Original instructions

AVANTI CLIMB ASSISTANCE – TYPE VII

User's Manual and Installation Instructions

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EU-Declaration of Conformity for Machinery

Directive 2006/42/EC, Annex II, A

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herewith declares that the model of the following machinery:

Climb Assistance VII

Serial Nº: Manufacturing year:

Park: Tower Nº:

- is in conformity with the provisions of the Machinery Directive 2006/42/EC as amended at the time of the declaration

- is in conformity with the provisions of the following additional EC-directives as amended at the time of the declaration

Electromagnetic compatibility 2014/30/EU

- conform to the following standards:

EN ISO 12100 : 2010 Safety of machinery -- General principles for design - Risk assesment and risk reduction

EN 60204-1:2006 Safety for machinery; Electrical equipment of machinery; Part 1: General requirements;

- Reponsible for documentation: Germán Sacramento

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Place: ***La Muela***
Date:

Signature:

Signature:

Name: Germán Sacramento
Identification: Technical Director

Limited Warranty

Avanti Wind Systems Technololgy, 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 AVANTI Climb Assistance (“Product”) described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

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

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

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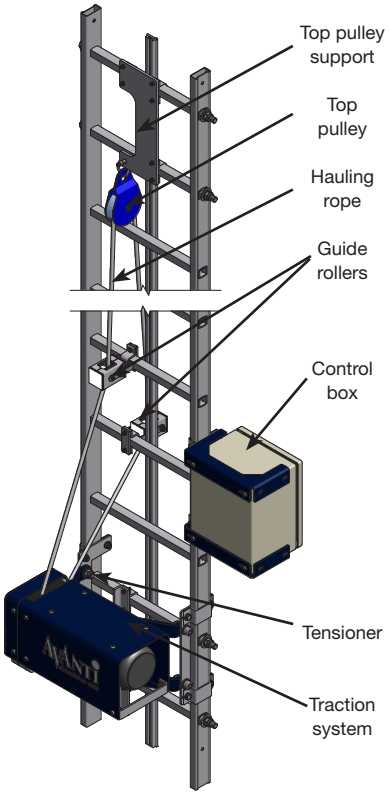
In any cases of dispute the English original shall be taken as authoritative.

List of content

Introduction

The AVANTI Climb Assistance is a safe and reliable piece of equipment designed to relief the technician of a given weight in his way up the ladder of a wind turbine. The AVANTI Climb Assistance can also be used in the way down.
An endless rope runs in loop from the bottom to the top of the ladder, tracked by a motor installed in the lower end of the wind turbine. In addition to the PPE usually worn, the technician uses a clamp to get safely fastened to the assistance rope. Pulling force can be adjusted within the 35- 45 kg range. The system's control self-adjusts to follow up with the user climbing pace.

Fig. 1: System outline



The system start and stop is controlled by a motion detection system; when it detects upward/downward motion, the system starts.
When the technician stops, the motion detection system stops the motor. The AVANTI Climb Assistance must be used only by authorized personnel holding the relevant training certificates.

1. System outline

CAUTION:
A competent person is a person who has fully read and understood this Climb Assistance User's Manual and Installation Instructions

The AVANTI Climb Assistance installation and service may only be conducted by a competent person, a properly trained personnel and/or AVANTI-authorized employees.
Once a competent person or an expert installs, services, or in any other ways alters the Climb Assistance system, he becomes responsible in accordance with this User's Manual and Installation Instructions.

DANGER:

- Do not keep or store the hauling rope in direct sunlight.

- Keep the hauling rope clean and free of oil, grease and chemicals.

- Install a residual current device type B according to IEC-61008/9 (to prevent from faults due to D.C. current)

Installation manual

AVANTI recommends the following installation procedure.
1. Install the motor using the low-end steps of the ladder as shown in Fig. 2
2. Install top fitting with pulley, then guide rollers and hauling rope.

1. Motor installation:

Decide the configuration that matches your needs of the four different installation arrangements allowed by the system:
• Right or left hand motor setup, combined with
• Linking bars off-centered to the right or to the left
In all cases the system asymmetry will guarantee enough clearance between hauling rope and the fall protection rail. Use the supplied ladder brackets and the M10x25 bolts/nuts to anchor the assembly to the ladder (see figure 2). The assembly must be installed so the hauling rope stands 40 mm off the fall protection rail according to figure 3.(*)

1. Place the motor-gear-pulley assembly on the opposite side of the fall protection rail (see figure 2). CAUTION: until the rope is in place the assembly will not be balanced and sound. Make sure that the assembly is safely fixed during setup to avoid injuries by sudden, involuntary moving load.
DO NOT MOUNT THE MOTOR AND THE MOTOR PLATE UNTIL THE HAULING ROPE IS FULLY INSTALLED AND TENSIONED

2. Fix the electrical control box to the ladder using the ladder brackets and supports supplied (see fig. 5). Other options might be available out of the existing standard.

Fig. 2

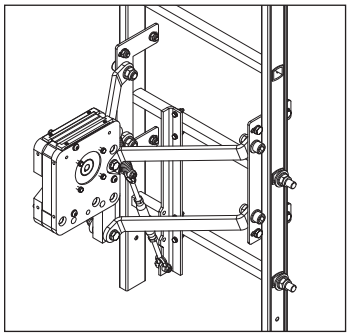
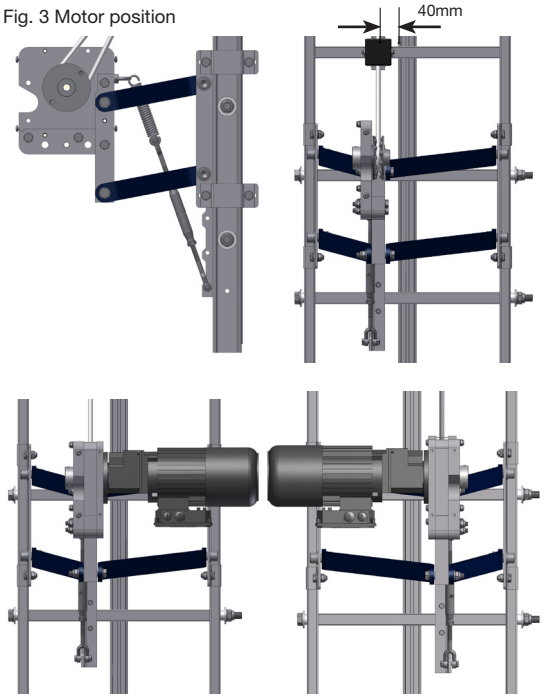


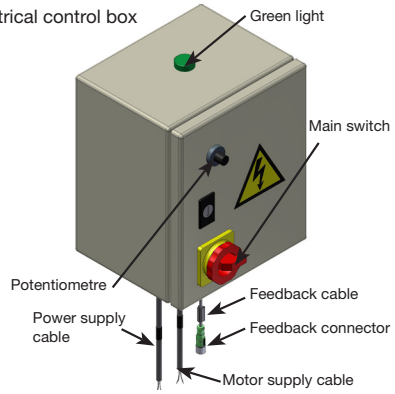
Fig. 3 Motor position



** Note: Contact Avanti Wind Systems for alternative installation arrangement.*

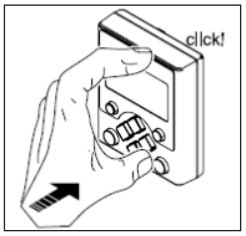
2. Electrical installation

Fig. 4 Electrical control box



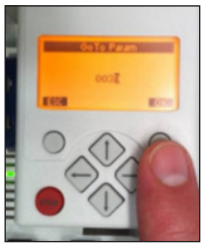
The electrical control box comes in the kit crate fully wired and ready to connect. No programming or special setup of the inverter and encoder is required. However it is possible to modifiy settings of inverter to fit the user´s comfort needs.

1. Mount keypad on inverter cover.

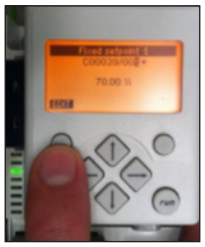


2. Go to main menu, select “Got to param” and press right arrow.

3. Select parameter 0022 and press OK.

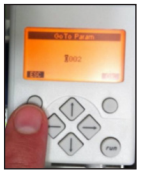


4. Select parameter level C00022 and press EDIT.

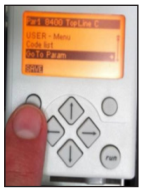


5. Alter Imax parameter (between 2,2 and 2,8 A) and press OK.

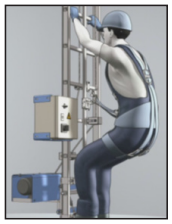
6. Press left button and then press ESC to exit to main menu.



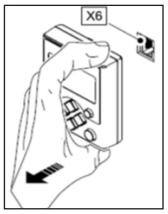
7. Press SAVE to save changes.



8. Check modifications.



9. If it is OK dismount the keypad. If it is not OK go back to step 4.



Wires and sealing glands are also supplied with the kit.

2.1 Sensor installation

Connect the control box feedback connector (M12,4P) to the motor male connector. The motor male connector is located on the rear side of the motor.

Fig. 5 Control box support

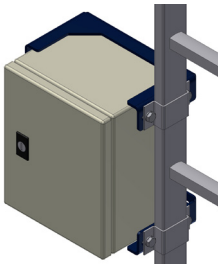
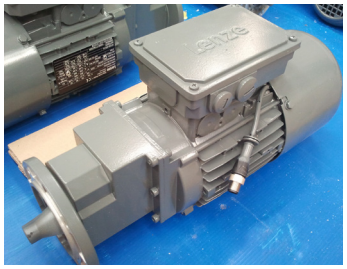


Fig. 6 Sensor cable



2.2 Sensor test

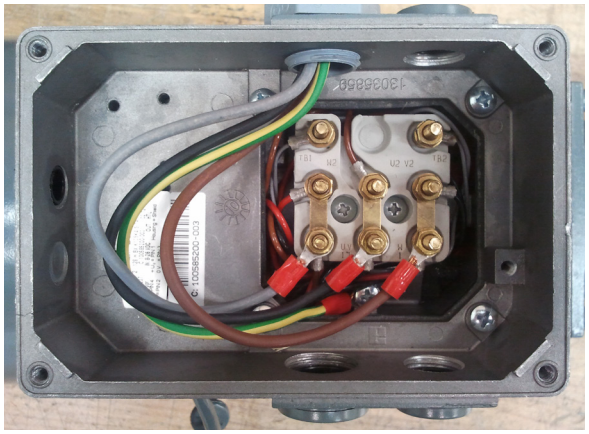
- After installing the hauling rope, turn on the power supply.
- Then, the green light of the control box will light permanently.
- Pull down the rope. The encoder should register the movement of the drive wheel and the motor will start.
- Turn off the power supply

2.3 Motor cable installation

In case the connection of the motor was hardwired, connect the control box to the motor according to the wiring diagram supplied inside the control box:

- Conductor 1/gray to U
- Conductor 2/black to V
- Conductor 3/brown to W
- Green-yellow conductor to earth connection

Fig. 7 Motor connection
The motor is connected in delta connection.



2.4 Power cable installation

When the Climb Assistance is fully installed, connect the electrical control box to the 230 V, 50-60 Hz (1 phase + N + earth) power supply according to the wiring diagram supplied inside the control box. * Make sure that the power supply is protected with:

- Circuit breaker: 2 pole 10A, 230V, 10kA, D

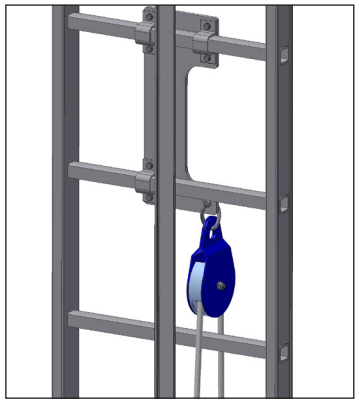
- Residual current circuit breaker: 25A, 230V, 1+N, 30mA (super-immunized)

** Note: Contact Avanti Wind Systems for alternative installation arrangement.*

3. Rope mounting
3.1 Rope installation

1. Get up to the ladder top, taking up the top fitting, top pulley, bolts, and one of the ends of the hauling rope. It is easier to bring the rope up the front side of the ladder and feed it down the rear.

Fig. 8



2. At the top of the ladder, mount the top fitting as shown in fig. 8. The top pulley is positioned just off the rail center, at the left or right, depending of the motor installation arrangement. Assemble two short guide rollers in case the rope touches the rungs below the pulley in order to guarantee the appropriate guiding of the rope.

3. Pass the rope through the top pulley and feed it down the rear of the ladder while descending.

4. Assemble a double guide roller with bearing on the first rung over the motor and a single guide roller with bearing on the second rung over the motor (Fig 9.).

CAUTION:

• *Mount the guide rollers so that no element of the tower interferes with any element of the tower (e.g. the power cables and other internal parts).*

5. Down the ladder, by the assembly setting: put the rope through the guide rollers and the drive wheel. Then tighten the rope slightly and fasten it - do not splice it yet.

6. Mount the remaining rope guide rollers on the rear side of the ladder. Make sure thathe brackets are mounted with bolt heads facing away from the climber. This will avoid rope from rubbing on the bolt heads and causing damage to the rope. The guide roller's function is to prevent the rope from rubbing on both the tower and resting platforms.

Use a short guide roller at every tower platform and a long guide roller at the resting platforms.
Guide roller guards are designed to prevent from involuntary trapping.

7. Rope tensioning:
All protecting rollers have been installed; linking bars and traction pulley are in place; electric motor and its plate are NOT in place yet; now, proceed with the rope tensioning process:

a) Push the gear box upwards to its upper position. Secure the assembly to avoid injuries by sudden, involuntary moving load.

b) Pass the hauling rope around the traction pulley. Make sure that the rope ends leave enough excess rope at each end to perform the splice (3.5 rungs of excess from the bottom rope grab and 7 rungs of excess from the top rope grab).

Fig. 9

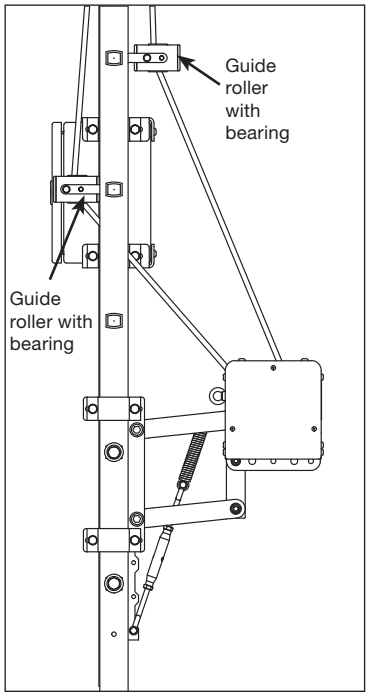


Fig. 10

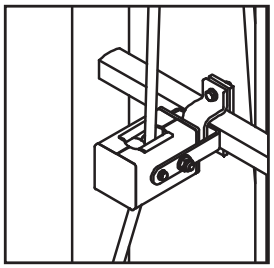
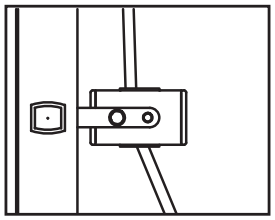


Fig. 11



c) Using a rope tensioner and a dynamometer, tension the rope 110 kg

d) Then pull the rope back and forth 5 cycles. Tension will drop to around 95 kg.

e) Now tension the rope to 95 kg (90 kg for a used rope) to mark the rope ends for splicing

8. Cut off the excess rope, leaving an overlap of 50cm. These 50 cm are needed for the splicing

9. Splice the rope as described in section 3.2. The rope can be taken apart from the traction pulley during splicing, since service tension will later be fine tuned by adjusting the tensioning spring.

10. Pass the hauling rope again around the traction pulley. Now tension the hauling rope by stretching the tensioning spring. An average 60-80 mm stretch will bring the rope to its service tension.

11. The tension after splice and the tension of the spring must be 75 kg to operate properly.

12. Mount the motor plate without tightening the screws.

13. Mount the motor to the plate.

14. Tighten the screws on the plate.

15. Test the sensor as described in section 2.2.

16. Check the pulling force by using the equipment according to section 9 (Instructions for use). Connect a dynamometer between the rope clamp and the harness in order to check the pulling force.

Fig. 12

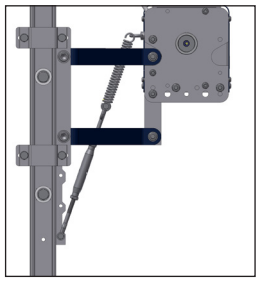


Fig. 13

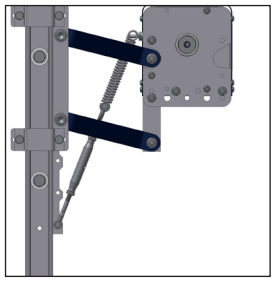
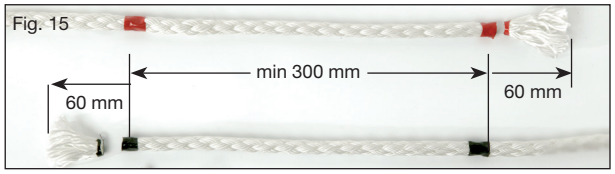


Fig. 14

3.2 Splicing the hauling rope

1. For the rope splicing use the supplied splicing needle.
2. For clarifying the splicing process one rope-end will be marked with red tape and the other one with black tape.
3. From the end of the rope measure 60mm and then seal with red tape and cut off the strands. On the same rope from place another red tape mark at 300 mm from the previous red tape.
4. The other rope-end should be sealed and marked with black tape using the same method.

Fig. 15



5. Insert the black rope-end into the Ø10mm splicing needle. Make sure that the rope-end is firmly placed inside the needle and is securely positioned in the needle slot.

Fig. 16

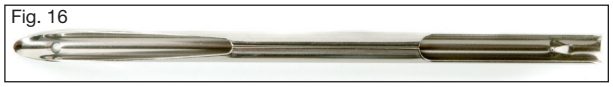
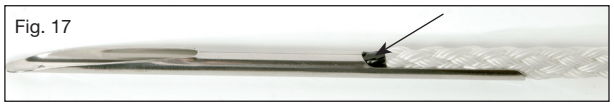
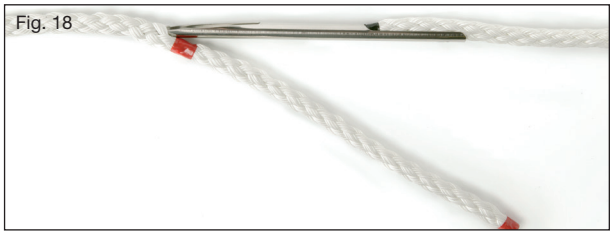


Fig. 17



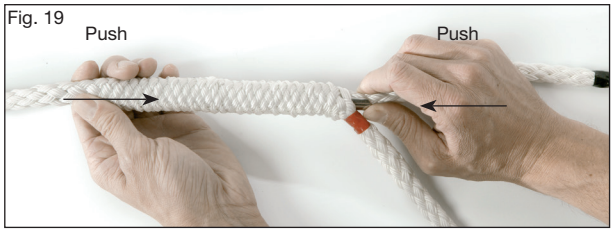
6. Insert the splicing needle into the red rope just after the mark.

Fig. 18



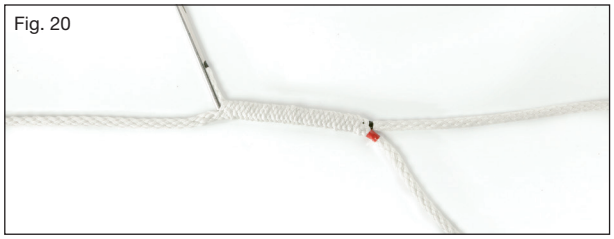
7. Feed the full length of the splicing needle through the red rope.

Fig. 19



8. Take the splicing needle out of the red rope.

Fig. 20



9. Remove the splicing needle. Pull the black rope through the red rope until the black mark passes the red mark.

Fig. 21

10. Take off the black tape used to seal the rope at the end. You must open the strands of the end, take them in three groups and cut them at different lengths (3cm between cuts). In this way, we get a softer transition between the diameter of the splicing and the diameter of the rope.

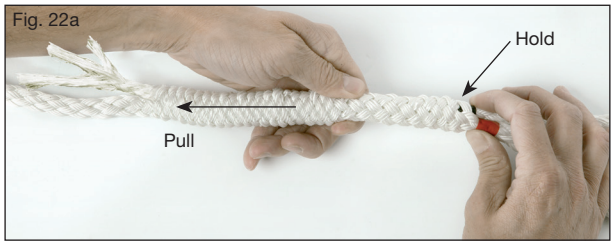


Fig. 22a

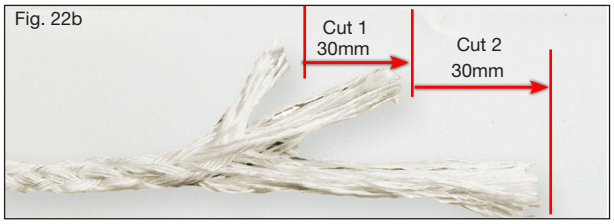


Fig. 22b

11. With your right hand hold together the red and black rope marks. Use your left hand for sliding the red rope over the black rope.

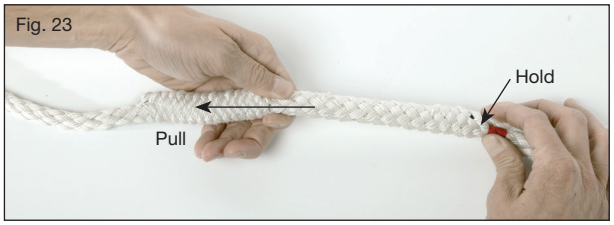


Fig. 23

12. The rope-end should be hidden.

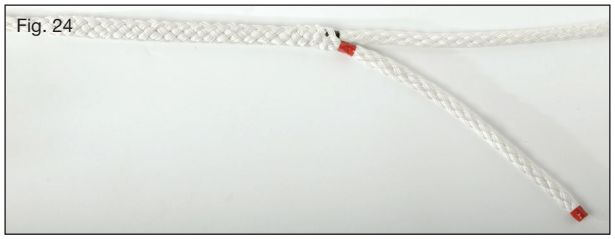


Fig. 24

13. Now feed the red rope-end into the black rope as follows.

14. Insert splicing needle into black rope as close to the black rope mark as possible.

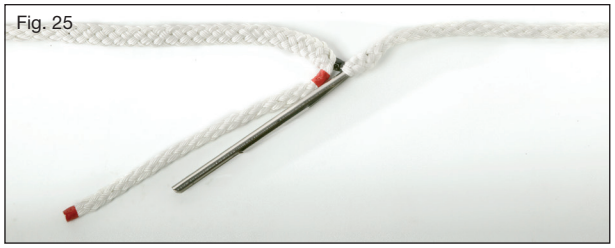


Fig. 25

15. Fasten the red rope-end into splicing needle.


Fig. 26

16. Feed the splicing needle through the black rope along the full length of the splicing needle.

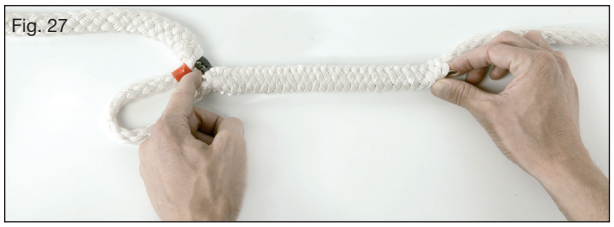


Fig. 27

17. Take the splicing needle out of the black rope.


Fig. 28

18. Pull the red rope as far as possible.


Fig. 29


Fig. 30

19. Take off the red tape used to seal the rope at the end. We must open the strands of the end, take them in three groups and cut them at different lengths (3 cm between cuts).

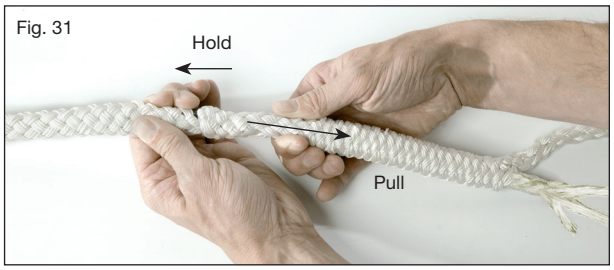


Fig. 31

20. Hold the splice point with your left hand and then pull the black rope back over the end of the rope so that the rope end gets hidden.

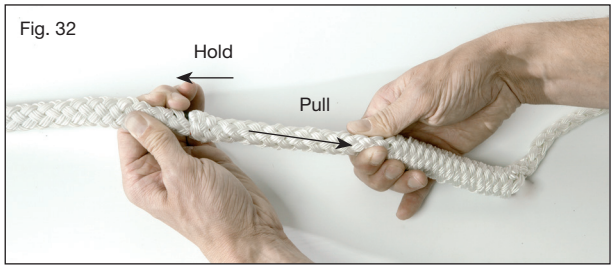


Fig. 32

21. Finally stretch the rope by pulling the outer rope from the splice point towards the ends.
This assures a snug splice join.

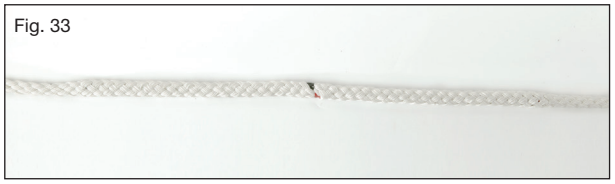


Fig. 33

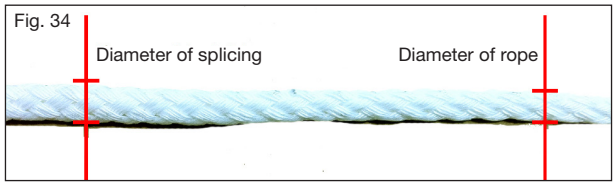


Fig. 34

4. Dismantling

Remove the rope followed by the guide rollers, top pulley, motor, and electrical control box. Dispose according to local regulations.

5. Marking

Marking will vary depending upon the model:
UL/CE

Fig. 35
Product marking

Fig. 36
Quick guide

AVANTI Climbing assistance
AVANTI Sistema de ayuda a la ascensión

STOP

- **User must be at least 18 years old.**
- **User must have a bodyweight of minimum 55 kg/120 Lb**
- **Use only original AVANTI rope clamp.**
- **Always use fall protection equipment (P.P.E.).**
- **Do not use the device more than one person at the same time**

The Climbing Assistance does not replace fall protection equipment (P.P.E.).

Instructions:

1. **Check rope tension spring on motor base.**
   If spring length is more than 60 mm, the rope needs tensioning. See manual for tensioning method.
2. **Check if green light on motor wheel casing is on.**
   If not: connect to the power supply and/or turn on the red switch on the grey control box.
3. **Adjust pull force on grey control box (1 to 10).**
4. **Connect Personal Protective Equipment (P.P.E.) as prescribed by manufacturer.**
5. **Fasten rope clamp carabiner on harness.**
6. **Fasten rope clamp on climbing assistance rope.**
7. **Pull climbing assistance rope to activate motor.**
8. STOP – stand still for 5 seconds.
9. **After use, turn off the power supply.**

- ***El usuario debe tener al menos 18 años***
- ***El dispositivo no puede ser utilizado por personas con un peso inferior a 55 Kg./120 lbs***
- ***Sólo se puede utilizar conjuntamente con un sistema anti-caída.***
- ***El dispositivo no se puede usar por más de una persona simultáneamente***

El dispositivo de ayuda a la ascensión no sustituye al sistema anti-caída (línea de vida).

Instrucciones:

1. ***Controlar el muelle tensor del cable en la base del motor.***
   Si la longitud es superior a 60 mm, tensar el cable. Consultar en el manual las instrucciones para tensar el cable.
2. ***Comprobar si la luz verde en la rueda motor está encendida.***
   En caso contrario: conectar el dispositivo a la red y/o encenderlo desde el botón rojo de la caja de control
3. ***Ajustar la fuerza de arrastre (de 1 a 10) desde la caja de control.***
4. ***Utilizar el sistema anti-caída según las instrucciones del fabricante.***
5. ***Conectar el cáncamo al arnés.***
6. ***Conectar el cáncamo en la cuerda de arrastre del sistema***
7. ***Tirar de la cuerda para activar el motor***
8. ***Detenerse 5 segundos.***
9. ***Después del uso, desconectar la alimentación eléctrica.***

45541073 Quickguide climb EN/ES

AVANTI Established 1985

6. Technical specifications

Power supply:	Standard: 230V, 50-60 Hz AC (1 phase + N + earth) Option: 110V, 60 Hz AC (1 phase + N + earth)
Electrical protection:	Circuit breaker MCB 10 Amps Type D. Residual current device RCD 30mA superimmunized.
Maximum current:	4 A ± 10%
Rated Power:	0,37 KW
Rated current consumption:	2,40 A ± 10%
Adjustable lifting capacity approx:	35 – 45 kg
Speed:	30 m/min without load, adjusts automatically to the climber speed.
Working temperature:	Standard: -10°C - +55°C Option: -25°C - +55°C
Weight:	Motor: 8 kg Control box: 6 kg
Hauling rope Ø12mm:	Approx. 75 g/m
Breaking load:	2700 da N
Gear oil:	CLP HC 320
Protection Rating:	IP Protection motor IP55 IP Protection control box IP66
Max. Noise Level	< 70 dB

User's Manual

7. Purpose

CAUTION:

- A competent person is a person who has fully **read and understood** this Climb Assistance User's Manual and Installation Instructions.
- The AVANTI Climb Assistance installation and service may only be carried out by a competent person or an expert.
- Once a competent person or an expert installs, services or in any other way alters the Climb Assistance system, he alone is responsible for doing so in accordance with this User's Manual and Installation Instructions.

DANGER:

- Do not store the hauling rope in direct sunlight.
- Keep the hauling rope clean and free of oil, grease and chemicals.
- The power supply must not be equipped with an earth leakage circuit breaker not also reacting to pulsing DC as this will cause operational problems.

Intended use

The AVANTI Climb Assistance is intended for helping personnel to ascend and descend fixed ladders by relieving them from 35kg to 45 kg of its weight.

Not suitable for

- Not suitable for lifting tools or parts.
- Not suitable for people below the age of 18 or people below the weight of 55 kg.
- Not suitable for multiple users at the same time.
- Not to be fastened to body parts or cloth.

The Climb Assistant is not a fall protection device. Always wear proper fall protection equipment (P.P.E.)
Use original parts. No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts.

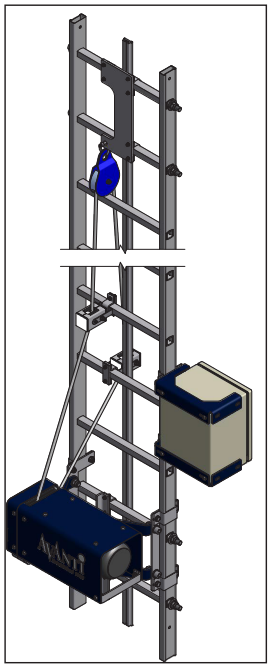
Functionality

The system includes a motor, a continuous hauling rope, an electrical control box. Hook on to the hauling rope using the Rope Clamp and activate the motor by pulling the hauling rope. The integrated sensor of the motor then registers the movement and starts the motor. The hauling rope then pulls with the pre-adjusted force (e.g. 40 kg.) regardless of the pace and direction of climb. Stop the rope in the same position for 3 seconds, then the sensor will register that the motion has stopped, and the pulling force fades out.

8. Daily inspections

Check the rope tension spring connected to the base plates. If total length is less than 200 mm, the rope needs tensioning. Extend the spring by means of the tensioner. If this does not tighten the rope sufficiently, a rope shortening is needed. See Installation Manual section 3.2.
Assure the rope is aligned on the guide rollers and on the drive wheel (see Fig. 37). The rope can be placed on both right and left side.
If anything abnormal is observed, take Climb Assistance out of use. Repair the problem before continuing using the system.

Fig. 37



CAUTION:

- Check ambient light; in case of insufficient light conditions, do not start using the Climb Assistance.

- With temperature under -20°C proceed as follows: Loosen the rope tension by means of the tension spring on the assembly. The length of the spring must be around 140mm. Turn on the control box and start the system without load. Let the system run for 5 minutes at least. This will allow the gearbox oil and the control box to increase the temperature for a proper performance. The stiffness of the rope will decrease as well. Turn off the control box and proceed to tighten the rope again by means of the tension spring. The final length of the spring must be 200 mm.

9. Instructions for use

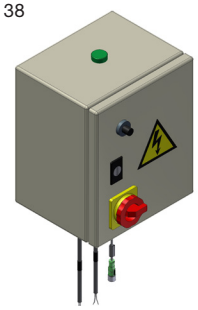
Before use, read these instructions.
For use do as follows:

1. Perform the daily inspection described below.

2. Check the green light at the top of the electrical box. If it does not work, connect to the power supply and/or turn the On / Off switch on the electrical control box.

3. Adjust the pulling force (1 to 10) on the electrical control box (Fig. 38). Depending on the rope length, it is equivalent to approximately 35kg - 45kg.

Fig. 38



4. Connect harness and fall protection device (P.P.E) as prescribed by manufacturer.

5. Fasten the Rope Clamp with the Release- Strap carabineer to the harness.

NOTE!
The AVANTI Climb Assistance VII System and the AVANTI Fall Arrest System have been tested together ensuring that they work seamlessly together and do not have any adverse effect on each other and there is no need of use of release strap. Contact AVANTI Wind Systems to verify that the Avanti Climb Assistance can work together with your fall protection system.

6. Fasten the Rope Clamp with the Release-Strap on the Climb Assistance rope (Fig. 39).
It has to be anchored above the fall arrest attachment of the centered chest attachment of the fully body harness (Fig. 40).

Fig. 39 Rope Clamp with Release-Strap

7. Pull down the Climb Assistance rope to activate the motor. The rope will start pulling the climber up relieving the weight previously set. The system will keep a continuous pulling force following the climber's pace.

8. Keep still for 3 seconds to stop the system. The climber can now detach the Rope Clamp with the Release-Strap from the rope.

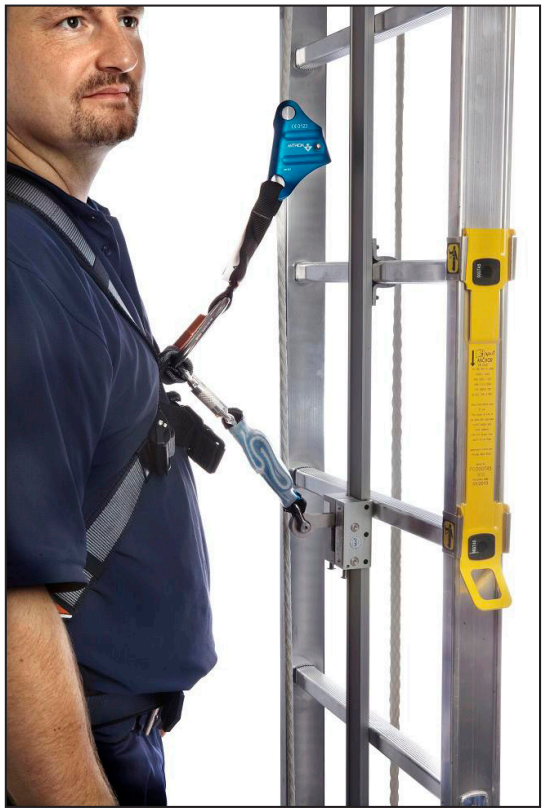
CAUTION: *Do not let the Release-Strap be attached to the rope at anytime.*

9. After use, turn off the power supply and unplug it from the power socket.

WARNING!
When using the climb Assistance keep your fingers and other body parts, clothes, etc. away from the hauling rope, drive wheel, guide rollers and pulley.

NOTE!
The main switch must not be connected/ disconnected several times in rapid succession. Doing so may damage the electrical installation.

Fig. 40



10. Maintenance

Perform daily inspection as prescribed above and take action if any abnormalities were found.

11. Annual inspection

Once a year a competent person or an expert authorized by Avanti must inspect the Climb Assistance. If not, this will void the warranty.

AVANTI runs “training classes” on a regular basis. If interested, contact AVANTI.

CAUTION!
Before servicing the Climb Assistance System, unplug the power supply and wait for at least 1 minute.

Annual inspection:

1. Assure that all the bolts and nuts are tight (on motor, electrical control box, guide rollers, and top fitting).
2. Assure that the extension spring is extended to L = 200mm (see Daily inspections section 8).
3. Gearbox oil: Change the gearbox oil every 3 years (see section 6, Technical Specifications). The date of last oil replacement is recorded in the Yearly Control Template, Appendix B.
4. Damaged parts should be replaced once they show signs of wear (on drive wheel, hauling rope, etc.). If only a section of the hauling rope needs replacement, insert a new section where it is damaged.

12. Trouble shooting

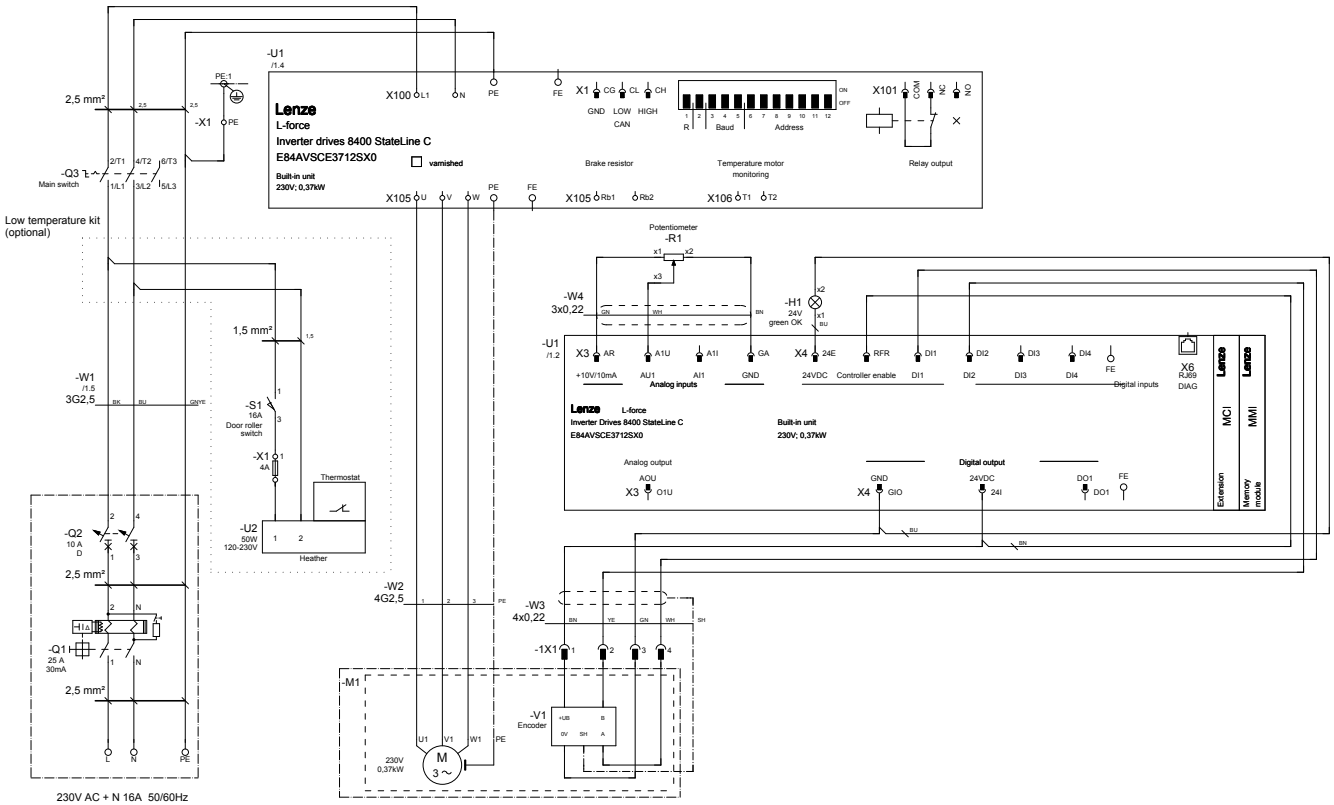
Breakdown: The system does not start by pulling down the hauling rope.	
Cause:	**Solution:**
Power supply is off or unplugged.	Turn on the power supply. Plug the power supply to the power outlet.
The rope is stuck.	Find the blocking factor and remove it.

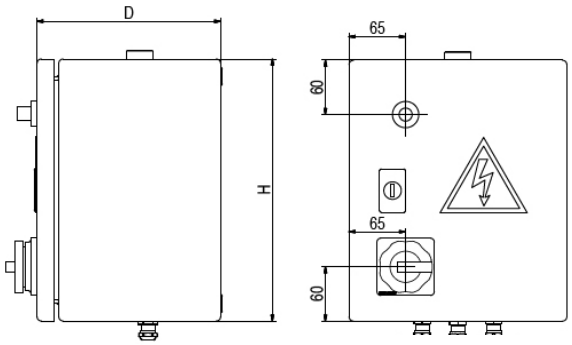
Breakdown: The direction of rotation of the motor is not correct.	
Cause:	**Solution:**
Unsuitable phases motor connection	Swap any two of the three phases of the motor.
Unsuitable inverter-sensor connection	Check wiring according to Appendix A.

Breakdown: Motor and drive wheel turn, however the hauling rope does not move.	
Cause:	**Solution:**
The hauling rope is not properly tensioned and it slips around the drive wheel.	Check whether the spring is extended to approximately 200mm long. If not, adjust rope tension as specified in section 8, Daily inspections.
The hauling rope and/or the drive wheel is worn.	Replace the worn components.

Breakdown: The pulling force is too small	
Cause:	**Solution:**
The motor is not connected in delta / triangle connection	Check wiring at the motor connection box. Perform wiring according to delta / triangle connection.

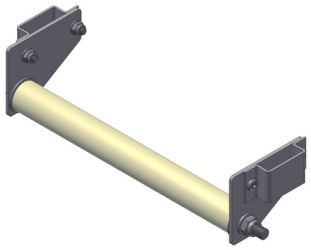
Appendix A: Electrical control box overview



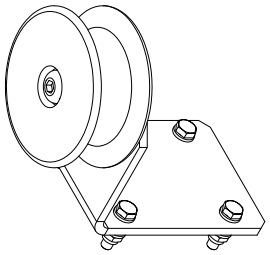


Appendix C: Accessories

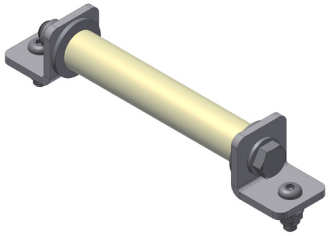
Roller for rung:
Due to the change of inclination on the ladder in some cases, it is possible to install a roller assembly that avoids the rope to touch the rungs of the ladder.



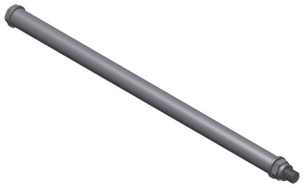
Front roller for rung:
It is also possible to install a front roller on the front side of the ladder. When overpassing this element, the user shall ensure that the rope clamp does not collide with the front roller for rung.



Roller for hatch:
Due to the dimensions of the hatch of the platform in some cases it is necessary to install this roller assembly to avoid that the rope touches the hatch.



Rung reinforcement:
Possibility of reinforcing the rungs of the ladder.

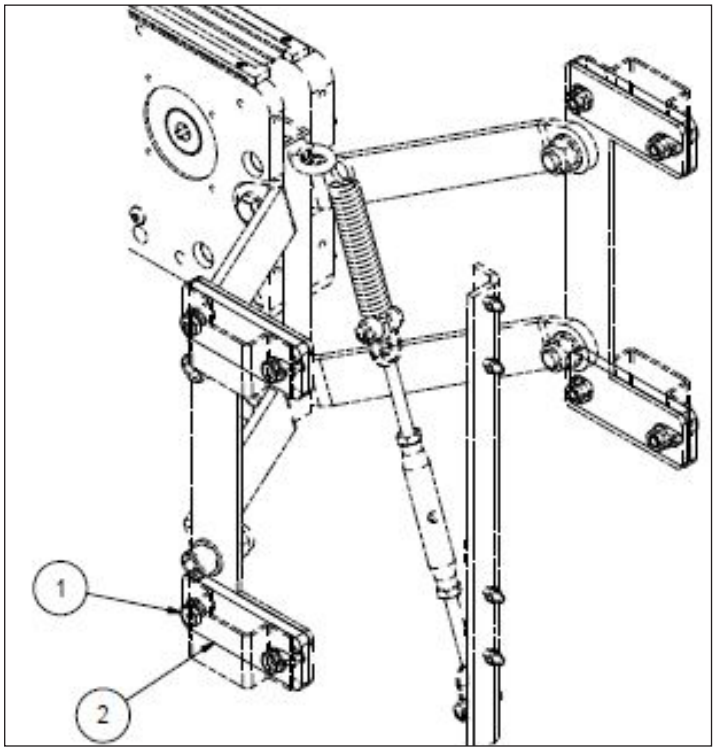


Appendix D: Non-standard ladder width installation

Non-standard ladder width installation:
If the ladder, where the AVANTI Climb Assistance VII is going to be installed on, has a width greater than the AVANTI standard ladder (470mm), then a spacer kit shall be used. A spacer kit consists of the following items:

- 4 spacer plates denoted by a (2) in figure below. They are installed between the ladder and the mounting arms of the AVANTI Climb Assistance VII base unit.
- 8 M10 bolts denoted by a (1) in figure below. Every AVANTI Climb Assistance VII comes with M10 bolts to mount to a 470mm wide ladder. Replace these bolts with the bolts in the spacer kit to account for the thickness of the spacer plates.

All other components shall be installed as described in this manual.



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