Original instructions

AVANTI SERVICE LIFT

User's, Maintenance and Installation Manual

Model Service Lift SWP

CE
AECO

CE AECO

CE certificate for SWP L & XL :

CERTIFICATE

EC Type Examination

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

Number of registration: 01/205/0711C/14

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

AVANTI WIND SYSTEMS A/S
Rønnevangs Allé 6
DK- 3400 Hillerød
Denmark

the close conformity of the product

Service lift inside wind turbine systems

Technical data:

Type:	SWP L	SWP XL
- max. load capacity:	240 kg / 2 persons	320 kg / 3 persons
- traction hoist:	M508	M508
- safety gear:	ASL508	ASL508
- speed:	18 m/min	18 m/min
- net weight:	165 kg	200 kg
- cabin doors:	Roller-door	Sliding-door
- max. travelling height:	135 m	120 m
- tension beam:	IPE 140 max. length 1.783 m	IPE 220 max. length 2.498 m
- optional:	- Cabin external send function - Wind turbine platform send / call function - high (2.4 m) and low (1.1 m) fences	

Modification B to the certificate 01/205/0711A/12 from 2012-10-28 - New lift model with a lift capacity of 320 kg
Modification C to the certificate 01/205/0711B/12 from 2013-07-04 - Change the type identification SWP to SWP L

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.: 14_006-1 from 2014-02-14 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Zaragoza, Spain and after examined the documents.

This certificate is valid until 2019-02-17

TÜVRheinland® 0035 Notified Body

Certification body
Notified under No. 0035
certifier

Cologne, 2014-02-17

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TÜVRheinland®
Precisely Right.

AECO certificate for SWP L :

UL LLC

Presents this

AECO CERTIFICATE

Certificate Number: **20160319478734600 2**

Date: 2016-03-19
To

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

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

Turbine Service Lift
(See addendum for details)

Effective from: March 19, 2016 Until March 19, 2019

Andrew Eng
Issued by: Andrew Eng
AECO Certification Services

Reviewed by: Daniel Posner
AECO Certification Services

WN Bartunek
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:
5th Edition: February 2015
Revision 9: 27/03/2018

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

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Ed.Rev	Notes
05.09	Section 2.1 re-worded. Added section 2.4 Terms and definitions. Updated inspection and maintenance planning in section 6. Updated sections 6.4.1 Traction hoist and 6.4.2. Fall arrest device. Updated Appendix D. Other minor changes.

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 prior notice.

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

2.2 Symbols

Symbol	Signal word	Meaning	Possible injury if not observed
Safety instructions			
	**DANGER!**	IMMEDIATE or possibly imminent danger:	Death or severe injury!
	**DANGER!**	IMMEDIATE or possibly imminent danger of hazardous voltage:	Death or severe injury!
	**CAUTION!**	Potentially hazardous situation:	Light injury or material damage.
Additional instructions			
	**ATTENTION!**	Potentially dangerous situation:	Damage to equipment or workplace
	**IMPORTANT!**	Useful tips for optimum working procedure	None
	**VERSION!**	Differentiation between CE versions and AECO version.	
		Reference to written specification/documentation	

2.3 Cautions

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

Installation and maintenance of the service lift shall only be performed by certified technicians.
Personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this Service Manual.
Personnel shall wear PFPE (safety helmet, full body harness, shock absorber, lanyard and slider) at all times, when using the lift.

A copy of the Service Manual must be handed out to the personnel involved and must always be available for reference.
If more than one person is entrusted with service tasks, the employer shall appoint a supervisor in charge of the operation.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!
If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

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

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by AVANTI or certified technicians.
Only original fault-free parts may be used.
Use of non-original parts will render the manufacturer's warranty void and any type approval invalid.

No modification, extension or reconstruction of the service lift is allowed without AVANTI's prior written consent.

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

Service lift must be inspected by AVANTI or by certified technician before first use.
Service lift must be inspected at least once a year by AVANTI or certified technicians. 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.
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 weath- er, including wind speeds over 25 m/s (55.5 mph), , electric storms, hurricanes, temperature out of lift's operating range (-25°C to +60°C), and any other that jeopardize safe operation.

AECO service lift personnel shall be equipped with a wired or wireless two way communication device connected to a location staffed by personnel authorised by AVANTI.

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 gone through the relevant training associated with the scheduled task from Avanti or from a certified trainer and is in possession of a valid (non expired) certificate for the task.
User	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.
Manual descent	Action performed to descend the lift at a controlled speed without power supply by manually opening the hoist electromagnetic brake. (Also manual no-power descent)

3. Description

3.1 Purpose

The service lift described in this User's Manual serves the following purposes:
- Transportation of staff and material inside wind turbine systems, lattice towers for wind turbines, and telecommunication towers.
- Transportation for mounting, inspection and repairs.

The service lift may be used to transport two persons plus their tools and equipment to the most convenient height for performing work on the tower.

The service lift is designed for permanent installation in one specific tower.

3.2 Scope

The system consists of a service lift, its guiding system along the tower, its traction and safety wire ropes made in steel, power supply system and the protective fences at landings including their interlock system [1)]. The system details are described along this manual.
The service lift consists of a cabin made in aluminium, a traction system, a fall arrest device, a control system and safety devices.
The guiding system consists of a set of guiding wire ropes made in steel, the attachments to the tower and the guides of the car.
The protective fences consist of aluminium structures covered with perforated sheet of different geometries depending on the landings where they are installed.
They shall comply with the relevant regulations which may include EN14122-3, OSHA 1926.502
Maximum evacuation distance from the point of emergency exit to the accessible means of evacuation shall be no more than 1,1 m.
The system as whole meets the essential health and safety requirements as required by the European Machinery directive 2006/42, as well as ASME A17.7-2007/CSA B44.7-07.
There are two versions: L and XL, which mainly differ in size and lifting capacity.

[1)]Note: Interlock system is an optional feature for AECO version.

3.3 Exclusions

The lift is not designed for use
- in silos,
- at drilling sites,
- as a permanently installed facade lift,
- as a crane lift,
- in environments with explosion hazards.

3.4 Technical specifications

Operating temperature:
-25°C to +60°C (-13°F to +140°F).
Survival temperature:
-40°C to +80°C (-40°F to +176°F)

Low temperature kit is also available:
Operating temperature:
-30°C to +40°C (-22°F to +104°F).
Survival temperature:
-40°C to +60°C (-40°F to +140°F).

Lifting capacity: SWP L 240 kg (max 2 persons) and SWP XL 320 kg (max 3 persons).

Weight of lift: SWP L 165 kg and SWP XL 200 kg.

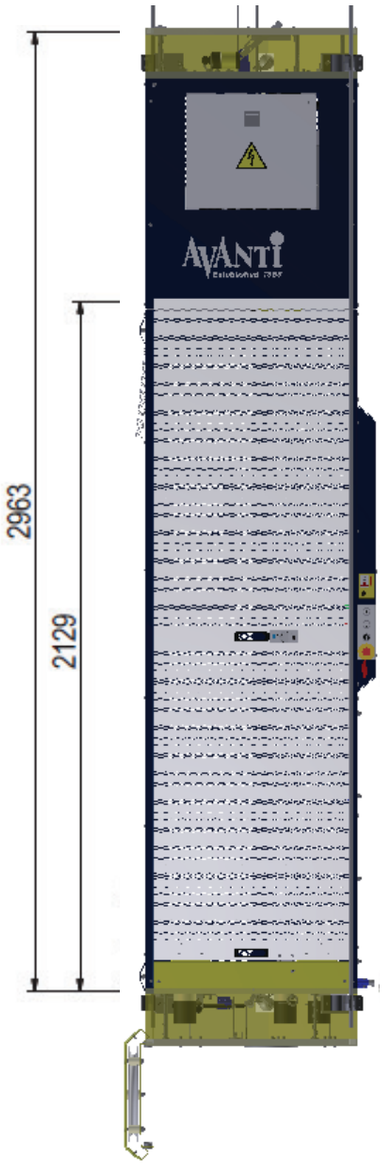
Weight of the power supply cable:
send/call configuration 0.5 kg/m
and send only 0.2 kg/m

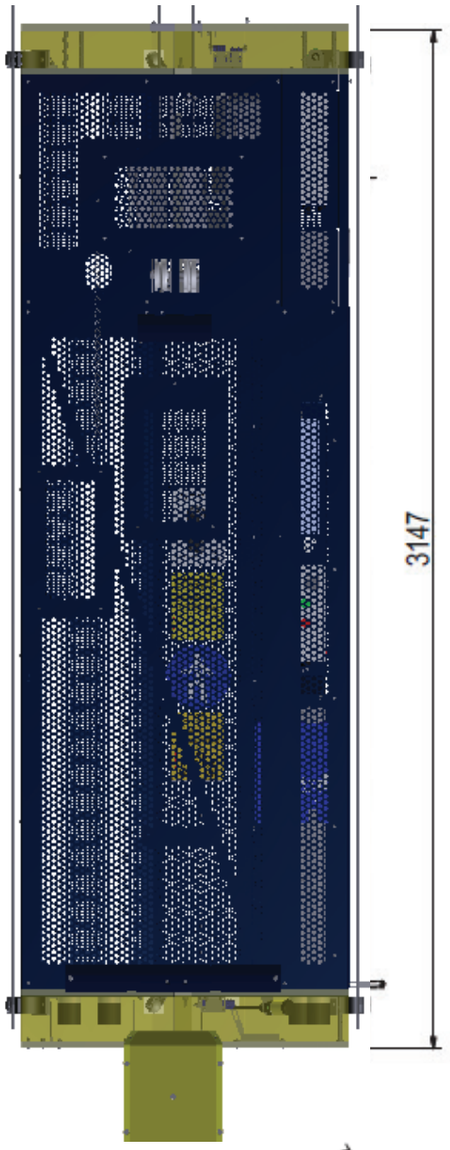
Door opening: 600 mm

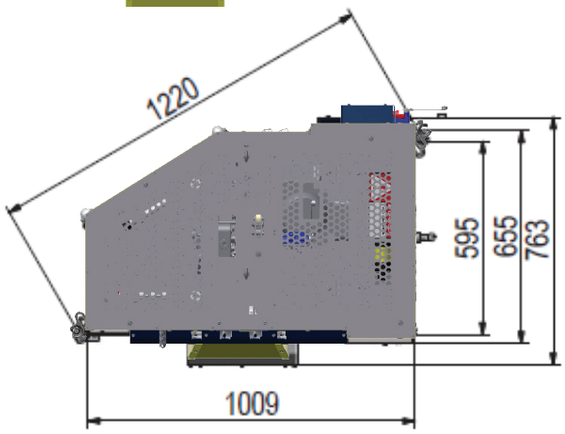
The maximum noise level of the service lift is 80 dB(A).

3.5 Dimensions

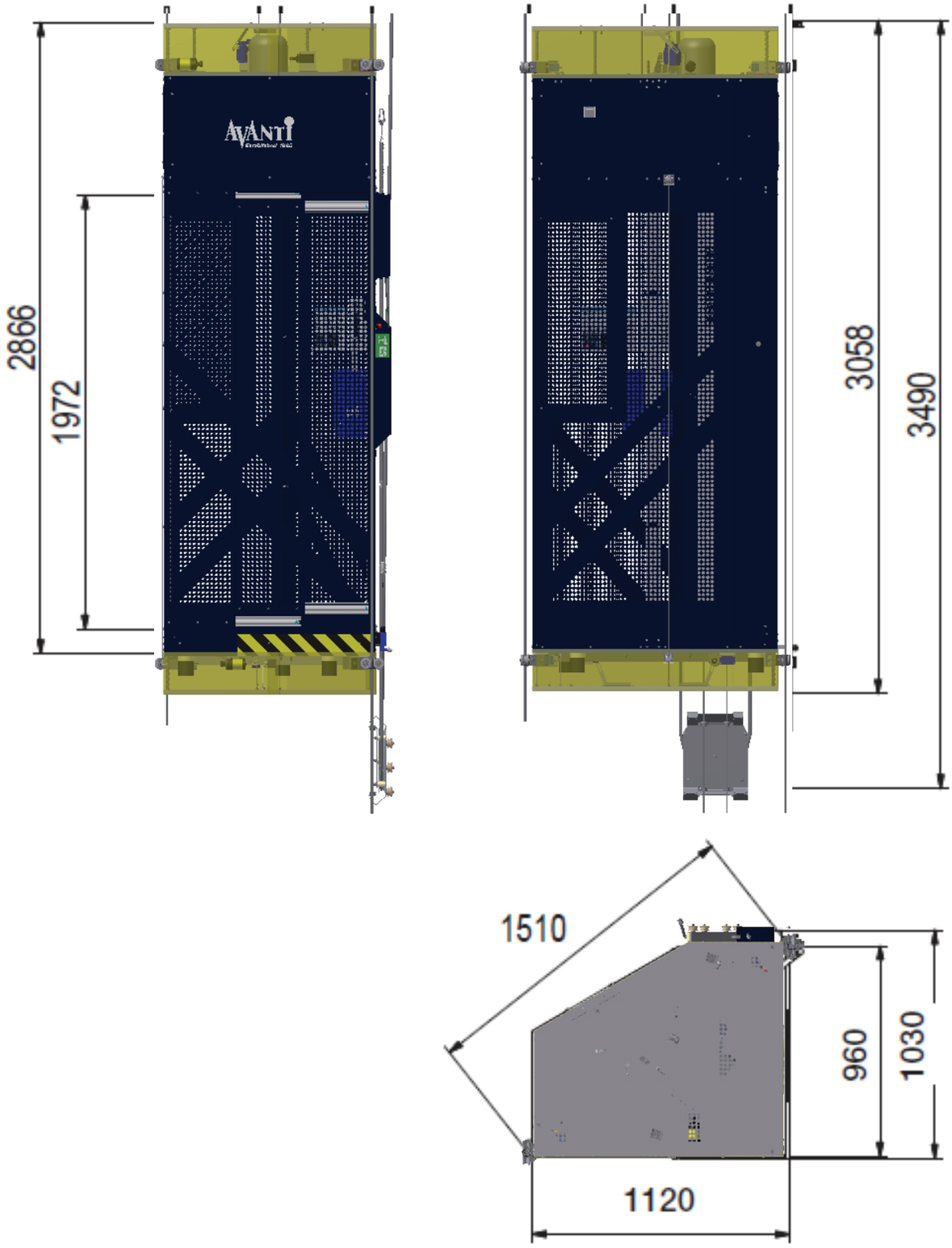
3.5.1 Dimensions of SWP L





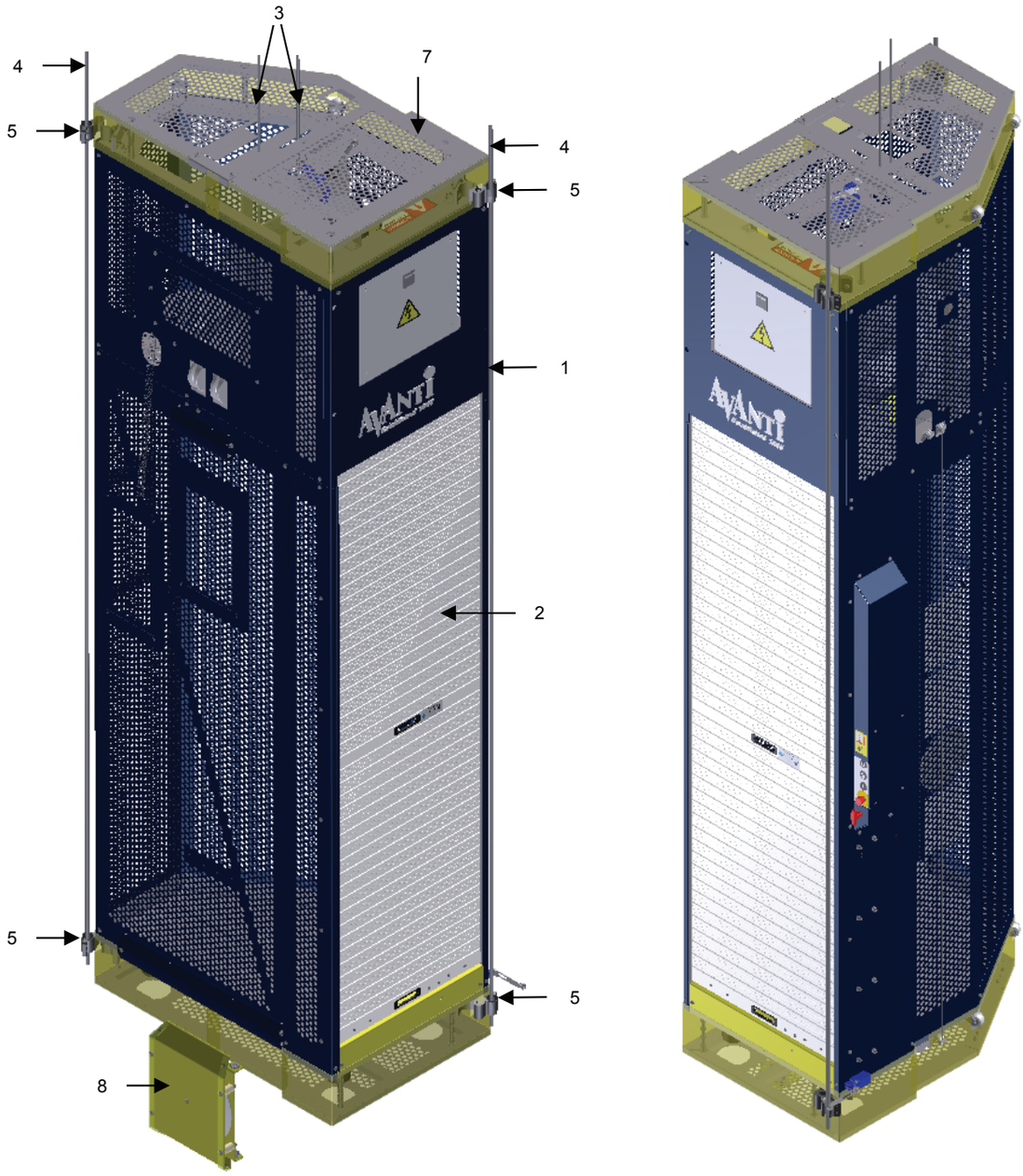


3.5.2 Dimensions of SWP XL



3.6 Components

3.6.1 Components of SWP L



1 Cabin
2 Door
3 Traction and safety wire ropes
4 Guiding wire rope
5 Wire rope guides
6 Bottom obstruction device
7 Top obstruction device / AECO top obstruction device
8 Traveling cable pulley [1)]

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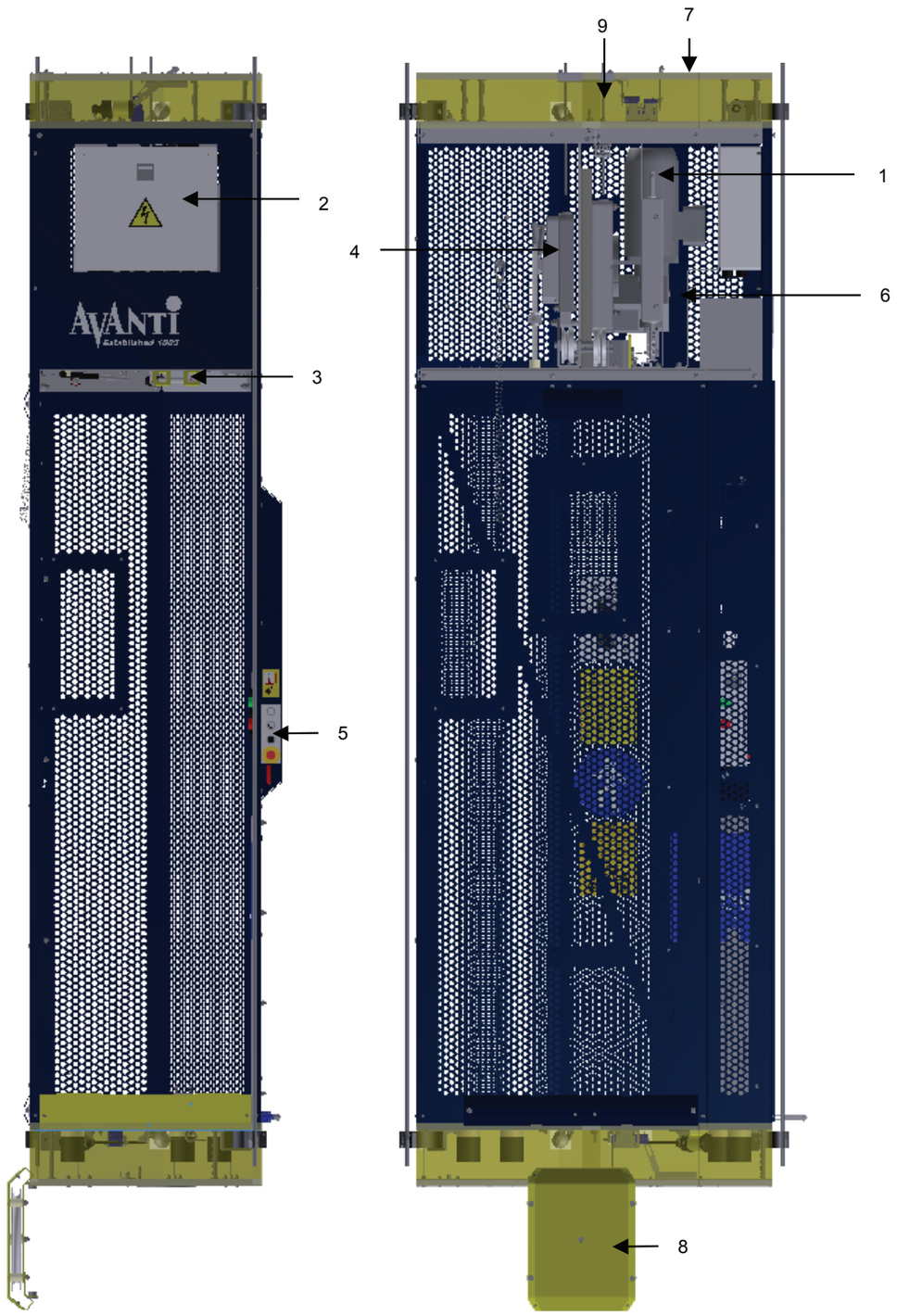
[1)] *Optional feature. Mandatory for AECO versions.*

3.6.1.1 Other components of SWP L

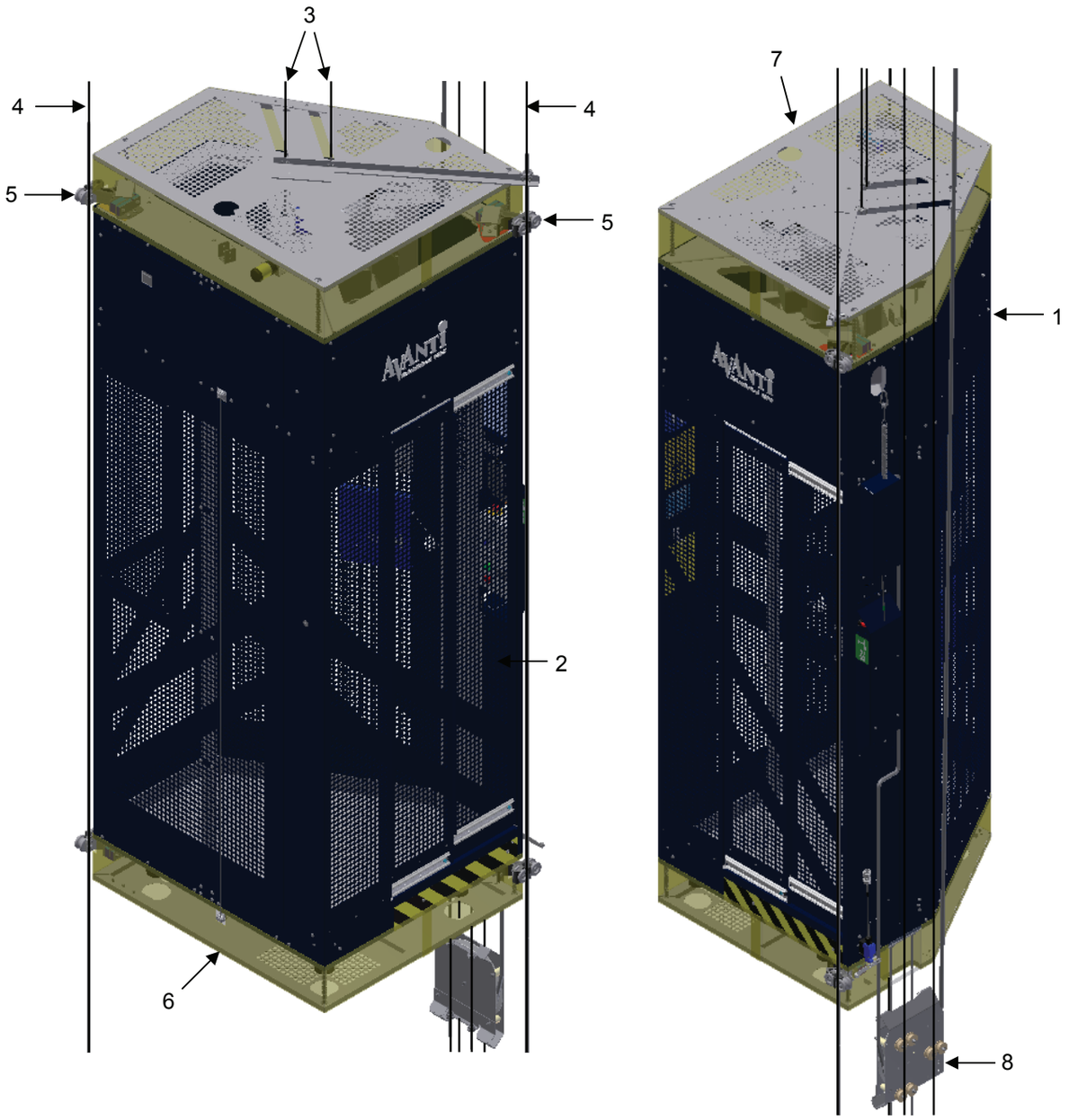


1 Traction system
2 Electrical control box
3 Anchor points
4 Fall arrest device
5 Cabin control
6 Engine room
7 Top obstruction device / AECO top obstruction device
8 Traveling cable [1)]
9 Slack rope sensor [1)]

CE AECO

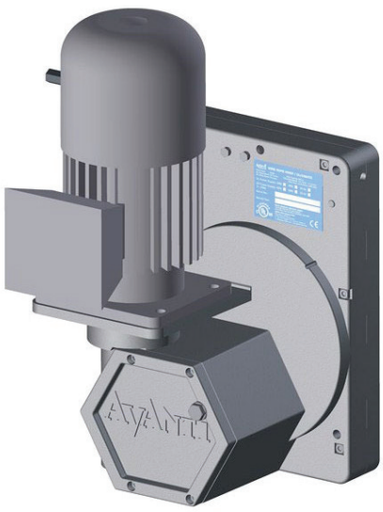
[1)] Optional feature. Mandatory for AECO versions.

3.6.2 Components of SWP XL



1 Cabin
2 Door
3 Traction and safety wire ropes
4 Guiding wire rope
5 Wire rope guides
6 Bottom obstruction device
7 Top obstruction device (Optional full cover top obstruction device)
8 Travelling cable (Optional feature)

Traction system



Fall arrest device

3.6.3 Traction system

Lift	Hoist	Lifting capacity	Power supply	Wire rope speed	Effect	Rated current	Traction wire rope Ø	Unit weight approx.
Model	**Type**	**Kg (lbs)**	**Voltage/ Frequency**	**m/min (ft/min)**	**kW**	**A**	**mm**	**Kg (lbs)**
SWP L CE	**M508**	500 (1100)	690V/50Hz	18 (60)	1.5	2.3	8.4	50
SWP L CE	**M508**	500 (1100)	690V/60Hz	18 (60)	1.5	2.8	8.4	50
SWP L AECO	**M508**	500 (1000)	400V/60Hz	21 (70)	1.8	4.9	8.4	50
SWP L AECO	**M508**	500 (1000)	480V/60Hz	21 (70)	1.8	4.1	8.4	50
SWP L AECO	**M508**	500 (1000)	480V/60Hz	10 (33)	1.1	3.1	8.4	50
SWP XL CE	**M508**	600 (1320)	690V/50Hz	18 (60)	2	2.6	8.4	55
SWP XL CE	**M508**	600 (1320)	690V/60Hz	18 (60)	2	3.2	8.4	55

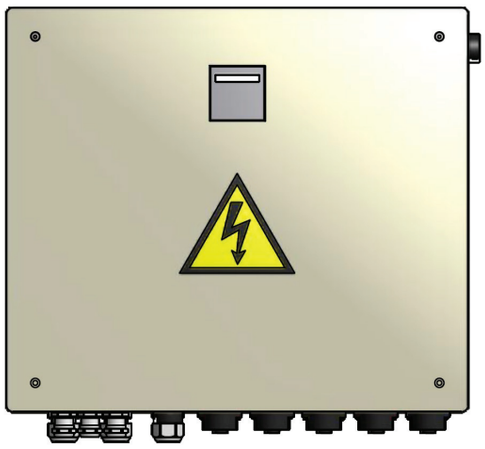
3.6.4 Fall arrest device

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

3.6.5 Traction, safety and guiding wire ropes

Lift model	Wire rope type	Wire rope diameter	Surface Treatment	Mark/ feature	Min. break resistance	Attached with
SWP L CE & AECO	**M508 / ASL 508**	8.4 mm, 5x19	HDG	no	55 kN	2 t shackle
SWP XL CE	**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

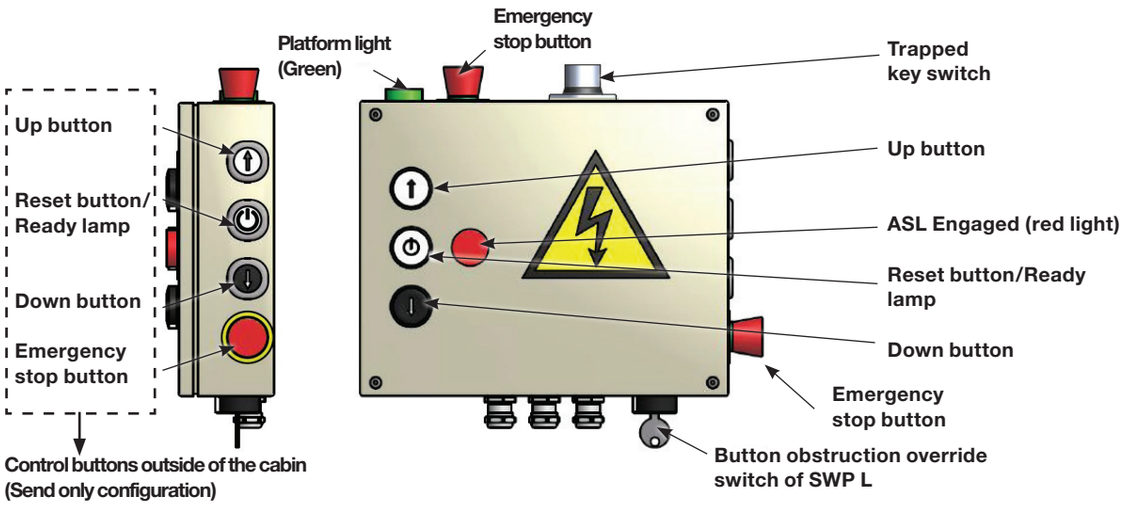
3.6.6 Main control box of SWP L and SWP XL



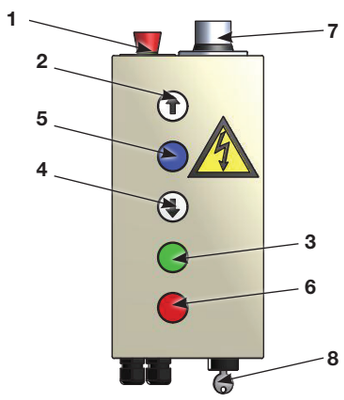
Hour counter

3.6.7 Cabin control box

3.6.7.1 Cabin control box of SWP L

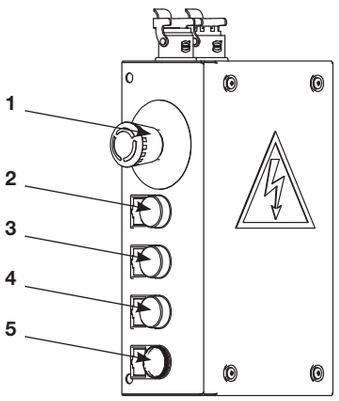


3.6.7.2 Cabin control box of SWP XL



1 Emergency stop button
2 UP button
3 Platform light (green)
4 DOWN button
5 Reset button / Ready lamp
6 Fall arrest device engaged (red light)
7 Trapped key switch
8 Bottom obstruction override switch of SWP XL

3.6.8 Platform control boxes



1 Emergency stop button
2 UP button (send function)
3 Reset button / ready light (blue)
4 DOWN button (call function)
5 Platform light (green)

3.6.9 Main switch
Power supply is interrupted by turning the main switch of the bottom platform box to OFF position.

3.6.10 Trapped key switch
All control is interrupted by turning the Trapped key switch to OFF position. In this case the key is able to be taken out. The key allows the user to open the fence door of tower platforms. The key will remain locked until the fence door is closed.

3.6.11 Electromagnetic motor brake
The hoist integrates an electromagnetic spring-loaded brake which engages automatically
– on releasing the UP/DOWN control buttons
– following a power failure.

3.6.12 Emergency stop button
When a red emergency stop button is pushed in an emergency, all control is interrupted. After remedying the fault, control is reactivated by pulling the button, until it pops out again and pressing a reset button.

3.6.13 Overload limiter
The overload limiter is built into the wire rope traction system and will prevent upward travel in the event of an overload. A warning signal (buzzer) is triggered which will stop only when the cause of the overload has been removed.
Possible reasons for activation of the limiter:
- The service lift is overloaded or
- The service lift encounters an obstacle during upward travel.

Operator intervention:
- Reduce the load to below the overload limit, or
- Lower the lift until it is free of the obstacle and remove the obstacle before using the lift again.

3.6.14 Manual descent
The hoist is delivered with a lever that allows manual release of the electromagnetic motor brake. Once the motor brake is released, the motor speed is controlled by a mechanical overspeed limiter installed between the motor shaft and the gear box. Manual descent speed is approximately 30% higher than nominal speed. During manual descent and no power supply, the bottom obstruction device is still operational by means of the emergency bottom obstruction breaker.

3.6.15 Fall arrest device
Service lift is equipped with a fall arrest device which will prevent the load from falling in case of a traction system failure or a traction wire rope breaking. The fall arrest device can be opened manually from inside the cabin. The speed of the safety wire rope passing through the device is continuously monitored, and the jaws automatically close in the event of sudden excessive speed.

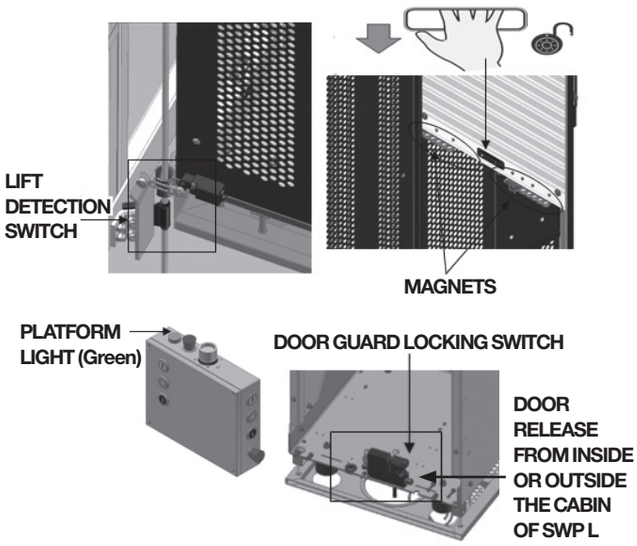
Tightness of safety wire rope must be frequently checked, as it fully affects functionality of fall arrest device!

This protects the lift from:
a) Traction wire rope breaks and
b) Hoist failures

The fall arrest device can also be engaged manually in an emergency by turning counterclockwise the Emergency stop lever.

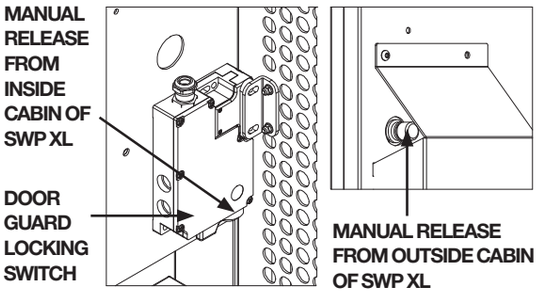
3.6.16 Warning lights
Warning lights are mounted on the top and at the base of the lift. The lights are flashing when the lift is in movement.

3.6.17 Service lift doors
3.6.17.1 Service lift door of SWP L
The roller door is closed by pushing the actuator in the door guard locking switch. The control is interrupted if the door is not closed properly.
The roller has oval handles, push down to close the roller. Push up to unlatch and open the roller.
Magnets at the bottom of the roller shutter help to keep the roller door close.
The roller door is opened when the door guard locking switch is automatically unlocked when the cabin is located on a platform with the lift detection switch activated. In the user control box there is a platform light, the green light is ON when the lift is on platform.
In an emergency use (for example power cut, need of evacuation, rescue) the door guard locking switch can be unlocked by pushing Door Manual Release from inside or outside the cabin.



3.6.17.2 Service lift door of SWP XL

The SWP XL lift features a full sliding door. It is equiped with a guardlocking switch, that can be manually released in case of emergency.



3.6.18 Obstruction switches

3.6.18.1 Top obstruction switch

At the top of the cabin a top obstruction switch will stop upward travel when activated. Downward travel will still be possible after pressing the reset button. A top limit device which activates the top obstruction switch is installed below the traction wire rope attachment.

When the top obstruction switch is engaged, press the DOWN button until the top obstruction switch is released.

3.6.18.2 Emergency top limit switch

The emergency top limit switch acts a backup of the top obstruction switch. If the top obstruction switch fails to engage against the top limit device, the emergency top limit switch is triggered and interrupts control. The service lift will not be able to ascend nor descend.
Manual descent is possible to disengage the top obstruction switch or to descend to bottom platform.

Do not use the service lift until the top obstruction switch fault has been rectified.

3.6.18.3 Bottom obstruction switches

SWP L features one bottom obstruction switch (S2) and SWP XL features two bottom obstruction switches (S2 and S3). These switches stop downward travel if the service lift
– encounters an obstacle or
– touches the ground.

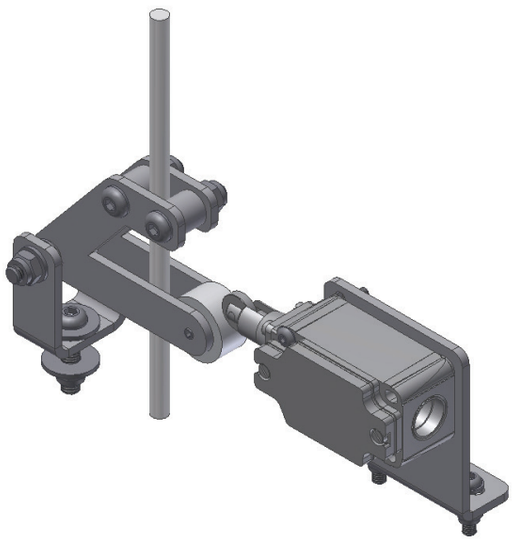
After pressing the reset button, upward travel will be possible, for instance to remove the obstacle. In order to put the service lift on the ground, the bottom obstruction switches can be bypassed with the bottom obstruction override switch (located in the cabin control box).

3.6.19 Light with emergency function [1)]

An emergency light can be installed to illuminate inside the lift with and without electric supply.

3.6.20 Slack rope sensor [1)]

Installed on the top of the service lift, over the traction system, when engaged it will remove power from service lift.
It detects slack traction wire rope.



3.6.21 Maintenance cover of SWP XL

Maintenance cover allows safe and fast inspection of traction and safety wire ropes from inside the cabin while travelling.

3.6.22 Anchor points

The service lift is equipped with two anchor points in SWP L and three in SWP XL. During operation personnel should hook to the Anchor point.

3.6.23 Information signs and documents

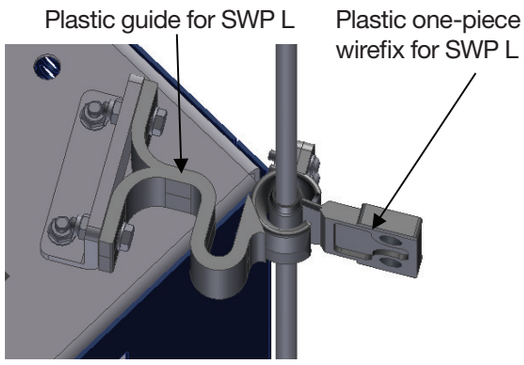
The following documents, signs and labels are supplied with the service lift and shall always be available.

Location	Document
Inside blue bag	Manual
	Quick guide document
	Evacuation guide
Cabin	Serial number plate
	Use of PPE label sign
	Working load limit / N° persons label
	Manual descent label
	Fall arrest deactivation label
	Fall arrest activation label
	Door guard locking label
	Location of anchor points sticker
	Emergency manual release sticker
Main control box	Wiring diagram
	Electrical hazard warning label

CE AECO

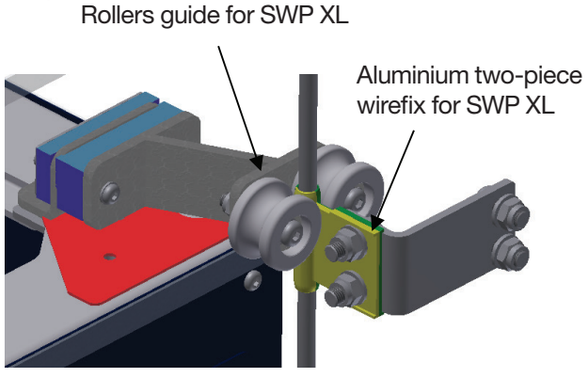
[1)] Optional feature. Mandatory for AECO versions.

3.6.24 Guiding system for SWP L

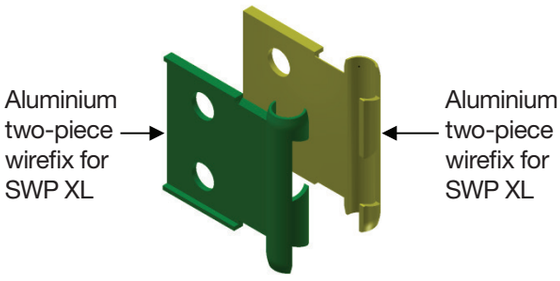


3.6.25 Guiding system for SWP XL

The SWP XL 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.

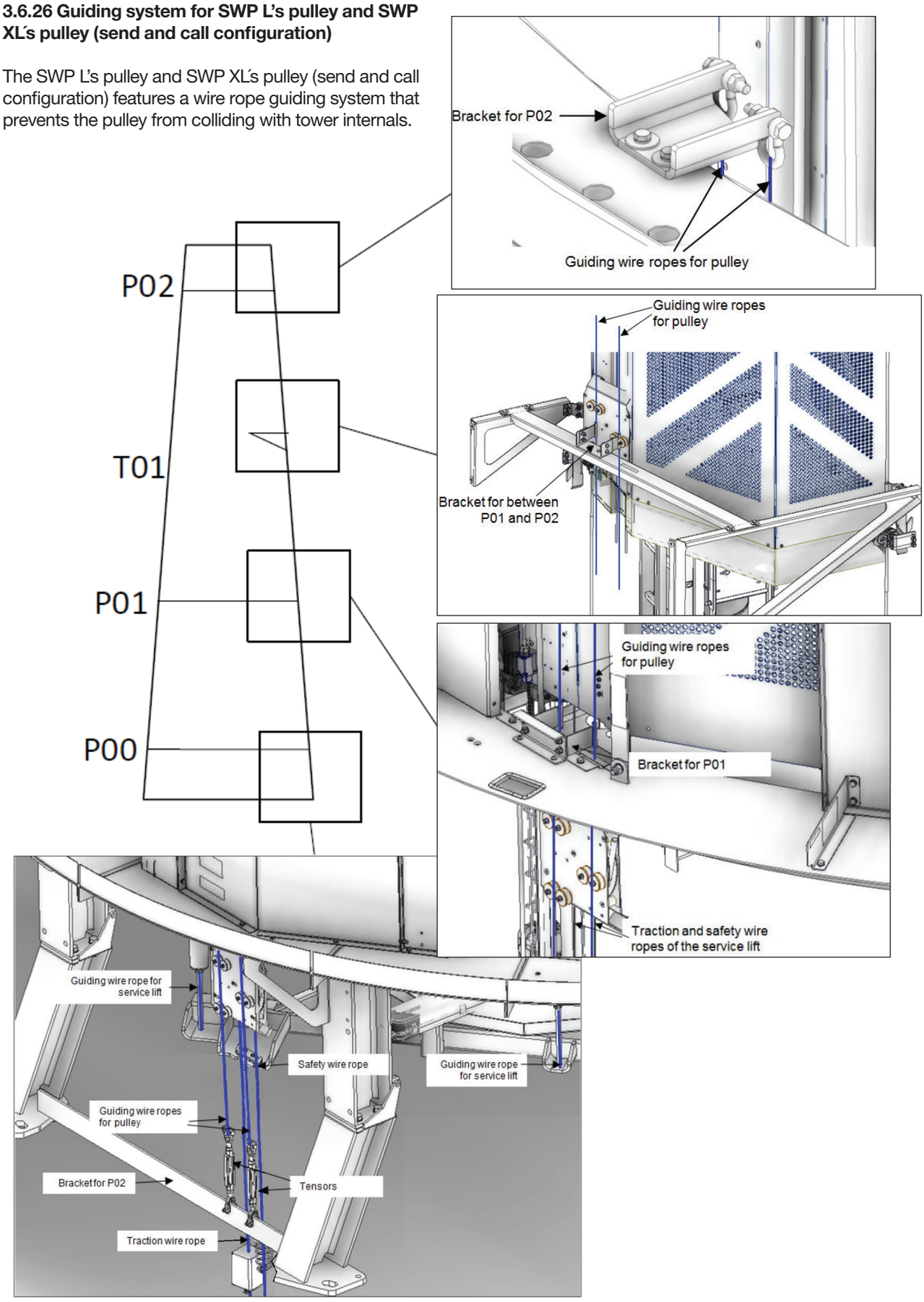


The SWP XL´s wirefix is made of aluminium material, which results in an improved durability. In addition, the SWP XL´s wirefixes are made of two symmetric parts. These two-piece concept allows the wirefix to be installed at any moment, without having to introduce it through the bottom end of the wire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



3.6.26 Guiding system for SWP L's pulley and SWP XL's pulley (send and call configuration)

The SWP L's pulley and SWP XL's pulley (send and call configuration) features a wire rope guiding system that prevents the pulley from colliding with tower internals.



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:

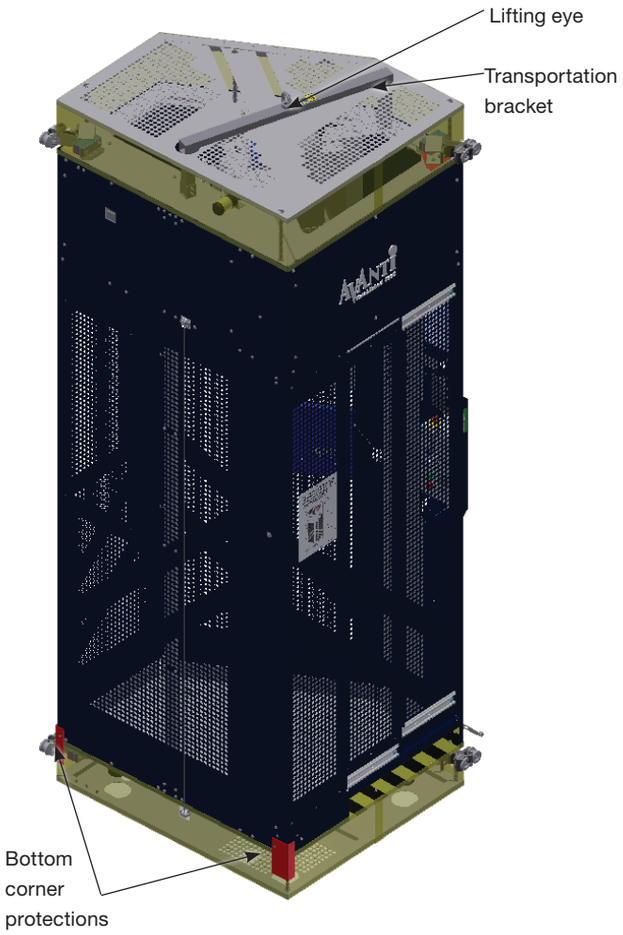
- Wear at least the following PPE: fall arrest equipment if falling height is higher than 2 m, hand gloves, helmet, safety glasses, working gear.
- Use a hand winch attachable to the ladder when elevating heavy weights.
- Use a wire rope clamp or grip when lowering wire ropes, in order to avoid the risk 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.

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

4.2 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. Place the service lift at bottom platform.
4. Remove the freight kit.

4.3 The wire ropes

Carefully place the cabin in the tower. Do not drag in order to avoid any damage on the bottom of the cabin.

Wire rope lengths depend on the tower height and should be specified when ordering. The coils are marked with their length.

STOP

Ensure that lift evacuation to the tower ladder is possible.

4.3.1 Tower top

The wire rope coils hang from the suspension beam.

Fig. 1a SWP L

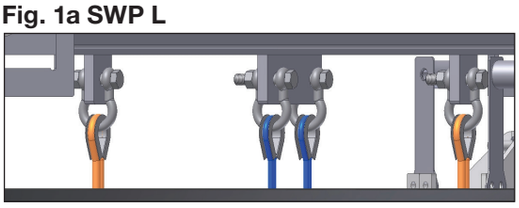
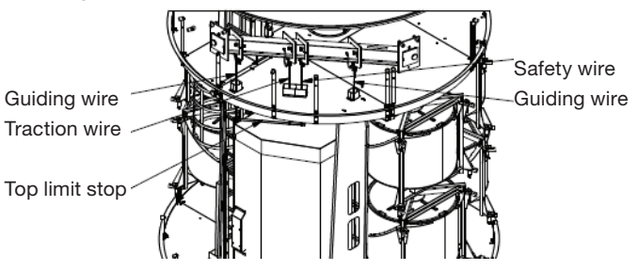


Fig. 1b SWP XL



1) Fit the top limit device on the traction, safety and left guiding wire ropes (see Fig. 2a-b).

Fig. 2a SWP L

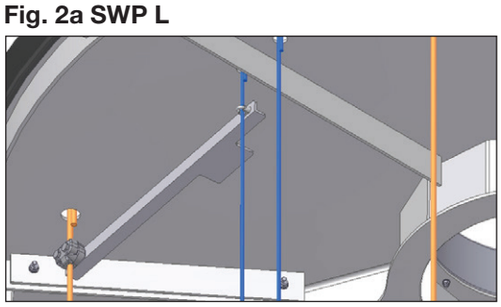
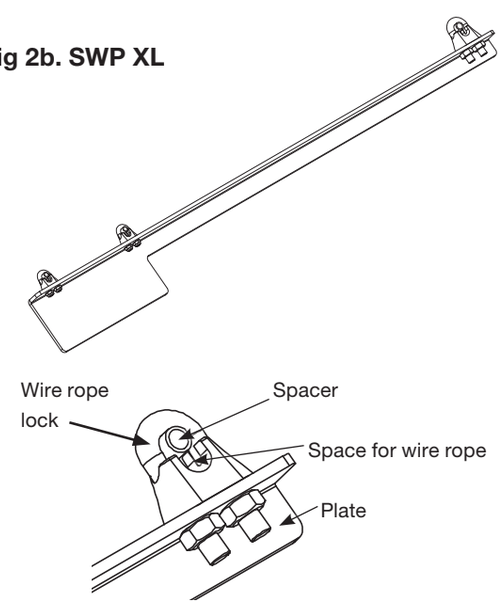


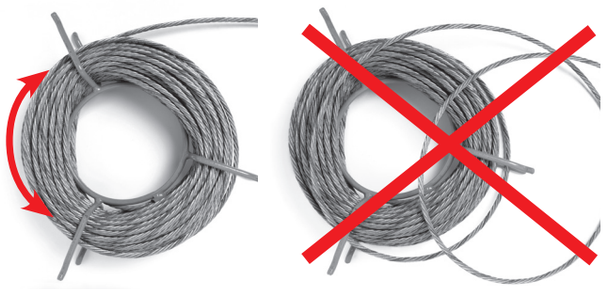
Fig 2b. SWP XL



The spacers must be positioned next to the wire rope locks, opposite to the plate.

2) Uncoil wire ropes correctly (Fig. 3).

Fig. 3



3) Feed all wire ropes to the bottom of the tower.

All wire ropes are evenly uncoiled as shown in Fig 3 to prevent looping.

Ensure that no obstacles are in the way of the service lift. / Do not pull wire over edges.

4.3.2 Tower bottom

Holes in the bottom platform of the tower for wire rope bushing are positioned as shown in Fig. 4a SWP L and Fig. 4b SWP XL.

Fig. 4a SWP L

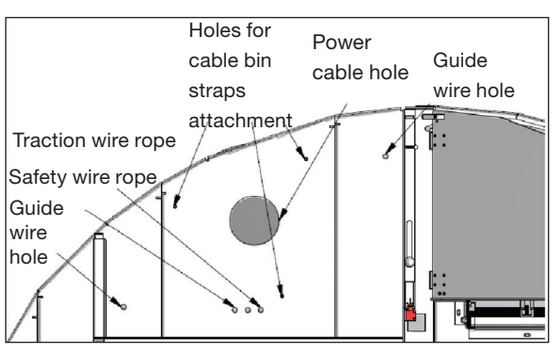
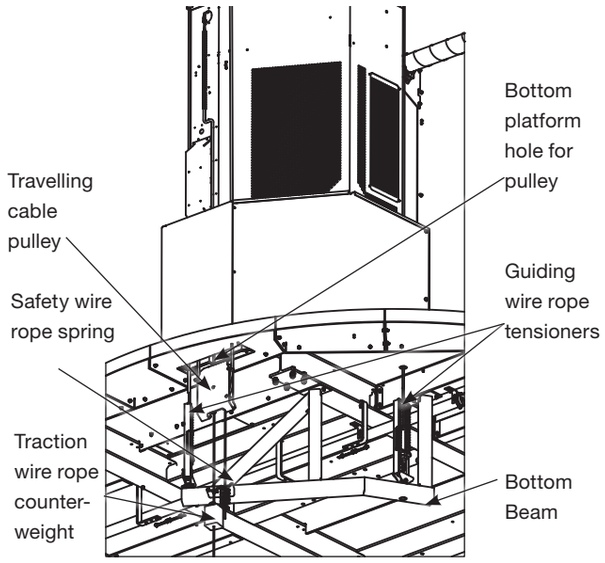


Fig. 4b SWP XL



Power cable hole is fitted with rubber edging.

4.3.3 Securing the guiding wire rope-ground level

4.3.3.1 Guiding wire ropes in SWP L

Mount the wire rope as shown in Fig. 6a following the procedure below.

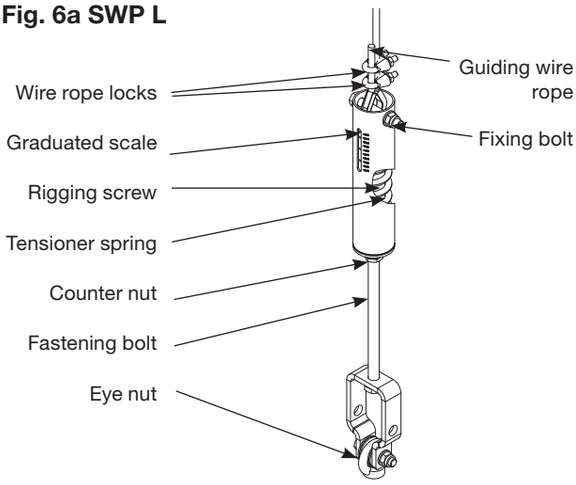
Before feeding the guiding wire ropes through the service lift wire rope guides and bottom platform, fit the correct number of wire rope fixes on the wire rope and feed through the wire rope guides (See Fig. 5). The wire rope fixes are fitted during the first run.

Fig. 5

Feed the guiding wire rope through the 2 guiding wire ropes holes in the platform (see Fig. 4a & 4b).

Mount the wire rope as shown in Fig. 6a following the procedure below.

Fig. 6a SWP L

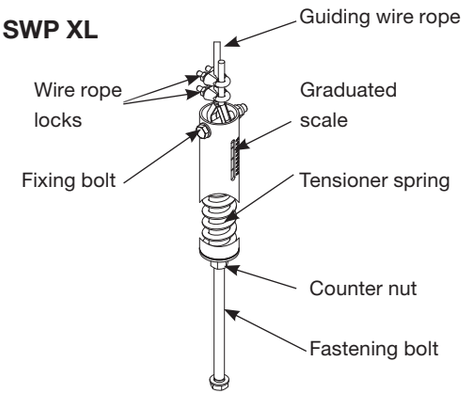


1. Drill 2 holes of Ø20x110mm on the basement floor, aligned with the 2 guiding wire ropes holes of the bottom platform (see Fig. 4a).
2. Fasten the wedge anchors in the holes and mount a M20 eye nut.
3. Fix the preassembled tensioner to the eye nut.
4. Feed the guiding wire rope around the fixing bolt.
5. Pretension the wire rope by hand and fix with 2 wire rope locks.
6. Stretch the guiding wire rope by means of the fastening bolt until the graduated scale indicates 7 kN.
6. Coil the excess of wire rope and fix with at least 3 cable ties.
7. Repeat the previous steps for the second guiding wire rope.

4.3.3.2 Guiding wire ropes in SWP XL

Mount wire ropes as shown in Fig. 6b following procedure below.

Fig. 6b SWP XL



1. Mount the preassembled tensioner on the bottom beam (see Fig. 4b).
2. Feed the guiding wire rope around the fixing bolt.
3. Pretension the wire rope by hand and fix with 2 wire rope locks.
4. Stretch the guiding wire rope by means of the fastening bolt until the graduated scale indicates 7 kN.
5. Coil the excess of wire rope and fix with at least 3 cable ties.
6. Repeat the previous steps for the second guiding wire rope.

Check the distance between the wire ropes (1220 mm for SWP L and 1510 mm for SWP XL) so that the wire rope fix and wire ropes are in the centre of the wire rope guides.

Tighten the guiding wire ropes after the first run.

4.3.3.3 Guiding system for SWP L's pulley and SWP XL´s pulley (send and call configuration)

1. Install a bracket below the bottom platform P00.
2. Install a bracket at platform P01.
3. Install a bracket at the tower support T01 (between P01 and P02).
4. Install a bracket at platform P02.
5. Install the guiding wire ropes.
6. Install the pulley.
7. Adjust the guiding system.

The detailed installation instructions of the guiding system for SWP L's pulley and SWP XL´s pulley (send and call configuration) are available from AVANTI upon request.

4.4 Electrical connections

4.4.1 Power supply

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

The power supply must be protected by a fuse and an earth leak circuit breaker (30mA). Disconnect the main power supply before handling power units. Verify that the rated grid and motor voltages are identical. The three-phase motor is supplied in a star connection configuration.

Check the correct phase lay after first installation and after each work at control box and/or power supply. In case the lift travels up when the down button is pushed, switch two phases on the power cable plug.

SWP L CE 690V 3 phases+gnd. 50 Hz Y I = 2.3A 1.5 kW 18m/min
SWP L CE 690V 3 phases+gnd. 60 Hz Y I = 2.8A 1.5 kW 18m/min
SWP L AECO 400V 3 phases+gnd. 60 Hz Y I = 4.9A 1.8 kW 21m/min
SWP L AECO 480V 3 phases+gnd. 60 Hz Y I = 4.1A 1.8 kW 21m/min
SWP L AECO 480V 3 phases+gnd. 60 Hz Y I = 3.1A 1.1 kW 10m/min
SWP XL CE 690V 3 phases+gnd. 50 Hz Y I = 2.6A 2 kW 18m/min
SWP XL CE 690V 3 phases+gnd. 60 Hz Y I = 3.2A 2 kW 18m/min

Control voltage: 230V

4.4.2 Installation of main switch

The main switch is installed on the bottom platform fence (Fig 7).

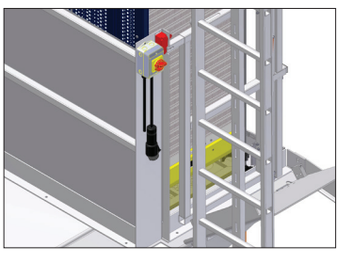


Fig. 7

Mount the send and call control boxes to the platform fences and connect them to the main switch control box according to the wiring diagram supplied in the main control box of the cabin.
1. Connect the power input cable to the WTG electrical cabinet.
2. Connect the circuit to the plug available on the power cable coiling bin under the platform.

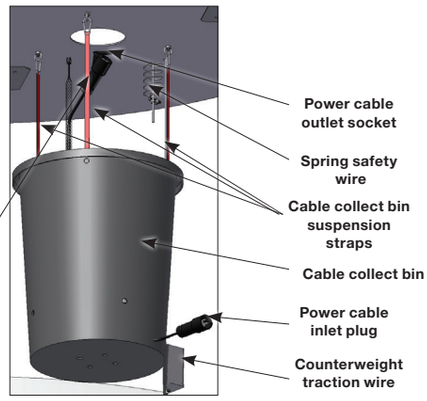
4.4.3 Supply cable

1. The length of the cable depends on the height of the tower. The power cable is marked with its length.
2. Use heavy rubber cable strips for fastening the supply cable to service lift.
3. An installed generator will have to provide at least 2.5 times the output of the traction system.

4.4.4 Power connection

1. Push the EMERGENCY STOP button of the cabin operation box.
2. Check that the various stop switch cables and fall arrest device cable are connected to the power cabinet according to colour code.
3. If cable coiling bin is used (Fig. 8):

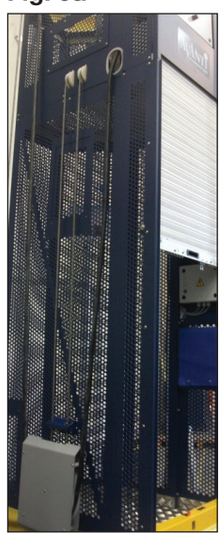
Fig.8



3.1 Hang the cable collect bin underneath the power cable hole of the bottom platform. Attach the straps on the holes shown in Fig. 4.
3.2 Hang the bucket in the full length of the webbing. Keep the webbing as long as possible.
3.3 Cut the transport strips and tape which hold the wire rope inside the bin.

The plug and socket connection between the lift and cable bin must be placed inside the engine room.

Fig. 9a



If traveling cable is used (Fig. 9):
3.1 Install the junction box on the first platform over mid tower's height.
3.2 Cut the transport strips which hold the cable and connect the cable inlet to the junction box.
3.3 Uncoil the cable to the bottom platform and guide it through the cable pulley supplied.
4. Connect the power cable outlet socket to the service lift inlet plug using cable stocking. Attach shackle to the eyebolt on the back of the service lift (Fig. 10).
5. Connect the power cable plug to the grid.
6. Pull the EMERGENCY STOP button to deactivate. The wiring diagram is found in the electrical control box.

Fig. 10

4.5 Installation of traction and safety wire rope in lift

Wear protective gloves when handling wire ropes.

4.5.1 Traction wire rope installation

1. Remove top window from the service lift (see Fig. 11).
2. Put the wire rope into the traction system's wire rope inlet opening.
3. Push the UP button on the cabin operation control (manual control from inside the cabin) and feed wire rope through until the traction system starts pulling. Ensure that the wire rope can exit without obstruction!
4. Continue feeding the wire rope underneath (round) the back guide wheel and over the front guide wheel.
5. Let the traction wire rope pass through until it is slightly tightened.
6. Feed wire rope through platform floor.

Fig. 11 SWP L

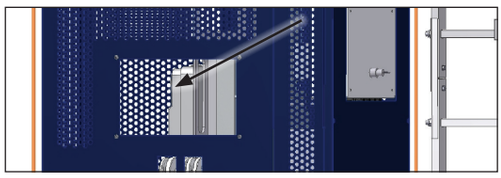
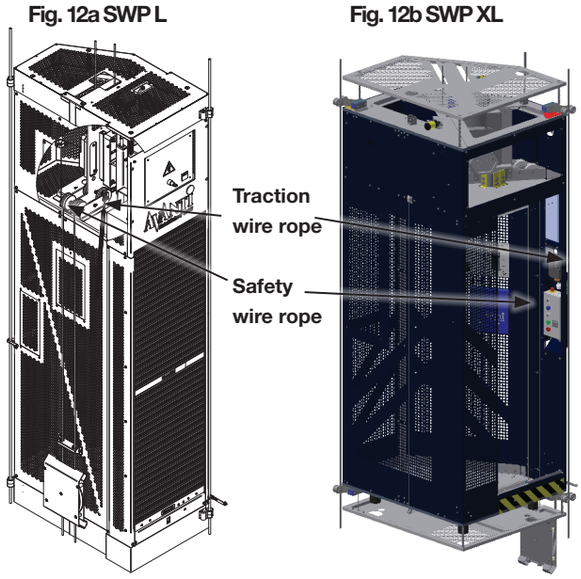


Fig. 12a SWP L

Fig. 12b SWP XL



4.5.2 Safety wire rope installation

1. Unlock the fall arrest device by pulling down the black handle. Feed the safety wire rope through the fall arrest device.
2. Like the traction wire rope, continue feeding the wire rope underneath (round) the back guide wheel and over the front guide wheel.
3. Pull the safety wire rope to tighten it.
4. Feed wire rope through platform floor.
5. Mount the top window on the service lift.

Fig. 13 a SWP L

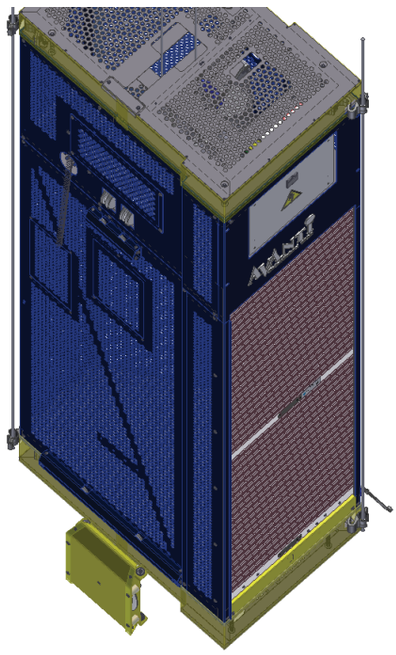
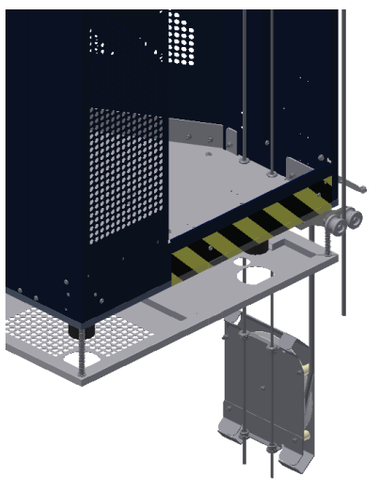


Fig. 13 b SWP XL



4.6 Securing the traction and safety wire rope

The traction wire rope is fastened as described in point 4.6.1 below and the safety wire rope is fastened as shown in point 4.6.2.

4.6.1 Traction wire rope counterweight

An 11kg (24,25 lb) weight is mounted approximately 200mm (7,87 in) below the cable bin, on the traction wire rope. Excess of wire rope is coiled with at least 3 strips (See Fig. 14 and Fig. 8).

Fig. 14

Ensure that counter-weight and wire rope coils can rotate freely.

4.6.2 Safety wire rope push spring

1. Feed the safety wire rope through the bottom platform hole.
2. Ascend the service lift 50 cm.
3. Activate the fall arrest device.
4. Perform manual descent so that the weight of the service lift is transmitted to the safety wire rope.
5. Compress the spring to 40 mm and fix with cable ties.
6. Feed the safety wire rope through the compressed spring.
7. Pull the safety wire rope downwards by hand as much as possible.
8. Place and fasten the wire rope grip.
9. Cut the cable ties so that the spring decompresses to 55 mm.

Fig. 15

Before fastening the safety wire rope carry out the fall arrest device test (See User's Manual section).

4.7 Wire rope fix alignment

Having mounted the service lift, the wire ropes, and the power cable, adjust the wire rope fix alignment during the first run.

Fig. 16 a SWP L

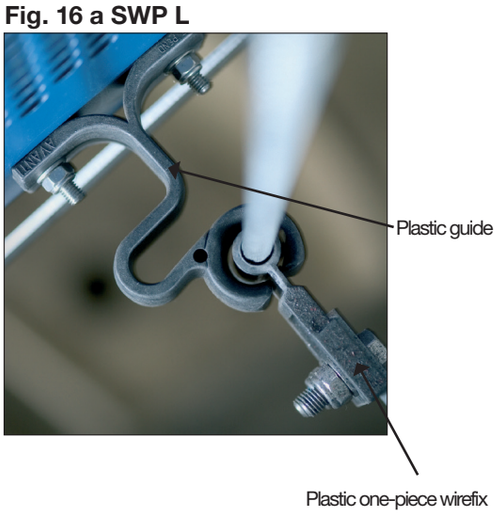
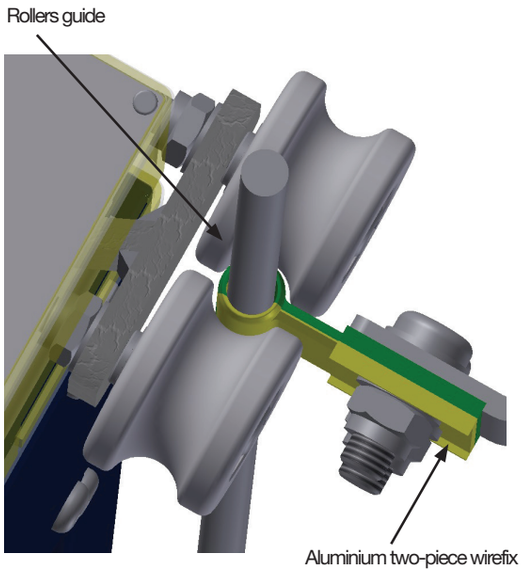


Fig. 16 b SWP XL



STOP *There are 2 installation windows located on the rear of the service lift. These shall only be used during installation and maintenance tasks.*

STOP *In order to avoid risks, turn the power supply off from the service lift before opening the 2 installation windows. Do not turn the power supply back on until the windows are closed.*

4.7.1 Wire rope fix alignment for SWP L

Additional tool is needed to make the reference to right wirefix position as the guide wire rope is not reachable (for SWP L only) (see Fig. 17).

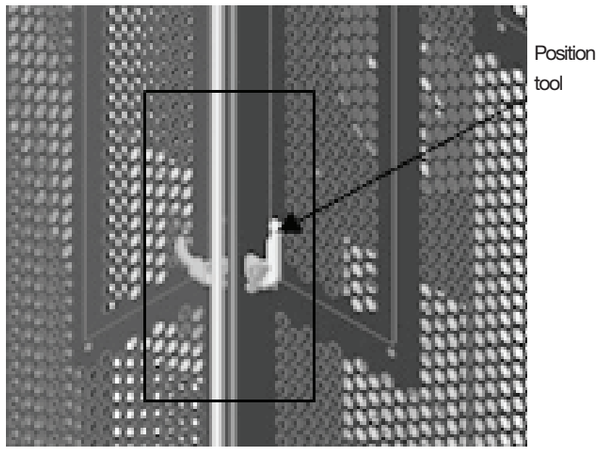


Fig. 17: Closed windows

By means of the oblong holes in the wire fix fittings, adjust the fittings so that the two parts pass each other easily, when the service lift moves.
Once the wirefix is properly fixed, open the tool and lift the cabin up to overtake the fixed wirefix. Then close the tool with remaining wirefixes above it and go to the next platform.

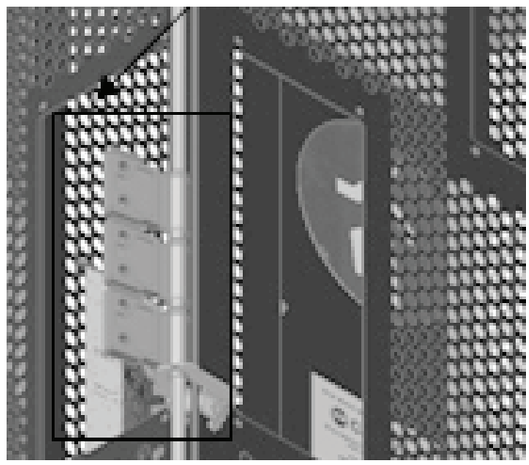


Fig. 18: Opened windows

4.7.2 Wire rope fix alignment for SWP XL

The final position of the wire rope fixes for SWP XL shall be adjusted with the help of an installation tool (see Fig. 19) and following the procedure below.

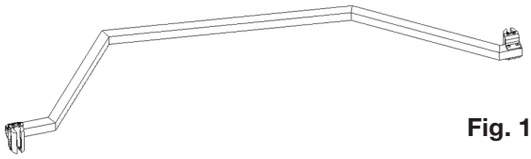
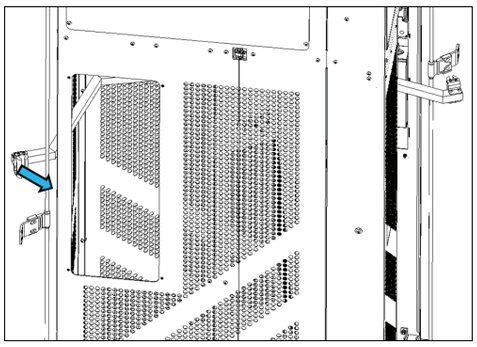


Fig. 19

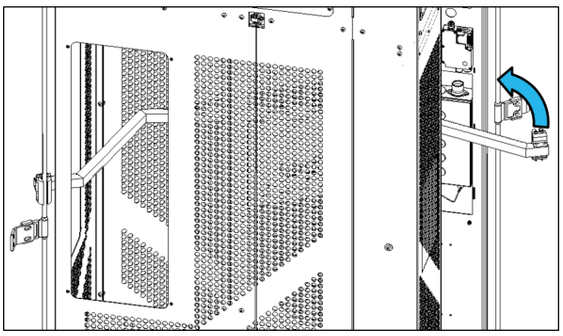
1. Put the installation tool inside the service lift and ascent to the first pair of wire rope fixes.
2. Turn the trapped key to OFF position, and then open the 2 installation windows.
3. Attach the left end of the installation tool to the left guiding wire rope (see Fig. 20).

Fig. 20



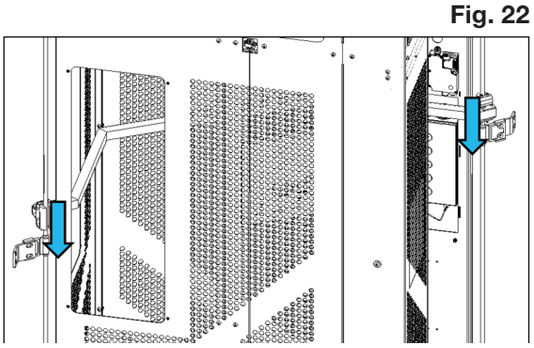
4. Attach the right end of the installation tool to the right guiding wire rope (see Fig. 21).

Fig. 21



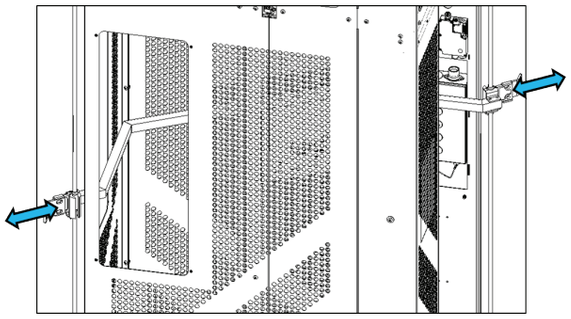
5. Slide the installation tool downwards until it contacts the wire rope fixes (see Fig. 22).

Fig. 22



6. Adjust the position of the wire rope fixes horizontally so that they insert in the indentations of the installation tool (see Fig. 23).

Fig. 23



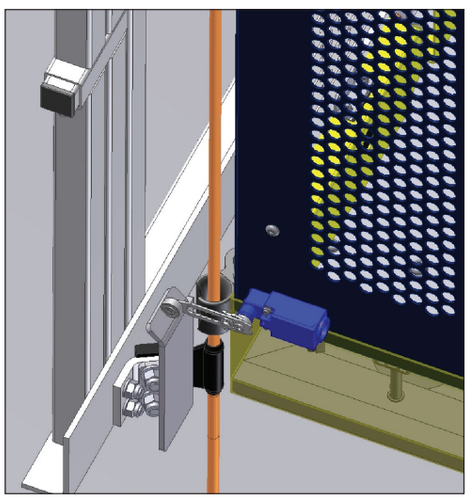
7. Tighten the bolts of the wire rope fixes.
8. Slide the installation tool upwards.
9. Release the right end of the installation tool from the right guiding wire rope.
10. Release the left end of the installation tool from the left guiding wire rope.
11. Put the installation tool inside the service lift.
12. Close the 2 installation windows, and then turn the trapped key to ON position.
13. Repeat the previous steps with each pair of wirefixes throughtout the travel path.

4.8 Adjustment of safe-zone plates

The service lift door should be able to be opened whenever the cabin is in alignment with the platform (tolerance ± 100mm).

The safe-zone is adjusted in relation to the service lift switch in order to fulfil the above requirement (see Fig. 16).

Fig. 16



4.9 Adjustment of top obstruction device

The top obstruction device is adjusted so the top obstruction switch stops the lift in alignment with the top landing platform.

4.10 Danger zone! sticker

Mount the “Danger Zone” sticker in the tower behind the lift. Make sure the wall and platform are clean and dry before attaching the sticker.

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

4.11 Inspection before first use

A service lift inspector must carry out an inspection before first use.

Inspection shall only be carried out by AVANTI, or an authorized person, following the “6.4 Annual inspection”.

And filling in the “Appendix B: Inspection checklist” for future possible reference.

The WTG owner must ensure that the results of this inspection before first use are logged in the “Appendix C: Inspection Log Sheet”.

When the lift travel path is extended to the foundation when the WTG is installed over the foundation, for example in off-shore installations, the bolded points of the check list have to be checked again although they were checked during the first installation.

4.12 Disassembling

Disassemble in reverse order and dispose of in accordance with local authority regulations.

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 more than its rated load.
- Try to repair machine components. Only personnel from AVANTI or competent persons certified by AVANTI are allowed to perform service on the machine.
- To manipulate switches and safeties.
- To place objects on service lift roof.
- To descent on service lift roof.

5.2 Entry and exit

To ensure safe entry and exit:
a) Lower the service lift onto the access platform until the bottom obstruction device is activated and the cabin stops, or: bring the lift to a height corresponding to the correct level for exiting from the wind turbine's platform.
b) Open the door and exit/enter the lift through the door.

5.3 Stop/Emergency stop

a) Release the Up or Down button; the service lift should stop

If it does not:
b) Push the EMERGENCY STOP button, and all controls should be disabled.

5.4 Operation from inside the cabin

a) Close the door
b) The key switch ON/OFF should be ON
c) Press the reset button
d) To go up or down, push and hold the Up or Down button.
e) To place the service lift on the floor after the bottom obstruction device has stopped the lift.
- Turn the override bottom obstruction device switch clockwise and hold.
- Press the DOWN button until the service lift rests on the floor, then release.

5.5 Operation from outside the cabin (send only configuration)

Transportation of people is forbidden if the operation is controlled from outside the cabin

Operation by means of the user control box:
a) The key switch ON/OFF should be ON
b) Close the door.
c) Press the reset button
d) Press the UP or DOWN button respectively and the cabin starts ascending/descending.

Transportation of people is forbidden if the operation is controlled from outside the cabin

5.6 Operation from platforms (send and call configuration)

Transportation of people is forbidden if the operation is controlled from the platforms.

Operation by means of the platform control box:
a) Turn the trapped key switch to ON.
b) Close the door of the cabin and of the platform fence.
c) Press the reset button.
d) Press and hold the UP or DOWN button to ascend or descend the cabin.
e) When platform light (green) illuminates, cabin is aligned with a platform and can be opened.

When actuating UP or DOWN buttons, response of cabin is delayed and an acoustic signal sounds, in order to warn personnel in the surroundings that cabin is going to move.

5.7 Overload limiter

a) In case of an overload, the lift's upward travel should be blocked, and a buzzer should sound in the connection cabinet.

Attempting to run in an overloaded lift is prohibited!

b) Remove enough of the load to make the buzzer stop and enable upward travel.

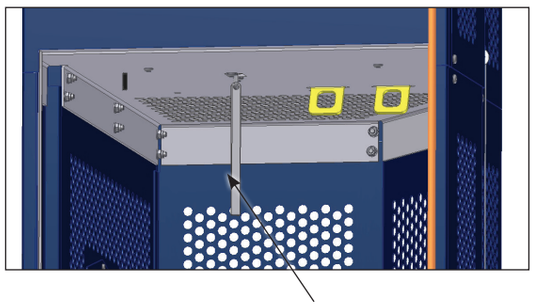
On entering and starting the lift, the buzzer may sound briefly. This is due to temporary load peaks occurring as the lift takes off.

The control box is designed not to activate the buzzer or stop the lift because of peak loads caused by the cabin swinging.

If the problem persists have an AVANTI expert adjust the overload limiter (see "Appendix A: Regulation of overload limiter").

5.8 Manual descent

If a power failure or an operation fault etc. interrupts the hoist, a manual descent is possible from inside the cabin.



Brake release lever of SWP L

1. The lever is attached underneath the cabin top. Turn it down.
2. Push the lever upwards the full way. The service lift moves downwards. The built-in mechanical overspeed limiter limits the pace of descent.
3. To stop, simply loosen the lever.
4. After manual descent, the system must be checked by an expert

During manual descent if the bottom obstruction device hits an obstacle, the brake release lever is mechanically disengaged so the further descent is disabled. The system is automatically reset once the obstacle is removed.

5.9 Fall arrest device

To lock the fall arrest device in an emergency:

- Pull down the red handle in SWP L.
- Push the red lever upwards in SWP XL.

If the fall arrest device engages, simply disengage it from inside the cabin until the fall arrest device is unlocked by:

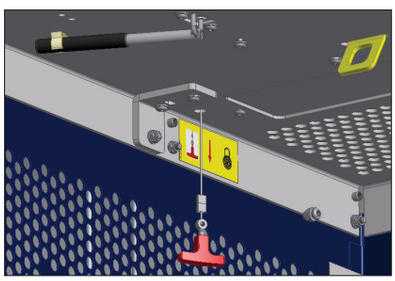
- Pulling the black handle downwards in SWP L.
- Pushing the black actuator upwards in SWP XL.

However, this is not possible if the safety wire rope is under tension. If this is the case:

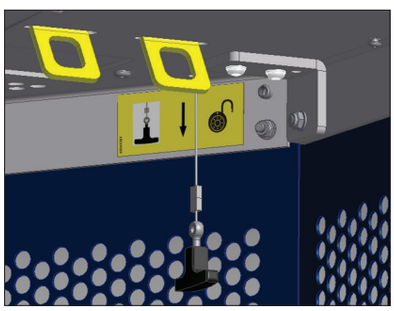
1. Remove the load on the safety wire rope by pushing the UP button taking the lift upwards a few centimetres.
2. Manually open the fall arrest device until the fall arrest device is unlocked by:

- Pulling the black handle downwards in SWP L.
- Pushing the black lever upwards in SWP XL.

In case of no power and the fall arrest device is locked with the safety wire rope under tension evacuate the lift according to the "Evacuation guide".

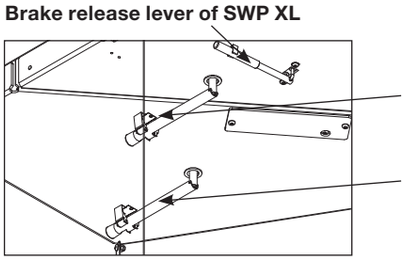


PULL TO LOCK (red) in SWP L



PULL TO UNLOCK (Black) in SWP L

Brake release lever of SWP XL



Red locking lever of SWP XL

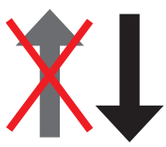
Black locking lever of SWP XL

5.10 Troubleshooting

1. All tests and repairs to the electronic components should be performed by **certified technicians 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 **certified technicians 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.	Deactivate the button in question by pulling it until it pops out.
	A2 Wire rope loop on traction system. 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 rope. a) Lift wire rope breakage b) Hoist failure	a) + b) Evacuate the service lift according to the "Evacuation guide".
	A4 The service lift is stuck on an obstacle.	Carefully remove the obstacle. Test the operational safety of affected building sections. Inform the supervisor.
DANGER! *Unplug the power supply before opening the power cabinet.*	**A5 Power failure** a) Control not switched on or deactivated. b) Grid voltage interrupted. c) Supply between grid connection and control interrupted. d) Phase control relay [1] tripped due to wrong phase sequence. CE AECO *[1] Optional for CE versions. Mandatory for AECO versions.*	a) Turn EMERGENCY STOP button to the right until it is released. 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. d) Check and correct phase lay at power supply.
	A6 Safety switch is triggered a) EMERGENCY top limit switch was pressed. **b) Door switch is not properly closed** or is defective.	a) Perform manual descent until the emergency top limit switch is released. b) Close the door and test the door switch.
	A7 Protection switch on overheating a) A phase is missing b) Motor is not cooling c) Voltage too high/low d) Magneto thermal protection [1] tripped CE AECO *For AECO versions with 400V/60Hz power supply.*	a) Test/repair fuses, supply and connection. b) Clean the hood. c) Measure voltage and power consumption on the loaded motor. If voltage deviates from specifications, use cable with increased dimensions. d) Turn magneto thermal switch ON.
	A8 Brake does not open (no click on on/off) a) Supply, braking coil or rectifier defective. b) Braking rotor closes.	a) Have an electrician test, repair/replace the supply, braking coil and rectifier. b) Return traction system for repair.

Breakdown	Cause	Solution
The service lift will **neither go up nor down** 	**A9 The reset function has not been activated.**	Press a reset button
	A10 The key switch ON/OFF has not been activated.	Turn the key to ON
	A11 The main switch is in the OFF position.	Turn the main switch ON.
	A12 The product is stuck on an obstacle below it.	- Evacuate the service lift. - Inform the supervisor. - Check the bottom obstruction device connection/function. Replace if necessary. - Check the slack rope sensor [1] connection/ function. Replace if necessary. *[1]Note: Optional feature. Mandatory for AECO*
Service lift goes **down but not up** 	STOP *Irresponsible behaviour jeopardizes system safety!* **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 Overload - Buzzer sounds in the connection cabinet.	Test and possibly reduce load until buzzer stops.
DANGER! *Unplug the power supply before opening the power cabinet.*	**B3 Top obstruction switch:** a) Top obstruction switch is defective or not connected properly. b) Top obstruction switch is activated.	a) Test the top obstruction switch connection/function. Replace if necessary. b) Move lift down until the top obstruction switch is released.
	B4 Fault in UP control circuit in control box or traction system	Test and possibly repair connections, wiring and relays.
Motor hums loudly or wire ropes squeak, but the lift can go both up and down.	**C1 Wire ropes dirty** **WARNING!** *Further use of lift may result in damage to the wire rope traction.*	If possible, immediately replace the traction system and return it for test/repair at AVANTI.

Breakdown	Cause	Solution
Service lift will **go up but not down!** 	STOP *Irresponsible behaviour jeopardizes system safety!* **D1 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.
	D2 The fall arrest device is holding the service lift on the wire rope. a) Excessive hoist speed b) Too low release speed on fall arrrest device. STOP *A defective fall arrest device will threaten the safety of the service lift! Replace immediately!*	a) + b) Take the service lift upwards to relieve the safety wire rope. unlock the fall arrest device by pull down the black 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.**
	D3 Fault in down controller circuit on traction system	Insert brake lever into the traction system and lower lift manually. Test, and if necessary have connections, wiring, and relays repaired.
	D4 Slack rope sensor[1] is engaged CE AECO *[1] 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.
Button lamp not lit although operation is normal.	**E A lamp is defective**	Have an electrician replace it.
Hoist goes down when up button is pressed and up when down button is pressed.	**F Two phases changed in the supply**	Have an electrician switch the 2 phases in the plug
Loud noise and / or smoke coming from hoist motor	**G Brake closed or partially closed** **WARNING !** Damage of hoist brake leading to brake function lost	**Stop work immediately!** Call supervisor for advice and potential repair of hoist

DANGER!

Unplug the power supply before opening the power cabinet.

If these steps do not identify the cause and rectify the fault: Consult a certified technician or contact the manufacturer.

5.11 Out of service

1. **Securing the service lift:**
   Bring the service lift all the way down, until the bottom obstruction device 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". Contact the service technician for repair.

6 Maintenance

Mandatory requirements

The lift must have been installed and serviced by certified technicians. Operation of the lift requires user training. All the installation, inspections / maintenance operations from first use, periodical and extraordinary must be logged in the Inspection and Maintenance Log Book. All required values measured must be logged, as well as parts replaced. Annual inspections and service tasks made to the hoist and fall arrest device must be carried out by certified technicians. Ambient conditions must comply with the technical specifications. Service lift misuse is prohibited, including but not limited to:

- By passing overload system
- Excessive use of no power descend
- By passing safeties
- Etc.

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

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

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

The relevant maintenance instructions are provided to each person during the service training.

6.1 Mandatory inspection and maintenance planning

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

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

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.
- 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.
- Dismount hatch to access the engine room.

Only certified technicians shall perform electrical installation tasks.

6.3 Daily inspection

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

6.3.1 Overall

Visual Inspection:
a) Check that the cabin has no damages.
b) Check that the top and bottom obstruction devices are free of damages.
c) Check that the traction and safety wire rope ropes are correctly fed and guided.
d) Record the hour meter reading on the service lift log.

6.3.2 Travel zone

a) Ensure that there are no obstacles within the service lift's operating area which may obstruct the travel of the cabin or cause the cabin to hit the ground.

6.3.3 Control and safety devices

6.3.3.1 Cabin control from inside the cabin

a) Close the doors. Press the EMERGENCY STOP button.
The lift should remain still when the UP/DOWN button is pressed. To restart, pull the EMERGENCY STOP button and press the reset button.

b) Test the EMERGENCY top limit switch:
During upward travel, press the switch manually, and the service lift shall stop immediately. Neither upward nor downward travel should now be possible.

c) Bottom obstruction device. Lower the lift;
It shall stop before the rubber feet of the cabin reach the tower ground level.

d) Door switch:
Open the door – it shall not be possible to move the lift upwards or downwards.

Place the cabin at a height no corresponding to platform – it shall not be possible to open the door. The door is only able to open by turning the emergency release lever up.

e) Key switch ON/OFF:
Turn the key to OFF - it shall not be possible to move the lift upwards or downwards
f) Top obstruction device:
activate device by pressing it down. The service lift shall not move up until device is released.

g) Slack rope sensor [1]: Activate the slack rope sensor by manually pulling traction wire rope. The power supply to the service lift should be removed (therefore neither upward nor downward travel shall be possible).

STOP

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.

h) Fall arrest device. Activate the fall arrest device by pulling down the red locking knob. Press and hold the DOWN button of the cabin control box. The service lift should not descend. Try to perform manual descent. The service lift should not descend. Press and hold the UP button of the cabin control box. The service lift should ascend. Unlock the fall arrest device by pulling down the black unlocking knob.

6.3.3.2 Cabin control from outside of the cabin – Send only configuration

The automatic mode function is only available from the control buttons outside of the cabin and shall be checked as follows:

a) Press the UP button on the control box. The lift should travel upwards.

b) Press the EMERGENCY STOP button on the control box. The lift stops.

c) Pull the EMERGENCY STOP button and press the DOWN button. The service lift should travel downwards until the bottom obstruction device engages.

6.3.3.3 Cabin control from platform control boxes – Send and call configuration

The automatic mode function is only available from the platform control boxes.
a) Press and hold the UP button on the control box – the service lift ascends with a delayed response.

b) Press the emergency stop button on the control box - the service lift stops.

c) Pull the emergency stop button and press and hold the DOWN button - the service lift descends.

6.4 Annual inspection

Have the entire system, especially the traction system and the fall arrest device tested by certified technicians authorised by AVANTI at least once annually. However, inspect more frequently depending on use and the conditions of use.
The traction system and fall arrest device must be overhauled at an AVANTI workshop and furnished with new certificate for every 250 hours of operation. The hour counter is found in the power cabinet.

A certified technician must carry out the annual inspection following the Annual Inspection Checklist detailed in Appendix B.

Owner must ensure that the results of all annual and extraordinary inspections and tests are logged in the "Appendix C: Inspection log sheet".

6.4.1 Traction hoist

The traction hoist shall be maintained according to maintenance planning (please see section 6.1). Relevant maintenance instructions are provided to each person during the training. These maintenance inspections must be only carried out by a certified technician.

6.4.2 Fall arrest device

The fall arrest device shall be maintained according to maintenance planning (please see section 6.1). 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.

STOP

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

6.4.3 Traction, safety and guiding wire ropes

Perform 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 on the safety wire rope is correctly installed and that the wire rope locks are fastened
8. Check that the counterweight on the traction wire rope is properly fastened. The traction wire rope coil and counterweight shall be able to rotate freely. Do not attach it to a fixed part.
9. Check that the guiding wire ropes are correctly tensioned as described in the instructions of tensioning the guiding wire ropes.

Record any visible change of the condition of the wire rope on the "Appendix C: Inspection Log Sheet", and monitor closely throughout time.

6.4.3.1 Cleaning

1. Open the top lift hatch to access the wire ropes from inside the service lift.
2. Use a cloth to wipe off the old grease from the wire ropes.
3. Close the top lift hatch and ascend the service lift 1 or 2 m.
4. Repeat steps 1 to 3 until the entire length of the wire ropes is clean.

Always keep the traction, safety and guiding wire ropes clean and slightly greasy.
Only use mechanical means to clean the dirty wire ropes, i.e. a cloth or a hand brush. Do not use solvents or other detergents.

6.4.3.2 Lubrication

If the distance between platforms is more than 20 m perform the following procedure:
1. Ascend the service lift 20 m.
2. Open the top lift hatch.
3. Through the top lift hatch and with a spray can, apply lubricant on the wire ropes.
4. Close the top lift hatch and ascend the service lift 1 or 2 m.
5. Repeat steps 1 to 4 until the entire length of the wire ropes is lubricated.

6. Finally, perform two complete ascends and descends in order to distribute the new lubricant evenly along the wire ropes.

If the distance between platforms is equal or less than 20 m perform the following procedure:
1. A first person ascends in the service lift several meters so that the wire ropes are accessible from the platform.
2. From the platform and with a spray can, a second person applies lubricant on the wire ropes.
3. Both persons ascend in the service lift to the next platform.
4. One person egresses to the next platform.
5. Repeat steps 1 to 4 on each platform until the entire length of the wire ropes is lubricated.
6. Perform two complete ascends and descends in order to distribute the new lubricant evenly along the wire ropes.

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.

- *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.*

6.4.3.3 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.

6.4.3.4 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.

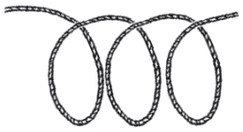
AVANTI recommends to replace the traction and safety wire ropes after 250 hours of operation corresponding with the refurbishment of the traction hoist and fall arrest device. Please check with your local author-ity regulations if it's mandatory in your case.

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

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

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

Kinks resulting from counterweight of traction wire rope not being able to rotate freely.



Wire rope strap/ loop, which cannot be unwound

Loop knot forming when a wire loop is pulled tight

Bends resulting from inappropriate treatment (e.g. securing the load with the wire)

Damage resulting from crushing, squeezing, running over, etc.

Wire bags

Loop formation

CE AECO

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

6.4.4 Electrical cables

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

6.4.5 Information signs and documents

Verify the completeness and legibility of all rating plates/information signs.
Replace missing or illegible plates/signs!

6.5 Repairs

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

- Amount required: 1,5 l
- Traction system: M508
- Specification: Mobil SHC 632

Each oil has to be verified by AVANTI.

6.6 Ordering spare parts

6.6.1 Wire ropes

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

6.6.2 Motor and brake

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

6.6.3 Electric control

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

6.6.4 Fall arrest device

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

6.7 Removing wires for replacement

Wear protective gloves when handling wire ropes.

6.7.1 Parking the service lift

Lower the lift until bottom obstruction device engages.

6.7.2 Wire rope ends

Beneath the access platform:
a) Loosen and uncoil all coiled and secured wire rope ends.
b) Remove the weight and the tightening spring.

6.7.3 Removing the traction wire rope

a) Turn the bottom obstruction override switch to the right and press the DOWN button until the cabin rests on the platform.
b) After having removed the traction wire rope counter weight press the DOWN button. The wire rope now exits the traction system at the top.
c) From above the traction system remove the wire rope by hand.

6.7.4 Removing the safety wire rope

a) Keep the fall arrest device open and manually pull out the wire.
b) Pull out the wire on top of the lift.

6.8 Replacing traction hoist

Follow maintenance cautions at all times when performing replacement tasks.

It necessary to use a lifting crane in order to replace the traction hoist.

1. Remove traction wire rope.
2. Use a ladder (2 m high) to access engine room.
3. Dismount top front window and top obstruction device (if full surface top obstruction device supplied).
4. Disconnect electric cables from traction hoist.
5. Dismount emergency bottom obstruction breaker.
6. Secure the traction hoist by means of lifting slings.
7. Dismount traction hoist from supporting structure
8. Extract traction hoist upwards through top of the cabin using a lifting crane attached to lifting slings.
9. Secure the new traction hoist by means of lifting slings and mount to supporting structure using a lifting crane.
10. Mount emergency bottom obstruction breaker.
11. Connect electric cables to traction hoist.
12. Install traction wire rope.
13. Mount top front window and top obstruction device (if full surface top obstruction device supplied).
14. Perform inspection before first use.

6.9 Replacing fall arrest device

1. Remove the safety wire rope.
2. Use a ladder (2 m high) to access engine room.
3. Dismount top obstruction device (if full surface top obstruction device supplied).
4. Unplug electric cable of fall arrest device from the main control box.
5. Cut and remove the wire ropes of the fall arrest device actuators.
6. Dismount fall arrest device from supporting structure.
7. Extract fall arrest device upwards through top of the cabin.
8. Mount new fall arrest device to supporting structure.
9. Mount wire ropes of fall arrest device actuators.
10. Plug electric cable of fall arrest device to the main control box.
11. Install safety wire rope.
12. Mount top obstruction device (if full surface top obstruction device supplied).
13. Perform inspection before first use.

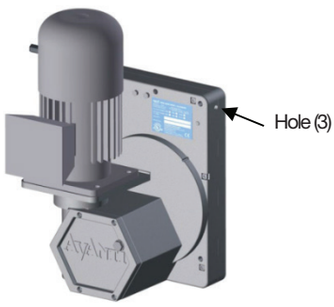
Appendix A: Adjustment of the overload limiter

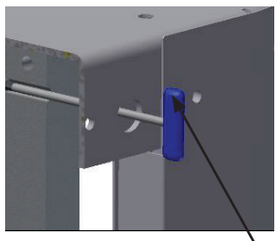
The adjustment of the overload limiter of the service lift shall be carried out only by a certified technician.

Required tools/material:

- Security Torx 40.
- Test weights for applying the test load.

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





When the lift travel path is extended to the foundation in the final installation, for the adjustment of the overload limiter, the total travel distance (Wind Turbine Tower and Foundation) has to be considered.

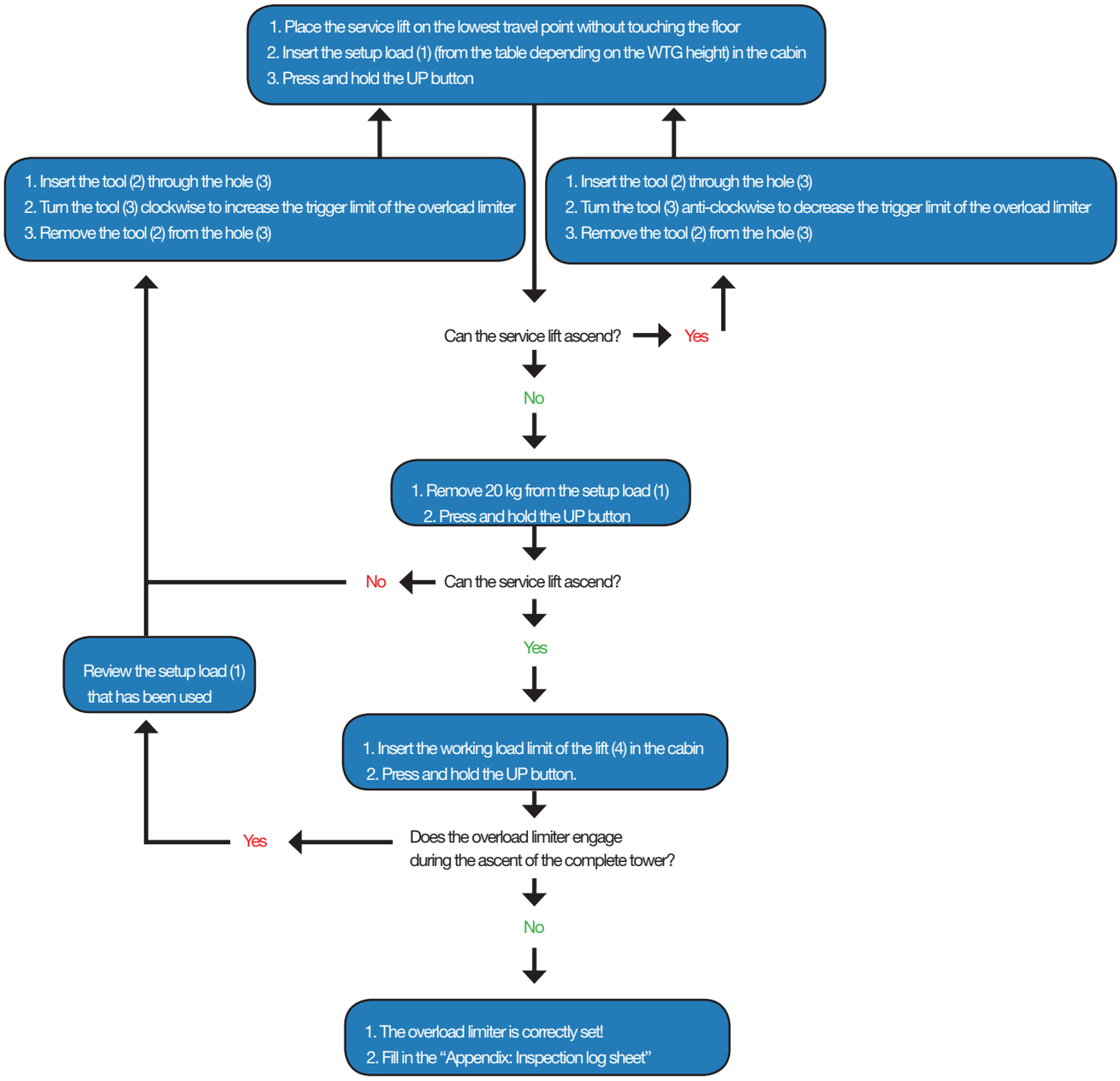
Travel distance (m)	Setup load (1) (kg)	
	For SWP L	For SWP XL
From 60 to 79	315	395
From 80 to 99	325	405
From 100 to 119	335	415
From 120 to 139	350	430

WLL of lift (4) (kg)	
For SWP L	For SWP XL
240	320

The overload limiter complies with EN 1808 8.3.5.5 1) since it will trigger before reaching a load of 1,25 times the working load limit of the hoist. In case that a third party inspector requests this test to be done, the load to be introduced in the cabin is as follows.
Overload test load = WLL hoist x 1,25 – Weight of lift, counterweight, traction wire rope and power cable
For SWP L = 440 kg
For SWP XL = 530 kg

CE AECO

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



Appendix B: Inspection Checklist

Data:		Serial n° traction system:	
Name of competent:		Serial n° fall arrest device:	
Lift n°:		Tower n°:	
Total hours of operation:		Address of installation:	

1	OVERALL (More info in chapter: 6.3.1)	OK	NOT OK	ISSUE DESCRIPTION
1.1	Is the cabin assembled with all plate ends and edges touching each other?			
1.2	Are the top and bottom obstruction devices without dents, cracks and disparities?			
1.3	Are the traction and safety wire ropes hanging parallel equally distanced? (i.e. look out for potential entanglement with tower internals)			
1.4	Is the hour meter reading recorded on the “Inspection log sheet”?			
2	**CONTROL & SAFETY DEVICES (More info in chapter: 6.3.3)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
2.1	Are the cabin and main control boxes without dents, cracks and disparities?			
2.2	Are all the internal buttons of the cabin control box fully functional?			
2.3	(If provided) Are the optional external buttons of the cabin control box fully operational? (Automatic send.)			
2.4	Is the bottom obstruction override key present? And is it fully functional?			
2.5	Does the reset button lamp light up when activated?			
2.6	Do all emergency stop buttons interrupt lift control when activated?			
2.7	Does the bottom obstruction switch(es) interrupt descent when activated? (One switch for SWP L. Two for SWP XL.)			
2.8	Does the emergency bottom obstruction breaker interrupt manual descent when activated?			
2.9	Does the top obstruction switch(es) interrupt ascent when activated? (Two switches for SWP L. One for SWP XL.)			
2.10	Does the emergency limit switch (S13) function properly? Is it properly adjusted at top and bottom platforms?			
2.11	Does the platform light (green) light up when service lift is parked at each platform?			
2.12	Is the emergency manual release button fully functional from inside and outside the cabin?			
2.13	(If provided) Is the slack rope sensor switch stopping the hoist when activated? (Only for the AECO version.)			
2.14	Does the manual descent system function properly when actuated?			
2.15	Are all the platform control boxes without dents, cracks and disparities? (Only if send / call version)			
3	**CABIN**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
3.1	Is the cabin free of cracks, dents and disparities?			
3.2	Is the cabin clean and in overall good condition?			
3.3	Are all the assembling screws of the cabin properly mounted and tightened?			
3.4	Does the bottom obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated?			
3.5	Does the top obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated?			
3.6	Are the anchor points free of cracks, deformities, corrosion and other damages? Are their screws properly tightened?Are its guiding shafts clean and lubricated?			

4	GUIDING SYSTEM (More info in chapter: 6.4.3)	OK	NOT OK	ISSUE DESCRIPTION
4.1	Are the wire rope guides clean, free of cracks, wear, dents and disparities?			
4.2	Are the bolts of the wire rope guides properly tightened?			
4.3	Are the wire ropes free of the damages described in the manual?			
4.4	Are each pair of wire rope fixes properly distanced (1220 mm for SWP L & 1510 mm for SWP XL)? If not, use the installation tool for wire rope fixes.			
4.5	Is each platform opening mounted with 2 wirefixes?			
4.6	Are all the wirefixes free of cracks, dents and disparities?for SWP XL)? If not, use the installation tool for wire rope fixes.			
4.7	Are the bolts of wirefixes and their brackets properly tightened?			
4.8	(Only for SWP XL) Are the roller guides free of damages and properly installed?			
4.9	(Only for SWP XL) Are the aluminium two-piece wirefixes free of damages and properly installed?			
4.10	(Only for SWP XL) Is the guiding system of SWP XL's pulley free of damages and properly installed?			
4.11	Are the guiding wire ropes tensioned to 7KN ±10%?			
4.12	(Only for SWP XL) Are the wirefixes of the travelling cable guiding system separated 150 mm?			
4.13	(Only when lift descents to foundation) Are the lift and travelling cable guide wire ropes out of damage where they were tightened in the preassembly?			
5	**DOOR**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
5.1	Is the door properly mounted and tightened to the cabin?			
5.2	Does the door open and close smoothly?			
5.3	Does the door lock and unlock smoothly?			
6	**ELECTRICAL SYSTEM**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
6.1	Are all the electrical cables free of squeeze marks? Are their isolations present and free of damages?			
6.2	Are the electrical cables laid and fixed with cable ties ensuring that there is no slack?			
6.3	(If provided) Does the cabin light illuminate with a constant light?			
6.4	(If provided) Do the warning lights flash during ascent and descent?			
6.5	(If provided) Is the cable collect bin free of dents and cracks? Is it mounted according to the manual?			
6.6	(If provided) Is the cable opening of bottom platform floor properly placed? Is it mounted with a rubber edge protection?			
6.7	(If provided) Is the travelling cable pulley free of damage?			
6.8	(If provided) When the lift is at bottom platform, is the pulley 100 mm below the platform floor (for CE versions)? Is the pulley 150 mm above the platform floor (for AECO version)?			
6.9	Does the cable stocking(s) or cable relief prevent loading on the cable plug(s)? (1 cable stocking when bin is provided. 2 cable stockings when pulley is provided.)			
6.10	(If provided) Is the travelling cable free of squeeze marks? Is the isolation of the cable present and free of damages?			
6.11	(If provided) Is the hanging cable free of squeeze marks? Is the isolation of the cable present and free of damages?			
6.12	Are all the electrical plugs correctly mounted and connected? Are the plugs free of dents, cracks, disparities and loose screws?			
6.13	(If provided) Is the mid tower electrical cable support properly installed and tightened?			

6.14	(If provided) Is the mid tower power cable connector free of dents, cracks, disparities and loose screws?			
6.15	(Only when lift descents to foundation) Is the main switch control box located in the lift lower end of travel in the foundation?			
7	**TRACTION HOIST (More info in chapter: 6.4.1)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
7.1	Is the traction hoist clean?			
7.2	Does the hour counter read less than 250 h since last overhaul? If it reads more, overhaul traction system and fall arrest device at AVANTI so that a new certificate is issued.			
7.3	Does the current of electrical circuit match the current described on the service lift data plate?			
7.4	Are the 4 fixing bolts, the washers and the nuts present? Are they tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
7.5	Is there no trace of “Teflon® snow/dust” beneath the wire rope pulleys?			
7.6	Are the pulleys of the traction wire rope free of damage, abnormal deformation and wear?			
7.7	Is there no trace of oil leak around motor and gearbox?			
7.8	Is the traction hoist free of damage, dents, cracks or similar?			
7.9	Is the manual descent actuator present? Can it be properly stored?			
7.10	Does the traction hoist sound normal (no abnormal noises or alike) when running?			
7.11	Is the electromagentic brake air gap 0.3 to 0.35 mm?			
8	**FALL ARREST DEVICE (More info in chapter: 6.4.2)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
8.1	Is the fall arrest device free of cracks, dents and disparities?			
8.2	Is the fall arrest device clean?			
8.3	Does the fall arrest device engage when performing overspeed “hand test”? (The safety wire rope is pulled upwards by hand from the first platform.)			
8.4	Does the red locking knob engage the fall arrest device when pulled downwards? Does the black unlocking knob release the fall arrest device when pulled downwards? (Only SWP L.)			
8.5	Does the red locking lever engage the fall arrest device when pushed upwards? Does the black unlocking lever release the fall arrest device when pushed upwards? (Only SWP XL.)			
8.6	Does the red light of the cabin control box light up when the fall arrest device is activated?			
9	**OVERLOAD LIMITER (More info in Appendix A)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
9.1	Was the complete overload test performed according to the “Appendix A: Adjustment of the overload limiter” of the manual?			
9.2	Does the buzzer sound when the service lift is overloaded?			
9.3	Is the service lift able to carry 240 kg to the top platform? (Only for SWP L.) Is the service lift able to carry 320 kg to the top platform? (Only for SWP XL.)			
10	**TRACTION AND SAFETY WIRE ROPES (More info in chapter: 6.4.3.1)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
10.1	Are the traction and safety wire ropes clean and slightly greased with a standard multipurpose grease free of disulphide?			
10.2	Are the wire ropes free of deformations and squeeze marks?			
10.3	Is there no severe corrosion on the surface or the inside of the wire ropes?			
10.4	Are the wire ropes free of heat damages? (Evident by blue discolouration.)			
10.5	Are the wire ropes´ diameters not less than 7,6 mm at any point?			
10.6	Are the wire ropes free of the damages described in chapter “6.4.3.1 Traction and safety wire ropes”?			

10.7	(Only for SWP L) Are the top and bottom spacers free of damages and properly installed?			
10.8	(Only when lift descents to foundation) Are the traction and safety wire ropes out of damage where they were tightened in the preassembly.			
11	**WIRE ROPES AT BOTTOM PLATFORM (More info in chapter: 6.4.3)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
11.1	Is the safety wire rope properly mounted according to the manual, with the torqued spring and the 2 wire rope locks?			
11.2	Is the traction wire rope properly mounted according to the manual, with an 11kg counterweight and the 2 wire rope locks?			
11.3	Are the traction and safety wire ropes properly coiled up and fixed with 3 cable ties each?			
11.4	Are the traction wire rope coil and the counterweight able to rotate freely?			
11.5	Are the locks of the guiding wire ropes tightened to 20 N·m?			
12	**WIRE ROPES AT TOP BEAM (More info in chapter: 6.4.3)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
12.1	Is the top beam properly mounted and properly tightened to the WTG? If welded, are the top beam´s weldings in good condition and not showing corrosion?			
12.2	Are all the nuts of the shackles locked with a cotter pin?			
12.3	Is the top limit device properly positioned and tightened so that it activates the top obstruction switch?			
12.4	Is the length between the top end of each wire rope and its ferrule equal to or more than 0 mm?			
13	**TRAPPED KEY SYSTEM**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
13.1	Is the trapped key properly secured to the cabin with a chain or wire rope?			
13.2	Is the trapped key lock properly tightened to the platform fence? Is it fully functional?			
13.3	Is the trapped key switch of the cabin control box fully functional?			
14	**PLATFORMS**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
14.1	Does the service lift pass freely through all platform openings without hitting the WTG flanges, platform floors and platform fences?			
14.2	Are the safe zone plates properly positioned and tightened so that the platform switch (S18) is activated at each platform?			
14.3	Do the platform fences fulfil specifications for proper mounting?			
14.4	Are the bolts of platform fences properly tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
14.5	(If provided) Are the send and call controls of the platform control boxes fully functional? (UP & DOWN buttons, platform light, reset buttons/lights, and emergency stop button).			
14.6	Does the travelling cable pass freely though all platform openings without hitting the WTG flanges, platform floors and platform fences? (Only in Send/Call versions).			
15	**INFORMATION SIGNS AND DOCUMENTS (More info in chapter: 6.4.5)**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
15.1	Are all the information signs and documents present and legible? (For example: Max. load and PPE stickers.)			
16	**FINAL ASSESSMENT**	**OK**	**NOT OK**	**ISSUE DESCRIPTION**
16.1	Is the service lift installation in overall good operational condition?			

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

Competent inspection may only be carried out by a certified technician.

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

Appendix C: Inspection Log Sheet

Date & time	TYPE OF INSPECTION (BEFORE FIRST USE, ANNUAL OR UNSCHEDULED)	OVERALL RESULT		HOUR COUNTER	ISSUE DESCRIPTION & COMMENTS	NAME (IN CAPITAL LETTERS) & SIGNATURE OF COMPETENT
		OK	NOT OK			

Date & time	TYPE OF INSPECTION (BEFORE FIRST USE, ANNUAL OR UNSCHEDULED)	OVERALL RESULT		HOUR COUNTER	ISSUE DESCRIPTION & COMMENTS	NAME (IN CAPITAL LETTERS) & SIGNATURE OF COMPETENT
		OK	NOT OK			

Date & time	TYPE OF INSPECTION (BEFORE FIRST USE, ANNUAL OR UNSCHEDULED)	OVERALL RESULT		HOUR COUNTER	ISSUE DESCRIPTION & COMMENTS	NAME (IN CAPITAL LETTERS) & SIGNATURE OF COMPETENT
		OK	NOT OK			

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.
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.

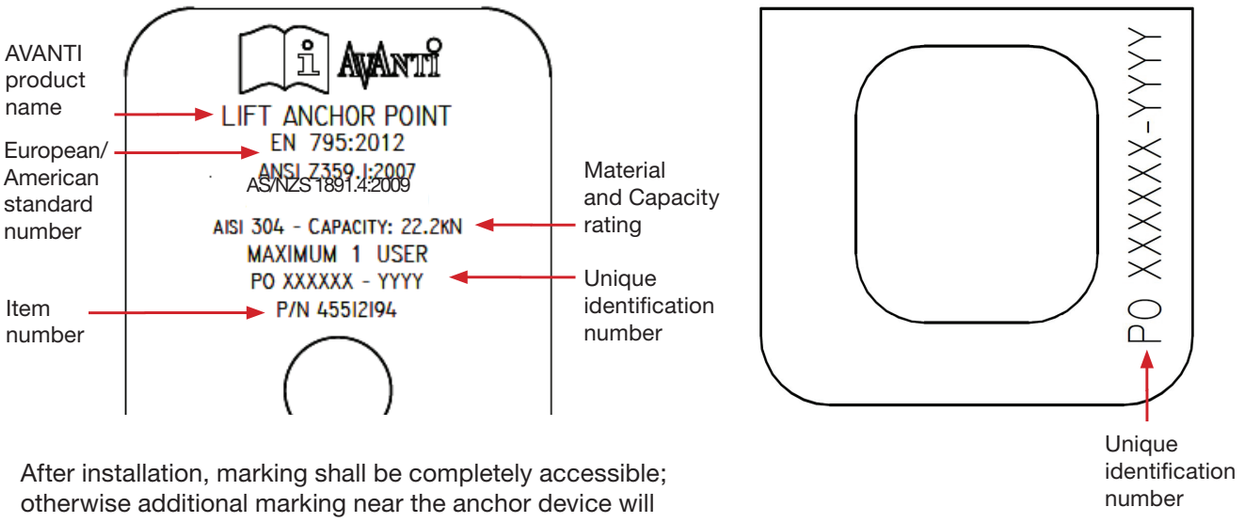
Only to be used for preventing vertical fall!

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:

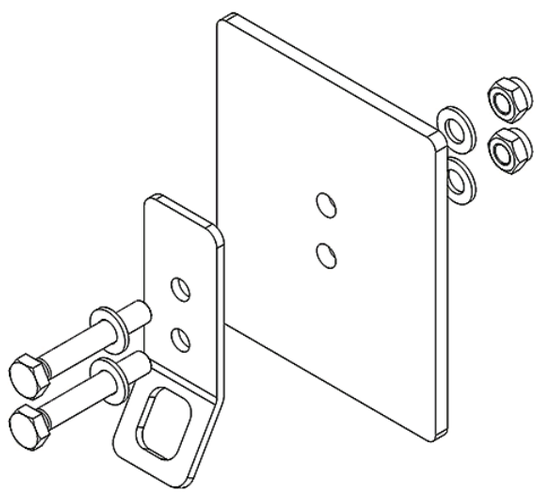
1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.

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

PFPE 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.

D.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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45540028 SWP Service Lift Manual CE AECO EN
5th Edition: February 2015
Revision 9: 27/03/2018