Maintenance Manual

Plug Sliding Door

Version 2 20140620

Reference: ISO 9001 (2008) §7.5.1 Control of production and service provision

Vehicle Type:	
Vehicle Number:	
Customer:	

Revision no.	Date:		
4	11-04-2014	Description of the change:	
		Name & function:	K. Slager Technical Documentation Specialist

SAFETY INSTRUCTIONS

The instructions in this maintenance manual are essential for a correct operation of the door system. Please take notice of all warnings and safety precautions on this page to prevent injury to yourself or others or damage to the Ventura door system. The safety and operation instructions should be retained for future reference.

The consequences that could result from failure to observe the precautions are listed in this section and indicated by the following symbol:

Read instructions; It is important to read the instructions before installing and adjusting the door system. Sufficient technical knowledge is needed to be able to follow the instructions.

Operation; The door system consists of movable parts. Lack of operation knowledge about the door system may causes high risk when not informed. When connecting the power supply, you have to be cautious about the operation of the door system.

Heavy components; the door system consists of relatively large and heavy components. For lifting and fitting these components use a lifting machine or ask a colleague to assist. Ventura Systems advice a maximum lifting weight of 22 Kg per person.

Calibrated tools; For installation and the adjustment of the door system are no special tools necessary. It is important to use tools of good quality and calibrated to prevent damage to the door system or injury to yourself.

Power sources; During the installation period the door leafs may only be moved by hand. During adjustment of the door system it is forbidden to connect the power supply, unless it is written.

Replacements parts; When replacement parts are required, be sure that the power supply is removed from the door system and that the door system can only be moved by hand. Safety features may not be active when replacing parts.

Notices

- While every effort has been made to ensure the information in this maintenance manual is correct and complete, in case of errors we would appreciate you will contact Ventura Systems.

INSTRUCTIONS

This guide is meant for the maintenance of Ventura plug sliding door systems. It is important to follow all instructions. **All instructions must be conducted without air/electric pressure** unless mentioned otherwise. When pressure is needed it will be mentioned. The instructions should be executed for the left and right door leaf when it's a double leaf door system (seen from the inside of the vehicle). How often you need to do maintenance on the door system can be seen in the table below.

Use	Times per day open/close	Frequent Maintenance
Normal	0-230	1x per year
Mid-Heavy	230-350	2x per year
Heavy	350-…	3x per year

Maintenance of a door system should only be performed when the bus is positioned on a **flat surface** to prevent distortion/twisting of the bus body, which can lead to inaccurate measurements of the door aperture.

The following tools are recommended:

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1 MAINTENANCE DOOR

1.1 Door leafs fitted correctly

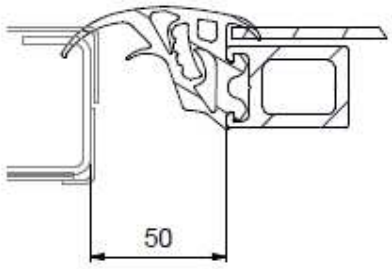

Figure 1.1: Space between the aperture and the door leaf

Nr.	Check	Checked by:
1.	Check if the door leafs are in line with each other. Distance between door leaf profile and the aperture (excluding the rubber) should be 50±1mm.	
2.	Check if the door leafs are parallel with the step edge when fully open and without pressure. When closed the door leaf can be put straight by the catch wedge, but should be straight on its own. Adjust the door wing when not straight at fully open position.	

1.2 Door leafs

Figure 1.2: Old style rail

Figure 1.3: New style rail

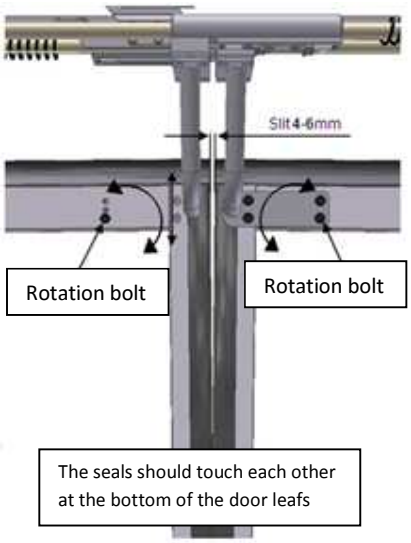

Figure 1.4: Gap between the door leafs old style rail

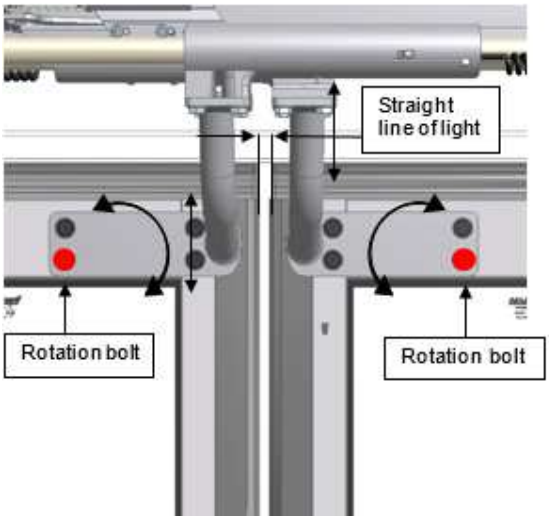

Figure 1.5: Gap between the door leafs new style rail

Nr.	Check	Checked by:
1.	<u>This check should only be performed when the door leafs have the old style rail that is on the outside of the door leaf. See Figure 1.2.</u> Check if a gap of approximately 4-6mm at the top between the door leafs is visible (without pressure). The door leafs should touch each other at the bottom in closed position (See Figure 1.4).	
2.	<u>This check should only be performed when the door leafs have the new style rail (See Figure 1.3).</u> Check if there is an equal gap between the door leafs (without pressure).	

Figure 1.6: Distance between door leafs

Nr.	Check	Checked by:
3.	When closed there should be 102±2mm distance between the door leafs measured from the aluminum profiles of the door leafs (with pressure). See Figure 1.6. If not adjusted correctly the sensitive edges are compressed or a gap between the door leafs can lead to potential hand traps.	

1.3 Door height

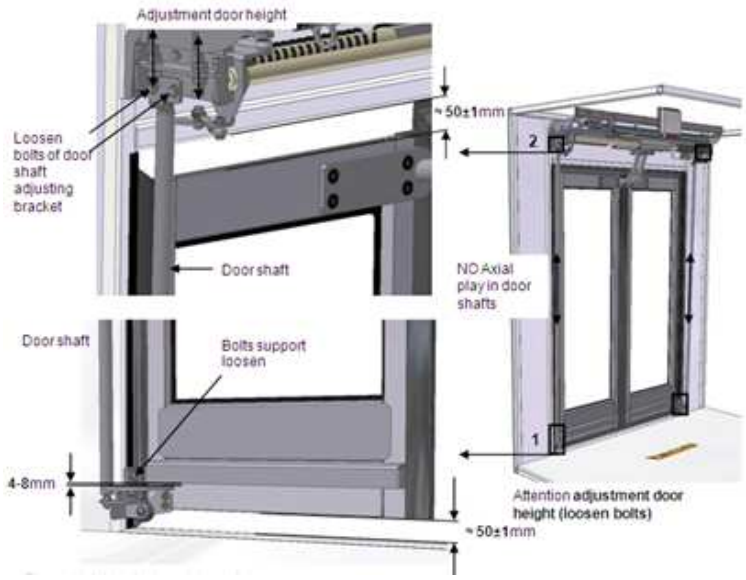

Figure 1.7: Check door height

Figure 1.8: Check clearance catch plate

Nr.	Check	Checked by:
1.	Check if the distances at the top and bottom of the door leaf are 50± 1mm (Measured between the door leaf profile and the aperture).	
2.	Check if the distance between the bottom lever of the door shaft and the guiding rail of the door leaf is 4-8mm (closed position), otherwise re-adjust the door shaft height.	
3.	Check if the door shaft is free from vertical play (up and downward movement).	
4.	Check if the lever of the door shaft does not touch the catch plate when in closed position. See paragraph 1.8: Adjustment of the catch wedge (Bottom).	

1.4 Door shafts

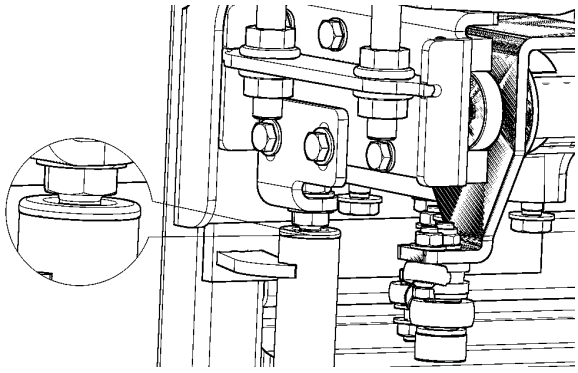

Figure 1.9: Top door shaft bush and pivot

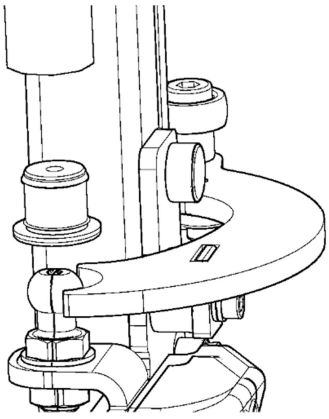

Figure 1.10: Bottom door shaft bush and pivot

Nr.	Check	Checked by:
1.	Check if the top bearing bush and pivot aren't broken or worn out. If so replace part.	
2.	Check if the bottom bearing bush and pivot aren't broken or worn out. If so replace part.	

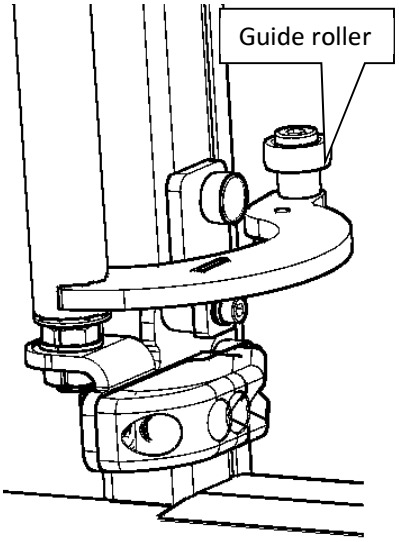

Figure 1.11: Guide roller on the door shaft bottom lever

Nr.	Check	Checked by:
3.	Check if the guide roller is not broken or worn out. If so replace part.	

1.5 Adjustment of the side seals

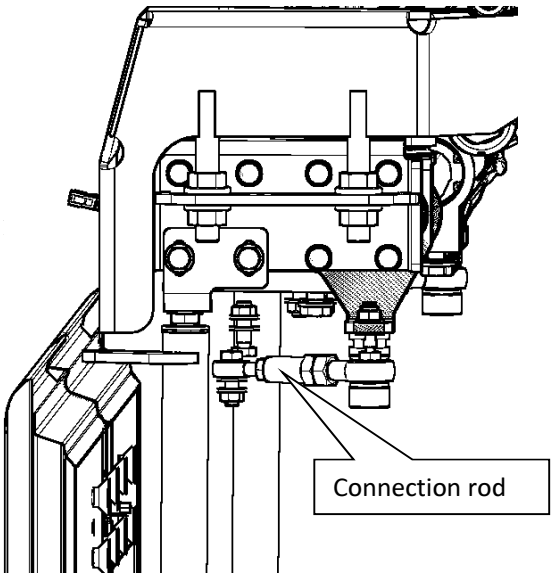

Figure 1.13: Adjusting side seal

Nr.	Check	Checked by:
1.	Check if the side seals of the door leafs are fitting well to the side of the aperture. The outward side of the side seal should be relatively straight and not bend inwards or leaf a gap between the side seal and the aperture.	

1.6 End stopper of the door shafts

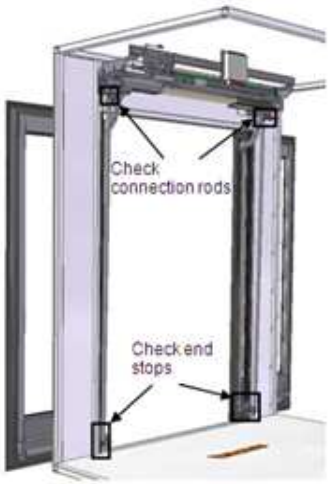

Figure 1.14: Location end stoppers

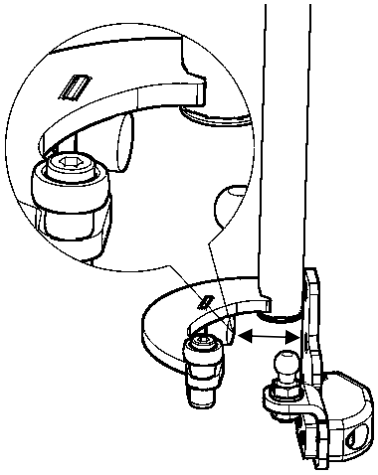

Figure 1.15: End stop on door shaft

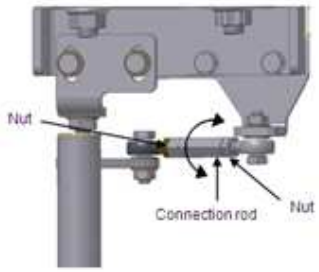

Figure 1.16: Adjustment end stop

Nr.	Check	Checked by:
1.	Put the door leafs in open position and check if the roller of the door shaft support touches the end of the guiding rail. If not the door leaf doesn't swing fully open at the bottom. This can be adjusted with the connection rods (See figure 1.14)	
2.	The end stop of the door shaft should touch the door shaft support when door is open (See figure 1.13).	

1.7 Fully opening of door leafs

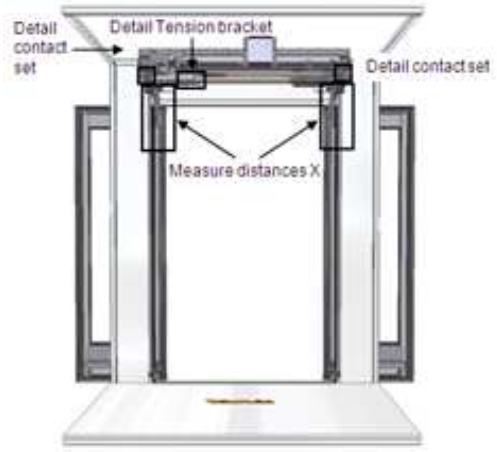

Figure 1.17: Location of the bearing house bushes

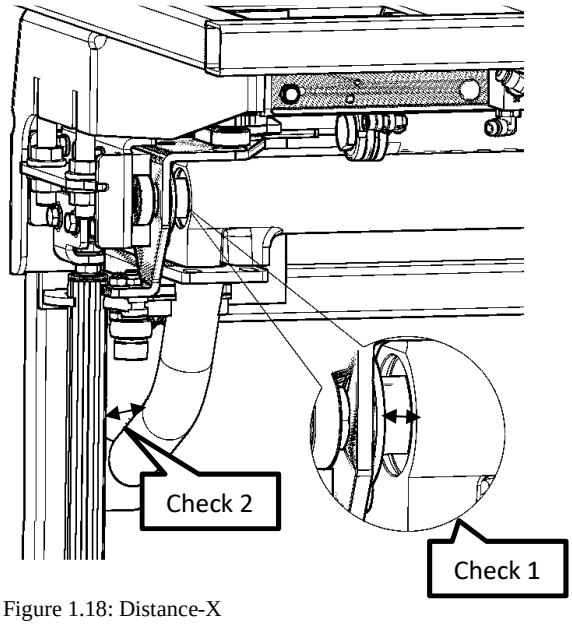

Figure 1.18: Distance-X

Nr.	Check	Checked by:
1.	Put the door in a 100% open position. The bearing housing bushes should touch the cushioning rubber on the frame of the door mechanism.	
2.	Check if “Distance X” between the aperture and the door arm of both door leafs are equal.	

1.8 Adjustment of the catch wedge (Bottom)

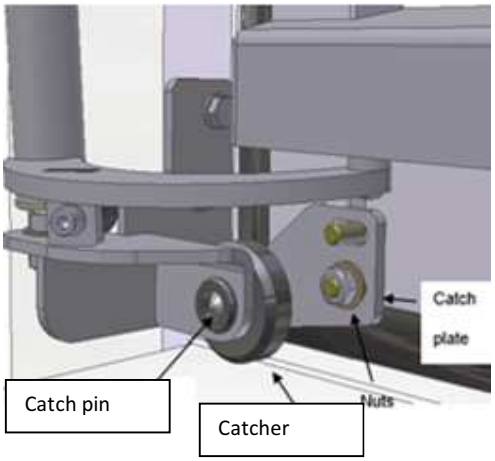

Figure 1.19: First type catch block

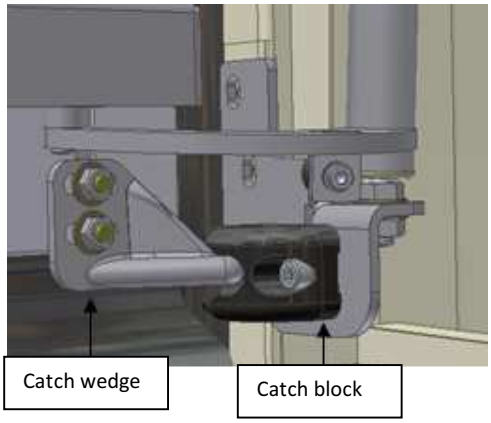

Figure 1.20: Second type catch block

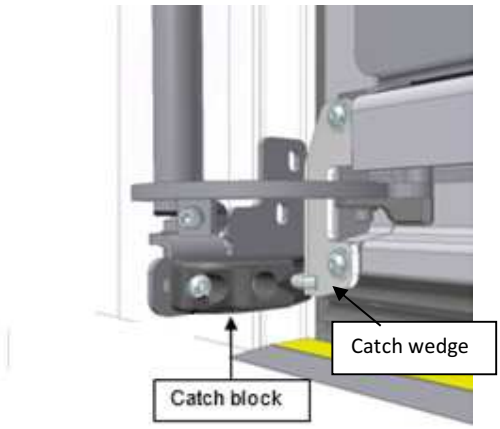

Figure 1.21: Third type catch block

Nr.	Check	Checked by:
1.	First identify the type of catch block using figure 1.18 to 1.20. Check if the catch wedge is caught by the catch block when closing the door. If not then readjust the alignment of the catch wedge. If so, recheck paragraph 1.2 point 3 to see if the space between the door leafs is still 102±2mm.	

1.9 End stop

Older end stops	Newer end stops (since 2011)

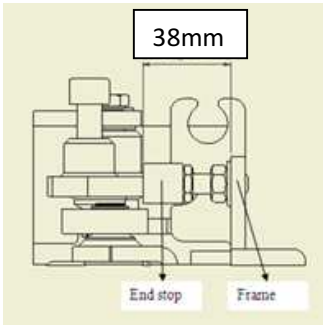

Figure 1.22: Without overcenter

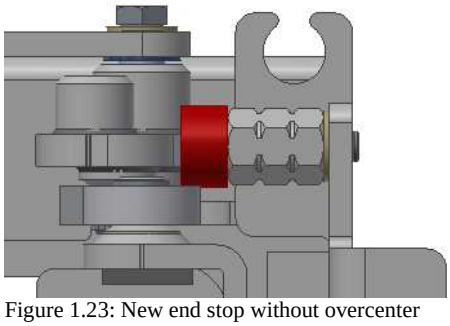
Figure 1.23: New end stop without overcenter

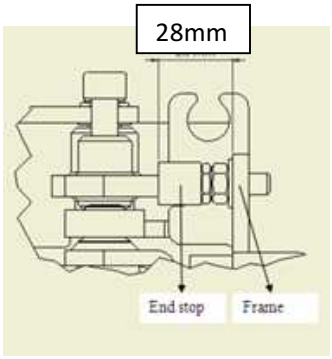

Figure 1.24: Overcenter pneumatic **with unlock cylinder**

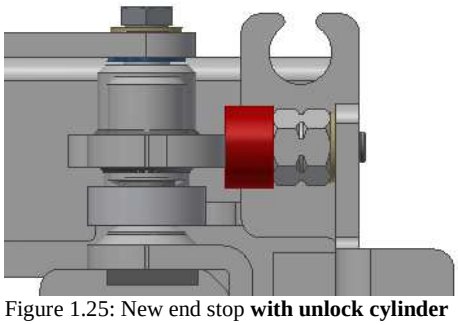
Figure 1.25: New end stop **with unlock cylinder**

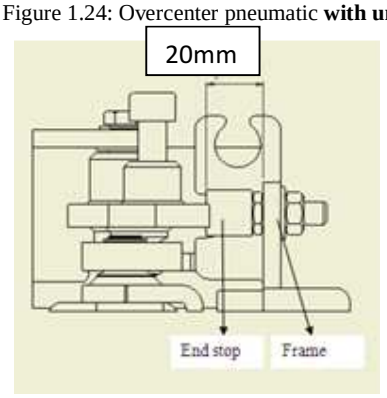

Figure 1.26: Overcenter electric **with unlock cylinder**

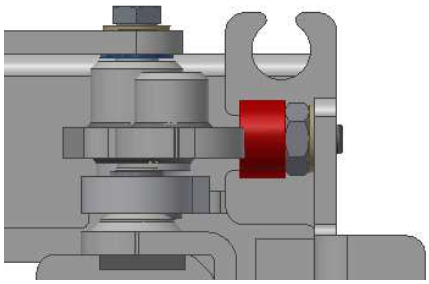
Figure 1.27: new end stop electric with **unlock cylinder**

Nr.	Check	Checked by:
1.	Check if the end stop is the right distance from the frame according to Figure 1.21 - figure 1.26 depending on the situation.	

1.10 Tension steel cables

Figure 1.28: Measuring cable tension

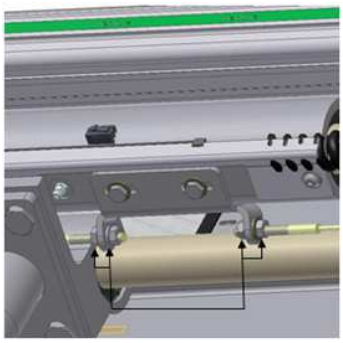
Figure 1.29: Adjust cable tension

Nr.	Check	Checked by:
1.	Check the steel cables with a tension gauge. The tension should be within 260-310 Newton. (Doors at least in half open position and without pressure). If necessary adjust cable length on spanner (see figure 1.29).	

1.11 Greasing Bearing housing

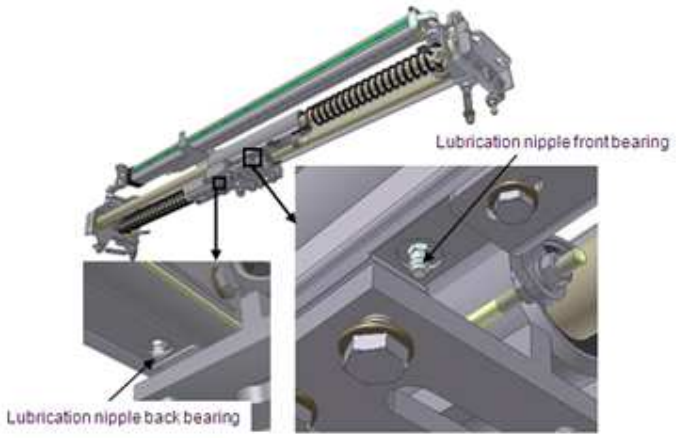

Figure 1.30: Apply multipurpose grease (Q8 Rembrand EP2) to bearing housings

Nr.	Check	Checked by:
1.	- Greasing of the bearing housing. The housing is greased before delivering. (Advice: *multipurpose grease, Q8 Rembrandt EP-2*[1]). - Both bearing housings have to be refilled every year (Normal use, 20 gr. Grease.) - First 10 gr. grease after moving the door wing a few times, again 10 gr. grease).	

[1] NLGI 2
Multi-purpose lithium soap based greases with the **addition of an extreme pressure (EP) additive** to give excellent anti-wear properties for plain and anti-friction bearings operating under heavy or shock loaded conditions. Q8 Rembrandt EP greases provide for long service life and offers rust protection even in the presence of water. (http://www.q8oils.com/)

1.12 Electric actuator (if applicable)

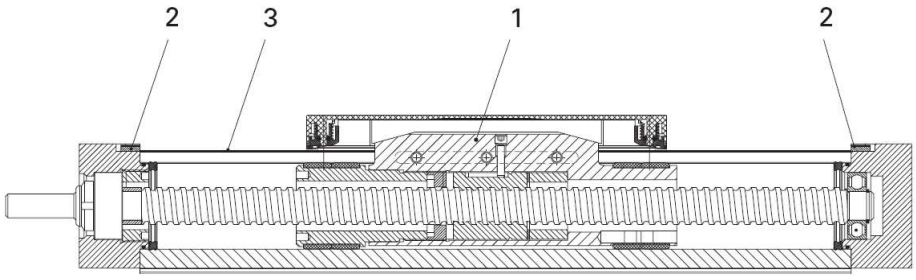

Figure 1.31: Electric actuator

Screw thread	Torque setting galvanized head screws
M 3	0.5 ± 0.1 Nm
M 4	2.2 ± 0.1 Nm

Nr.	Check	Checked by:
1.	Check if the surface between the cover strip (3) and the aluminum profile of the actuator is clean from dirt and other impurities. (When cleaning do not use any aggressive cleaning materials and fluffy cloths.	
2.	Remove the cover strip and check if the spindle axis have a thin coating of grease. If not, then follow these steps: (It is advised to grease every 12 months) 1. Move the carrier (1) to the middle of the actuator. 2. Remove the clamps (2) at the end of the actuators and remove the cover strip (3). 3. Grease the spindle axis and the inside of the actuator evenly over the full length of the actuator. 4. Move the carrier a few times to each side. 5. Put the cover strip back in place and screw the clamps. *Note: Use lubricant HOERBIGER-ORIGA-Fett 2 (HO-grease 2 identification no. #15071 tube 45 gr).* *The shaft bearings don't need greasing.*	

1.13 Filter regulator

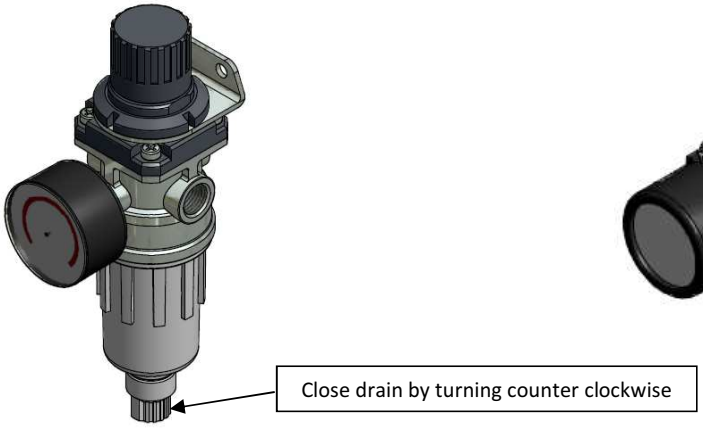

Figure 1.32: Camozzi filter regulator

Figure 1.33: Parker filter regulator

Nr.	Check	Checked by:
1.	Locate the filter regulator if present and check if the clear bowl of the filter regulator is not full. When full press the bottom release drain nipple upwards until the clear bowl is empty.	
2.	In case the filter regulator is a Camozzi instead of an older Parker. The Camozzi filter regulator is semi-automatic meaning the filter will drain itself when the pneumatic pressure drops below 0.3 bar (4.3 PSI) and the drain is also turned open. It is advised to always keep the drain closed so the drain will not spill dirt over vital parts of the bus, depending on the filter regulator location.	
3.	Check if the pressure of the pneumatic system is between 7.5 ±1.5 and 9 bar.	

1.14 Sensitive edge

Nr.	Check	Checked by:
1.	Check if the sensitive edges are functioning.	

2 OPERATIONAL

2.1 Operation and controls

Nr.	Check	Checked by:
1.	Open cycle, speed and cushioning (nominal 3.5 – 4 sec).	
2.	Closing cycle, speed and cushioning (nominal 3.5 – 4 sec).	
3.	Check the pneumatic system for leaking during opening and closing.	
4.	Check the electric system by looking for short circuits or damages.	
5.	Check if all fasteners are properly tightened (See chapter 3).	

Table 2.1: Checking of operational and control functions

2.2 Safety

Nr.	Check	Checked by:
1.	Check emergency buttons.	
2.	Check pneumatic obstruction detection (if applicable)	

Table 2.2: Checking of safety measurements

Signed on behalf of: Date:

3 TORQUE SETTINGS

Guidelines for mounting and securing joints with steel fasteners. In the tables below are the Torque M_a values given for bolts with nominal dimensions over full thread (no special bolts) with metric thread of hexagon bolts type DIN931, DIN933, DIN912. The Torque of fasteners depends of friction coefficients of materials, surface treatments, surface conditions, fabrications methods etc. The values in tables below are values which correspond most with the practice, Torque dry.

	Class 8.8
Size	**Torque dry range (Nm)**
M5 pitch 0.8	6
M6 pitch 1.00	10
M8 pitch range (1.25 – 1.00)	25-27
M10 pitch range (1.50 – 1.00)	51 – 57
M12 pitch range (1.76 – 1.25)	87 – 96
M14 pitch range (2.00 – 1.50)	140 – 150
M16 pitch 2.00	215

Table 3.1: Torque chart for hex fasteners. Zinc plated in Nm. [2] [3]

Note: Torque of the fasteners depends of pitch size, the lowest value in the table refers to the biggest pitch of the fastener.

Size	**Metric**[4]	**Torque dry range (Nm)**
T25	M5	16 - 19
T30	M6	31 - 37
T40	M8	54 - 65
T50	M12	132 - 158
T55	M12	218 - 256
T60	M14	379 - 445
T70	M17	630 - 700

Table 3.2: Torque chart for torx fasteners in Nm[5]

Note: Metric size correspond to Torx “Flat head” and Torx “Pan head”

[2] Imperial. Fastener Torque Chart. In Imperial Supplies. Retrieved May 7, 2014, from http://www.imperialsupplies.com/pdf/A_FastenerTorqueCharts.pdf.
[3] Torque values according Fabory, values correspond with friction coefficient µk=0.14, most common, Faborycentres issue 04, 15092002, page 15-37-1, 15-37-2
[4] 15092002, page 15-371,15-37-2
[5] Wiha. Typical Dimensional & Torque Specifications. In Wiha Tools Marketing. Retrieved May 7, 2014, from http://www.wihatools.com/Marketing/torxspec.htm.

4 REMARKS