



Original instructions



AVANTI

AVANTI SERVICE LIFT

Service manual

Model SWP L02 CE-AECO



Date of publication:
2nd Edition: June 2019
Revision 1: 17/06/2019

This manual covers products with Serial numbers from A2-L0001

AT00010648 SWP L02 CE-AECO Ed.02 R01 – Language: ENGLISH





CE certificate for SWP L02:

CERTIFICATE

EC Type Examination

EC-Directive 2006/42/EC, Article 12, Section 3b
Machinery

Number of registration: 01/205/0950/19

Certification body for machinery NB0035
at TÜV Rheinland Industrie Service GmbH
herewith confirms for the company

AVANTI WIND SYSTEMS TECHNOLOGY, S.L.
Calle Angeles (Los), Num. 88
Pol. Industrial Centrovia
50196 Muela (La) - (Zaragosa)
Spain

the close conformity of the product

Service lift inside wind turbine systems

Technical data:

Type:	SWP L01	SWP L02	SWP XL01	SWP XL02
- max. load capacity:	240 kg / 2 persons		320 kg / 3 persons	
- traction hoist:	M508		M608	
- fall arrest device (FAD):	ASL508		ASL608	
- lifting speed:	18 m/min (50 Hz) or 21 m/min (60 Hz)			
- triggering speed of FAD:	30 m/min or 40 m/min			
- net weight:	190 kg		220 kg	
- cabin doors:	Roller-door		Sliding-door	
- max. travelling height:	140 m			
- optional:	<ul style="list-style-type: none"> - Cabin external send function - Wind turbine platform send / call function - high (2.4 m) and low (1.1 m) fences 			

with the requirements according to annex I of Directive 2006/42/EC about machinery and amending the Directive 95/16/EC of the European Parliament and the Council from May 2006 for adaptation of legal and administration regulations of the member countries regarding safety of machinery.

The verification was proved by EC-type approval test, Test-Report- No.: 19_006-1 from 2019-01-19 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Cologne.

This certificate is valid until 2024-02-04

Cologne, 2019-02-04



Certification body
Notified under No. 0035
certifier

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 **TÜVRheinland®**
Precisely Right.



AECO certificate for SWP L02:



UL LLC

Presents this

AECO CERTIFICATE

Certificate Number: **201712154787904922**

Date: 2017-12-15

To

**AVANTI WIND SYSTEMS A/S
Rønnevangs Allé 6
3400 HILLEROED DENMARK**

For certification in accordance with the ASME A17.7-2007 / CSA B44.7-07 (Reaffirmed 2012)
of the following Elevator Subsystem:

Turbine Service Lift

(See addendum for details)

Effective from: December 15, 2017 Until December 15, 2020

Muhammad Asad

Issued by: Muhammad Asad
AECO Certification Services

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Reviewed by: Lenworth E. Grant
AECO Certification Services

Gregory DeLaFuente

Reviewed by: Gregory DeLaFuente, PE
AECO Certification Services

Please look for the UL Classification Mark and Certificate Number on the product





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Ed.Rev	Notes
01.01	New document
02.01	Included cells in the checklist for the wire ropes diameter values measured. Wording improved in paragraphs 3.4.5.2 and 3.5. Definitive (approved) edition. Option of 2 or 3 counterweights in the safety wire rope. Manufacturer updated. Certificates updated.

1. Limited Warranty

Avanti Wind Systems Technology, S.L. warrants that commencing from the date of shipment to the Customer and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard AVANTI warranty, the Product (1) described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of Avanti under this limited warranty, shall be, at the option of Avanti, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to Avanti, freight and insurance prepaid. The obligations of Avanti are expressly conditioned upon return of the Product in strict accordance with the return procedures of Avanti.

This warranty does not apply if the Product (i) has been altered without the authorization of Avanti or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from Avanti; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by Avanti to Customer without charge; or (v) has been sold on an "AS-IS" basis.

(1) Avanti service lift ("Product")

Except as specifically set forth in this Limited Warranty,

ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.

This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall be taken as authoritative.

¹⁾Avanti service lift ("Product")

2. Introduction

2.1 Observations

Only trained people may use this lift.

This manual must be available to staff at all times during installation, maintenance and operation.

Additional copies are available from the manufacturer upon request.

All measurements are indicative only and subject to change without notice.



The pictures and sketches in this manual may not reflect the product aesthetics, colours, arrangement precisely. This has no impact on the function or safety.

2.2 Symbols

Symbol	Signal word	Meaning	Possible injury if not observed
--------	-------------	---------	---------------------------------

Safety instructions



DANGER!

IMMEDIATE or possibly imminent danger:

Death or severe injury!



DANGER!

IMMEDIATE or possibly imminent danger of hazardous voltage:

Death or severe injury!



CAUTION!

Potentially hazardous situation:

Light injury or material damage.

Additional instructions



ATTENTION!

Potentially dangerous situation:

Damage to equipment or workplace



IMPORTANT!

Useful tips for optimum working procedure

None



VERSION!

Differentiation between CE versions and AECO version.



Reference to written specification/documentation

2.3 Cautions

Use and daily inspection of the service lift shall only be performed by person who has gone through the relevant training associated with the Avanti service lift use and daily inspection and is in possession of a valid (non expired) certificate for the task.

Installation and maintenance of the service lift shall only be performed by certified technicians.

Personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this Service Manual.

Personnel shall wear PFPE (safety helmet, full body harness, shock absorber, lanyard and slider) at all times, when using the lift.

A copy of the Service Manual must be handed out to the personnel involved and must always be available for reference.

If more than one person is entrusted with service tasks, the employer shall appoint a supervisor in charge of the operation.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!

If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

All tests/repairs of electrical installations may only be performed by AVANTI or certified technicians.

All repairs to the traction, braking and supporting systems may only be performed by AVANTI or certified technicians.

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by AVANTI or certified technicians.

Only original fault-free parts may be used.

Use of non-original parts will render the manufacturer's warranty void and any type approval invalid. No modification, extension or reconstruction of the service lift is allowed without AVANTI's prior written consent.

No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by AVANTI.

Service lift must be inspected by AVANTI or by certified technician before first use.

Service lift must be inspected at least once a year or after 60 hours of use (whichever occurs first) by AVANTI or certified technicians.

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 60 hours/year for the first year and the 10 hours/year for the rest of the years (250 h in total).

Service lift may not be used by persons who are under the influence of alcohol or drugs which may jeopardize working safety.

The service lift shall not be used in case of fire in the tower.

Service lift shall ONLY be used when the turbine is not generating power.

All wind farm site specific rules must be followed. Service lift shall not be used during inclement weather, including wind speeds over 25 m/s (55.5 mph), electric storms, hurricanes, temperature out of lift's operating range (-25°C to +60°C), and any other that jeopardize safe operation.

Personnel shall be equipped with a wired or wireless two way communication device that shall be connected to a location staffed by authorised personnel. Personnel shall be equipped with portable lights of minimum 200 lx 1) (i.e. headlamps).



Avoid injury – follow all instructions!



The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.



¹⁾ Optional for CE versions. Mandatory for AECO version.

2.4 Terms and definitions

Terms	Definitions
Certified technician	Person who has received relevant training from Avanti or a qualified instructor associated with the intended work and who holds valid certification (current) for the task in question.
User	Person who has received relevant training associated with using the Avanti service lift and carrying out the corresponding daily inspections and who holds valid certification (current) for the task in question.
Manual descent (also: descent without electrical power)	Action performed to descend the cabin at a controlled speed without electrical power, by releasing the traction system's electromagnetic brake manually.

3 Maintenance

Mandatory Requirements

The lift must have been installed and serviced by certified technicians. Operation of the lift requires user training. All the installation, inspections / maintenance operations from first use, periodical and extraordinary must be logged in the Inspection and Maintenance Log Book. All required values measured must be logged, as well as parts replaced. Annual inspections and service tasks made to the hoist and fall arrest device must be carried out by certified technicians.

Ambient conditions must comply with the technical specifications.

Service lift misuse is prohibited, including but not limited to:

- By passing overload system.
- Excessive use of no power descend – i.e. hour counter not registering use.
- By passing safeties.
- Etc.

In case the mentioned required conditions are not fully met, it is not allowed to use the lift. Put the lift out of operation and inform the site management. The site manager shall initiate the ten year inspection scope before putting the lift in use again.



Before any maintenance operation, check that the service lift is properly out of service.



In case of a fault, do not use the service lift until it is solved. If required secure work- place.



Next maintenance instructions must be complemented by the theoretical and practical competency provided to each person during the service training.

3.1 Mandatory inspection and maintenance planning

Having the above required conditions under control, the following inspection and maintenance planning is mandatory:

Frequency	Performed by	Components
Daily	User	Overall / Travel zone
		Control and safety devices
		Fall arrest device
Annually or every 60 hours of operation (whatever occur first)	Certified technician	Overall / Travel zone
		Control and safety devices
		Cabin
		Traction hoist
		Fall arrest device
		Overload limiter
		Traction and safety wire ropes
		Guiding system
		Electrical system
		Information signs and documents
		Doors and hatches
		Cabin control box
		Safety switches
		Interlock system
Platforms		
Replace after 4 years	Certified technician	Battery for emergency light
		UPS batteries
Every ten years or every 125 hours of operation (whatever occurs first)	Certified technician	Fall arrest device (enhanced inspection)
		Traction hoist (enhanced inspection)
Every 20 years or 250 hours of operation (whatever occurs first)	At Avanti Workshop	Traction hoist (recertification)
		Fall arrest device (recertification)



3.2 Cautions

Before any maintenance task, ensure that walking way surfaces are dry and not slippery.

During maintenance tasks, personnel shall:

- Wear at least the following PFPE: fall arrest equipment (when falling height is more than 2 m), safety footwear, hand gloves, helmet, safety glasses and working gear.
- Place cabin at bottom platform and disconnect power supply.
- Use an electricity measuring tool when performing inspection of electrical components.
- Use mechanical help when handling big/heavy loads and shall be performed at least by 2 persons.
- Panel parts shall be removed to facilitate access to confined spaces.
- Guiding rollers shall be replaced one by one.
- Use a cable grip when replacing supply cable loop.
- Keep cabin doors closed when climbing to the folding step.
- Dismount top side panels to access the upper enclosure.
- Always perform all the maintenance tests and tasks at bottom platform or as low above ground as possible.



Only certified technicians shall perform electrical installation tasks.



When plugging the service lift to the power supply, ensure that supply phases are correct!

3.3 Daily inspection

Pre-use inspection must be conducted EVERY day lift is operated by the user. Refer to “AT00010431_User Manual SWP L02_EN”, chapter 4.1, for further information in how to carry out this inspection.

The result shall be recorded in the “Daily inspection log”.



Daily inspection of the service lift shall only be performed by the user. If there is more than one user, the employer shall appoint a supervisor in charge of the daily inspection.

3.4 Annual inspection

Have the entire system, especially the traction system and the fall arrest device tested by certified technicians at least once annually or every 60 working hours (whatever happens first). The traction hoist and fall arrest device must be inspected according to intervals included in the section 3.1 table (see above).

The traction system and fall arrest device must be overhauled at an AVANTI workshop and furnished with new certificate for every 250 hours of operation.

The hour counter is found in the service-lift operating panel inside the cabin.



A certified technician must carry out the annual inspection. Detailed instructions are provided in Appendix B: “Annual Inspection Checklist”.



Check the “Inspection and Maintenance Log Book” for reference about values previously measured and problems found.



Owner must ensure that the results of all annual and extraordinary inspections are logged in the “AT00010646_Inspection and Maintenance log book” (2nd and subsequent copies).



Alternatively, this information may also be stored electronically, as long as it is always available for reference.



In case of replacement of the Hoist, Fall Arrest Device and/or 8mm wire ropes, the operation/s and the related total hours of use of this/these component/s must also be logged in the “AT00010646_Inspection and Maintenance log book”.

3.4.1 Cabin

Inspect the cabin structure, joints, attachments and accessories.



3.4.2 Traction hoist

The traction hoist shall be maintained according to maintenance planning (please see section 3.1).

Annual inspections (only by certified technicians):

1. Ensure that hoist is clean and no visual defects or oil leakages have appeared.
2. Check that the hoist is firmly attached to the spine.
3. Check the reeving pulleys under the hoist.
4. Test manual descent function. Flashing lights must work during manual descent even in case of no power.
5. Perform overload test as specified in the Appendix A: "Adjustment of the overload limiter". In case of an overload, any movement of the service lift shall be avoided and an error light will be triggered on the error display of the service-lift operating panel, until overload condition is eliminated.
6. Read the manual descent hour counter.
7. Make sure the traction wire is able to rotate freely to relieve any twist that may be generated during the service lift operation.

Apart from the above, every **10 years or 125 hrs** (whatever occurs first) the following enhanced inspection tasks are planned: (see Appendix B.1: "Ten-year/125 hour enhanced inspection", points 5.10 to 5.12, for further instructions in how to perform these operations)

1. Dismount the hoist from the spine, take the traction wire rope out of the hoist and perform an endoscopic inspection of all the accessible key parts inside the hoist: traction sheave, pressure system and overload system. See chapter 3.9 for instructions in how to assemble and disassemble the hoist.
2. Unscrew the motor from the hoist and check the centrifugal brake linings thickness.
3. Drain the gearbox and open it to inspect the wormwheel condition.

The above 10 year scope can be done either on-site or in a workshop, after replacing the Hoist by a spare unit.

3.4.3 Overload check and adjustment

Annual test: Test switches and perform overload test as specified in the Appendix A: "Adjustment of the overload limiter".

3.4.4 Fall arrest device

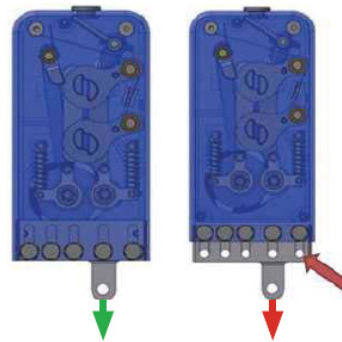


If fall arrest device has engaged due to a dynamic fall, a certified technician must verify the safety of the fall arrest device, the wire rope, and the wire rope attachment.



After fall arrest device has engaged, if the shock absorber has moved downwards, the fall arrest device unit must be replaced by a certified technician.

Shock absorber



Shock absorber deployed, unit has been through a fall. Avanti must be contacted and unit should be replaced.

Operating mode Impact Force

The fall arrest device shall be maintained according to maintenance planning (please see section 3.1).

Annual inspections (only by certified technicians):

1. Test that the fall arrest device red actuator engages the device avoiding downwards travel both electrically and by manual descent.
2. The corresponding light in the error display shall turn on.
3. Test the fall arrest device black actuator. If the lift is hanging from the safety wire, it will be necessary to move the lift up in order to release tension in the safety wire prior to unlock the FAD.
4. Ensure that no visual defects have appeared.
5. Release safety wire rope bottom attachment in tower and perform wire rope acceleration hand test.



Apart from the above, every **10 years or 125 hrs** (whatever occurs first) the following enhanced inspection tasks are planned: (see Appendix B.1: “Ten-year/125 hour enhanced inspection”, points 7.9 to 7.11, for further instructions in how to perform these operations)

The safety wire rope must be taken out of the FAD and the unit must be completely dismantled from the lift to perform the following tests.

6. Using a 5.4mm calibrated rod (test rod A) check the clamp jaws condition and functionality. The jaws must grab firmly the test rod.
 7. Check the rollers functionality by means of two calibrated rods: first with the 8mm one (test rod B) and then with another one of 6.2mm (test rod C). In both cases, the flyweights must spin smoothly.
 8. Perform an endoscopic inspection of key parts inside the device: torsion spring, 8mm rollers with their spring guides, levers and axles.
- The above 10 year scope can be done either on-site or in a workshop, after replacing the FAD by a spare unit.

3.4. Traction, safety and guiding wire ropes

Open the wire inspection cover (see picture below) to access the 8mm traction and safety wire ropes from inside the service lift. Open the back wirefix installation windows to access one of the 12mm guide wire ropes from inside the lift. The other one is accessible from inside the lift by opening the lift’s door. The 8mm guide wire ropes for the travelling cable pulley are only accessible from outside the lift. Since these wire ropes’ inspection is not that important, it can be done visually from platforms. Perform the following inspections and adjust if necessary:

1. Inspect the traction and safety wire ropes along their entire length from inside the cabin, and the 12mm guiding wire ropes from the platforms and periodically from the lift, opening the back window and the lift’s door every 15 metres minimum.
2. Pay special attention to the wire rope ends, parts of the wire ropes running over sheaves and wire ropes under frictional wear by external components.
3. When inspecting the wire ropes, consider the following points:
 - type and number of wire breaks,
 - position and time sequence of wire breaks,
 - decrease of the wire rope diameter during operation,
 - corrosion, abrasion, deformation,
 - influence of heat, and
 - operating time.

4. Check that the traction and safety wire ropes are fed correctly around the 2 wire rope guide wheels.
5. Check that the wire rope ends are coiled separately under the bottom platform and tied with at least 3 cable ties.
6. Check that the guiding wire rope tensioning system is correctly installed and that the wire rope locks and fixes are properly fastened.
7. Check that the compression spring (or the counterweights) on the safety wire rope is correctly installed and that the wire rope locks are fastened.
8. Check that the counterweight on the traction wire rope is properly fastened. The traction wire rope coil and counterweight shall be able to rotate freely. Do not attach it to a fixed part.
9. Check that the guiding wire ropes are correctly tensioned as described in the instructions of tensioning the guiding wire ropes (see checklist point 10.5, page 46).



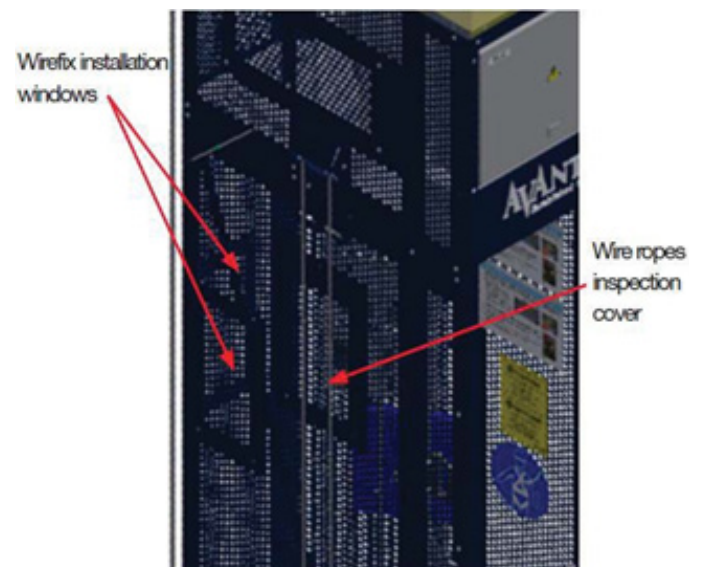
Record any visible change of the condition of the wire rope on the “ Inspection and Maintenance log book”, and monitor closely throughout time.



Always keep the traction, safety and guiding wire ropes clean and slightly greasy.



Only use mechanical means to clean the dirty wire ropes, i.e. a cloth or a hand brush. Do not use solvents or other detergents.





3.4.5.1 Lubrication of the traction and safety wire ropes

Lubricate the traction and safety wire ropes from inside the lift:

1. Open the wire ropes inspection cover to access the wire ropes.
2. While ascending the lift to top platform, apply lubricant on the wire ropes by means of a spray can, pausing the ascent every 10-15 meters (or less if the wire ropes are badly in need of greasing).
3. While applying the lubricant, use the second hand to place and hold a cloth around both wire ropes.

This way, the lubricant will be distributed uniformly on both wire ropes.

4. Check the lubricant has been applied properly and uniformly along the complete length of the two wire ropes while descending the lift back to bottom platform.

5. Clean off any lubricant accidentally applied on the cabin panels and close the wire ropes inspection cover.

! Only use specialised wire rope lubricants. Do not use lubricants based on lithium soap grease or bitumen. Do not use disulphide-containing lubricants like Molycote®.

! Apply lubricant using a spray can, brush, drip applicator or pressurized device.

! Pay special attention to sections of the wire rope where dehydration or denaturation of the lubricant can be seen.

! Re-lubricate the wire ropes before they show signs of corrosion or run dry, and taking in mind that:

- A poor lubrication leads to corrosion and to a quick wear of components.
- An excessive lubrication leads to dirt agglomeration on the wire rope surface. As a result, this can lead to quick wear of wire rope, sheaves and drum.
- A correct lubrication keeps the efficiency factor of the wire rope, protects against corrosion, helps to elongate their lifetime significantly and ensures a safe operation.

3.4.5.2 Measuring of the wire rope diameter

i When measuring the diameter of the wire ropes, use a digital calliper with broad measuring faces.

In general, measure the diameter of the wire rope at each WTG tower platform, and under the service lift, where the wire rope is less loaded. Specifically, if a wire rope wear is detected, measure on the affected area.

i Rotate the calliper around the wire rope to measure the minimum and maximum wire rope diameter at each measurement point. Check that minimum value is above the discard criteria and note it down in the inspection checklist.

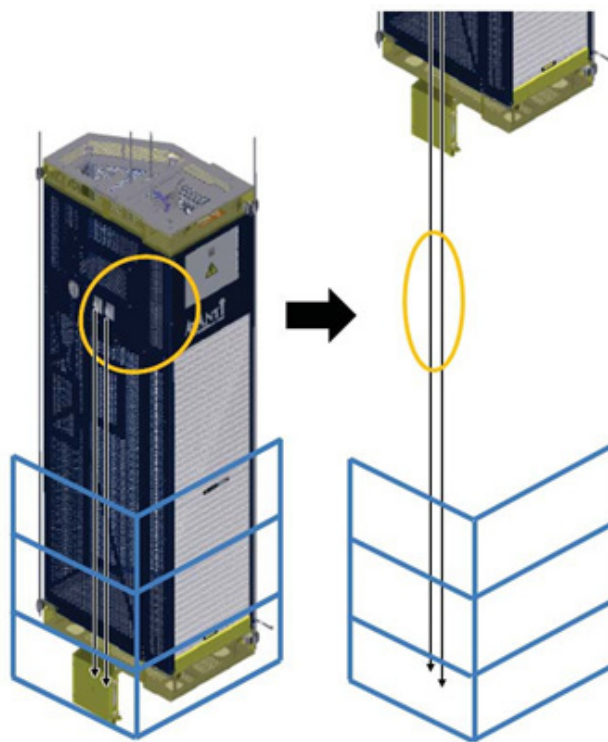


Guide wire ropes 12mm

Measure at least and top, bottom and mid tower platforms. Move the lift as necessary to measure safely and comfortably from the platforms.

Traction and safety wire ropes 8mm

Raise the lift 2-3 m in order to measure the wire ropes in an area not being under the lift's load. Pay special attention to the wire ropes length corresponding to reeving rollers and hoist area at bottom platform where the lift is most of the time hanging from.



3.4.5.3 Discard criteria



The discard criteria of the wire ropes should be according to ISO 4309: Cranes - Wire ropes - Care and Maintenance, inspection and discard.



Determine and eliminate the cause before installing a new wire rope.

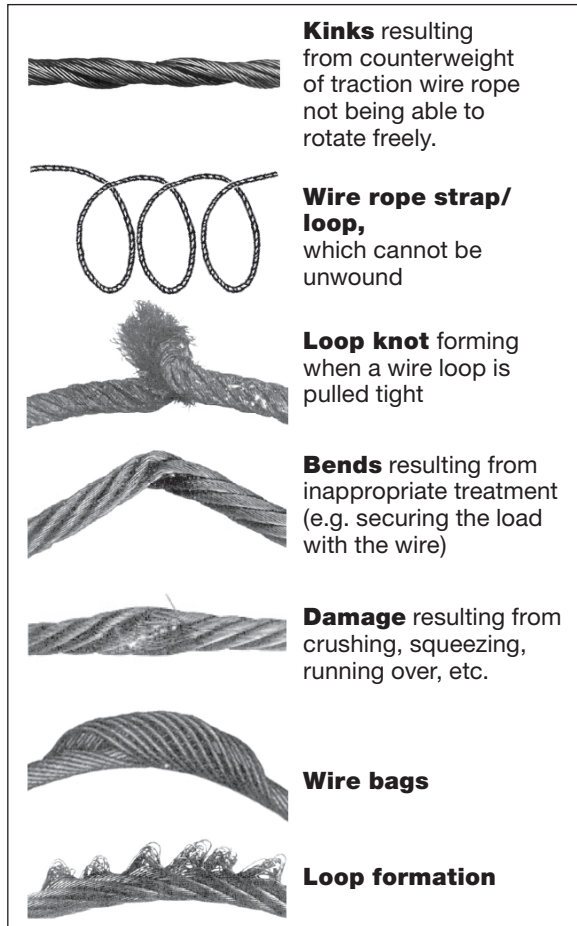
AVANTI recommends replacing the traction and safety wire ropes after 250 hours of operation, corresponding with the refurbishment of the traction hoist and fall arrest device. Please check with your local authority regulations if it is mandatory in your case.



On AECO service lifts, according to A17.1 5.11, traction and safety wire ropes must be replaced after 250 hours of operation or 5 years whichever occurs first.

Check and replace the respective wire rope(s) if one of the following defects is found:

- Severe corrosion on the surface or the inside.
- Heat damage, evident by the wire rope colour.
- Damage on the wire rope surface (see following figures for most common examples of rope damage).

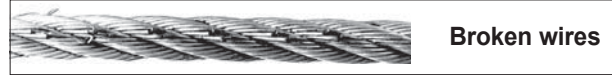


Guide wire ropes 12mm

There are more than one 8-wire strand break on a wire rope length of 360 mm.
The wire rope diameter is less than 11.4 mm.

Traction and safety wire ropes 8mm

There are more than one 4-wire strand break on a wire rope length of 250 mm.
The wire rope diameter is less than 7.6 mm.



3.4.6 Electrical cables

Check and replace the power supply and control cables if the cable jacket or cable connections are damaged.

3.4.7 Batteries

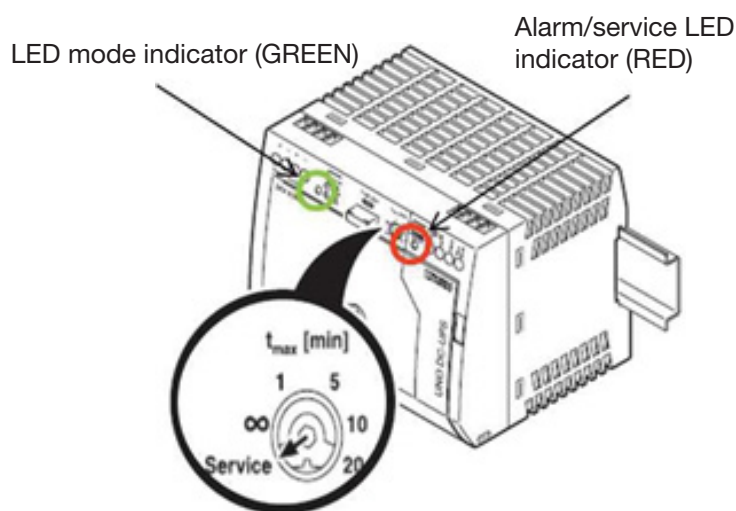
Check the emergency light's battery condition. Fully charged, it must last for 30 minutes when power supply fails. Replace it if necessary (Battery type Ni-Cd 4,8V/1,5Ah).



Avanti recommends changing the emergency light battery every 4 years. Check last time it was changed in the inspection and maintenance log book.

Check UPS module for the warning flashing lights. The UPS module has two LED indicating the state of the unit. In normal operation green is ON (or flashing during battery mode or charging battery) and red OFF. Red LED ON is usually associated to battery failure.

If UPS batteries need to be changed, set "service" mode in the UPS selector prior to open the unit.



! *Avanti recommends changing the UPS batteries every 4 years. Check last time they were changed in the inspection and maintenance log book.*

i *When replacing batteries, always use two new batteries (Yuasa NP0.8-12) from the same production batch.*

3.4.8 Information signs and documents

Verify availability and legibility of all data plates, documents and information signs. Replace missing or illegible documents, plates and signs!

Full list of documents and labels provided can be found at point 4.1 (page 34) in the “Annual Inspection Checklist” instructions (Appendix B).

3.5 Repairs

Repairs to traction system equipment may ONLY be performed by AVANTI, and only using original spare parts.

If the gearbox oil needs to be replaced, use the lubricant specified below:

- Amount required: 1.5 l
- Traction system: M508
- Specification: Mobil SHC 632

Each oil has to be verified by AVANTI.

3.6 Ordering spare parts

3.6.1 Wire ropes

In addition to the item number and name of the spare part, always state the traction system type, wire rope diameter and production number!

3.6.2 Motor and brake

In addition to the item number and name of the spare part, always state the motor type and the type and coil voltage of the brake!

3.6.3 Electric control

When ordering spare parts or making requests, always state the electricity category and wiring chart number. See the rating plate on the main control panel. There is a wiring chart in the main control panel and in the motor terminal box.

3.6.4 Fall arrest device

In addition to the item number and name of the spare part, always state the fall arrest device type, the wire rope diameter and lift serial no.

3.7 Removing wires for replacement



Wear protective gloves when handling wire ropes.

3.7.1 Parking the service lift

Lower the lift until bottom obstruction device engages.

3.7.2 Wire rope ends

Beneath the access platform:

- Loosen and uncoil all coiled and secured wire rope ends.
 - Remove the counterweight from the traction wire rope by loosening the two wire locks under it.
 - Compress the tightening spring by means of plastic strips, loosen the two wire locks holding it and remove it from the safety wire rope.
- If counterweights have been installed, just proceed as with the traction wire rope.

3.7.3 Removing the traction wire rope

- Turn the bottom obstruction override switch to the right and press the DOWN button until the cabin rests on the platform.
- After having removed the traction wire rope counterweight continue pressing the DOWN button while turning the override key switch. The wire rope now exits the traction system at the top.
- From above the traction system, help removing the wire rope pulling by hand.

3.7.4 Removing the safety wire rope

- Keep the fall arrest device open by pushing up the black lever and manually pull out the wire.
- Manually pull out the wire on top of the lift.

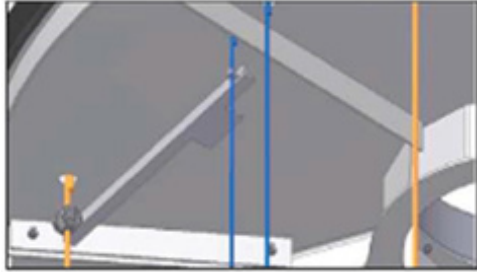




3.7.5 Removing the top limit device

The top limit device is attached to the traction wire rope.

When this wire rope has to be replaced, the top limit device has to be also removed by unscrewing the wire rope grips.



Ensure that counterweight and wire rope coils can rotate freely.

3.8.2 Safety wire rope installation

1. Feed the safety wire rope through the fall arrest device.
2. Continue feeding the wire rope underneath (round) the back guide wheel and over the front guide wheel.
3. Pull the safety wire rope to tighten it.
4. Feed wire rope through cabin bushings and then through the platform floor towards the basement.
5. Feed the safety wire rope through the bottom platform hole.

3.8 Re-installing new wire ropes



Wear protective gloves when handling wire ropes.



Apply the torques indicated (see appendix E) with lubricated screws (not dry). Only use lubricant type 'Molykote G-Rapid Plus' or similar which ensures no damage to screws.

One at a time, dismantle the wire ropes from the suspension beam using appropriate mechanical means (hoist and self-closing wire grippers that does not damage the wire) and descend them to bottom platform.

Carry the new wire ropes to the yaw platform. As explained in the installation manual, attach the wire ropes thimbles to the suspension beam by means of the 2 ton shackles and secure them with the cotter pins.

Then, one by one through the holes on yaw platform, descend the wire rope's tip to bottom platform while uncoiling them carefully.

3.8.1 Traction wire rope installation

1. Put the wire rope into the traction system's wire rope inlet opening.
2. Push the UP button on the cabin operation control and feed the wire rope through until the traction system starts pulling. Ensure that the wire rope can exit without obstruction!
3. Continue feeding the wire rope underneath (round) the back guide wheel and over the front guide wheel.
4. Let the traction wire rope pass through until it is slightly tightened.
5. Feed wire rope through cabin bushings and then through the platform floor towards the basement.
6. Refit the 11kg counterweight to the traction wire and fasten it by means of the two wire locks (new self locking nuts M8 are needed) torqued to 6Nm (see Appendix E).
7. Coil excess of wire with cable ties (at least three).

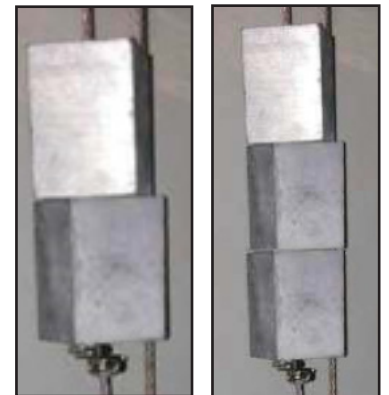
If push spring is used:

6. Ascend the service lift 50 cm.
7. Activate the fall arrest device.
8. Perform manual descent so that the weight of the service lift is transmitted to the safety wire rope.
9. Compress the spring to 40 mm and fix with cable ties.
10. Feed the safety wire rope through the compressed spring.
11. Pull the safety wire rope downwards by hand as much as possible.
12. Place and fasten the wire rope grips (new self locking nuts M8 are needed) torqued to 6Nm (see Appendix E).
6. Cut the cable ties so that the spring decompresses to 55 mm.



If counterweights are used:

14. Feed the wire rope through the two 11 kg counterweights and fasten them by means of two wire locks (new self locking nuts M8 are needed) torqued to 6Nm (see Appendix E).



15. Coil any wire excess with cable ties.



Operate the lift some meters up and down checking that it runs smoothly and sounds normal.

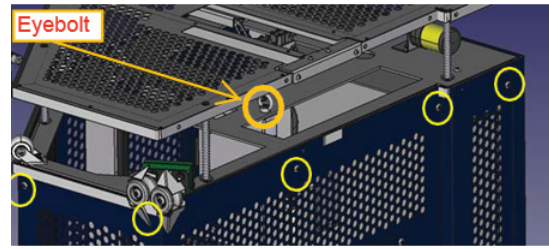
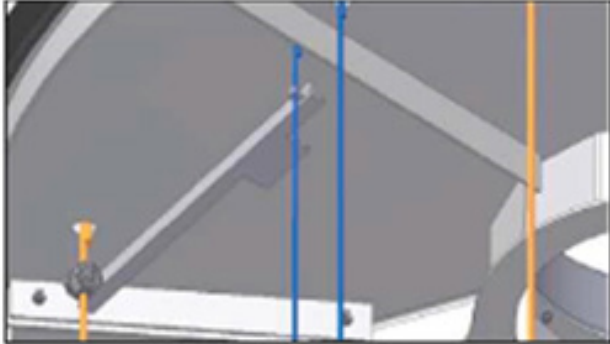


After replacing the traction wire rope check that the overload limiter is properly adjusted (see Appendix A).



3.8.3 Re-installing the top limit device

Fasten back the top limit device to the traction and guide wire ropes. Tightening torque required: 6Nm for 8mm traction rope grip plus half-bushings, 20Nm for 12mm guiding wire rope grip (see Appendix E). New lock nuts needed M8 and M10.



5. To prevent disconnecting or damaging the cables that connect the top switches and strobe light when raising the top structure, loosen them by cutting the cable strips as necessary.



3.9 Replacing traction hoist



Follow maintenance cautions at all times when performing replacement tasks.

1. Covering the lift's shaft by means of an appropriate sheet, place the Service Lift on a higher platform, using the override switch so it is resting evenly on its 4 rubber feet.
2. Switch main power OFF.
3. From inside the lift, remove the wheels cover located on the cabin's ceiling.



6. Hold the slack rope device¹⁾ (if provided) using a plastic strip so it does not generate a failure when operating the hoist.

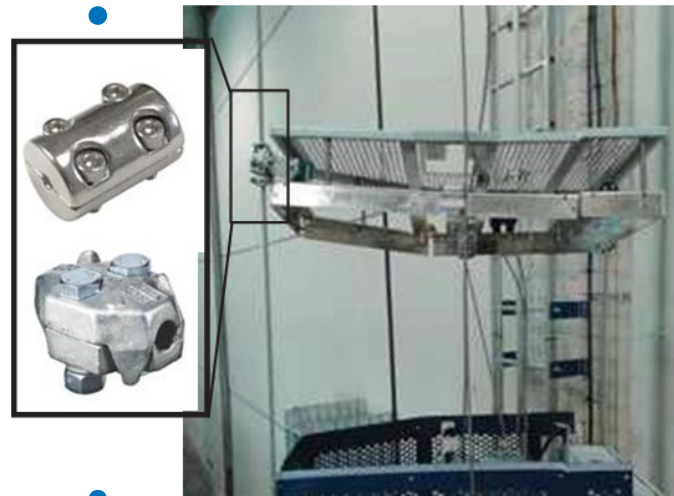


¹⁾ Optional for GE versions. Mandatory for AEGO version

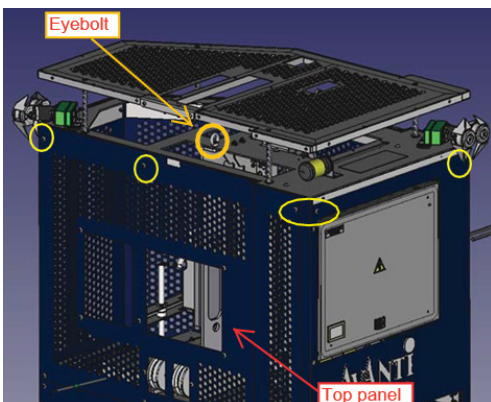
7. Move manually the top structure and hold it to the guiding wires using 2 wire grips letting enough free space to take out the hoist through it.



Take care wire grips used do not squeeze the wire. A couple of examples are shown below.



Take care not to raise the top structure more than 60cm to prevent disconnecting or damaging any of the wires that connect the top devices.





8. Dismount the manual descent lever from the motor.



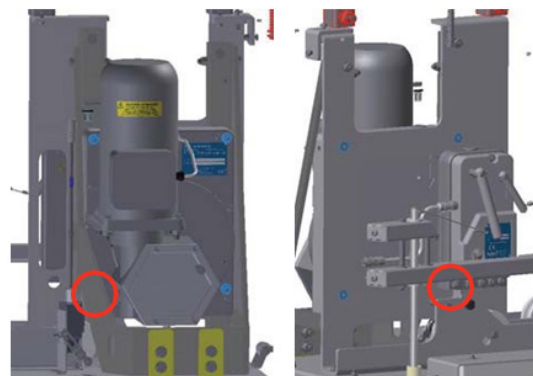
9. Dismount the motor terminal box cable glands plate.
10. Disconnect the motor pluggable terminal blocks from the main control box.



11. Disconnect the lift's main control box from power supply cable.
12. Connect the "maintenance control box" to the pluggable motor's terminals and to the power supply cable previously disconnected. Make sure main switch is OFF.



13. Dismount the 4 bolts that fasten the hoist to the spine. One (red circle) is not visible below.



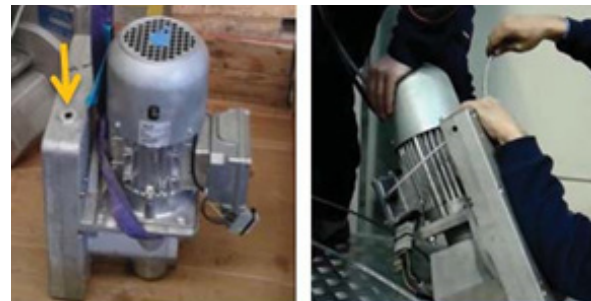
14. Pushing the up button in the "maintenance control box", climb up the hoist along the traction wire over the lift's top.



Take care not to hit the top that is resting over the lift attached to the guiding wires.



15. Remove the counterweight.
16. Pull the excess of the traction wire rope downstream the hoist out of the lift.
17. Descend the hoist along the wire until it is on the platform floor by pushing the down button in the "maintenance control box".
18. Pull the rest of the wire out of the hoist.
19. Connect the new hoist to the "maintenance control box" and feed the traction wire through it.



20. Ascend the hoist along the wire and position it inside the upper enclosure.
21. Mount it back to the spine (new lock nuts M10 are needed) and assemble the manual descent lever to the motor. Bolts connecting the hoist to the spine must be just snug-tightened, no specific torque value required.
22. Pass the wire rope through the rollers underneath the first guide wheel and over the second guide wheel and then through the bushings on the lift and the platform holes.
23. Switch power off.
24. Disconnect the "maintenance control box".
25. Connect again the power supply cable and the motor terminals directly to the lift's main control box.
26. Mount the otop structure back to the lift.
27. Refit the cables to the cabin using plastic strips.
28. Refit the counterweight to the traction wire by means of the two wirelocks (new lock nuts M8 are needed). Torque required is 6Nm (see Appendix E).





Make sure the counterweight and coiled wire are able to rotate freely in order to relieve any twist generated during lift operation.

29. Mount again the top side panel and the textile cover for the top obstruction device. Also close the wheels cover inside the cabin.

30. Perform inspection before 1st use of the traction system (see Appendix B “Annual inspection checklist”, sections 5 “traction hoist” and 6 “overload limiter”).



If it is not possible to replace the hoist electrically, use a hand winch and slings to take it out of the lift's upper enclosure.

3.10 Replacing fall arrest device

1. Covering the lift's shaft by means of an appropriate sheet, place the Service Lift on a higher platform, using the override switch so it is resting evenly on its 4 rubber feet.
2. From inside the lift, remove the wheels cover located on the cabin's ceiling.
3. Use a scaffold from outside the lift to access the upper enclosure.
4. Remove the top side panel and the textile cover of the top obstruction device.
5. Remove the safety wire rope as explained in section 3.7.
6. Unplug the electric cable of the fall arrest device from the main control box (socket 1X17).
7. Cut and remove the wire ropes of the fall arrest device actuators.



8. Dismount the fall arrest device from the supporting structure.



9. Extract the fall arrest device.
10. Mount the new fall arrest device to the supporting structure. New lock nut M12 needed. Bolt must be just snug-tightened, no specific torque value is required.
11. Mount the new wire ropes of fall arrest device actuators by means of talurits.
12. Plug the electric cable of the fall arrest device to the main control box.
13. Feed the safety wire rope through the fall arrest device, the rollers underneath the first guide wheel and over the second guide wheel, and then through the bushings on the lift and the platform holes.



To tighten the safety wire: move the Service Lift up about 50 cm from the floor. Then manually activate the fall arrest device by pushing upwards the red locking lever. Move the service lift down using the manual descent lever until the service lift stops, hanging from the safety wire.

14. Place the tightening spring (or counterweights) back with two wire rope grips. Torque required: 6Nm for 8mm wire rope grips (see Appendix E). New lock nuts M8 are needed.
15. Coil up the excess rope with at least 3 plastic strips.
16. Mount again the top side panel and the textile cover for the top obstruction device. Also close the wheels cover inside the cabin.
17. Perform inspection before 1st use of the fall arrest device (see Appendix B “Annual inspection checklist”, section 7).

3.11 Additional material needed

When replacing Hoist, fall arrest device and wire ropes, some additional material have to be taking into account to perform the re-assembly of them appropriately.

- Self locking nuts M8, M10, M12.
- Steel wire 2mm



- Talurits 2.5mm



- Plastic strips



3.12 Tools needed

Some special tools are needed to perform the maintenance tasks described along this manual:

- Wirefix installation tool: AT00011211



- Overload adjustment tool: 45108090



- Extension cable:
 - o 690V: AT00011304



- o 400V: AT00011308



- o US plug: AT00011309



- Kit overload test: AT00015925



- Talurit 2.5mm crimping pliers:



- Portable maintenance control box: (different models to be developed depending on power supply connection)



- Endoscope: 49912000





- Test rods: (kit 35799024)
 - o Test rod A (Ø5.4X200mm):AT00011024



- o Test rod B (Ø8X270mm):AT00011026



- o Test rod C (Ø6.2X270mm):AT00011029



- o Gauge Ø2mm: AT00011132





Appendix A: Adjustment of the overload limiter

Although below are described procedures for the adjustment of the overload limiter both by a dynamic and by a static method, whenever possible it shall be done following the dynamic procedure since it is much more convenient, it is demonstrated to be more accurate and, in addition, it prevents risks associated to carry heavy loads during maintenance. Just in case there is no other option available because it is required by a third party inspector or due to another unusual and fully justified reason, the static method shall be used.



Verification and/or adjustment of the overload device on the service lift can only be done by a certified technician, who must have been instructed by AVANTI or a certified trainer to perform this task.



Avoid injury by strictly following the instructions!

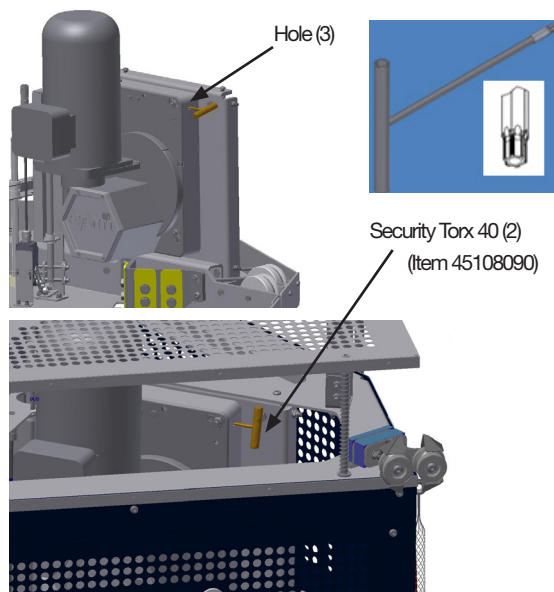


Required tools/material:

- Security Torx 40 (Item 45108090).
- Kit overload test (item AT00015925) or ballast weights for applying the test load.

To modify the lifting load limit:

1. Insert the overload adjustment tool in the adjustment screw through the hole located at the back of the cabin as shown in the figure below.



2. Turn the tool clockwise to increase the lifting load limit.
3. Turn the tool counter-clockwise to decrease the lifting load limit.



One turn on the adjustment screw represents a change of approximately 40 Kg on the lifting load limit.

The setup load depends on the WLL of the lift, travel distance and lift model (different power cable and accessories).

Table below summarizes the setup load values for different scenarios:

Travel distance (m)	Setup load (1) (kg)
From 60 to 69	280 (270-290)
From 70 to 79	285 (275-295)
From 80 to 89	289 (279-299)
From 90 to 99	294 (284-294)
From 100 to 109	298 (288-308)
From 110 to 119	302 (292-312)
From 120 to 129	307 (297-317)
From 130 to 140	312 (302-322)

WLL of lift (4) (kg)	WLL of hoist (kg)
240	500

(*) Numbers 1-4 in brackets in this section refer to the flow chart shown in section A.2



The overload limiter complies with EN 1808 8.3.5.5 1) since it will trigger before reaching a load of 1.25 times the working load limit of the hoist. In case that a third party inspector requests this test to be done, the load to be introduced in the cabin is as follows. Overload test load = WLL hoist x 1.25 – Weight of lift – Tolerance of device

$$\text{For SWP L} = 500 \times 1.25 - 190 - 20 = 415 \text{ kg}$$



The EN1808 test load is only applicable to CE versions. Not applicable to AECO version.

A.1 Dynamic overload test

This procedure is performed by means of the kit overload test and a dynamometer. The kit overload test (item AT00015925) includes the following materials:

- Set elastic cord.
- Set shock absorber with snap hooks.
- Upper snap hook.
- Blue rucksack for transport and storage.



A suitable anchor point on the foundation or at bottom platform of the WTG must be provided for anchoring the tool.

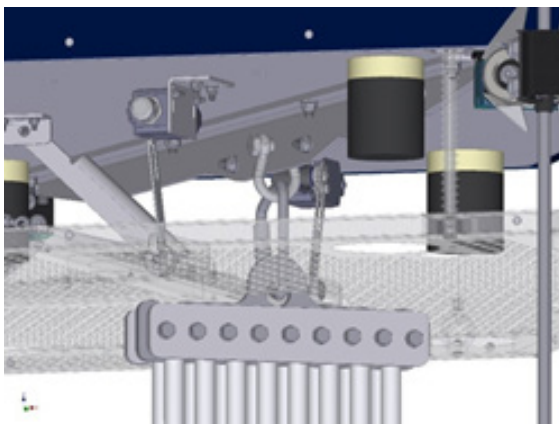
Such point should be located vertically aligned to the lift (tolerance $\pm 5^\circ$) and must be able to withstand a traction force of 1375 kg.

The procedure requires two people to be carried out:



Make sure there is not any obstacle in the way of the lift.

1. One technician gets into the cabin and raises the lift just to make possible anchoring the upper snap hook of the tool to the specifically provided point on the lift's bottom.
2. Activate the emergency stop button and manually trigger the safety brake (ASL) before accessing the lift's shaft
3. The technician outside the cabin hooks the tool to the lifts floor, taking care not to compress the bottom safety stop –this could disable the descent of the lift!
If necessary, use a textile sling (1 ton minimum) for joining the upper snap hook to the lift's bottom.



4. Attach a dynamometer to the snap hook of the shock absorber.



5. Use a textile sling (1 ton minimum) and a couple of snap hooks to join the dynamometer to the anchor point provided on the foundation or at bottom platform. This sling shall have the appropriate length so the dynamometer gets placed at a suitable height, easy to be read.



6. Turn on the dynamometer and set it to zero without tension on the elastic cord.
7. Get into the lift and close the door. The technician's weight has to be known in advance. Calculate the expected reading of the dynamometer according to it:

Dynamometer readout = setup load - technician weight

8. Release the emergency stop button and push the ready button in the cabin's operating panel.
9. Unlock the ASL.
10. Press and hold the up button until the overload device stops the lift. Release the up button. The overload light must be activated in the error display.



f the lift does not stop when surpassing the expected reading of the dynamometer by 20kg, the technician inside the lift shall immediately stop moving up and re-adjust before next try. This requires being in constant communication with the technician outside the lift who is monitoring the dynamometer.



The technician outside the lift can also stop it before reaching a potentially dangerous pulling force by pushing the emergency button in the bottom platform operating panel.



If, despite the above precautions taking into consideration, an excessive pulling force is reached, the load limiter of the tool (shock absorber) shall break preventing damaging the cabin and injuring people by fall or projection of broken parts



If the shock absorber seems break, stop pulling immediately, descend the lift and replace it before using the tool again --Even if it is the first breaking point!

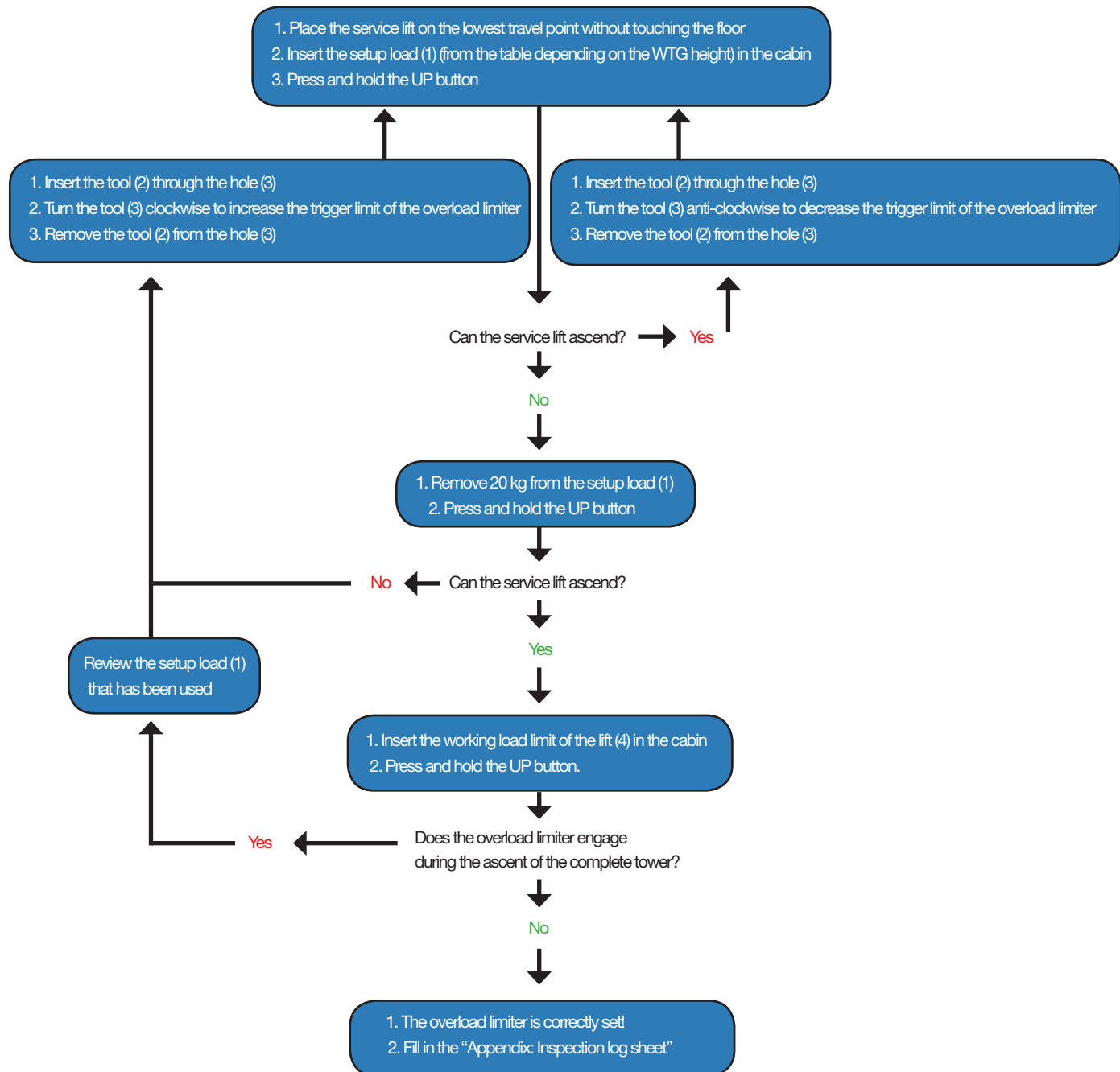
11. Check the reading at the dynamometer. The overload SET UP LOAD is the addition of the dynamometer reading plus the technician's weight.
12. If it differs in more than 10kg respect the expected value, descend the cabin and adjust the overload limiter as necessary by turning the adjusting screw in the hoist.
13. Repeat the process (steps 10- 12) until reaching the SET UP LOAD value (1).
14. After finishing the adjustment of the overload limiter, disassemble the overload kit in reverse order, taking the same precautions as during the installation, and storage it properly.

A.2 Static overload test

This procedure only shall be carried out if there is not any option to perform the dynamic one.

1. Place the service lift on the lowest travel point without touching the floor.
2. Insert the setup load (1) depending on the WTG height) in the cabin including the technician's weight.
3. Press and hold the UP button. The lift must not ascend. Adjust the overload limiter counterclockwise as above if it does and begin the adjustment procedure again.
4. If the lift does not go up, remove 20 kg from the setup load.
5. Press and hold the UP button. The lift must ascend. Adjust the overload limiter clockwise as above if it does not and begin the adjustment procedure again.
6. If it goes up after removing the 20 kg, insert the WLL of the lift in the cabin (240 kg) and carry out a complete ascent to the WTG. If the overload limiter does not engage during ascending, it is correctly adjusted.
7. If it engages, review the setup load that has been used and repeat the process.

The flow chart in the next page summarizes the process:



Appendix B: Annual Inspection Checklist

Date & Time:	<input type="text"/>	Serial n° traction system:	<input type="text"/>
Name of competent:	<input type="text"/>	Serial n° fall arrest device:	<input type="text"/>
Lift n°:	<input type="text"/>	Type of inspection:	<input type="text"/>
Total hours of operation:	<input type="text"/>	(BEFORE FIRST USE, ANNUAL, 10 YEAR, OR UNSCHEDULED)	
Manual descent hours:	<input type="text"/>		

1	OVERALL	OK	Not OK	ISSUE DESCRIPTION
1.1	Is the cabin assembled with all plate ends and edges touching each other? Is it free of cracks, dents and disparities?			
1.2	Are the top and bottom obstruction devices without dents, cracks and disparities?			
1.3	Are the traction and safety wire ropes hanging parallel equally distanced? (i.e. look out for potential entanglement with tower internals)			
1.4	Are both hour meter reading recorded on the "Daily inspection log" and on the "Inspection and Maintenance Log Book"? (Record readings at the end of inspection)			
2	CABIN	OK	Not OK	ISSUE DESCRIPTION
2.1	Is the cabin clean and in overall good condition?			
2.2	Are all the assembling screws of the cabin properly mounted and tightened?			
2.3	Are the anchor points free of cracks, deformities, corrosion and other damages? Are they properly installed and tightened (torque 15Nm)? Is marking readable? Does lift structure show deterioration?			
3	DOOR	OK	Not OK	ISSUE DESCRIPTION
3.1	Is the door properly mounted and tightened to the cabin?			
3.2	Does the door open and close smoothly?			
3.3	Does the door lock and unlock smoothly?			
3.4	Does the corresponding light in the error display turn on when the door is open?			
4	INFORMATION SIGNS AND DOCUMENTS	OK	Not OK	ISSUE DESCRIPTION
4.1	Are all the information signs and documents present and legible? (see AD00002404 for location reference)			
5	TRACTION HOIST	OK	Not OK	ISSUE DESCRIPTION
5.1	Is the traction hoist clean?			
5.2	Read the hour counter: If more than 245h, overhaul traction system at AVANTI so that a new certificate is issued. Every 125h (or year 10th), enhanced inspections must be performed (see point 5.9)			
5.3	Are the 4 fixing bolts, the washers and the nuts present? Are they tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
5.4	Are the pulleys of the traction wire rope free of damage, abnormal deformation and wear?			
5.5	Is there no trace of oil leak around motor and gearbox?			
5.6	Is the traction hoist free of damage, dents, cracks or similar?			
5.7	Does the traction hoist sound normal (no abnormal noises or alike) when running?			
5.8	Is the manual descent hour counter reading within the given parameters (annual increase 0,1 hours and fully documented)?			
	Every 10 years/125 hours only!	YES	NO	Serial no. New unit
5.9	Has the Hoist been swapped by a spare unit? (If Yes, log new serial number)			COMMENTS
	ENHANCED TESTS	OK	Not OK	ISSUE DESCRIPTION
5.10	Endoscopic inspection. Are all parts inspected (traction sheave, pressure rollers system, overload system and spring fixing angle) free of damage?			
5.11	Is the centrifugal brake shoes' wear less than 50%? (If measuring possible, It must be more than 2.5mm; If not, the D2mm gauge must not be able to enter the gap, gap must be less than 2mm)?			
5.12	Is the wormwheel free of damages?			
5.13	Is the electromagentic brake air gap 0.3 to 0.35 mm?			

(Sample sheet)



6	OVERLOAD LIMITER	OK	Not OK	ISSUE DESCRIPTION	
6.1	Was the complete overload test performed according to the "Appendix A: Adjustment of the overload limiter" of the Service Manual?				
6.2	Does the red light of the cabin control box error display turn on when the service lift is overloaded?				
6.3	When checking the overload limiter by the static method, verify that the lift is able to carry 240kg to the top platform.				
7	FALL ARREST DEVICE	OK	Not OK	ISSUE DESCRIPTION	
7.1	Is the fall arrest device free of cracks, dents and disparities?				
7.2	Is the fall arrest device clean?				
7.3	Read the hour counter: If more than 245h, overhaul fall arrest device at AVANTI so that a new certificate is issued. Every 125h (or year 10th), enhanced inspections must be performed (see point 7.8)				
7.4	Does the fall arrest device engage when performing overspeed "hand test"? (The safety wire rope is pulled upwards by hand from the first platform.)				
7.5	Does the red locking lever engage the fall arrest device when pushed upwards? Does the black unlocking lever release the fall arrest device when pushed upwards?				
7.6	Does the error display of the cabin control box indicate when the fall arrest device is activated?				
7.7	Are the locking/unlocking levers fully functional and in good condition? Are they properly fastened by the clips when not in use?				
	Every 10 years/125 hours only!	YES	NO	Serial no. New unit	COMMENTS
7.8	Has the FAD been swapped by a spare unit? (If Yes, log new serial number)				
	ENHANCED TESTS	OK	Not OK	ISSUE DESCRIPTION	
7.9	Are the clamp jaws in good condition? (Test rod A must get firmly trapped by them)				
7.10	Do the rollers & centrifugal flyweights work properly and are in good condition? (Check using test rods B, and subsequently test rod C)				
7.11	Endoscopic inspection. Are all parts inspected (rollers assembly and jaws torsion spring) free of damage?				
8	ELECTRICAL SYSTEM	OK	Not OK	ISSUE DESCRIPTION	
8.1	Are all the electrical cables free of squeeze marks? Are their isolations present and free of damages?				
8.2	Are the electrical cables laid and fixed with cable ties ensuring that there is no slack?				
8.3	Does the cabin light illuminate with a constant light? Does the emergency cabin light illuminate in case of power failure when someone is present and deactivated when the cabin is empty?				
8.4	Do the top and bottom warning lights flash during ascent and descent including when manual descent – even in case of no power? (Check batteries condition)				Log here batt. replacement
8.5	Is the cable collect bin free of damages and mounted according to the manual?				
8.6	Is the cable opening of bottom platform floor properly placed? Is it mounted with a rubber edge protection? Proper coiling of electrical supply cable in storage bin?				
8.7	Does the cable stocking(s) and/ -or cable relief prevent loading on the cable plug(s)?				
8.8	Is the travelling cable free of squeeze marks? Is the isolation of the cable present and free of damages?				
8.9	Are all the electrical plugs correctly mounted and connected? Are the plugs free of dents, cracks, disparities and loose screws?				





9	CONTROL & SAFETY DEVICES	OK	Not OK	ISSUE DESCRIPTION
9.1	Are the service-lift operating panel, the main control box and the rest of the electric devices without dents, cracks and disparities? Are all their covers present?			
9.2	Are all the internal buttons of the service-lift operating panel fully functional?			
9.3	Are the external buttons of the service-lift operating panel fully operational? (Automatic send function)			
9.4	Is the bottom obstruction override key present? And is it fully functional?			
9.5	Does the ready/reset button lamp light up when activated?			
9.6	Do all emergency stop buttons interrupt lift control when activated and the corresponding light turns on in the error display?			
9.7	Does the bottom obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated? Does the switch(es) interrupt descent when activated? Does the corresponding light indicate it in the error display?			
9.8	Does the emergency bottom obstruction breaker interrupt manual descent when activated?			
9.9	Does the top obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated? Does the switch(es) interrupt ascent when activated? Does the corresponding light turn on in the error display?			
9.10	Does the emergency top travel limit switch (S13) function properly? Is it properly adjusted at top platform? Does the corresponding light turn on in the error display?			
9.11	Does the platform light (green) light up when service lift is parked at each platform? (tolerance $\pm 150\text{mm}$).			
9.12	Are the door's emergency manual release button (from inside) and the emergency manual release lever (from outside) fully functional?			
9.13	(If provided) Is the slack rope sensor switch stopping the hoist when activated? (Only for the AECO version.)			
9.14	Does the manual descent lever function properly when actuated? Can it be properly stored?			
9.15	Is the photoelectric sensor correctly aligned, free of damage and clean so the lift stops levelled with platforms?			
10	WIRE ROPES AT BOTTOM PLATFORM	OK	Not OK	ISSUE DESCRIPTION
10.1	Is the safety wire rope properly mounted according to the manual, with the torqued spring or counterweights and the 2 wire rope locks? (Torque: 6 Nm for 8mm wire rope grips).			
10.2	Is the traction wire rope properly mounted according to the manual, with an 11kg counterweight and the 2 wire rope locks? (Torque: 6 Nm for 8mm wire rope grips).			
10.3	Are the traction and safety wire ropes properly coiled up and fixed with 3 cable ties each?			
10.4	Are the traction wire rope coil and the counterweight able to rotate freely?			
10.5	Are the guiding wire ropes tensioned to $7\text{KN} \pm 10\%$? Are the wirelocks of the 12mm guiding wire ropes properly torqued? (20Nm for 12mm wire rope grips).			
11	TRACTION AND SAFETY WIRE ROPES	OK	Not OK	ISSUE DESCRIPTION
11.1	Are the traction and safety wire ropes clean and slightly greased with standard multipurpose grease free of disulphide?			
11.2	Are the wire ropes free of deformations and squeeze marks?			
11.3	Is there no severe corrosion on the surface or the inside of the wire ropes?			
11.4	Are the wire ropes free of heat damages? (Evident by blue discolouration)			





11.5	Are the wire ropes' diameters not less than 7.6 mm at any measured point?									
	Note minimum values measured:									
	TRACTION	TOP		SAFETY				TOP		
		MIDDLE						MIDDLE		
BOTTOM			BOTTOM							
11.6	Are the wire ropes free of the damages described in the Service Manual chapter 3.4.5 "Traction, safety and guiding wire ropes"?									
11.7	Have traction and/or safety wire ropes been replaced? If Yes, mark the corresponding box(es) and record their total hours of use and serial number of the new wire rope(s).				Traction		Safety			
					Hours of use					
					Serial number new wire ropes					
12	GUIDING SYSTEM				OK	Not OK	ISSUE DESCRIPTION			
12.1	Are the cabin's roller wire rope guides clean, free of cracks, wear, dents and disparities? Are the bolts of the cabin's roller wire rope guides properly tightened?									
12.2	Are the wire ropes free of the damages described in the manual?									
12.3	Are all the wirefixes free of cracks, dents and disparities? Are the bolts of wirefixes and their brackets properly tightened?									
12.4	Is each platform opening mounted with 2 two-pieces wirefixes? Are they properly installed? Is each pair of wire rope fixes properly distanced and aligned so the lift passes smoothly through them (1220 mm ±2mm)? (Adjust if necessary)									
13	PLATFORMS				OK	Not OK	ISSUE DESCRIPTION			
13.1	Does the service lift pass freely through all platform openings without hitting the WTG flanges, platform floors and platform fences?									
13.2	Are the safe zone reflecting plates properly positioned, free of damage and clean so that the platform retro reflective sensor is activated at each platform?									
13.3	Do the platform fences fulfil specifications for proper mounting?									
13.4	Are the bolts of platform fences properly tightened so that there are at least 2 threads of the bolt sticking out past the nut?									
14	TRAPPED KEY SYSTEM				OK	Not OK	ISSUE DESCRIPTION			
14.1	Is the trapped key properly secured to the cabin with a wire rope?									
14.2	Is the trapped key lock properly tightened to the platform fence? Is it fully functional?									
15	WIRE ROPES AT TOP BEAM				OK	Not OK	ISSUE DESCRIPTION			
15.1	Is the top beam properly mounted and properly tightened to the WTG? If welded, are the top beam's weldings in good condition and not showing corrosion?									
15.2	Are all the nuts of the shackles locked with a cotter pin?									
15.3	Is the top limit device properly positioned and tightened so that it activates the top obstruction switch? (Tightening torque required: 6Nm for 8mm traction wire rope grip plus half-bushings, and 20 Nm for 12mm guiding wire rope grip).									
15.4	Is the length between the top end of each wire rope and its ferrule equal to or more than 0 mm?									
16	FINAL ASSESSMENT				OK	Not OK	ISSUE DESCRIPTION			
16.1	Is the service lift installation in overall good operational condition?									

Name of competent(s) in capital letters:	
Signature of competent(s):	





Instructions for performing periodic inspection and maintenance.

See below detailed explanations in how to carry out annual inspections and instructions to fill in this checklist: Every time the lift is inspected, the result of the different points to check and relevant issues found must be recorded in the Inspection and Maintenance Log Book, which shall always be available for reference either in hard copy or electronically.

Above there is a sample sheet of the checklist to be filled in, just for illustrative purposes.

Fill in the data required in the checklist heading:

Date & Time:	<input type="text"/>	Serial n° traction system:	<input type="text"/>
Name of competent:	<input type="text"/>	Serial n° fall arrest device:	<input type="text"/>
Total hours of operation:	<input type="text"/>	Type of inspection:	<input type="text"/>
Manual descent hours:	<input type="text"/>		

(BEFORE FIRST USE, ANNUAL, 10 YEAR, OR UNSCHEDULED)

1. Overall

Visual Inspection:

- 1.1. Check that the cabin is correctly assembled with no loose parts or hardware and it has no visible damages
- 1.2. Check that the top and bottom obstruction devices are free of damages.
- 1.3. Check that the traction and safety wire ropes are correctly fed and guided. They must not be twisted or entangled with tower internals or in contact with sharp edges.
- 1.4. Check that the hour counter readings of previous inspections are logged in the "Daily inspection Log" and in the "Inspection and Maintenance Log Book". Record the hour meter reading after current inspection is finished. Check the manual descent hour counter reading is recorded in the "Daily inspection Log". Record value after current inspection is finished.

2. Cabin

A mechanical inspection of the cabin condition must be carried out at this point:

- 2.1. The cabin must be clean, free of debris, oil, etc.
- 2.2. Make sure all the assembling screws of the cabin are properly mounted and tightened.
- 2.3. Perform a meticulous inspection of the 2 anchor point condition. Verify that:
 - Lift structure does not show any deterioration.
 - Anchor locking screws are fully inserted and tightened with 15 Nm.
 - Anchor does not show cracks, deformities, corrosion or other damages.
 - Anchor installed on the lift structure according to the instructions.
 - Anchor marking is clearly readable.

If the AVANTI LIFT ANCHOR is found not OK, it must be removed / replaced by a new AVANTI LIFT ANCHOR!

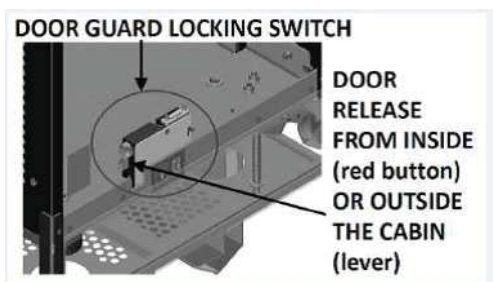


3. Door

The condition and functionality of the lift's door shall be checked. A full rolling door is provided for the SWP L02 service lift.



- 3.1. Check the door assembly to the cabin. All the parts and hardware must be properly installed and tightened.
- 3.2. Check the door opens and closes smoothly. Check the guides of the rolling door and door's handles.
- 3.3. The guard locking system of the door must lock and unlock smoothly. The door's guard locking switch and the actuator must be properly aligned and the magnets must fit with the counter-plates position.
- 3.4. When the door is open a red fault light turns on in the error display of the service-lift operating panel inside the lift (see image at point 9.2).



4. Information signs and documents

4.1. All the information signs and documents provided must be present and legible: warning stickers, manuals, quick guide, etc. See Appendix D: “Documentation location drawing AD00002404” for location reference. The documents/labels provided are listed below:

ITEM	DESCRIPTION
45541328	FAD disengagement label
45541327	FAD engagement label
45542221	Folding step label
45541025	Lift Helmet & Harness Label
45541318	Label, Max Load Sticker
AT00010139	Serial number plate SWP
45541359	Sticker_Release guard outside
AT00011246	Outer guard locking label
AT00010088	Anchor point label
45541357	Sticker Location anchor point
AT00011186	Manual descent label SWP
45541262	Manual M508 and ASL508 CE
AT00010431	SWP L02 Lift User's Manual EN
AT00010429	SWP L02 Evacuation guide EN
AT00010106	Quick guide SWP L02
AT00010650	Installation Manual SWP L02 EN
AT00010648	Service Manual SWP L02 EN
AT00010646	Inspection and Maintenance Log Book SWP L02 EN

5. Traction hoist

The traction system is largely maintenance free. Clean only when very dirty, e.g., swarf, fillings, debris or foreign substances that might affect the functionality or damage internal parts; a layer of dirt or grease that prevents reading the rating plate or complicate the visual inspection, etc.

During cleaning always ensure sufficient air supply. Inspect the traction system for wearing, cleaning and damages.

5.1. Check if the traction hoist is clean. Clean if needed.

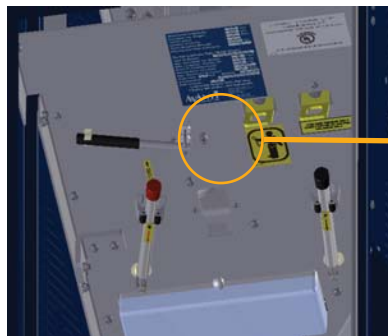
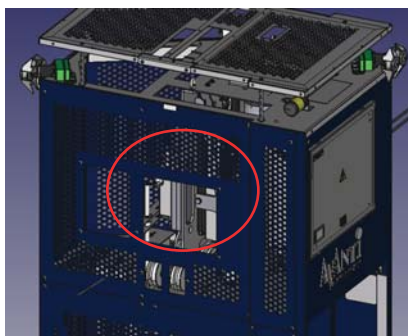
5.2. Read the hour counter on the service-lift operating panel.

If it reads more than 245 working hours since last overhaul, the traction system must be sent to AVANTI for complete refurbishment at the workshop so that a new certificate is issued.

In addition, every 125 hours or 10 years (whatever occurs first) enhanced inspection of the hoist must be carried out either on-site or by replacing the unit by a swapt kit (see 5.9). The lift shall be put out-of-service until the Hoist has been re-certificated or replaced. See chapter 3.9 in this manual for further instructions in how to replace the Hoist.

5.3. Check that none of the 4 bolts holding the hoist are missing and they are correctly tightened (at least 2 threads of the bolt should be sticking out past the nut). Grab it tight with both hands and pull hard to check if any parts are loose.

5.4. Open the cabin top windows and the pulleys cover on the cabin's ceiling to inspect the condition of the pulleys of the traction and safety wire ropes (free of damage, abnormal deformation and wear). Wire ropes must be properly routed and aligned through the groove of the pulleys. If there is white dust from the rollers beneath the wire rope pulleys it may be due to severe wear of them.



5.5. No trace of oil leak must be found around motor and gearbox. Pay special attention to the M16 plug, the gearbox cover seals and the lower wormshaft rubber cover. If dirty or wet, clean the hoist with cloths or paper and check again when finish the rest of the service tasks to found out if some part of the hoist is dripping or the oil has come from another WTG system.

If there is any oil leak coming from the hoist, it has to be dismantled and serviced.



5.6. Check the traction hoist condition: free of damage, dents, and cracks or similar.

5.7. Check the traction hoist behavior and sound are normal (no abnormal noises or alike) when running.

5.8 Read the manual descent hour-counter placed on the main control box. Any increase from last year inspection readout must be fully documented and justified in the daily inspection log. Lack of evidence or increase >0,2 hours with regards to last year have to be considered in order to evaluate the need of initiating the 10yr inspection scope to the adequate extent.

Take into account that for every hundredth (0,01h) in the reading of the hour counter, the service lift travels about 15 metres— 0,1 hours mean about 150 metres!

Depending on the importance and the severity of the breach in the required conditions of use, the following actions shall be taken prior to put the lift in use again.

Procedure:

Check in the Log Book the previous year readout of manual descent hour counter.

Manual descent increase (MDI) = previous readout – current readout

If MDI ≤ 0.1 hours → Perform annual normal inspection

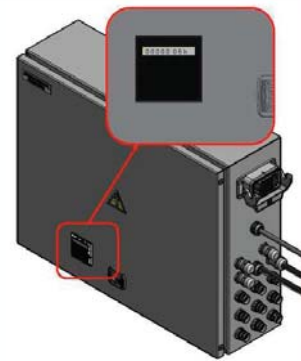
If MDI > 0.1 hours → Perform enhanced 10yr inspection

If previous readout missing and/or manual descent not documented, calculate the average per year since inspection before first use:

Average manual descent (AMD) = current readout/number of years in service

If AMD ≤ 0.1 hours → Perform annual normal inspection plus checking of both centrifugal and electromagnetic brakes (see points 5.11 and 5.13 in appendix B.1)

If AMD > 0.1 hours → Perform enhanced 10yr inspection



5.9. Enhanced inspection every 10 years/125 hours only!

Every 10 years or 125 working hours (whichever occurs first) enhanced inspection tasks of the Hoist are planned. These inspections can be performed on-site, as detailed in Appendix B.1, or in a workshop, replacing the unit by a swap kit. In this case, make sure that serial numbers are logged for traceability purposes. Anyway, to perform the enhanced inspections, it will be necessary to dismount the hoist from the spine and take the traction wire rope out of the unit (see chapter 3.9 for further details in how to do this).

6. Overload limiter

The overload switch must be regulated depending on tower height to comply with specific regulations. For further details in how to adjust it, refer to Appendix A: "Adjustment of the overload limiter". Perform the adjustment of the overload limiter following the dynamic procedure described in Appendix A.1. The static one, using ballast weight, should only be used when a third party inspector requires it or in case it is not possible performing the dynamic one for whichever reason. The procedure and tools needed are detailed in the abovementioned appendix.

6.1. The overload test must be performed according to the Appendix A: "Adjustment of the overload limiter" of this manual. The lift cannot move either upwards nor downwards until the overload condition is eliminated.

6.2. The red light of the service-lift operating panel error display shall turn on when the service lift is overloaded. The required setup load for each case is shown in the appendix A.

6.3. If the checking the overload limiter is made by the static method, verify that the lift is able to carry 240kg to the top platform.

7. Fall arrest device

Inspect the condition and functionality of the emergency brake (ASL508).

7.1. Check the fall arrest device is free of cracks, dents and disparities.

7.2. Check the cleanliness of the ASL. Clean it if necessary.

7.3. Read the hour counter on the service-lift operating panel. If it reads more than 245 working hours since last overhaul, the fall arrest device must be sent to AVANTI for complete refurbishment at the workshop so that a new certificate is issued.

In addition, every 125 hours or 10 years (whatever occurs first) enhanced inspection of the device must be carried out either on-site or by replacing the unit by a swap kit (see 7.8).

The lift shall be put out-of-service until the unit has been re-certificated or replaced.

See chapter 3.10 in this manual for further instructions in how to replace the fall arrest device.

7.4. Perform the overspeed Hand Test according to the following instructions:

- i. Position the lift to reach comfortably the cabin's top from the WTG's service ladder or from first platform.
- ii. At the basement, dismount the push spring (previously compressed by means of cable ties) or the two counterweights.
- iii. From the WTG's service ladder (properly positioned with the lanyard) or from the 1st platform, use both gloved hands to pull up the safety wire with a quick jerk .
- iv. Fall arrest device must engage.
- v. Lift descent must not be possible, neither electrically nor by manual descent.
- vi. Unblock the fall arrest device and repeat the test twice more.
- vii. The fall arrest device must engage and descent must not be possible all the three times, otherwise it has to be replaced.
- viii. Mount back the push spring or counterweights as explained at point 10.1 further on.

7.5. Check ASL manual operation: the red locking lever engage the fall arrest device when pushed upwards and the black unlocking lever release the fall arrest device when pushed upwards (if safety wire is under tension it will be necessary to release it by moving up the lift).



7.6. When the fall arrest is engaged (manually or due to over speed) the corresponding red light in the service-lift operating panel error display lights up.

7.7. Check the condition and functionality of the blocking/unblocking levers, including handles, stickers and clips to store them when not in use. Both levers must be properly fastened to the lift's ceiling by means of the handle clips when not in use.

7.8. *Enhanced inspection every 10 years/125 hours only!*

Every 10 years or 125 working hours (whichever occurs first) enhanced inspection tasks of the Fall Arrest Device are planned. These inspections can be performed on-site, as detailed in Appendix B.1, or in a workshop, replacing the unit by a swap kit. In this case, make sure that serial numbers are logged for traceability purposes. Anyway, to perform the enhanced inspections, it will be necessary to take the safety wire rope out of the unit and dismount the FAD from the spine (see chapter 3.10 for further details in how to do this).



8. Electrical System

Visually inspect the cabling and lights of the lift. A trailing cable system is installed for the power supply cable to the cabin.

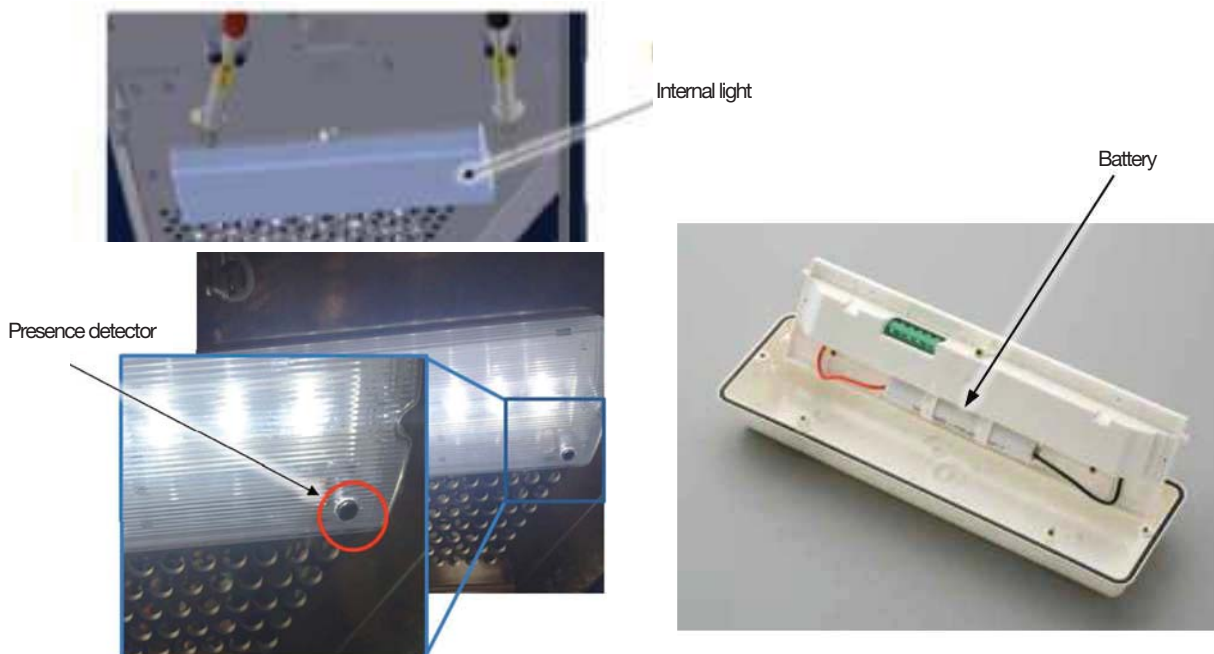
8.1. Check the condition of all cables for damages or cuts.

8.2. The electrical cables routed inside and outside the cabin must be properly fixed with cable ties with no slack in the cables.



8.3. The lighting level inside the cabin must be constant and high enough to allow reading the warning signs and operate the lift both with power supply present and in case of power failure.

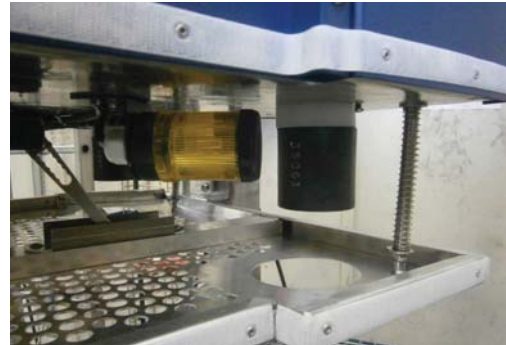
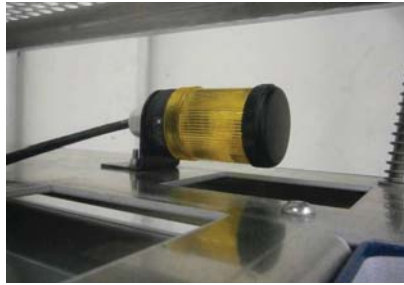
Check the presence detector that deactivates the cabin's light when nobody is inside the cabin. This system prevents draining the battery completely.



Avanti recommends changing the battery every four years in order to assure it will last for 30 minutes when fully charged. Check in the inspection and maintenance log book for the last time it was replaced. To access the battery, in case is needed, disconnect power, open the diffuser and dismount the inner tray. Unplug the old battery and plug the new one, routing properly the cables to avoid damaging it. Battery type: Ni-Cd 4,8V/1,5Ah (for Normalux EHL-200).



8.4. Check the top and bottom warning lights are flashing during ascent and descent, including manual descent.

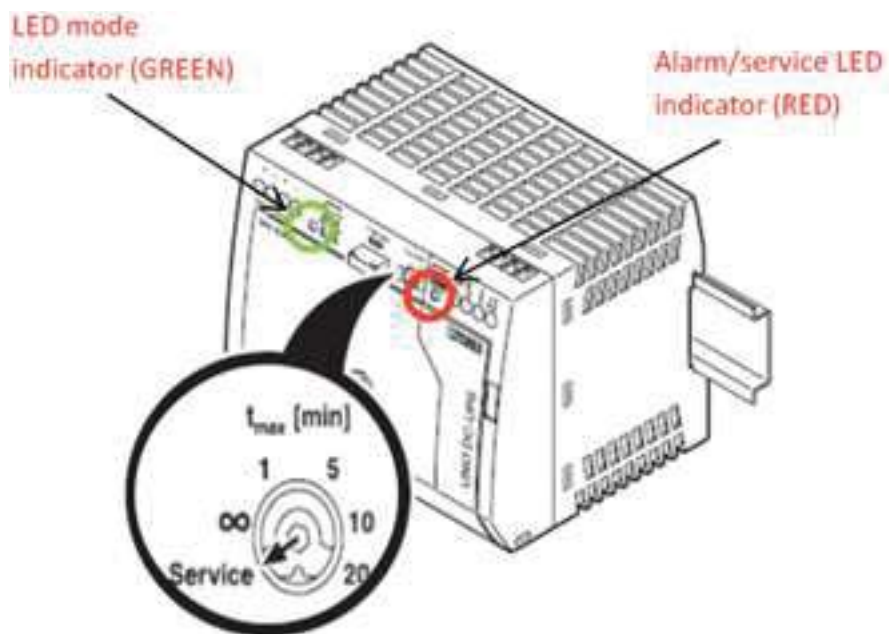


During manual descent with no power an UPS system provides the needed supply. Check UPS batteries for the warning flashing lights. The UPS module has two LED indicating the state of the unit and batteries condition. In normal operation green is ON (or flashing during battery mode or charging battery) and red OFF. Red LED ON is usually associated to battery failure. Following table shows all possible UPS state signs:

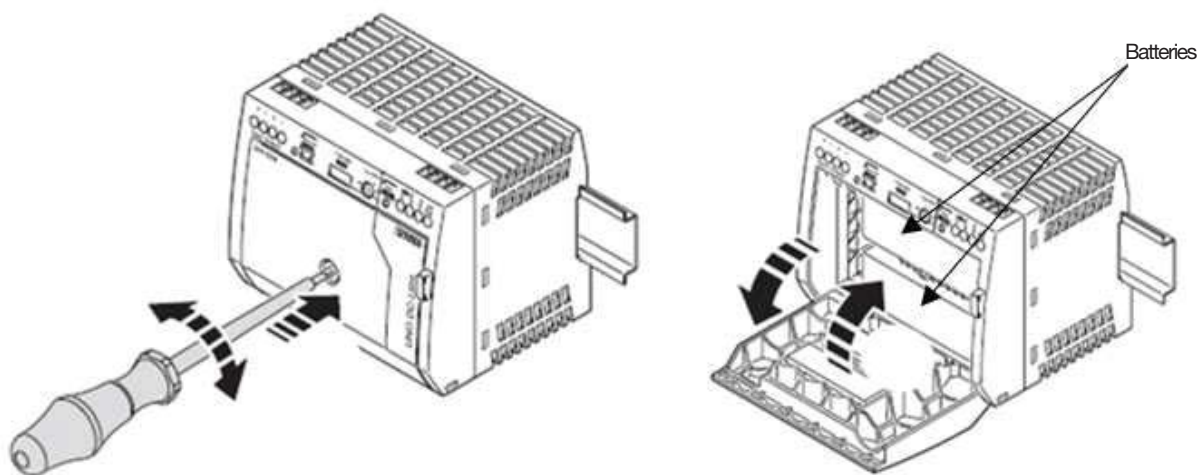
Status LED		Switching output		Note
Green	Red	Bat.-Mode	Alarm (active low)	
●	○	OFF	ON	Mains operation
	☀ D = 50%	OFF	ON	Mains operation, service mode for battery change
	●	OFF	OFF	Mains operation, battery failure (*)
☀ D = 50%	○	OFF	ON	Mains operation, battery charging in process
	☀ D = 50%	OFF	OFF	System initialization (3 sec.)
	●	OFF	OFF	Mains operation, battery charging in process, battery failure (*)
☀ D = 10%	○	ON	ON	Battery mode
	☀ D = 50%	ON	ON	Battery mode, service mode for battery change
	●	ON	OFF	Battery mode, battery voltage low or battery failure (*)
☀ D = 90%	○	OFF	ON	Mains operation, remote contact (R1/R2) open
	☀ D = 50%	OFF	ON	Mains operation, remote contact (R1/R2) open, service mode for battery change
	●	OFF	OFF	Mains operation, remote contact (R1/R2) open, battery failure (*)
○	○	OFF	OFF	Input voltage not present / invalid range
	☀ D = 10%	OFF	OFF	Undervoltage or overvoltage
	●	OFF	OFF	Input voltage not present / invalid range, output switched off in battery mode

☀ LED flashing
 ● LED on
 ○ LED off

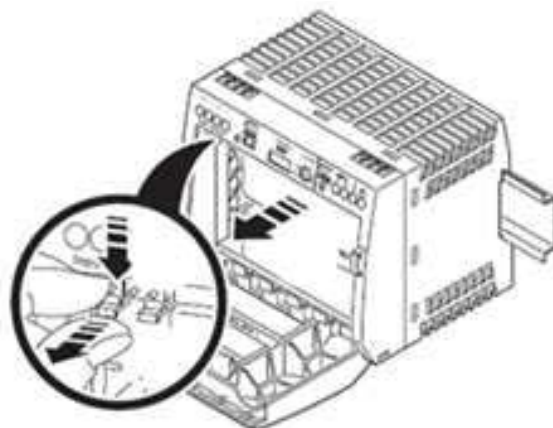
If UPS batteries need to be changed, basically in the four states marked with an (*) in the chart above, set "service" mode via the rotary selector on the front of the UPS prior to open the unit.



Then, open the battery compartment by unscrewing the cover and folding it forward.

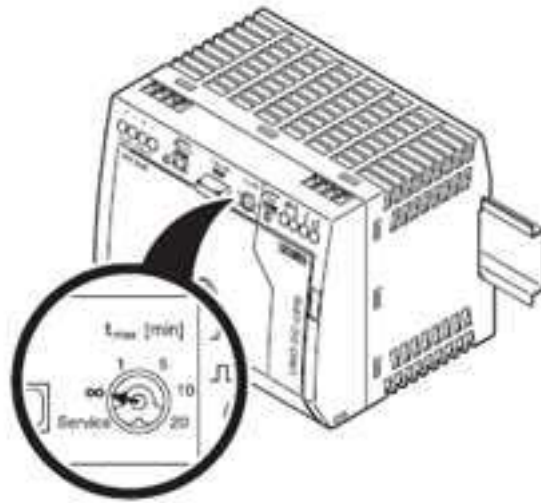


Unplug both connectors of the battery modules from the PCB and remove the batteries.



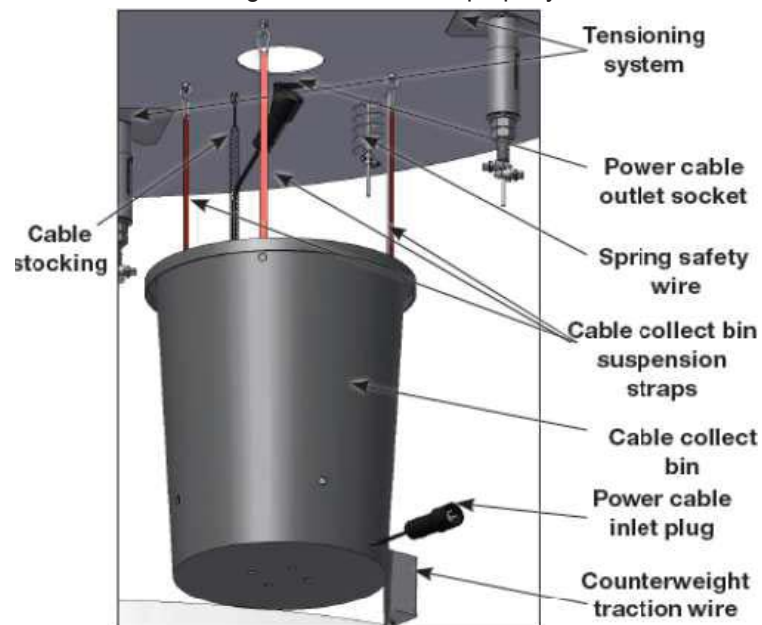
Insert the new battery modules (battery specification: 2 x Yuasa NP0.8-12) and plug the connectors onto the PCB (the order is not important). Then store the cables between the battery modules. Close the cover of the battery compartment and fix it by tightening the screw using the screwdriver. Exit service mode setting the buffer time again to unlimited (∞) in the rotary selector.





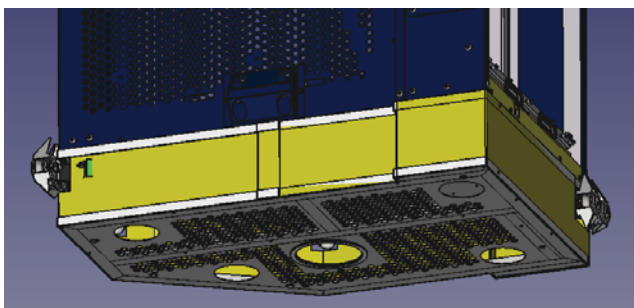
Avanti recommends changing the UPS batteries every 4 years. Record if the batteries have been replaced during annual inspection in the “ISSUE DESCRIPTION” box, point 8.4 in the “Annual inspection checklist”. Also verify when was the last time they were changed by checking previous years inspection checklists. Refer to UPS data sheet for further information.

8.5. Check the cable collect bin is in good condition and properly mounted.



8.6. Check the opening in the bottom platform for the trailing supply cable is aligned with the existing in the lift's bottom and fully protected with rubber edge to prevent damage the cable.

While descending the cabin, the cable must be properly coiled into the storage bin in such a way that it is able to unwind correctly when the lift ascends preventing kinks and entanglement.



8.7. Check that the cable stocking is in good condition and properly fixed to prevent damages to the supply cable and avoid the connectors to be unexpectedly unplugged.



8.8. Check the trailing cable is free of squeeze marks and the isolation of the cable is in good condition without cuts, high temperature or chemical marks, internal kinks bulging the surface, etc.

8.9. Check all the electrical plugs and cable glands are correctly mounted and connected and in good condition. Check for loose or missing screws.

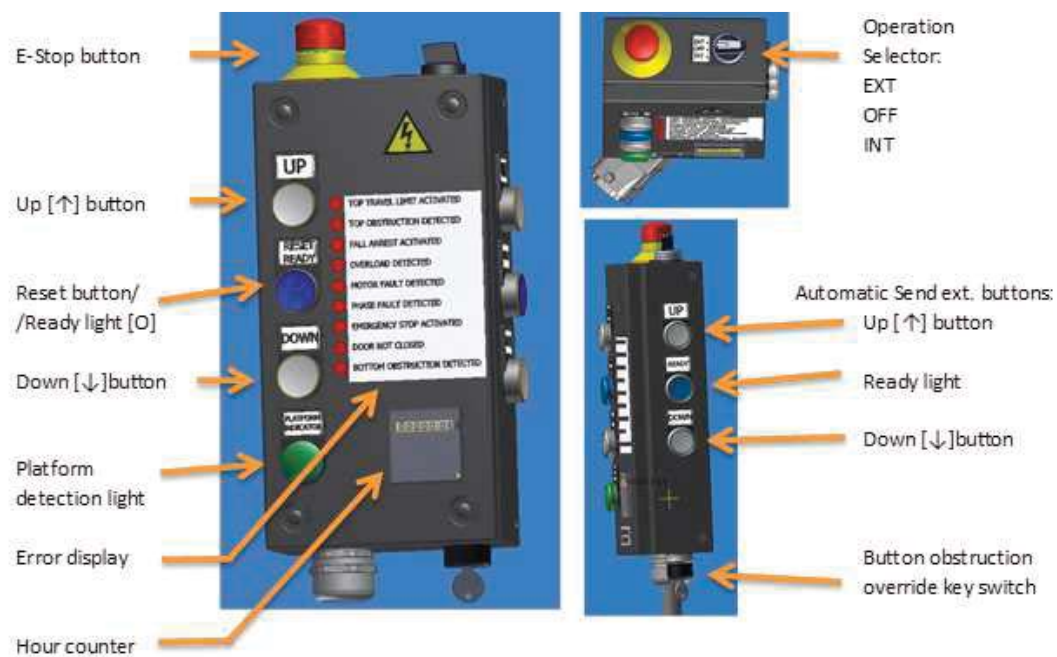
9. Control and safety devices

The functionality of the whole control and safety devices shall be verified at this point:

9.1. Check that the main control box, the service-lift operating panel and the rest of switches, lights, or any other electric device have no visual damages.

All their covers must be present and in good condition, and the screws fully tightened so none part potentially under electrical power is accessible.

9.2. Check the service-lift operating panel functionality:



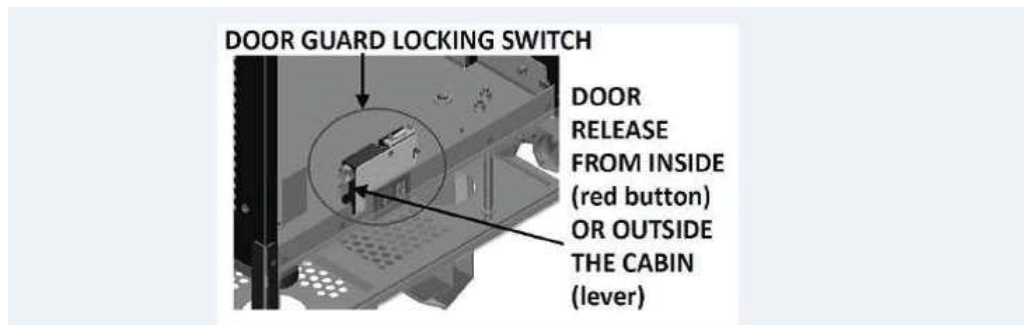
a) Close the door. Check the functionality of the Operation Selector: EXT/OFF/INT

b) Check the UP/DOWN buttons:

- Check that the service lift moves in upward direction with a 5 seconds delayed response when pressing the up [↑] button.
- Check that the service lift moves in downward direction with a 5 seconds delayed response when pressing the down [↓] button.
- When stop pushing the buttons, the lift must stop moving immediately.



- c) Press the EMERGENCY STOP button. The corresponding red light turns on in the error display.
- d) The lift must remain still when the UP/DOWN button is pressed. To restart, release the EMERGENCY STOP button and press the RESET [O] button. Blue READY light turns on.
- e) Door switch: Open the door – it shall not be possible to move the lift upwards or downwards and the corresponding red light turns on in the error display.
- f) Place the cabin at a height not corresponding to platform – it shall not be possible to open the door. The door is only able to open by turning the emergency release lever up (from outside) or by pushing the release red button (from inside).



9.3. Check the automatic send buttons functionality.

a) Check the UP/DOWN buttons:

- Check that the service lift moves in upward direction with a 5 seconds delayed response when pressing the up [↑] button.
- Check that the service lift moves in downward direction with a 5 seconds delayed response when pressing the down [↓] button.

b) Check that blue READY light turns on when the lift is ready to operate.

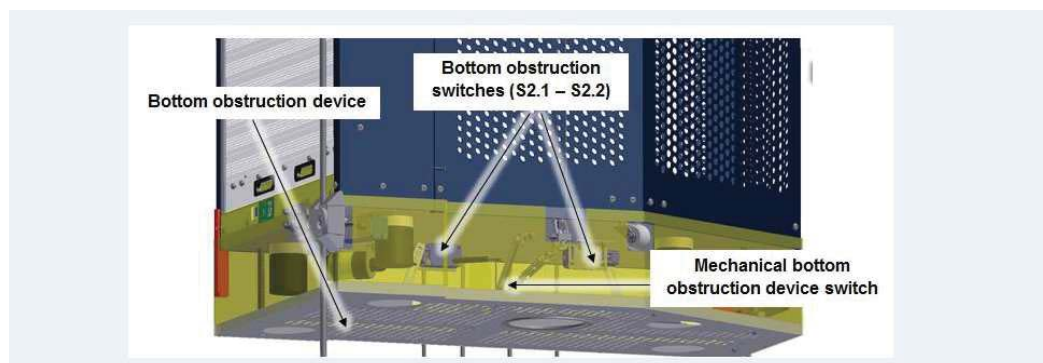
9.4. Verify that the override key is available and it bypasses the bottom obstruction switch when activated. Turn the key clockwise while pushing the down button and release the button as soon as the cabin's feet touch the platform floor. Otherwise, the counterweight underneath the platform floor could hit against it.



9.5. When the lift is ready the blue lamp must be lit on. When any of the fault lights is activated in the error display, the blue lamp must be off.

9.6. Check the functionality of every emergency stop switch outside the cabin. An emergency red light shall turn on in the error display and no further upwards nor downwards travel will be possible. The button must remain activated until it is intentionally released by turning it.

9.7. Check the bottom obstruction device.



Place the cabin in a suitable position and check that the bottom obstruction device compresses smoothly when pushed and decompresses when released by pressing it up in different points (by hand or using an appropriate implement). Check the shafts and springs condition and lubricate if necessary.





The corresponding light (“bottom obstruction detected”) shall turn on in the error display. Check downwards travel is not possible (upwards travel is still possible). Press reset again to allow lift operation and descend the lift to bottom platform. It shall stop before the rubber feet of the cabin reach the tower ground level.

9.8. Move up the lift, place an object (e.g. a carafe) on the platform and turn off the power. Push the manual descent lever. When the bottom obstruction device hits the object the lift must stop descending by means of the emergency bottom obstruction breaker.



If necessary, check and adjust the whole manual bottom obstruction breaker system. Lubricate mobile parts, if needed.

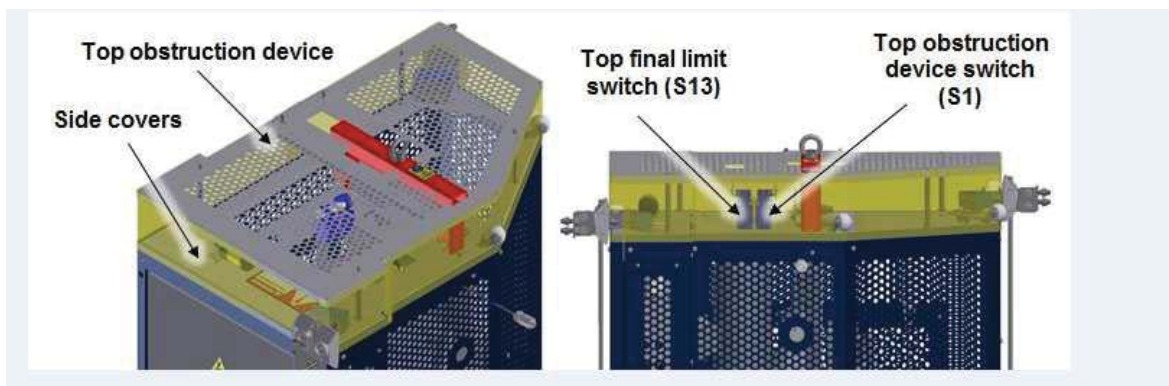


Turnbuckle to adjust cable's length



9.9. Test the top obstruction device (Switch S1).

Place the cabin in a suitable position and check that the top obstruction device compresses smoothly when pushed and decompresses when released. Check the shafts and springs condition and lubricate if necessary.

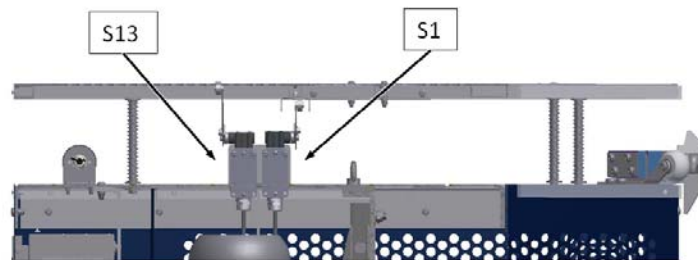


The service lift shall not move up until the device is released and lift operation restarted by pressing the reset button (downwards travel is still possible). The device activation is shown by the light “top obstruction detected” in the error display.



9.10. Verify that the switch (S13) adjustment is correct.

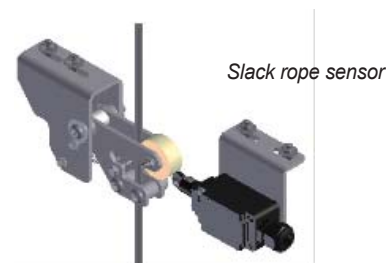
Place the cabin in a suitable position and press the switch (by hand or using some implement). The corresponding light ("top travel limit activated") shall turn on in the error display. Check neither upward nor downward travel is possible. Release the switch lever to normal position and press reset button.



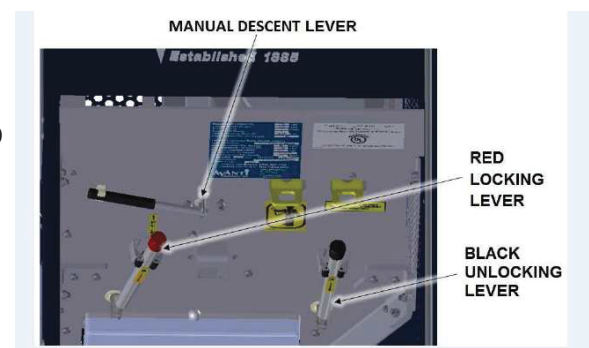
9.11. When the lift is leveled at each platform, the platform detection green light shall turn on in the service-lift operating panel inside the lift. Tolerance: ± 150 mm.

9.12. It must be possible to open the cabin's door by turning the emergency release lever up (from outside) or by pushing the release red button (from inside) in case of an emergency out of safe zone and in case of no power (see point 9.2f).

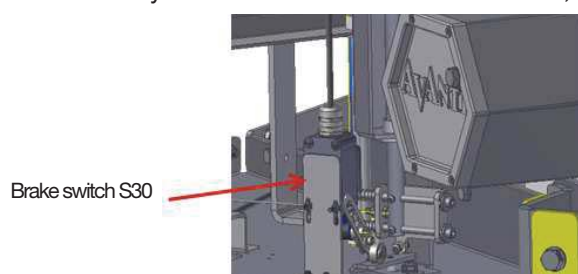
9.13. If there is a slack rope sensor (Aeco version), manually activate it. Downward travel of the lift shall be disabled (upward travel should still be possible).



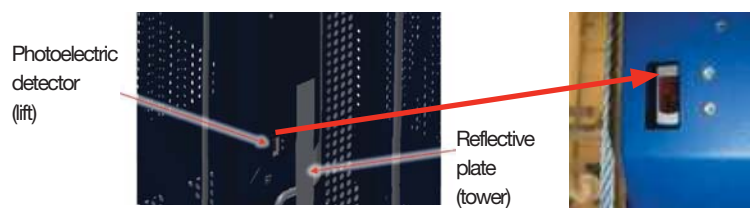
9.14 Using the foldable step and handles, take the manual descent lever out of its clip. Push it fully up. The lift must descent in a controlled speed, slightly faster than during normal operation but below the FAD trigger value so it does not engage.



When the manual descent lever is activated by pushing it up, the brake switch S30 prevents electrical operation of the lift. Check neither upwards nor downwards movement is possible. Besides, both flashing lights must be on, even in case of no power in the cabin due to this S30 switch that also connect the flashing lights to the UPS system. Switch S30 is shown below, in case it needs to be adjusted or repaired.



9.15. Check the condition and cleanliness of the cabin photoelectric sensor in order to detect the platform level. Clean it with a soft cloth to prevent scratching it.



10. Wire ropes at bottom platform

The traction and safety wire ropes are tensioned at the basement according to the installation manual. An 11kg counterweight is used to tension the traction wire and a pushing spring (or 2 or 3 counterweights, depending on the configuration) is used to tension the safety wire.

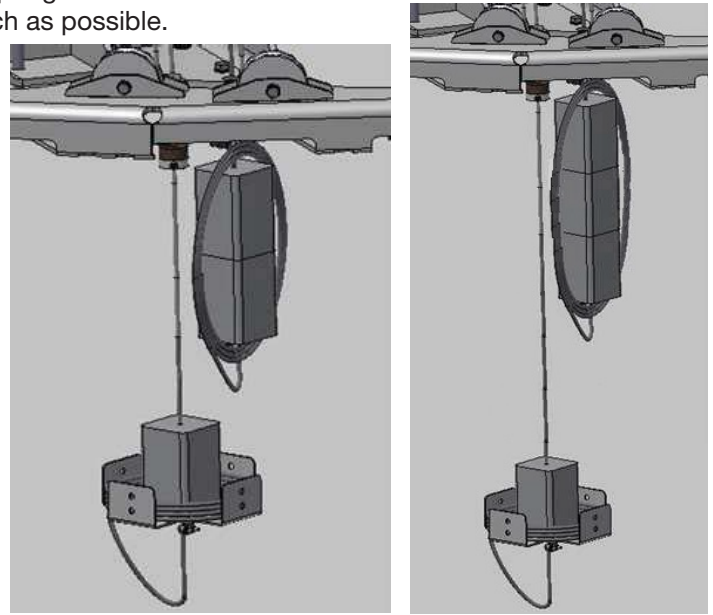
10.1. Check the safety wire rope is properly installed and tensioned with the tensioning spring (or the counterweights) and the 2 wire rope locks.

In case it is needed, procedure to correctly install the spring is as follows:

- Ascend the service lift 50 cm.
- Activate the fall arrest device.
- Perform manual descent so that the weight of the service lift is transmitted to the safety wire rope.
- Compress the spring to 40 mm and fix with cable ties.
- Feed the safety wire rope through the compressed spring.
- Pull the safety wire rope downwards by hand as much as possible.
- Place and fasten the wire rope grips.
- Cut the cable ties so that the spring decompresses to approximately 55 mm.

After re-installing the spring, torque the wire locks to 6 Nm for 8mm wire rope grips (see Appendix E). If necessary, mark again the nuts.

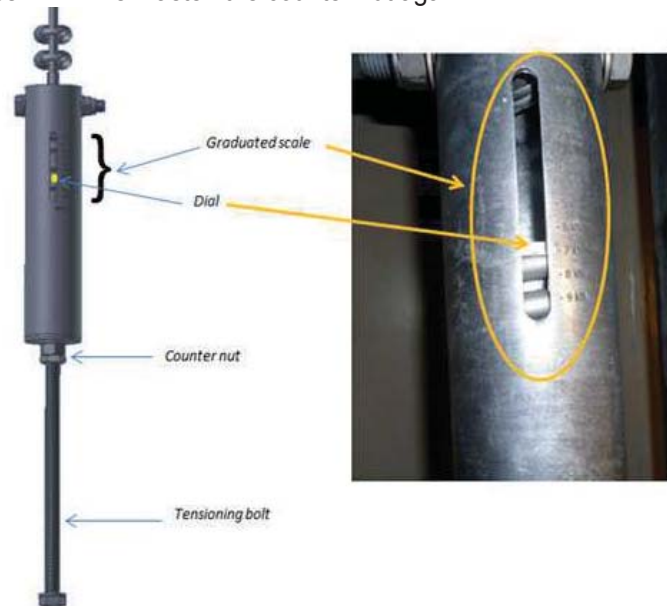
10.2. Check the traction wire rope is properly installed and tensioned by an 11kg counterweight attached to it by means of 2 wire rope locks, approximately placed 200mm below the bottom wire guiding bracket in such a way that the counterweight does not hit anything in case some bouncing is produced during lift's operation. Check the torque mark of the wire locks and re-tighten them if necessary to 6 Nm for 8mm wire rope grips (see Appendix E), marking again the nuts.



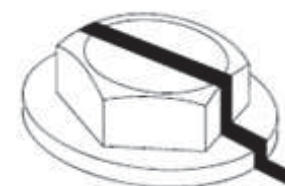
10.3. Check the traction and safety wire ropes are properly coiled up and fixed with at least 3 cable ties each one.

10.4. The traction wire rope must be properly coiled up so the counterweight is able to rotate freely 360 degrees to release any twist that may be generated, during lift operation.

10.5. The guiding wire ropes must be tensioned to 7kN \pm 10%. Check the graduated built-in scale and adjust if necessary. To adjust them: Loosen the counter nut, and turn the tensioning bolt until the dial (middle of the disc) indicates 7kN. Then fasten the counter nut again.



The adequate torque to apply to the wire locks of the guiding wire ropes is 20 Nm (see Appendix E). Check torque stripe or seal is not broken and re-tighten if necessary, marking again the nuts.





11. Traction and safety wire rope

Inspect the traction and safety wire ropes all along the tower length. Check they are free of the damages described in this manual. This is a safety matter of paramount importance. (See chapter 3.4.5 for more information regarding inspection, cleaning, lubrication and discard criteria of the wire ropes).

11.1. The traction and safety wire ropes must be clean of old grease and dirt from other tasks performed in the WTG, and slightly greased with standard multipurpose grease free of disulphide.

11.2. Visually inspect the wire ropes are free of deformations and squeeze marks.

11.3. No severe corrosion on the surface or the inside of the wire ropes must be found.

11.4. A visible sign of heat damages is the blue discoloration of the wire.

11.5. Measure the wire ropes' diameters at several points, as described in section 3.4.5.2 in this manual, and check it is not less than 7.6 mm at any measured point.

The adequate methodology for performing this operation is shown in deeper detail in section 3.4.5.2 in this manual.

11.6 Inspect the wire ropes are free of other damages, in addition to the described in the above points, such as the described in this manual (section 3.4.5).

11.7. If traction and /-or safety wire ropes need to be replaced during annual inspection, mark the corresponding box and record the wire rope(s) hours of use since last time that one was changed: current hourcounter readout minus previous replacement readout.

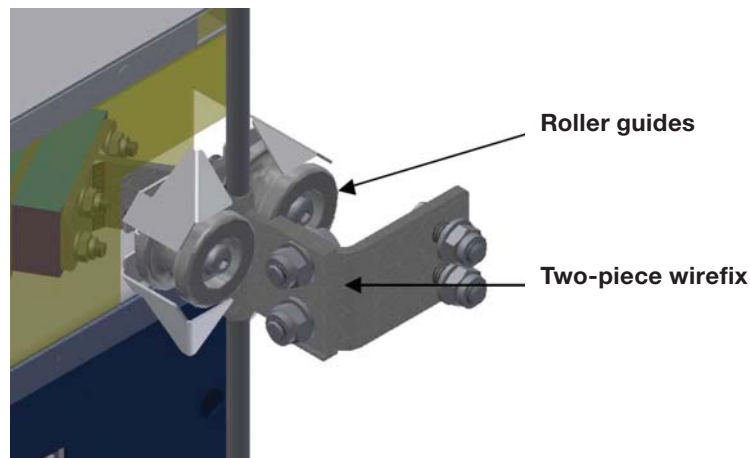
Also log the serial number of the new wire(s) installed.

12. Guiding system

This point is covering the guiding system of the lift (wire ropes, tower fixations, cabin guides).

12.1. Check the cabin's wire rope guides (rollers) are free of damages: cracks, wear, dents and disparities. Clean with a cloth if needed to uncover possible defects hidden under the layer of dirt or old grease.

The cabin roller wire guides must be firmly attached to the cabin. Check by hand that there are no loose parts.



12.2. Inspect the wire ropes (further information to carry out these inspections can be found at chapter 3.4.5 of this Service Manual). Check they are free of the damages described in this manual. (See chapter 3.4.5.3 for more information about discard criteria).

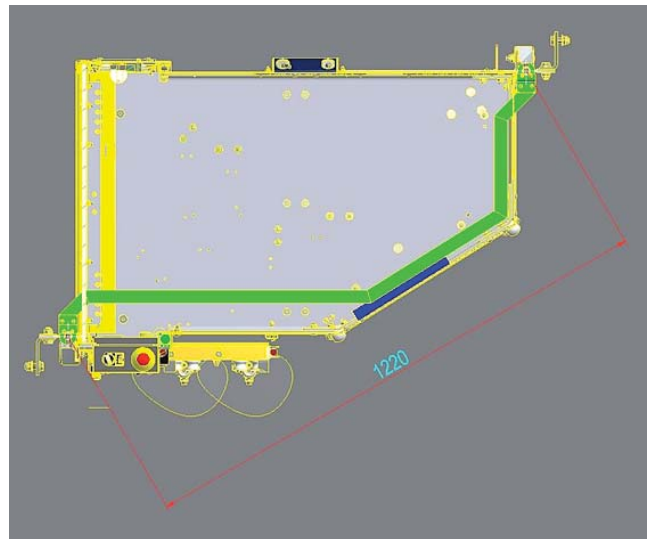
12.3. Visually inspect all the wirefixes for damages: cracks, dents and disparities. Check the bolts of the wirefixes and their brackets are properly tightened.

12.4. Each platform opening must be mounted with 2 wirefixes. Intermediate brackets might be installed too in accordance with tower integration.

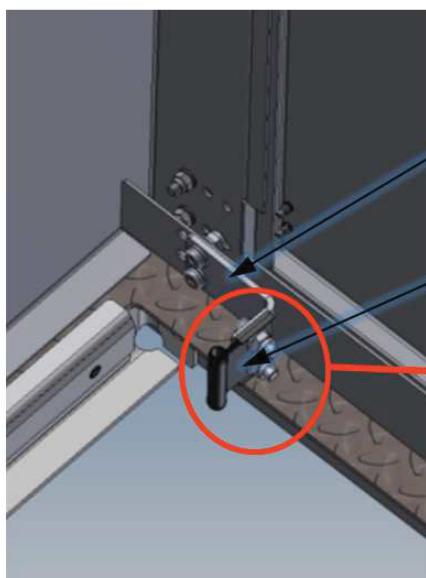




Check each pair of wire rope fixes all up the tower are properly distanced so the lift passes smoothly through them. If not, use the installation tool for wire rope fixes (item AT00011211) or measuring tape to adjust them to the proper distance (1220mm \pm 2mm) accordingly to the Installation Manual.

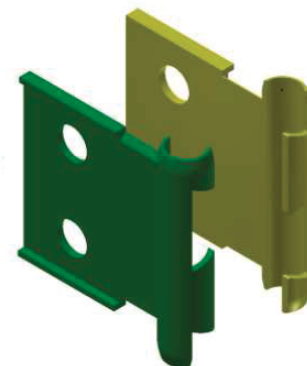


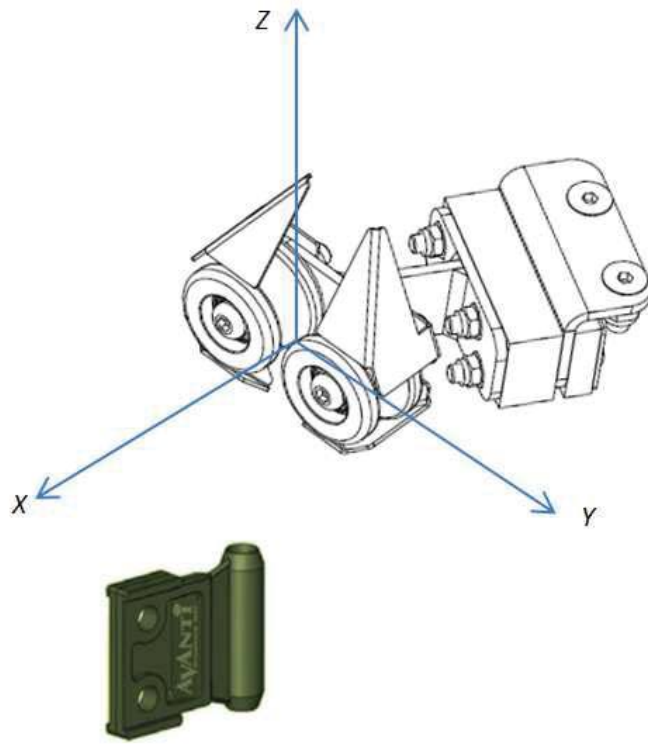
Also verify that aluminium two-piece wirefixes are properly installed. They must be aligned with the wire guides in all X, Y, Z dimensions so the cabin's roller guides pass through them smoothly.



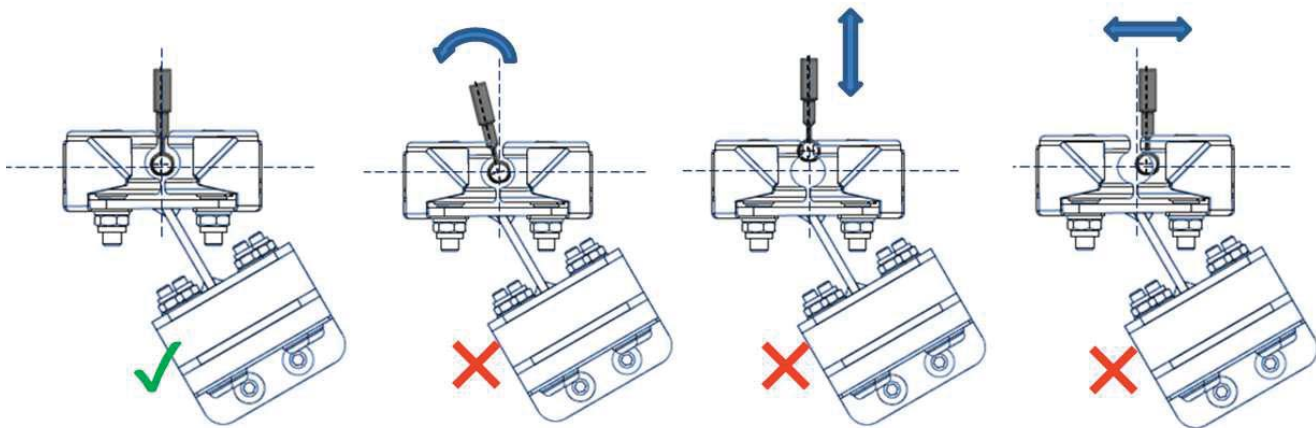
Wirefix bracket

2-piece aluminium wirefix

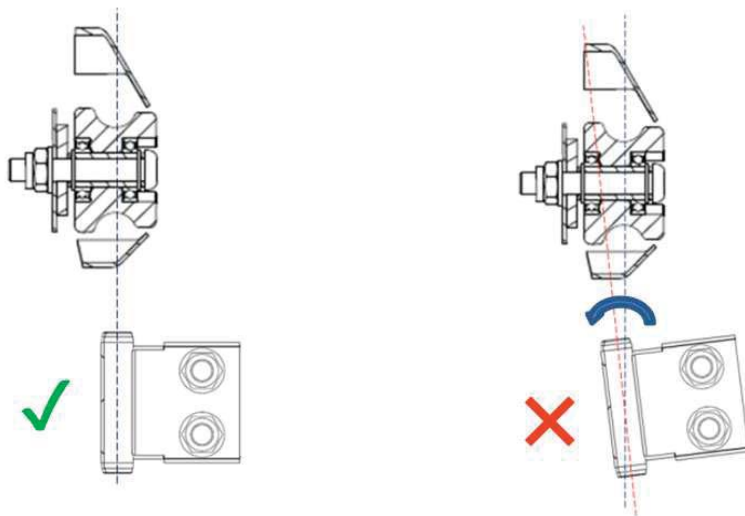




Check if the wire fix is in-line with each guide in the XY plane:

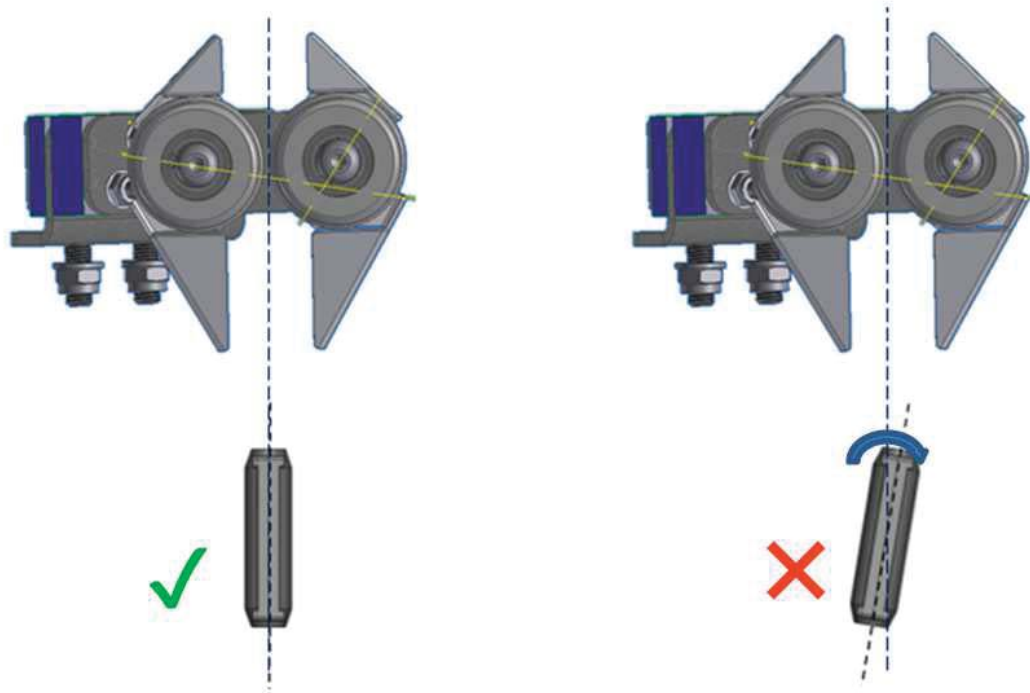


Check if the wire fix is in-line with each guide in the XZ plane:





Check if the wire fix is in-line with each guide in the YZ plane:



13. Platforms

Check the lift's behavior when passing through flanges and platforms. Getting off the lift and working at landing platforms must be safe.

13.1. Pay attention when the service lift passes through all platform openings. It must be properly mounted and adjusted to pass smoothly without hitting the WTG flanges, platform floors and platform fences (if not, go back to section 12 – guiding system).

13.2. Check at each platform that the reflective tape for platform indication is properly positioned, in good condition and clean so the platform retro reflective sensor is activated when lift and platform are leveled.



13.3. Inspect that the platform railing is fixed and correctly fitted.

Check protection railings and shielding are mounted at the work areas of the lift at the platforms above ground level.

13.4. The bolts of platform fences shall be properly tightened (at least 2 threads of the bolt sticking out past the nut).





14. Trapped Key System

14.1. Check the trapped key is properly secured to the cabin with a wire rope so there is no possibility to run the lift if any fence is open.



14.2. Each trapped key lock must be properly tightened to the platform fence and work properly. Check that the gate cannot open as long as the trapped key is not activated.



15. Wire ropes at top beam

Check guiding, traction and safety wires attachment to the beam at the top of the WTG.

15.1. Inspect the top beam. Check it is the properly mounted and attached to the WTG. If welded, visually inspect the welding is not showing corrosion or damages.



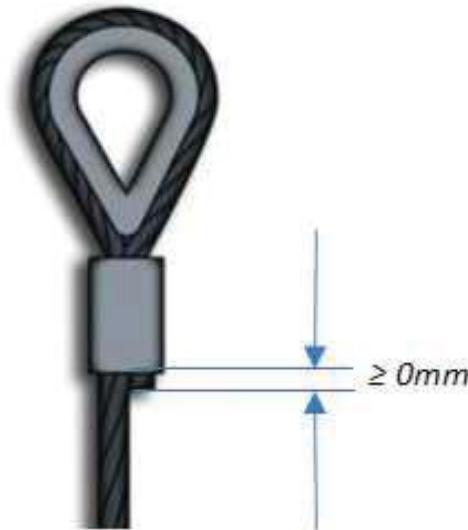
15.2. All the nuts of the 2 ton shackles must be tightened and locked with a cotter pin.



15.3. Check the position of the top limit device so that it activates the top obstruction switch before hitting the yaw platform. The lift must stop leveled with top platform. Adjust the top limit device position and/ –or the switches' levers if necessary. Check it is properly tightened to the wires so it does not slide when the lift's top hits against it. Torque required is 6Nm for 8mm traction and safety wire rope grip plus half-bushings, and 20 Nm for 12mm guiding wire rope grip (see Appendix E).



15.4. The “dead end” of each wire rope must be visibly going out of its ferrule to assure it is properly gripped.



16. Final assessment

16.1. After completing the inspection the lift will be released for use (if in good overall condition) or lock out of service if any major defects are found. To finish:

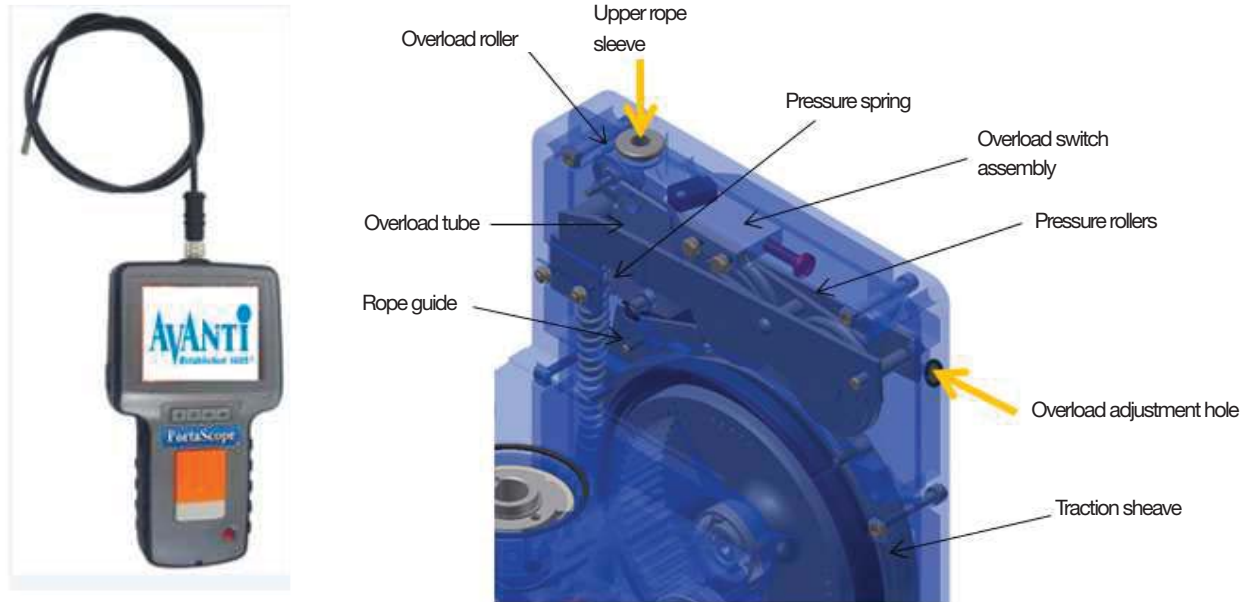
1. Complete relevant documents.
2. Report the completion of work and result of the service inspection to the site manager.
3. Any defects or concerns must be documented with evidence forwarded to the site manager.
4. If the lift is in good operational condition, affix a visible label informing the lift is “valid for use” and the next inspection date. In the contrary, put the lift lock out of service until major defects are solved.

Appendix B.1: Ten-year/125 hour enhanced inspections

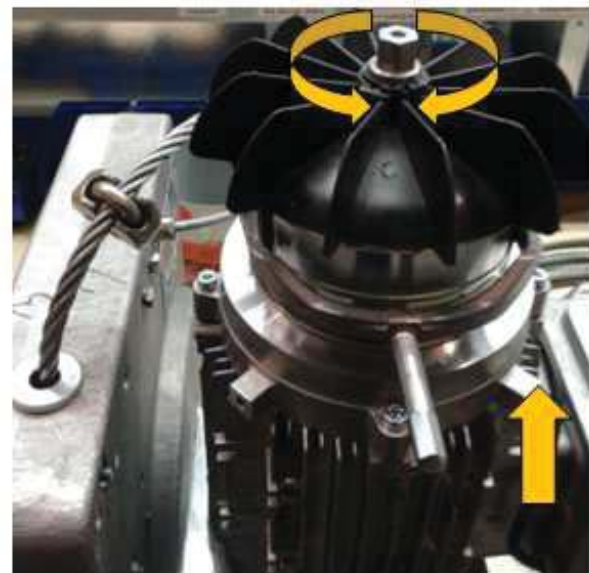
Every 10 years or 125 working hours (whichever occurs first) enhanced inspection tasks of the Hoist and FAD are planned. These inspections can be performed on-site, as detailed below, or in a workshop, replacing the units by swap kits. In this case, make sure serial numbers are logged for traceability purposes. Anyway, to perform the enhanced inspections, it will be necessary to dismount the hoist and FAD from the spine and take the safety and traction wire ropes out of the units (see chapters 3.7 to 3.12 for further details in how to do this).

HOIST

5.10. Introduce the endoscope (item 49912000) through the overload adjustment hole and through the upper rope sleeve as many times as needed to inspect the traction sheave, pressure system and overload assembly parts for damages or excessive wear.



In order to fully inspect the sheave and rollers entire surface, push up brake lever and turn the motor by the fan's shaft while inspecting either manually or using an accu drill.



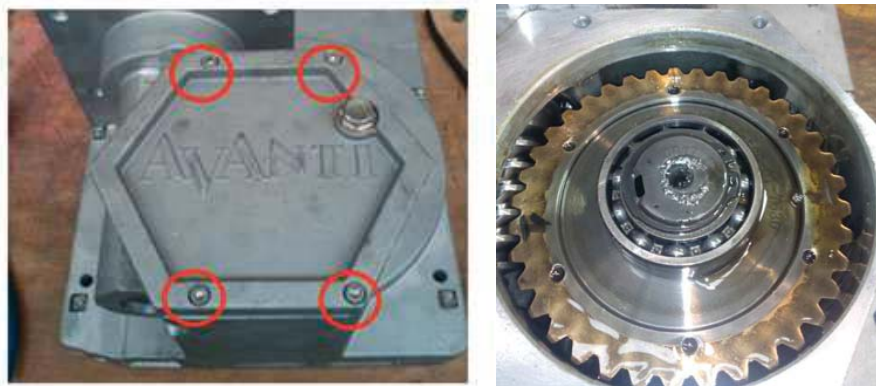


5.11. Remove the 4x M10 bolts that join the motor to the gearbox. Lift up the motor to separate it from the gearbox using pry bars. Introduce the 2mm rounded gauge (item AT00011132) to check the centrifugal brake wear; If the gauge enters into the gap between brake shoes and ring the centrifugal brake has to be replaced. Check at least in two different points per each shoe. Pay attention the gauge is not entering in the free springs' zone (1) but in the linings area of the brake (2).



Alternatively, the linings can be measured by means of a caliper taking the centrifugal brake completely out of the ring. The thickness must be more than 2.5mm at every point and free of damages. Assemble the motor again and torque the bolts to 46Nm (see Appendix E).

5.12. Unscrew M16 plug and drain the gearbox oil. Check cleanliness and colour of oil. Remove cover 1 and visually inspect the wormwheel and wormshaft for serious wearing appreciable to the naked eye such as: cracks; tooth breakage; pitting, spalling or scuffing on the teeth surface; tooth contact pattern excessively off-centered, etc.



Refill the gearbox with the oil. Change it if necessary using Mobil SHC 632. Mount back cover 1. Pay attention the O-ring around the cover is in good condition. Inspect the M16 plug for damage and screw the plug back. The copper washer must be changed by a new one (item number 73999900).

5.13. Remove fan's cover and check the electromagnetic brake air gap by means of feeler gauges in three different points separated 120° close to the adjusting screws (0.30mm must enter, 0.35mm must enter tight, 0.40mm must not enter).



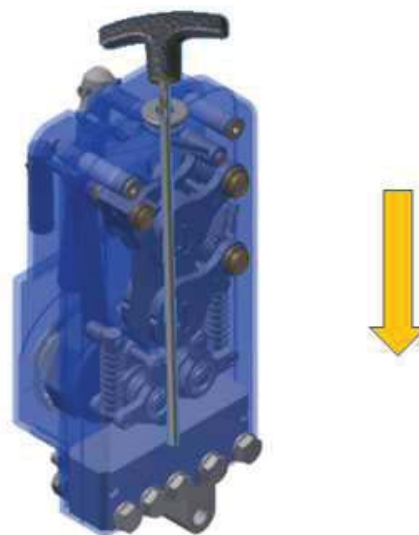
Adjust if necessary by loosening the 3 fixing screws half turn and turning the threaded collars below them a quarter lap. Check and re-adjust as necessary. Once the brake air gap is properly adjusted tighten the screws half turn clockwise. Mount the fan's cover and assemble the hoist back to the lift.





FALL ARREST DEVICE

7.9. Unlock the unit and insert test rod A (5.4X200mm, item AT00011024) entirely down through the top rope sleeve. Block the device. The rod must get firmly trapped by the clamp jaws.



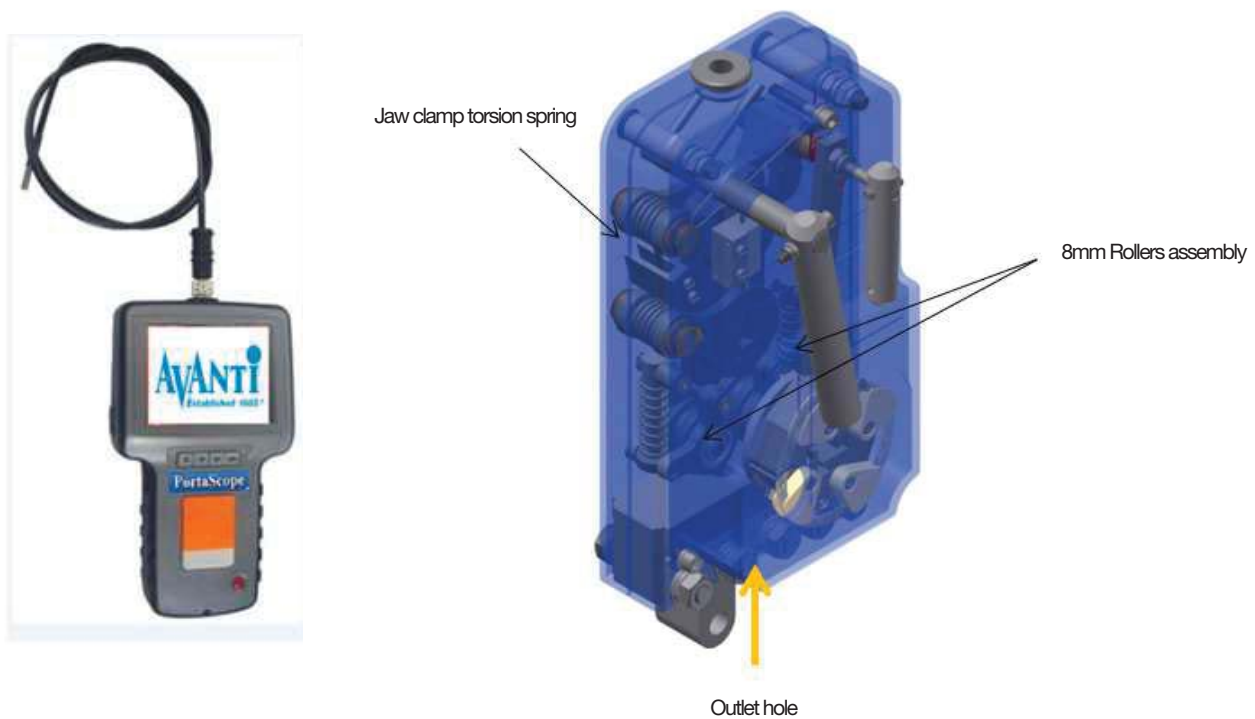
7.10. Introduce the test rod B (8X270mm, item AT00011026) entirely down through the top rope sleeve and move up and down to check the rollers condition; the flyweights must spin smoothly. Repeat process using test rod C (6.2X270mm, item AT00011029); the rollers have also to spin smoothly now, assuring that monitoring of speed is still functional even with this smaller diameter.



7.11. Introduce the endoscope through the wire rope's outlet hole and guide it through the rollers and towards the jaw clamp torsion spring in the unit's left side. The device will need to be locked so there is more space available, since the jaws are in upper position. Inspect the torsion spring while moving the unlocking lever taking care not to damage the endoscope's probe. The spring must be properly placed into the support and free of damage.

Then, inspect the 8mm rollers (spin the flyweight to the adequate direction to help the probe getting in and out the unit). In order to inspect around the entire surface of the rollers manually take out the probe, change the rollers position by manually turning the centrifugal flyweights and check again.

Continue tilting the articulated tip and moving the endoscope through the rollers and towards left and right side seeking for wear or missing/loose parts in the roller's assembly: axles, levers, spring guides and screws. Repeat the process as many times as needed.



Appendix C: AVANTI lift anchor

C.1 Caution

AVANTI LIFT ANCHOR is an anchor point used for protection against falls from heights intended for use with a full body harness approved according to EN 361 or Z359.1:2007 as applicable. Connection to the LIFT ANCHOR is only allowed by using self-closing connectors according to EN 362 or Z359.1:2007 as applicable.

Use in connection with other equipment than specified, may be potentially dangerous. User shall be equipped with a means of limiting the maximum dynamic forces exerted on the user during the arrest of a fall to a maximum of 6kN. In case of doubt, please contact AVANTI.

The maximum load that can be transmitted in service from the anchor device to the structure is 22.2 kN in $\pm 15^\circ$ vertical direction. The maximum deflection of the anchor point that can occur in service is 10mm.

AVANTI LIFT ANCHOR is tested and approved only to be mounted on AVANTI lifts. Activities at height are dangerous and may lead to severe injury or even death.

Gaining an adequate apprenticeship in appropriate techniques and methods of protection is important and is your own responsibility.

C.2 Danger

The AVANTI LIFT ANCHOR is for the use of one person only. It is strictly forbidden to carry out work if the person is in unfit mental or physical condition. Climbing and working under the influence of alcohol, drugs or any medication which can interfere with the safety are also much prohibited.

Users are obliged to read and understand this User Manual. Further they need to be properly equipped and instructed with the use of the necessary fall arrest equipment and emergency procedures in case of injury or sudden illness.

Users going to install AVANTI LIFT ANCHOR need to be familiar with the installation section of this manual. It's essential to the safety, that the user always attach the energy absorber as high as possible above his/her position, to minimize the fall distance most possible in case of a fall.

The position of the anchor point is crucial for fall arrest – the height of the fall, elongation of lanyard and energy absorber or pendulum movement of the user should be considered in order to minimize the risk of impact in obstacles in case of a fall. It's prohibited for the user to do any modifications or use non original AVANTI components when assembling AVANTI LIFT ANCHOR.

Re-use of demounted AVANTI LIFT ANCHORS or parts is not allowed. Any changes or other uses beyond this manual are strictly forbidden.

Any changes or other uses beyond this manual are strictly forbidden. This documentation must be kept in the service lift for the purpose of subsequent examinations of the anchor device.

If there are any doubts to the safety of the AVANTI LIFT ANCHOR, or it isn't properly fixed, deformed or damaged with cracks or similar incompatible harms it may never be used – Please contact the manufacturer immediately. In case of corrosion the anchor immediately needs to be removed.

Observations:

Only to be used by instructed workers! Instructed workers must be aware, instructed and prepared to utilize site rescue plans.

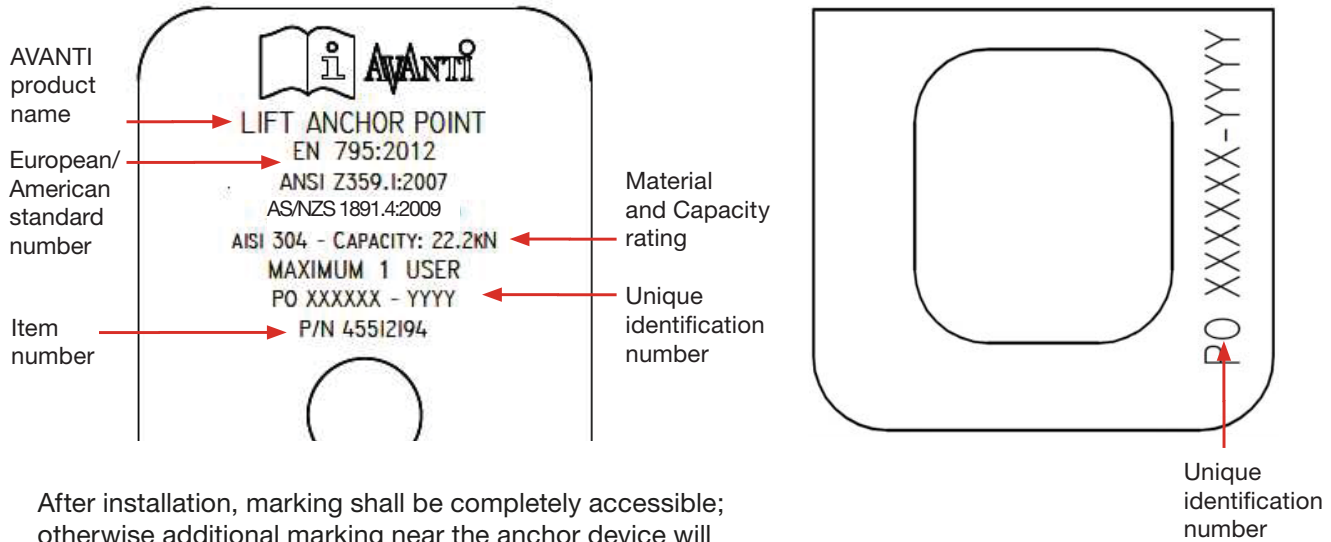
Only to be used for preventing vertical fall!

Only to be used for fall arrest, not to hoist or hang in goods or similar! Before attaching in the ANCHOR the user needs to check it is sitting fixed and screws are sitting tight and proper.

If AVANTI LIFT ANCHOR has arrested a fall it may never be used again. Part must be removed from service immediately.

C.3 Marking

Marking on Lift Anchor plate:



After installation, marking shall be completely accessible; otherwise additional marking near the anchor device will be necessary.

C.4 Installation

The installation must be performed by a certified technician following the instructions of this manual.

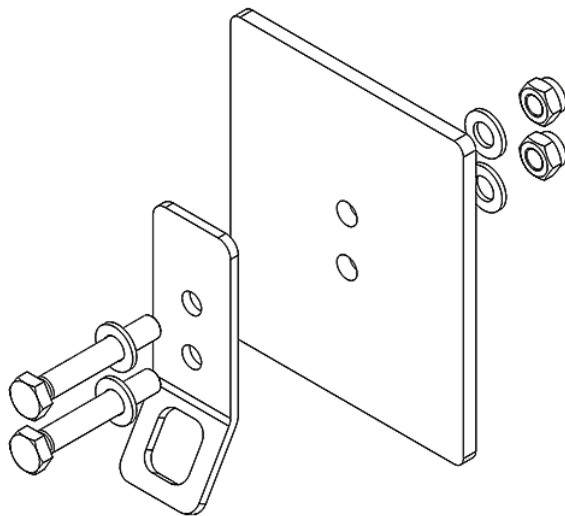
AVANTI LIFT ANCHOR is tested and approved only to be installed on AVANTI lift. AVANTI LIFT ANCHOR made from AISI 304 Steel has to be screwed with two bolts DIN 933 A2-70 M12 mm, 4 washers DIN 125A A4 and self locking nuts DIN 985 A4 M12. In case of doubt, please contact AVANTI.

Before installing the AVANTI LIFT ANCHOR in heights, assure to be proper secured against fall from height by using relevant fall arrest equipment.

AVANTI LIFT ANCHOR:

1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.
2. Torque the nuts with 15 N·m (11 lb·ft).
3. Make sure the Anchor is fully seated and properly tightened.
4. Fill in "Installation form".
5. Carry out yearly inspection by following the procedure in the section "Inspection".

The stickers with the additional marking and the location of the anchor points are shown in the right picture below.



C.5 Inspection

After installation:

An inspection must be carried out by a certified technician following the inspection form in this manual.

Before use:

Each time using the AVANTI LIFT ANCHOR the user inspects the ANCHOR visual and manually by twisting / pulling. Check the parts are properly fixed and free of deformities, damages, cracks or similar unacceptable defects.

Periodical examination:

A periodic examination at least every 12 month is essential for the safety of the AVANTI LIFT ANCHOR. The examination must be performed by a certified technician following the inspection form in this manual.

For the AVANTI LIFT ANCHOR the certified technician only needs to be trained in any metallic component covered by the European/American standard norms for fall arrest equipment.

C.6 Inspection form

PPE Anchor:	Manufacturer:	Avanti
	Type / Model:	Lift Anchor
	Identification no.:	
Fixing structure:	Lift serial no.:	
	Lift model:	
	Wind farm / WTG no.:	
Installed by:		
Installation company:		

	OK	not OK
1. Lift structure does not show any deterioration.		
2. Anchor locking screws are fully inserted and tightened with 15 N·m.		
3. Anchor does not show cracks, deformities, corrosion or other damages.		
4. Anchor installed on the lift structure according to the instructions.		
5. Anchor marking is clearly readable.		

Is the Anchor in good condition to be used?

Yes

No (Replace)

--	--

Signature of competent:

Name of competent in capital letters:

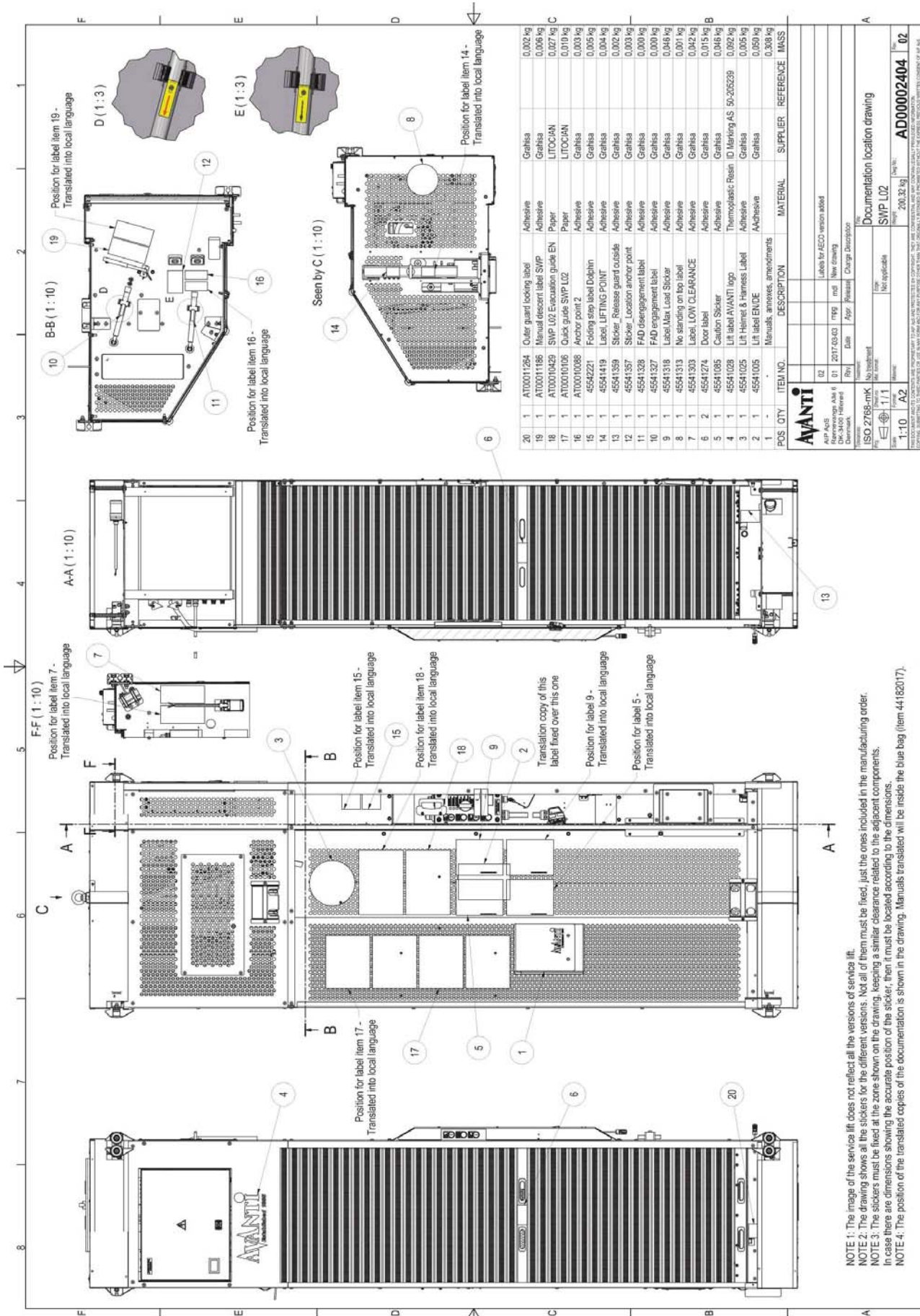
Date:

If the AVANTI LIFT ANCHOR is found not OK, it must be removed / replaced by a new AVANTI LIFT ANCHOR! The result of the periodic examination must be recorded in the Registration form of anchor.

C.7 Registration form of anchor

Avanti lift Anchor		Identification no.:		Avanti Wind Systems A/S DK-3400 Hillerød Tel:+45 48 24 90 24 Fax: +45 48 24 91 24 www.avanti-online.com	
Date of purchase:			Date first put into service:		
Periodic examination and repair history					
Date	Reason for entry (per. exam)	OK / not OK	Inspector	Periodic exam next due date	

Appendix D: Documentation location drawing (AD00002404)



NOTE 1: The image of the service lift does not reflect all the versions of service lift.
 NOTE 2: The drawing shows all the stickers for the different versions. Not all of them must be fixed, just the ones included in the manufacturing order.
 NOTE 3: The stickers must be fixed at the zone shown on the drawing, keeping a similar clearance related to the adjacent components.
 In case there are dimensions showing the accurate position of the sticker, then it must be located according to the dimensions.
 NOTE 4: The position of the translated copies of the documentation is shown in the drawing. Manuals translated will be inside the blue bag (item 44182017).

Appendix E: Torque values



All the screw connections listed in the following table shall be marked to indicate their position once the final tightening torque is applied.

Check the tightening torque of all the screw connections, using an approved and calibrated torque wrench. The correct tightening torque of each screw connection is listed in the following table.

Joint	Torque (Nm)
Top limit device fastening to 8mm traction wire rope (8mm wire rope grip plus half bushings)	6
Top limit device fastening to 12mm guiding wire rope (12mm wire rope grip)	20
Counterweight fastening to 8mm traction wire rope (8mm wire rope grips)	6
Push spring or counterweights fastening to 8mm safety wire rope (8mm wire rope grips)	6
12mm guiding wire ropes fastening to the tensioners (12mm wire rope grips)	20
Anchor points M12 fasteners to the lift structure	15
M10 bolts fasteners joining electrical motor to the gearbox	46



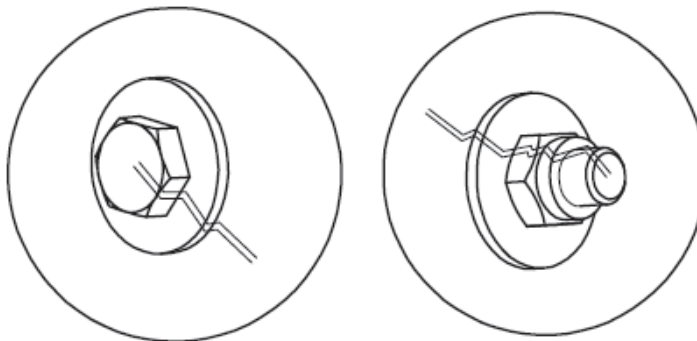
Apply the torques indicated in the table with lubricated screws (not dry). Only use lubricant type 'Molykote G-Rapid Plus' or similar which ensures no damage to the screws and self-locking nuts.



Replace the self-locking nuts that are loose.



Mark the screws and nuts after tightening them.





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