

AVANTI SERVICE LIFT

Model: SHARK L02 Service Lift



IL_S0001



Installation and Maintenance Manual

Original instructions

CERTIFICATE

EC Type Examination

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

Number of registration: 01/205/0900C/19

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

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

the close conformity of the product

Service lift inside wind turbine

**with protection fences for service lift holes at landings
and fence door interlock system**

Technical data:

Type:	Shark L02
- max. load capacity:	240 kg / 2 persons
- max. weight lift:	186 kg
- traction hoist:	M508 or M608
- fall arrest device (FAD):	ASL508 or ASL608
- lifting speed:	18 m/min (50 Hz) or 21 m/min (60 Hz)
- triggering speed of FAD:	30 m/min or 40 m/min
- doors:	Sliding door standard (left or right)
- max. lifting height:	160 m
- control:	Standard (hold to run in the cabin + send unattended) and Send/Call with control in the platforms
- Protection fences:	Swinging doors or sliding doors with interlock system
- Fence Interlock system:	Guard locking switch system or Trapped-key system

Modification C to the certificate 01/205/0900B/18 from 2018-07-22 - New address of the company

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


The verification was proved by EC-type approval test, Test-Report- No.: 18_044-1 from 2018-07-20 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Zaragoza, Spain.

This certificate is valid until 2022-01-11

Cologne, 2019-02-28



Certification body
Notified under No. 0035
certifier


Dipl.-Ing. Walter Ringhausen

AVANTI SERVICE LIFT

EN-AV-03-00-0001-01

Limited Warranty

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

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

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

Except as specifically set forth in this Limited Warranty,

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

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

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

¹⁾Avanti service lift ("Product")

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1 Introduction

1.1 Symbols

EN-AV-04-02-0001-01

DANGER



*Immediate or potentially imminent danger.
Failure to observe may result in injuries or damages:
- Death or serious injury.*

WARNING



*Potentially hazardous situation.
Failure to observe may result in injuries or damages:
- Moderate injury or material damage.*

CAUTION



*Dangerous situation.
Failure to observe may result in injuries or damages:
- Minor or moderate injury*

NOTICE



*Useful tips for optimum working process.
Failure to observe may result in injuries or damages:
- None*

1.2 Terms and definitions

EN-AV-04-04-0001-01

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

1.3 Observations

EN-AV-04-01-0001-01

Only persons who have received the required training are authorised to use the service lift in accordance with the instructions in this manual.

Only the version of the manual supplied with the product is valid except with written authorisation from the manufacturer.

This manual must always be available to the personnel responsible for the installation, maintenance and operation of the service lift.

Additional copies may be requested from the manufacturer.

The contents of this manual (processes, components, descriptions, instructions, recommendations, requirements, etc.) are subject to change without prior notice.

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

NOTICE



The pictures and diagrams in this manual may not reflect the exact appearance, colours or layout of the Product. This does not have any impact on the Product's functionality or safety.

1.4 Cautions

EN-AV-04-03-0002-01

CAUTION



Risk of accident. Follow all of the instructions in order to prevent injuries.

Cautions about personnel:

- Should be of legal age.
- Should be familiar with the accident prevention instructions and receive adequate training in terms of occupational health and safety.
- Do not use the service lift under the influence of alcohol or drugs that might compromise safety at the workplace.
- Must wear PPE personal protective equipment (safety helmet, harness, energy absorber, positioners, and fall arrester) and be reachable at all times via a bidirectional communication device in accordance with local regulations.
- Only certified technicians are authorised to perform the service lift installation and maintenance.
- Only certified technicians are authorised to perform the service lift inspection before the first use once it is installed.
- In case several technicians perform the installation, inspection and maintenance operations, the manager must appoint a supervisor.
- Only certified technicians are authorised to check the functional safety of the system in case of repair or replacement of any component.
- Only certified technicians are authorised to check/repair the electrical installations and repair the traction system, fall arrest device and suspension system.

Cautions about installation:

- Check that the sections of the wind turbine are able to withstand the service lift's loads.
- Check that the travel path is protected by fences in each platform.
- Check that the walkway surfaces are dry and do not slip.
- Check that all the service lift components are available and fully functional.
- Check that the wind speed is lower than the maximum allowed by the wind turbine manufacturer for a safe installation.
- Observe the procedures for handling and lifting loads.
- Do not work at different levels if the tasks involve a risk of falling objects.

Cautions about maintenance:

- Inspect the service lift at least once a year.
- Increase the frequency of inspections in the case of a high frequency of operation or severe conditions of use.
- The service lift is designed for a useful life of 20 years with an approximate operating frequency of 12.5 h/year (250 h in total).
- Stop working immediately and inform the supervisor in case any damages or malfunctions occur during operation or in case circumstances arise that could jeopardise safety.
- Do not use the service lift in case of a fire in the wind turbine.
- Do not use the service lift while the wind turbine is generating power.
- Observe the rules of the wind farm.
- Do not use the service lift under adverse weather conditions, including wind speeds of more than 25 m/s, except where other more restrictive speeds are defined.
- Check that the walkway surfaces are dry and do not slip.
- Sign and inform about the prohibition of use during maintenance tasks.
- Keep the cabin door closed while using the steps.

Cautions about service lift parts:

- Only use original parts.
- Use of non-original parts renders the manufacturer's warranty void and invalidates any type approval.
- No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts that are not approved by the manufacturer.
- No modification, extension or reconstruction of the service lift is permitted without the manufacturer's prior written consent.

NOTICE



The owner must check the need for third-party service lift inspections with local authorities and comply with any specified standards.

1.5 Wind turbine integration requirements

EN-AV-04-05-0012-01

Unless otherwise agreed with Avanti, the wind turbine manufacturer is responsible for fitting the service lift and ensuring compliance with any relevant health and safety requirements as stipulated in the 2006/42/EC Machinery Directive and the applicable harmonized standards in accordance with Avanti's recommendations.

For this purpose, it is necessary to provide the following interface components at the very least:

- Platform fences
- Electrical power supply protection
- An evacuation route (e.g. ladder)

The wind turbine manufacturer is responsible for including a wind turbine integration study within its risk assessment, analyzing the influence of other equipment out of AVANTI scope of supply.

NOTICE



The detailed list of service lift integration requirements is available at AVANTI upon request.

NOTICE



Depending on the local regulations, an approval of the final integration by a third party may be necessary.

1.5.1 Height and angle

EN-AV-04-05-0004-01

The maximum height of the cabin's travel path may vary depending on the service lift's configuration and traction hoist model.

- 120 m, for send/call configuration and M508 traction system (500 kg)
- 140 m, for send/call configuration and M608 traction system (600 kg)
- 160 m, for automatic send configuration and M508 traction system (500 kg)

The maximum angle between the cabin's travel path and vertical axis must be $\pm 1.5^\circ$.

1.5.2 Minimum distances of the service lift

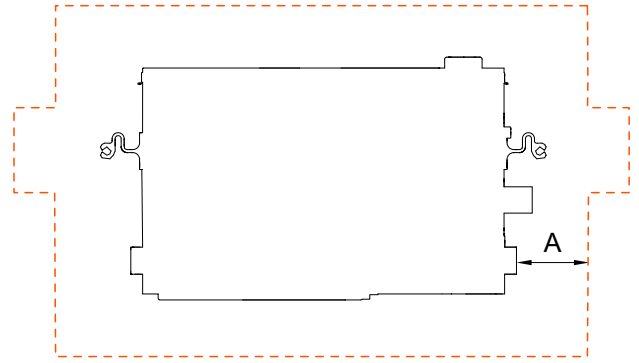
EN-AV-04-05-0005-01

The fixed or mobile components installed in the wind turbine must maintain a minimum distance of 50 mm to the service lift in platform transit zones and 200 mm in the zones between platforms to avoid collisions. The minimum distance in the zone between platforms must be increased if necessary depending on the distance between the guiding points and the tower's movements.

The minimum and maximum distances of the service lift to the fences and platforms in platform transit zones are shown in the figures *Minimum distances from the service lift to fixed or mobile components in the wind turbine*, see on page 5 and *Minimum and maximum distances from the service lift to the fences and platforms*, see on page 6.

The wind turbine components that may come in contact with mobile elements of the service lift must be protected to avoid damage to both the components of the wind turbine and the components of the service lift.

The wind turbine components that may come in contact with the traction wire rope, safety wires and power and control cables must be designed and protected to avoid entanglement.



IL_S0060

Figure 1 : Minimum distances from the service lift to fixed or mobile components in the wind turbine

Minimum distances from the service lift to fixed or mobile components in the wind turbine

A	min. 50 mm (Platform transit zones)
	min. 200 mm (Zones between platforms)

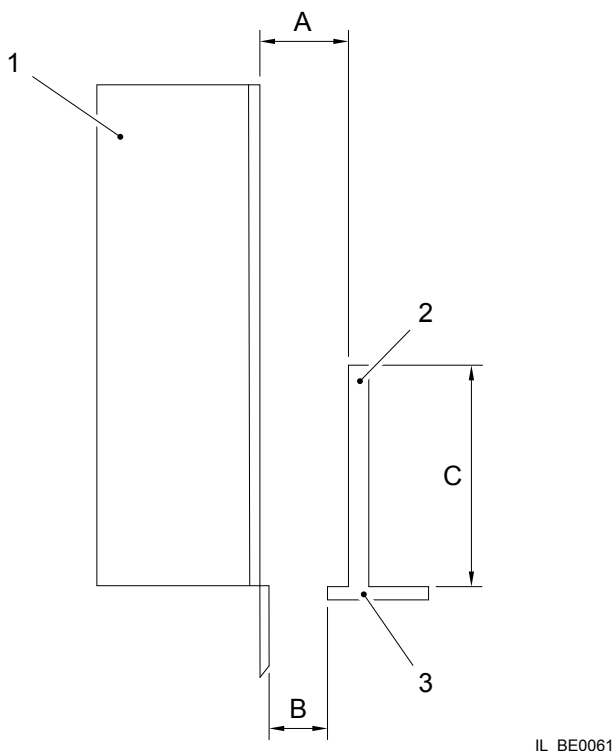


Figure 2 : Minimum and maximum distances from the service lift to the fences and platforms (The maximum distances only apply to the cabin's access side)

Minimum and maximum distances from the service lift to the fences and platforms (The maximum distances only apply to the cabin's access side)

1	Service lift
2	Platform fence
3	Platform ground
A	max. 150 mm (Fixed fences) max. 120 mm (Fences with door)
B	min. 50 mm - max. 150 mm (Fixed fences) min. 50 mm - max. 120 mm (Fences with door)
C	min. 1100 mm

1.5.3 Electrical power supply

EN-AV-04-05-0006-01

WARNING



Electrical hazard. Check that the phase sequence in the electric power supply is correct when connecting the service lift to the power supply.

The characteristics of the electrical power supply to the service lift must be in accordance with one of the options specified in the following table.

Electrical power supply requirements

Version	Requirements	Applicable standard
400 V 50/60 Hz	3 Phases + N + PE	EN 60204-1
690 V 50/60 Hz	3 Phases + PE	EN 60204-1

The installation of the service lift must be protected against overload, overvoltage and ground faults or residual current. The wind turbine manufacturer must provide the protection devices, unless otherwise agreed with Avanti, which can provide them as an option.

The wind turbine manufacturer must provide information on the type of grounding system, protection devices installed upstream, short-circuit power and impedance of the electrical connection point. In systems with a TN system, a fuse with a double element or a circuit breaker set to a nominal current must be used in accordance with the following values depending on the electrical power supply.

- 690 V 50 Hz, 3 Phase + PE: $I_n = 2.6 \text{ A}$
- 690 V 60 Hz, 3 Phase + PE: $I_n = 3.2 \text{ A}$
- 400 V 50 Hz, 3 Phase + N + PE: $I_n = 4.6 \text{ A}$
- 400 V 60 Hz, 3 Phase + N + PE: $I_n = 5.5 \text{ A}$

In installations with a TT system, in addition to the requirements for installations with a TN system, a residual current switch with a sensitivity of 30 mA (or an equivalent device) must be used in accordance with EN 60204-1.

In installations with an IT system, in addition to the requirements for installations with a TN system, a device must be used to monitor the grounding impedance in accordance with EN 60204-1.

1.5.4 Evacuation distance

EN-AV-04-05-0007-01

The maximum distance between the cabin door and the evacuation ladder must be 1000 mm along the entire travel path to ensure a safe evacuation in case of emergency.

1.5.5 Suspension beam

EN-AV-04-05-0008-01

The suspension beam supports the loads transferred from the traction, safety and guiding wire ropes. Contact Avanti to obtain the loads transferred to the suspension beam depending on the service lift model and version, and the wind turbine tower configuration.

The calculation and design of the suspension beam must be in accordance with the EN 1808 standard and any other applicable local regulations.

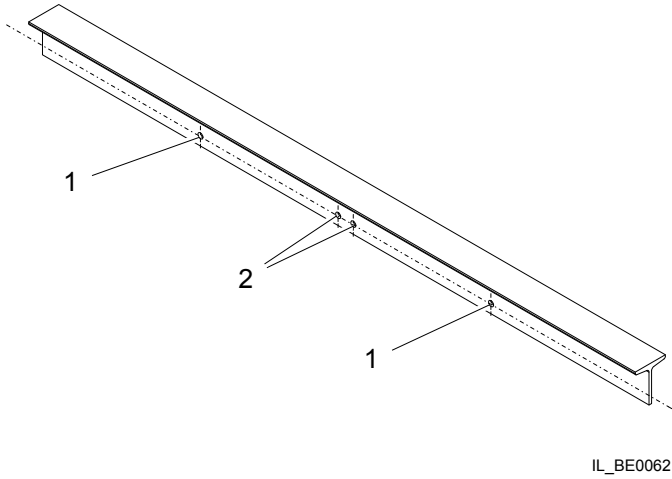


Figure 3 : Suspension beam design

Suspension beam design

- | | |
|---|---|
| 1 | Hole for the guiding wire rope shackle |
| 2 | Holes for the traction wire rope shackle and safety wire rope shackle |

1.5.6 Platform fences

EN-AV-04-05-0009-01

The cabin's travel path must be protected by fences in each of the platforms. The geometry of the fences may vary depending on the platform in which they are installed.

The fences must have a minimum height of 1100 mm and their design must be in accordance with EN 14122-3.

The fence's doors must be equipped with an interlock system.

There are two types of interlock systems for the fences [See Platform fences in the user manual].

- Trapped-key interlock system.
- Guard locking interlock system.

1.5.7 Lighting

EN-AV-04-05-0010-01

The lighting on the platforms must be in accordance with the requirements established in EN 50308, guaranteeing a minimum illumination level of 50 lux.

The lighting on the platforms in case of failure of the electrical power supply must be in accordance with the requirements established in EN 50308, guaranteeing a minimum illumination level of 10 lux.

NOTICE



Minimum lighting values may be more restrictive depending on local regulations.

2 Transport

2.1 General transport requirements

EN-AV-08-01-0001-01

The transport requirements must be agreed between Avanti and the customer.

3 Installation

EN-AV-04-06-0001-01

This manual does not exhaustively describe operations, general-purpose tools, general safety protocols or specify the sequence of installation of the service lift.

The installation instructions for the service lift are provided to the technicians during their training period.

3.1 Delivery inspection

EN-AV-10-13-0001-01

Check that the materials delivered correspond with those specified in the order and that they are in good state. In case of damage to the goods caused during transport, inform the company in charge of transport management within 24 hours following the date of delivery.

For any other type of claim, contact the local Avanti representative within 24 hours of the delivery date.

3.2 Storage

3.2.1 General storage requirements

EN-AV-10-14-0001-01

The storage and conservation requirements must be agreed to between Avanti and the customer.

3.3 Pre-installation tasks

3.3.1 Assembling the cabin

EN-AV-10-11-0003-01

Only certified technicians are authorised to assemble the cabin if supplied by parts. The cabin's assembly instructions are provided to the technicians during their training period.

3.4 Electrical connections

3.4.1 Connection to the electrical power supply

EN-AV-10-03-0000-01

The connection to the electrical power supply may vary depending on the model and configuration of the service lift.

Make the connection of the service lift to the electrical power supply following the indications of the wiring diagrams [See section [Platform control boxes](#), see on page 19].

3.4.2 Power and control cable management

3.4.2.1 Trailing cable management system

EN-AV-10-03-0001-01

WARNING

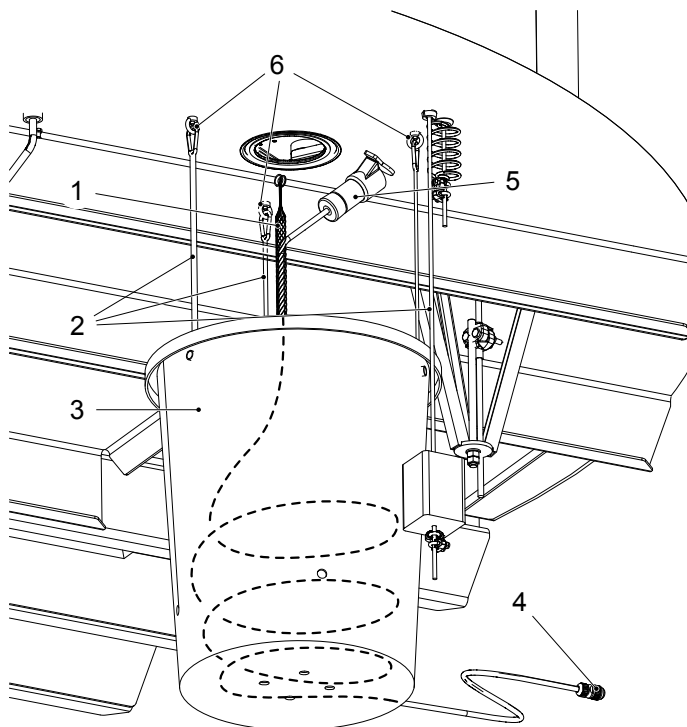


Risk of breakage. Install the cable collect bin at a minimum recommended distance of 650 mm below the bottom platform. This distance can be adjusted to adapt the installation to the available space according to the different types of towers.

Do not uncoil the cable or disconnect it from the connector mounted inside the bin. This would eliminate the pre-twisting of the cable, causing it not to wrap properly inside the bin when the service lift is in operation.

The power cable's sheath can harden at temperatures below -15 ° C.

1. Mount the eyebolts for the suspension straps at the bottom of the platform.
2. Hang the cable collect bin by connecting the carabiners at the ends of the suspension straps to the eyebolts under the bottom platform.
3. Cut the cable ties and the adhesive tape that hold the cable inside the bin.
4. Pass the power cable and the cable stocking through the hole for the power cable on the bottom platform.
5. Hang the cable stocking from the carabiner installed in the eyebolt located under the floor of the cabin.
6. Route the cable and connect the electrical power supply to the service lift to the power cable inlet plug.
7. Fix the power cable to the cabin with cable ties.
8. Route the other end of the cable located on the outside of the bin and connect the electrical power supply connector to the control box of the bottom platform or to the electrical supply of the wind turbine depending on the installation.



IL_S0028

Figure 4 : Trailing cable management system

Trailing cable management system

- | | |
|---|---|
| 1 | Cable stocking |
| 2 | Cable collect bin suspension straps |
| 3 | Cable collect bin |
| 4 | Electrical power supply connector |
| 5 | Electrical power supply connector to service lift |
| 6 | Eyebolts for suspension straps |

3.4.2.2 Travelling cable management system

EN-AV-10-03-0008-01

1. Install the junction box on the first platform located above the height corresponding to the cabin's halfway point or in the position indicated in the installation drawings. Install the power cable up to the platform if necessary.
2. Cut the cable ties that hold the cable for transport.
3. Connect the wind turbine electrical power supply connector to the junction box.
4. Uncoil the cable to the bottom platform.
5. Route the travelling cable through the travelling cable pulley.
6. Hang the cable stocking from the carabiner installed in the eyebolt located inside the cabin.
7. Connect the electrical power supply to the service lift to the cabin's power cable inlet plug.
8. Fix the travelling cable to the cabin with cable ties.

9. Adjust the length of the cable so that the travelling cable pulley does not hit the cabin or rest on the platform when the cabin is on the bottom platform.

NOTICE



The travelling cable management system is a mandatory system for the send / call configuration.

NOTICE

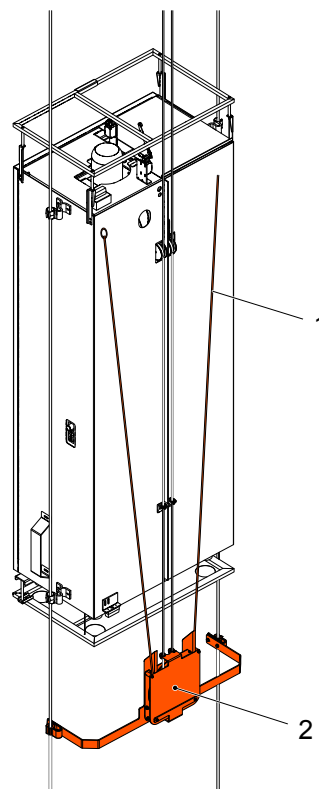


The travelling cable management system is an optional system for the automatic send configuration.

NOTICE



Some of the steps of the installation process may have been completed prior to the final installation.



IL_S0029

Figure 5 : Travelling cable management system

Travelling cable management system

- | | |
|---|-------------------------|
| 1 | Travelling cable |
| 2 | Travelling cable pulley |

3.4.2.3 Guided trailing cable management system

EN-AV-10-03-0009-01

1. Mount the eyebolts for the suspension straps under the platform.
2. Hang the cable collect bin by hanging the carabiners at the ends of the suspension straps from the eyebolts under the bottom platform.
3. Cut the cable ties and the adhesive tape that hold the cable inside the bin.
4. Pass the power cable and the cable stocking through the hole for the power cable on the bottom platform.
5. Uninstall the cable bracket installed on the side of the cabin.
6. Disassemble and separate the two halves of the cable bracket.
7. Insert the cable stocking and the power cable into the cable bracket.
8. Join and mount the two halves of the cable bracket.
9. Insert the power supply connector, the cable and the cable stocking through the hole on the side of the cabin.
10. Install the cable bracket on the side of the cabin.
11. Hang the carabiner of the cable stocking from the eyebolt located inside the cabin.
12. Connect the electrical power supply connector to the service lift to the power cable inlet plug inside the cabin.
13. Install the cable guides on the platforms.
14. Adjust the position of the guides so that the cable bracket and the power cable move through the cable guides avoiding metal to metal contact.
15. Route the cable and connect the electrical power supply connector to the bottom platform control box or to wind turbine power supply depending on the installation.

NOTICE



The guided trailing cable management system is an optional system.

NOTICE



Some of the steps of the installation process may have been completed prior to the final installation.

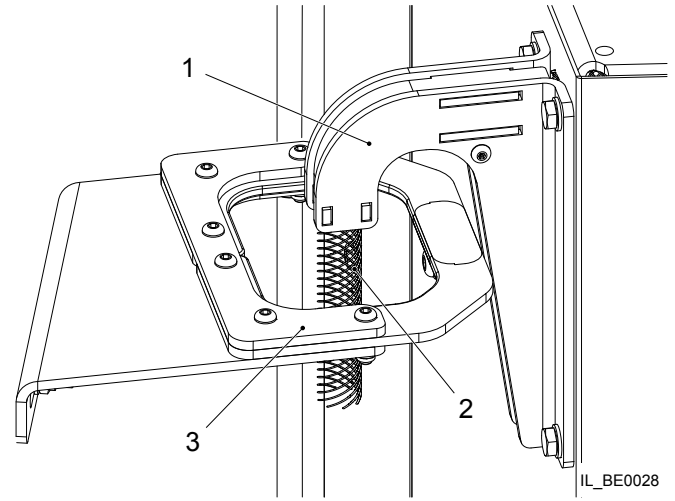


Figure 6 : Guided trailing cable management system

Guided trailing cable management system

- | | |
|---|----------------|
| 1 | Cable bracket |
| 2 | Cable stocking |
| 3 | Cable guide |

3.5 Traction and safety wire ropes

3.5.1 Traction wire rope

3.5.1.1 Traction wire rope on the suspension beam

EN-AV-10-15-0001-01

WARNING



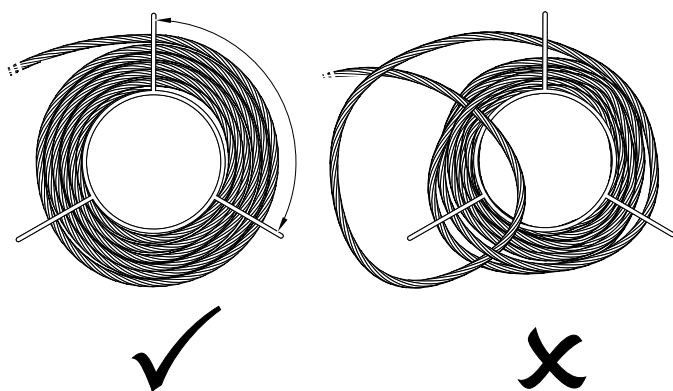
Risk of breakage. Do not slide the wire rope along corners and edges.

WARNING



Risk of breakage. Uncoil the wire rope evenly to prevent tangling.

1. Install the shackle on the traction wire rope thimble.
2. Fix the traction wire rope (Ø 8 mm) on the suspension beam using the shackle.
3. Tighten the shackle nut and fit the cotter pin.
4. Uncoil the traction wire rope to the bottom platform.

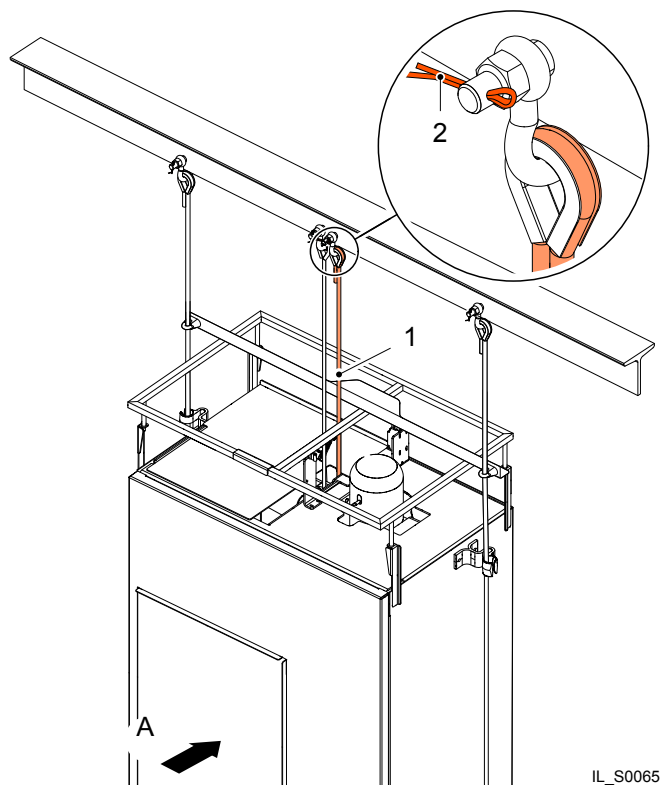


IL_G0007

Figure 7 : Coiled wire rope

Coiled wire rope

- ✓ Correctly coiled wire rope
- ✗ Incorrectly coiled wire rope



IL_S0065

Figure 8 : Traction wire rope on the suspension beam

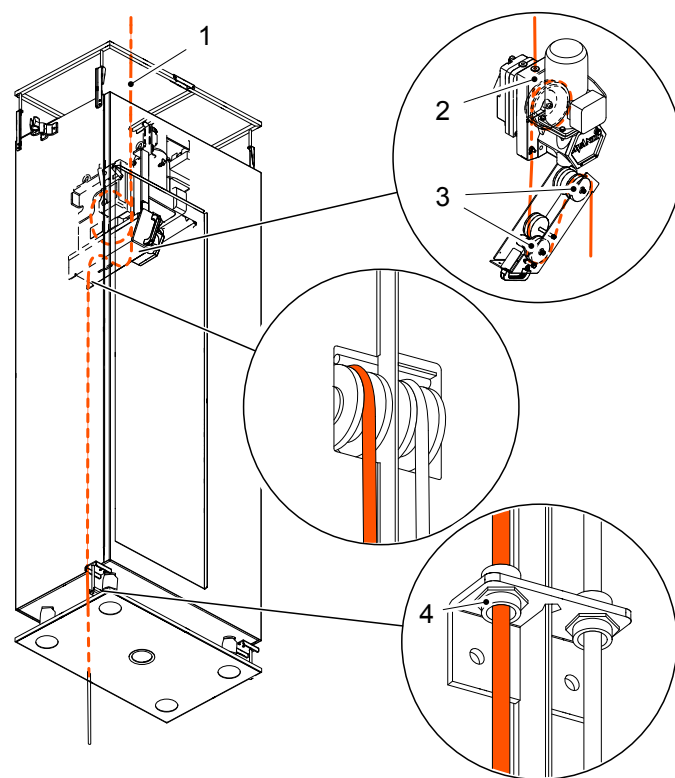
Traction wire rope on the suspension beam

- 1 Traction wire rope
- 2 Cotter pin
- A Cabin access direction

3.5.1.2 Travel path of the traction wire rope through the service lift

EN-AV-10-15-0002-01

1. Disassemble the protective covers and the wire rope deflection pulleys subassembly.
2. Route the traction wire rope between the 2 slack rope sensor bushings (if installed).
3. Route the traction wire rope through the top of the cabin and into the entrance bushing at the top of the traction hoist.
4. Press and hold the UP button of the user control box and insert the wire rope until the traction hoist begins to pull it. Check that the traction wire rope is correctly exiting the bottom of the traction hoist.
5. Route the traction wire rope around the wire rope deflection pulley to the back of the cabin.
6. Route the traction wire rope through the cabin's wire guide bushing.
7. Route the traction wire rope through travelling cable pulley guide bushing (if installed).
8. Assemble the protective covers and the wire rope deflection pulleys subassembly.



IL_S0064

Figure 9 : Travel path of the traction wire rope through the service lift

Travel path of the traction wire rope through the service lift

- 1 Traction wire rope
- 2 Traction hoist
- 3 Wire rope deflection pulleys
- 4 Cabin wire guide bushing

3.5.1.3 Secure the traction wire rope

EN-AV-10-15-0003-01

WARNING



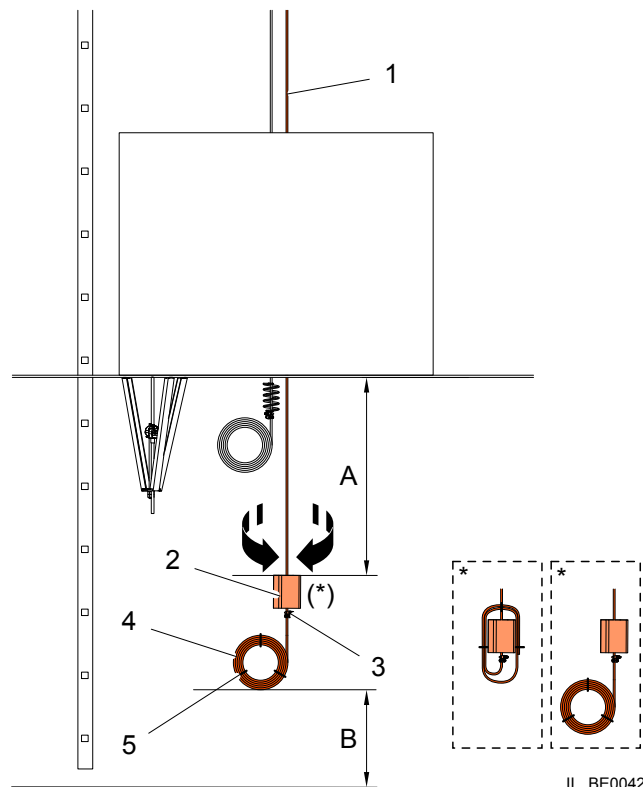
Risk of breakage. Install the traction wire rope according to the established procedure. Otherwise, damage, deformation or other critical defects in the traction wire rope can occur.

WARNING



Risk of injuries. The counterweight has a weight of 11 kg. Handle correctly to avoid injury.

1. Insert the protection into the hole for the traction wire rope on the bottom platform.
2. Route the traction wire rope through the corresponding hole of the bottom platform.
3. Route the traction wire rope through the counterweight.
4. Fix the position of the counterweight at a minimum distance of 400 mm below the bottom platform by installing two wire rope clamps on the traction wire rope below the counterweight.
5. Coil the excess length of the traction wire rope under or around the counterweight and secure it with a minimum of 3 cable ties.
6. Check that the counterweight and the excess wire rope rotate freely around the vertical axis.



IL_BE0042

Figure 10 : Traction wire rope on the bottom platform

Traction wire rope on the bottom platform

- | | |
|---|--------------------------------------|
| 1 | Traction wire rope |
| 2 | Counterweight |
| 3 | Wire rope clamp |
| 4 | Traction wire rope excess |
| 5 | Wire rope excess cable ties (min. 3) |
| A | min. 400 mm |
| B | min. 150 mm |

3.5.2 Safety wire rope

3.5.2.1 Safety wire rope on the suspension beam

EN-AV-10-16-0001-01

WARNING



Risk of breakage. Do not slide the wire rope along corners and edges.

WARNING



Risk of breakage. Uncoil the wire rope evenly to prevent tangling.

1. Install the shackle on the safety wire rope thimble.
2. Fix the safety wire rope (Ø 8 mm) on the suspension beam using the shackle.
3. Tighten the shackle nut and fit the cotter pin.
4. Uncoil the safety wire rope to the bottom platform.

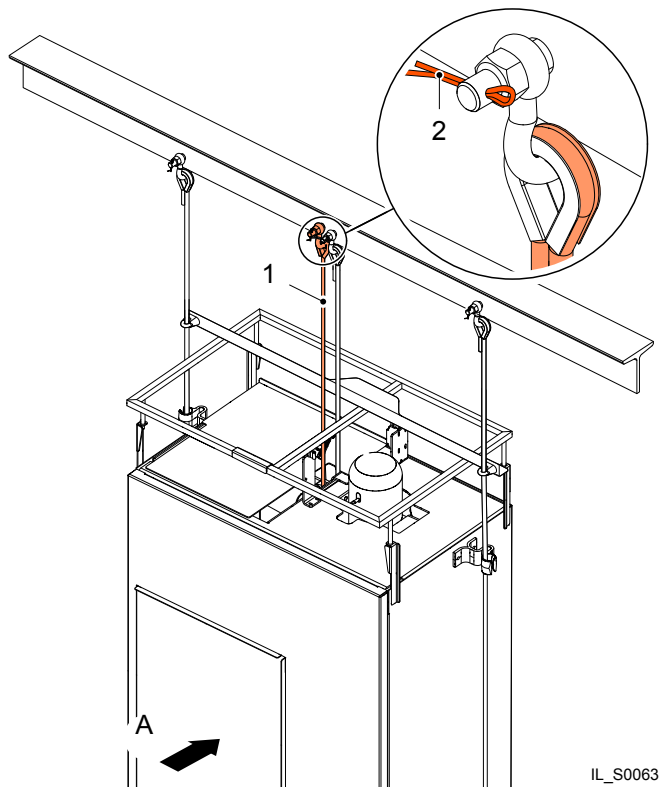


Figure 11 : Safety wire rope on the suspension beam

Safety wire rope on the suspension beam

- | | |
|---|------------------------|
| 1 | Safety wire rope |
| 2 | Cotter pin |
| A | Cabin access direction |

3.5.2.2 Travel path of the safety wire rope through the service lift

EN-AV-10-16-0002-01

1. Disassemble the protective covers and the wire rope deflection pulleys subassembly.
2. Route the safety wire rope through the cabin's top and into the entry bushing on the top part of the fall arrest device.
3. Deactivate the fall arrest device by turning the deactivation lever clockwise. Pass the safety wire rope through the fall arrest device. Check that the safety wire rope comes out correctly through the bottom part of the fall arrest device.
4. Route the safety wire rope around the wire rope deflection pulley to the back of the cabin.
5. Route the traction wire rope through the cabin's wire guide bushing.
6. Route the traction wire rope through the travelling cable pulley guide bushing (if installed).
7. Assemble the protective covers and the wire rope deflection pulleys subassembly.

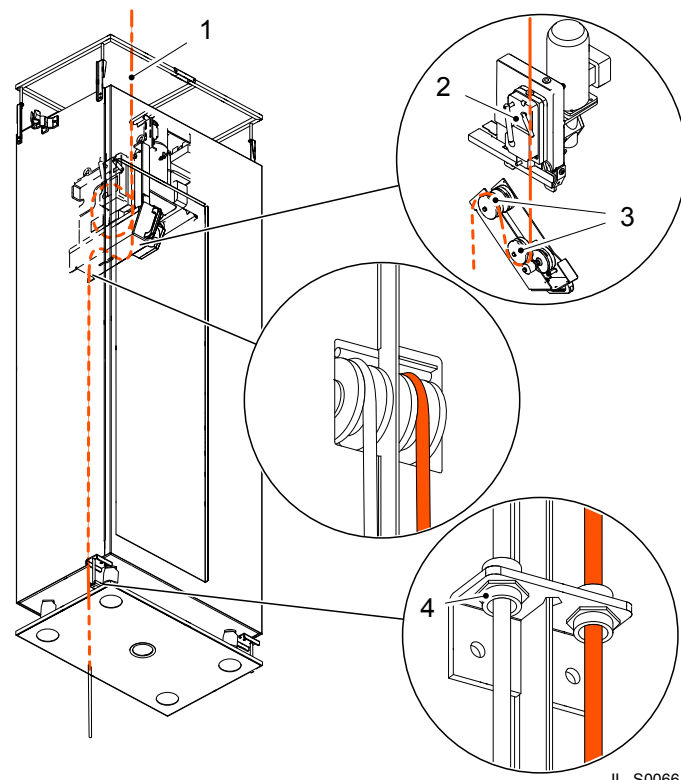


Figure 12 : Travel path of the safety wire rope through the service lift

Travel path of the safety wire rope through the service lift

- | | |
|---|------------------------------|
| 1 | Safety wire rope |
| 2 | Fall arrest device |
| 3 | Wire rope deflection pulleys |
| 4 | Cabin wire guide bushing |

3.5.2.3 Tensioning system of the safety wire rope

EN-AV-10-16-0003-01

- Tensioning system of the safety wire rope by compression spring:
 1. Insert the protection into the hole for the safety wire rope on the bottom platform.
 2. Route the safety wire rope through the corresponding hole of the bottom platform.
 3. Ascend the cabin 50 cm.
 4. Activate the fall arrest device by turning the activation lever anti-clockwise.
 5. Perform a manual descent so that the fall arrest device keeps the cabin's load suspended from the safety wire rope.
 6. Compress the spring and fix it with cable ties to a length of 40 mm.
 7. Route the safety wire rope through the compressed spring.
 8. Pull the safety wire rope manually down as far as possible.

9. Place the spring in contact with the bottom platform.
10. Fix the compression spring by installing two wire rope clamps under the spring.
11. Cut the cable ties from the spring. The length of the spring when decompressing should be between 50 mm and 70 mm .
12. Coil the excess length of the safety wire rope and secure it with a minimum of 3 cable ties so that it does not interfere with the traction wire rope or the cable management system.

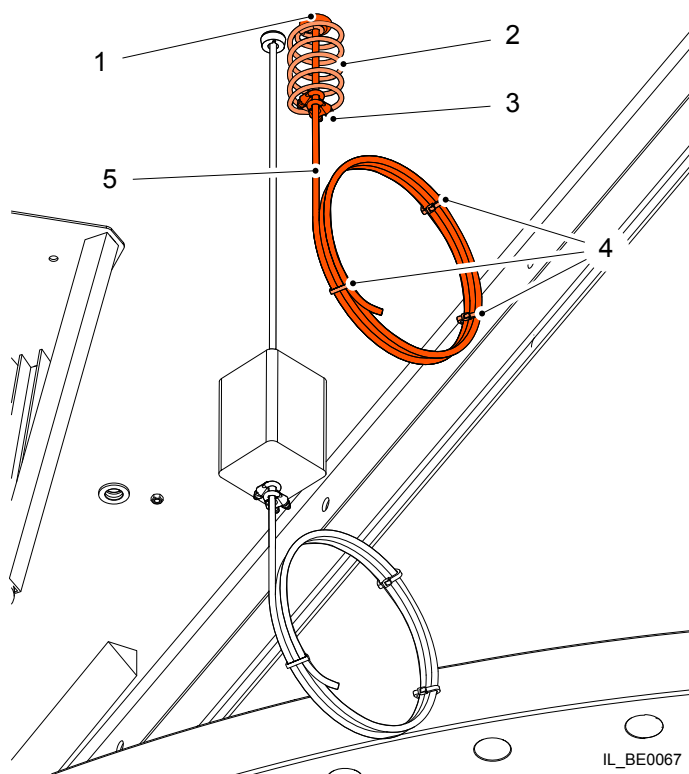


Figure 13 : Tensioning system of the safety wire rope by compression spring

Tensioning system of the safety wire rope by compression spring

- | | |
|---|--------------------------------------|
| 1 | Hole protector |
| 2 | Spring |
| 3 | Wire rope clamp |
| 4 | Wire rope excess cable ties (min. 3) |
| 5 | Safety wire rope |

- Tensioning system of the safety wire rope by 2 counterweights:

WARNING



Risk of injuries. The counterweight has a weight of 11 kg. Handle correctly to avoid injury.

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

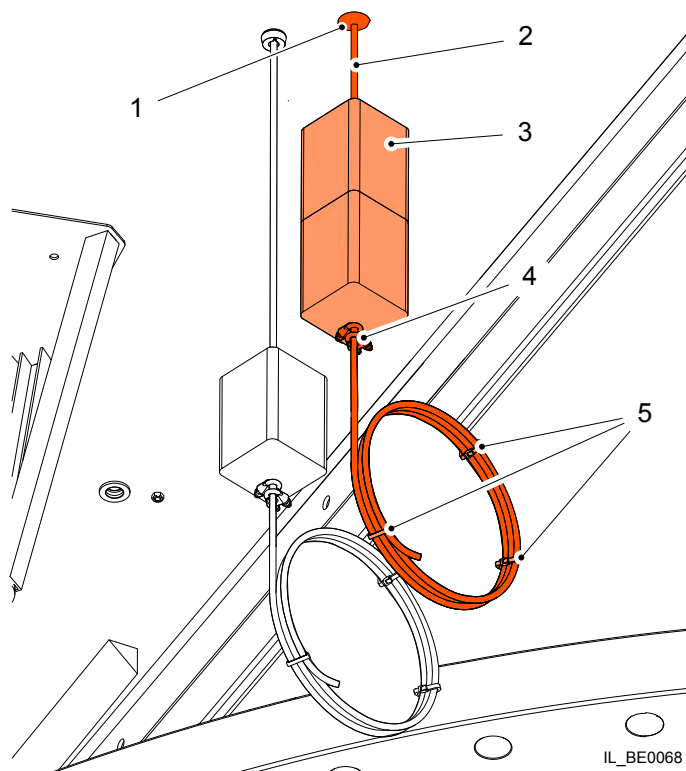


Figure 14 : Tensioning system of the safety wire rope by 2 counterweights

Tensioning system of the safety wire rope by 2 counterweights

- | | |
|---|--------------------------------------|
| 1 | Hole protector |
| 2 | Safety wire rope |
| 3 | Counterweights |
| 4 | Wire rope clamp |
| 5 | Wire rope excess cable ties (min. 3) |

3.6 Guiding system

3.6.1 Guiding wire ropes

3.6.1.1 Guiding wire ropes on the suspension beam

EN-AV-10-17-0001-01

WARNING



Risk of breakage. Do not slide the wire rope along corners and edges.

WARNING



Risk of breakage. Uncoil the wire rope evenly to prevent tangling.

1. Fix the guiding wire ropes (Ø 12 mm) on the suspension beam using the shackles installed on the wire rope thimbles.
2. Tighten the shackle nut and fit the cotter pin.
3. Uncoil the guiding wire rope to the bottom platform, guiding the wire ropes through the wire rope fixes (if installed) along the travel path. The number of the wire rope fixes depends on the specific configuration of each tower.

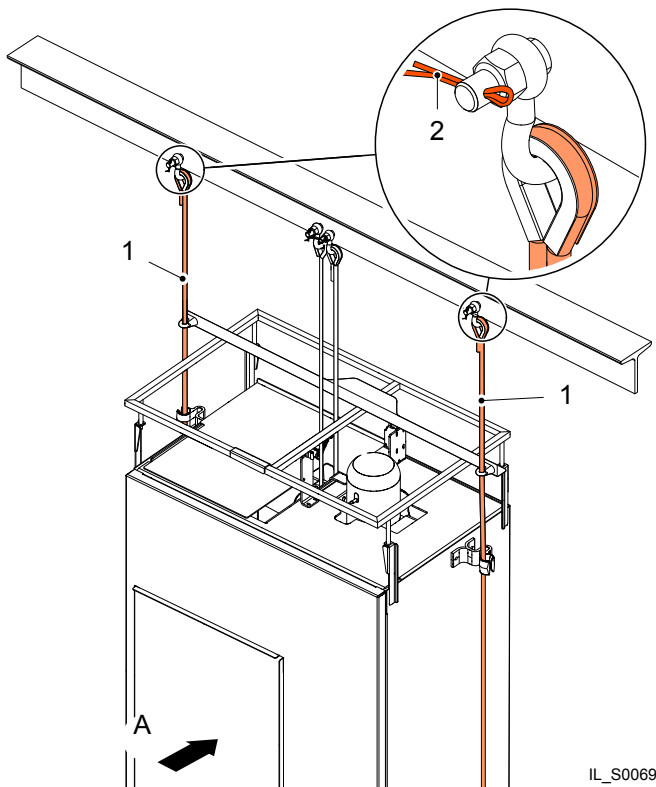


Figure 15 : Guiding wire ropes on the suspension beam

Guiding wire ropes on the suspension beam

- | | |
|---|------------------------|
| 1 | Guiding wire ropes |
| 2 | Cotter pin |
| A | Cabin access direction |

3.6.1.2 Travel path of the guiding wire ropes through the service lift

EN-AV-10-17-0002-01

1. Insert the wire rope fixes into the guiding wire rope (if it has not been done in a previous stage). The number of the wire rope fixes depends on the configuration of each tower.
2. Route the guiding wire ropes through the wire rope guides or guide rollers installed on the outer sides of the cabin.
3. Route the guiding wire ropes through the guide rollers of the travelling cable pulley (if installed).

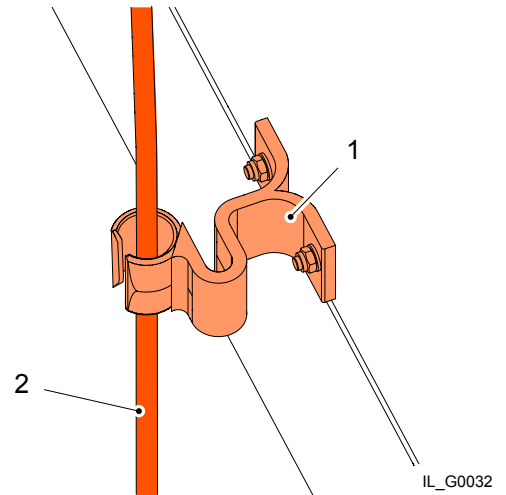


Figure 16 : Passing the guiding wire ropes through the wire rope guides

Passing the guiding wire ropes through the wire rope guides

- | | |
|---|-------------------|
| 1 | Wire rope guide |
| 2 | Guiding wire rope |

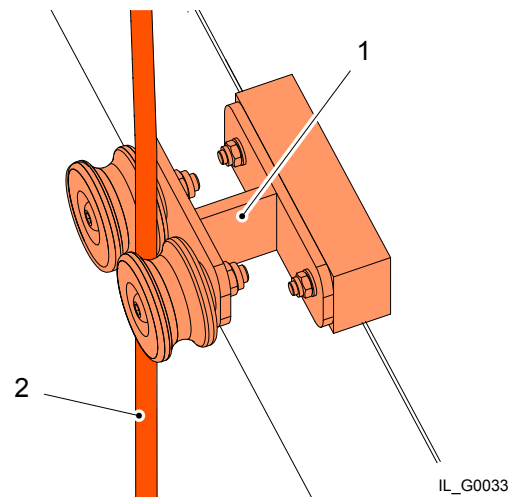


Figure 17 : Passing the guiding wire rope through the guide rollers

Passing the guiding wire rope through the guide rollers

- | | |
|---|-------------------|
| 1 | Guide rollers |
| 2 | Guiding wire rope |

3.6.1.3 Tensioning systems of the guiding wire rope

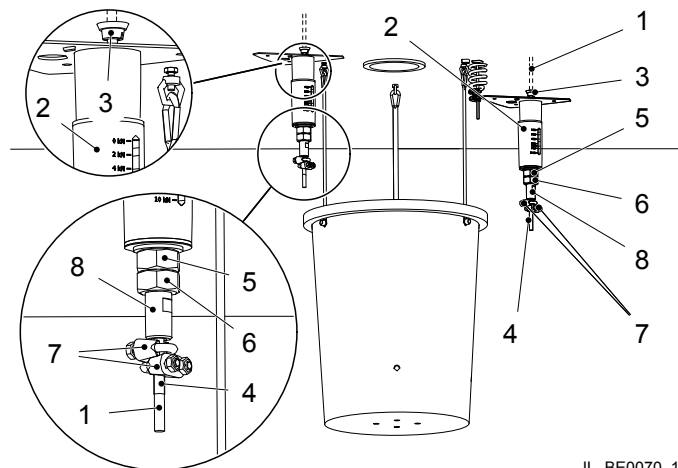
EN-AV-10-17-0003-01

1. Insert the protectors into the holes for the guiding wire rope on the bottom platform.
2. Route the guiding wire ropes through the corresponding holes in the bottom platform.
3. Fix the guiding wire rope to the tensioners:
 - a. Pass the guiding wire rope through the tensioning system.
 - b. Pull the guiding wire ropes manually downward as much as possible.
 - c. Fix the guiding wire ropes to the tensioning systems by installing two wire rope clamps and the protective bushing in each tensioner.
 - d. Make a mark on the guiding wire ropes to check that there is no slippage in the wire rope clamps.
4. Perform the tension adjustment of the guiding wire ropes after the first test run:
 - a. Turn the adjusting nut of the tensioning system until the desired tension is obtained.
 - b. Fit a locknut to prevent loosening of the adjusting nut on the tensioning system.

NOTICE



The tensioning system model and the tension values for the guiding wire ropes may vary depending on the specific configurations and tower design.

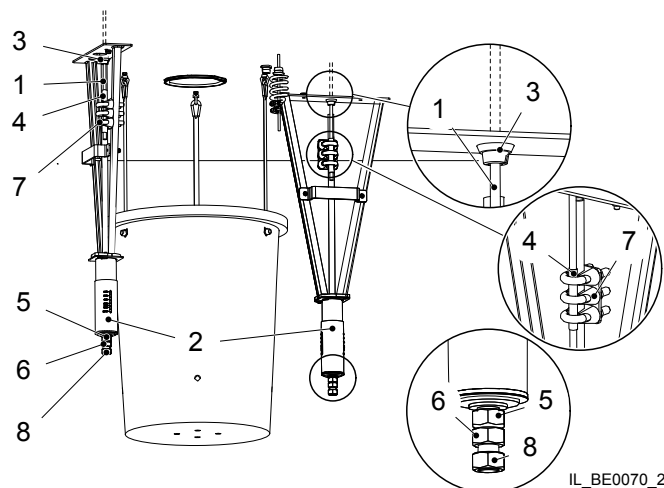


IL_BE0070_1

Figure 18 : Graduated tensioning system

Graduated tensioning system

- | | |
|---|-------------------------|
| 1 | Guiding wire rope |
| 2 | Tensioner |
| 3 | Hole protector |
| 4 | Protective bushing |
| 5 | Adjusting nut |
| 6 | Locknut |
| 7 | Wire rope clamps |
| 8 | Threaded tensioning rod |



IL_BE0070_2

Figure 19 : Graduated bipod tensioning system

Graduated bipod tensioning system

- | | |
|---|-------------------------|
| 1 | Guiding wire rope |
| 2 | Tensioner |
| 3 | Hole protector |
| 4 | Protective bushing |
| 5 | Adjusting nut |
| 6 | Locknut |
| 7 | Wire rope clamps |
| 8 | Threaded tensioning rod |

3.6.1.4 Guiding wire rope fixes on platforms

EN-AV-10-17-0004-01

Mount the guiding wire rope fixes on each platform along the cabin travel path (max 30 m between fixes).

Mount additional wire rope fixes between platforms depending on the specific configurations and design of the tower.

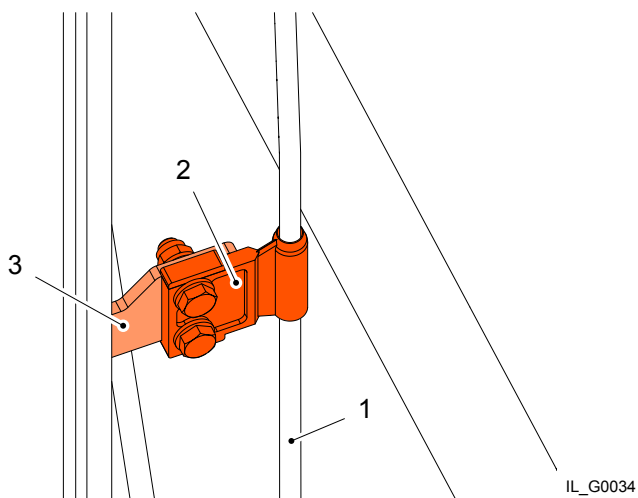


Figure 20 : Guiding wire ropes fixes

Guiding wire ropes fixes

- | | |
|---|-------------------------------|
| 1 | Guiding wire rope |
| 2 | Guiding wire rope fix |
| 3 | Guiding wire rope fix support |

3.6.1.5 Aligning the guiding wire rope fixes

EN-AV-10-17-0005-01

Align and/or adjust the guiding wire rope fixes (if it has not been done previously).

Check the alignment and adjustments during the first test run of the service lift:

1. Ascend the cabin until it reaches the level where each of the guiding wire rope fixes are mounted.
2. Check and align/adjust, if necessary, the centre of the guiding wire rope fixes with the centre of the wire rope guides installed on the outer sides of the cabin. If guide rollers are installed in the cabin, check and align/adjust, if necessary, the guiding wire rope fixes of the guiding wire ropes with the centre of the wire rope path between the rollers.

NOTICE



Use the oblong holes in the supports to align and adjust the guiding wire rope fixes.

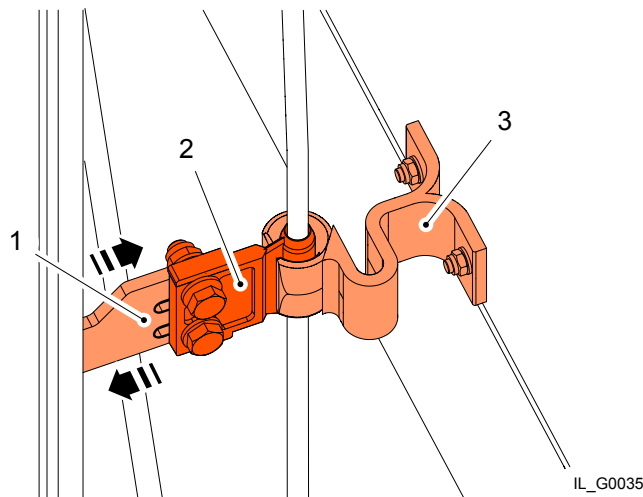


Figure 21 : Alignment of guiding wire rope fixes and wire rope guides

Alignment of guiding wire rope fixes and wire rope guides

- | | |
|---|-------------------------------|
| 1 | Guiding wire rope fix support |
| 2 | Guiding wire rope fix |
| 3 | Wire rope guide |

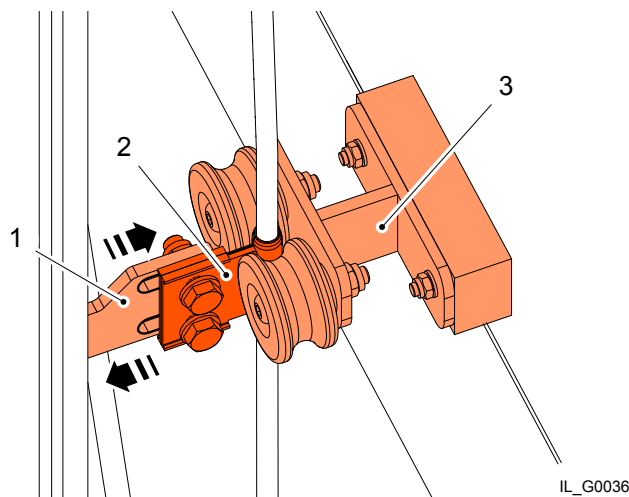


Figure 22 : Alignment of guiding wire rope fixes and guide rollers

Alignment of guiding wire rope fixes and guide rollers

- | | |
|---|-------------------------------|
| 1 | Guiding wire rope fix support |
| 2 | Guiding wire rope fix |
| 3 | Guide rollers |

3.7 Top limit plate

EN-AV-10-18-0001-01

Install and adjust the top limit plate:

1. Position and fix the top limit plate to the traction wire rope at an approximate height of 2800 mm above the level of the top platform.
2. Ascend the cabin until the top limit switch stops the ascent.

3. Check that the floor of the cabin and the top platform are level. If they are not level, readjust the position of the top limit plate and recheck until they are level.

NOTICE



The top limit plate is used if the service lift does not have a top obstruction detection device.

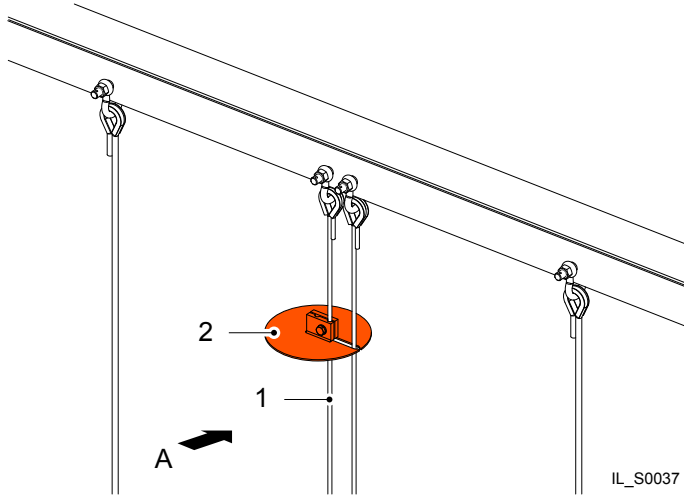


Figure 23 : Top limit plate

Top limit plate

- | | |
|---|------------------------|
| 1 | Traction wire rope |
| 2 | Top limit plate |
| A | Cabin access direction |

3.8 Top limit bar

EN-AV-10-19-0001-01

Install and adjust the top limit bar:

1. Position and fix the top limit bar to the guiding wire ropes at an approximate height of 2800 mm above the level of the top platform.
2. Ascend the cabin until the top limit switch stops the ascent.
3. Check that the floor of the cabin and the top platform are level. If they are not level, readjust the position of the top limit bar and recheck until they are level.

NOTICE



The top limit bar is used if the service lift has a top obstruction detection device.

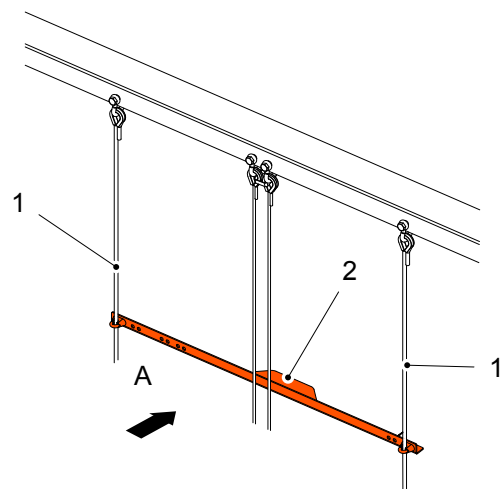


Figure 24 : Top limit bar

Top limit bar

- | | |
|---|------------------------|
| 1 | Guiding wire rope |
| 2 | Top limit bar |
| A | Cabin access direction |

3.9 Platform control boxes

3.9.1 Bottom platform control box

EN-AV-06-04-0030-01

WARNING



Electrical hazard. Disconnect the electrical power supply from the service lift and the fence interlock system before making any connection.

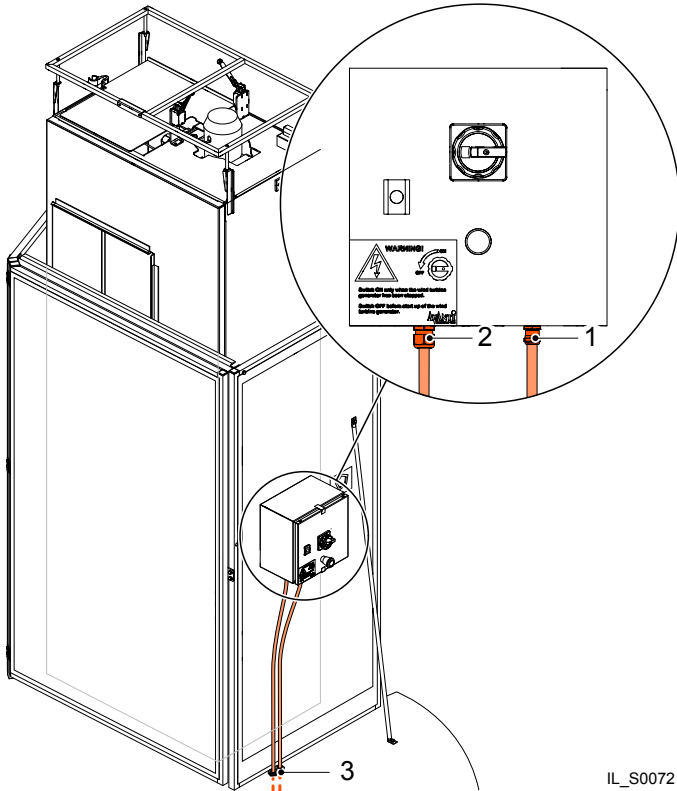
1. Position and fix the bottom platform control box.
2. Insert the protection in the platform hole for cables to run through.
3. Route and fix the connection cable of the bottom platform control box to the electrical power supply of the wind turbine.

4. Make the connection of the bottom platform control box to the wind turbine power supply.

NOTICE



Make the electrical connections following the indications of the wiring diagrams and following the cables route agreed to with the customer.



IL_S0072

Figure 25 : Bottom platform control box

Bottom platform control box

- 1 Connection cable to the cable management system
- 2 Connection cable to the wind turbine electrical power supply
- 3 Hole protector for cables to run through

3.9.2 Top or intermediate platform control box

EN-AV-06-04-0031-01

WARNING



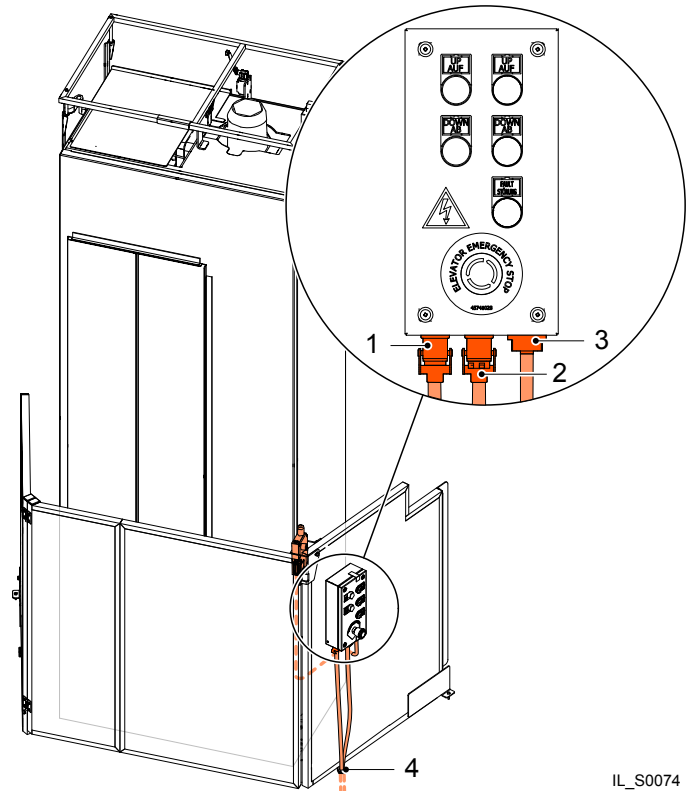
Electrical hazard. Disconnect the electrical power supply from the service lift and the fence interlock system before making any connection.

1. Position and fix the platform control box.
2. Insert the protection in the platform hole for cables to run through.
3. Route and fix the power and control cable from the platform control box on the previous platform.
4. Connect the power and control cable to the platform control box.

NOTICE



Make the electrical connections following the indications of the wiring diagrams and following the cables route agreed to with the customer.

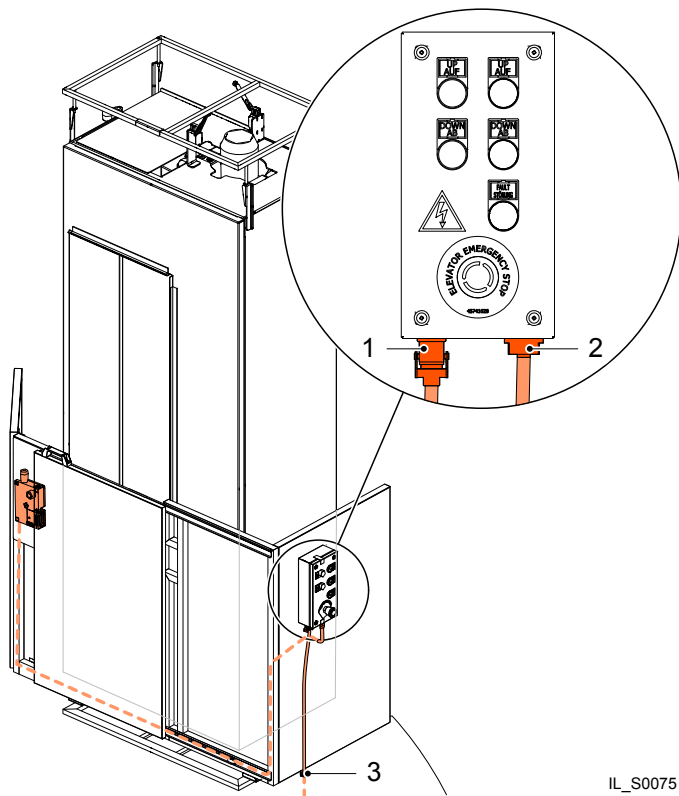


IL_S0074

Figure 26 : Intermediate platform control box

Intermediate platform control box

- 1 Connection cable from the previous platform control box
- 2 Connection cable to the next platform control box
- 3 Connection cable to the fence interlock system
- 4 Hole protector for cables to run through



IL_S0075

Figure 27 : Top platform control box

Top platform control box

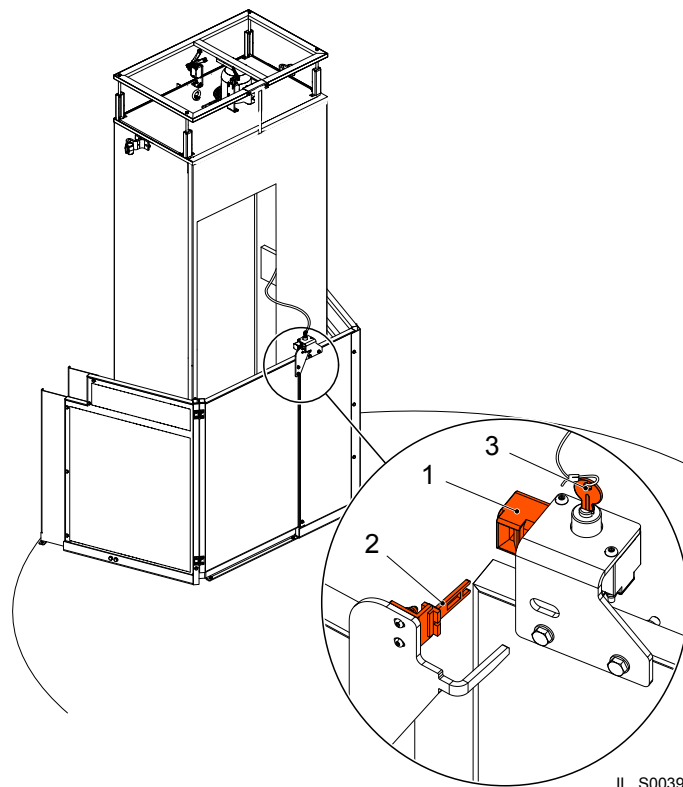
- | | |
|---|---|
| 1 | Connection cable from the previous platform control box |
| 2 | Connection cable to the fence locking system |
| 3 | Hole protector for cables to run through |

3.10 Interlock system for platform fence doors

3.10.1 Trapped-key interlock system

EN-AV-10-03-0005-01

1. Position and fix the brackets of the safety lock and the fence actuator.
2. Position, align and fix the safety lock and the actuator in their respective brackets.



IL_S0039

Figure 28 : Trapped-key interlock system

Trapped-key interlock system

- | | |
|---|-------------|
| 1 | Safety lock |
| 2 | Actuator |
| 3 | Key |

3.10.2 Guard locking interlock system

EN-AV-10-03-0002-01

WARNING



Electrical hazard. Disconnect the electrical power supply from the service lift and the fence interlock system before making any connection.

1. Position and fix the brackets of the interlock switch and the fence actuator.
2. Position, align and fix the interlock switch and the actuator in their respective brackets.
3. Position and fix the bracket of the service lift detection switch on platform in the platform fence depending on wind turbine configuration.
4. Position and fix the service lift detection switch on platform onto its bracket.
5. Connect the interlock switch to the control box or junction box of the platform following the indications of the wiring diagrams and following the route for the cables agreed with the customer.

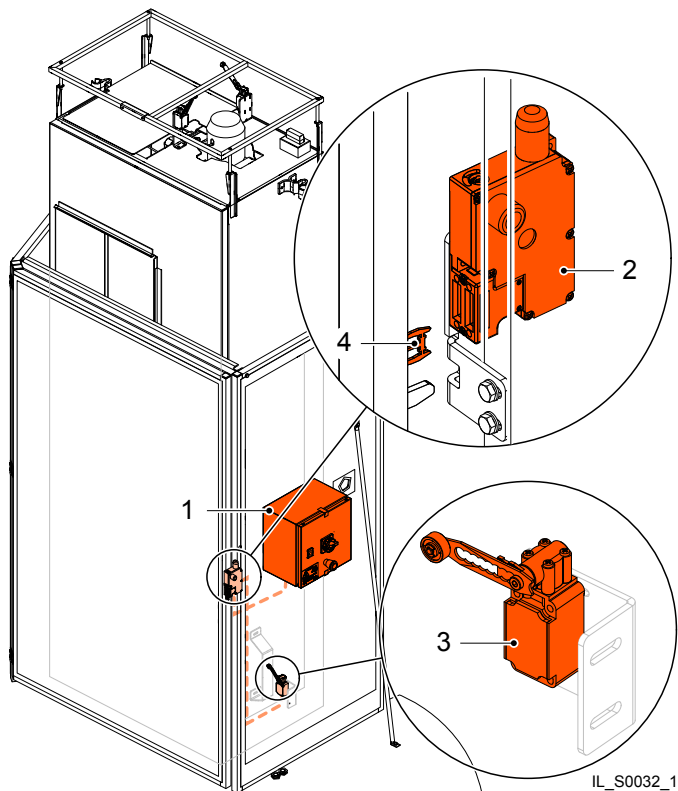


Figure 29 : Guard locking interlock system

Guard locking interlock system

- | | |
|---|---|
| 1 | Platform control box or junction box |
| 2 | Interlock switch |
| 3 | Service lift detection switch on platform |
| 4 | Actuator |

3.10.3 Level activation plates of the platform level monitoring system

EN-AV-10-03-0010-01

- Platform level monitoring system by switch:
 1. Position and fix the level activation plates of the platform level monitoring system on each platform.
 2. Adjust the level activation plates of the platform level monitoring system so that the platform level switch of the service lift is activated when the floor of the cabin is aligned with the platform.

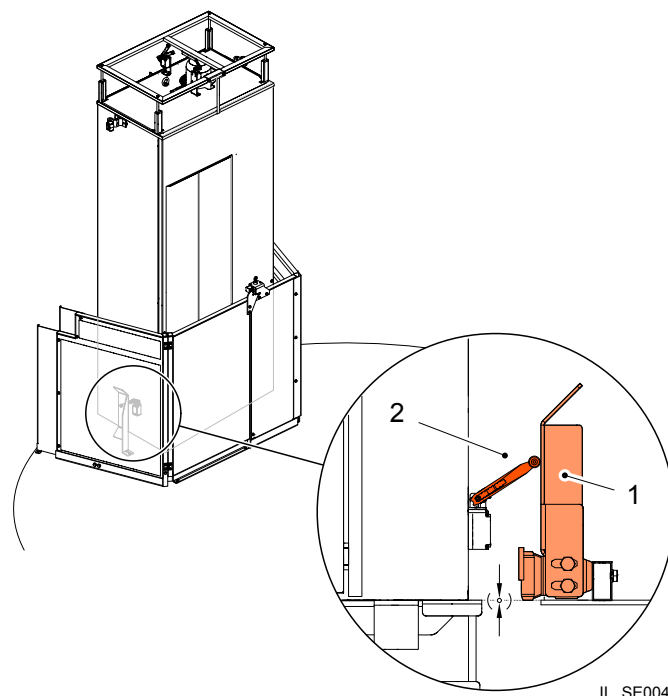


Figure 30 : Platform level monitoring system by switch

Platform level monitoring system by switch

- | | |
|---|------------------------------------|
| 1 | Level activation plate |
| 2 | Service lift platform level switch |

- Platform level monitoring system by photoelectric sensor:
 1. Position and fix the plates or brackets of the reflective strips on each platform.
 2. Adjust the level activation reflective plates or strips of the platform level monitoring system so that the photoelectric levelling sensor is activated when the floor of the cabin is aligned with the platform.

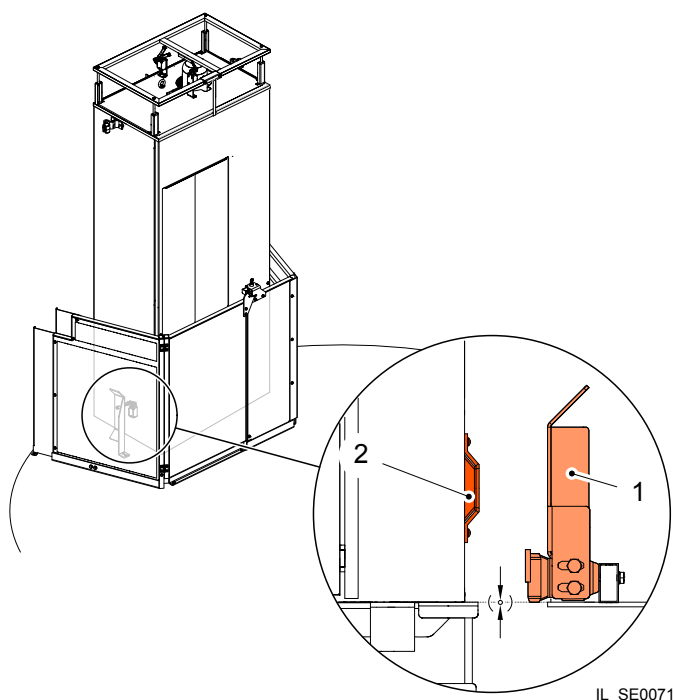


Figure 31 : Platform level monitoring system by photoelectric sensor

Platform level monitoring system by photoelectric sensor

- 1 Level activation reflective plate
- 2 Photoelectric level sensor

3.11 Informative signs and documentation

EN-AV-06-09-0001-01

The documentation, signs and stickers included with the service lift should always be available and legible. They provide the user with information about the service lift and instructions regarding safety and emergency situations.

Location	Documentation
Cabin	Serial number plate
	Manuals
	Electrical diagram
	Quick guide
	Evacuation guide
	Mandatory use of PPE
	Maximum load / number of persons
	Manual release (internal and external)
	Manual descent
Main control box	Electric hazard warning
Bottom platform fence	Rescue guide

3.12 Rescue guide

EN-AV-10-20-0001-01

Place the rescue guide in a visible place on the bottom platform fence. It must be available if necessary to rescue the cabin or a person trapped inside.

3.13 Inspection before first use

EN-AV-10-07-0001-01

Only certified technicians are authorised to perform the service lift inspection before the first use once it is installed.

1. Perform the inspection before the first use following the annual inspection procedure and completing the installation and maintenance checklist.
2. File and record the installation and maintenance checklist with the service lift documentation for future reference.

3.14 Disassembly

EN-AV-10-09-0002-01

WARNING



Electrical hazard. Switch off the electrical power supply from the service lift before disassembling.

WARNING



Electrical hazard. Do not disassemble the service lift when the wind turbine is generating power.

WARNING



Risk of injuries. Inform personnel and sign the zone before starting the work.

Disassemble the cabin and the components installed in the tower in reverse order of assembly and discard or recycle materials and components in accordance with local regulations.

Use only the appropriate tools respecting safety and health procedures.

Before completing the disassembly, check that the platforms and fences have not suffered any damage and that there are no dangers for people.

NOTICE



Disassembly operations may vary depending on the specific configurations of the service lift and the design of the tower or circumstances such as the different general tasks performed in the wind farm or the available resources (cranes, winches, etc.).

4 Maintenance

EN-AV-11-00-0004-01

This manual does not exhaustively describe operations, general-purpose tools, general safety protocols or specify the sequence of installation and maintenance of the service lift.

Only certified technicians are authorised to perform service lift annual maintenance following the installation and maintenance checklist.

The maintenance instructions for the service lift are provided to the technicians during their training period.

4.1 Recommended planning

EN-AV-11-01-0001-01

Avanti recommends the following maintenance planning:

Depending on the conditions of use and operation of the service lift or in accordance with local regulations, inspections may be required more frequently than that established in the maintenance planning.

NOTICE



Record the result of maintenance inspections and repairs performed on the service lift in the Appendix: Installation and maintenance log.

Frequency	Performed by	Function / System
Daily	User	General
		Control and safety devices
Annually	Certified technician	General
		Control and safety devices
		Cabin
		Traction hoist
		Fall arrest device
		Cable management system
		Traction and safety wire ropes
		Guiding system
		Top limit device
		Interlock system for platform fence doors
		Overload detection device
		Informative signs and documentation
Every 2 years	Certified technician	Fall arrest device
Every 5 years or 50 hours of operation (whichever comes first)	Certified technician	Traction hoist
Every 20 years or 250 hours of operation (whichever comes first)	Avanti (Workshop)	Fall arrest device
		Traction hoist

4.2 Alternative planning

EN-AV-11-02-0001-01

Owners who strictly follow the maintenance program and daily inspections, and have the corresponding records, can decide to take responsibility and follow the alternative planning:

Frequency	Performed by	Function / System
Daily	User	General
		Control and safety devices
Annually	Certified technician	General
		Control and safety devices
		Cabin
		Traction hoist
		Fall arrest device
		Cable management system
		Traction and safety wire ropes
		Guiding system
		Top limit device
		Interlock system for platform fence doors
		Overload detection device
		Informative signs and documentation
Every 10 years or 125 hours of operation (whichever comes first)	Certified technician	Fall arrest device
		Traction hoist
Every 20 years or 250 hours of operation (whichever comes first)	Avanti (Workshop)	Fall arrest device
		Traction hoist

4.3 Annual inspection and maintenance

EN-AV-11-04-0000-01

WARNING



A bolt is considered tight as long as the nut cannot be turned by hand.

In cases where the bolt surpasses the nut, it must surpass at least half the diameter of the thread.

Check the bolts tightening torque when is specified.

Replace the self-locking nuts if they can be loosened by hand.

Depending on the tools and resources available to perform the operations described in the annual inspection and maintenance, the intervention of 2 certified technicians may be required.

NOTICE



Record the result of the inspection and annual maintenance in the Appendix: Installation and maintenance log.

NOTICE



Consult the user manual for information on the functions and systems of the service lift, if necessary.

4.3.1 General

EN-AV-11-00-0005-01

Function / System	Operations
Cabin and cabin components	<ol style="list-style-type: none"> 1. Visually check the structure and general state of the cabin. The cabin must be clean and the cabin structure must not have dents, cracks, corrosion or other damages. 2. Visually check the state of the door, windows and the covers The door, windows and covers must not have dents, cracks, corrosion or other damages. 3. Check the presence of the manual descent actuator. The manual descent actuator must be placed in its support inside the cabin. 4. Visually check the state of the bottom and top obstruction detection devices. The bottom and top obstruction detection devices must not have dents, cracks, corrosion or other damages. 5. Visually check the state of the switches in the cabin. The switches must not have dents, cracks, corrosion or other damages. 6. Visually check the state of warning lights. Warning lights must not have cracks or other damages. 7. Visually check the guiding system (wire rope guides/guide rollers). The guiding system must not have cracks, corrosion or other damages.
Components installed in the wind turbine	<ol style="list-style-type: none"> 1. Visually check the state of platform control boxes, electrical cables and electrical connections. Platform control boxes must not have dents, cracks, corrosion or other damages. The sealing of the platform control boxes must be in good state. Electrical cables must not have damage to the sheath, indentations, compression marks or marks caused by heat. The electrical cables must be fixed with cable ties. The electrical connections must not have dents, cracks, corrosion or other damages. The bolts of the electrical connections must be tight. 2. Visually check the state of the travelling cable pulley (if installed). The travelling cable pulley must not have dents, cracks, corrosion or other damages. 3. Visually check the state of the fence door interlock system. The components of the fence door interlock system must not have dents, cracks, corrosion or other damages.
Travel path	<ol style="list-style-type: none"> 1. Visually check the cabin's travel path. The cabin's travel path must be free of obstacles.
Hour counter	<ol style="list-style-type: none"> 1. Check the reading of the hour counter. Record the hour counter reading on the Installation and maintenance log.

4.3.2 Safety and control devices

4.3.2.1 Control from inside the cabin

EN-AV-11-04-0014-01

DANGER



Risk of injuries. In case of malfunction during operation:

- *Stop the service lift immediately.*
- *If necessary, secure the work site.*
- *Resolve the issue.*

DANGER



Risk of injuries. Check that nobody is exposed to danger below the cabin, for instance, due to falling parts.

Function / System	Operations
Main switch	<ol style="list-style-type: none">1. Turn the main switch on the bottom platform control box to the OFF position. The service lift ready light on the bottom platform control box (green) (if installed) should turn off.2. Press and hold the UP button, release it, and then press and hold the DOWN button. The cabin should not ascend or descend.3. Turn the switch to the ON position.
Service lift ready light (green)	<ol style="list-style-type: none">1. Close and lock the bottom platform fence door and the cabin door.2. Turn the trapped-key switch (if installed) to the ON position. The service lift ready light (green) (if installed) should turn on.
Emergency-stop button	<ol style="list-style-type: none">1. Ascend the cabin approximately 1 m.2. Push the emergency-stop button in the user control box [See section User control box in the User Manual].3. Press and hold the UP button, release it, and then press and hold the DOWN button. The cabin should not ascend or descend.4. Deactivate the emergency-stop button.
Manual descent	<ol style="list-style-type: none">1. Perform a manual descent of approximately 1 m. The cabin should descend. The manual descent buzzer should sound (if installed).
Cabin door	<ol style="list-style-type: none">1. Pull the sliding door to open it when the cabin is positioned at platform level. The door should not open.2. Press the green opening button on the cabin door interlock switch. Pull the sliding door to open it. The door should open. The service lift ready light (green) should turn off.3. Press and hold the UP button, release it, and then press and hold the DOWN button. The cabin should not ascend or descend.4. Close the sliding door.

Function / System	Operations
Fall arrest device	<ol style="list-style-type: none"> 1. Ascend the cabin electrically several centimetres and visually check that the fall arrest device's centrifugal system spins. 2. Activate the fall arrest device by turning the activation lever anti-clockwise. The activated fall arrest device light (red) should turn on. 3. Press and hold the DOWN button on the user control box. The cabin should not descend. 4. Perform a manual descent. The cabin should not descend. The fall arrest device should hold the cabin load, which is suspended from the safety wire rope. Otherwise, descend the cabin electrically immediately until it is located on the floor of the bottom platform. In order to do this, steps 5 and 6 must be performed first. Disconnect, lock out and tag out the service lift to prevent it from being used. Contact Avanti for assistance. 5. Ascend electrically once more to relieve the tension in the safety wire rope. 6. Deactivate the fall arrest device by turning the deactivation lever clockwise. The activated fall arrest device light (red) should turn off. 7. Descend the cabin electrically several centimetres and visually check that the fall arrest device's centrifugal system spins. <p>The stomp test is an alternative method for inspecting the fall arrest device during the daily inspection. [Refer to the Instruction for the stomp-test in the User Manual].</p>
Bottom obstruction detection device	<ol style="list-style-type: none"> 1. Press and hold the DOWN button on the user control box until the bottom obstruction detection device contacts the bottom platform and stops. The cabin should stop before the rubber bumpers contact the bottom platform.
Override switch for bottom obstruction detection device	<ol style="list-style-type: none"> 1. Ascend the cabin electrically several centimetres until the bottom obstruction detection device does not contact the bottom platform. 2. Turn and hold the override switch of the bottom obstruction detection device to override the bottom obstruction detection device. 3. Press and hold the internal UP button on the user control box. The cabin should not ascend. 4. Press and hold the internal DOWN button of the service lift until the rubber bumpers contact the bottom platform. Release the DOWN button immediately after the rubber bumpers contact the bottom platform. The cabin should stop when the rubber bumpers contact the bottom platform. 5. Release the override switch of the bottom obstruction detection device.
Top obstruction detection device	<ol style="list-style-type: none"> 1. Activate the top obstruction detection device by pressing it downwards. 2. Press and hold the UP button. The cabin should not ascend.
Emergency top limit switch	<ol style="list-style-type: none"> 1. Ascend the cabin approximately 0.5 m. 2. Activate the emergency top limit switch. 3. Press and hold the UP button, release it, and then press and hold the DOWN button. The cabin should not ascend or descend. 4. Deactivate the emergency top limit switch. 5. Press and hold the service lift DOWN button until it stops at the bottom platform.
Platform level switch and platform level light (green)	<ol style="list-style-type: none"> 1. Check that the level activation plate activates the platform level switch correctly. The platform level light (green) should turn on. 2. Press the green opening button on the cabin door interlock switch. Pull the sliding door to open it. The door should open.

Function / System	Operations
Slack rope sensor ¹⁾	<ol style="list-style-type: none"> 1. Activate slack rope sensor. 2. Press and hold the DOWN button. <p>The cabin should not descend.</p>

NOTICE



¹⁾ The slack rope sensor is an optional accessory.

4.3.2.2 Control from outside the cabin (automatic send configuration)

EN-AV-11-04-0015-01

Function / System	Operations
Ascend	<ol style="list-style-type: none"> 1. Press the UP button on the outside of the user control box. <p>The impending movement buzzer should emit an acoustic warning sound during the delay time before the cabin starts moving.</p> <p>The cabin should ascend and the warning lights (if installed) should flash once the delay time to start moving has elapsed.</p>
Emergency-stop button	<ol style="list-style-type: none"> 1. Push the emergency-stop button on the outside of the user control box immediately after starting to ascend while performing the ascent verification. <p>The cabin should stop and the warning lights (if installed) should turn off.</p> <ol style="list-style-type: none"> 2. Press the external UP button and then the external DOWN button on the user control box. <p>The cabin should not ascend or descend.</p>
Descend	<ol style="list-style-type: none"> 1. Deactivate the emergency-stop button. 2. Press the DOWN button on the outside of the user control box. <p>The impending movement buzzer should emit an acoustic warning sound during the delay time before the cabin starts moving.</p> <p>The cabin should descend and the warning lights (if installed) should flash once the delay time to start moving has elapsed until the bottom obstruction detection device is activated.</p>

4.3.2.3 Control from the platforms (send / call configuration)

EN-AV-07-01-0019-01

Function / System	Operations
Ascend	<ol style="list-style-type: none"> 1. Press and hold the UP button on the platform control box. <p>The impending movement buzzer should emit an acoustic warning sound during the delay time before the cabin starts moving.</p> <p>The cabin should ascend and the warning lights (if installed) should flash once the delay time to start moving has elapsed.</p> <p>The ascent light (green) should turn on when the cabin starts moving.</p>
Emergency-stop button	<ol style="list-style-type: none"> 1. Push the emergency-stop button on the platform control box immediately after starting to move up while performing the ascent verification. <p>The cabin should stop and the warning lights (if installed) should turn off.</p> <p>The fault light (red) should turn on.</p> <ol style="list-style-type: none"> 2. Press and hold the UP button, release it and then press and hold the DOWN button on the platform control box. <p>The cabin should not ascend or descend.</p>

Function / System	Operations
Descend	<ol style="list-style-type: none"> Deactivate the emergency-stop button. The fault light (red) should turn off. Press and hold the DOWN button on the platform control box. The impending movement buzzer should emit an acoustic warning sound during the delay time before the cabin starts moving. The cabin should descend and the warning lights (if installed) should flash once the delay time to start moving has elapsed. The descent light (green) should turn on when the cabin starts moving.

NOTICE



Control from the platforms is an optional configuration.

4.3.3 Cabin

EN-AV-11-04-0001-01

Function / System	Operations
Cabin	<ol style="list-style-type: none"> Check that the bolts of the cabin structure are tight. The bolts must be tight.
Door	<ol style="list-style-type: none"> Open and close the door when the cabin is positioned at platform level. The door should slide effortlessly and be adjusted. The bolts must be tight. The interlock switch must be adjusted. Turn the main switch on the bottom platform control box to the OFF position. Activate the manual unlocking of the door inside the cabin and pull the sliding door to open it. The door should open. Deactivate the manual unlocking of the door inside the cabin and close the door. Activate the manual unlocking of the door outside the cabin and pull the sliding door to open it. The door should open. Turn the main switch on the bottom platform control box to the ON position.
Windows and covers	<ol style="list-style-type: none"> Check that the bolts of the windows and covers are tight. The bolts must be tight.
Control boxes, electrical cables and connectors	<ol style="list-style-type: none"> Visually check the state of control boxes, electrical cables and electrical connections. Control boxes must not have dents, cracks, corrosion or other damages. The sealing of the control boxes must be in good state. Electrical cables must not have damage to the sheath, indentations, compression marks or marks caused by heat. The electrical cables must be fixed with cable ties. The electrical connections must not have dents, cracks, corrosion or other damages. The connectors must be tight.
Bottom and top obstruction detection devices	<ol style="list-style-type: none"> Manually check the displacement of the bottom and top obstruction detection devices. Bottom and top obstruction detection devices must be compressed when manually displaced and must be decompressed when released. Visually check the guide shafts of the bottom and top obstruction detection devices. The guide shafts of the bottom and top obstruction detection devices must be clean and lubricated.

Function / System	Operations
Anchor points	<ol style="list-style-type: none"> 1. Visually check anchor points. The anchor points must not have permanent deformation, cracks, corrosion or other damages. The marking of the anchor points is clearly legible. 2. Check that the bolts on the anchor points are tight and the tightening torque is the indicated by the manufacturer. The bolts must be tight and the tightening torque must be 15 N-m.
Service light	<ol style="list-style-type: none"> 1. Turn the main switch on the bottom platform control box to the ON position (if it has not been done previously). The service light must illuminate the interior of the cabin. 2. Turn the main switch on the bottom platform control box to the OFF position. The service light with emergency function (if installed) must illuminate the interior of the cabin. 3. Turn the main switch on the bottom platform control box to the ON position.
Handles and steps	<ol style="list-style-type: none"> 1. Visually check the state of the handles and steps. The handles and steps must not have permanent deformation, cracks, corrosion or other damages. The handles and steps should not have traces of grease or dirt. 2. Check that the bolts of the handles and steps are tight. The bolts must be tight.

4.3.4 Traction hoist

EN-AV-11-04-0002-01

Only certified technicians are authorised to perform traction hoist inspection and maintenance.

The maintenance instructions for the traction hoist are provided to the technicians during their training period.

Function / System	Operations
Traction hoist	<ol style="list-style-type: none"> 1. Perform the corresponding inspection and maintenance according to the total hours of operation of the service lift or according to the hours of operation since the last maintenance on the traction hoist. The inspection and maintenance of the traction hoist must be performed according to the frequencies specified in the maintenance planning [See section Recommended planning, see on page 24 and section Alternative planning, see on page 25] 2. Remove the protective covers from the wire rope deflection pulleys subassembly and visually check the state of the traction wire rope deflection pulleys (if this has not been done previously). The traction wire rope deflection pulleys must not be damaged, deformed and/or worn. 3. Assemble the protective covers of the wire rope deflection pulleys subassembly once the inspection of the traction hoist and the fall arrest device has been performed.

4.3.5 Fall arrest device

EN-AV-11-04-0003-01

Only certified technicians are authorised to perform fall arrest device inspection and maintenance.

The fall arrest device maintenance instructions are provided to the technicians during their training period.

Function / System	Operations
Fall arrest device	<ol style="list-style-type: none"> 1. Visually check the shock absorber system of the fall arrest device. The shock absorber system of the fall arrest device must not be displaced. (In case it has shifted, do not use the service lift). 2. Perform the corresponding inspection and maintenance according to the total hours of operation of the service lift or according to the hours of operation since the last maintenance on the fall arrest device. The inspection and maintenance of the fall arrest device must be performed according to the frequencies specified in the maintenance planning [See section Recommended planning, see on page 24 and section Alternative planning, see on page 25]. 3. Remove the protective covers from the wire rope deflection pulleys subassembly and visually check the state of the safety wire rope deflection pulleys (if this has not been done previously). The safety wire rope deflection pulleys must not be damaged, deformed and/or worn. 4. Assemble the protective covers of the wire rope deflection pulleys subassembly once the inspection of the traction hoist and the fall arrest device has been performed.

4.3.6 Cable management system

4.3.6.1 Trailing cable management system

EN-AV-11-04-0008-01

Function / System	Operations
Trailing cable management system	<ol style="list-style-type: none"> 1. Visually check the cable stocking in the cabin. The cable stocking must not be damaged. 2. Visually check the hole protector for the trailing cable on the bottom platform. The protector must not have significant damage or wear and must fully protect the perimeter of the hole preventing contact of the cable with edges of the platform. 3. Ascend 20 m and descend 20 m. Visually check the trailing cable and the uncoiling and coiling of the trailing cable inside the cable collect bin. When ascending, the cabin must pull the trailing cable and uncoil it from the inside of the cable collect bin without jerks and without interfering or becoming entangled with other components. When descending the cabin, the trailing cable must coil inside the cable collect bin without interfering or becoming entangled with other components. The trailing cable must not have damage to the sheath, indentations, compression marks or marks caused by heat.

4.3.6.2 Travelling cable management system

EN-AV-11-04-0009-01

Function / System	Operations
Travelling cable management system	<ol style="list-style-type: none"> 1. Visually check the travelling cable pulley. The travelling cable pulley, its rollers and guides must not have dents, cracks, corrosion or other damages. The bolts must be tight. 2. Ascend 20 m and descend 20 m. Visually check the displacement of the travelling cable and the travelling cable pulley. When ascending, the cabin must pull the travelling cable and the travelling cable pulley without jerks and without interfering or becoming entangled with other components. When the cabin descends, the travelling cable pulley and the travelling cable itself must descend without interfering or becoming entangled with other components. The travelling cable must not have damage to the sheath, indentations, compression marks or marks caused by heat.

4.3.6.3 Guided trailing cable management system

EN-AV-11-04-0010-01

Function / System	Operations
Guided trailing cable management system	<ol style="list-style-type: none">1. Visually check the cable stocking in the cabin. The cable stocking must not be damaged.2. Check that the bolts of the cable guides on the platforms and the cable bracket on the cabin side are tight. The bolts must be tight.3. Visually check the adjustment of the cable guides on the platforms. The cable guides on the platforms should be adjusted so that the cable bracket and the power cable travel through the cable guides avoiding metal to metal contact.4. Visually check the hole protector for the trailing cable on the bottom platform. The protector must not have significant damage or wear and must fully protect the perimeter of the hole preventing contact of the cable with edges of the platform.5. Ascend 20 m and descend 20 m. Visually check the trailing cable and the uncoiling and coiling of the trailing cable inside the cable collect bin. When ascending, the cabin must pull the trailing cable and uncoil it from the inside of the cable collect bin without jerks and without interfering or being entangled with other components. When descending the cabin, the trailing cable must coil inside the cable collect bin without interfering or becoming entangled with other components. The trailing cable must not have damage to the sheath, indentations, compression marks or marks caused by heat.

4.3.7 Suspension beam

EN-AV-11-04-0033-01

Function / System	Operations
Suspension beam	<ol style="list-style-type: none">1. Visually check the suspension beam. Check the zone of holes for wires and welds. The suspension beam must not have dents, cracks, corrosion or other damage.2. Check that the connecting bolts to the wind turbine are tight. The bolts must be tight and the torque marks aligned.

4.3.8 Traction and safety wire ropes

EN-AV-11-04-0034-01

CAUTION



Risk of breakage. In case the wire ropes are damaged, determine and correct the cause of the damage before replacing the wire ropes.

WARNING



Risk of breakage. Check the lubrication state of the wire ropes. In case lubrication is needed, consider that:

- *Poor lubrication will cause corrosion on the wire ropes and premature wear of the components.*
- *Excessive lubrication will cause build-up of dirt on the wire ropes and premature wear of the components.*
- *Use only special lubricants for wire ropes. Do not use lithium or bituminous soap grease based lubricants or lubricants containing disulfides such as Molycote®.*

4.3.8.1 Traction wire rope

EN-AV-11-04-0016-01

Function / System	Operations
Shackle	<ol style="list-style-type: none">1. Visually check the wire rope shackle (if it has not been done previously). The shackle must not have dents, cracks, corrosion or other damage. The shackle must have the cotter pin installed.
Wire rope	<ol style="list-style-type: none">1. Visually check the wire rope thimble and the pressed bushing. The wire rope thimble and the pressed bushing must not have dents, cracks, corrosion or other damages. The wire rope must protrude 1/2 of the diameter of the wire rope outside the pressed bushing [See figure <i>Pressed bushing</i>, see on page 35].2. Visually check the state of the wire rope and measure its diameter at regular intervals along the entire length of the wire rope (if it has not been done previously during the inspection of the other wire ropes). Replace the traction wire rope if any of the following conditions are not met: The wire rope should not show signs of corrosion. The wire rope should not show damage due to heating (blue discolouration). The wire rope should not have deformations, cracks or damage on its surface [See figure <i>Examples of damage to the wire ropes</i>, see on page 35]. The wire rope should not have more than 4 broken wires in a length of 250 mm. The diameter of the wire rope must be greater than 7.6 mm (measure the diameter of the wire rope using the maintenance windows / wire rope inspection covers).3. Visually check the wire rope protector on the bottom platform. The protector must not have significant damage or wear and must fully protect the perimeter of the hole preventing contact of the wire rope with edges of the platform.
Cleanliness and lubrication	<ol style="list-style-type: none">1. Visually check the cleanliness and lubrication of the wire rope (if it has not been done previously). The wire rope should be clean and slightly lubricated. In case the wire rope is dirty and/or not lubricated, clean and lubricate using only a cloth or a brush. Do not use solvents or other detergents.2. Visually check the state of the cabin after lubricating the wire rope. The cabin must be clean. There must be no remaining lubricant in the cabin.
Counterweight	<ol style="list-style-type: none">1. Visually check the counterweight. The counterweight must not have cracks, corrosion or other damages.2. Check that the bolts of the wire rope clamp are tight. The bolts must be tight.3. Check the remaining length of the traction wire rope. The remaining length of the traction wire rope must be coiled and secured with a minimum of 3 cable ties below or around the counterweight depending on the installation. The excess length of the traction wire rope must not interfere with the safety wire rope or with the cable management system.4. Check the mobility of the counterweight and the excess wire rope. The counterweight and the excess wire rope must rotate freely around the vertical axis.

NOTICE



Record any anomaly of the traction wire rope in the Appendix: Installation and maintenance log.

NOTICE



The discard criteria of the wire ropes follows the ISO 4309 standard: Cranes - Wire ropes - Care and maintenance, inspection and discard.

NOTICE



Check the frequency of replacement of the traction wire rope, depending on local regulations.

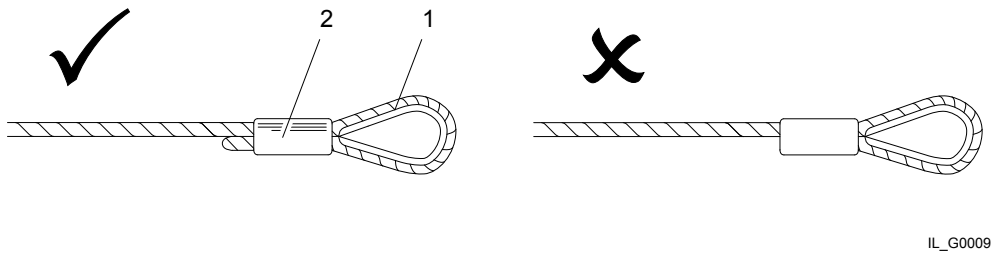
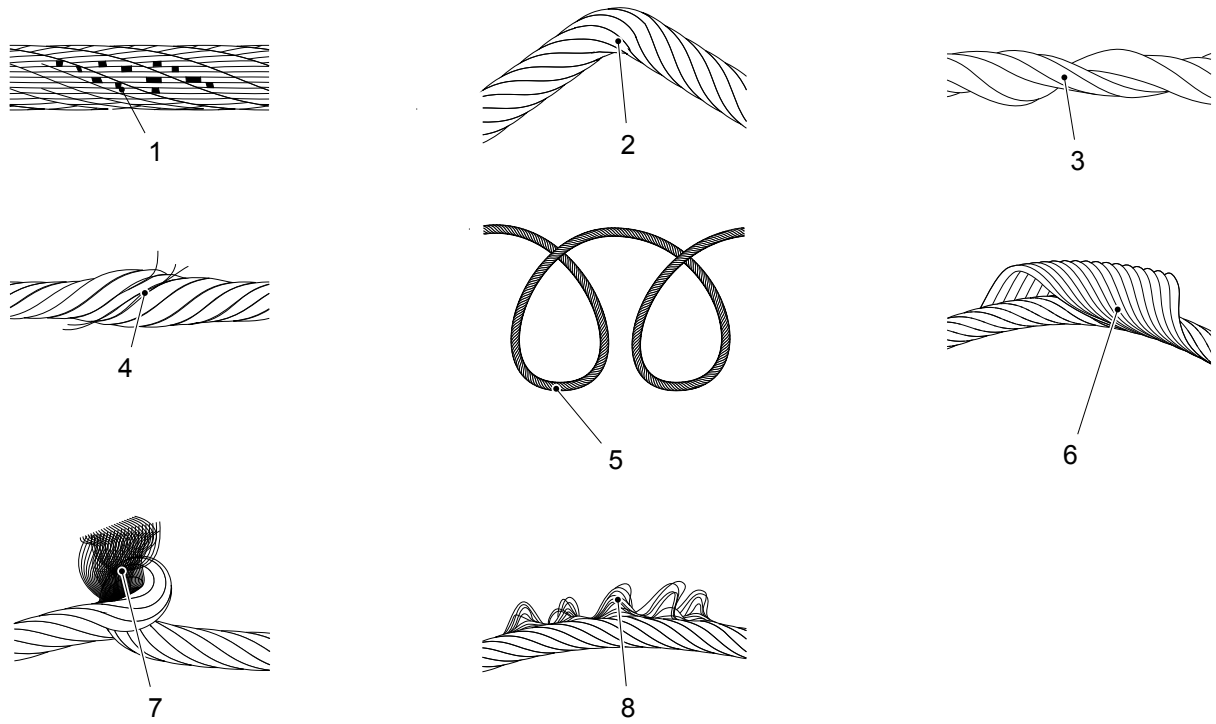


Figure 32 : Pressed bushing

Pressed bushing

- 1 Wire rope thimble
- 2 Pressed bushing



IL_G0009

Figure 33 : Examples of damage to the wire ropes

Examples of damage to the wire ropes

- | | | | |
|---|-------------|---|--------------------|
| 1 | Wire breaks | 5 | Loops |
| 2 | Bends | 6 | Basket deformation |
| 3 | Kinks | 7 | Kinks |
| 4 | Damages | 8 | Protrusions |

4.3.8.2 Safety wire rope

EN-AV-11-04-0019-01

Function / System	Operations
Shackle	<ol style="list-style-type: none"> 1. Visually check the wire rope shackle (if it has not been done previously). The shackle must not have dents, cracks, corrosion or other damage. The shackle must have the cotter pin installed.
Wire rope	<ol style="list-style-type: none"> 1. Visually check the wire rope thimble and the pressed bushing. The wire rope thimble and the pressed bushing must not have dents, cracks, corrosion or other damages. The wire rope must protrude 1/2 of the diameter of the wire rope outside the pressed bushing [See figure <i>Pressed bushing</i>, see on page 35]. 2. Visually check the state of the wire rope and measure its diameter at regular intervals along the entire length of the wire rope (if it has not been done previously during the inspection of the other wire ropes). Replace the wire rope if any of the following conditions are not met: The wire rope should not show signs of corrosion. The wire rope should not show damage due to heating (blue discolouration). The wire rope should not have deformations, cracks or damage on its surface [See figure <i>Examples of damage to the wire ropes</i>, see on page 35]. The wire rope should not have more than 4 broken wires in a length of 250 mm. The diameter of the wire rope must be greater than 7.6 mm (measure the diameter of the wire rope using the maintenance windows / wire rope inspection covers). 3. Visually check the wire rope protector on the bottom platform. The protector must not have significant damage or wear and must fully protect the perimeter of the hole preventing contact of the wire rope with edges of the platform.
Cleanliness and lubrication	<ol style="list-style-type: none"> 1. Visually check the cleanliness and lubrication of the wire rope (if it has not been done previously). The wire rope should be clean and slightly lubricated. In case the wire rope is dirty and/or not lubricated, clean and lubricate using only a cloth or a brush. Do not use solvents or other detergents. 2. Visually check the state of the cabin after lubricating the wire rope. The cabin must be clean. There must be no remaining lubricant in the cabin.
Counterweights (if installed)	<ol style="list-style-type: none"> 1. Visually check the counterweights. The counterweights should not have cracks, corrosion or other damages. 2. Check that the bolts of the wire rope clamp are tight. The bolts must be tight. 3. Check the remaining length of the safety wire rope. The excess length of the safety wire rope must be coiled and secured with a minimum of 3 cable ties under the counterweights. The counterweights and the excess length of the safety wire should not interfere with the rotating movement of the traction wire rope or with the cable management system.

Function / System	Operations
Compression spring (if installed)	<ol style="list-style-type: none"> 1. Visually check the compression spring. The compression spring should not have cracks, corrosion or other damages. 2. Check that the bolts of the wire rope clamp are tight. The bolts must be tight. 3. Check the compression spring length. The length of the spring should be between 50 mm and 70 mm. 4. Check the remaining length of the safety wire rope. The excess length of the safety wire must be coiled and secured with a minimum of 3 cable ties under the compression spring. The excess length of the safety wire should not interfere with the rotating movement of the traction wire rope or with the cable management system.

NOTICE



Record any anomaly of the safety wire rope in the Appendix: Installation and maintenance log.

NOTICE



The discard criteria of the wire ropes follows the ISO 4309 standard: Cranes - Wire ropes - Care and maintenance, inspection and discard.

NOTICE



Check the frequency of replacement of the safety wire rope, depending on local regulations.

4.3.9 Guiding system

4.3.9.1 Guiding wire ropes

EN-AV-11-04-0020-01

CAUTION



Risk of breakage. In case the wire ropes are damaged, determine and correct the cause of the damage before replacing the wire ropes.

Function / System	Operations
Shackle	<ol style="list-style-type: none">1. Visually check the wire rope shackle (if it has not been done previously). The shackle must not have dents, cracks, corrosion or other damage. The shackle must have the cotter pin installed.
Wire ropes	<ol style="list-style-type: none">1. Visually check the wire rope thimble and the pressed bushing. The wire rope thimble and the pressed bushing must not have dents, cracks, corrosion or other damages. The wire rope must protrude 1/2 of the diameter of the wire rope outside the pressed bushing [See figure <i>Pressed bushing</i>, see on page 35].2. Visually check the state of each wire rope in the zone of the platforms (if it has not been done previously during the inspection of the other wire ropes). Replace the wire rope if any of the following conditions are not met: The wire rope should not show signs of corrosion or visible damage. The diameter of the wire ropes must be greater than 11.4 mm.3. Visually check the wire rope protector on the bottom platform. The protector must not have significant damage or wear and must fully protect the perimeter of the hole preventing contact of the wire rope with edges of the platform.
Wire rope fixes	<ol style="list-style-type: none">1. Visually check the state of the wire ropes fixes. The wire ropes fixes must not have deformations, dents and signs of breakage.2. Check that the bolts of the wire ropes fixes and their brackets installed along the travel path are tight. The bolts must be tight.3. Check the alignment and adjustment of the wire rope fixes installed along the travel path. The centre of the guiding wire rope fixes should be aligned with the centre of the wire rope guides installed on the outer sides of the cabin. In case of installing guide rollers in the cabin, the centre of the guiding wire rope fixes should be aligned with the centre of the wire rope path between the rollers.
Tensioning systems	<ol style="list-style-type: none">1. Visually check the state of the tensioning systems. Wire rope tensioning systems must not have dents, cracks, corrosion or other damage.2. Check the tension of the wire ropes. The value of the tension of the wire ropes must be the one specified for the configuration and design of the tower.3. Check that the bolts of the wire rope clamp are tight. The bolts must be tight.4. Check that the adjusting nut of the tensioning system and the locknut are tight. The adjusting nut of the tensioning system and the locknut must be tight.

NOTICE



Record any anomaly of the guiding wire ropes in the Appendix: Installation and maintenance log.

NOTICE



The discard criteria of the wire ropes follows the ISO 4309 standard: *Cranes - Wire ropes - Care and maintenance, inspection and discard.*

4.3.10 Top limit plate

EN-AV-11-04-0021-01

Function / System	Operations
Top limit plate (if installed)	<ol style="list-style-type: none">1. Visually check the state of the top limit plate. The top limit plate must not have dents, cracks, corrosion or other damages.2. Check that the fixing bolts of the top limit plate to the traction wire rope are tight. The bolts must be tight.3. Ascend the cabin electrically until it stops. The top limit switch must stop the ascent of the cabin when contacting the top limit plate. The floor of the cabin and the top platform must be level.

4.3.11 Top limit bar

EN-AV-11-04-0022-01

Function / System	Operations
Top limit bar	<ol style="list-style-type: none">1. Visually check the state of the top limit bar. The top limit bar must not have dents, cracks, corrosion or other damages.2. Check that the fixing bolts of the top limit bar to the guiding rope wires are tight. The bolts must be tight.3. Ascend the cabin electrically until it stops. The top limit switch must stop the ascent of the cabin when contacting the top limit bar. The floor of the cabin and the top platform must be level.

4.3.12 Interlock system for platform fence doors

4.3.12.1 Trapped-key interlock system

EN-AV-11-04-0024-01

Function / System	Operations
Trapped-key interlock system (if installed)	<ol style="list-style-type: none">1. Check the safety lock and actuator brackets on the fence. The brackets of the safety lock and the actuator in the fence door must be adjusted. The bolts must be tight.2. Check the position, alignment and fixing of the safety lock and the actuator on their respective supports. The safety lock and the actuator on the fence door must be adjusted and aligned. The bolts must be tight.3. Check the fixing of the trapped-key inside the cabin. The trapped-key must be fixed inside the cabin by means of a steel chain or steel wire rope.4. Turn and remove the trapped-key from the trapped-key switch inside the cabin.5. Unlock the safety lock on the fence door with the trapped-key. The fence door should open. The key should remain trapped in the safety lock while the fence door is open or while the safety lock is not locked.6. Close the fence door.7. Turn and remove the trapped-key from the fence door lock and pull the door to open. The fence door should not open.8. Insert the trapped-key into the trapped-key switch inside the cabin and turn the trapped-key to the ON position. The key should remain trapped in the trapped-key switch inside the cabin while the trapped-key switch is in the ON position.

4.3.12.2 Guard locking interlock system

EN-AV-11-04-0023-01

Function / System	Operations
Guard locking interlock system (if installed)	<ol style="list-style-type: none"> Check the brackets of the interlock switch and the actuator on the fence door. The brackets of the interlock switch and the actuator on the fence door must be adjusted. The bolts must be tight. Check the position, alignment and fixing of the interlock switch and the actuator in their respective brackets. The interlock switch and the actuator in the fence door must be adjusted and aligned. The bolts must be tight. Check the bracket of the service lift detection switch on the platform. The service lift detection switch bracket must be adjusted. The bolts must be tight. Check the position and fixing of the service lift detection switch on the platform onto its support. The service lift detection switch on the platform must be adjusted to activate when the lift floor is aligned with the platform (intermediate and top platforms) or when the bottom obstruction detection device contacts the bottom platform. The bolts must be tight. Ascend or descend the cabin electrically until the floor of the cabin is uneven by at least 30 cm from the platform, press the interlock switch button and simultaneously pull to open the fence door. The interlock switch must block the fence door. The fence door should not open. Ascend or descend the cabin electrically until the floor of the cabin is level with the platform and press the interlock switch button and simultaneously pull to open the fence door. The interlock switch must release the fence door. The fence door should open. Turn the main switch on the bottom platform control box to the OFF position. Activate the manual release system of the fence interlock switch and pull to open the fence door. The fence door should open. The service lift ready light on the bottom platform control box (green) (if installed) should turn off. Deactivate the manual release system of the fence door interlock switch and close the fence door. Turn the main switch on the bottom platform control box to the ON position. The service lift ready light on the bottom platform control box (green) (if installed) should turn on.

4.3.12.3 Level activation plates of the platform level monitoring system

EN-AV-11-04-0025-01

Function / System	Operations
Level activation plates of the platform level monitoring system by switch (if installed)	<ol style="list-style-type: none"> Check the position and fixing of the level activation plates of the platform level monitoring system by switch. The level activation plates of the platform level monitoring system must be adjusted so that the lift platform level switch is activated when the lift floor is aligned with the platform. The bolts must be tight.
Level activation plates of the platform level monitoring system by photoelectric sensor (if installed)	<ol style="list-style-type: none"> Check the position and fixing of plates or the level activation reflective plates or strips of the platform level monitoring system by photoelectric sensor. The plates or brackets of the reflective strips of the platform level monitoring system must be adjusted so that the photoelectric sensor is activated when the floor of the lift is aligned with the platform. The bolts must be tight. The reflective strips must be clean and must not be detached from the plates or brackets.

4.3.13 Check and overload adjustment

EN-AV-11-04-0006-01

Function / System	Operations
Overload test	<p>1. Perform an overload test to check the adjustment of the overload detection device.</p> <p>The cabin must not ascend with the test load defined according to the wind turbine height [See section Instructions for the overload test in appendix <i>Test and adjustment of the overload detection device</i>, see on page 44].</p> <p>Otherwise, adjust the overload detection device [See section Instruction for overload adjustments in the appendix <i>Test and adjustment of the overload detection device</i>, see on page 44].</p>
Overload adjustment	<p>1. Adjust the overload detection device following the instructions of the overload adjustments [See section Instruction for overload adjustments in the appendix <i>Test and adjustment of the overload detection device</i>, see on page 44].</p>

4.3.14 Informative signs and documentation

EN-AV-11-04-0007-01

Function / System	Operations
Informative signs and documentation	<p>1. Visually check the state of the documentation, signs and stickers supplied with the service lift.</p> <p>The documentation, signs and stickers included with the service lift should always be available, in good state and legible.</p>

4.4 Repairs

EN-AV-11-05-0001-01

Only certified technicians are authorised to perform the repair on the traction hoist and using only original spare parts.

In case of replacement of the lubricant of the traction hoist gearbox M508 use:

- Lubricant: Mobil SHC 632
- Quantity: 1.5 l

NOTICE



Do not use lubricants other than those specified without the verification and prior authorization of Avanti.

4.5 Request for spare parts

EN-AV-11-06-0001-01

Use only original spare parts.

Indicate the model and the serial number of the service lift when requesting the list of spare parts from Avanti.

NOTICE



The list of spare parts of the service lift is available at AVANTI upon request.

4.6 Out of service due to lack of use

EN-AV-11-08-0001-01

Follow the steps below to place the service lift out of service due to lack of use:

1. Descend the cabin until the bottom obstruction detection device stops the cabin on the bottom platform.
2. Turn the main switch to the OFF position to prevent the service lift from being operated unintentionally.
3. Close the cabin door and the fence door.

Appendix

Test and adjustment of the overload detection device

EN-AV-12-05-0001-01

CAUTION



Risk of accident. Only certified technicians are authorised to perform the overload detection device adjustment.

NOTICE



The necessary weights and the Avanti overload detection device adjustment tool must be available before starting the overload test or the overload detection device adjustment.

A) Instructions for the overload test

Stages	Operations
A1	<ol style="list-style-type: none">1. Descend the cabin until the bottom obstruction detection device stops the cabin on the bottom platform.2. Introduce the load for the overload test in the cabin (the value depends on the height of the cabin's travel path) [See table Load values for the test and adjustment of the overload detection device, see on page 46].3. Press and hold the UP button.<ol style="list-style-type: none">a. The cabin should not ascend. Go to stage A2 of the process for the overload test.b. Otherwise, follow process B described for the adjustment of the overload detection device.
A2	<ol style="list-style-type: none">1. Introduce the rated load in the cabin.2. Press and hold the UP button.<ol style="list-style-type: none">a. The cabin should ascend. The overload test is correct.b. Otherwise, descend the cabin until the bottom obstruction detection device stops the cabin on the bottom platform and follow process B described for the adjustment of the overload detection device.

NOTICE



The overload test is part of the annual inspection and in accordance with local regulations can also be performed by external inspectors.

NOTICE



In accordance with local regulations, the adjustment system of the overload detection device may require a seal. If necessary, Avanti can provide the seal upon request.

B) Instruction for the adjustment of the overload detection device

Stages	Operations
B1	<ol style="list-style-type: none"> 1. Descend the cabin until the bottom obstruction detection device stops the cabin on the bottom platform. 2. Introduce the load for the overload detection device in the cabin (the value depends on the height of the cabin's travel path) [See table Load values for the test and adjustment of the overload detection device, see on page 46]. 3. Press and hold the UP button. <ol style="list-style-type: none"> a. The cabin should not ascend. Go to the next operation. b. Otherwise, descend the cabin until the bottom obstruction detection device stops the cabin on the bottom platform and follow the process B2 described for the adjustment of the overload detection device. 4. Remove 20 kg of the load for the adjustment of the overload detection device. 5. Press and hold the UP button. <ol style="list-style-type: none"> a. The cabin should ascend. Go to the next operation. b. Otherwise, continue with stage B3 of the process for adjusting the overload detection device. 6. Descend the cabin until the bottom obstruction detection device stops the cabin on the bottom platform. The overload detection device is correctly adjusted. 7. Record the adjustment of the overload detection device in the Appendix: Installation and maintenance log, see on page 50.
B2	<ol style="list-style-type: none"> 1. Insert the overload detection device adjustment tool in the hole for the adjustment tool. 2. Turn the overload detection device adjustment tool anti-clockwise to decrease the activation limit of the overload detection device. 3. Remove the overload detection device adjustment tool from the overload detection device. 4. Perform the process again to adjust the overload detection device from stage B1.
B3	<ol style="list-style-type: none"> 1. Insert the overload detection device adjustment tool in the hole for the adjustment tool. 2. Turn the overload detection device adjustment tool clockwise to increase the activation limit of the overload detection device. 3. Remove the overload detection device adjustment tool from the overload detection device. 4. Perform the process again to adjust the overload detection device from stage B1.

NOTICE



A full turn of the overload detection device adjustment tool [See figure [Overload detection device adjustment tool](#), see on page 46] represents a change of approximately 40 kg of the activation limit of the overload detection device.

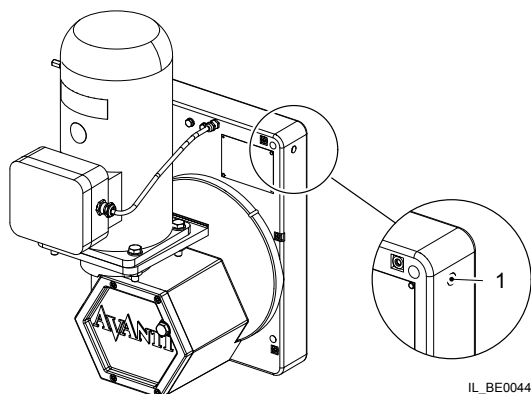


Figure 34 : Overload detection device

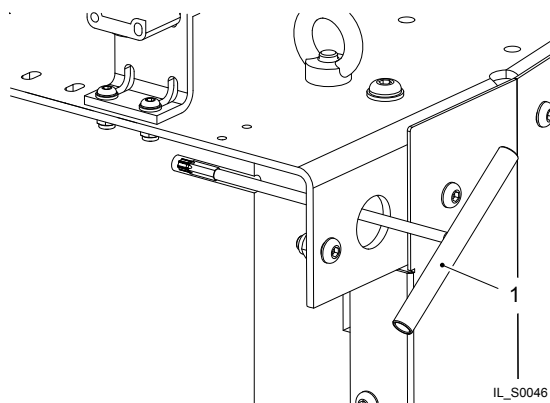


Figure 35 : Overload detection device adjustment tool

Overload detection device

1 | Hole for overload detection device adjustment tool

Overload detection device adjustment tool

1 | Overload detection device adjustment tool

Load values for the test and adjustment of the overload detection device

Travel path distance (m)	Shark L02 (automatic send configuration)	
	Load for overload test (kg)	Load for the overload detection device adjustment (kg)
From 61 to 80	370	310
From 81 to 100	375	315
From 101 to 120	385	325
From 121 to 140	395	335
From 141 to 160	405	345

Load values for the test and adjustment of the overload detection device

Travel path distance (m)	Shark L02 (send / call configuration) with traction hoist M508 (500 kg)	
	Load for overload test (kg)	Load for the overload detection device adjustment (kg)
From 61 to 80	380	320
From 81 to 100	390	330
From 101 to 120	400	340

Load values for the test and adjustment of the overload detection device

Travel path distance (m)	Shark L02 (send / call configuration) with traction hoist M508 (600 kg)	
	Load for overload test (kg)	Load for the overload detection device adjustment (kg)
From 61 to 80	380	320
From 81 to 100	390	330
From 101 to 120	400	340
From 121 to 140	410	350

Load for overload test = Load for the overload detection device adjustment + 25% of the rated load

Rated load for Shark L02 = 240 kg.

NOTICE



The load for the adjustment of the overload detection device is calculated to reach the top platform with 250 kg (4% overload).

Installation and maintenance checklist

EN-AV-12-06-0001-01

Installation information			
Date:		Serial number of the service lift:	
Name of the certified technician:		Serial number of the traction hoist:	
Hour counter reading:		Serial number of the fall arrest device:	
Wind farm:		Wind turbine number:	

Installation and maintenance checklist			
4.3.1 General	OK	NOK	Incidents and comments
Cabin and cabin components			
Components installed in the wind turbine			
Travel path			
4.3.2.1 Control from inside the cabin	OK	NOK	Incidents and comments
Main switch			
Service lift ready light (green)			
Emergency-stop button			
Manual descent			
Cabin door			
Fall arrest device			
Bottom obstruction detection device			
Override switch for bottom obstruction detection device			
Top obstruction detection device			
Emergency top limit switch			
Platform level switch and platform level light (green)			
Slack rope sensor activated (if installed)			
4.3.2.2 Control from outside the cabin (Automatic send configuration)	OK	NOK	Incidents and comments
Ascend			
Emergency-stop button			
Descend			
4.3.2.3 Control from the platforms (send / call configuration)	OK	NOK	Incidents and comments
Ascend			
Emergency-stop button			
Descend			

NOTICE



Write the result of the verification in the OK or NOK field:

OK: result of the verification approved

NOK: result of the verification not approved

Installation and maintenance checklist			
4.3.3 Cabin	OK	NOK	Incidents and comments
Cabin			
Door			
Windows and covers			
Control boxes, electrical cables and connectors			
Bottom and top obstruction detection devices			
Anchor points			
Service light			
Handles and steps			
4.3.4 Traction hoist	OK	NOK	Incidents and comments
Traction hoist			
4.3.5 Fall arrest device	OK	NOK	Incidents and comments
Fall arrest device			
4.3.6.1 Trailing cable management system	OK	NOK	Incidents and comments
Trailing cable management system (if installed)			
4.3.6.2 Travelling cable management system	OK	NOK	Incidents and comments
Travelling cable management system (if installed)			
4.3.6.3 Guided trailing cable management system	OK	NOK	Incidents and comments
Guided trailing cable management system (if installed)			
4.3.7 Suspension beam	OK	NOK	Incidents and comments
Suspension beam			
4.3.8.1 Traction wire rope	OK	NOK	Incidents and comments
Shackle			
Wire rope			
Cleanliness and lubrication			
Counterweight			
4.3.8.2 Safety wire rope	OK	NOK	Incidents and comments
Shackle			
Wire rope			
Cleanliness and lubrication			
Counterweights (if installed)			
Compression spring (if installed)			
4.3.9.1 Guiding wire ropes	OK	NOK	Incidents and comments
Shackle			
Wire ropes			
Wire rope fixes			
Tensioning systems			
4.3.10 Top limit plate	OK	NOK	Incidents and comments
Top limit plate (if installed)			
4.3.11 Top limit bar	OK	NOK	Incidents and comments
Top limit bar (if installed)			

NOTICE



Write the result of the verification in the OK or NOK field:

OK: result of the verification approved

NOK: result of the verification not approved

Installation and maintenance checklist			
4.3.12.1 Trapped-key interlock system	OK	NOK	Incidents and comments
Trapped-key interlock system (if installed)			
4.3.12.2 Guard locking interlock system	OK	NOK	Incidents and comments
Guard locking interlock system (if installed)			
4.3.12.3 Level activation plates of the platform level monitoring system	OK	NOK	Incidents and comments
Level activation plates of the platform level monitoring system by switch (if installed)			
Level activation plates of the platform level monitoring system by photoelectric sensor (if installed)			
4.3.13 Check and overload adjustment	OK	NOK	Incidents and comments
Overload test			
4.3.14 Informative signs and documentation	OK	NOK	Incidents and comments
Informative signs and documentation			

Result of installation and maintenance verification	OK	NOK	Incidents and comments
The service lift is suitable for use			

Name of the certified technician (in capital letters):	
Signature:	

NOTICE



Write the result of the verification in the OK or NOK field:

OK: result of the verification approved

NOK: result of the verification not approved

Installation and maintenance log

EN-AV-12-01-0002-01

CAUTION



It is necessary to perform extraordinary inspections in case of loss of the Installation and Maintenance log.

Record the results of maintenance inspections and repairs performed on the service lift on the Installation and maintenance log.

The Installation and Maintenance log must be available to the competent authority.

If necessary, request additional pages for the Installation and maintenance log from the manufacturer. Contact your local Avanti representative for assistance.

Date and time	Type of inspection	General result		Hour counter	Incidents and comments	Name (in capitals)	Signature
		OK	NOK				

NOTICE



Write the type of inspection performed on the service lift in the Type of inspection field:

P: planned

R: repair

NOTICE



Write the result of maintenance inspections and repairs performed on the service lift in the OK or NOK field:

OK: result of maintenance inspections and repairs performed on the service lift approved

NOK: result of maintenance inspections and repairs performed on the service lift not approved

AVANTI LIFT ANCHOR

EN-AV-12-07-0001-01

Cautions

Cautions about personnel:

- Activities at heights are dangerous and can cause serious injury and even death.
- Should be familiar with the accident prevention instructions and receive adequate training in terms of occupational health and safety.
- Only persons who have received the required training in the use and daily inspection of the AVANTI LIFT ANCHOR are authorised to use and perform the AVANTI LIFT ANCHOR daily inspection.
- Must wear PPE personal protective equipment (safety helmet, harness, energy absorber, positioners, and fall arrester).
- Must wear personal protective equipment that limits the dynamic forces on your body to 6 kN during an arrest of a fall.
- Only certified technicians are authorised to check the functional safety of the system in case of repair or replacement of any component.

Cautions about the use:

- Connect the energy absorber to the AVANTI LIFT ANCHOR directly through self-closing connectors in accordance with standard EN 362 or Z359.1 (as applicable).

Cautions about the parts of the AVANTI LIFT ANCHOR:

- Only use original parts.
- Use of non-original parts renders the manufacturer's warranty void and invalidates any type approval.
- The modification, extension or reconstruction of the AVANTI LIFT ANCHOR without the written authorization of the manufacturer is prohibited.
- No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts that are not approved by the manufacturer.

NOTICE



The owner must check the need for third-party inspections of the AVANTI LIFT ANCHOR with local authorities and comply with any specified standards.

Description

The AVANTI LIFT ANCHOR is an anchor point for fall protection designed for use with a full body harness certified in accordance with standard EN 361 or Z359.1, as appropriate.

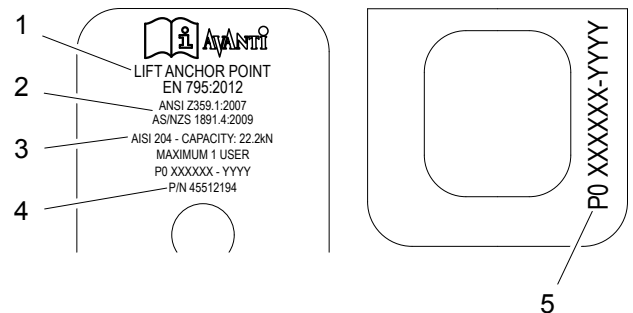
The AVANTI LIFT ANCHOR anchor point has been designed exclusively for assembly and use in AVANTI service lifts.

The AVANTI LIFT ANCHOR can transmit to the structure a maximum load of 22.2 kN at $\pm 15^\circ$ in a vertical direction. The AVANTI LIFT ANCHOR can suffer a maximum deformation of 10 mm.

The AVANTI LIFT ANCHOR is made of AISI 304 steel. The AVANTI LIFT ANCHOR is fixed to the structure with bolts M12 A2-70, washers DIN 125A A4 and self-locking nuts M12 DIN 985 A4-70.

Identification

The identification information of the AVANTI LIFT ANCHOR must be accessible and legible. Add an additional marking near the anchor point in case the marking is not visible after installation.



IL_AL0016

Figure 36 : Identification of AVANTI LIFT ANCHOR

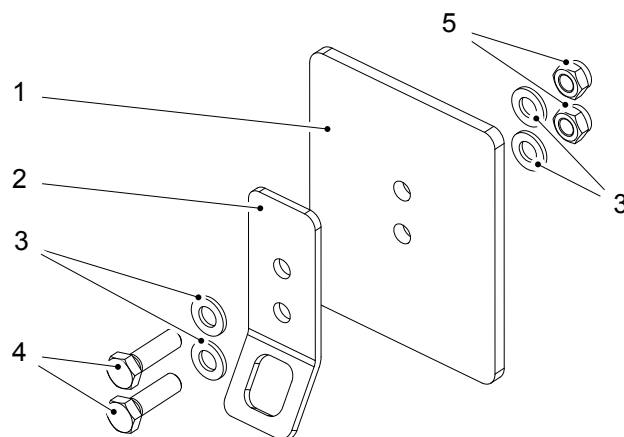
Identification of AVANTI LIFT ANCHOR

- | | |
|---|-------------------------------|
| 1 | Product name |
| 2 | Applicable standards |
| 3 | Material and nominal capacity |
| 4 | Item Number |
| 5 | Unique identification number |

Installation

Installation of the AVANTI LIFT ANCHOR:

1. Position the AVANTI LIFT ANCHOR on the structure.
2. Fit the fixing bolts, nuts and washers.
3. Tighten the nuts with a tightening torque of 15 N·m.
4. Perform the checks and fill in the Installation and Maintenance Checklist of the AVANTI LIFT ANCHOR.
5. Record the results of the checks in the Installation and Maintenance log of the AVANTI LIFT ANCHOR.



IL_AL0015

Figure 37 : Installation of the AVANTI LIFT ANCHOR

Installation of the AVANTI LIFT ANCHOR

- | | |
|---|--------------------|
| 1 | Structure |
| 2 | AVANTI LIFT ANCHOR |
| 3 | Washers |
| 4 | Fixing bolts |
| 5 | Nuts |

Periodic Inspection and Maintenance

Only certified technicians are authorised to perform the AVANTI LIFT ANCHOR periodic inspection and maintenance following the AVANTI LIFT ANCHOR installation and maintenance checklist.

Perform an inspection of the AVANTI LIFT ANCHOR at least every 12 months or more frequently in accordance with local regulations.

NOTICE



Record the result of the periodic inspections and repairs of the AVANTI LIFT ANCHOR in the Installation and Maintenance log of the AVANTI LIFT ANCHOR.

Installation and maintenance checklist of the AVANTI LIFT ANCHOR

Inspection information			
Date:		Unique identification number:	
Name of the certified technician:		Serial number of the service lift:	
Operations		OK	NOK
The structure of the cabin has no dents, cracks, corrosion or other damage.			
The tightening torque of the anchor point bolts is 15 N·m.			
The anchor point does not have permanent deformations, cracks, corrosion or other damages.			
Assembly of the anchor point according to the instructions.			
The marking of the anchor point must be clearly legible.			
Installation and maintenance verification results of the AVANTI LIFT ANCHOR.		OK	NOK
AVANTI LIFT ANCHOR is ready for use.			

NOTICE



Write the result of the verification of the installation and maintenance checklist of the AVANTI LIFT ANCHOR in the OK or NOK field:

OK: result of the verification of the installation and maintenance checklist of the AVANTI LIFT ANCHOR approved

NOK: result of the verification of the installation and maintenance checklist of the AVANTI LIFT ANCHOR not approved

Installation and maintenance log of the AVANTI LIFT ANCHOR

Installation information		
AVANTI LIFT ANCHOR	Manufacturer:	AVANTI
	Item-No.:	
	Unique identification number:	
STRUCTURE	Serial number of the service lift:	
	Service lift model:	
	Wind farm / Wind turbine no.:	
Installation technician name:		
Installation company:		

[illegible]

NOTICE



Write the result of the inspection of the installation and maintenance of the AVANTI LIFT ANCHOR in the OK or NOK field:

OK: result of the inspection of the installation and maintenance of the AVANTI LIFT ANCHOR approved

NOK: result of the inspection of the installation and maintenance of the AVANTI LIFT ANCHOR not approved

Changelog

EN-AV-02-00-0002-01

Version	Date [month/year]	Description
01.01	12/2018	Installation and Maintenance Manual Shark L02
02.01	08/2019	Shark L02 Model Service Lift installation and maintenance manual (serial production)



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