

OPTIMUM 8 - OPTIMUM 1931 E

Maintenance Book

OPTIMUM 8 - OPTIMUM 1931 E

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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.

A - Preface - Foreword

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

A

- Preface - Foreword

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.

A - Preface - Foreword

[illegible]

B - Safety

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.

B

 - Safety

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.

B - Safety

1.3 - ELECTROCUTION 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.

M i n i m u m s a f e a p p r o a c h d i s t a n c e s

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.



B - Safety

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.



B - Safety

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.

B - Safety

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.

B

 - Safety

3 - Manufacturer's warranty

3.1 - WARRANTY ACCEPTANCE

On reception of his machine, the owner or rental company must check the machine's condition and fill out the machine reception slip provided.

3.2 - WARRANTY PERIOD

The present warranty is valid for a period of 12 months or up to a maximum of 1000 operating hours for personnel lifting machines and 12 months or up to a maximum of 1500 operating hours for the other machines, including MJX or the Telescopic Handlers, starting from delivery and terminating when the first limit is reached.

Spare parts are covered by a 6 month warranty.

3.3 - CONDITIONS OF WARRANTY

HAULOTTE® guarantees its products against defects, faults or manufacturing defects when the owner or rental company has informed HAULOTTE® of the defect.

The warranty does not cover the consequences of normal wear, nor any defects, failure or damage resulting from poor maintenance or abnormal usage, in particular overloading, impact by an external source, faulty installation or any modification made to products marketed by HAULOTTE® and performed by the owner or rental company.

In the event of operation or use which does not comply with the instructions or recommendations in the maintenance book, warranty claims will not be accepted.

The machine utilisation period must be recorded by reading the engine hour meter whenever an intervention is made. The engine hour meter must be maintained in good working order to guarantee maximum working life and to justify maintenance at the recommended time.

Warranty obligations for the time period stated above will cease immediately in situations where the defect is due to the following reasons :

- Use of spare parts that are not HAULOTTE® originals.
- If elements or products other than those recommended by the manufacturer are used.
- If the HAULOTTE® name, serial numbers or identification marks are removed or altered.
- After an unreasonably long delay before reporting a manufacturing problem.
- If the owner or rental company continues to use the machine despite problems.
- If damage is caused by modifications that do not comply with HAULOTTE® specifications.
- If lubricants, hydraulic oils or fuels that do not comply with HAULOTTE® recommendations are used.
- If the machine is incorrectly repaired or used by the customer.

If no particular agreement has been made, any claims made after the previously established warranty period has expired will be refused.

B

 - Safety

The present warranty does not cover damage that may result directly or indirectly from any flaws or defects covered by the latter :

- Consumables : No claims will be accepted for objects or parts replaced in the context of normal machine usage.
- Settings : Adjustments of all sorts may become necessary at any time. Therefore adjustments are considered a part of normal machine usage conditions and are not covered by the warranty.
- Hydraulic and fuel circuit contamination : Every possible precaution is taken to ensure that fuel and hydraulic liquid delivered is clean. On the other hand, in certain cases it is possible to contaminate fuel and hydraulic circuits, especially when fuel and lubricants are stored on the work site. Moreover, irregular or poor cleaning of the decanting device may also cause fuel/hydraulic circuit contamination and therefore damage the parts in direct contact with these liquids. HAULOTTE® will not accept any claims concerning cleaning of the fuel circuit, filter, injection pump or any other equipment in direct contact with fuel or lubricants.
- Wearing parts (pads, bearings, tires/tyres, connections, etc.) : These parts are, by definition, subject to deterioration during the period of operation. Wearing parts will therefore not be covered by the warranty agreement.

3.4 - WARRANTY CONDITIONS

To benefit from the warranty, the owner or rental company must inform the nearest HAULOTTE® subsidiary or the subsidiary that delivered the machine (the only dealer authorised to carry out an intervention under the manufacturer's warranty agreement) of the defect in writing as quickly as possible.

The subsidiary will decide whether to repair or replace the part that proves to be faulty.

The owner or rental company must present the duly completed maintenance book supplied with the machine as proof that the maintenance operations recommended by the manufacturer have been carried out.

The owner or rental company must ensure that the defect covered by the HAULOTTE® warranty is reported to and acknowledged by the HAULOTTE® subsidiary the only dealer authorised to carry out work covered by the warranty) as rapidly as possible or must report the defect in writing.

Work carried out under the HAULOTTE® warranty will be performed by the subsidiary which delivered the machine, wherever possible.

Notes

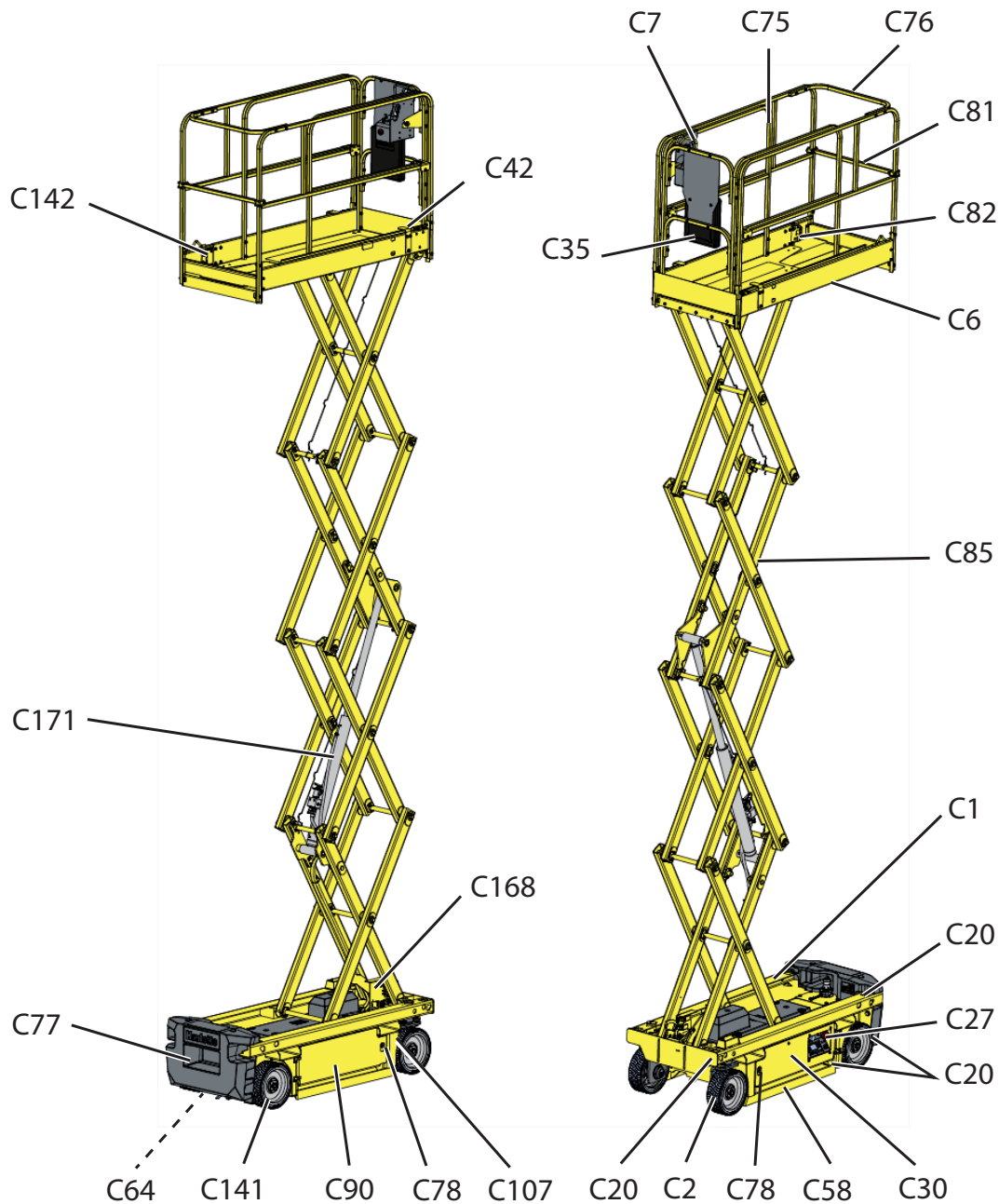
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C - Familiarization

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		

U n i v e r s a l p l u g



C - Familiarization

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.



C - Familiarization

1.3 - EXTENSION DECK

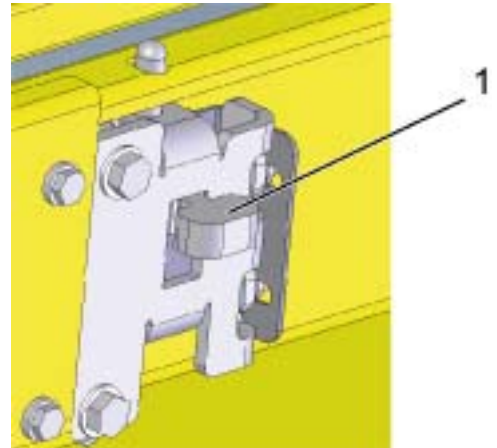
N.B.: -DO NOT LOAD THE EXTENSION DECK, FOR EASE OF MANOEUVRING.

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

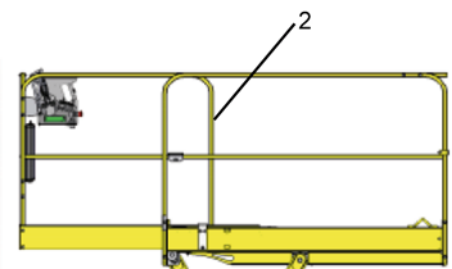
Perform the extending and retracting operations of the extension deck on flat, horizontal ground.

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 :

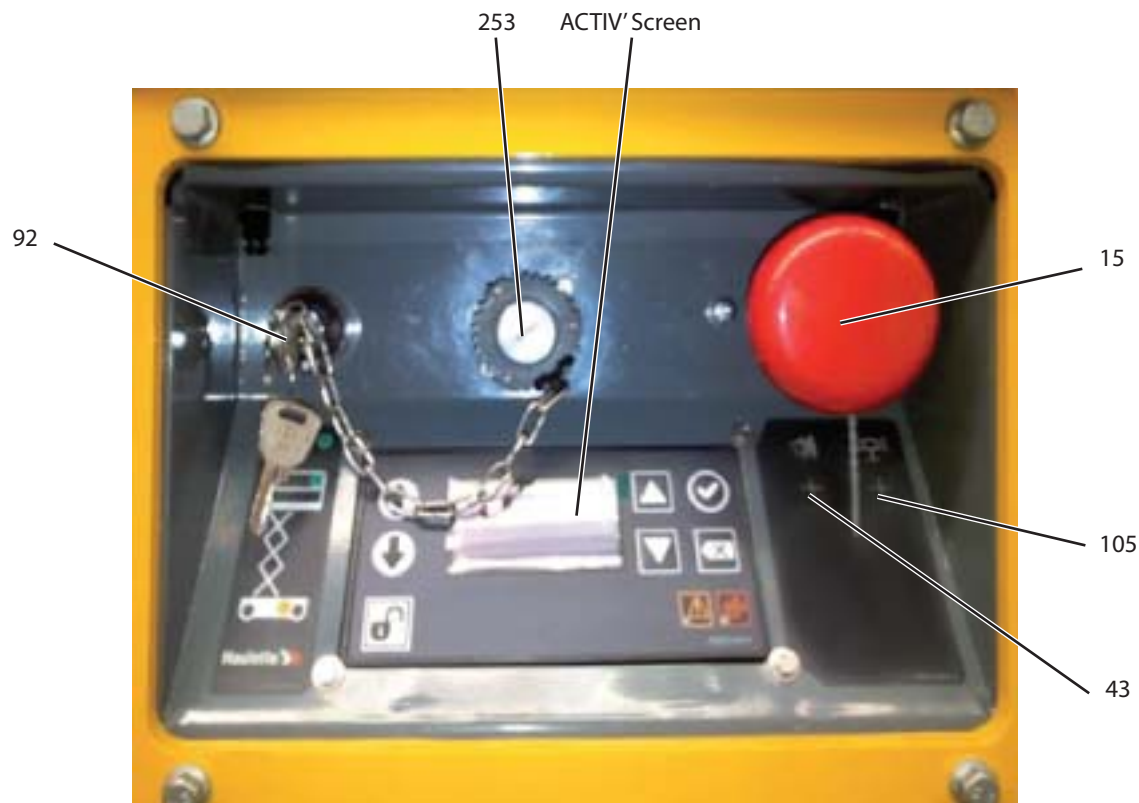
- Press pedal (1) and pull the extension deck rails (2) inwards to the locked position.
- Release the pedal.

C - Familiarization

1.4 - GROUND CONTROL BOX

1.4.1 - Layout

General view



Controls and indicators

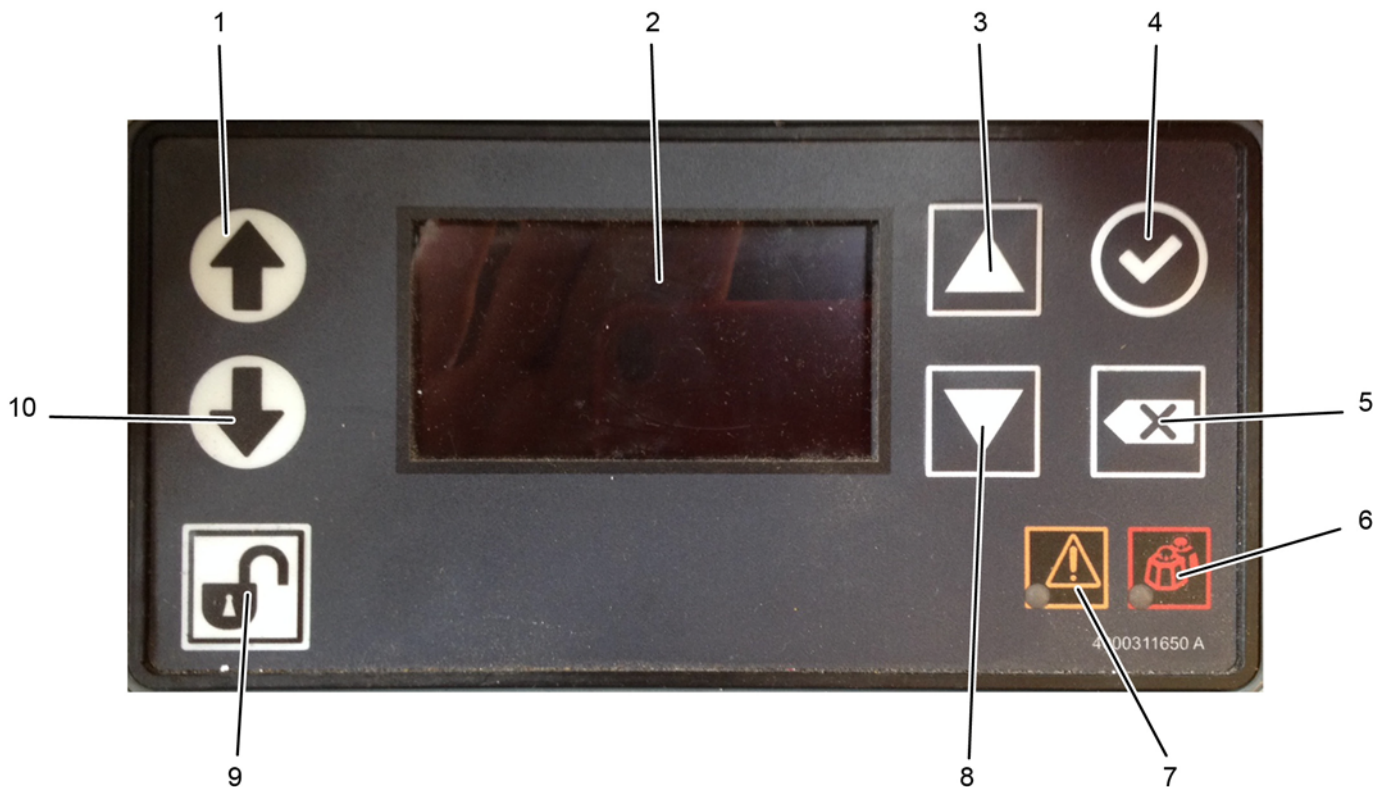
Marking	Description	Function
15	E-stop button	Pulled out : Ground control box energized Pushed in : De-energizes control system
43	Horn button	Not used
92	Control box activation key switch	Right : Ground control box energized Center : De-energizes control system Left : Platform control box energized
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)

C - Familiarization

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.

HAULOTTE Activ'Screen



Controls and indicators

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

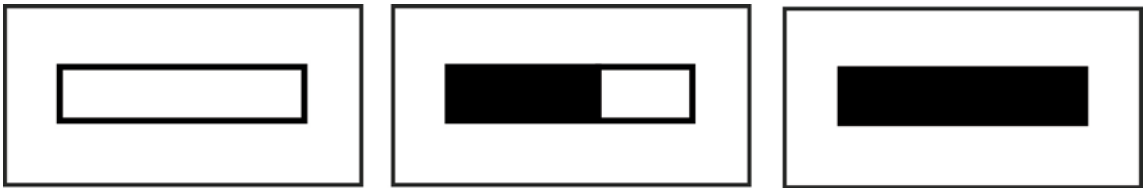
C - Familiarization

1.4.2.1 - LCD screen

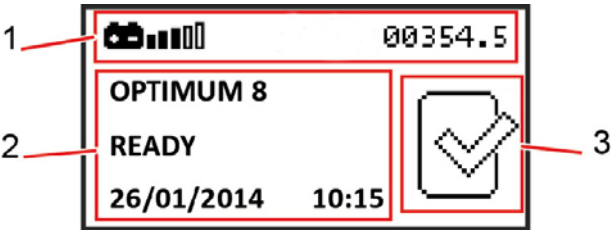
At startup :

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.

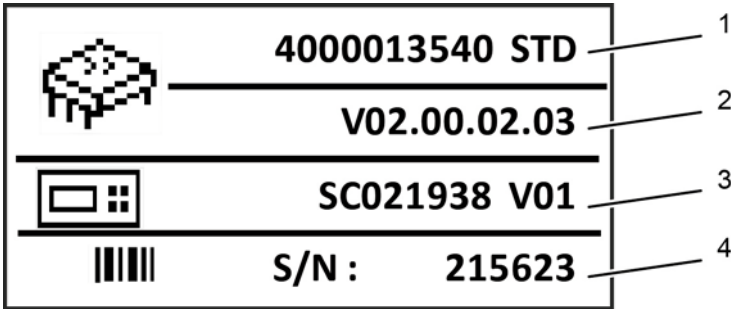


Symbol	Description
1	Information icons
2	Information text
3	Status icon of the machine

Symbol	Description
	Battery status
	Maintenance use
	Fault / alarms
	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 usage

C - Familiarization

Alarm status :

Alarm status displayed as applicable - samples shown below

Tilt :**Overload :****Low battery :**

C - Familiarization

Recharge the batteries :



Fully recharge the batteries.

Low battery water level :



Low water tank level :



Present fault :

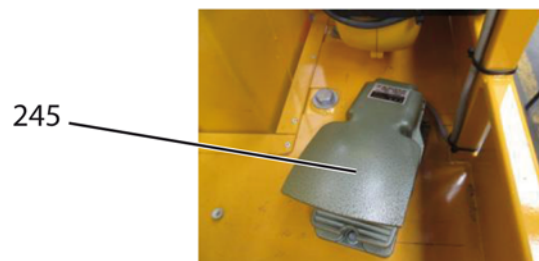
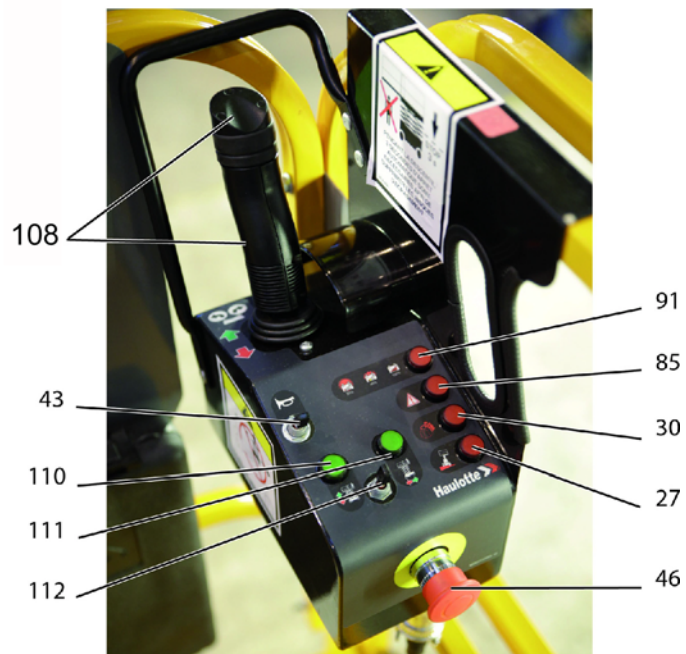
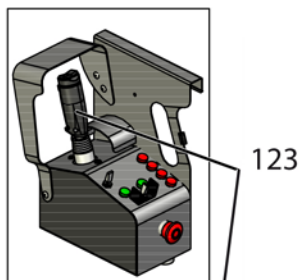


C - Familiarization

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

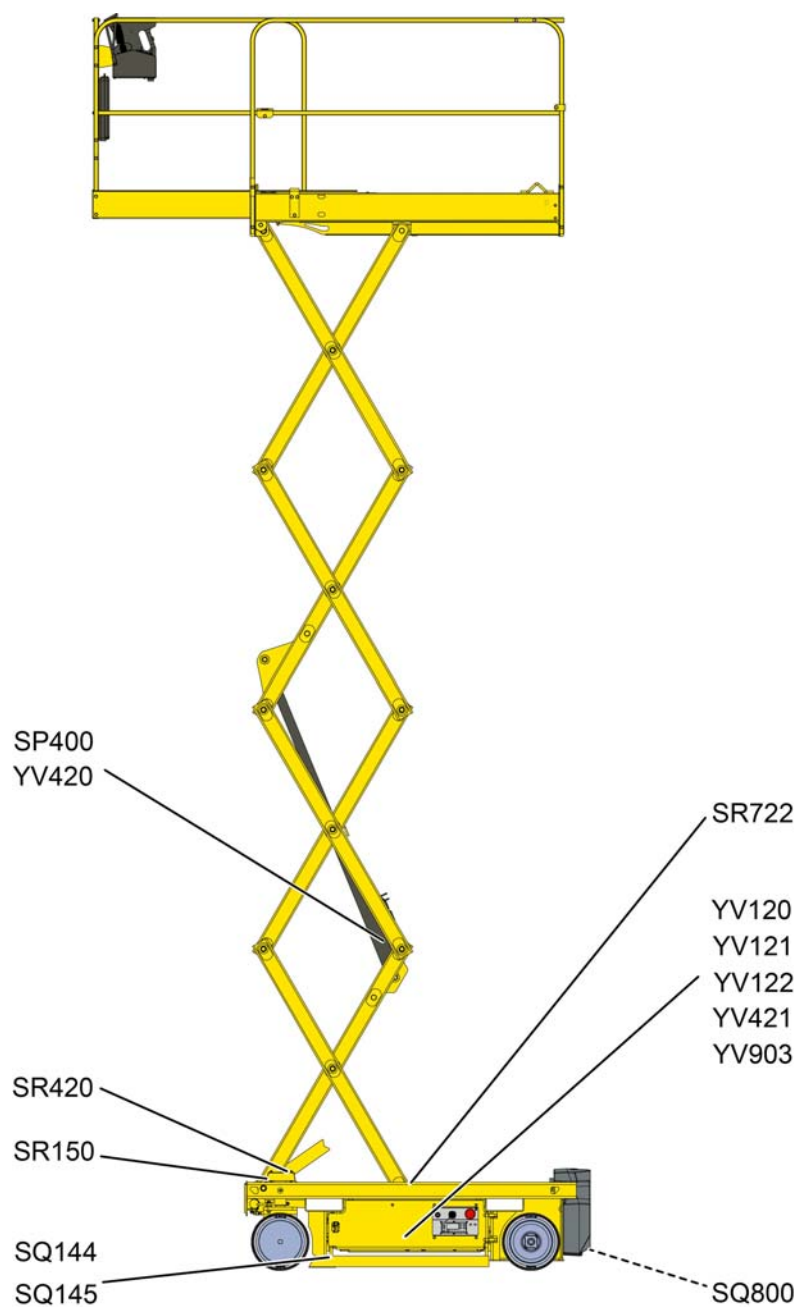
Marking	Item	Description	Function
			 Battery charged
91	HL904	Battery charging indicator	 Flashing : Batteries have 40 % charge left
			 Constantly on : Batteries have only 20 % charge left
108	SM901	Movement joystick	Move forward : Forward drive or platform raising Move backwards : Reverse drive or 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 Press in and hold : Associated command is validated
123	SA905	Enable Switch	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

C - Familiarization

2 - List of actuators and sensors

2.1 - SENSORS AND ACTUATORS

Sensors and actuators



C

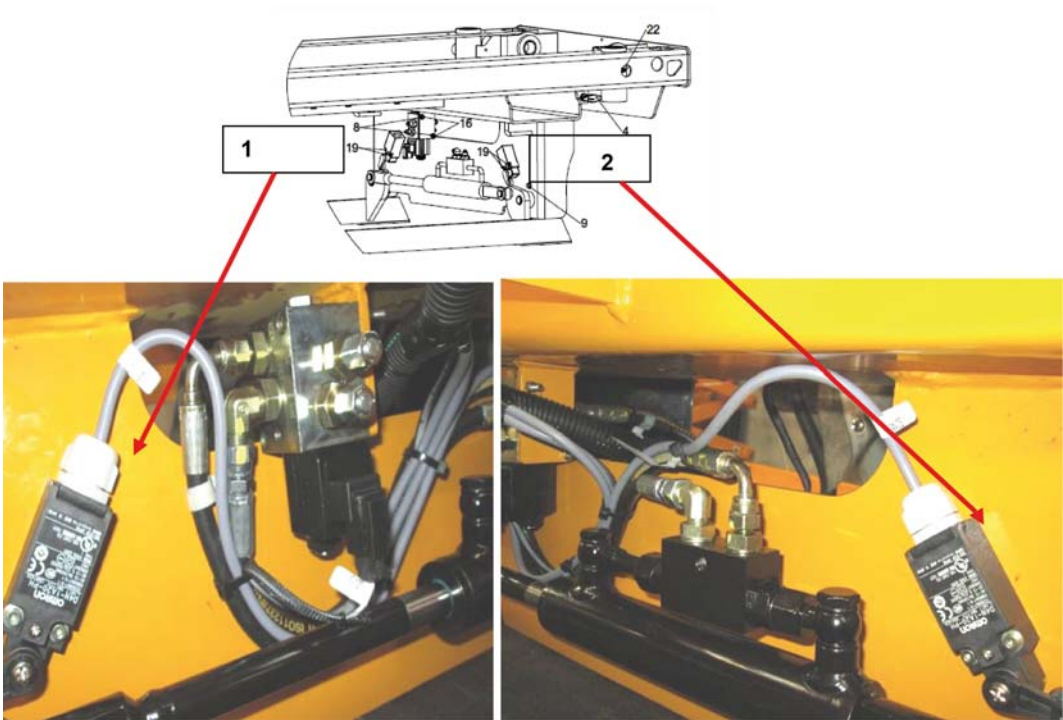
- Familiarization

Name	Description
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
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)

C - Familiarization

2.2 - SENSORS DETAIL

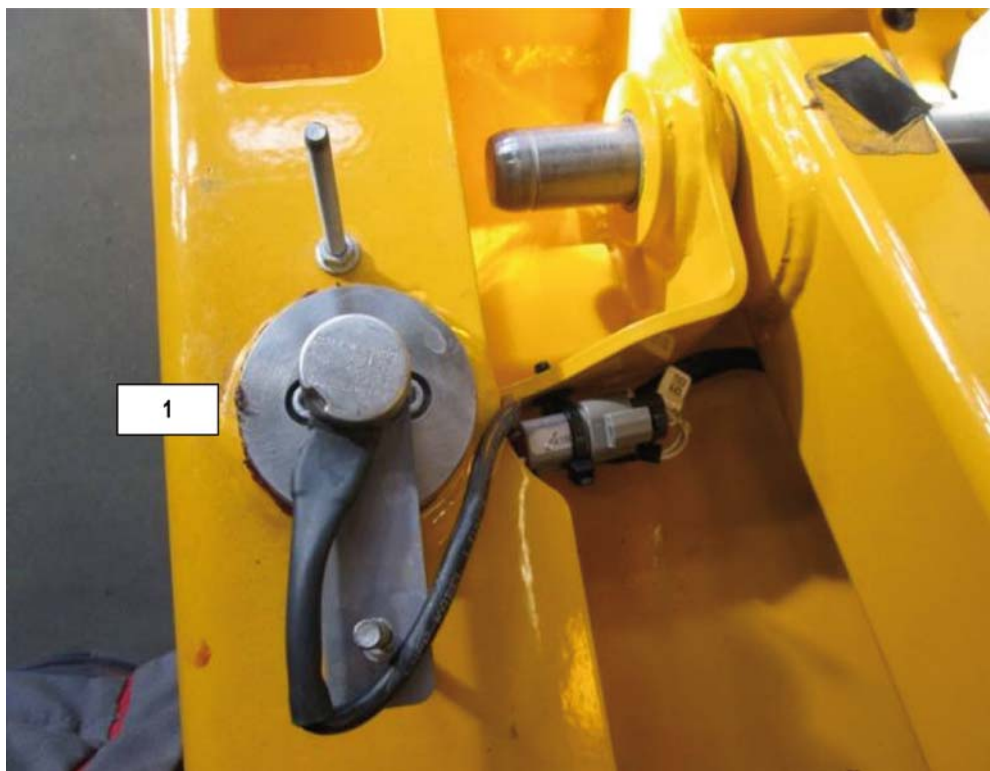
2.2.1 - Limit switches for potholes



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

C - Familiarization

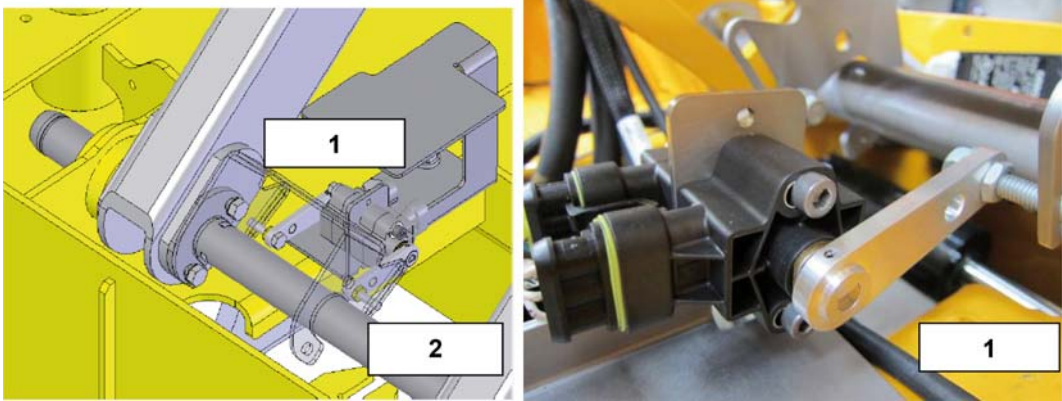
2.2.2 - Steering potentiometer



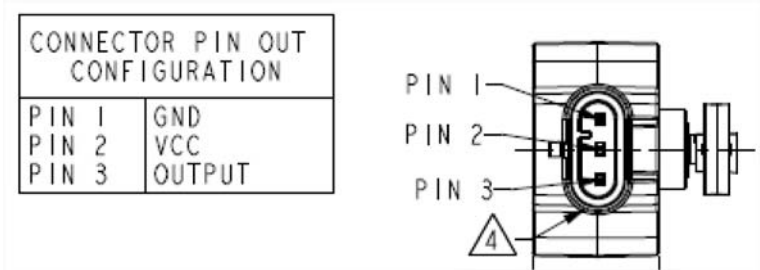
Marking	Item	Description
1	SR150	Value 2.5 O, supply in 12 VDC (coming from ACEX variator) Before to launch the calibration, the pre-setting has to be done at mid-range value then use the consoles in order to set the potentiometer values to adjust current/voltage of the internal motor depends the direction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

C - Familiarization

2.2.3 - Angle transducers



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



C - Familiarization

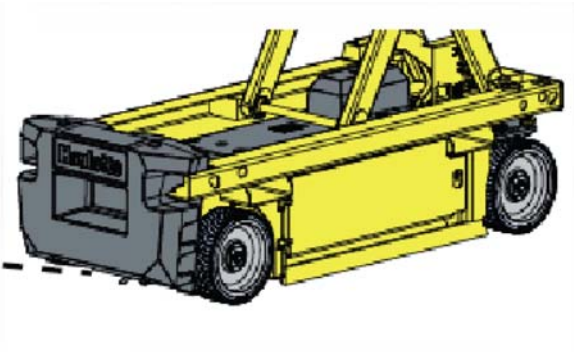
2.2.4 - Pressure transducer



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

C - Familiarization

2.2.5 - Slope sensor



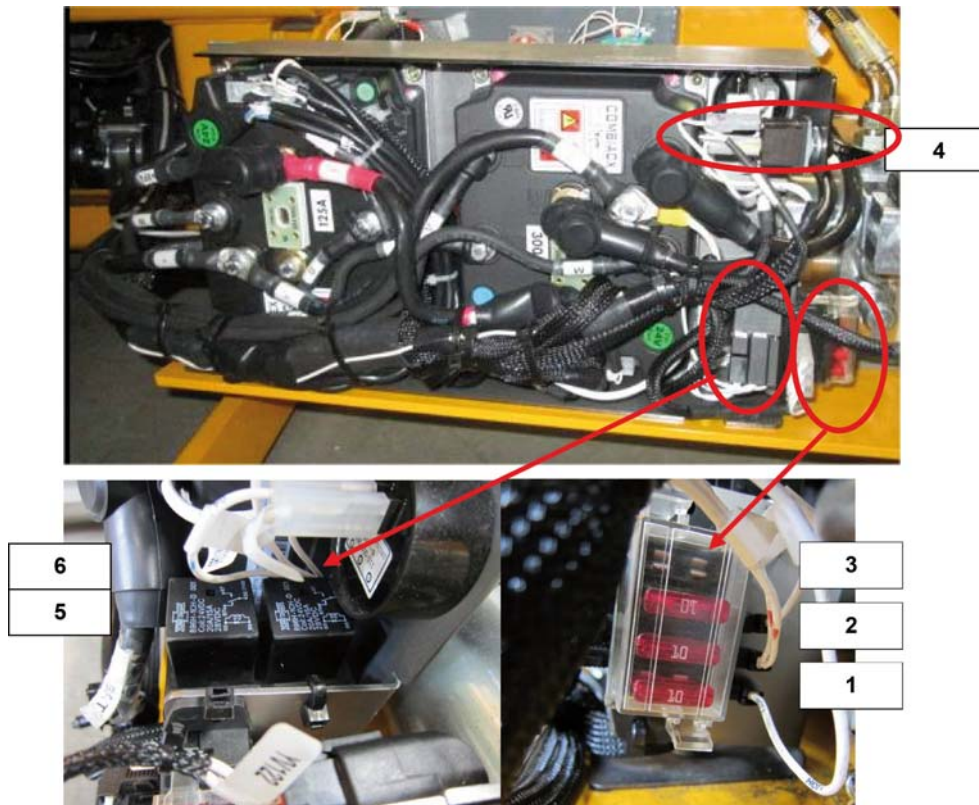
Marking	Item	Description
1	SQ800	Tilt Y = 1.5° / X = 3° (wire 12 = Vbat if machine on flat surface) 1=red=+Batt / 2=white=signal / 3=black=GND

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	

C - Familiarization

2.2.7 - Fuses and relays



Marking	Item	Description
1	FU2	Protection electrovalve circuit (10A)
2	FU3	Protection main circuit (10A)
3	FU4	Protection accessories circuit (10A)
4	SA103	Toggle switch for manual brake release function
5	KA1	Relay for horn
6	KAH	Relay for main modules power supply

C - Familiarization

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

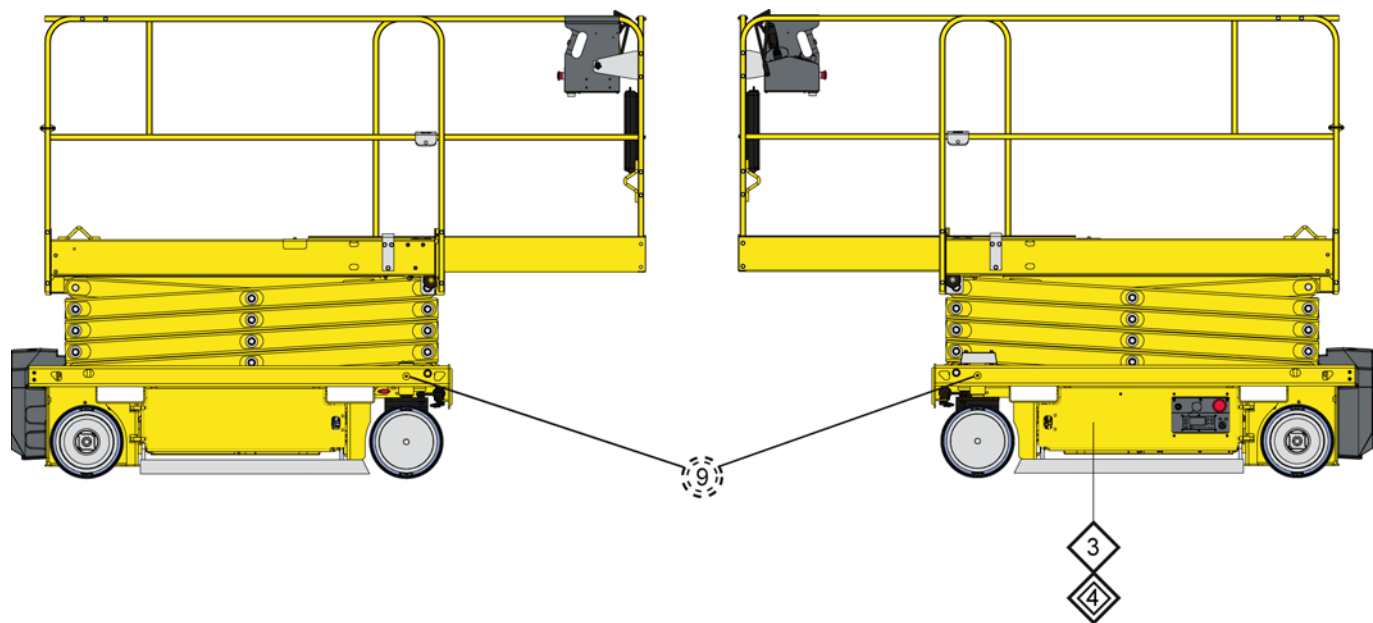
Biodegradable oils may be used if they comply with the following requirements :

- 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 mm ² / s
Viscosity at + 100° C (+ 260° F)	> 8 mm ² / s
Viscosity index	> 160
Flashpoint	> 220° C (> 572° F)
Pour point	< - 40° C (> - 104° F)

C - Familiarization

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

C

- Familiarization

5.1 - GREASING POINTS LOCALIZATION

- Front-right wheel pivot greasing
- Front-left wheel pivot greasing



C - Familiarization

6 - Machine specifications

6.1 - 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 1930 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)

C - Familiarization

[illegible]

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 be 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.

D

- Inspection and maintenance schedule

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.

D - Inspection and 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.



The information contained in our manual is to be complemented by the information found in the engine manufacturer's maintenance manual, which can be found on the link in the associated maintenance sheet MS0238.

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 50 H

First 50H	Page or associated procedure	First 50H	OK	NOK	Corrected	Comments
Chassis assembly : Wheel, reducer, steering, wheel pivot						
Tighten the wheel nuts	E006					
Hydraulic : oils, filters and hoses						
Replace the hydraulic filter	E003					

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	E018					

Preventive Maintenance Level 1 - Every 6 months or 250 H

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 500 H

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 1000 H

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						

D - Inspection and maintenance schedule

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						

D - Inspection and maintenance schedule

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®.

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.

For safety reasons, imperatively respect the following stages during the tests :

- To set up e beaconing of safety around the test area.
- To put the machine in position transport (horizontal jib accepted)
- Use safety straps.

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 - 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.

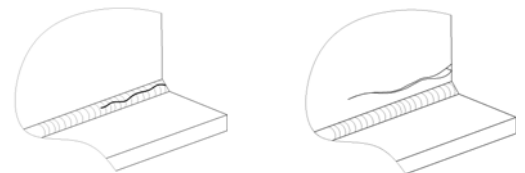
3.1 - DAILY INSPECTION

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.



3.2 - MAJOR INSPECTION

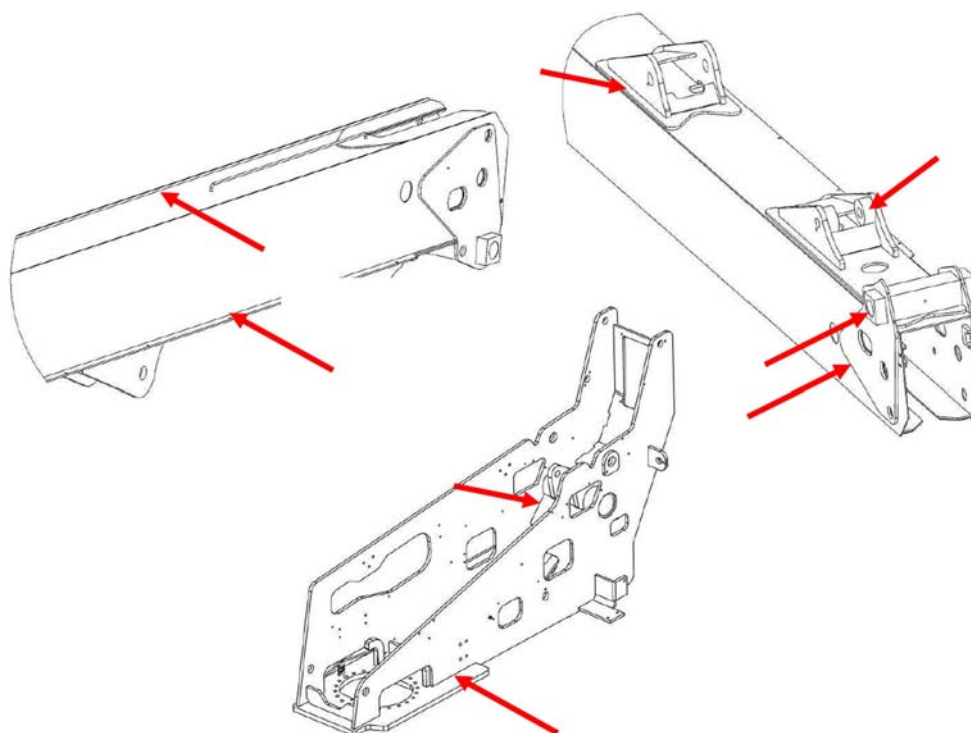
All structural part listed Section Familiarization must be disassembled and all welds must be review using non-destructive checks  Section D - Inspection and maintenance schedule.

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).

3.3 - 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.

3.4 - 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.

3.5 - 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 mn.
- 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.

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.

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 - 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 $> 0,5 \text{ mm}$ ($19690 \text{ } \mu\text{in}$) 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).

4 - 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.

5 - Procedure of reassembly

5.1 - PINS AND BUSHES

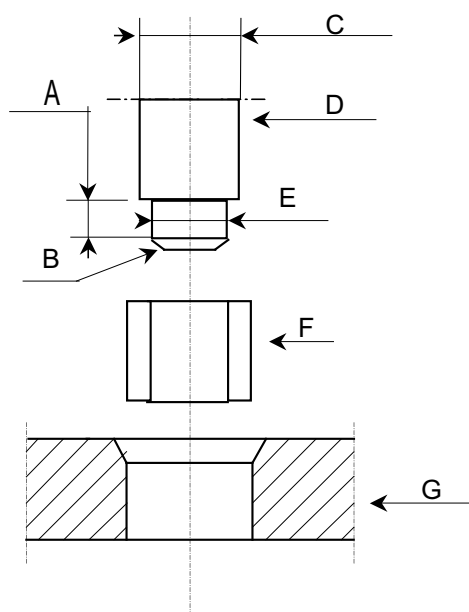


For OPTIMUM 8 - OPTIMUM 1931 E only : Never grease the pins and rings of scissor arms.

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.

5.2 - 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 - 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.

For safety reasons, imperatively respect the following stages during the tests :

- To set up a beaconing of safety around the test area.
- Put the machine in stowed position.
- Use safety straps.

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 - Control and maintenance

3.1 - 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).

3.2 - 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	
	After 10 mn, creep	After 60 mn, creep
Lift cylinder arm or boom (Machine with working heights > 26 m(85 ft4 in))	< 0,2 mm (7874 µ in)	< 1 mm (0.039 in)
Outriggers cylinder, Oscillating axle locking, Lift cylinder arm or boom (Machine with range-limiting system)	< 0,5 mm (0.01196 in)	< 2,5 mm (0.098 in)
Lift cylinder arm or boom, Telescoping, Compensation, ...	< 1 mm (0.039 in)	< 6 mm (0.236 in)
Steering cylinder	< 1,5 mm (0.059 in)	< 9 mm (0.354 in)



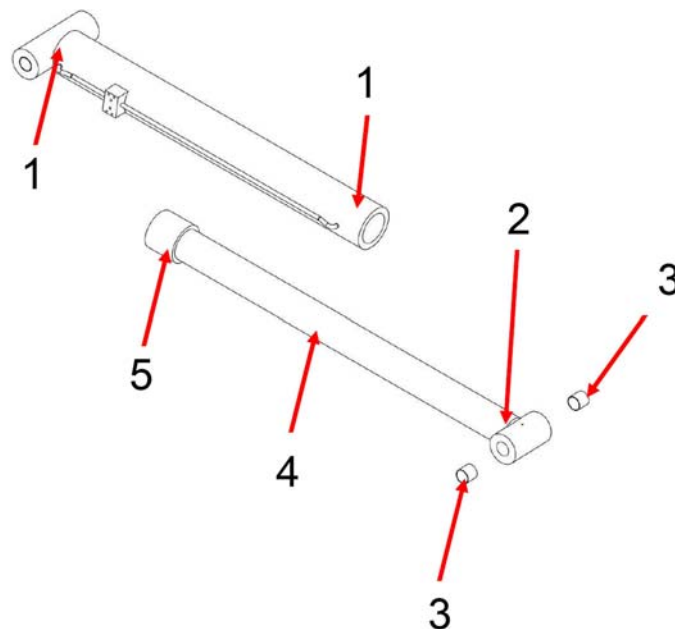
These tests must be made in conditions of equivalent temperatures.

3.3 - 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.

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.

For safety reasons, imperatively respect the following stages during the tests :

- Set up a beaconing of safety around the test area.
- Put the machine in position transport (Pendular horizontal accepted).
- Use safety straps.

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 - 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.



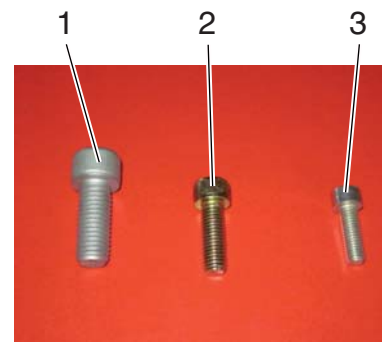
Notes

[illegible]

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											
This chart 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 %)

BSP 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).

H y d r a u l i c h o s e t o r q u e (M i n i m u m / M a x i m u m)

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 : • Cartridge • Nut		39 - 51 Nm 2 - 4 Nm
Hydraulic block - Potholes - Steering : • Nut		2 - 4 Nm
Electric pump unit : • Cartridge • Nut		27 Nm max 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

MS0005



Notes

[illegible]

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.

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.

T i g h t e n i n g t o r q u e t a b l e

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
- Protective goggles
- 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 side 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

[illegible]

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.

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.

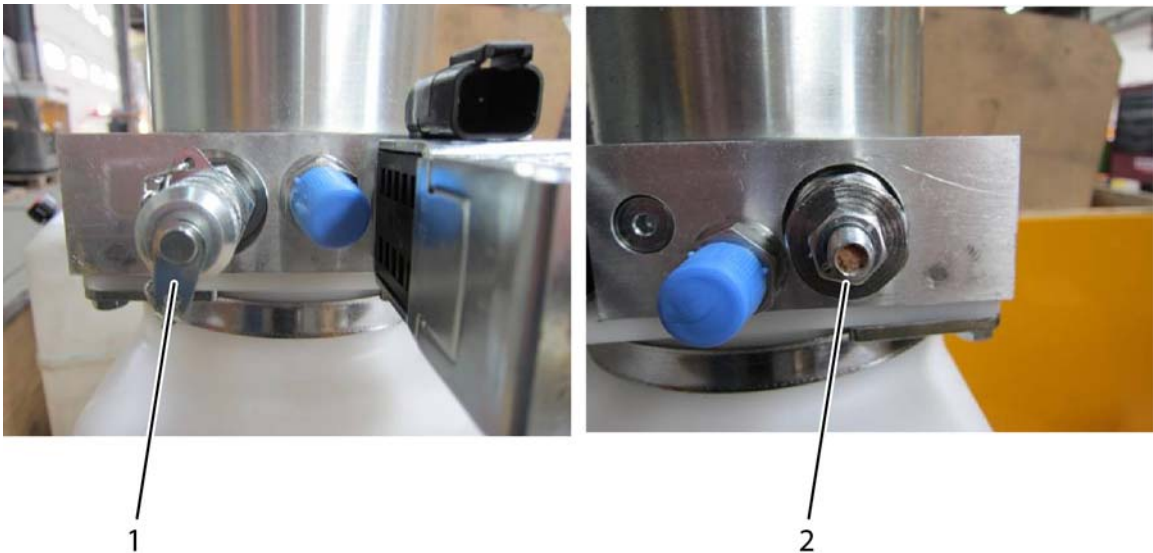
If the values measured by test are not equal to the following :

- 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

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- Torque spanner - 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.

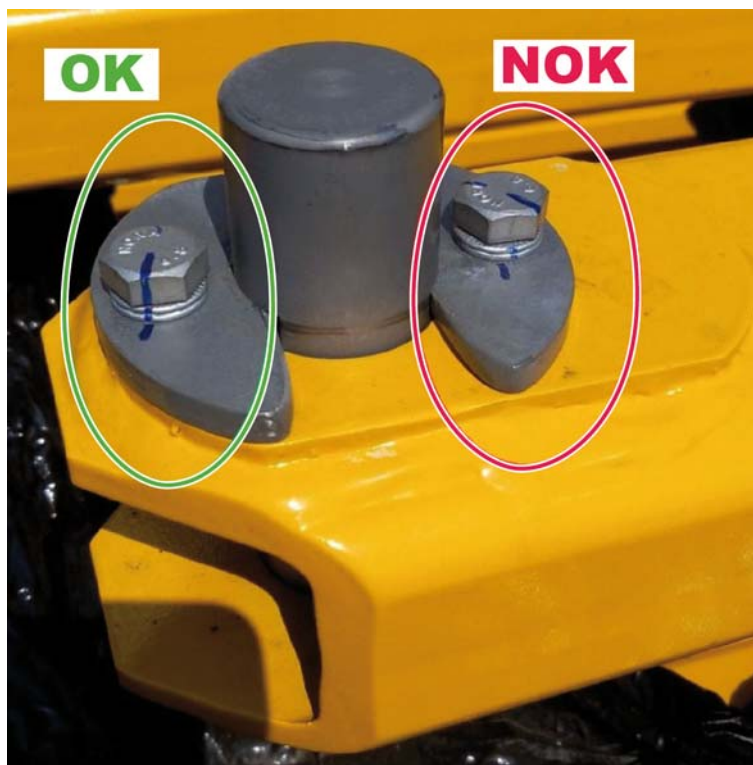
2 - Checks



- 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

[illegible]

Removal / Replacement of motor reducer assembly

MS0084

1 - You will need

- Standard tool kit
- Protective goggles
- Gloves
- Overhead crane or equivalent, 1 tonne capacity minimum
- Forklift min 2 T capacity
- 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.

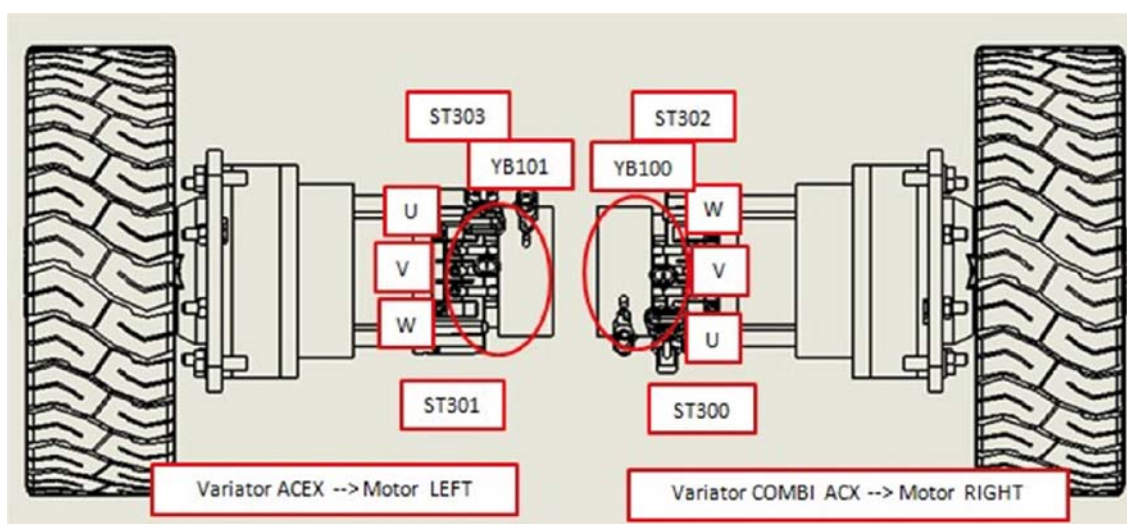
Respect, in addition to the instructions appearing in the present instructions, the legal tendencies generally applicable for safety accident prevention.

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

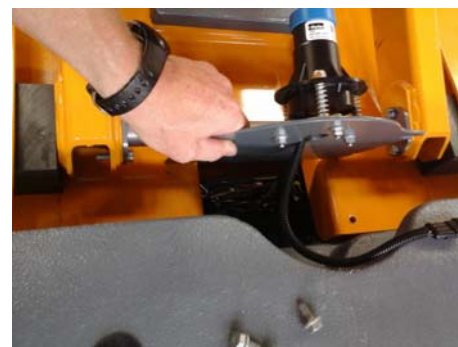
N.B.-:-THIS PROCEDURE IS EXPLAINED WITHOUT REMOVING OF THE REAR COUNTERWEIGHT (AS PERHAPS PERFORMED IN THE FIELD). BUT REMOVAL OF THE REAR STEP COUNTERWEIGHT MAKES THE ACCESS MUCH BETTER AND IS RECOMMENDED WHEN POSSIBLE. IF THE COUNTERWEIGHT IS REMOVED, THERE IS NO NEED TO RAISE THE SCISSOR FRAME AND 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.



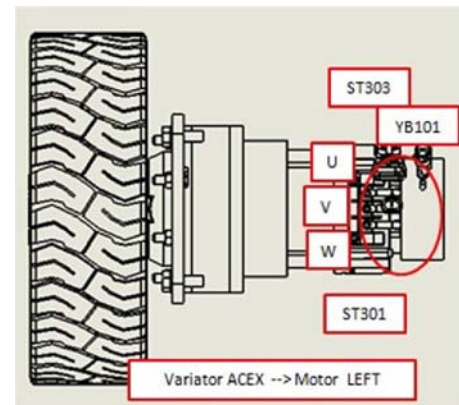
- Once the machine is stable on the blocks, from the lower controls, raise the machine from lower controls and place on the safety support
- After placing the machine in this configuration, switch off the machine, then disconnect the battery.
- In order to gain access to the wiring of the motors, unbolt 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.

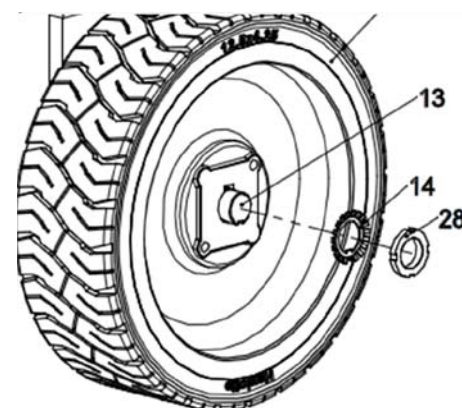


5 - Reinstall

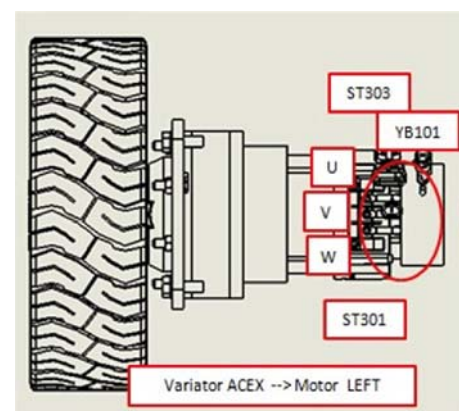
- Lift the motor into place, and refit the 4 bolts by hand.
- Tighten the 4 bolts in X pattern with the top bolts in X pattern, with a top bolt first. Tension the bolts to 67 Nm.



- 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.

Removal / replacement of steering pivot assembly

MS0090

1 - You will need

- Standard tool kit
- Protective goggles
- Gloves
- Overhead crane or equivalent, 1 T / 1,205 lb capacity minimum
- Torque wrench for 10 Nm , 80 Nm and 250 Nm
- Grease gun



- Place barriers around the perimeter of the work area

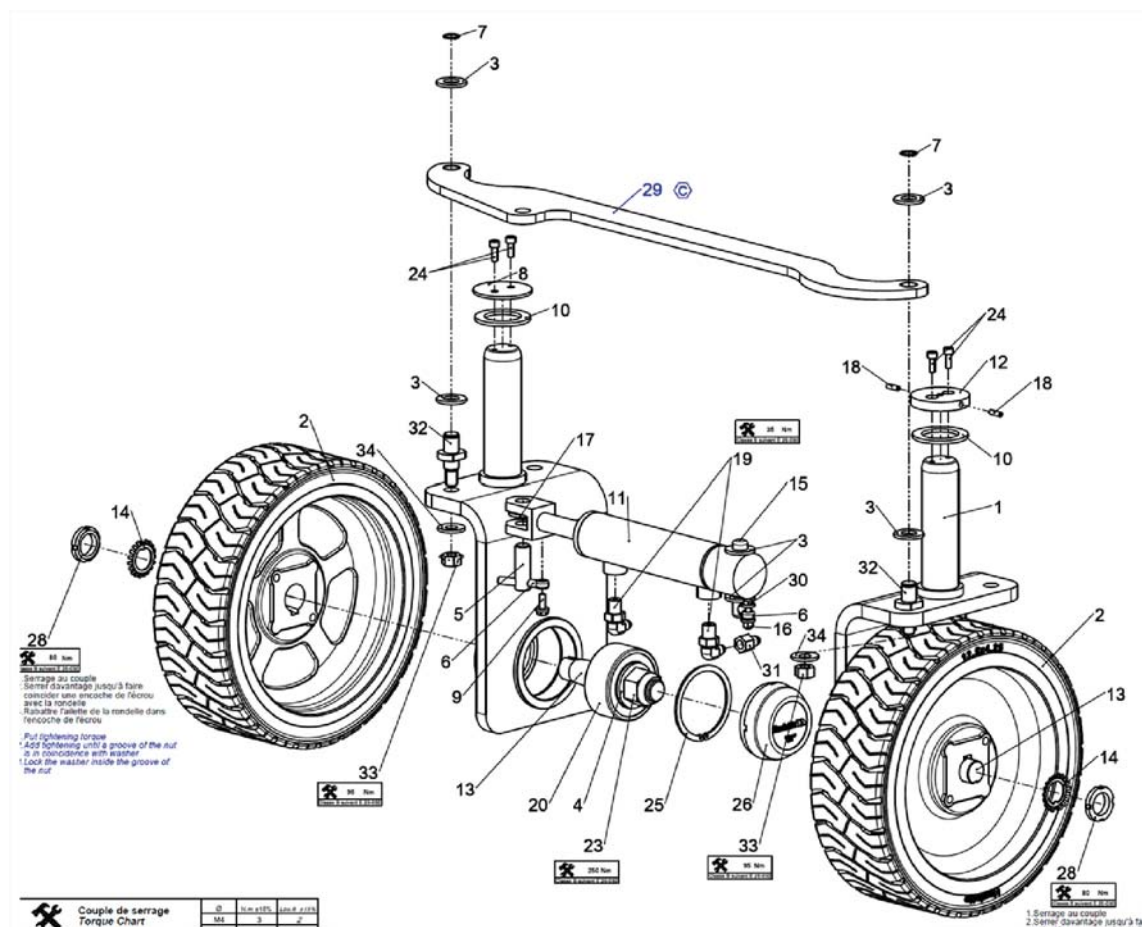


1

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

2 - Plan of the assembly

Plan of the assembly



3 - Removal

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

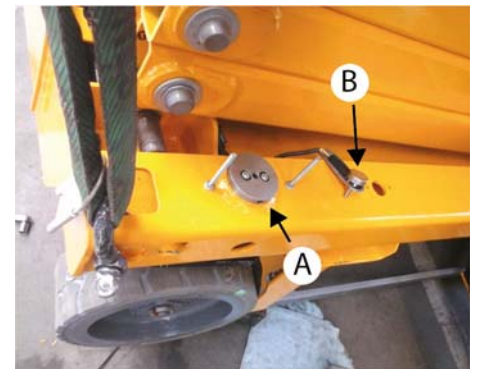
N.B.-:-IF THE WHEEL IS GOING TO BE REMOVED, THE NUT MUST BE LOOSENED BEFORE THE MACHINE IS LIFTED OFF THE GROUND, IF NOT IT IS DIFFICULT TO HOLD THE WHEEL.

- 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).

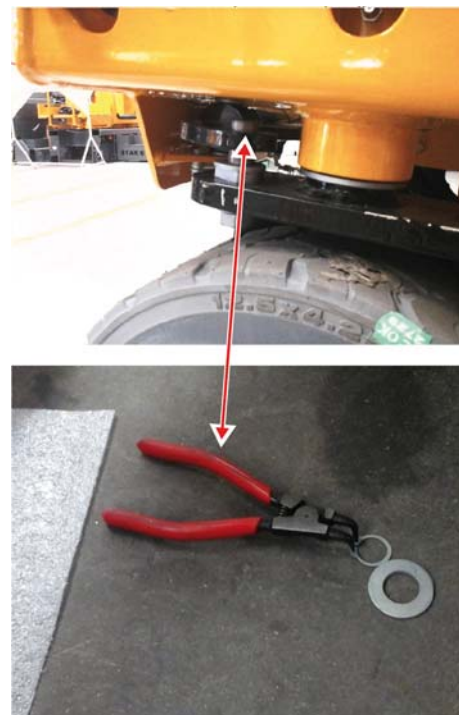


Removal / replacement of steering pivot assembly

MS0090

Removing the steering bar from the pivot :

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

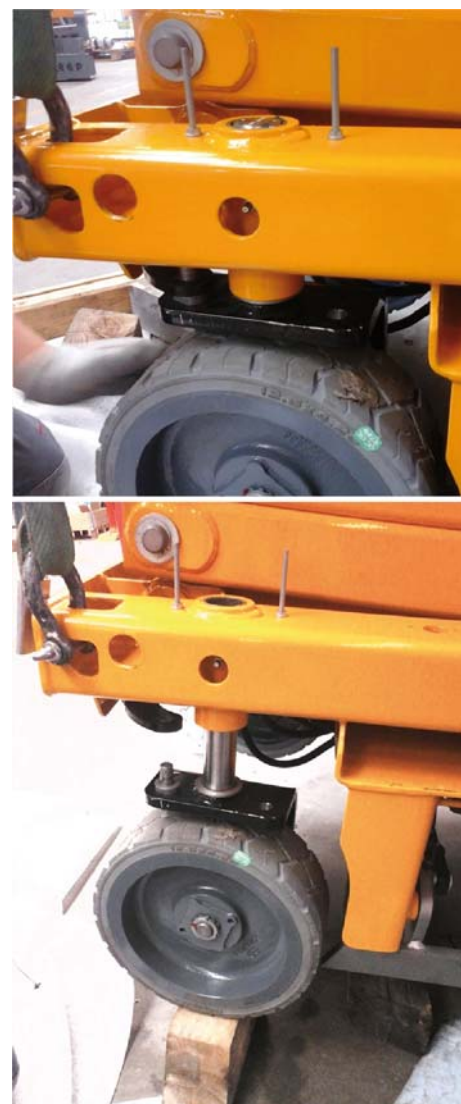


Removal / replacement of steering pivot assembly

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.

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- Overhead crane or equivalent, 1 T / 2,205 lbs capacity minimum
- 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.

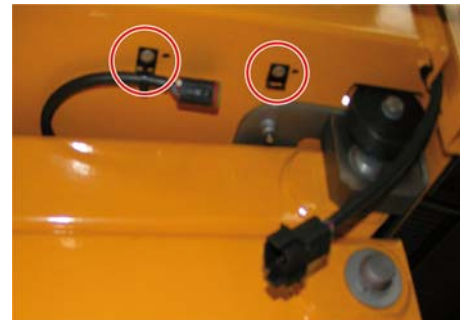
All the precautions must be done in work before intervening on and near the machine.

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

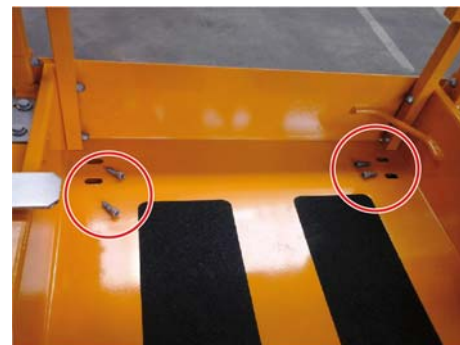
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site).
- Position the machine on a flat and firm surface, clear of obstructions (beware 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 minimum Slings are passed through the interior of the platform.
3	2 x sling 2 m / 6 ft 7 in, 500 kg / 1,103 lb minimum Slings are passed through the exterior of the platform.

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

[illegible]

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- Torque wrench for 21 Nm
- 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.

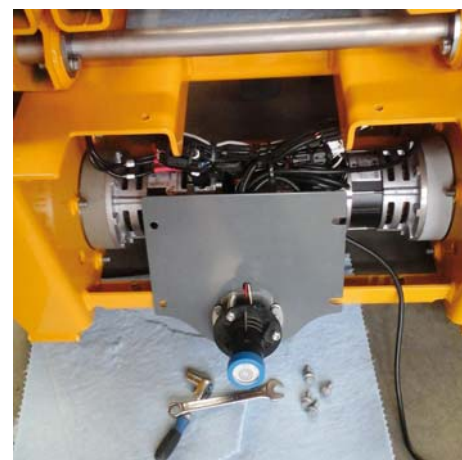
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site).
- Position the machine on a flat and firm surface, clear of obstructions (beware 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 be 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.



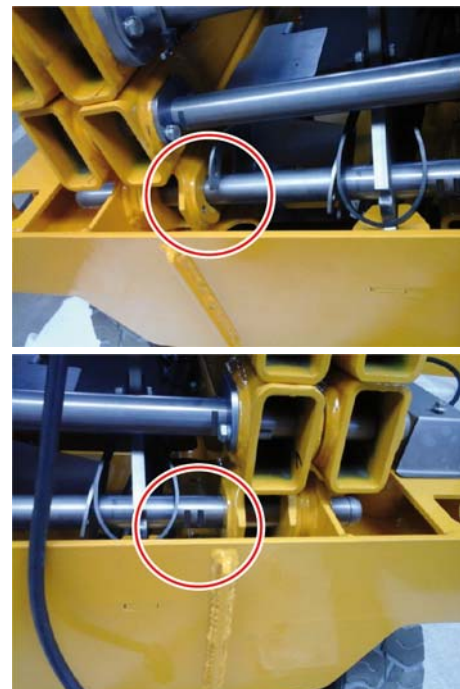
- Remove the angle sensor assembly : Loosen the 2 screws on the chassis, slide the support towards the centre of the chassis and carefully remove the assembly.
- Be careful to not twist or force the arms on the sensors as this will damage the sensors.



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 pin 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).

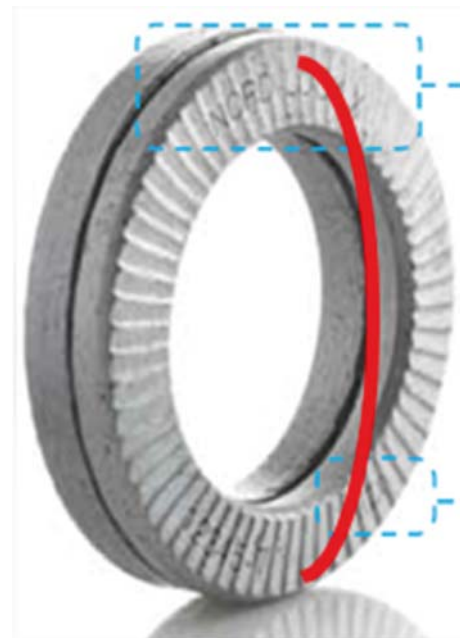


- Fix the actuator plate and keeper plate to the machine.
- Do not yet tighten !

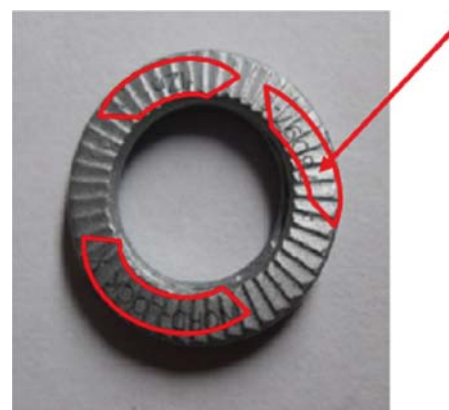
N.B.: -USE NEW BOLTS AND NORDLOCK WASHERS. FOR THE INSTALLATION OF THE WASHERS SEE BELOW.



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



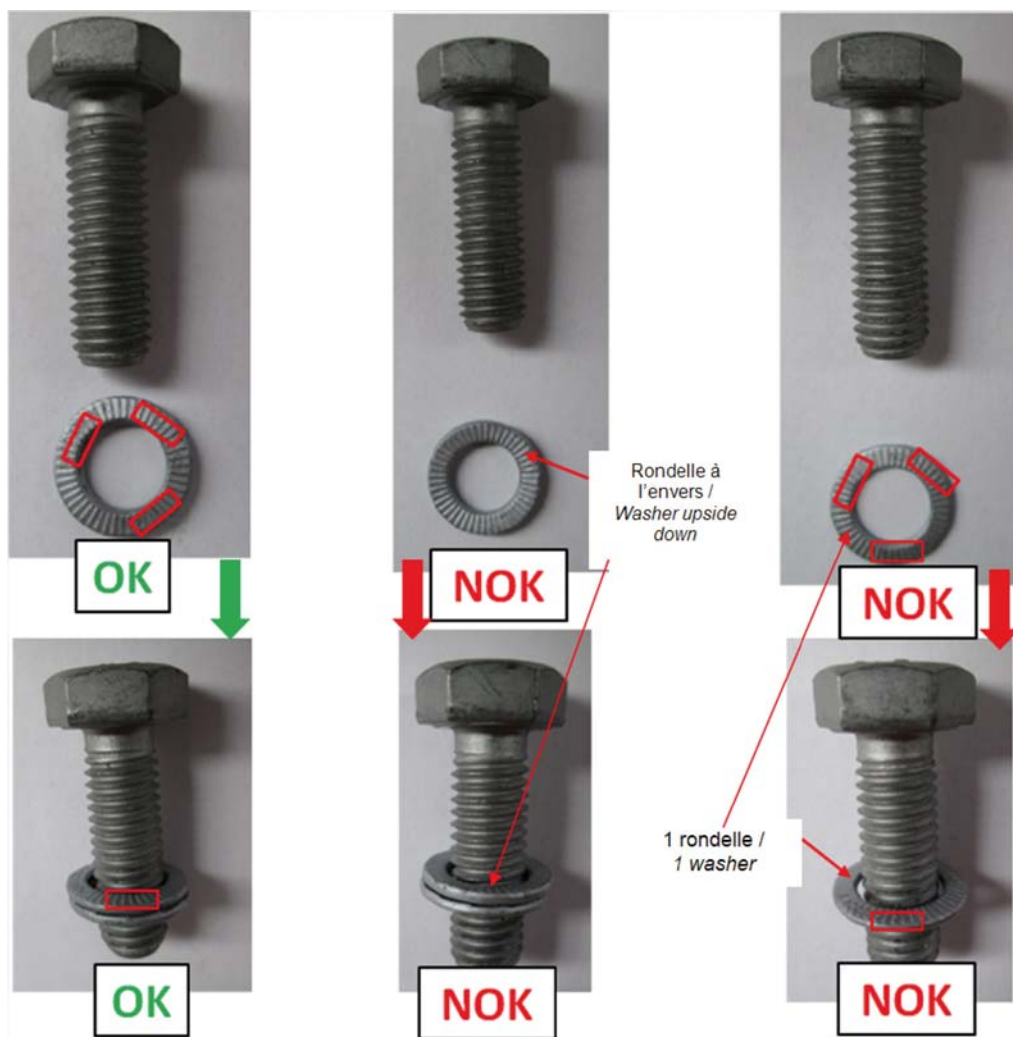
- The Side of the washer that goes towards the bolt head has markings on it.



Installation order of the NORDLOCK washer :

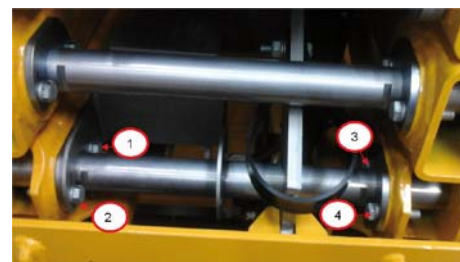
- Bolt head
- Side with markings
- Convex side





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

[illegible]

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.

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.

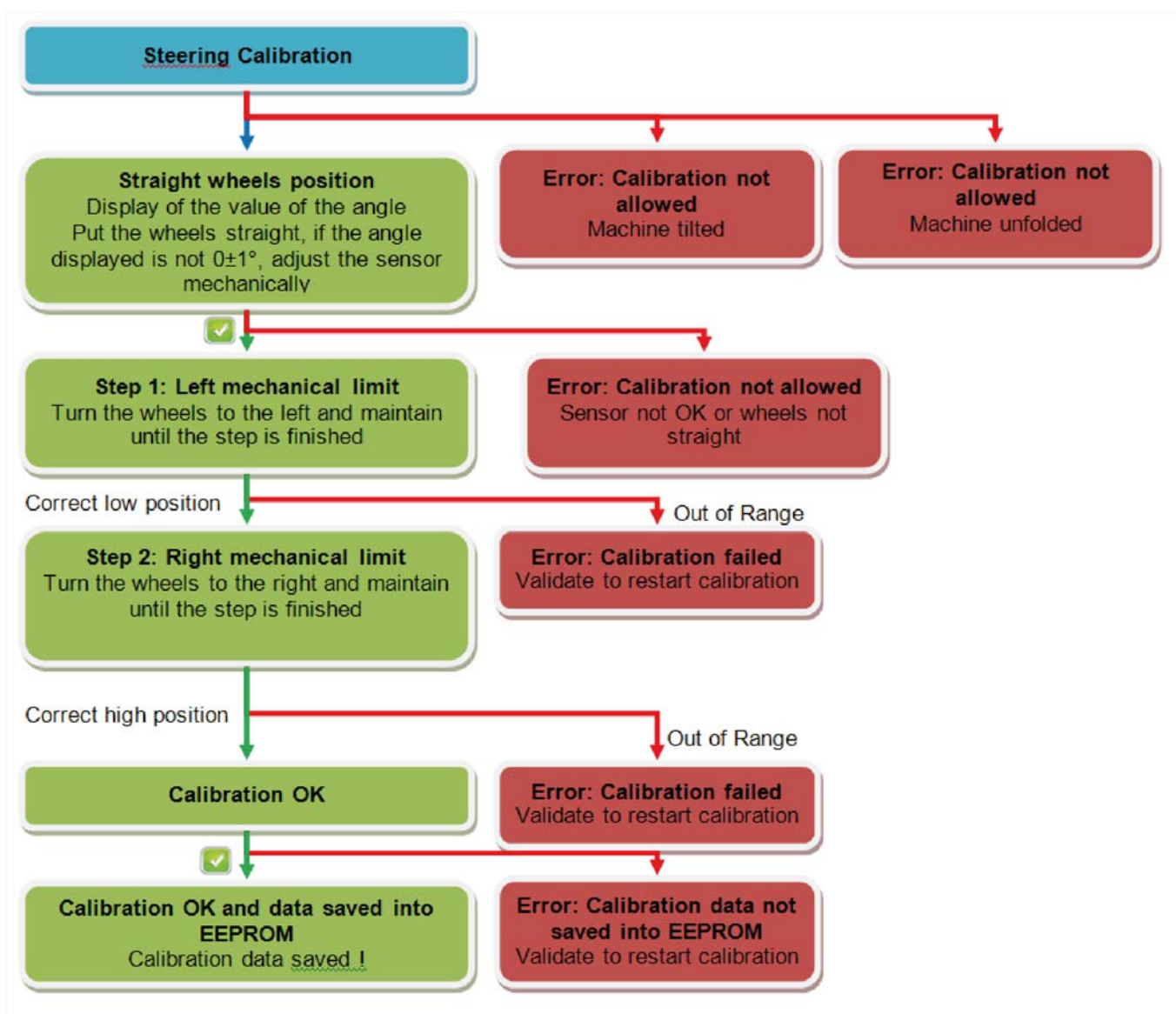
It is important that the person performing the work on the machine knows all the relative safety information contained in the instruction manual.



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

4 - Steering calibration procedure

In the ACTIV'Screen (or using Haulotte Diag) 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 °



Notes

[illegible]

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- Weight 250 kg / 550 lb



- Place barriers around the perimeter of the work area



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2 - Preliminary operation

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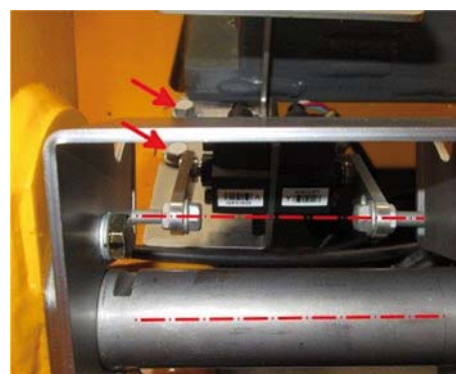
4 - Load management calibration Procedure

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

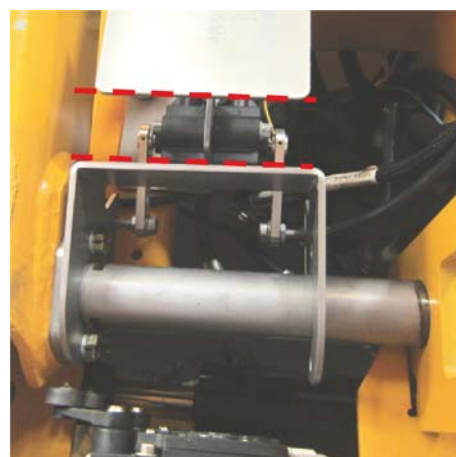
- The sensors are mounted parallel with the front edge of the support for the sensors.



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



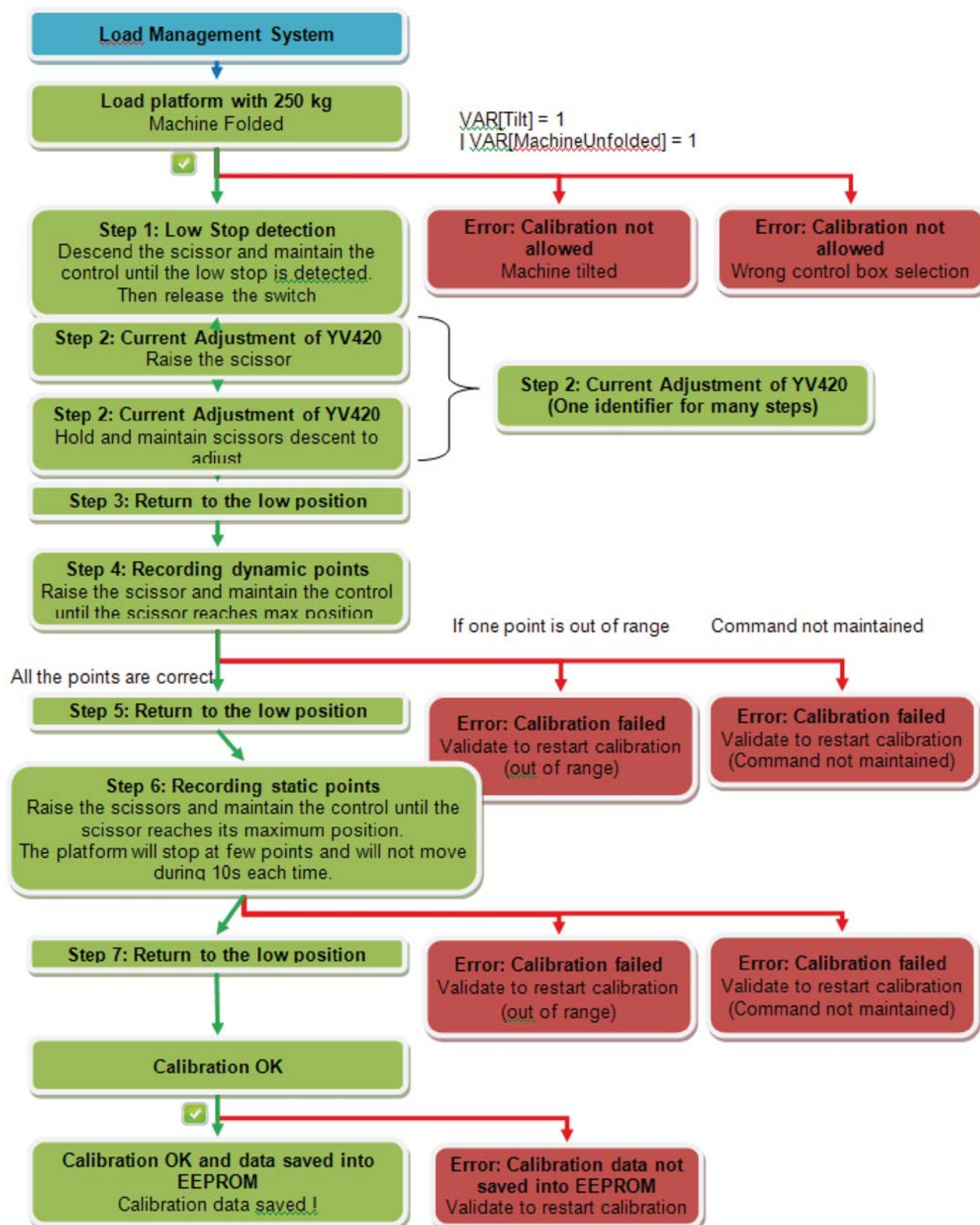
- The sensors support is parallel with the pin and with the sensors.



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 Haulotte Diag) 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

[illegible]

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- 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

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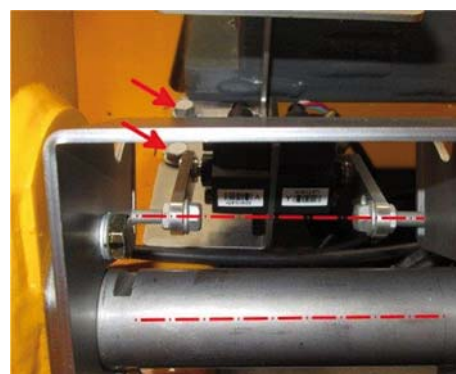
4 - Procedure of load management system calibration

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

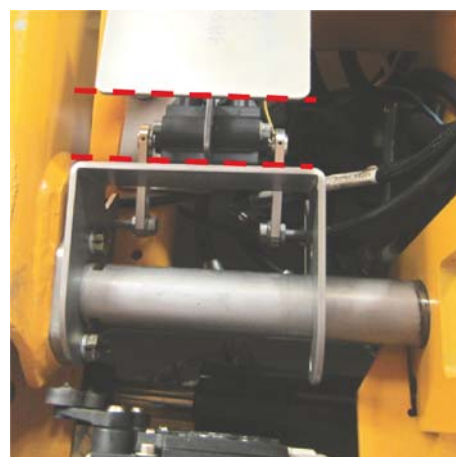
- The sensors are mounted parallel with the front edge of the support for the sensors.



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



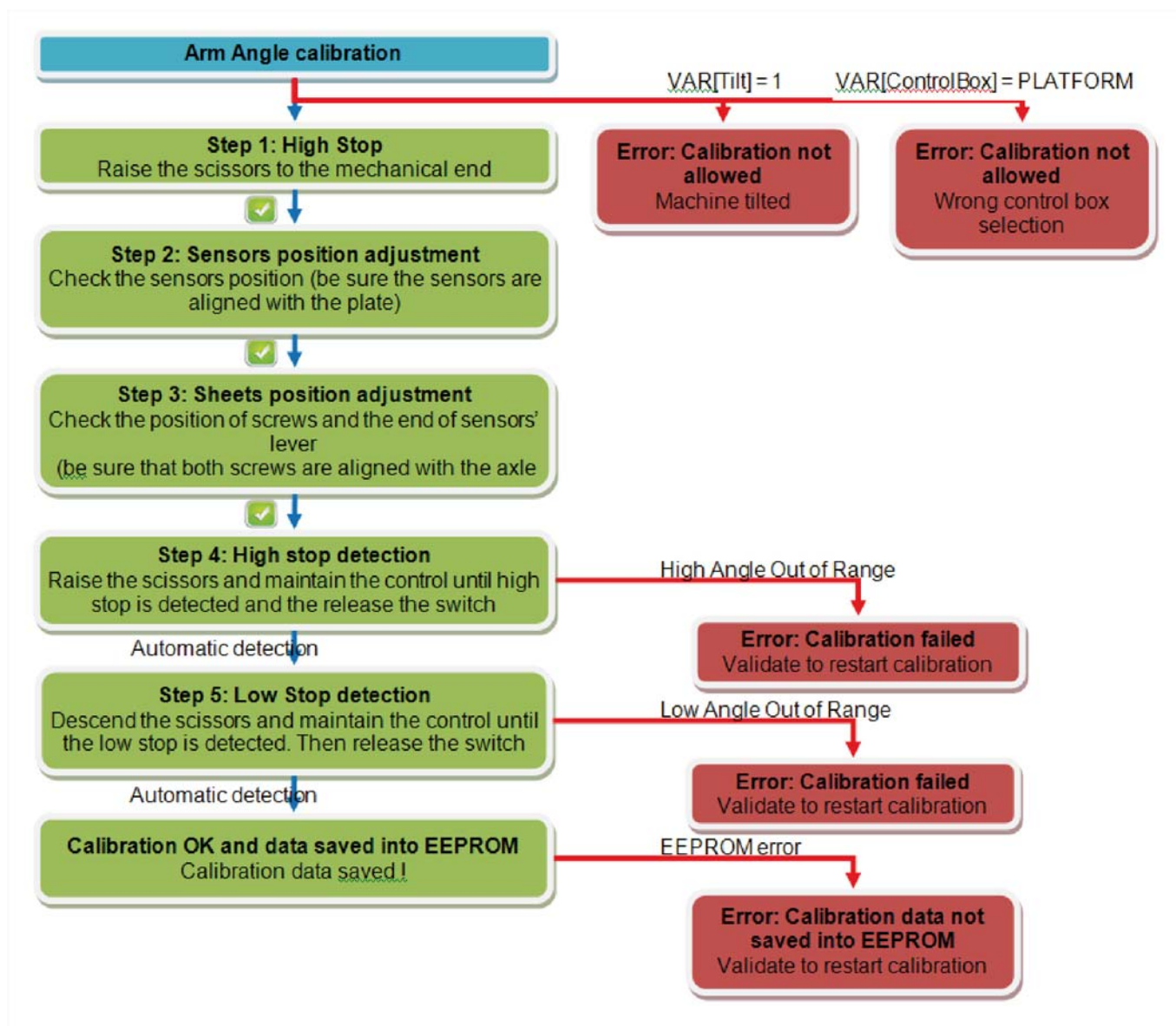
- The sensors support is parallel with the pin and with the sensors.



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 Haulotte Diag) 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 ambient 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 - Steering front right valve
		YV150L - Steering front left 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

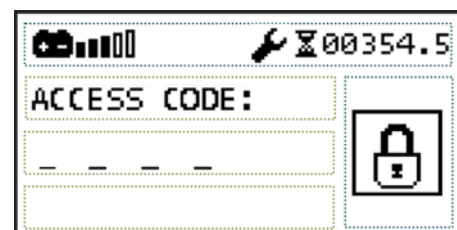
3.1.1 - Screen 0d

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 :

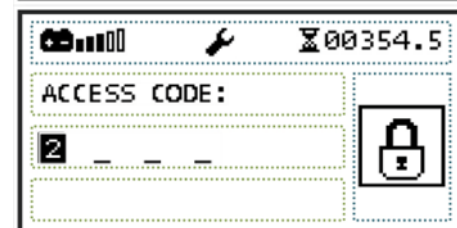
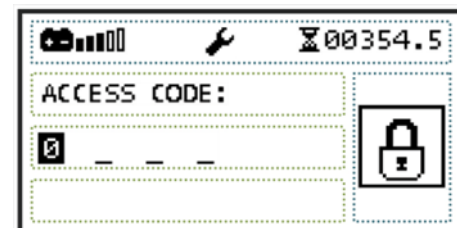
- Level 1 : 1250 User code
- Level 2 : 2031
- Level 3 : "Turning" code. Based on the date and the machine serial number.

Screen_Acces_code Username :

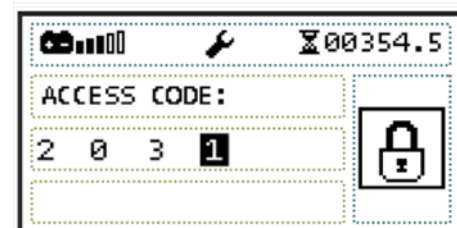
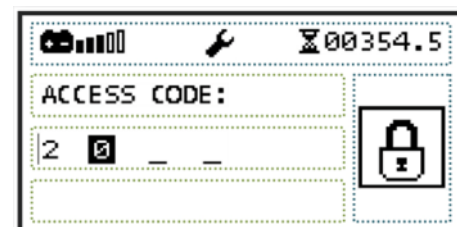
- Press the validation button (4).



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

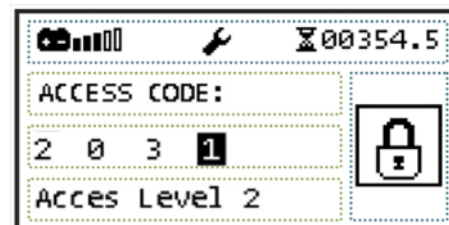


- Press the (4) validation button in order to pass to the next digit.
- The return/cancel key returns to the previous digit, without erasing, or to the previous menu if the first digit is selected.



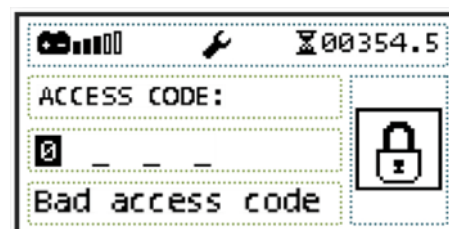
Screen_Acces_level_x Username :

- 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

[illegible]

1 - You will need



- The tracker with its cable.
- A clamp to strip the wires.
- A clamp to crimp the wires.



1



- Place barriers around the perimeter of the work area

2 - Procedure

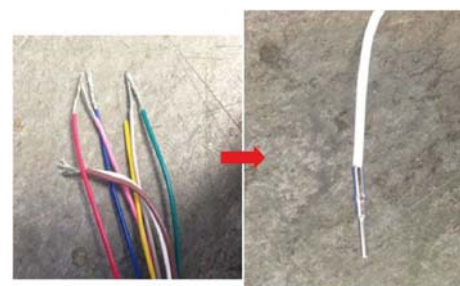
Step 1 :

- 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.



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. • 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

[illegible]

1 - You will need

- Standard tool kit
 - Protective goggles
 - Gloves
 - EPI (Personal protective equipment)
- Kit 4000502080 which contains :
- Plate : 4000468460 - Quantity : 1.
 - Lever : 4000468340 - Quantity : 1.
 - Spring : 2421808300 - Quantity : 1.
 - Pin : 24000468450 - Quantity : 1.
 - Pad : 4000474370 - Quantity : 1.
 - Pad plate : 4000307760 - Quantity : 1.
 - Roller : 196D160350 - Quantity : 2.
 - Roller guide : 96D160360 - Quantity : 2.
 - Rivet : 2421809000 - Quantity : 2.
 - Screw : 2308231220 - Quantity : 1.
 - Screw : 2700101600 - Quantity : 2.
 - Screw : 2331231590 - Quantity : 2.
 - Washer : 2351112030 - Quantity : 1.
 - Washer : 2351112090 - Quantity : 2.
 - Nut : 2700200450 - Quantity : 2.
 - 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.

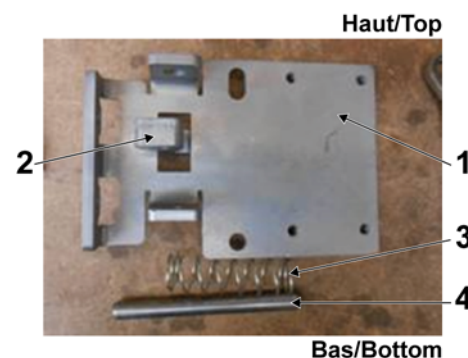
After completion of work, all the covers and safety devices must be positioned back completely and operational.

- 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.

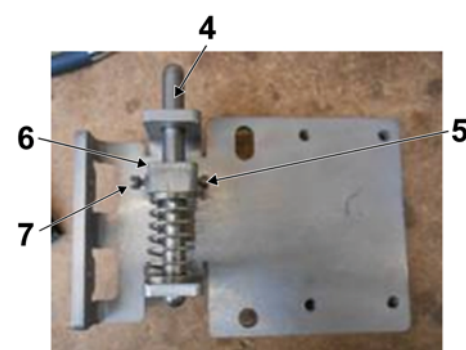
MS0174

4 - Procedure

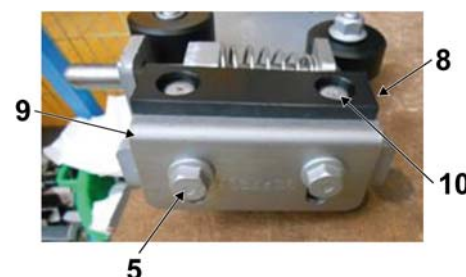
- Take the plate (1) : 4000468460 and insert the lever (2) : 4000468340.
- Install the compressed spring (3) : 2421808300 between the lever and the plate.



- 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.



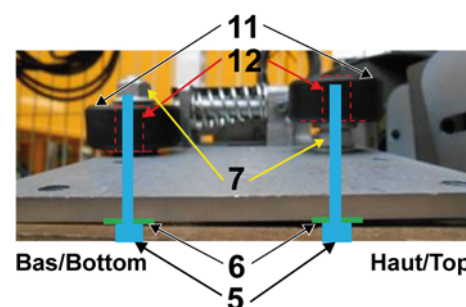
- Fix the pad (8) : 4000474370 to the pad plate (9) : 4000307760 with two rivets (10) 2421809000.
- Fix the ensemble to the plate (1) : 4000468460 with 2 screw (5) 2700101600; do not yet tighten.



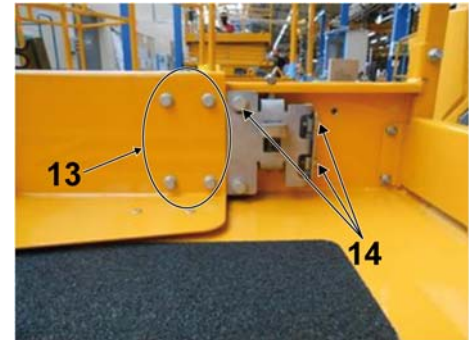
- Install the two rollers (11) : 196D160350 with two roller guides (12) : 196D160360 to the plate (1) : 4000468460.
- Use two screw (5) : 2331231590, two washers (6) : 2351112090, and two nuts (7) : 2700200450.



- 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.

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- EPI (Personal protective equipment)
- Assorted hydraulic plugs and caps (JIC fitting)



- Place barriers around the perimeter of the work area



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2 - Level of knowledge required



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- 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.
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- 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 (12 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.



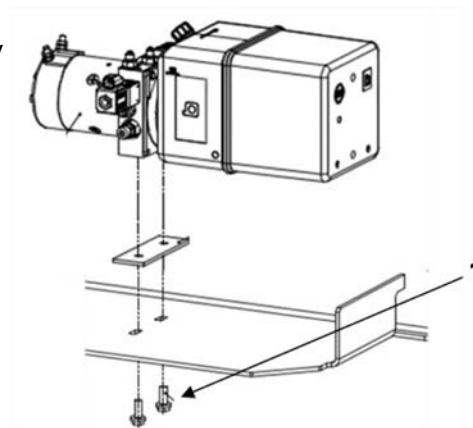
- Mark the electrical cables on the motor to identify them, and then you can disconnect them.



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
- Protective goggles
- Gloves
- EPI (Personal protective equipment)
- Oils recovery system
- Absorbent for any oil spills
- Hydraulic filter : 2505000970 - Quantity : 1.



- Place barriers around the perimeter of the work area



1

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2 - Level of knowledge required



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- 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.

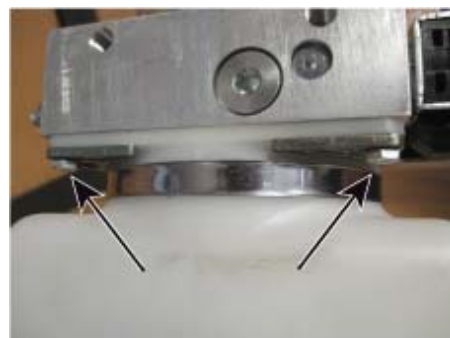
4 - Removal

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.

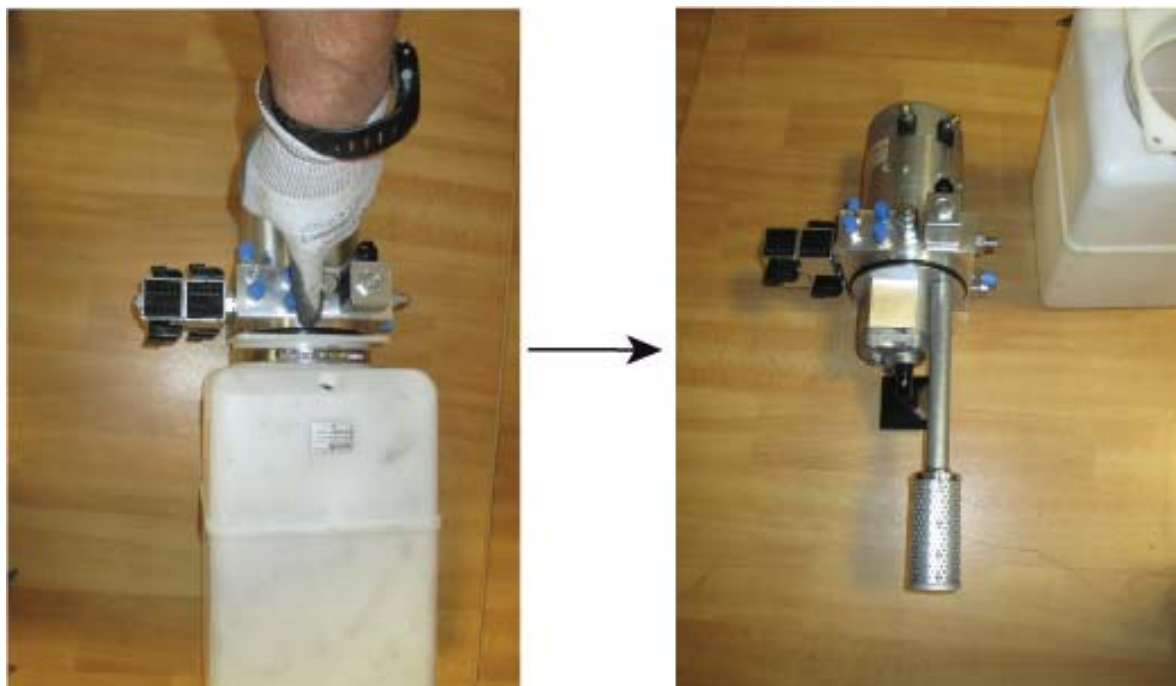


- Use a large screwdriver (or flat blade) to carefully separate the block from the tank.

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

[illegible]

1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- EPI (Personal protective equipment)
- Tension wrench 2,66 Nm
- Shaft puller
- Press
- Kit protection : 4000595410 - Quantity : 1 per brake unit



- Place barriers around the perimeter of the work area



1

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2 - Level of knowledge required



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- 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 :

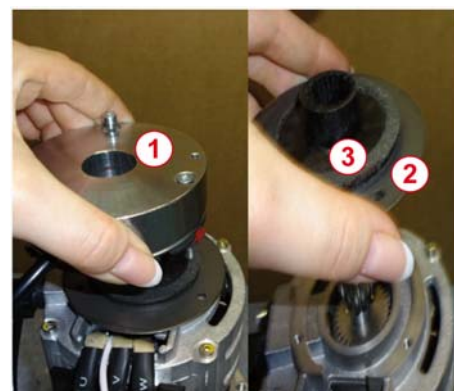
- Remove the plastic cover (A), and the rubber ring cover (B).



- 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.



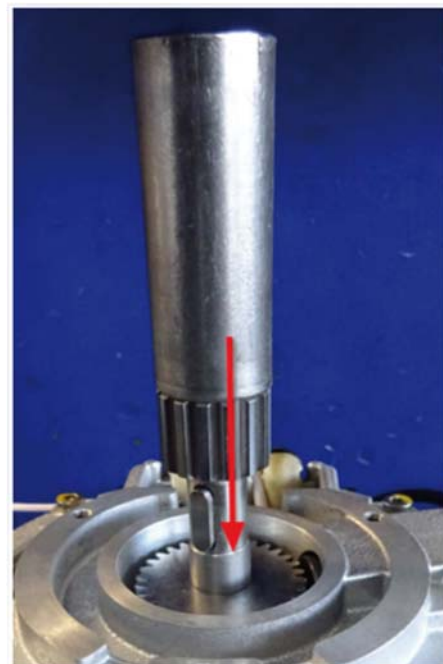
- Remove the gear from the shaft using a shaft puller.



5 - Reinstall

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

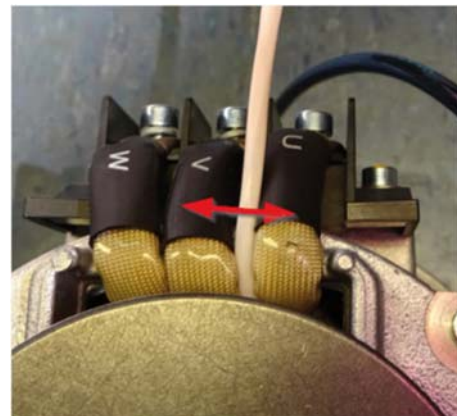
- Install the key in the shaft, and then use a press to install the gear onto the motor shaft.



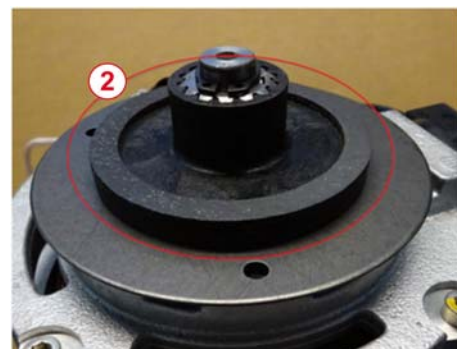
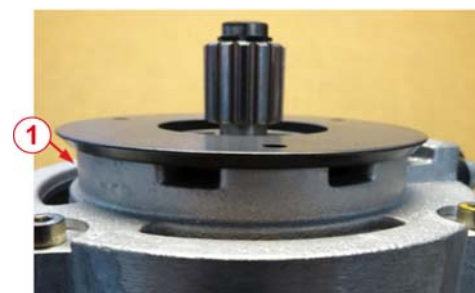
- Install the circlip onto the shaft.



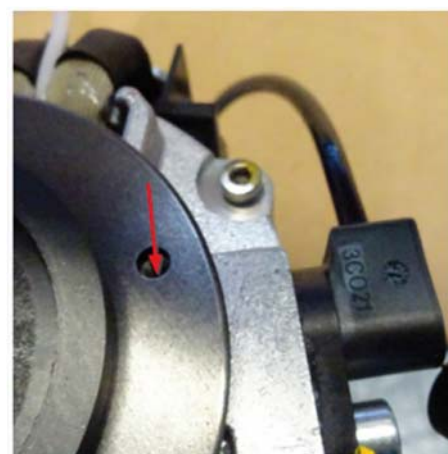
- Check that the wires are correctly positioned as shown below.



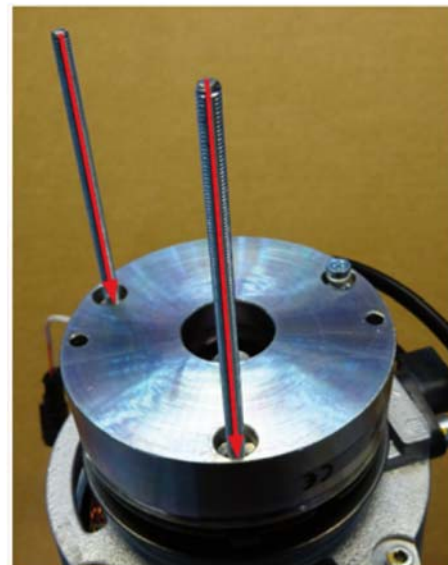
- Install the backing plate (1) and then install the rotor disk (2).



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



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

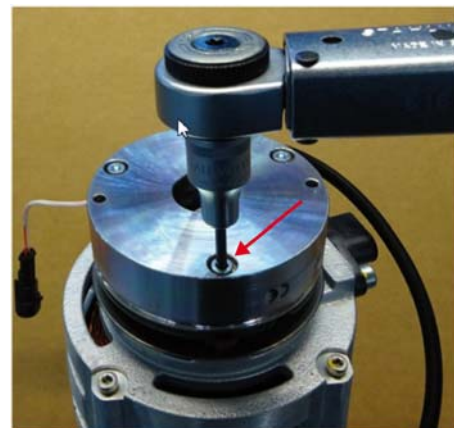


- Position the brake electromagnet onto the motor, and align it so the wiring is just next to the "U" wire as shown below.



MS0177

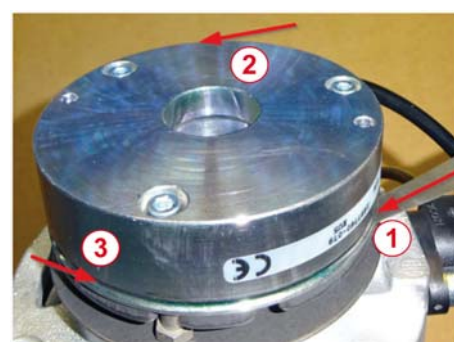
- Remove the threaded bars, and insert the bolts.
- Tension the bolts to 2,66 Nm +/-10% .



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

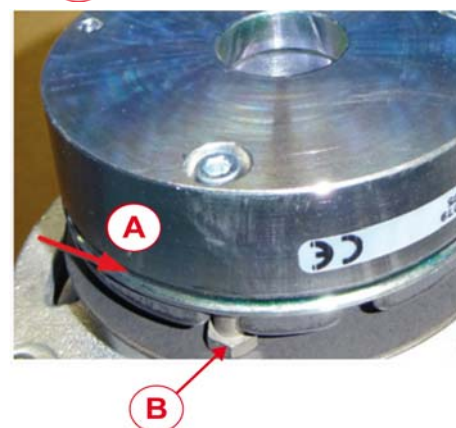
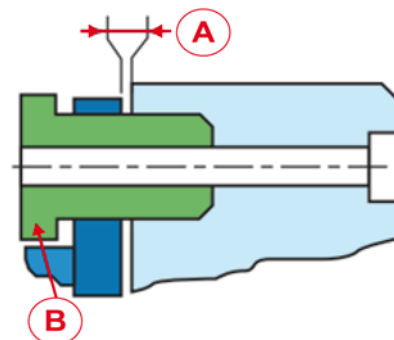


- Check the air gap at 3 points.
- The nominal clearance should be 0,2 mm (min 0,15 mm / max 0,3 mm).



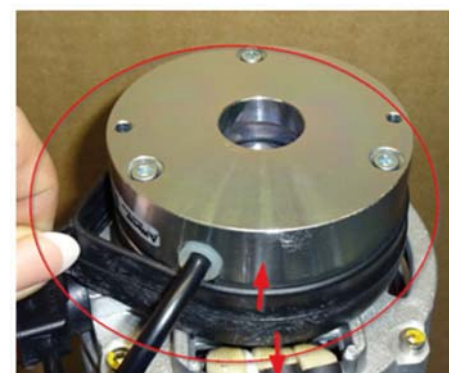
MS0177

- 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.

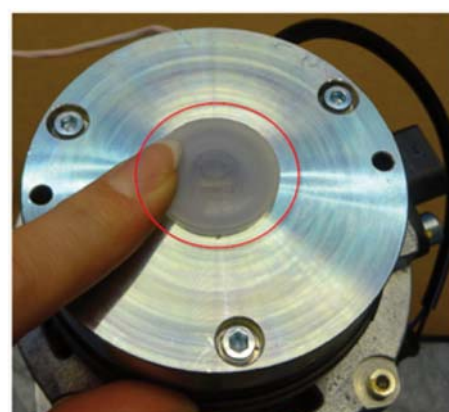


If using dust cover :

- 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.

1 - You will need

- Standard tool kit
- Protective goggles
- Gloves
- EPI (Personal protective equipment)
- Lifting device (floor crane or similar) 300 kg (661 lbs) capacity minimum
- Lifting slings, 300 kg (661 lbs) capacity minimum
- M16 eye bolts to attach to counterweight
- Tension wrench 2,66 Nm
- Tension wrench 190 Nm
- 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

4.1 - REMOVE THE COUNTERWEIGHT

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



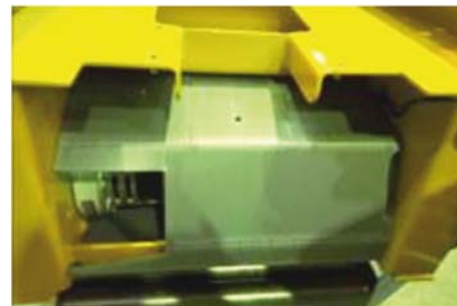
- Loosen and remove the counterweight fixing screw (2) on each side.



- Remove the counterweight then open the motor cover.
- **Counterweight is about 250 kg (551 lbs).**

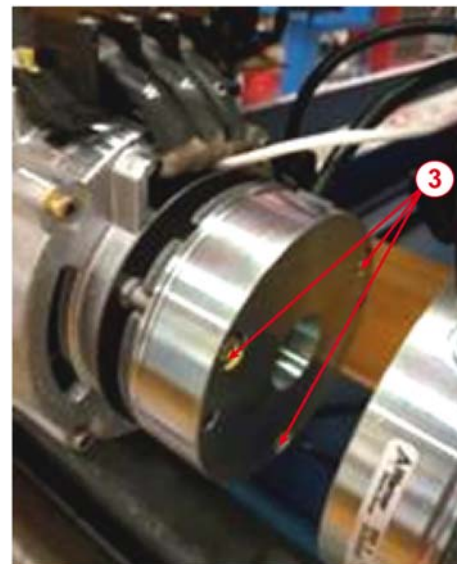


- Treating a stuck brake.



4.2 - TREATING A STUCK BRAKE

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



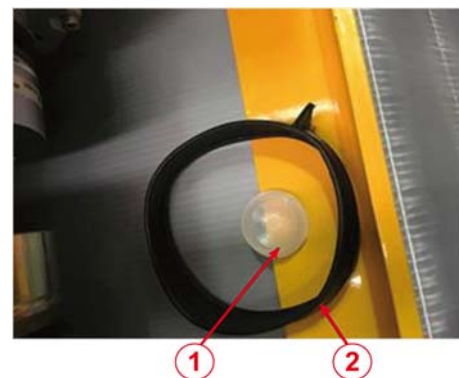
- Tap, very softly, the brake with a rubber hammer this will release the stuck brake.
- Re-tighten the three screws to a torque of 2,66 Nm, then mark the back of each motor.



5 - Reinstall

5.1 - INSTALLING THE PROTECTION KIT

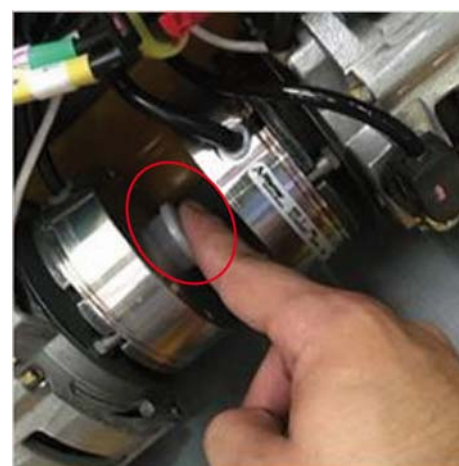
- Remove the plastic cover (A), and the rubber ring cover (B).



- 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

[illegible]

1 - You will need

- Standard tool kit
- Protective goggles
- Gloves
- EPI (Personal protective equipment)
- Thread lock light type Loctite 222 or LOXEAL 24-18
- Torque wrench for 6 Nm
- Torque wrench for 15 Nm
- Kit 4000303350 which contains :
 - Stud - Quantity : 8.
 - Paper gasket - Quantity : 2
 - Crown gear and 26 needle rollers - Quantity : 1.
 - Key DIN6885 - Quantity : 1
 - Cam disk - Quantity : 2
 - Eccentric bearing - Quantity : 1
 - Shim spacer - Quantity : 1
 - Inner dowel pins - Quantity : 8
 - Shim spacer for shaft - Quantity : 1
 - Ball bearing - Quantity : 1
 - Housing with axle shaft - Quantity : 1
 - Flat nut M8 - Quantity : 2
 - Plug - Quantity : 1
 - Fastening plate - Quantity : 1.
 - Spring washer - Quantity : 8
 - Nut M8 - Quantity : 8
 - 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



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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.

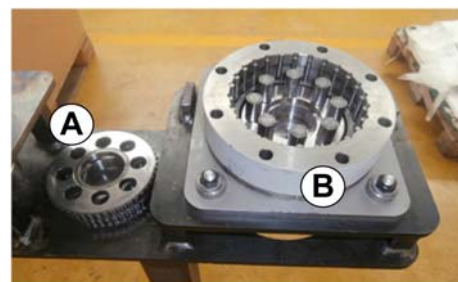
- The worker must make sure to have the EPI (Personal Protective Equipment) suited to the work and to the environment's specific conditions in which the equipment is located (see safety information specific to the work site).
- Position the machine on a flat and firm surface, clear of obstructions (beware 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

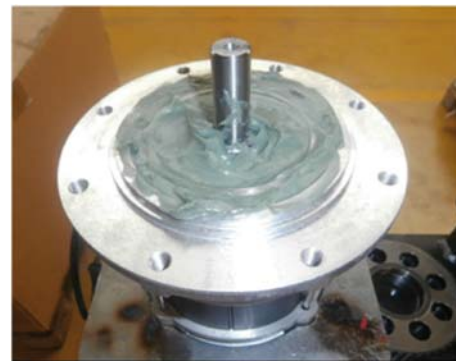
- Position the motor and reducer on a flat surface.



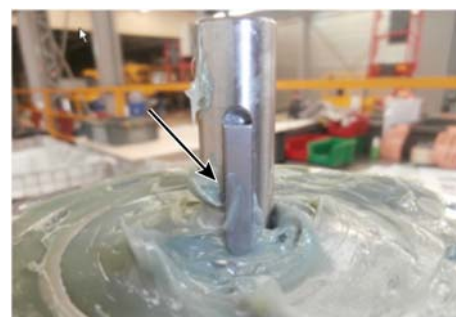
- Remove the protective cover, the discs and the washers (A) from the reducer (B).



- 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.



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



- Install the paper gasket.

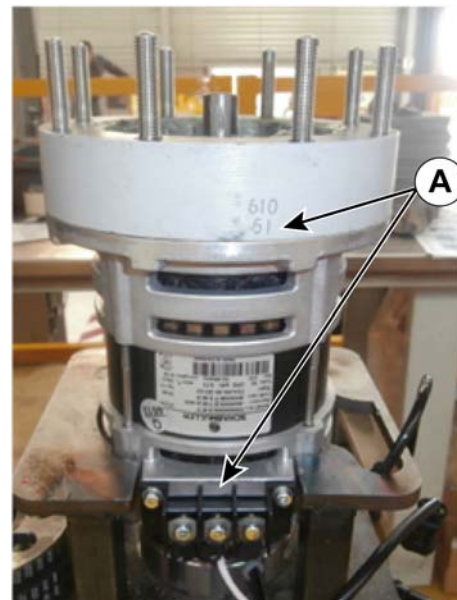


- If necessary, clean up all traces of thread lock before installing the paper gasket.

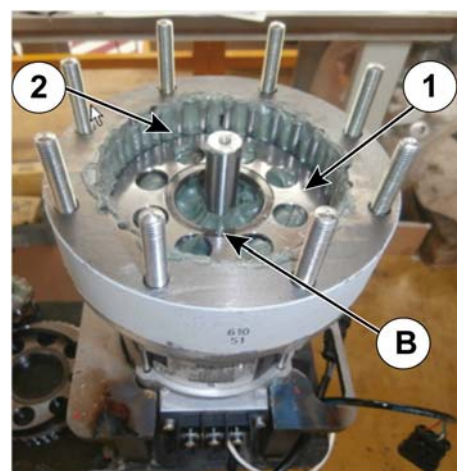


Assemble the crown gear with the 26 needle rollers :

- 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 positioned correctly in its cut-out.
- N°51 on the disk needs to line up with the N°51 on the housing as shown (B).



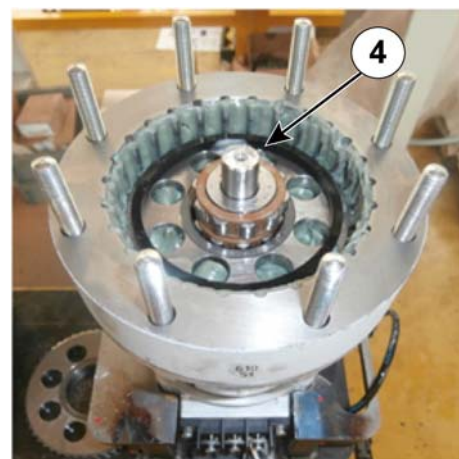
- Insert the bearing (3).



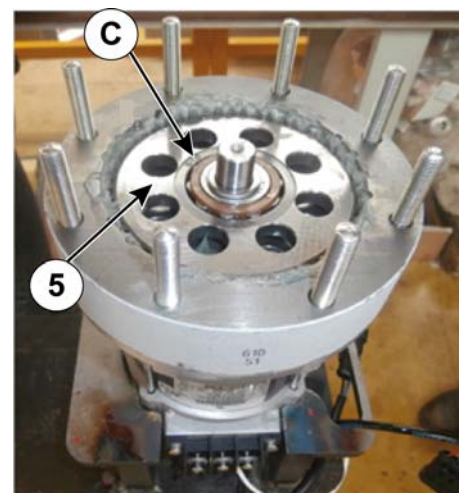
- The references on both, the disk and the bearing, need to be facing upward.



- 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.

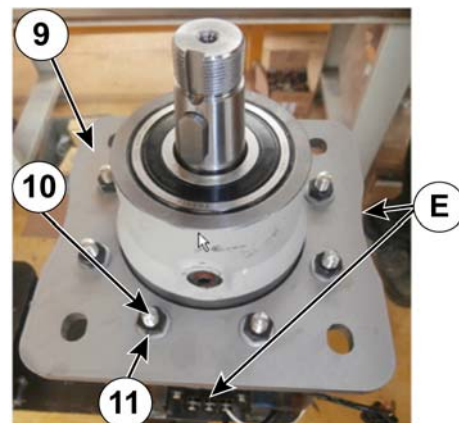


- Mark a red paint straight line on the stud, the nut and the main housing.

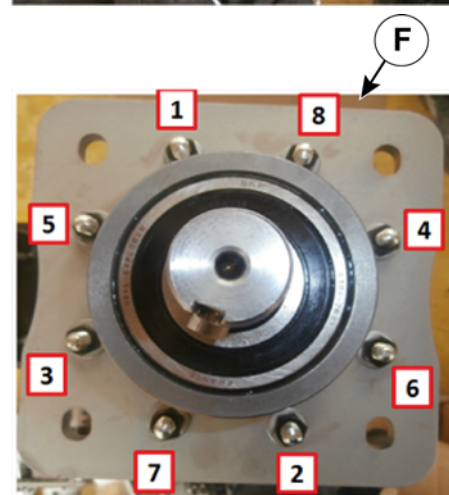


MS0179

- 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

[illegible]

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
- Personal protective equipment
- Standard tool kit
- 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

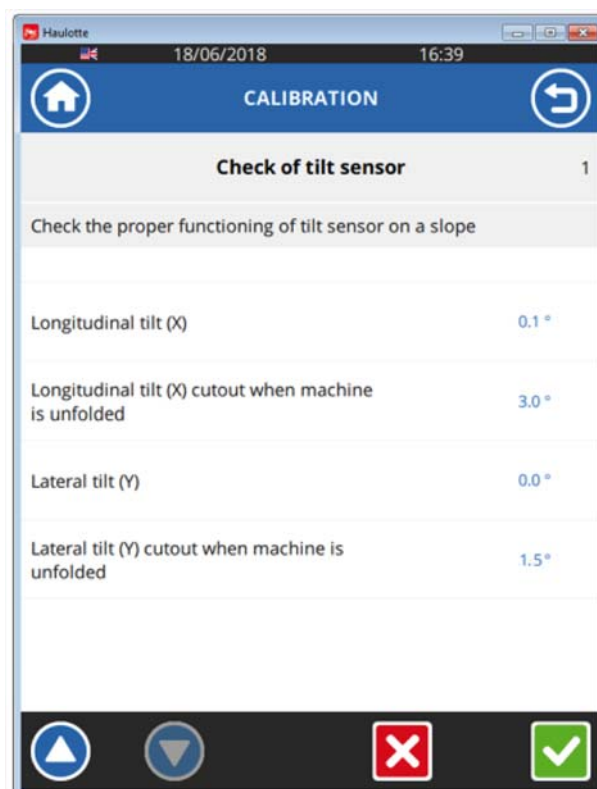


A x i s Y



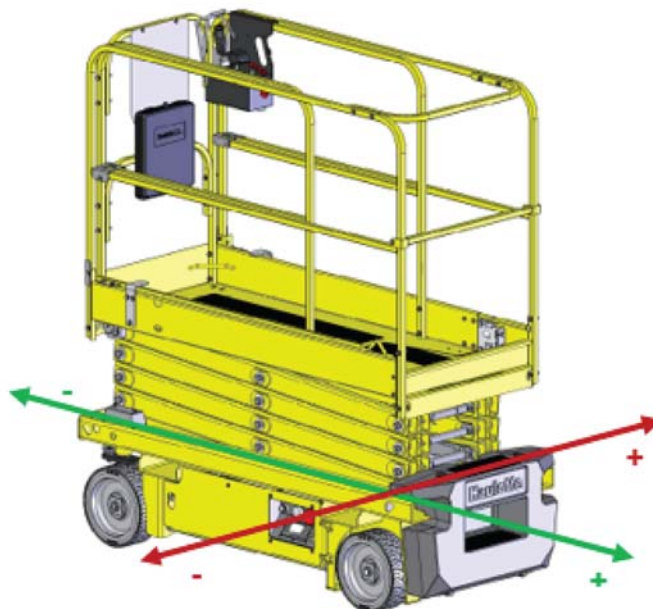
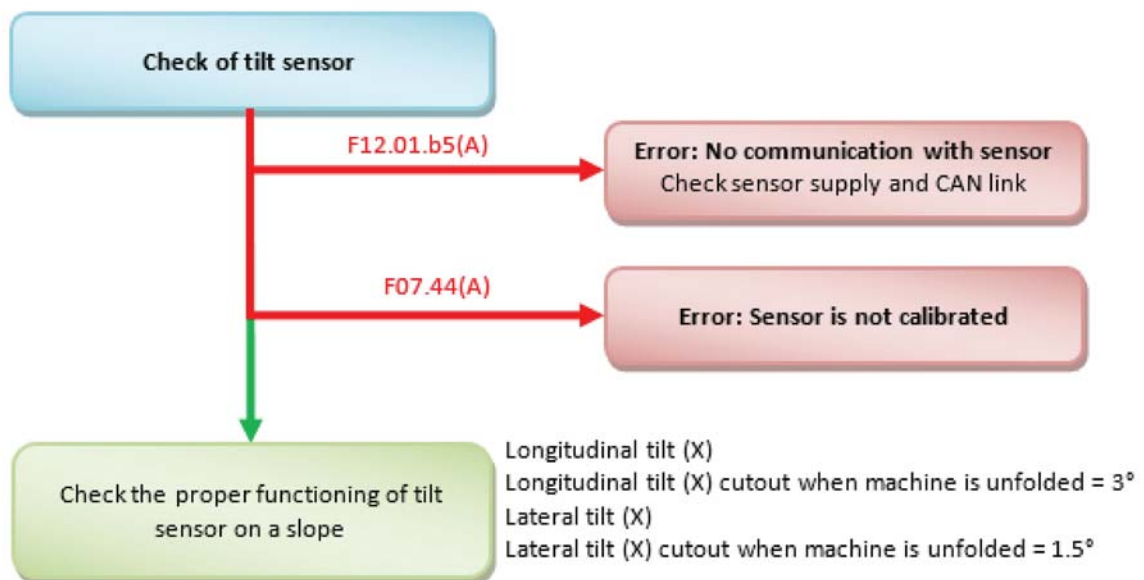
- Turn on ignition key and start up engine.
- Compare the tilt values X and Y of the machine with an electronic level to those displayed on the screen Activ' Screen.

- 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 $> 0,5^\circ$, carry out a new calibration (Refer to  MS0245 - Dismantling/Reassembling the Tilt Sensor).





Notes

[illegible]

1 - Warning



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- 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
- Personal protective equipment
- Standard tool kit
- 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.



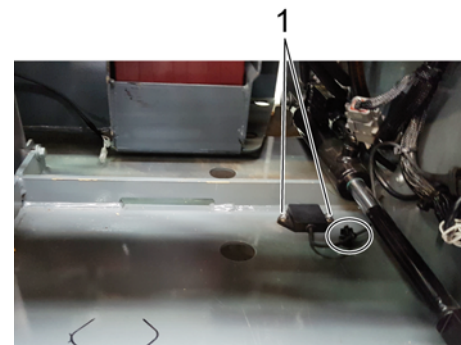
- Place a do not operate tag at the start/stop switch location to inform personnel that the equipment is being worked on.



Dismantling/Reassembling the Tilt Sensor

MS0245

- 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).

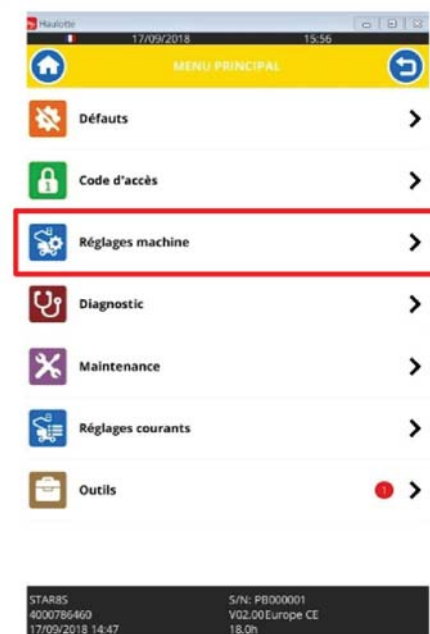
6 - Calibration



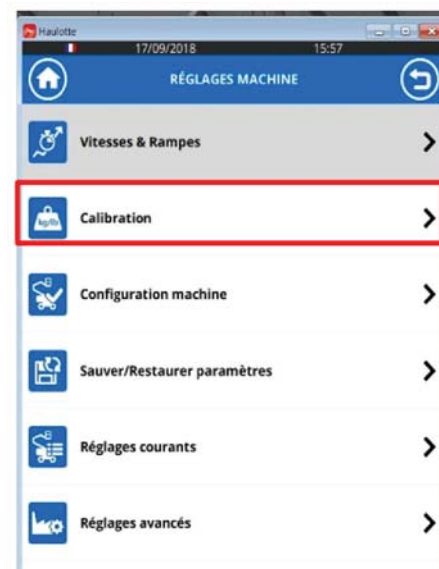
Tilt calibration must be performed on perfectly flat ground.

Using an electronic level, check the level of the chassis and calibration of the machine if necessary ($\pm 0.3^\circ$ for each axis).

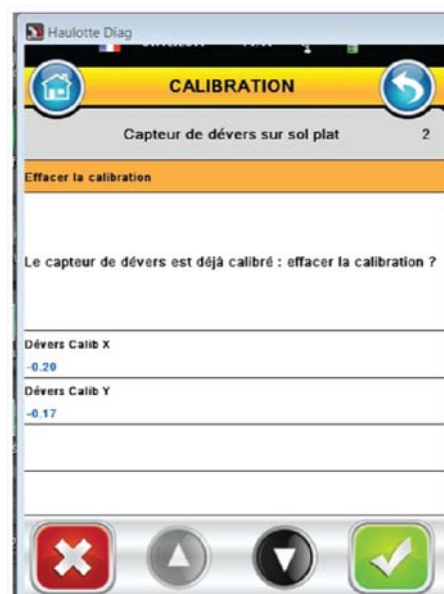
- On the Activ'Screen screen, enter the level 2 access code.
- Menu : Machine settings



- Menu : Calibration

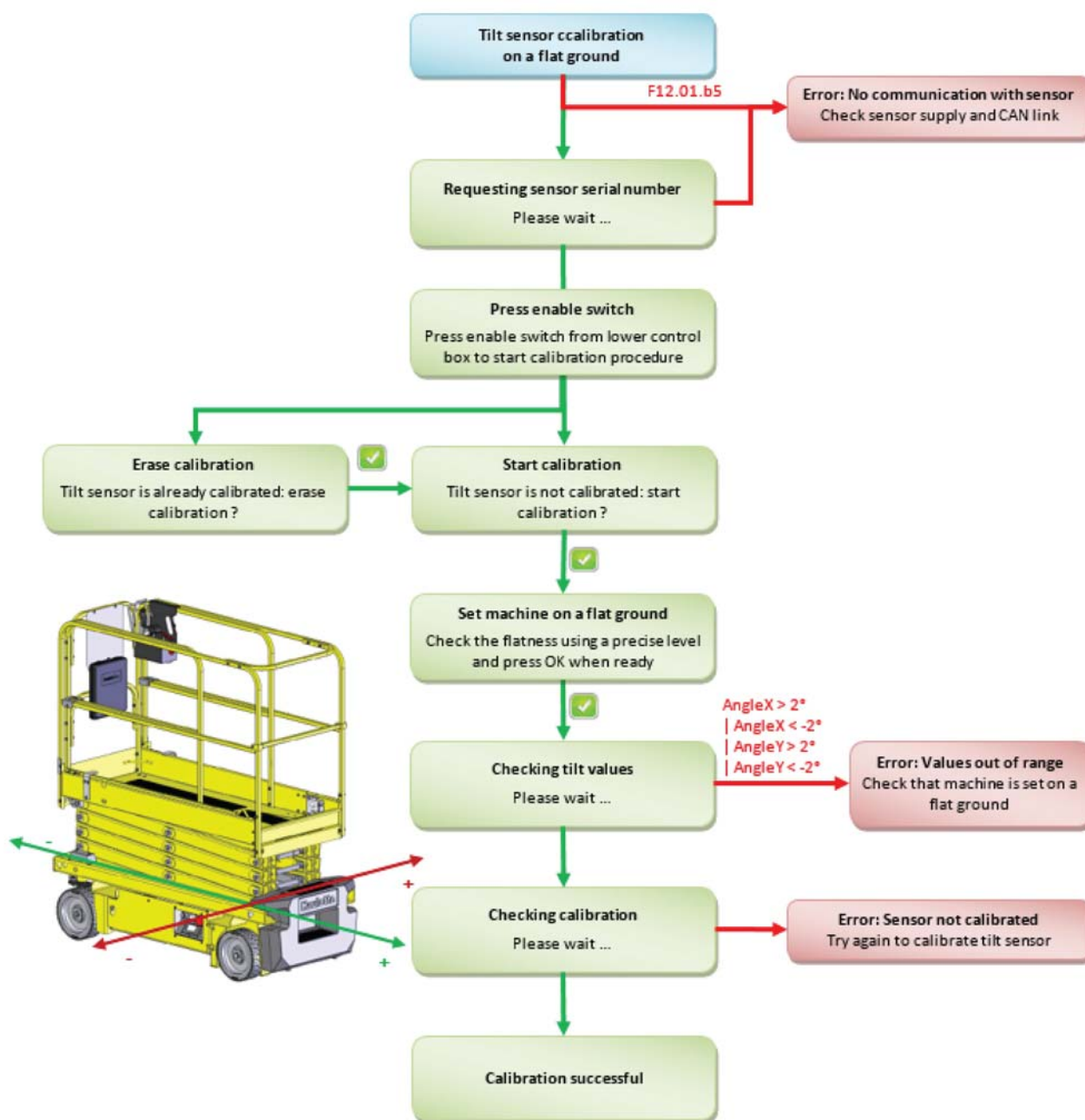


- Menu : Slope sensor on flat ground



Dismantling/Reassembling the Tilt Sensor

MS0245



	Lateral angle (sensor Y axis) : Lateral angle decreases in this direction : -Y : Lateral angle increases in this direction : +Y :
	Longitudinal angle (sensor X axis) : Longitudinal angle decreases in this direction : -X : 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) $\pm 0.3^\circ$.

The position of the electronic tilt :

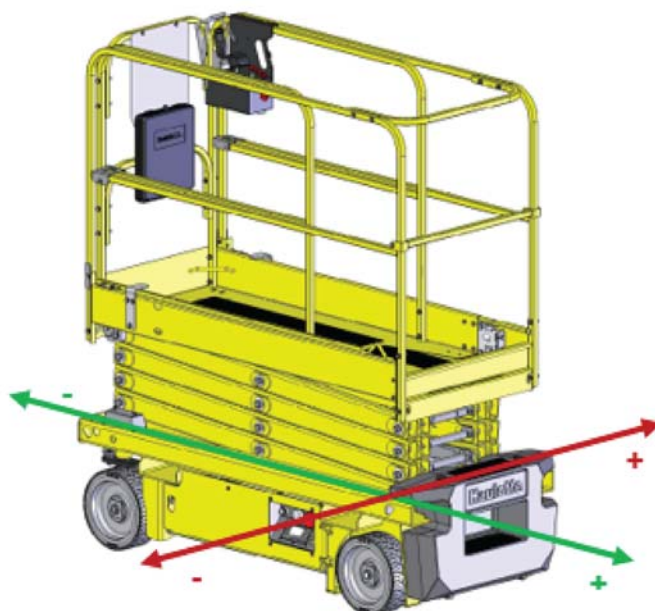
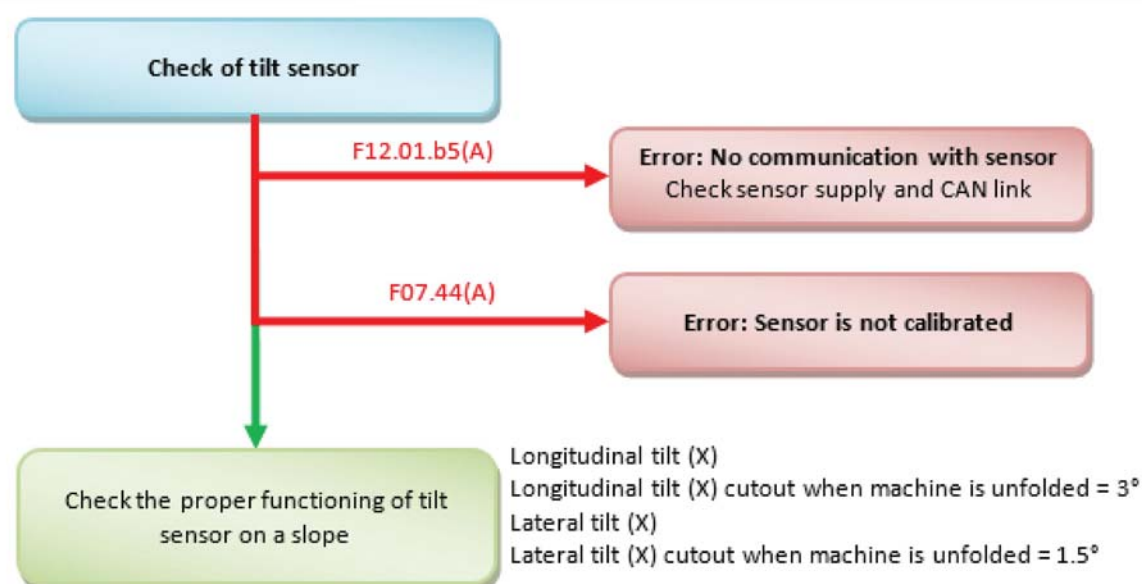
A x i s X

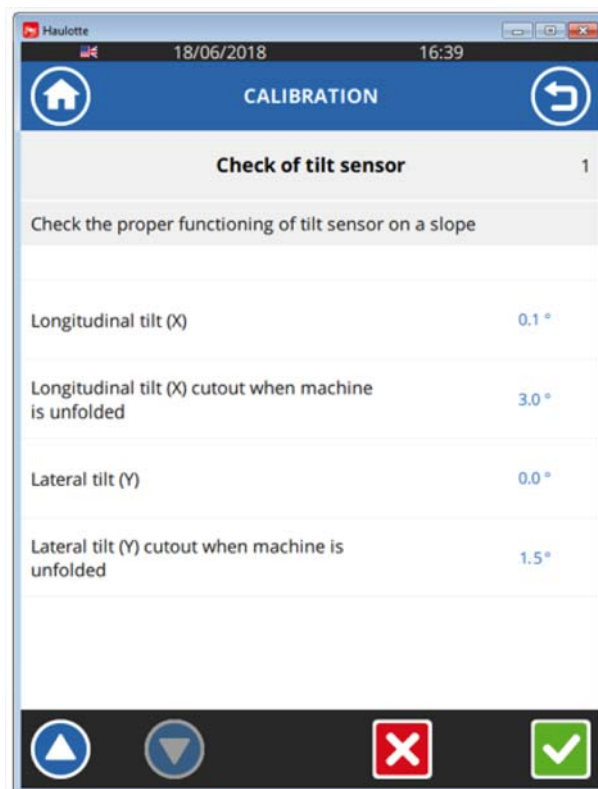


A x i s Y



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





1 - You will need



- Standard tool kit
- Protective goggles
- Gloves
- EPI (Personal protective equipment)
- Tension wrench 2,66 Nm
- Shaft puller
- Press
- 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



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- 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 :

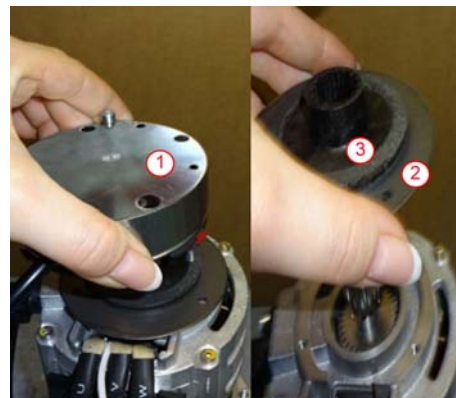
- Remove the rubber dust cover.



- Unscrew the 4 mounting screws progressively.



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



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

- Remove the circlip from the end of the shaft.



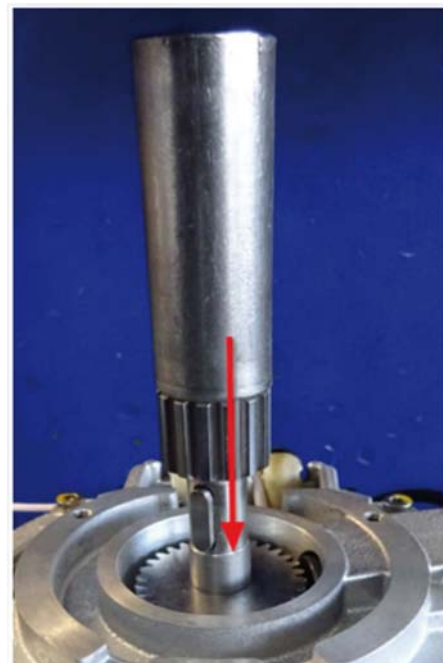
- Remove the gear from the shaft using a shaft puller.



5 - Reinstall

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

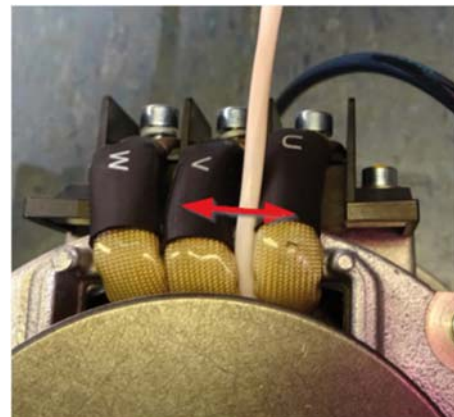
- Install the key in the shaft, and then use a press to install the gear onto the motor shaft.



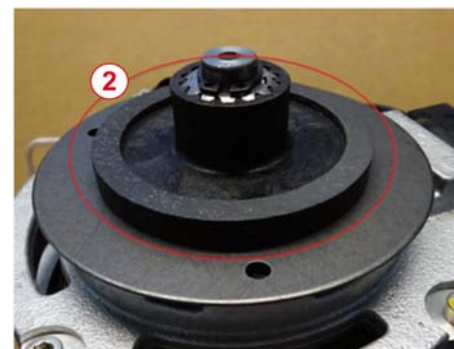
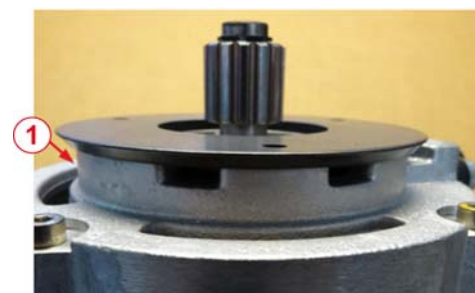
- Install the circlip onto the shaft.



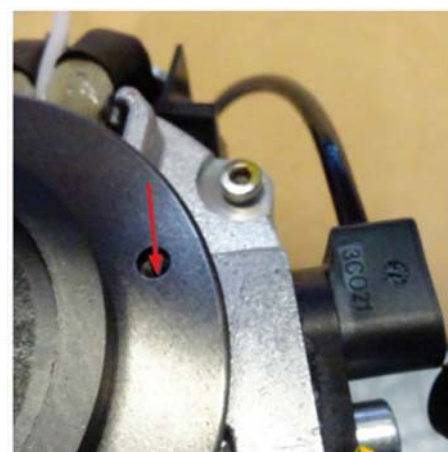
- Check that the wires are correctly positioned as shown below.



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



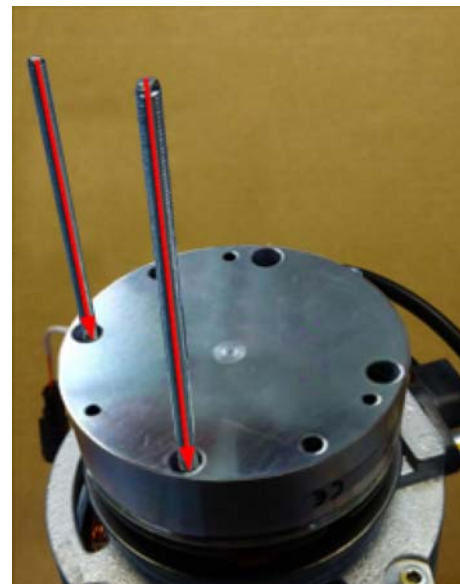
- Check the alignment of the backing plate, so it is aligned with the holes.
- Install threaded rods into 2 of the 3 mounting holes.



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.



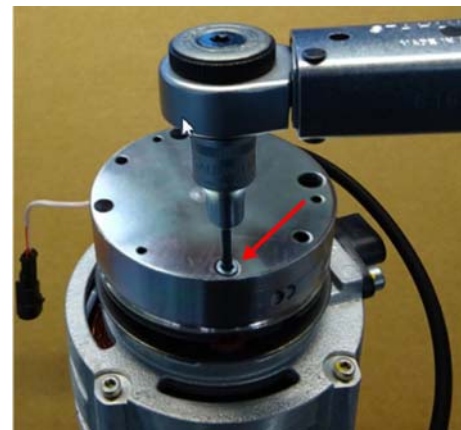
- Position the brake electromagnet onto the motor, and align it so the wiring is just next to the "U" wire as shown below.



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).



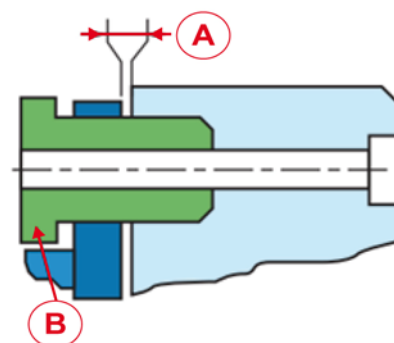
- Check the air gap at 3 points.
- The nominal clearance should be 0,2 mm (min 0,15 mm / max 0,3 mm).



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.

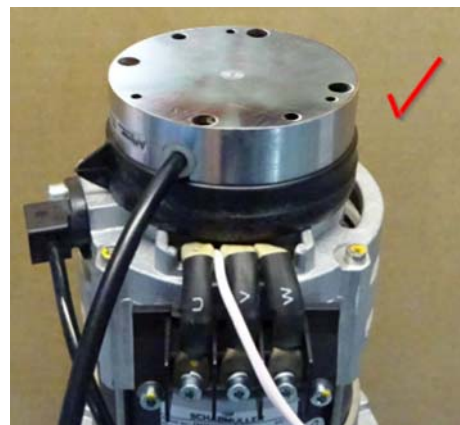


If using protection kit :

- 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.



Notes

[illegible]

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

E - Trouble shooting and diagram

Failure	Code	C	Description
Inverter Master	F01.01 (A)	F01 : Inverter	
		1	COMBIACX : Failure in the high current hardware protection circuit. • Internal fault. • Replace the inverter.
		2	COMBIACX : When no current is applied to the traction motor, the current feedbacks are out of permitted standby range. • Type of default not related to external components. • Cycle power to clear the fault. • If the fault is not cleared, replace the controller.
		4	COMBIACX : Driver of main contactor coil is damaged (not able to close). • Type of default not related to external components. • Cycle power to clear the fault. • 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. • Internal fault. • Replace the controller.
		16	COMBIACX : Pump current sensor out of range (at start-up or standby). • Internal fault. • 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). • Internal fault. • Replace the controller.

E - Trouble shooting and diagram

Failure	Code	C	Description
F01 : Inverter			
		1	COMBIACX : The software waits for the motor pump to stop at start-up. • If the motor connected to "-P" is still moving, wait for it to be still. • If not, wait 30 seconds until alarm "PUMP VMN NOT OK" appears. • Refer to corresponding alarm chapter.
		2	COMBIACX : Pump driving voltage different than the expected one. • Key OFF/ON.
		4	COMBIACX : The pump motor output voltage is lower than expected, considering the control applied. • Check the motor power wiring and connections. • Check the motor phases for proper insulation with the chassis. • Check that MC DRIVE power contact close properly, with a good contact. • If no problem is found on the motors, replace the controller.
Pump failure	F01.05 (A)	8	COMBIACX : The pump motor output voltage is higher than expected, considering the control applied. • Check the motor power wiring and connections. • Check the motor phases for proper insulation with the chassis. • Check that main contactor drive power contact close properly, with a good contact. • 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. • Check the pump motor connection and continuity. • Type of default not related to external components. • Cycle power to clear the fault. • If the fault is not cleared, replace the controller.
		1	COMBIACX: The controller has reached thermal cutout (temperature of the controller base plate is higher than 85°C / 185°F). • Power down and allow to cool. • Do not operate in ambient temperatures over to 60°C / 140°F.
Overheating	F01.06 (A)	2	• Check for jammed or obstructed drive motor. • Check for excessively high drive motor current consumption while driving on the level (over 70A). • Check controller for proper installation. • If the controller is cold when the default appears, replace it.
			ACEX : The controller has reached thermal cutout (temperature of the controller base plate is higher than 85°C / 185°F) • Power down and allow to cool. • Do not operate in ambient temperatures over to 60°C / 140°F.
			• Check for jammed or obstructed drive motor. • Check for excessively high drive motor current consumption while driving on the level (over 70A). • Check controller for proper installation. • If the controller is cold when the default appears, replace it.

E - Trouble shooting and diagram

Failure	Code	C	Description
F01 : Inverter			
Low Battery	F01.08 (A)	1	Low battery voltage (estimated value < 10%). • Check for damaged batteries, battery cables or connections. • Recharge batteries. • Measure batteries voltage and compare it with the value BATTERY VOLTAGE parameter in the TESTER menu. • If they are different, adjust the value of the ADJUST BATTERY function. COMBIACX : Short circuit detected on electromechanical brake or main contactor output (overcurrent).
		1	• Main contactor drive coil : Check connections and wiring for interruptions between controller and coil. • Motor brake coil : Check connections and wiring for interruptions between controller coil. • If the wiring is correct, the problem is in the controller : Replace it. COMBIACX : The driver of the electromechanical brake coil is shorted.
Electrical park brake 1	F01.09 (A)	2	• Check if there is a short or a low impedance pulldown between NEB CNA#4 and -BATT. • The driver circuit is damaged in the controller, which has to be replaced. COMBIACX: The driver of the electromechanical brake is shorted to +Vbatt. 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.
		4	• Check the harness, in order to verify if a positive is connected to the Smart driver output CNB#1. • 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. COMBIACX: A short circuit on the power outputs of the controller has been detected.
		8	• Check the EB driver output for a short circuit with +Vbatt. • If, even disconnecting the wire from the connector pin, the output stays at high value, the problem is inside the controller : Replace it. COMBIACX: Voltage on PEB present but not expected.
		16	• Check external wiring. • If the wiring is correct and no problem is found on the coil, replace the controller. COMBIACX: Internal Smart driver KO and ACEX : internal Smart driver is not KO (if both signals are KO failure F08.10).
		32	• Check the driver output for a short circuit with -Vbatt. • 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

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

E

- Trouble shooting and diagram

Failure	Code	C	Description
F02 : Contactor			
Power contactor SB801	F02.04 (D)	1	The driver of main contactor drive coil is shorted, or its coil is disconnected. • Ensure there is no short or low-impedance pull-down between MC and -Vbatt. • Check connections and wiring for interruptions of MC DRIVE coil. • 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. • 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. The controller drives the bridge for some tens milliseconds, trying to discharge the capacitors bank. If they don't discharge the fault condition is entered. • 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. • Key OFF / ON.

E - Trouble shooting and diagram

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

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

Failure	Code	C	Description
F06 : Overload			
No Loading Cal Calibration required	F06.01(A)		Angle/pressure weighting system missing or not calibrated and EU AU RUk.

E - Trouble shooting and diagram

Failure	Code	C	Description
F07 : Sensors			
Motor Temperature Sensor	F07.05 (D)	1	COMBIACX : The motor temperature sensor is not correctly connected or damaged. Key OFF / ON. Check wiring.
		2	ACEX : The motor temperature sensor is not correctly connected or damaged. Key OFF / ON. Check wiring.
		1	SR420 Arm angle sensor is out of allowed range when calibrated : --> VAR[SR420_OutOfRange]=1
Arm angle	F07.06 (D)	2	SR722 Arm angle sensor is out of allowed range when calibrated : --> VAR[SR722tOfRange]=1
		4	SR420 and SR722 arm angle measured are not coherent when calibrated (with no error of out of range), first level of incoherence : --> 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 : --> VAR[ArmAngleIncoherent]=2
Pressure sensor	F07.21 (D)	1	Pressure sensor is considered as out of range : Scissor arm angle is above 8° and pressure sensor measures less than 10b (to handle the arm on kickstand --> pressure is null)
		2	Pressure sensor is considered as out of range: pressure sensor voltage is above 11.0V --> SP400 > (=10,5.0V)
Steer Angle	F07.33 (D)	1	Steer angle sensor is out of range.
Motor encoder	F07.35 (D)		COMBIACX : Problem on the encoder during drive
		1	• Check connections and wiring for interruptions between controller and motor encoder. • Check the harness for proper installation. • 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
ECU temperature	F07.36 (D)	1	• Check connections and wiring for interruptions between controller and motor encoder. • Check the harness for proper installation. • Check the encoder mechanical installation. If the encoder slips inside its compartment, replace the encoder or change the drive motor.
			COMBIACX : The ECU thermal sensor is out of range.
		2	• Key OFF / ON • Replace the controller ACEX : The ECU thermal sensor is out of range. • Key OFF / ON • Replace the controller

E - Trouble shooting and diagram

Failure	Code	C	Description
F08 : Electric circuit			COMBIACX : Power capacitors voltage does not increase at start-up
		1	• Ensure that no external device is connected to the batteries. • Check battery, power cables and connections.
		2	COMBIACX : The controller detects an overvoltage or under voltage condition. Overvoltage threshold is 35 V, under voltage threshold is 9.5 V. • 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. • If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : Replace the controller. • Check if the fault appears during driving acceleration (under voltage condition detected) : Check battery charge ; check for damaged batteries, battery cables and connections. • Check if the fault appears during release braking (overvoltage condition detected) : Check line contactor contact, battery power cable connection. COMBIACX : At start-up, the battery voltage is too low or too high (< 0.8 Vbatt or > 1.2 Vbatt)
		4	• Check that the controller SET BATTERY parameter value matches the battery nominal voltage (24VDC). • Check that the TESTER MENU / BATTERY VOLTAGE parameter shows same value as the battery voltage measured with a voltmeter. If it does not match, then do a ADJUST BATTERY function • If the default still appears, replace the battery
Supply	F08.04 (A)		COMBIACX : A low logic level of Key-Off has been detected during start-up diagnosis
		8	• Check that no external device (relays switching, solenoids energizing/de-energizing...) is connected to the batteries, creating down-going pulses • 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 5,6Nm-8,4Nm • If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON
		16	ACEX : Power capacitors voltage does not increase at start-up • Ensure that no external device is connected to the batteries. • Check battery, power cables and connections. ACEX : The controller detects an overvoltage or under voltage condition. Overvoltage threshold is 35 V, under voltage threshold is 9.5 V. • 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.
		32	• If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : Replace the controller. • Check if the fault appears during driving acceleration (under voltage condition detected) : Check battery charge ; check for damaged batteries, battery cables and connections. • Check if the fault appears during release braking (overvoltage condition detected) : Check line contactor contact, battery power cable connection.

E - Trouble shooting and diagram

Failure	Code	C	Description
F08 : Electric circuit			
Supply	F08.04 (A)	64	ACEX : At start-up, the battery voltage is too low or too high ($< 0.8 V_{batt}$ or $> 1.2 V_{batt}$) • Check that the controller SET BATTERY parameter value matches the battery nominal voltage (24VDC). • Check that the TESTER MENU / BATTERY VOLTAGE parameter shows same value as the battery voltage measured with a voltmeter. If it does not match, then do a ADJUST BATTERY function • If the default still appears, replace the battery
		128	ACEX : A low logic level of Key-Off has been detected during start-up diagnosis • Check that no external device (relays switching, solenoids energizing/de-energizing...) is connected to the batteries, creating down-going pulses • 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 5,6Nm-8,4Nm • If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON : If no voltage transient is detected on the supply line and the alarm appears every time the key is switched ON
Circuit selector	F08.07 (A)	1	2 panels are selected : Check selector key --> SA901T=ON & S0901PF=ON
		2	No panel is selected : Check selector key --> SA901T=OFF & S0901PF=OFF
Common Output Supply	F08.09 (A)	1	COMBIACX : The PEV connector (B2) is not connected to the battery or the voltage is different. • Check B2 connector is connected to +Vbatt. • 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. • Check B2 connector is connected to +Vbatt. • If the harness connections are correct, replace the controller.
Power supply	F08.10 (D)	1	ACEX : Internal Smart driver KO and COMBIACX : Internal Smart driver KO. • Check the driver output for a short circuit with -Vbatt. • 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. • Check supply wiring (B+). • Check wiring between COMBIACX and ACEX.
		4	ACEX : Problem on supply. • Check supply wiring (B+). • Check wiring between COMBIACX and ACEX.

Failure	Code	C	Description
F10 : Functions			
Steering angle not calibrated	F10.14 (A)		Steer angle is not calibrated. Perform steer angle calibration
Arm angle not calibrated	F10.16 (A)		Arm angle is not calibrated Perform arm angle calibration

E - Trouble shooting and diagram

Failure	Code	C	Description
F11 : Safeties			
Arm incoherence	F11.09 (D)		Arm raise is controlled and arm angle is decreasing, out of calibration process (arm angle or pressure angle table). Check YV903 valve (wiring and connection).

Failure	Code	C	Description
F12 : Internal faults			
CAN Fault Check wiring	F12.01 (A)		For all failure details : • Check wiring. • Check the Can Bus connections. • Ensure that all the connectors pins are properly in place and the connectors are free of moisture or oxidation. • Machine powered off, measure the resistance between CN03.F and CN03.G. If it is not 60 Ohm $\pm 5\%$, check continuity of the bus wires : • 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. • 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).
E2P Read / Write Error Change calc.	F12.02 (D)	1	EEPROM failure status error
		2	EEPROM failure stack full
		4	COMBIACX : Wrong slip profile parameters or EEPROM damage Perform a CLEAR EEPROM. If problem persists, replace the controller COMBIACX : Software or hardware error has been detected, default parameters are applied Execute a CLEAR EEPROM operation
		8	Cycle power to clear the fault : • If the alarm disappears, the previously stored parameters will have been replaced by the default parameters • If the fault is not cleared, replace the controller
		16	ACEX: Wrong slip profile parameters or EEPROM damage. • Perform a CLEAR EEPROM. • If problem persists, replace the controller.
			ACEX : Software or hardware error has been detected, default parameters are applied Execute a CLEAR EEPROM operation
		32	Cycle power to clear the fault : • If the alarm disappears, the previously stored parameters will have been replaced by the default parameters • If the fault is not cleared, replace the controller
		64	Problem reading EEPROM at start-up Restart machine

E - Trouble shooting and diagram

Failure	Code	C	Description
E2P Param Reset Check SETTINGS	F12.04 (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.
E2P Param Not Set	F12.05 (A)	1	Model not set (not possible => always Optimum8) Model = Not Set
		2	Country not set : Set country Country = Not Set
		4	Serial number = 0: set serial number SerialNumber = "000000"
		8	At least one of the parameter used and not set ; Check all speeds and ramps SPEED[xxx] = Not Set RAMP[xxx] = Not Set
		16	At least one option used and not set ; Check all options OPT[xxx] = Not Set
		32	At least one config not set ; Check all configurations CFG[xxx] = Not Set
ECU software version incoherence	F12.07 (A)	1	ZAPI software version different on COMBIACX and on ACEX
		1	COMBIACX : Software watchdog active • Key OFF / ON
		2	COMBIACX : Problem on the Analog/Digital conversion of micro controller • Key OFF / ON
			COMBIACX : Watchdog circuit output became high due to hardware or software problem (WDG1). • Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem.
		4	• Type of default not related to external components. • Cycle power to clear the fault. • If the fault is not cleared, replace the controller.
			COMBIACX : Watchdog circuit output became high due to hardware or software problem (WDG2). • Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem.
		8	• Type of default not related to external components. • Cycle power to clear the fault. • If the fault is not cleared, replace the controller.
		16	COMBIACX : Current gain acquisition has not been performed or EEPROM damaged. • Key OFF / ON : If fault persists, a new current gain acquisition has to be performed
ECU fault (master)	F12.08 (A)	32	COMBIACX : Wrong client software. • Load the software to COMBIACX and ACEX controllers
		64	COMBIACX : RAM checksum failed. • Internal fault. Replace the controller
		128	COMBIACX : Timeout of client function (execution time exceed maximum allowable time). • Key OFF / ON

E - Trouble shooting and diagram

Failure	Code	C	Description
ECU fault (slave)	F12.09 (A)	1	ACEX: Software watchdog active. • Key OFF/ON.
		2	ACEX: Problem on the Analog/Digital conversion of micro controller. • Key OFF/ON.
		4	ACEX: Watchdog circuit output became high due to hardware or software problem (WDG1). • Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem. • Type of default not related to external components. • Cycle power to clear the fault. • If the fault is not cleared, replace the controller.
		8	ACEX: Watchdog circuit output became high due to hardware or software problem (WDG2). • Alarm caused by a hardware failure in one of two (or both) controllers or due to a software execution problem. • Type of default not related to external components. • Cycle power to clear the fault. • If the fault is not cleared, replace the controller.
		16	ACEX: Current gain acquisition has not been performed or EEPROM damaged. • Key OFF/ON. • If fault persists, a new current gain acquisition has to be performed.
		32	ACEX: Wrong client software. • Load the software to COMBIACX and ACEX controllers.
		64	ACEX: RAM checksum failed. • Internal fault. • Replace the controller.
		128	ACEX: Timeout of client function (execution time exceed maximum allowable time). • Key OFF/ON.
			This failure could happen when changing the software of the machine. Check evolution log. If happening, restart machine.
Parameters reload	F12.10	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.
Parameters reload Restart machine	F12.11		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.

E - Trouble shooting and diagram

Failure	Code	C	Description
F13 : Switches			
Lower Box Switches Check switches	F13.01 (D)	1	Incoherence between the 2 signals of front steering switch of platform box (both active) --> SM901L = 1 & SM901R = 1
		2	Incoherence between the 2 signals of movement selection --> SM903A = 1 & SM903B = 1
Neutral switch Check chassis switches	F13.10 (A)	1	Neutral position of arm switch of turret box not detected after power on --> SA420U = 1 SA420D = 1
		2	Neutral position of enable switch of turret box not detected after power on --> SA905 = 1
		4	Neutral position of horn switch of turret box not detected after power on --> SA907B = 1
		8	Neutral position of brake release switch of turret box not detected after power on --> SA103 = 1
Switches neutral 2 Check platform switches	F13.11 (A)	1	Neutral position of front steering switch of platform box not detected after power on --> SM901L = 1 SM901R = 1
		2	Neutral position of enable trigger of platform box not detected after power on --> SM901DM = 1
		4	Neutral position of movement selection of platform box not detected after power on --> SM908A = 1 SM908B = 1
		8	Neutral position of klaxon switch of platform box not detected after power on --> SM907 = 1
		16	Neutral position of brake release switch not detected after power on --> SM103 = 1

Failure	Code	C	Description
F15 : J1939 Failure			
J1939	F15.06 (D)	1	Error on CAN BUS

Failure	Code	C	Description
F16 : Motor			
Overheating	F16.01 (A)	1	COMBIACX : Motor maximum temperature reached. • Check the thermal sensor wiring and ohm value • Improve the air cooling of the motor • If the warning is present when the motor is cool, then the problem is inside the controller : Replace it
		2	COMBIACX : Motor maximum temperature reached. • Check the thermal sensor wiring and ohm value • Improve the air cooling of the motor • If the warning is present when the motor is cool, then the problem is inside the controller : Replace it
Speed problem	F16.02 (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

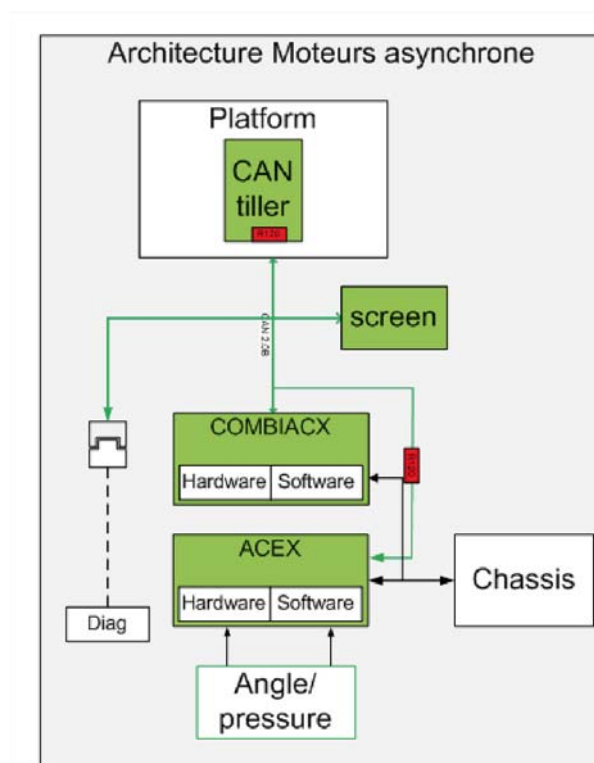
Failure	Code	C	Description
F16 :Motor			COMBIACX: During drive, motor output voltage is lower than expected. • Check the motor power wiring and connections. 1 • Check the motor phases for proper insulation with the chassis. • Check that MC DRIVE power contact close properly, with a good contact. • If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

E - Trouble shooting and diagram

2 - Legend

2.1 - SYSTEM ARCHITECTURE

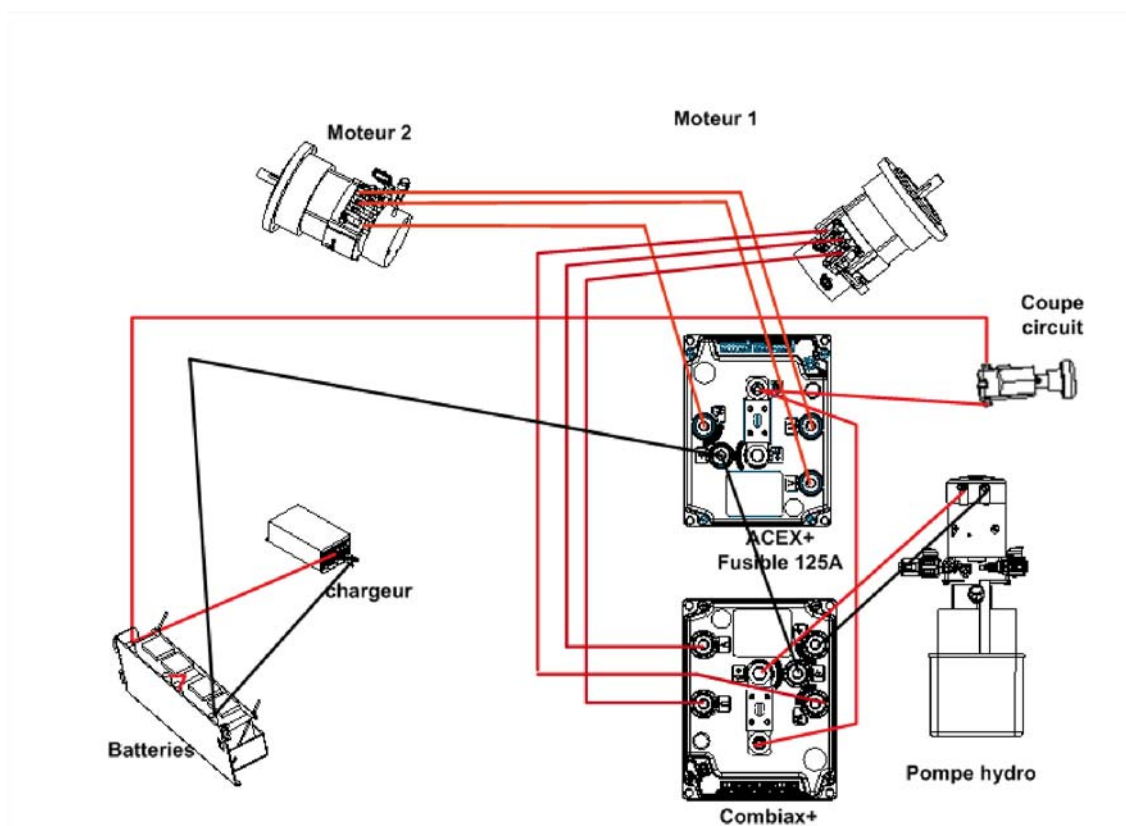
System architecture



E - Trouble shooting and diagram

2.1.1 - Power circuit

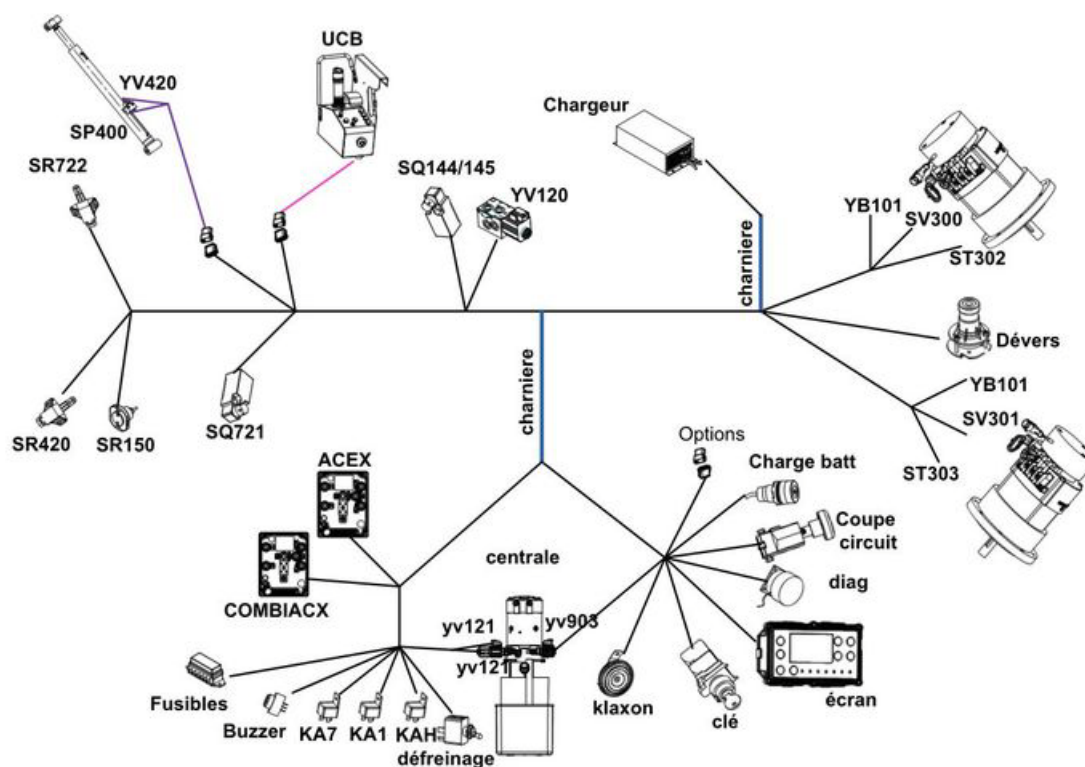
Power circuit



E - Trouble shooting and diagram

2.1.2 - Control circuit

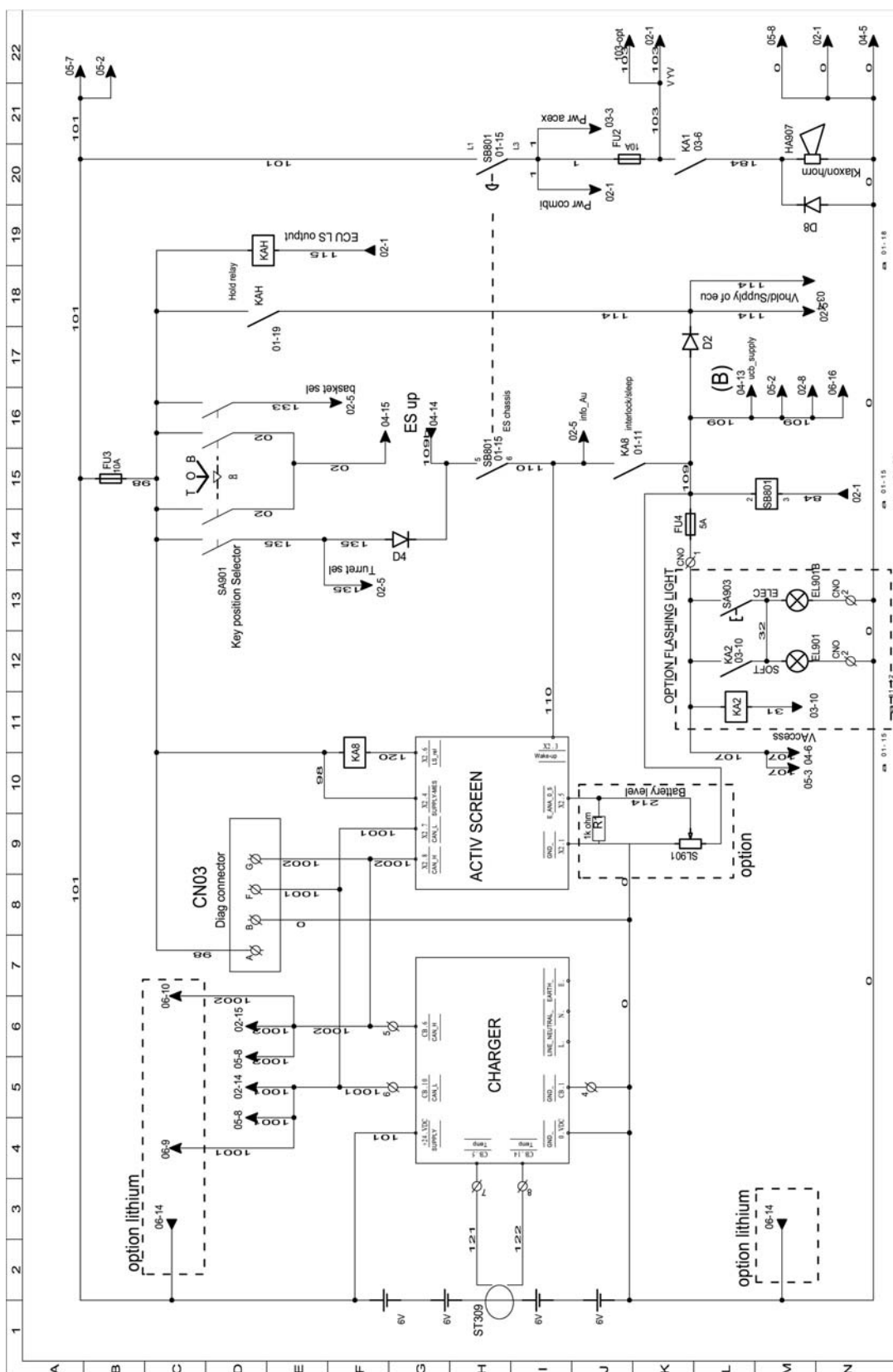
Control circuit



E - Trouble shooting and diagram

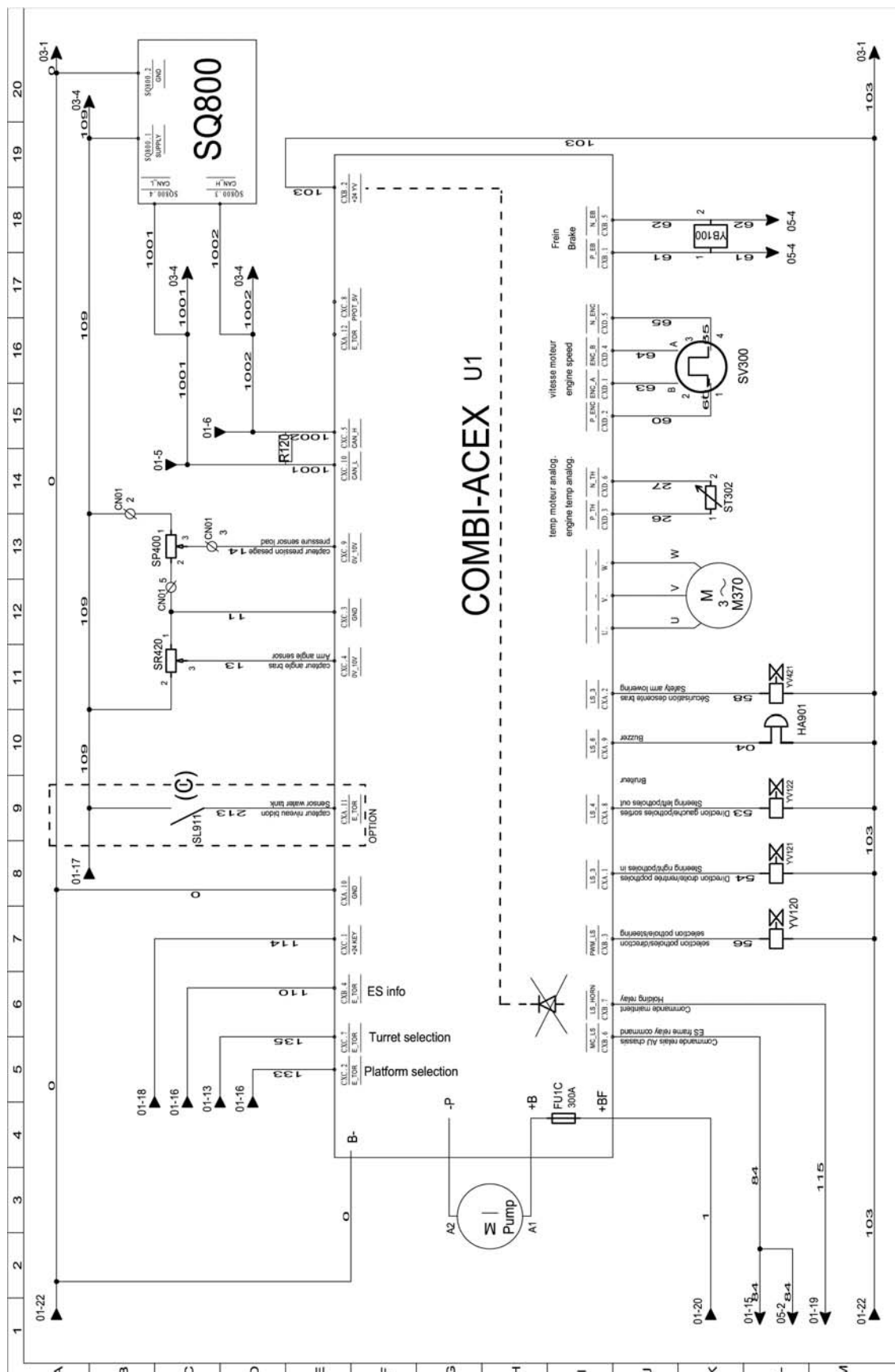
3 - Electric diagram

Electricity part 4000822760 C - folio 1

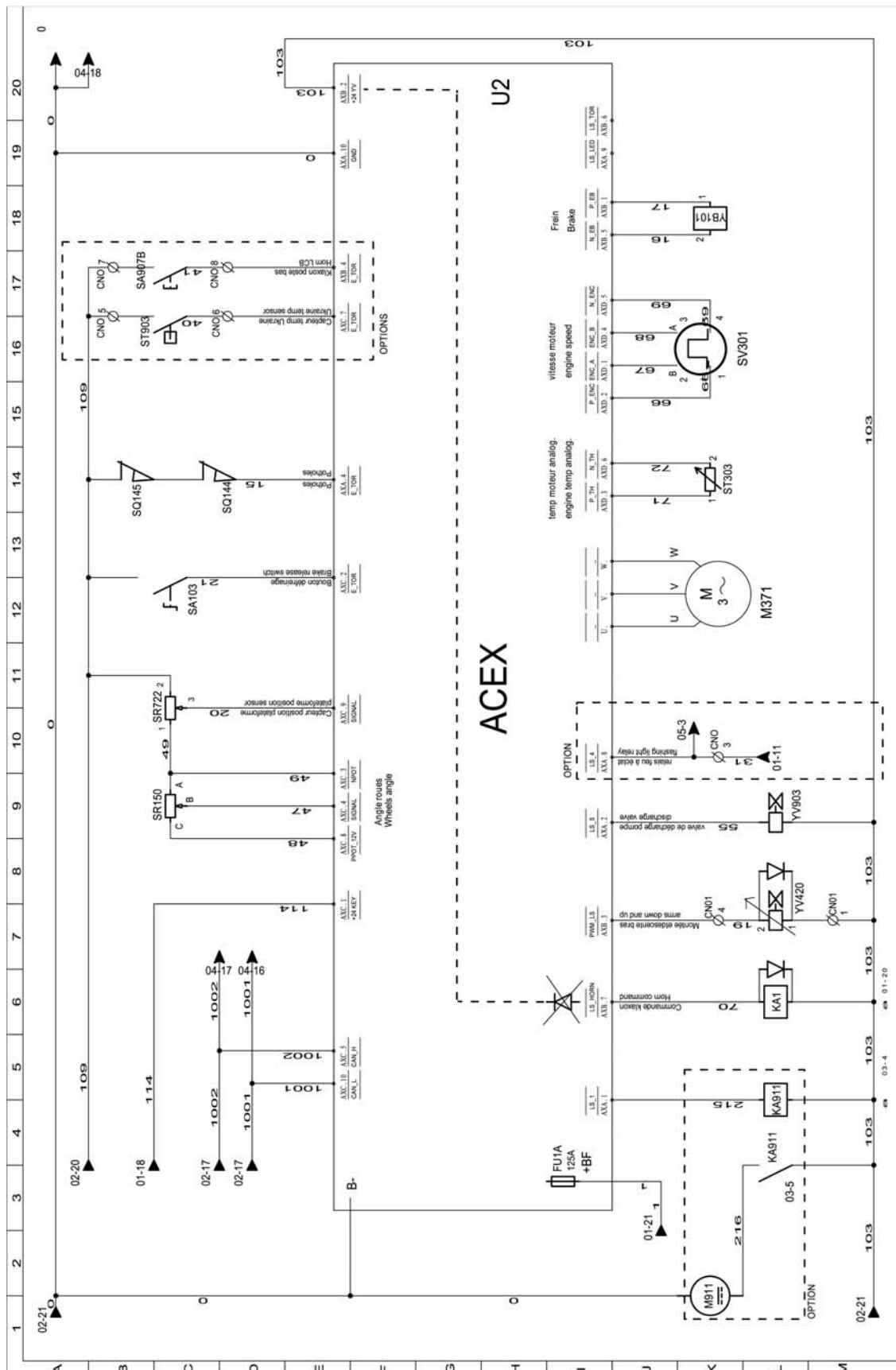


E - Trouble shooting and diagram

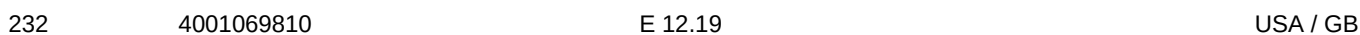
Variable speed drive part 4000822760 C - folio 2



Variable speed drive part 4000822760 C - folio 3

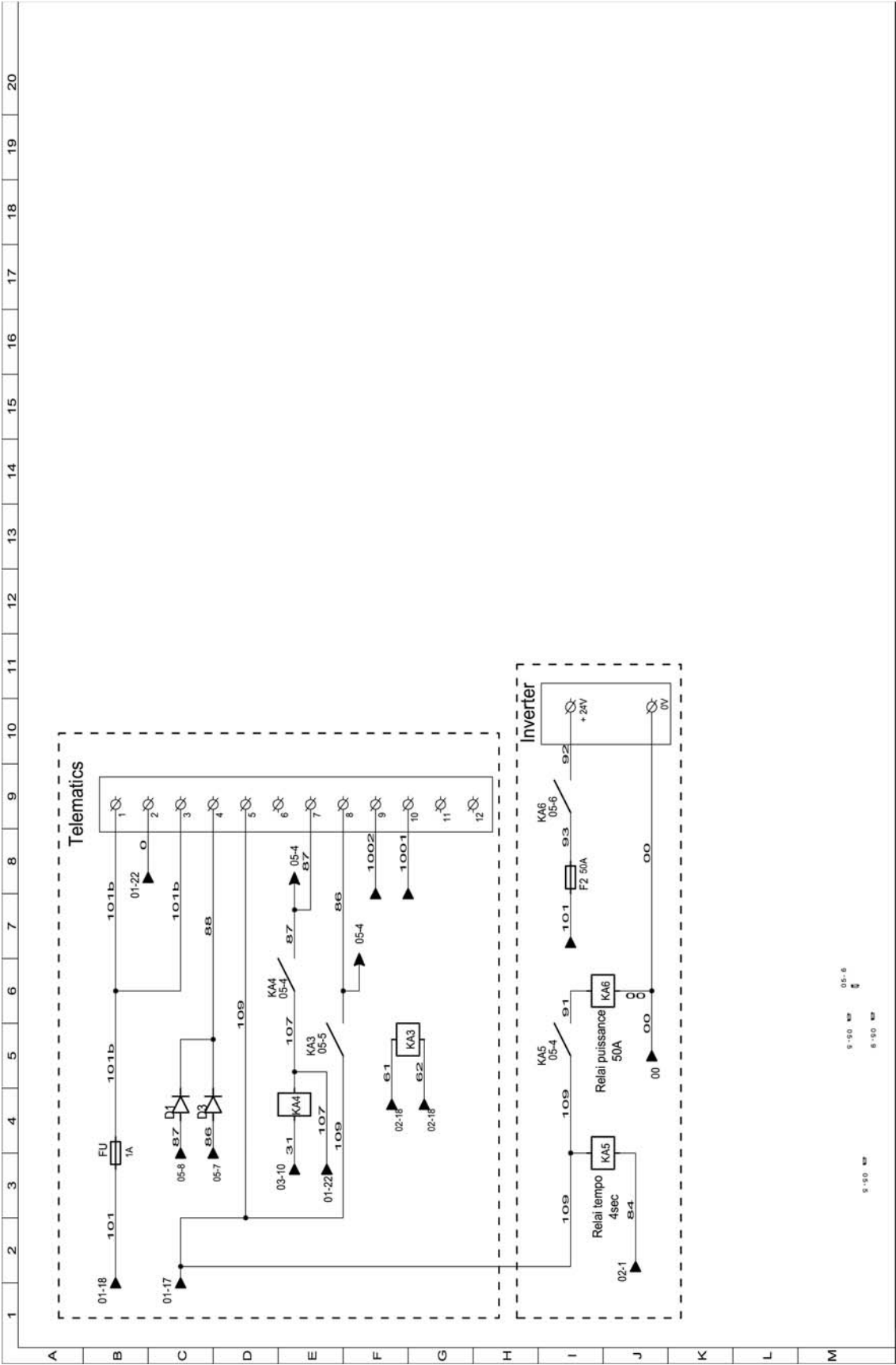


C a g e p a r t 4 0 0 0 8 2 2 7 6 0 C - f o l i o 4



E - Trouble shooting and diagram

Options 4000822760 C - folio 5

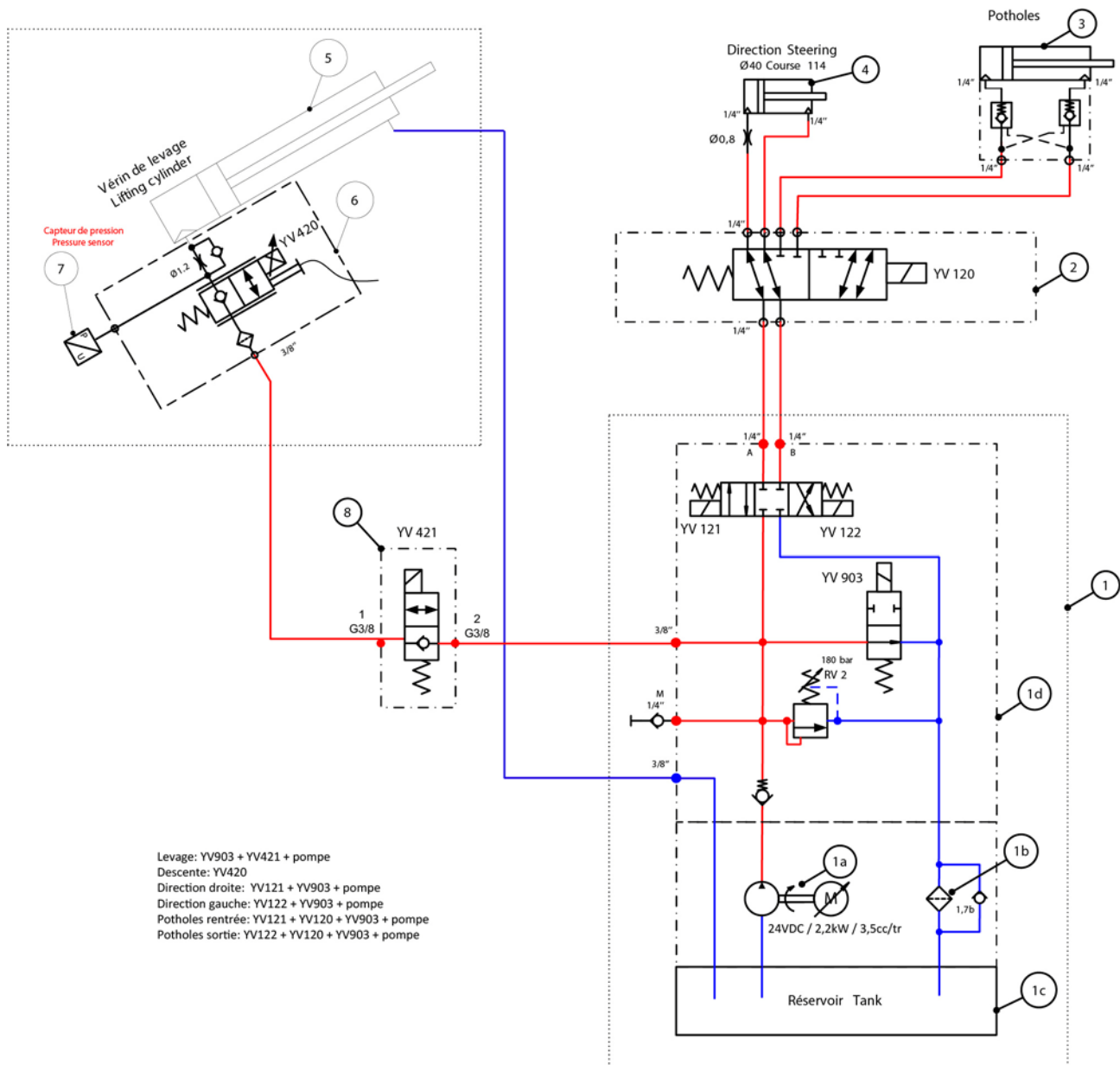


Option - Lithium battery 4000822760 C - folio 6



E- Trouble shooting and diagram

4 - Hydraulic diagram



E- Trouble shooting and diagram



Notes

[illegible]

1 - Intervention register

N.B.:-IN THE CASE OF A HAULOTTE SERVICES® INTERVENTION, THE QUALIFIED TECHNICIAN MUST INDICATE THE HAULOTTE SERVICES® INTERVENTION NUMBER.

[illegible]

F - Records

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