OPTIMUM 8 - OPTIMUM 1931 E

Maintenance Book

# OPTIMUM 8
# OPTIMUM 1931 E

4001069810 E 06.21 USA / GB

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# A- Preface - Foreword

**You have just purchased a HAULOTTE® product and we would like to thank you for your business.**

The Aerial Work Platform is a mechanical device primarily designed and manufactured with the intent to position people with the necessary tools and material to overhead elevated temporary workplaces. All other uses or alterations/modifications to the aerial work platform must be approved by HAULOTTE®.

This manual shall be considered a permanent component of the machine and shall be kept with the aerial work platform in the designated Manual Holder, at all times.

Safe operation of this product can only be assured if you follow the operating instructions contained in this manual are followed. To ensure proper and safe use of this equipment, it is strongly recommended that only trained and authorized personnel operate and maintain the aerial work platform.

We would particularly like to draw your attention to 2 essential points :

- Compliance with safety instruction (machine, use, environment).
- Use of the equipment within the performance limits.

With regard to the designation of our equipment, we stress that this is purely for commercial purposes and not to be confused with the technical specifications. Only the specifications in this manual should be used to study the suitability of the equipment for the intended use.

This maintenance and repairs book is specific to the HAULOTTE® products listed on the cover page of this manual. The maintenance book is intended for the on-site maintenance technician.

It is the on-site maintenance technician's duty to carry out the regular maintenance work recommended by HAULOTTE Services®.

This maintenance work is essential for correct machine operation.

If regular maintenance is not carried out, this may :

- Void the warranty.
- Cause machine malfunction.
- Reduce machine reliability and shorten its service life.
- Jeopardize operator safety.

**To ensure that the regular maintenance requirements are fully satisfied, contact HAULOTTE Services®.**

**HAULOTTE Services® technicians are specially trained to carry out extensive repairs, interventions or adjustments on the safety systems or elements of HAULOTTE® machines. They carry genuine HAULOTTE spare parts and tools as required, and also provide fully documented reports on all work completed.**

# 1 - Symbols and colors

Symbols and colors are used to alert the operator of safety precautions and/or to highlight important safety information.

The following safety symbols are used throughout this manual to indicate specific hazards and the hazard severity level when operating or maintaining the Aerial Work Platform.

**S y m b o l**

| Symbol | Description |
|---|---|
|  | Danger : Risk of injury or death |
|  | Caution : Risk of material damage |
|  | Prohibition relating to work safety and quality |
|  | Reminder to use good practice or follow pre-operation checks |
|  | Cross-reference to another part of the manual |
|  | Cross-reference to another manual |
|  | Cross-reference to repair (contact HAULOTTE Services®) |
|  | Maintenance sheet |
|  | Recommended tools |
|  | Recommended part |
|  | Safety |
| N.B. : | Additional technical information |

## D e c a l s

| Color | Title | Description |
|---|---|---|
| | DANGER | Danger : Indicates a hazardous situation which if not avoided, WILL result in death or serious injury. |
| | WARNING | Warning : Indicates a hazardous situation which if not avoided, COULD result in death or serious injury. |
| | CAUTION | Caution : Failure to comply could result in minor or moderate injury. |
| | NOTICE | Notice : Indicates practices not related to personal injury. |
| | PROCEDURE | Procedure : Indicates a maintenance operation. |

***N.B.-:-THE FOLLOWING SAFETY ADVISORIES ARE USED THROUGHOUT THIS MANUAL TO INDICATE SPECIFIC HAZARDS WHEN OPERATING OR MAINTAINING THE TELEHANDLER.***

# Notes

# 1 - General safety rules

## 1.1 - MAINTENANCE IMPLEMENTATION

Your safety and the safety of the people around are essential.

Make sure the work area is clean in order to not to pollute the system of the machine.

Before performing any maintenance interventions, place the machine in maintenance configuration.

The maintenance stand must be in place before any maintenance operation is begun.

**Placing the machine in maintenance configuration :**

- Lift scissor arms to a sufficient height (floor of the platform at around 2,5 m / 8 ft 2 in from the ground).
- Pull the plastic handle and put the stand in the vertical position.
- Release the handle. The stand should remain in the vertical position.
- Lower the scissor arms.
- Scissor arm pivoting rod should rest on the V groove of the stand.
- Push the E-stop button to cut off the electricity supply.

**Putting in use position :**

- To put back the machine into its normal operation, reverse the steps used above.

Never leave the hydraulic cylinders fully extended before switching off the machine, or when stationary for an extended period of time. Keep the elements of the machine in configuration of maintenance thanks to mechanics devices.

Report that the machine is under maintenance by tagging the platform and ground control boxes.

**Note :**

- Using the machine during maintenance is strictly forbidden.
- Do not climb onto the covers.
- The handling of parts must be carried out using appropriate equipment (Chains, Lifting slings, Lifting anchors).
- Plug the end of any hoses removed, and cap any open ports to prevent contamination during maintenance.

### 1.2 - UNCONTROLLED MOVEMENT HAZARD

Be aware of uncontrolled movement and always respect the following :

- Maintain clearance from high voltage lines.
- Maintain clearance from generators, radar, electromagnetic fields.
- Never expose the batteries or electrical components to water (high pressure washer, rain).
- Never tow the machine over extended distances.
- In case of a machine breakdown, it is possible to tow short distance to load it onto a trailer.
- Never leave the hydraulic cylinders fully extended before switching off the machine, or when stationary for an extended period of time.
- Put the machine in stowed position.
- Select a safe parking location, on a firm level surface, clear of obstruction and traffic.
- Ensure all compartments are closed and secured.
- Chock the wheels.

## 1.3 - ELECTRIC SHOCK HAZARDS

The machine is not electrically insulated and does not provide protection from contact or proximity to electrically charged conductors.

Always position the lift at a safe distance from electrically charged conductors to ensure that no part of the machine is within an unsafe area.

Respect the local rules and the minimum safety distance from power lines.

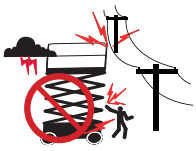
**Minimum safe approach distances**

| Electric voltage | Minimum safety distance | |
|---|---|---|
| | Mètre | Feet |
| 0 - 300 V | Avoid contact | |
| 300 V - 50 kV | 3 | 10 |
| 50 - 200 kV | 5 | 15 |
| 200 - 350 kV | 6 | 20 |
| 350 - 500 kV | 8 | 25 |
| 500 - 750 kV | 11 | 35 |
| 750 - 1000 kV | 14 | 45 |

***N.B.-:-THIS TABLE IS APPLICABLE, EXCEPT WHEN THE LOCAL REGULATIONS ARE MORE STRICT.***

Do not operate the machine :

- Do not operate the machine when close to live power lines, consider the movement of the machine and the sway of the electric power lines particularly in windy conditions.
- Do not operate the machine during lightning, thunderstorms, snow/ice or any weather condition that could compromise operator safety.
- Do not operate the machine during lightning or storms.
- Do not use the machine as a welding earth.
- Do not wash electrical components with a high pressure washer.
- Do not weld on the machine without first disconnecting the battery terminals.
- The machine must not be used while charging the batteries.
- When using the platform AC power line, ensure it is protected with a circuit breaker.



Keep away from the machine if it contacts energized power lines. Personnel on the ground or in the platform must not touch or operate the machine until energized power lines are shut off.

In the event of accidental contact with a high voltage line, wait for the power to the line be de-energized before attempting to operate the machine.

## 1.4 - Explosion / Fire Hazards

Always wear protective clothing and eye wear when working with batteries and power sources/systems.

***N.B.-:-Acid is neutralized with sodium bicarbonate and water.***

- Do not work in an explosive or flammable atmosphere / environment.
- Do not touch hot components.
- Do not bridge the battery terminals with metallic objects.
- Do not service the battery in proximity of spark, open flame, lit cigarettes.

# 2 - Maintenance and repair training

## 2.1 - OWNER'S RESPONSABILITY

The owner (or hirer) has the obligation to inform technician of the instructions contained in the Operator Manual and Maintenance Book.

The owner (or hirer) has the obligation to renew all manuals or decals that are either missing or in bad condition.

Additional copies can be ordered from HAULOTTE Services®.

The owner (or hirer) is responsible for applying the local regulations regarding maintenance of the machine.

## 2.2 - TECHNICIAN'S RESPONSABILITY

The technician must read and understand the contents of this manual, operators manuals and the decals affixed on the machine.

The technician must inform the owner (or hirer) if the manual or any decals are missing or in poor condition, and of any malfunction of the machine.

**Only authorized and qualified operators may operate HAULOTTE® machines.**

## 2.3 - HAULOTTE SERVICES®

The HAULOTTE® is at your service in all 5 continents of the world via an extensive network of its own factory trained technicians, who are ready to respond to your every need.

## 2.4 - TRAINING

Whether you want to just service your equipment or carry out a complete overhaul, HAULOTTE® can provide you with a structured training program or we can tailor a program to suit your specific requirements or circumstances. Training can cover the general operation of the equipment, breakdowns, engine maintenance and repairs and electrical/hydraulic/mechanical repairs and trouble shooting.

## 2.5 - PRODUCT MODIFICATION

In a constant effort to improve the quality of machines, HAULOTTE continually monitors technical improvements that enable to develop products with improved safety and greater reliability. The target being that HAULOTTE® always work to build confidence in the relationships with our customers.

These improvements will be shared via the following documents :

- OI : Obligatory Intervention, Safety information requiring immediate action (take into account by HAULOTTE®).
- NI : Technical improvement requiring immediate action (take into account by HAULOTTE®).
- RI : Improvement proposed to customers to take into account during maintenance operation.
- PI : Product information for knowledge.

## 2.6 - AFTER SALES SERVICE

Our HAULOTTE Services® After Sales Service is at your disposal throughout your machine's service life to ensure the optimum use of your HAULOTTE product :

- When contacting our After Sales Service, ensure that you provide the machine model and serial number.
- When ordering any consumables or spare parts, please use this manual and the HAULOTTE® Essential catalogue to receive your genuine HAULOTTE® spare parts, your only guarantee of parts interchangeability and correct machine operation.
- If there is an equipment malfunction involving a HAULOTTE® product, then contact HAULOTTE Services® immediately even if the malfunction does not involve material and/or bodily damage.

## 2.7 - PRODUCT INFORMATION

Without the written permission from Haulotte, modifying a HAULOTTE® product is a Safety concern. Any modification may violate Haulotte design parameters, local regulations and industry standards.

If you desire a modification to the product, submit a request in writing to HAULOTTE.

With the utmost care to ensure enhanced reliability and greater safety of the HAULOTTE® products, it is pertinent that when a "Service or Safety Bulletin" is issued, action is taken immediately. Once the bulletin has been addressed, make sure that the completed form is submitted to HAULOTTE Services®.

Do not hesitate to contact HAULOTTE Services® , should you have any questions relating to the issued bulletin(s) or with questions on the policy itself.

## 3 - Conditions of warranty

Our warranty conditions and extension contracts are now available on the websites of our sales network : www.haulotte.com

# Notes

# C- Familiarization

## Notes

# 1 - Primary machine components

## 1.1 - LAYOUT

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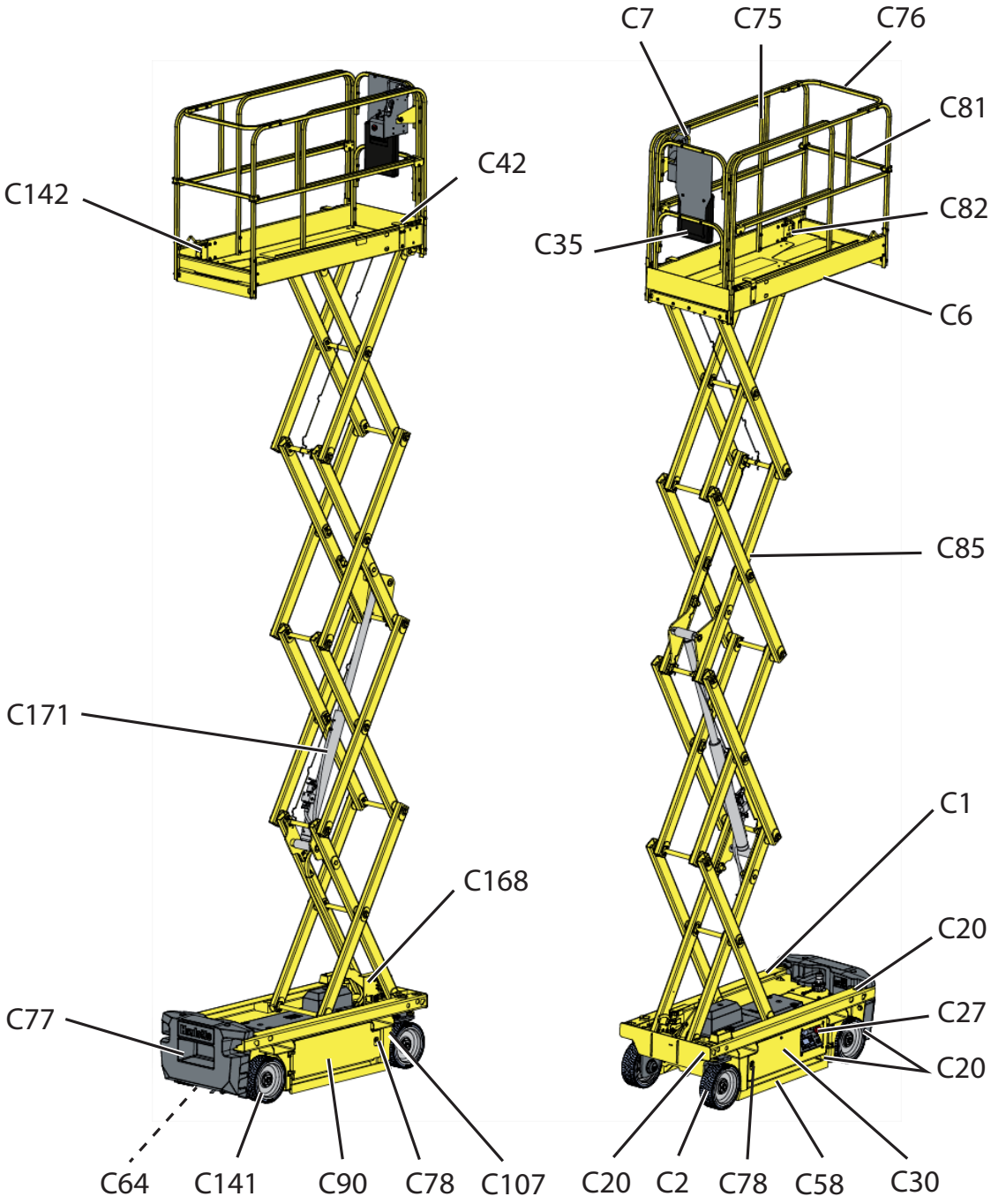


# C - Familiarization

| Marking | Description | Marking | Description |
|---|---|---|---|
| C1 | Chassis | C77 | Platform access ladder |
| C2 | Front drive wheels | C78 | Compartment locking latch |
| C6 | Platform | C81 | Sliding guardrail |
| C7 | Platform control box | C82 | Extension deck lock pin |
| C20 | Tie-down (and/or forklift loading) | C85 | Scissors |
| C27 | Ground control box + Universal plug | C90 | Battery bay (block) |
| C30 | Hydraulic oil tank | C107 | Pull T-handle for emergency lowering |
| C35 | Document holder | C141 | Rear wheel |
| C42 | Foot Switch (For Japan only) | C142 | Lanyard attachment points |
| C58 | Pothole protection | C168 | Maintenance support |
| C64 | Tilt sensor | C169 | Folding guardrails / Swing gate (Optional - Not shown) |
| C75 | Extension deck | C171 | Scissors lifting cylinder |
| C76 | Guardrail | | |

**Universal plug**

## 1.2 - MAINTENANCE SUPPORT

The maintenance stand must be in place before any maintenance operation is begun.

Placing the machine in maintenance configuration :

- Lift scissor arms to a sufficient height (floor of the platform at around 2,5 m / 8 ft 2 in from the ground).
- Pull the plastic handle and put the stand in the vertical position.
- Release the handle. The stand should remain in the vertical position.
- Lower the scissor arms.
- Scissor arm pivoting rod should rest on the V groove of the stand.

Putting in use position :

- To put back the machine into its normal operation, reverse the steps used above.

## 1.3 - EXTENSION DECK

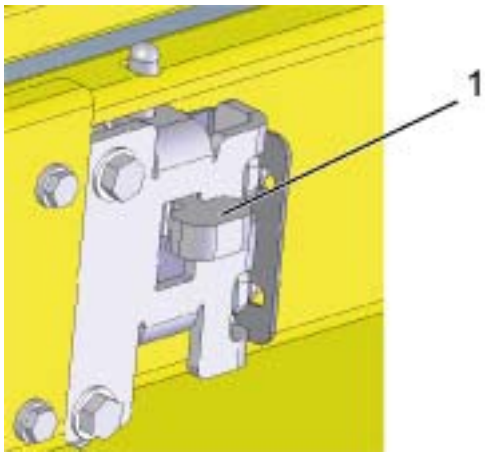
***N.B.-:-DO NOT LOAD THE EXTENSION DECK, FOR EASE OF MANOEUVRING.***

Ensure that gate or sliding bar is in it's proper closed position.

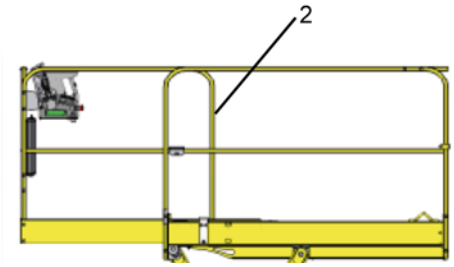
Perform the extending and retracting operations of the extension deck on flat, horizontal ground.

**To extend the extension deck :**

- Press the pedal ( 1 ) to release the extension deck lock pin.




- With pedal ( 1 ) pressed, push the extension deck guard rails ( 2 ) to the extended position.
- Keep hands clear of pinch points.




**Make sure that the extension deck is in locked position. Be aware of the extended platform position when moving the machine.**

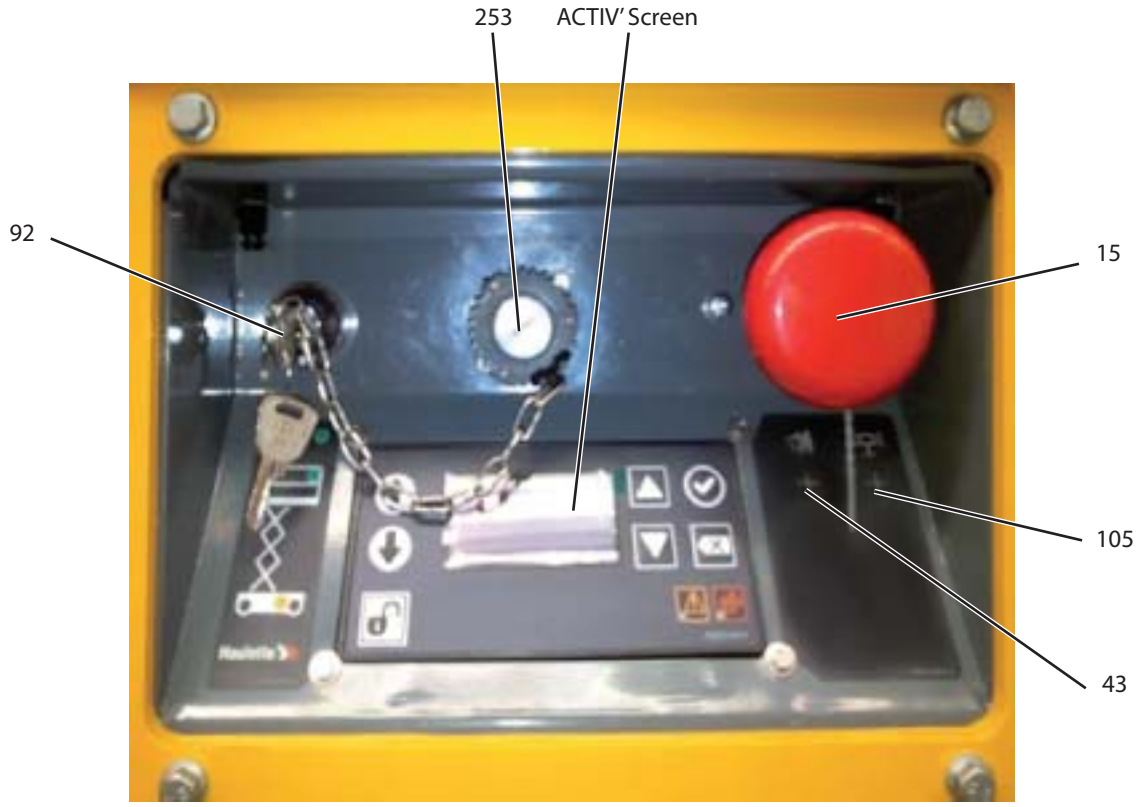
**To retract the extension deck :**

- Press pedal ( 1 ) and pull the extension deck rails ( 2 ) inwards to the locked position.
- Release the pedal.

## 1.4 - GROUND CONTROL BOX

### 1.4.1 - Layout

**General view**



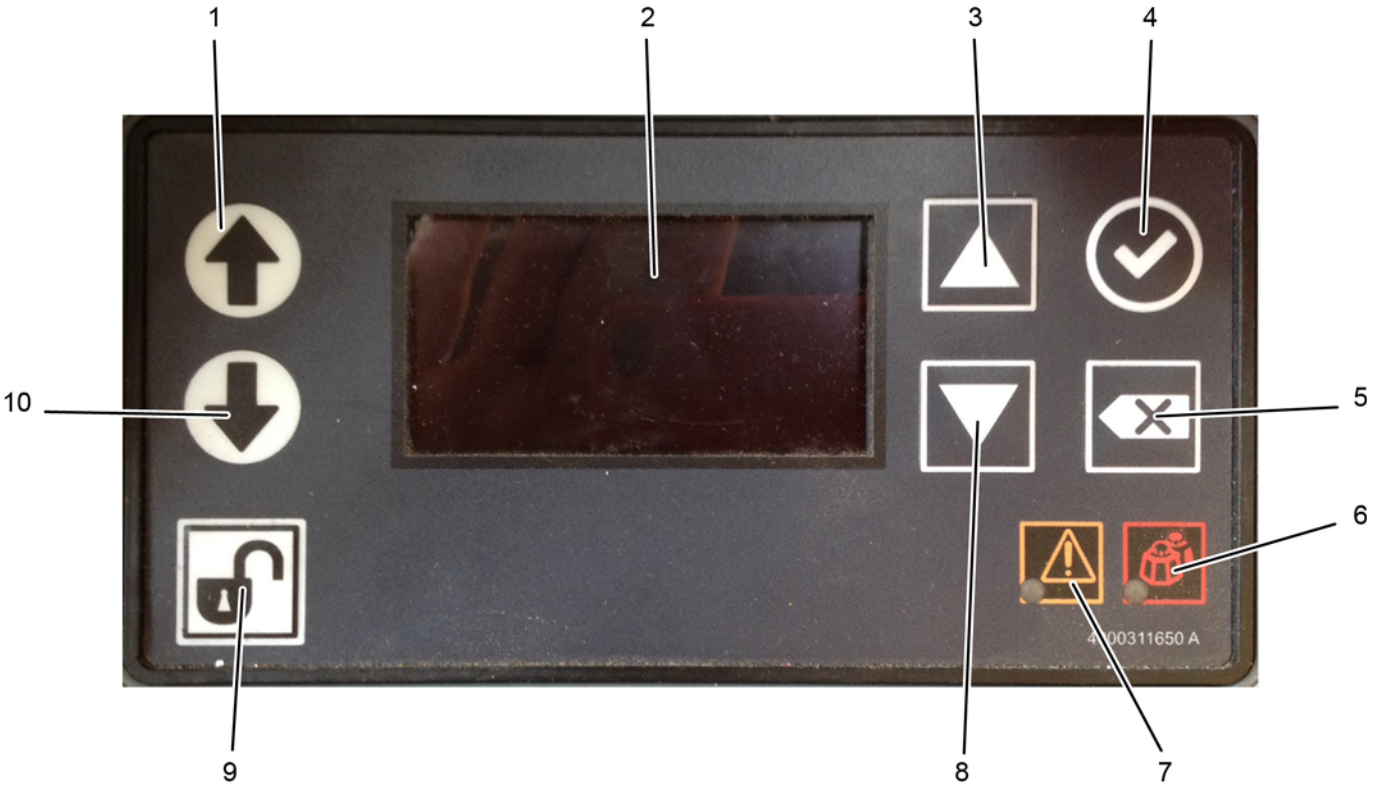

**Controls and indicators**

| Marking | Description | Function |
|---|---|---|
| 15 | E-stop button | Pulled out : Ground control box energized |
| | | Pushed in : De-energizes control system |
| 43 | Horn button | Not used |
| 92 | Control box activation key switch | Right : Ground control box energized |
| | | Center : De-energizes control system |
| | | Left : Platform control box energized |
| 105 | Beacon light (Optional) | Move upwards : Flashing light turn ON |
| | | Move downwards : Flashing light turn OFF |
| 253 | Diagnostic tool socket | Connection to the diagnostic tool (HaulotteDiag) |

### 1.4.2 - HAULOTTE Activ'Screen

Upon starting and during operation of the machine, the LCD screen "Activ'Screen" located on the ground control box displays in real time the machine operating status.

**H A U L O T T E A c t i v ' S c r e e n**




**C o n t r o l s a n d i n d i c a t o r s**

| Marking | Description | Function |
|---|---|---|
| 1 | Platform raising control | Platform raises |
| 2 | LCD screen | Display status of operation of the machine |
| 3 | Navigation button | Navigation of menu to select function - Scroll up |
| 4 | Confirmation button | Confirmation of the selected function |
| 5 | Cancellation button | Go back |
| 6 | Platform overload indicator | Platform overload indicator |
| 7 | Machine fault indicator | Constantly lit in the event of an operation malfunction |
| 8 | Navigation button | Navigation of menu to select function - Scroll down |
| 9 | Enable Switch | Press in and hold : Enable switch |
| 10 | Platform lowering control | Platform lowers |

# C- Familiarization

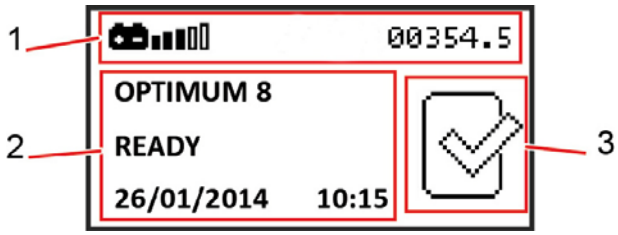
***LCD screen***

**At startup :**

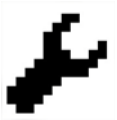
At startup with the ground or platform controls selected; system initiates a self check :

- Bar gets filled up.

- Home screen comes on with status icon of the machine - okay to proceed functioning the controls.

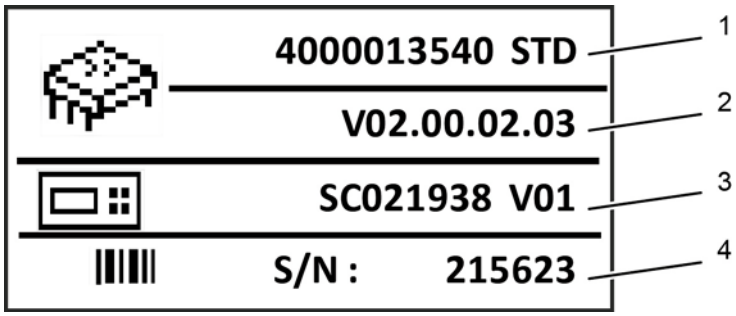



| Symbol | Description |
|---|---|
| 1 | Information icons |
| 2 | Information text |
| 3 | Status icon of the machine |

| Symbol | Description |
|---|---|
|  | Battery status |
|  | Maintenance use |
|  | Fault / alarms |
| ⧗00354.5 | Hour meter |

# C - Familiarization

- After pressing on  :




| Symbol | Description |
|---|---|
| 1 | Software part number |
| 2 | Software version + Screen software version + Screen version |
| 3 | Screen identification + Screen software version |
| 4 | Machine serial number displayed |

- After again pressing on 
- Access code screen comes on - refer to maintenance manual for entering the access code

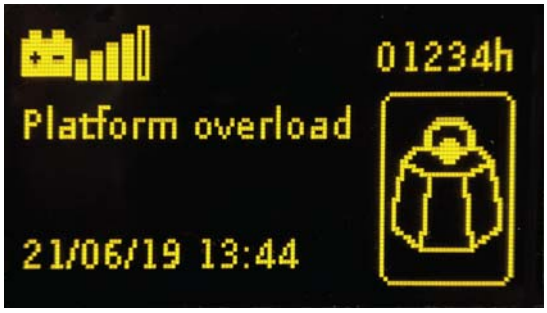

- Validation by pressing on is active only if access code is known and entered - refer to maintenance manual for the procedure for the different level code useage

**Alarm status :**

Alarm status displayed as applicable - samples shown below

Tilt :


Overload :




Low battery :

Recharge the batteries :


Fully recharge the batteries.

Low battery water level :

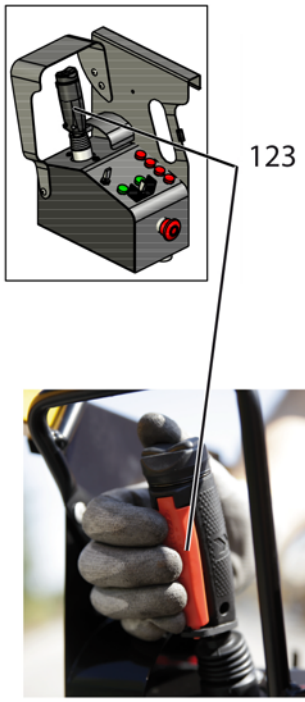

Low water tank level :

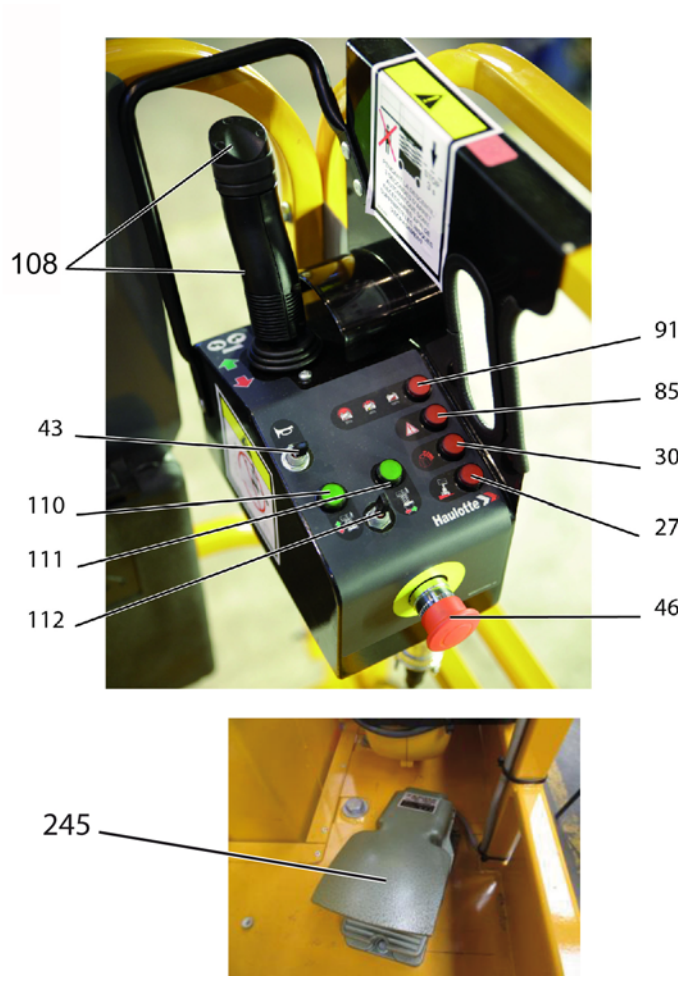

Present fault :

## 1.5 - PLATFORM CONTROL BOX

### 1.5.1 - Layout

**General view**







**Controls and indicators**

| Marking | Item | Description | Function |
|---|---|---|---|
| 27 | HL800 | Tilt indicator | Machine on excessive slope |
| 30 | HL802 | Overload indicator | Platform overloaded |
| 43 | SA907 | Horn button | Move upwards and hold to activate horn |
| 46 | SB802 | E-stop button | Pulled out : Platform control box power supply energized |
| | | | Pushed in : De-energizes control system |
| 85 | HL903 | Fault indicator | Fault indicator Faulty or tilting or overloaded machine |

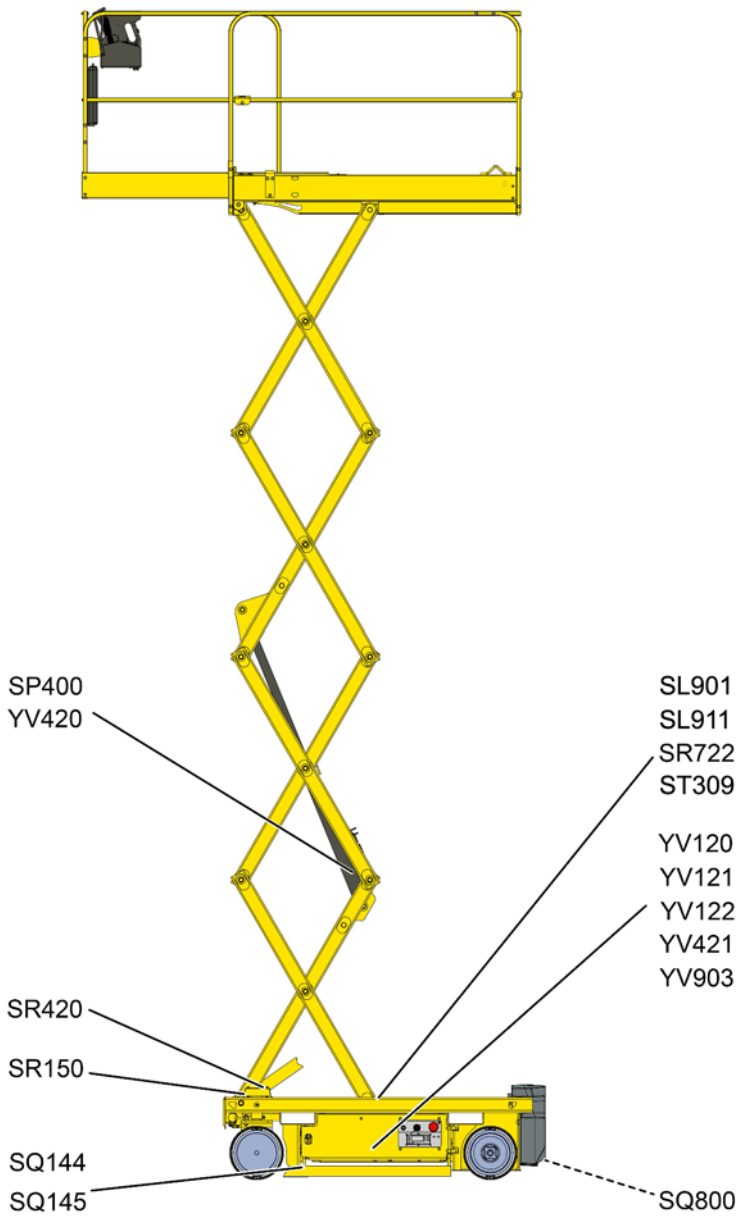
# C- Familiarization

| Marking | Item | Description | Function |
|---|---|---|---|
| 91 | HL904 | Battery charging indicator |  Battery charged |
| | | |  Flashing : Batteries have 40 % charge left |
| | | |  Constantly on : Batteries have only 20 % charge left |
| 108 | SM901 | Movement joystick | Move forward : Forward drive or platform raising |
| | | | Move backwards : Reverse drive or platform lowering |
| | | Front axle steering selector | Press right side of button : Right-hand steering |
| | | | Press left side of button : Left-hand steering |
| 110 | HL420 | Raising / lowering selector | On : Raising / Lowering selection activated |
| | | | Off : Raising / Lowering movement is not selected |
| 111 | HL100 | Driving selection indicator | On : Driving function activated |
| | | | Off : Driving movement is not selected |
| 112 | SA908 | 2-position selector | Move to the left : Platform raising / lowering |
| | | | Move to the right : Drive movements |
| 123 | SA905 | Enable Switch | Press in and hold : Associated command is validated |
| | | | Press in and hold : Enable switch |
| | | | Press in and hold : Enable switch |
| | | | Release : Associated command movement is halted |
| 245 | SB800 | Foot Switch (For Japan only) | Press in and hold : Enable switch |

# 2 - List of actuators and sensors

## 2.1 - SENSORS AND ACTUATORS

Sensors and actuators

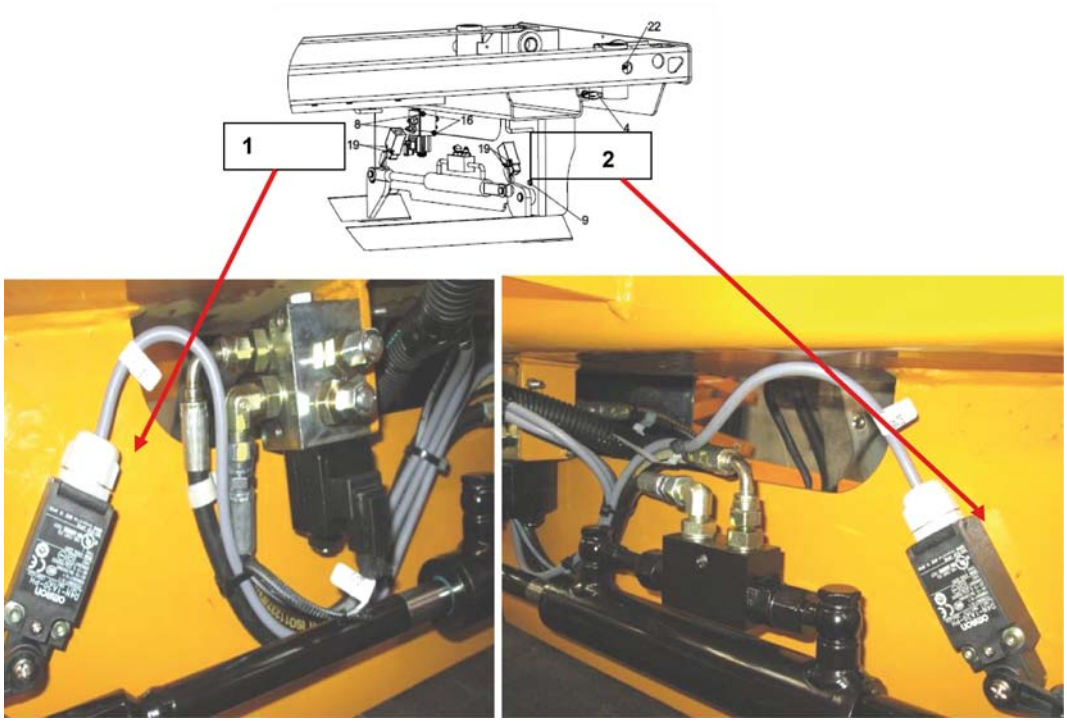


# C- Familiarization

| Name | Description |
|---|---|
| SL901 | Battery level sensor for centralized filling (If option installed) |
| SL911 | Level sensor in water tank |
| SP400 | Pressure sensor |
| SQ144 | Pothole limit sensor |
| SQ145 | Pothole limit sensor |
| SQ800 | Tilt sensor |
| SR150 | Steering potentiometer |
| SR420 | Tilt sensor low position |
| SR722 | Arm angle sensor |
| ST309 | Temperature sensor in batterie for centralized filling (If option installed) |
| YV120 | 6 tracks / 2 positions for potholes or steering switch (priority for potholes) |
| YV121 | Right steering or pothole entry valve |
| YV122 | Left steering or pothole exit valve |
| YV420 | PWM platform raising/lowering proportional valve |
| YV421 | Safety valve for platform lift/descent |
| YV903 | Valve by-pass (pump pressurization) |

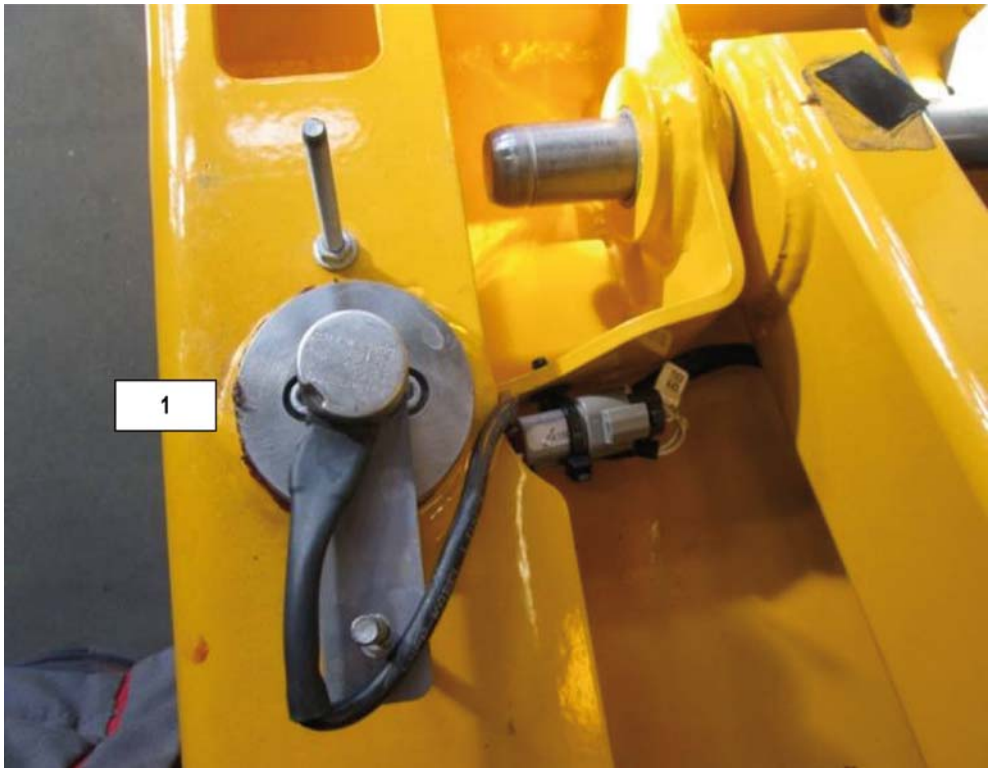
## 2.2 - SENSORS DETAIL

### 2.2.1 - Limit switchs for potholes



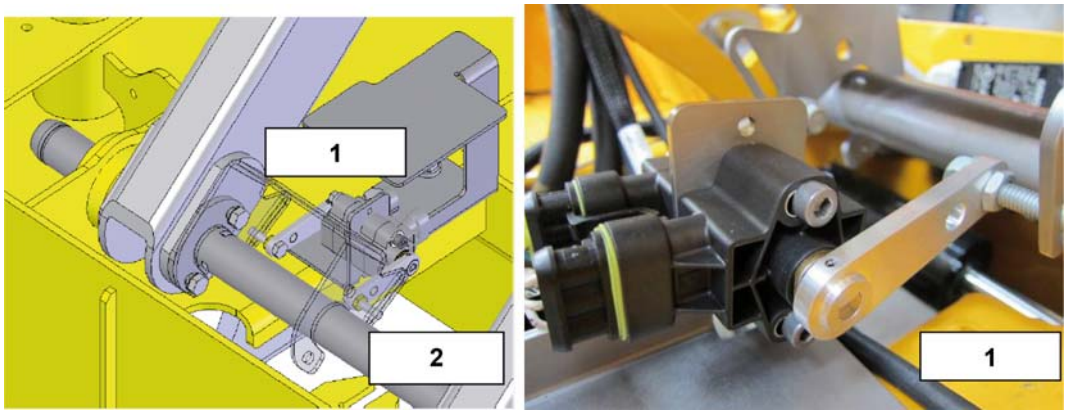

| Marking | Item | Description |
|---|---|---|
| 1 | SQ144 | Sensors = 1 when potholes are retracted |
| 2 | SQ145 | |

### 2.2.2 - Steering potentiometer

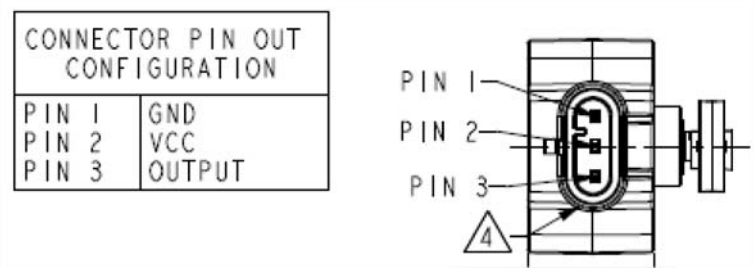



| Marking | Item | Description |
|---|---|---|
| 1 | SR150 | Value 2.5 O, supply in 12 VDC (coming from ACEX variator)<br>Before to launch the calibration, the pre-setting has to be done at mid-range value then use the consoles in order to set the potentiometer values to adjust current/voltage of the internal motor depends the direction of steering (left/right) |

### 2.2.3 - Angle transducers



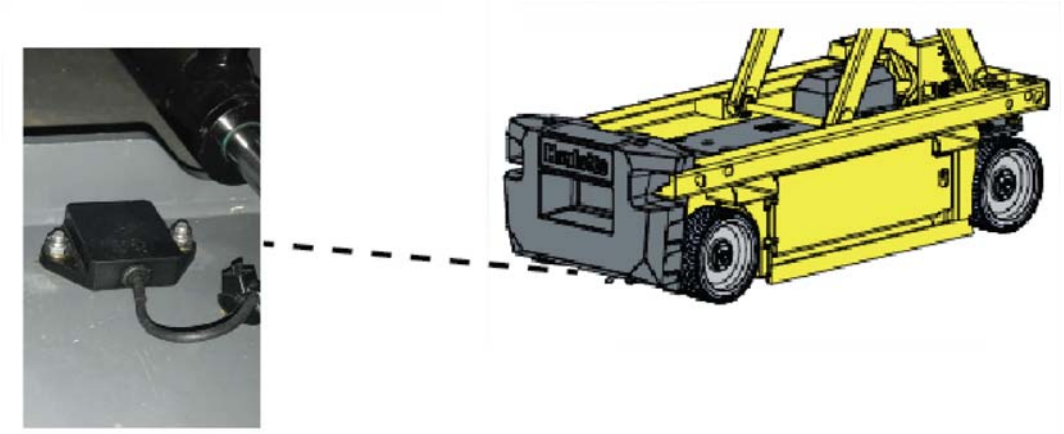

| Marking | Item | Description |
|---|---|---|
| 1 | SR420 | Analogic sensor (0.5/4.5VDC), detection of low position<br>Value adjustable according to scissors angle (~ 74 – 535 pts)<br>Calibration system angle/pressure through consoles or active screen |
| 2 | SR722 | Detection of upper position<br>Value adjustable according to scissors angle (~ 420 – 135 pts)<br>Calibration system angle/pressure through consoles or active screen |



### 2.2.4 - Pressure transducer


| Marking | Item | Description |
|---|---|---|
| 1 | SP400 | Analogic transducer (4-20mA), value variable depends of the pressure on big chamber of the lifting cylinder<br>Calibration system angle/pressure through consoles or active screen |

### 2.2.5 - Slope sensor



| Marking | Item | Description |
|---|---|---|
| 1 | SQ800 | Tilt Y = 1.5° / X =3° (wire 12 = Vbat if machine on flat surface)<br>1=red=+Batt / 2=white=signal / 3=black=GND |

### 2.2.6 - Battery charger

| |  |  |
|---|---|---|
| Battery charger | 36V / 35A | 36V / 27A |
| Electric power supply | 190 - 265 Vac / 50Hz / 10A | 85 - 265 Vac / 50-60Hz / 8A max |
| Battery voltage | 24V | |
| Charging time | 10h | |

# 3 - Consumables

| Consumable | HAULOTTE® code |
|---|---|
| Hydraulic filter cartridge | 2505000970 |

# 4 - Ingredient

| Ingredient | HAULOTTE® code |
|---|---|
| Hydraulic oil | 2420801310 |
| Hydraulic oil (Winter option) | 2505002640 |
| Biological hydraulic oil | 2820304310 |

## 4.1 - HYDRAULIC OIL

Hydraulic oils must comply with the following requirements :
- Oil filterability must be compatible with absolute filters
- Have properties such as :
  - Antifoam and deaeration
  - Anti-wear, anti-shear and antioxydant
  - Rust and corrosion inhibitors (copper)

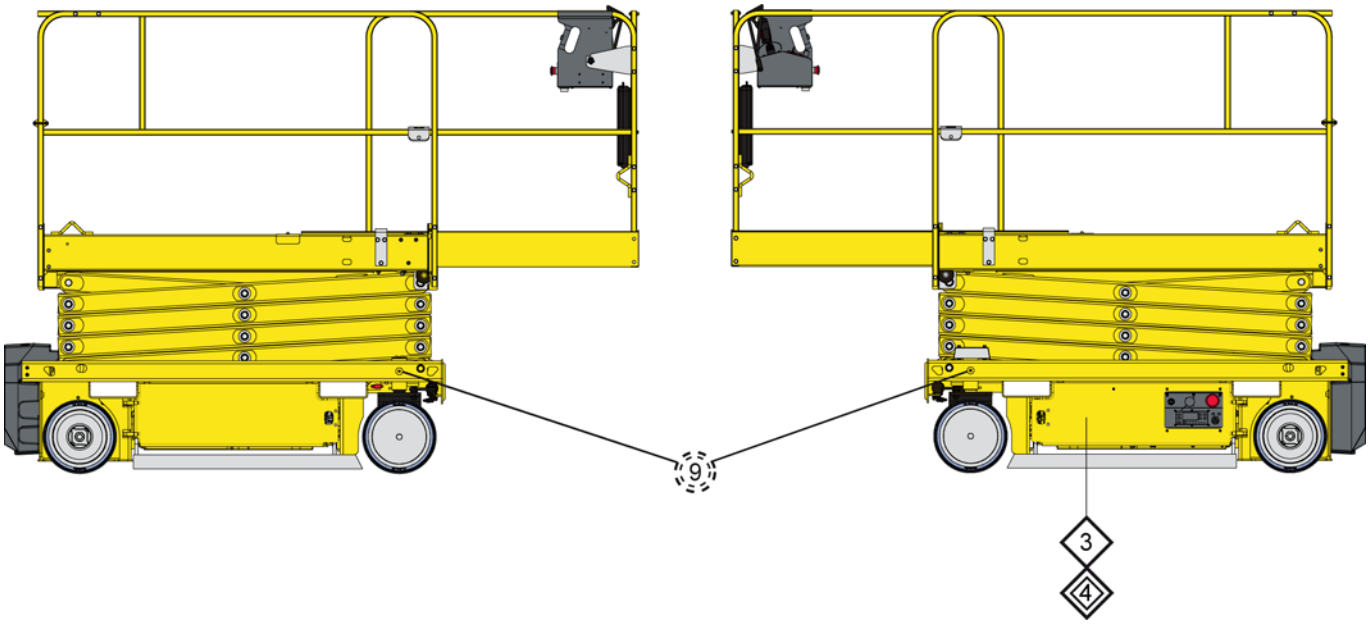
The recommended viscosity grades depending on the environmental conditions are as follows :

| Environmental conditions | ISO Viscosity grade |
|---|---|
| Ambient temperature between - 15° C (- 9° F) and + 40° C (+ 104° F) | HV 46 |
| Ambient temperature between - 35° C (- 31° F) and + 35° C (+ 95° F) | HV 32 |
| Ambient temperature between 0° C (32° F) and + 45° C (+ 113° F) | HV 68 |

Biodegradable oils may be used if they comply with the following requirements :
- Ambient operating temperature between - 15° C (- 9° F) and + 40° C (+ 104° F)
- HEES type biodegradable oil only according to standards ISO 15380 and VDMA 24568
- Necessary characteristics :

| Viscosity grade | ISO Viscosity grade |
|---|---|
| Viscosity at + 40° C (+ 104° F) | 46 +/- 3 mm² / s |
| Viscosity at + 100° C (+ 260° F) | > 8 mm² / s |
| Viscosity index | > 160 |
| Flashpoint | > 220° C (> 572° F) |
| Pour point | < - 40° C (> - 104° F) |

## 5 - Lubrication diagram




**List of ingredients**

| Marking | Ingredient | Symbol | HAULOTTE® code |
|---|---|---|---|
| 3 | Hydraulic oil (Standard) - Barrel 209 l(55,2 gal US) | ◇ | 2420801310 |
| | Hydraulic oil (Winter option) | | 2505002640 |
| 4 | Biological hydraulic oil - Barrel 209 l(55,2 gal US) | ◈ | 2820304310 |
| 9 | Extreme-pressure lithium grease | ○ | 2820304320 |

## 6 - Greasing points localization

- Front-right wheel pivot greasing

- Front-left wheel pivot greasing

# 7 - Machine specifications

## 7.1 - MOVEMENT SPEED

To allow checking operation, refer to the following table about originally time per movement. If the values measured by test are not equal to the following :

- Do not use the machine.
- Setting updating is needed.

Always check speed movement from the ground control box.

| | OPTIMUM 8 - OPTIMUM 1931 E |
|---|---|
| Folded machine maximum speed | 4,5 km/h - 2.79 mph |
| Unfolded machine maximum speed | 0,5 km/h - 0.3 mph |
| Maximum towing speed | 4,5 km/h - 2.79 mph |
| Platform elevation time (when empty) | 22 s +/- 2 s |
| Platform lowering time (when empty) | 29 s +/- 3 s ( 3 s without stopping) |

# D - Inspection and maintenance schedule

## 1 - Inspection program

The machine must be inspected at regular intervals in accordance with the requirements set out in the country of use and at least once a year. The purpose of the inspection is to detect any defect which could lead to an accident during routine use of the machine.

Inspections and maintenance must be carried out by a qualified company or person chosen by the owner of the machine.

The results of these visits must be recorded in a safety register created by the owner. This register as well as the list of competent repair persons must made available to the work inspector, government inspector and company safety committee at any time.

| Frequency | Person-in-charge | Stakeholder | Type | Documentation |
|---|---|---|---|---|
| Before each hire | Owner | On-site technician | Daily inspection | Operator's manual |
| Before each use or each change of user | Operator | Operator | Daily inspection | Operator's manual |
| At intervals recommended by HAULOTTE® | Owner | On-site technician, qualified HAULOTTE Services® technician | Preventive maintenance | Maintenance Book |
| Before sale | Owner | On-site technician, qualified HAULOTTE Services® technician | Periodic inspection | Maintenance Book |
| Annually ( 1 year) (*) | Owner | On-site technician, qualified HAULOTTE Services® technician | Periodic inspection | Maintenance Book |
| After 10 years then every 5 years | Owner | Qualified technician HAULOTTE Services® | Major inspection | Maintenance Book |

(*) Or according to local regulations.

## 2 - Daily inspection

The daily inspection must be performed every day, before the start of a new work shift and at every change of user.

This inspection is performed by and under the responsibility of the user and includes the visual and functional inspection of the machine as well as the testing of its safety systems.

A description of the daily inspection can be found in the machine's user manual.

We recommend these forms to be completed daily and stored to assist with your maintenance schedule.

## 3 - Preventive maintenance

Maintenance operations must be carried out by a qualified technician chosen by the owner and ensure that the machine operates correctly.

Severity of operating conditions may require a reduction in time between maintenance periods.

Maintenance operations performed must be recorded in a register / log book of the machine.

**S y m b o l m e a n i n g s**

| | | | | | |
|---|---|---|---|---|---|
|  | Oil change |  | To check by test |  | Tightening |
|  | Levelling |  | Visual inspection |  | Functional adjustments / Checks / Cleaning |
|  | Lubrication-Lubrication | | |  | Systematic replacement |

**P r e v e n t i v e M a i n t e n a n c e L e v e l 1 - F i r s t 5 0 H**

| First 50H | Page or associated procedure | First 50H | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **Chassis assembly : Wheel, reducer, steering, wheel pivot** | | | | | | |
| Tighten the wheel nuts | |  | | | | |
| **Hydraulic : oils, filters and hoses** | | | | | | |
| Replace the hydraulic filter | |  | | | | |

# D- Inspection and maintenance schedule

## Preventive Maintenance Level 1 - Every 2 weeks

| Every 2 weeks | Page or associated procedure | Every 2 weeks | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **Batteries** | | | | | | |
| Check the electrolyte level of the battery/batteries | |  | | | | |

## Preventive Maintenance Level 1 - Every 6 months or 250H

| Every 6 months or 250H | Page or associated procedure | Every 6 months or 250H | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **Chassis assembly : Wheel, reducer, steering, wheel pivot** | | | | | | |
| Tighten the wheel nuts | |  | | | | |
| Grease the steering system | |  | | | | |
| Clean the pads slide | |  | | | | |
| Check that the ground strap is present and in good condition | |  | | | | |
| **Hydraulic : oils, filters and hoses** | | | | | | |
| Check the hydraulic oil level | |  | | | | |
| **Platform** | | | | | | |
| Tighten the guardrail and the platform access | |  | | | | |
| Clean the platform extension | |  | | | | |

# D- Inspection and maintenance schedule

## Preventive Maintenance Level 2 - Every 1 year or 500H

| Every 1 year or 500H | Page or associated procedure | Every 1 year or 500H | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **Batteries** | | | | | | |
| Check the condition of the battery terminals, cables (Corrosion, not damaged) | |  | | | | |
| Grease the terminals | |  | | | | |
| **Hydraulic : oils, filters and hoses** | | | | | | |
| Replace the hydraulic filter | |  | | | | |
| Drain the hydraulic oil | |  | | | | |

## Preventive Maintenance Level 2 - Every 2 years or 1000H

| Every 2 years or 1000H | Page or associated procedure | 2 year(s) or 1000H | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **Chassis assembly : Wheel, reducer, steering, wheel pivot** | | | | | | |
| Check the bushings and pins - Replacement if necessary | |  | | | | |
| **Lower arm** | | | | | | |
| Check the pads - Replacement if necessary | |  | | | | |

## 4 - Periodic inspection

The Periodic inspection is a thorough inspection of the operation and safety features of the machine. This must take place prior to the sale or resale of the machine and every 1 year. Local regulations may have specific requirements on frequency, and content of inspections.

This intervention must take place after :

- Extensive dismantling and reassembly
- Repairs involving the machine's essential components
- Any accident causing stress to the machine

This inspection is the responsibility of the owner, and must be conducted by a qualified technician.

Under no circumstances may this inspection replace the control required by local regulations.

Use the detailed program below.

| Periodic | Page or associated procedure | Periodic | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **Chassis assembly : Wheel, reducer, steering, wheel pivot** | | | | | | |
| Check state of tires/tyres and inflations | |  | | | | |
| **Batteries** | | | | | | |
| Check the condition of the battery | |  | | | | |
| **Hydraulic : oils, filters and hoses** | | | | | | |
| Check the hoses, blocks and pumps, fittings, cylinders and the tank for the absence of leaks, deformations and damage | |  | | | | |
| **Platform** | | | | | | |
| Test the closure and locking of access platform | |  | | | | |
| Check that the harness anchor points are not cracked or damaged | |  | | | | |
| Check the quick ties and the good location of the guardrail | |  | | | | |

# D- Inspection and maintenance schedule

| Periodic | Page or associated procedure | Periodic | OK | NOK | Corrected | Comments |
|---|---|---|---|---|---|---|
| **General** | | | | | | |
| Check for the presence, cleanliness and readability of the manufacturer's plates, security labels, user manual and maintenance manual | |  | | | | |
| Check the cleanliness and readability of the control box | |  | | | | |
| Check chassis opening and locking of covers | |  | | | | |
| Check the condition of electrical harnesses, cables and connectors | |  | | | | |
| Check for the absence of abnormal noise and jerky movements | |  | | | | |
| Check for the absence of visible deterioration and damage | |  | | | | |
| Check for the absence of cracks, broken welds and chipped paintwork on the structure | |  | | | | |
| Check for the absence of missing or loose screws and bolts | |  | | | | |
| Check for the absence of deformation, cracking and breakage of axis stops, bushing and axes | |  | | | | |
| Check for the absence of foreign bodies in joints and sliding parts | |  | | | | |
| **Safety devices** | | | | | | |
| Test the operation of the upper and lower control boxes: manipulators, switches, buttons, horn, emergency stops, screens and lights | |  | | | | |
| Check the absence of visual and audible alarms | |  | | | | |
| Test the operation of the tilt system | |  | | | | |
| Test the operation of the emergency lowering system | |  | | | | |
| Test the operation of the drive speed limiter systems | |  | | | | |
| Test the speed and behavior of movements | |  | | | | |
| Check the operation of the load control system - Calibrate if necessary | |  | | | | |
| Test the overriding system | |  | | | | |

## 5 - Major inspection

The inspection is a thorough inspection of the machine to ensure that it is fully functional. It must be carried out after 10 years then every 5 years.

This inspection is the responsibility of the owner and must be carried out by a technician HAULOTTE Services® or an authorized and qualified person.

In order to carry it out, contact the subsidiary HAULOTTE® or the authorized distributor.

***N.B.-:-The list of Maintenance Sheets is not exhaustive. Other Sheets may be sent upon request. Contact HAULOTTE Services®.***

# Notes

# 1 - Warning

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- **The use of this form implies that its user has been trained on this type of equipment.**
- **It is important that the person working on the machine is familiar with all of the safety information contained in the user manual.**
- **Generally speaking, the user must comply with regulatory obligations in force, particularly those relating specifically to working alone, co-activity and manual load handling...**
- **The user must have all the permits/authorizations required to work (fire permit, etc.) and comply with the specific safety instructions at the intervention site.**
- **Only risks linked specifically to activities relating to the disassembly and assembly of the machine HAULOTTE® are described in this sheet.**

# 2 - Risk prevention

**Means of protection to be used when implementing the range**

| | | | |
|---|---|---|---|
|  | Appropriate workwear |  | Gloves |
|  | Safety shoes | | |

# 3 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit |  | • Place barriers around the perimeter of the work area |

# 4 - Control and maintenance

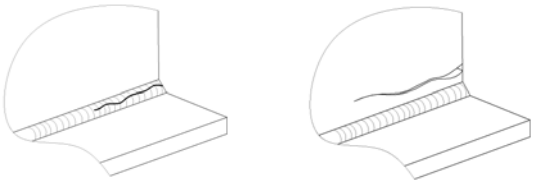
To guarantee the integrity of the machine, it is necessary to carry out periodical controls on the mechanical structure such as defines hereafter.

## 4.1 - DAILY INSPECTION

All the accessible structural part without disassembling must be subjected to a fast visual inspection.

If anomalies are noted, according to the list below, a reinforced control will have to be carried out to judge conformity of the part :

- Absence of foreign body to the articulations and slides.
- Absence of deformation and visible damage.
- Absence of crack, broken welding, oxidation, glare of painting.
- Absence of excessive gap to the articulations and slides.
- Check that locking device are not damaged and are functional.
- No screws or missing part loosened or unscrew.
- Anchorage points firmly fixed and not damaged.



The list of part to check are define Section Familiarization.

## 4.2 - MAJOR INSPECTION

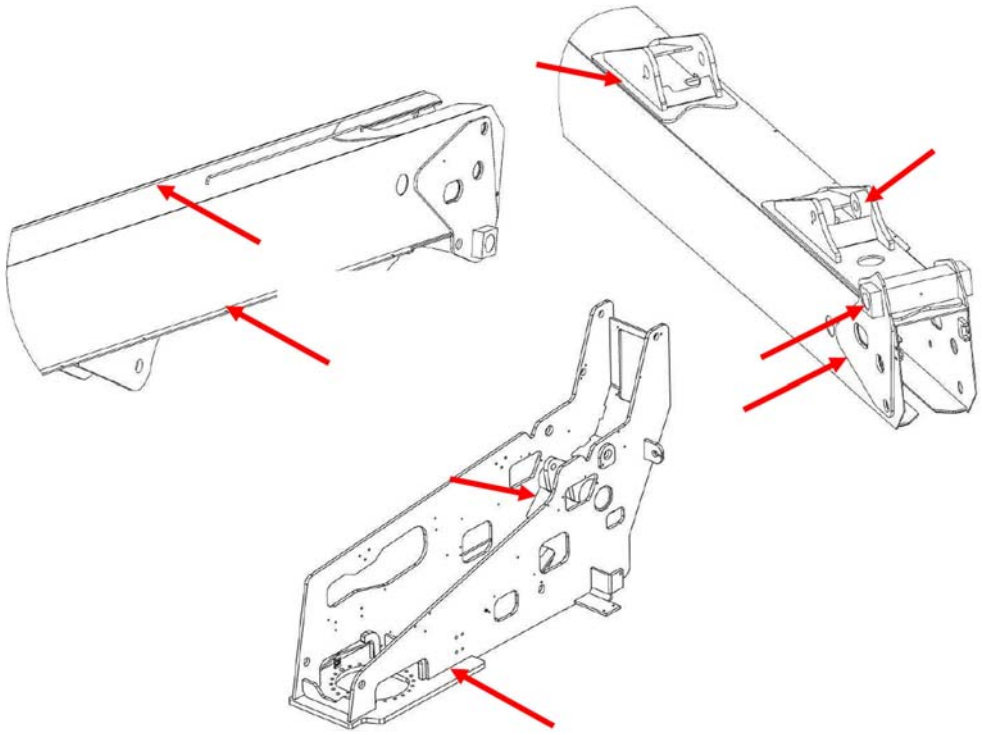
All structural part listed Section Familiarization must be disassembled and all weldsmust be review using non-destructive checks Section D - Inspection and maintenance schedule.

The criteria quoted above are applicable.

The main items to be inspected are :

- Boss welds on chassis, turret, arms, booms and jib.
- Booms and arms welds.

**E x a m p l e**



In the event of suspicion of crack, a cleaning and a sweating are to be carried out to guarantee the integrity of the part before reassembly.

Check presence and torque of each bolts and screw used to assembly part listed in Section Familiarization. Refer to spare part catalog for additional information if needed.

**Some screws are not reusable and must be systematically changed (ex: screws from the gear ring).**

## 4.3 - FUNCTIONAL TESTS

The following tests must be performed periodically Section D - Inspection and maintenance schedule :
- An important technical intervention.
- An accident resulting from a failure of a major component.

The following tests must be realized by a qualified staff under secure conditions.

The results of the tests must be entirely documented.

To avoid the swing of the machine during the test, it is imperative that a device of reserve (chain, not of anchoring) is used during the test.

## 4.4 - DYNAMIC TESTS

The machine must be place on level and firm ground.

With 100% of the maximum allowed load, operate from ground control box (or emergency control box) all the movements ; the platform floor must reach a height of about 1 above the ground.

The functional tests must show the following facts :
- The machine carried out all the movements without jolts while supporting the load.
- All the security device function correctly.
- Authorized maximum speeds of operation are not exceeded.

Refer to the user manual for the description of the safety device and technical characteristics to be reached.

## 4.5 - STRUCTURAL TEST

The following test shows that the structure of the machine is in conformity with the safety requirements.

The machine must be place on level and firm ground.

With 100% of the maximum allowed load, operate from ground control box (or emergency control box) all the movements ; the platform floor must reach a height of about 1 above the ground :
- Measure the distance between the ground and the basket (or of the platform).
- Leave the machine in static during 15 mnn.
- Measure the distance between the ground and the basket (or of the platform).

If the difference between two measurements does not exceed 4 cm (1.575 in) : the test is validated.

If the difference between two measurements exceeds 4 cm (1.575 in), to contact HAULOTTE Services® or to carry out the additional tests described below. MS0003 - § 3.2 Cylinder inspection.

# Pins and bearing inspection



## 1 - Warning

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- **The user must have all the permits/authorizations required to work (fire permit, etc.) and comply with the specific safety instructions at the intervention site.**
- **Only risks linked specifically to activities relating to the disassembly and assembly of the machine HAULOTTE® are described in this sheet.**

## 2 - Risk prevention

**Means of protection to be used when implementing the range**

| | | | |
|---|---|---|---|
|  | Appropriate workwear |  | Gloves |
|  | Safety shoes | | |

## 3 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit |  | • Place barriers around the perimeter of the work area |

# 4 - Control and maintenance

Inspection of the pins, stop pins, bushings and bearings must be carried out according to the recommendations Section D - Inspection and maintenance schedule :

- Fast visual inspection without disassembling Section D - Inspection and maintenance schedule :
    - Check the presence of the pins and visible stops pins without disassembling.
    - Check the presence of the screws.
    - Check absence of deformations, cracks or breakage of pins and/or stops pins.
    - Check absence of heavy abrasion, wear or oxidation of the pins, stops pins.
- Reinforced visual inspection with disassembling of certain elements to reach the bushes or bearing Section D - Inspection and maintenance schedule : In addition to the above cited criteria, verify the following :
    - Check the presence and the position of the bushes and bearings.
    - Check the absence of shaving in periphery of the pins.
    - Check the absence of heavy abrasion, wear or oxidation of the bushes and bearing.
    - Check the absence of deformations, cracks or breakage of the bushes and bearing.
    - Check the absence of radial gap > 0,5 mm (19690 µ in) on the pins.
- Complete disassembling of the pins, bushes and bearing Section D - Inspection and maintenance schedule : In complement of the inspections above cited, it is necessary to check :
    - For the stages :
- Check the presence of material of friction.
    - For the bearings :
- After disassembling, protect the bearing from pollution and shocks.
- Clean the bearing with a suitable solvent.
- Check the absence of shaving in the housing of the bearing and/or the bearing.
- Check the absence of heavy abrasion, wear, oxidation, deformations of the balls (or rollers) and the ball races.

The periodicity can evolve under the following conditions Section D - Inspection and maintenance schedule :

- Abnormal noise during movements of the structure.
- Prolonged storage of the machine ( 6 months).
- Specific storage and use Environment (strong moisture and salinity of the air).

# 5 - Criteria of replacement

The pins, stop pins, bushes and bearing must be replaced as soon as one of the anomalies quoted above is noted. Bearing and bushes must be imperatively changed at the end of 10 years of use.

# 6 - Procedure of reassembly

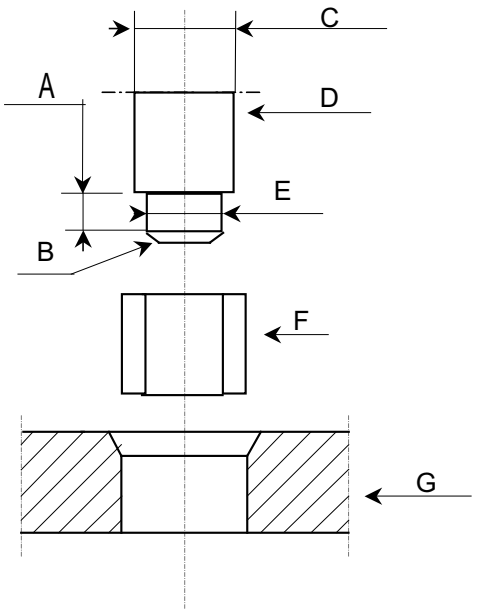
## 6.1 - PINS AND BUSHES

**For OPTIMUM 8 - OPTIMUM 1931 E only : Never grease the pins and rings of scissor arms.**

When reassembling bearings and pins ensure that :

- Lightly lubricate the housing into which the bearing is to be installed.
- Insert the bearing using a bearing drift, preferably out of mild steel.
- The bearing, the bearing drift and the bearing housing must be correctly aligned during the assembly process.
- The recommended values for the bearing drift are given on the diagram below :

**Recommended Values**




| Marking | Description |
|---|---|
| A | At least 0,5 times the nominal diameter |
| B | Make a chamfer |
| C | Nominal diameter of the bearing - 0,2 / - 0,3 mm (-7874 µ in / -11810 µ in) |
| D | Bearing drift |
| E | Diameter of the bearing guide - 0,20 / - 0,25 mm (-7874 µ in / -9843 µ in) |
| F | Bearing |
| G | Housing |

- After inserting the bearing, lubricate and fit the pin.

## 6.2 - BEARINGS

For the reassembly of bearings, respect the following stages :

- Clean boring and/or the pins to remove all the foreign bodies.
- Slightly lubricate boring and/or pins.
- Lubricate the ring of the bearing slightly.
- To fit bearing in a boring: take support on the external ring of the bearing.
- To fit bearing on an axis: take support on the interior ring of the bearing.

# 1 - Warning

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- The user must have all the permits/authorizations required to work (fire permit, etc.) and comply with the specific safety instructions at the intervention site.
- Only risks linked specifically to activities relating to the disassembly and assembly of the machine HAULOTTE® are described in this sheet.

- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.

# 2 - Risk prevention

**Means of protection to be used when implementing the range**

| | | | |
|---|---|---|---|
|  | Appropriate workwear |  | Gloves |
|  | Safety shoes | | |

# 3 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit |  | • Place barriers around the perimeter of the work area |

# 4 - Control and maintenance

## 4.1 - VISUAL INSPECTIONS

The hydraulic actuating cylinders must be subjected to visual inspections periodic all the 250 hours or 6 months such as defined below :

- Absence of leakage.
- Absence of deformations, visible damage , cracks on the body and fixing of the cylinder.
- Absence of rust and shock on the rod.
- Absence of foreign objects on all surfaces.
- Absence of missing or loosened part (bolt, nut, connection, flexible device, etc).

## 4.2 - FUNCTIONAL TESTS

To guarantee an optimal level of performance and safety, functional tests must be realized all the 250 hours or 6 months.

The periodicity can evolve under the following conditions :

- Anomaly noted during visual inspection.
- Abnormal noise during movements of the structure.
- Prolonged storage of the machine ( 6 months).
- Specific storage and use Environment (strong moisture and salinity of the air).

Generic Control :

- Position a load equal to the rated capacity on the cage (or platform).
- Raise the cage (or the platform) using the ground control box. To activate the cylinder to be tested, proceed as follows :
  - Lift Arm hydraulic cylinder : Lift the arm to approximately half full height. The telescopic boom should be fully extended and in the horizontal position. (For machines fitted with).
  - Boom lifting cylinder or Jib cylinder : Lift the concerned equipment (boom or jib) of approximately half way. Extend the telescope to its maximum.
  - Telescoping cylinder : Lift the boom to its maximum angle and telescope approximately 50 cm (19.69 in).
- Measure the distance between the floor of the cage (or of the platform) and the ground.
- Leave the machine in this condition for 15 mn (minutes).
- Measure the distance between the floor of the cage (or of the platform) and the ground.
  - If the difference between two measurements does not exceed 4 cm (1.575 in) : the test validates correct operation.
  - If the difference between two measurements exceeds 4 cm (1.575 in), contact HAULOTTE Services® or carry out the additional tests described below.

**Control cylinder by cylinder :**

- Position a load equal to the rated capacity on the cage (or platform).
- Perform the movement of the concern cylinder to half of its stroke.
- Fix the cylinder with a comparator :
  - Attach the body of the comparator on the cylinder rod.
  - The needle of the comparator must be in contact with the end of the casing of the cylinder.
  - The target is to measure the creep of the cylinder rod.
- If the creep of the cylinder rod is higher than the values indicated in the table below, replace the cylinder.

| Type of cylinders | Maximum drift authorised due to an internal leak of the cylinder | |
|---|---|---|
| Lift cylinder arm or boom (Machine with working heights > 26 m(85 ft4 in)) | After 10 mn, creep < 0,2 mm (7874 µ in) | After 60 mn, creep < 1 mm (0.039 in) |
| Outriggers cylinder, Oscillating axle locking, Lift cylinder arm or boom (Machine with range-limiting system) | After 10 mn, creep < 0,5 mm (0.01196 in) | After 60 mn, creep < 2,5 mm (0.098 in) |
| Lift cylinder arm or boom, Telescoping, Compensation, ... | After 10 mn, creep < 1 mm (0.039 in) | After 60 mn, creep < 6 mm (0.236 in) |
| Steering cylinder | After 10 mn, creep < 1,5 mm (0.059 in) | After 60 mn, creep < 9 mm (0.354 in) |

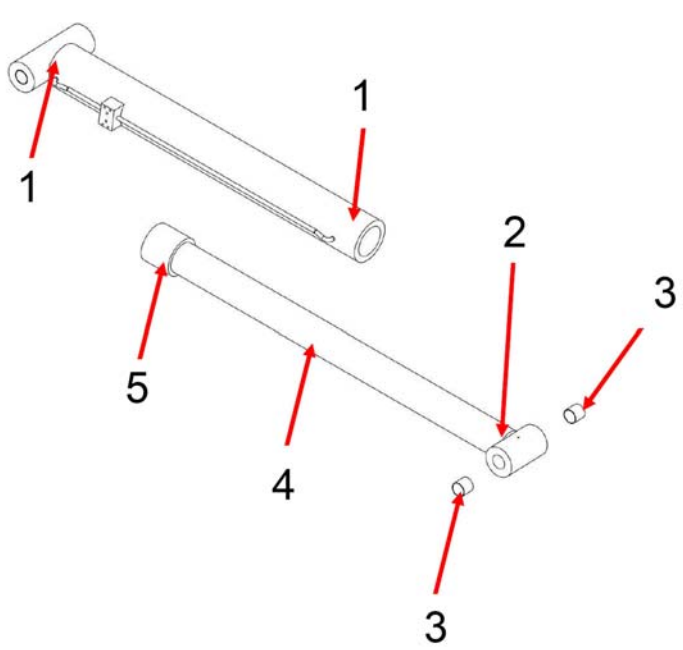
**These tests must be made in conditions of equivalent temperatures.**

## 4.3 - MAJOR INSPECTION

A thorough inspection of the structural parts must be realized all the 5000 h or 10 years with disassembling of the element to check the entirety of the welding. Each Cylinder must be disassembled and must be review using non-destructive checks.

The criteria quoted above are applicable :

- Absence of deformation and visible damage.
- Absence of crack, broken welding, oxidation, glare of painting.




Check :

1. Pipe weld connection.
2. Rod weld connection.
3. Ring.
4. Rod.
5. Piston.

# Braking test procedure

MS0004

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- The user must have all the permits/authorizations required to work (fire permit, etc.) and comply with the specific safety instructions at the intervention site.
- Only risks linked specifically to activities relating to the disassembly and assembly of the machine HAULOTTE® are described in this sheet.

## 2 - Risk prevention

**Means of protection to be used when implementing the range**

| | | | |
|---|---|---|---|
|  | Appropriate workwear |  | Gloves |
|  | Safety shoes | | |

## 3 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit |  | • Place barriers around the perimeter of the work area |

# 4 - Test procedure

The brake system is a significant component of the safety of the machine. The following tests must be performed periodically Section D - Inspection and maintenance schedule.

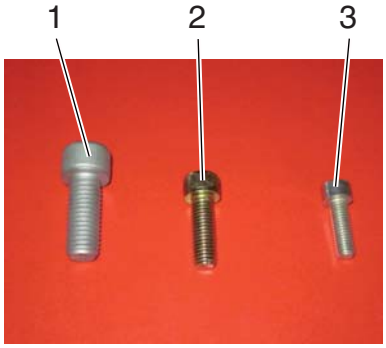
High speed :

- On a flat ground or slightly inclined (always lower than the authorized slope: see plate manufacturer).
- Trace on the ground, a line being used as reference mark of stop.
- Roll moving front until reaching maximum speed :
- Between 3 km/h (1.9 mph) and 6,5 km/h (4,039 mph) according to the machines.
- Release the manipulator as soon as the wheels axles are on the level of the traced reference mark.
- Stopped machine, measure the distance between the wheel axles and traced reference mark on the ground :
- If the distance lies between 0.2 m (0ft 8in) and 2,7 m (8 ft 11 in), the test is validated.
- If not, Contact HAULOTTE Services® to repair the system.

# 1 - Metric torque chart

For screws HAULOTTE®, use columns ( A ), ( B ) and ( C ) :

- Screw ( 1 ) grey dull dry, use colums ( A )
- Screw ( 1 ) grey dull greasy, use column ( B )
- Screw ( 2 ) yellow dry, use column ( C )
- Screw ( 2 ) yellow greasy, use column ( B )
- Screw ( 3 ) grey bright dry, use column C
- Screw ( 3 ) grey bright greasy, use column ( B )




**Metric fastener torque chart**
**This charts is to be used as a guide only unless noted elsewhere in this manual**

| Size (mm) | Class 4.6 | | | | | | Class 8.8 | | | | | | | | | | Class 12.9 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dull dry (A) | | Lubed (B) | | Yellow dry (C) | | Dull dry (A) | | Lubed (B) | | Yellow dry (C) | | Dull dry (A) | | Lubed (B) | | Yellow dry (C) | | Dull dry | | Lubed | | Yellow dry | |
| | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm |
| 5 | 17.7 | 2 | 16 | 1.8 | 21 | 2.4 | 44 | 5 | 41 | 4.63 | 54 | 6.18 | 68 | 7.7 | 58 | 6.63 | 78 | 8.84 | 79 | 9 | 68 | 7.75 | 91 | 10.3 |
| 6 | 30 | 3.4 | 19 | 3.05 | 36 | 4.07 | 80 | 9.1 | 69 | 7.87 | 93 | 10.5 | 118 | 13.4 | 100 | 11.3 | 132 | 15 | 139 | 15.7 | 116 | 13.2 | 155 | 17.6 |
| Size (mm) | Dull dry | | Lubed | | Yellow dry | | Dull dry | | Lubed | | Dry | | Dull dry | | Lubed | | Dry | | Dull dry | | Lubed | | Dry | |
| | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm |
| 8 | 5.9 | 8 | 5.4 | 7.41 | 7.2 | 9.88 | 16.2 | 22 | 14 | 19.1 | 18.8 | 25.5 | 23.6 | 32 | 20.1 | 27.3 | 26.9 | 36.5 | 28 | 38 | 23.6 | 32 | 31.4 | 42.6 |
| 10 | 12.17 | 16.5 | 10.8 | 14.7 | 14.4 | 19.6 | 32.45 | 44 | 27.9 | 37.8 | 37.2 | 50.5 | 47.2 | 64 | 39.9 | 54.1 | 53.2 | 72.2 | 55 | 75 | 46.7 | 63.3 | 62.3 | 84.4 |
| 12 | 20.65 | 28 | 19.8 | 25.6 | 25.1 | 34.1 | 56 | 76 | 48.6 | 66 | 64.9 | 88 | 81.8 | 111 | 69.7 | 94.5 | 92.2 | 125 | 95.9 | 130 | 81 | 110 | 108 | 147 |
| 14 | 33.19 | 45 | 30.1 | 40.8 | 40 | 54.3 | 89.24 | 121 | 77.4 | 105 | 103 | 140 | 131.28 | 178 | 110 | 150 | 147 | 200 | 154.15 | 209 | 129 | 175 | 172 | 234 |
| 16 | 52.37 | 71 | 46.9 | 63.6 | 62.5 | 84.8 | 139.4 | 189 | 125 | 170 | 166 | 226 | 205.04 | 278 | 173 | 235 | 230 | 313 | 239.7 | 325 | 202 | 274 | 269 | 365 |
| 18 | 72.28 | 98 | 64.5 | 87.5 | 86.2 | 117 | 192.5 | 261 | 171 | 233 | 229 | 311 | 283.2 | 384 | 238 | 323 | 317 | 430 | 331 | 449 | 278 | 377 | 371 | 503 |
| 20 | 102.5 | 139 | 91 | 124 | 121 | 165 | 272.9 | 370 | 243 | 330 | 325 | 441 | 401.2 | 544 | 337 | 458 | 450 | 610 | 469.8 | 637 | 394 | 535 | 525 | 713 |
| 22 | 140.87 | 191 | 124 | 169 | 166 | 225 | 345.4 | 509 | 331 | 450 | 442 | 600 | 551.7 | 748 | 458 | 622 | 612 | 830 | 645.3 | 875 | 536 | 727 | 715 | 970 |
| 24 | 176.27 | 239 | 157 | 214 | 210 | 285 | 469.8 | 637 | 420 | 570 | 562 | 762 | 690.3 | 936 | 583 | 791 | 778 | 1055 | 807.6 | 1095 | 682 | 925 | 909 | 1233 |

## 2 - SAE fastener torque chart

| SAE fastener torque chart<br>This charts is to be used as a guide only unless noted elsewhere in this manual | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | Thread | Grade 5 | | | | Grade 8 | | | | A574 High strength black oxide bolts | |
| | | Lubed | | Dry | | Lubed | | Dry | | Lubed | |
| | | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm | in-lbs | Nm |
| 1/4 | 20 | 80 | 9 | 100 | 11.3 | 110 | 12.4 | 140 | 15.8 | 130 | 14.7 |
| | 28 | 90 | 10.1 | 120 | 13.5 | 120 | 13.5 | 160 | 18 | 140 | 15.8 |
| | | Lubed | | Dry | | Lubed | | Dry | | Lubed | |
| | | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm | ft-lbs | Nm |
| 5/16 | 18 | 13 | 17.6 | 17 | 23 | 18 | 24 | 25 | 33.9 | 21 | 28.4 |
| | 24 | 14 | 19 | 19 | 25.7 | 20 | 27.1 | 27 | 36.6 | 24 | 32.5 |
| 3/8 | 16 | 23 | 31.2 | 31 | 42 | 33 | 44.7 | 44 | 59.6 | 38 | 51.5 |
| | 24 | 26 | 35.2 | 35 | 47.4 | 37 | 50.1 | 49 | 66.4 | 43 | 58.3 |
| 7/16 | 14 | 37 | 50.1 | 49 | 66.4 | 50 | 67.8 | 70 | 94.7 | 61 | 62.7 |
| | 20 | 41 | 55.5 | 55 | 74.5 | 60 | 81.3 | 80 | 108.4 | 68 | 92.1 |
| 1/2 | 13 | 57 | 77.3 | 75 | 101.6 | 80 | 108.4 | 110 | 149 | 93 | 126 |
| | 20 | 64 | 86.7 | 85 | 115 | 90 | 122 | 120 | 162 | 105 | 142 |
| 9/16 | 12 | 80 | 108.4 | 110 | 149 | 120 | 162 | 150 | 203 | 130 | 176 |
| | 18 | 90 | 122 | 120 | 162 | 130 | 176 | 170 | 230 | 140 | 189 |
| 5/8 | 11 | 110 | 149 | 150 | 203 | 160 | 217 | 210 | 284 | 180 | 244 |
| | 18 | 130 | 176 | 170 | 230 | 180 | 244 | 240 | 325 | 200 | 271 |
| 3/4 | 10 | 200 | 271 | 270 | 366 | 280 | 379 | 380 | 515 | 320 | 433 |
| | 16 | 220 | 298 | 300 | 406 | 310 | 420 | 420 | 569 | 350 | 474 |
| 7/8 | 9 | 320 | 433 | 490 | 583 | 450 | 610 | 610 | 827 | 510 | 691 |
| | 14 | 350 | 474 | 470 | 637 | 500 | 678 | 670 | 908 | 560 | 759 |
| 1 | 8 | 480 | 650 | 640 | 867 | 680 | 922 | 910 | 1233 | 770 | 1044 |
| | 12 | 530 | 718 | 710 | 962 | 750 | 1016 | 990 | 1342 | 840 | 1139 |
| 1 1/8 | 7 | 590 | 800 | 790 | 1071 | 970 | 1315 | 1290 | 1749 | 1090 | 1477 |
| | 12 | 670 | 908 | 890 | 1206 | 1080 | 1464 | 1440 | 1952 | 1220 | 1654 |
| 1 1/4 | 7 | 840 | 1138 | 1120 | 1518 | 1360 | 1844 | 1820 | 2467 | 1530 | 2074 |
| | 12 | 930 | 1260 | 1240 | 1681 | 1510 | 2047 | 2010 | 2725 | 1700 | 2304 |
| 1 1/2 | 6 | 1460 | 1979 | 1950 | 2643 | 2370 | 3213 | 3160 | 4284 | 2670 | 3620 |
| | 12 | 1640 | 2223 | 2190 | 2969 | 2670 | 3620 | 3560 | 4826 | 3000 | 4067 |

# 3 - Hydraulic couplings and hoses tightening torque charts

**Hydraulic fitting torque (Tolerance = 0 / +10%)**

| BSPP threads according to ISO1179 | | |
|---|---|---|
| Thread | Torque | |
| | ft-lbs | Nm |
| G1/4 | 26 | 35 |
| G3/8 | 52 | 70 |
| G1/2 | 66 | 90 |
| G3/4 | 133 | 180 |
| G1" | 229 | 310 |
| G1"1/4 | 332 | 450 |
| G1"1/2 | 398 | 540 |
| **UNF threads according to ISO11926-2/3** | | |
| Thread | Torque | |
| | ft-lbs | Nm |
| 7/16-20 | 15 | 20 |
| 1/2-20 | 30 | 40 |
| 9/16-18 | 33 | 45 |
| 3/4-16 | 59 | 80 |
| 7/8-14 | 100 | 135 |
| 1"1/16-12 | 136 | 185 |
| 1"5/16-12 | 199 | 270 |
| 1"5/8-12 | 251 | 340 |
| 1"7/8-12 | 306 | 415 |

| Metric threads according to ISO 6149-2/3 or ISO9974 / DIN 3852-1 | | | | |
|---|---|---|---|---|
| Thread | Torque ISO 6149-2/3 | | Torque DIN 3852-1 | |
| | ft-lbs | Nm | ft-lbs | Nm |
| M10x1,0 | 18 | 25 | 18 | 25 |
| M12x1,5 | 26 | 35 | 26 | 35 |
| M14x1,5 | 30 | 40 | 33 | 45 |
| M16x1,5 | 51 | 70 | 41 | 55 |
| M18x1,5 | 66 | 90 | 52 | 70 |
| M20x1,5 | 92 | 125 | 59 | 80 |
| M22x1,5 | 100 | 135 | 74 | 100 |
| M26x1,5 | 133 | 180 | 125 | 170 |
| M33x2,0 | 229 | 310 | 229 | 310 |
| M42x2,0 | 332 | 450 | 243 | 330 |

***N.B.-:- ISO6149: Sealing with O-ring without any retaining ring (or form). ISO9974 / DIN3852: Sealing with O-ring and retaining ring (or form).***

**Hydraulic hose torque (Minimum / Maximum)**

| Hose size | JIC thread | JIC torque | | ORFS thread | ORFS torque | |
|---|---|---|---|---|---|---|
| | | ft-lbs | Nm | | ft-lbs | Nm |
| DN06 - 1/4" | 7/16-20 | 11-15 | 15-21 | 9/16-18 | 18-21 | 25-28 |
| DN10 - 3/8" | 9/16-18 | 22-31 | 30-42 | 11/16-16 | 30-33 | 40-45 |
| DN12 - 1/2" | 3/4-16 | 37-52 | 50-70 | 13/16-16 | 41-44 | 55-60 |
| DN16 - 5/8" | 7/8-14 | 51-69 | 69-94 | 1"-14 | 59-66 | 80-90 |
| DN19 - 3/4" | 1"1/16-12 | 72-99 | 98-133 | 1"3/16-12 | 85-96 | 115-130 |
| DN25 - 1" | 1"5/16-12 | 103-140 | 140-190 | 1"7/16-12 | 111-125 | 150-170 |
| DN32 - 1"1/4 | 1"5/8-12 | 155-210 | 210-285 | 1"11/16-12 | 148-166 | 200-225 |
| DN38 - 1"1/2 | 1"7/8-12 | 214-280 | 290-380 | 2"-12 | 221-243 | 300-330 |
| DN50 - 2" | 2"1/2-12 | 332-443 | 450-600 | 2"1/2-12 | 367-406 | 500-550 |

## 4 - OPTIMUM 8 - OPTIMUM 1931 E

| Sub-assemblies | Concerned elements | Torque |
|---|---|---|
| Axles | Wheels | 320 Nm |
| | Wheel studs / Driving reducer | Loctite 243 - Normal threadlocker |
| | Hydraulic motor / Driving reducer | 50 Nm |
| | Wheel reducer / Chassis | 190 Nm |
| | Wheel reducer / Wheel steering pivots | 190 Nm |
| | Steering cylinder / Chassis | 190 Nm |
| | Hydraulic block - Lift cylinder :<br>• Cartridge<br>• Nut | 39 - 51 Nm<br>2 - 4 Nm |
| | Hydraulic block - Potholes - Steering :<br>• Nut | 2 - 4 Nm |
| | Electric pump unit :<br>• Cartridge<br>• Nut | 27 Nm max<br>4,5 Nm max |
| ECU | ECU / Carrier | 6 Nm |
| Counterweight | Counterweight / Turntable | 320 Nm |
| Platform control box | | 16 Nm |
| Silentbloc fastening platform control boxPlatform | Floor | 22 Nm |

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves |  | • Place barriers around the perimeter of the work area |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Control and inspections

The state of hoses devices plays a significant role in the safety of the machines.

Section D - Inspection and maintenance schedule :

- Check the absence of leakage to the junctions of the hoses.
- Check that all the hoses are correctly tightened.
- Check the absence of tear and crack of the external hoses.
- Check that the shielding of the hose is not apparent.
- Check the absence of chemical aggression of the membrane of the hose.

If anomalies are noted, it is necessary to replace the elements by respecting the following recommendations.

## 3 - Hoses Disassembling

For safety reasons, respect imperatively the following conditions of disassembling :

- Fold the machine on a flat and released ground :
- The machine is not in slope.
- The boom is horizontal.
- Put the turret (if equipped) in the axis.
- Carry out a beaconing of the sector (maximum risk zone = machine height).
- Locate the hoses and their connections points to guarantee the good performance of the machine after intervention.
- Locate the hoses course to facilitate the reassembly.

To recover oil, use an oils container in order not to pollute the environment.

**Unscrew the flexible device slowly in order to make fall residual water pressure.**

**It is imperative to secure and maintain cylinders when removing hoses cylinders. An analysis of the hydraulic system is imperative.**

**After disassembling :**

- Close the hose openings and the hydraulic components to avoid the pollution of the hydraulic system.
- Check the cleanliness of the hoses and the hydraulic components :
- Absence of plastic, rubber or metal shaving.
- If necessary, purge and clean the circuit (tank included).

## 4 - Hoses Reassembly

For safety reasons, respect imperatively the following conditions of reassembly :

- Using the reference marks carried out previously; carry out the courses of hoses.
- During the fixing of the hoses, respect the tightening torques below.

**Tightening torque table**

| Description | Torque (JIC) | Torque (ORFS) |
|---|---|---|
| Hose 1/4" (diameter 6mm) | 1,5 daN.m(11,08 lbf.ft) | 2,6 daN.m(19,22 lbf.ft) |
| Hose 3/8" (diameter 10mm) | 3,5 daN.m(25,86 lbf.ft) | 4,2 daN.m(31,04 lbf.ft) |
| Hose 1/2" (diameter 12mm) | 5 daN.m(36,95 lbf.ft) | 5,7 daN.m(42,12 lbf.ft) |
| Hose 5/8" (diameter 16mm) | 8 daN.m(59,12 lbf.ft) | 8,5 daN.m(62,82 lbf.ft) |
| Hose 3/4" (diameter 19) | 10 daN.m(73,91 lbf.ft) | 12,2 daN.m(90,17 lbf.ft) |

Once all the hoses are correctly tight :

- Put the machine in operational configuration
- Carry out some movements implementing the hoses concerned in order to purge the hydraulic system.
- Check the absence of leakage.
- Control the level of hydraulic oil tank.
- Check the pressures.

# 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves |  | • Place barriers around the perimeter of the work area |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

Maintaining electrical wiring in good condition is essential to safe operation and good machine performance. Failure to find and replace burnt, chafed, corroded or pinched wires could result in unsafe operating conditions and may cause component damage.

- Open the engine side turntable cover.
- Remove the safety pin from the engine pivot plate latch.
- Open the engine pivot plate latch and swing the engine pivot plate out and away from the machine.
- Inspect the following areas for burnt, chafed, corroded and loose wires :
- Engine wiring harness.
- Hydraulic manifold wiring.
- Open the ground control box aside turntable cover.
- Inspect the following areas for burnt, chafed, corroded and loose wires :
- Ground control box wire harnesses.
- Inside of the ground control box.
- Hydraulic manifold wiring.
- Hydraulic manifold wiringInspect for a liberal coating of dielectric grease at the following location :
- All wire harnesses connectors to the ground control box.
- Start the engine from the ground control box and raise the secondary boom above the turntable covers.
- Remove the center turntable cover retaining fasteners. Remove the center turntable cover from the machine.
- Inspect the turntable area for burnt, chafed and pinched cables.
- Lower the boom to the stowed position and turn the engine off (If equipped).
- Inspect the following areas for burnt, chafed, corroded, pinched and loose wires :
- Cable track on the primary boom (If equipped).
- Cables on the primary, and jib booms (If equipped).
- Jib boom/Platform rotate manifold (If equipped).
- Inside of the platform control box.
- Inspect for a liberal coating of dielectric grease at the following location :
- All wire harnesses connectors to the platform control box.

# Notes

# 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves |  | • Place barriers around the perimeter of the work area |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

# 2 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

# 3 - Pressure adjustment

To allow checking operation, refer to the following table about originally pressure adjustment

***N.B.-:-THE PRESSURE INTAKE SETTING IS THE SAME FOR ALL THE MACHINE'S MOVEMENTS.***

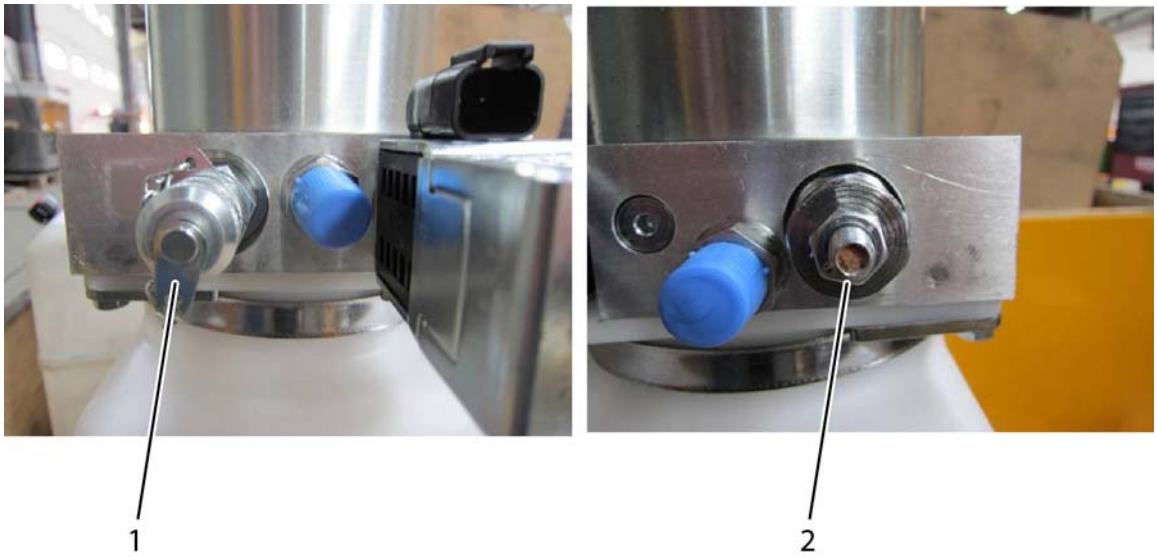
If the values measured by test are not equal to the following :

- Do not use the machine.
- Setting updating is needed.

| Description | In Bar | In PSI |
|---|---|---|
| General | 180 +/- 5 | 2610 +/- 72 |

## 4 - Pressure plug location

General pressure intake




| Marking | Description |
|---|---|
| 1 | Pressure reading |
| 2 | Pressure relief valve |

# Scissor arms screw - Periodical checks

MS0073

## 1 - You will need

| | | | |
|---|---|---|---|
| | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Torque wrench - Tightening torques 22 N.m | | • Place barriers around the perimeter of the work area |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Checks

- **Daily, visually check the presence of the screw of the scissor arms.**
- **Once a month, visually check that there's no untightening of screws of the scissor arm.**

## 3 - Tightening the screws of the scissor arms

If the visual check of the marking is not correct (unscrewing), perform tightening with a torque wrench, torque de 22 N.m

# Notes

# Removal / Replacement of motor reducer assembly

MS0084

## 1 - You will need

| | | | |
|---|---|---|---|
| | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Overhead crane or equivalent, 1 tonne capacity minimum<br>• Forklift min 2 T capacity<br>• Torque wrench for 67 Nm , and 80 Nm | | • Place barriers around the perimeter of the work area |
| | | | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

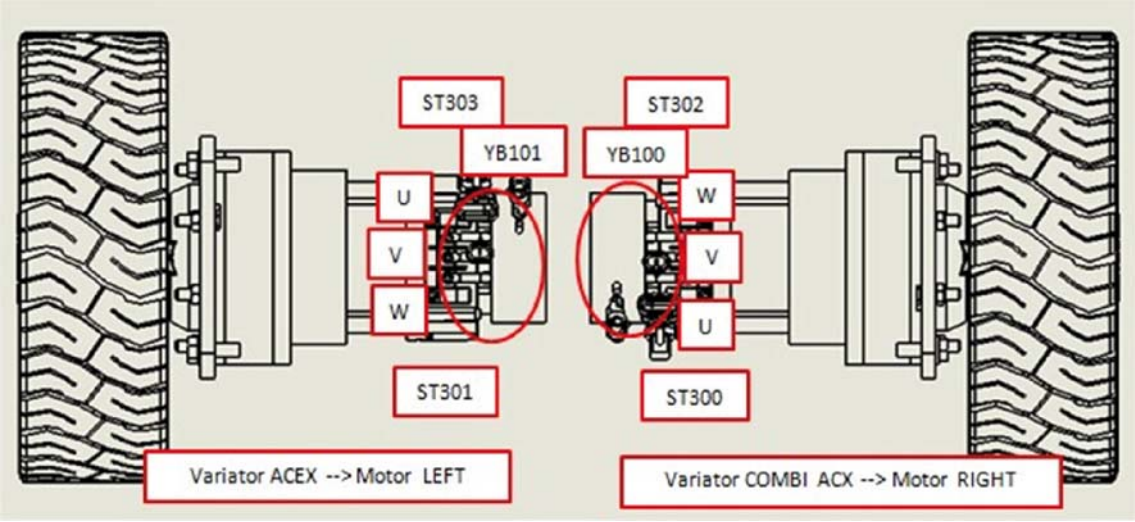
Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

## 3 - Plan of the assembly

**P l a n o f t h e a s s e m b l y**



## 4 - Removal

***N.B.-:-This procedure is explained without removing of the rear counterweight (as perhaps performed in the field). But removal of the rear step counterweight makes the access much better and is recommended when possible. If the counterweight is removed, there is no need to raise the scissor frame and place on the safety support, all work can be done with the platform in stowed position.***

***N.B.-:-This procedure was completed using an overhead crane but could equally be performed using a forklift.***

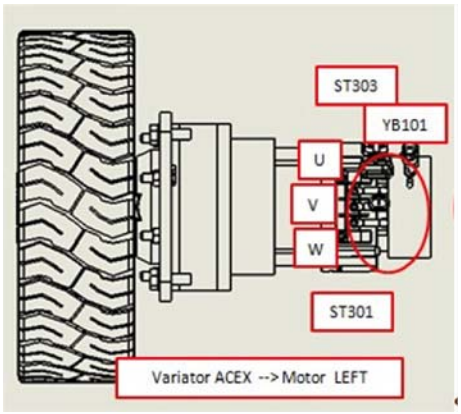
- Lift the machine very lightly off the ground, attaching to the lifting points on the chassis, and place a block of wood under the chassis to support the machine.

- Once the machine is stable on the blocks, from the lower controls, raise the machine from lower controls and place on the safety support
- After placing the machine in this configuration, switch off the machine, then disconnect the battery.
- In order to gain access to the wiring of the motors, unbolt the covering plate that the slope sensor is mounted to, disconnect the slope sensor (some cable ties may need to be cut) and remove the slope sensor and plate from the machine. .

# Removal / Replacement of motor reducer assembly

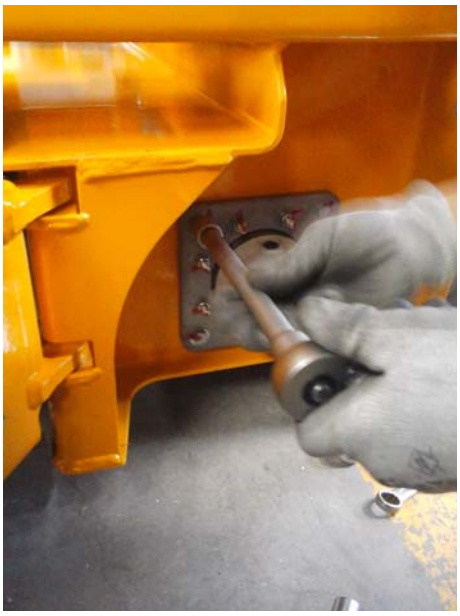
## MS0084

- Disconnect the 3 power cables from the motor (U - V - W).
- Disconnect the plug for the brake unit ( YB101 or YB100 depending on the side).
- Disconnect the plug for the speed sensor ( SV301 or SV300, depending on the side).
- Disconnect the plug for the temperature sensor ( ST302 or ST303 , depending on the side).




- Remove the axle nut and remove the wheel. Use a puller if required.
- Unbolt the 4 bolts (socket 16 mm / 0.63 in) that hold the adaptor plate onto the machine

**When the bolts are removed the motor is no longer fixed and may fall. Remove the lower bolts first, and then gently remove the upper bolts.**

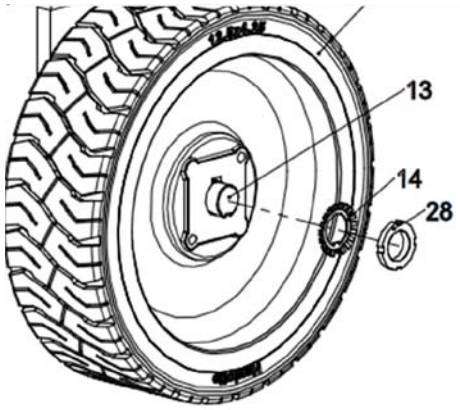


- Carefully remove the motor/reducer assembly, attention to the wiring and connectors for the sensors and brake unit.

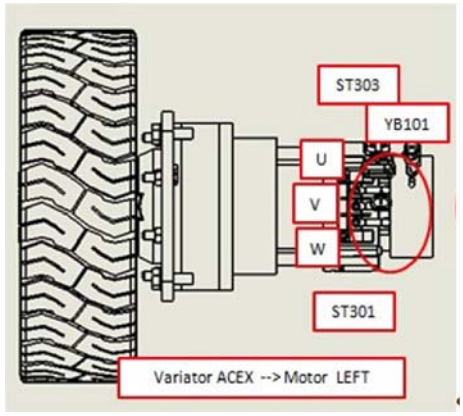
## 5 - Reinstall

- Lift the motor into place, and refit the 4 bolts by hand.
- Tighten the 4 bolts in X pattern with the top bolts in X patter, with a top bole First. Tension the bolts to 67 Nm.

- Fit the key to the axle, and fit the wheel to the axle.
- Fit the new locking washer ( 14 ).
- Install the new wheel nut, and tighten to 80 Nm.
- If, when tensioned to 80 Nm the locking nut does not align with a tab on the lock washer, tighten the wheel nut a little more to align with the next close nut.




- Reconnect the 3 power cables to the motor (U - V - W).
- Reconnect the plug for the brake unit ( YB101 or YB100 depending on the side).
- Reconnect the plug for the speed sensor ( SV300 or SV301, depending on the side).
- Reconnect the plug for the temperature sensor ( ST302 or ST303, depending on the side).
- Secure the wiring with cable ties as required.




## 6 - Checks

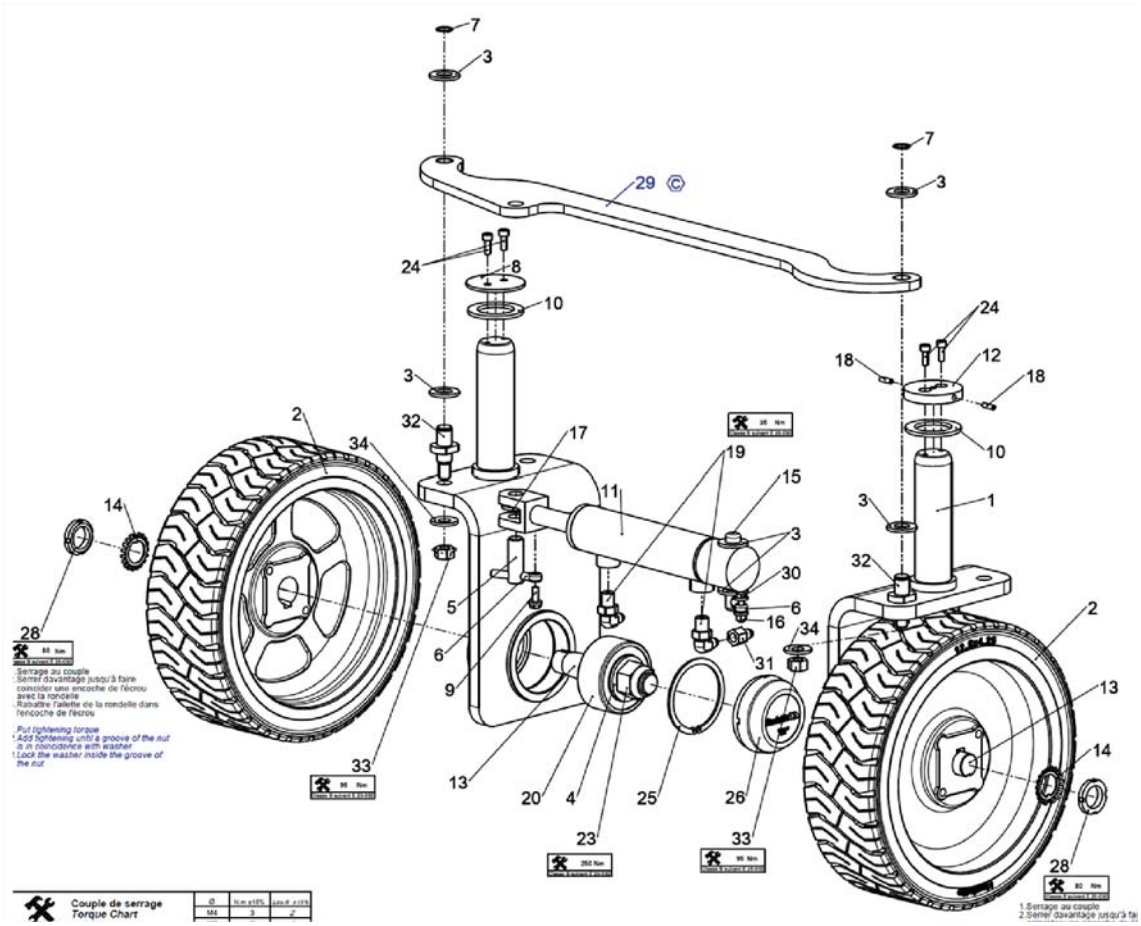
- Switch the machine on.
- Engage drive and steering.

## 1 - You will need

| | | | |
|---|---|---|---|
| | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Overhead crane or equivalent, 1 T / 1,205 lb capacity minimum<br>• Torque wrench for 10 Nm , 80 Nm and 250 Nm<br>• Grease gun | | • Place barriers around the perimeter of the work area |
| | | | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Plan of the assembly

**P l a n o f t h e a s s e m b l y**



## 3 - Removal

***N.B.-:-THIS PROCEDURE WAS COMPLETED USING AN OVERHEAD CRANE BUT COULD EQUALLY BE PERFORMED USING A FORKLIFT.***

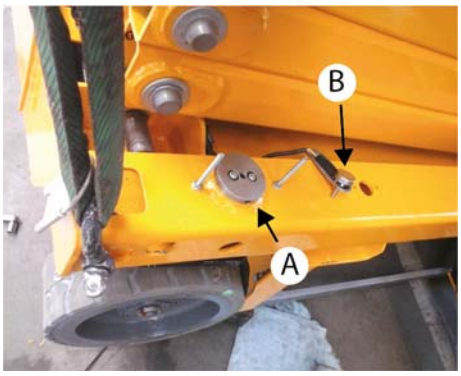
***N.B.-:-IF THE WHEEL IS GOING TO BE REMOVED, THE NUT MUST BE LOOSENED BEFORE THE MACHINE IS LIFTED OFF THE GROUND, IF NOT IT IS DIFFICULT TO HOLD THE WHEEL.***

- Isolate the main power by activating the battery isolation switch and disconnect any other sources of electrical energy (battery charger for example)

- Lift the machine approx 20 cm / 8 in off the ground, to have enough height to remove the pivot, and place the machine on blocks.

For the left side pivot the steering sensor needs to be removed first :

- Unscrew the nuts holding the cover and remove the cover.
- Loosen the grub screw that locks the steering sensor shaft ( A ).
- Lift the sensor and support out together ( B ).



# Removal / replacement of steering pivot assembly

MS0090

Removing the steering bar from the pivot :

- Remove the circlip and washer.
- Slide the bar up off the pin.

# Removal / replacement of steering pivot assembly

MS0090

Removing the steering pivot :

- Place a block under the pivot (or wheel) so the assembly does not fall out on the ground when the upper plate is unscrewed.
- Unscrew the 2 cap head bolts on the top of the pivot. Attention, the pivot is no longer fixed in the chassis.
- Slide the assembly down and out of the chassis.
- Remove the thrust washer from the top of the pivot.
- Unscrew the axle nut and remove the wheel (if wheel is to be removed).

# Removal / replacement of steering pivot assembly

## MS0090

***N.B.-:-THIS STEP IS ONLY POSSIBLE IF THE WHEEL IS ALREADY REMOVED.***

Removing the axle from the pivot :

- Place the assembly face down on a flat surface.
- Using a screwdriver and soft hammer, remove the dust cover.
- Remove the circlips from the inside of the hub pivot.
- Using a hammer, tap on the axle end and the axle will come out the inside.

## 4 - Reinstall

The mounting procedure is the opposite of the removal, with attention to the following nut tensions :

- Nut on the inner axle 250 Nm
- 6 cap head screws on the top of the wheel pivot 10 Nm
- Wheel nut, 80 Nm then continue tightening to the next tab on the lock washer

## 5 - Complementary operations

- Complete the calibration of the steering pivot assembly See MS0097 - Calibration steering.
- Grease the steering pivot.

## 6 - Checks

- Switch the machine on.
- Test the steering and drive function.

# Removal / replacement of platform assembly

MS0095

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Overhead crane or equivalent, 1 T / 2,205 lbs capacity minimum<br>• Lifting slings 3 x 2m - 500 kg (3 x 6ft 7in - 1,103 lb) + 2 x 1m - 500 kg (3 x 3ft 3in - 1,103 lb) or lifting slings 4 x 2 m - 500kg (4 x 6 ft 7 in - 1,103 lb) |  | • Place barriers around the perimeter of the work area |
| | |  | |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

## 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

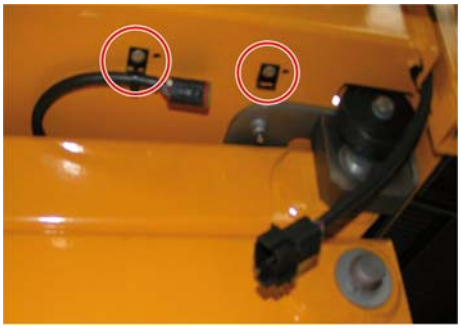
All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

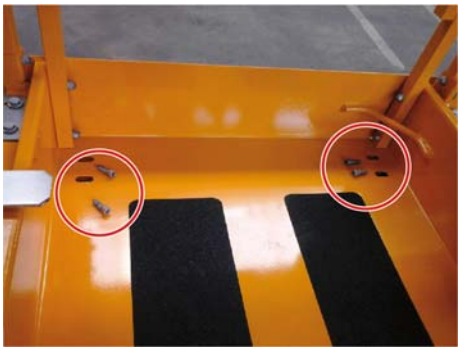
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

## 4 - Removal

- Cut the 3 cable ties under the platform that hold the platform wiring loom to the underside of the platform ( 1 near plug and 2 under platform).
- Disconnect the plug in the harness. Cut the 3 cable ties that hold the cable going from the plug to the upper control box ( 1 near plug and 2 on the vertical part towards the upper control box).
- Remove the upper control box.

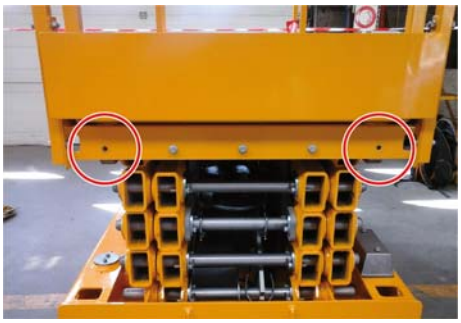


- With the extension deck fully retracted, unscrew the 4 cap head screws that hold the mounting block for the front pivot pin to the platform.



- Unscrew the 2 outer bolts that hold the block.

***N.B.-:-DO NOT UNSCREW THE REST OF THE SCREWS THAT HOLD THE SUPPORT TO THE MACHINE, THESE WILL BE LEFT ATTACHED TO THE PLATFORM.***



- The block is now disconnected, the platform is no longer fixed to the machine.

***N.B.-:-DO CLIMB INTO THE PLATFORM AS IT IS NO LONGER SECURED TO THE MACHINE.***

- The platform can now be removed.

***N.B.-:-TO REMOVE THE PLATFORM, THE FRONT OF THE PLATFORM NEEDS TO BE RAISED AT LEAST 20 CM / 8 IN HIGHER THAN THE REAR, SO IT DOESN'T CONTACT THE TOP OF THE REAR SCISSOR ARMS WHEN BEING REMOVED.***

- Attach the slings to the mid rail of the platform front and rear like shown on the following foto :


| | |
|---|---|
| 1 | 1 x sling 2 m / 6 ft 7 in, 500 kg / 1,103 lb minimum |
| 2 | 2 x sling 1 m / 3 ft 3 in, 500 kg / 1,103 lb minimumSlings are passed through the interior of the platform. |
| 3 | 2 x sling 2 m / 6 ft 7 in, 500 kg / 1,103 lb minimumSlings are passed through the exterior of the platform. |

# Removal / replacement of platform assembly

MS0095

***N.B.-:-IT IS POSSIBLE TO DO THE SAME PROCEDURE WITH 4 X SLINGS 2 METERS, 500 KG / 1,103 LB), BUT THE FRONT MUST BE RIGGED LOWER THAN THE REAR SO AS TO BE SLIGHTLY SHORTER IN LENGTH***

***.***

- Using the overhead crane, slide the platform towards the rear.

***N.B.-:-AFTER THE PLATFORM IS MORE THAN 1/2 WAY, LOWER THE CRANE GENTLY, TO RAISE THE FRONT OF THE PLATFORM.***

- If the platform isn't low enough at the rear side, it will contact and be stuck on the inner scissor arms (Clearance necessary).

- Look under the platform at the wear pad.
- Once the pad is clear of the rail, lift the platform assembly with the crane.

- The platform assembly can now be lifted clear and placed on a pallet.

## 5 - Reinstall

- The installation procedure is the exact reverse of the removal procedure.

***N.B.-:-ENSURE THE PLATFORM IS LIFTED WITH THE REAR OF THE PLATFORM LOWER. THIS WILL MAKE ALIGNMENT EASIER.***

## 6 - Complementary operations

***N.B.-:-IN NORMAL CIRCUMSTANCES A CALIBRATION OF THE OVERLOAD SYSTEM IS NOT REQUIRED.***

## 7 - Checks

Check the general machine operation, clean machine and lightly lubricate the wear pad slides.

# Notes

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Torque wrench for 21 Nm<br>• Overhead crane or equivalent, 1 T / 2,205 lb capacity minimum |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

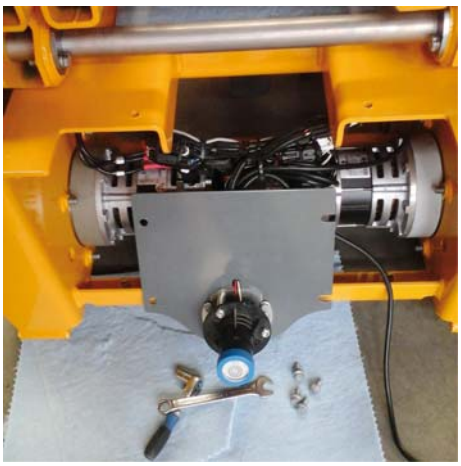
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.
- Remove the platform : See  MS0095 - Removal / replacement platform.

# 3 - Removal

***N.B.-:-This procedure is explained without removing of the rear counterweight (as perhaps performed in the field). But removal of the rear step counterweight makes the access much better and is recommended when possible. If the counterweight is removed, there is no need to raise the scissor frame and place on the safety support, all work can be done with the platform in stowed position.***

***N.B.-:-This procedure was completed using an overhead crane but could equally be performed using a forklift.***

- After removing the counterweight, remove the plate supporting the slope sensor (the scissor assembly will need to extracted towards the rear later on).



- At the front of the machine, between the steering wheels you will find connections for the platform wiring loom, the wiring to the lift cylinder and the connections for the 2 angle sensors.
- Disconnect all these cables.

- Loosen the emergency cable from its fixation on the chassis and pull the cable into the middle of the chassis where the connectors above are located. The cable can rest in place when the scissor frame is removed.

# Removal / replacement of Scissor pack

MS0096

- Open the right side swing out tray, and disconnect the 2 hydraulic hoses (pressure and return) that go up the scissor frame to the lift cylinder. Plug and cap the hoses.
- Pay attention to oil that will leak from the hoses during this process.
- Pull the hoses out and free between the front wheels like above.

- Remove the angle sensor assembly : Loosen the 2 screws on the chassis, slide the support towards the centre of the chassis and carefully remove the assembly.
- Be careful to not twist or force the arms on the sensors as this will damage the sensors.

# Removal / replacement of Scissor pack

## MS0096

- Remove the fixation screws that hold the keeper plates on the lower front scissor frame pin and remove the keeper plates.

- Take 2 slings (2 m x 1000 kg / 6 ft 7 in x 2,205 lb) and attach them to the platform.
- On the front side (as shown, attach to the second pin from bottom, on the rear attach to the bottom pin.
- This difference will lift the front side first to help slide out the scissor stack.

***N.B.-:-If you attach to the upper pins, you will simply raise the scissor frame.***

***N.B.-:-Thread the slings inside the upper pin as shown, to avoid the scissor frame from rotating when lifted.***

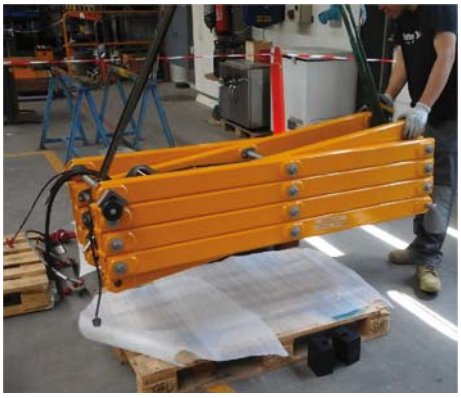
- Using a bar and hammer, remove the front pin.
- At 1/2 way out, stop and remove the safety prop and the actuator plate for the angle sensors from the pin.
- Use the crane to take the load, and remove the pin totally.
- Pull all the hoses and cables up and out the top of the scissor stack so they don't get tangled when removing the assembly.

# Removal / replacement of Scissor pack

MS0096

- Lift the scissor assembly so the front clears the counterweight on the chassis, and slide towards the rear until the rear wear pads come free of the chassis.
- Pay attention to the hosing that it does not get caught on the chassis. Otherwise pull the hoses and cabling to the top of the scissor.

- Place the scissor assembly on a pallet.



## 4 - Reinstall

- Attach the slings to the scissor assembly in the same manner as for the removal.
- Lift the assembly, and position behind the chassis so as to slide the scissor assembly into the chassis rails.

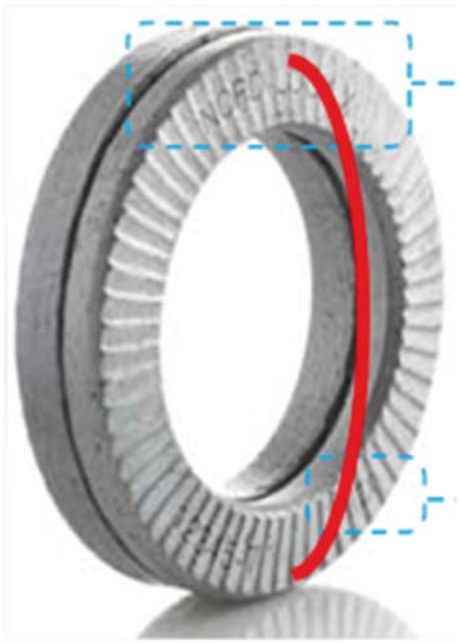
- Remount the support with the 2 angle sensors to the chassis if they were removed.
- Do not tighten just yet, as this will need adjusting for the calibration.

- With the scissor frame in position, partially fit the pen starting from the left (lower control box) side.
- This side makes it easier for re-installing the angle sensor actuation plate and safety support.
- Install the angle support and safety support on the pin (attention to the orientation for both parts).

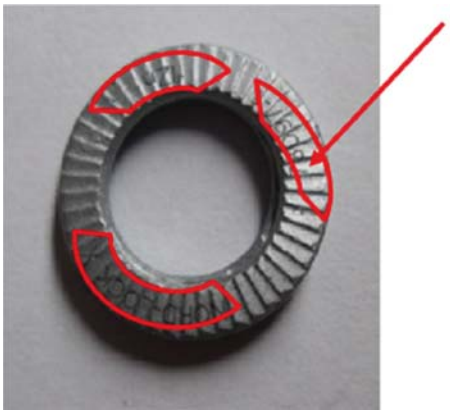
- Fix the actuator plate and keeper plate to the machine.
- Do not yet tighten !

***N.B.-:-USE NEW BOLTS AND NORDLOCK WASHERS. FOR THE INSTALLATION OF THE WASHERS SEE BELOW.***

- The NORDLOCK washer is made up of 2 different washers.
- These must be assembled in the right order.

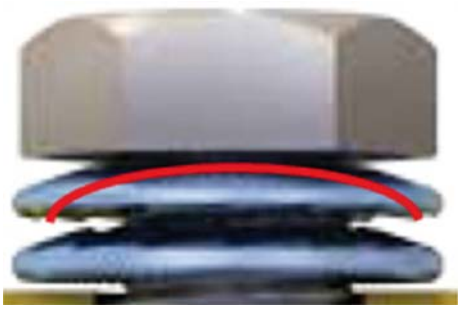


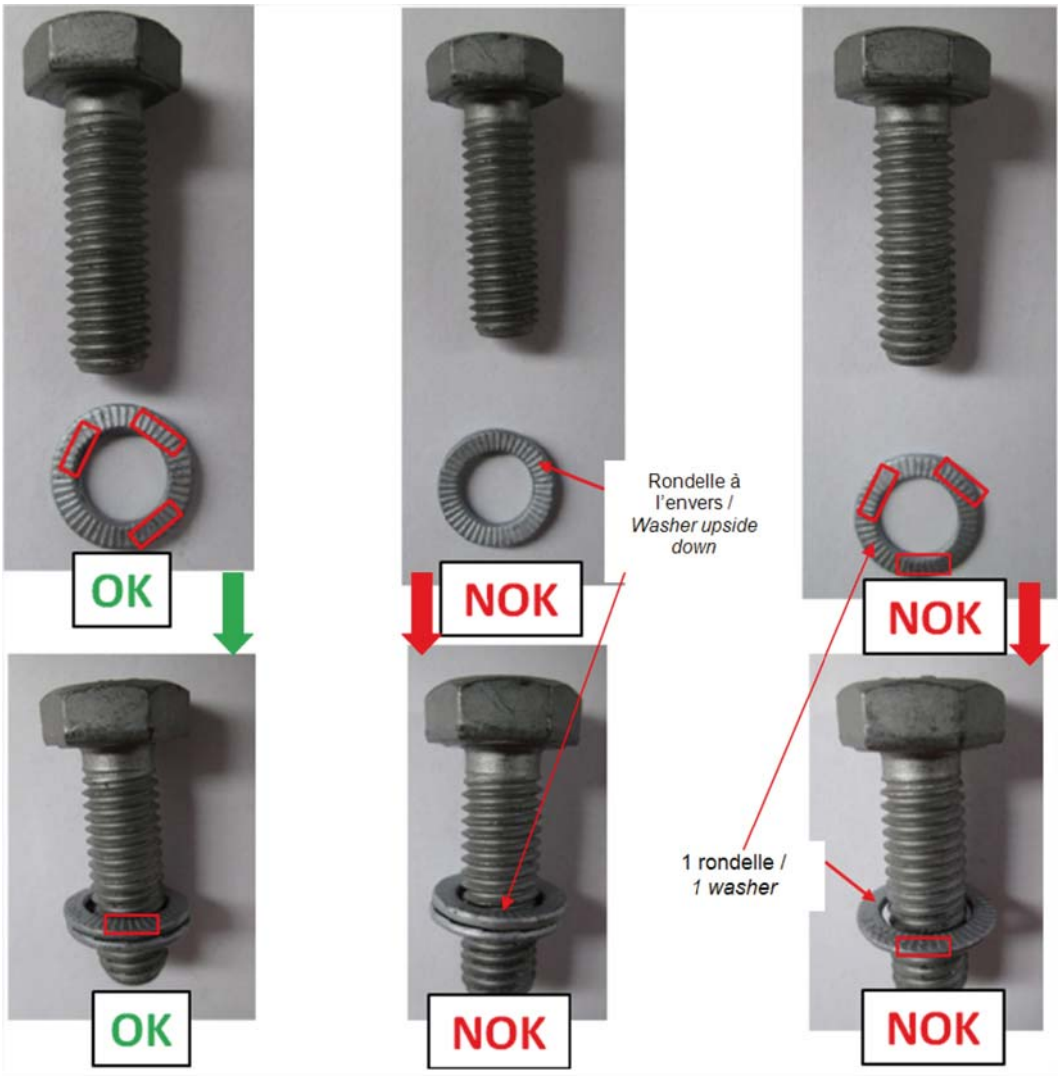
- The Side of the washer that goes towards the bolt head has markings on it.



Installation order of the NORDLOCK washer :

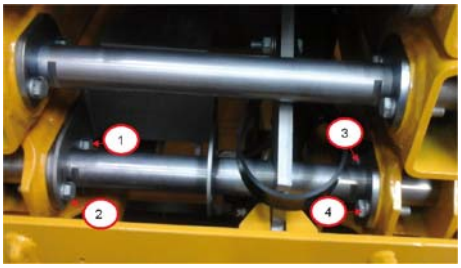
- Bolt head
- Side with markings
- Convex side






Tighten the keeper bolts as follows :

- Tighten the screw ( 1 ) then ( 2 ) to 22 Nm.
- Re tighten the screw ( 1 ) then ( 2 ) to 22 Nm.
- Tighten the screw ( 3 ) then ( 4 ) to 22 Nm.
- Re tighten the screw ( 3 ) then ( 4 ) to 22 Nm.
- .
- Reconnect the hydraulic hoses.
- Re-connect the wiring for the angle sensors, the connector for the upper control box wiring loom and the connector for the wiring to the lift cylinder.
- Refit the wiring and hoses with cable ties.
- Refit the emergency lower cable to the support in the chassis.



## 5 - Complementary operations

- Reinstall the platform : See MS0095 - Removal / replacement platform.
- Verify the hydraulic oil level.
- The lift cylinder may contain air. Complete several lift/lower cycles to remove any air from the system.
- If the machine was set to US mode for the operation, set machine to correct country zone.
- Complete the calibration of the overload (refer MS0098) or Angle sensors ( MS0099).

## 6 - Checks

- Turn on the machine and test the lifting/lowering function.
- Verify absence of any oil leaks.

# Notes

# 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves |  | • Place barriers around the perimeter of the work area |
| | |  | |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

# 2 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

# 3 - Level of knowledge required

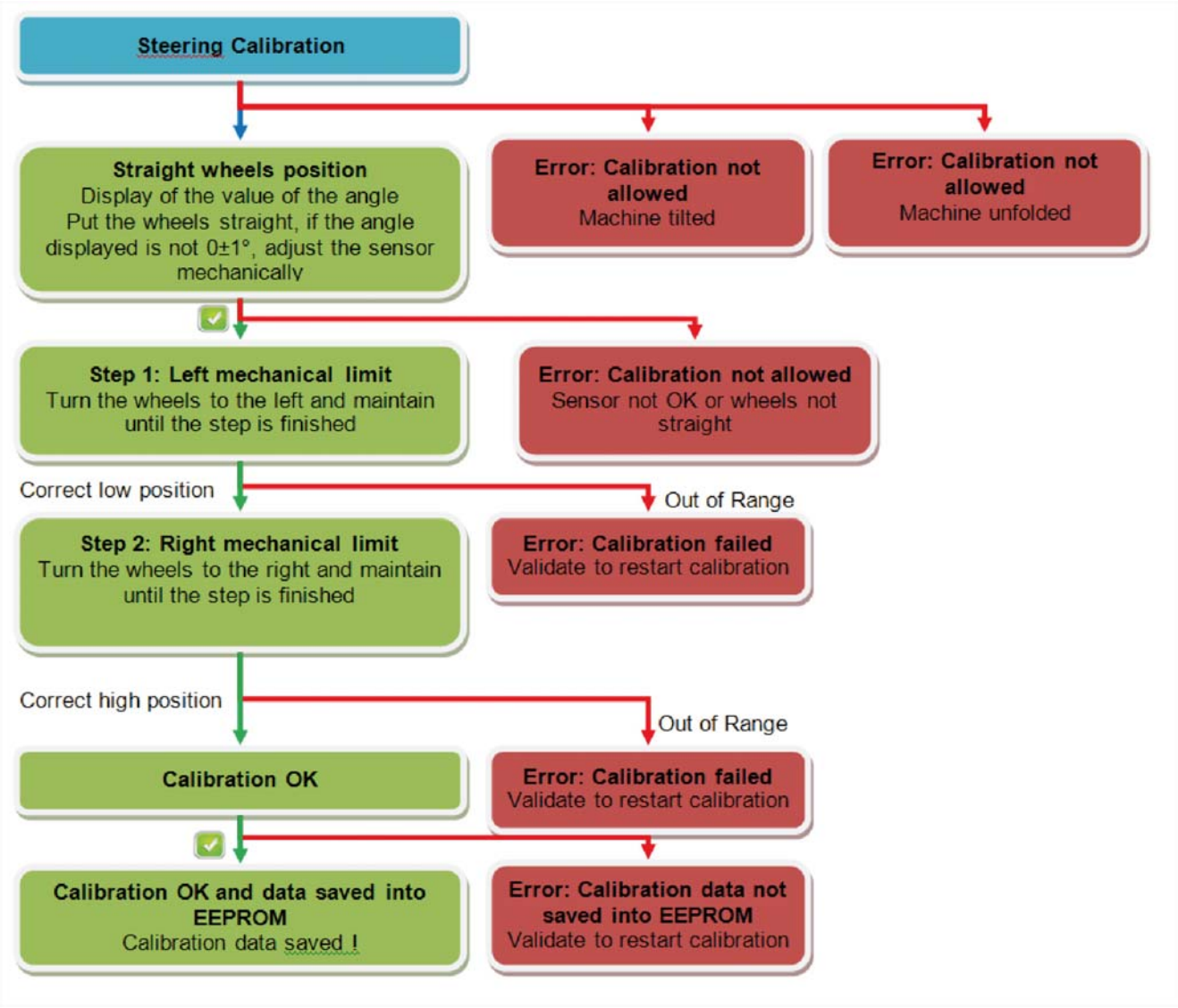
The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.

It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.

**Only an authorized and qualified technician can work on HAULOTTE® machines.**

## 4 - Steering calibration procedure

**In the ACTIV'Screen (or using HaulotteDiag) navigate to the calibration menu and enter Steering calibration**




## 5 - Checks

Turn on the machine and test the steer function- the pump motor should stop when the steering is at mechanical limit and the steering switch is held on :

- When wheels steer to the left the steer angle decreases : Its limit is set to + 47,6°
- When wheels steer to the right the steer angle increases : Its limit is set to - 75,2 °

# 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Weight 250 kg / 550 lb |  | • Place barriers around the perimeter of the work area |
| | |  | |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

# 2 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
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- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

# 3 - Level of knowledge required

The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.

It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.

**Only an authorized and qualified technician can work on HAULOTTE® machines.**

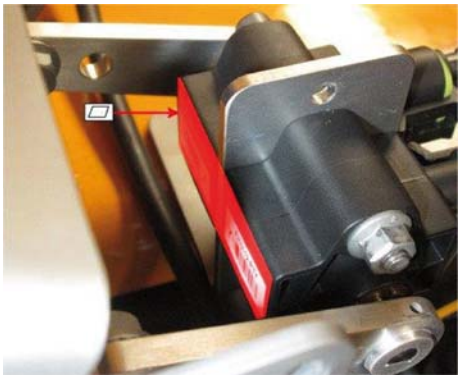
# 4 - Load management calibration Procedure

**Before any calibration procedure, make sure to remove from the basket / platform all options weighing more than 15 kg / 33 lbs (Welding machine support, Basket mesh, ...).**

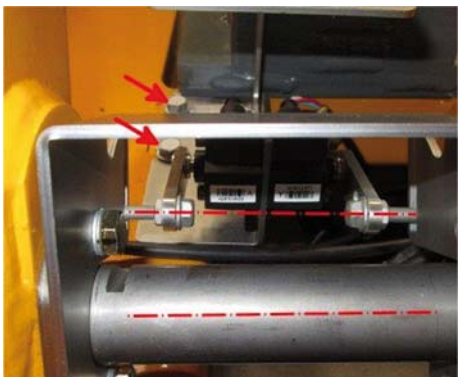
**For calibration with a fixed or adjustable weight, the load must integrate the weight of all basket options.**

Before starting the calibration, check that the sensors are correctly mounted :

- The sensors are mounted parallel with the front edge of the support for the sensors.



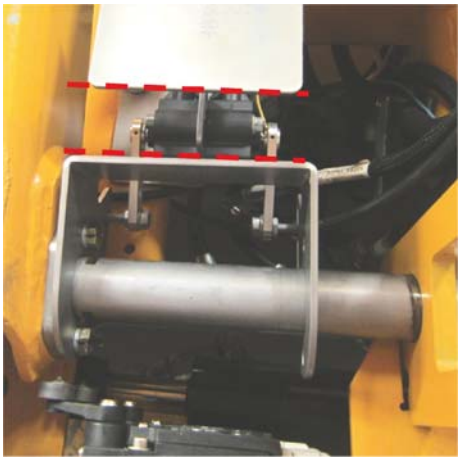
- The sensor arms are parallel with the pivot pin for the scissor arm.

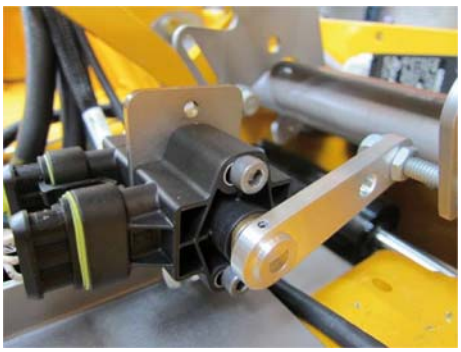


# Calibration Load management system

## MS0098

- The sensors support is parallel with the pin and with the sensors.

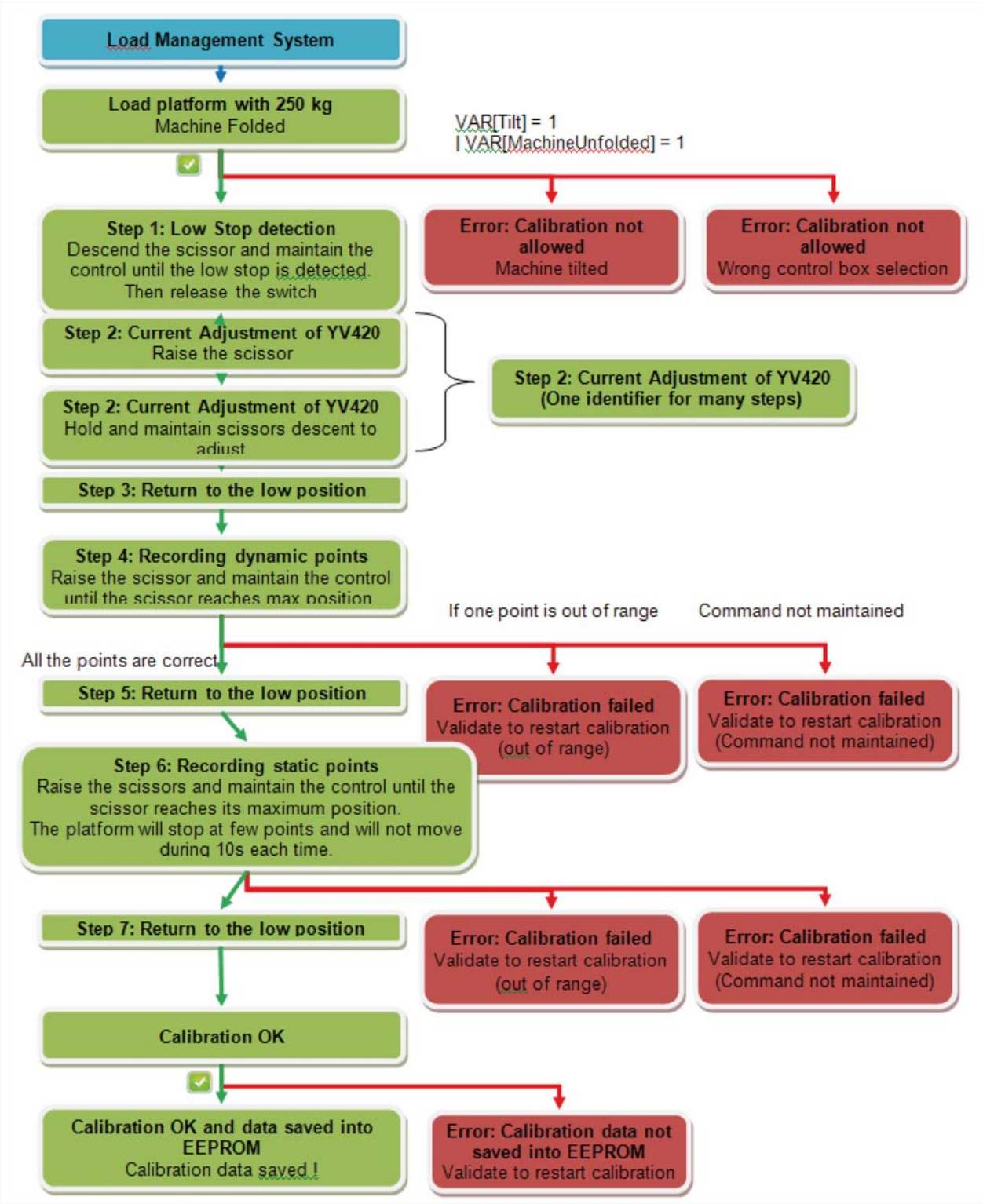




| Sensors | Low position | Upper position |
|---|---|---|
| SR420 | environ 74 pts | environ 530 pts |
| SR722 | environ 420 pts | environ 135 pts |

- Place the 250 kg / 550 lb load in the middle of the platform

**In the ACTIV'Screen (or using HaulotteDiag) navigate to the calibration menu and enter Load management System**



## 5 - Checks

- Turn the machine off then on, and test the lift function.
- Check that the function is stopped over 3 m / 9 ft 10 in with 250 kg / 550 lb in platform.
- Check that the function is not stopped at 3 m / 9 ft 10 in with less than 230 kg / 507 lb in platform

# Notes

# 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• Weight 250 kg / 550 lb |  | • Place barriers around the perimeter of the work area |
| | |  | |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

# 2 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

# 3 - Level of knowledge required

The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.

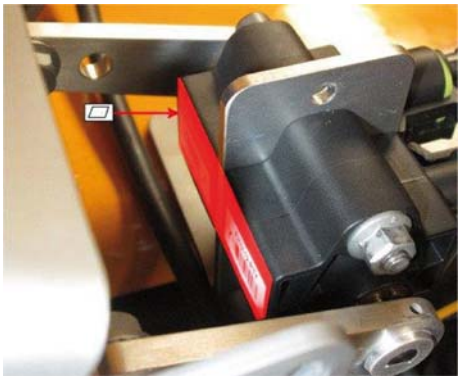
It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.

**Only an authorized and qualified technician can work on HAULOTTE® machines.**

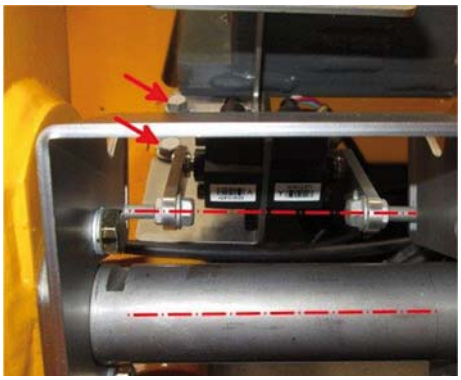
# 4 - Procedure of load management system calibration

Before starting the calibration, check that the sensors are correctly mounted :

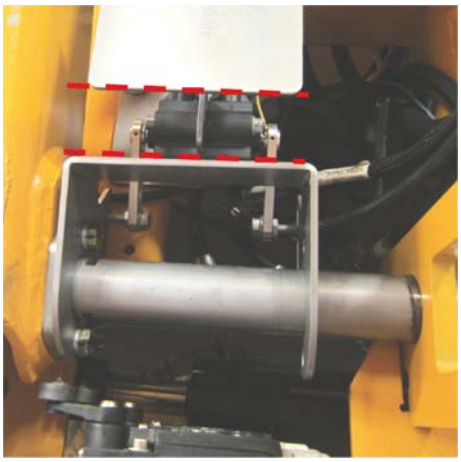
- The sensors are mounted parallel with the front edge of the support for the sensors.



- The sensor arms are parallel with the pivot pin for the scissor arm.



- The sensors support is parallel with the pin and with the sensors.



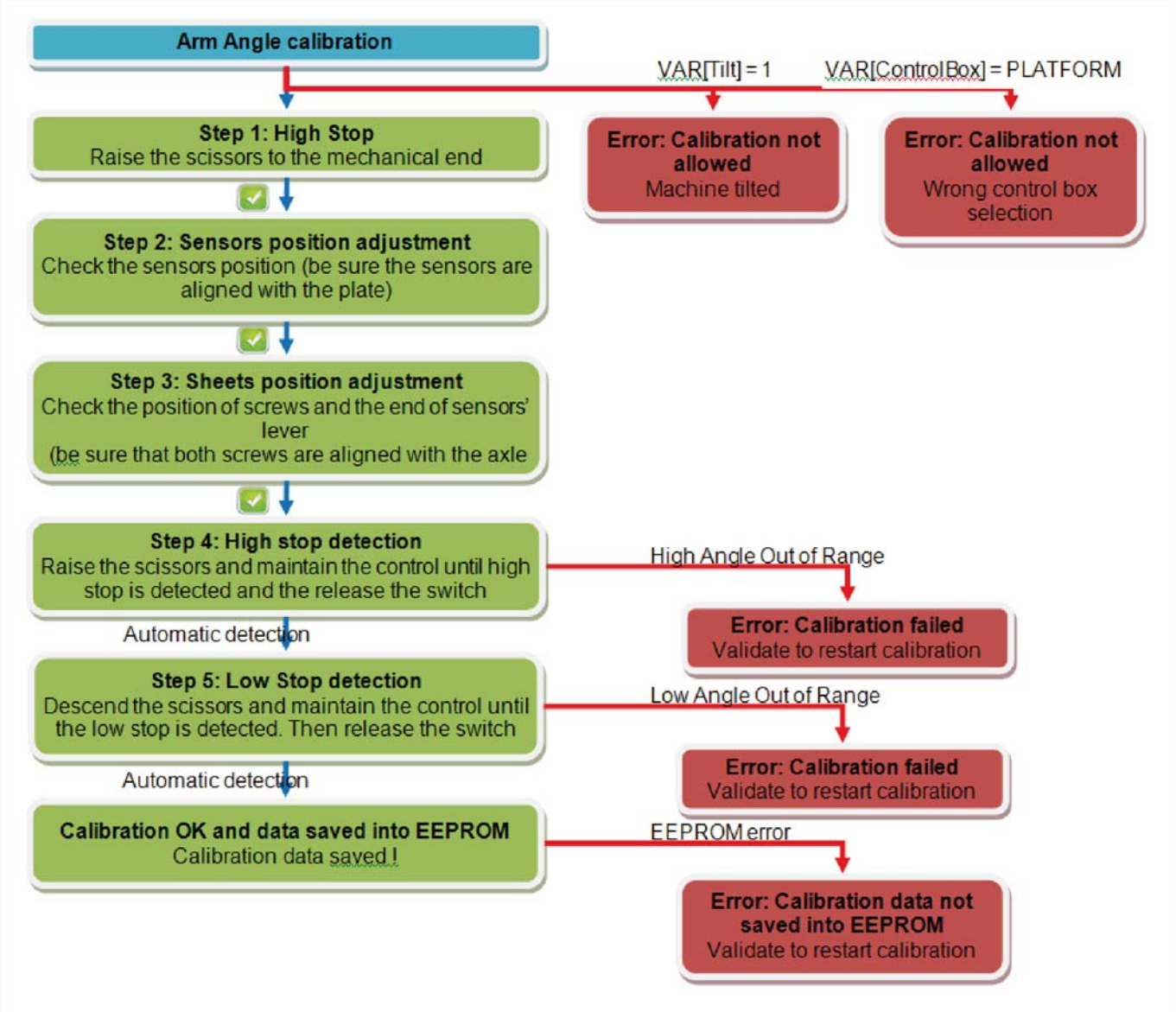
# Calibration arm angle sensors

## MS0099

***N.B.-:-BEFORE LAUNCHING THE CALIBRATION, CHECK AND ADJUST IF NECESSARY THE SENSORS VALUE.***

| Sensors | Calibration | Valid range (V) |
|---|---|---|
| SR420 | Low (0°) | [0.65 ; 1.10] |
| SR722 | Low (0°) | [4.05 ; 4.40] |
| SR420 | High (57°) | [3.35 ; 3.80] |
| SR722 | High (57°) | [1.30 ; 1.65] |

In the ACTIV'Screen (or using HaulotteDiag) navigate to the calibration menu and enter Arm angle calibration




## 5 - Checks

- Turn the machine off then on, and test the lift function.

# 1 - You will need

- Standard tool kit
- Protective goggles
- Gloves

- Place barriers around the perimeter of the work area

Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing.

Upon starting and during operation of the machine, the LCD screen "Activ'Screen" located on the ground control box displays in real time the machine operating status.

# 2 - Simplified menus

| Main menu | Submenu 1 |
|---|---|
| 0. Home screen | |
| 0b. Information | |
| 0c. Information | |
| 0d. Access codes settings | |
| 1. Failures | 1.1. Current failures |
| | 1.2. Failures log |
| 2. Access code | |
| 3. Machine settings | 3.1. Speeds and Ramps |
| | 3.2. Calibration |
| | 3.3. Machine configuration |
| | 3.4. Save / restore parameters |
| | 3.5. Advanced settings |
| 4. Diagnostic | 4.1. Functions |
| | 4.2. Machine state |

| Main menu | Submenu 1 |
|---|---|
| | 4.3. Inputs / Outputs |
| | 4.4. System test |
| 5. Maintenance | 5.1. Maintenance to be done |
| | 5.2. Maintenance log |
| | 5.3. Events log |
| | 5.4. Usage log |
| | 5.5. Upload software |
| | 5.6. Software versions |
| | 5.7. Event counters |
| 6. Tools | 6.1. Upload software |
| | 6.2. Camera |
| | 6.3. Wifi |
| | 6.4. Photos |
| | 6.5. General settings |
| | 6.6. Files manager |

# 3 - Detailed menus

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 1. Failures | 1.1. Current failures | | (Detected failures list) |
| | 1.2. Failures log | | (Failure history) |
| | | By date | (Failure history by date) |
| | | By counters | (Failure history by counters) |
| 2. Access code | | Enter HAULOTTE® Acces Code ( ▼ ▲ + ENTER) | |
| 3. Machine settings | 3.1. Speeds and Ramps | Drive forward | |
| | | | Min speed |
| | | | Max speed |
| | | | Max speed micro |
| | | | Acceleration |
| | | | Deceleration |
| | | Drive reverse | |
| | | | Min speed |
| | | | Max speed |
| | | | Max speed micro |
| | | | Acceleration |
| | | | Deceleration |
| | | Steering left | |
| | | | Max speed |
| | | Steering right | |
| | | | Max speed |
| | | Potholes extend | |
| | | | Max speed |
| | | Potholes retract | |
| | | | Max speed |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 3. Machine settings | 3.1. Speeds and Ramps | Mast raise | |
| | | | Min speed |
| | | | Max speed raise |
| | | | Acceleration raise |
| | | | Deceleration raise |
| | | Mast descent | |
| | | | Min speed |
| | | | Max speed raise |
| | | | Acceleration raise |
| | | | Deceleration raise |
| | 3.2. Calibration | Steering angle | |
| | | Load management system | |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 3. Machine settings | 3.3. Machine configuration | Option setting | |
| | | | Buzzer |
| | | | Flashing light |
| | | | Tracking system |
| | | | Drive restriction when lifted |
| | | | User identification inhibited |
| | | | Platform protection |
| | | Country selection | |
| | | | Standard |
| | | | USA |
| | | | Australia |
| | | | Russia / Ukraine |
| | | ECU Date and hour | |
| | | | Automatic setting |
| | | | Manual setting |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 3. Machine settings | 3.4. Save / restore parameters | Save parameters | |
| | | Restore parameters | |
| | 3.5. Advanced settings | Components configuration | |
| | | | Battery types |
| | | | Mast descent valve |
| | | Machine Model | |
| | | | STAR 6 (STAR 13) |
| | | | STAR 6P (STAR 13P) |
| | | | STAR 8S (STAR 20) |
| | | Serial number | |
| | | Hourmeter | |
| | | Security settings | |
| | | Machine checking | |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.1. Functions | Drive micro speed | |
| | | Drive high speed | |
| | | Forward steering | |
| | | Mast | |
| | | Picking plate (only on STAR 6P (STAR13P)) | |
| | 4.2. Machine state | Machine | |
| | | | Active control box |
| | | | Chassis control box |
| | | | Platform control box |
| | | | Picking control box (only on STAR 6P (STAR13P)) |
| | | | Machine unfolded |
| | | | Tilt |
| | | | Hourmeter |
| | | | Platform Foot Switch state |
| | | | Chassis enable switch state |
| | | | Battery level |
| | | | Battery voltage |
| | | | Unbraking enabled |
| | | | User identified |
| | | | User identification |
| | | | Running calibration |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.2. Machine state | ECU | |
| | | | Max number of EEPROM queries (R/W) into the stack |
| | | | Current number of EEPROM queries (R/W) into the stack |
| | | | Current EEPROM status |
| | | | Number of EEPROM stack errors |
| | | | Number of EEPROM status errors |
| | | | Execution time of 4 ms task |
| | | | Execution time of 8 ms task |
| | | | Execution time of 32 ms task |
| | | | Execution time of 128 ms task |
| | | | Execution time of 1000 ms task |
| | | | ZAPI network failure present on ECU CombiACX |
| | | | ZAPI network failure present on ECU ACEX |
| | | | Software version CAN Tiller |
| | | | Number of initialization tries |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.2. Machine state | Driving | |
| | | | Drive movement setpoint |
| | | | Drive movement slowdown |
| | | | Drive forward cuttings |
| | | | Drive reverse cuttings |
| | | | Drive movement control |
| | | | Drive speed |
| | | | Speed reduction |
| | | | Brake release switch (Driving) |
| | | | Right motor speed setpoint |
| | | | Left motor speed setpoint |
| | | Steering | |
| | | | Steering movement setpoint |
| | | | Steering movement slowdown |
| | | | Steering left cuttings |
| | | | Steering right cuttings |
| | | | Steering movement control |
| | | | Wheels steering angle |
| | | | Steering left limit |
| | | | Steering right limit |
| | | | Steering angle calibration performed |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.2. Machine state | Potholes | |
| | | | Potholes movement setpoint |
| | | | Potholes out cuttings |
| | | | Potholes in cuttings |
| | | | Potholes movement control |
| | | Mast | |
| | | | Mast movement setpoint |
| | | | Mast movement slowdown |
| | | | Mast raise cutouts |
| | | | Mast descent cutouts |
| | | | Mast movement control |
| | | Picking machine (only on STAR 6P (STAR13P)) | |
| | | | Picking tray movement setpoint |
| | | | Picking tray movement cutouts |
| | | | Picking tray movement control |
| | | | Threshold of the picking overload |
| | | | Instantaneous picking overload alarm |
| | | | Overload alarm of the picking |
| | | | Maximum current during a picking movement |
| | | | Current drawn by the picking motor |
| | | | Offset current |
| | | | Mean current during a picking movement |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.3. Inputs / Outputs | DIGITAL INPUTS ( TOR) | |
| | | | SB801 - Emergency stop (turntable/frame) |
| | | | SQ800 - Slope sensor |
| | | | SA901TU - Control box selector - Turntable |
| | | | SA901PF - Control box selector - Platform |
| | | | SA907TU - Horn switch - Turntable |
| | | | ST903 - Extrem ambiant temperature sensor |
| | | | SA103 - Brake release switch |
| | | | SQ144_145 - Potholes left/right position sensors |
| | | | SR120 - Chassis inclination detector 1 |
| | | | SR121 - Chassis inclination detector 2 |
| | | | SM901EN - Enable switch - Enable Switch |
| | | | SM901L - Joystick steering rocker - Left |
| | | | SM901R - Joystick steering rocker - Right |
| | | | SA907 - Horn switch |
| | | | SM901N - Drive/Arm joystick - Enable Switch |
| | | | SA908a - Drive/Arm movement selection switch - Direction a |
| | | | SA908b - Drive/Arm movement selection switch - Direction b |
| | | | SQ700_701 - Platform doors position sensors |
| | | | SQ920 - Platform protection detector |
| | | | SA520U - Mast switch (picking) up-Raise (only on STAR 6P (STAR13P)) |
| | | | SA520D - Mast switch (picking) down-Descent (only on STAR 6P (STAR13P)) |
| | | | SB806 - Enable switch (only on STAR 6P (STAR13P)) |
| | | | SA110 - Drive speed selection |
| | | | SWITCH1 - Top arm |
| | | | SWITCH2 - Bottom arm |
| | | | SWITCH3 - Enable switch |
| | | | SWITCH5 - Navigation Up |
| | | | SWITCH6 - Navigation Down |
| | | | SWITCH7 - Navigation Confirm |
| | | | SWITCH8 - Navigation Cancel |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.3. Inputs / Outputs | Outputs TOR | |
| | | | KAH - Supply holding relay |
| | | | YV150R - Front right steering valve |
| | | | YV150L - Front left steering valve |
| | | | HA901 - Buzzer (Turntable) |
| | | | YV144 - Pothole lift down |
| | | | YV145 - Potholes lift up |
| | | | KA1 - Horn relay |
| | | | YV903 - Pump unloading valve |
| | | | KA2 - Flashing light relay |
| | | | HL420 - Indicator light - Lifting mode |
| | | | HL100 - Indicator light - Driving selection |
| | | | HL802 - Indicator light - Overload platform |
| | | | HL904 - Indicator light - Low Battery |
| | | | HL800 - Indicator light - Tilt |
| | | | HL903 - Indicator light - Impacting Machine Behaviour Failure(s) |
| | | | SA723S - Picking tray switch - Supply voltage (only on STAR 6P (STAR13P)) |
| | | | EL909 - Indicator light - Road light 4 |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 4. Diagnostic | 4.3. Inputs / Outputs | ANALOG INPUTS | |
| | | | MOT_D_I - Right engine current |
| | | | SV300 - Motor speed sensor 1 |
| | | | ST302 - Motor temperature sensor 1 |
| | | | ECU_TEMP - ECU internal temperature |
| | | | PUMP_I - Pump current |
| | | | SI900 - Picking motor current consumption (only on STAR 6P (STAR13P)) |
| | | | SR150 - Front wheels angle sensor |
| | | | MOT_G_I - Left engine current |
| | | | SV301 - Motor speed sensor 2 |
| | | | ST303 - Motor temperature sensor 2 |
| | | | ECU_TEMP - ECU internal temperature |
| | | | SM901 - Drive/Arm joystick |
| | | | SA723 - Picking tray switch (only on STAR 6P (STAR13P)) |
| | | | AU_INFO - Emergency stop (platform) status |
| | | Analogic output | |
| | | | YV520 - Mast valve |
| | 4.4. System test | (System test history) | |

| Main menu | Submenu 1 | Submenu 2 | |
|---|---|---|---|
| 5. Maintenance | 5.1. Maintenance to be done | Hydraulic oil filter change | |
| | | Lubrication - Lubricant system | |
| | | Hydraulic tank oil change | |
| | | Replacement : Chains, pulleys, wear pads | |
| | | Replacement : Pins, rings, bearings | |
| | 5.2. Maintenance log | (Maintenance done history) | |
| | 5.3. Events log | By event | |
| | | By date | |
| | | | Machine tilt and unfolded |
| | | | Country changes (EEPROM) |
| | | | Parameter changes (EEPROM) |
| | | | Software version changes |
| | | | Updated hourmeter |
| | | | Overload alarm (only on STAR 6P (STAR13P)) |
| | | | Change of the calibration values of the Picking load system (only on STAR 6P (STAR13P)) |
| | 5.4. Usage log | (Usage machine history : Date and hourmeter) | |
| | 5.5. Upload software | From local drive | |
| | | From USB drive | |
| | 5.6. Software versions | HAULOTTE® Application | |
| | | CombiACX | |
| | | ACEX | |
| | | Can Tiller | |
| | | Activ'Screen | |

| Main menu | Submenu 1 | Submenu 2 |
|---|---|---|
| 5. Maintenance | 5.7. Event counters | Hourmeter |
| | | Mast movement |
| | | Drive movements |
| | | Picking plate movement |
| | | Turret control box selection |
| | | Platform control box selection |
| | | Picking control box selection (only on STAR 6P (STAR13P)) |
| | | Maximum right inverter temperature |
| | | Maximum right engine temperature |
| | | Maximum left inverter temperature |
| | | Maximum left engine temperature |
| | | Mast raising movement |
| | | Mast descent movement |
| | | Drive movements |
| | | Steering movement |
| | | Picking plate movement |
| | | Turret control box selection |
| | | Platform control box selection |
| | | Picking control box selection (only on STAR 6P (STAR13P)) |
| | | Steering movement |
| | | Overload |
| | | Picking usage (only on STAR 6P (STAR13P)) |

| Main menu | Submenu 1 | Submenu 2 |
|---|---|---|
| 6. Tools | 6.1. Upload software | By event |
| | | By date |
| | 6.2. Camera | (Camera history) |
| | 6.3. Wifi | (Wifi history) |
| | 6.4. Photos | (Photos history) |
| | 6.5. General settings | Language |
| | | Brightness |
| | | Date & Time format |
| | | HAULOTTE DIAG Update |
| | | System properties |
| | 6.6. Files manager | File manager history |

## 3.1 - SCREEN ACCESS CODE SETTINGS

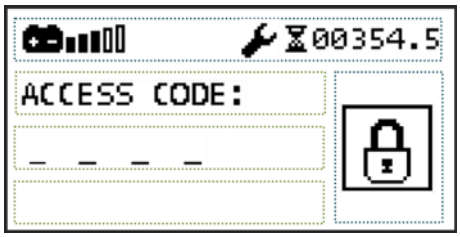
### 3.1.1 - Screen 0d

This screen allows the access to the following screens. When this state is active, there is no scrolling with other possible states. Only the "screen saver" is active. In this screen, it is possible to enter a level code from 1 to 3 :

- Level 1 : 1250 User code
- Level 2 : 2031
- Level 3 : "Turning" code. Based on the date and the machine serial number.

Screen_Acces_code Username :

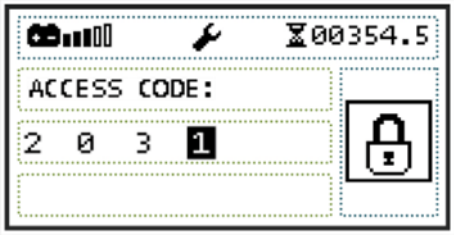
- Press the validation button ( 4 ).




- Press the up ( 3 ) or down ( 8 ) navigation button to increment / decrement the digits.



- Press the ( 4 ) validation button in order to pass to the next digit.
- The return/cancel key returns to the previous digit, without erasing, or to the previous menu if the first digit is selected.

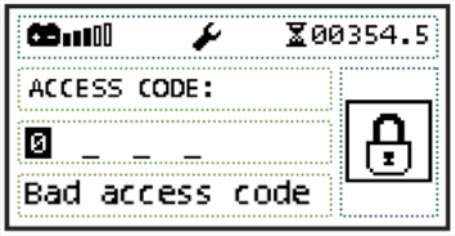



Screen_Acces_level_x Username :

- Press the validation code ( 4 ) to validate the entered code.


Screen_Bad_code Username :

- The screen 1 access (faults) after 1s if the entered code corresponds to an access level.
- Otherwise, stay on this screen to allow the user to enter a new code.



# Notes

## 1 - You will need

| | | | |
|---|---|---|---|
| | • The tracker with its cable.<br>• A clamp to strip the wires.<br>• A clamp to crimp the wires. | | • Place barriers around the perimeter of the work area |
| | 1 person | | |

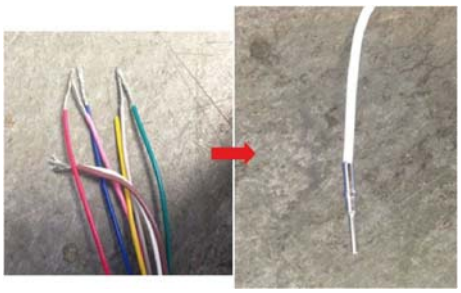
## 2 - Procedure

Step 1 :

- Disconnect the plug 2.
- Remove the caps on the plug.

Step 2 :

- Pick up the pins in the plastic bag.
- Strip the wires of the tracker.
- Crimp the wires with the pins with a crimping clamp.



# Universal plug

## MS0133

Step 3 :

- Take the wedgelock off the plug.
- Thread the wires in the positions regarding the information.

| C1 | Universal connector |
|---|---|
| Pin 1 | + permanent battery |
| Pin 2 | GND (0 V) |
| Pin 3 | + battery voltage |
| Pin 4 | • Machine with engine : Engine ON information.<br>• Electrical machine : Movement and driving information. |
| Pin 5 | Power ON information |
| Pin 6 | |
| Pin 7 | Movement information (Flashing light option activation) |
| Pin 8 | Driving information |
| Pin 9 | CAN 1 H |
| Pin 10 | CAN 1 L |
| Pin 11 | CAN 2 H |
| Pin 12 | CAN 2 L |

***N.B.-:-Refer to the instructions provided with the tracker for the wires correspondence. Depending of the type of unit, a resistance (200 Ohms, 1 W) must be integrated between signal and ground.***

Step 4 :

- Put the wedgelock back on the plug to fix the pins.

Step 5 :

- Reconnect the plugs.
- Mount the tracker.
- The tracking device is operational.

# Notes

# Platform extension lock assembly

MS0174

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>Kit 4000502080 which contains :<br>• Plate : 4000468460 - Quantity : 1.<br>• Lever : 4000468340 - Quantity : 1.<br>• Spring : 2421808300 - Quantity : 1.<br>• Pin : 24000468450 - Quantity : 1.<br>• Pad : 4000474370 - Quantity : 1.<br>• Pad plate : 4000307760 - Quantity : 1.<br>• Roller : 196D160350 - Quantity : 2.<br>• Roller guide : 96D160360 - Quantity : 2.<br>• Rivet : 2421809000 - Quantity : 2.<br>• Screw : 2308231220 - Quantity : 1.<br>• Screw : 2700101600 - Quantity : 2.<br>• Screw : 2331231590 - Quantity : 2.<br>• Washer : 2351112030 - Quantity : 1.<br>• Washer : 2351112090 - Quantity : 2.<br>• Nut : 2700200450 - Quantity : 2.<br>• Nut : 2349221480 - Quantity : 1. |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

## 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

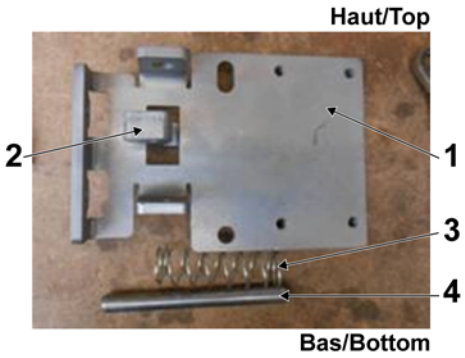
All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

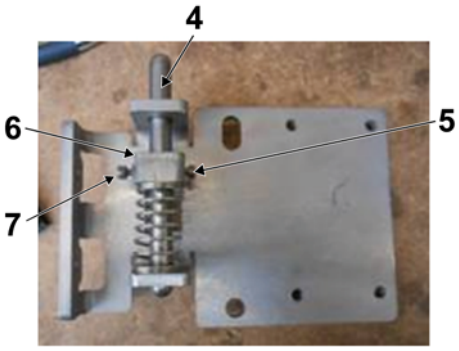
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

## 4 - Procedure

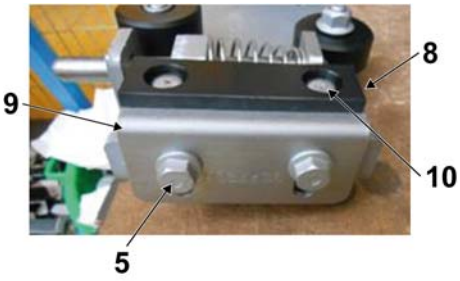
- Take the plate ( 1 ) : 4000468460 and insert the lever ( 2 ) : 4000468340.
- Install the compressed spring ( 3 ) : 2421808300 between the lever and the plate.




- Install the pin ( 4 ) : 24000468450 in the holes in the plate ( 1 ) : 4000468460 and lever ( 2 ) : 4000468340.
- Fix the lever ( 2 ) to the pin ( 4 ) with a screw ( 5 ) : 2308231220, a washer ( 6 ) : 2351112030, and a nut ( 7 ) : 2349221480.

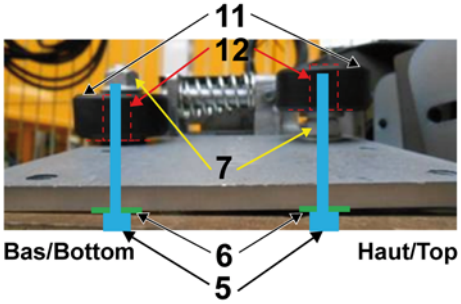



- Fix the pad ( 8 ) : 4000474370 to the pad plate ( 9 ) : 4000307760 with two rivets ( 10 ) 2421809000.
- Fix the ensemble to the plate ( 1 ) : 4000468460 with 2 screw ( 5 ) 2700101600; do not yet tighten.

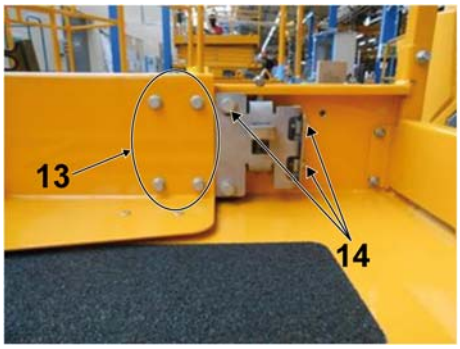



- Install the two rollers ( 11 ) : 196D160350 with two roller guides ( 12 ) : 196D160360 to the plate ( 1 ) : 4000468460.
- Use two screw ( 5 ) : 2331231590, two washers ( 6 ) : 2351112090, and two nuts ( 7 ) : 2700200450.

**• The lower roller needs to be tightened between the plate and the nut but the upper roller must be slipped over the screw and not tightened and as a result it is offset compared to the other roller.**



- In the platform, unscrew the 4 screw ( 13 ) HM8x12 from the old pedal plate.
- Loosen the screw ( 14 ) HM10 for the top roller.
- Remove the old pedal plate, and slide the new plate into place.
- Tighten the 4 screw 13 HM8 for the pedal plate. Adjust and tighten the screws for the top roller and the pad plate.




## 5 - Additional operations

Nothing to report.

## 6 - Checks

Slide the extension in and out several times and verify that the platform locks in every position, and there is no excess play in the rollers or pad. Adjust if necessary.

# Removal - Replacement of the motor/pump assembly

MS0175

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>• Assorted hydraulic plugs and caps ( JIC fitting) |  | • Place barriers around the perimeter of the work area |
| | |  | |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

## 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

## 4 - Removal

- Open the swing out trays on both sides.
- To work in security, disconnect the battery cable to isolate the machine.

- Disconnect the plugs from the 3 electrical coils on the motor pump group as shown below.

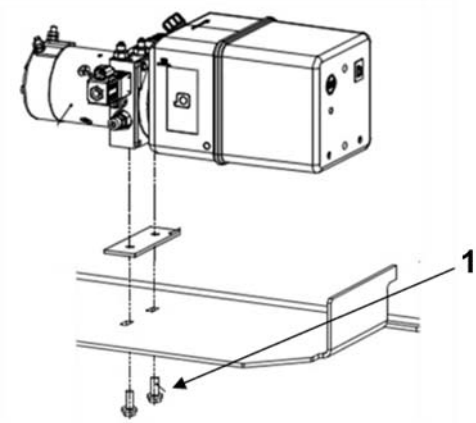
- Mark the 4 hydraulic hoses ( I2 on the top, one on each side as identified left) on the motor/pump group to identify them.
- Clean the fittings from dirt if necessary, then unscrew them.
- Install plugs on the hydraulic manifold and caps on the hoses to avoid contamination.

- Mark the electrical cables on the motor to identify them, and then you can disconnect them.

# Removal - Replacement of the motor/pump assembly

MS0175

- The motor / Pump group can now be removed.
- Remove the 2 M10 bolts ( 1 ) that fix the motor/pump group to the tray (they are access from underneath the tray).




- Carefully remove the group complete (do not lift the assembly by only the motor, but also do not lift by only the reservoir.
- Ensure that you support the 2 parts.
- Place the motor vertically on the hydraulic reservoir end.

## 5 - Reinstall

Re-installation is a reversal of the removal procedure, with the following important points :

- Ensure that the spacer plate (shown below) is positioned correctly under the motor/pump group.
- Ensure all the hydraulic and electrical connections are clean, and free from corrosion.

## 6 - Complementary operations

- Verify the hydraulic oil level.

## 7 - Checks

Test all hydraulic functions for correct operation :

- Platform raising / lowering.
- Pothole system operation.
- Steering system operation.

# 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>• Oils recovery system<br>• Absorbent for any oil spills<br>• Hydraulic filter : 2505000970 - Quantity : 1. |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

# 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

# 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

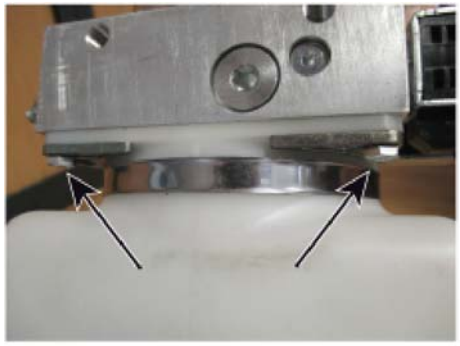
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

## 4 - Removal

***N.B.-:-YOU CAN EMPTY THE RESERVOIR VIA THE FILLER PLUG BEFORE REMOVING THE FILTER, BUT IT IS EASIER TO DO AFTER THE MOTOR/PUMP IS REMOVED.***

- Stand the motor/pump group vertically and loosen the band clamp.

- Remove the 4 X 6 mm screws that fix the reservoir to the hydraulic block.

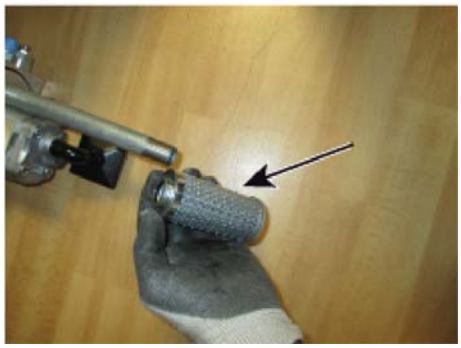


- Use a large screwdriver (or flat blade) to carefully separate the block from the tank.

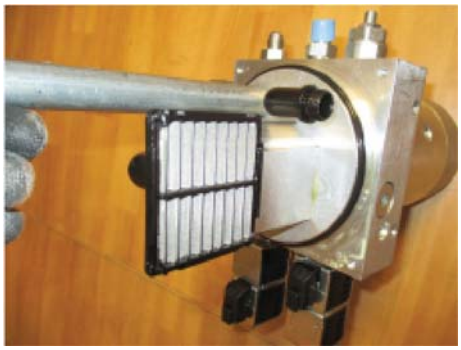
***N.B.-:-TAKE CARE TO NOT MARK THIS SURFACE.***

- Remove the motor/pump group from the reservoir.

- The filter can now be removed- it simply slides onto the pick-up tube.



- There is a secondary filter on the pickup side, this can be washed with cleaner if required.



## 5 - Reinstall

- Reverse the above procedure.

## 6 - Complementary operations

- Refit the hydraulic unit and refill the oil reservoir.

## 7 - Checks

- Test the machine.
- Check the oil level and top up if necessary.
- Check for any oil leaks.

# Notes

# Assembly electro-brake unit



## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>• Tension wrench 2,66 Nm<br>• Shaft puller<br>• Press<br>• Kit protection : 4000595410 - Quantity : 1 per brake unit |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

# 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

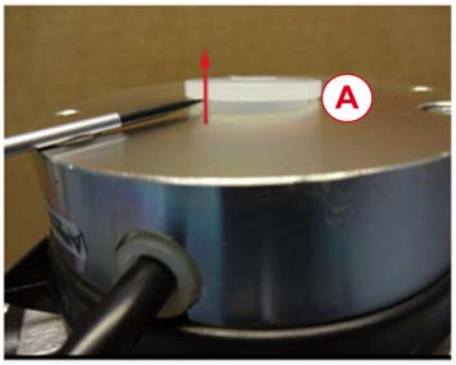
After completion of work, all the covers and safety devices must be positioned back completely and operational.

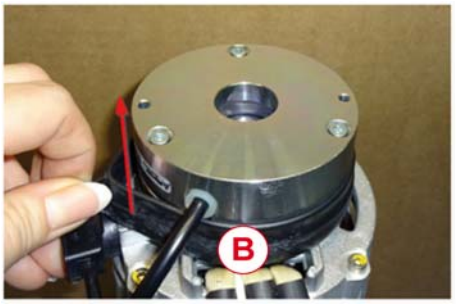
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

## 4 - Removal

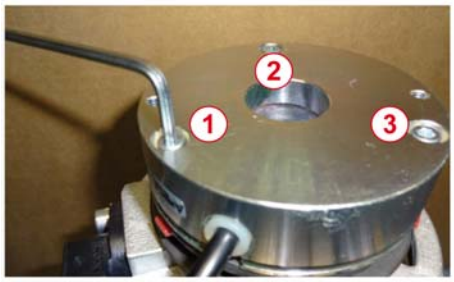
If fitted with dust protection kit :

- Remove the plastic cover ( A ), and the rubber ring cover ( B ).

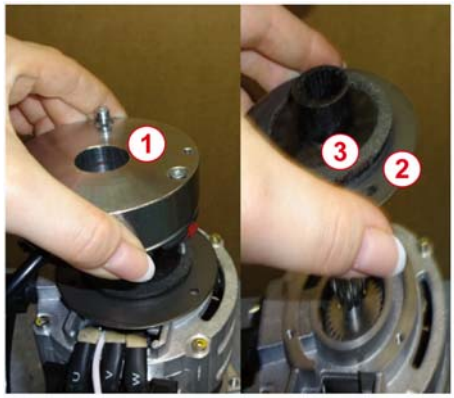



- Unscrew the 3 mounting screws progressively.

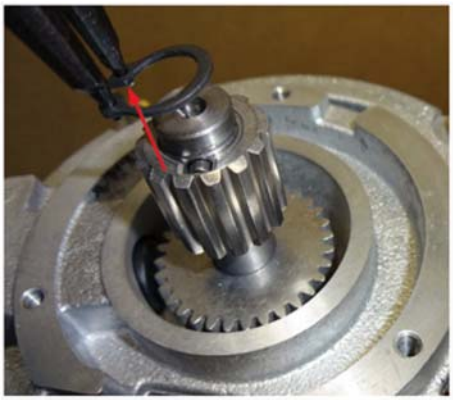



- Remove the brake magnet ( 1 ), the friction disk ( 2 ) and the inner flange ( 3 ).



***N.B.-:-THE FOLLOWING IS ONLY REQUIRED IF YOU WISH TO REPLACE THE GEAR :***

- Remove the circlip from the end of the shaft.

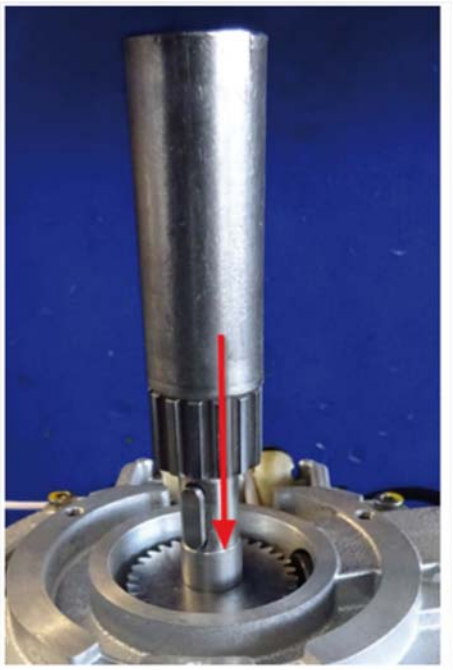


- Remove the gear from the shaft using a shaft puller.

## 5 - Reinstall

***N.B.-:-THESE FIRST STEP IS ONLY REQUIRED IF THE GEAR WAS REPLACED :***

- Install the key in the shaft, and then use a press to install the gear onto the motor shaft.



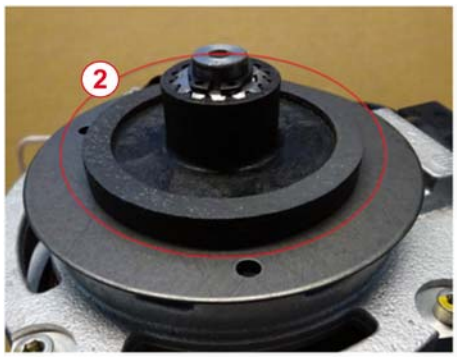
- Install the circlip onto the shaft.

# Assembly electro-brake unit

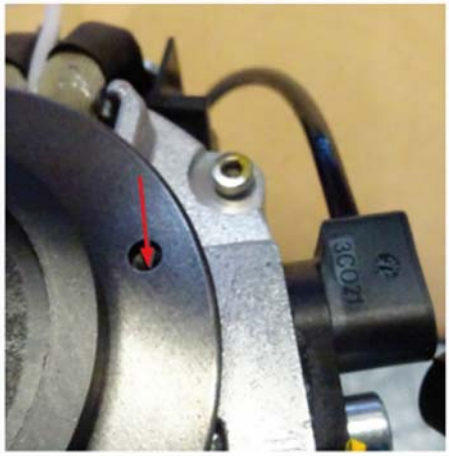
## MS0177

- Check that the wires are correctly positioned as shown below.

- Install the backing plate ( 1 ) and then install the rotor disk ( 2 ).

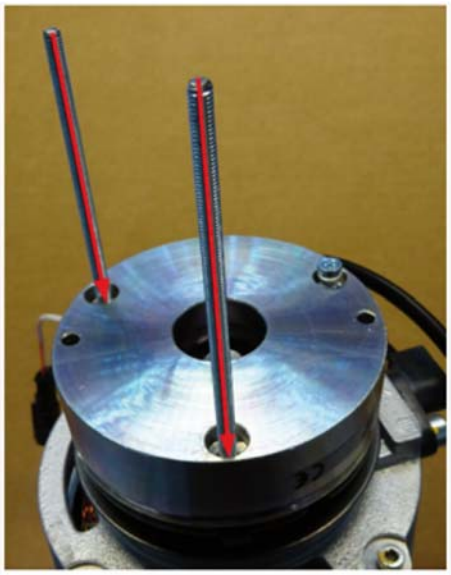

- Check the alignment of the backing plate, so it is aligned with the holes.
- Install threaded rods into  2 of the  3 mounting holes.



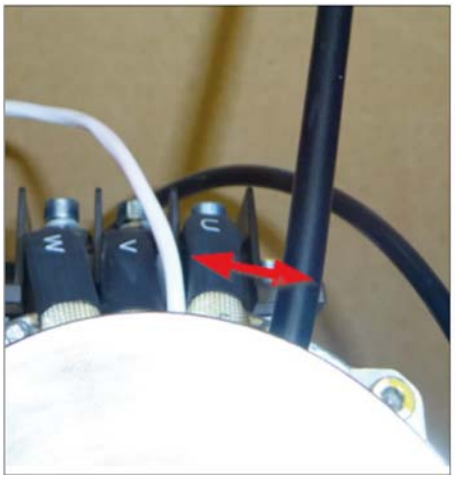
# Assembly electro-brake unit

MS0177

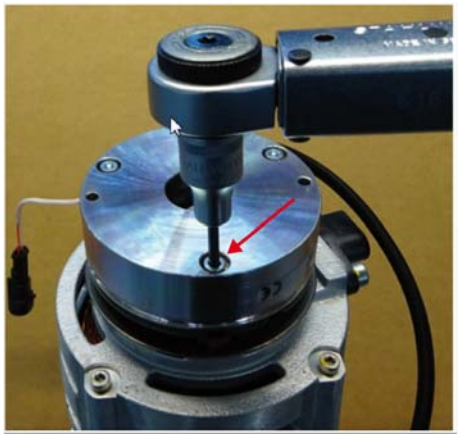
- Install the brake uni onto the motor.
- Do not forget to install the washer onto the mounting bolts.



- Position the brake electromagnet onto the motor, and align it so the wiring is just next to the "U" wire as shown below.

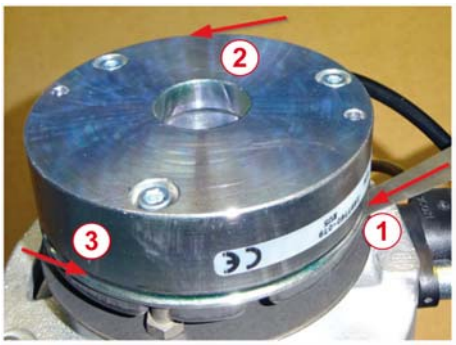


- Remove the threaded bars, and insert the bolts.
- Tension the bolts to 2,66 Nm +/-10% .

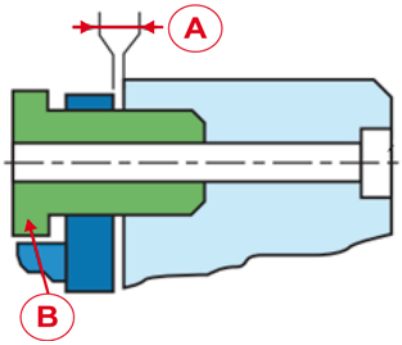


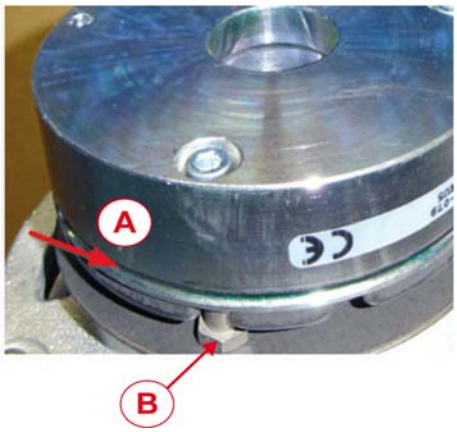
- Remove the plastic wedges which hold the adjusting screws in position.

- Check the air gap at 3 points.
- The nominal clearance should be 0,2 mm (min 0,15 mm / max 0,3 mm).



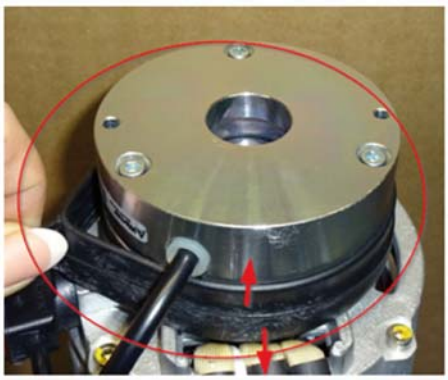
- To reset the airgap ( A ), undo the adjustment bolts ( B ) and adjust to obtain the necessary gap size.
- Measure the airgap at several points.
- Cycle the brake a number of times then re-check.



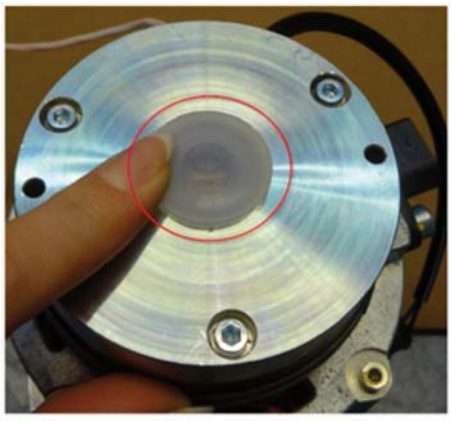




If using dust cover :

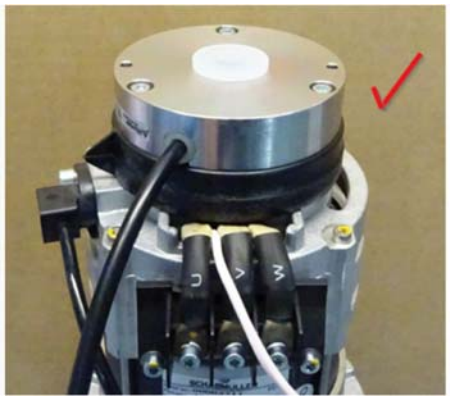
- Install the dust cover to the motor unit.



- Install the end cap.



- The installation is complete.



## 6 - Complementary operations

- For instructions on installing the motor-reducer assembly to the machine : See MS0084 - Removal / Replacement of motor reducer assembly.

## 7 - Checks

- After installation, verify the correct drive operation in both directions.
- If clearance needed adjusting, re-check clearance after a few cycles.

# Brake unit protection installation

MS0178

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>• Lifting device (floor crane or similar) 300 kg (661 lbs) capacity minimum<br>• Lifting slings, 300 kg (661 lbs) capacity minimum<br>• M16 eye bolts to attach to counterweight<br>• Tension wrench 2,66 Nm<br>• Tension wrench 190 Nm<br>• Kit protection : 4000595410 - Quantity : 1 per brake unit |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

## 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

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All the precautions must be done in work before intervening on and near the machine.

After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

# 4 - Removal

## 4.1 - REMOVE THE COUNTERWEIGHT

- Remove the counterweight thread cover, connect M16 eye bolts ( 1 ) and attach slings.

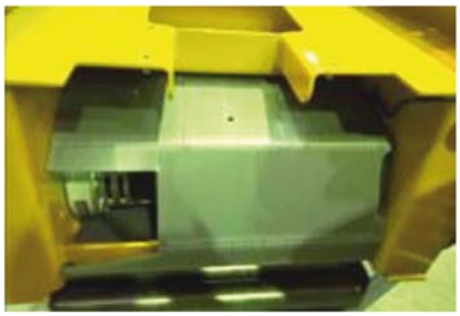


- Loosen and remove the counterweight fixing screw ( 2 ) on each side.

# Brake unit protection installation

MS0178

- Remove the counterweight then open the motor cover.

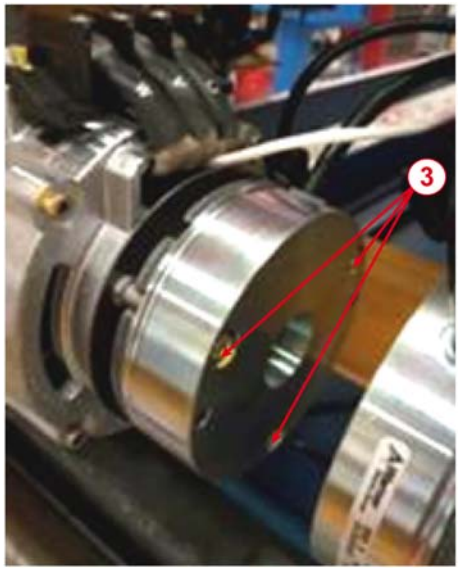


- **Counterweight is about 250 kg (551 lbs).**

- Treating a stuck brake.

## 4.2 - TREATING A STUCK BRAKE

- Slightly loosen the three screws ( 3 ) on the back of each motor.

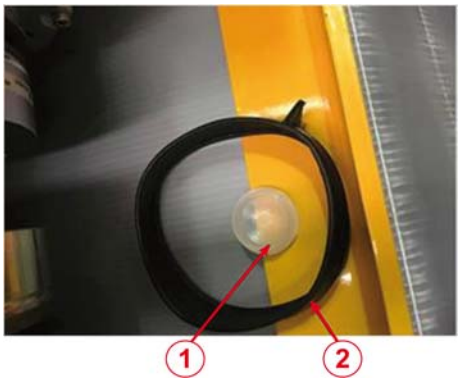



- Tap, very softly, the brake with a rubber hammer this will release the stuck brake.
- Re-tighten the three screws to a torque of 2,66 Nm, then mark the back of each motor.

# 5 - Reinstall

## 5.1 - INSTALLING THE PROTECTION KIT

- Remove the plastic cover ( A ), and the rubber ring cover ( B ).




- Assemble the rubber ring.

- Assemble the plastic cover.

- Reconnect the plugs for YB100 and YB101.

### 5.2 - REINSTALL THE COUNTERWEIGHT

- Step 1 : Refit the motor cover and pose the counterweight in.
- Step 2 : Tighten the counterweight screw on both side to 190 Nm.
- Step 3 : Remove the M16 lifting gear and refit the counterweight thread covers.


## 6 - Checks

- After remounting the entire machine, please operation machine to ensure brake work well.
- If there are other on-going issues with the brake performance : See MS0177 - Assembly electro-brake unit.

# Notes

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>• Thread lock light type Loctite 222 or LOXEAL 24-18<br>• Torque wrench for 6 Nm<br>• Torque wrench for 15 Nm<br>Kit 4000303350 which contains :<br>• Stud - Quantity : 8.<br>• Paper gasket - Quantity : 2<br>• Crown gear and 26 needle rollers - Quantity : 1.<br>• Key DIN6885 - Quantity : 1<br>• Cam disk - Quantity : 2<br>• Eccentric bearing - Quantity : 1<br>• Shim spacer - Quantity : 1<br>• Inner dowel pins - Quantity : 8<br>• Shim spacer for shaft - Quantity : 1<br>• Ball bearing - Quantity : 1<br>• Housing with axle shaft - Quantity : 1<br>• Flat nut M8 - Quantity : 2<br>• Plug - Quantity : 1<br>• Fastening plate - Quantity : 1.<br>• Spring washer - Quantity : 8<br>• Nut M8 - Quantity : 8<br>• Grease M8 - Quantity : 140 g |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

# 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

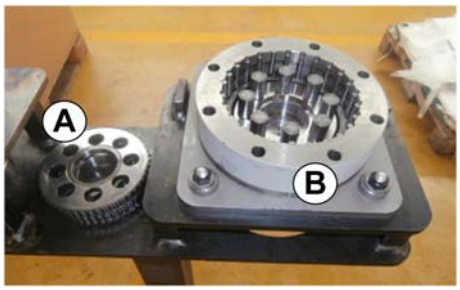
After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

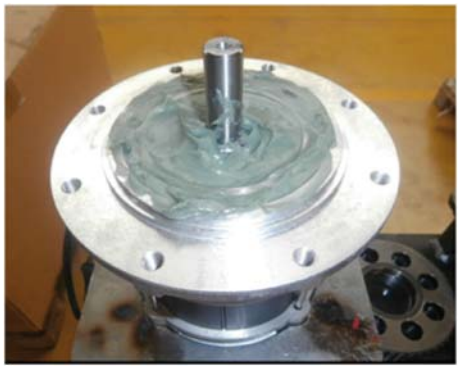
## 4 - Assembly

- Position the motor and reducer on a flat surface.

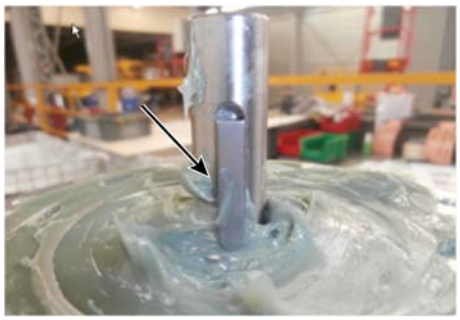
- Remove the protective cover, the discs and the washers ( A ) from the reducer ( B ).




- Grease the reducer and motor with 1/3 of the grease supplied.



- Install the shaft key, with the round side facing down.

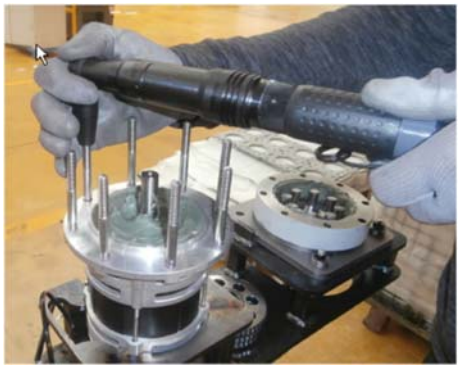


- Take the 8 studs and add a small amount of the thread locking agent.

# Assembly moto - reducer

## MS0179

- Glue and screw the studs to the motor.
- Tighten the studs to  6 Nm.



- Install the paper gasket.

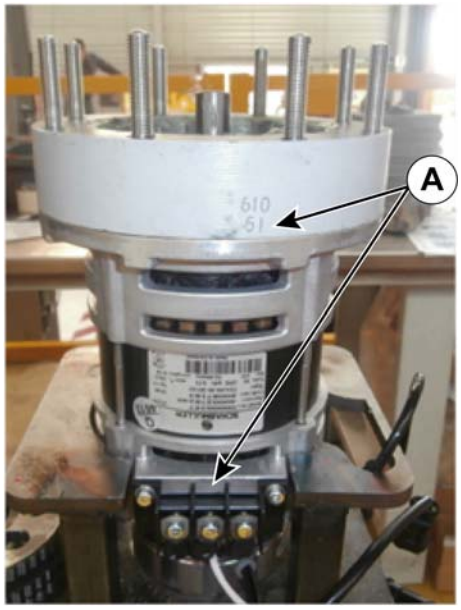
- **If necessary, clean up all traces of thread lock before installing the paper gasket.**

# Assembly moto - reducer

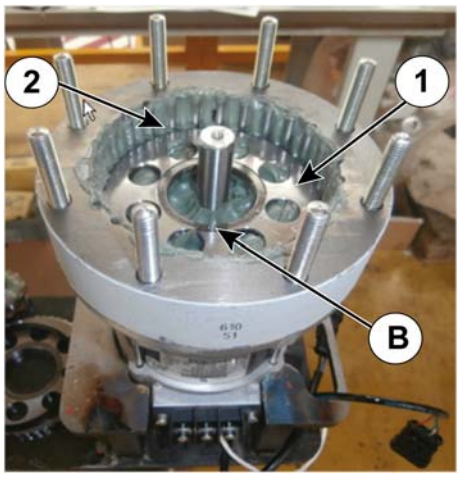
MS0179

Assemble the crown gear with the 26 needle rollers :

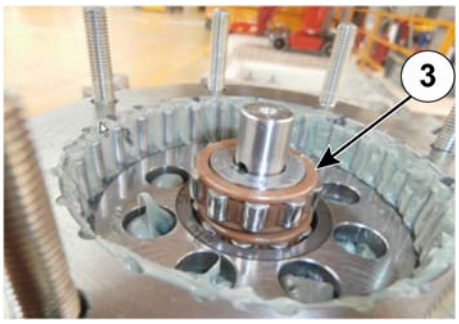
- Align the N°51 stamped on the reducer with the electrical terminal on the motor as shown ( A ).
- Grease the needle rollers and the housing with another 1/3 of the grease from the kit.




- Assemble the first disk ( 1 ).
- Each needle roller ( 2 ) needs to be positions correctly in its cut-out.
- N°51 on the disk needs to line up with the N°51 on the housing as shown ( B ).

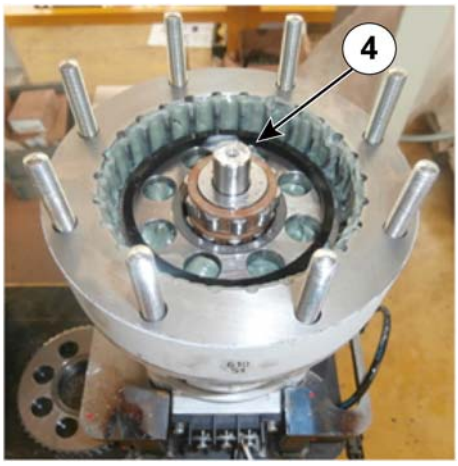


- Insert the bearing ( 3 ).

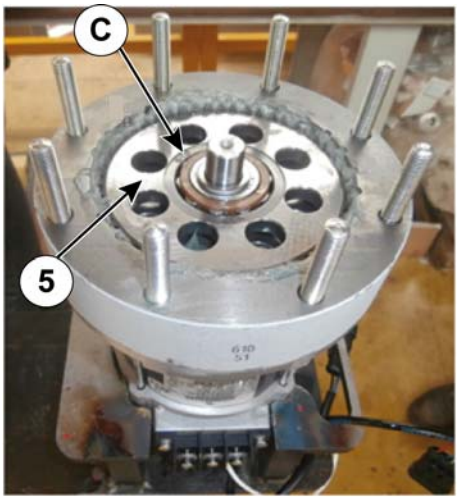



- **The references on both, the disk and the bearing, need to be facing upward.**

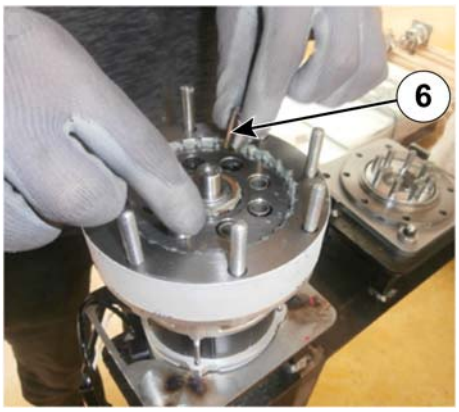
- Insert the shim spacer ( 4 ).




- Install the second disk ( 5 ).
- N°51 on second disk needs to be positioned 180° from N°51 on first disk (so, opposite to N°51 on housing) ( C ).

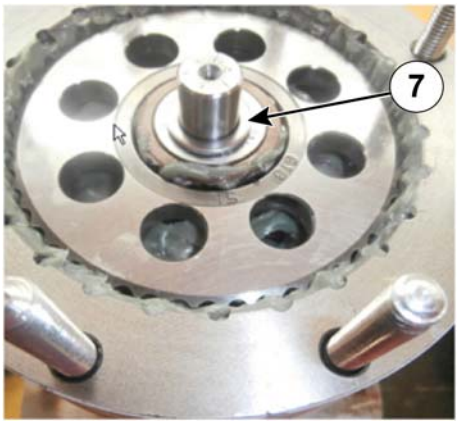


- Install the  8 dowel pins ( 6 ).



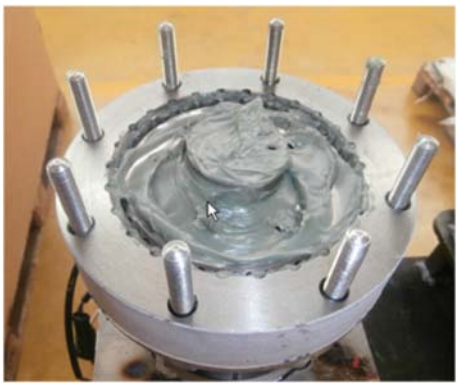

**• Each dowel pin must fit in without effort and not protrude above the height of the upper disk.**

- Install the shim spacer ( 7 ).



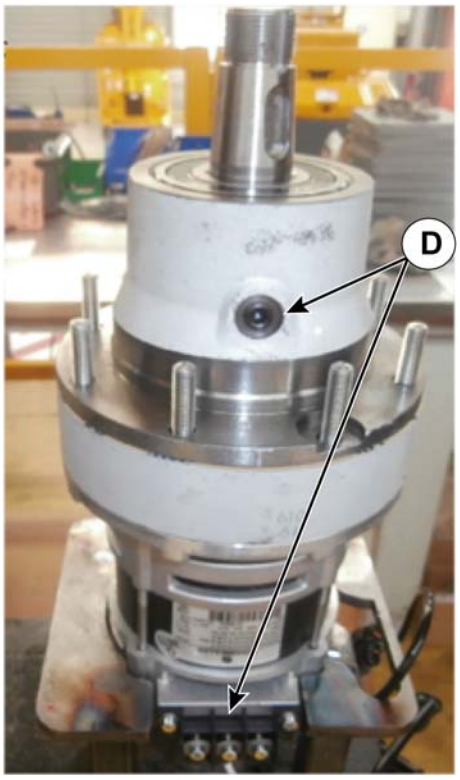

- Install the roller bearing ( 8 ).

- Apply the remaining of the grease.
- Install the paper gasket.




**• Clean the surface if needed, to ensure there is no grease on the gasket surface.**

- Install the housing with axle shaft.
- Align the grease hole with the electrical terminal (and therefore the N°51 on the housing) ( D ).



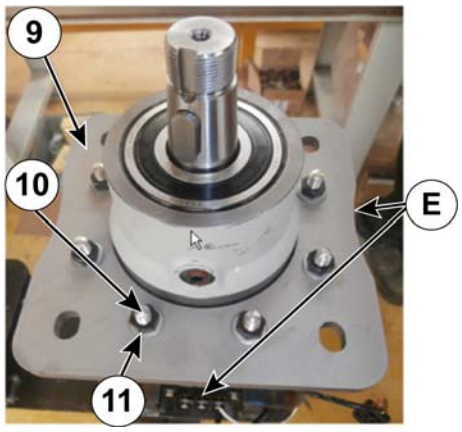
- Install and tighten the  2 flat nuts that hold the housing.

- Mark a red paint straight line on the stud, the nut and the main housing.

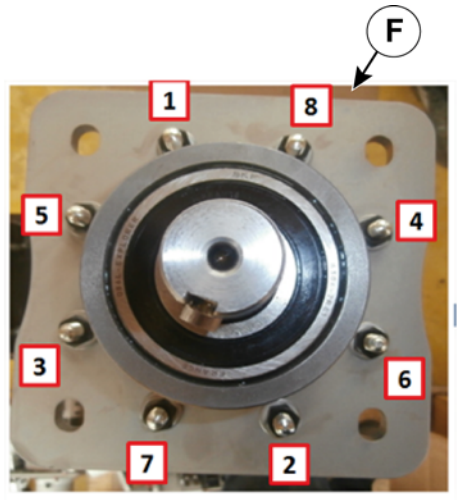
# Assembly moto - reducer

## MS0179

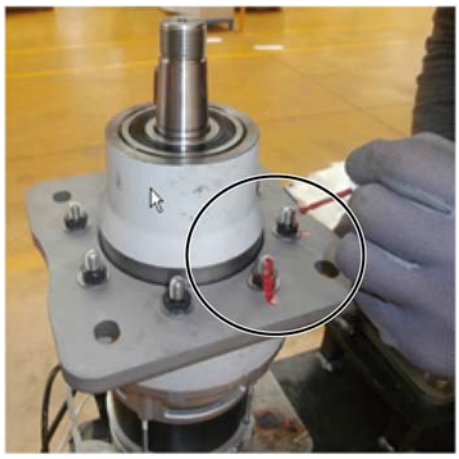
- Position the mounting plate ( 9 ) on the motor - reducer.
- Install the spring washers ( 10 ).
- Tighten the nuts ( 11 ).
- Pay attention to the position ( E ) of the cutouts at ( 90° ) to the electric terminal.




- Tighten the nuts in cross pattern ( F ) to  15 Nm.



- Mark a red paint straight line between the stud, the nut and the mounting plate.



## 5 - Complementary operations

- For instructions on installing on the machine : See MS0084 - Removal / Replacement of motor reducer assembly.

## 6 - Checks

- After installation, verify the correct drive operation in both directions.

# Notes

# 1 - Warning

- **Only an authorised and qualified technician is permitted to work on the machines HAULOTTE®.**
- **The use of this form implies that its user has been trained on this type of equipment.**
- **It is important that the person working on the machine is familiar with all of the safety information contained in the user manual.**
- **Generally speaking, the user must comply with regulatory obligations in force, particularly those relating specifically to working alone, co-activity and manual load handling...**
- **The user must have all the permits/authorizations required to work (fire permit, etc.) and comply with the specific safety instructions at the intervention site.**
- **Only risks linked specifically to activities relating to the disassembly and assembly of the machine HAULOTTE® are described in this sheet.**

- **Beware of the risk of burns; the hydraulic system operates at high temperatures.**
- **The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.**
- **The engine exhaust gases contain harmful combustion products. Always start and run the engine in a well ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.**
- **Do not wear any metal jewellery (rings, watches, chains, etc.) when working on the batteries.**
- **ONLY use insulated tools when working on or near batteries or electrical connections.**
- **Do not produce sparks or flames or smoke near the battery.**

# 2 - Risk prevention

Means of protection to be used when implementing the range :

- Appropriate workwear  .
- Safety shoes  .
- Gloves  .
- Safety goggles  .

## 3 - You will need

| | | | |
|---|---|---|---|
| | • "DO NOT OPERATE" tag<br>• Personal protective equipment<br>• Standard tool kit<br>• Electronic level | | • Place barriers around the perimeter of the work area |
| | 1 | | |

## 4 - Check of tilt sensor

- Put the machine in stowed position.
- Position the machine on an incline that is greater than the maximum permitted incline.
- Check that the tilt indicator is on ( 27).
- Fit the platform and ensure that movement is off and the buzzer is triggered.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area (barriers, cones, marking tape).
- Restrict access to the area (restricted access sign).
- Switch off the ignition and remove the ignition key.

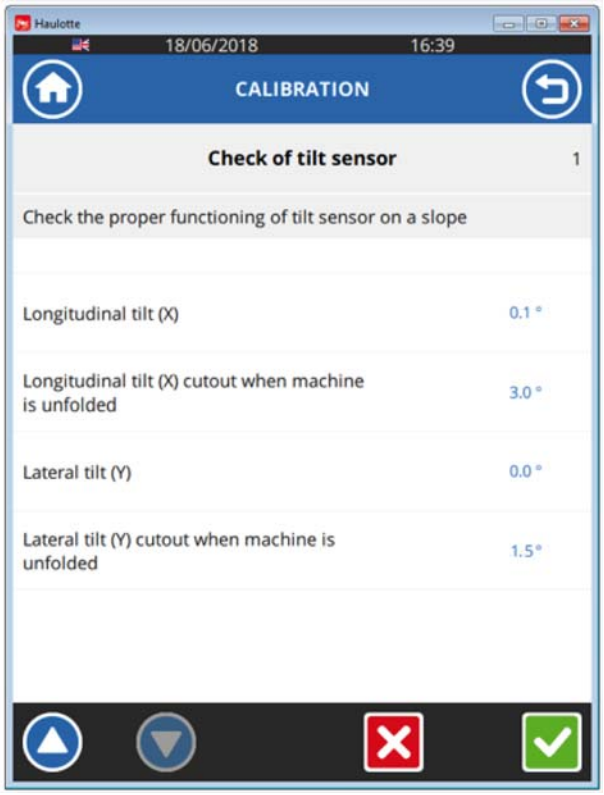
- Place a do not operate tag at the start/stop switch location to inform personnel that the equipment is being worked on.

- Position the electronic level under the chassis and note the values displayed on the X and Y axis.
- Check the X and Y axis :

**A x i s X**

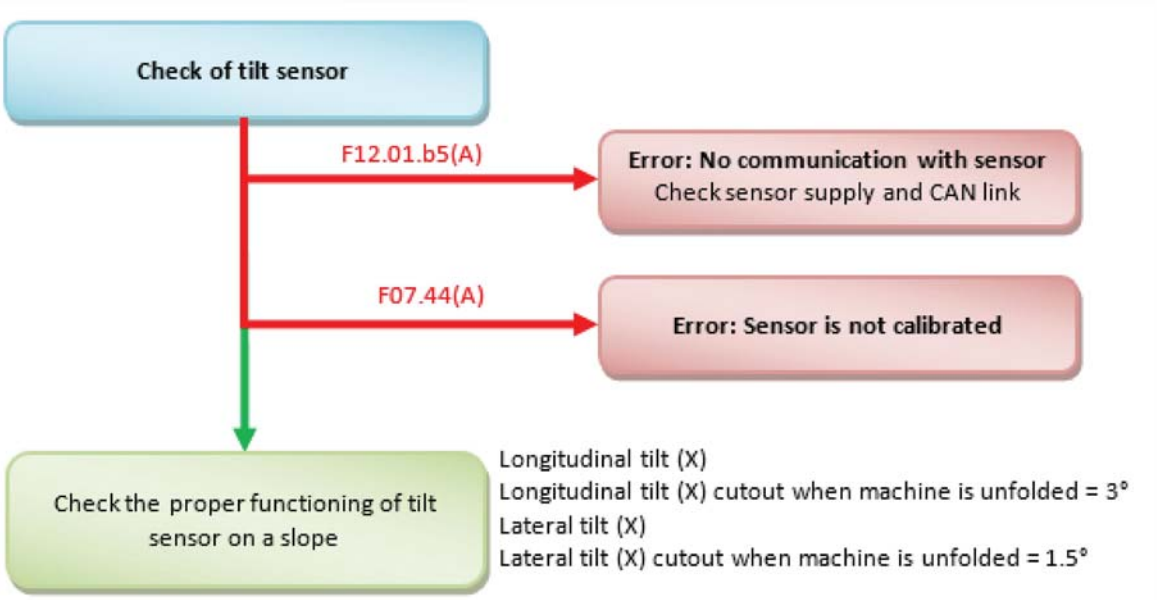
**A x i s Y**

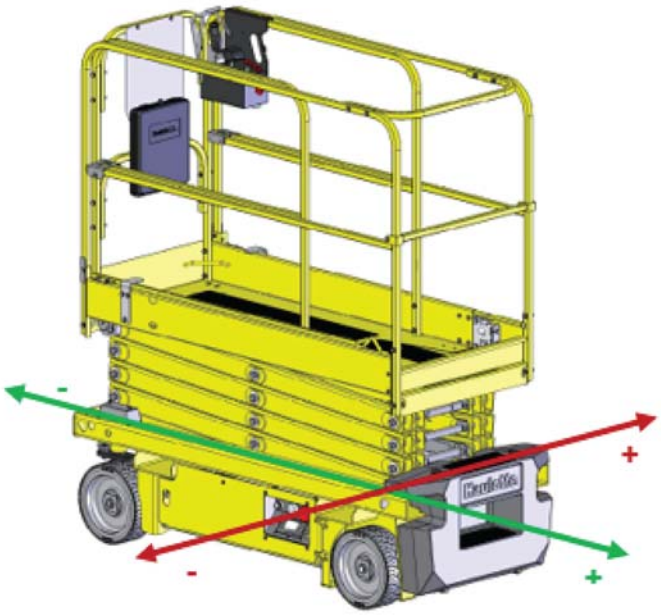
- Turn on ignition key and start up engine.
- Compare the tilt values X and Y of the machine with an electronic level to those displayed on the screen Activ' Screen.
- In the main menu select : Machine settings > Calibration > Tilt > Check of tilt sensor :




**For each axis ( X and Y) : The difference in values between the electronic level and those displayed on the Activ' Screen display must not exceed 0,5 °.**

- If the gap is > 0,5°, carry out a new calibration (Refer to MS0245 - Dismantling/Reassembling the Tilt Sensor).



# Notes

# Dismantling/Reassembling the Tilt Sensor

MS0245

## 1 - Warning

- Only an authorised and qualified technician is permitted to work on the machines HAULOTTE®.
- The use of this form implies that its user has been trained on this type of equipment.
- It is important that the person working on the machine is familiar with all of the safety information contained in the user manual.
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- Only risks linked specifically to activities relating to the disassembly and assembly of the machine HAULOTTE® are described in this sheet.

- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- The engine exhaust gases contain harmful combustion products. Always start and run the engine in a well ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.
- Do not wear any metal jewellery (rings, watches, chains, etc.) when working on the batteries.
- ONLY use insulated tools when working on or near batteries or electrical connections.
- Do not produce sparks or flames or smoke near the battery.

## 2 - Risk prevention

**Means of protection to be used when implementing the range**

| | | | |
|---|---|---|---|
|  | Appropriate workwear |  | Gloves |
|  | Safety shoes |  | Safety goggles |

## 3 - You will need

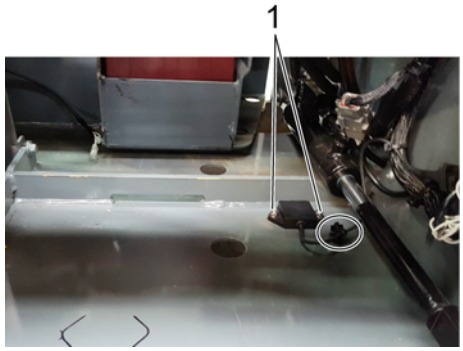
| | | | |
|---|---|---|---|
|  | • "DO NOT OPERATE" tag<br>• Personal protective equipment<br>• Standard tool kit<br>• Electronic level |  | • Place barriers around the perimeter of the work area |
|  | 1 | | |

## 4 - Dis-assembly

- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area (barriers, cones, marking tape).
- Restrict access to the area (restricted access sign).
- Switch off the ignition and remove the ignition key.

- Place a do not operate tag at the start/stop switch location to inform personnel that the equipment is being worked on.


- Cut the COLSON tie holding the tilt cable.
- Unscrew the 2 fixing screws (1).



## 5 - Reassembly

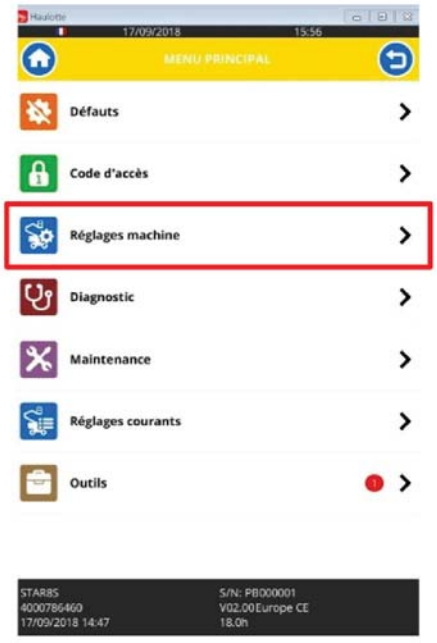
- Reverse the above procedure.
- Tighten the brake nuts to a torque of 10 Nm then mark the screws with the sealing.
- Fasten the tilt cable with a COLSON tie onto the sleeve clamp.
- Carry out the calibration procedure(Refer to the illustrations below).

## 6 - Calibration

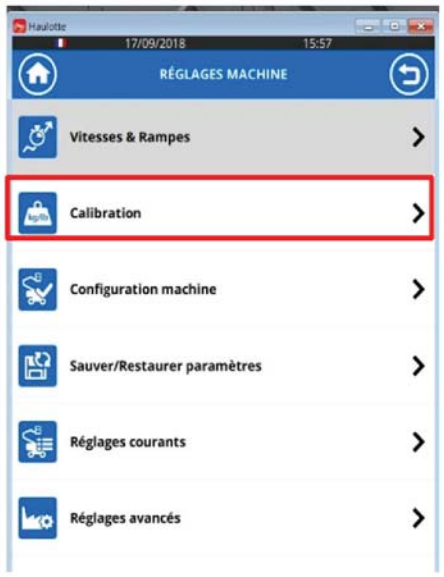
**Tilt calibration must be performed on perfectly flat ground.**

**Using an electronic level, check the level of the chassis and calibration of the machine if necessary ( +/-0.3° for each axis).**

- On the Activ'Screen screen, enter the level 2 access code.
- Menu : Machine settings



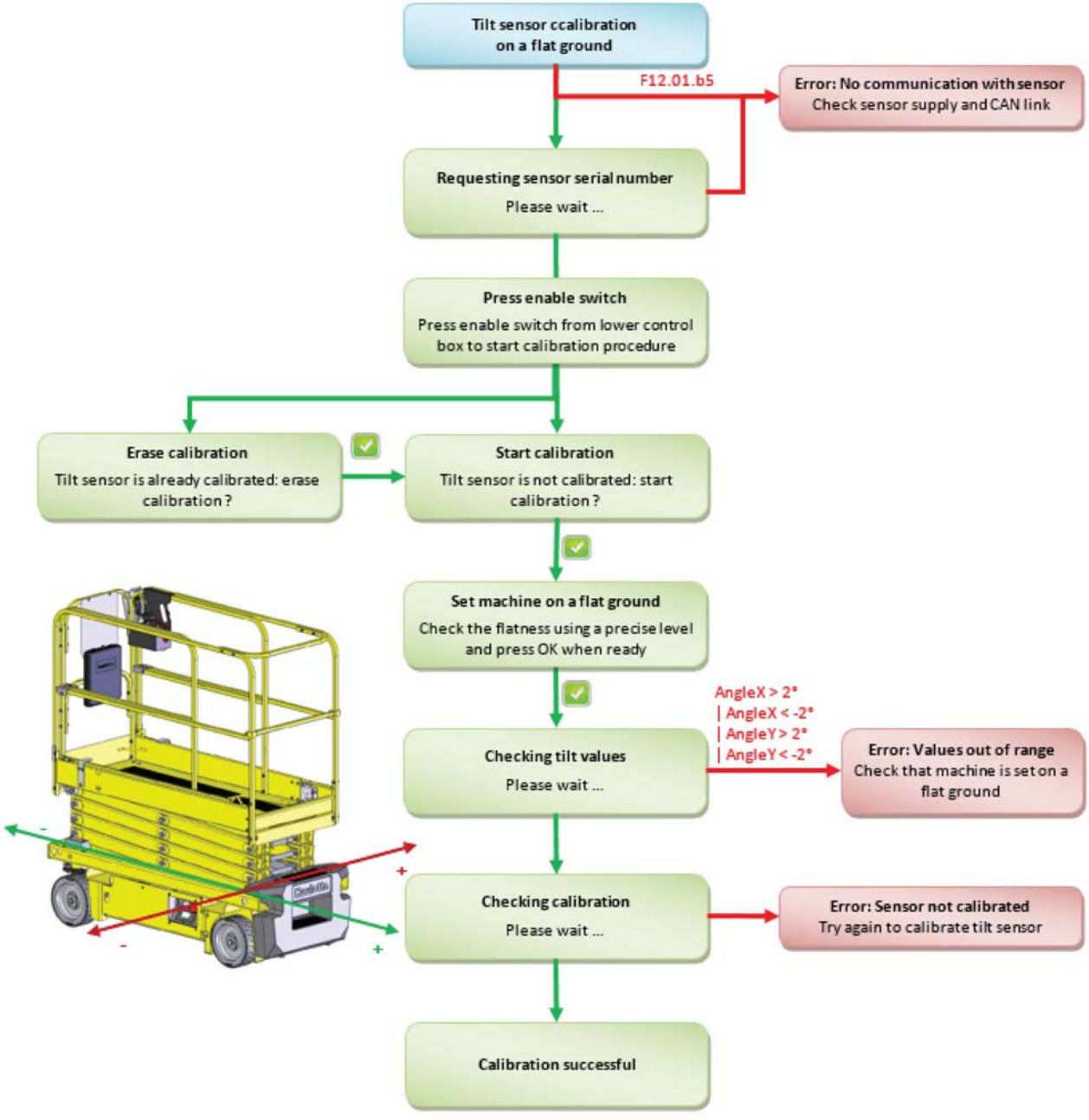
- Menu : Calibration




- Menu : Slope sensor on flat ground

# Dismantling/Reassembling the Tilt Sensor

## MS0245




| | |
|---|---|
| ——— | Lateral angle (sensor Y axis) :<br>Lateral angle decreases in this direction : –Y :<br>Lateral angle increases in this direction : +Y : |
| ——— | Longitudinal angle (sensor X axis) :<br>Longitudinal angle decreases in this direction : –X :<br>Longitudinal angle increases in this direction : +X : |

## 7 - Additional operations

- Position the machine on an incline that is greater than the maximum permitted incline.
- Fit the platform and ensure that movement is off and the buzzer is triggered.
- Check that the tilt values in X and Y displayed on the screen Activ' Screen are identical to the current machine values (check using an electronic level on the chassis) +/-0.3°.

The position of the electronic tilt :

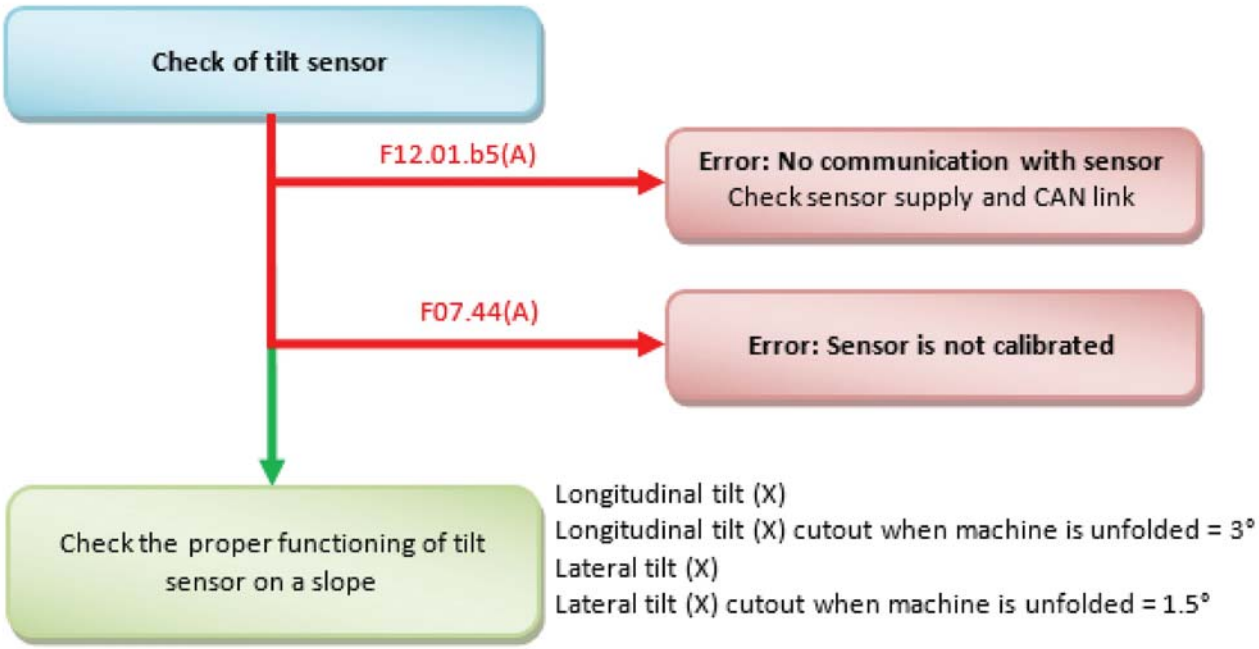
**A x i s X**

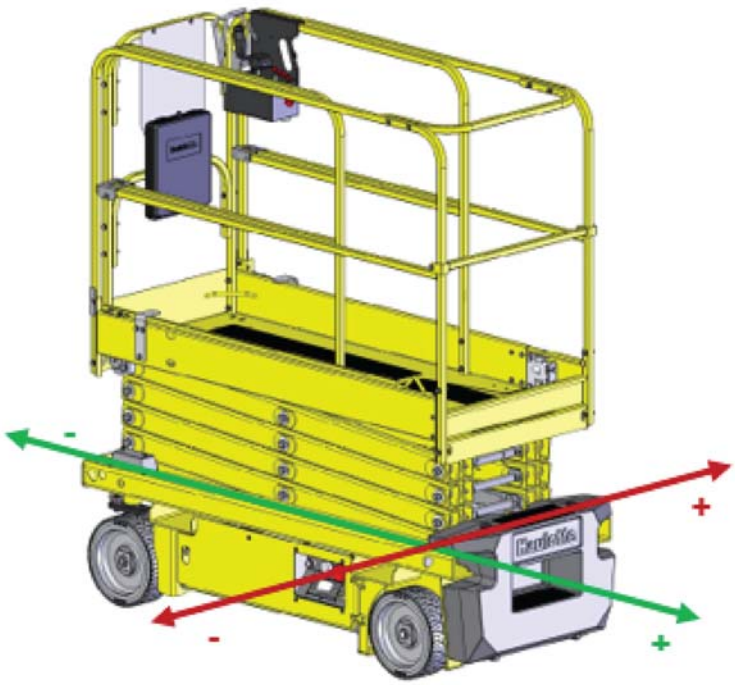

**A x i s Y**

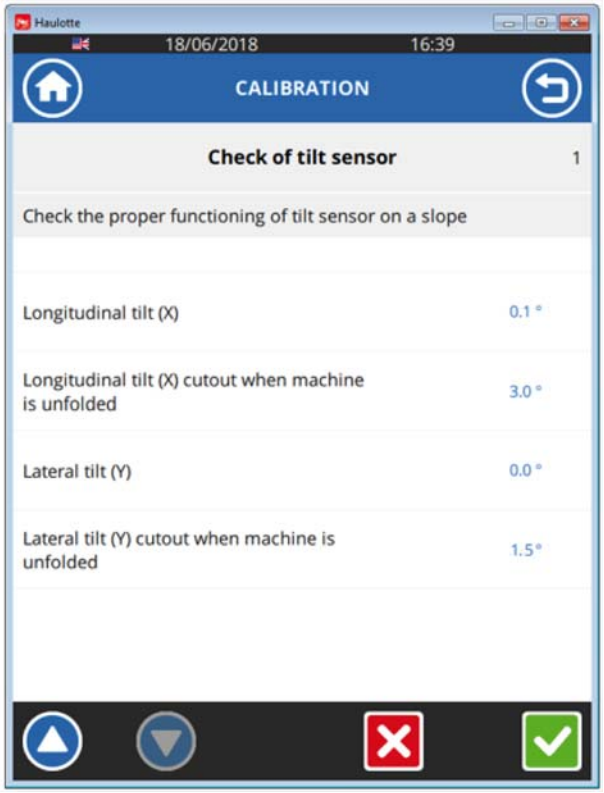
# Dismantling/Reassembling the Tilt Sensor

MS0245

- Procedure to verify the tilt angle using the screen  Activ' Screen :
- In the main menu select : Machine settings > Calibration > Tilt > Check of tilt sensor.




Haulotte
18/06/2018
16:39
CALIBRATION
Check of tilt sensor
1
Check the proper functioning of tilt sensor on a slope
Longitudinal tilt (X)
0.1 °
Longitudinal tilt (X) cutout when machine is unfolded
3.0 °
Lateral tilt (Y)
0.0 °
Lateral tilt (Y) cutout when machine is unfolded
1.5°

# Assembly electro-brake unit (For the Asia-Pacific market only)

MS0283

## 1 - You will need

| | | | |
|---|---|---|---|
|  | • Standard tool kit<br>• Protective goggles<br>• Gloves<br>• EPI (Personal protective equipment)<br>• Tension wrench 2,66 Nm<br>• Shaft puller<br>• Press<br>• Kit protection : 4000595410 - Quantity : 1 per brake unit |  | • Place barriers around the perimeter of the work area |
| | |  | 1 |
| Exclusively use tools and auxiliary average adapted. Always wear necessary safety clothing. | | | |

## 2 - Level of knowledge required

- **The use of this card implies that its user is trained on this kind of machine and that this training was delivered by Haulotte or an authorised representative.**
- **It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.**
- **Only an authorized and qualified technician can work on HAULOTTE® machines.**

## 3 - Preliminary operation

The operations of disassembling if they exist should be carried out only on the installations completely disconnected and must be entrusted only to people having the necessary technical training.

Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

All the precautions must be done in work before intervening on and near the machine.

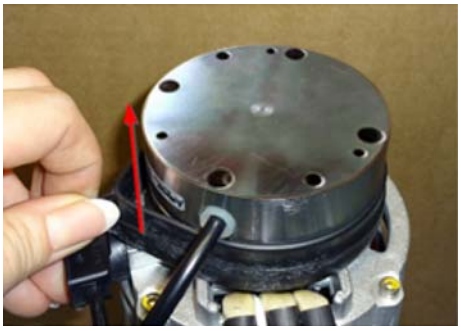
After completion of work, all the covers and safety devices must be positioned back completely and operational.

- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site.
- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Switch off the ignition and remove the ignition key.
- Put a "DO NOT USE" decal near the start/stop button to inform personnel that work is currently in progress on the equipment.
- Beware of the risk of burns; the hydraulic system operates at high temperatures.
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Engine exhaust gases contain harmful products of combustion. Always start and run the engine in a well-ventilated area. In a closed room, ensure the exhaust gases are evacuated to the outside.

## 4 - Removal

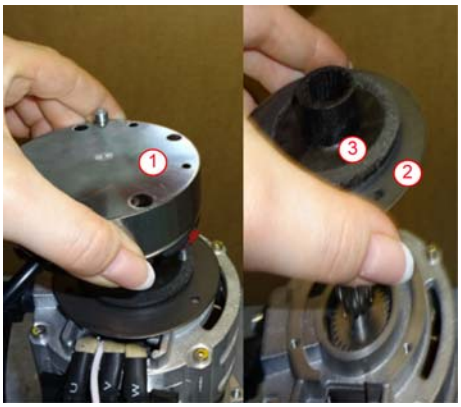
If fitted with dust protection kit :

- Remove the rubber dust cover.



- Unscrew the 4 mounting screws progressively.


- Remove the brake magnet ( 1 ), the friction disk ( 2 ) and the inner flange ( 3 ).

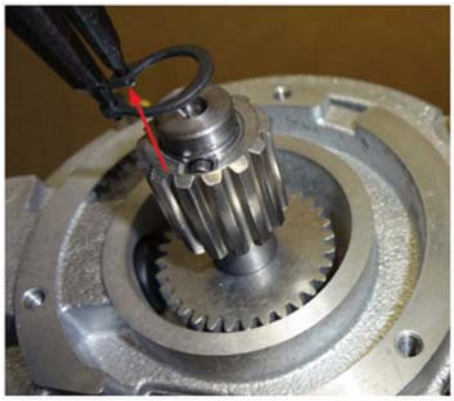


# Assembly electro-brake unit (For the Asia-Pacific market only)

## MS0283

***N.B.-:-THE FOLLOWING IS ONLY REQUIRED IF YOU WISH TO REPLACE THE GEAR :***

- Remove the circlip from the end of the shaft.

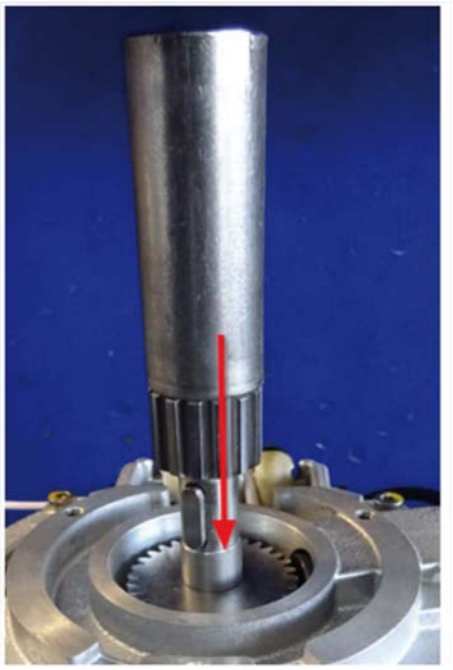


- Remove the gear from the shaft using a shaft puller.

## 5 - Reinstall

***N.B.-:-THESE FIRST STEP IS ONLY REQUIRED IF THE GEAR WAS REPLACED :***

- Install the key in the shaft, and then use a press to install the gear onto the motor shaft.



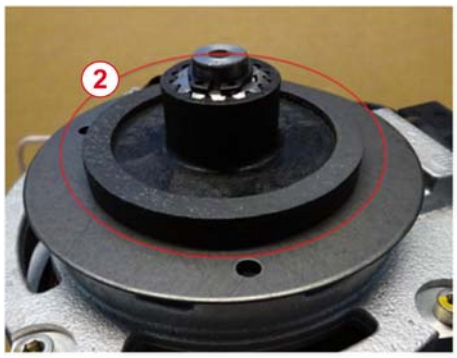
- Install the circlip onto the shaft.

# Assembly electro-brake unit (For the Asia-Pacific market only)

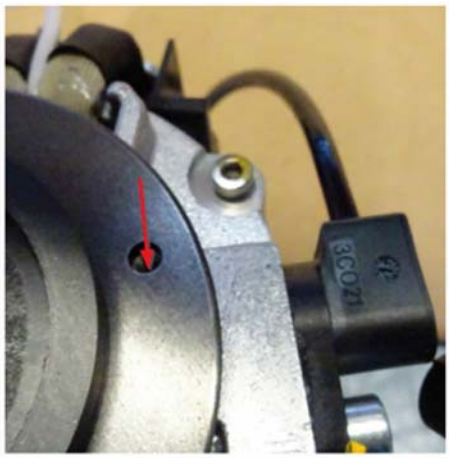
## MS0283

- Check that the wires are correctly positioned as shown below.

- Install the backing plate ( 1 ) and then install the rotor disk ( 2 ).

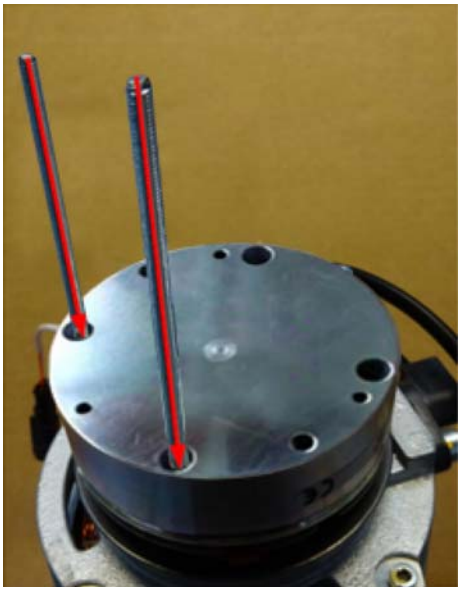

- Check the alignment of the backing plate, so it is aligned with the holes.
- Install threaded rods into  2 of the  3 mounting holes.



# Assembly electro-brake unit (For the Asia-Pacific market only)

## MS0283

- Install the brake uni onto the motor.
- Do not forget to install the washer onto the mounting bolts.

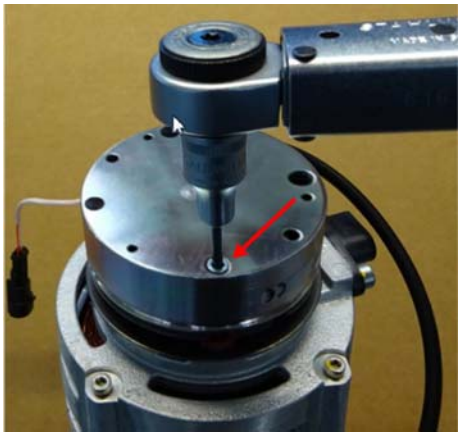


- Position the brake electromagnet onto the motor, and align it so the wiring is just next to the "U" wire as shown below.

# Assembly electro-brake unit (For the Asia-Pacific market only)

## MS0283

- Remove the threaded bars, and insert the bolts.
- Tension the bolts to 2,66 Nm +/-10% .



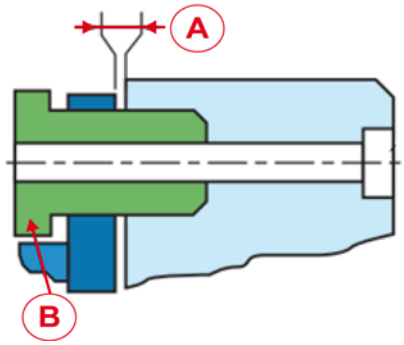
- Remove the plastic wedges which hold the adjusting screws in position (If present).

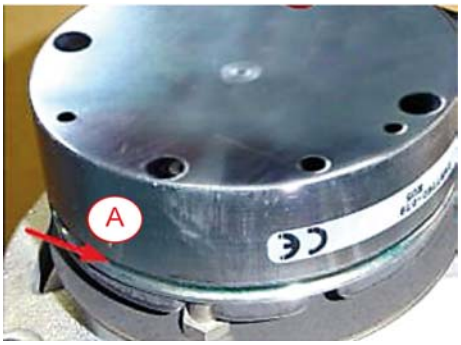
- Check the air gap at 3 points.
- The nominal clearance should be 0,2 mm (min 0,15 mm / max 0,3 mm).

# Assembly electro-brake unit (For the Asia-Pacific market only)

## MS0283

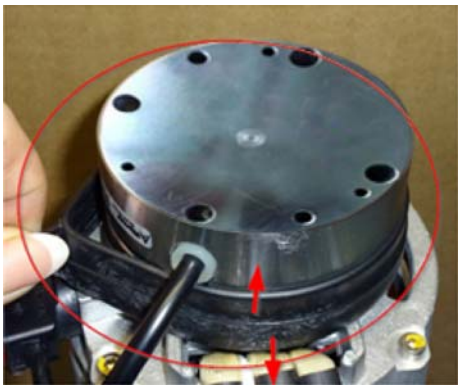
- To reset the airgap ( A ), undo the adjustment bolts ( B ) and adjust to obtain the necessary gap size.
- Measure the airgap at several points.
- Cycle the brake a number of times then re-check.



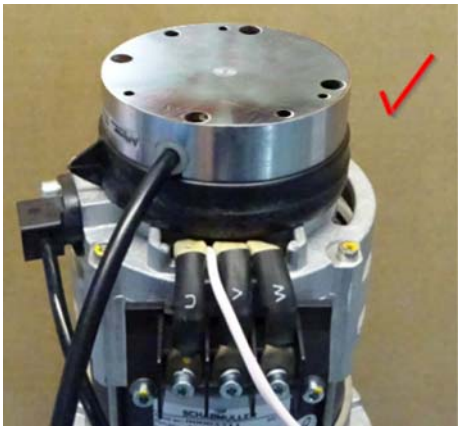




If using protection kit :

- Install the rubber dust cover to the motor unit.



- The installation is complete.



## 6 - Complementary operations

- For instructions on installing the motor-reducer assembly to the machine : See MS0084 - Removal / Replacement of motor reducer assembly.

## 7 - Checks

- After installation, verify the correct drive operation in both directions.
- If clearance needed adjusting, re-check clearance after a few cycles.

E

# Notes

# E- Trouble shooting and diagram

## 1 - Trouble shooting

### 1.1 - RECOMMENDATIONS

If a malfunction occurs, check the following points :

- Sufficient hydraulic oil in the tank.
- Batteries are charging.
- Control box E-stop push-buttons are pulled out.
- The control box selector key is set to platform or ground control box.
- Control box relays are engaged.
- Fuse status.
- Ground control box solenoid valve status.

If the malfunction persists, consult the troubleshooting table to identify the problem.

IF you cannot identify the problem, contact HAULOTTE Services®.

### 1.2 - DESCRIPTION

The FAILURES function describes the requirements relative to failures : monitoring, information recording, information reading.

### 1.3 - REQUIREMENTS

| Requirements | Definition |
|---|---|
| FAIL_xx_001 | An ACTIVE failure ( A ) signals that the failure is stive active |
| FAIL_xx_002 | A DETECTED failure ( D ) signals the cause of the failure has been valid one at least power on, but is inactive |
| FAIL_xx_003 | A code CODE is linked to failures which have several causes of activation to identify the one of activation (if many conditions are active the code are added) |
| FAIL_xx_004 | At power on, the failure log and failure counter are not changed for a failure which was already active at power off |
| FAIL_xx_005 | The failure log and failure counter are changed for a failure which internal code is changed |

***N.B.-:- VAR[ACTIVEFAILURE] = 1 IF ONE OR MORE OF THE FOLLOWING FAILURES ARE IN ACTIVE STATE***

### 1.4 - FAILURES LIST


With Activ'screen, it is possible to visualize the defects in "FAILURES".

- For any type A (ACTIVE) failure code, it will appear on display in lower control and the warning light will flicker on upper controls (see below).
- For any type D (DETECTED) failure code, it will also appear on display in lower control and the warning light will flicker on upper controls. In order to reset this failure which has been detected and no more active, it will be necessary to fold the machine until full stowed position, and then switch OFF then ON again the main power.
- For any type N failure code, it means that this alarm will never appear on display.

Explanation on the column C of the table of failures :

- An internal code (column C) with 5 digits, visible only on the console, allows specifying the trigger conditions of the failure.
- Each trigger condition is associated with a single code number (16 possible single codes in decimal format corresponding to a single bit in binary format) :

# E- Trouble shooting and diagram

| Individual code | | |
|---|---|---|
| Decimal | Binary | Bit |
| 1 | 0000000000000001 | 0 |
| 2 | 0000000000000010 | 1 |
| 4 | 0000000000000100 | 2 |
| 8 | 0000000000001000 | 3 |
| 16 | 0000000000010000 | 4 |
| 32 | 0000000000100000 | 5 |
| 64 | 0000000001000000 | 6 |
| 128 | 0000000010000000 | 7 |
| 256 | 0000000100000000 | 8 |
| 512 | 0000001000000000 | 9 |
| 1024 | 0000010000000000 | 10 |
| 2048 | 0000100000000000 | 11 |
| 4096 | 0001000000000000 | 12 |
| 8192 | 0010000000000000 | 13 |
| 16384 | 0100000000000000 | 14 |
| 32768 | 1000000000000000 | 15 |

If several conditions are active at the same time, single codes are added to form the resulting code displayed.

For example, if the conditions of single code 1 and 2 are active, the resulting code posted will be 3 ( 1 +2 = 3 into decimal or 0000000000000011 in binary format).

| Definition |
|---|
| Machine failures are checked only if power is ON for more than 3s :<br>• 3s(WUI = 1) |
| The notification (N) of failures on the lights and displays of the machine is managed in the following way (See Lights and Buzzers function) :<br>• A: the failure is notified only if it is active<br>• B: the failure is notified if it has been detected after the power on, even if it is not active anymore<br>• C: the failure is never notified (it is visible only with the console)<br>In all cases, active and detected failures are always visible with the console. |
| An internal code (column C) with 5 digits, visible only on the console, allows specifying the trigger conditions of the failure. Each trigger condition is associated with a single code number (16 possible single codes in decimal format corresponding to a single bit in binary format).<br>If several conditions are active at the same time, single codes are added to form the resulting code displayed. For example, if the conditions of single code 1 and 2 are active, the resulting code posted will be 3 ( 1+2 = 3 into decimal or 0000000000000011 in binary format). |
| Failures related to ECU outputs ( F02 for contactors, F03 for relays and F04 for electrovalves) require the following conditions to be triggered :<br>• A failure due to an open circuit OC can appear or disappear only if the output is inactive<br>• A failure due to a short circuit (SC) to GND or VBAT can appear or disappear only if the output is active |
| A failure active at power off does not increment the counter or the log if it is still active at the next power up. |
| The counter of an active failure is incremented when its internal code changes and the failure is again recorded into the log with the new code. |
| Update of failures state is inhibited when battery level drops below 15% :<br>• Failure which is active before battery level drops below 15% stays active.<br>• Failure which is inactive before battery level drops below 15% stays inactive. |

### 1.4.1 - List of failures per category

| Failures | N | C | Description |
|---|---|---|---|
| **Inverter** | | | |
| **F01.01 Inverter Master** | A | 1 | COMBIACX: Failure in the high current hardware protection circuit.<br>• Internal fault.<br>• Replace the inverter. |
| | | 2 | COMBIACX: When no current is applied to the traction motor, the current feedbacks are out of permitted standby range.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |
| | | 4 | COMBIACX: Driver of main contactor coil is damaged (not able to close).<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |
| | | 8 | COMBIACX: The driver of the electromechanical brake coil is not able to drive the load.<br>• Internal fault.<br>• Replace the controller. |
| | | 16 | COMBIACX: Pump current sensor out of range (at start-up or standby).<br>• Internal fault.<br>• Replace the controller. |
| | | 32 | COMBIACX: At start-up, the amplifiers voltage (used to measure the motor voltage) is too low or too high (< 2 V or > 3 V).<br>• Internal fault.<br>• Replace the controller. |
| **F01.05 Pump failure** | A | 1 | COMBIACX: The software waits for the motor pump to stop at start-up.<br>• If the motor connected to "-P" is still moving, wait for it to be still.<br>• If not, wait 30 seconds until alarm "PUMP VMN NOT OK" appears.<br>• Refer to corresponding alarm chapter. |
| | | 2 | COMBIACX: Pump driving voltage different than the expected one.<br>• Key OFF/ON. |
| | | 4 | COMBIACX: The pump motor output voltage is lower than expected, considering the control applied.<br>• Check the motor power wiring and connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• Check that MC DRIVE power contact close properly, with a good contact.<br>• If no problem is found on the motors, replace the controller. |
| | | 8 | COMBIACX: The pump motor output voltage is higher than expected, considering the control applied.<br>• Check the motor power wiring and connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• Check that main contactor drive power contact close properly, with a good contact.<br>• If no problem is found on the motors, replace the controller. |
| | | 16 | COMBIACX: The pump current sensor feedback is always 0A, even if pump motor is running.<br>• Check the pump motor connection and continuity.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Inverter** | | | |
| **F01.06 Overheating** | A | 1 | COMBIACX: The controller has reached thermal cutout (temperature of the controller base plate is higher than 85°C / 185°F).<br>• Power down and allow to cool.<br>• Do not operate in ambient temperatures over to 60°C / 140°F.<br>• Check for jammed or obstructed drive motor.<br>• Check for excessively high drive motor current consumption while driving on the level (over 70A).<br>• Check controller for proper installation.<br>• If the controller is cold when the default appears, replace it. |
| | | 2 | ACEX: The controller has reached thermal cutout (temperature of the controller base plate is higher than 85°C / 185°F).<br>• Power down and allow to cool.<br>• Do not operate in ambient temperatures over to 60°C / 140°F.<br>• Check for jammed or obstructed drive motor.<br>• Check for excessively high drive motor current consumption while driving on the level (over 70A).<br>• Check controller for proper installation.<br>• If the controller is cold when the default appears, replace it. |
| **F01.08 Low Battery** | A | 1 | Low battery voltage ( estimated value < 10%).<br>• Check for damaged batteries, battery cables or connections.<br>• Recharge batteries.<br>• Measure batteries voltage and compare it with the value BATTERY VOLTAGE parameter in the TESTER menu.<br>• If they are different, adjust the value of the ADJUST BATTERY function. |
| **F01.09 Electrical park brake 1** | A | 1 | COMBIACX: Short circuit detected on electromechanical brake or main contactor output (overcurrent).<br>• Main contactor drive coil : Check connections and wiring for interruptions between controller and coil.<br>• Motor brake coil : Check connections and wiring for interruptions between controller coil.<br>• If the wiring is correct, the problem is in the controller : Replace it. |
| | | 2 | COMBIACX: The driver of the electromechanical brake coil is shorted.<br>• Check if there is a short or a low impedance pulldown between NEB CNA#4 and – BATT.<br>• The driver circuit is damaged in the controller, which has to be replaced. |
| | | 4 | COMBIACX: The driver of the electromechanical brake is shorted to +Vbatt.<br>The output of the built in Smart Driver, which supplies the positive to the electromechanical brake coil is high when the Tiller and the H and S switch are opened.<br>• Check the harness, in order to verify if a positive is connected to the Smart driver output CNB#1.<br>• If, even disconnecting the wire from the connector pin, the output stays at high value, the problem is inside the controller and the Smart Driver is probably shorted. |
| | | 8 | COMBIACX: A short circuit on the power outputs of the controller has been detected.<br>• Check the EB driver output for a short circuit with +Vbatt.<br>• If, even disconnecting the wire from the connector pin, the output stays at high value, the problem is inside the controller : Replace it. |
| | | 16 | COMBIACX: Voltage on PEB present but not expected.<br>• Check external wiring.<br>• If the wiring is correct and no problem is found on the coil, replace the controller. |
| | | 32 | COMBIACX: Internal Smart driver KO and ACEX : internal Smart driver is not KO (if both signals are KO failure F08.10).<br>• Check the driver output for a short circuit with -Vbatt.<br>• If, even disconnecting the wire from the connector pin, the output stays at low value, the problem is inside the controller : Replace it. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Inverter** | | | |
| **F01.10 Electrical park brake 2** | A | 1 | ACEX: Short circuit detected on electromechanical brake or main contactor output (overcurrent).<br>• Main contactor drive coil : Check connections and wiring for interruptions between controller and coil.<br>• Motor brake coil : Check connections and wiring for interruptions between controller coil.<br>• If the wiring is correct, the problem is in the controller : Replace it. |
| | | 2 | ACEX: The driver of the electromechanical brake coil is shorted.<br>• Check if there is a short or a low impedance pulldown between NEB CNA# and – BATT.<br>• The driver circuit is damaged in the controller, which has to be replaced. |
| | | 4 | ACEX: The driver of the electromechanical brake is shorted to +Vbatt.<br>The output of the built in Smart Driver, which supplies the positive to the electromechanical brake coil is high when the Tiller and the H and S switch are opened.<br>• Check the harness, in order to verify if a positive is connected to the Smart driver output CNB#1.<br>• If, even disconnecting the wire from the connector pin, the output stays at high value, the problem is inside the controller and the Smart Driver is probably shorted. |
| | | 8 | ACEX: A short circuit on the power outputs of the controller has been detected.<br>• Check the EB driver output for a short circuit with +Vbatt.<br>• If, even disconnecting the wire from the connector pin, the output stays at high value, the problem is inside the controller : Replace it. |
| | | 16 | ACEX: Voltage on PEB present but not expected.<br>• Check external wiring.<br>• If the wiring is correct and no problem is found on the coil, replace the controller. |
| | | 32 | ACEX: Internal Smart driver KO and ACEX : internal Smart driver is not KO (if both signals are KO failure F08.10).<br>• Check the driver output for a short circuit with -Vbatt.<br>• If, even disconnecting the wire from the connector pin, the output stays at low value, the problem is inside the controller : Replace it. |
| **F01.11 Inverter Slave** | A | 1 | ACEX: Failure in the high current hardware protection circuit.<br>• Internal fault.<br>• Replace the inverter. |
| | | 2 | ACEX: When no current is applied to the traction motor, the current feedbacks are out of permitted standby range.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault. If the fault is not cleared, replace the controller. |
| | | 4 | ACEX: Driver of main contactor coil is damaged (not able to close).<br>• Type of default not related to external components.<br>• Cycle power to clear the fault. If the fault is not cleared, replace the controller. |
| | | 8 | ACEX: The driver of the electromechanical brake coil is not able to drive the load.<br>• Internal fault.<br>• Replace the controller. |
| | | 16 | ACEX: Pump current sensor out of range (at start-up or standby).<br>• Internal fault.<br>• Replace the controller. |
| | | 32 | ACEX: At start-up, the amplifiers voltage (used to measure the motor voltage) is too low or too high (< 2 V or > 3 V).<br>• Internal fault.<br>• Replace the controller. |
| **F01.12 Wrong controller hardware** | D | 1 | COMBIACX : Hardware version is not the expected one. |
| | | 2 | ACEX : Hardware version is not the expected one. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Contactor** | | | |
| **F02.04**<br>**Power Contactor**<br>SB801 | D | 1 | The driver of main contactor drive coil is shorted, or its coil is disconnected.<br>• Ensure there is no short or low-impedance pull-down between MC and -Vbatt.<br>• Check connections and wiring for interruptions of MC DRIVE coil.<br>• If wiring and connection are correct, the problem is in the controller : Replace it. |
| | | 2 | The main contactor coil has been driven by the controller, but the contactor does not close.<br>• Check the contact in the main contactor drive contactor and if it is not working, replace the main contactor drive. |
| | | 4 | Before driving the LC coil, the controller checks if the contactor is stuck.<br>The controller drives the bridge for some tens milliseconds, trying to discharge the capacitors bank.<br>If they don't discharge the fault condition is entered.<br>• Check the power contact of the main contactor drive and replace it if necessary. |
| | | 8 | Supervisor status is "alarm" or "wait reset" and main contactor is not forced open.<br>• Key OFF/ON. |

| Failures | N | C | Description |
|---|---|---|---|
| **Relays** | | | |
| **F03.15**<br>**Water refill pump control relay**<br>KA911 | D | 1 | Automatic refill pump KA911 control relay failure.<br>• KA911: Check relay output status. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Electrovalves** | | | |
| **F04.01**<br>**Steering**<br>YV121/YV122 | D | 1 | Short circuit detected on steering front left electrovalve :<br>--> YV121 = FAIL |
| | | 2 | Short circuit detected on steering front right electrovalve :<br>--> YV122 = FAIL |
| **F04.04**<br>**Arm**<br>YV420 | D | 1 | Short circuit detected on arm descent electrovalve :<br>--> YV420 = FAIL |
| | | 16 | Short circuit detected on arm raise electrovalve (Only with Lowering Security Kit selected) :<br>--> YV421 = FAIL |
| | | 32 | Short circuit detected on arm descent electrovalve (Only with Nishio "ON" Kit selected) :<br>--> YV421 = FAIL |
| **F04.11**<br>**Principal movements**<br>YV903 | D | 1 | Short circuit detected on pump discharge electrovalve :<br>--> YV903 = FAIL |
| **F04.40**<br>**Potholes**<br>YV121/YV122 | D | 1 | Short circuit detected on pothole extend electrovalve :<br>--> YV122 = FAIL |
| | | 2 | Short circuit detected on pothole retract electrovalve :<br>--> YV121 = FAIL |
| **F04.41**<br>**Movement Selection valve** | D | 1 | Short circuit detected on steering / potholes selection electrovalve :<br>--> YV120 = SHORT CIRCUIT FAILURE |
| | | 2 | Short circuit detected on steering / potholes selection electrovalve :<br>--> YV120 = OPEN CIRCUIT FAILURE |

| Failures | N | C | Description |
|---|---|---|---|
| **Joysticks** | | | |
| **F05.01**<br>**Arm/Drive joystick**<br>SM901 | D | 1 | Analog signal SM901 is out of allowed range :<br>--> SM901 < 0.2V I SM901 > 4.8V |
| | | 2 | Incoherence between analog signal and out of neutral signals for SM901 joystick :<br>--> SM901N = 1 & (2,45V < SM901Y < 2,55V)<br>--> or SM901N = 0 & (SM901Y < 2.0V I SM901Y > 3.0V) |
| **F05.11**<br>**Joystick neutral**<br>SM901 | D | 1 | Neutral position of arm and drive joystick SM901 not detected after upper control box selection :<br>--> SM901 < 2.35V I SM901 > 2.65V |

| Failures | N | C | Description |
|---|---|---|---|
| **Load management system** | | | |
| **F06.01**<br>**No Loading Cal**<br>Calibration required | A | | Angle/pressure weighting system missing or not calibrated. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Sensors** | | | |
| **F07.05 Motor temperature sensor** | D | 1 | COMBIACX: The motor temperature sensor is not correctly connected or damaged.<br>• Key OFF/ON.<br>• Check wiring. |
| | | 2 | ACEX: The motor temperature sensor is not correctly connected or damaged.<br>• Key OFF/ON.<br>• Check wiring. |
| **F07.06 Arm Angle** | D | 1 | SR420 Arm angle sensor is out of allowed range when calibrated :<br>--> VAR[SR722_OutOfRange]=1 |
| | | 2 | SR722 Arm angle sensor is out of allowed range when calibrated :<br>--> VAR[SR722_OutOfRange]=1 |
| | | 4 | SR420 and SR722 arm angle measured are not coherent when calibrated (with no error of out of range), first level of incoherence :<br>--> VAR[ArmAngleIncoherent]=1 |
| | | 8 | SR420 and SR722 arm angle measured are not coherent when calibrated (with no error of out of range), second level of incoherence :<br>--> VAR[ArmAngleIncoherent]=2 |
| **F07.21 Pressure sensor** | D | 1 | Pressure sensor is considered as out of range : Scissor arm angle is above 18° and pressure sensor measures less than 10b (to handle the arm on kickstand --> pressure is null) And arm descent is not running :<br>--> SP400 < (=0.2V) & VAR[ArmAngle] > 18 & CTRL[Arm]?D |
| | | 2 | Pressure sensor is considered as out of range: pressure sensor voltage is above 10.5 V :<br>--> SP400 > (=10.5V) |
| **F07.33 Steer angle** | D | 1 | Steer angle sensor is out of range :<br>-->VAR[SteerAngle] > 55.65° I VAR[SteerAngle] < -83.19° |
| **F07.35 Motor encoder** | From version v2.07: fix issue when driving in 25% ramp and steering at same time : In some cases, failure F07.35 appeared, now fix. | | |
| | D | 1 | COMBIACX: Problem on the encoder during drive.<br>• Check connections and wiring for interruptions between controller and motor encoder.<br>• Check the harness for proper installation.<br>• Check the encoder mechanical installation. If the encoder slips inside its compartment, replace the encoder or change the drive motor. |
| | | 2 | ACEX: Problem on the encoder during drive.<br>• Check connections and wiring for interruptions between controller and motor encoder.<br>• Check the harness for proper installation.<br>• Check the encoder mechanical installation. If the encoder slips inside its compartment, replace the encoder or change the drive motor. |
| **F07.36 ECU temperature** | D | 1 | COMBIACX: The ECU thermal sensor is out of range.<br>• Key OFF/ON.<br>• Replace the controller. |
| | | 2 | ACEX: The ECU thermal sensor is out of range.<br>• Key OFF/ON.<br>• Replace the controller. |
| **F07.44 Tilt sensor not calibrated** | A | 1 | Tilt sensor is not calibrated.<br>• Perform the calibration. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Sensors** | | | |
| **F07.46 Tilt sensor error** | D | 1 | Checksum failure |
| | | 2 | Fault detected on X - axis |
| | | 4 | Fault detected on Y - axis |
| | | 8 | Supply voltage < 8V |
| | | 16 | Supply voltage > 28V |
| | | 32 | Temperature > 90°C |

| Failures | N | C | Description |
|---|---|---|---|
| **Electric circuit** | | | |
| **F08.04 Supply** | A | 1 | COMBIACX: Power capacitors voltage does not increase at start-up.<br>• Ensure that no external device is connected to the batteries.<br>• Check battery, power cables and connections. |
| | | 2 | COMBIACX: The controller detects an overvoltage or under voltage condition.<br>Overvoltage threshold is 35 V, under voltage threshold is 9.5 V.<br>• If the fault appears at start-up or during standby : Check that no external device (relays switching, solenoids energizing/de-energizing... ) is connected to the batteries, creating down-going pulses.<br>• If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : Replace the controller.<br>• Check if the fault appears during driving acceleration (under voltage condition detected) : Check battery charge ; check for damaged batteries, battery cables and connections.<br>• Check if the fault appears during release braking (overvoltage condition detected) : Check line contactor contact, battery power cable connection. |
| | | 4 | COMBIACX: At start-up, the battery voltage is too low or too high (< 0,8 Vbatt or >1,2 Vbatt).<br>• Check that the controller SET BATTERY parameter value matches the battery nominal voltage (24VDC).<br>• Check that the TESTER MENU / BATTERY VOLTAGE parameter shows same value as the battery voltage measured with a voltmeter.<br>• If it does not match, then do a ADJUST BATTERY function.<br>• If the default still appears, replace the battery. |
| | | 8 | COMBIACX: A low logic level of Key-Off has been detected during start-up diagnosis.<br>• Check that no external device (relays switching, solenoids energizing/de,energizing...) is connected to the batteries, creating downgoing pulses.<br>• Check the connection of power cabled to the battery terminal, positive and negative, to MC DRIVE and to +Batt and -Batt, which must be screwed with a torque comprised in the range 5,6 Nm - 8,4 Nm.<br>• If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : Replace the controller. |
| | | 16 | ACEX: Power capacitors voltage does not increase at start-up.<br>• Ensure that no external device is connected to the batteries.<br>• Check battery, power cables and connections. |
| | | 32 | ACEX: The controller detects an overvoltage or under voltage condition.<br>Overvoltage threshold is 35 V, under voltage threshold is 9.5 V.<br>• If the fault appears at start-up or during standby : Check that no external device (relays switching, solenoids energizing/de-energizing... ) is connected to the batteries, creating down-going pulses.<br>• If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : Replace the controller.<br>• Check if the fault appears during driving acceleration (under voltage condition detected) : Check battery charge ; check for damaged batteries, battery cables and connections.<br>• Check if the fault appears during release braking (overvoltage condition detected) : Check line contactor contact, battery power cable connection. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Electric circuit** | | | |
| **F08.04 Supply** | A | 64 | ACEX: At start-up, the battery voltage is too low or too high (< 0,8 Vbatt or >1,2 Vbatt).<br>• Check that the controller SET BATTERY parameter value matches the battery nominal voltage (24VDC).<br>• Check that the TESTER MENU / BATTERY VOLTAGE parameter shows same value as the battery voltage measured with a voltmeter.<br>• If it does not match, then do a ADJUST BATTERY function.<br>• If the default still appears, replace the battery. |
| | | 128 | ACEX: A low logic level of Key-Off has been detected during start-up diagnosis.<br>• Check that no external device (relays switching, solenoids energizing/ de,energizing...) is connected to the batteries, creating downgoing pulses.<br>• Check the connection of power cabled to the battery terminal, positive and negative, to MC DRIVE and to +Batt and -Batt, which must be screwed with a torque comprised in the range 5,6 Nm - 8,4 Nm.<br>• If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : Replace the controller. |
| **F08.07 Circuit selector** | A | 1 | Two panels are selected : Check selector key :<br>--> SA901T=ON & S0901PF=ON |
| | | 2 | No panel is selected : Check selector key :<br>--> SA901T=OFF & S0901PF=OFF |
| **F08.09 Common output supply** | A | 1 | COMBI ACX: The PEV connector (B2) is not connected to the battery or the voltage is different.<br>• Check B2 connector is connected to +Vbatt.<br>• If the harness connections are correct, replace the controller. |
| | | 2 | ACEX: The PEV connector (B2) is not connected to the battery or the voltage is different.<br>• Check B2 connector is connected to +Vbatt.<br>• If the harness connections are correct, replace the controller. |
| **F08.10 Power supply** | D | 1 | ACEX: Internal Smart driver KO and COMBIACX : Internal Smart driver KO.<br>• Check the driver output for a short circuit with -Vbatt.<br>• If, even disconnecting the wire from the connector pin, the output stays at low value, the problem is inside the controller : Replace it. |
| | | 2 | ACEX: Problem on supply.<br>• Check supply wiring (B+).<br>• Check wiring between COMBIACX and ACEX. |
| | | 4 | ACEX: Problem on supply.<br>• Check supply wiring (B+).<br>• Check wiring between COMBIACX and ACEX. |
| **F08.13 Charger** | D | 1 | Phase 1 timeout. |
| | | 2 | Phase 2 timeout. |
| | | 4 | Phase 3 timeout. |
| | | 8 | Batteries over temperature. |
| | | 16 | Charger failure (check charger internal failure code in reference). |
| | | 32 | Temperature sensor failure --> ST309. |
| | | 64 | Flash memory corrupted. |
| | | 128 | Not an original HAULOTTE® charger. |
| **F08.16 Charger dialog** | D | 1 | Incoherence between Request and Acknowledge (index or sub-index). |
| | | 2 | Acknowledge control error (0x80). |
| | | 4 | Acknowledge timeout (no response within 1s). |
| | | 8 | Wrong charge settings CRC between screen and main ECU (Restart machine). |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Electric circuit** | | | |
| **F08.19 Battery voltage drop too deep** | A | 1 | The critical battery level flag is active before the low battery level flag is active<br>This failure is maintained active until switch off the electric circuit - F08.19(A) |

| Failures | N | C | Description |
|---|---|---|---|
| **Functions** | | | |
| **F10.03 Micro drive Overspeed** | D | 1 | Drive speed detected too high while machine is unfolded (COMBIACX). |
| | | 2 | Drive speed detected too high while machine is unfolded (ACEX). |
| **F10.14 Steering angle not calibrated** | A | | Steer angle is not calibrated.<br>Perform steer angle calibration. |
| **F10.16 Arm angle not calibrated** | A | | Arm angle is not calibrated.<br>Perform arm angle calibration. |
| **F10.21 Battery water refill system** | N | 1 | Detector SL911 indicates low level in automatic refill tank. |
| | | 2 | Battery water refill needed but temperature is too cold (<3°C). |
| **F10.22 Battery water refill needed** | N | | Battery water level is low. |
| **F10.24 Incoherence between water level in refill tank and water level in batteries** | A | | Check the functional state of refill system components :<br>• Check ambient temperature is beyond 3°.<br>• Check refill system circuit pipes: no leakage, no blockage.<br>• KA911: Check functional state of refill tank electric pumps.<br>• SL911: Check refill tank water level detector and the presence of demineralized water in the tank. |

| Failures | N | C | Description |
|---|---|---|---|
| **Safeties** | | | |
| **F11.09 Arm incoherence** | D | | Arm raise is controlled and arm angle is decreasing, out of calibration process (arm angle or pressure angle table).<br>Check YV903 valve (wiring and connection). |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Internal faults** | | | |
| **F12.01**<br>**CAN Fault**<br>Check wires | A | | For all failure details :<br>• Check wiring.<br>• Check the Can Bus connections.<br>• Ensure that all the connectors pins are properly in place and the connectors are free of moisture or oxidation.<br>• Machine powered off, measure the resistance between CN03.F and CN03.G. If it is not 60 Ohm ±5%, check continuity of the bus wires :<br>• CAN LOW / 1001: From CN03.G (diagnostic connector) to ACTIV SCREEN X2.8 to COMBIACX CXC.10 to ACEX AXC.10 to CANTILLER C.4.<br>• CAN HIGH / 1002: From CN03.F (diagnostic connector) to ACTIV SCREEN X2.7 to COMBIACX CXC.5 to ACEX AXC.5 to CANTILLER C.6. |
| | | 1 | No data is received from upper control box card. |
| | | 2 | No data is received from lower control box screen. |
| | | 4 | COMBIACX Module doesn't receive any CAN messages from ACEX module. |
| | | 8 | ACEX Module doesn't receive any CAN messages from COMBI ACX module. |
| | | 16 | No time (date/hour) update (problem with screen communication). |
| | | 32 | CAN frame not received from tilt sensor or stagnant transmission (timestamp not updated anymore). |
| **F12.02**<br>**E2P Read/Write Error**<br>Change calc. | D | 1 | EEPROM failure status error. |
| | | 2 | EEPROM failure stack full. |
| | | 4 | COMBIACX: Wrong slip profile parameters or EEPROM damage.<br>• Perform a CLEAR EEPROM.<br>• If problem persists, replace the controller. |
| | | 8 | COMBIACX: Software or hardware error has been detected, default parameters are applied.<br>• Execute a CLEAR EEPROM operation.<br>• Cycle power to clear the fault :<br>• If the alarm disappears, the previously stored parameters will have been replaced by the default parameters.<br>• If the fault is not cleared, replace the controller. |
| | | 16 | ACEX: Wrong slip profile parameters or EEPROM damage.<br>• Perform a CLEAR EEPROM.<br>• If problem persists, replace the controller. |
| | | 32 | ACEX: Software or hardware error has been detected, default parameters are applied.<br>• Execute a CLEAR EEPROM operation.<br>• Cycle power to clear the fault :<br>• If the alarm disappears, the previously stored parameters will have been replaced by the default parameters.<br>• If the fault is not cleared, replace the controller. |
| | | 64 | Problem reading EEPROM at start-up.<br>Restart machine. |
| **F12.04**<br>**E2P Param Reset**<br>Check settings | D | 1 | ID of software loaded into machine is different from the ID stored into EEPROM: all machine parameters have been reset and must then be set again (speeds, ramps, options, configs, access code level 2, failure counters and calibration data). |
| | | 2 | Machine speeds and ramps have been reset and must be set again. |
| | | 4 | Machine options have been reset and must be set again. |
| | | 8 | Machine configurations. |
| | | 16 | Machine maintenance counters have been reset. |
| | | 32 | Machine daily log have been reset. |
| | | 64 | Machine events counters have been reset. |
| | | 128 | Machine events log counters have been reset. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Internal faults** | | | |
| **F12.05**<br>**E2P Param Not Set** | D | 1 | Model not set (not possible => always Optimum8)<br>Model = Not Set |
| | | 2 | Country not set : Set country<br>Country = Not Set |
| | | 4 | Serial number = 0: set serial number<br>SerialNumber = "000000" |
| | | 8 | At least one of the parameter used and not set ; Check all speeds and ramps<br>SPEED[xxx] = Not Set I RAMP[xxx] = Not Set |
| | | 16 | At least one option used and not set ; Check all options<br>OPT[xxx] = Not Set |
| | | 32 | At least one config not set ; Check all configurations<br>CFG[xxx] = Not Set |
| **F12.07**<br>**ECU software version incoherence** | A | 1 | Zapi software version different on COMBIACX and on ACEX. |
| **F12.08**<br>**ECU fault (master)** | A | 1 | COMBIACX: Software watchdog active.<br>• Key OFF/ON. |
| | | 2 | COMBIACX: Problem on the Analog/Digitial conversion of micro controller.<br>• Key OFF/ON. |
| | | 4 | COMBIACX: Watchdog circuit output became high due to hardware or software problem (WDG1).<br>• Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |
| | | 8 | COMBIACX: Watchdog circuit output became high due to hardware or software problem (WDG2).<br>• Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |
| | | 16 | COMBIACX: Current gain acquisition has not been performed or EEPROM damaged.<br>• Key OFF/ON.<br>• If fault persists, a new current gain acquisition has to be performed. |
| | | 32 | COMBIACX: Wrong client software.<br>• Load the software to COMBIACX and ACEX controllers. |
| | | 64 | COMBIACX: RAM checksum failed.<br>• Internal fault.<br>• Replace the controller. |
| | | 128 | COMBIACX: Timeout of client function (execution time exceed maximum allowable time).<br>• Key OFF/ON. |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Internal faults** | | | |
| **F12.09**<br>**ECU fault (slave)** | A | 1 | ACEX: Software watchdog active.<br>• Key OFF/ON. |
| | | 2 | ACEX: Problem on the Analog/Digitial conversion of micro controller.<br>• Key OFF/ON. |
| | | 4 | ACEX: Watchdog circuit output became high due to hardware or software problem (WDG1).<br>• Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |
| | | 8 | ACEX: Watchdog circuit output became high due to hardware or software problem (WDG2).<br>• Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem.<br>• Type of default not related to external components.<br>• Cycle power to clear the fault.<br>• If the fault is not cleared, replace the controller. |
| | | 16 | ACEX: Current gain acquisition has not been performed or EEPROM damaged.<br>• Key OFF/ON.<br>• If fault persists, a new current gain acquisition has to be performed. |
| | | 32 | ACEX: Wrong client software.<br>• Load the software to COMBIACX and ACEX controllers. |
| | | 64 | ACEX: RAM checksum failed.<br>• Internal fault.<br>• Replace the controller. |
| | | 128 | ACEX: Timeout of client function (execution time exceed maximum allowable time).<br>• Key OFF/ON. |
| **F12.10**<br>**Parameters reload**<br>Restart machine | A | This failure could happen when changing the software of the machine. Check evolution log. If happening, restart machine. | |
| | | 1 | Incoherence of Battery Parameters ; new value forced, restart mandatory. |
| | | 2 | Incoherence of Motor Accessories Parameters ; new value forced, restart mandatory. |
| | | 4 | Incoherence of Motor Parameters ; new value forced, restart mandatory. |
| | | 8 | Incoherence of Option Parameters ; new value forced, restart mandatory. |
| | | 16 | Incoherence of Input Output Parameters ; new value forced, restart mandatory. |
| | | 32 | Incoherence of Machine Parameters ; new value forced, restart mandatory. |
| | | 128 | No parameters check / internal use for R and D only. |
| **F12.11**<br>**Parameters reload**<br>Restart machine | A | This failure happens at first power-on when reloaded on machine with software version 2.11 or on machine never loaded before. If happening out of these cases, power off and power on again after 5 s. | |
| | | 1 | Wrong parameter : out of expected range. |
| | | 2 | Wrong parameter : EEPROM problem or RAM problem. |
| | | 4 | Wrong parameter : parameter current value is different from parameter initialized value. |
| | | 8 | Wrong parameter : incoherence between master and slave parameter source. |

| Failures | N | C | Description |
|---|---|---|---|
| **Internal faults** | | | |
| **F12.16**<br>**Internal error of diagnostic system (request)**<br>Check diagnostic system configuration | A | Invalid identification ( ID ) used during a request of diagnostic system (screen or diag console). The value indicates the wrong request. | |
| | | 4 | Maintenance log |
| | | 6\|7 | Events log |
| | | 193 | Failure |
| | | 196 | Machine parameter (speed or ramp) |
| | | 197 | Machine calibration |
| | | 198 | Option |
| | | 199 | Country |
| | | 200 | Machine configuration |
| | | 201 | Machine Model |
| | | 205 | Security settings |
| | | 206 | Machine state |
| | | 207 | Inputs/Outputs |
| | | 209 | Internal function |
| | | 210 | Internal cut-out |
| | | 211 | Machine maintenance |
| | | 212 | Event counters |
| | | 213 | Internal version |
| **F12.17**<br>**Internal error of diagnostic system (set)**<br>Check diagnostic system configuration | A | Invalid identification ( ID ) used during a request of diagnostic system (screen or diag console). The value indicates the wrong set : | |
| | | 4 | Maintenance log |
| | | 6\|7 | Events log |
| | | 193 | Failure |
| | | 196 | Machine parameter (speed or ramp) |
| | | 197 | Machine calibration |
| | | 198 | Option |
| | | 199 | Country |
| | | 200 | Machine configuration |
| | | 201 | Machine Model |
| | | 205 | Security settings |
| | | 206 | Machine state |
| | | 207 | Inputs/Outputs |
| | | 209 | Internal function |
| | | 210 | Internal cut-out |
| | | 211 | Machine maintenance |
| | | 212 | Event counters |
| | | 213 | Internal version |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Switches** | | | |
| **F13.02**<br>**Platform switches**<br>Check switches | D | 1 | Incoherence between the 2 signals of front steering switch of platform box (both active) :<br>--> SM901L = 1 & SM901R = 1 |
| | | 2 | Incoherence between the 2 signals of movement selection :<br>--> SM903A = 1 & SM903B = 1 |
| **F13.10**<br>**Neutral switch**<br>Check chassis switches | A | 1 | Neutral position of arm switch of turret box not detected after power on :<br>--> SA420U = 1 I SA420D = 1 |
| | | 2 | Neutral position of enable switch of turret box not detected after power on :<br>--> SA905 = 1 |
| | | 4 | Neutral position of horn switch of turret box not detected after power on :<br>--> SA907B = 1 |
| | | 8 | Neutral position of brake release switch of turret box not detected after power on :<br>--> SA103 = 1 |
| **F13.11**<br>**Switches neutral 2**<br>Check plat. switches | A | 1 | Neutral position of front steering switch of platform box not detected after power on :<br>--> SM901L = 1 I SM901R = 1 |
| | | 2 | Neutral position of enable trigger of platform box not detected after power on :<br>--> SM901DM = 1 |
| | | 4 | Neutral position of movement selection of platform box not detected after power on :<br>--> SM908A = 1 I SM908B = 1 |
| | | 8 | Neutral position of klaxon switch of platform box not detected after power on :<br>--> SM907 = 1 |
| | | 16 | Neutral position of brake release switch not detected after power on :<br>--> SM103 = 1 |

# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **CAN J1939** | | | |
| **F15.06**<br>J1939 | D | 1 | Error on CAN BUS. |

| Failures | N | C | Description |
|---|---|---|---|
| **Engine** | | | |
| **F16.01**<br>**Overheating** | A | 1 | COMBIACX: Motor maximum temperature reached.<br>• Check the thermal sensor wiring and ohm value.<br>• Improve the air cooling of the motor.<br>• If the warning is present when the motor is cool, then the problem is inside the controller : Replace it. |
| | | 2 | ACEX: Motor maximum temperature reached.<br>• Check the thermal sensor wiring and ohm value.<br>• Improve the air cooling of the motor.<br>• If the warning is present when the motor is cool, then the problem is inside the controller : Replace it. |
| **F16.02**<br>**Speed problem** | A | 1 | COMBIACX: The drive motor has been detected stalled or the encoder is not working. |
| | | 2 | ACEX: The drive motor has been detected stalled or the encoder is not working. |

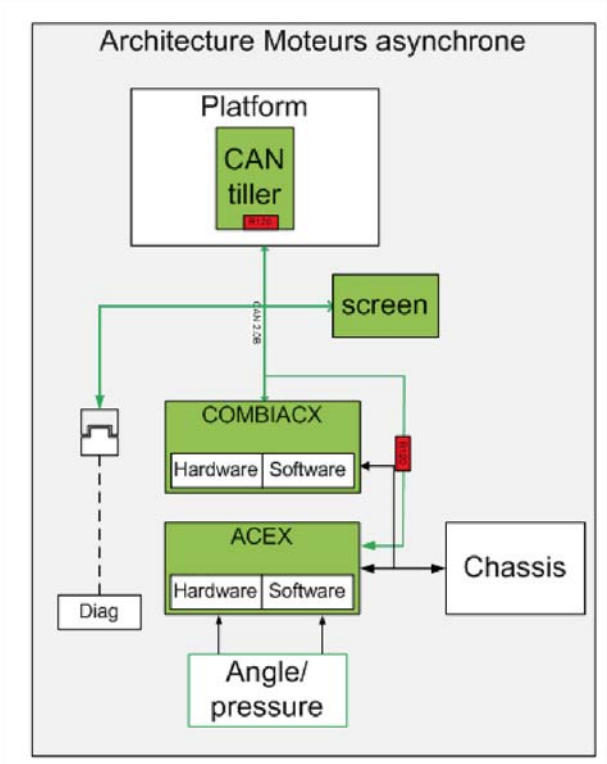
# E- Trouble shooting and diagram

| Failures | N | C | Description |
|---|---|---|---|
| **Engine** | | | |
| **F16.03**<br>**Motor supply** | A | 1 | COMBIACX: During drive, motor output voltage is lower than expected.<br>• Check the motor power wiring and connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• Check that MC DRIVE power contact close properly, with a good contact.<br>• If no problem is found on the motors, replace the controller. |
| | | 2 | COMBIACX: During drive, motor output voltage is higher than expected.<br>• Check the motor power wiring and connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• Check that MC DRIVE power contact close properly, with a good contact.<br>• If no problem is found on the motors, replace the controller. |
| | | 4 | COMBIACX: Motor voltage feedback circuits are damaged.<br>• Check the motor power wiring and connections.<br>• If the wiring is correct, the controller is damaged : Replace it. |
| | | 8 | COMBIACX: The motor output voltage is lower than expected, before MC DRIVE switch ON.<br>• Check the motor phase to phase impedance.<br>• Check the motor power cables connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• If the motor connections are correct, replace the controller. |
| | | 16 | COMBIACX: The motor output voltage is higher than expected, before MC DRIVE switch ON.<br>• Check the motor phase to phase impedance.<br>• Check the motor power cables connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• If the motor connections are correct, replace the controller. |
| | | 32 | ACEX: During drive, motor output voltage is lower than expected.<br>• Check the motor power wiring and connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• Check that MC DRIVE power contact close properly, with a good contact.<br>• If no problem is found on the motors, replace the controller. |
| | | 64 | ACEX: During drive, motor output voltage is higher than expected.<br>• Check the motor power wiring and connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• Check that MC DRIVE power contact close properly, with a good contact.<br>• If no problem is found on the motors, replace the controller. |
| | | 128 | ACEX: Motor voltage feedback circuits are damaged.<br>• Check the motor power wiring and connections.<br>• If the wiring is correct, the controller is damaged : Replace it. |
| | | 256 | ACEX: The motor output voltage is lower than expected, before drive main contactor switches ON.<br>• Check the motor phase to phase impedance.<br>• Check the motor power cables connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• If the motor connections are correct, replace the controller. |
| | | 512 | ACEX: The motor output voltage is higher than expected, before drive main contactor switches ON.<br>• Check the motor phase to phase impedance.<br>• Check the motor power cables connections.<br>• Check the motor phases for proper insulation with the chassis.<br>• If the motor connections are correct, replace the controller. |

# 2 - Legend

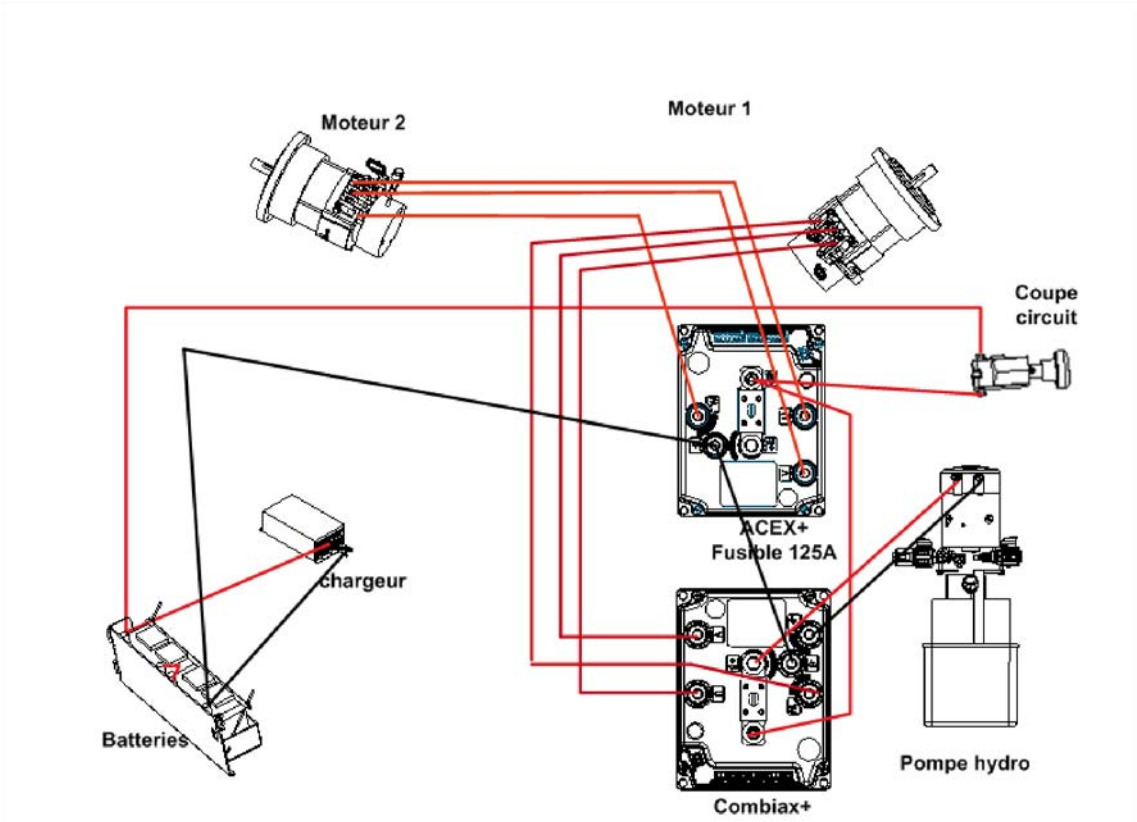
## 2.1 - SYSTEM ARCHITECTURE

**System architecture**



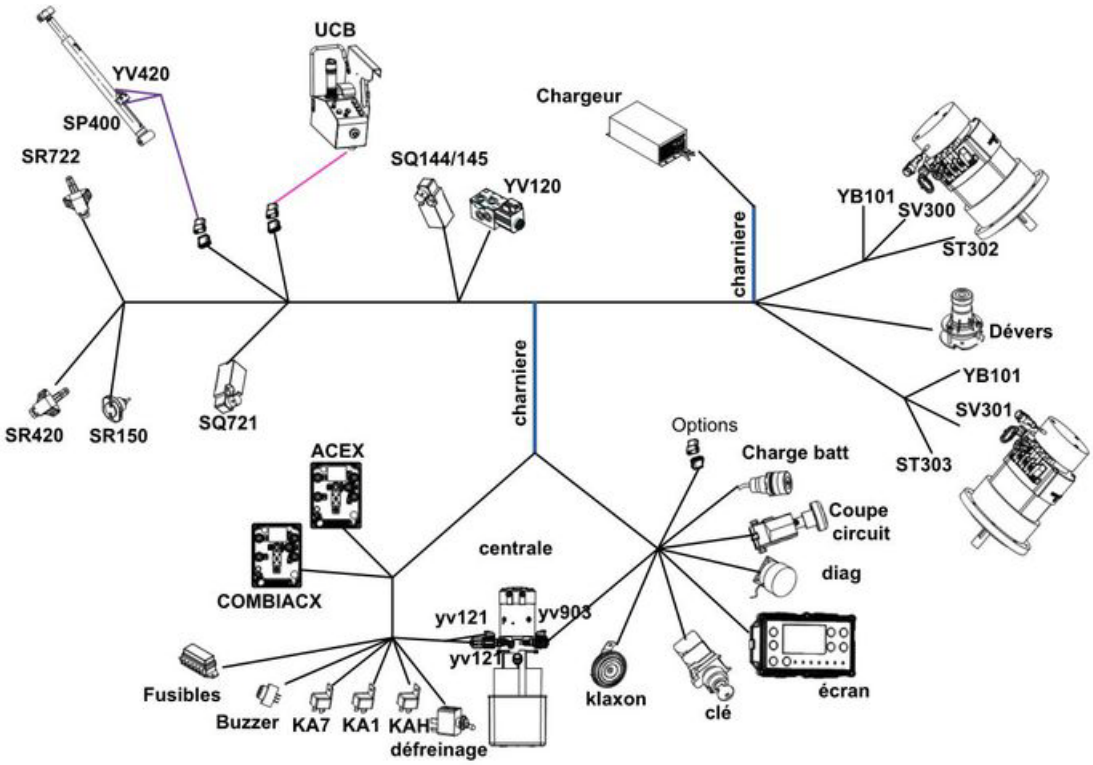
### 2.1.1 - Power circuit

**P o w e r  c i r c u i t**



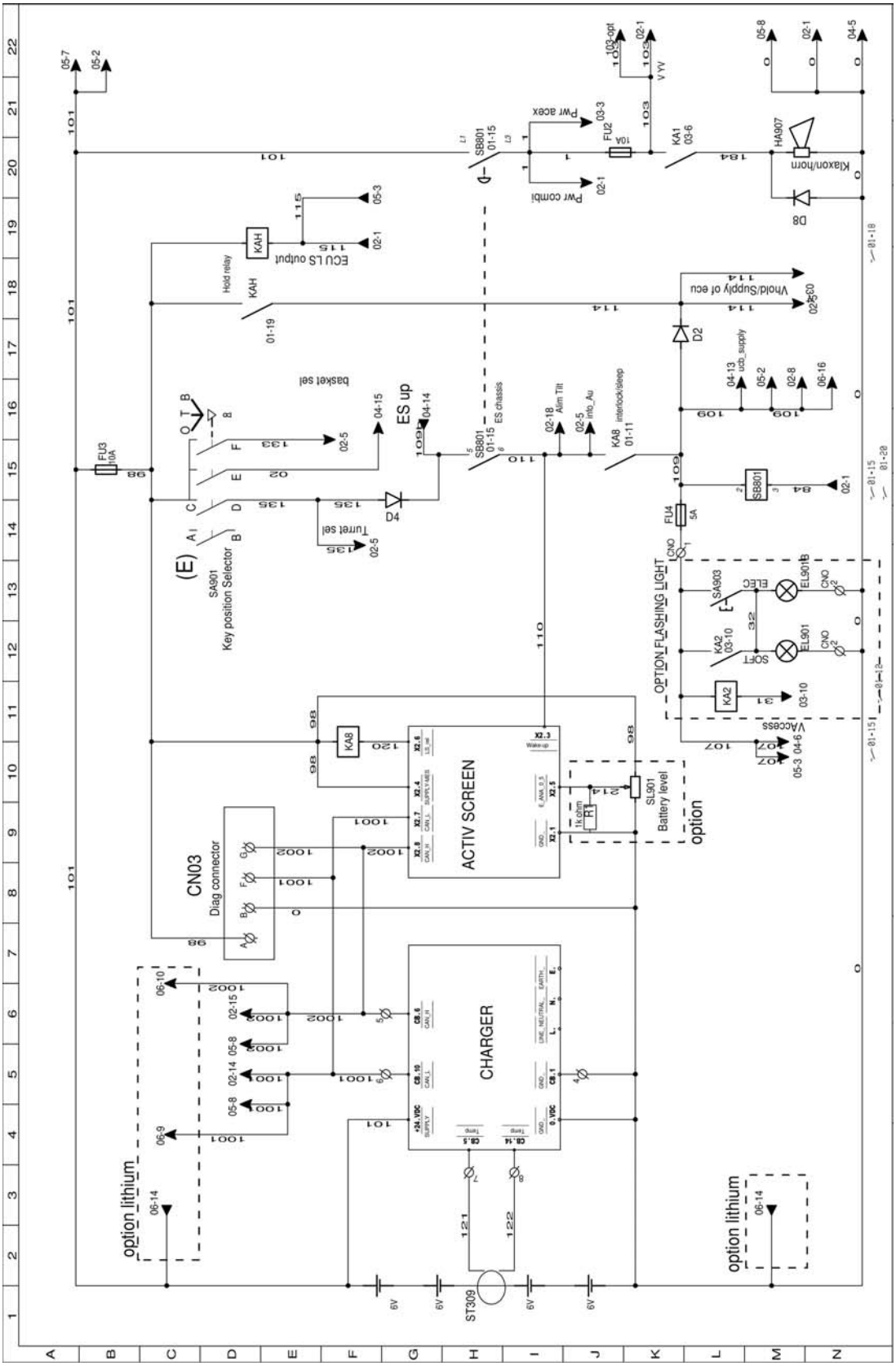
### 2.1.2 - Control circuit

**C o n t r o l  c i r c u i t**

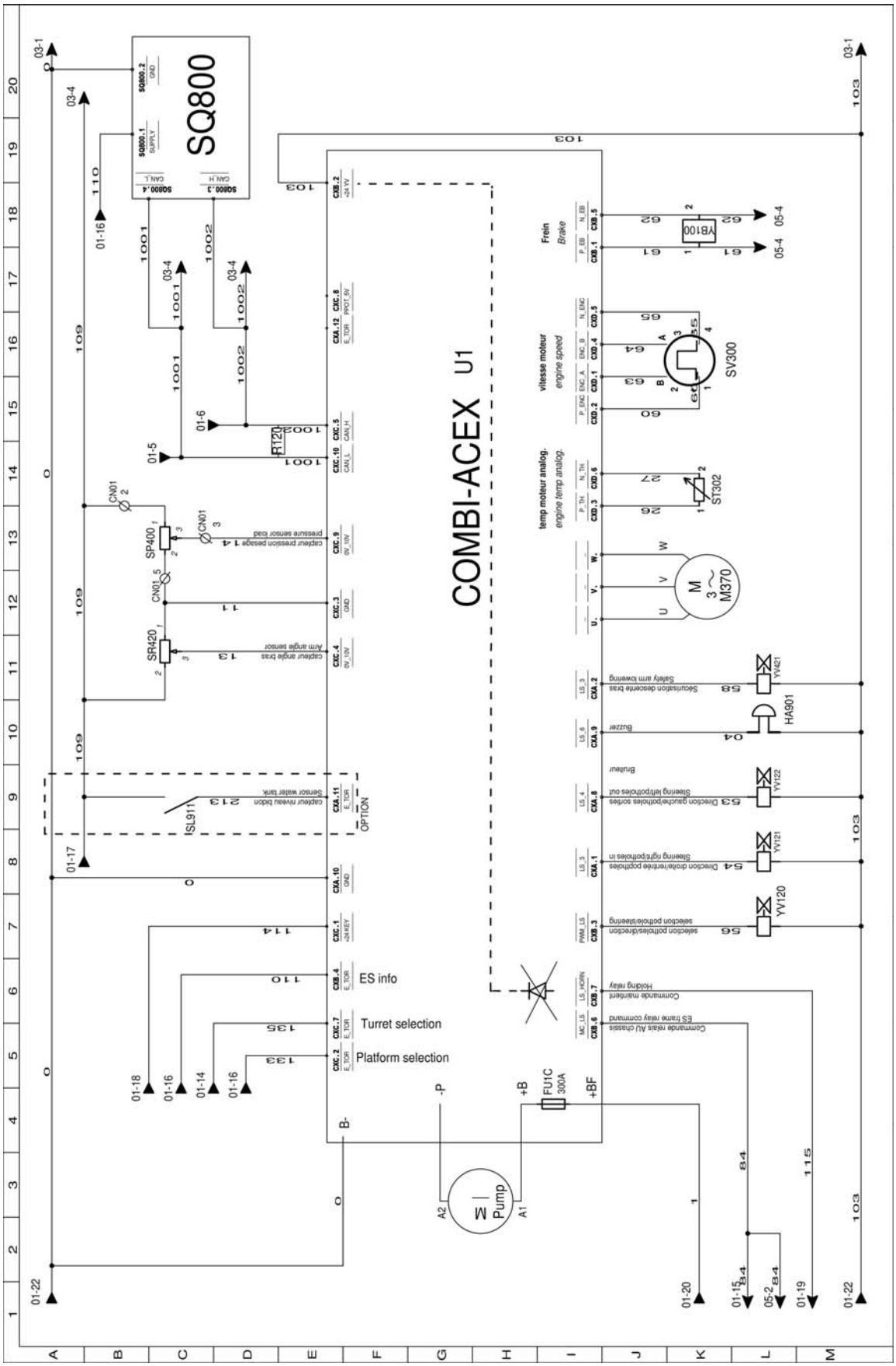


## 3 - Electric diagram

**Electricity part 4000822760 E - folio 1**

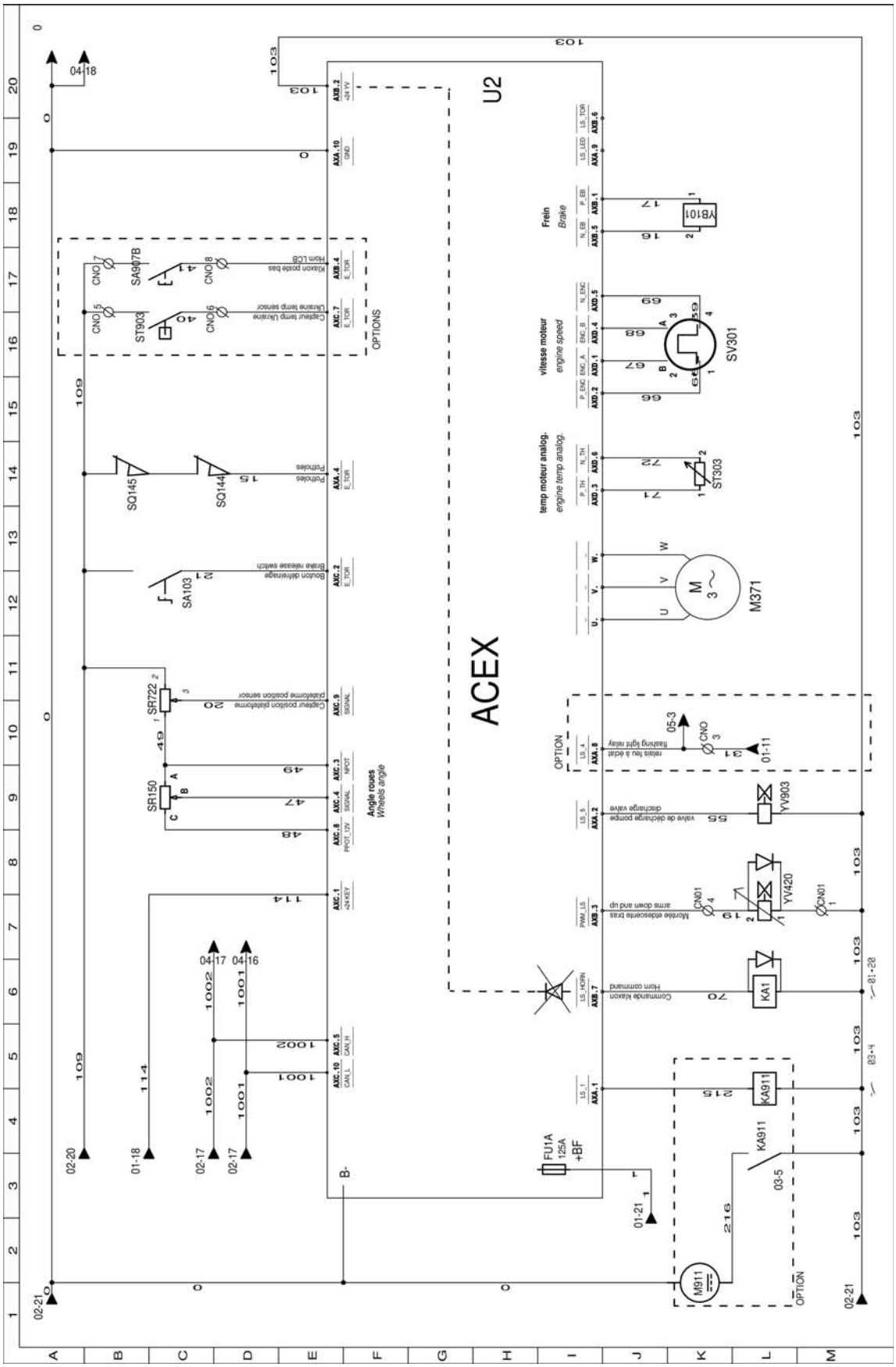


**Variable speed drive part 40008227 60 E - folio 2**

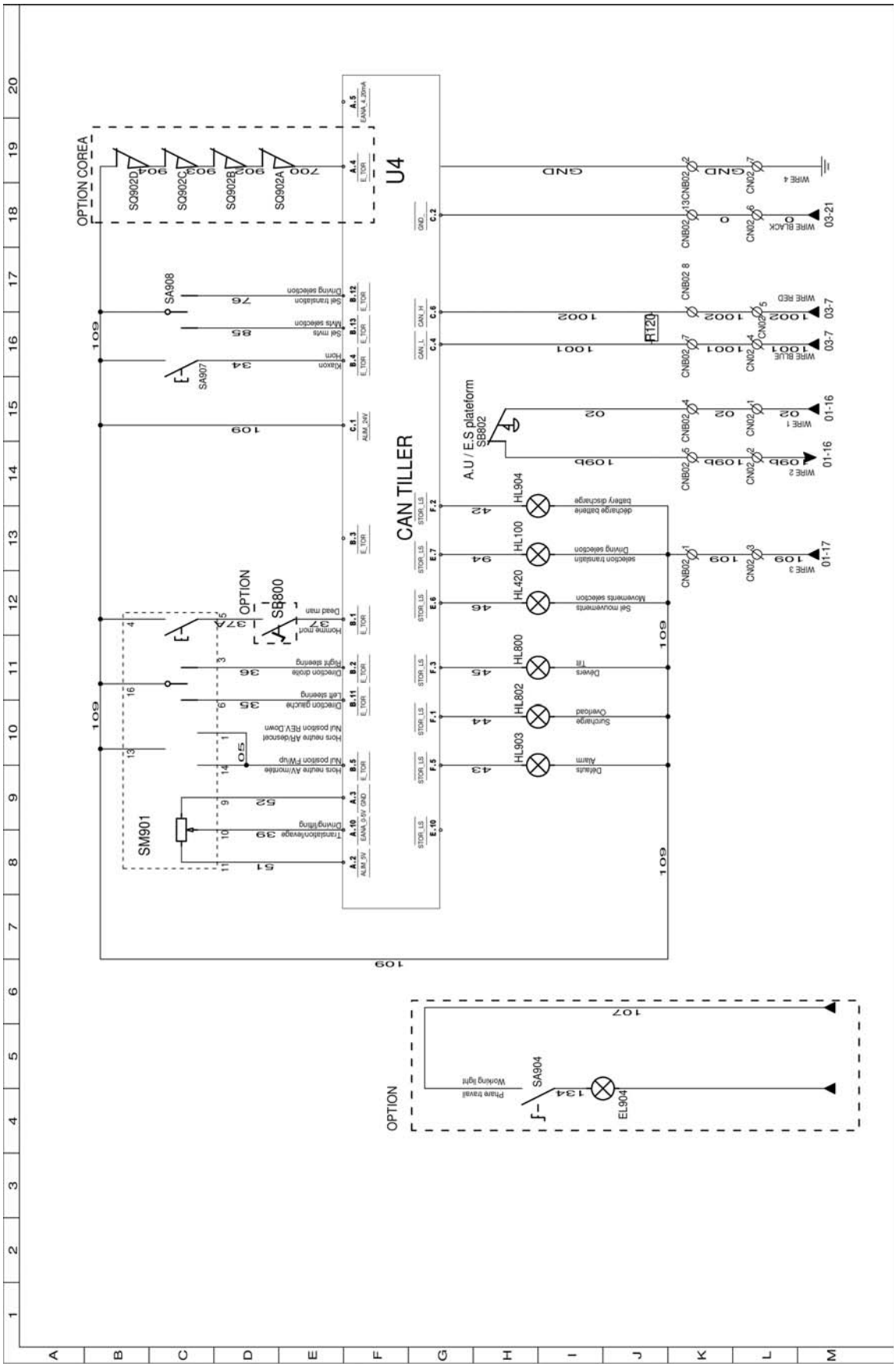


# E- Trouble shooting and diagram

**Variable speed drive part 4000822760 E - folio 3**

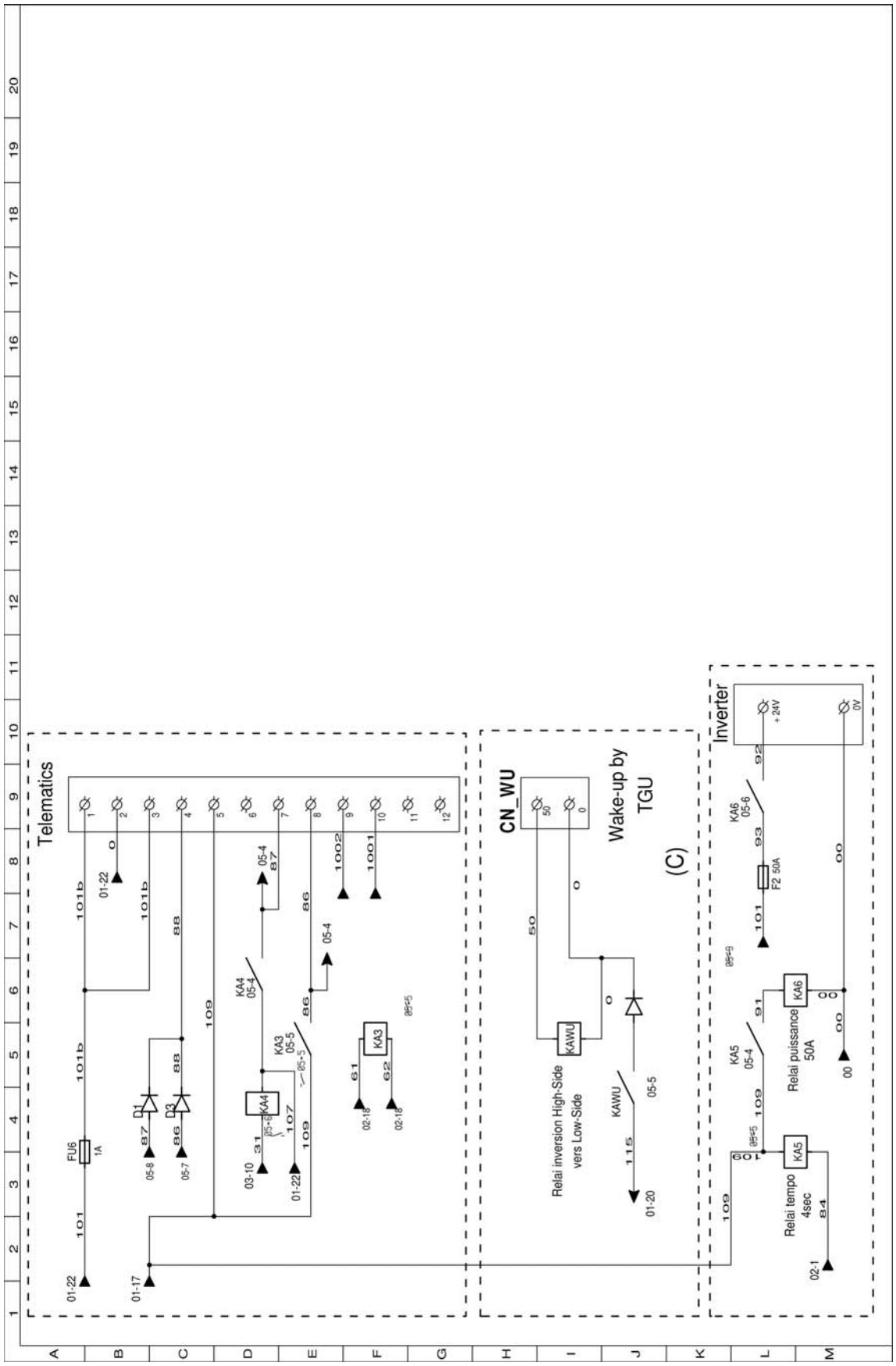


Cage part 40008227 60 E - folio 4

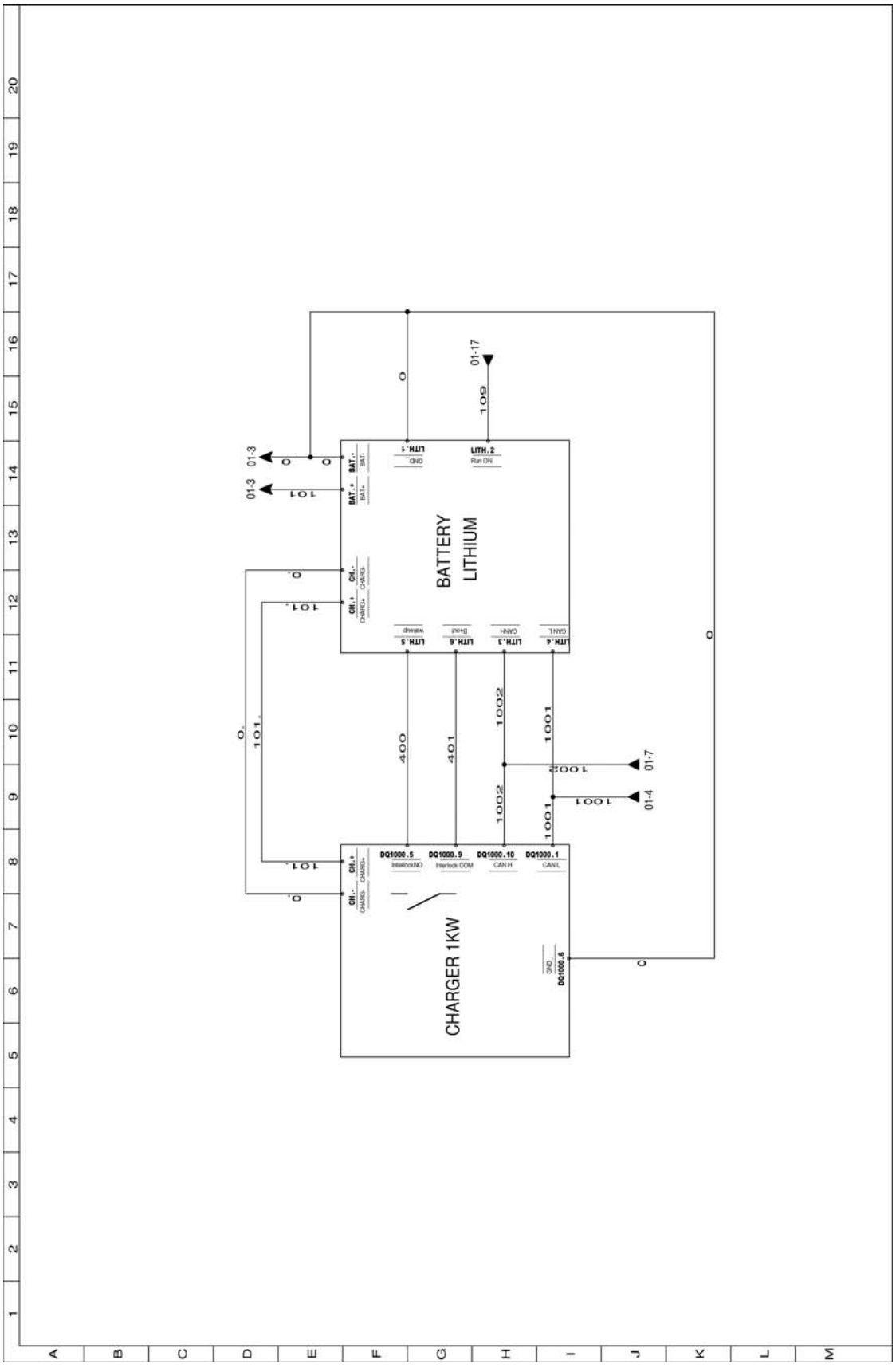


# E- Trouble shooting and diagram

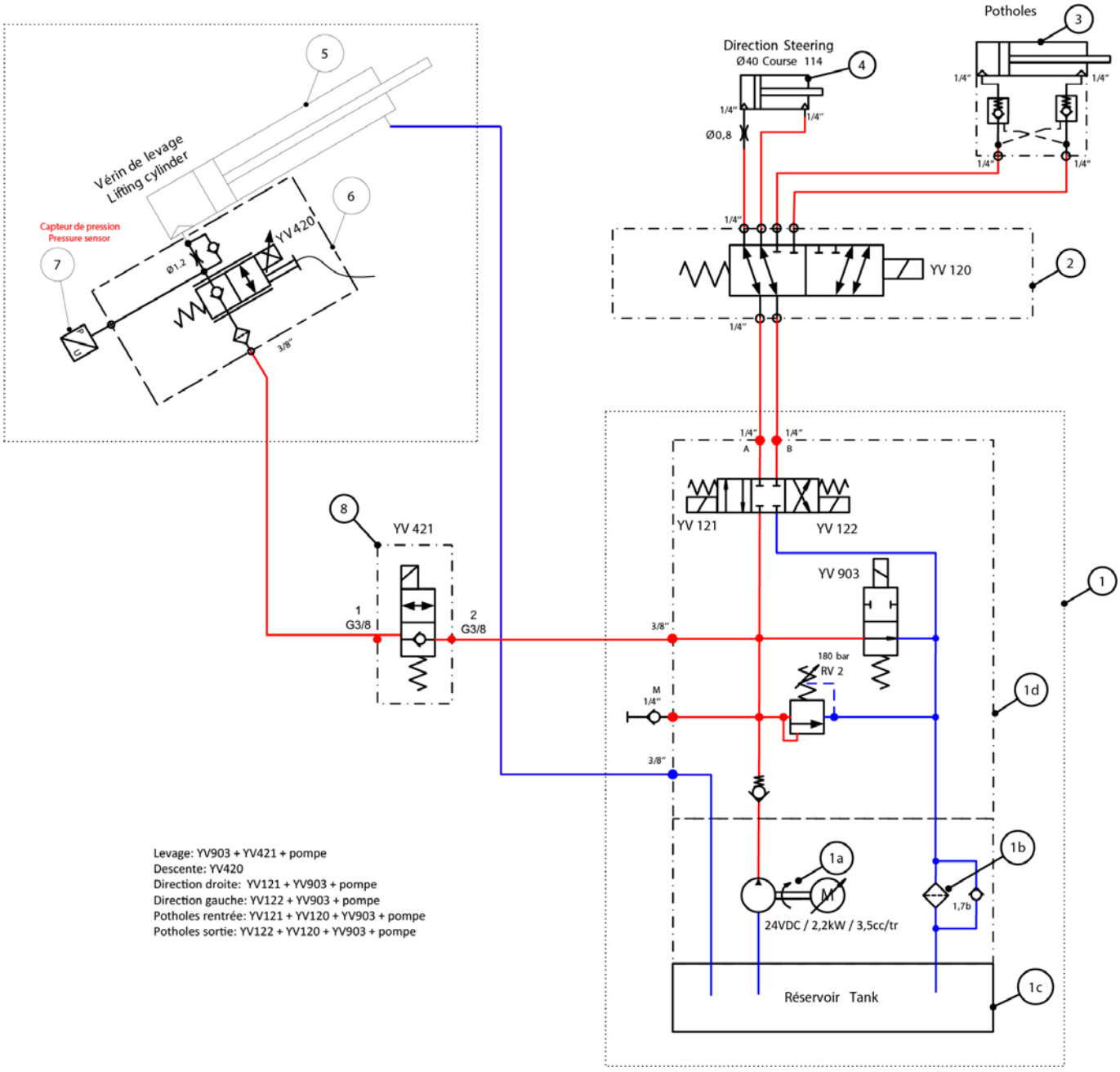
**Options 40008227 60 E - folio 5**



## Option - Lithium battery 40008227 60 E - folio 6



## 4 - Hydraulic diagram



# Notes

# 1 - Intervention register

The intervention register keeps a record of maintenance and repair work carried out inside or outside the maintenance programme.

***N.B.-:-In the case of a HAULOTTE Services® intervention, the qualified technician must indicate the HAULOTTE Services® intervention number.***

| Date | Type of intervention | Number of hours | Intervenor | HAULOTTE Services® intervention number |
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# F - Records

| Date | Type of intervention | Number of hours | Intervenor | HAULOTTE Services® intervention number |
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