AVANTI WORK CAGE

User's Manual and Installation Manual
Model SHARK

Date of publication:
3rd UL Edition: September 2008

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WORK CAGE
AS TO LOAD CAPACITY ONLY
12xz

This product is UL Classified.
See the complete Classification marking above.

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NOTICE OF AUTHORIZATION TO APPLY THE UL MARK

2006-08-31

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Reference: File SA13063 Project 06CA30988 P.O. Number 492603-1
Product: USC/CNC- UL CLASSIFICATION OF NEW MODEL SHARK WITH SLIDING & DOUBLE DOORS

Dear Mr. Bramsen,

Any information and documentation provided to you involving UL Mark services are provided on behalf of Underwriters Laboratories Inc.

UL's investigation of your product has been completed under the above project number and the subject product was determined to comply with the applicable requirements.

This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Classification Mark only at the factory under UL's Follow-Up Service Program to the subject product, which is constructed as described below:

> Identical to the subject model, which was submitted to UL for this investigation. The UL Records covering the product will be in the Follow-Up Services Procedure, File SA13063, Volume 1.

This authorization applies only to the address on this letter.

This authorization is effective from the date of this Notice and only for products at the indicated manufacturing locations. Records in the Follow-Up Services Procedure covering the product are now being prepared and will be sent to the indicated manufacturing locations in the near future. Please note that Follow-Up Services Procedures are sent to the manufacturers only unless the Applicant specifically requests this document.

Products that bear the UL Mark shall be identical to those that were evaluated by UL and found to comply with UL's requirements. If changes in construction are discovered, appropriate action will be taken for products not in conformance with UL's requirements and continued use of the UL Mark may be withdrawn.

Sincerely,

SANDER RIEZEBOS
Materials Engineer
UL International (Netherlands) B.V.

SANDER NIEUWENHUIJZEN
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Reviewed by:

Edgar Wolff-Klammer

EDGAR WOLFF-KLAMMER
Principal Engineer
Underwriters Laboratories Inc.

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

Contents

Installation manual

Limited Warranty

Avanti Wind Systems A/S warrants that commencing from the date of shipment to the Customer, and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard Avanti warranty, the Avanti work cage ("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 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 HERBY 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.

1. Explanation of symbols used in this manual

Symbol	Signal word	Meaning	Possible injury if not observed
Safety instructions			
	**DANGER!**	*IMMEDIATE or possibly imminent danger:*	Death or severe injury!
	**DANGER!**	*IMMEDIATE or possibly imminent danger of hazardous voltage:*	Death or severe injury!
	**CAUTION!**	*Potentially hazardous situation:*	Light injury or material damage.
Additional instructions			
	**Attention!**	*Potentially dangerous situation:*	Damage to equipment or workplace
	**Important!**	*Useful tips for optimum working procedure*	None
Order			
		*Reference to written specification/documentation*	

2. Cautions

CAUTION!
Avoid injury – follow all instructions!

a) Installation and/or maintenance and/or operation of the work cage and its suspension may be performed only by qualified staff, hired by the employer for the job at hand.

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

c) Staff is obliged to read and understand this User's Manual.

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

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

DANGER!

f) Whenever installation, ascending, and/or descending involves danger of falling, all persons inside the danger area must wear personal protective equipment which will prevent them from falling down by means of a safety system secured to the building.

g) Only fault-free suspension devices, cabin components, traction hoist equipment, safety brake gripping devices, original traction hoist wires and stopping devices may be used.

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

i) Prior to mounting, all parts must be tested to ensure their completeness and full functionality.

j) Self-locking nuts must be used at all times, and the following must always be observed:
- The screw must extend from the nut by at least half of the thread diameter.
- The nut may not be used anymore when it has become possible to loosen it with the fingers!

k) Prior to mounting the suspension system, ensure that the building sections involved will be able to carry the load.

l) If any damage or faults are found during operation, or in case of circumstances which may jeopardise safety:
– Immediately interrupt the work in progress and notify the supervisor or employer!

m) All tests/repairs of electrical installations may be performed only by qualified electricians.

n) All repairs of the traction hoist, safety brake gripping device and the system's supporting parts may be performed only by qualified fitters.

o) If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by an expert.

p) Use of non-original parts, in particular use of other wires than the prescribed original traction hoist wire will render the manufacturer's warranty void and the CE approval invalid.

q) No modification, extension or reconstruction of the work cage is allowed without the manufacturer's prior written consent.

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

s) Before using the work cage an inspection by the authorised security organisation must be carried out.

The tower owner must verify the need for 3rd party work cage inspections with the local authority and comply with the standards specified.

3. Instructions

a) Before using, check all parts for proper function and damage to component parts. Do not use a damaged or improperly functioning platform.

b) A platform exposed to excessive heat, as in the case of fire, should be immediately removed from service and destroyed due to loss of structural strength.

c) Do not permit oil, grease, or slippery material to accumulate on climbing or gripping surfaces.

d) Do not use the product if the decking surface is damaged or has deteriorated. Periodically coat wood decking and rails with a transparent wood preservative. Do not paint.

e) Do not use the product for cantilever applications. Never stand on that portion of the product that extends beyond the supporting point.

f) Planks and stages are designed with rated working loads of 250, 500, and 750 pounds (113, 227, and 340 kg). The total combined weight of each worker and all materials should not exceed the rated working load. Do not overload.

g) Erect the plank or platform so that the working or standing surface is level.

h) Support plank or platform ends by stirrups, scaffold bearer members, trusses or other equipment intended for this purpose.

i) Use guardrails, midrails, and toe boards as required by local, state, and federal regulations. Their use is recommended in all cases.

j) Do not allow unstable objects, such as barrels, boxes, loose brick, tools, and debris to accumulate on the work surface.

k) Do not use a ladder or other device on a plank or platform to gain greater heights.

l) Never climb onto a stage from a ladder unless both the stage and the ladder are secured from movement in all directions.

m) Do not ride on a moving plank or platform. Tools, materials, and equipment should not be stored on planks or platforms that are being moved.

n) Do not apply impact loads to a plank or platform.

o) Do not use acids or other corrosive substances on a plank or platform without consulting the plank or platform manufacturer for specific instructions.

p) Scaffolds and tools shall not be allowed to contact unprotected, energized electrical lines or equipment. Maintain a minimum safe distance of at least 10 ft. (3m). Consult the power company to shut off power or insulate/relocate the line if working closer than 10 ft. DANGER! – To avoid contact and shock hazard, scaffolds and tools shall not be used in the vicinity of energized power lines or electrical lines.

q) Before using, refer to manufacturer's instructions.

r) Use only appropriate duty-rated ladders when using planks or platforms with ladder jacks.

s) Never attempt to straighten a deformed side rail or decking member.

t) Each end of a platform unit shall extend over its support centreline not less than 6 inches nor more than 18 inches. User(s) shall not stand on the cantilevered portion of platforms.

4. Description of equipment

4.1 Purpose

The work cage described in this User's Manual serves the following purposes:
- transportation of staff and material inside wind turbine systems, lettuce towers for wind turbines, and telecommunication towers.
- transportation for mounting, inspection and repairs.

The work cage may be used for transportation of two persons plus their tools and equipment to the most convenient height for performing work on the tower.

The work cage is designed for permanent installation in one specific tower.

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

4.2 Function

The work cage uses a traction hoist for ascending and descending on a wire secured to the building.

Two safety brake safety gripping devices secures the work cage to a separate safety wire.

Upward and downward travel is controlled from within the work cage in hand mode, from the remote control transmitter in remote mode (optional), or from the outside in the automatic mode (optional).

A lifting force limiter prevents upward travel in case of an overload of the traction hoist.

Two guide wires on either side of the work cage prevent the lift from swivelling/tilting.

4.3 Work cage models

This User's Manual and Installation Manual describes the following models:

- SHARK L Sliding/Double door/4-door with 533 Lbs (240kg) lifting capacity.

- SHARK XL sliding door with 650 Lbs lifting capacity (300 kg).

4.4 Temperature

Operating temperature
5ºF - +140ºF (-15ºC - +60ºC).

Survival temperature
-13ºF - +176ºF (-25ºC - +80ºC).

Low temperature kit is also available.
Operational temperature - low temperature kit
-13ºF - +104ºF (-25ºC - +40ºC).

4.5 Components

4.5.1 Cabin overview

Fig. 1 Double door

1 Cabin
2 Double door
3 Drive and safety wires
4 Second safety brake gripping device.
5 Guide wire
6 Wire guides
7 Bottom safety stop
(Details see Page 13-18)

Fig. 1a Sliding door

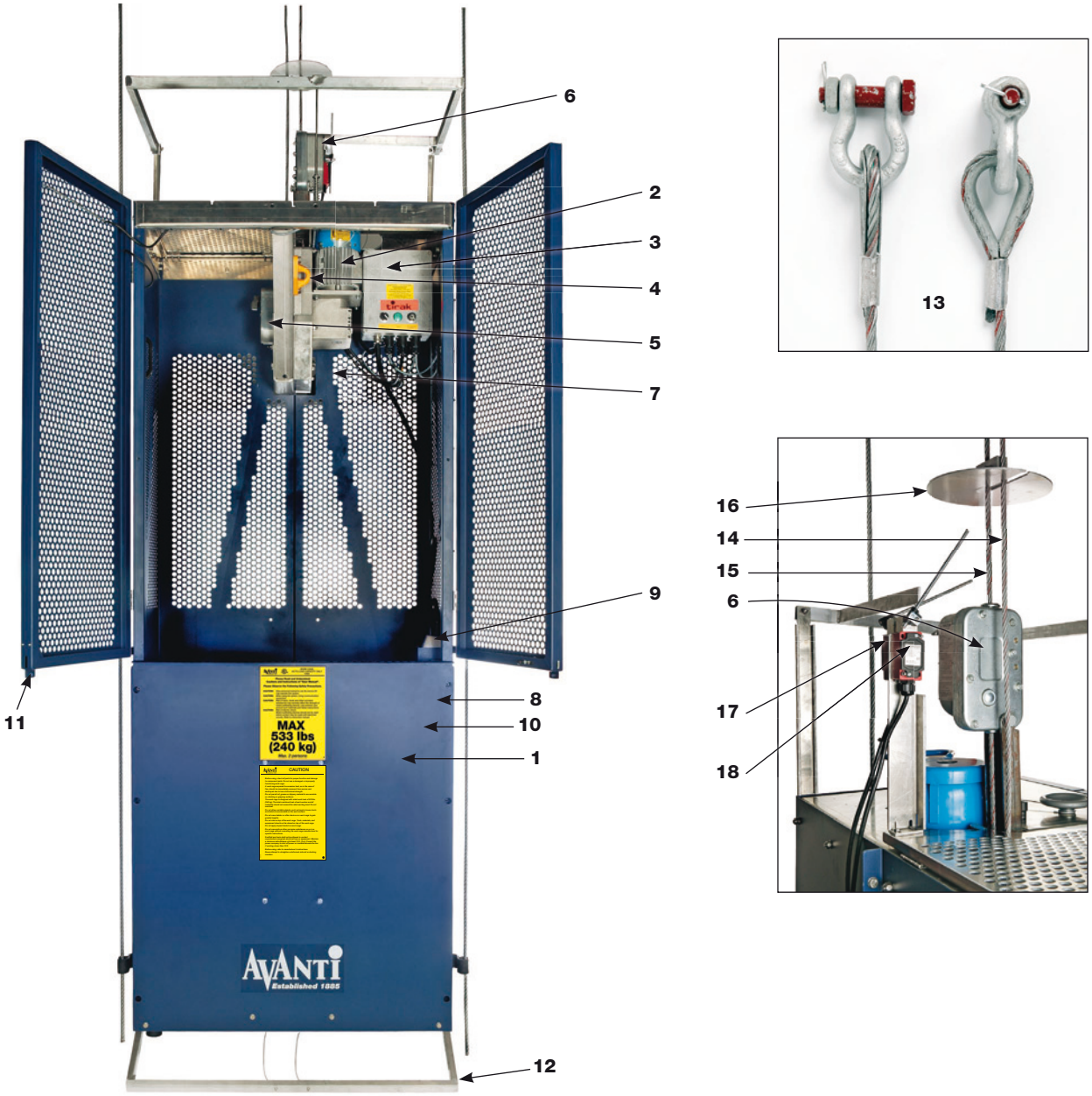
1 Cabin
2 Sliding door
3 Drive and safety wires
4 Second safety brake gripping device.
5 Guide wire
6 Wire guides
7 Bottom safety stop
(Details see Page 13-18)

Fig. 1b SHARK L 4-door version

1 Cabin
2 4 door
3 Drive and safety wires
4 Guide wire
5 Wire guides
6 Bottom safety stop
(For details see pages 13-18)

4.5.2 Cabin with safety gripping device, traction hoist, electrical control box and pendant control

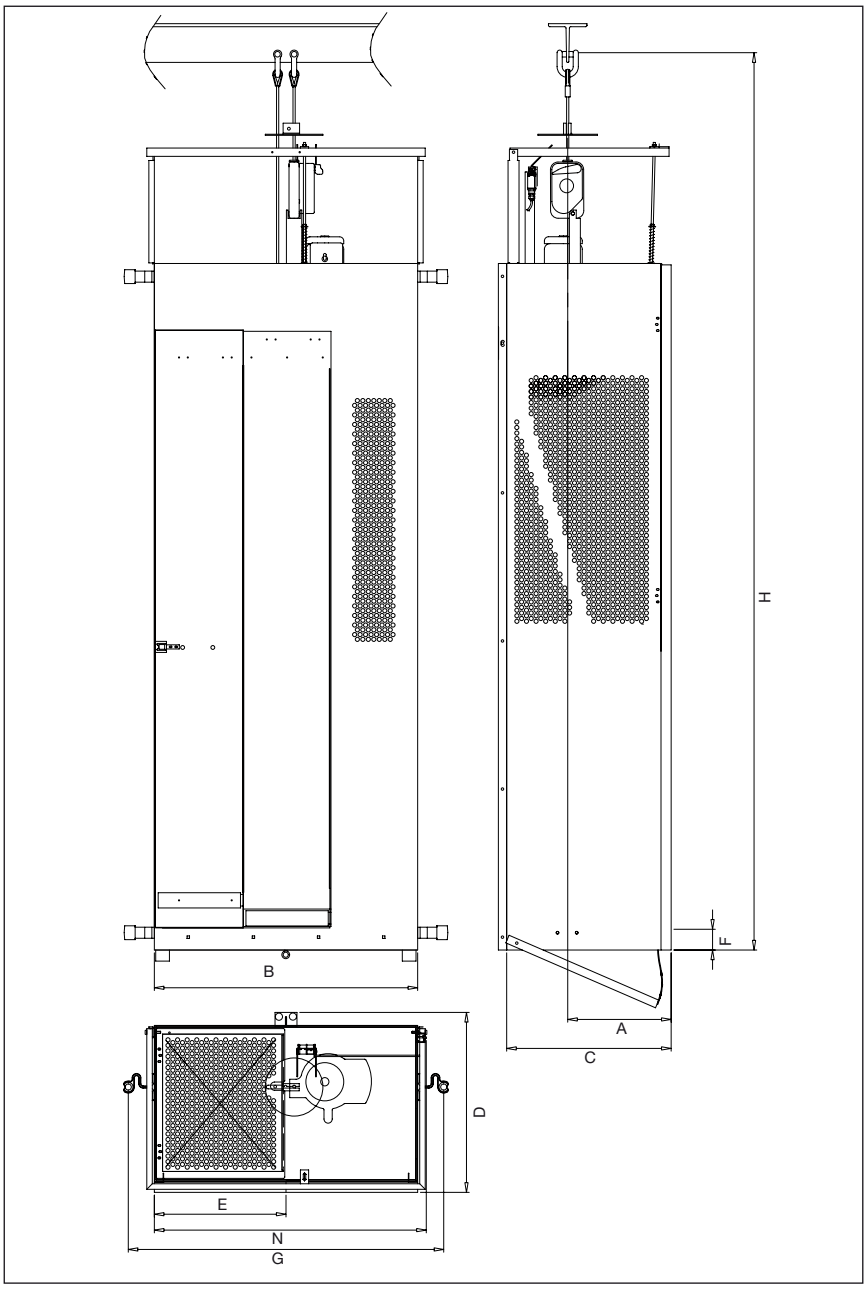
Fig. 2



1 Cabin
2 Traction hoist
3 Electrical control box
4 Anchor point
5 Safety brake safety gripping device
6 Second safety brake safety gripping device
7 Cable connection (behind the lift)
8 EMERGENCY STOP button fixed (Inside cabin optional)
9 Pendant control
10 Override automatic operation switch (optional)
11 Door stop switch
12 Bottom safety stop
13 Shackle
14 Safety wire
15 Lifting wire
16 Top stop disc for 17/18
17 EMERGENCY limit stop switch
18 Operation limit stop switch

4.5.3 Technical data for the work cage L, and XL

Fig. 3a Dimensions sliding door



Lifting capacity:
- Motor LE500P:
  533 Lbs (240 kg)
  (max 2 persons).
  650 Lbs (300 kg)
  (max 2 persons).

Weight of lift:
L: 242 Lbs (kg 110)
XL: 265 Lbs (kg 120)

To the weight of the lift should be added the weight of the power supply cable.
approx. 0.22 Lbs per foot (0.23 kg per m).

Standing height:
Under spine: 1980 mm
Under
Traction hoist: 2100 mm

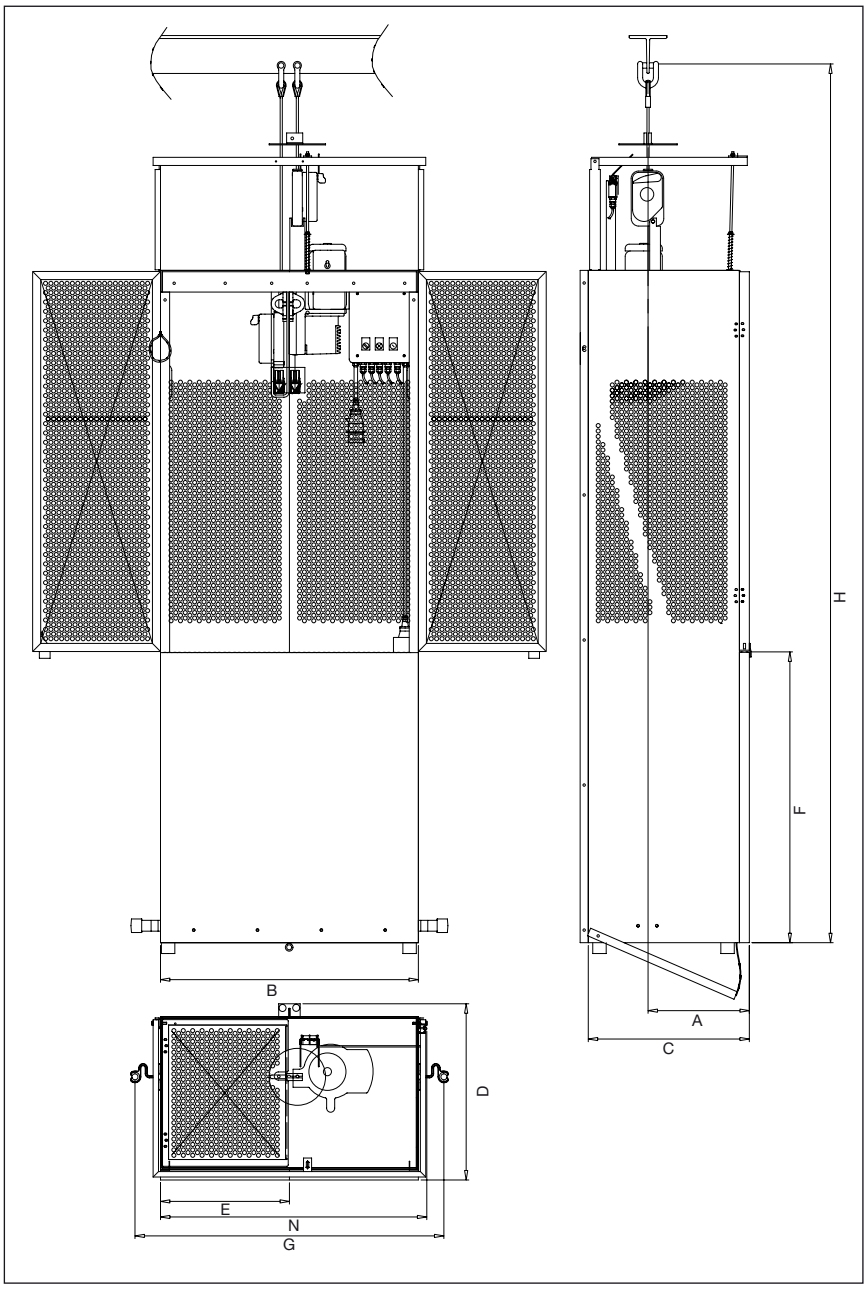
Slide door opening:
X - XL: 550 mm

Dimensions in mm:

Shark	A	B	C	D	E	F	G[1)]	N	H
L	380	960	600	650	475	75	1020/1150	990	2980
XL	480	960	800	850	475	75	1020/1150	990	2980

[1)] Standard wire guide/narrow wire guide. (Details p. 46)

Fig. 3b Dimensions double door



Lifting capacity:
- Motor LE500P:
  533 Lbs (240 kg)
  (max 2 persons).

Weight of lift:
L: 242 Lbs (kg 110)

To the weight of the lift should be added the weight of the power supply cable.
approx. 0.22 Lbs per foot
(0.23 kg per m).

Standing height:
Under spine: 1980 mm
Under
Traction hoist: 2100 mm

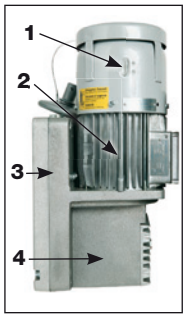
Dimensions in mm:

Shark	A	B	C	D	E	F	G[1)]	N	H
L	380	960	600	650	475	1100	1020/1150	990	2980

[1)] Standard wire guide/narrow wire guide. (Details p. 46)

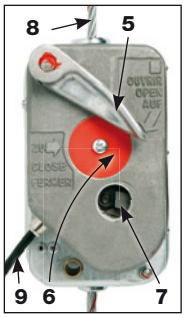
4.5.4 Drive system, safety gripping device and controls

Fig. 4
Traction hoist LE500P



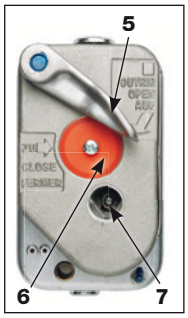
1 Insertion point for brake lever
2 Motor
3 Wire traction w/overload protection
4 Drive system/ gearbox

Fig. 5
Safety brake BSO 500E



5 Control handle/ gear lever
6 Safety brake stop button
7 Inspection window
8 Safety wire
9 Connection cable

Fig. 6
Safety brake BSO 500

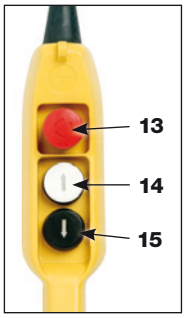


5 Control handle/gear lever
6 Safety brake stop button
7 Inspection window

Fig. 7
Electrical control box

10 Hand/Auto-matic
11 Ready lamp "ON"
12 Override bot-tom limit stop (key switch)

Fig. 8
Pendant control



13 EMERGENCY STOP button
14 UP
15 DOWN

Fig. 9
Remote control

16 On/Off
17 Connection Cable

Table 1. Traction hoist

Construction in accordance with DIN 15 020.
Traction hoist sound/noise level emitted: max. 72 dB(A). Subject to technical change without notice.

Hoist	Lifting capacity	Wire speed	Effect	Rated current	Traction Hoist wire Ø	Unit weigth approx.	Measures/dimensions a	b	c
Traction hoist type	Lbs (kg)	Feet/min (m/min)	kW	A	mm	Lbs (kg) [1]	mm	mm	mm
LE500P 400V	880(400)	35 (9)	1.5	3.5	8	65 (29.5)	485	250	220
LE500P 480V	880(400)	35 (9)	1.5	2.0	8	65 (29.5)	485	250	220
LE500P 400V	1100(500)	35 (9)	1.5	3.5	8	65 (29.5)	485	250	220
LE500P 480V	1100(500)	35 (9)	1.5	2.0	8	65 (29.5)	485	250	220

[1] Weight without wire.

Table 2. Safety brake

Safety gripping device	Lifting capacity	To max. wire speed	Traction hoist wire Ø	Unit weigth approx.	Measures/dimensions a	b	c
Safety brake type	Lbs (kg)	Feet/min (m/min)	mm	Lbs (kg)	mm	mm	mm
BSO 500 Electrical	880 (400)	35 (9)	8	10.3 (4.7)	214	121	131
BSO 500	880 (400)	35 (9)	8	10.3 (4.7)	251	140	131

4.5.5 Drive wire, safety wire and guide wire

Original traction hoist and safety brake wire

Wire diameter: 8 mm, 4x26 or 5x19
Surface treatment: galvanised
Mark/feature: 1 red string/cord
Min. break resistance: 39.7 kN
Attached with: 2 t shackle, Form C

Guide wire

Wire diameter: 12 mm
Surface treatment: galvanised
Min. break resistance: 85 kN
Anchoring: Min. every 115 ft (35 m)
Tighten to: 2 to 4 kN
Attached with: Shackle, 2t

4.6 Safety devices

4.6.1 Safety brake

Electromagnetic spring-loaded brake which engages automatically
- on releasing the direction selector and
- on power failures.

4.6.2 EMERGENCY STOP

When the red EMERGENCY STOP (Pendant control) switch is pushed in emergencies, all control is interrupted. After remedying the fault, control is reactivated by turning the switch clockwise, until it pops out again.

4.6.3 EMERGENCY STOP fixed (optional)

Only in work cages with function AUTOMATIC installed. A backup switch to the pendant control EMERGENCY STOP switch situated on the right hand panel inside the work cage. Works like described above. (See Fig. 9).

4.6.4 Override “automatic operation” switch

A switch situated inside the pendant control holder. It prevents the work cage from being controlled from the inside when the control is in automatic mode.

4.6.5 Phase monitoring relay

With three-phase power operation, the phase monitoring relay will interrupt operation when a faulty phase sequence is detected, preventing faulty assignment of UP/DOWN direction power which deactivates the limit stop switch and the lifting force limiter functions.
Remedy: Have an electrician switch two phases in the electric plug.

4.6.6 Mechanical lifting force limiter

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

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

4.6.7 Safety gripping device

Hoistable personal transportation means must be equipped with 2 safety gripping devices which will prevent the load from falling.

Safety brake Type BSO
The safety brake BSO safety gripping device is opened manually (Fig. 8).

Fig. 8
Safety brake

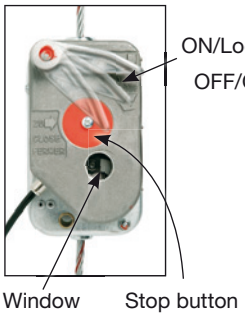


Fig. 9
Emergency stop and override bottom stop switch

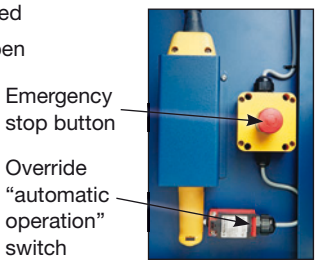


Fig. 9a
Yellow flash

The speed of the safety wire passing through the device is continuously monitored, and the jaws automatically close in case of sudden excessive speed.
This protects the lift against
a) Lifting wire breaks and
b) Hoist failures.

The safety gripping device can also be engaged manually in emergencies by pressing the EMERGENCY STOP switch. The window is used to monitor the centrifugal force mechanism’s function during operation. **For information on required intervention when the safety gripping device engages.** (See section 8 on page 23).

4.6.8 Sliding door lock

Sliding doors are closed by pushing the steel tap on the door into the red door lock switch. The door is unlocked by pushing the black button on the red door lock switch. From the outside the same button is reached through a hole.

4.6.9 Limit stop switch

4.6.9.1 Top limit stop switch

At the top of the cabin frame a top limit stop switch will stop upward travel when activated (Fig. 10).

Downward travel will still be possible. A top stop disc which activates the top stop switch is installed below the lifting wire attachment. (Fig. 5 page 38)

ATTENTION!
When the top limit stop switch is engaged, activate the DOWN switch until the top limit stop switch is released.

4.6.9.2 EMERGENCY top limit stop switch

Deactivates control if the top limit stop switch fails (Fig. 10). Manual downward travel is possible.

CAUTION!
Do not use the work cage until the top limit stop switch fault has been remedied.

4.6.9.3 Bottom safety stop

The bottom safety stop switch (Fig. 11) stops downward travel if the work cage
- encounters an obstacle or
- touches the ground.

Upward travel will be possible, for instance to remove the obstacle. In order to put the work cage on the ground, the contact plate's operation can be bypassed with the key switch in the control box. If it is possible to enter underneath the work cage a double button safety stop must be installed.
(See installation manual page 31).

4.6.9.4 Door stop switch

Sliding door: The red door lock switch will interrupt control if the door is not closed properly.
Double door: A switch (Fig. 12) will interrupt control if the door is not closed properly.

4.7 Other risks (hazards)

CAUTION!

The following risks relating to the traction hoist and safety brake safety gripping device have not been specifically determined for the construction in question:

The safety brake safety gripping device will provide its safety function only if the safety wire between the wire attachment and the safety brake is tight (no loose wires!).

Safety brake is tight (no loose wires!). Therefore, any loose safety wire must be secured with a tightening spring approx. 20 cm below the access platform (See page 45).

Anchor points
Avanti work platform is equipped with one or two anchor points (Fig. 2, page 12). During operation user should hook up to the Anchor point. Further an optional safety bar can be mounted.

Fig. 10

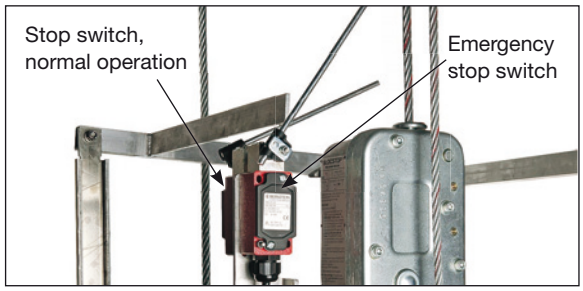


Fig. 11

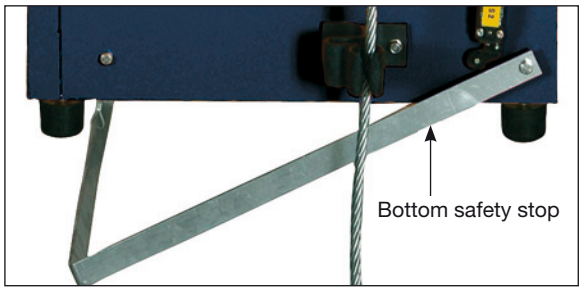
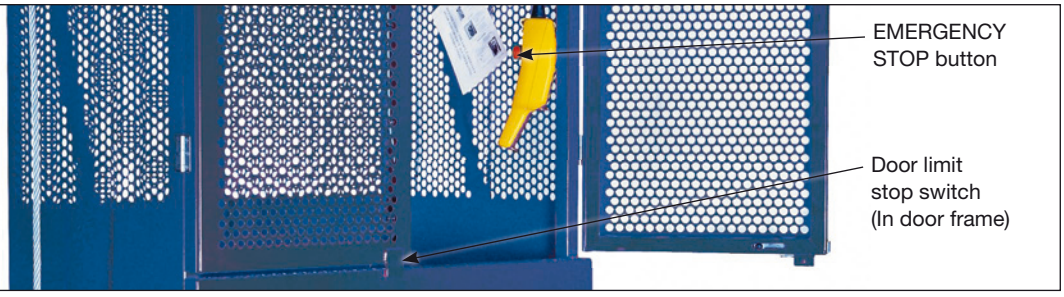


Fig. 12



5. Daily inspection by the supervisor

5.1 Work cage

a) Before every operation, ensure that the traction hoist, the safety brake, and all auxiliary components (stoppers, wire guide wheels, etc.) are mounted in accordance with specifications and without any noticeable defects.
b) Check whether the drive, and safety wires are feed correctly around the two wire guide wheels.
c) Wire ends (of 3 m or more in length) must be coiled separately at the floor and tied with strips at least 3 places.
d) Check lifting capacity: (see the rating plate or section 3.5.3) – the extra load (persons and materials!) must not exceed the maximum rated lifting capacity.

5.2 Operating area

a) Ensure that there are no obstacles within the work cage's operating area which may cause the cabin to be stuck or hit the ground.
b) Ensure that all relevant and required protection measures below the cabin are in place. Such measures could include pent roofs or barriers to protect the staff against falling objects.

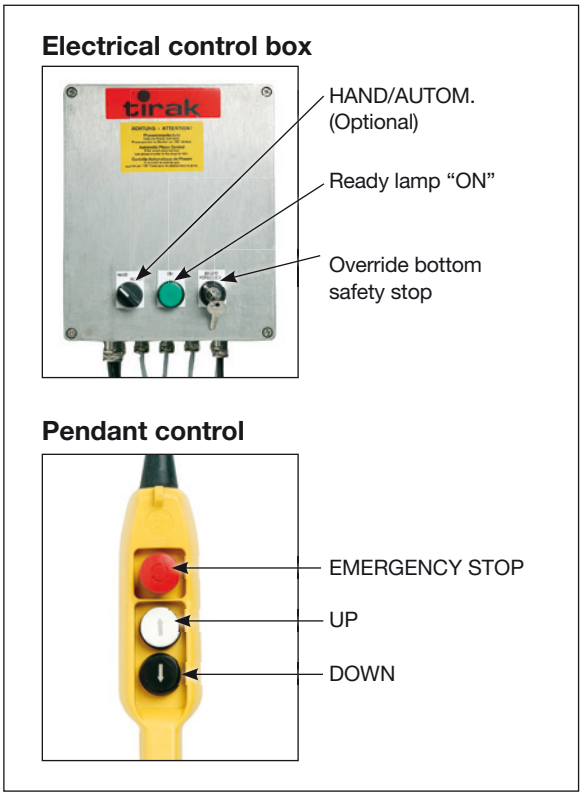
5.3 Control function

a) Close doors. Push EMERGENCY STOP Button. Pushing button UP/DOWN the lift should remain still. To restart, turn EMERGENCY STOP button clockwise. (If EMERGENCY STOP button fixed is installed (Fig. 9 page 17) test this button likewise.
b) Test the Operation limit stop switch:
During upward travel, push the switch manually, and the work cage should stop immediately. Pushing the limit stop switch should enable the lift to travel down again.
c) Test EMERGENCY limit stop switch:
During upward travel, push the switch manually, and the work cage should stop immediately. Following this, neither upward nor downward travel should be possible.
d) Bottom safety stop. Take the lift down;
it should stop before the rubber feet of the cabin reaches the tower ground level.
When the "bypass switch" is activated, it should be possible to take the lift all the way down to the ground.
e) Door stop switch:
Open the doors – it should neither be possible to take the lift up nor down.
f) If optional function AUTOMATIC is installed.
Set selector HAND/AUTOM. on AUTOM.
Holding the handle the lift should remain still if button UP or DOWN is activated.

ATTENTION!
If any defects occur during work,
- stop working,
- if required secure the workplace and
- remedy the defect!
(See page 24-26).

DANGER!
Make sure that nobody is exposed to danger below the work cage, for instance from falling parts.
Suitable measures:
Pent roof or barriers.

Fig. 13

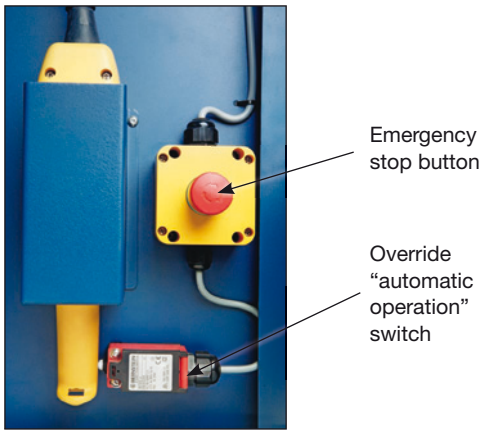


5.4 Automatic operation control

Perform only this inspection if function AUTOMATIC is installed.

a) Push EMERGENCY STOP button on pendant control. Turn HAND/AUTOM. switch on electrical control box to the right to activate automatic operation. (Fig. 13 page 19)
b) Deactivate EMERGENCY STOP button by turning button clockwise. (Check EMERGENCY STOP button fixed is deactivated.) The work cage should stand still.
c) It is forbidden to manipulate with the “override automatic” operation switch.
d) With closed doors push UP and DOWN buttons. Neither upward nor downward travel should be possible (Switch in pendant control holder blocks operation).
e) Push EMERGENCY STOP button on pendant control.
f) Place pendant control in holder so it is operational from the outside.
g) Leave cabin and close door.
h) Deactivate EMERGENCY STOP button. The work cage should stand still.
i) Push UP button. The lift should travel upwards.
j) Push EMERGENCY STOP button. The lift stops.
k) Turn EMERGENCY STOP button clockwise and push DOWN button. The work cage should travel downwards until emergency stop bottom stops the work cage.
l) Remove pendant control from holder.
m) Return HAND/AUTOM. button to HAND.
n) Test that the UP and DOWN buttons works again.
o) DO NOT try to activate the override “automatic operation” switch FIG 13b.

Fig. 13b



5.5 Remote operation control

Perform only this inspection if remote control is installed.

a) On the electrical control box switch HAND/AUTOM. Switch to hand (fig 7).
b) On top of the remote operation receiver switch the device on.
c) Push upward arrow on remote operation transmitter. The work cage should ascend.
d) Push downward arrow on remote operation transmitter. The work cage should descend.
e) Once the test is complete, switch the remote operation function off.

5.6 Safety gripping device

a) Engage the **safety brake** by pressing the safety brake stop button - the handle should jump to position “ON” (Fig. 8 page 16).
b) Reopen the safety brake by pressing down on the lever – the lever must engage.
c) During operation, regularly monitor the centrifugal force regulator relay’s rotation by looking through the window.

5.7 Wires and suspension

a) During operation: Checking of the **lifting and safety wires** – free passage through hoist and safety gripping device.
b) When the lift is at the top landing, inspect the **wire attachment** and all the building sections that suspend the lift.

6. Operation - lift transport

Transportation of people in AUTOM. mode is forbidden.

6.1 Entry and exit

To ensure safe entry and exit:

a) Lower the work cage onto the access platform until the contact plate is activated and the cabin stops, or: bring the lift to a height corresponding to the correct level for exiting from the wind turbine's platform.
b) Open the door and exit/enter the lift through the door/over the cabin railing.

6.2 Stop/EMERGENCY STOP

a) Release the direction selector; the work cage should stop
If it does not:
b) Push the EMERGENCY STOP switch, and all controls should be disabled. Open the door and enter/exit the lift through the door/over the cabin railing.

6.3 Normal operation

a) Turn the red EMERGENCY STOP switch on the control box clockwise and the switch should pop out (Fig. 13 page 19). Do likewise with EMERGENCY STOP fixed (Fig. 9 page 17).
b) To go up or down, push and hold the direction selector in the relevant direction.
c) To place work cage on floor after the bottom safety stop has stopped the lift.
   - Turn override bottom safety stop switch (Fig. 6 page 16) clockwise and hold.
   - Push DOWN button until the work cage rests on the floor and let go.

6.4 Automatic

Only in work Cages with function AUTOMATIC installed.

a) Push EMERGENCY button on pendant control. Turn HAND/AUTOM. switch on power cabinet to activate automatic operation.
b) Close door.
c) Push UP or DOWN button respectively and the cabin starts ascending/descending.
d) Remove pendant control from holder.
e) Return HAND/AUTOM. button to HAND.

6.5 Remote operation

a) On the electrical control box switch the HAND/AUTOM. switch to hand (fig. 7).
b) On top of the remote operation receiver switch the device on (fig. 9).
c) For ascending push upward arrow on remote operation transmitter.
d) For descending push downward arrow on remote operation transmitter.
e) Once the operation is complete, switch the remote operation function off.

6.6 Lifting force limiter

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

CAUTION!
Attempting to go up in an overloaded lift is prohibited!

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

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

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

If the problem persists have an AVANTI expert adjust the overload limiter (Appendix A page 49).

7. Manual operation (EMERGENCY)

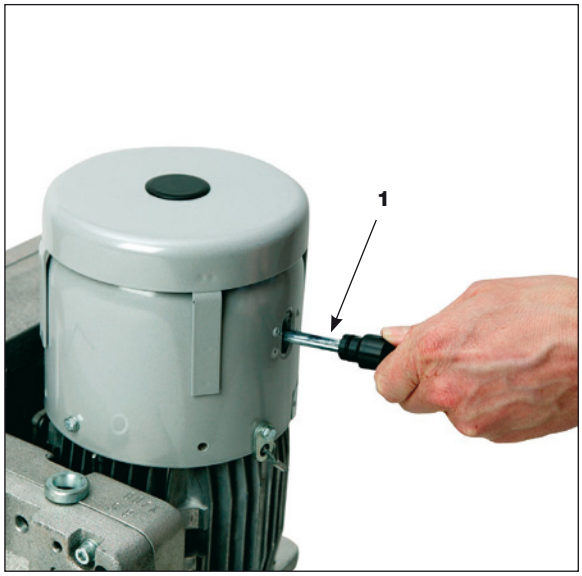
If a power failure or an operation fault etc. interrupts the lift, a manual EMERGENCY descent is possible.

7.1 EMERGENCY descent

a) Open the manhole by pushing the lid in the roof and operate the lift from above.
b) On top of the lift insert the leaver into the break leaver hole in front of the Traction hoist (Fig. 14 (1)).
c) Pull the leaver upwards. The work cage moves downwards. The build-in centrifugal force brake limits the pace of descent.
d) To stop, simply loosen the leaver.
e) After use, replace leaver in roof hole.

For emergency situation only

Fig. 14



7.2 Manual ascent

With the break open, the work cage can be pulled upwards using the hand wheel (Fig. 15).

a) Remove the rubber cap.
b) Mount the hand wheel [2] on the motor shaft and turn it counter clockwise with the brake [1] open.
c) After use, retract the hand wheel and leaver from the traction hoist and replace them in the roof holes. Replace the rubber cap.

Fig. 15

8. What to do if the safety gripping device engages

If the safety brake engages simply disengage by pusing down the lever (Fig. 16A) until it clicks. However this is not possible if the work cage is hanging on the wire - if so, see below.

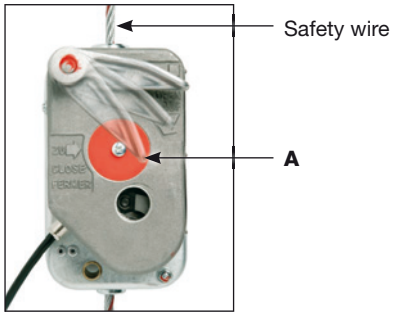
DANGER!
On lifting wire breaks or hoist failures, evacuate staff from the work cage.

The safety wire suspension and the attachment between the safety brake and the work cage are exposed to dynamic loads when a fall is blocked.

If the **safety brake has locked** and the work cage is **hanging on the wire** ascending is blocked. Do as follows:

a) Remove the load on the safety wire by taking the work cage upwards
   - On power failures operate the work cage manually as explained in section 7.2.
b) Manually open the two safety brake by pressing down leavers (Fig. 16A) until they disengage. On ground level perform **test as specified in Installation Manual section 4. e) and User's Manual section 5.6** before resuming normal operation.

Fig. 16



ATTENTION!
When the work cage has returned to ground level, test the safety brake function as specified in Installation Manual 4 e) and User's manual 5.6.

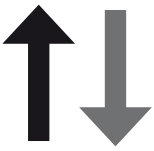
CAUTION!
Replace any defective safety brake components and return them for repair to the manufacturer.

9. Remedying break-downs

DANGER!
Avoid serious injuries:

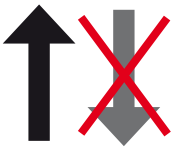
1. All tests and repairs of the electronic components should be performed by an **authorised electrician only!** The power chart is placed in the traction hoist's power cabinet.
2. Repairs on the traction hoist, the BLOC-STOP® safety brake and on the system's supporting components should be performed by **qualified fitters only!**

Break-down	Cause	Remedy
The work cage will **neither go up nor down!** 	**DANGER!** *Attempting to use the lift will jeopardise work safety!*	
	A1 The fixed EMERGENCY STOP button has been activated.	Deactivate the button in question by turning it clockwise until it pops out.
	A2 Wire loop on traction hoist. Damaged or defective wire or wire outlet causes problems.	**Stop work immediately!** Ask the supplier or manufacturer for help.
	A3 The safety brake aligning device is holding the work cage on the safety wire. a) Lift wire breakage b) Hoist failure	a) + b) Evacuate the work cage and follow the directions in section 9
	A4 work cage is stuck on an obstacle.	Carefully remove the obstacle. Test the operational safety of affected building sections. Inform the supervisor.
DANGER! *Unplug the power supply before opening the power cabinet.*	**A5 Failing power supply** a) Control not switched on or deactivated. b) Grid voltage interrupted. c) With 3-phase motors: Phases switched in the supply, the built-in protection against phase switching blocks control. d) Supply between grid connection and control interrupted.	a) Turn EMERGENCY STOP switch to the right until it is released. b) Find the cause and wait for the power to return. c) Have an electrician switch 2 phases in the plug. d) Test and possibly repair the supply cable, guide wires, fuses, and/or wiring from the control box.
	A6 Limit stop switch functions a) EMERGENCY limit stop switch was hit. b) **Door limit stop switch blocks** or is defective.	a) Manually take the lift up until the limit stop switch is released. b) Close the doors and test the limit stop switch.
	A7 Protection switch on overheating a) A phase is missing b) Lacking motor cooling c) Voltage too high/low	a) Test/repair fuses, supply and connection. b) Clean the hood. c) Measure voltage and power consumption on the loaded motor. If voltage deviates from specifications, use cable with increased dimensions.
	A8 Brake does not open (no click on on/off) a) Supply, braking coil or rectifier defective. b) Braking rotor closes.	a) Have an electrician test, repair/replace the supply, braking coil and rectifier. b) Return traction hoist for repair.

Break-down	Cause	Remedy
The work cage will neither go up nor down 	**A8 The HAND/AUTOM.** switch is on AUTOM.	Turn the HAND/AUTOM. switch back to HAND.
work cage goes **down but not up** 	**DANGER!** *Irresponsible behaviour jeopardises system safety!* **B1 work cage is stuck on an obstacle.**	Carefully move the work cage downwards and remove the obstacle. **Test the operational safety of affected platform components. Inform the supervisor.**
	B2 Overload - Buzzer sounds in the connection cabinet.	Test and possibly reduce load until buzzer stops.
	B3 Limit stop UP: a) Limit stop defective or not connected. b) Operation limit stop was activated	a) Test the limit stop connection/function. Replace if necessary. b) Move work cage down until the limit stop switch is released.
	B4 A phase is missing	Test fuses and power supply.
	B5 Fault in UP control circuit in control box or traction hoist	Test and possibly repair connections, wiring and relays.
Motor hums loudly or **wire ropes squeak,**  but the work cage can go both up and down.	**C1 Overheating**	For descriptions of individual causes and how remedy faults, see page 24 under item **A5**.
	C2 Wire ropes dirty **ATTENTION!** *Further use of work cage may result in damage to the wire traction.*	If possible, immediately replace the traction hoist and return it for test/repair at AVANTI.

DANGER!

Unplug the power supply before opening the power cabinet.

Break-down	Cause	Remedy
work cage will **go up but not down!** 	**DANGER!** *Irresponsible behaviour threatens the system's safety!*	
	D1 The work cage has encountered or is stuck on an obstacle.	Carefully take the work cage up and remove the obstacle. **Test the operational safety of affected platform components. Inform the supervisor.**
DANGER! *Unplug the power supply before opening the power cabinet.*	**D2 Either of the two safety brake devices is holding the work cage on the wire.**	
	a) Excessive hoist speed b) Too low release speed on safety brake.	a) + b) Take the work cage upwards to relieve the safety wire. Open both safety brake by pressing the handle, and test its function as specified in section 5.6 on page 20! **Functional test when the lift is back on the ground: Replace the hoist and safety brake and return them for testing.**
	DANGER! **A** *defective safety brake will threaten the safety of the work cage! Replace immediately!*	
	D3 Fault in down controller circuit on traction hoist	Insert brake leaver in the traction hoist and lower lift manually. (See details in section 7) Test, and if necessary have connections, wiring, and relays repaired. 
Green lamp not lit although operation is normal	**E The lamp is defective**	Have an electrician replace the bulb.

If these steps do not clarify the cause and remedy the fault:
Consult a qualified electrician or contact the manufacturer.

10. Out of service

a) **Securing the work cage:**
Bring the work cage all the way down, until the contact plate switch stops the cabin.

b) **Switch off the power supply** to prevent inadvertent operation of the work cage: Push in the EMERGENCY STOP button fixed – all controls are now blocked. Mark the work cage “OUT OF SERVICE”. Contact the service technician for repair.

11. Removing wires for replacement

CAUTION!
Wear protective gloves when handling wires.

11.1 Parking the work cage

Ascend the work cage until bottom safety stop engages.

11.2 Wire ends

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

11.3 Removing the lifting wire

a) Turn the “override bottom limit stop switch” key to the right and turn the direction selector towards DOWN until the cabin rests on the platform.
b) After having removed the drive wire contra weight turn the travel direction selector towards “DOWN”. The wire now exits the traction hoist at the top.
c) From above the traction hoist remove the wire by hand.

11.4 Removing the safety wire

a) Keep safety brake open and manually pull out the wire.
b) Pull out the wire on top of the work cage.

12. Maintenance

Time (Performance)	Component	Details on page
Daily: (Supervisor)	**Attachment components** **Traction hoist** **Control box** **Safety brake**	19-20
Annually: (Expert)	**Wires** **Electrical cable**	28-29
Annually: (Expert)	**Entire system**	28-29
Annually, however at least for every 250 hours of operation: (Expert)	**Traction hoist**	28
Annually: (Expert)	**Safety brake**	28

12.1 Yearly inspection

Have the entire system, especially the traction hoist and the safety brake tested by an AVANTI trained expert at least once annually however more frequently if required depending on use and the conditions of use and operation.
The traction hoist and safety brake must be overhauled at an authorized work shop and furnished with new certificate for every 250 hours of operation (Time counter is found in the power cabinet (Fig. 20 page 29).

ATTENTION!
If safety brake has engaged, an expert must verify the safety of the saftey break, the wire, and wire attachment.

The tower owner must ensure that results of all annual and extraordinary testing are logged (Appendix B).

12.1.1 Traction hoist

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

Annual test:
a) Ensure that no visual defects appear.
b) Test emergency descent function
(See Users's Manual section 7.1)

12.1.2 Safety brake

The safety brake is largely maintenance free. Clean only when very dirty. Keep free from dirt and lubricate often (See table 4, page 29). Using too much oil will not harm the equipment or the gripping function.

Annual test:
a) Test safety brake stop button.
b) Test safety brake stop button reset.
c) Release safety wire bottom attachment in tower and Perform wire acceleration test by hand (See Installation Manual 4 e) 2)).
d) Repeat with the second safety brake.

12.1.3 Work cage

Annual test:
Inspect the work cage as specified in User's Manual section 5.1.

12.1.4 Suspension/Wires/Cables

Always keep the wires clean and slightly greasy. Use ordinary universal lubricating grease, however, do **not** use bisulphide-containing lubricants like Molycote®.

Annual test:
a) Check and replace the respective wire(s) if one of the following defects are found:
- 8 **wire strand breaks** or more on a wire length corresponding to 30 times the wire diameter (Fig. 17).
- Severe **corrosion** on the surface or inside.
- **Heat damage**, evident by the wire colour.
- **Reduction of the wire diameter** by 5% or more compare to the nominal wire diameter (Fig. 18 page 29)
- **Damage on the wire surface** – See fig. 19 page 29 for most common examples of wire damage.

These examples do not, however, replace the relevant provisions laid down by **ISO 4309!**

b) Check and ensure all wires are mounted at the top and ground level in accordance to the mounting instructions (See Installation Manual section 2.1, 2.3, and 2.6 page 38 ff).

c) Power cables
Check and replace the supply and control cables if the cable jacket or cable connections are damaged.

d) Wire guide wheels
Ensure wires are lead round guide wheels in accordance to mounting instructions (See Installation Manual section 2.5 page 43).

Fig. 17
Wire strand breaks

Fig. 18 Wire diameter

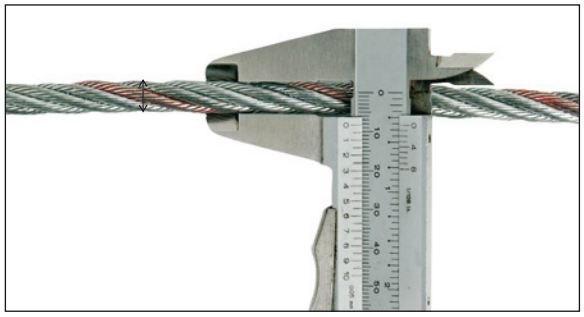


Fig. 19

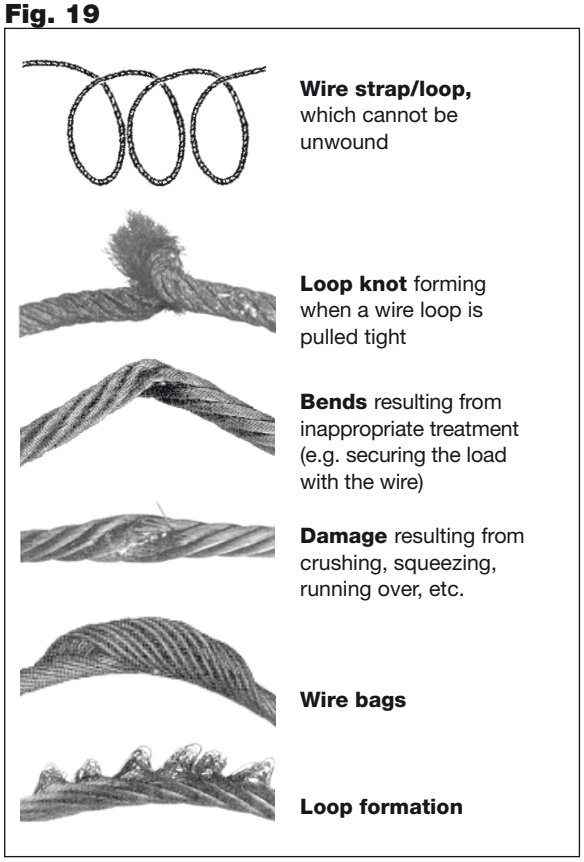


Table 4

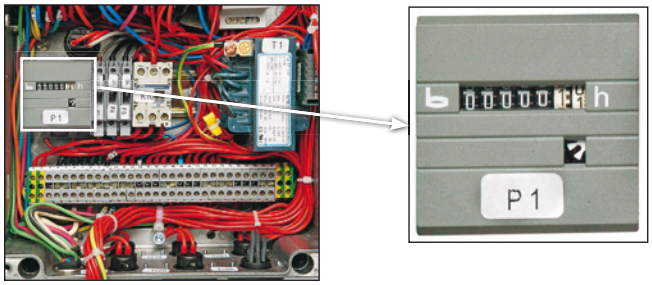
Temperature range	5°F to 176°F (-15°C to 80°C)	-31°F to 104°F (-35°C to 40°C)
API specification	Synthetic oil	
	CLPPG or	CLPPG or
	PGLP ISO VG 460[1)]	PGLP ISO VG 100
Oil specifikation	Klübersynth GH6 460	Klübersynth GH6 100
	Use of other synthetic oil only with approval by AVANTI.	

[1)] Standard filling

12.1.5 Overload limiter/information signs

Annual test:
Test switches as specified in User's Manual section 5.3 and 5.4. (page 18 ff.)
Perform overload test as specified in Installation Guide section 4.c) page 48)
Verify completeness and legibility of all rating plates and information signs. Replace missing or illegible plates and signs!

Fig. 20



12.2 Repairs

Repairs to traction hoist equipment may ONLY be performed by the manufacturer or a hoist service centre, and only using original spare parts.

If the gearbox oil needs to be replaced, use one of the lubricants specified in the following table, corresponding to the temperature range in which the traction hoist equipment is used.

Amount required:
traction hoist LE500P: **1.4 l.**

See table 4.

13. Ordering spare parts

13.1 Wire/ropes

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

13.2 Motor and brake

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

13.3 Electric control

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

13.4 Safety brake

In addition to the **item number** and **name of the spare part**, always state the **safety brake type**, the **wire diameter** and l**ift serial no.**

A spare parts list is available from the supplier or directly from AVANTI.

13.5 Rating plate/information signs

Verify the completeness and legibility of all rating plates/information signs (see Fig. 21). Replace missing or illegible plates/signs!

Rating plate on the work cage back frame

Information signs

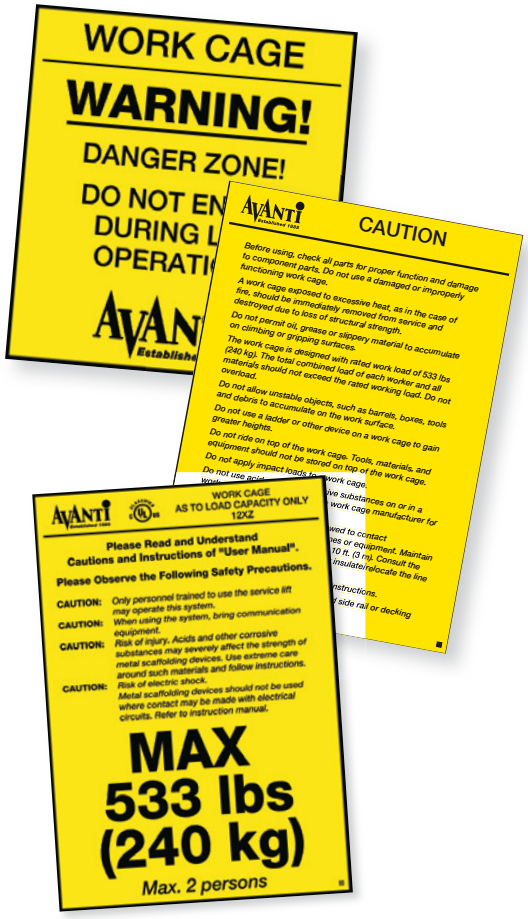
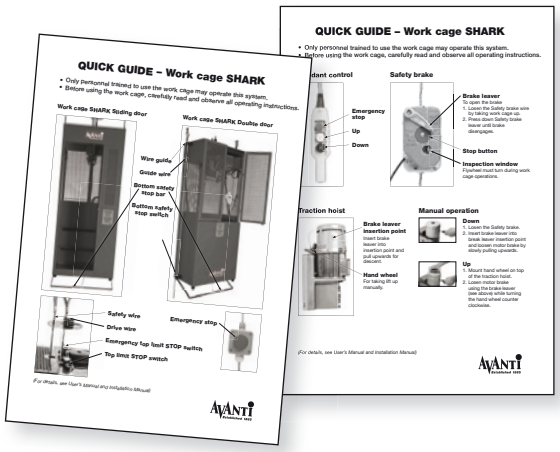


Fig. 21

Operating instructions inside the lift



Installation Manual

Please familiarise yourself with these instructions and the User Manual (Model SHARK) before installing the work cage. Ensure that all specified parts are present before commencing installation.

No warranty is provided against damage and injury resulting from not following this "User's Manual and Installation Manual" i.e. reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

1. Assembling SHARK cabin

The work cage SHARK version sliding doors and version double doors are assembled close to their final mounting position as follows:

Installation holes have been pre-drilled. Bolts, nuts etc can be found in the plastic bags supplied.

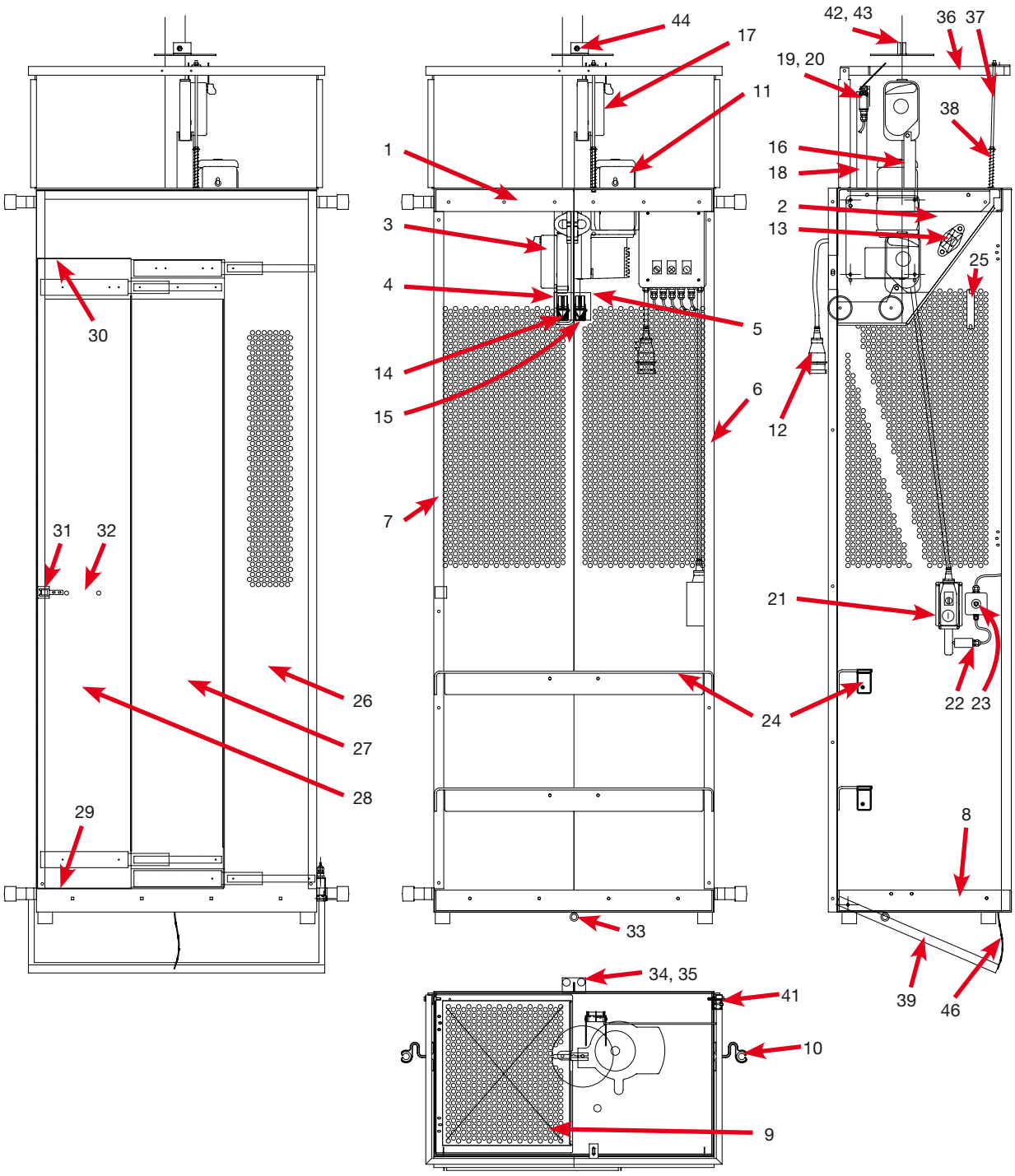
1. Assemble the right, left and bottoms sections with the cabin resting on its back.
2. Mount the roof spine and then slide the roof into position and fit to the cabin.
3. Fit the wire guides.
4. Mount the traction hoist and safety brake to the spine.
5. Attach the cabin front.
6. Mount the 4 bottom rubber feet to the bottom of the cabin.
7. Mount the operation limit stop switch and emergency limit stop switch on the roof using the contact bracket.
8. Attach the bottom safety stop beam including the wires that hold the bottom safety stop beam.
9. Bring the cabin to its upright position.
10. Double door version - Mount the doors remembering the ground wire at the top hinge.
11. Mount the steps and handle inside the cabin.
12. Feed the power cable through the rear hole and fit the socket to the back using the strips.
13. Mount the bottom safety stop switch and adjust. Connect the switch cables to the power cabinet according to the color code. All wires are secured using strips (max 200mm between strips).

All bolts and nuts are stainless steel.

DANGER!
If it is possible to enter underneath the work cage a double buttom safety stop must be fitted. (See Installation Manual page 32-34).

1.1 Parts list - SHARK Sliding door

Fig. 1



Parts list - SHARK Sliding door

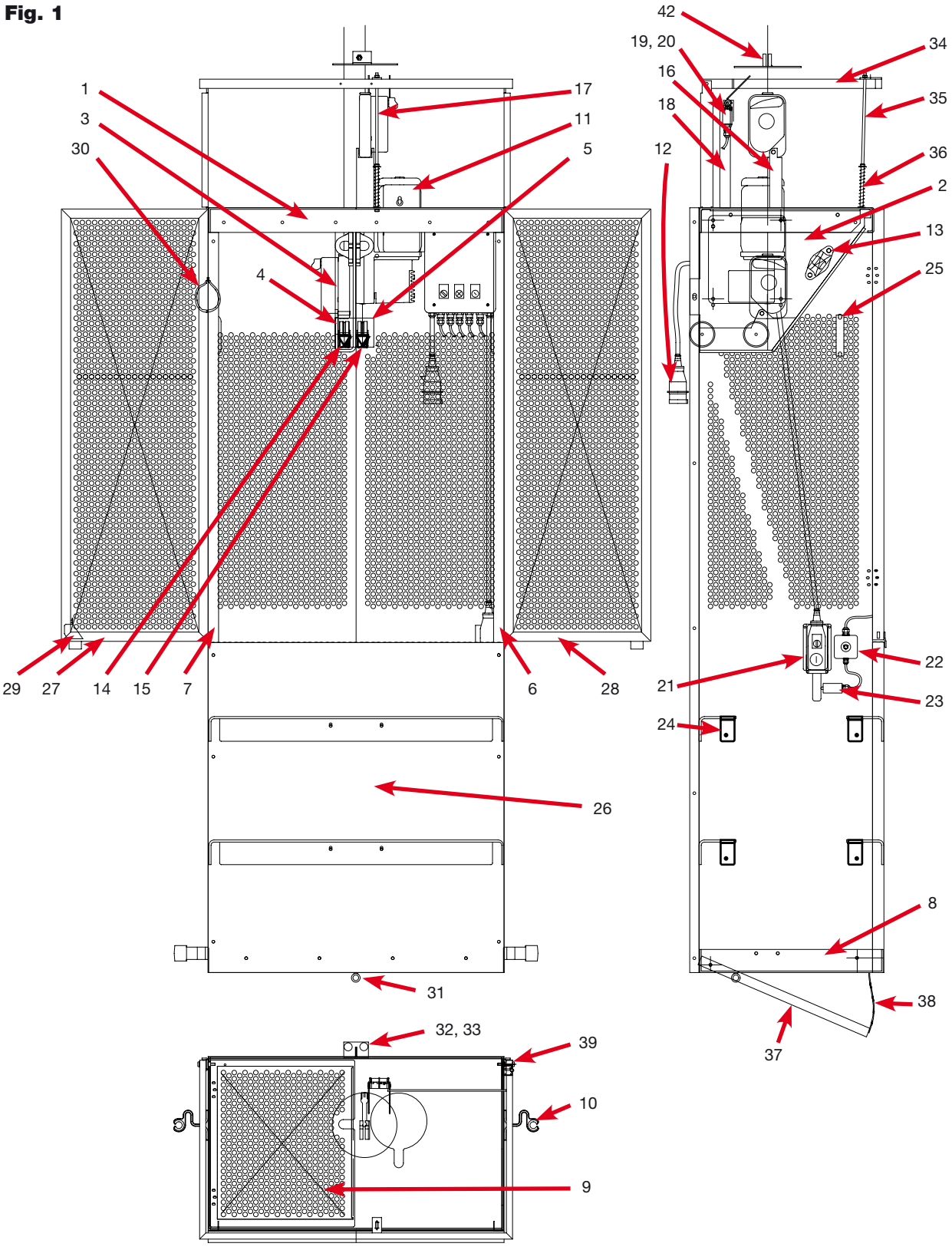
Pos.	Item no.	Part description	Pcs	Reference
1	45303112	Top(Shark L)	1	
2	45303107	Spine(Shark L)	1	
3	45108037	Safety brake BSO500E, UL.	1	
4	45303121	Guard small for Spine (Shark)	1	
5	45303120	Guard large for Spine (Shark)	1	
6	45303105	Cabin, right (Shark)	1	
7	45303106	Cabin, left (Shark)	1	
8	45303111	Bottom (Shark)	1	
9	45303117	Hatch (Shark)	1	
10	45511002	Wire guide	4	Install. fig. 14
11		Traction hoist, LE500P 480V or 690V, UL,3Ph/1E	1	
12	45502082	Hubbell-plug, female 480V	1	
13	45512004	Anchor point, yellow	2	
14	45570001	Roller 1 for spine (Shark)	2	
15	45547002	Roller 2 for spine (Shark)	2	
16	45303146	Bracket for BSO500, UL	1	
17	45108038	Blockstop BSO500, UL.	1	
18	45303145	Bracket for top switches+200mm	1	
19	45502071	Top stop swich (S1) /UL	1	Manual fig. 10
20	45502072	Emergency top stop switch (S13) /UL	1	Manual fig. 10
21	45303118	Pendant control holder (Shark)	1	Manual fig. 13b
22	45502074	Emergency stop button, Shark /UL	1	Manual fig. 13b
23		Override automatic operation switch		
24	45303116	Step (Shark)	3	
25	45512009	Handle for cabin, black	2	
26	45303153	Front for sliding door UL (Shark)	1	
27	45303154	Door-middel for Shark sliding door /UL	1	
28	45303155	Door-left for Shark sliding door /UL	1	
29	45303125	Door rail 1, Shark sliding door /UL	1	
30	45303126	Door rail 2, Shark sliding door /UL	1	
31	45502073	Door stop switch, Shark sliding door /UL	1	
32	45303124	Handle for Shark sliding door /UL	1	
33	79999562	Eye not, M8, FZV	1	
34	45303123	Angel for wirebush	1	
35	45512006	Guide for wirebush	2	

Parts list - SHARK Sliding door

Pos	Part no.	Part description	Pcs	Reference
35	45303143	Top stop bar /UL	1	
36	79999503	Threaded rod, M8, A2, m..	0,45	
37	45515004	Push spring for top safety stop	1	
38	45303128	Bottom stop bar (Shark)	1	
39	45512064	Wire Ø2,3mm, coated	0,62	
40	45502070	Bottom stop swich, Shark /UL	1	
41		Safety wire / Drive wire ø8	2	
42		Guide wire Ø12mm	2	
	45512005	Schackle, 2 ton	2	Manual fig. 13
	45303100	Tripod	2	Install. fig. 8a
	45512060	Threaded rod, M16, FZV, L=330mm	2	Install. fig. 8a
	45515001	Push spring for safety wire	1	Install. fig. 12
	45512011	Contra weight 11 kg for drive wire	1	Install. fig. 12
	45512001	Cable bucket	1	
		Power cable 4G1,5 /UL	1	
	45502080	Hubbell-plug, male 480V	1	
	45512003	Cable suspension	1	Install. Fig 9
	45512056	Snap hook, Galv. L=70mm	1	Install. Fig 9
	45511001	Wirefix	10	Install. fig. 14
	45512010	Bracke for wirefix 70	10	Install. fig. 14
43	45303101	Top stop disc	1	Manual fig. 2
	45541105	Quick-guide, English	1	Manual fig. 21
	45541106	Quick-guide, Spanish	1	
	45541011	“Warning”, UL- & CSA-approved	1	Manual fig. 21
	45541012	“MAX 533 lbs”, UL- & CSA-approved	1	
	45541025	Warning sign - hook on to anchor point	1	
	45541040	Rating plate for Shark /UL	1	Manual fig. 21
	Optional			
	45502053	Remote control, 2 transmitters	1	Manual fig. 9
	45502075	Flash, yellow 277v /UL	2	
	45502076	Base for flash	2	
	45502077	2nd base for yellow flash /UL	2	
	45303148	Fitting for UL-flash	12	
	35499011	Safety bar for sliding door	1	
	35499010	Double button stop		

1.2 Parts list - SHARK Double door

Fig. 1



Parts list - SHARK Double door

Pos	Part no.	Part description	Pcs	Reference
1	45303112	Top (Shark)	1	
2	45303107	Spine(Shark L)	1	
3	45108037	Safety brake BSO500E, UL	1	
4	45303121	Guard small for Spine (Shark)	1	
5	45303120	Guard large for Spine (Shark)	1	
6	45303105	Cabin, right (Shark)	1	
7	45303106	Cabin, left (Shark)	1	
8	45303111	Bottom (Shark)	1	
9	45303117	Hatch (Shark)	1	
10	45511002	Wire guide	4	Install. fig. 14
11		Traction hoist, LE500P 480V or 690V, UL,3Ph/1E	1	
12	45502080	Hubbell-plug, male 480V	1	
13	45512004	Anchor point, yellow	1	
14	45570001	Roller 1 for spine (Shark)	2	
15	45547002	Roller 2 for spine (Shark)	2	
16	45303146	Bracket for BSO500, UL	1	
17	45108038	Safety brake BSO500, UL	1	
18	45303145	Bracket for top switches+200mm	1	
19	45502071	Top stop swich (S1) /UL	1	Manual fig. 10
20	45502072	Emergency top stop switch (S13) /UL	1	Manual fig. 10
21	45303118	Pendant control holder (Shark)	1	Manual fig. 13b
22	45502074	Emergency stop button, Shark /UL	1	Manual fig. 13b
23		Override “automatic operation” switch	1	
24	45303116	Step (Shark)	4	
25	45512009	Handle for cabin, black	2	
26	45303108	Front for double door (Shark)	1	
27	45303109	Double door right	1	
28	45303110	Double door left	1	
29	45502078	Double door switch, Shark /UL	1	
30	45502007	Cable 1,5Q Flex yellow/green	0,55	
31	79999562	Eye not, M8, FZV	1	
32	45303123	Angel for wirebush	1	
33	45512006	Guide for wirebush	2	
34	45303143	Top stop bar /UL	1	
35	79999503	Threaded rod, M8, A2, m..	0,45	
36	45515004	Push spring for top safety stop	1	

Parts list - SHARK Double door

Pos	Part no.	Part description	Pcs	Reference
37	45303128	Bottom stop bar, (Shark)	1	
38	45512064	Wire Ø2,3mm, coated	0,62	
39	45502070	Bottom stop swich, Shark /UL	1	
40		Safety wire / Drive wire ø8	2	
41		Guide wire Ø12mm	2	
	45512005	Schackle, 2 ton	2	Manual fig. 13
	45303100	Tripod	2	Install. fig. 8a
	45512060	Threaded rod, M16, FZV, L=330mm	2	Install. fig. 8a
	45515001	Push spring for safety wire	1	Install. fig. 12
	45512011	Contra weight 11 kg for drive wire	1	Install. fig. 12
	45512001	Cable bucket	1	
		Power cable 4G1,5 /UL	1	
	45502082	Hubbell-plug, female 480V	1	
	45512003	Cable suspension	1	Install. fig 9
	45512056	Snap hook, Galv. L=70mm	1	Install. fig 9
	45511001	Wirefix	10	Install. fig. 14
	45512010	Bracke for wirefix 70	10	Install. fig. 14
42	45303101	Top stop disc	1	Manual fig. 2
	45541105	Quick-guide, English	1	Manual fig. 21
	45541106	Quick-guide, Spanish	1	
	45541011	“Warning”, UL- & CSA-approved	1	Manual fig. 21
	45541012	“MAX 533 lbs”, UL- & CSA-approved	1	Manual fig. 21
	45541040	Rating plate for Shark /UL	1	Manual fig. 21
	Optional			
	45502053	Remote control, 2 transmitters	1	Manual fig. 9
	45502075	Flash, yellow 277v /UL	2	
	45502076	Base for flash	2	
	45502077	2nd base for yellow flash /UL	2	
	45303148	Fitting for UL-flash	2	
	35499033	4-door folding type, Shark /UL	1	
	35499011	Safety bar for sliding door	1	
	35499010	Double button stop		

2. Mounting of wires

2.1 Tower top

Wire lengths depend on tower height and should be specified when ordering. The coils are marked with length; check for accuracy prior to mounting. Do not pull wire over any edges. Uncoil correctly (Fig. 5a).

ATTENTION!
Do not pull wire over edges.

IMPORTANT!
Place all wire coils on the top platform when tower is raised or use the tower mounting crane to place the wires on the top platform before nacelle is mounted. (It may also be possible to use the internal tower crane to hoist wires).

1) The Ø12 mm guide wire and the Ø8 mm drive and safety wires are mounted using the shackles supplied for the suspension beam at the top of the tower, with the guide wire outermost on either side. (Measures: See Fig. 6 and dimensions page 39).
2) Nuts and bolts are mounted. Lock with cotters.
3) The top stop disc is mounted on the suspension wire leaving at least 200mm between disc and shackle (See Fig. 5).
4) All wires are led to the bottom of the tower (See Fig. 5).

Fig. 5

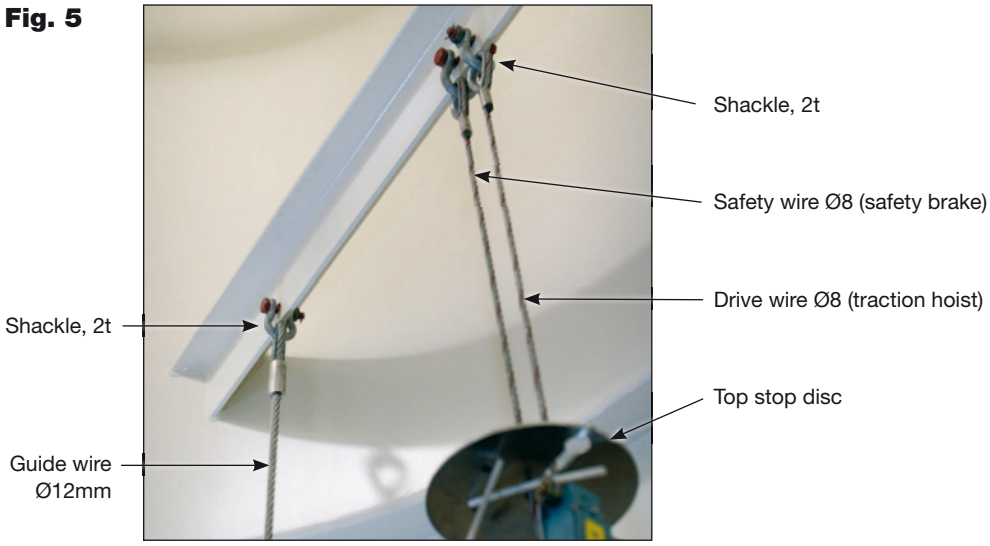
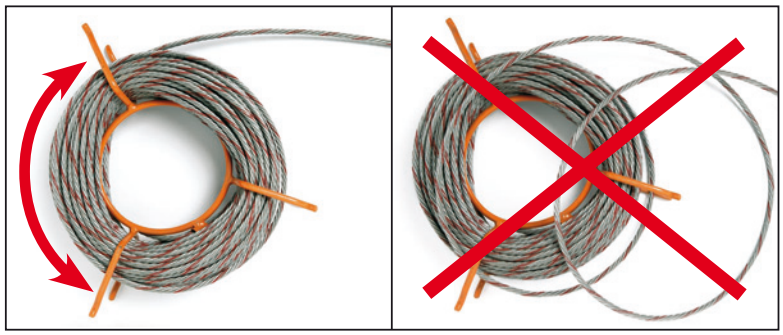


Fig. 5a

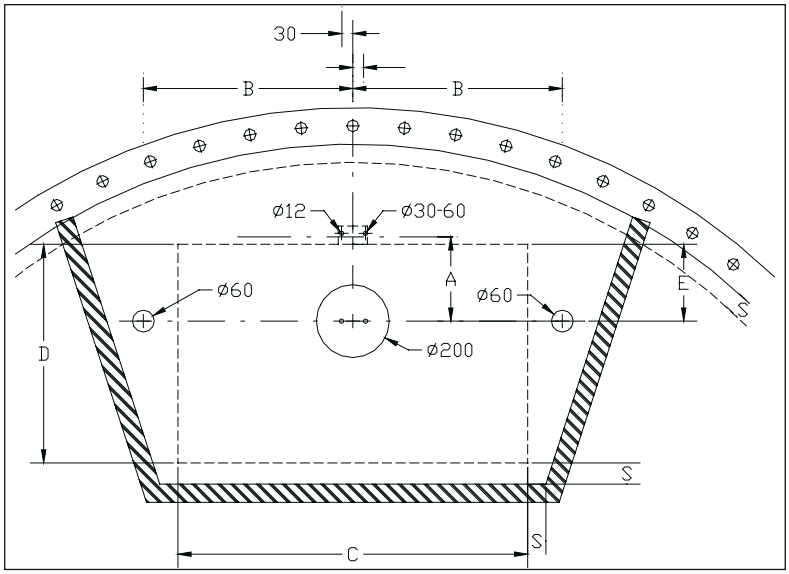


IMPORTANT!
All wires are evenly uncoiled as shown in Fig. 5a to prevent looping.

2.2 Measures for positioning of wires

Holes in base platform in the tower for wire bushing are positioned as outlined below.

Fig. 6



Minimum shaft clearance dimensions required for the work cage to run, and distance between the guide wires.

Dimensions:

Shark	A	B[1)]	C	D	E	S
L	240	575/510	960	600	220	50
XL	340	575/510	960	800	320	50

[1)] Standard wire guide/narrow wire guide (details page 46).

The holes are positioned with a tolerance of +/-5 mm. Hole with diameter Ø200 mm are fitted with rubber edging.

Attention!
Ensure that no obstacles are in the way of the work cage.

DANGER!
Ensure that lift evacuation to the tower ladder is possible.

2.3 Securing the guide wire - ground level

IMPORTANT:
Before feeding guide wires through the platform place correct number of wire fix on wire and feed wire through wire guides (See Fig. 7 and Fig. 14 page 46). Wire fix are mounted during first run.

Feed the guide wire through the 2 times Ø60mm holes in the platform. Underneath the platform the guide wires are fastened and tightened using one of the following three methods.

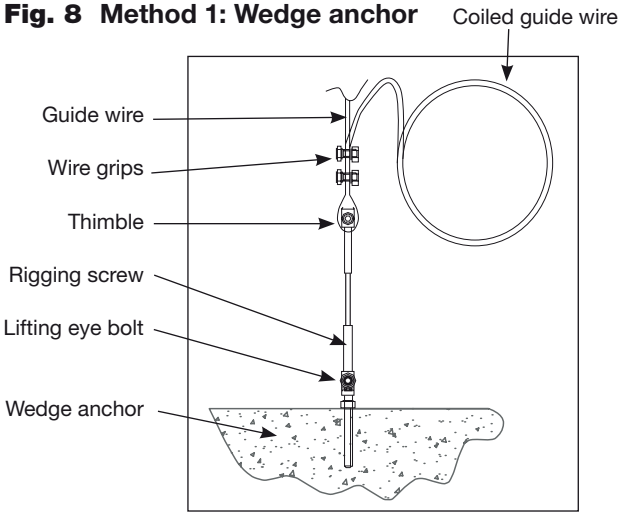
Fig. 7 Wire fix

2.3.1 Wedge anchor

Mount wire as shown in Fig. 8 following procedure below.

1) Drill two Ø16x75mm holes in the floor underneath the 2 Ø60mm holes in the platform.
2) Fasten the wedge anchors in the holes and mount an M16 lifting eyebolt.
3) After loosening the rigging screw as much as possible the rigging screw is fastened to the eyebolt in one end and the wire using wire grips in the other.
4) Tighten the wire as described in section 2.3.4. (page 41)
5) Excess wire is coiled and hung by means of wire strips. Use at least 3 strips.
6) Mount the second wire.

Fig. 8 Method 1: Wedge anchor



2.3.2 Tripod

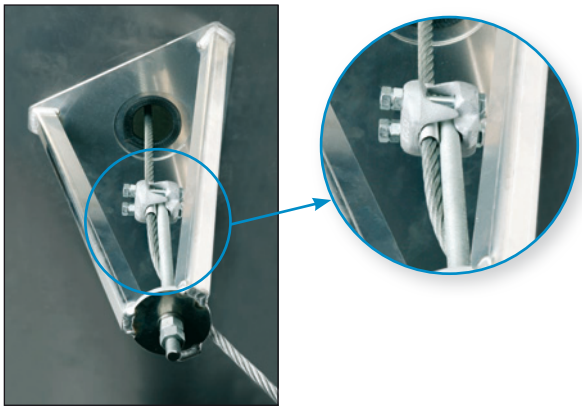
Pull the guide wire through the platform and fasten with tripod (See Fig. 8a.)

1) After feeding the guide wire through the platform continue feeding the wire through the tripod and the Ø16 mm x 1,5 mm aluminium tube.
2) Lock the aluminium tube, the wire, and the treated rod using a wire locking device. Make sure to place the tube so no contact appear between wire and treated rod. (See Fig 8a).
3) Tighten the bolts with 75 Nm.
4) Mount the second wire.

ATTENTION!
Check the distance between wires so that the wire fix and wires are in the centre of the wire guides (See Fig. 6 page 39).

ATTENTION!
Tighten the wire locking device after the first run.

Fig. 8a Method 2: Tripod



2.3.3 Steel beam

There may be a steel beam beneath the platform intended for work cage mounting. If so, use rigging screws as described in method 2.3.1 for mounting the guide wire to the steel beam.

2.3.4 Tensioning of the guide wires Ø12 mm

Tighten the wires by hand and mark with a water-resistant marker. Measure the distance to the floor.

- For 60 m long wires, stretch the wire 40 mm.
- For 80 m long wires, stretch the wire 50 mm.
- For 100 m long wires, stretch the wire 60 mm.

For each additional 20 m, stretch the wire by a further 10 mm.

After some time it may be necessary to stretch 60 m wire by another 5mm and longer wire by a further 7-10 mm (all wires stretches after some time).

ATTENTION!
This will tighten the wires to approximately 2000-4000 N.

2.4 Electrical connections

Connections

2.4.1 Power supply

DANGER!

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

The power supply must be protected by a fuse and an earth leak circuit breaker (30mA).

Disconnect the main power supply before handling power units.

Verify that the rated **grid and motor voltages** are identical.
The three-phase motor is normally supplied in a star connection configuration:

400 V,	3 phases + gnd.	I = 3.5 A	1.5 kW
480 V,	3 phases + gnd.	I = 2.0 A	1.5 kW

Control voltage: 230 V

2.4.2 Supply cable

a) The length of the cable depends on the height of the tower and the positioning of the power outlet. The cable length is found prior to ordering. The power cable is marked with length; check for accuracy before installing.
b) Minimum cross-sectional dimension of the supply cable. Important with increased distance between grid connection, generator, and traction hoist, respectively:

Table 3

	For cable lengths up to...
	190 m
1 hoist	**1.5**
	Cable-cross sectional dimension [mm²]

c) Use heavy rubber cable ducts for fastening live wire on work cage.
d) An installed generator will have to provide at least 2.5 times the output of the traction hoist.

Fig. 9 Cable suspension

2.4.3 Power connection

a) Push the EMERGENCY STOP button
b) Check that the various stop switches cables and safety brake cable are connected to the power cabinet according to colour code.
c) Place or hang the cable collect bin underneath the Ø200 mm hole in the platform.
d) Cut the transport strips and tape that holds the wire inside the bin and connect the cable suspension (Fig. 9) to the eyebolt underneath the work cage floor.
e) Connect the socket to the lift plug on the back of the work cage.
f) Connect the power cable plug to the grid:
400V / 3Ph + gnd. / 60 Hz
480V / 3Ph + gnd. / 60 Hz Pre-fuse: 10 A.
g) Turn the two EMERGENCY STOP buttons (Fig. 10 and Fig. 10a) clockwise to deactivate.
h) The power is turned on and the green indicator on the electrical control box lit. In order for the work cage to be operational the door must be locked and the HAND/AUTOM switch must be in HAND mode.

The wiring diagram is found in the Electrical control box.

Fig. 10

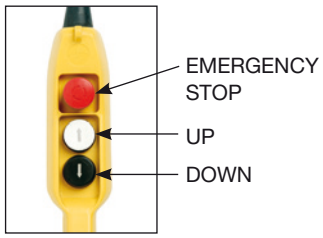
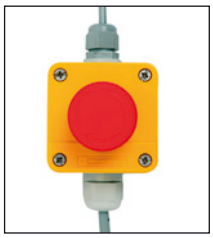


Fig. 10a



IMPORTANT:

If the traction hoist does not start, two phases in the supply connection have been switched around – the built-in protection against phase switching blocks the control. Remedy: Have an electrician switch the two phases in the plug.

2.5 Installation of drive and safety wire in work cage

CAUTION!
Wear protective gloves when handling wires.

2.5.1 Drive wire installation

a) Remove protection guard above rollers
b) Feed the wire through the roof into the traction hoist's wire inlet opening. (Right side seen from front of work cage).
c) Push the UP button on the pendant control and feed wire through until the traction hoist starts pulling. **Ensure that the wire can exit without obstruction!**
d) Continue feeding the wire underneath (round) the front guide wheel, over the back guide wheel, and through the back panel.
e) Let the lift wire pass through until it is slightly tightened.
f) Replace roller protection guard.
g) Feed wire through platform floor.

2.5.2 Safety wire installation

a) Remove protection guard above rollers.
b) Open the safety brake gripping device by pushing down the lever until it engages/clicks (Fig. 16 page 23). Feed the safety wire through the roof hole above the safety brake and continue by feeding through the safety brake.
c) Like the lifting wire, continue feeding the wire underneath (round) the front guide wheel, over the back guide wheel, and through the back panel.
d) On the back of the work cage pull the safety wire to tighten it.
e) Replace roller protection guard.
f) Feed wire through platform floor.

Fig. 11

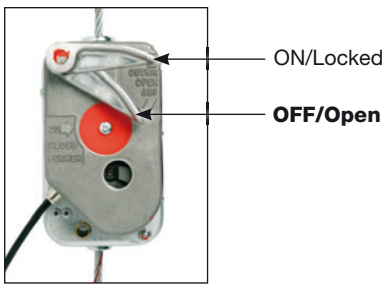
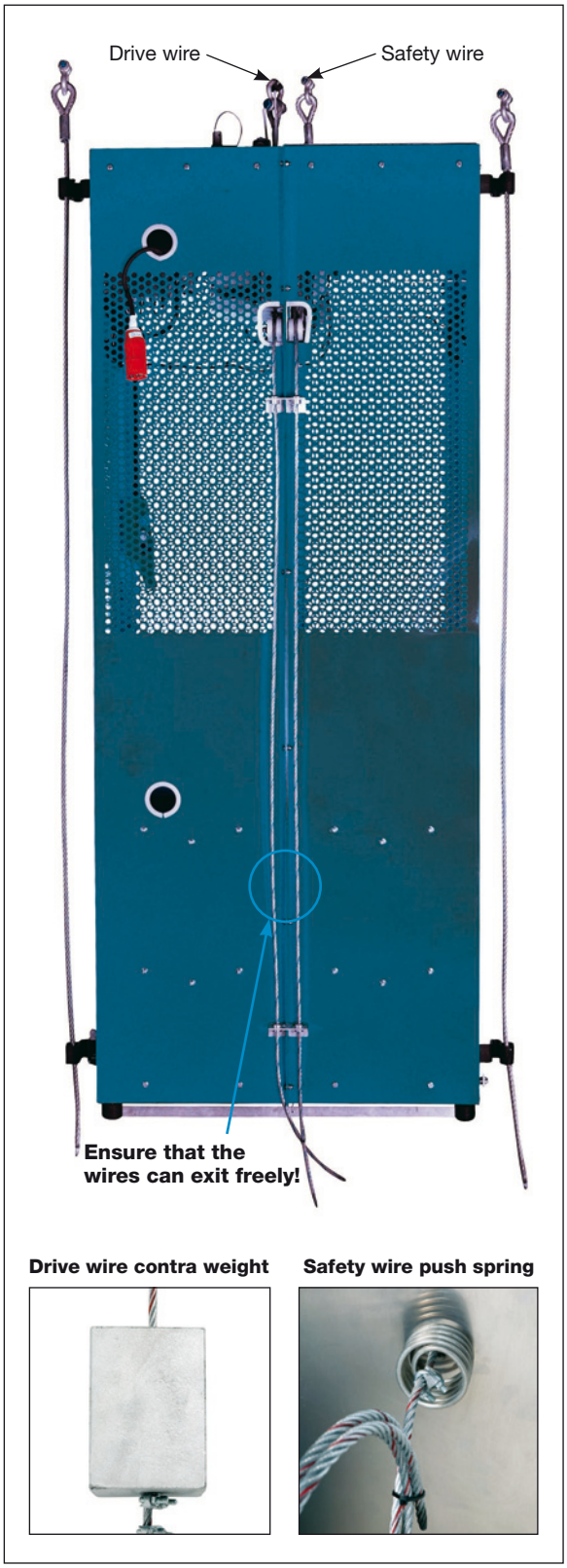


Fig. 12 Back side



2.6 Securing the drive and safety wire

The drive wire is fastened as described in point 2.6.1 beneath and the safety wire is fastened in one of three ways described in point 2.6.2, 2.6.3, or 2.6.4.

IMPORTANT!
Before fastening the safety wire carry out the safety brake test ***(See Installation Manual section 4.2) e) page 48).***

2.6.1 Drive wire contra weight

An 11 kg weight is mounted approximately 300mm above the floor on the drive wire. Excess wire is coiled with at least 3 strips (See Fig. 13).

Fig. 13 Method1: Drive wire contra weight

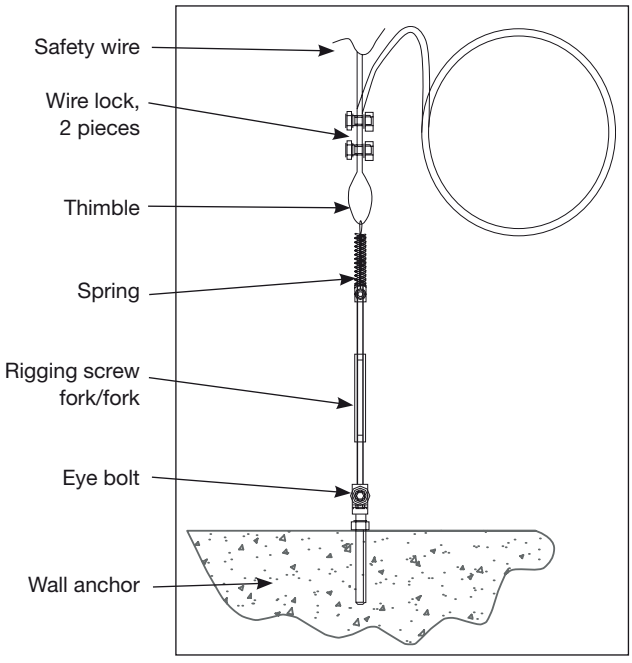
2.6.2 Safety wire – wedge anchor with spring

Like in point 2.3.1 above the wire is fastened using a rigging screw **with spring** (See Fig. 13a). Mounting safety wire without spring will cause the safety brake block often. Excess wire is coiled with at least 3 strips.

- At wire length of 60 m, tighten the rigging screw so the wire stretches 9 mm.
- At wire lengths of 100 m, tighten the rigging screw so the wire stretches 15 mm.

This will tighten the wire to approximately 400-500 N (88-100 Lbs).

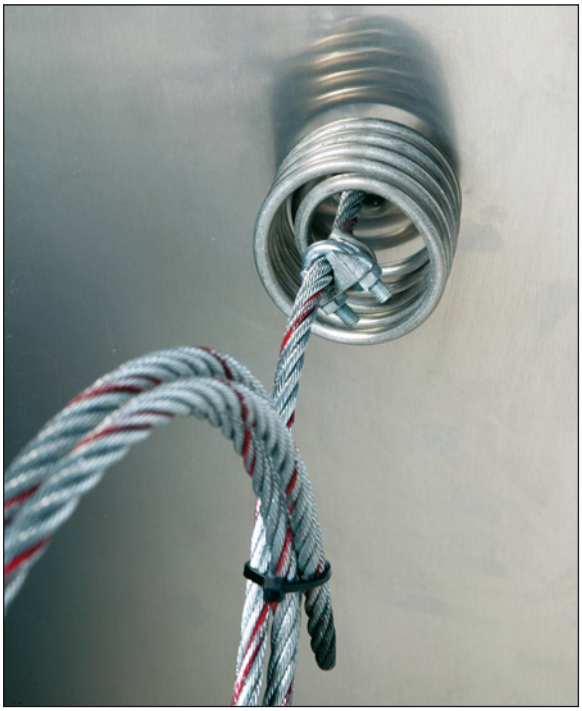
Fig. 13a Method 2: safety brake safety wire. Left wire on work cage viewed from the front



2.6.3 Safety wire – push spring

Underneath the platform the wire is fed through the two holes at each end of the push spring. The wire is then tightened as much as possible before being fastened with the wire locking device. If prior to mounting the spring was held tight by strips, cut them loose. If properly tightened, this will stretch the spring by approximately 15 mm (See Fig. 13b).

Fig. 13b **Method 3: safety brake safety wire. Left wire with push spring on lift viewed from the front**



2.6.4 Steel beam

There may be a steel beam beneath the platform intended for lift mounting. If so, use wire screws as described in method 2.6.2 for mounting the safety wire to the steel beam.

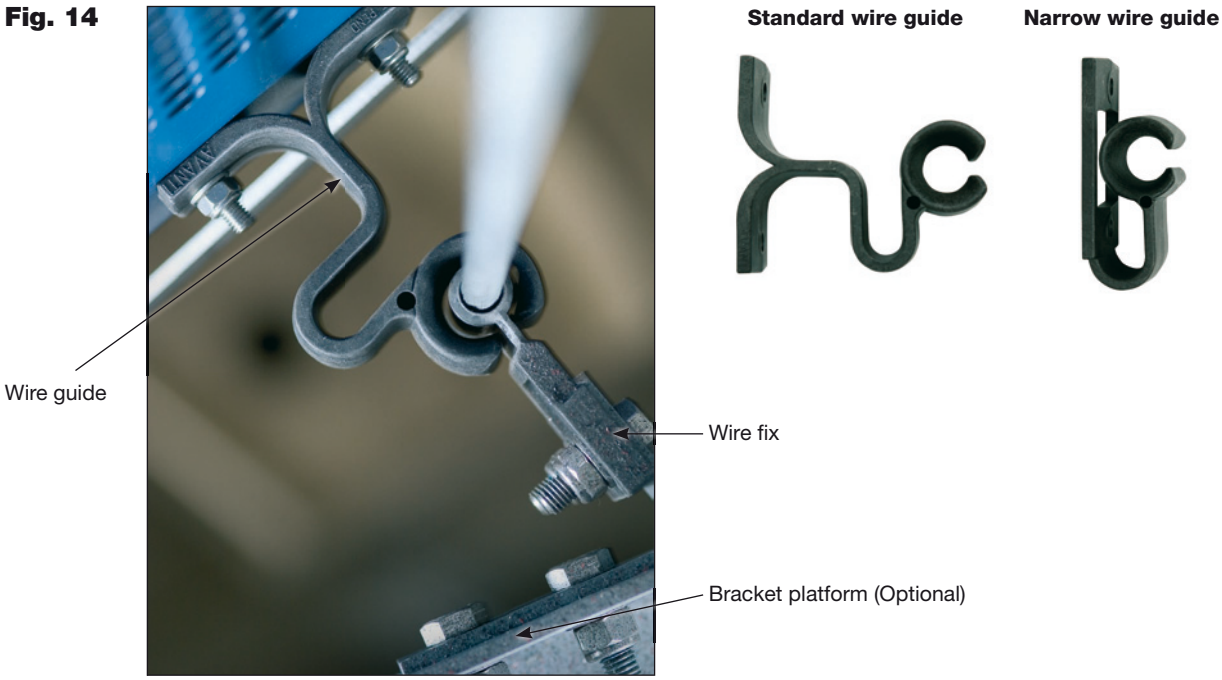
2.7 Wire fix alignment

Having mounted the work cage, the wires, and the power, the wire fix fittings are adjusted during the initial ascent.

a) Perform the tests prescribed in the User's Manual section 5 (page 19 ff.).
b) Install wires as shown in Fig. 14

By means of the oblong holes in the wire fix fittings, adjust the fittings so that the two parts pass each other easily, when the work cage passes.

Fig. 14



CAUTION!
Wire fix shall be mounted on guide wires at all platforms with max. 30 m between each wire fix.

ATTENTION!
During the first run make sure the power cable untwists evenly.

ATTENTION!
If tripods are used for guide wire fixing tighten the wire locking device after the first run.

2.8 Adjustment of top stop disc

The top stop disc is adjusted so the operation limit stop switch stops the work cage in alignment with the top landing platform, however at least 200 mm before contact with wire thimble.

The emergency limit stop switch is a backup. It is adjusted so it stops the work cage in case the operation limit stop switch fails (See User's Manual Fig. 10 on page 18).

The emergency limit stop shuts off everything, just like an emergency stop. If the emergency limit stop is activated, lowering can only be done manually as described on page 21 of the User's Manual. Manual lowering will activate the work cage again.

3. Danger zone! Sticker

Mount the sticker "Danger Zone" in the tower behind the work cage and the yellow marking ribbon on the floor. Make sure the wall and platform is clean and dry before attaching sticker and ribbon.

DANGER!

Make sure that nobody is exposed to danger below the work cage, for instance from falling parts.
Suitable measures: Pent roof or barriers.

The work cage is now ready for use.

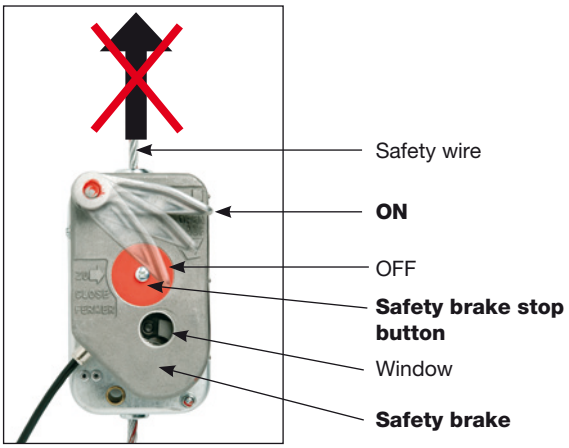
Prior to use, however, carry out the inspection specified in Installation Guide section 5!

4. Inspection before initial use

An officially recognised expert must:

a) Inspect the work cage as specified in section 11.1 of the User's Manual.
b) carry out a test run with the maximum rated load.
c) Overload test: The test load depends on the work cage motor. Load the cabin as follows: Motor LE500P: load 662 Lbs (kg 300) (125% of lifting capacity). When an attempt is made to start the work cage, the platform should stop, and the buzzer in the connection cabinet should sound.
– If not, see Appendix A: "Adjusting instructions for overload limiter" on page 49.
d) The guide, drive and safety wires as well as the top and bottom wire fastenings must be tested at full length as part of the initial test run.

Fig. 15



e) Testing of the two **safety brake safety gripping devices:**

IMPORTANT!
Before testing, the tightening spring beneath the access platform must be removed. Remember to secure it again after testing (Fig. 13a or 13b pages 44-45)!

DANGER!
If the safety brake safety gripping device is engaged, it must not be possible to pull the safety wire upwards!

1) Engage the safety brake by pressing the stop button – the handle should jump to the "ON" position (Fig. 15).
Should it nevertheless be possible to pull the safety wire upwards, the safety brake must be replaced and sent to the supplier for testing.
2) Reopen the safety brake by pressing down on the lever. On top of the lift, pull up the safety wire with a quick jerk – the safety brake should now engage automatically; if it does not, replace it and return to the supplier for testing.

f) Repeat the control with the second safety brake.

g) If guide wires are mounted using the tripod now tighten the tripod wire locking device.

The results from this test must be recorded in writing and saved for later reference (Appendix B page 47 f).

Appendix A: Adjusting instructions for overload limiter

CAUTION!
Avoid injuries by strictly following the instructions!

a) Verification and/or adjustment of the overload device on the work cage can only be done by a qualified person, who must have been instructed by AVANTI to perform this task.
b) Verification and/or adjustment must be performed under the supervision of the site foreman respectively another person authorized by the manufacturer.
c) One copy of this instruction must be provided to the personnel and always be available.
d) Other alterations/modifications of the work cage than necessary for adjusting the overload device are not allowed, unless the manufacturer has agreed to in writing.
e) AVANTI assumes no liability for damages due to retrofit/alterations on equipment or where non-original spare parts are used, especially the prescribed traction hoist wire rope, that the company has not approved in writing.
f) The manufacturer of the work cage assumes no liability for damages due to retrofits and alterations on equipment or where non-original spare parts are used that the company has not approved in writing, and the UL/CSA approval becomes invalid.
g) The result of the verification/adjustment of the overload device must be written down in the "Test report of annual inspection" and must be signed by the supervisor. If only adjusting takes place (no annual inspection) simply fill in point 5.9 and sign.

1 Purpose of this instruction

It may occur that the overload limiter inside the traction hoist of the work cage stops the upwards travel, although the work cage is not under overload.

In the case that other causes can be excluded by following the instructions of section 2.2, the overload limiter has to be adjusted according to section 3.2.

[1] With older hoists you may need an allen key **size 6**.

2 Adjusting instruction

2.1 Preparation

Required tools/material:
- **Allen keys**, size 2 and 4 [1],
- **ballast** for applying the **test load;**
  NOTE! Before driving to the work cage make sure, that the work cage can be loaded with the **admissible test load**, i. e. „safe working load" + 25%:

IMPORTANT!
Before leaving for the tower make sure you bring the needed test load of 660-880 Lbs (300-400kg).

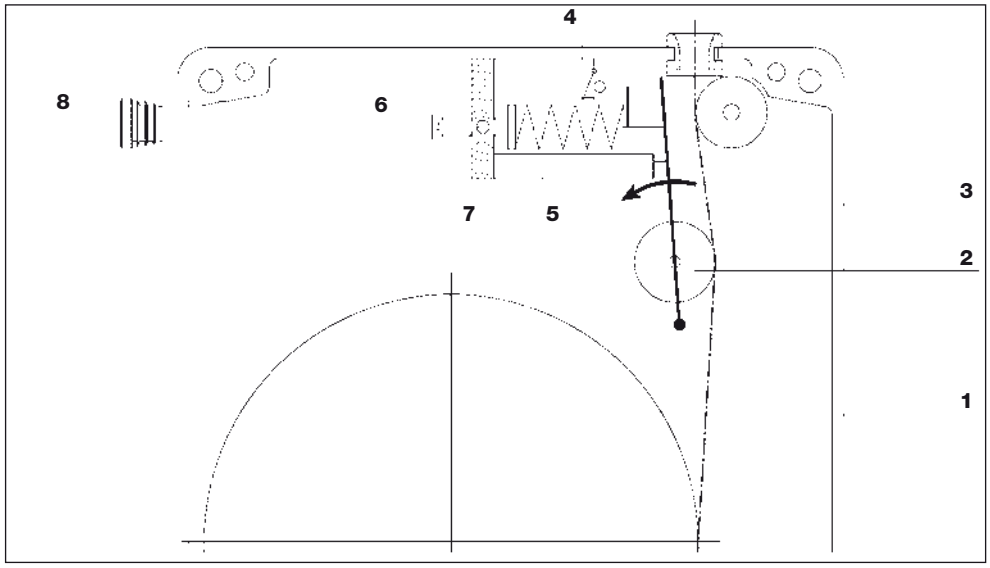
We recommend to:
- **weighing the person(s)**, who can climb into the work cage during the test procedure, **and**
- **bring** enough **weighed ballast** (sandbags or similar).

2.2 Exclusion of other causes

Before modifying the overload limiter settings **check if the upwards travel stopping is caused by other reasons:**
a) If the cage is guided by wire ropes or ladder: Check for **obstructions** on the **guiding device(s)** and remove them.
b) Check trouble-free **wire rope guiding** at **diverter pulley** or similar:
   - Is the rope nowhere blocked/squeezed?
   - Do the pulleys freely rotate? (Check with the work cage set to ground with no load on the ropes, or by a person from outside the cage, when going up and down.)
c) When starting, does the **primary brake open?** You can hear the „klick-sound", respectively feel a mechanical shock, when putting your hand on the motor fan cover.

In the cases b) and c) **have the trouble be corrected/repaired by a qualified person.**

Fig. 16



3 Overload limiter

3.1 Function (Fig. 16)

The traction hoist wire rope under load (1) activates the lever (3) by means of the deflection pulley (2).
Under overload the limit switch (4) is activated, which stops the upwards travel and, on man-riding installations, activates a warning signal.

A hydraulic shock absorber (5) neutralizes the dynamic overload when starting the hoist.

3.2 Adjusting

a) Apply the **Max work load** (MWL) (see work cage name plate) to the cage and close the door.
b) Activate the control and push the UP-button. When **upwards travel is NOT possible**, go down to the parking position and adjust the setting of the overload limiter:
c) Apply the **test load = MWL + 25%**
d) Loosen set screw (7) in casing cover with Allen key (size 2).
e) Remove the cap (8). Put Allen key (size 4[1)], 150 mm long) into the adjusting screw (6).
f) Turn the adjusting screw (6) clockwise, until the test load can be lifted.
g) **Step by step reduce the trigger point** of limit switch (4) by means of the adjusting screw (6), until the test load can no more be lifted:
   1) Turn the adjusting screw by **1/4 turn anti-clockwise** to reduce the trigger point;
   2) push UP-button
      – **Upwards travel is still possible?**
      YES: Stop, go down with the cage and repeat step 1).
      NO: Continue with h).
h) Tighten set screw (7).
i) Take off the tools.
k) Insert the cap (8) to the casing hole.
l) Fill in the ”Test report of annual inspection” check point 5.9 and sign.

1) With older hoists you may need an Allen key **size 6**.

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