Original instructions

AVANTI SERVICE LIFT

User's, Installation and Maintenance Manual

Model Service Lift PEGASUS

CE certificate of Pegasus CE versions:

CERTIFICATE

EC Directive 2006/42/EC, Article 12, Paragraph 3b
Machinery

Certificate Registration No.: 01/205/0823/14 B

Certification body for machinery NB 0035
of TÜV Rheinland Industrie Service GmbH
hereby certifies the company

AVANTI WIND SYSTEMS, S.L.

Pol. Ind. Centrovía – c/ Los Ángeles, nº88
E-50196 La Muela, Zaragoza
España

Conformity of the product

Vertical Platform Service Lift
Inside Wind Turbine Systems

Type: PEGASUS-250 kg

Modification: additional basket "tool kit"

Technical data:

Ident. No: 20LP0001
Type of drive: Electric / Pinion-Rack
Max. Lifting height: 150 m
Max. load capacity: 250 kg / 2 People
Max. Lifting speed: 0,33 m/s

with the requirements defined in Annex I to Directive 2006/42/EC on machinery and amending Directive 95/16/EC of the European Parliament and the Council in May 2006 on the approximation of laws, regulations and administrative Member States relating to machinery.
Proof has been furnished on the basis of an EC Type Examination, Report No.: AE.COL.00022-12 from 03.02.2014, and is valid subject to compliance with the requirements stated in this document.
This certificate is valid until 17.09.2018

TÜVRheinland 0035 Notified Body

Berlin, 28.02.2014

Certification body
Notified under No. 0035
Head / Certifier

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TÜVRheinland®
Genau. Richtig.

AECO certificate of Pegasus AECO version:

LIFTINSTITUUT

CERTIFICATE OF CONFORMANCE

Acting under ASME A17.7.1/CSA B44.7.1 issued by Liftinstituut B.V.
identification number ANSI AECO #0842
(AECO = Accredited Elevator/Escalator Certification Organization)
Certification system 3 according to ISO Guide 67: 2004

Certificate no.	:	NA14-0842-1004-018-01	Revision no.: 1
Description of the product	:	Wind Turbine Elevator	
Type	:	Pegasus L	
Model no.	:	-	
Name and address of the manufacturer	:	Avanti Wind Systems SL Poligono Industrial Centrovia Calle Los Angeles n°88 Nave 1 50198 La Muela (Zaragoza) Spain	
Name and address of the certificate holder	:	Avanti Wind Systems A/S Rønnevangs Allé 6 DK-3400 Hillerød Denmark	
Certificate issued on the basis of the following requirements	:	ASME A17.7-2007 / CSA B44.7-07 (I-4 Elevator Systems)	
Test laboratory/location	:	Avanti Wind Systems SL	
Date and number of the laboratory report	:	None	
Date of verification of conformance	:	June 2013 – September 2014	
Annexes with this certificate	:	Certificate of Conformance Report no: NA14-0842-1004-018-01 Rev. 1	
Additional remarks	:	For GESRs, SPs and other information see supporting report.	
Conclusion	:	The Elevator System meets the requirements of the ASME A17.7-2007 / CSA B44.7-07, taking into account any additional remarks mentioned above.	

Issued in Amsterdam

Date of issue : 27-10-2014

Valid thru : 27-10-2017

ing. A.J. van Ommen
Manager Business Unit
Certification

Certification decision by

Date of publication:
4th CE Edition: 10/2014
Revision 3: 9/02/15

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Contents

1. Limited Warranty

AVANTI Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of 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.

* Avanti service lift (“Product”)

2. Introduction

2.1 Observations

Only trained people may use this lift.
This manual must be available to staff at all times during installation, maintenance and operation.
Additional copies are available from the manufacturer upon request.
All measurements are indicative only and subject to change without notice.

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

2.2 Symbols

Safety instructions

Symbol	Signal word	Meaning	Possible injury if not observed
	**DANGER!**	IMMEDIATE or possibly imminent danger:	Death or severe injury!
	**DANGER!**	IMMEDIATE or possibly imminent danger of hazardous voltage:	Death or severe injury!
	**CAUTION!**	Potentially hazardous situation:	Light injury or material damage.

Additional instructions

	**ATTENTION!**	Potentially dangerous situation:	Damage to equipment or workplace
	**IMPORTANT!**	Useful tips for optimum working procedure	None
	**VERSION!**	Differentiation between CE versions and AECO version.	
		Reference to written specification/documentation	

2.3 Cautions

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

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

Personnel are obliged to read and understand this User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard, gloves, safety shoes and a slider compatible with the safety line of the ladder) at all times.

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

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

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

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

All tests/repairs of electrical installations may only be performed by AVANTI or qualified personnel authorised by AVANTI.

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

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

Only original fault-free parts may be used.
Use of non-original parts will render the AVANTI's warranty void and any type approval invalid.
No modification, extension or reconstruction of the service lift is allowed without the 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.

Before using the lift perform an inspection by AVANTI or qualified personnel authorised by AVANTI.

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

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/year (250 h in total).

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

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

All wind farm site specific rules must be followed. Service lift shall not be used during inclement weather, including wind speeds over 18 m/s.

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

Avoid injury – follow all instructions!

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

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

3. Description

3.1 Purpose

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

Its use is limited to personnel authorised by AVANTI holding the relevant training certificates.
The access to the WTG and consequently to the service lift is controlled and forbidden to public access.
The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point).
It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

3.2 Scope

This manual contains instructions for three different versions of the Pegasus lift:

- *Pegasus CE bucket type version and Pegasus CE full sliding door version, which are certified to Machinery Directive 2006/42/EC.*

- *Pegasus AECO version, which is certified to ASME A17.7/CSA B44.7-2007.*

The scope of the certificate is:

- a rack and pinion service lift,
- a ladder (mast),
- the necessary accessories to allow the connection to the WTG and the control and safety functions described in the manual. The accessories include: ladder supports (ties to the tower brackets), rest platforms, mechanical stops, safe zone plates, platform control boxes and other electrical equipment. It also includes the hardware necessary to make the connections, stickers and warning signs.
- and the platform fences.

The ladder sections, their supports, related accessories and platform fences may be assembled to the tower in the WTG factory and supplied later on site for final installation.
The service lift is supplied pre-assembled and may be supplied to the WTG factory or on site directly.
Final assembly, adjustment, installation and verification of the service lift shall be made on site.

3.3 Exclusions

A declaration of conformity of the complete system integrated in the WTG can only be issued after the system has been fully incorporated. In case the necessary information for the evaluation is not supplied to AVANTI, a declaration of incorporation shall be issued.

In such case, equipment with missing information shall be specifically out of the scope of the certificate, but will be needed for the safe integration and use of the service lift. The WTG manufacturer will be responsible for ensuring full compliance of the system once integrated in the tower. To do so, the instructions and WTG requirements stated in this manual shall be observed.

For example, the emergency lighting along the WTG shall be considered, in order to guarantee a safe evacuation from WTG in case of emergency.

The WTG manufacturer's risk assessment shall include a service lift integration study.

The service lift must not be used outdoor or in potentially explosive atmospheres.

3.4 Technical specifications

Service lift		CE versions	AECO version
Cabin type		Bucket type [2], front fence (1.1 m) with double door Full sliding door	Full sliding door
Service lift speed		19.4 m/min ± 10 % (50 Hz) 17.4 m/min ± 10 % (60 Hz)	17.4 m/min ± 10 % (60 Hz)
Working load limit / N° persons (max)		250 Kg / 2 Persons	250 Kg / 2 Persons
Travelling height		150 m	150 m
Operating temperature[1]	Standard	-10°C to +60°C	-10°C to +60°C
	Low	-25°C to +40°C	-25°C to +40°C
Survival temperature [1]	Standard	-25°C to +80°C	-25°C to +80°C
	Low	-40°C to +80°C	-40°C to +80°C
Traction system type		Rack and pinion	Rack and pinion
Max.noise level		80 dB (A)	80 dB (A)
Power supply		3 kW, 16 A 3 Phase 400V, 50Hz / 60Hz	3 kW, 16 A 3 Phase 400V, 60Hz
IP protection / NEMA type [1]		min. IP 54	Type 4
Control voltage		24 VAC	24 VAC

[1]Note: for special working conditions, check with the manufacturer

Traction system	CE versions	AECO version
Power	2 x 1.5 kW	2 x 1.5 kW
Gear box ratio	1 : 15 (50 Hz)- 1 : 20 (60 Hz)	1 : 20 (60 Hz)
Rack / Pinion module	6	6
Centrifugal brake limiting speed	24 m/min	24 m/min
Dimensions	220 x 225 x 580 mm	220 x 225 x 580 mm
Weight by motor group	30 Kg	30 Kg
Motor speed	1400 rpm (50 Hz) – 1680 rpm (60 Hz)	1680 rpm (60 Hz)
Nominal current	2 x 3.7 A	2 x 3.7 A
Start current	2 x 18.5 A	2 x 18.5 A

Cabin	CE versions	AECO version
Cabin weight	225 kg	225 kg
Outer dimensions (W x D x H)	996 x 777 x 2642 mm	996 x 777 x 2642 mm
Inner dimensions (W x D x H)	976 x 481 x 2232 mm	976 x 481 x 2232 mm
Door opening of bucket type (W x H)	920 x 1100 mm	
Door opening of full sliding door (W x H)	564 x 1988 mm	564 x 1988 mm
Top hatch dimensions (W x D)	640 x 400 mm	640 x 400 mm
Bottom hatch dimensions (W x D)	600 x 400 mm	600 x 400 mm
Lateral windows [2] dimensions (W x H)	280 x 810 mm	

Power & Control cable		CE versions	AECO version
Type	Bottom platform to junction box	18 G 2.5	7 G 4 + 12 G 1.5
	Top platform to junction box	8 G 1.5	12 G 1.5
	Travelling cable	1 x 8 G 2.5 + 1 x 10 G 1.5	7 G 4 + 12 G 1.5
Travelling cable weight (approx.)		0.6 kg/m	0.5 kg/m

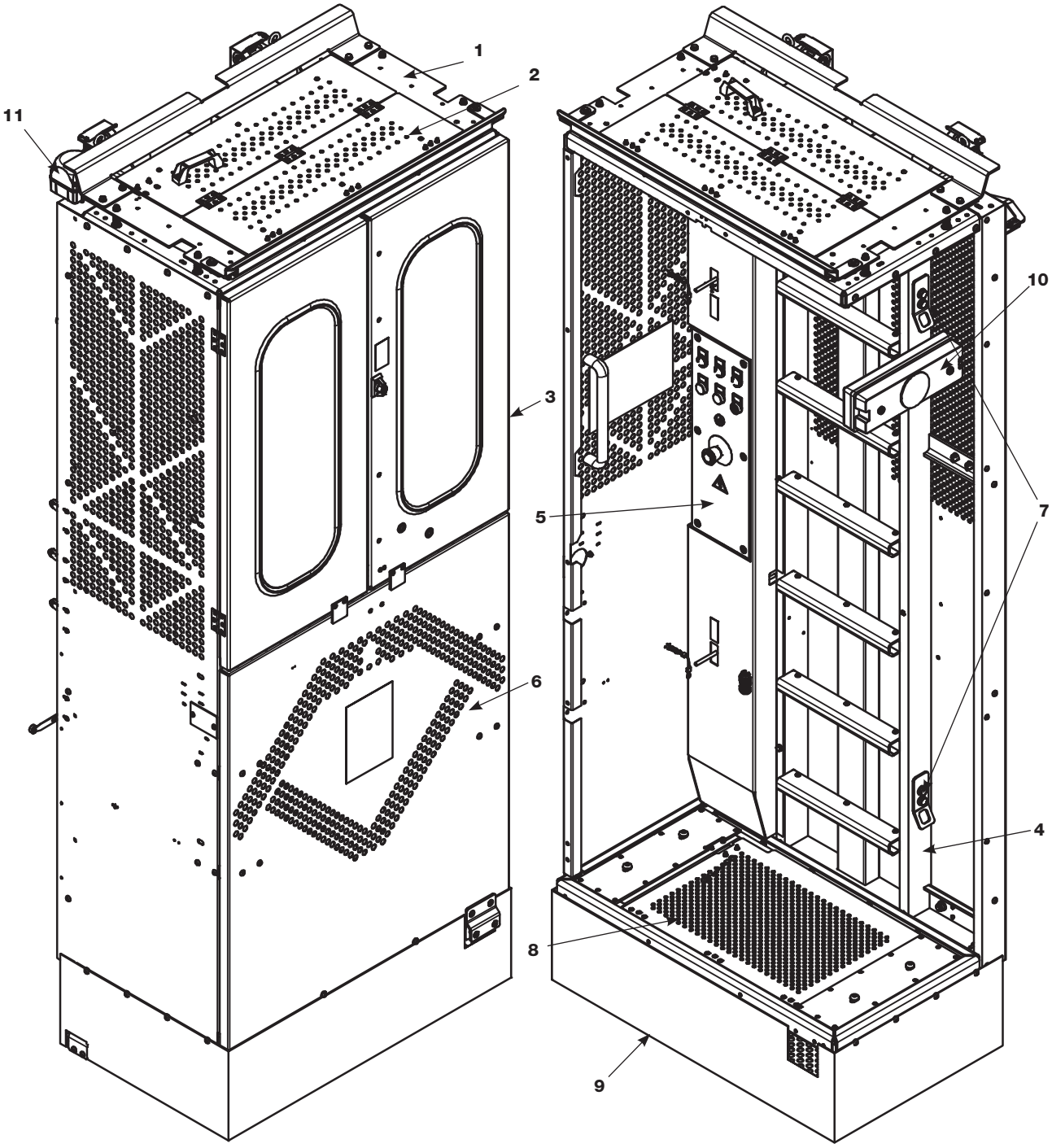
Ladder rack (Mast)	CE versions	AECO version
Dimensions	530 x 30 x 1489 mm / 530 x 30 x 2978 mm	530 x 30 x 1489 mm / 530 x 30 x 2978 mm
Weight (per piece)	15 kg / 30 kg	15 kg / 30 kg
Attachment distance	1 per mast section, max. 3000 mm	1 per mast section, max. 2100 mm

CE AECO

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

3.5 Service lift overview

3.5.1 Bucket type [1)]



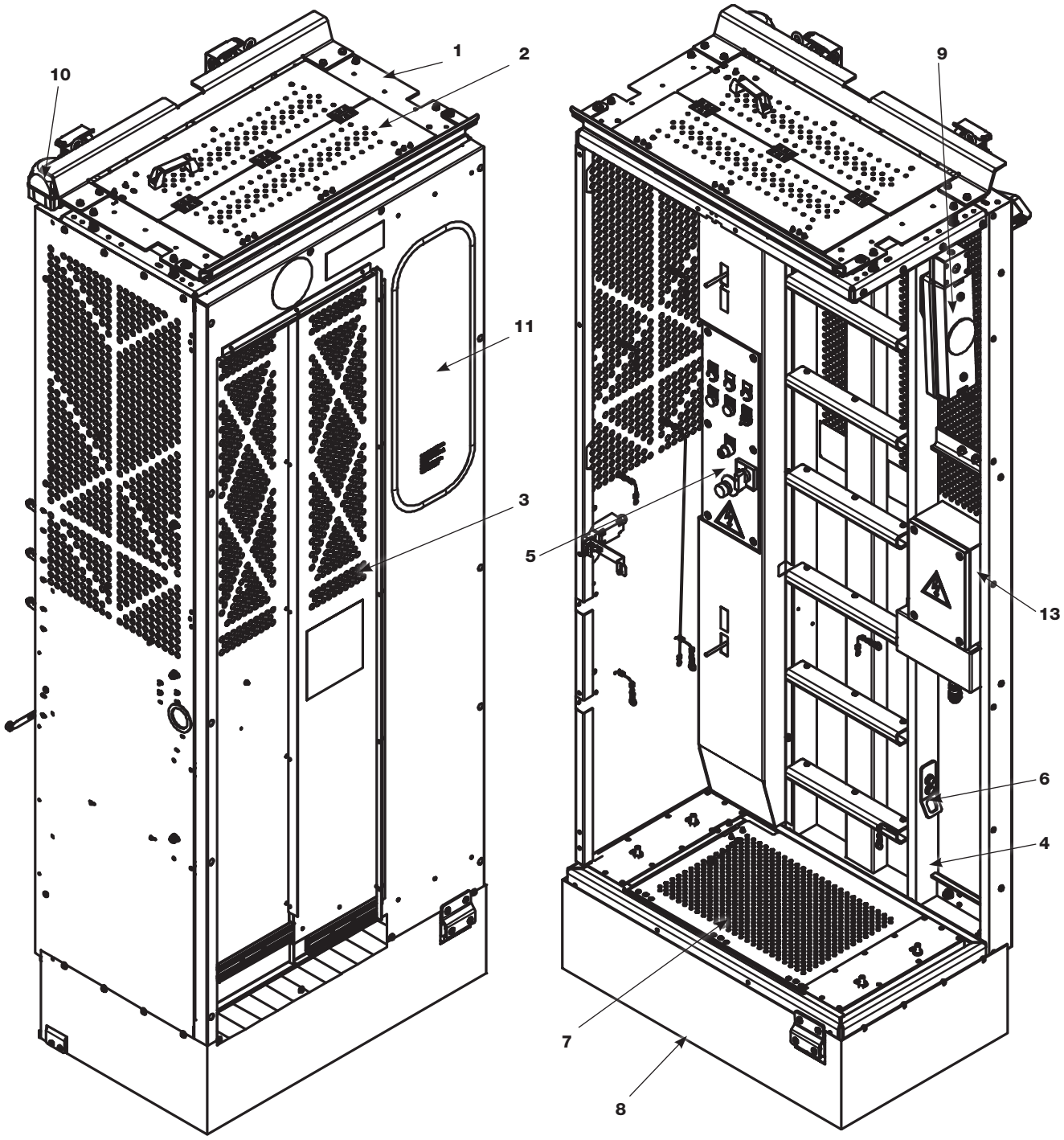
1. Top obstruction device
2. Top hatch
3. Double door
4. Main frame
5. Cabin control box
6. Fixed front
7. Anchor points for PPE (2x)
8. Bottom cabin hatch
9. Bottom obstruction device
10. Cabin light [2)]
11. Warning lights (2x) [2)]

CE AECO

[1)] Optional for CE versions. Not available for AECO version.

[2)] Optional for Pegasus CE versions. Mandatory for AECO version.

3.5.2 Full sliding door [1]

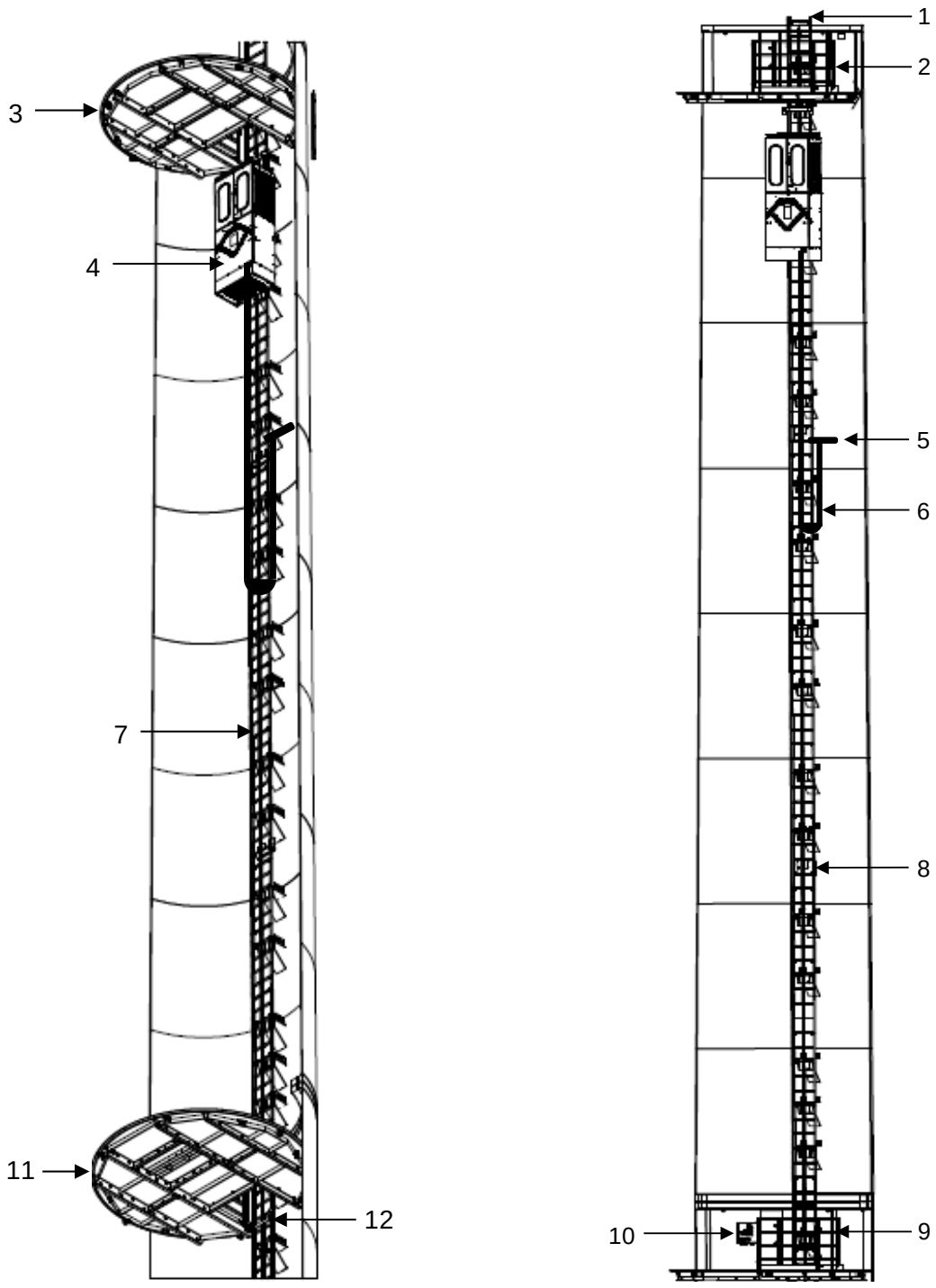


1. Top obstruction device
2. Top hatch
3. Full sliding door
4. Main frame
5. Cabin control box
6. Anchor points for PPE (3x)
7. Bottom cabin hatch
8. Bottom obstruction device
9. Cabin light [1]
10. Warning lights (2x) [1]
11. Front window [2]
12. Top obstruction device
13. Second cabin control box [3]

CE AECO

[1] Optional for CE versions. Mandatory for AECO version.
[2] Optional for CE versions and for AECO version.

3.6 General arrangement of service lift inside a generic WTG

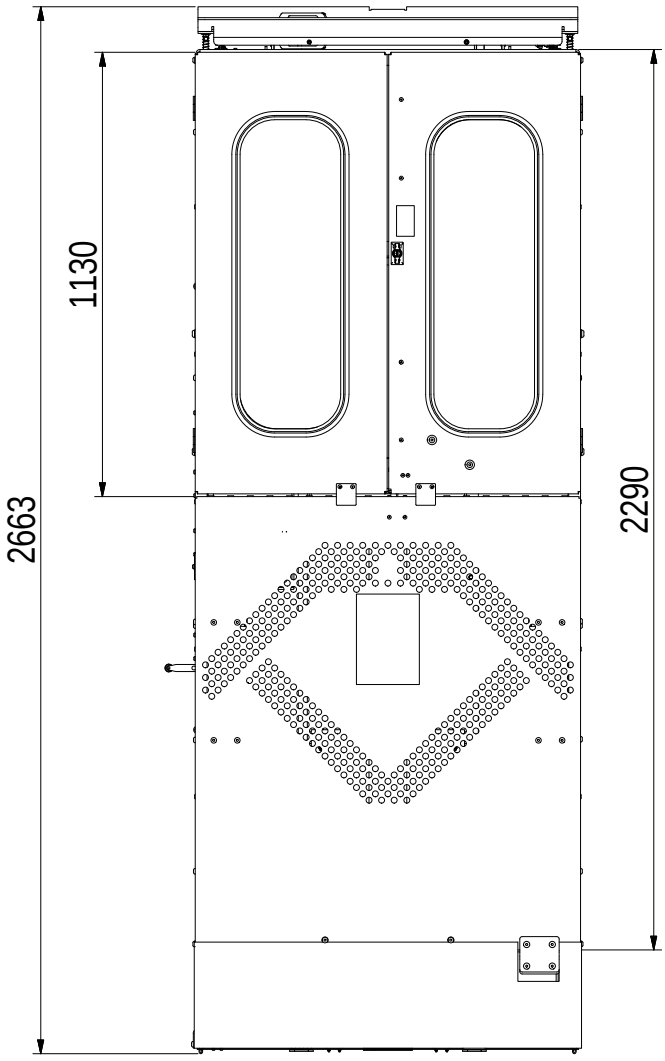


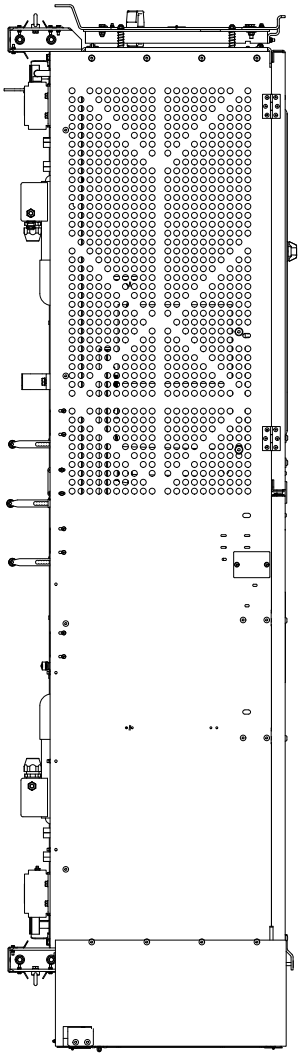
The service lift features a travelling cable system. This system consists of a cable that is connected from the service lift to a support installed above the middle of the tower height. This way, the cable travels with the service lift.

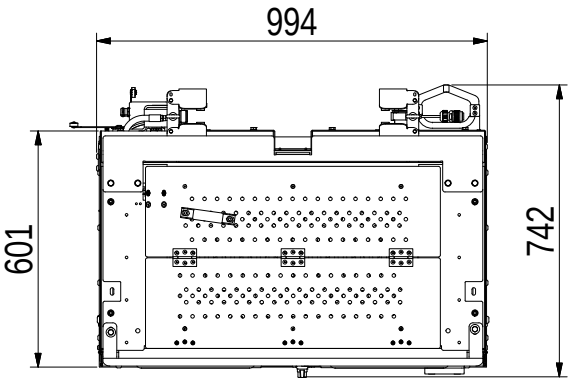
1. Top mechanical stop
2. Top platform fence
3. Top platform
4. Service lift
5. Intermediate support
6. Travelling cable
7. Ladder rack
8. Rest platform
9. Bottom platform fence
10. Bottom platform control box
11. Bottom platform
12. Bottom mechanical stop

3.7 Service lift dimensions

3.7.1 Bucket type [1)]



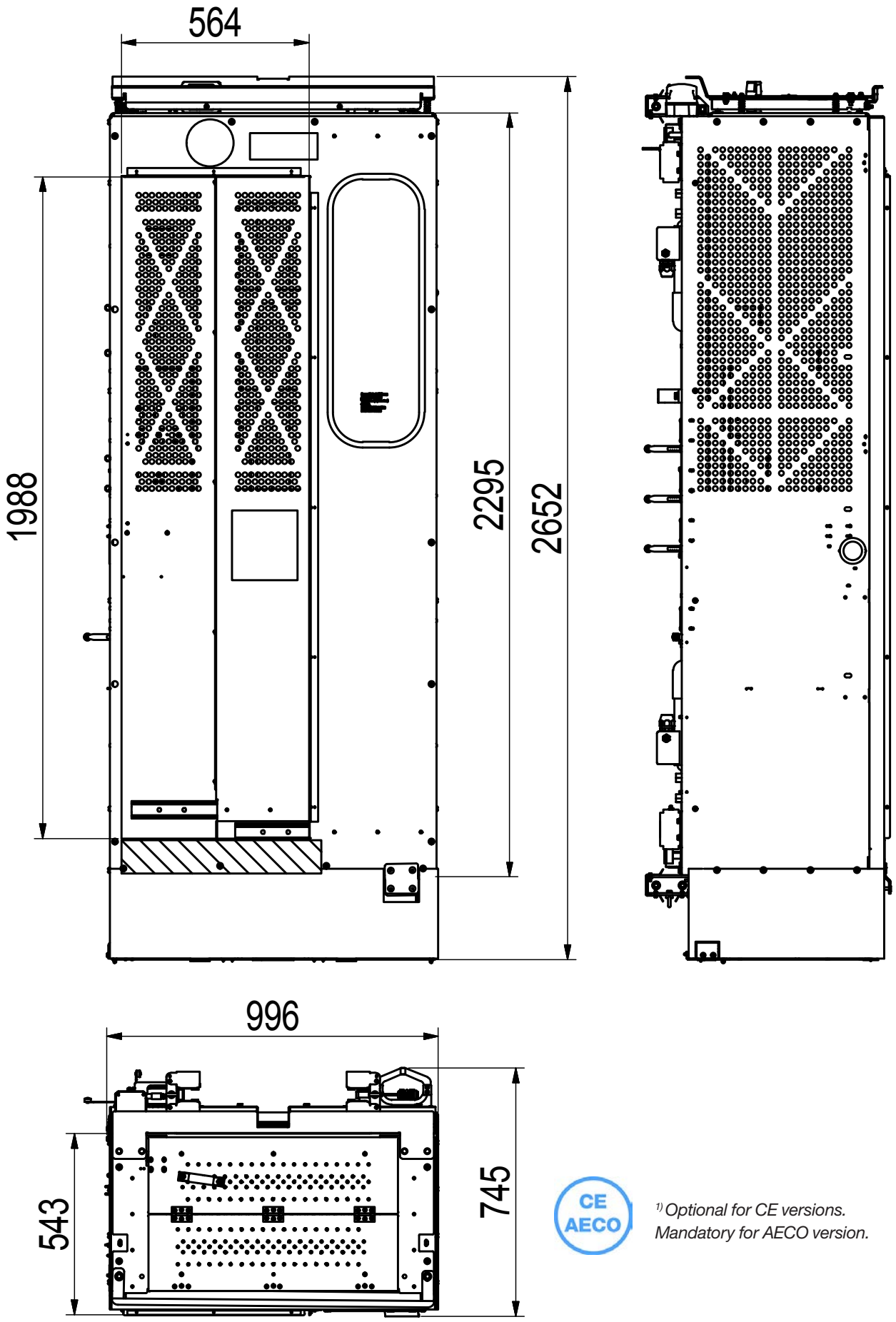




CE
AECO

[1)] Optional for CE versions.
Not available for AECO version.

3.7.2 Full sliding door [1)]

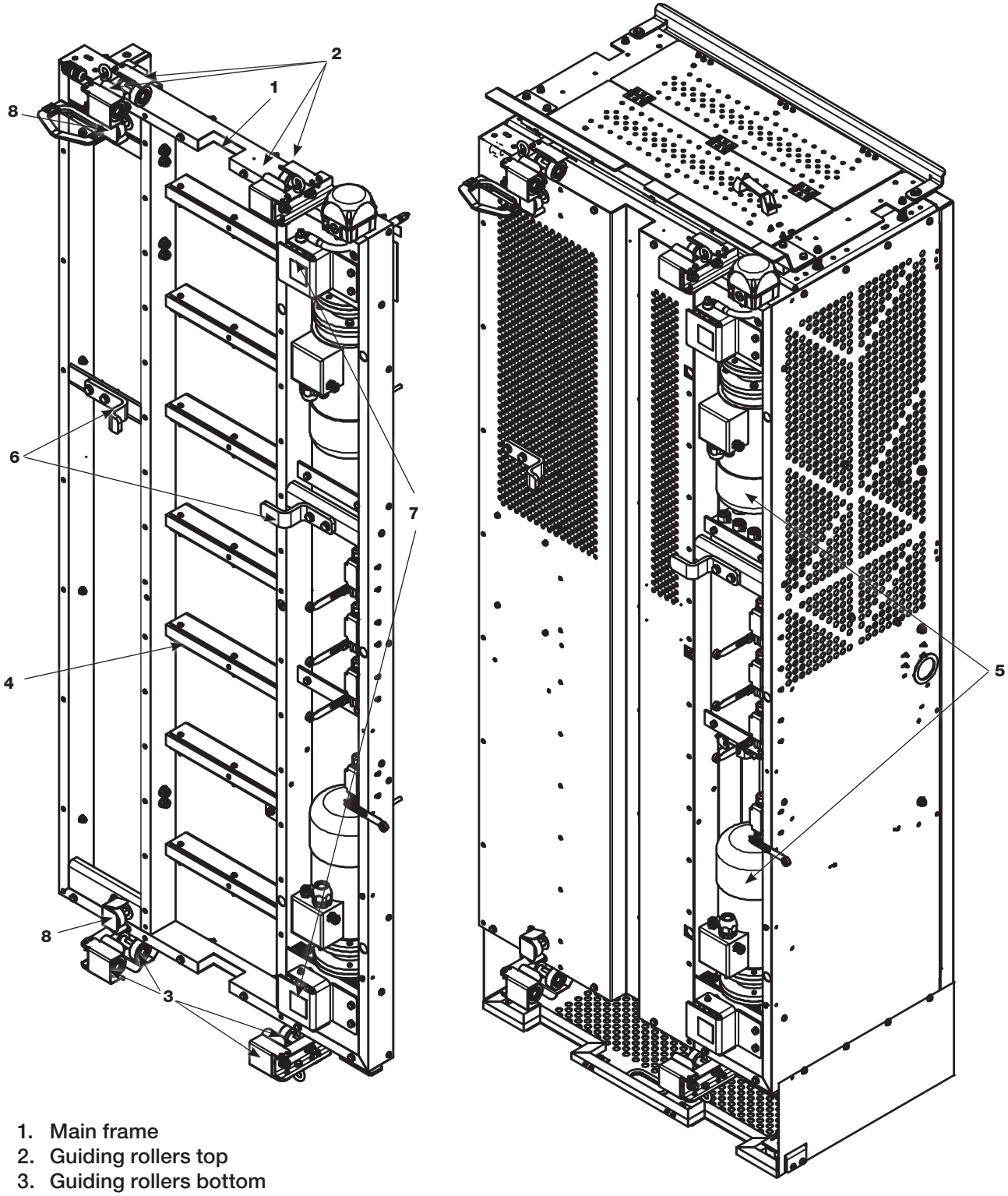


CE AECO

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

3.8 Main frame

The main frame is a welded steel structure. The traction and guiding systems are bolted to the main frame.

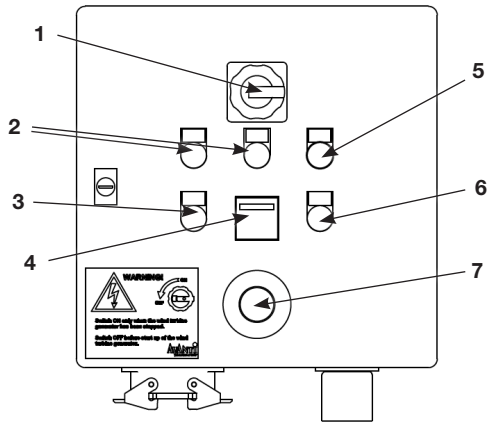


1. Main frame
2. Guiding rollers top
3. Guiding rollers bottom
4. Evacuation ladder
5. Traction system/ 2 Motor groups
6. Anti- derailment brackets
7. Pinions
8. Counter guiding rollers

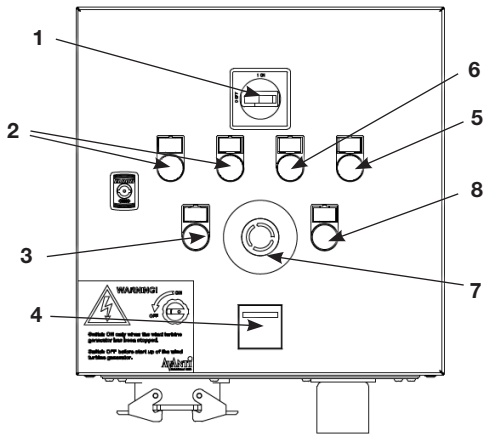
3.9 Controls

3.9.1 Bottom platform control box

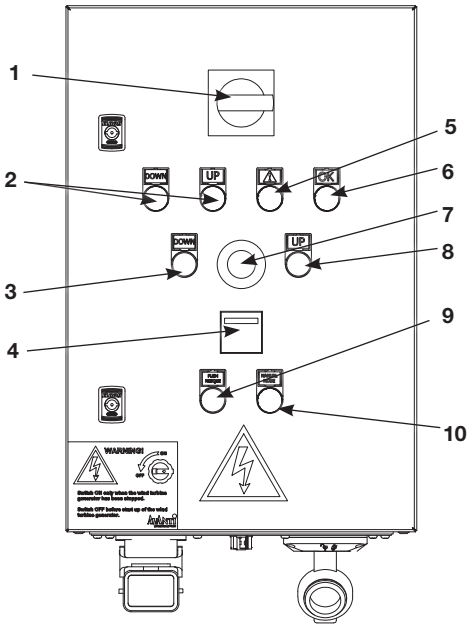
CE Call only configuration:



CE Send [1] and call configuration:



AECO configuration:



1. ON/OFF MAIN SWITCH

2. UP/DOWN LIGHTS (GREEN)
Lights up when the lift is going up or down respectively.

3. DOWN BUTTON
Press and hold DOWN button to call the lift to the bottom platform.

4. HOUR COUNTER

5. FAULT LIGHT (RED)
Lights up when there is an activated switch on the safety circuit i.e: Open door, emergency stop pressed, open hatch or the ON/OFF buttons of the cabin control box is not in the ON position.

6. READY LIGHT (GREEN)
Lights up when the box has electric current.

7. EMERGENCY STOP BUTTON
Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.

8. UP BUTTON
Press and hold UP button to send the lift to the top platform.

9. RESCUE BUTTON [2]
Press this button to enable send [1] and call functions in case of rescue. This selector is sealed and is for emergency use only.

10. MANUAL MODE LIGHT [3]
Lights up when the MANUAL/AUTO selector [2] of the cabin control box is left in MANUAL position.

The send [1] and call buttons have a delayed reponse function. A buzzer is included on the cabin control box. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

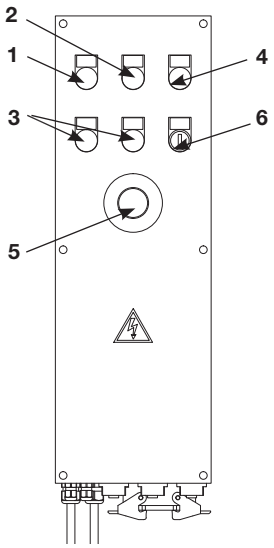
CE AECO

[1] Optional for CE versions and for AECO version.
[2] Not available for CE versions. Mandatory for AECO version.
[3] Not available for CE versions. Optional for AECO version.

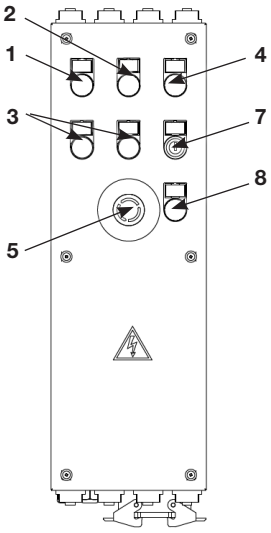
3.9.2 Cabin control box

Cabin control box inside the cabin has control priority over control boxes at platforms.

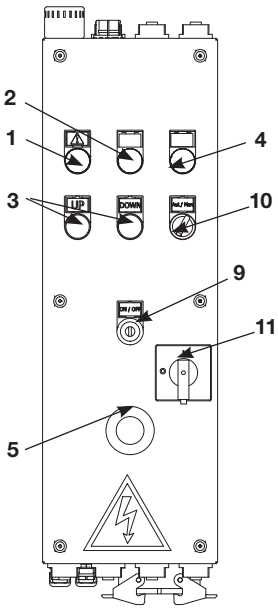
CE without lateral windows [1] configuration:



CE with lateral windows [1] configuration:



AECO configuration:



1. FAULT LIGHT (RED)
It lights up when there is an activated switch of the safety circuit (i.e. a door or hatch is open, an emergency stop button is pressed, the ON/OFF selector is at the OFF position, or a limit switch is activated).

2. PLATFORM LIGHT (GREEN)
It lights up when the lift reaches the bottom or top platform.
If the platform switch (S18) [2] is provided: the light lights up when the lift reaches any platform.

3. UP/DOWN BUTTONS
Press and hold the "UP" or "DOWN" button, to ascend or descend respectively.

4. OVERLOAD LIGHT (YELLOW)
It lights up when the cabin is overloaded.

5. EMERGENCY STOP BUTTON
Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.

6. ON/OFF SELECTOR (GREEN)
It lights up when all the switches of the safety circuit are deactivated and the ON/OFF selector is at the ON position.
Select the ON position to enable control from the lift.
Select the OFF position to interrupt control from the lift.

7. CABIN KEY LOCK

8. READY LIGHT (GREEN)
It lights up when the box has electrical current and all the switches of the safety circuit are deactivated.

9. TRAPPED KEY LOCK
Insert the trapped key and turn to ON position, then the control box has electric current.

10. MANUAL/AUTO SELECTOR (GREEN) [4]
It lights up when the box has electrical current and all the switches of the safety circuit are deactivated.
Turn to the MANUAL position to enable control from the cabin control box and to interrupt control from the platform control boxes.
Turn to the AUTO position to enable control from the platform control boxes and to interrupt control of the cabin control box.

11. ON/OFF SELECTOR [4]
Select the ON position to connect the electric current.
Select the OFF position to disconnect the electric current.

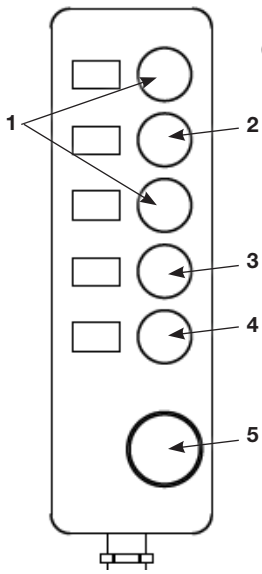
A buzzer is included on the cabin control box. The send [3] and call buttons of the platform control boxes have a delayed response function. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

CE AECO

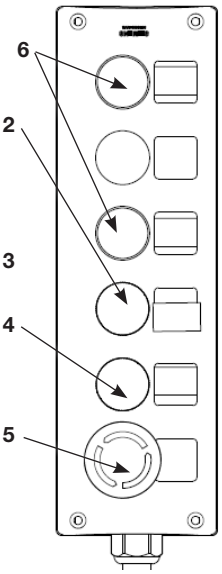
[1] Optional for CE versions. Not available for AECO version.
[2] Optional for CE bucket type version.
Mandatory for CE full sliding door version and for AECO version.
[3] Optional for CE versions and for AECO version.
[4] Not available for CE versions. Mandatory for AECO version.

3.9.3 Top platform control box

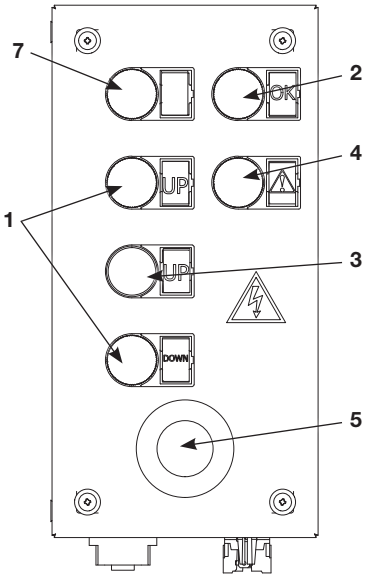
CE Call only configuration:



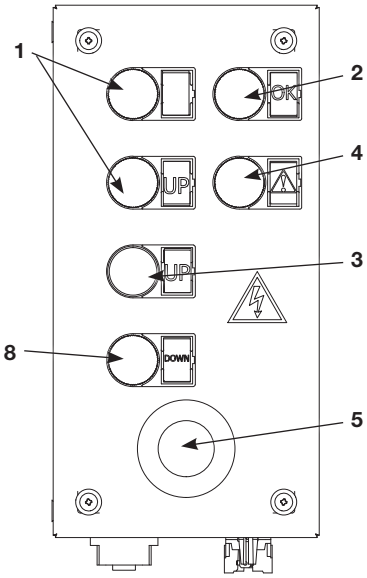
CE Send [1] and call configuration:



AECO Call only configuration:



AECO Send [1] and call configuration:

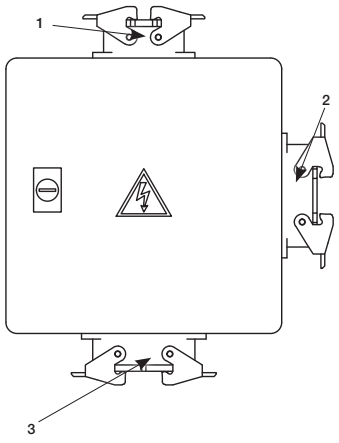


1. UP/DOWN LIGHTS (GREEN)
They light up when the lift is going up or down respectively.
2.READY LIGHT (GREEN)
It lights up when the box has electric current.
3. UP BUTTON
Press and hold the UP button to call the service lift.
4. FAULT LIGHT (RED)
It lights up when there is an activated switch on the safety circuit (i.e. an open door, emergency stop button pressed, open hatch or the ON/OFF selector of the cabin control box is not in the ON position).
5. EMERGENCY STOP BUTTON
Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.
6. UP/DOWN LIGHT BUTTONS (GREEN)
Press and hold UP/DOWN light-buttons to ascend or descend the service lift respectively. UP/DOWN light-buttons light up when the lift is ascending or descending respectively.
7. PLATFORM LIGHT (GREEN)
It lights up when lift reaches the top platform.
8. DOWN BUTTON
Press and hold the DOWN button to send the service lift.

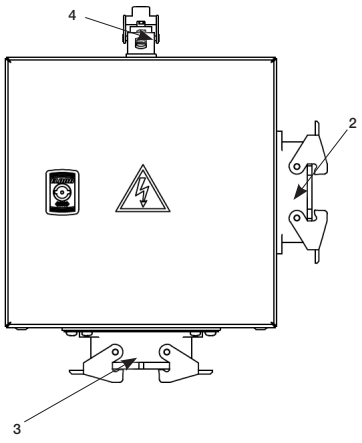
The send [1] and call buttons have a delayed reponse function. A buzzer is included on the cabin control box. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

3.9.4 Mid tower junction box

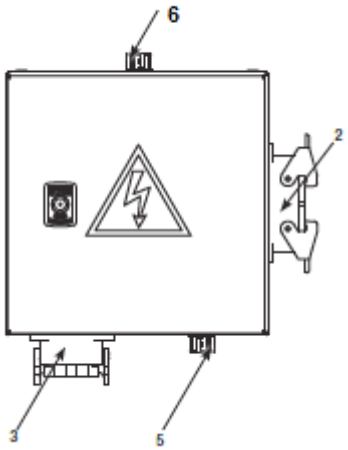
CE Call only configuration :



CE Send [1] and call configuration:



AECO configuration:



1. 10 pin connector for electrical round cable
To connect to top platform control box.
2. Connector for travelling flat cable
To supply electric power to the cabin.
3. Connector for electrical round cable
To connect to bottom platform control box.
4. 12 pin connector for electrical round cable
To connect to top platform control box.
5. Connector for control signal.
To connect to bottom platform control box.
6. Connector for control signal.
To connect to top platform control box.

CE AECO

[1] Optional for CE versions and for AECO version.

3.10 Service lift doors

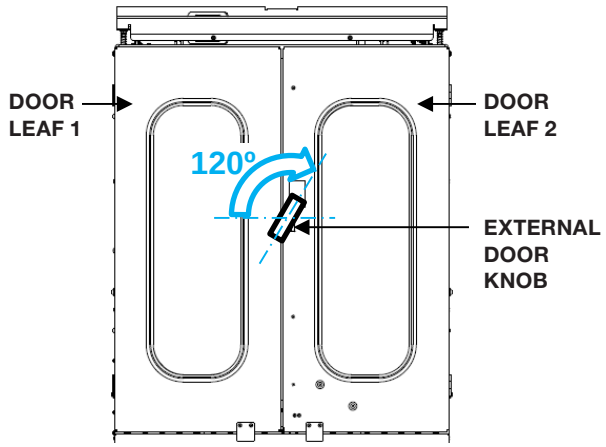
3.10.1 Double door [1)]

The main access to the service lift is done through the double door installed on the front. The double door consists of two hinged door leaves that open outwards.

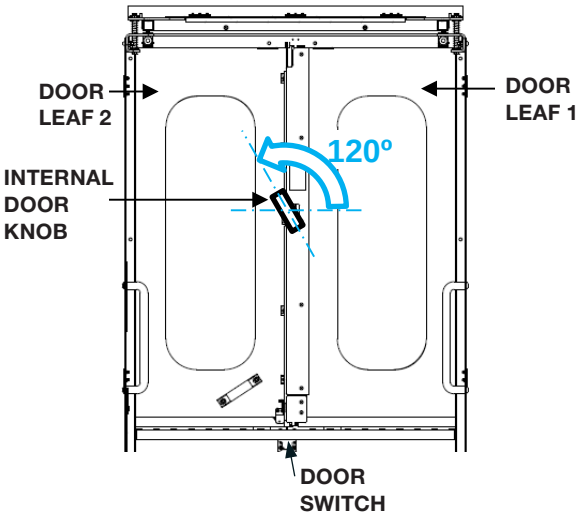
The door can be opened at any time. If the door is opened, a safety switch that monitors the closed function will interrupt control.

A mechanical lock locks the door to the fixed front. It presents two door knobs, one outside of the cabin and one inside. The door lock is unlocked by turning one of its door knobs 120° until you hear a click. The door lock will then stay unlocked until the door leaves are closed again. When the door leaves are finally closed, the door lock will automatically lock.

If the user is outside the cabin, the external door knob has to be turned clockwise.



If the user is inside the cabin, the internal door knob has to be turned anticlockwise.

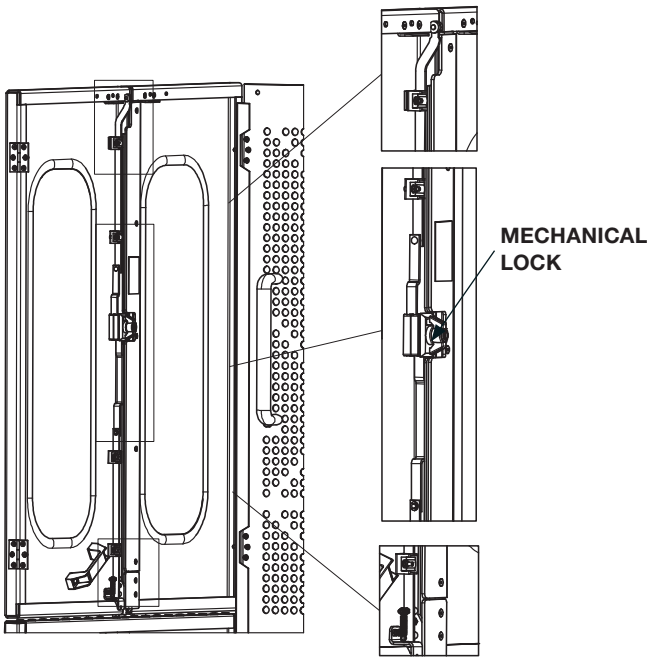


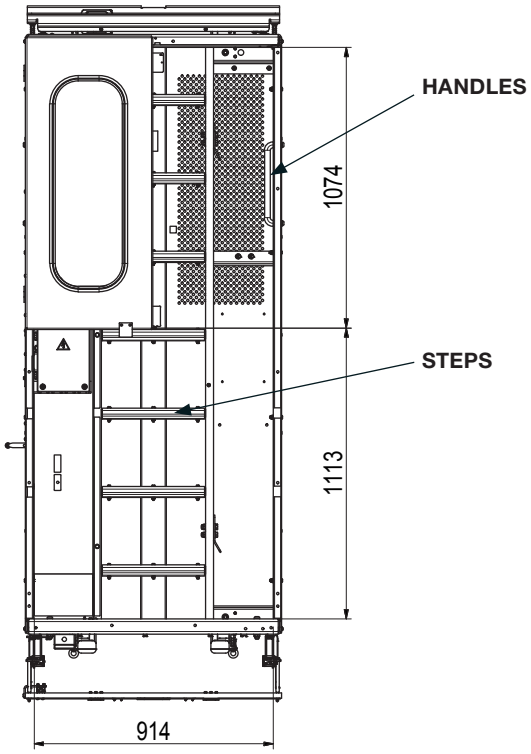
If the door knob is turned ONLY 45°, the door lock will unlock but it will NOT stay unlocked. In such case, it will not be possible to close the door leaf 2! To fix this, simply turn the door knob 120° until you hear a click.

If the door is not closed properly, the fault light (red) will light up.

The steps inside the cabin are provided with non-slip surface to mitigate the risk of falling.

When the door is open, user(s) MUST BE attached with the shock absorber to a cabin anchor point.





[1)] *Optional for CE versions. Not available for AECO version.*

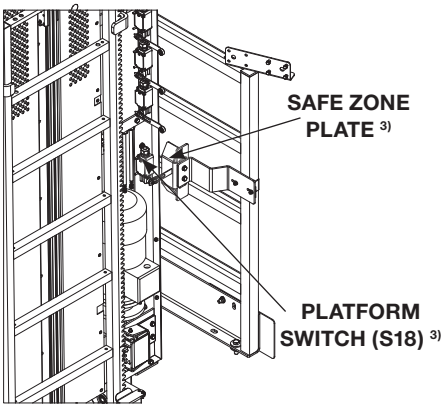
3.10.2 Full sliding door [1]

It consists of two perforated sheets that slide horizontally.

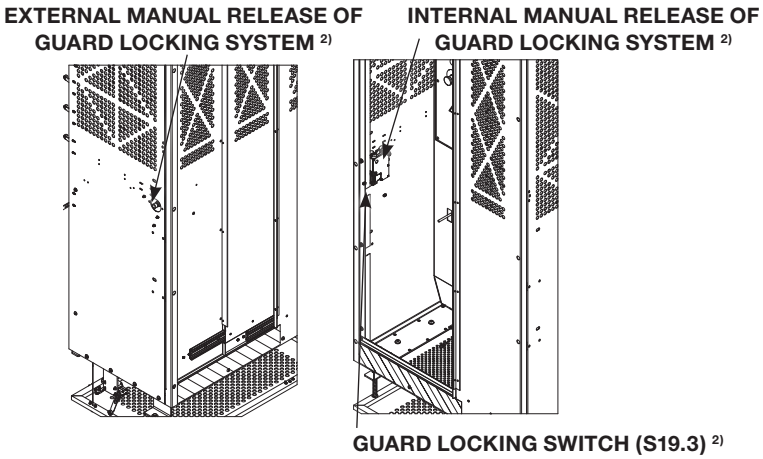
3.10.2.1 Guard locking configuration [2]

It features a guard locking system [2] that:

- Prevents service lift to travel if the door is open. This opening condition is monitored by the guard locking switch (S19.3) [2].
- Permits door to be opened only when service lift is levelled with a platform. This levelling condition is monitored by the platform switch (S18) [3] which is triggered by the safe zone plates [3].



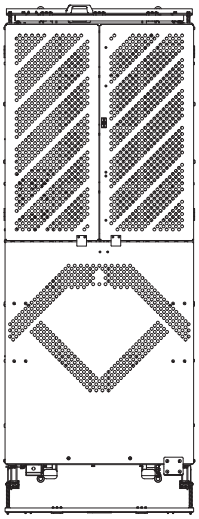
It is possible to manually release the guard locking system [2] in order to open the door between platforms for maintenance tasks or installation of WTG parts.



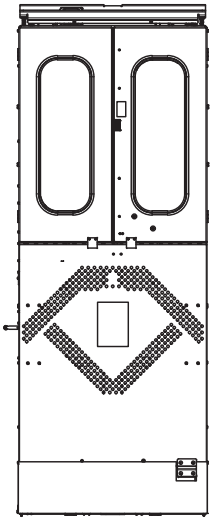
3.10.2.2 Interlock without monitoring configuration [4]

It features an interlock without monitoring [4] that does not allow the door to be opened involuntarily.
In order to open the door, the user must actuate a manual release button, which is accessible from the inside and the outside of the cabin.

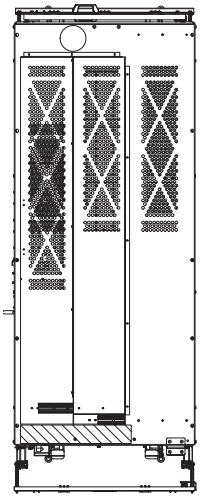
Bucket type without windows [5]:



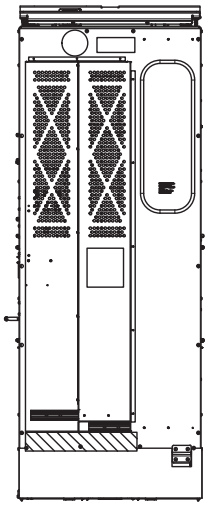
Bucket type with windows [5]:



Full sliding door without windows [6]:



Full sliding door with windows [6]



3.11 Front windows

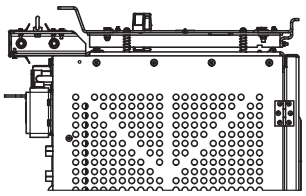
The service lift features perforations that allow visibility inside the cabin. Additionally, the service lift may feature front windows to improve visibility.

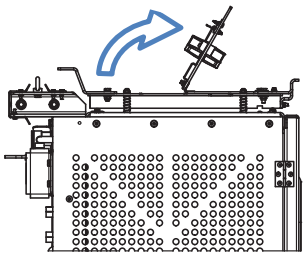
[1] Optional for CE versions. Mandatory for AECO version.
[2] Mandatory for CE full sliding door version. Not available for AECO version.
[3] Optional for CE bucket type version. Mandatory for CE full sliding door version. Optional for AECO version.
[4] Not available for CE full sliding door version. Mandatory for AECO version.
[5] Optional for CE bucket type version.
[6] Optional for CE full sliding door version. Optional for AECO version.

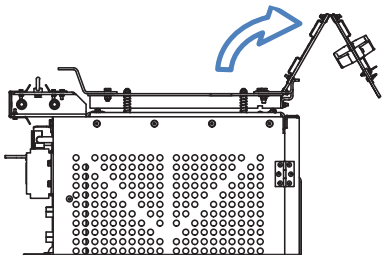
CE AECO

3.12 Top hatch

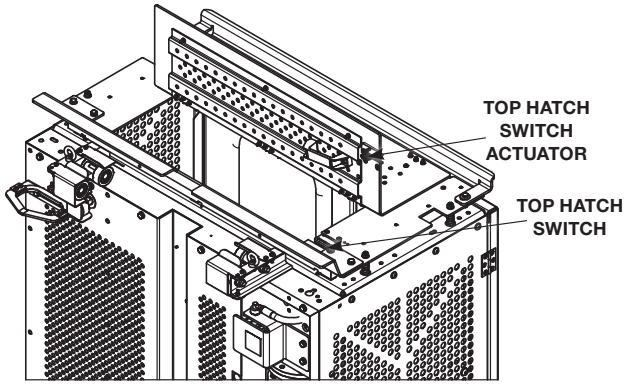
The top hatch consists of a double hinged sheet, that minimizes necessary space to open it.
This hatch is used to evacuate the service lift or to access the top platform.





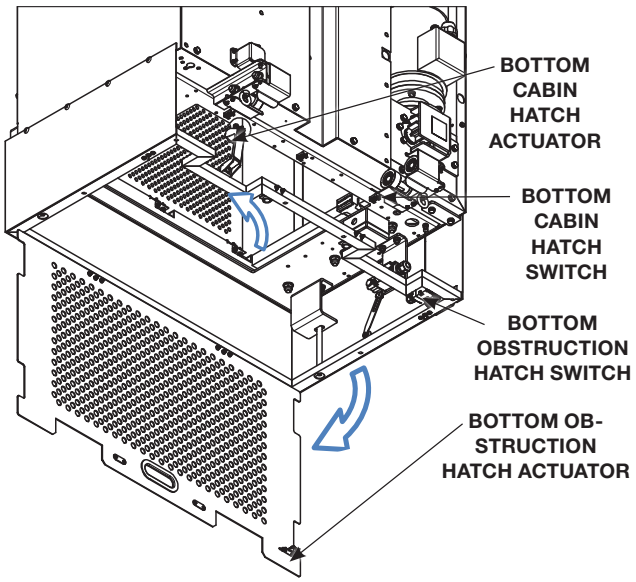


The dimensions of the clear opening are 640 x 400 mm.
A switch interrupts control if the hatch is open or not properly closed. In this case the fault light illuminates.
The top hatch is mounted over a top floating frame.
If a person stands on the top floating frame, a switch is triggered and control is interrupted. This prevents misuse of the service lift; e.g. persons riding on top.



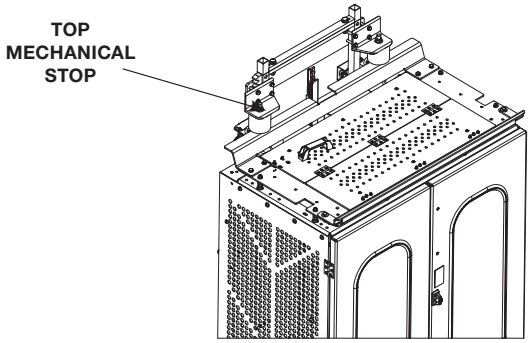
3.13 Bottom hatches

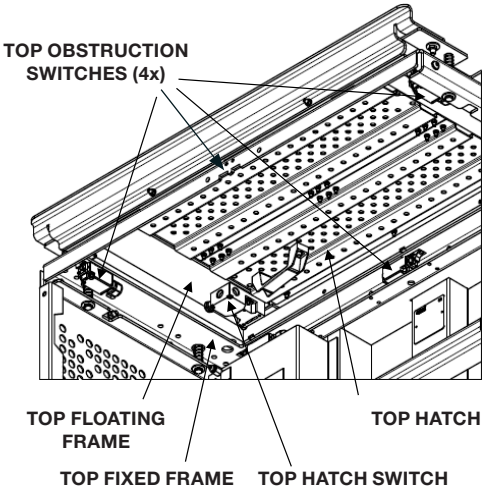
The bottom cabin hatch and the bottom obstruction hatch consist of a perforated sheet that open inwards and outwards respectively. They are used in case of evacuation. A corresponding switch interrupts control if one these hatches is opened or not closed properly. In this case the fault light of the cabin control box illuminates. The dimensions of the clear opening are 600 x 400 mm.



3.14 Top obstruction device

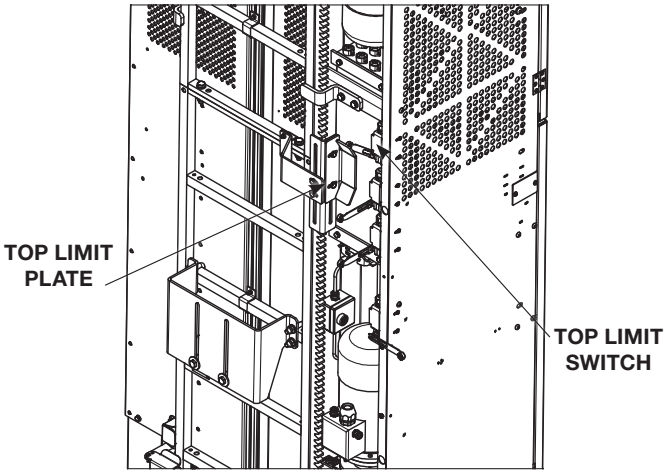
The top obstruction device interrupts control if it encounters an obstacle.





3.15 Top limit switch

The top limit switch interrupts ascent if the service lift reaches top platform.



3.16 Bottom obstruction device

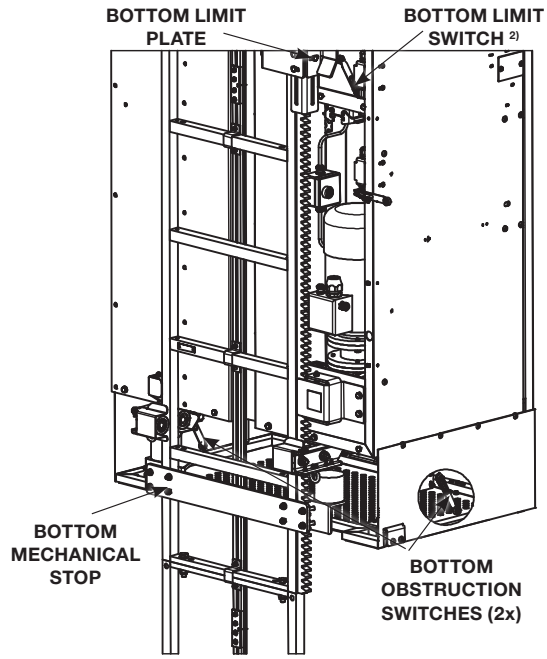
3.16.1 Without bottom limit switch configuration [1)]

The bottom obstruction device interrupts descent if:
1. It encounters an obstacle.
2. It reaches the bottom platform.

Ascent is still possible; i.e. to remove the obstacle.

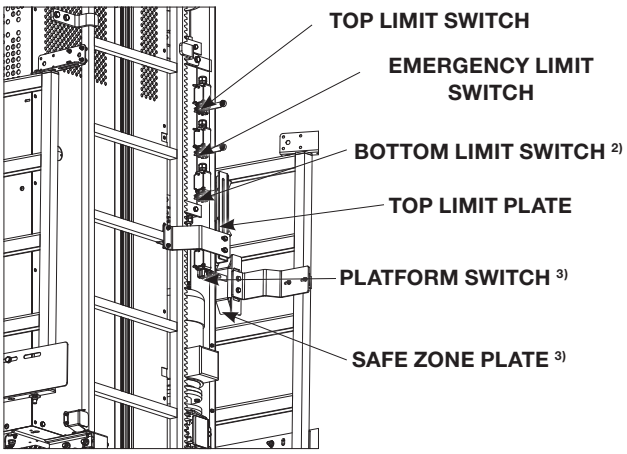
3.16.2 With bottom limit switch configuration [2)]

The bottom obstruction device interrupts descent if it encounters an obstacle. The bottom limit switch [2)] interrupts descent if the service lift reaches the bottom platform.



3.17 Emergency limit switch

The emergency limit switch interrupts the control if top limit switch or top obstruction switches fail, or if bottom limit switch or bottom obstruction switches fail. The emergency limit switch is triggered by the bottom limit plate and top limit plate located at bottom and by the top platforms respectively. To release the switch at bottom platform: temporarily remove the switch lever, put the lever back afterwards and verify adjustment. To release the switch at top platform, perform manual descent some metres.



3.18 Top and bottom mechanical stops

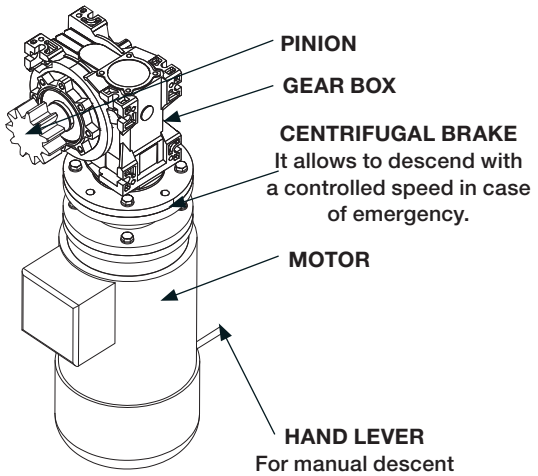
Top and bottom mechanical stops are installed on the ladder and act as travel limits in case that the top or bottom limit switches, and the emergency limit switch fail to trigger.

CE AECO

1) Mandatory for CE versions. Optional for AECO version.
2) Not available for CE versions. Optional for AECO version.
3) Optional for CE bucket type version. Mandatory for CE full sliding door version. Mandatory for AECO version.

3.19 Traction system

The traction system is rack and pinion type. The system has two motor group working on the same rack. They are installed on the main frame of the cabin. Each motor groups has a centrifugal brake, a gear box, a pinion and a brake motor. Each motor brake includes a manual release lever allowing a manual descent in absence of electric current.



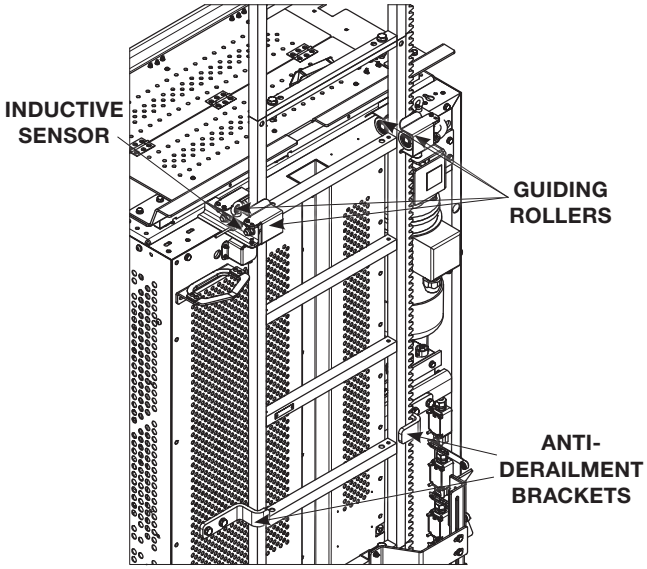
3.20 Guiding and anti-derailment system

The service lift is guided along the stiles of a ladder by means of ten guiding rollers.

An inductive sensor detects the presence of the stile. If the stile is not detected (bigger distance than setting), control is interrupted, avoiding derailment of the service lift.

After a short circuit, check that the inductive sensor and its light work properly.

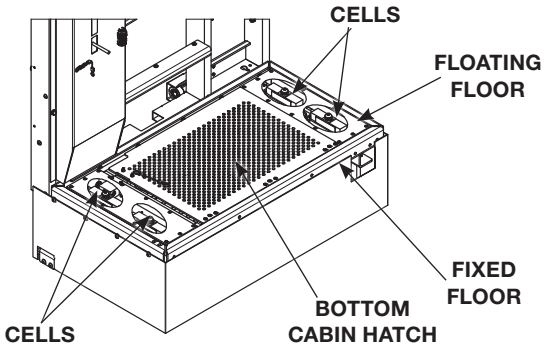
The service lift features two anti-derailment brackets that prevent derailment if guiding rollers fail.



3.21 Overload limiter

The overload limiter prevents any movement of the service lift in the event of an overload. In case of an overload, the overload light (yellow) lights up.

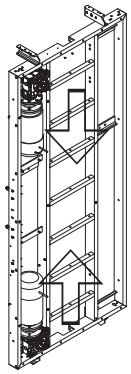
The overload limiter consists of a floating floor with four load cells. The load cells send the load signal to the electronic equipment of the cabin control box.



3.22 Manual descent system

Each motor group features a hand lever, that allow manual release of the motor electromagnetic brake. Once the motor brakes are released, the service lift descends with a controlled speed limited by the centrifugal brake installed in each motor group.

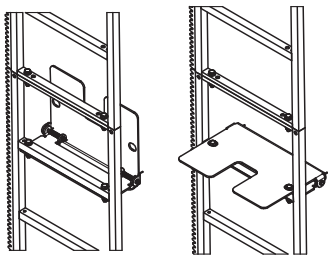
Push hand levers upwards and downwards at the same time to perform manual descent and always look through the perforated sheet holes.



3.23 Rest platforms

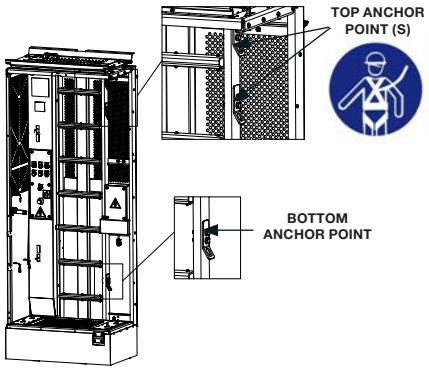
There is a rest platform at least every 6 metres. The rest platforms are attached to the ladder on the ladder section connection.

Rest platforms are self folding using torsion springs so they do not interfere with the cabin movement when they are not used.



3.24 Anchor points for PPE

The service lift is equipped with two anchor points inside the cabin in bucket type version and three anchor points in full sliding door versions.



STOP

Each anchor point may only be used by one user simultaneously.

3.25 Information signs and documents

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

Document	Position
Serial number plate	Inside the cabin.
Manual	Inside the blue bag.
Quick guide	Inside the cabin.
Evacuation guide	Inside the cabin.
Rescue guide	Close to the bottom platform control box.
Use of PPE sticker	On the motor cover.
Work load / N° persons sticker	On the front side of cabin.
Warning risk of falling sticker	On the motor cover.
Warning risk of crushing sticker (2x)	On the pinion covers.
Manual descent sticker	On the motor cover.
Wiring diagram	Inside the bottom platform control box.
Eletrical warning disconnection sticker	On the bottom platform control box.
UL sticker [2]	Underneath the cover of the bottom platform control box.
Alignment stickers	Inside the cabin and at each landing
Lubrication sticker	On the motor cover.
No standing on top prohibition sticker [1]	On the front side of the cabin.
Top clearance sticker [2]	On the front side of the cabin.
Maintenance brake sticker [2]	Inside the cabin.
Measurement of pinion and rack [2]	Inside the cabin.
AECO Data plate [2]	Inside the cabin.
Jurisdictional Code Data plate [2]	On the motor cover.
Pull to release sticker [2]	On the cabin control box.
Electrical hazard sticker	On the cabin control box.
Electrical hazard sticker	On the weighing module box [2].

3.26 Cabin light [1]

The service lift is equipped with a light inside the cabin. When service lift is connected to power supply, this light illuminates at all times.

The cabin light is battery packed in order to illuminate the inside of the cabin in case of a power failure. When fully charged, it will last at least for 30 minutes. The cabin light can be disattached [2] from the cabin to allow to place it where convenient during maintenance tasks.

3.27 Warning lights [1]

A set of warning lights is mounted on the top and on the bottom of the service lift. The flashes warn that the service lift is moving.

3.28 Platform fences

The platform fences protect users from falling through the service lift hole at platforms.

CE AECO

These platform fences shall comply with:

- *EN 14122-3 for Pegasus CE bucket type version. They shall have non-slip rails or steps facilitating access to the lift and to the guiding ladder from the platforms and shall have no doors.*
- *EN 14122-3 for Pegasus CE full sliding door version. They shall feature a fence door monitored by a guard locking system, or a trapped key system, preventing any movement of the lift if the fence doors are not closed and locked.*
- *5.11 of ASME A17.1-2012/CSA B44-13 for Pegasus AECO version. Given that call function is included, the fence doors shall be monitored by a guard locking system, or a trapped key system, preventing any movement of the lift if the fence doors are not closed and locked.*

3.29 Differential controller [2]

The service lift is equipped with a differential controller that interrupts control after 1 second, in case of a motor malfunction (i.e. a motor is not working or the motors are rotating at different rpm) or in case of a safety switch malfunction (i.e. the lift encounters an obstacle and the obstruction and limit switches do not work).

The differential controller is located inside the cabin control box and it is sealed to avoid uncontrolled manipulation. It has a green light to indicate that no malfunction is detected. If any of the red lights are lit up, the differential controller has tripped and hence interrupted control.

CE AECO

[1] Optional for CE versions. Mandatory for AECO version.
[2] Not applicable to CE versions. Mandatory for AECO version.

4. Instructions for use

4.1 Cautions

Aspects to consider for a good use of the service lift:

1. No person is on the ladder when the service lift is in operation.
2. The service lift is free of objects.
3. No objects are located on the top of the cabin.
4. Electrical system is properly insulated.

The ladder and rest platforms must be used only for evacuation or when the service lift is out of service.

In the bucket type version: users inside the cabin shall be attached to an anchor point when door is open. In full sliding door [1] version: users inside the cabin shall be attached to an anchor point at all times.

(If the MANUAL/AUTO selector [1] on cabin control box is provided) After using service lift and before exiting the WTG, the MANUAL/AUTO selector of cabin control box shall be turned to the AUTO position. This way it will be possible to call the lift from top platform if necessary.

4.2 Prohibited uses

The following prohibitions shall be observed when using the service lift. The consequences of not following them are extremely hazardous to the physical integrity of the users.

It is prohibited to:

1. Use the service lift beyond its intended purpose.
2. Operate the lift without following the safety warnings and operating instructions.
3. Load the service lift more than its rated load.
4. Try to repair machine components.

Only personnel from AVANTI or qualified personnel authorised by AVANTI are allowed to carry out service on the service lift.

5. To travel on service lift roof.
6. To use the emergency manual release of door lift or fence doors during normal use.
7. To manipulate switches or safeties.
8. To disattach trapped key [2] from wire rope.
9. To have a second trapped key [2].

4.3 Operation from inside the cabin

1. Turn the ON/OFF main switch of the bottom platform control box to the ON position.
2. Open the door, climb the fence-railing and go inside the cabin and close the door.
3. Turn the ON/OFF selector of the cabin control box to the ON position.
4. To go up or down, press and hold the UP or DOWN button as needed.

4.4 Operation from bottom platform

To send [3] or call the service lift from the bottom platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP [3] or DOWN button.

Coordinate send [3] or call actions between personnel by means of walkie-talkies.

The transportation of persons is forbidden if the operation is controlled from the platforms.

4.5 Operation from top platform

To send [3] or call the service lift from the top platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP or DOWN [3] button.

4.6 Landing alignment

The service lift can be landed at any platform totally aligned to permit safe egress and ingress. To do so:

1. Travel to desired platform (bottom, intermediates and top one).
2. Locate the service lift so that alignment sticker of inside the cabin overlaps alignment sticker of the ladder.

2B. If a platform switch [4] is provided, locate service lift so that platform light [4] of cabin control box illuminates.

3. Exit from cabin can be done safely.

4.7 Enter and exit the cabin

4.7.1 Bucket type [5]

To enter the cabin:

1. Turn the external door knob 120° clockwise until you hear a click.
2. Open the door leaf 2.
3. Open the door leaf 1.
4. Climb up the platform fence.
5. Hold the cabin handles and climb down the cabin steps.
6. Close the door leaf 1.
7. Close the door leaf 2 until you hear a click from the door lock.
8. If the door leaf 2 cannot be closed, turn the internal door knob 120° anticlockwise until you hear a click. Then repeat step 7.

To exit the cabin:

1. Attach the shock absorber to the cabin anchor point.
2. Turn the internal door knob 120° anticlockwise until you hear a click.
3. Open the door leaf 2.
4. Open the door leaf 1.
5. Hold the cabin handles and climb up the cabin steps.
6. Climb down the platform fence.
7. Close the door leaf 1.
8. Close the door leaf 2 until you hear a click from the door lock.
9. If the door leaf 2 cannot be closed, turn the external door knob 120° clockwise until you hear a click. Then repeat step 8.

[1] Not applicable to CE versions. Mandatory for AECO version.

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

[3] Optional for CE versions and for AECO version.

[4] Optional for CE bucket type version. Mandatory for CE full sliding door version and for AECO version.

[5] Optional for CE versions. Not available for AECO version.

4.7.2 Full sliding door [1)]

To enter the cabin:
1. Open the door.
2. Enter the cabin.
3. Attach the shock absorber to the cabin anchor point.
4. Close the door.

To exit the cabin:
1. Open the door.
2. Exit the cabin.
3. Release the shock absorber from the cabin anchor point.
4. Close the door.

4.7.3 Top / Bottom hatch

To enter the cabin:
1. Climb the ladder attached to the fall protection system or attach the shock absorber to the tower anchor.
2. Open the hatch.
3. Attach the shock absorber to the cabin anchor point.
4. Release the fall protection device or shock absorber from the tower anchor point to enter the cabin.
5. Climb inside the cabin holding the handles [2)] and the cabin main frame ladder as support.
6. Close the hatch

To exit the cabin:
1. Attach the shock absorber to the cabin anchor point.
2. Open the hatch.
3. Climb out of the cabin using the handles [2)] and the cabin main frame ladder as support.
4. Attach to the fall protection system or attach the shock absorber to a tower anchor point.
5. Release the shock absorber on the cabin anchor point.
6. Close the hatch.

WTG manufacturer must ensure that access to the top platform or nacelle can be done safely to avoid risk of falling.

4.10 Emergency stop button

Release the UP/DOWN buttons and the service lift should stop. If it does not, push the emergency stop button, and all controls should be disabled.
Turn / pull the emergency stop button to reset the control.

4.11 Manual descent

In case of power failure or an operation fault, a controlled descent without power can be performed. To do so:
1. Remove the seals of the hand levers of the motor brake.
2. Check that there are no obstacles or person on the way.
3. Push the top and bottom hand levers simultaneously, downwards and upwards respectively. The service lift will start descending.
4. To stop, simply loosen the hand lever.

A buzzer [1)] will sound during manual descent.

The manual descent shall only be performed if it is strictly necessary.

STOP *During the manual descent, the door and hatches of the lift shall be kept closed.*

STOP *Always look through the perforated floor of the cabin to see if anyone is standing on the ladder.*

STOP *Use the walkie-talkie to report about the manual descent.*

STOP *During the manual descent, stop the service lift just before reaching the bottom platform floor. This way, the bottom obstruction device will not get damaged.*

STOP *The manual descents shall be of maximum 30 m. Between two consecutive manual descents, the user shall wait minimum 10 minutes for centrifugal brakes to cool down. This way, the premature wear of the centrifugal brakes will be prevented.*

4.12 Rest platforms

If use of rest platforms is needed:
1. Climb up on the ladder to be one step above the rest platform.
2. With the safety of all your PPE, push down the rest platform with your foot.
3. Once platform is properly supported on the rung, stand over it with both feet.
4. The rest platform returns to its folded position once it is not in use.

Always wear all the PPE and attach the fall protection device to the fall protection rail system of the ladder.
User(s) in a rest platform MUST ALWAYS BE attached safely to the fall protection system.

4.13 Service ladder

The service lift uses a ladder as support and guide. In case of failure of the lift, this ladder is used to evacuate people (see “Appendix A: Safety measures”).

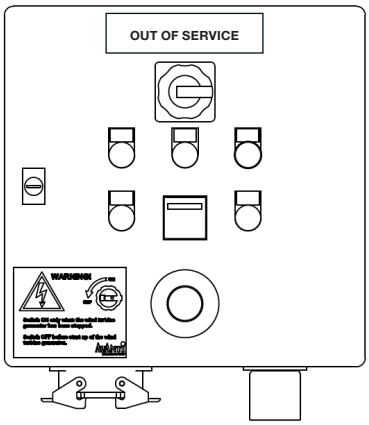
CE AECO

[1)] Optional for CE versions. Mandatory for AECO version.
[2)] Applicable to CE bucket type only.

5. Out of Service

1. Securing the service lift:
Bring the service lift all the way down, until the lift reaches bottom platform.

2. Turn off the main switch to prevent inadvertent operation of the lift:
Turn the main switch to the OFF position. Power supply is now interrupted. Mark the lift “OUT OF SERVICE” and padlock as necessary. Contact AVANTI or qualified personnel authorised by AVANTI.



6. Maintenance

A maintenance is required and necessary:

- To avoid premature wear
- To prolong the lifetime of the machine
- To maintain the level of safety which the service lift was designed and manufactured to.

6.1 Maintenance planning

The inspections shall be carried out filling in the "Appendix B: Inspection checklist" and the "Appendix C: Inspection log sheet" for future reference.

Frequency	Carried out by	Inspection checklist reference	Components
Daily	Supervisor	1	Travel zone
		2	Control and safety devices
		3	Cabin
Annually and in the inspection before the first use	AVANTI or qualified personnel authorised by AVANTI	1	Travel zone
		2	Control and safety devices
		3	Cabin
		4	Guiding system
		5	Doors and hatches
		6	Electrical system
		7	Electronic system
		8	Traction system
		9	Overload limiter
		10	Trapped key
		11	Guard locking
		12	Platforms
		13	Information signs and documents
		14	Final assessment

6.2 Cautions

STOP *Before any maintenance operation check that the service lift is out of service.*

STOP *If any faults occur during work,*
- Stop working,
- If required secure the workplace and
- Rectify the fault!

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

STOP *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 service lift at bottom platform and disconnect power supply.
- Use an electricity measuring tool when carrying out inspection of electrical components.
- Use a hand winch attachable to the ladder when handling big/ heavy loads and carried out at least by 2 persons.
- The panel parts shall be removed to facilitate access to confined spaces.
- The guiding rollers shall be replaced one by one.
- Use a cable grip when replacing travelling cable.
- Keep service lift doors closed when using a 3-step ladder.

! *Electrical installation tasks shall be carried out only by AVANTI or qualified personnel authorised by AVANTI.*

6.3 Daily inspection

! *Daily inspection of the service lift shall only be carried out 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 Travel zone

1. Ensure that there are no obstacles within the service lift's travel zone which may obstruct the travel of the cabin or hit the cabin.
2. Ensure that the ladder rack is solidly and safely fixed.

6.3.2 Visual inspection

1. Check that the service lift components are mounted in accordance with the specifications and without any noticeable defects or missing components.
2. Check that the traction system (ladder rack & pinion) is not damaged or jammed.
3. Check that the guided system is not damaged or jammed.
4. Check that the two motor groups are in good conditions and not damaged.

6.3.3 Functional inspection

Check that the safeties are in place and working.

6.3.3.1 BOTTOM PLATFORM CONTROL BOX

1. Main switch ON/OFF: Turn the ON/OFF electric isolator on the bottom platform control box to the OFF position. The green light shall be OFF. The service lift shall not run. Turn it ON; the green light shall be ON.
2. Emergency stop button: The service lift shall not move UP/DOWN. Release the emergency stop button and drive the lift UP approximately 1 m.
3. Press UP/DOWN buttons on the control box. The lift should travel upwards or downwards.

6.3.3.2 CABIN CONTROL BOX

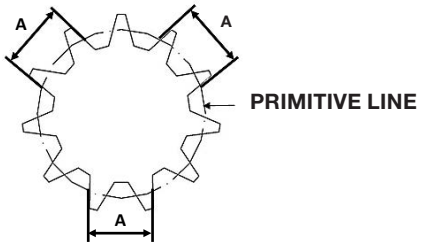
1. ON/OFF selector: Turn the ON/OFF selector on the cabin control box to the OFF position. The green light shall be OFF. The service lift shall not be able to run. Turn it ON; the ready light (green) shall be ON. The service lift shall be able to run.
2. Emergency stop button: Press the emergency stop button. The service lift shall not move UP/DOWN. Release the emergency stop button and drive the lift UP approximately 1m.
3. Fault light: Press the emergency stop button, the fault light (red) of the cabin control box shall be ON.
4. Top and bottom hatch: Open the hatch, the fault light (red) shall be ON and the lift shall not move UP/DOWN.
5. Service lift door: Open the door, the fault light (red) shall be ON and the lift shall not move UP/DOWN.
6. Drive the service lift DOWN until the bottom obstruction device hits the bottom mechanical stop. The lift shall stop.
7. Drive the service lift UP until the top obstruction device hits with the top mechanical stop. The lift shall stop.
8. Pull down the top hatch handle until the roof switch is activated, the fault light (red) shall be ON and the lift shall not move.

6.4 Annual inspection

Annual inspection shall only be carried out by AVANTI or qualified personnel authorised by AVANTI.

6.4.1 Pinions

Check that the pinions are free from deterioration, damage or abrasion.
Measure the wear limit of the pinion on the primitive line and at 3 different points, each separated 120°. The “A” dimension shall be between 26.49 and 27.49 mm.



The pinion replacement criteria is shown in the table below:

DIMENSION	NEW PINION (mm)	REPLACEMENT CRITERIA (mm)
A	27.49	< 26.49

6.4.2 Ladder rack

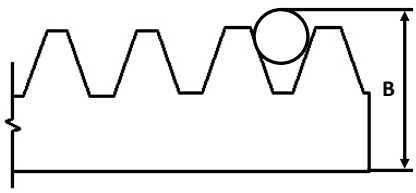
The personnel shall inspect the full length of the ladder by climbing along the ladder.

1. Check that the rack is free from deterioration, damage or abrasion.
2. Check that the ladder has no cracks, dents or damages.

The detailed instructions of the measuring procedure of the rack and pinions are available from AVANTI upon request.

6.4.2.1 Wear limit

1. Using a calibrated rod of Ø 12 mm h6, check that the dimension control “B” is between 33.39 and 34.59 mm.
2. Repeat this measurement on each mast section.

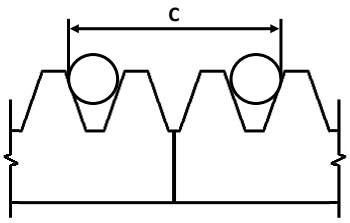


The rack replacement criteria is shown in the table below:

DIMENSION	NEW RACK (mm)	REPLACEMENT CRITERIA (mm)
B	34.59	< 33.39

6.4.2.2 Tolerance between 2 consecutive ladder sections

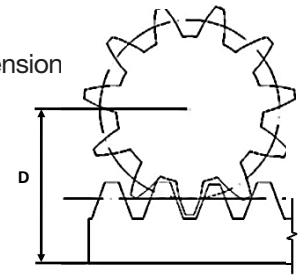
Using 2 calibrated rods of Ø 12 mm h6 check that the distance “C” between the dents of 2 consecutive ladder sections is between 48.7 and 50.7 mm.



DIMENSION	MINIMUM (mm)	MAXIMUM (mm)
C	48.7	50.7

6.4.2.3 Looseness limit:

To evaluate the looseness, check that the control dimension “D” is between 57 and 58 mm. If “D” is not OK, the shafts of the counter guiding rollers need to be revised.

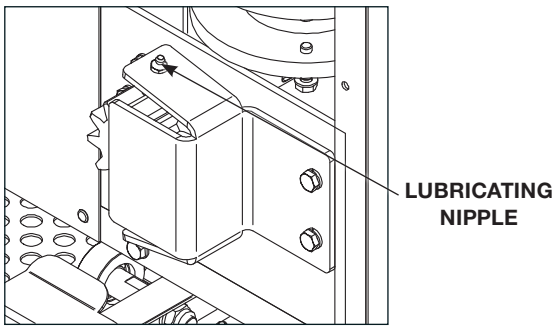


DIMENSION	MINIMUM (mm)	MAXIMUM (mm)
D	57	58

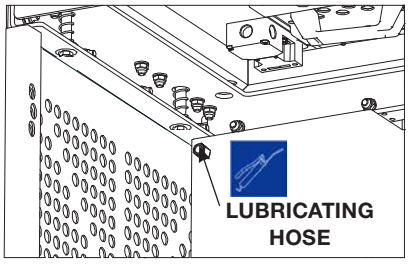
6.4.2.4 Lubricate the rack

Check that the lubricant on the rack and pinions is in proper conditions. If the lubricant is not in proper conditions, proceed as follows:

1. Place the lift at the bottom platform and disconnect the power supply.
2. Clean the old lubricant off the rack and pinions.
3. Use a grease gun and a zipper sleeve to lubricate the low pinion through the lubricating nipple.



4. Turn on the power supply and enter the lift.
5. Remove the female adaptor form the grease gun and connect the gun to the lubricating hose. Its location is indicated by means of a lubricating point sign.
6. Apply lubricant to the top pinion from inside the cabin throughout the ascent.
7. Repeat the lubrication throughout the descent.
8. If necessary, clean the excess of new lubricant off the rack.



The type of grease shall be KRAFFT KGP 2M or equivalent. For low temperature use LUBEKRAFTT KMG or equivalent.

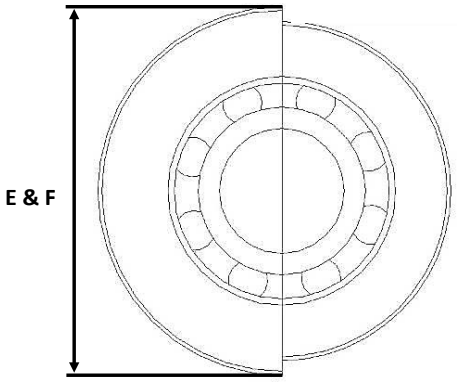
6.4.3 Guiding rollers and counter guiding rollers

Clean and lubricate the rack every time you replace a section of the ladder. If use is more severe, it will be necessary to lubricate more often.

1. Check that the outer surface of the rollers is uniform and free from damage.
2. Check that the control dimension “E” is between 48 and 50 mm on each counter guiding rollers.
3. Check that the control dimension “F” is between 46 and 50 mm on each guiding rollers.

DIMENSION	NEW COUNTER GUIDING ROLLER (mm)	REPLACEMENT CRITERIA (mm)
E	50	>48

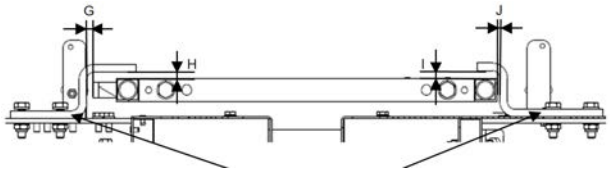
DIMENSION	NEW GUIDING ROLLER (mm)	REPLACEMENT CRITERIA (mm)
F	50	>46



6.4.4 Anti-derailment brackets

Check that the gaps between the anti-derailment brackets and the ladder stiles are within the ranges described in the following table.

DIMENSION	MINIMUM (mm)	MAXIMUM (mm)
G	7	9
H	6	8
I	6	10
J	3	4



Anti-derailment brackets

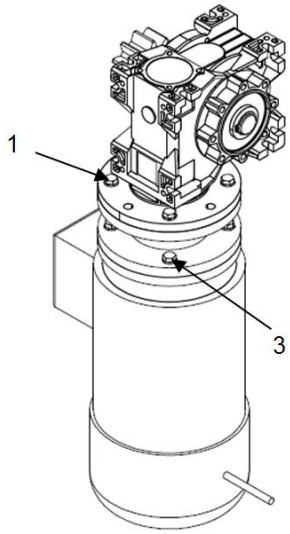
6.4.5 Torques assurance

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

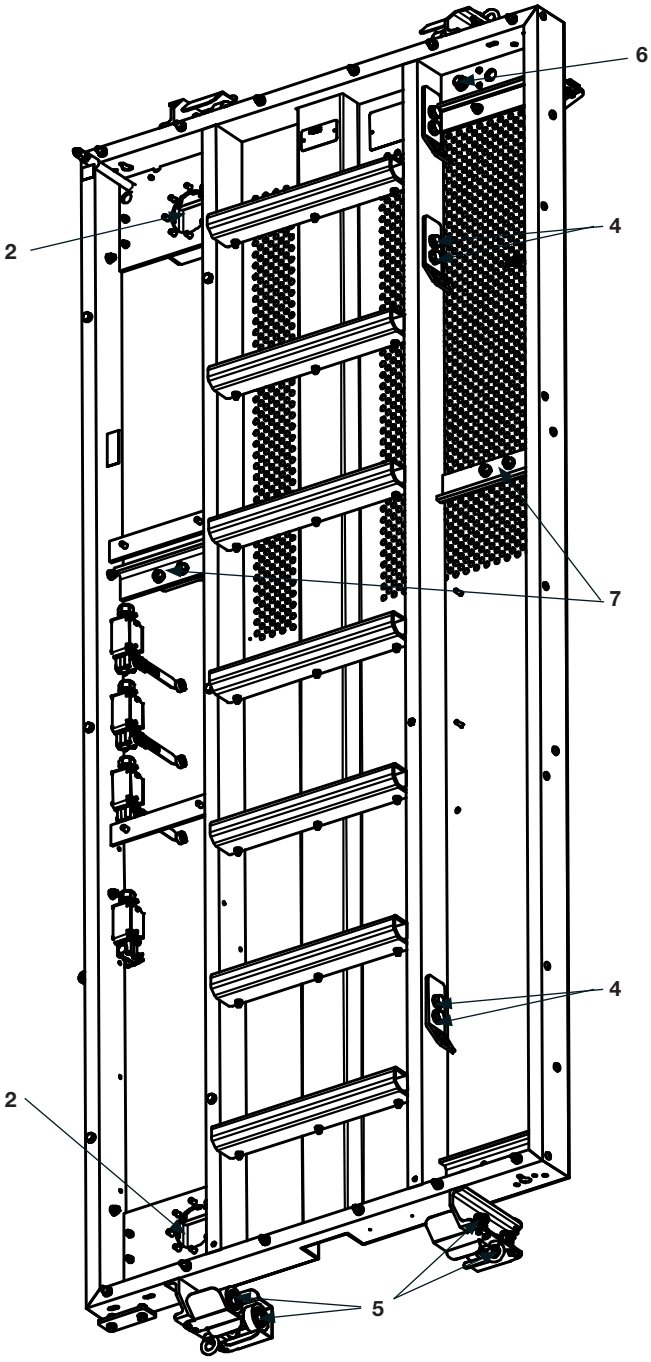
Check the tightening torque of all the screw connections, using an approved and calibrated torque wrench, in each of the following cases:
1. In the tower factory, during the assembly of the ladder section to the tower section.
2. On site, during the pre-commissioning, and in each annual inspection.

The correct tightening torque of each screw connection is listed the following tables.

Motor group:			TORQUE (N•m)	
JOINT		METRIC	ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
1	Gear box – Centrifugal brake	8	15	15
2	Motor group – Main structure	8	15	15
3	Motor – Centrifugal brake	8	15	15



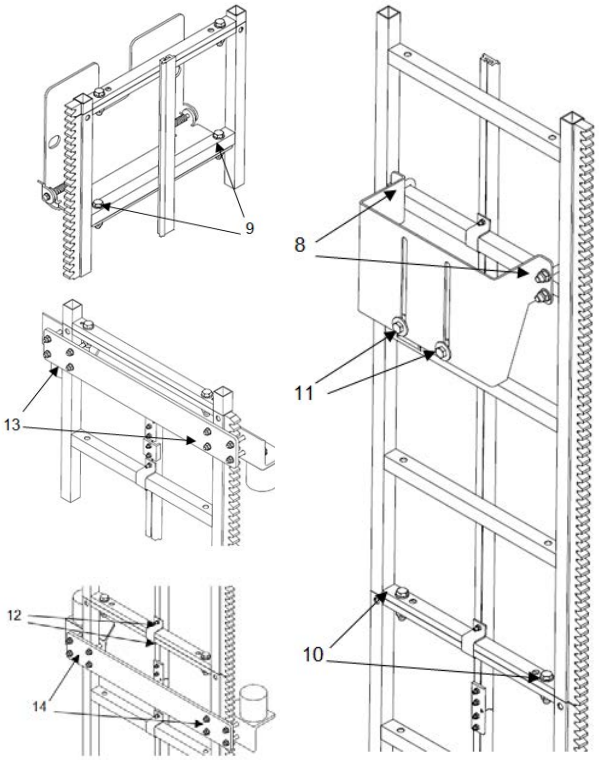
Cabin:			TORQUE (N•m)	
JOINT		METRIC	ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
4	Fall protection anchor point – Cabin	12	15	15
5	Roller shafts – Main structure	12	50	50
6	Counter roller guide shafts – Main structure	12	50	50
7	Anti-derailment brackets	10	30	30



CE AECO

[1)] *Mandatory for CE versions. Not applicable for AECO version.*

Ladder:			TORQUE (N•m)	
JOINT		METRIC	ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
8	Rung U-bolts	12	50	50
9	Rest platforms attachment	12	50	50
10	Ladder sections	12	50	50
11	Ladder anchor-ages – Tower brackets	12	50	12 for CE 50 for AECO
12	Rung fittings of safety rail	6	8	8
13	Ladder – Top mechanical stop	8	15	15
14	Ladder – Bottom mechanical stop	8	15	15



6.4.6 Overload limiter

1. Introduce 250 kg inside the cabin.
2. Press and hold the UP button. The lift shall ascend.
3. Introduce 25 kg more (275 kg in total) inside the cabin.
4. Press and hold the UP button. The lift shall not ascend, and the overload light (yellow) shall light up.
5. If any of the previous steps is unsatisfactory, readjust the overload limiter by following the instructions of the "Appendix A: Adjustment of the overload limiter".

6.4.7 Motor group

6.4.7.1 Gear box

1. Visually check for oil leaks. If an oil leak is found, AVANTI or qualified personnel authorised by AVANTI shall check that the gear box is proper conditions.
2. If needed, replace the gasket of the gear box cover, and re-fill with oil as needed.
3. Then close the cover of the gear box and apply the correct torque to the screws.

6.4.7.2 Centrifugal brakes

If the hour counter reads 90 h or more since the last inspection of the centrifugal brakes follow the steps below.

1. Open the motor cover.
2. Dismount the bottom motor from the centrifugal brake.
3. Extract the brake hub from the brake housing.
4. Replace brake linings if their thickness less than 1,5 mm.
5. Insert the brake hub back in the brake housing.
6. Mount the bottom motor on the centrifugal brake.
7. Repeat the previous steps with the top motor.
8. Close the motor cover.

Record the thickness measurings and the hour counter reading in the "Appendix C: Inspection log sheet". The detailed instructions of the adjustment of the motor brakes are available from AVANTI upon request.

This operation shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the centrifugal brake manufacturer instructions.

6.4.7.3 Electromagnetic brakes

The test and adjustment of the electromagnetic brakes shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the steps described in the "Appendix F: Test and adjustment of the electro-magnetic brakes".

6.4.8 Obstruction devices

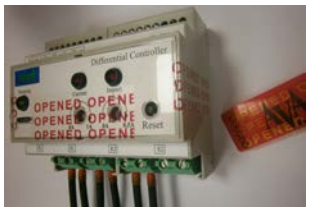
Clean and lubricate the guiding shafts of the top and bottom obstruction devices, in order to guarantee that the obstruction devices compress and decompress properly.

6.4.9 Differential controller [1)]

1. Open the cabin control box.
2. Check that the 3 sealing stickers of the differential controller have not been manipulated and that their serial numbers coincide with those written in the "Appendix C: Inspection log sheet".

If any of the sealing stickers has been manipulated, the differential controller needs to be adjusted.

Sealing sticker OK



Sealing sticker NOK

The detailed instructions of the adjustment of the differential controller are available from AVANTI upon request.

6.4.10 Bottom and top mechanical stops

1. Check that the bottom and top mechanical stops are not bent.
2. If the mechanical stops are bent, fix them, and revise the bottom, top and emergency limit switches thoroughly.

6.5 Ordering spare parts

Only original parts must be used. Spare parts list is available from AVANTI upon request.

CE AECO

[1)] Not available for CE versions. Mandatory for AECO version.

7. Troubleshooting

All tests and repairs to the electric components shall only be carried out by AVANTI or qualified personnel authorised by AVANTI.

Repairs to the motor group and to the system's supporting components shall only be carried out by AVANTI or qualified personnel authorised by AVANTI.

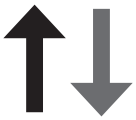
The wiring diagram is placed in the traction hoist's power cabinet.

If these steps do not identify the cause and rectify the fault: consult AVANTI or qualified personnel authorised by AVANTI.

Breakdown	Cause	Solution
The service lift cannot ascend nor descend.   **DANGER!** *Attempting to use the lift will jeopardize work safety.*	**A1 The fixed EMERGENCY STOP button is activated.**	Turn this button clockwise until it moves out to deactivate it.
	A2 Rack or pinions are damaged.	a) Check the damage. b) Evacuate the cabin.
	A3 The service lift is stuck on an obstacle.	a) Remove the obstacle. b) Test the operational safety of affected tower sections. c) Inform the supervisor.
	A4 Power failure. a) Main switch is set to OFF. b) Grid voltage is interrupted. c) Supply between grid connection and control is interrupted.	a) Turn the main switch to ON. b) Find the cause and wait for the power to return. c) Test and if necessary repair the supply cable, fuses, and/ or wiring from the control box.
	A5 Two phases are changed in the supply.	Have AVANTI or qualified personnel authorised by AVANTI switch the two phases in the plug.
	A6 The hatches or door switches are triggered.	Check that door and hatches are properly closed.
	A7 Motor thermal protection.	a) Rearm. b) If repeated, contact AVANTI.
	A8 ELECTROMAGNETIC BRAKES do not open.	a) Check voltage to the electromagnetic brakes. b) Check the springs. c) Check the brake disc. d) Regulate the brake disc.
	A9 MAGNETIC THERMAL CONTROL.	a) Rearm. b) If repeated, contact AVANTI.
	A10 CONTROL DIFFERENTIAL.	a) Rearm. b) If repeated, contact AVANTI.
	A11 OVER VOLTAGE PROTECTION.	a) Rearm. b) If repeated, contact AVANTI.
	A12 EMERGENCY TOP AND BOTTOM LIMIT SWITCH is activated.	a) At top platform, perform manual descent until the switch is released. b) At bottom platform, disassemble the bottom plate safe zone until the switch is released. c) Check the position of the safe zone plates. d) Check the top and bottom mechanical stop position.
	A13 OVERLOAD (overload light illuminates).	a) Test and if possible reduce the load, until overload lights stops illuminating. b) If repeated, contact AVANTI.
	A14 (If trapped key system [1] is provided) the trapped key is not present or the trapped key switch is in the OFF position.	Insert the key and turn it to the ON position.
	A15 (If guard locking system [1] of fences is provided) the guard locking switch is defective.	Test / repair defective components.
	A16 (If the differential controller [2] is provided) the differential controller is tripped.	a) Open the cabin control box. b) If any of the red lights of the differential controller is lighted up, have AVANTI or qualified personnel authorised by AVANTI adjust the differential controller.

CE AECO

[1] Guard locking or trapped key systems are mandatory for CE full sliding door version. Not necessary for CE bucket type version. Mandatory for AECO version if send or call function is provided. [2] Not available for CE versions. Mandatory for AECO version.

Breakdown	Cause	Solution
The service can descend but cannot ascend. 	**B1 The service lift is stuck under an obstacle.**	a) Carefully move the service lift downwards and remove the obstacle. b) Test the operational safety of the affected platform components. c) Inform the supervisor.
	B2 TOP OBSTRUCTION DEVICE is activated.	a) Check the springs. b) Move the lift down until the top obstruction switches are released.
	B3 INDUCTIVE SENSOR is activated.	a) Check section ladders. b) Check the status LED.
	B4 (If provided) Top limit switch [1] is activated. a) Top limit switch [1] is defective or not connected. b) Top limit switch [1] is activated.	a) Test the top limit switch [1] connection / function. Replace if necessary. b) Descend the service lift until the top limit switch [1] is released.
The service lift can ascend but cannot descend. 	**C1 (If provided) Bottom limit switch [2] is:** a) defective. b) activated.	a) Test the bottom limit switch [2] connection / function. Replace if necessary. b) Ascend service lift until bottom limit switch [2] is released.
	C2 Bottom obstruction switches are: a) defective. b) activated.	a) Test the bottom obstruction switches connection / function. Replace if necessary. b) Ascend service lift until bottom obstruction switches are released.
	C3 The service lift is stuck on an obstacle.	a) Carefully move the service lift upwards and remove the obstacle. b) Test the operational safety of the affected platform components. c) Inform the supervisor.
 The service lift can ascend and descend but motor hums loudly.	**D1 Motor is damaged.**	Contact AVANTI.

8.Transport

The transport conditions shall be agreed with customer. If special transport requirements are needed, customer must specify them to AVANTI prior to delivery. The following conditions shall be considered.

8.1 Cabin

- Land transport: rear support over pallet, non-stackable. Dimensions: 3000 x 800 x 1200 mm.
- Sea transport: package using wooden box and plastic shrink on a pallet. Dimensions: 3000 x 800 x 1200 mm.

8.2 Installation accessories

The installation accessories other than mast sections (rest platforms, power cable, etc.) are supplied on a European pallet.

8.3 Mast sections

Mast sections are supplied on a pallet. Dimensions: 1500 x 800 x 1000 mm.

9. Delivery inspection

Check the delivery against shipping lists and look for transport damages. Should there be any damage, report it to the responsible transport insurance company within 24 hours from the date of arrival of the goods.

Other claims should be made to AVANTI representative within the same period.

10. Storage

The storage conditions shall be agreed with customer. If special storage requirements are needed, customer shall specify them to AVANTI prior to delivery. The following conditions shall be considered.

10.1 Before installation of service lift on WTG tower section

Keep the service lift in its original packaging until it is mounted on the WTG tower section.
Avoid direct contact of package with floor by placing a pallet under it. Position the pallet on a stable ground.
Store the service lift in a dry place and protected from rain (i.e. in roofed areas). In corrosive environments (i.e. near the sea or in foggy places) store indoors.
Store in a clean and ventilated place, free of negative influences of chemical and water vapours or other corrosive substances.
Store between -30°C and 80°C (survival temperature). If possible, avoid sudden temperature changes.
Handle the service lift with care and store in a safe place in order to avoid unintended damages.
Do not stack.
Should any of these conditions not be maintained, the service lift could be spoilt with dirt or other substances, which could start corrosion before even the service lift is put into operation.
Store the package so that its labelling is clearly readable.

10.2 After installation of service lift on WTG tower section

After installing the service lift in the WTG tower section, confirm that the service lift is properly attached to the ladder (i.e. pinions are engaged with rack, and rollers and anti-derailment brackets are mounted).

Close top and bottom holes of WTG tower sections with covers to prevent water entry.

10.3 During WTG tower erection

During the erection of the WTG tower sections, and while there is risk of rain entry, protect the service lift with wrapping film to prevent water entry.

If WTG tower erection is left uncompleted, close the top hole of the WTG tower section with a cover.

10.4 After service lift is put into service

If the service lift is not going to be used for a long period of time:

- Clean all the parts of the service lift using non-abrasive brushes.
- Clean the pinions and racks thoroughly and grease them to prevent corrosion.

Before using the service lift, if it has not been used for a long period of time:

- Clean all the parts of the service lift of accumulated dust.
- Grease the shafts, pinions and rack.

11. Installation

11.1 WTG requirements

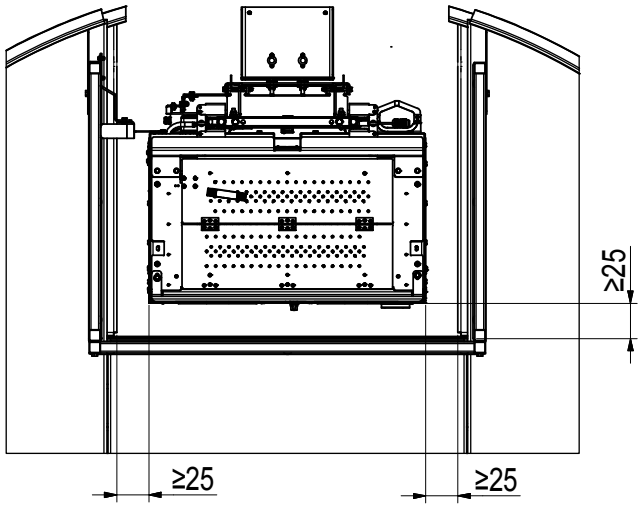
The following information is necessary for the correct integration of the service lift inside a wind turbine tower.

11.1.1 Height and angle

The service lift can be installed on towers up to 150 m high, and with a maximum inclination angle to the ladder axis of ±2° and of ±0,5° for every 3 m of ladder.

11.1.2 Lift holes at platforms and air gap to tower parts

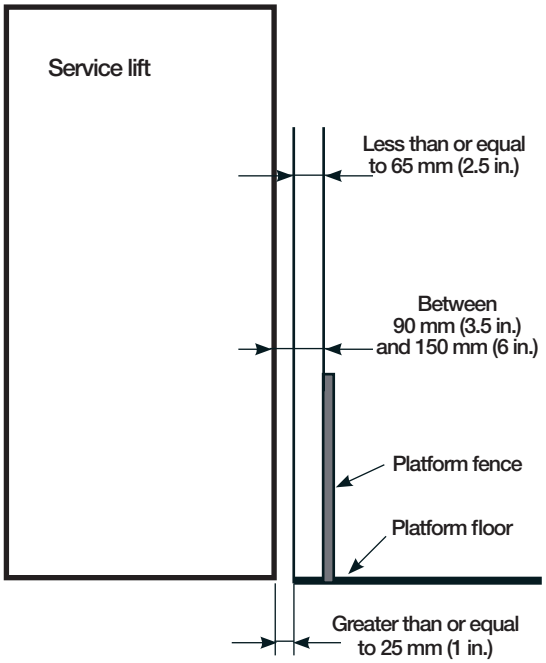
The service lift must have an air gap of at least 25 mm around it along the tower to avoid collision with tower components and to avoid finger trapping. The wind tower manufacturer must verify this as part of the integration process not only in the static position but also considering possible movement of components inside the tower as a consequence of the tower sway.



CE AECO

[1] Optional for CE versions. Mandatory for AECO version.
[2] Not available for CE versions. Optional for AECO version.

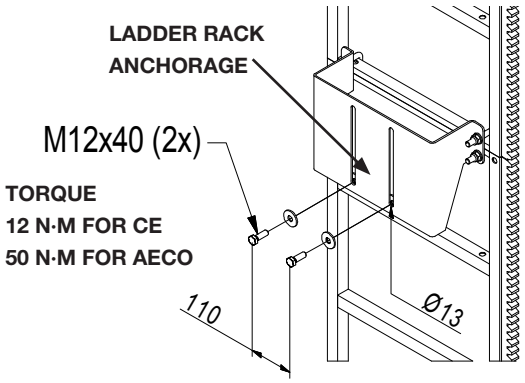
The gaps on the loading side of the service lift shall conform to applicable requirements of 5.11 of ASME A17.1-2013/CSA B44-13 [1].



The components subjected to possible movement inside the tower may include, but are not limited to, dampers, cables, doors, hatches, etc. The service lift needs a gap of 500mm below the lowest landing area to accommodate the bottom buffers.

11.1.3 Tower support brackets

The ladder rack is attached to the tower structure at a distance of max 3000 mm. The tower support brackets must be so designed that the ladder rack anchorages can be mounted. The connection between the tower support brackets and the ladder rack anchorages is done with M12 bolts A2-70 tighten with a torque of 50 N·m in the tower factory but with a torque of 12 N·m for CE (50 N·m for AECO) on site once the tower has been erected and before the cabin is going up. Reaction forces on connection bolts must be considered in the design of the tower brackets. This information may vary with the installation characteristics. Contact AVANTI to get the information.



11.1.4 WTG electrical supply requirements

Electrical supply requirements		
Version	**CE**	**AECO**
Power Supply Type	3 Phase +PE + N	3 Phase + PE
Voltage	400 V ± 5 %	400 V ± 5 %
Frequency	50 / 60 Hz	60 Hz
Fuses	16 A	16 A
Protection	Acc. To EN 60204 - 1	UL 508A

11.1.5 Other requirements

The WTG manufacturer must provide any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI´s scope.

11.2 Cautions on site

All installation process must be made according to the installation drawing supplied by AVANTI.

Prior to installation, check the instructions and drawings.

Prior to installation, ensure that building sections involved will be able to withstand the service lift loads.

Prior to installation, ensure that all necessary parts and tools are available and fully functional.

Prior to installation, ensure that platform holes are protected with fences.

Wear PPE for protection against falls if falling height is higher than 2 m.

Installation shall only be carried out by AVANTI or qualified personnel authorised by AVANTI.

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

At the end of the workday security measures must be taken to put the elevator out of service and make the ladder accessible. Place a warning sign: SERVICE LIFT OUT OF SERVICE. DO NOT USE

CE AECO

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

11.3 Assembly in tower factory

11.3.1 Top tower section

1. Install and adjust upper ladder section at the top of the top tower section (see Fig. 1 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.

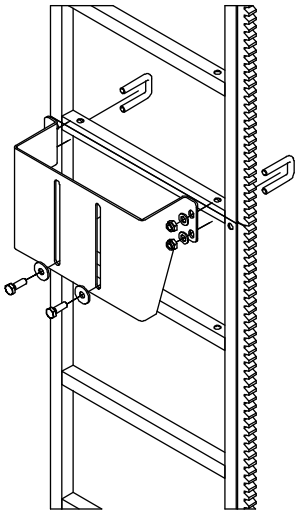


Fig. 1

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

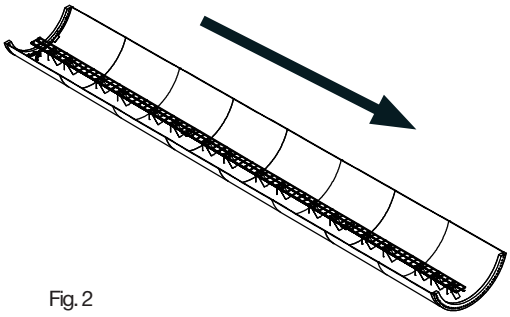


Fig. 2

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

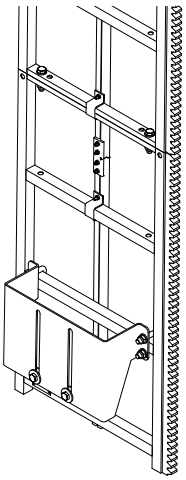


Fig. 3

4. Install the top mechanical stops and the top limit plate (see Fig. 4 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.

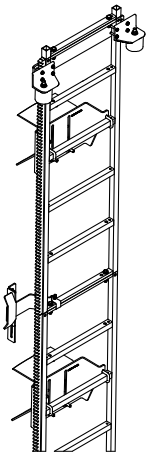


Fig. 4

11.3.2 Intermediate tower sections

1. Install and adjust upper ladder section at the top of the intermediate tower section (see Fig. 1 and installation drawing).

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

4. Install the electric cable arm support (see Fig. 5 and installation drawing).

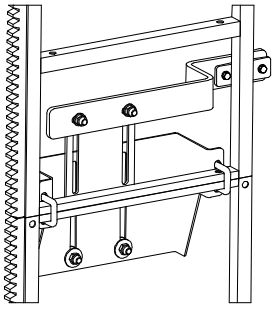


Fig. 5

5. (If platform switch [1)] on service lift is provided) install a safe zone plate on the ladder at each platform.

11.3.3 Bottom tower section

1. Install and adjust upper ladder section at the top of the bottom tower section (see Fig. 1 and installation drawing).

CE AECO

[1)] Optional for CE bucket type version.
Mandatory for CE full sliding door version.
Optional for AECO version.

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

4. Position the cabin inside the bottom tower section ensuring that bottom guiding rollers are aligned with a ladder support (see Fig. 6).

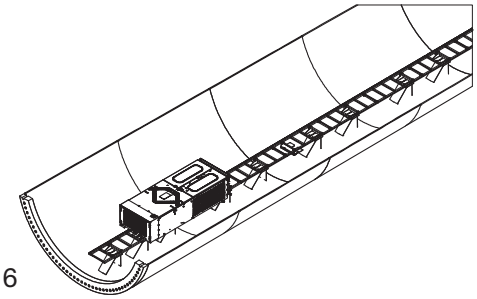


Fig. 6

STOP *Mount the guiding rollers shafts into the correct holes: green shafts into green coloured holes and orange shafts into orange coloured holes.*

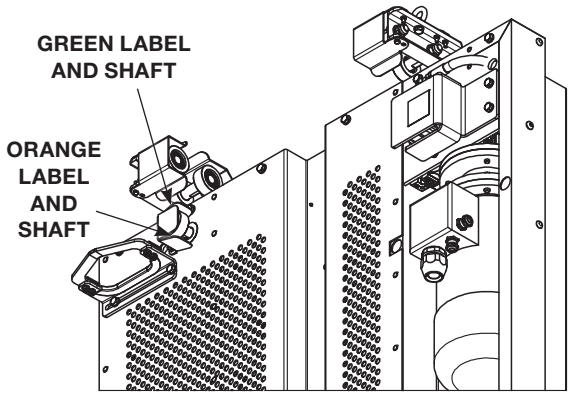


Fig. 7

5. Install the bottom mechanical stop and the bottom limit plate (see Fig. 8 and installation drawing).

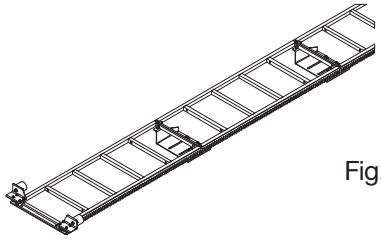


Fig. 8

It is also possible to install the cabin and bottom mechanical stop on site.

Service lift can be used during installation.

11.4 Assembly on site

After the tower sections are erected:

1. Climb up to the second tower flange.
2. While descending to the previous tower flange, loosen connection bolts between the ladder rack anchorages from the tower support brackets.
3. Lower down the loose ladder section until it contacts the previous ladder section, so that no gap exists.
4. Tighten the connection bolts between the ladder sections (see Fig. 9).
5. Check that the dimension C is between acceptable ranges.

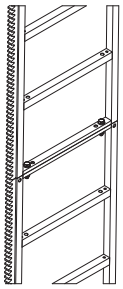
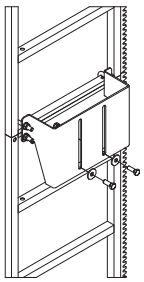


Fig. 9

6. While climbing up, tighten the connecting screw (M12) between the ladder rack anchorages and tower support brackets with a torque of 12 N·m for CE (50 N·m for AECO) (see Fig.10).



STOP *Check that the gap between each connecting screw (M12) and the top end of its corresponding oblong hole is at least 5 mm.*

Fig. 10

7. Climb up to next tower flange and repeat actions 2 to 5 until there are no gaps between the ladder sections.

8. Check that gap between anti-derailment bracket and ladder stile is 4 mm.

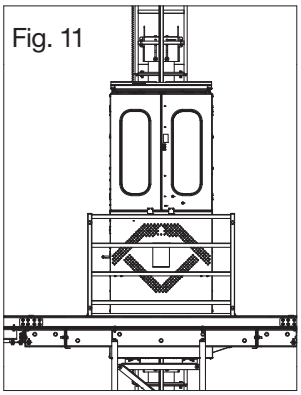


Fig. 11

9. With the service lift at bottom platform:
9.1. For bucket type [1]: adjust the bottom mechanical stop so that it is possible to open the double door just above the fence railing. The service lift must stop when obstruction device reaches the bottom mechanical stop (see Fig. 11).

9.2. For full sliding door without bottom limit switch configuration [2]: adjust bottom mechanical stop so that cabin floor is lined up with platform floor.

9.3 For full sliding door with bottom limit switch configuration [3]: adjust bottom limit plate so that cabin floor is aligned with platform floor.

CE AECO

[1] Applicable to CE bucket type version.
[2] Applicable to CE full sliding door version. Optional for AECO version.
[3] Optional for AECO version.

11.5 Electrical connections on site

Electrical connections must be made in accordance with EN 60204-1 for CE versions and in accordance with UL 508A for AECO version.

1. Install the top and bottom platform control boxes and connect the cable connections and the electrical boxes.

2. Use cable ties to attach the fixed cable to the tower internal (see Fig. 12).

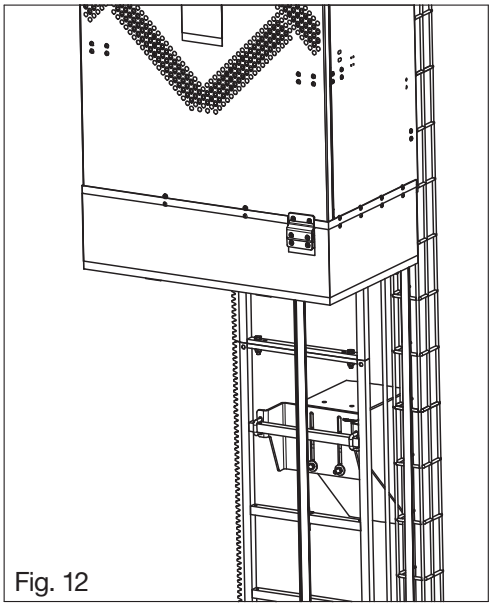
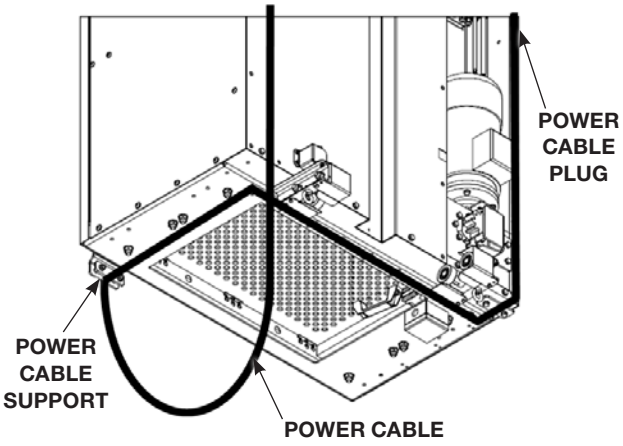


Fig. 12

3. Conect power supply cable.



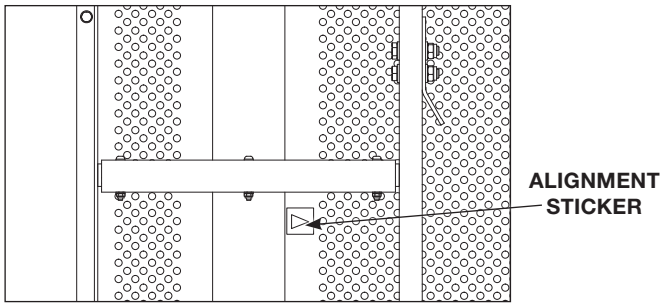
11.6 Differential controller [1)]

The differential controller is already mounted inside the cabin control box.

The detailed instructions of the adjustment of the differential controller are available from AVANTI upon request.

11.7 Alignment stickers installation

1. Stick the alignment sticker inside the cabin next to the grid of holes at a height of 1,5 m from cabin floor.



2. There is an alignment sticker for each tower platform. Stick the sticker on right ladder stile at a height of 1,5 m from each platform, and with triangle pointing to the left.

3. For top platform, and for ring shape platforms, stick the sticker on right ladder stile at 0,9 m under each platform, and with triangle pointing to the left.

11.8 Two runs without grease on the rack

1. Once the installation is complete, and before applying the grease on the rack, ascend and descend the service lift along the complete travel path two times. This way, any metal swarfs coming from the galvanised rack will be removed.

2. Remove the pinion covers and clean off the metal swarfs.

3. Put back the pinion covers.

4. Grease the rack.

12. Disassembling

The disassembling shall be done following the installation instructions but in reverse order.

The disposal shall be done in accordance with local authority regulations.

[1)] Not available for CE versions. Mandatory for AECO version.

13. Inspection before the first use

An inspection shall be carried out before the first use of the service lift.

The inspection before the first use shall only be carried out by AVANTI or by qualified personnel authorised by AVANTI.

The inspection beforethe first use shall be carried out following and filling in the "Appendix B: Inspection checklist" and the "Appendix C: Inspection log sheet" for future possible reference. Chapter 6.4 shall be used as a more detailed guideline for some of the inspection steps.

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