Original instructions

AVANTI SERVICE LIFT

User's, Maintenance and Installation Manual

Model Service Lift DOLPHIN

CE certificate of Dolphin CE version and of Dolphin CE 350 version:

CERTIFICATE

EC Type Examination

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

Number of registration: 01/205/0799B/13

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

AVANTI WIND SYSTEMS A/S
Høgevej 19
DK- 3400 Hillerød
Denmark

the close conformity of the product

Service lift inside wind turbine
from VESTAS (V66, V80, V90, V100, V112, V117, V126, V164) including protection fences for service lift holes at landings and fence door interlock system

Technical data:

Type:	Dolphin	Dolphin 350
- max. load capacity:	240 kg / 2 persons	350 kg / 2 persons
- net weight:	160 kg	180 kg
- traction hoist:	M500 or M508	M508 (version 600 kg)
- safety gear:	OSL500 or ASL508	ASL508 (version 600 kg)
- max. lifting height:	180 m	150 m
- lifting speed:	18 m/min	
- Protection fences:	Swinging door or sliding door with interlock system, or fixed fence	
- Fence Interlock system:	Guard locking switch system or Trapped-key system	

Modification B to the certificate 01/205/0799A/12 from 2012-10-28
- New lift model with a lift capacity of 350 kg

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.: 13_049-1 from 2013-09-30 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Zaragoza, Spain.

This certificate is valid until 2018-10-02

Cologne, 2013-10-02

TÜVRheinland® 0035 Notified Body

Certification body
Notified under No. 0035
certifier

Dipl.-Ing. Walter Ringhausen

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TÜVRheinland®
Precisely Right.

AECO certificate of Dolphin AECO version (not of Dolphin CE nor Dolphin CE 350):

UL LLC

Presents this

AECO CERTIFICATE

Certificate No. 20130429 12CA15816

Date: 2013-04-29

To

Avanti Wind Systems Inc.
5150 South Towne Drive
New Berlin, WI 53151 USA

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

Turbine Service Lift
(See addendum for details)

Effective from: April 29, 2013 Until April 29, 2016

Issued by: Daniel Posner
AECO Certification Services

Reviewed by: Len Grant
AECO Certification Services

Reviewed by: William N. Bartunek, PE
AECO Certification Services

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

Date of publication:
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Revision 2: 4/04/14

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Manufactured Under Process Patent NO.8,499,896.
® Registered in Europe

Contents

1. Limited Warranty

Avanti Wind Systems A/S 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.

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 AVANTI or personnel authorised by AVANTI, hired by the employer for the job at hand. Installation and maintenance of the service lift shall only be performed by AVANTI or qualified personnel authorised by AVANTI, hired by the employer for the job at hand. Additionally, these tasks may be performed by qualified personnel authorised by a trainer authorised by AVANTI.

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 AVANTI or qualified personnel authorised by AVANTI.

All repairs to the traction, braking and supporting systems may only be performed by AVANTI or qualified personnel authorised by AVANTI.

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

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 AVANTI or by qualified personnel authorised by AVANTI before first use.

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

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/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.

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).

Personnel of Dolphin AECO version shall be equipped with a wired or wireless two way communication device connected to a location staffed by authorized personnel.

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.

3. Description

3.1 Purpose

The service lift purpose is to transport persons plus their tools and equipment to the most convenient height for performing work in wind turbine generators (WTG).

Its use is limited to AVANTI or personnel authorised by AVANTI holding the relevant training certificates.
The access to the WTG and consequently to the service lift is controlled and forbidden to public access.

The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point).
It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

3.2 Scope

The system consists of:
·a service lift, which is formed by: a cabin, a traction system,
·a fall arrest device, a control system, and safety devices. ·a guiding system along the tower, which is formed by: a pair of steel guiding wire ropes, attachments to the tower, and guides on the service lift.
·traction and safety wire ropes made of steel, ·a power supply system, and
·protective fences at platforms including their interlock system1).
The protective fences consist of structures with or without perforated sheets of different geometries depending on the platforms where they are installed.

CE AECO *The protective fences shall comply with the relevant regulations of: EN14122-3 for CE versions. OSHA 1926.502 for AECO version.*

The system details are described along this manual.

CE AECO *This manual contains instructions for three different versions of the Dolphin lift:*
·Dolphin CE version and Dolphin CE 350 version: which are compliant with essential health and safety requirements of European Machinery directive, and are CE certified.
·Dolphin AECO version: which is compliant with requirements of 5.11 of ASME A17.7/CSA B44-7, and is AECO certified.

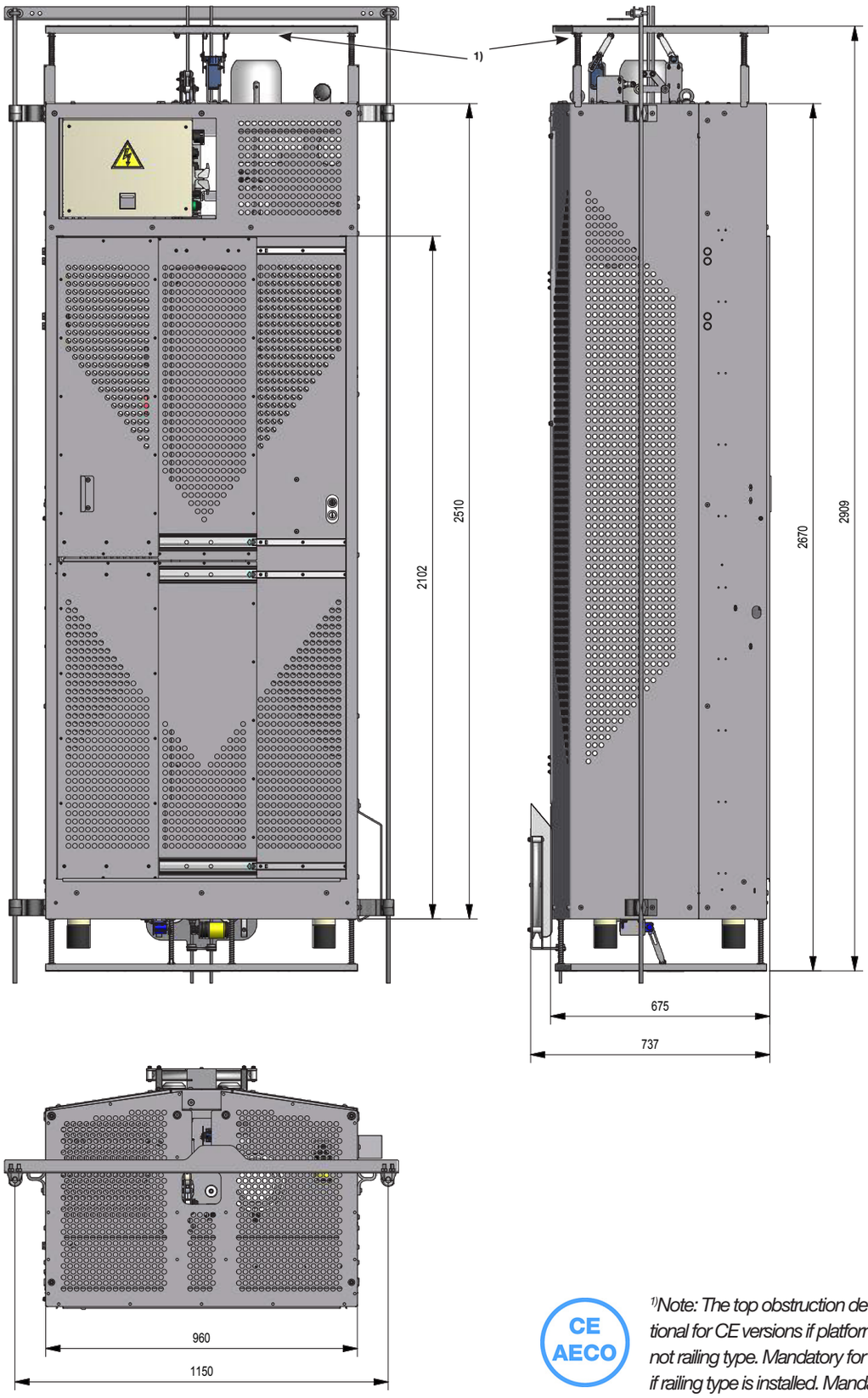
3.3 Technical specifications

Service lift	Dolphin CE	Dolphin CE 350	Dolphin AECO
Service lift weight	165 kg	180 kg	165 kg
Service lift speed	10 or 18 or 21 m/min ± 10 %	18 m/min ± 10%	10 or 21 m/min ± 10 %
Working load limit / Nº persons (max)	240 kg / 2 Persons	350 kg / 2 Persons	240 kg / 2 Persons
Operating temperature	-15ºC to +60ºC (5ºF to +140ºF)	-15ºC to +60ºC (5ºF to +140ºF)	-15ºC to +60ºC (5ºF to +140ºF)
Survival temperature	-25ºC to +80ºC (-13ºF to +176ºF)	-25ºC to +80ºC (-13ºF to +176ºF)	-25ºC to +80ºC (-13ºF to +176ºF)
Max. Noise level	80 dB (A)	80 dB (A)	80 dB (A)
Wire rope fastenings	Shackle 2T form C with safety pin	Shackle 2T form C with safety pin	Shackle 2T form C with safety pin
Power supply	3 Phase 400V / 480V / 690V, 50Hz / 60Hz	3 Phase 400V / 690V, 50Hz / 60Hz	3 Phase 400V / 480V, 60Hz
Power cable	**Dolphin CE**	**Dolphin CE 350**	**Dolphin AECO**
Type	5G1.5 (400V) / 5G1.5 (480V) / 4G1.5 (690V)	5G1.5 (400V) / 4G1.5 (690V)	5G1.5 (400V) / 5G1.5 (480V)
Weight (approx.)	0.16 kg/m	0.16 kg/m	0.16 kg/m

Maximum evacuation distance from the point of emergency exit to the accessible means of evacuation shall be no more than 1,1 m.

CE AECO *[1)]Note: Mandatory for CE versions. Optional for AECO version.*

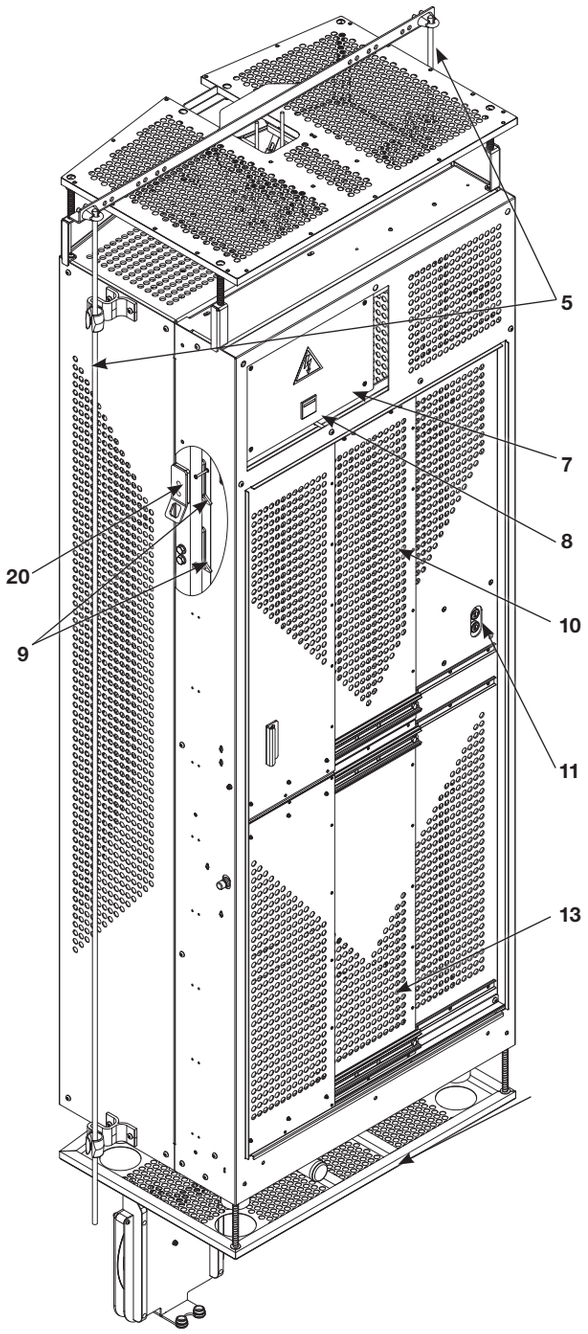
3.4 Dimensions

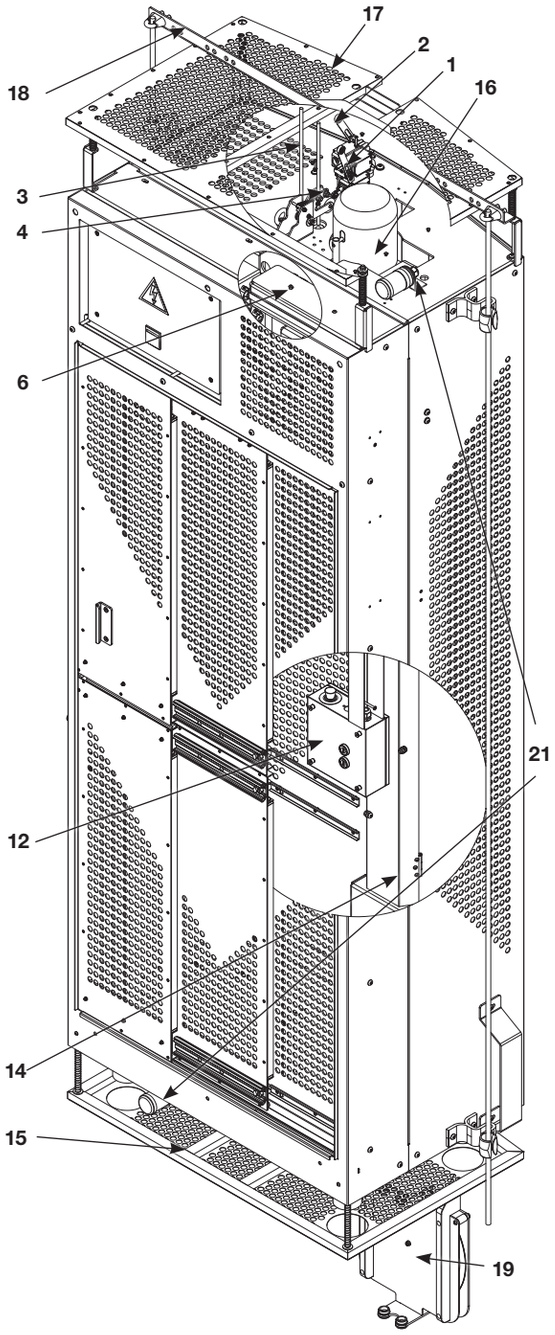


CE AECO

[1)]Note: The top obstruction device is optional for CE versions if platform fences are not railing type. Mandatory for CE versions if railing type is installed. Mandatory for AECO versions.

3.5 Components





1. Emergency top limit stop switch
2. Top limit switch
3. Safety wire rope
4. Traction wire rope
5. Guiding wire ropes
6. Internal Light
7. Main control box
8. Hour counter
9. Anchor points
10. Top sliding door
11. External controls
12. Cabin control box
13. Bottom sliding door
14. Maintenance cover
15. Bottom obstruction device
16. Traction hoist and fall arrest device
17. Top obstruction device [1)]
18. Top stop bar[1)]
19. Travelling cable pulley [1)]
20. External anchor point (optional)
21. Warning lights [1)]

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

CE
AECO

Traction system

Fall arrest device

3.5.1 Traction system

Service Lift	Hoist	Lifting capacity	Wire rope speed	Effect	Rated current	Traction wire rope Ø	Unit weight approx.
Version	**Traction system type**	**Kg**	**m/min**	**kW**	**A**	**mm**	**Kg**
Dolphin CE	**M500-M508/400V**	500	18	1.5	4.1	8.4	50
Dolphin CE	**M500-M508/690V**	500	18	1.5	2.3	8.4	50
Dolphin AECO	**M508/400V**	500	21.4	1.8	4.9	8.4	50
Dolphin CE 350	**M508 / 400V 50Hz/60Hz**	600	18	2	4.4 / 5.3	8.4	55
Dolphin CE 350	**M508 / 690V 50Hz/60Hz**	600	18	2	2.6 / 3.2	8.4	55

3.5.2 Fall arrest device

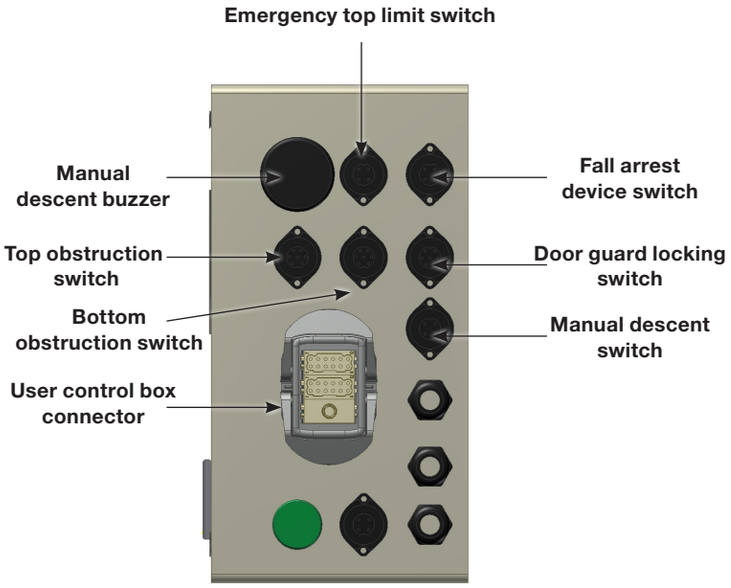
Service Lift	Fall arrest device	Lifting capacity	Triggering speed	Safety wire rope Ø	Unit weight approx.
Version	**Type**	**Kg (lbs)**	**m/min (ft/min)**	**mm**	**Kg (lbs)**
Dolphin CE	**OSL 500 - ASL 508**	500 (1100)	30 (100)	8.4	7 (15.4)
Dolphin AECO	**ASL 508**	500 (1100)	30 (100)	8.4	7 (15.4)
Dolphin CE 350	**ASL 508**	600 (1320)	30 (100)	8.4	7 (15.4)

3.5.3 Traction, safety and guiding wire ropes

Service Lift Version	Wire rope type	Wire rope diameter	Surface Treatment	Mark/ feature	Min. break resistance	Attached with
Dolphin CE	**M500 / OSL 500**	8.4 mm, 5x19	HDG	no	55 kN	2 t shackle
Dolphin CE & AECO	**M508 / ASL 508**	8.4 mm, 5x19	HDG	no	55 kN	2 t shackle
Dolphin CE 350	**M508 / ASL 508**	8.4 mm, 5x19	HDG	no	59 kN	2 t shackle
ALL	**Guiding wire rope**	12 mm	HDG	no	53 kN	2 t shackle

3.6 Control boxes

3.6.1 Main control box



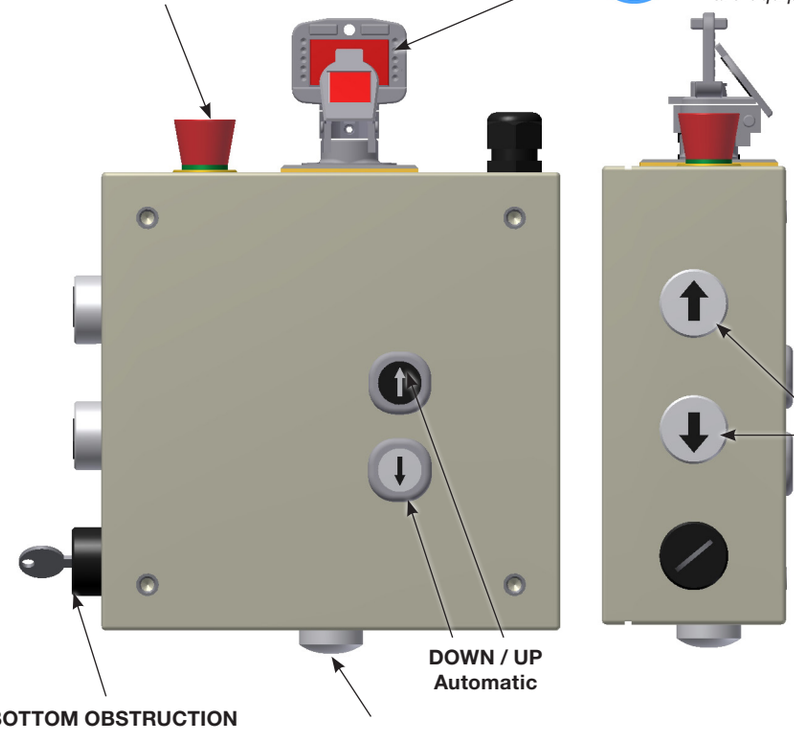
3.6.2 User control box

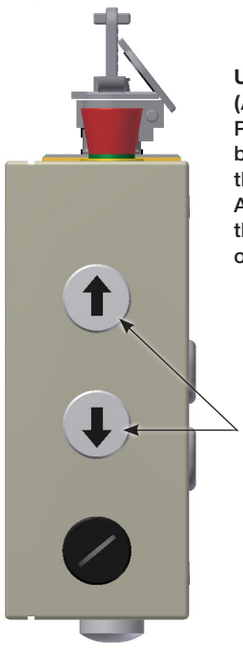
EMERGENCY STOP BUTTON
Press to interrupt any control function. Pull to reset the control after necessary verifications.

TRAPPED KEY SWITCH [1)]
Turn the key to ON to operate the lift. The key will be trapped and can't be removed until it is switched OFF Remove the key and use it to open the trapped key lock on the top gallery.

CE AECO

[1)]Note: An interlock system (trapped key or guard locking) is mandatory for CE versions if platform fences are equipped with doors. Optional for AECO version.





UP/DOWN BUTTONS
(Automatic - Send)
Push the automatic "UP" or "DOWN" button, to send the lift all the way to the top or bottom of the tower.
Automatic DOWN is only possible from the top platform and Automatic UP is only possible from the bottom platform.

3.6.3 Bottom platform control box

The control box is installed at the bottom platform fence. The control box has a main switch. Turn the switch to the OFF position to cut the power to the service lift. The main switch must be set to OFF when the lift is not in use, when leaving the wind turbine and while the wind turbine is running. It must be set to OFF before starting an electrical generator.

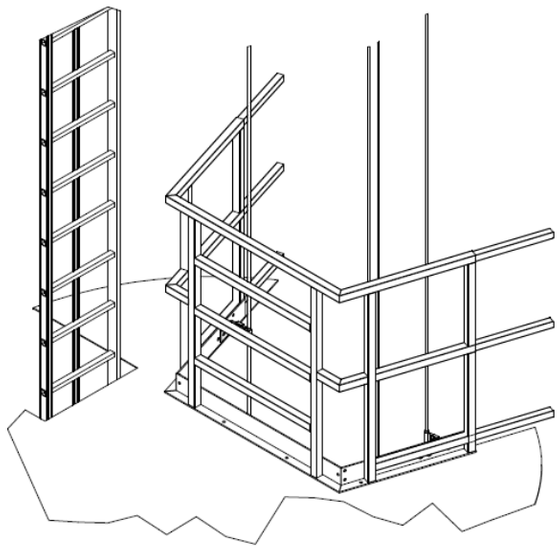
CE control box if guard locking system is provided:

CE AECO *CE control box if guard locking system not provided; and AECO control box:*

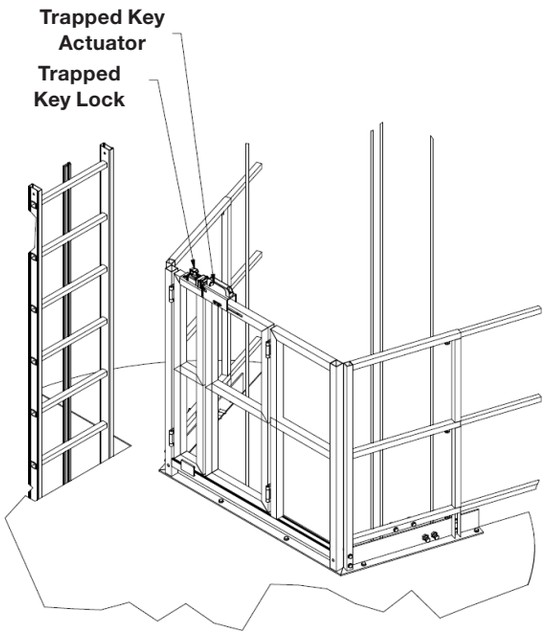
3.8 Fence system CE versions

The following types of fences are available:

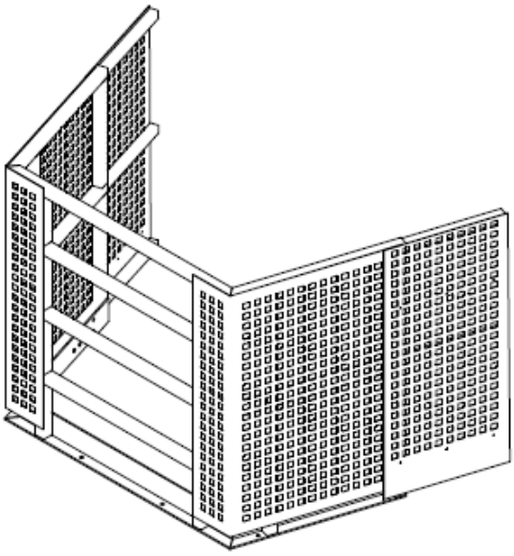
1. Fixed railing.



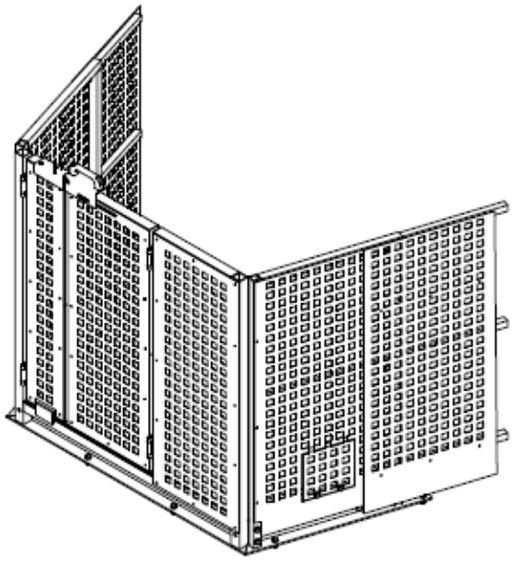
2. Railing type with door.



3. Fixed perforated sheets.



4. Perforated sheets with door.



5. Perforated sheet type of 2,4m high, and with door equipped with guard locking.

Any combination of fences is possible as long as all the following points are fulfilled:

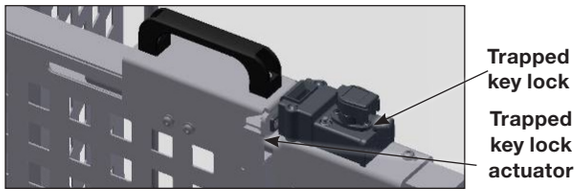
1. Fixed fences shall only be installed in infrequently accessed platforms (access to platform maximum once per year).

2. Doors shall be equipped with an interlock system: either trapped key or guard locking.

3. Railing type is only possible if top obstruction device is installed on service lift.

3.8.1 Trapped key system [1)]

The platform fence door is fitted with a trapped key lock keeping the door locked while the service lift is not at the platform. The door can be unlocked by using the trapped key on the user control box and opening the trapped key lock. The key will get trapped until the door is closed and locked again.

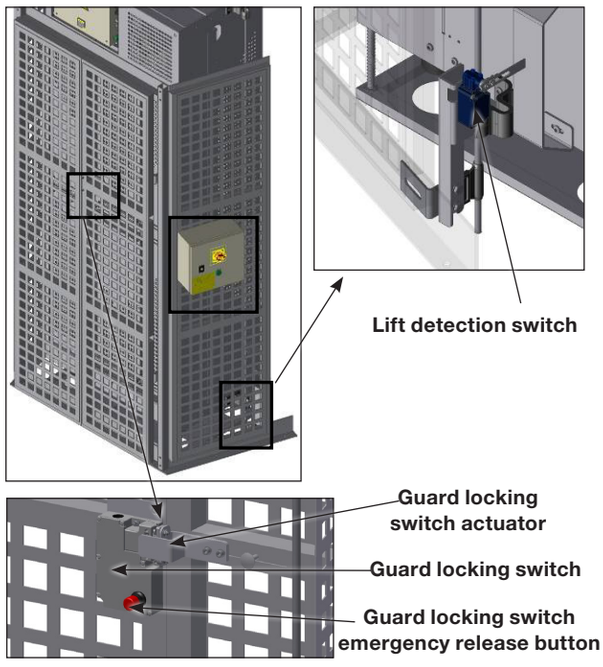


3.8.2 Guard locking system [1)]

The platform fence door is fitted with an interlock system keeping the door locked while the service lift is not at the platform. The door is unlocked when the service lift is at the platform with the lift detection switch activated. The green light is ON when the door is closed.

CE AECO

[1)]Note: An interlock system (trapped key or guard locking) is mandatory for CE versions if platform fences are equipped with doors. Optional for AECO version.

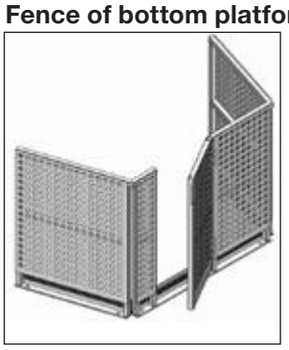


3.9 Fence system AECO version

CE AECO

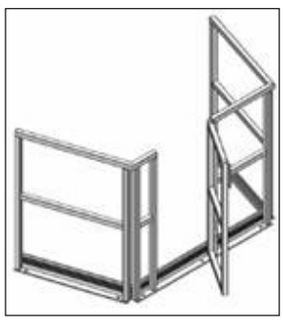
Fences are 1,1 m high, shall at least have a door with self closing / self latching system and conform to ASME 17.1.5.11. or one of the door interlock systems described before.

Fence of bottom platform



Fence of intermediate platform

Fence of top platform

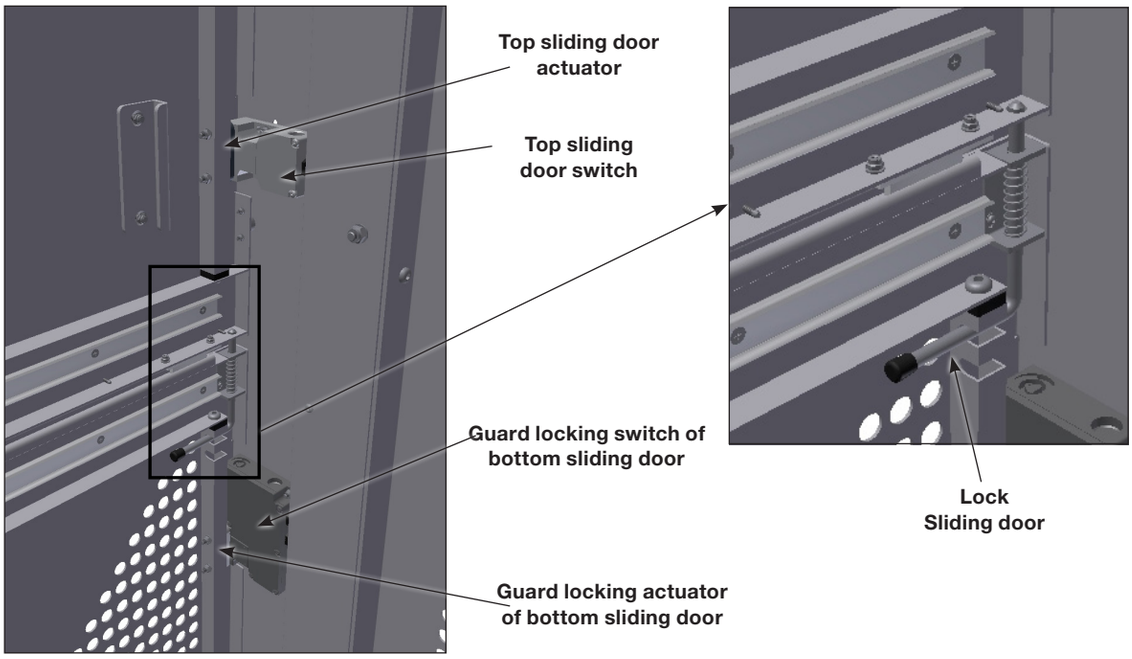


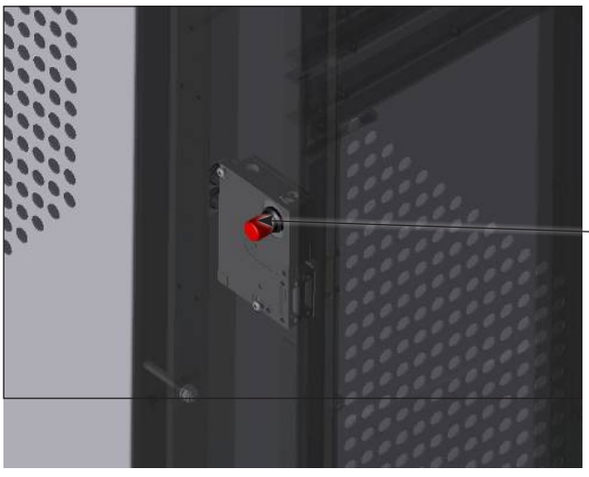
3.10 Service lift door

The top sliding door is closed by pushing the actuator into the door switch. The control will be interrupted if the door is not closed properly or opened while the lift is moving.

The bottom sliding door is closed by pushing the actuator into the guard locking switch. The guard locking switch is automatically unlocked when the cabin is located on the top or the bottom platform.
Optionally, the service lift can be equipped with a platform switch (S18), which allows the bottom sliding door to be opened when the service lift is levelled with a platform. This switch is triggered by the platform activation plates.

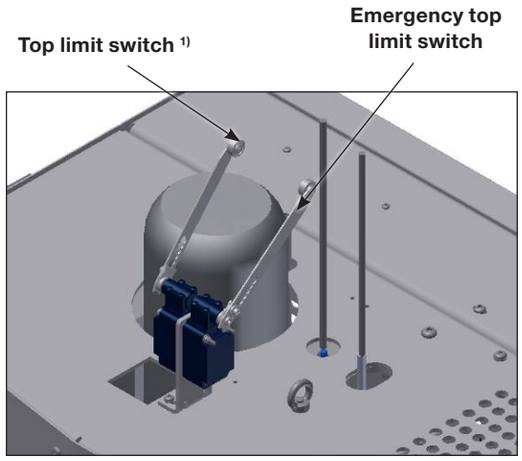
In case of power cut, need of evacuation between platforms or need to access intermediate platforms, the guard locking switch can be unlocked by pushing its emergency release red button. To reach the emergency release red button from inside the cabin the following actions are required:
- Remove the lock between the top and bottom sliding door by pushing it down
- Open the top sliding door
- Push the emergency release red button and open the bottom sliding door at the same time.





3.11 Emergency top limit switch

At the top of the cabin a top limit switch [1] will stop ascent when activated. Descent will still be possible. A top limit device activating the top stop switch is installed below the traction wire rope fastenings. Emergency top limit switch [1] interrupts the control if the top limit switch [1] fails. Manual descent is possible.



When the top limit switch [1] is engaged, press the DOWN button until the top limit switch [1] is released

Do not use the service lift until the top limit switch [1] fault has been rectified.

[1]Note: Top limit switch, or top obstruction switch if top obstruction device is supplied.

3.12 Top obstruction device [2]

The top obstruction device switch stops ascent if the service lift:

- encounters an obstacle
- touches the top limit device

Descent will be possible, for instance to remove the obstacle.

CE AECO

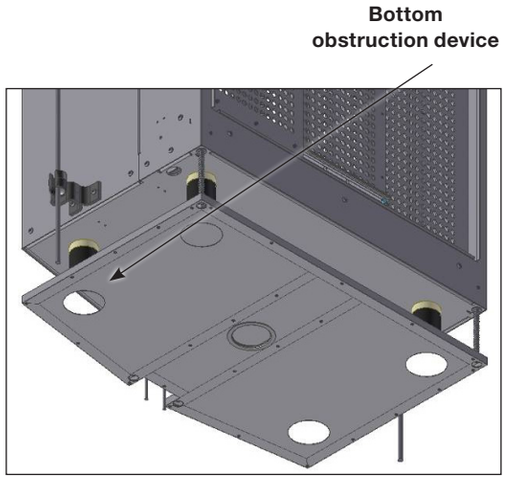
[2] Note: Optional for CE versions if platform fences are not railing type. Mandatory for CE versions if platform fences are railing type. Mandatory for AECO versions.

3.13 Bottom obstruction device

The bottom obstruction switch stops descent if the service lift:

- encounters an obstacle
- touches the ground

Ascent will be possible, for instance to remove the obstacle.
In order to put the service lift on the ground, the functionality of the Bottom obstruction device can be bypassed with the bottom obstruction override switch in the user control box. To do so, turn the bottom obstruction override switch while pressing the DOWN button.

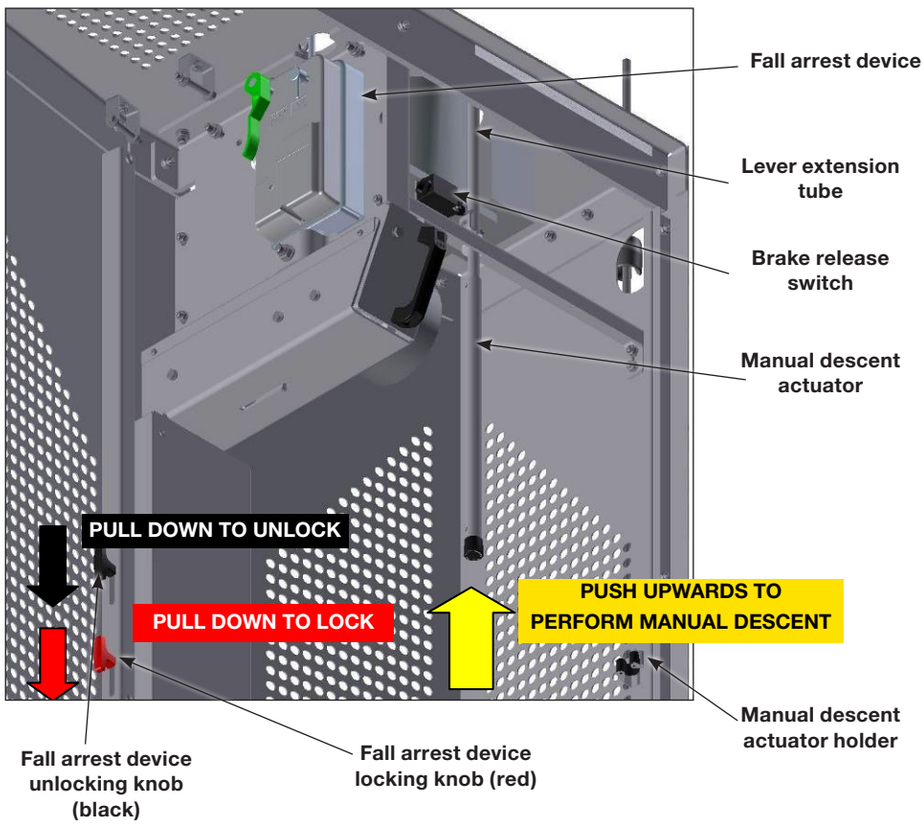


Release the DOWN button as soon as the rubber bumpers hit the floor. Otherwise the lift or the installation may get damaged.

3.14 Manual descent system

The service lift is provided with a lever allowing manual release of the electromagnetic motor brake. Once the motor brake is released, the service lift descends with a controlled speed limited by a centrifugal brake installed between the motor shaft and the gear box.

When the manual descent actuator is pushed upwards, the brake release switch is activated. The brake release switch will interrupt any control function. The manual descent buzzer will sound while the service lift descends.



3.15 Fall arrest device

The service lift is equipped with a fall arrest device which will be triggered in case of an overspeed condition. The speed of the safety wire rope passing through the device is continuously monitored, and the jaws are automatically closed in the event of sudden excessive speed.

This device protects the service lift against traction wire rope breakages or traction system failures.

The fall arrest device can also be engaged manually in an emergency by pulling downwards the red locking knob on the back of the lift, this will turn its emergency stop lever counter clockwise. To release the fall arrest device stop lever, the black unlocking knob on the back part of the lift has to be pulled downwards.

STOP

Tightness of safety wire rope must be frequently inspected to ensure full functionality of fall arrest device!

3.16 Overload limiter

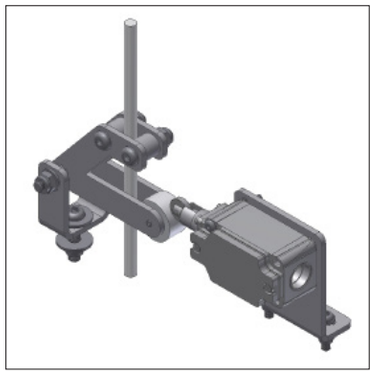
A lifting force limiter is built into the wire rope traction system and will prevent upward travel in the event of overload. In case of overload, the lift's upward travel will be blocked, and a buzzer will sound in the user control box. The buzzer will stop only when the cause of the overload has been removed.

- Reduce the load to below the overload limit.
- Lower the lift until it is free of the obstacle

and remove the obstacle before using the lift again

On entering and starting the lift, the buzzer may sound briefly. This is due to temporary load peaks occurring as the lift takes off. The control box is designed not to activate the buzzer or stop the lift because of peak loads caused by the cabin swinging.

Attempting to run an overloaded lift is prohibited!



3.17 Slack rope sensor [1)]

Installed on the top of the service lift, over the traction hoist, when engaged it interrupts descent. It detects slack traction wire rope.

3.18 Warning light [1)]

An optional set of warning lights can be mounted on the top and at the base of the lift. The flashes warn that the lift is moving.

3.19 Acoustic buzzer

An optional audible signal can be installed with the same warning function.

3.20 Anchor points

The service lift is equipped with two anchor points inside the cabin. During operation personnel shall hook themselves up to the anchor points inside the cabin. In case of need of evacuation, the evacuation procedure must be observed.
There is an optional external anchor point outside the cabin to facilitate the evacuation and rescue operations.

3.21 Internal light

The service lift is equipped with a light inside the cabin. The light is on when the lift is powered. Optionally [1)] this light can be battery packed in order to illuminate inside cabin without electric supply (once charged).

CE AECO

[1)]Note: Optional for CE versions. Mandatory for AECO version.

4. Installation

4.1 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.

4.2 Electrical connections

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

CE AECO

For CE versions: the electrical connection of the system must be made in accordance with EN 60204-1.

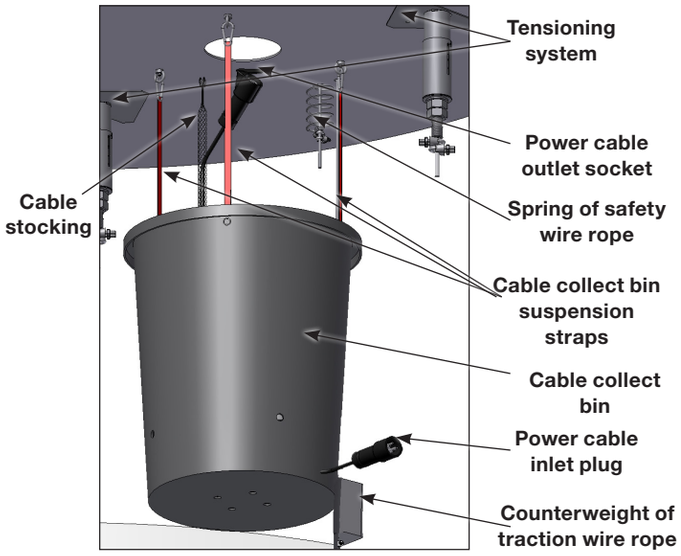
The power supply must be protected by a fuse and against indirect contacts according to local regulations. Verify that the rated grid and motor voltages are identical.

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

4.2.1 Power cable

4.2.1.1 Cable bin [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 cable outlet socket to the service lift inlet plug attaching the cable to the cabin with cable ties.

CE AECO

[1)]Note: Optional for CE versions. Not present for AECO version.

4.2.1.2 Travelling cable [2)]

If optional travelling cable is used instead of standard cable bin:
-Install the junction box on the first platform over mid tower's height.
-Cut the transport strips which hold the cable and connect the cable inlet to the junction box
-Uncoil the cable to the bottom platform.
-Connect the power cable outlet socket to the service lift inlet plug.

CE AECO

[2)]Note: Optional for CE versions. Not present for AECO version.

4.2.2 Guard locking system [3)]

- 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.

CE AECO

[3)]Note: An interlock system (trapped key or guard locking) is mandatory for CE versions if platform fences are equipped with doors. Optional for AECO version.

4.3 Guiding, traction and safety wire ropes

4.3.1 Top platform

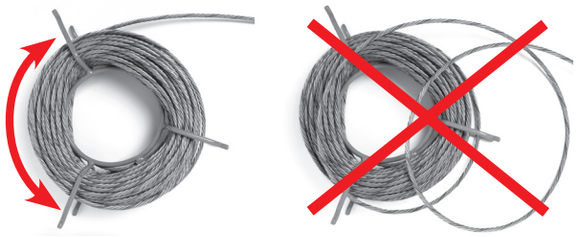
Guiding, traction and safety wire ropes are attached to the suspension beam on the available holes. To install them on the suspension beam:

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 [1] on the traction wire rope leaving at least 200 mm between top limit device [1] 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

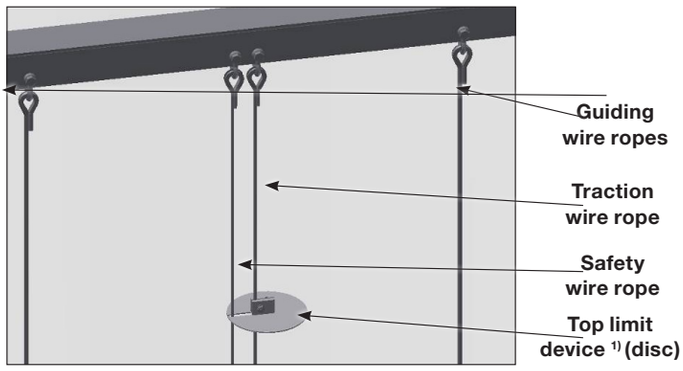
All wire ropes must be evenly uncoiled to prevent looping.

STOP

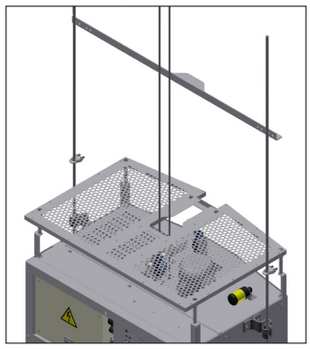
Do not pull wire rope over edges.



4.3.1.1 Top limit device [1] (disc)



4.3.1.2 Top limit device [1] (bar)



[1]Note: Top limit device (disc) is mandatory for CE versions if top obstruction device is not present. Top limit device (bar) is mandatory for CE versions if top obstruction device is present. Top limit device (bar) is mandatory for AECO version.

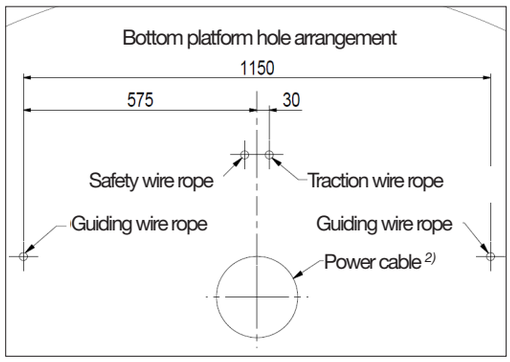
CE AECO

4.3.2 Bottom platform

4.3.2.1 Guiding wire ropes:

1) Feed the guiding wire ropes through the wireguides on the service lift and the holes in the platform
2) Fit the correct number of wire rope fixes on the wire rope and feed through the wire rope guides. The wire rope fixes are fitted during the first run
3) Pull the guiding wire rope through the platform and fasten it with the tensioning system
4) Pre-tighten the wire ropes using the tensioning system
5) Final tightening must be performed after the first run

a. Feed the wire ropes through the tensioning system
b. Attach the wire rope to the tensioning system using the wire rope grips and make a mark on the wire rope before starting tensioning.
c. After the first run tightens, tension the wire ropes to 4000 N (the wire rope stretches approximately 50 N/mm) using the supplied nut. Use the second nut to lock the assembly.



[2]Note: Power cable hole is only necessary when cable bin is installed.

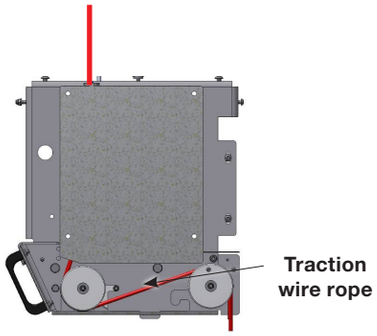
4.3.2.2 Traction wire rope

1) Open the maintenance cover on the back of the service lift.
2) Remove protection guard above rollers.
3) Feed the wire rope between the two bushings of the slack rope sensor [1].

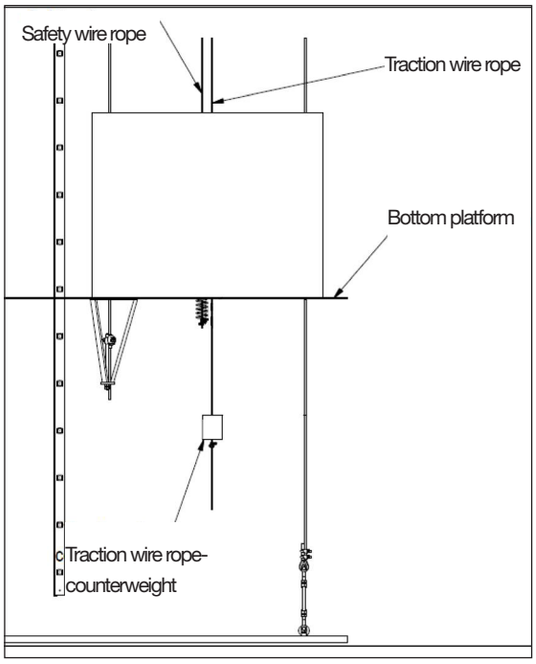
CE AECO

[1]Note: Optional for CE versions. Mandatory for AECO version.

4) Feed the wire rope through the roof into the traction hoist's wire rope inlet opening.
5) Push the UP button of the cabin control box and feed wire rope through until the traction hoist starts pulling. Ensure that the wire rope can exit without obstruction!
6) Continue feeding the wire rope around the pulleys to the back of the lift.

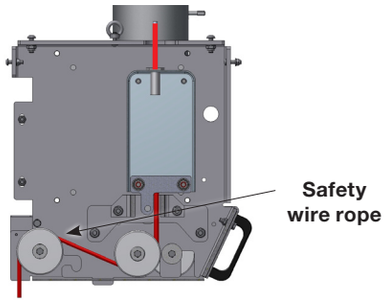


7) Feed the wire through the guide bushings (including pulley ones when using travelling cable).
8) Feed the wire rope through the platform holes.
9) Secure the 11 kg counterweight on the traction wire rope at least 600 mm below the bottom platform (See figure below). The remaining wire rope must be coiled and fastened with at least 3 strips. The counterweight and the excess of wire rope shall be able to rotate freely.



4.3.2.3 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 tothe 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) Feed the wire rope through the platform holes.
9) Feed the compression spring through the safety wire rope.
10) Pre-tension the safety wire by hand as much as possible before fastening the wire locks.
11) Cut the mounting strips that keep the spring compressed. This will apply a tension of approximately 40 kg to the safety wire rope.

4.3.2.4 Travelling cable [2] adjustment

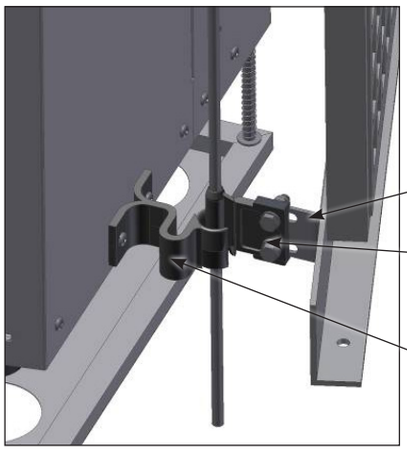
1. Guide the travelling cable through the travelling cable [2] pulley.
2. Connect the outlet socket of the travelling cable to the inlet plug of the service lift using a cable stocking. Attach the schacle to the eyebolt on the back of the service lift.
3. Attach the travellin cable [2] to the cabin by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

CE AECO

[2]Note: Optional for CE versions. Mandatory for AECO version.

4.4 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.



4.5 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.

4.6 Inspection before first use

AVANTI or qualified personnel authorised by AVANTI must carry out an inspection before first use following the “Appendix C: Inspection checklist”.

The inspection before first use must be recorded for future reference (filling in the “Appendix D: Operation log sheet”).

5. Instructions for use

5.1 Prohibited uses

The consequences of not following below prohibitions are extremely hazardous to the physical integrity of the users.

When using the service lift it is prohibited to:
- Use the service lift beyond its intended purpose.
- Operate the service lift without following the safety warnings and operating instructions.
- Overload the service lift
- Try to repair machine components. Only personnel from AVANTI or qualified personnel authorised by AVANTI are allowed to perform service on the machine.
- To use the ladder, unless service lift is out of service, or in case of evacuation or rescue.

- To manipulate switches and safeties.
- To place objects on service lift roof.
- To descend on service lift roof.

5.2 Operation from inside the cabin (manual)

1. Turn the main switch of the platform control box to the ON position
2. Enter the service lift and close the bottom / top fence door
3. Turn the trapped key switch ON
4. To go up or down, push and hold the UP or DOWN button as needed

5.3 Operation from outside the cabin (automatic)

Transportation of people is forbidden if the operation is controlled from outside the service lift.

Automatic function is only possible from top platform to bottom platform and vice versa.

5.3.1 Bottom platform

1. Turn the main switch ON of the platform control box.
2. Insert the trapped key inside the switch on the user control box and turn it ON
3. Close the service lift door
4. Close the bottom platform fence door
5. Press the UP button using the send tool

5.3.2 Top platform

1. Close the top fence door.
2. Insert the trapped key in the switch of the user control box and turn it ON
3. Close the service lift door
4. Press the DOWN button

In the event of traction wire rope breaks or traction hoist fails, evacuate the service lift.

5.4 Fall arrest device

If the fall arrest device engages simply disengage it by pulling downwards the black knob on the back of the lift until the fall arrest device is unlocked. However, this is not possible if the safety wire rope is under tension. If this is the case:
1. Remove the load on the safety wire rope by pushing the UP button ascending the service lift a few centimetres.
2. Manually open the fall arrest device by pulling downwards the black knob until the fall arrest device is unlocked.

In case of power failure and the fall arrest device is locked with the safety wire rope under tension evacuate the lift according to the evacuation procedure.

5.5 Manual descent

In case of power failure, a manual descent without power can be performed. To do so:
1. Verify that the fall arrest device is unlocked
2. Check that there are no obstacles or persons in the travel zone.
3. Take the manual descent actuator from its holder and insert it on the lever extension tube.
4. Push the manual descent actuator upwards. The service lift will start descent and a buzzer will sound.
5. To stop the manual descent, stop pushing upwards.

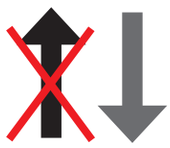
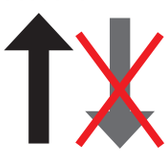
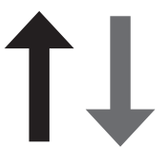
The safety wire rope and the attachment between the fall arrest device and the service lift are exposed to dynamic loads when a fall is prevented. When the service lift has returned to the bottom platform, test the fall arrest device functionality. Replace any defective fall arrest device components and return them for repair to AVANTI.

5.6 Troubleshooting

1. All tests and repairs to the electronic components should be performed by **authorised personnel only!** The wiring diagram is placed in the power cabinet.

2. Repairs to the traction hoist, the fall arrest device and to the system's supporting components should be performed by **qualified personnel only!**

Breakdown	Cause	Solution
The service lift will **neither go up nor down!**  **DANGER!** *Attempting to use the lift will jeopardize work safety*	**A1 The fixed EMERGENCY STOP button has been activated.**	Reset the button in question by pulling or turning it
	A2 Wire rope loop on traction hoist. Damaged or defective wire rope or wire rope outlet causes problems.	**Stop work immediately!** Ask the supplier or manufacturer for help.
	A3 The fall arrest device is holding the service lift on the safety wire. a) Lift wire rope breakage b) Hoist failure	a) + b) Evacuate the service lift
	A4 The service lift is stuck on an obstacle.	Carefully remove the obstacle. Test the operational safety of affected tower sections. Inform the supervisor.
	A5 Power failure a) Main switch is OFF b) Grid voltage interrupted c) Supply between grid connection and control interrupted	a) Turn the main switch ON b) Find the cause and wait for the power to return. c) Test and if necessary repair the supply cable, fuses, and/or wiring from the control box.
	A6 A safety switch is triggered: a) Emergency top limit switch is activated. b) Top and/or bottom sliding door is open. c) Manual descent switch is activated	a) Perform manual descent until the limit stop switch is released. b) Close the top and/or bottom sliding door. c) Adjust manual descent switch so that it is not involuntarily activated.
	A7 Protection switch on overheating a) A phase is missing b) Motor is not cooling c) Voltage too high/low	a) Test/repair fuses, supply and connection. b) Clean the motor cover. c) Measure voltage and power consumption on the loaded motor. If voltage deviates from specifications, use cable with increased dimensions.
	A8 Brake does not open (no click on on/off) a) Supply, braking coil or rectifier defective. b) Braking rotor closes.	a) Have an authorized person, repair/ replace the supply, braking coil and rectifier. b) Return traction hoist for repair.
	A9 If trapped key system is provided: the trapped key is not present or the trapped key switch is in the OFF position.	Insert the key and turn it to the ON position
	A10 If guard locking system of fences is provided: the guard locking switch and/or interlock control box is defective.	Test / Repair defective components.

Breakdown	Cause	Solution
	A11 The service lift is stuck on an obstacle below it.	a) Evacuate the service lift b) Inform the supervisor c) Check the Bottom obstruction device connection/function. Replace if necessary.
	A12 Service lift is overloaded (buzzer sounds). CE AECO *Not applicable to CE versions. Only applicable to AECO version.*	Test and/or reduce load until buzzer stops.
Service lift goes down but not up 	**B1 The service lift is stuck on an obstacle.**	Carefully move the service lift downwards and remove the obstacle. Test the operational safety of affected platform components. Inform the supervisor.
	B2 Service lift is overloaded (buzzer sounds). CE AECO *Only applicable to CE versions. Not applicable to AECO version.*	Test and possibly reduce load until buzzer stops.
	B3 Top limit switch [1]: a) Top limit switch [1] is defective or not connected. b) Top limit switch [1] is activated. *[1]Note: Top limit switch, or top obstruction switch if top obstruction device is supplied.*	a) Test the top limit switch [1] connection/function. Replace it if necessary. b) Descend the service lift until the top limit switch [1] is released.
	B4 A phase is missing	Test fuses and power supply.
	B5 Fault in UP control circuit	Test and possibly repair connections, wiring and relays.
Service lift can ascend but cannot descend. 	**C1 Slack rope sensor[1] is engaged** CE AECO *[1]Note: Optional for CE version. Mandatory for AECO version.*	Check the reason why it is engaged, possibly it's an obstacle under the service lift or the bottom obstruction device is not functioning properly.
Motor hums loudly or wire ropes squeak, but the lift can go both up and down. 	**D1 Wire ropes are dirty.** STOP *Further use of lift may result in damage to the traction wire rope.*	If possible, immediately replace the traction hoist and return it for test/repair at AVANTI.

Breakdown	Cause	Solution
Service lift will **go up but not down!** 	**D2 The service lift has encountered or is stuck on an obstacle.**	Carefully take the service lift up and remove the obstacle. Test the operational safety of affected platform components. Inform the supervisor.
	D3 The fall arrest device is holding the service lift on the wire rope. a) Excessive hoist speed b) Too low release speed on fall arrest device.	a) + b) Take the service lift upwards to relieve the safety wire rope. Open the fall arrest device by pressing the handle, and test its function. Functional test when the lift is back on the ground: Replace the hoist and fall arrest device and return them for testing. **DANGER!** *A defective fall arrest device will threaten the safety of the service lift! Replace immediately!*
	D4 Fault in down controller circuit	Insert brake lever into the traction hoist and lower lift manually. Test, and if necessary have connections, wiring, and relays repaired.
	D5 The slack rope sensor is holding the service lift on the traction wire rope.	a) The slack rope sensor has engaged: move the service lift upwards to disengage the device. b) The sensor is not properly installed: have a competent technician adjust the device correctly. c) The sensor is defective: replace it and return it for test/repair at AVANTI.
	D5 Bottom stop switch: **a) Bottom stop switch is defective or not connected.** **b) Bottom stop switch is activated.**	a) Test the bottom stop switch connection/ function. Replace if necessary. b) Descend service lift until bottom stop switch is released.
Button lamp not lit although operation is normal	**E The lamp is defective**	Have an authorised person replace it.
Service lift descends when UP button is pressed and ascends when DOWN button is pressed.	**F If a phase control relay is not provided: two phases changed in the supply**	Have an authorised person switch the 2 phases in the plug.

If these steps do not identify the cause and rectify the fault:
Consult a qualified authorised person or contact the manufacturer.

5.7 Out of service

1. **Securing the service lift:**
   Bring the service lift all the way down, until the bottom stop switch stops the cabin.
2. **Turn off the main switch to prevent inadvertent operation of the lift:**
   Turn the main switch to the OFF position – power supply is now interrupted. Mark the lift "OUT OF SERVICE" and padlock as necessary. Contact the service technician for repair.

6. Maintenance

6.1 Planning

Time (Performance)	Component
Daily (User)	Operating area and service lift visual inspection Service lift controls and safety devices
Annually (Expert)	Wire ropes Electrical cable
Annually (Expert)	Entire system
Annually, at least every 250 hours of operation (Expert)	Traction hoist
Annually (Expert)	Fall arrest device

6.2 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 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.
- Use a cable grip when replacing travelling cable.
- Keep cabin doors closed when using a 3-step ladder.

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

6.3 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 cabin 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 Activate the fall arrest device by pulling down the red locking knob. Press the DOWN button of the User control box. The service lift should not move down. Press the Up button of the User control box. The service lift should ascend. Unlock the fall arrest device by pulling down the black unlocking knob.
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 [1)]: activate top stop by pressing it down. The service lift should not ascend until top obstruction device is released.
3.9 Slack rope sensor[1)]: Activate the slack rope sensor by manually pulling the traction wire rope upwards. Descent should not be possible.

CE AECO

[1)]Note: Optional for CE versions. Mandatory for AECO version.

4. When the lift is at the top platform, check the wire rope fastenings.
5. Record the hour meter reading in the "Appendix D: Operation log sheet".

STOP

If any faults occur during work,
- stop working,
- if required secure the workplace and
- rectify the fault!

STOP

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 at the bottom platform and top platform. It shall be checked as follows:
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.

6.4 Annual inspection

Have the entire system tested by an AVANTI trained expert 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 overhauled at AVANTI workshops and furnished with new certificate for every 250 hours of operation. Hour counter is found in the main control box.

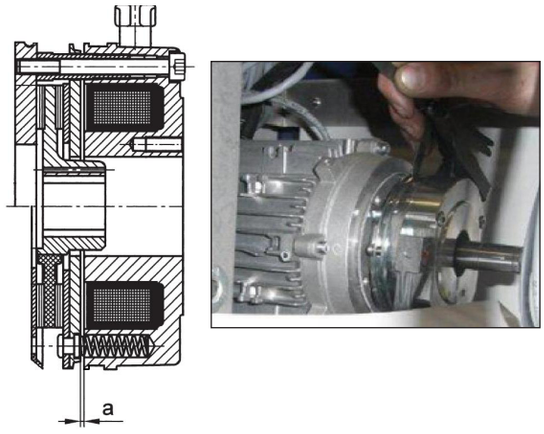
If fall arrest device has engaged, an expert must verify the safety of the fall arrest device, the wire rope, and wire rope fastenings.

The tower owner must ensure that the results of all annual and extraordinary inspections are logged in the "Appendix D: Operation log sheet".

6.4.1 Cabin
Inspect the cabin structure, joints, attachments and accessories.

6.4.2 Traction hoist
The traction hoist is largely maintenance free. Clean only when very dirty. During cleaning always ensure sufficient air supply.

Annual test (only by authorized persons):
a) Ensure that no visual defects have appeared.
b) Check that air gap "a" between brake and disc is 0.3 mm using a thickness gauge.



c) Test manual descent function.
d) Test speed and current should match the service lift data plate.
e) Check that sound and behaviour are normal.

6.4.3 Fall arrest device

The fall arrest device is largely maintenance free. Clean only when very dirty. Keep free from dirt and lubricate often. Using too much oil will not harm the equipment or the gripping function.

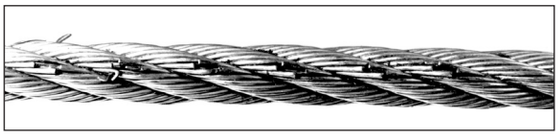
Annual test (only by authorized persons):
a) Test the fall arrest device stop lever by pulling down the red locking knob.
b) Test the fall arrest device stop lever reset, by pulling down the black unlocking knob.
c) Release safety wire rope bottom attachment in the tower and pull the safety wire rope with a jerk. The overspeed device should trigger the fall arrest device automatically.
d) Ensure that no visual defects have appeared

6.4.4 Wire ropes

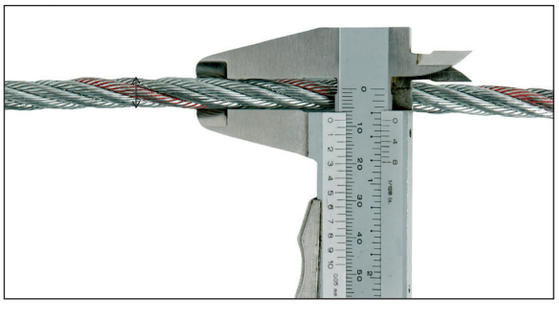
Always keep the wire ropes clean and slightly greasy. Wire ropes must be greased regularly with standard multipurpose grease. Greases containing disulphide must not be used.

Annual inspection:

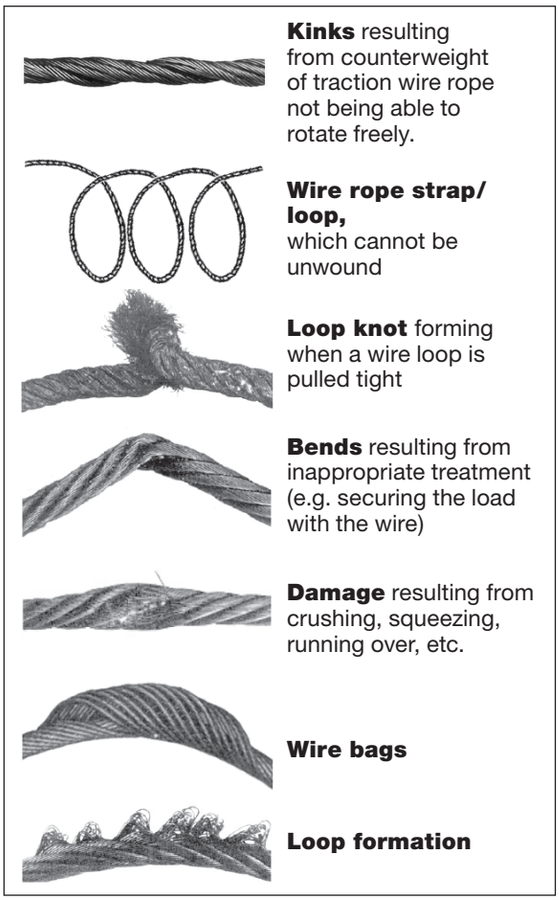
a) Check and replace the respective wire rope(s) if one of the following defects are found:
- 8 wire strand breaks or more on a wire length corresponding to 30 times the wire rope diameter.



- Severe corrosion on the surface or inside.
- Heat damage, evident by the wire colour.
- Reduction of the wire diameter by 5% or more compared to the nominal wire diameter.



- Damage on the wire rope surface. See figures below for common examples of wire rope damage.



These examples do not, however, replace the relevant provisions of ISO 4309, and of A17.6-2010!

b) Check and ensure that all wire ropes are mounted at the top and ground level as specified in this manual

c) Check the guiding wire rope tensioning system is correctly installed and the wire rope fixes are properly fastened.

CE AECO

On AECO version 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, corresponding with the refurbishment of the traction hoist.

6.4.5 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: M500 / M508
- Specification: MSHC 632 VG320

Each oil has to be verified by AVANTI.

6.4.6 Overload check and adjustment

Annual test:
Test switches and perform overload test as specified in the “Appendix A: Regulation of overload limiter”.

6.5 Information signs and documents

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

6.6 Ordering spare parts

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

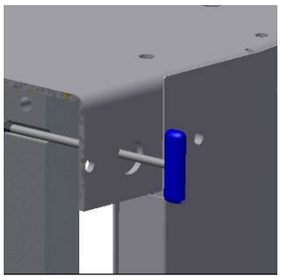
Appendix A: Regulation of overload limiter

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

Avoid injury by strictly following the instructions!

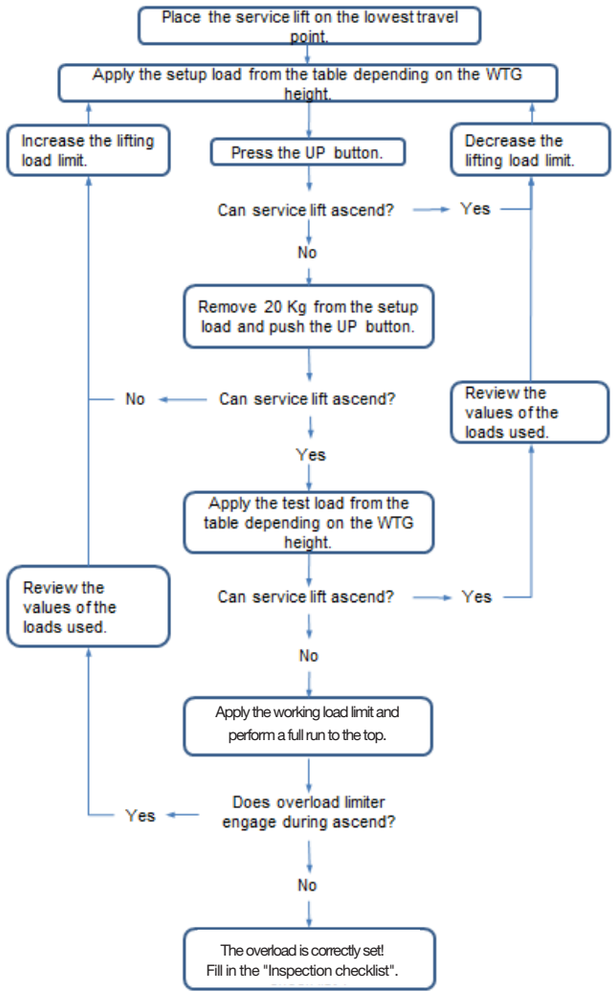
Required tools/material:
- Security Torx 40.
- Test weights for applying the test load.

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.

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



Service Lift travel distance	Dolphin CE & AECO		Dolphin CE 350	
	Setup	Test	Setup	Test
51 to 60 m	295	355	405	475
60 to 70 m	300	360	410	480
71 to 80 m	305	365	415	485
81 to 90 m	310	370	420	490
91 to 100 m	315	375	425	495
101 to 110 m	320	380	430	500
111 to 120 m	325	385	435	505
121 to 130 m	330	390	440	510
131 to 140 m	335	395	445	515
141 to 150 m	340	400	450	520

Appendix B: Safety measures

General: Only use service lift if you have received instructions in operating the service lift in all predictable situations. These instructions can only be given by a person with the proper knowledge e.g. Avanti Trainer or Trainer approved by AVANTI.
If service lift stops and manual emergency cannot be performed, follow evacuation procedure.

Operating the service lift: Wear your PPE at all times (safety helmet, full body harness, shock absorber, lanyard and runner fitting the fall protection system on the ladder).

Evacuation of personnel from the service lift is only necessary in extreme situations.
If necessary AVANTI recommends the following procedures:

1. Confirm that your shock-absorbing lanyard is attached to the yellow anchor point of the cabin (one user per anchor point) and open the service lift door (see Fig. 1).

Note: if external anchor point is installed, attach your second shock-absorbing lanyard to the external anchor point and then release your first shock-absorbing lanyard.

2. Attach your second shock-absorbing lanyard to the ladder anchor point. If ladder anchor point is not reachable, attach your shock-absorbing lanyard to the ladder stile.

3. Step onto the ladder and release your first shock-absorbing lanyard from the cabin.

4. Climb round the ladder to its climbing side.

5. Attach your fall protection system (slider) to the safety line of the ladder (see Fig. 3).secure yourself to the ladder with your positioning lanyard (see Fig. 2).

6. Release your shock-absorbing lanyard from the ladder.

7. Climb down the ladder (see Fig. 4).


Fig. 1


Fig. 2


Fig. 3


Fig. 4

Rescue of lift from the ladder is only necessary in extreme situations.
If necessary AVANTI recommends the following procedures:

1. Climb up the ladder and position yourself at the same level as the service lift.

2. Attach your first shock-absorbing lanyard to the ladder anchor point. If ladder anchor point is not reachable, attach your shock-absorbing lanyard to the ladder stile (see Fig. 5).

3. Release your fall protection system (slider) from the safety line of the ladder (see Fig. 6).

4. Climb round the ladder to the opposite side of the ladder.

5. Open the service lift door and attach your second shock-absorbing lanyard to the yellow anchor point of the cabin (one user per anchor) (see Fig. 7).

6. Step into the cabin and release your first shock-absorbing lanyard from the ladder.


Fig. 5


Fig. 6


Fig. 7

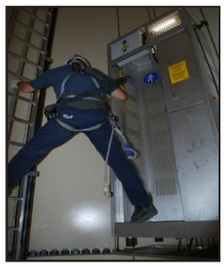


Fig. 8

Appendix C: Inspection Checklist

Date:		**Serial nº traction system:**	
Name of competent:		**Serial nº fall arrest device:**	
Lift nº:		**Tower nº:**	
Total hours of operation:		**Address of installation:**	

1	OVERALL	OK	Not OK	ISSUE DESCRIPTION
1.1	Cabin is free of damage.			
1.2	Top and bottom obstruction devices are free of damage.			
1.3	Traction and safety wire rope ropes are correctly fed and guided.			
1.4	Record the hour meter reading on the "Operation log sheet".			
2	**TRAVEL ZONE**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
2.1	Travel zone is clear of obstacles.			
3	**CONTROL & SAFETY DEVICES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
3.1	User control box is free of damage.			
3.2	All internal buttons of user control box are fully functional.			
3.3	All external buttons of user control box are fully functional (send function).			
3.4	Bottom obstruction override switch of control box is fully functional.			
3.5	The ready lamp (green) functions properly.			
3.6	The platform indicator (green) functions properly.			
3.7	All emergency stop buttons function properly.			
3.8	Bottom obstruction switch sits and functions properly.			
3.9	Emergency bottom obstruction breaker functions properly.			
3.10	Top obstruction switch sits and functions properly.			
3.11	The emergency top limit switch functions properly and is properly adjusted at top and bottom platforms.			
3.12	Slack rope sensor is fully functional.			
4	**CABIN**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
4.1	Cabin is free of damage and properly assembled.			
4.2	Cabin is clean and in overall good condition.			
4.3	All screws assembling the cabin are mounted and tightened.			
4.4	Bottom obstruction device is free of damage, properly installed and fully functional (it compresses and decompresses properly).			
4.5	Top obstruction device is free of damage, properly installed and fully functional (it compresses and decompresses properly).			
4.6	Anchor points are free of damage (without cracks, dents and have no permanent deformation) and properly tightened.			
5	**GUIDING SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
5.1	Wire rope guides are free of damage and are properly mounted and tightened.			
5.2	Wire rope fixes are mounted at a correct distance at platform openings.			
5.3	Each platform opening is mounted with 2 wire rope fixes.			
5.4	All wire rope fixes are free of damage (normal shape and without cracks).			
5.5	Bolts of wire rope fixes are properly tightened.			
6	**DOOR**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
6.1	Door is properly mounted and tightened.			
6.2	Main service lift door is fully functional (opens and closes properly).			
6.3	Main service lift door guard locking is fully functional (locks and unlocks properly).			
6.4	Main service lift door guard locking is properly mounted and tightened.			
6.5	The emergency manual release button is fully functional.			
7	**ELECTRICAL SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
7.1	All electrical cables are free of damage (specially isolation).			
7.2	Electric cables are properly layed and fixed with necessary cable ties.			
7.3	Sealing of control boxes is in order.			
7.4	Internal light illuminates properly with and without power supply (emergency function).			
7.5	Warnings lights function properly.			
7.6	Cable collect bin is in proper condition and mounted according to the manual.			
7.7	Cable opening of bottom platform floor is properly mounted with a rubber edge protection profile.			
7.8	Travelling cable pulley is in proper condition and mounted according to the manual.			
7.9	Cable stockings are properly mounted (cables not loaded at the cable plug).			
7.10	The flat travelling cable is free of damages.			
7.11	The roung electrical cable is free of damages.			
7.12	The electrical plugs are correctly connected and free of damages.			
7.13	The mid tower electric cable support is properly installed and tightened.			
7.14	Mid tower junction box is free of damages.			
8	**TRACTION HOIST**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
8.1	Clean only when very dirty ensuring sufficient air supply.			

8.2	If hour counter reads 250 h since last overhaul, overhaul device at AVANTI workshop and furnish with new certificate.			
8.3	Current matches figure of service lift data plate.			
8.4	All fixing screws and bolts are present and properly tightened.			
8.5	Electromagnetic motor brake: check that air gap between brake and disc is 0.3 mm.			
8.6	There are no signs of “Teflon® snow/dust” beneath the pulleys.			
8.7	Wire rope pulleys are free of damage (no abnormal deformation or wear).			
8.8	There is no trace of oil leak around motor and gearbox.			
8.9	Traction hoist is free of damage (no dents, cracks or similar).			
8.10	The manual descent system functions properly.			
8.11	Manual descent actuator is present and is properly stored.			
8.12	Traction hoist sounds normal during travel.			
9	**FALL ARREST DEVICE**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
9.1	Fall arrest device: no visual defects have appeared.			
9.2	Clean only when very dirty ensuring sufficient air supply.			
9.3	If hour counter reads 250 h since last overhaul, overhaul device at AVANTI workshop and furnish with new certificate.			
9.4	It is well lubricated: using too much oil will not harm the equipment or the gripping function.			
9.5	Fall arrest device engages when performing overspeed "hand test"(safety wire rope is pulled by hand from first platform).			
9.6	The red locking knob engages fall arrest device when pulled down.			
9.7	Power supply is cut off when fall arrest device is engaged.			
9.8	The black unlocking knob releases fall arrest device when pulled down.			
10	**OVERLOAD LIMITER**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
10.1	Perform overload test according to manual.			
10.2	Adjust rated load of overload limiter according to manual.			
10.3	Perform test run with maximum capacity from bottom to top platform.			
11	**TRACTION AND SAFETY WIRE ROPES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
11.1	They are clean and slightly greasy with a standard multipurpose grease free of disulphide.			
11.2	There are no 8 wire strand breaks or more on a wire rope length corresponding to 30 times the wire rope diameter.			
11.3	There is no severe corrosion on the surface or the inside.			
11.4	There is no heat damage, evident by the wire rope colour.			
11.5	There is no reduction of wire rope diameter by 5% or more compared to nominal wire rope diameter.			
11.6	Wire ropes are free of damages described in common damages on wire ropes.			
12	**WIRE ROPES AT BOTTOM PLATFORM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
12.1	Safety wire rope is properly mounted with a spring according to specific type manual.			
12.2	Safety wire rope is provided with 2 properly tightened wire rope locks.			
12.3	Traction wire rope is mounted with an 11kg counterweight.			
12.4	Traction wire rope is provided with 2 properly tightened wire rope locks beneath the counter weight.			
12.5	Traction wire rope coil and counterweight are free to rotate.			
12.6	Traction and safety wire ropes are properly coiled up and fixed with 3 cable ties each.			
13	**WIRE ROPES AT TOP BEAM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
13.1	Top beam is properly mounted; and properly tightened to WTG, or if welded, its welding is in good condition.			
13.2	Each wire rope is properly mounted with a shackle, a nut and a bolt locked with a cotter pin.			
13.3	Top limit device is properly positioned and tightened.			
14	**TRAPPED KEY SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
14.1	Trapped key is properly secured to the cabin with a chain or wire rope.			
14.2	The trapped key lock is properly tightened to the platform fence and fully functional.			
14.3	Trapped key switch of service lift is fully functional.			
15	**GUARD LOCKING SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
15.1	Interlock control box is properly tightened and functions properly (including main disconnect switch).			
15.2	Interlock detection switch of platform fence is properly adjusted and tightened.			
16	**PLATFORMS**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
16.1	Cabin passes freely through all platform openings.			
16.2	Fences of each platform fulfil specifications for proper mounting.			
16.3	Screws and bolts are properly tightened.			
17	**INFORMATION SIGNS AND DOCUMENTS**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
17.1	Verify that all information signs and documents are available and legible.			
18	**FINAL ASSESSMENT**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
18.1	Service lift is in overall good operational condition.			Name of competent(s) in capital letters:
				Signature of competent(s):

Competent inspection may only be performed by AVANTI or competent person certified by AVANTI.

Every 12 months competent inspection has to be carried out, and the Inspection checklist and Operation log sheet must be completed for possible future reference.

Appendix D: Operation Log Sheet

DATE/TIME	DAILY INSPECTION CHECK		SIGN	HOUR COUNTER	COMMENTS
	OK	NOT OK			

Appendix E: AVANTI lift anchor

E.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.

E.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.

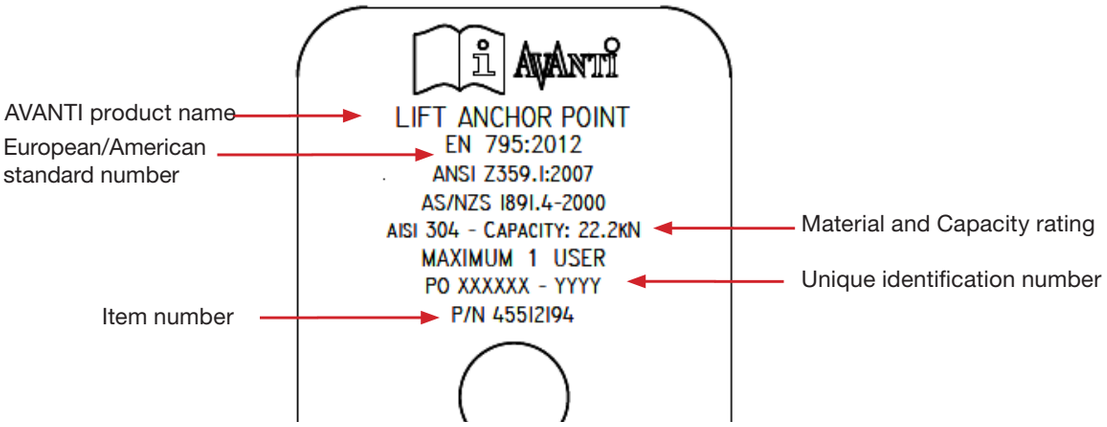
Only to be used for preventing vertical fall!

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.

E.3 Marking

Marking on Lift Anchor plate:



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

E.4 Installation

The installation must be performed by a competent person 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:

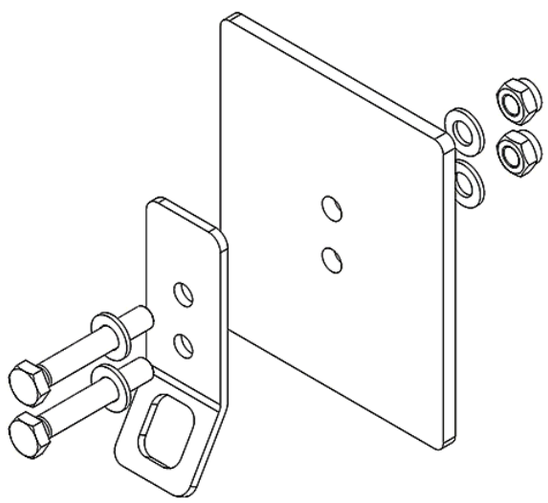
1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.

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”.



E.5 Inspection

After installation:
An inspection must be carried out by a competent person 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 competent person following the inspection form in this manual.

For the AVANTI LIFT ANCHOR the competent person (authorized in writing by AVANTI) only needs to be trained in any metallic component covered by the European/American standard norms for fall arrest equipment.

E.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	Needs Repair	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.

E.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**

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