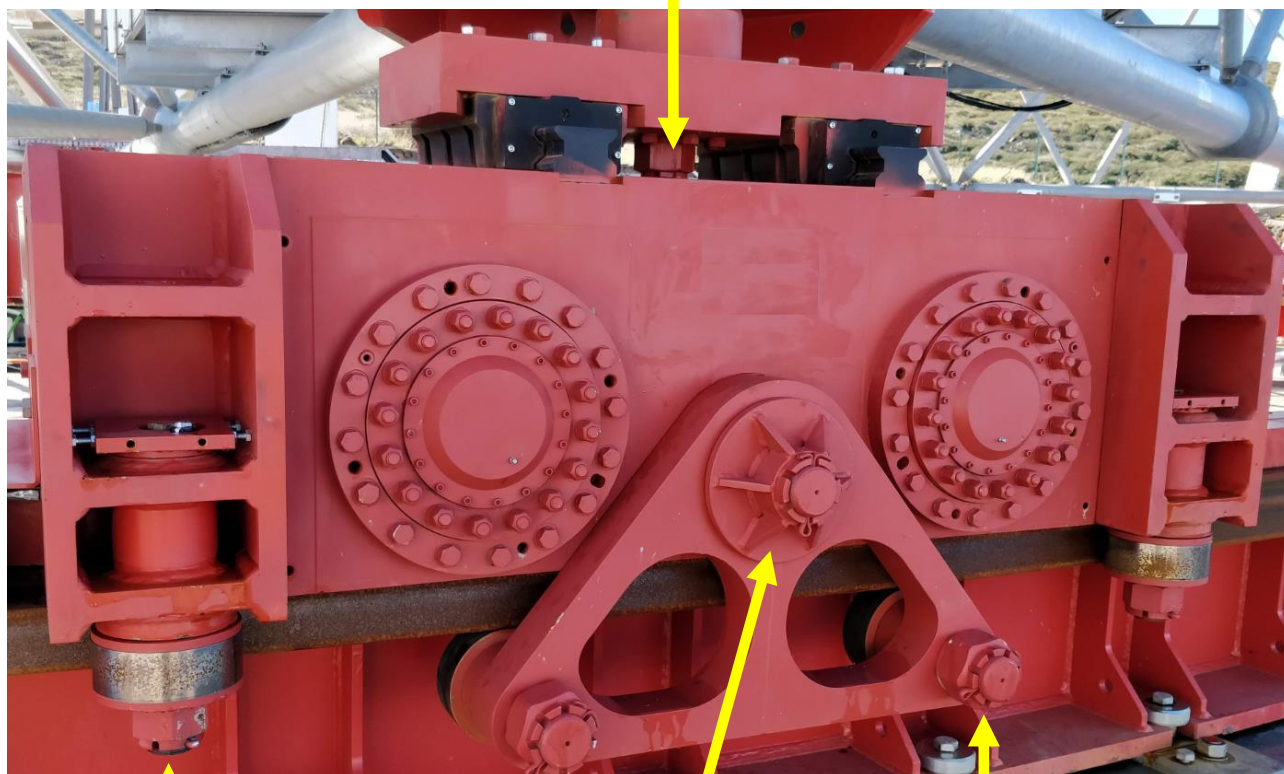
(x12/bogie) M6

	LST-1	Ref : LST/20190326_02
	BOGIES	Version : 2
	User Manual & Maintenance	Date: 17.07.2020
	(Original instructions)	Page : 18/50

Check that all the castle nuts have their cotter pin, if not the case, please write down/indicate the bogie & position, take a picture and re-install the cotter pin.




(x1/bogie) M52 + DIN 94 8x90



(x4/bogie) M52x3 + DIN 94 8x90

(x4/bogie) M64x2 + DIN 94 10x100

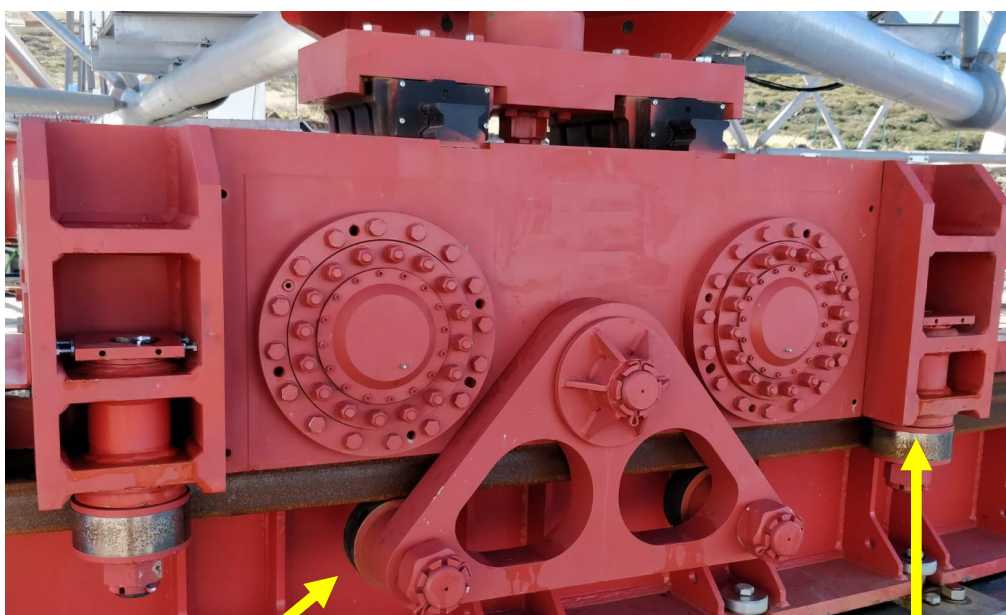
(x2/bogie) Customize nut + DIN 94 10x100

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 19/50

5.4 GUIDING & UPLIFTING WHEELS


The following inspections/tasks must be carried out:

- visual inspection every 6 months to verify there are not scratches, pitting signs or other type of defect on the Guiding & Uplifting wheels, If so, take pictures and report immediately to IF AE.
- Rotation verification every 6 months to ensure that the bearings are not damaged. If any wheel does not rotate (Guiding wheels in contact with Rail might not be moved manually), report immediately to IF AE.



(x4/bogie) Uplifting wheel

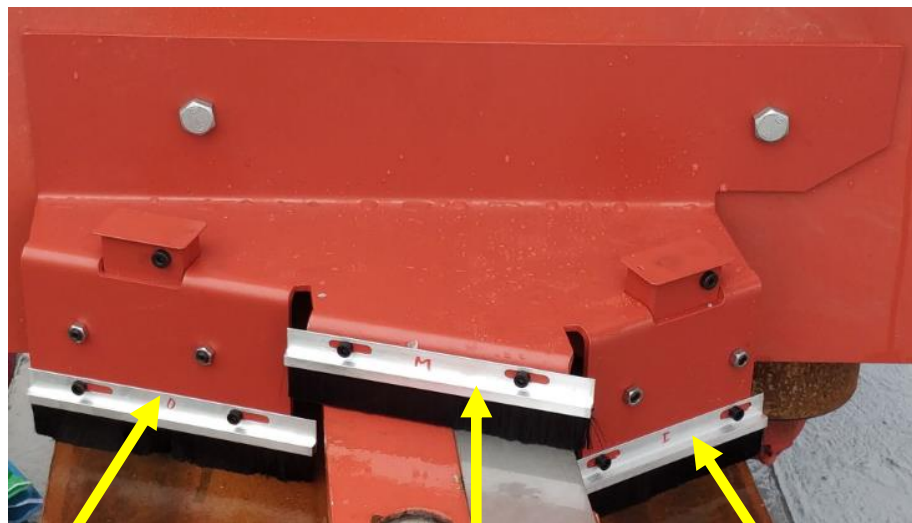
(x4/bogie) Guiding

	LST-1	Ref : LST/20190326_02
	BOGIES	Version : 2
	User Manual & Maintenance	Date: 17.07.2020
	(Original instructions)	Page : 20/50

5.5 BROOMS & DRY LUBRICATION SCRAPERS

The following inspections/tasks must be carried out:

- a) visual inspection every 6 months to verify that the brooms are not damaged, if so, take pictures and report immediately to IF AE. Drawings of Broom_out, Broom_mid and Broom_in are attached in *Annex IV*.



(x2/bogie) Broom_out

(x2/bogie) Broom_mid

(x2/bogie) Broom_in

- b) Replace the Dry Lubrication Scraper if there is no trace of graphite on the rail as defined in § 5.1 c).

1. Loose and remove the bolted connection M6.
2. Remove the lid with the spring.




Bolted connection M6

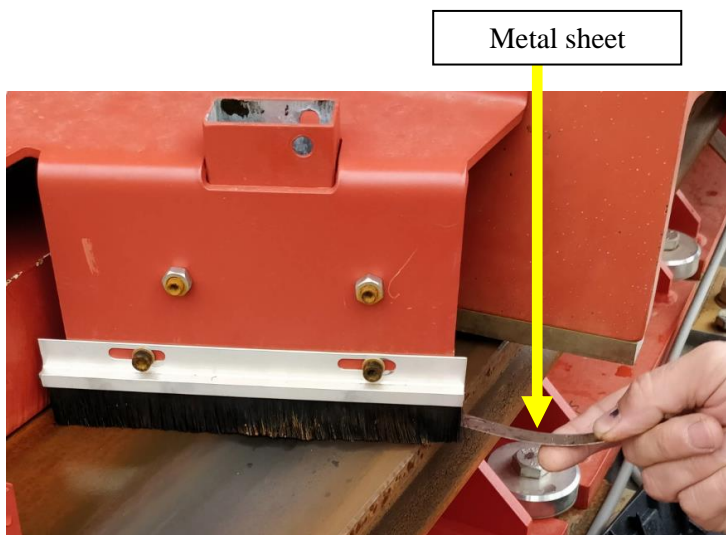


Lid with spring



	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 21/50

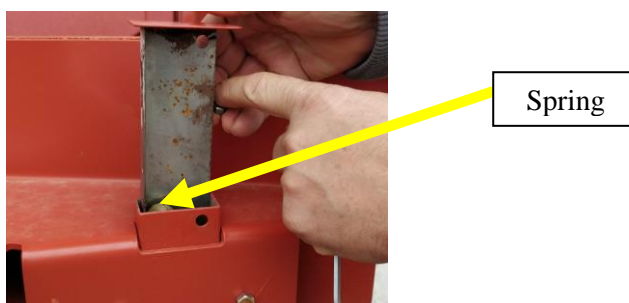
- Remove the remaining of the graphite block (e.g. by using metal sheet), if not possible loose and remove the 2 M16 bolts that fix the Broom & Dry lubrication scrapers to remove the graphite block and re install the mentioned frame.




- Install the new graphite block.



- Put again the lid with the spring as shown in the image (position is important).



- Install the bolted connection and tight to torque (manually).

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 22/50

5.6 WELDED STRUCTURES


All the welded joints connections which have responsibility must be visual carefully visually inspected every 6 months to ensure that these connections are free of defects (cracks). If any defect is found, please indicate the bogie number and position, take a picture and report immediately to IF AE.

The Chassis (Bogie Frame), the Guiding and Driving Frames and the Guiding Frame are the structural components that contain welded connection with responsibility.



ATTENTION!

IT IS VERY IMPORTANT TO INSPECT CAREFULLY THE WELDED JOINTS CONNECTION.

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 23/50

5.7 GEARBOX

Before doing any maintenance, please take a look (*Annex V*) to the Gearbox drawing to become familiar with the parts.

[CD00002817-01 x approvazione](#)

The maintenance to be carried out is defined by BONFIGLIOLI in *Installation, Operation and Maintenance Manual HDP, HDO Series - Atex Included*.

Click on the following link to download it.

<http://www.bonfigliolidocslibrary.com/index.php/user-manuals/manuals-gearboxes/113-installation-operation-and-maintenance-manual>

- [BR IOM HDPO ATX SPA R03 0 en](#)
- [BR IOM HDPO ATX SPA R03 0 es](#)



ATTENTION!
PLEASE READ CAREFULLY THE INSTALLATION, OPERATION AND MAINTENANCE MANUAL HDP, HDO Series – Atex included.


The oil used for the Gearbox is Klübersynth GH 6-150. For oil specifications consult *Annex VI*.

For further information about the oil:

[Kluebersynth GH 6-sp](#)

For additional information about the Gearbox consult the catalogue.

[BR Catalogue HDP](#)

	LST-1	Ref : LST/20190326_02
	BOGIES	Version : 2
	User Manual & Maintenance	Date: 17.07.2020
	(Original instructions)	Page : 24/50

5.8 SPHERICAL ROLLER BEARING

As a general rule, the Spherical Roller Bearings must be properly re-greased every 2 years, that it means that the greasing must done by taking out the lid and greasing the bearings manually instead of doing it by the nipple.



Re-greasing time must be reduced to 1 year or 6 months if during any regular inspection the grease conditions are found to be not the appropriate (grease damaged).



ATTENTION!

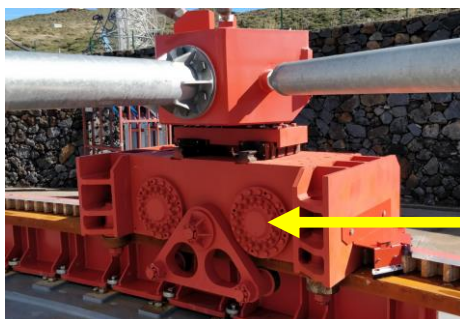
BRANDS & REFERENCE OF GREASE MUST NOT BE MIXED. MIXING GREASE WITH DIFFERENT TYPES OF THICKENERS MAY DESTROY ITS COMPOSITION AND PHYSICAL PROPERTIES. EVEN THICKENERS ARE OF THE SAME TYPE, POSSIBLE DIFFERENCES IN THE ADDITIVE MAY CAUSE DETRIMENTAL EFFECTS.

Re-grease all the Bogie Spherical roller bearings each 2 years with the same Grease
COGELSA – ULTRAPLEX FG 2

 	ULTRAPLEX FG 00	00	-	<p>Grasas complejas de aluminio de grado alimentario para la lubricación de puntos con posible contacto accidental con alimentos. Alta protección frente al desgaste, las altas cargas y la corrosión. Temperatura de trabajo de -20 a +150°C. Certificación NSF H1.</p> <p>Food grade aluminium complex greases for lubrication of points with possible incidental food contact. High protection in front of wear, high loads and corrosion. Operating temperature from -20 up to 150°C. NSF H1 certification.</p> <p>Graisses complexes d'aluminium de qualité alimentaire pour la lubrification des points de graissage avec possibilité de contact alimentaire fortuit. Haute protection contre l'usure, des charges élevées et à la corrosion. Température de fonctionnement -20 à +150 ° C. Certification NSF H1.</p>
	0	0	210	
	1	1	230	
	2	2	250	


To access the Spherical roller bearings:

1. Loose and remove 16 units of DIN 912 M6x12 8.8 per each Lid (4 lids/bogie).



(x16/lid) M6 bolts

2. Remove the Lid and the o-ring EPIDOR NBR70 175.
3. Verify the current grease is not damaged, that is to say, the grease is not hardened and/or oxidized. Example shown next. If grease is damaged, indicate the bogie number/position, take pictures and report immediately to IFAE.

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 25/50



Aged Grease Between Cage and IR



Relubrication is Not Possible




Mixed Lubrication in a CRB

4. Verify that DIN 981 KM (locknut) is not loose, if so identify the bogie/position, take pictures, tight to torque according to DIN 981 KM assembly instructions and report immediately to IFAE.
5. Re-grease always using the same brand/reference used for the first greasing. Under general operation conditions, it is appropriate to pack a large quantity of grease internal space and to pack grease into the housing internal space other than the bearing itself, to the extent of 1/3 or 2/3 of the free space. The total free space for the Roller spherical bearing NSK 22320EAE4 is 410 cm³.
6. Re install the o-ring, the lid and tight to torque all the M6 bolts.
7. Re paint Lids with the spray RAL 3016.

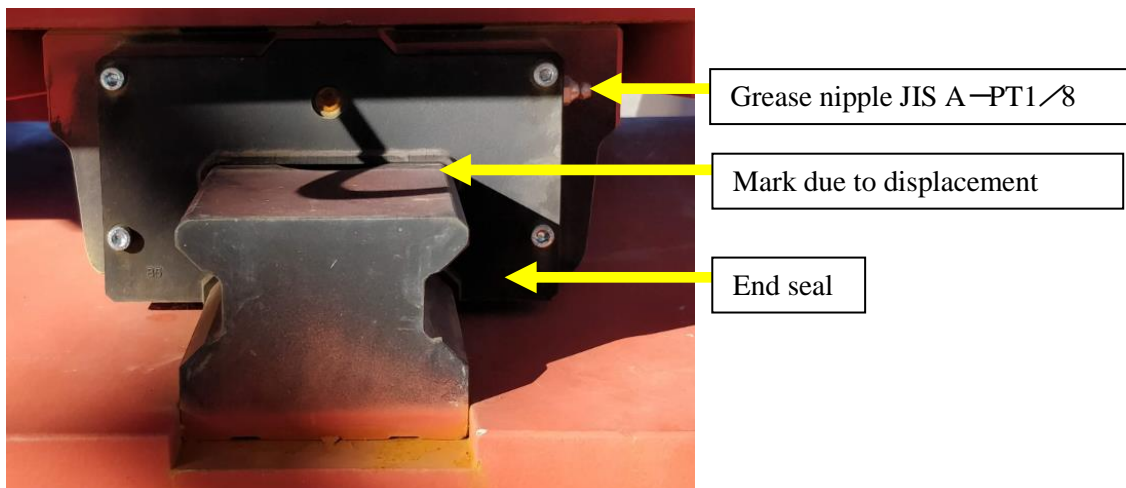
Pump grease every 6 month through the nipples (DIN 71412 A M6), which are placed on the Lid. **Grease quantity cannot be specified.**

For further information about the spherical roller bearing see *Annex VII*.

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 26/50


5.9 LINEAR ROLLER WAY

Before doing any maintenance, please take a look at **Annex VIII** to the Linear roller way.



The following inspections/tasks must be carried out every 6 months:

- Make sure that in both sides or 1 side of the slide unit there is/are a mark due to the displacement. Measure the width of this/these mark/s. If there is no mark, indentify the bogie/position, take pictures and report to IF AE.
- Check the condition of each end seal, if not in good conditions, indentify the bogie/position, take pictures and report to IF AE.
- Re-grease with SHELL GADUS S2 V220 2 (before ALVANIA EP Grease 2 from SHELL).through the nipple.

	LST-1	Ref : LST/20190326_02
	BOGIES User Manual & Maintenance (Original instructions)	Version : 2
		Date: 17.07.2020
		Page : 27/50

5.10 NODE AXIAL SEAL

Visual inspection every 6 months that axial seal is not damaged, if damaged (with cracked appearance) indentify the bogie/position, take pictures and report immediately to IFAE.



5.11 CLEANING & RE-PAINTING

Every 6 months clean all the surfaces.

To clean, do not use solvents or others products that might be incompatible with the materials, and do not direct high pressure jets of water on.

After cleaning, re-paint with spray RAL 3016 the surface/areas without paint.