



Original instructions



AVANTI

AVANTI SERVICE LIFT
Installation and Maintenance Manual
Model Service Lift DOLPHIN A-V164



CERTIFICATE

EC Type Examination

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

Number of registration: 01/205/0869D/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 Centrovía
50196 Muela (La) - (Zaragosa)
Spain

the close conformity of the product

Service lift inside wind turbine
with protection fences for service lift holes at landings
and fence door interlock system

Technical data:

Type:	Dolphin A
- max. load capacity:	240 kg / 2 persons
- net weight:	165 kg to 185 kg depending on the configuration
- traction hoist:	M508
- safety gear:	ASL508
- max. lifting height:	135 m to 180 m depending on the configuration (net weight)
- lifting speed:	18 m/min (50 Hz) or 21 m/min (60 Hz)
- Protection fences:	Swinging door or sliding door with interlock system
- Fence Interlock system:	Guard locking switch system or Trapped-key system
- Optional:	- Automatic send, call or send / call function - Roller guides

Modification D to the certificate 01/205/0869C/17 from 2017-09-11 - New address of the company

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.: 17_076-1 from 2017-09-06 and is valid only duly considering the requirements mentioned in this document.

This certificate is valid until 2022-09-11

Cologne, 2019-02-28

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Certification body
Notified under No. 0035
certifier

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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 Product¹⁾ 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.

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.

This manual, including, but not limited to, measurements, procedures, components, descriptions, instructions, recommendations and requirements, is subject to change without prior notice. Please check Avanti website/manuals for the latest revisions of the manuals.

Any additional cost related to or arising from any changes in the manuals does not entitle Customer to any form of compensation or other legal remedies.



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
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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



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 User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard and slider) at all times.

A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

If more than one person is entrusted with one of the above 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 a certified technician.

All repairs to the traction, braking and supporting systems may only be performed by a certified technician.

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

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 the manufacturer'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 the manufacturer.

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

Service lift must be inspected at least once a year by a certified technician. In case of high operating frequency or severe conditions of use, more frequent inspection is required.

Service lift is designed for a lifetime of 25 years with an operating frequency of approximately 10h/year (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).



Avoid injury – follow all instructions!



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

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 perform the corresponding daily inspections and who holds valid certification (current) for the task in question.
Manual descent (also: descent without electrical power supply)	Action performed to descend the cabin at a controlled speed without electrical power, by releasing the traction system's electromagnetic brake manually.

3. Installation

3.1 WTG integration requirements

WTG component	General integration requirements	
	Service lift	Dolphin A-V164
Power supply	Type	3 Phase + PE + N ¹⁾
	Voltage (50 Hz)	400 V/ 690 V
	Voltage (60 Hz)	400 V/ 690 V
	Fuses	16 A
	Protection	According to EN 60204-1
Platforms	Minimum clearance around service lift	50 mm ²⁾
Evacuation way	Means of evacuation shall be provided with a maximum distance of	1100 mm
Platform fences	Minimum height	1100 mm
	Compliant to requirements of standard	EN 14122-3
	Fence door interlock system	Trapped key or guard locking
Hoistway	Maximum total travel height	See note (3)
	Maximum angle between hoistway and vertical axis	±5,3°
Top beam	Forces capable to withstand	Upon request from AVANTI



- 1) Note: Neutral applies only to 400 V.
- 2) Note: Up to a minimum value of 40 mm. after evaluation and approval by Avanti
- 3) Note: With all options: 135 m. / Standard design: 160 m.

Depending on travel path, dimensions may need to be larger in order to avoid collisions of travelling cable pulley¹⁾ with platforms. Other dimensions are possible upon request and design verification by AVANTI. The WTG manufacturer shall put in place any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI's scope.

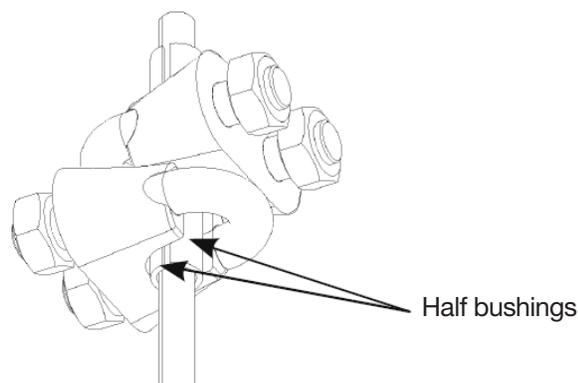


- ¹⁾ Optional feature for the automatic send configuration. Mandatory for send call configuration.

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In the event of installation procedure divided into two different stages and extension of travel path is needed (e.g.: offshore configuration):

There is a first assembled onsite at harbor stage where some of the lift components are preassembled by the tower manufacturer. All the wire ropes have to be tightened at provisional bottom platform and the extra length coiled up in a secure manner to prevent damages in them since they have to be used for the final extension. Half bushings must be installed to protect wire ropes (traction, safety and guiding) before travel path extension.



The assembly of the tower to the offshore foundation extending the operation of the service lift to the transition piece (TP) will be undertaken in the second stage. In this second stage, TP bottom platform will be the final low travel end of the lift, and therefore when the tower is located over the TP, the Control Box previously mounted on first stage provisional bottom platform will be disassembled and re-mounted on the TP Bottom Platform. When the travel path of the cabin is extended to TP bottom platform, travelling cable and wire ropes need to be longer, for this reason, these are previously ready coiled on the first stage.

3.2 Cautions



Please familiarise yourself with these instructions and the User's Manual before installing the service lift. Ensure that all specified parts are present before commencing installation.

No warranty is provided against damage and injury resulting from not following this "User's, Maintenance and Installation Manual" i.e. reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

Prior to installation, ensure that:

- Building sections involved will be able to withstand the service lift loads.
- All parts are available and fully functional.
- Travel zone is protected by fences at each platform.
- Walking way surfaces are dry and not slippery.

The customer must define the maximum allowable wind speed ensuring safe installation.

During installation tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment if falling height is higher than 2 m, hand gloves, helmet, safety glasses, working gear.
- Use a hand winch attachable to the ladder when elevating heavy weights.
- Use a wire rope clamp or grip when lowering wire ropes, in order to avoid the risk of personnel losing the wire rope, and wire rope getting damaged or person being hit. The clamp shall be secured to a platform anchor point. The diameter of the clamps or grips shall match the diameter of the wire ropes.
- Not work at different levels if tasks involve risk of falling objects.

3.3 Freight kit

The service lift shall be transported to destination inside a box.

1. Open the box.
2. Turn the service lift from horizontal to vertical position by means of the freight kit.
3. By means of carabiners and slings, attach the lifting machinery (i.e. forklift, chain hoist, crane, etc.) to the lifting eye.
4. Use the lifting machinery to lift the service lift over the pallet level. One person is needed to ensure the lifting process is being done properly.
5. In the picture below you can see the detail of where the lift must lay during the lifting.
6. Place the lift inside the lift shielding at bottom platform.
7. Remove the freight kit.



3.4 Electrical connections



Before making any connection, disconnect any power supply to the service lift and the fence interlock system.



The electrical connection of the system must be made in accordance with EN 60204-1.

The power supply must be protected by a fuse and against indirect contacts according to local regulations. Verify that the rated grid and motor voltages are identical.



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

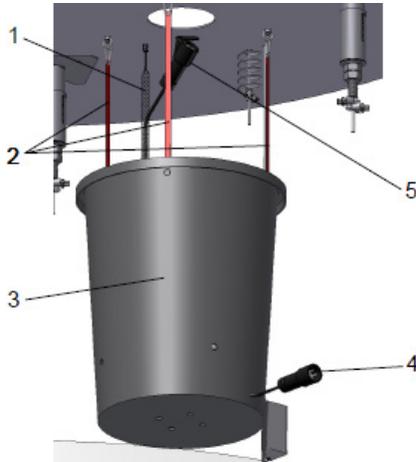
3.4.1 Power cable

3.4.1.1 Trailing cable management system ¹⁾

- Hang the cable collect bin underneath the power cable hole of the bottom platform using the straps supplied. Attach the straps on the holes.
- Cut the transport strips and tape holding the cable inside the bin and connect the cable stocking to the eyebolt underneath the service lift floor
- Connect the power supply connector to the service lift inlet plug attaching the cable to the cabin with cable ties.

i ¹⁾Optional feature.

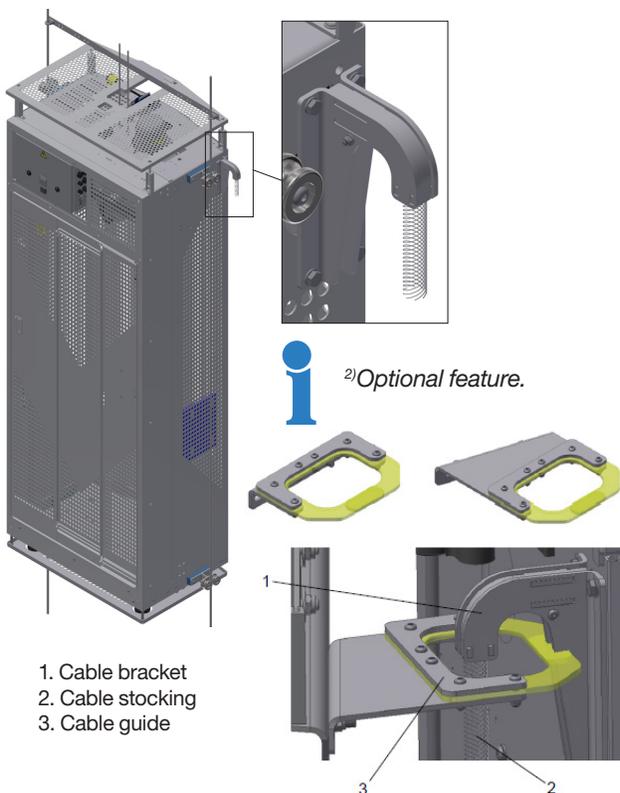
1. Cable stocking
2. Cable collect bin suspension straps
3. Cable collect bin
4. Power supply connector to wind turbine
5. Power supply connector to service lift



! Cable bin should be installed 650 mm below platform but needs to be adjusted and tested to adopt different tower basements. The cable must not be removed out of the cable bin nor disconnected from the switch assembled in cable bin. This will remove pretorsion of cable resulting in cables not coiling inside cable bin properly. Power cable may get stiff under temperature below 15°C.

3.4.1.2 Guided trailing cable management system ²⁾

- Install the cable bracket on the side of the cabin.
- Install the cable collection bin in the vertical of the power cable when the cabin is in the lower platform.
- Install the cable guides on the platforms.
- Adjust the position of the cable guides so that the cable bracket and the power cable move through the cable guides avoiding metal to metal contact.



1. Cable bracket
2. Cable stocking
3. Cable guide

i ²⁾Optional feature.

3.4.1.3 Travelling Cable ³⁾

- Install power supply socket over mid tower's height platform.
- Cut the transport strips which hold the cable and connect the cable inlet to the power supply socket.
- Uncoil the cable to the bottom platform.
- Connect the power cable outlet socket to the service lift inlet plug as described on 3.5.2.4.

i ³⁾Optional feature for the automatic send configuration. Mandatory for send call configuration.



3.4.2 Guard locking system ⁴⁾

- Install the guard locking control box on the bottom platform fence.
- Install the guard locking switch and its actuator on the fence door using the supplied hardware
- Install the lift detection switch on its bracket on the bottom fence toeboard and connect to the socket on the guard locking control box.
- Connect the power cable power inlet plug to the guard locking control box outlet.

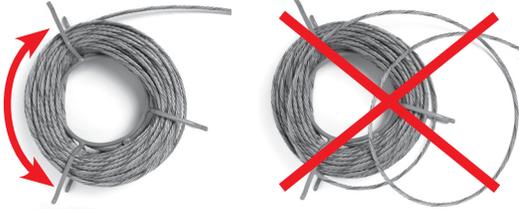
i ⁴⁾Note: An interlock system (trapped key or guard locking) is mandatory for CE versions if platform fences are equipped with doors.

3.5 Guiding, traction and safety wire ropes

3.5.1 Top platform

Guiding, traction and safety wire ropes are attached to the suspension beam on the available holes. To install them on the suspension beam:

- 1) Mount the guiding wire ropes (12 mm) and the traction and safety wire ropes (8 mm) using the shackles supplied for the suspension beam at the top of the tower, with the guide wire rope outermost on either side.
- 2) Fit the nuts and bolts on the shackles. Lock with cotter pins.
- 3) Fit the top limit device ²⁾ on the traction wire rope leaving at least 200 mm between top limit device ²⁾ and shackle. Adjust the final position during first run so that the service lift is levelled with the top platform when it stops.
- 4) Uncoil all wire ropes to the bottom of the tower.

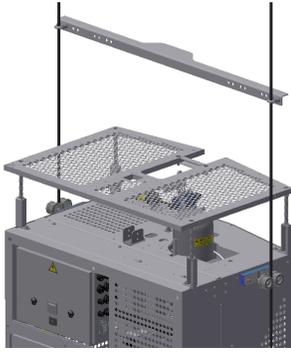


! All wire ropes must be evenly uncoiled to prevent looping.

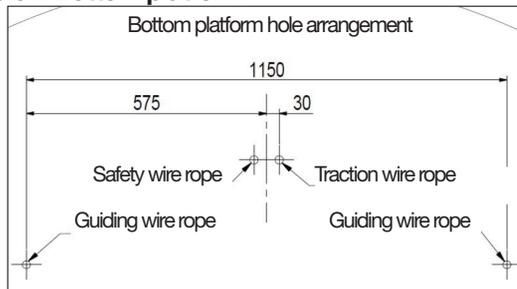


Do not pull wire rope over edges.

3.5.1.1 Top limit device (bar) ²⁾



3.5.2 Bottom platform



3.5.2.1 Guiding wire ropes:

- 1) Feed the guiding wire ropes through the wire guides on the service lift.
- 2) Fit the correct number of wire rope fixes on the wire rope and feed through the wire rope guides. The wire rope fixes must be installed and adjusted during the first run.
- 3) Pull the guiding wire rope through the bottom platform and fasten it with the tensioning system. The tensioning system may vary depending on the tower configuration.



- 4) Attach the wire ropes to the tensioner:
 - a) Feed the wire ropes through the tensioning system.
 - b) Attach the wire rope to the tensioning system using the wire rope grips to allow for the first run.
 - c) Make a mark on the wire rope to ensure no sliding occurs at the wire rope grips and to use as a reference for checking stroke if necessary.

- 5) Perform final tension adjustment after first run:
 - a) Tension the wire ropes by turning the supplied nut until the desired tension is shown on the graduated scale (7000N).
 - b) Use the second nut to lock the assembly.



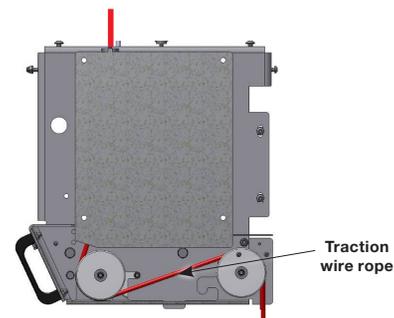
Tensioning methods and tension values may vary depending on specific tower configurations



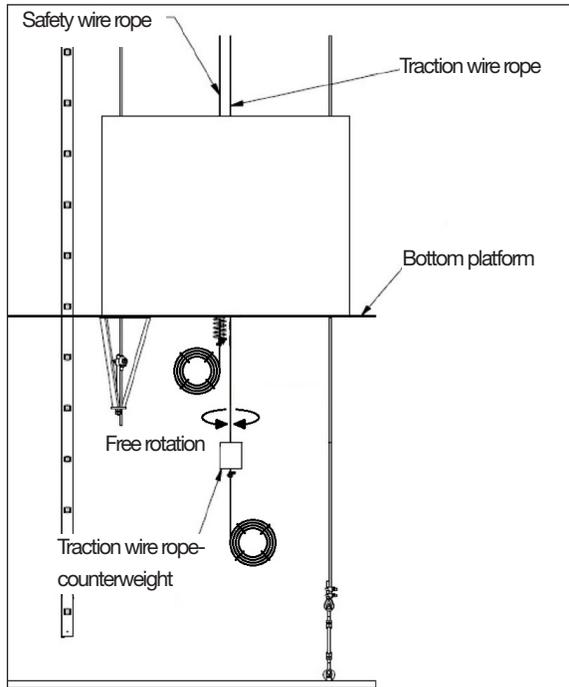
If the applied tension to the guiding wire ropes is below the stated values, the cabin sway may be high enough to prevent the power cable to coil properly.

3.5.2.2 Traction wire rope

- 1) Open the maintenance cover on the back of the service lift.
- 2) Remove protection guard above rollers.
- 3) Feed the wire rope through the roof into the traction hoist's wire rope inlet opening.
- 4) Push the UP button of the user control box and feed wire rope through until the traction hoist starts pulling. Ensure that the wire rope can exit without obstruction!
- 5) Continue feeding the wire rope around the pulleys to the back of the lift.
- 6) Feed the wire through the guide bushings (including pulley ones when using travelling cable).
- 7) Feed the wire rope through the platform holes.



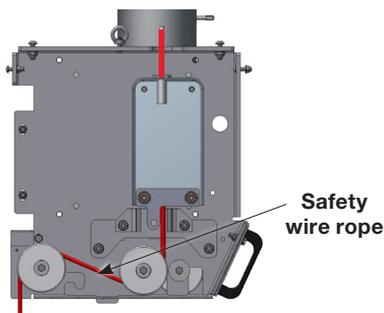
8) Secure the 11 kg counterweight on the traction wire rope at least 600 mm below the bottom platform (See figure below). The remaining wire rope must be coiled and fastened with at least 3 strips. The counterweight and the excess of wire rope shall be able to rotate freely.



If the wire rope is not installed in accordance with the stated procedure, it can get damaged, deformed or show other critical defects.

3.5.2.3 Safety wire rope

- 1) Open the maintenance cover on the back of the service lift.
- 2) Remove protection guard above rollers.
- 3) Feed the wire rope through the roof into the fall arrest device's wire inlet opening.
- 4) Pull the wire rope through the fall arrest device while turning the release lever clockwise.
- 5) Continue feeding the wire rope around the pulleys to the back of the lift.



- 6) Feed the wire rope through the guide bushings of the cabin.
- 7) Feed the wire rope through the guide bushings of the travelling cable pulley.
- 8) Tension the safety wire rope following one of the following tensioning systems depending on the specific configurations and tower design:

• Tensioning system of the safety wire rope by compression spring:

1. Insert the protection into the hole for the safety wire rope on the bottom platform.
2. Route the safety wire rope through the corresponding hole of the bottom platform.
3. Ascend the cabin 50 cm.
4. Activate the fall arrest device by turning the activation lever anti-clockwise.
5. Perform a manual descent so that the fall arrest device keeps the cabin's load suspended from the safety wire rope.
6. Compress the spring and fix it with cable ties to a length of 40 mm.
7. Route the safety wire rope through the compressed spring.
8. Pull the safety wire rope manually down as far as possible.
9. Place the spring in contact with the bottom platform.
10. Fix the compression spring by installing two wire rope clamps under the spring.
11. Cut the cable ties from the spring. The length of the spring when decompressing should be between 50 mm and 70 mm.
12. Coil the excess length of the safety wire rope and secure it with a minimum of 3 cable ties so that it does not interfere with the traction wire rope or the cable management system.

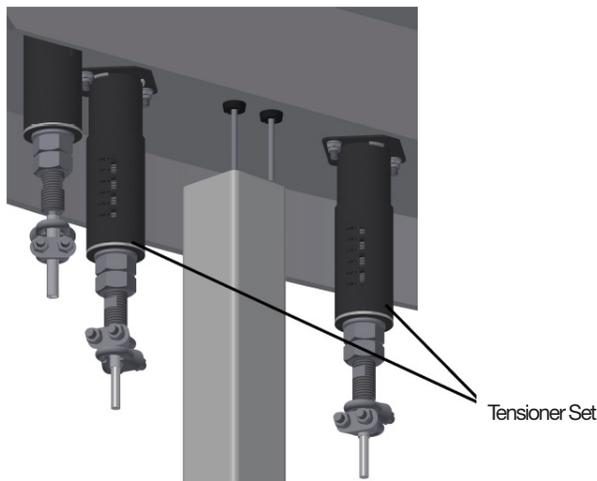
• Tensioning system of the safety wire rope by 3 counterweights ¹⁾:

1. Insert the protection into the hole for the safety wire rope on the bottom platform.
2. Route the safety wire rope through the corresponding hole of the bottom platform.
3. Route the safety wire rope through the 3 counterweights.
4. Fix the position of the counterweights by installing two wire rope clamps on the safety wire rope under the counterweights.
5. Coil the excess length of the safety wire rope and secure it with a minimum of 3 cable ties so that it does not interfere with the traction wire rope or the cable management system.

¹⁾ Mandatory tensioning system when guided travelling cable pulley configuration is installed.

3.5.2.4 Travelling cable pulley guiding wire ropes

- 1) Fix the guiding wire ropes (\varnothing 12 mm) on the travelling cable pulley guiding system top bracket installed on the first platform above the height corresponding to the cabin's halfway point using the shackles installed on the wire rope thimbles.
- 2) Tighten the shackle nut and fit the cotter pin.
- 3) Uncoil the guiding wire rope to the bottom platform, guiding the wire ropes through the wire rope fixes (if installed) along the travel path. The number of the wire rope fixes depends on the specific configuration of each tower.
- 4) Route the guiding wire ropes through the guide rollers of the travelling cable pulley.
- 5) Insert the protectors into the holes for the guiding wire rope on the bottom platform.
- 6) Route the guiding wire ropes through the corresponding holes in the bottom platform.
- 7) Fix the guiding wire rope to the tensioners:
 - a. Pass the guiding wire rope through the tensioning system.
 - b. Pull the guiding wire ropes manually downward as much as possible.
 - c. Fix the guiding wire ropes to the tensioning systems by installing two wire rope clamps and the protective bushing in each tensioner.
 - d. Make a mark on the guiding wire ropes to check that there is no slippage in the wire rope clamps.
- 8) Perform the tension adjustment of the guiding wire ropes after the first test run:
 - a. Turn the adjusting nut of the tensioning system until the desired tension is obtained.
 - b. Fit a locknut to prevent loosening of the adjusting nut on the tensioning system.



Tensioning methods and tension values for the travelling cable pulley guiding wire ropes may vary depending on the specific configurations and tower design.

3.5.2.5 Travelling cable adjustment

1. Guide the travelling cable through the travelling cable pulley.
2. Connect the outlet socket of the travelling cable to the inlet plug of the service lift using a cable stocking. Attach the schackle to the eyebolt on the back of the service lift.
3. Attach the travelling cable to the cabin by means of cable ties.

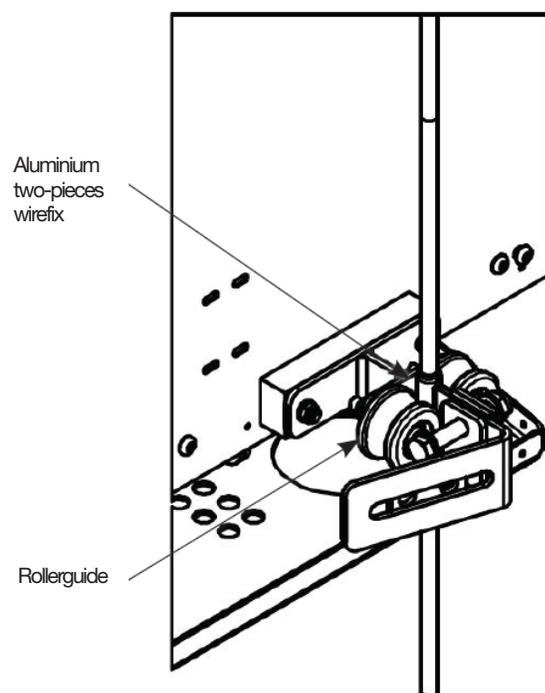
3.6 Wire rope fix

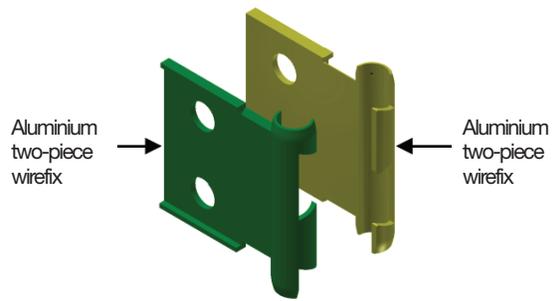
Wire rope fixes are installed and adjusted during the first run so that the centres of the wire rope fixes are in the centre of the service lift wireguides. Wire rope fixes must be installed on each platform and as required along the tower (MAX. 30 m) to improve guiding to avoid collision with tower elements.

Use the oblong holes on the wirefix brackets to align and adjust the wire rope fix position.

Dolphin A-V164 service lift is guided along the guiding wire ropes by means of roller guides. These roller guides have rubber parts that allow them to adapt to deviations on the trajectory of the guiding wire ropes.

Wirefixes are made of aluminium material, which results in an improved durability. In addition, the wirefixes are made of two symmetric parts. These two-piece concept allows the wirefix to be installed at any moment, without having to introduce it through the bottom end of the wire rope.





Wire rope fixes are installed and adjusted during the first run so that the centres of the wire rope fixes are in the centre of the service lift roller guides. Additional wire rope fixes could be installed if necessary to allow boarding upright. This extra wire rope fixes are installed on a structure so that the lower and upper wire rope fixes are aligned vertically. This way, the landing angle on the lift in platform will be reduced.

3.7 Danger zone sticker

Mount the “Danger Zone” sticker in the front door of the bottom platform fence. Make sure that the fence is clean and dry before attaching the sticker.

3.8 Rescue guide

Place the “Rescue guide” in the front door of the bottom platform fence by using plastic flanges to attach it to the perforated sheet.



Certified technicians must carry out an inspection before first use following the “Inspection checklist” Appendix.



The inspection before first use must be recorded for future reference filling the “Inspection Log Sheet” Appendix.



4. Maintenance

All the inspections / maintenance operations (periodical or extraordinary) must be logged in the appropriate Inspection Appendix.

All inspections and service tasks made to the hoist and fall arrest device must be carried out by certified technicians. The relevant maintenance instructions are provided to each person during the training.

4.1 Recommended planning

Avanti recommends the following maintenance planning:

Frequency	Performed by	Components
Daily	User	Overall / Travel zone
		Control and safety devices
		Fall arrest device
Annually	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
		User control box
		Safety switches
		Interlock system
Platforms		
Every two years	Certified Technician	Fall arrest device
Every five years or 50 hours (whatever occurs first)	Certified Technician	Traction hoist
Every 20 years or 250 hours of operation (whatever occurs first)	At Avanti Workshop	Traction hoist
		Fall arrest device

4.2 Alternative planning

Owners who strictly follow the maintenance program and the daily inspections, and can document it could decide with taking over the responsibility as well to provide the following alternative planning:

Frequency	Performed by	Components
Daily	User	Overall / Travel zone
		Control and safety devices
		Fall arrest device
Annually	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
		User control box
		Safety switches
		Interlock system
Platforms		
Every ten years or every 125 hours of operation (whatever occurs first)	Certified Technician	Traction hoist
Every 20 years or 250 hours of operation (whatever occurs first)	At Avanti Workshop	Fall arrest device
		Traction hoist
		Fall arrest device

4.3 Cautions

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

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 workplace.

During maintenance tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment (when falling height is more than 2 m), 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 a hand winch attachable to the ladder 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 travelling cable.
- Keep cabin doors closed when using a 3-step ladder.



Only certified technicians shall perform electrical installation tasks.



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

4.4 Daily inspection

Travel zone:

Ensure that there are no obstacles in the travel zone which may obstruct the travel of the service lift.

Service lift:

1. Check that the service lift components are mounted in accordance with the specifications and without any noticeable defects or missing components.
2. Check that the traction and safety wire ropes are not damaged or jammed.
3. Check that the safety devices are in place and working:
 - 3.1 Main switch: Turn the main switch on the interlock control box to the OFF position. The green light must be OFF. The service lift must not run. Turn it ON, the light shall be ON.
 - 3.2 Green light (Ready) – Service lift: Close and lock the bottom platform gallery door and the service lift door. Turn the trapped key to the ON position. The green light must be ON. It should not be possible to remove the trapped key unless it is switched OFF again.
 - 3.3 Emergency stop button: Press the emergency stop button on the user control box. The service lift should not move UP / DOWN. Release the emergency stop and drive the lift UP approximately 1 meter.
 - 3.4 Service lift door: Pull the door to open. The door should not open. Unlock the top sliding door from the bottom sliding door and pull to open. The top sliding door should open, the green light must be OFF and

the lift must not move UP / DOWN. Close the top sliding door and apply the lock to the bottom sliding door.

3.5 Ascend lift electrically a few centimeters and observe centrifugal weight during this. Activate the fall arrest device by turning the lock lever counter clock wise. Press and hold the DOWN button of the user control box. The service lift should not descend. Try to perform manual descent and observe centrifugal weight during this. The FAD should hold the load (if not, leave the lift and tag it out). Ascend electrically again to unload the FAD. Unlock the fall arrest device by turning the unlock lever clockwise. There is an alternative method to check the FAD functionality, called 'Stomp Test'. The procedure is explained in the 'Stomp-test Instruction' Appendix.

3.6 Perform a manual descent test for a meter. The lift should descend and the buzzer should sound.

3.7 Drive the service lift down until the Bottom obstruction device hits the bottom platform. The service lift should stop before the rubber bumpers hit the bottom platform. The service lift door and the fence door should be unlocked.

3.8 Top obstruction device: activate top stop by pressing it down. The service lift should not ascend until top obstruction device is released.

4. When the lift is at the top platform, check the wire rope fastenings.

5. Record the hour meter reading in the "Inspection log sheet" Appendix.



If any faults occur during work,

- stop working,
- if required secure the workplace and
- rectify the fault!



Make sure that nobody is exposed to danger below the service lift, for instance from falling parts.

Cabin control from outside of the cabin- Automatic:

The automatic mode function is only available from the control buttons outside of the cabin and shall be checked as follows (one technician inside the cabin/one technician outside):

1. Press the UP button on the control box. The lift should ascend.
2. Press the emergency stop button on the control box. The lift stops.
3. Pull the emergency stop button and press the DOWN button. The service lift should descend until the bottom obstruction device engages.

4.5 Annual inspection

Have the entire system tested by a certified technician at least once a year, especially the traction hoist and the fall arrest device. However, it may be required more frequently depending on use and the conditions of use and operation. The traction hoist and fall arrest device must be inspected according to intervals included in the sections 4.1 or 4.2 tables (see above). Hour counter is found in the main control box.



A certified technician must carry out the annual inspection following the appropriate Inspection Appendix.



Owner must ensure that the results of all annual and extraordinary inspections are logged in the appropriate Inspection Appendix.



In case of replacement of hoist, Fall Arrest Device and/or 8 mm. wire ropes, the operation/s and the related total hours of use of this/these component/s, must be logged in the appropriate Inspection Appendix.

4.5.1 Cabin

Inspect the cabin structure, joints, attachments and accessories.

4.5.2 Traction hoist

The traction hoist shall be maintained according to maintenance planning (please see sections 4.1 or 4.2). Relevant maintenance instructions are provided to each person during the training. These maintenance inspections must be only carried out by a certified technician.

4.5.3 Fall arrest device

The fall arrest device shall be maintained according to maintenance planning (please see sections 4.1 or 4.2). Relevant maintenance instructions are provided to each person during the training. These maintenance inspections must be only carried out by a certified technician.



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 wire rope fastenings.



After FAD has engaged, if the FAD damper has moved downwards, the FAD unit must be replaced by a certified technician.

4.5.4 Traction, safety and guiding wire ropes



The inspection of the wire ropes can be carried out from inside the cabin. To do so, open the maintenance cover. The cabin panel has a white sticker attached to it. This sticker makes the wire ropes' silhouette stand out and therefore facilitates the inspection of the wire ropes.

Carry out the following inspections and adjust if necessary:

1. Inspect all the wire ropes along their entire length.
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 counterweights on the safety wire rope is correctly installed and that the wire rope locks are properly 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 them to a fixed part.
9. Check that the guiding wire ropes are correctly tensioned.



Record any visible change of the condition of the wire ropes on the appropriate Inspection Appendix, and monitor closely throughout time.

4.5.4.1 Lubrication of the traction and safety wire ropes



Traction / safety wires are lubricated by supplier and should keep their lubrication during operation. When touched you should find little grease on finger tip. To ensure this, the storage of the wires MUST be adequate and without any harmful conditions as for example dust, water, etc.

1. Position the lift at the bottom platform.
2. Open the maintenance cover by unscrewing its screws.
3. Apply lubricant on the traction and safety wire ropes by means of a spray can.
4. 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.
5. While the first user uses the spray can and the cloth, a second user presses and holds the UP button from inside the lift. This way, while the service lift ascends, the lubricant is applied along the complete length of the two wire ropes.



6. After applying the lubricant, leave the maintenance cover open and carry out a descent back to the bottom platform.
7. While descending, check that the two wire ropes have been properly and uniformly lubricated.
8. Once the service lift is at the bottom platform, clean off any lubricant accidentally applied on the cabin panels.
9. Finally, close the maintenance cover by screwing back its screws.



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.

4.5.4.2 Measuring of the wire rope diameter



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.



Rotate the calliper around the wire rope to measure the minimum and maximum wire rope diameter at each measurement point.

4.5.4.3 Discard criteria



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



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



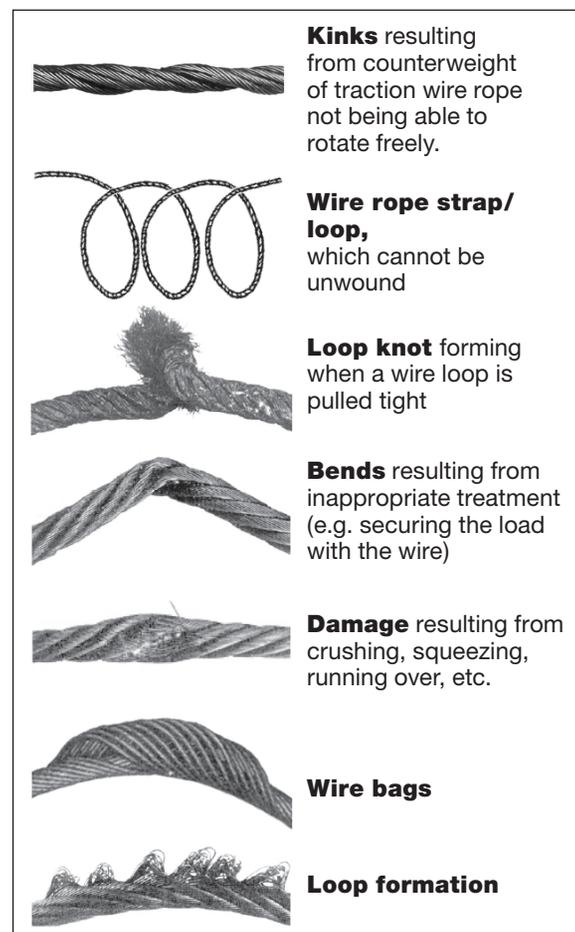
AVANTI recommends to replace the traction and safety wire ropes after 250 hours of operation corresponding with the refurbishment of the traction hoist and fall arrest device. Please check with your local authority regulations if it's mandatory in your case.

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

- For traction and safety wire ropes, if there are more than one 4-wire strand break on a wire rope length of 250 mm.



- For guiding wire ropes, if there are more than one 8-wire strand break on a wire rope length of 360 mm.
- If there is severe corrosion on the surface or the inside.
- If there is heat damage, evident by the wire rope colour.
- For traction and safety wire ropes, if the wire rope diameter is less than 7,6 mm.
- For guiding wire ropes, if the wire rope diameter is less than 11,4 mm.
- If there is damage on the wire rope surface (see following figures for most common examples of wire rope damage).





4.5.5 Guiding system

Check all the wirefixes are free of cracks, dents and disparities on each platform and proceed to lubricate them.

1. Position the lift at the bottom platform.
 2. Ascend to the top platform.
 3. Once located on top platform, exit the service lift and using the fence's windows apply lubricant to wirefixes by using a brush.
 4. Descend and perform the same lubrication operation of all the wirefixes on each platform.
- The type of grease shall be LUBERKRAFFT KL.



In case of using an equivalent grease, it must be previously verified by AVANTI.



The wirefixes must be replaced in case of damage.

4.5.6 Electrical cables

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

4.5.7 Overload check and adjustment

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

4.5.8 Information signs and documents

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

4.6 Repairs

Repairs to traction hoist equipment must ONLY be performed by AVANTI, and only using original spare parts. If the gearbox oil needs to be replaced, use one of the lubricants specified below, corresponding to the temperature range in which the traction hoist equipment is used.

- Amount required: 1,5 l
- Traction hoist: M508
- Oil: Mobil SHC 632.

Each oil has to be verified by AVANTI.

4.7 Ordering spare parts

Only use original parts. Spare part lists are available from AVANTI. Please indicate lift model when requesting a spare part list.

Appendix A: Adjustment of the overload limiter

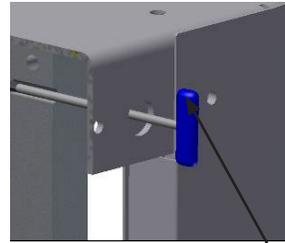
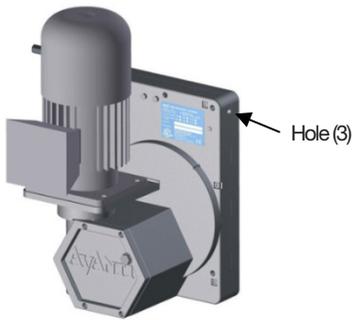


The adjustment of the overload limiter of the service lift shall be carried out only by a certified technician.

For the tests, test weights shall be needed.



One turn of the tool (2) represents a change of approximately 40 kg of the triggering limit of the overload limiter.



Overload adjustment tool (2) with security Torx 40

Travel distance (m)	Setup load (1) (kg)
	Dolphin A-V164
From 61 to 80	300
From 81 to 100	309
From 101 to 120	318
From 121 to 140	327
From 141 to 160	336

WLL of lift (4) (kg)
Dolphin A-V164
240

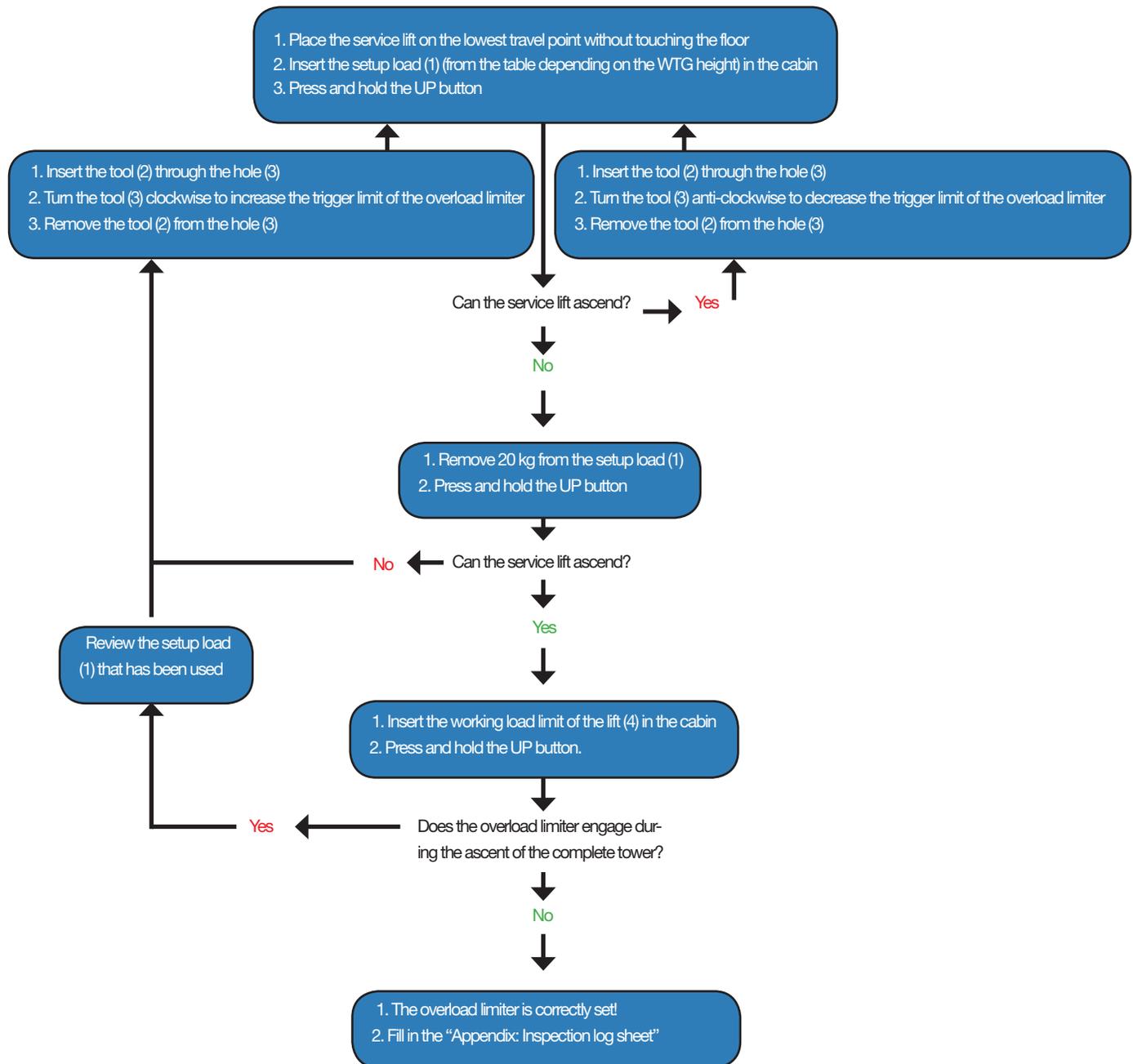


The overload limiter complies with EN18088.3.5.5 ¹⁾ since it will trigger before reaching a load of 1,25 times the working load limit of the hoist. In case that a third party inspector requests this test to be done, the load to be introduced in the cabin is as follows.

Overload test load = WLL hoist x 1,25 – Weight of lift, counterweight, traction wire rope and power cable for Dolphin A-V164 = 440 kg



¹⁾ The EN1808 test load is only applicable to CE versions.





Appendix D: AVANTI lift anchor

D.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 ±15° 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. This manual always needs to be represented in language of sale and provided for use by all technicians. 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.

Users are obliged to read and understand this User Manual. Further they need to be proper 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 many 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.

D.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.

If there are any doubts to the safety of the AVANTI LIFT ANCHOR, or it isn't proper fixed, deform or damaged with cracks or similar incompatible harms it may never be used – Please contact the manufacture 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!

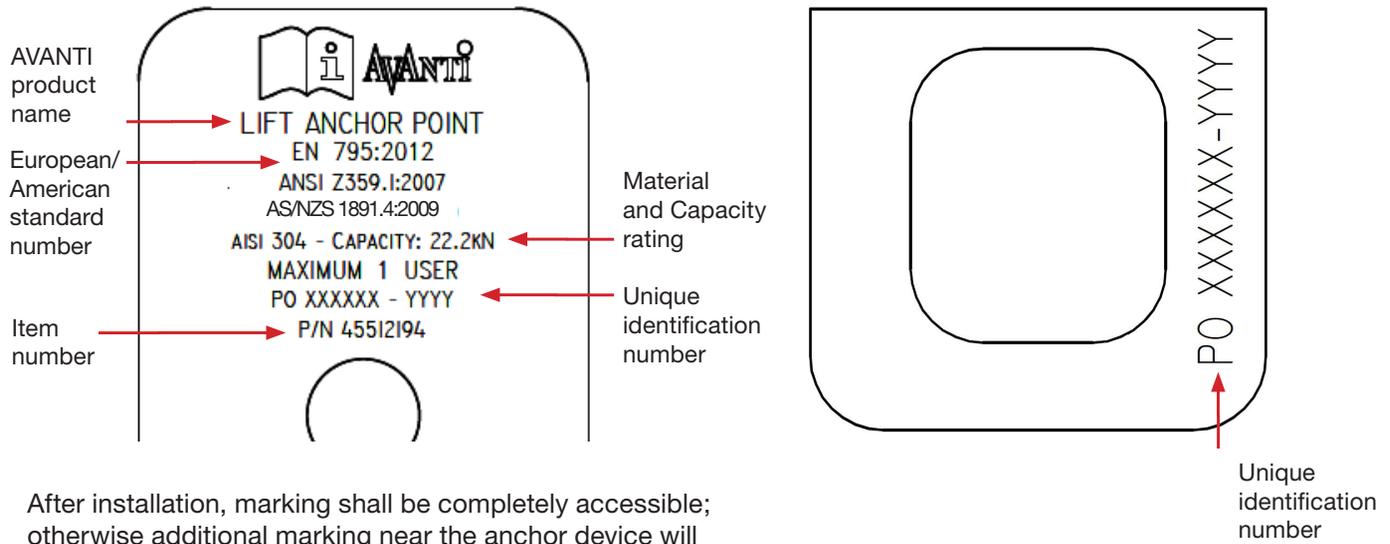
Only to be used for fall arrest, not to hoist or hang in goods or similar! Before attaching in the ANCHOR the user needs to check it is sitting fixed and screws are sitting tight and proper.

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



D.3 Marking

Marking on Lift Anchor plate:



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

D.4 Installation

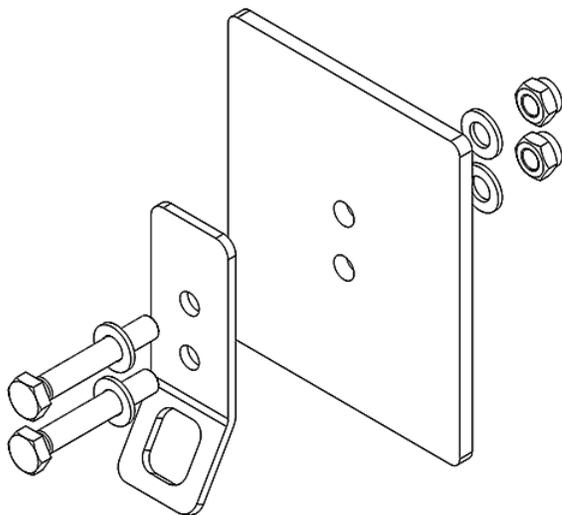
The installation must be performed by a certified technician following the instructions of this manual.

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".



D.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.

D.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.





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