SIGMA 16 - SIGMA 46 - SIGMA 16 PRO - SIGMA 46 PRO

Service and Repair Manual

SIGMA 16 - SIGMA 46
SIGMA 16 PRO - SIGMA 46 PRO

4001160950 E 04.22 USA / GB

3.3.1 - Implementing manufacturer safety campaigns

It is essential to implement the safety campaigns issued by the manufacturer. All of these campaigns are accessible on our website.

Connect to our website : www.haulotte.com

Never market (or sell) a machine without first having carried out all of the safety campaigns.

4 - Conditions of warranty

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

C - Familiarization

Controls and indicators

Icon	Description	Function
	Activ' Shield Bar disable	The secondary safety system is switched off
	Activ' Shield Bar triggered	 The secondary safety system is triggered. An operator may be trapped on the platform : • In this situation, supervisor(s) at ground level must turn the control box key selector (21) to the ground control box  position to take control. • The platform box controls are now de-energized. • Check that the E-Stop button (9) at ground is not pressed in. • To safely activate movements from the ground control box, the Enable Switch (6)  must be pressed and held.

3.4 - GREASE

N.B.-:-REFER TO - CONSUMABLES

	Units	Standards	Grease for telescope	Shell gadus S2 V220AC 2 grease	Polyplex Bardahl grease
Nature of the lubricating oil			Semi-synthetic	Mineral oil	Semi-synthetic
Appearance			Viscous grease	Semi-solid	Semi-solid
Thickening nature			Lithium	Lithium / Calcium	Complex lithium
Color			Ivory	Red	Blue
Grade NLGI			1	2	2
Operating temperature	°C		- 40 at 140	- 20 at 120	- 20 at 160
Viscosity of the basic oil at 40° C / 104° F	mm² / s	ISO 3104	25	220	140
Viscosity of the basic oil at 100°C / 212° F	mm² / s	ISO 3104	-	18	14,5
Penetration at 25° C / 77° F	0,1 mm	ISO 2137	310 - 340	277	265 - 295
Drop point	°C / °F	ISO 2176	> 180	175	> 250
Welding 4 ball test	kg		> 315	-	> 315
Density at 20° C / 68° F			0,91	0,9	0,9

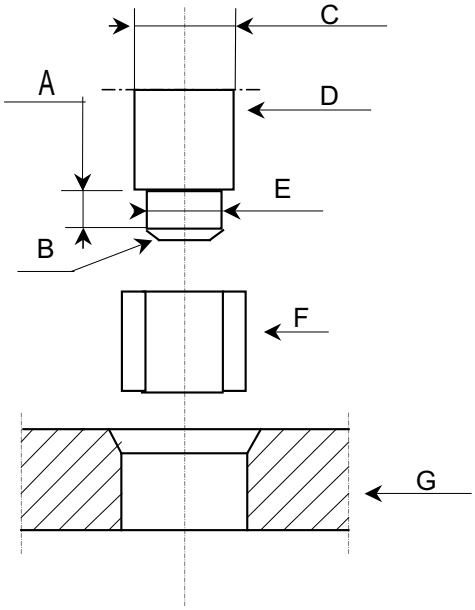
6 - Procedure of reassembly

6.1 - PINS AND BUSHES

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.

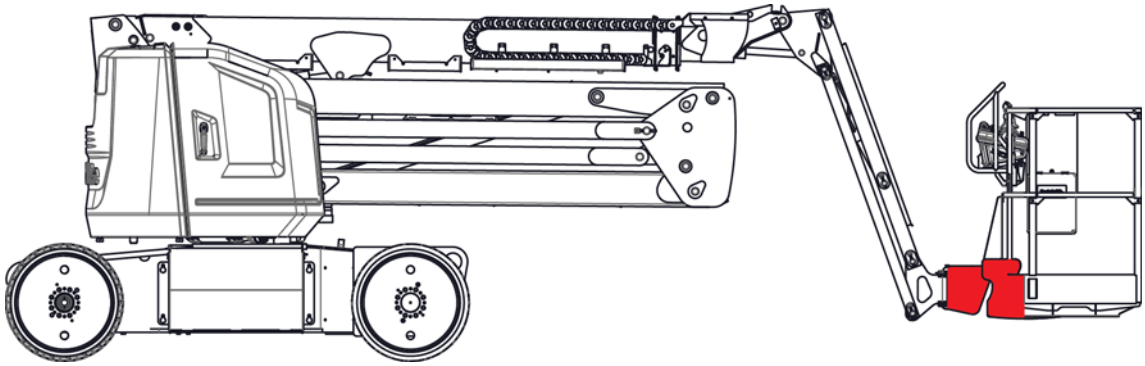
Step 4 :

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

Step 5 :

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

1 - Concerned area



2 - Warning

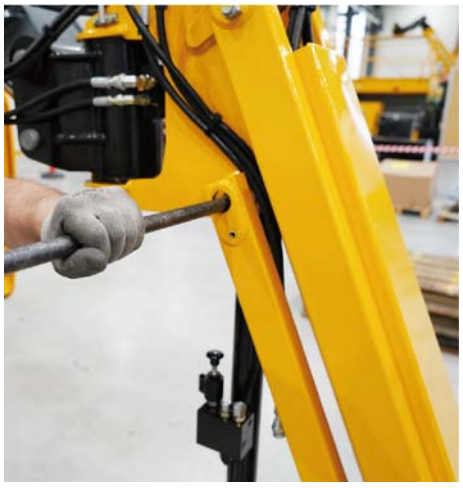
- Only an authorised and qualified technician is permitted to work on the machines HAULOTTE®.
- The use of this form implies that its user has been trained on this type of equipment.
- It is important that the person working on the machine is familiar with all of the safety information contained in the 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.

On each side of the pin, platform side :

- Remove the end-play take up screw and smooth clevis then extract the pin on the platform side (Using a 15 mm / 0,60 in wrench).

- Use a pin of diameter 20 mm / 0,80 in and length 500 mm / 20 in to knock out the cylinder pin.



- Leave the cylinder pin in the link piece and the second jib arm.

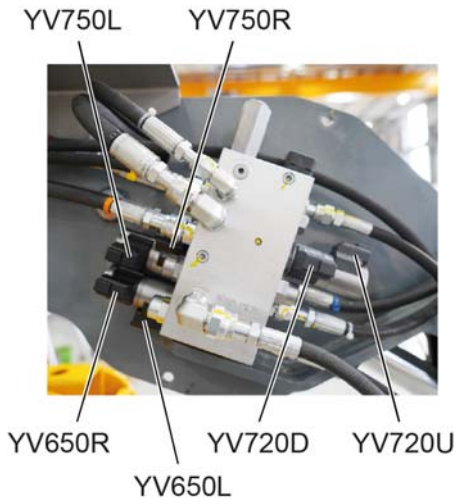
5 - Removal

- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Stow the machine.
- Fit the platform on a handling device.
- Mark out the work area.

- Switch off the ignition and remove the key (1) from the ignition.

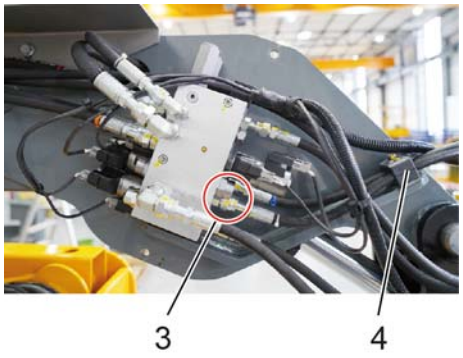
- Place a do not operate tag at the start/stop switch location to inform personnel that the equipment is being worked on.
- Turn off the circuit breaker.
- Disconnect the terminal from the negative terminal (-) then from the positive terminal (+).

- Disconnect the solenoid valves and leave them with the jib.



- Reduce the pressure in the hydraulic lines before removing the hoses.
- Identify, disconnect and plug the 2 hoses supplying the jib rotation cylinder (1).
- Leave them to hang with the block.
- Identify, disconnect and plug the 2 hoses supplying the platform rotation cylinder at the link piece (2).
- Leave them to hang with the block.

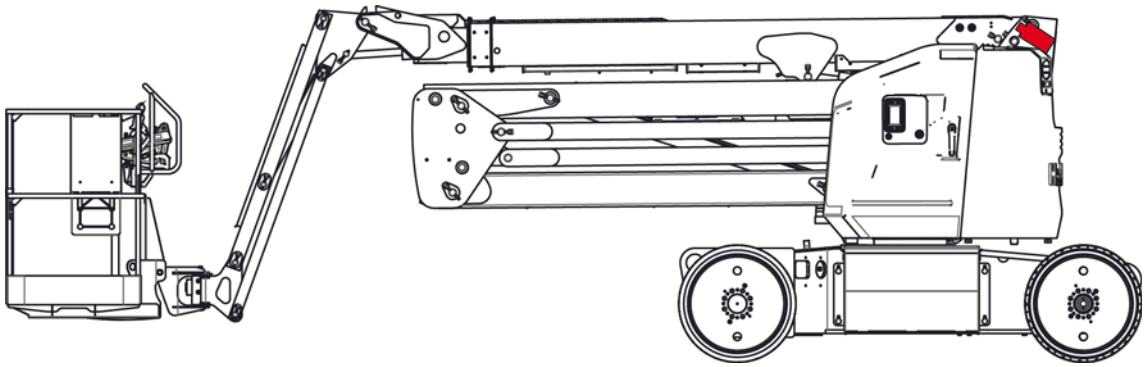
- Identify, disconnect and plug the 2 hoses supplying the jib cylinder on the block (3).
- Open the hose clamp (4).
- Leave them to hang with the jib.



Remove/Re-install output compensation cylinder

MS0341

1 - Concerned area



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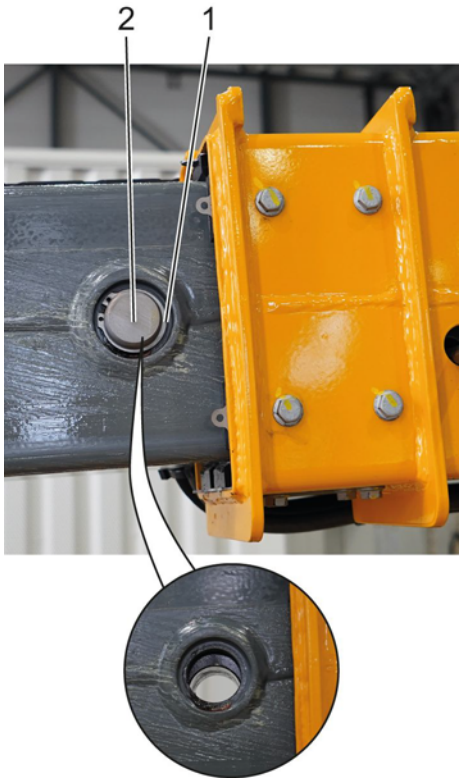
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- Do not wear any metal jewellery (rings, watches, chains, etc.) when working on the batteries.
- ONLY use insulated tools when working on or near batteries or electrical connections.
- Do not produce sparks or flames or smoke near the battery.

Remove - Replace telescope cylinder

MS0342

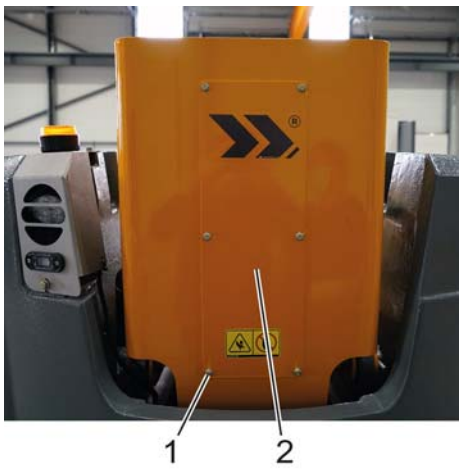
Cylinder rod side :

- Remove the circlip (1).
- Remove the pin (2).



Cylinder body side :

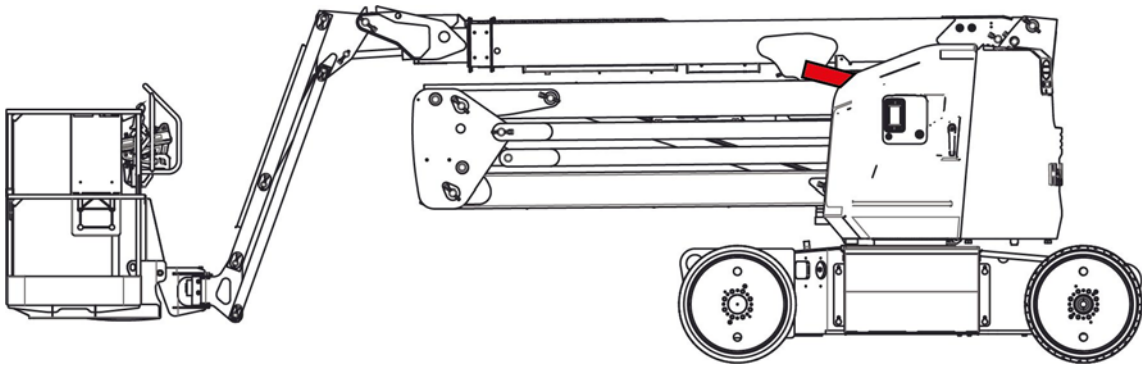
- Remove the 6 pins (1).
- Remove the plate (2).



Removing the boom lifting cylinder

MS0344

1 - Concerned area



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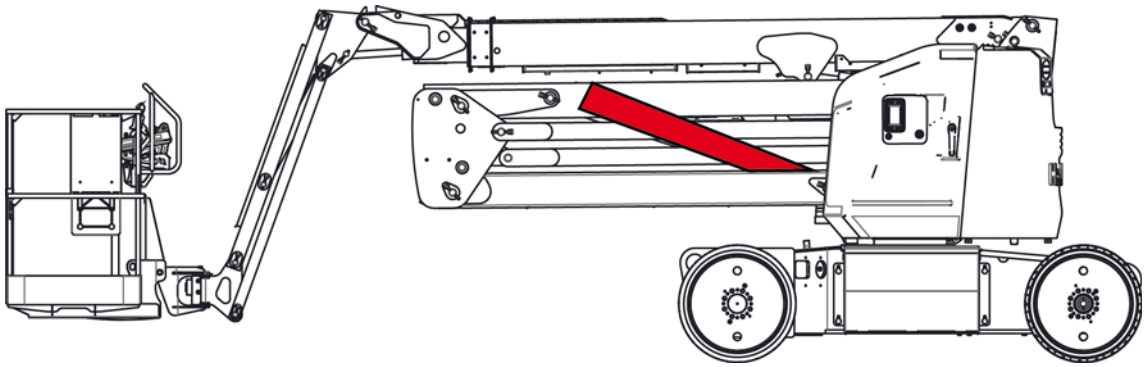
- The pressure in the hydraulic system is very important. It can cause accidents. Relieve the pressure before beginning any work and never search for oil leaks using your hands.
- The engine exhaust gases contain harmful combustion products. Always start and run the engine in a well ventilated area. 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.

Remove - Replace arm cylinder

MS0345

1 - Concerned area



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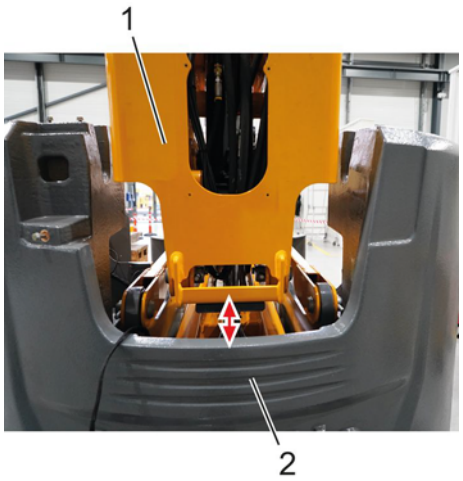
- ONLY use insulated tools when working on or near batteries or electrical connections.
- Do not produce sparks or flames or smoke near the battery.

5 - Removal

- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Lift the arm (1) so that it is not in contact with the counterweight (2).



- Lower the boom to the lowest point.
- Retract the telescope to the maximum point.
- Position the chocks (1) between the arm and the ground.
- Set the machine down on the chocks.
- Mark out the work area.

6 - Re-installation

- Perform the operations in the reverse order of dismantling.
- If the motor has been replaced, remove and retain its traceability number.
- Check state and presence of the seals on hydraulic motor.
- Be aware of the position of the pin when reinstalling the hydraulic motor. If the pin is not correctly positioned, turn the screw located on the other side of the wormscrew in order to line up the key with its position :

- Reassemble and tighten the 2 screws to a torque of 105Nm using a torque wrench.
- Check for the presence of seal on connections.
- Maintain hoses so they do not turn when tightening fittings.

7 - Additional operations

- From the ground control box, rotate the turntable to bleed the hydraulic circuit

- Ensure that there are no hydraulic leaks.
- Check the level of the hydraulic oil reservoir. Top up the oil if necessary.
- Clean the work area.

5 - Removal

- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Stow the machine.
- Turn the turret 90 ° to improve accessibility.
- Mark out the work area.

- Switch off the ignition and remove the key (1) from the ignition.

- Place a do not operate tag at the start/stop switch location to inform personnel that the equipment is being worked on.
- Turn off the circuit breaker.
- Disconnect the terminal from the negative terminal (-) then from the positive terminal (+).

- Remove the pin stop screw and the smooth clevis.

- Extract the pin between the compensation cylinder and the boom using a metal pin.
- Carefully set down the cylinder outside the access hole.

- Attach the boom with a sling on the platform side.
- Tighten the sling around the boom.

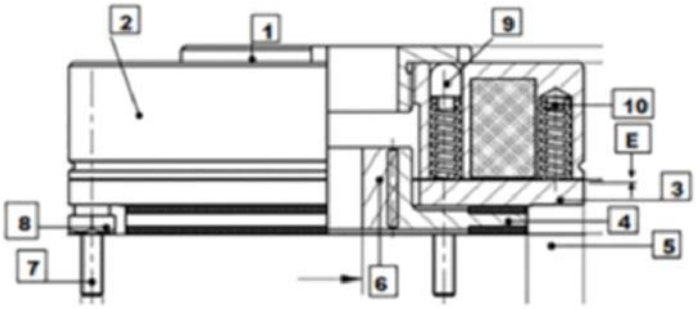
- Remove the pin stop screw and the smooth clevis of the boom lift cylinder pin.

- Mark the passage of the hoses through the collars.
- Remove the collars (1) retaining the hoses on the chassis .

- Bring the hoses to the back of the arm.

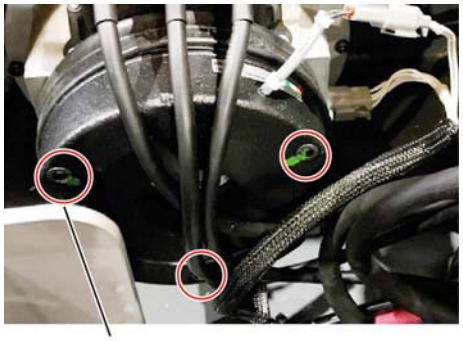
- Using a 1000 kg / 2205 lbs ratchet strap, of 2 m / 6 ft 56 in in length, strap the lower arm and the upper arm.
- Tighten the strap.

6 - Brake adjustment



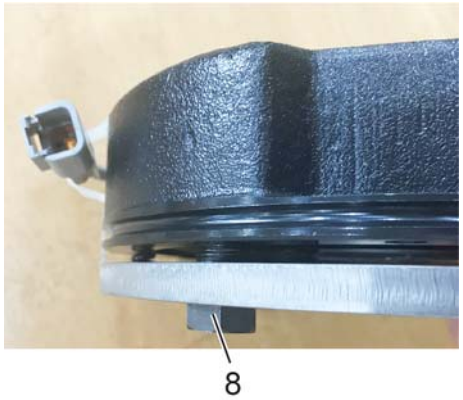
Marking	Description	Marking	Description
1	Ring	6	Hub
2	Coil	7	Fastening screw
3	Anchor	8	Adjustment screw
4	Disc brake	9	Spring pusher
5	Flange	10	Spring

- Unscrew the fastening screw (7) by one turn.



Move the adjustment screws (8) :

- If you turn in one direction the clearance (E) will increase, in the opposite direction the play decreases (E).

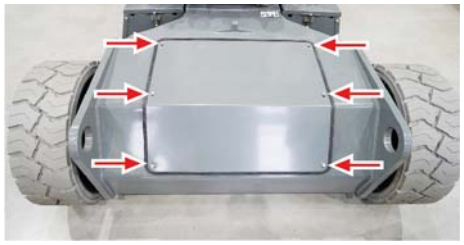


5 - Removal

- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Stow the machine.

- 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.
- Place the machine in maintenance configuration. Refer to MS0360 - Placing the machine in maintenance configuration.

- Unscrew and remove the 6 screws.
- Remove cover from chassis.



- Sling the machine using 2 slings, capacity 4000 kg / 8818 lbs, length 3 m / 9 Ft 10 in and handling equipment.
- Lift the machine.
- Place the machine on resistant and stable wedges.

Removal - Replacement of semi-traction batteries

MS0355

- Remove the support (3) between the 2 batteries.

- Remove the battery using the handles provided.

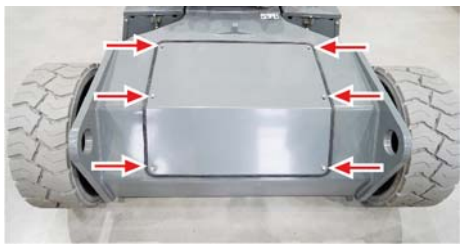
Keep batteries upright.

5 - Removal

- Position the machine on a flat and firm surface, clear of obstructions (beware of power lines).
- Mark out the work area.
- Place the machine in its folded position.
- Turn the turntable through 90° to access the chassis cover.

- 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.
- Place the machine in maintenance configuration. Refer to MS0360 - Placing the machine in maintenance configuration.

- Unscrew and remove the 6 screws.
- Remove cover from chassis.

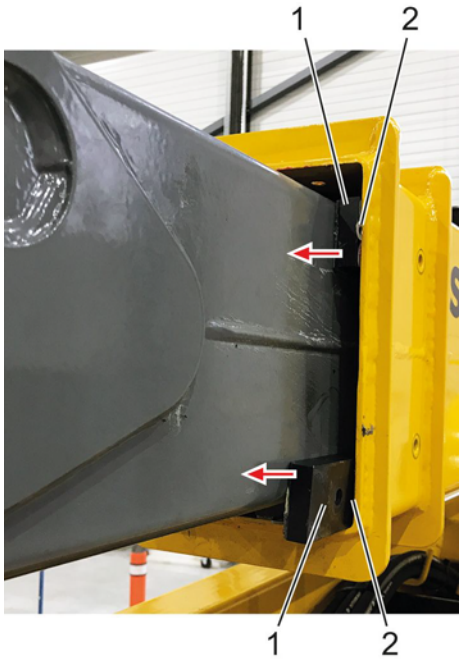


- Locate the cables before disassembly.

Removal-Side pads :

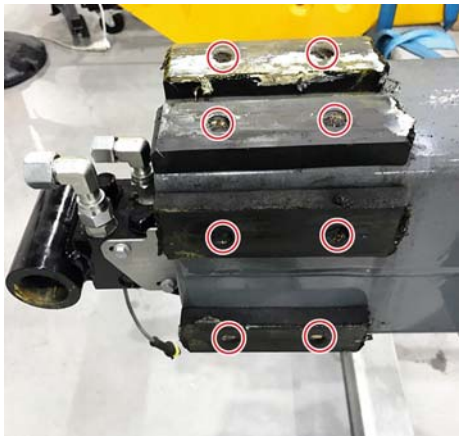
- Remove the screws (1)(4 on each side).

- Remove the pads (1) and wedges adjustment (2).



Rear pads replacement :

- Unscrew and remove the 8 pads (2 on each side).



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

- Grease the surface of the new pads and ensure that the adjustment wedges are reset identically.
- Install the screws with threadlock.
- Tighten the pad screws to a torque of 25 Nm (18.4 lbs/ft).
- Perform the operations in the reverse order of dismantling.
- Remember to refit the pin stop screws. Install the screws with threadlock.
- Tighten the screws to the recommended torque : 44 N.m (32.45 lb.ft).
- Grease the pins, the seals, and the bored holes.
- Check that the seals are on the connections before reconnecting the hoses.
- Hold the hoses to ensure that they don't turn while tightening the connections (risk of seal damage). This will avoid the hoses twisting when they are connected to the rigid tubes.
- Connect the sensor SQ530 and attach the wiring harness to the attachment point provided using a collar.

During reinstallation, pay attention to the hoses and cables.

7 - Additional operations

- From the ground control box, operate the telescope function several times.
- Ensure there are no jerky movements, jamming or other elements which could lead to abnormal operation of the machine.
- Clean the work area.

6 - Re-installation

- To refit it, proceed in the opposite order to removal.
- Place the old wiring harness next to the new and transfer the marks previously made on the old wiring harness to it.
- Follow the initial harness routing.
- Put contact grease on the connectors and the platform control panel socket.
- Connect the plugs.
- Attach the cables.

7 - Additional operations

- Unlock the machine. Refer to MS0360 Placing the machine in maintenance configuration.
- From the ground control box, perform complete movements of the jib, telescope extension and retraction and arm and boom lifting.
- Attach the wiring harnesses with polyamide ties, ensuring that the routing is correct.
- From the ground control box, ensure that the all of the machine's movements are working properly.

D - Trouble shooting

- Each trigger condition is associated with a single code number (16 possible single codes in decimal format corresponding to a single bit in binary format) :

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

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

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

D - Trouble shooting

Failures	Dec	Description
Supplies		
F08.13 Charger	1	LOGIC FAILURE #1
	2	BMS OFFLINE
	3	WATCHDOG
	6	MISSING PHASE
	7	OVERCURRENT
	8	HIGH TEMPERATURE
	9	MISMATCH VOLTAGE
	16	LOGIC FAILURE #2
	17	FLASH CHECKSUM
	18	EEPROM KO
	21	LOGIC FAILURE #3
	23	POWER FAILURE #1
	24	WRONG INPUT VOLTAGE
	25	SHORTED OUTPUT
	26	WRONG MARKER EEP
	27	NO MAINS
	28	LOW TEMPERATURE
	29	CLK BATTERY OFF
	31	NODES MISMATCH
	33	MASTER NOT FOUND
	37	FIRMWARE MISMATCH
	40	BMS OVERVOLTAGE
	41	CLEAR EEPROM REQUEST
	43	ADR INPUTS FAILURE
	56	EVSE ERROR
	57	EVSE NOT FOUND
	59	FIRMWARE NOT VALID
	60	WRONG PROTOCOL
	65	ADDRESS CLAIM FAILED
	This failure is checked only if wake-up 1 by key (WUI1) or wake-up 2 by charger (WUI2) is active.	

D - Trouble shooting

Failures	Bit	Dec	Description
Electrical Motor (pump)			
F17.12 **Motor overheat**	b0	1	• Overheat of pump motor (> 95°C).

E - Electric and hydraulic diagrams

S P U 1 / 3 + C L U S T E R - 4 0 0 0 7 1 1 2 5 0 F f o l i o 0 5