



Qatar Company for
Airports Operation
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MATAR

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MAINTENANCE MANUAL

FMC DECK

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Reference Documents

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1 PRECAUTIONS

1.1 Safety Definitions

The prerequisite for the safe handling and a trouble-free operation of the transport equipment is the adherence to basic safety instructions and the knowledge of safety regulations.

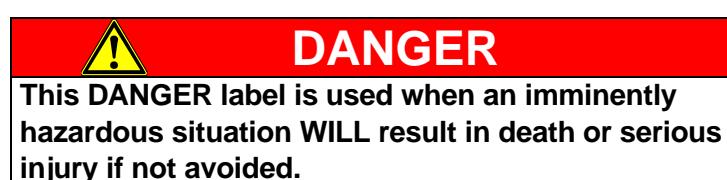
Please obey all safety precautions and warnings found in the respective area. If in doubt, ask your respective supervisor and report if you found any unsafe condition or hazard in your working place.

1.2 Symbols

This manual shows three precautionary labels **[DANGER]**, **[WARNING]**, and **[CAUTION]** to draw your attention where required. Definition and example of these labels are as follows.

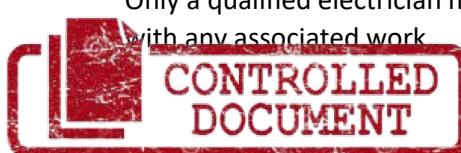


Risk levels that point toward hazardous situations that can cause personal injuries and possible damage to the transport equipment.



RISK of ELECTRICAL SHOCK

This symbol warns about electrical hazards that can lead to severe injuries and potential death due to electrical shock. Only a qualified electrician must be permitted to proceed with any associated work.





Environmental protection information



Warning! Automatic start-up



Warning! Risk of crushing limbs



*Caution! Infrared ray
(light barriers)*



Warning! Hot surfaces - risk of burning



Caution! Trip hazard



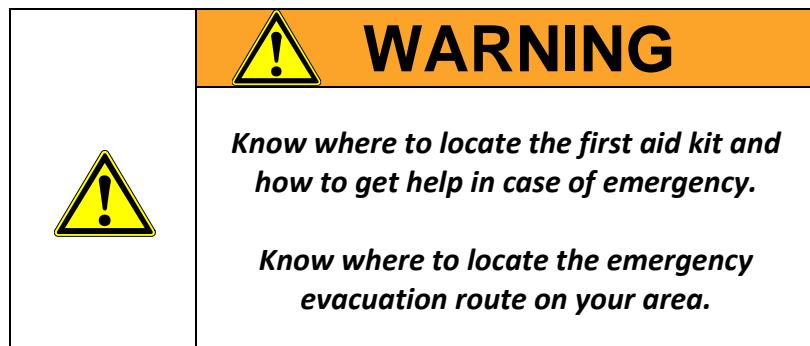
Warning! Stay clear of moving parts



No unauthorized personnel beyond this point



1.3 Caution before inspection



1.4 Precautions during inspection



1.5 Precautions after inspection



1.6 Basic Safety PPE's

All operating personnel must be supplied with the appropriate safety equipment, e.g.,

- ear protection
- safety goggles
- safety gloves
- safety footwear
- safety helmet

All personnel with loose clothing, jewelry including rings must not be worn as they risk being pulled into or getting caught by moving machine parts. Serious injuries are likely. Provide appropriate tools and supplies for the operation of the transport equipment, e.g., suitable means of transport.



2 FMC DECK

FMC Deck in CP11 Cargo Terminal can be located in ULD System which are on **MCC 1 F03 – D10**, **MCC 2 F03 – D10**, **MCC 3 F03 – D10**, **MCC 4 F03 – D10**.

FMC (Food, Machinery and Chemical) Technology is the company that manufactures the FMC Decks. FMC transfer decks possess HeliRoll technology which can accept, rotate, convey and transfer standard ULD's in 4 directions. No other system conveys and rotates air cargo with the speed, simplicity, flexibility and reliability of HeliRoll Rotation.

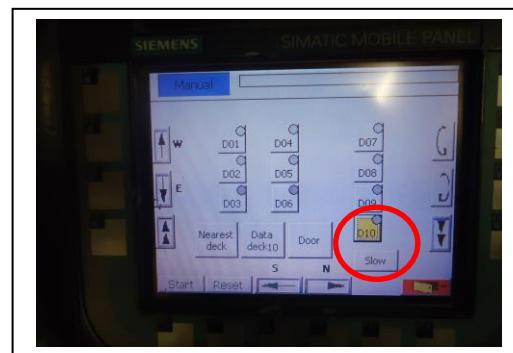
This transport equipment is explicitly for the:

- Horizontal conveying of the ULDs in NEP direction.
- Turning or adjusting of misleading ULDs.
- Change of transport direction as well as orientation of the ULDs.

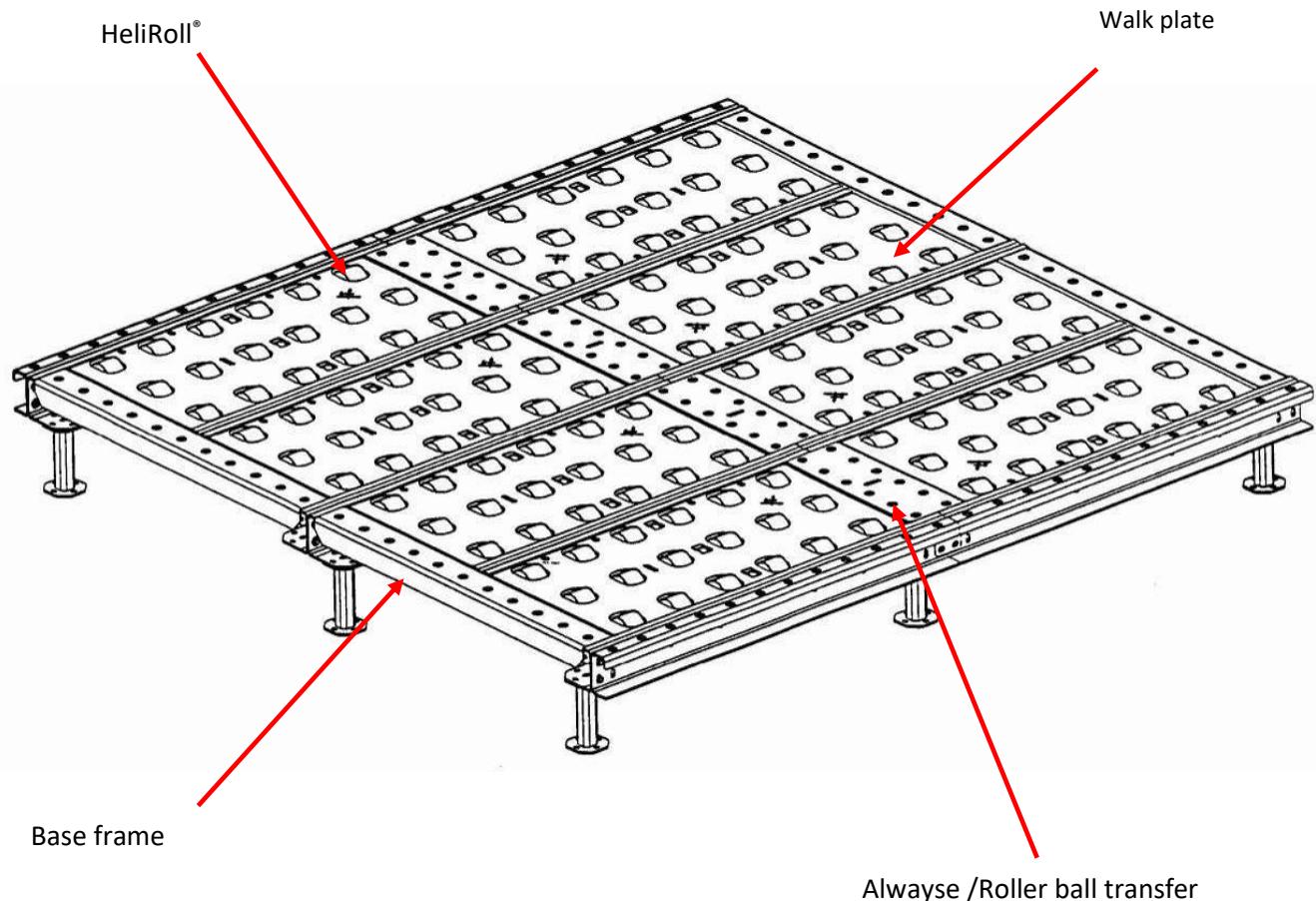


2.1 Testing Protocol

Check the functionality of all drive units if it is working properly by operating the machine using the mobile panel in "Manual" mode or Control Panel. Check N, S, E and W direction as well as the Rotations.



3 GENERAL ASSEMBLY



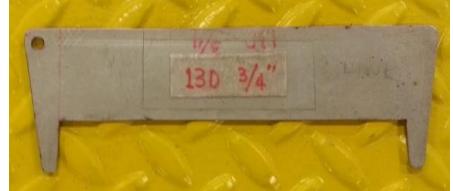
4 PERIODIC INSPECTION

Periodic Inspection is very important for long time duration of the FMC Deck. Taking a little time to perform periodic inspection will reduce the number of accidents. In addition, it helps to extend life of the system and maintain best system performance.

4.1 Tools and Equipment Required

Tool or Equipment	Image or Specification	Usage
Mobile Panel		Use to control the equipment during Preventive Maintenance
Spanner and Ratchet with extension		Use to tighten loose bolts and other fixing. Use <u>17mm</u> for removing the bolt of walk plate.
Broom		Use to clean the walk plates.
Mechanical & Electrical Screwdrivers		Universal usage. Normally use to tighten any loose screws
Set of Allen key		Use for tightening and removing of Allen screws and fixing.



Brush		Use to lubricate the chains
Rags		Use for cleaning and general purposes.
Vacuum		Use to clean underneath of FMC and HeliRolls for any accumulated dust/dirt.
Chain Gauge Plate		Use to measure the elongation of the chains.
Spray bottle, electric drill and mop.		Use for cleaning ball units
Blower or Compressed Air		Use for drying the ball units after cleaning



4.2 Periodic Inspection Point

The personnel in charge of the FMC Deck inspection should perform periodic inspection strictly observing the inspection points and items. For the inspection cycle, [QC] means Quick Check inspection, [1 Month] means Monthly inspection, [3 Months] means Quarterly inspection, [6 Months] means Half Year inspection and [12 Months] means Yearly inspection.

4.2.1 General Inspection

Point	Maintenance point	Maintenance activity	Maintenance interval
1	Operators	Interview: special occurrences break down & documents.	QC
	Function	Conduct functional test on all drive units (Manual Mode). <i>See Chapter 2.1 Testing Protocol, on Page 8.</i>	Monthly
	Visual Check	Visually check the equipment for any damage, corrosion, cleanliness & surroundings.	QC

4.2.2 Inspection of Signs

Point	Maintenance point	Maintenance activity	Maintenance interval
2	Signs and Labels 	Check all signs and labels for damages or if it still present on the machine	Yearly

4.2.3 Inspection of FMC Deck

Point	Maintenance point	Maintenance activity	Maintenance interval
3		Listen for abnormal operating noises	Monthly
		Check for any oil leakage on the gear box	Quarterly
		Change oil as set out in lubrication chart. <i>See Chapter 5.1 for Recommended Lubricants & Coating List, on Page 14 and See Chapter 5.2.1 Lubrication intervals and quantity for the exact amount of lubricants on Page 15.</i>	Yearly



	Brake	Check function of the brake by rotating the HeliRolls, if the brake effect decreased it is advised to replace the complete brake.	Half Year
	Manual Override	Check if the hand lever is present, function, damages and corrosion	Quarterly
	HeliRolls	<p>Check for damages and replace if necessary. For replacing HeliRolls See <i>Chapter 7.7 LH and RH cluster, on Page 22</i></p> <p>Check for abnormal noise when it is turning.</p>	Monthly
	Walk plate	Check for damages and corrosion	Monthly
	Driving chain	<p>Check for wear, damage, lubrication and tension. For removing chain See <i>Chapter 6 REPLACING CHAIN on Page 17.</i></p> <p>Check elongation, max 3%. Use the special tool "Chain Gauge Plate" to measure the elongation.</p>	Quarterly
	Sprockets	Check for wear, damage and clean. For replacing sprocket See <i>Chapter 7.4 Sprocket, on Page 20.</i>	Quarterly



	Bearings 	Check for heat increase, unusual noise and vibration. For replacing bearings <i>See Chapter 7.5 Bearing 30mm, on Page 20 and Chapter 7.8 Bearing 50mm, on Page 23.</i>	Quarterly
	Bolts and other fixings	Look for loose bolts and other fixings, and tight. <i>See Chapter 8.3 Bolt Tightening Torque for required torque on Page 26.</i>	Half Year
	Connections 	Check connection from motor and initiators.	Monthly
	Drive shaft 	Check for damages, corrosion and position. For replacing Drive Shaft <i>See Chapter 7.9 Drive Shafts, on Page 24.</i>	Quarterly
	Ball units 	Check for damages and corrosion. For removing ball units <i>See Section 7.1 Roller ball transfer Page 18.</i> For cleaning the ball units <i>See Chapter 8 Instructions for cleaning ball transfer units, on Page 25.</i>	Quarterly
	Ram protection with stops 	Check for damages, corrosion. Lubricate the stops for easy access if necessary.	Quarterly



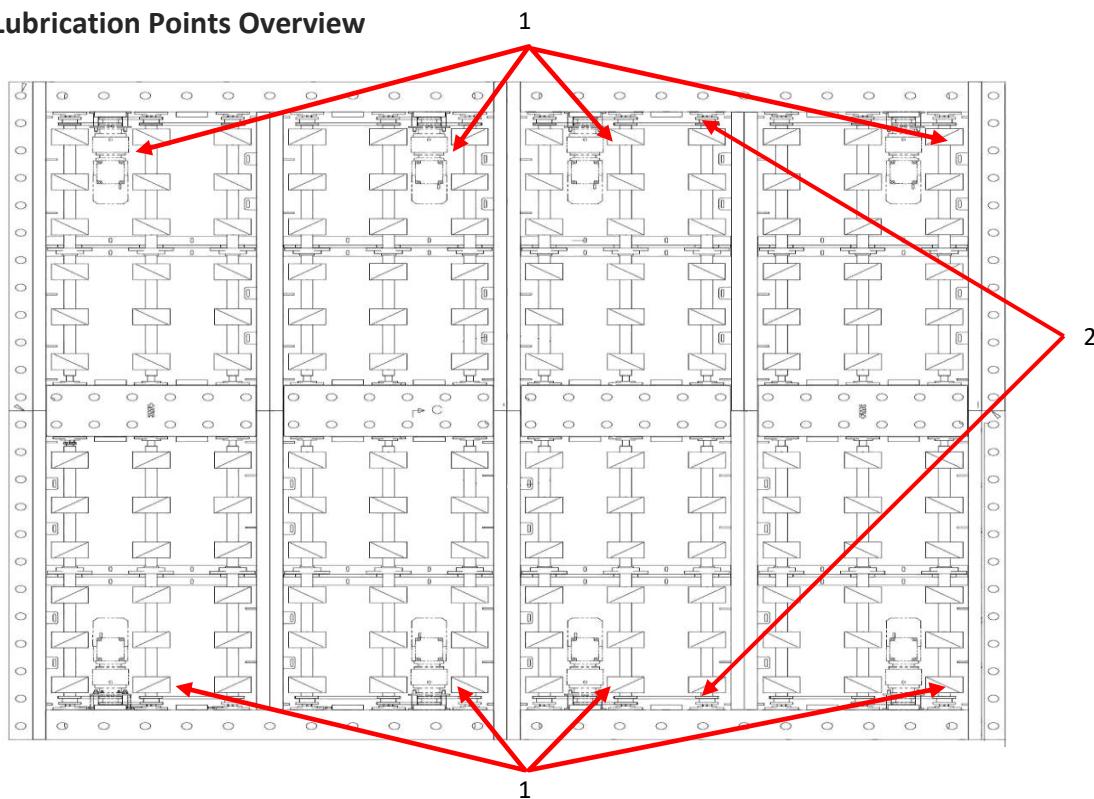
5 LUBRICATION

5.1 Recommended Lubricants & Coating List

Item	Image & Specification	Usage
WD 40		For removing corrosion and cleaning.
DTE Mobil Oil Heavy		For chain lubrication.
Rozone SW-3i		Cleaning Chemical for cleaning the "Always" Roller Ball Transfer in FMC Deck
Zinc Spray		For some part of the machine which requires Zinc after removal of corrosion.
Tectyl		For coating shafts and other parts of the machine that requires coating.
SHELL- Omala220	ISO VG 220	Helical gear motor (HeliRoll® drive) BG20-71/D08MA4-TOF-S/E008B5HA-C2



5.2 Lubrication Points Overview



1. Gearbox motor for **HeliRoll®**
2. Chains

5.2.1 Lubrication intervals and quantity

Number	Lubrication interval	Lubrication point	Lubrication Qty.
1	Yearly	Helical gear motor HeliRoll® drive BG20-71/D08MA4-TOF-S/E008B5HA-C2	dismantle electric motor and gearbox, drain oil and refill with new oil (ISO VG 220), 1.4 litres
2	Quarterly	Roller chains	few drops per chain, hand apply with oil can

5.3 Changing Lubricants to Gear Boxes

Gear units with sump lubrication are supplied "ready for use" complete with the lubricant. The lubricant must be replaced yearly, given normal operating conditions and a lubricant temperature below approximately 80 °C (176 °F).

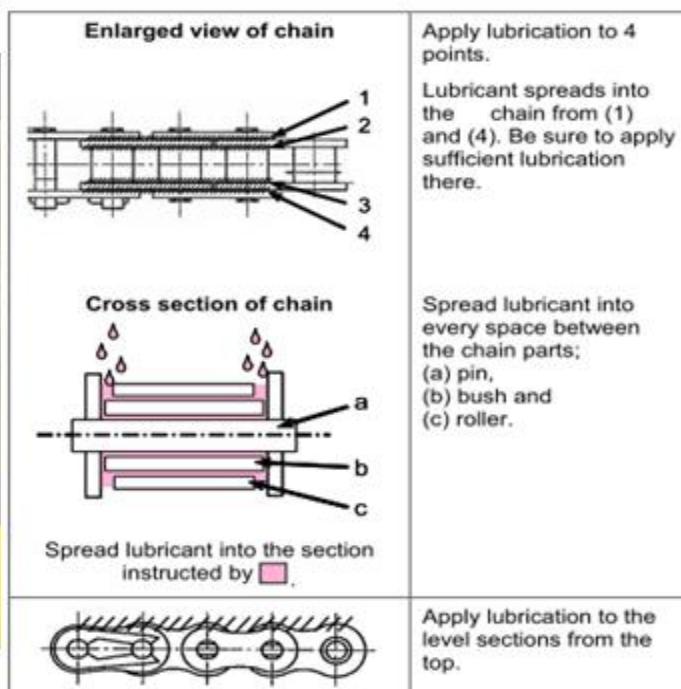
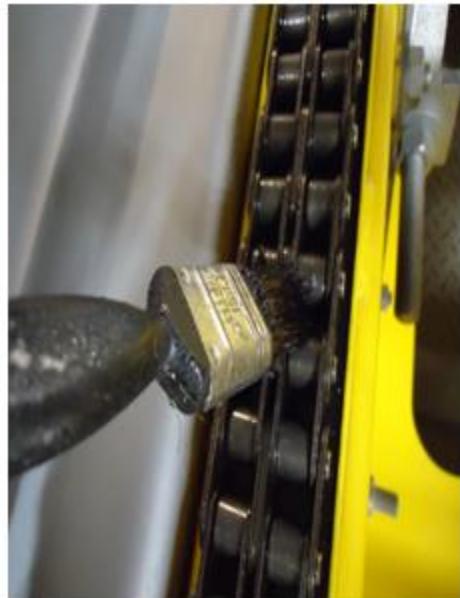
A lubricating interval of approx. half yearly must not be exceeded for lubricant temperatures of approx. 80 °C to 90 °C (176 °F to 194 °F) or approx. quarter yearly in the case of lubricant temperatures between 90 °C to 100 °C (194 °F to 212 °F).

Irrespective of the operating period, the lubricant must be changed at least every 2 years. Access to the interior of small gearboxes is obtained by removing the connecting screws. Precise reassembly is assured by

dowel pins or centring registers. The old lubricant can be easily removed by splashing with hot water or by washing the interior of the gearbox with kerosene or some other similar, non-corrosive detergent (do not use trichlore-ethylene).

Any lubricant or detergent residue must be thoroughly removed. Medium-sized and large gearboxes have filler screws and drain plugs. These facilitate inspection as well as lubricant change without dismantling. If necessary, flushing oil (for example spindle oil but not kerosene or trichlore-ethylene) can be added to the old lubricant. The mixture can be drained off after a few minutes of no load operation. Repeated flushing while the gear unit idles - preferably with an alternating direction of rotation - removes all residue of the old lubricant. Then fresh lubricant must be poured in while the motor is at rest, the amount being in accordance with the table shown in the "lubricant quantity" section or - in special cases - with oil gauge.

5.4 Lubrication to Chain



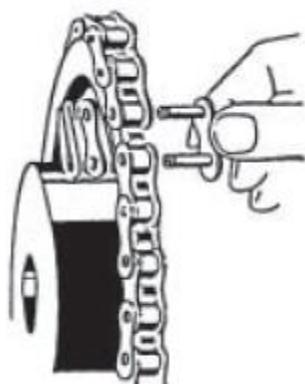
Apply lubrication to the drive chain by a lubricator or a brush. Be careful not to make it drip from chain. Apply lubrication periodically to keep the chain bushes from drying out.

Apply lubrication to the transport chain if it makes a noise while running. Apply a small quantity of oil to the rear of the chain by a lubricator or a brush.

- STEP 1** Be sure to apply lubrication to the entire chains.
- STEP 2** Apply lubrication operating the chain manually.
- STEP 3** Chain elongation is caused due to wear between the pins and the bushes of which the chain consists. The wider play occurs to each worn component, and it elongates the entire chain. Apply lubrication between the pins and the bushes to reduce wear and extend the chain duration.
- STEP 4** Apply lubrication sufficiently, but the lubricant should not drip from the lift chain. Be sure to remove extra lubricant.



6 REPLACING CHAIN



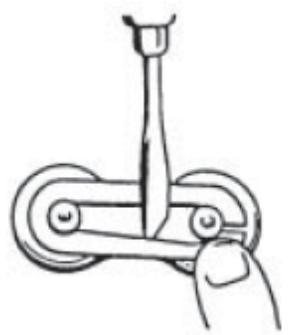
Assembly and disassembly:

1. Small chains are assembled by placing the two ends over a sprocket and inserting the open connecting link from one side and the counter piece and the securing clip from the other side.

Larger chains are to be assembled with a pre-tensioning device.



2. The securing clip is pushed with a pair of pliers over the two pins of the connecting link.

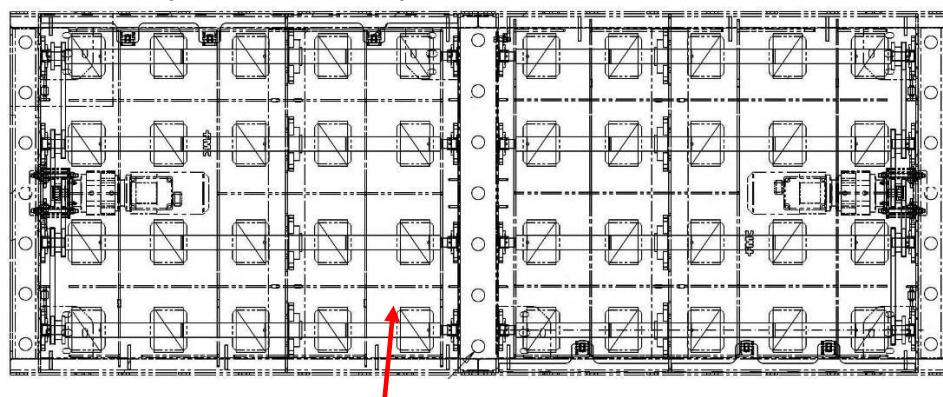


3. To disassemble the chain, remove the securing clip with a screwdriver.



7 REMOVING OR REPLACING MECHANICAL SPARE PARTS

7.1 Roller ball Transfer (Part.No.1120737)



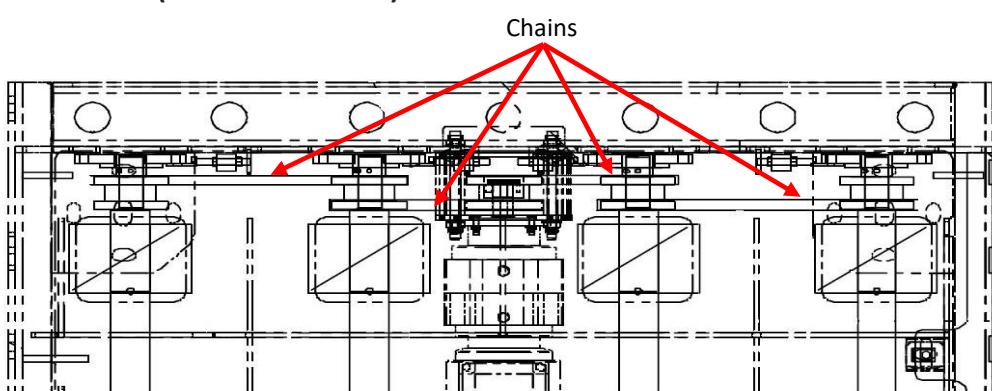
Roller ball transfer



Roller ball transfer

1. Draw the relevant roller ball transfer (Part.No.1120737) out of the profile and remove the roller ball transfer (Part.No.1120737).
2. Replace the removed roller ball transfer (Part.No.1120737) with a new roller ball transfer (Part.No.1120737).
3. The assembly is carried out in reverse direction.

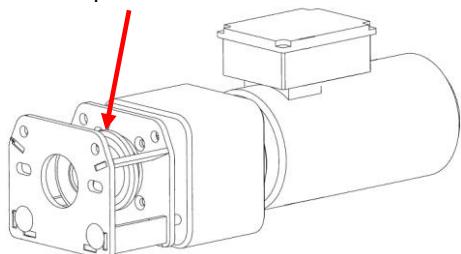
7.2 Chain Kit (Part.No.1160517)



1. Open the relevant roller chains according to Chapter 6 Replacing Chain and remove the roller chains from the sprockets.
2. Replace the removed roller chains with a new chain kit (Part.No.1160517).
3. Arrange the new roller chain kit (Part.No.1160517) on the sprockets and close the chain in accordance with Chapter 6.

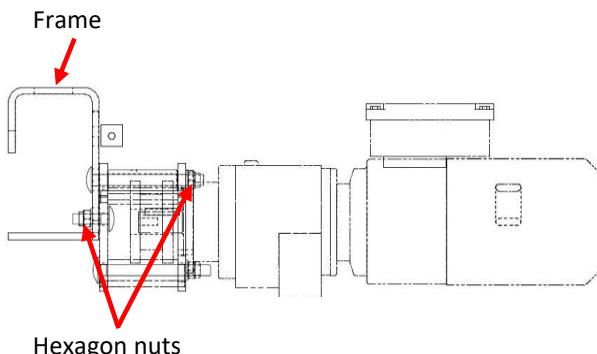
7.3 Retainer Sprocket (Part No.1160516)

Retainer
Sprocket

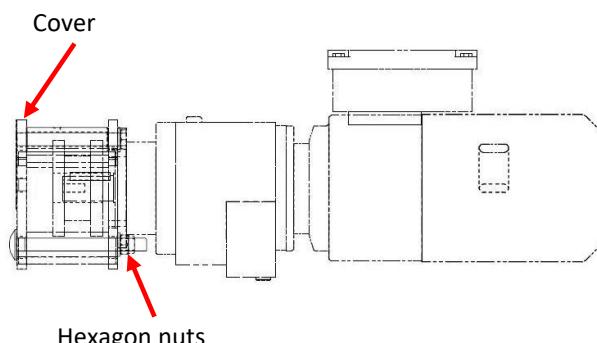


1. Perform the disassembly process described in section 7.2 "Chain kit".

2. Loosen the hexagon nuts and remove the drive motor from the frame.



3. Loosen the hexagon nuts and remove the cover.



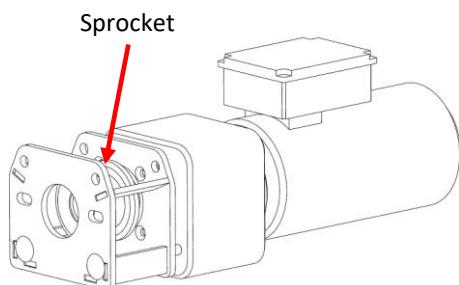
4. Draw off the retainer sprocket (Part.No.1160516) from the drive shaft and remove the retainer sprocket (Part.No.1160516).

5. Replace the removed retainer sprocket (Part.No.1160516) with a new retainer sprocket (Part.No.1160516).

6. The assembly is carried out in reverse order.

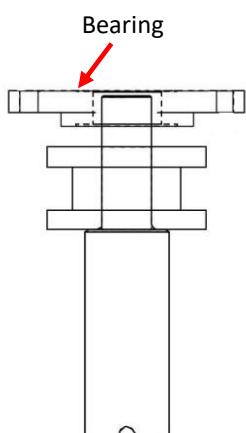
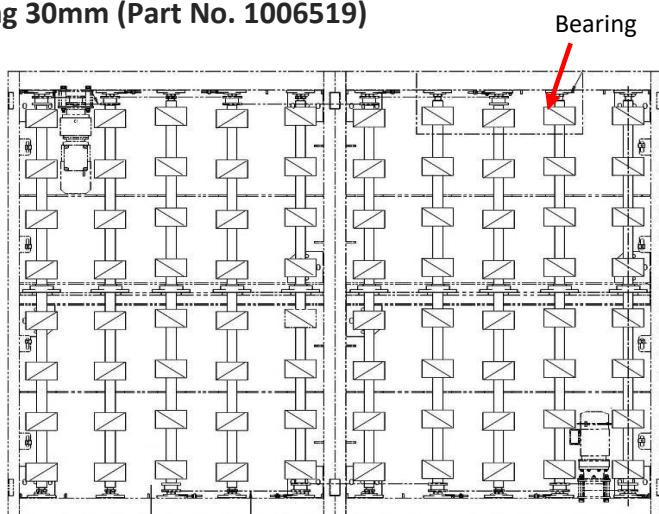


7.4 Sprocket (Part No. 1160515)

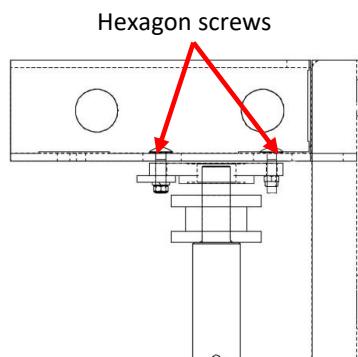


1. Perform the disassembly process described in section 7.3 "Retainer sprocket".
2. Draw off the sprocket (Part.No.1160515) from the drive shaft and remove the sprocket (Part.No.1160515).
3. Replace the removed sprocket (Part.No.1160515) with a new sprocket (Part.No.1160515).
4. The assembly is carried out in reverse order.

7.5 Bearing 30mm (Part No. 1006519)



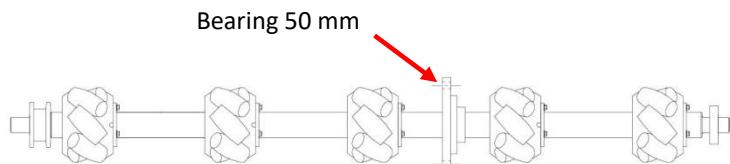
1. Perform the disassembly process described in section 7.2 "Chain kit".
2. Loosen the hexagon screws at the bearings and remove the hexagon screws, nuts and washers.



3. Repeat step 2 at the opposite side.



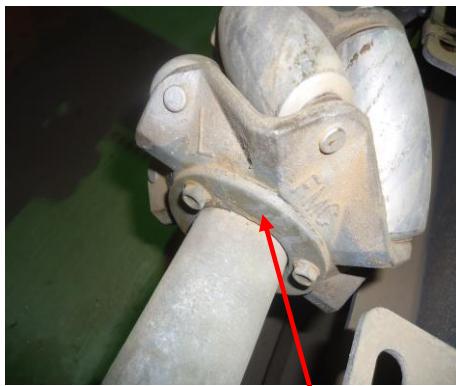
4. Remove the assembled shaft out of the frame.
5. Loosen the hexagon screws at the bearing 50 mm and remove the hexagon screws, nuts and washers.



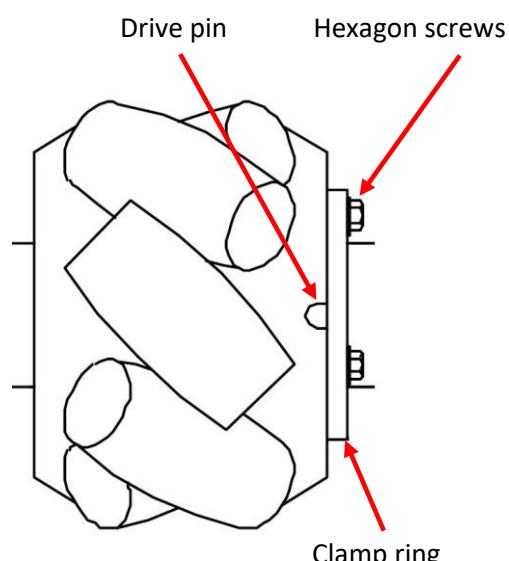
6. Draw off the bearing (Part.No.1006519) from the shaft and remove the bearing (Part.No.1006519).
7. Replace the removed bearing (Part.No.1006519) with a new bearing (Part.No.1006519).
8. The assembly is carried out in reverse order.

7.6 Drive Pin (Part No. 1006574)

1. Perform the disassembly process described in section 7.5 "Bearing 30 mm", steps 1 to 5.
2. Loosen the hexagon screws at the clamp ring of the relevant cluster.



Clamp ring



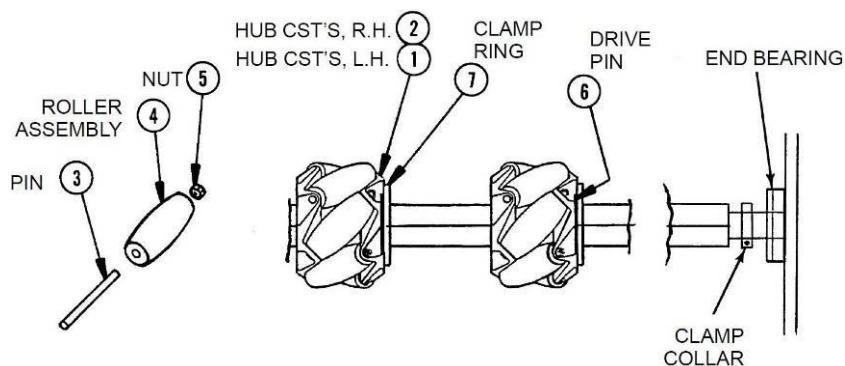
3. Move the relevant cluster until there is the possibility to remove the drive pin.
4. Pull the drive pin (Part.No.1006574) out of the drive shaft



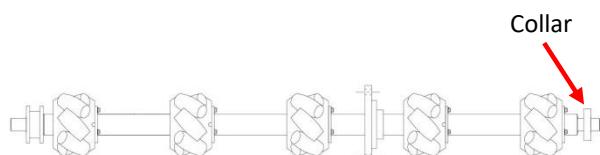
and remove the drive pin (Part.No.1006574).

5. Replace the removed drive pin (Part.No.1006574) with a new drive pin (Part.No.1006574).
6. The assembly is carried out in reverse order.

7.7 LH and RH Cluster (Part.No.1152666 and Part.No.1152667)



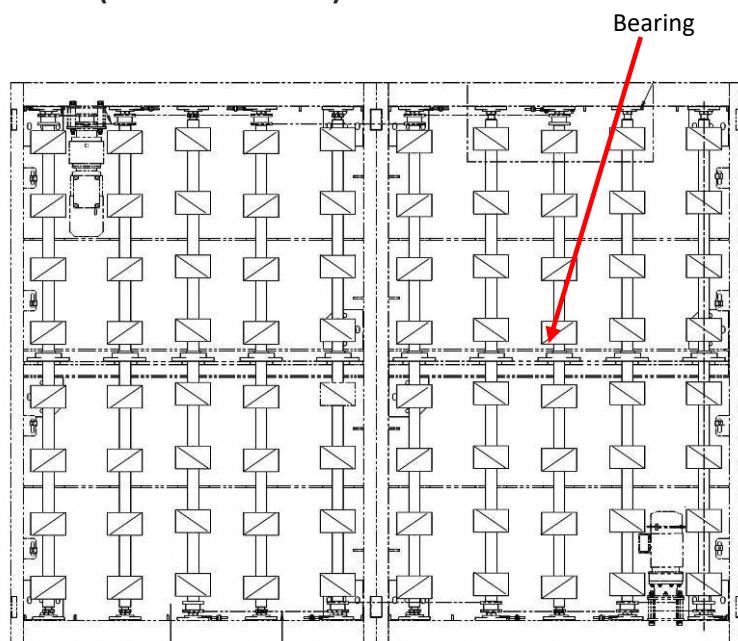
1. Perform the disassembly process described in section 7.6 "Drive pin".
2. Slightly loosen the set screw at the collar.
3. Draw off the collar from the drive shaft.



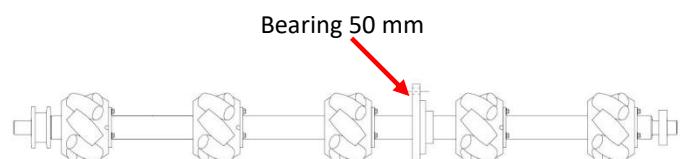
4. Draw off the LH cluster (Part.No.1152666) respectively the RH cluster (Part.No.1152667) from the drive shaft and remove the LH cluster (Part.No.1152666) respectively the RH cluster (Part.No.1152667).
5. Replace the removed LH cluster (Part.No.1152666) respectively the RH cluster (Part.No.1152667) with a new LH cluster (Part.No.1152666) respectively the RH cluster (Part.No.1152667).
6. The assembly is carried out in reverse order.



7.8 Bearing 50mm (Part.No.1006522)

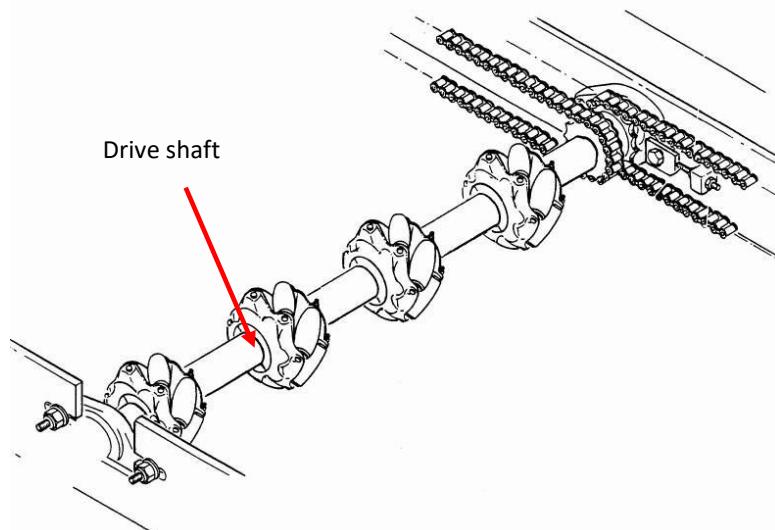


1. Perform the disassembly process described in section 7.7 "LH and RH Cluster".
2. Draw off the bearing (Part.No.1006522) from the drive shaft and remove the bearing (Part.No.1006522).

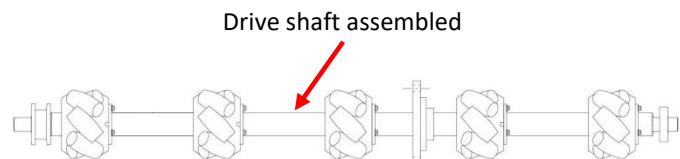


3. Replace the removed bearing (Part.No.1006522) with a new bearing (Part.No.1006522).
4. The assembly is carried out in reverse order.



7.9 Drive Shafts (Part.No.1160518)

1. Perform the disassembly process described in section 7.8, "Bearing 50 mm".
2. Remove the drive shaft (Part.No.1160518).



3. Replace the removed drive shaft (Part.No.1160518) with a new drive shaft (Part.No.1160518).
4. The assembly is carried out in reverse order.



8 INSTRUCTIONS FOR CLEANING BALL TRANSFER UNITS

Instructions for cleaning Alwayse Ball Transfer Units in ball decks



Picture 1: Spray ball units with cleaning chemical and leave for 5 to 10 minutes to loosen dirt. *Rozone SW-3i is a suitable cleaning chemical that is non-flammable.



Picture 2: Clean ball units with wet cleaning mop and electric drill by powering the load ball of the ball unit to loosen any dirt.



Picture 3: Dry the wet ball units with a clean and dry mop by powering the load ball of the ball unit. We cannot over state the need for drying of the ball units.



Picture 4: Clean ball units until the load ball revolves freely when spun by hand. If load ball does not revolve freely please repeat the cleaning process.

Safety notes

- 1.) It is very important to dry the ball unit to stop dirt sticking to the wet ball unit.
- 2.) Compressed air can help the drying of the ball units. Check if any vapours produced will be dangerous.
- 3.) Cleaning fluids must comply with safety rules.
- 4.) Care must be taken to stop any dirty fluid from the ball unit dripping onto equipment below the ball deck.
- 5.) The cleaning fluid should not leave any wet lubricant on the load ball.



9 TECHNICAL DATA SHEET

9.1 Machine Data

Self-weight	n/a
Dimensions:	
length	4,000 mm
width	4,200 mm
height	508 mm
Operating voltage	415 V / 50 Hz
Horizontal conveying speed	18 m/min
Load capacity	6,800 kg

9.2 Drive Data (HeliRoll® drive)

Manufacturer	Danfoss Bauer
Motor Type	BG20-71/D08MA4-TOF-S/E008B5HA-C2 (Part.No.1110785)
Ratio	37.02
Voltage	415 V
Frequency	50 Hz
Phases	3
Insulation Class	F
Output Speed	38 rpm
Output Torque	240 Nm
Power	0.55 kW
rpm	1,400 rpm



9.3 Bolt Tightening Torque

Please use the tightening torque values of nuts and bolts, listed in the table below.

Size in mm	Screws and nuts made of steel with metric standard threading and connecting-surface measurements as DIN 912, 931, 934 etc.					Screws and nuts acc. to DIN 931/933/934 made of A2/A4, property class -70	HV-screw-connections DIN 6914/6915	
	Steel grade						Steel grade	
	4.6	5.6	8.8	10.9	12.9	galvanized	raw slightly oiled	
MA in Nm, coefficient of friction = 0.14 µ								
M4	0,9	1,2	2,7	3,9	4,6			
M5	1,8	2,4	5,3	7,8	9	3,8		
M6	3,1	4,1	9	13,5	16,2	6,6		
M8	7,6	9,9	23	32	39	15,8		
M10	15	20	44	65	75	31,5		
M12	26	35	77	112	130	54	90	108
M14	41	56	121	180	211			
M16	64	85	189	279	328	130	225	315
M18	87	117	270	387	450			
M20	124	166	382	550	639	253	405	540
M22	167	225	522	740	864		585	810
M24	211	283	657	945	1098	242	720	990
M27	315	423	990	1395	1620		1125	1485
M30	427	571	1305	1890	2205		1485	1980
M33	580	778	1800	2520	3060		1980	2430
M36	972	1296	2340	3330	3870		2520	3420
M39	1197	1602	3060	4320	5040			



10 TROUBLE, CORRECTIVE MEASURES

10.1 Normal trouble shoot: FMC-Deck

No.	Fault	Possible Cause	Measures
1	Load coasts after drive shutdown	Motor brake or brake controls faulty	Repair or replace motor brake or controls
		Motor brake linings worn	Adjust or replace brake linings
2	Load travel direction hard to control	Some HeliRoll® shafts do not rotate or rotate too slow	Check motor chains and sprockets
		Drive gear motors faulty	Repair or replace gear motors
		Roller chain broken	Replace roller chains
		Sprocket broken	Replace sprocket
		Drive shaft broken	Replace shaft

10.2 After repair maintenance

No.	Fault	Possible Cause	Measures
1	Motor does not start up or only with difficulty	Designed for delta circuit but connected in star	Correct circuit
		Voltage or frequency deviate considerably from rated value	improve mains conditions
2	Motor does not start up in star circuit, but starts in delta	Insufficient torque in star circuit	Switch on directly if delta circuit switch-on current not too high
		Contact fault on star / delta switch	Repair contact fault
3	Motor is too warm	Motor connected in delta	Switch circuit to star
		Supply voltage exceeds the rated voltage by more than 5 %	Set correct mains voltage
		Insufficient cooling air: cooling air channels blocked	Clean cooling air inlet and outlet
		Cooling air too warm	Ensure good supply of fresh air
		Bearing seized or stiff movement	Replace gearbox motor
		Supply line has loose contact (temporary failure of one phase)	Repair loose contact
		Fuse tripped	Reset fuse
4	Motor has incorrect direction of rotation	Motor connected incorrectly	Interchange two phases
5	Gear unit is too hot	Lubricant not refilled	Refill
6	Gear unit runs noisily	Lubricant not refilled	Refill
7	Malfunction	Incorrectly spare parts installed	Order original spare part from manufacturer
8	Assembly does not start	Incorrectly or not wired	Wire correctly
9	Assembly runs noisily or abnormally	Adjustment instructions not observed	Adjust correctly

