MODELS
TOUCAN 1210
TOUCAN 1310

SERVICE MANUAL

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MA0295-04
English - Service Manual

CE Models
English

MACHINE SERIAL NUMBER :

Toucan 1210 _____

Toucan 1310 _____

MA0295-04

TABLE OF CONTENTS

TABLE OF CONTENT

4 ELECTRICAL SYSTEM

5 BATTERIES - CHARGERS

TABLE OF CONTENT

6 TORQUE VALUES

7 SERVICE - MAINTENANCE

FOREWORD

This manual has been compiled to assist you in properly operating and maintening your JLG aerial work platform.

Constant improvement and engineering progress make it necessary that JLG reserve the right to make specification and equipment changes without notice.

The definitions of DANGER, CAUTION and NOTE as used in this manual apply as follows :

DANGER

A DANGER is used to emphasize that if an operation, procedure or practice is not followed exactly, death or serious injury to personnel may result.

CAUTION

A CAUTION is used to emphasize that if an operation, procedure, or practice is not followed exactly, equipment damage may result.

NOTE

A NOTE is used to emphasize an important procedure or condition

GENERAL WARNING

It is mandatory that all hydraulic hoses and fittings are correctly tagged and identified before they are disconnected to effect repairs or service. Failure to correctly tag and identify hoses and fittings can cause wrong reconnection, which can result in death or serious injury to personnel.

NOTICE TO OWNER/USER

Should this work platform become involved in a accident, please contact your local JLG distributor immediately and relate details of the incident so he can notify JLG. If the distributor is unknown and/or cannot be reached, please contact :

USA :

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CORRECTIVE ACTION REQUEST

The following form is for the use of the Distributor, Customer, Mechanic, and all other person who use this manual and recognize beneficial ways to improve its purpose as a worthy reference. SMCAR's are to be made in regards to, but not limited to : Safety, Operation Correctness, and Technical Content. All SMCAR's will be reviewed by the responsible Department at JLG Approved SMCAR's will be distributed in a Service Bulletin immediately and then incorporated in the next scheduled change to the manual. An answer to the SMCAR, approved or disapproved, will be sent directly to the one submitting the SMCAR.

Date _____

Customer name _____

Name/first name _____

Address _____

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Telephone _____

Service Manual
Affected _____

Page(s) Affected _____

Reason for submitting SMCAR (Use additional paper or back if necessary)

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Signature (optional)

Adress SMCAR's to :
Supervisor, Publications
JLG France SAS
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B.P. 20
47400 Tonneins, France

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2.1 Description

The Mobile Elevating Work Platform consists of a self propelled all welded chassis, of a telescopic mast mounted on a turntable and a telescopic jib. The platform is mounted at the end of the jib.

The main hydraulic power unit supplying the functions of the work platform is located at the rear of the chassis on the right hand side. When the "Power Plus" option is installed, an auxilliary unit is installed on the rear of the chassis on the left hand side.

The drive function is accomplished by two hydraulic motors propelling the rear axle.
The parking brakes integrated to the hydraulic motors work through lack of pressure.
Steering (front axle) is accomplished by a hydraulic cylinder.

The slewing movement is accomplished by a worm gear motor located at the base of the superstructure.

The movements of the telescopic mast, pendular jib and telescope are accomplished by means of hydraulic cylinders.

The machine may be equipped (optional) with a system controlled by a hydraulic cylinder enabling the rotation of the platform.

The platform is kept horizontal by hydraulic cylinders working following the "master-slave" principle.

The movements of the machine are controlled from control panels through solenoid valves. They are located at the front of the chassis (for structure movements) and on the left hand side of the chassis (for drive movements).

The progressivity of movements is obtained by an electronic controller which controls the rotation speed of the main hydraulic group motor. The electronic controller is located near the emergency control panel (ground controls), on the left hand side of the telescopic mast.

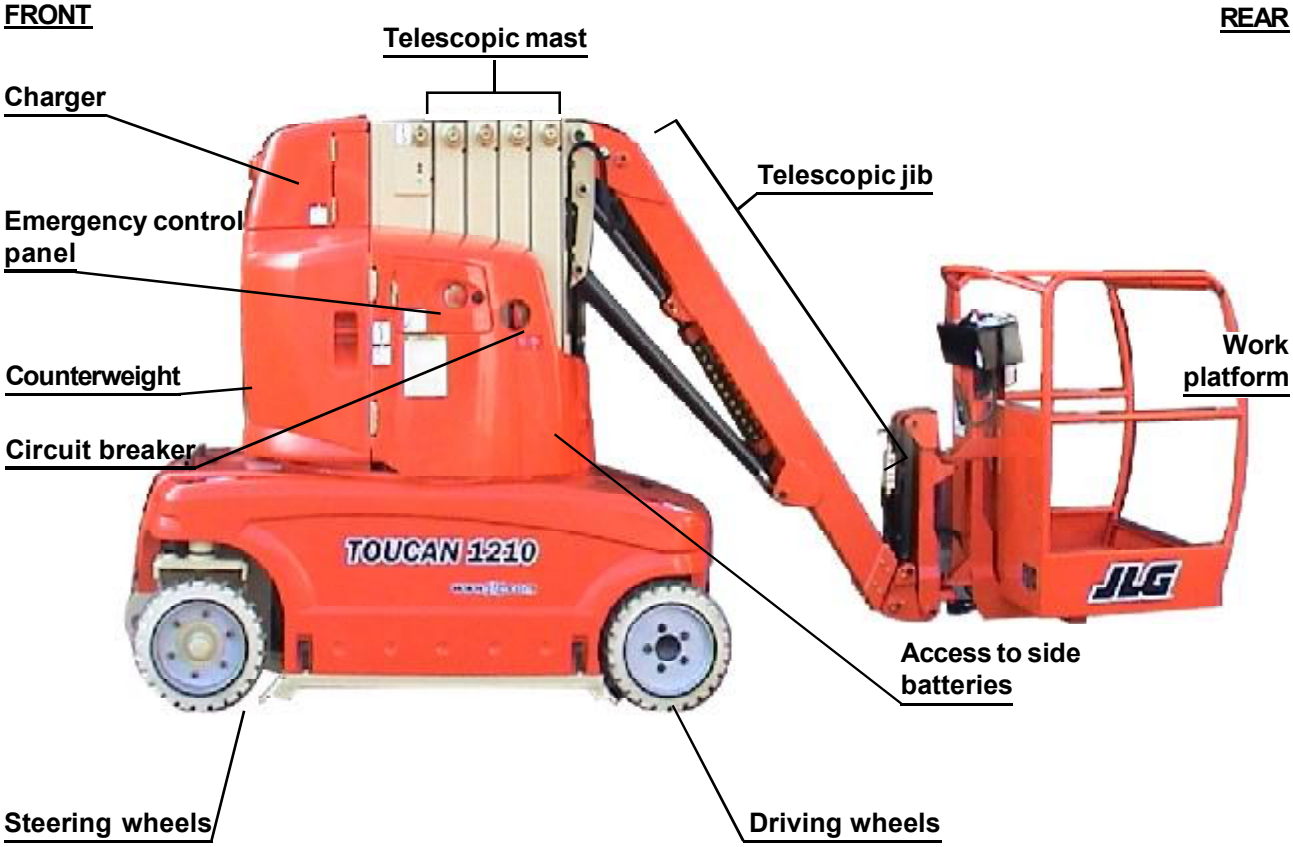
The energy for the control and power circuits of the mobile elevating work platform is supplied by a 24VDC battery.

REAR VIEW

FRONT VIEW

VIEW LEFT FRONT

REAR



2.2. Characteristics - Dimensions - Performances

	Toucan 1210		Toucan 1310
DIMENSIONS (LOWERED)	**Standard**	**Rotation (option)**	**Standard**
Length	3,85 m	4,07 m	4,07 m
Width	1,20 m	1,20 m	1,345 m
Height	1,99 m	1,99 m	2,19 m
Weight	5 200 kg	5 300 kg	5 600 kg
Ground clearance	0,08 m	0,08 m	0,09 m
CAPACITY - MANOEUVRABILITY	**Standard**	**Rotation (option)**	**Standard**
Floor height min.	0,40 m	0,40 m	0,57 m
Floor height max.	10,00 m	10,00 m	11,00 m
Max. outreach (from centerline)	4,93 m	5,16 m	5,16 m
Floor height with max. outreach	7,20 m	7,20 m	8,20 m
Working height with max. outreach	9,20 m	9,20 m	10,20 m
Slewing		345° (2 x 172,5°)	
Rotation (option)		120° (2 x 60°)	
WORK PLATFORM	**Toucan 1210**		**Toucan 1310**
Length		0,70 m	
Width		1,10 m	
Rated load		200 kg	
HYDRAULIC CIRCUIT	**Toucan 1210**		**Toucan 1310**
Hydraulic tank capacity		35 l	
Main hydraulic pump displacement		5,2 cm³/t	
Auxilliary hydraulic pump displacement (T1210 option)		3,5 cm³/t	
FILTRATION	**Toucan 1210**		**Toucan 1310**
Pressure		10 µm absolute	
Return		10 µm absolute	
PRESSURE	**Toucan 1210**		**Toucan 1310**
Main hydraulic circuit maximum pressure		24 MPa	
ELECTRICAL COMPONENTS	**Toucan 1210**		**Toucan 1310**
Power of the main hydraulic power unit motor		4,8 kw / 24 VDC	
Power of the auxilliary hydraulic power unit motor (T1210 option)		4,8 kw / 24 VDC	
DRIVE SPEEDS (*)	**Toucan 1210**		**Toucan 1310**
1st gear (low speed)	0,65 to 0,7 km/h		0,45 à 0,7 km/h
2nd gear	2,0 km/h		1,5 km/h
3rd gear	3,6 km/h		2,6 km/h
4th gear			3,6 km/h
MOVEMENT DURATION (**)	**Toucan 1210**		**Toucan 1310**
Mast elevation movement duration	28 to 33 s		33 à 40 s
Mast lowering movement duration	28 to 33 s		34 à 40 s
Jib elevation movement duration	20 à 27 s		20 à 27 s
Jib lowering movement duration	23 à 30 s		23 à 30 s
Telescope extension movement duration	16 à 22 s		16 à 22 s
Telescope retraction movement duration	14 à 20 s		14 à 20 s
Slewing movement duration (from stop to stop)	75 à 85 s		75 à 85 s

(*) Speeds recorded on horizontal and level ground with a person on the platform (approximately 80 kg).
(**) Movements durations recorded with the maximum load in the platform (200 kg), the movements being controlled from the platform control panel.

Speeds are indicated for a machine with a battery fully charged and operated at ambiant temperature of 20°C.

Constant improvement makes it necessary that ***JLG France SAS*** reserve the right to make specification and equipment changes without notice.

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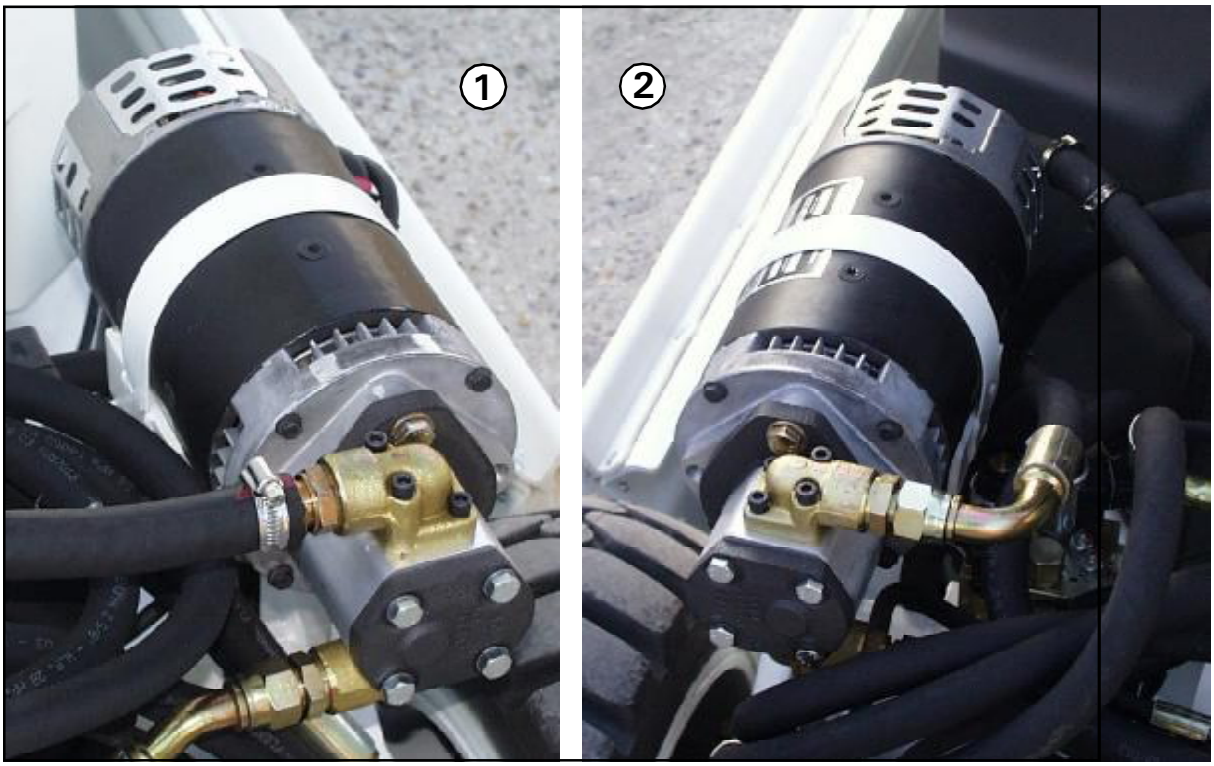
3.1. Hydraulic power units



1- Main hydraulic power unit - 4,8 kw - 5,2 cc/t

Function : Supply to the hydraulic circuit of the elevating work platform.

2- Auxilliary hydraulic power unit - 4,8 kw - 3,5 cc/t

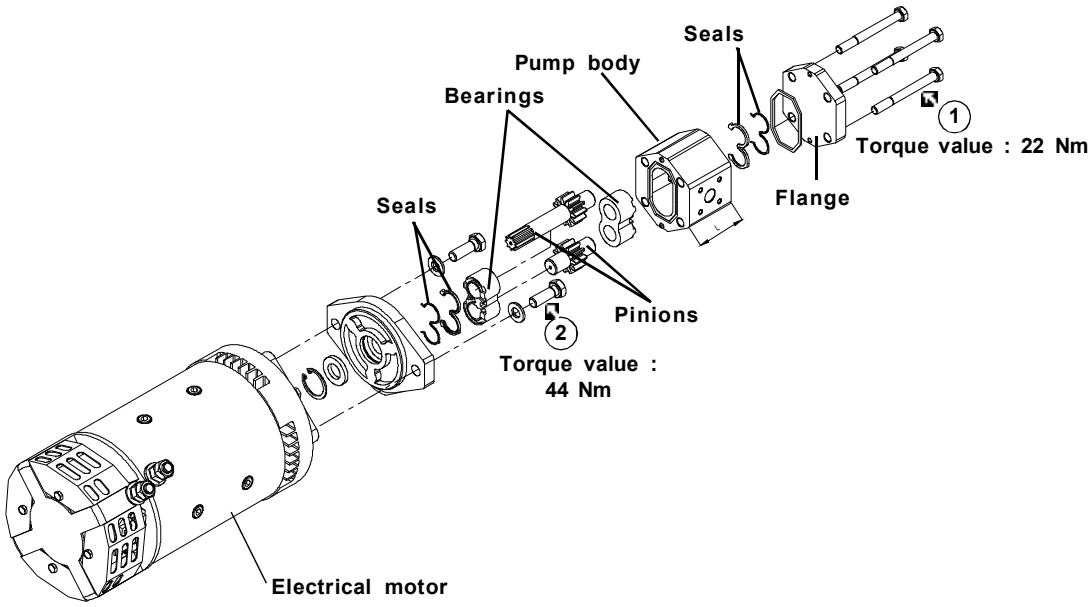
Function : Supply of an additional oil flow during a high speed drive to make up for the speed reduction due to the use of wheel motors of higher displacement.

⚠ DANGER

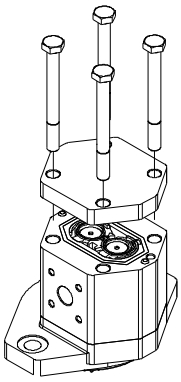
Do not interchange the pumps from the main and auxilliary power units.
Body length of the 5,2 cc/t pump on main power unit : L = 55 mm.
Body length of the 3,5 cc/t pump on auxilliary power unit : L = 50 mm.

⚠ CAUTION
Disassembly of the gear pump entails replacement of seals.

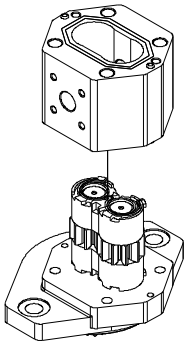
1- Remove both screws securing the pump to the motor. Disconnect the pump.



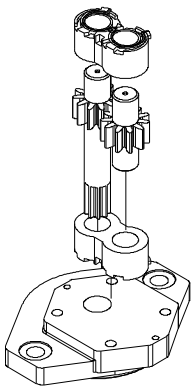
2- Place the pump vertically on a clean work area and remove the four flange attachment screws. Remove the flange.



3- Extract the pump body ensuring both pinions and bearings do not get damaged (beware the two seals on the upper bearing).



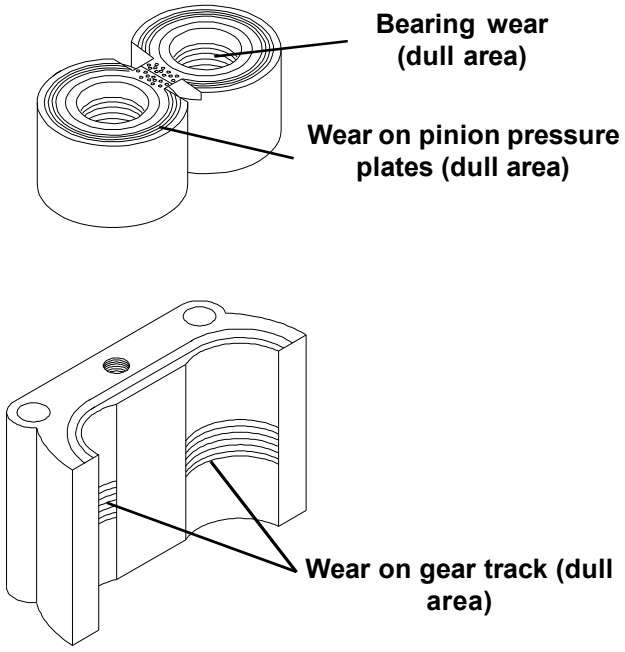
4- Extract the upper bearing, both pinions then the lower bearing.



Careful inspection of all pump components allows, depending on parts wear, to diagnose operating faults or pollution problems in the hydraulic circuit.

Hydraulic circuit pollution

- Abrasive wear caused by abrasive particles



Such a wear results in a gradual reduction of the power and speed of the hydraulic circuit.
Fine particles may enter the circuit:

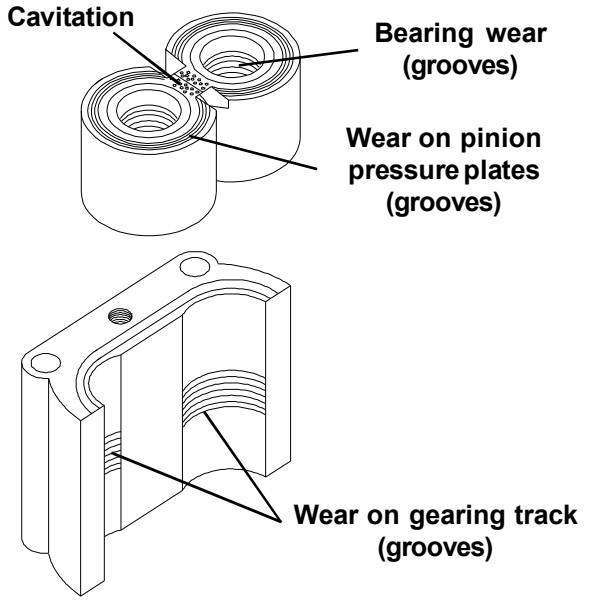
• During reservoir filling (clean the area around the filling neck before opening the cap. Use clean containers and funnels during filling procedure).

• Through worn seals, particularly on dirty and poorly maintained material.

• During maintenance if components are not capped after hose disconnection.

– Abrasive wear caused by metallic particles.

Such a wear results in a fairly sudden degradation of the performances of the pump. Metallic particles result generally from the degradation of a component or from an abnormal wear of the hydraulic circuit: the component must be identifed and replaced. Every hydraulic component must be removed and cleaned. The hydraulic circuit must be drained out and flushed and the filters changed.



Track grooved on suction side = overpressure

- Aeration or cavitation

Cavitation and aeration act alike in the system.

Aeration occurs when air mixes with the oil. Air may enter the system through a small suction leak or by agitation of the oil in the reservoir. Agitation occurs when the oil returns to the reservoir above the oil surface. This may occurs when the oil level is too low. Cavitation is the formation and collapse of vapour bubbles in the oil. This usually results from a restricted pump suction. Cavitation occurs more readily when the oil is cold.

Aeration and cavitation erode and pit the pressure plates and pump housing.

A pump which is either cavitating or operating on aerated fluid is usually noisy and the system operates in a spongy or jerky manner.

If erosion on the suction side of the pump is evident on the gear tracks, the cause is either air bubbles in the oil or a restricted suction.

- LACK OF OIL

When a failure is due to lack of oil, deteriorations are usually rapid. This type of failure may occur if :

- the oil level is low in the reservoir, or
- there is an air leak in the suction line.

- EXCESSIVE HEAT

Excessive heat will harden the seals.

Excessive heat may be caused by a pressure relief valve set too low, in which case, the machine will be slow.

- OIL PRESSURE TOO HIGH

There are two possible causes for overpressure :

- the pressure relief valve fails to function, producing an extreme surge and immediate failure.
- The pressure relief valve is set too high, resulting in repeated pressure peaks. Pump damage is very similar in both cases.

- INCORRECT ASSEMBLY

This type of failure is self explanatory : components are faulty, or parts have not been assembled correctly.

Pinching of the O-ring will occur if it is not seated properly in its groove. If the O-ring has been fitted incorrectly, the surface of the housing will show a depressed area (especially if the part is made of aluminium).

5- Remove the seals

NOTE

Align the seals in the order they were removed, mark their position and shape to facilitate later assembly.

6- Clean the pump components with an appropriate solvent and dry with compressed air. Replace the seals.
If components are damaged, replace the pump.

⚠ CAUTION

Avoid scratching the grooves and gland surfaces.

⚠ CAUTION

Inspect each groove before assembly. Parts must be free from dust and burrs. Grooves and gland surfaces must be in good condition. Worn or damaged parts must be replaced. Do not stretch seals during their assembly. Lubricate seals and gland surfaces with clean hydraulic oil before assembly.

7- Assemble the pump in the reverse order from disassembly.

Bolt torque value (Rep. 1) = 22 Nm
Bolt torque value (Rep. 2) = 44 Nm

⚠ CAUTION

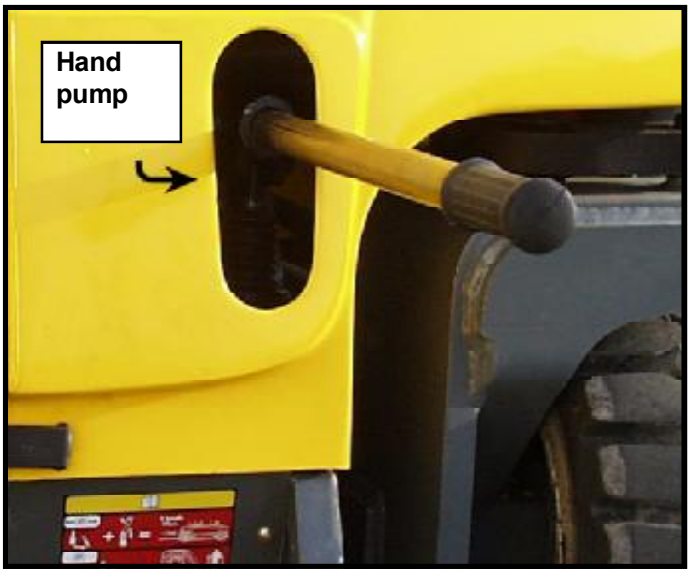
Respect scrupulously the bolt torque value (Rep. 1) and (Rep. 2). Incorrect torquing will affect the performance of the pump.

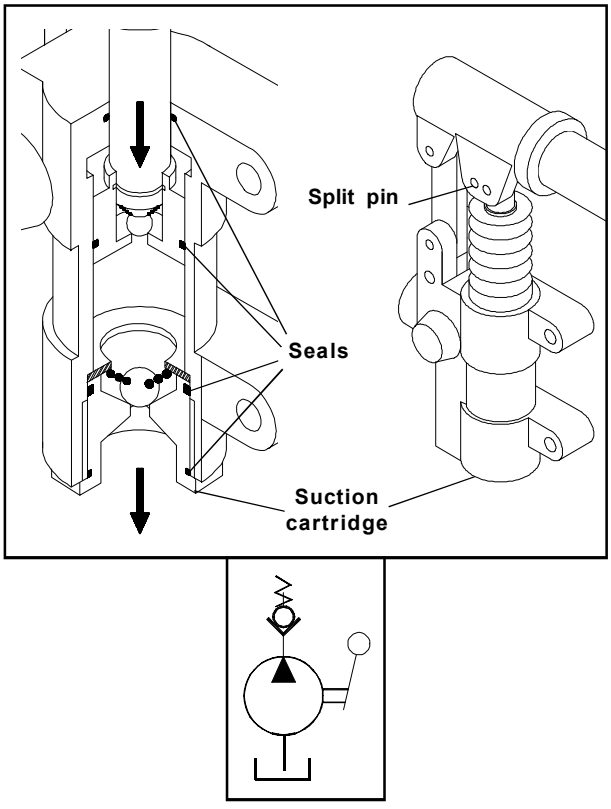
⚠ CAUTION

After pump installation, operate the work platform to bleed the air from the hydraulic circuit and check the oil level in the main reservoir (machine fully lowered). Check the good working order of all the control panels.

3.2. Hand pump

FUNCTION :
- Oil supply to the hydraulic circuit of the work platform when using the breakdown controls : elevation / lowering, telescope extension/retraction, slewing.
- Oil supply to the brake pilot circuit (See § 3.13).





3.3 Hydraulic filters

NOTE

The filter cartridges must be replaced :

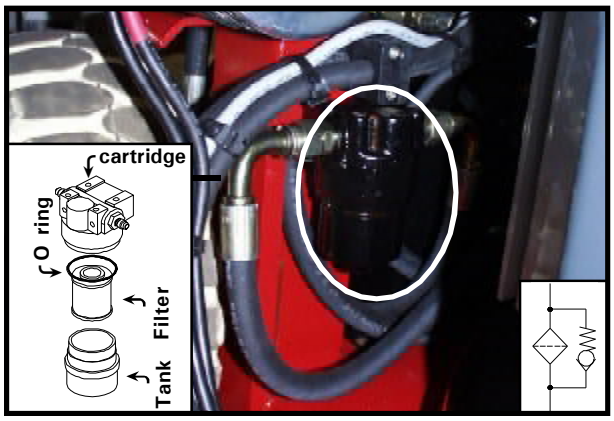
- **After the first 50 hours of operation.**
- **Every 250 hours of operation.**
- **At each oil change (see chapter 7).**

NOTE

Used oils and filter cartridges must be disposed of in accordance with the regulations in force.

3.3.1. Pressure filter

Filtration rating : 10µm abs.



1- Disconnect the battery from the electrical circuit of the work platform.
2- Position the release control valve lever on ⟵(P)⟶ to release the pressure in the hydraulic circuit.
3- Unscrew the filter tank

DANGER

Oil projection on the skin can cause injuries and burns. Loosen the filter tank very slowly to allow the oil pressure to drop progressively.

4- Install a new filter cartridge.
5- Check the presence and condition of the O ring.
6- Install the filter tank.

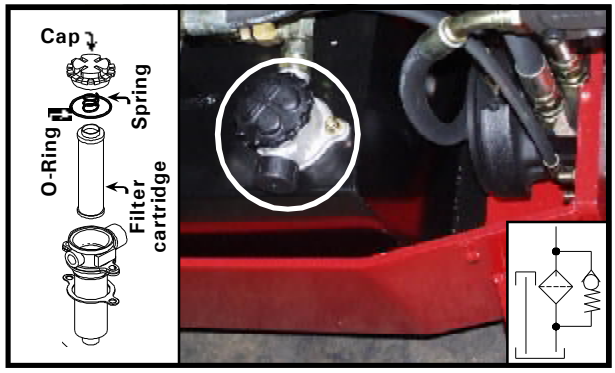
After installation, perform several movements to bleed the air from the hydraulic circuit, check the oil level in the reservoir (PLATFORM FULLY LOWERED)

CAUTION

The return filter must also be replaced.

3.3.2. Return filter

Filtration rating : 10 µm abs



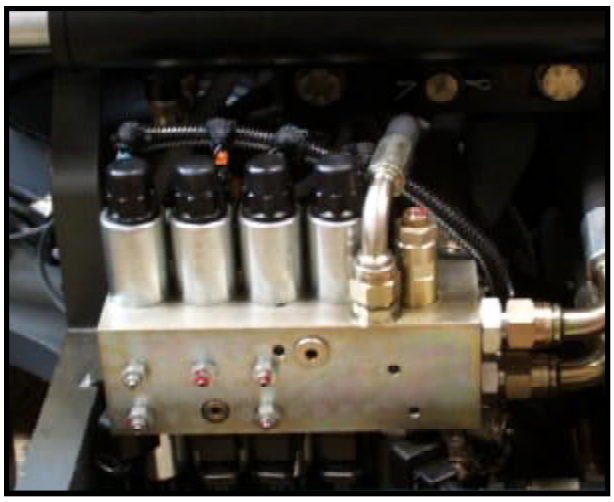
1- Disconnect the battery from the electrical circuit of the work platform.
2- Unscrew the return filter cap and remove the spring.
3- Install a new filter cartridge.
4- Check the presence and condition of the O ring, close the filter cap not forgetting to install the spring.

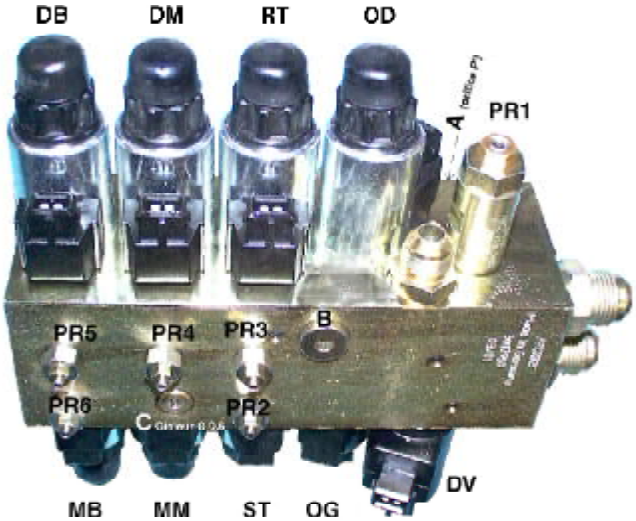
CAUTION

The pressure filter must also be replaced.

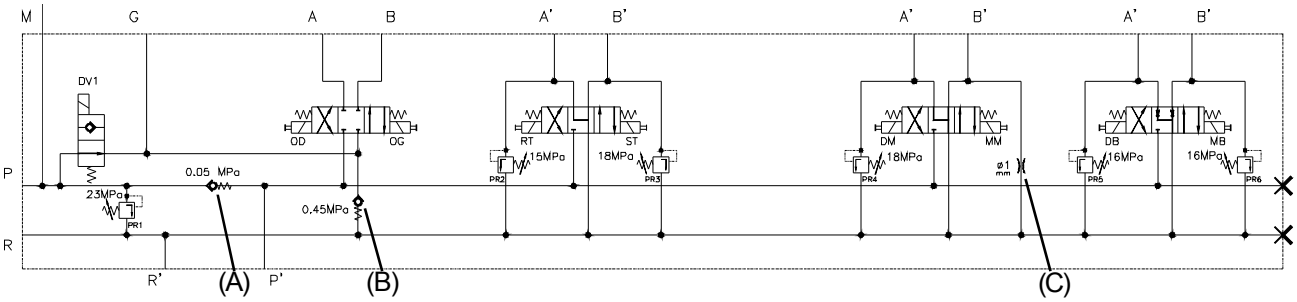
3.4 Function manifold

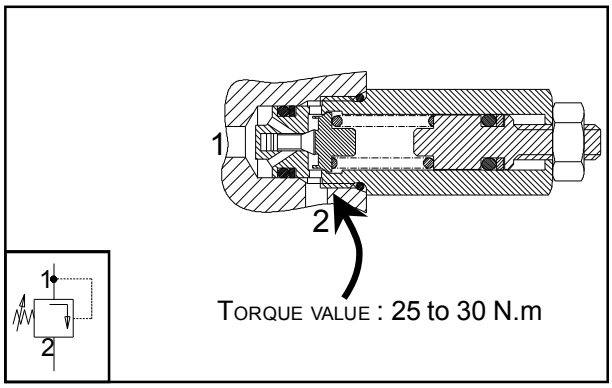
FUNCTION : Hydraulic control for the different structure movements of the work platform.

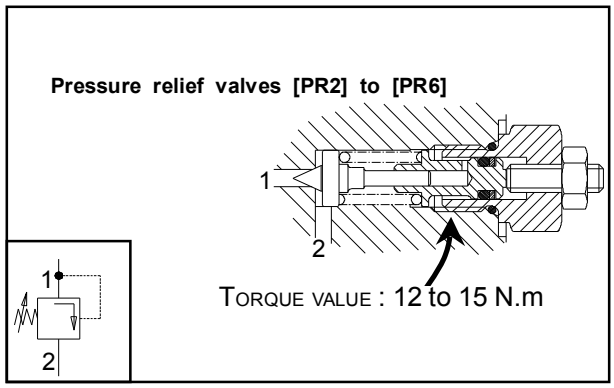




Manifold schematic :







PR1 : General pressure relief valve

PR2 : Pressure relief valve : Telescope extension
PR3 : Pressure relief valve : Telescope retraction
PR4 : Pressure relief valve : Mast elevation
PR5 : Pressure relief valve : Jib elevation
PR6 : Pressure relief valve : Jib lowering

Setting range of the pressure relief valves [PR2] to [PR6] : 0 to 25 MPa (0 to 250 bar).

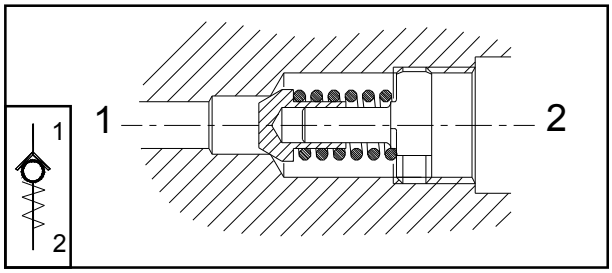
Setting of pressure relief valves : See § 3.19.

A. Check valve (0,05 MPa)

Function : Prevents the oil flow suplied by the hand pump from returning to the reservoir during operation using the breakdown controls.

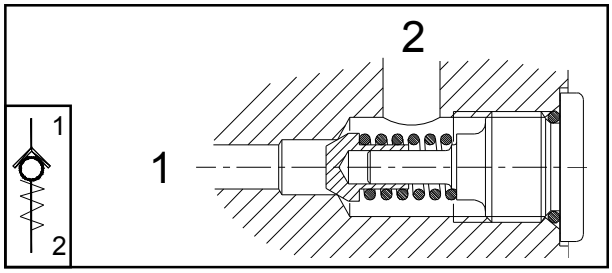
NOTE

The check valve is kept in position by deformation of the thread : cannot be removed.



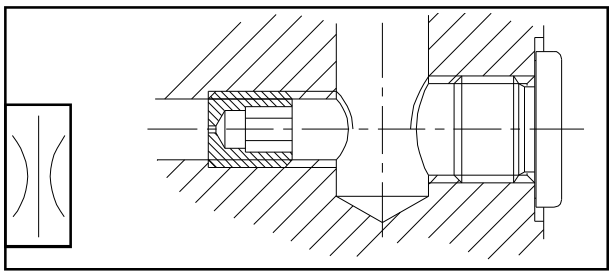
B. Check valve (0,45 MPa)

Function : Provides a necessary counter pressure in the boost circuit. Limits the oil return of the make up flow diverted by the solenoid valve [DV1].



C. Jet Ø 1 mm

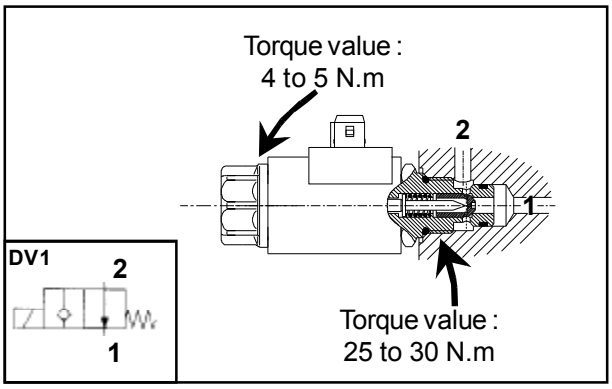
Function : Ensures decompression of the pilot circuit of the counterbalance valve on the mast cylinder (lowering movement).



NOTE

The jet is installed with glue : cannot be removed.

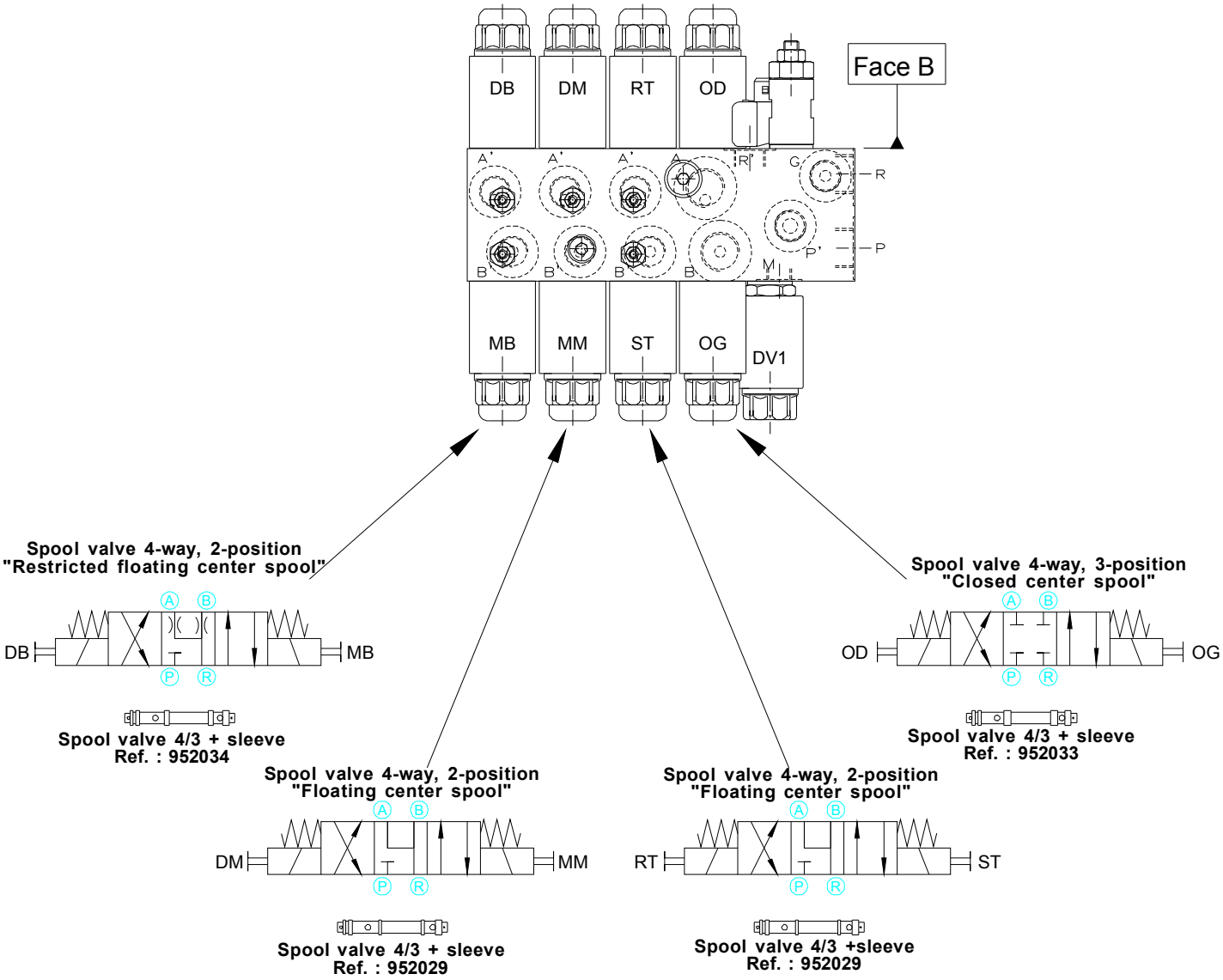
DV1 : Solenoid valve (NO).



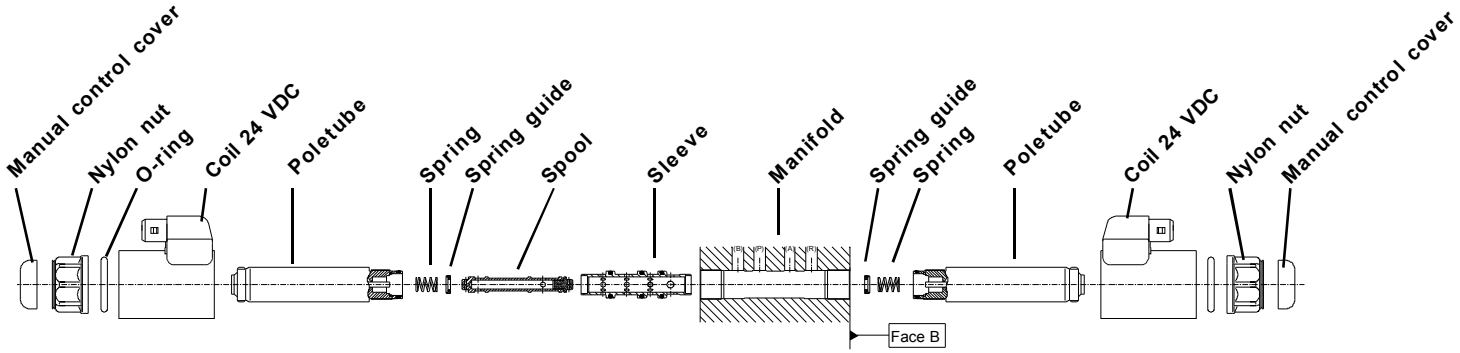
Function :

- Dumping of the oil flow supplied by the main hydraulic power unit (if not actuated).
- Divertion of the oil flow to the boosting circuit of the wheel motors during the stopping phases of the drive movements.

OG/OD : Solenoid valve 4-3 - Slewing movement Left / Right
RT/ST : Solenoid valve 4-3 - Telescope extension / retraction movement
MM/DM : Solenoid valve 4-3 - Mast elevation / lowering movement
MB/DB : Solenoid valve 4-3 - Jib elevation / lowering movement



Exploded view of a solenoid valve 4-way, 3-position :



Disassembly :

1- Remove the plastic nuts holding the coils.
2- Remove the O-rings and the coils.
3- Remove the poletubes using adequate tooling (Ref. 990005), (Torque to unscrew : 13 to 33 N.m).
4- Remove the spring guides and drive the spool out of the sleeve.

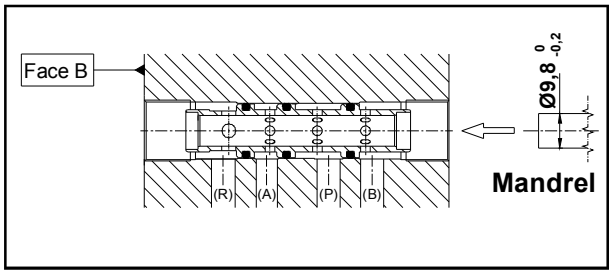
Inspection :

1- Clean all parts with an appropriate solvent and dry with compressed air.
2- Check the spool surfaces are not scratched.
3- Check the axial and radial holes at each end of the spool are not blocked.

NOTE

If the spool is scratched or if the holes are blocked, the spool AND the sleeve must be replaced.

If the spool and the sleeve have to be replaced, drive the sleeve out of the manifold using an appropriate mandrel in the direction indicated in the drawing below :



Assembly :

⚠ CAUTION

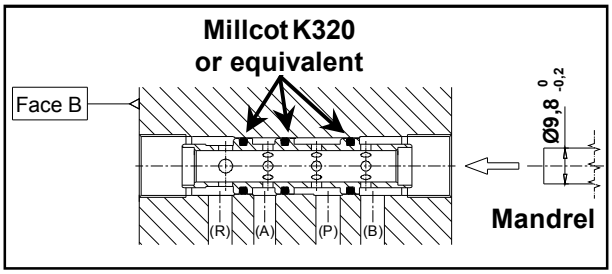
Never interchange spools and sleeves. All components must be clean before assembly.

1- Check for burrs that could damage O-rings during the installation of the sleeve.
2- Install the O-rings on the sleeve.

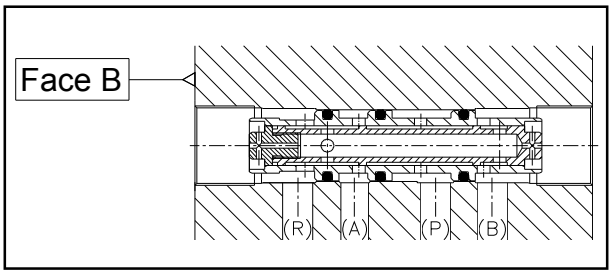
NOTE

Ensure the seals are not stretched and the grooves damaged during assembly.

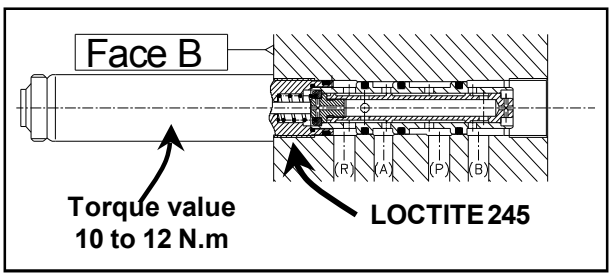
3- Lubricate the seals before sleeve installation (MILLCOT K320 or equivalent).
4- Insert the sleeve in the manifold using an appropriate mandrel in the direction indicated in the drawing below :



5- Lubricate the spool with clean hydraulic oil. Slide the spool into the sleeve as indicated below. Ensure the spool slides freely inside the sleeve.



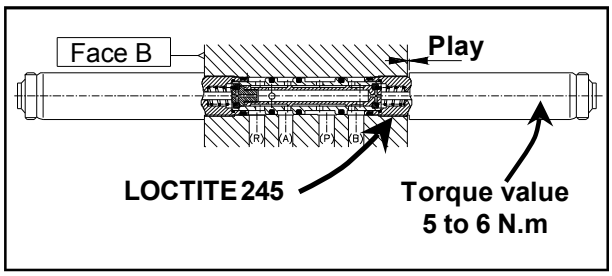
6- Install the spring guide on face B side as indicated in the drawing below. Install the spring in the poletube. Install the poletube on the manifold using Loctite® 245. Torque the poletube to 10 - 12 N.m using adequate tooling (Ref. 990005).



NOTE

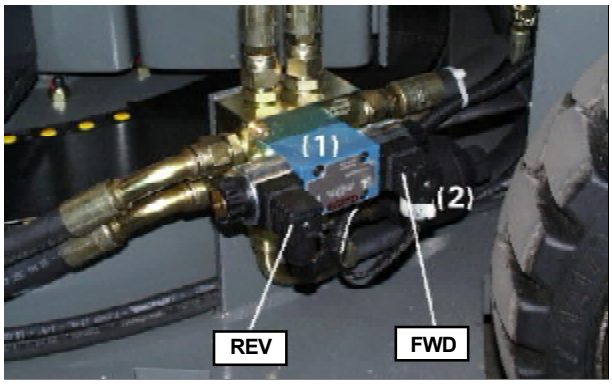
The thread on the poletube must be free from oil or grease before the glue is applied.

7- Install the spring guide on the other side of the sleeve. Install the spring in the poletube. Install the poletube in the manifold using glue Loctite® 245. Torque the poletube to 5 - 6 N.m using the adapted tooling (Réf. 990005).



8- Install the coils and O-rings. Torque the coil nylon nuts to 4 to 5 N.m

3.5 Drive manifold

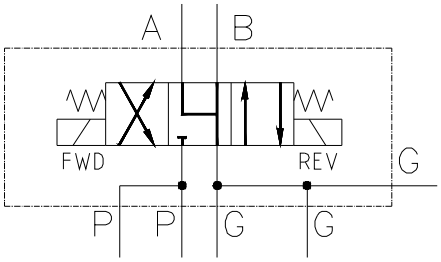


1 : Solenoid valve 4-way, 3-position (floating center spool).
Function : Selection of the drive direction (FWD / REV).

2 : Accumulator
See § 3.6.

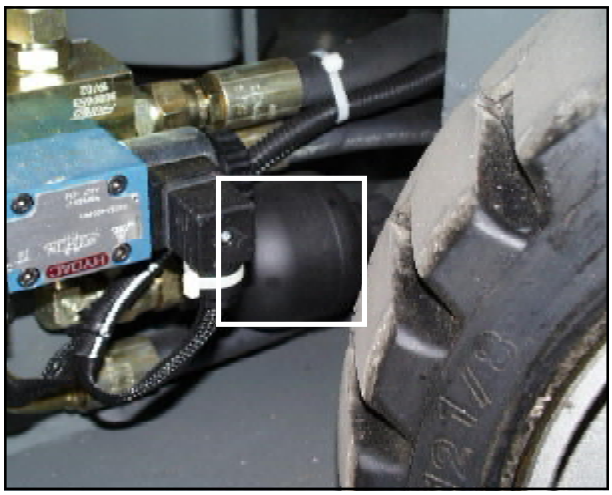
Torque value for the 4 bolts securing the solenoid valve : 9 N.m

Manifold schematic :



MAV : FWD
MAR : REV

3.6 Membrane accumulator



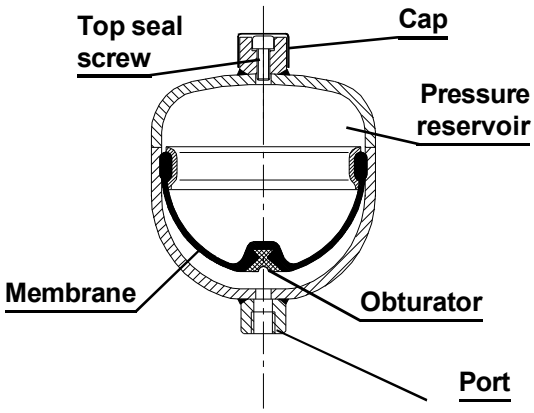
Function : Enables storage of a volume of oil destined to the make up flow for the wheel motors during reversal of the drive direction.

Technical characteristics :

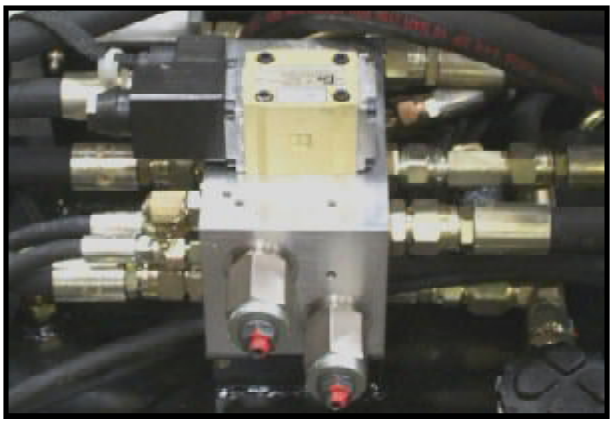
Inflating pressure	0,5 MPa (5 bar)
Gaz	Nitrogen
Maximum pressure	21 MPa (210 bar)
Nominal volume	0,16 litre
Port size	Ø 1/2" BSPP

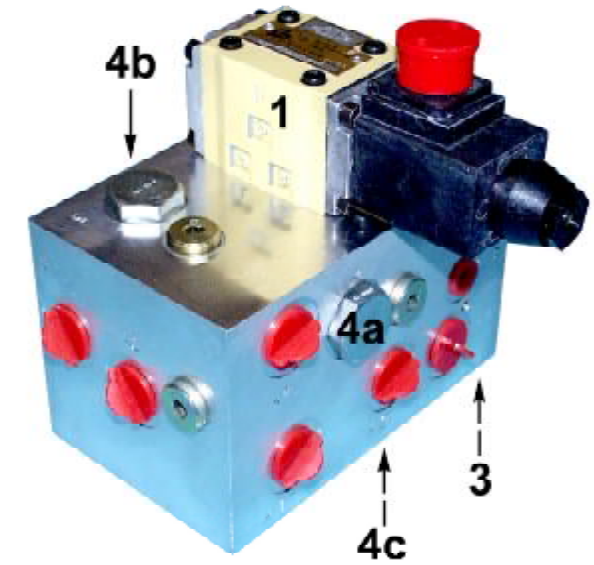
⚠ DANGER

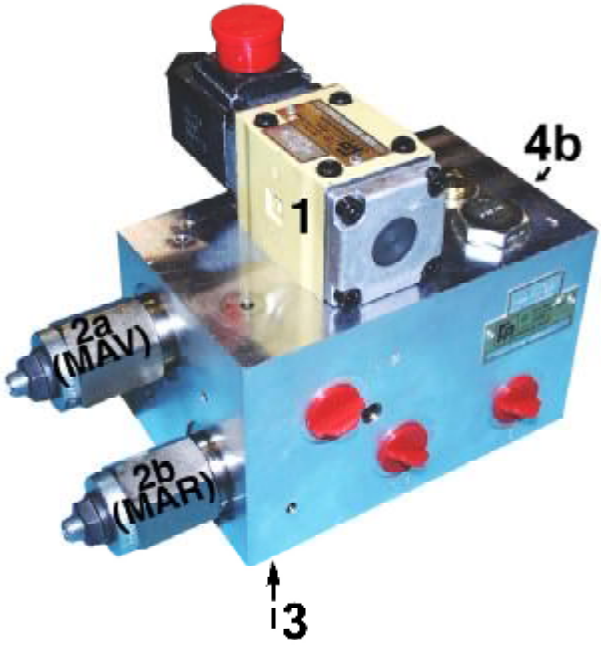
Never loosen the top seal screw.



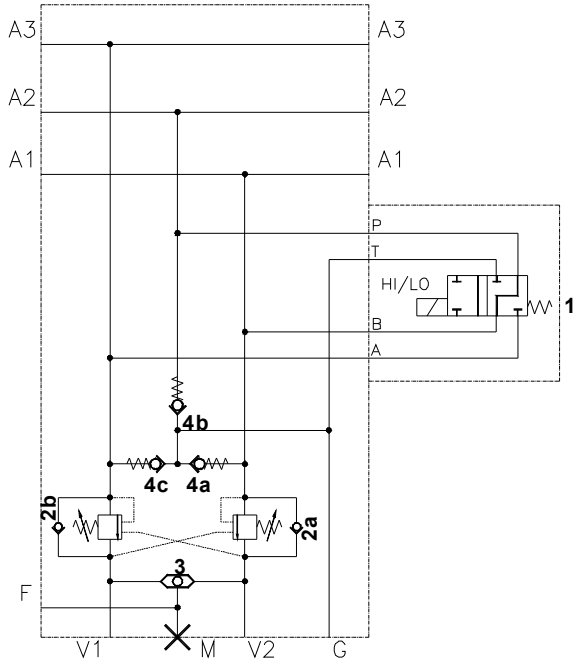
3.7 Wheel motor distribution manifold







Manifold schematic :



1 : Solenoid valve
Drive speed change [HI/LO]

2(a) : Counterbalance valve
Forward drive

2(b) : Counterbalance valve
Reverse drive

3 : Shuttle valve

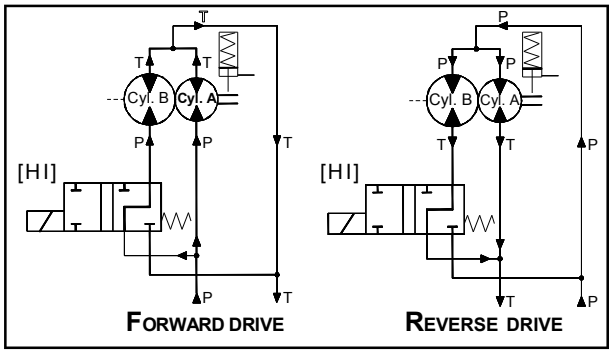
4(a).
4(b).
4(c). } Make up flow check valves

Torque value for the 4 bolts securing the solenoid valve [HI/LO] : 9 N.m

Solenoid valve 4-way, 2-position

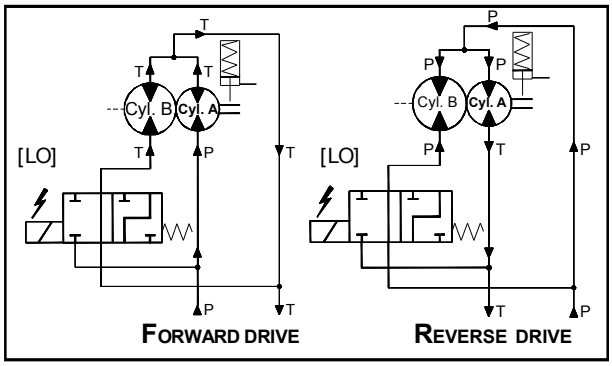
FUNCTION : Allows the change in drive speed by placing the "cyl. B" displacement of the wheel motors in "free wheel".

- When the solenoid valve is not actuated (and), both motor displacements (cyl. A + cyl. B) are supplied.



[HI] : High displacement ➔ slow speed

- When the solenoid valve is actuated ( ), only the motor displacement "cyl. A" is supplied, displacement "Cyl. B" is placed in "free wheel".



[LO] : Low displacement ➔ high speed

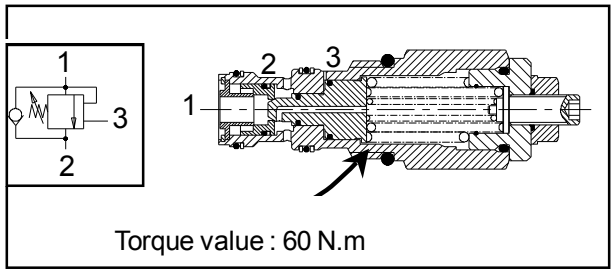
Counterbalance valves

FUNCTION : Allows dynamic braking of the work platform and the counter pressure necessary for the make up flow to the wheel motors.

Counterbalance valve setting : The tighter the setting screw is, the sharper is the braking of the work platform.
Adjustment must be done with the rated load correctly distributed in the work platform. Tighten completely the setting screw, then loosen by 4 1/2 turns to obtain an average setting.

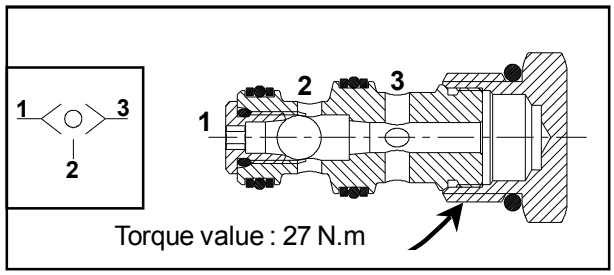
Sharpen the setting if necessary so that :

- When the work platform is driven at maximum speed, it stops over a distance of 0,8m to 1m on horizontal ground (in both drive directions) when the joystick is returned to its neutral position.
- When the work platform is driven down a 15% slope in 2nd gear, it stops over a distance below 1 m when the joystick is returned to its neutral position.

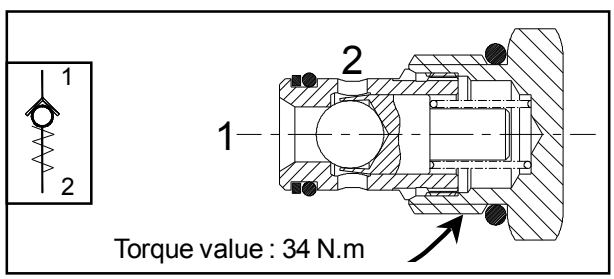


Shuttle valve

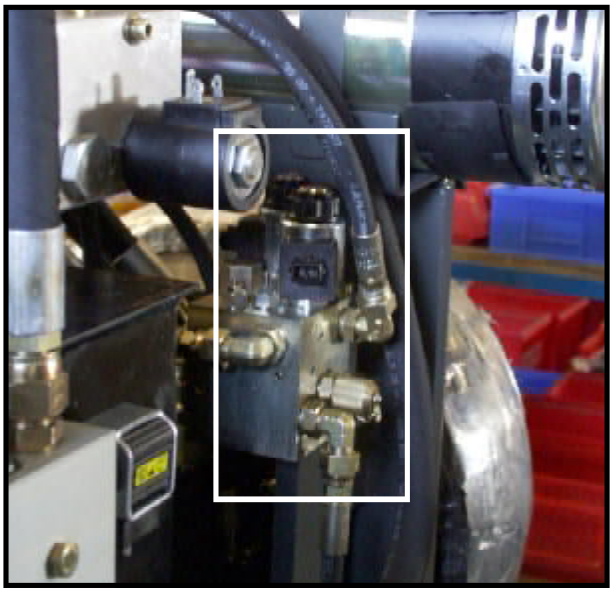
FUNCTION : Oil supply to the brake release circuit in both drive directions of the work platform.



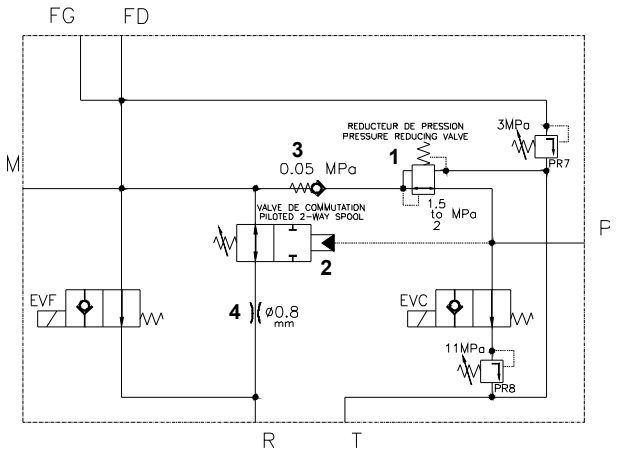
Make up flow check valves

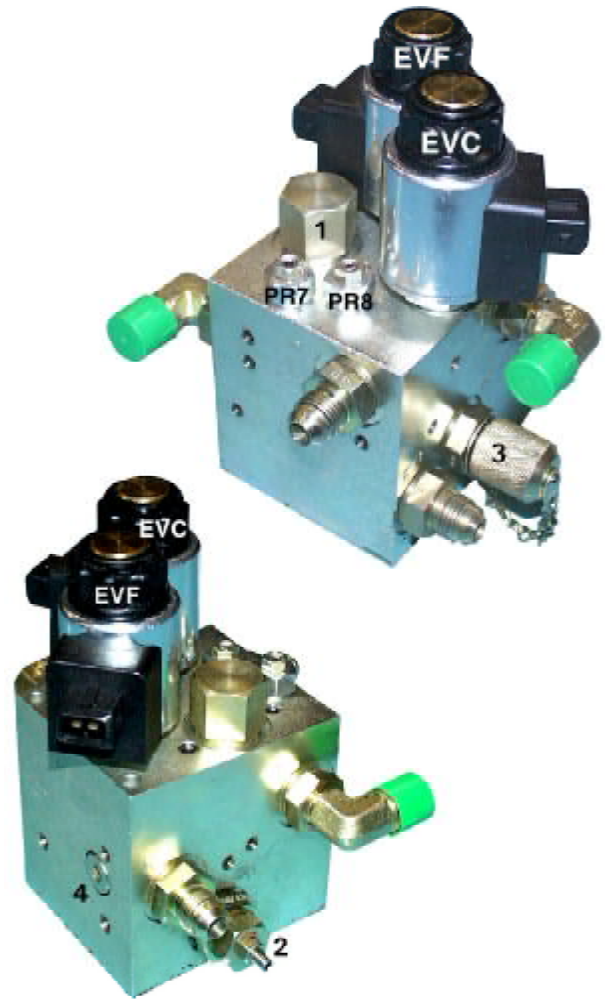


3.8 Brake manifold



Manifold schematic :





1 : Pressure reducing valve

2 : Piloted 2-way spool

3 : Check valve

4 : Jet

PR7 : Pressure relief valve
(Brake release using the hand pump)

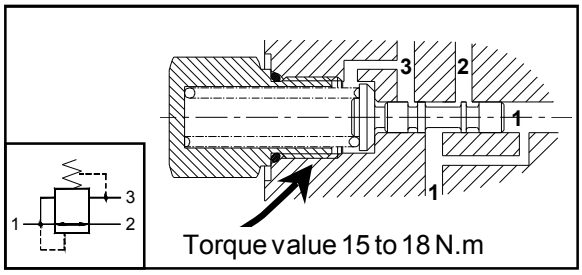
PR8 : Pressure relief valve
(Torque limiter at slow speed)

EVF : Decompression solenoid valve for the brake release circuit.

EVC : Solenoid valve enabling the relief valve [PR8] to operate.

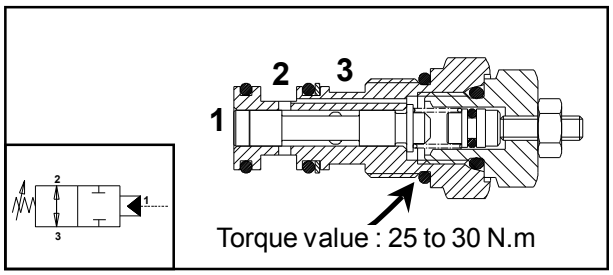
Pressure reducing valve

FUNCTION : Reduces the brake release pressure between 1,8 and 2,1 MPa (18 and 21 bar).



Piloted 2-way spool

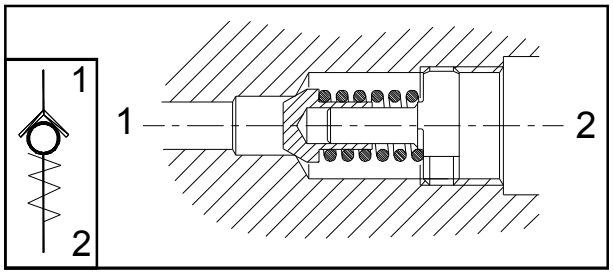
FUNCTION :
- Prevents the oil flow delivered to the brake release circuit from returning to the reservoir when the work platform is driven.
- Enables decompression of the brake release circuit when the drive control is released.



NOTE
Setting of the pilot pressure of the piloted 2-way spool is factory preset and should not be modified.

Check valve

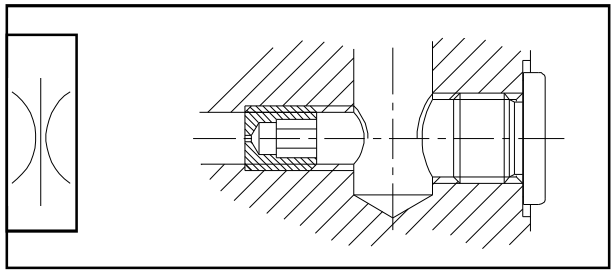
FUNCTION : Prevents the oil flow from returning to the tank (via the pressure reducing valve) while using the hand pump to release the brakes.



NOTE
The check valve is kept in position by deformation of the thread : cannot be removed.

Jet Ø 0,8

FUNCTION : Restricts the oil flow from returning to the tank during decompression of the brake release circuit (delays brake actuation during the dynamic braking phase performed by the counterbalance valves on the wheel motor distribution manifold).



NOTE
The jet is installed with glue : cannot be removed.

Pressure relief valve [PR7]

FUNCTION :
- Limits the brake release pressure while the hand pump is used.
- Protects the brake release circuit against any overpressure in case of malfunction of the pressure reducing valve.
- Setting range of the pressure relief valve [PR7] = 0 to 5 MPa (0 to 50 bar).

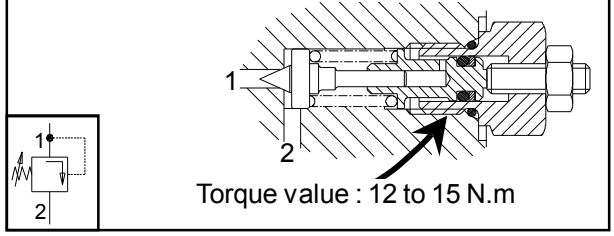
Pressure relief valve [PR8]

FUNCTION : Limits the pressure (therefore the wheel motor torque) in the drive circuit when the machine is driven at slow speed ( ).
- Setting range of the pressure relief valve [PR8] = 0 to 25 MPa (0 to 250 bar).

⚠ CAUTION

The pressure relief valves PR7 and PR8 do not share the same setting range. Do not interchange the valve springs.

Pressure relief valve PR7 - PR8



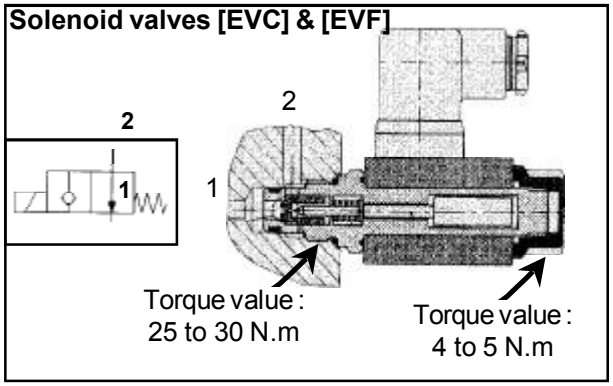
Setting of the relief valves : See § 3.19.

Decompression solenoid valve [EVF] for the brake release circuit

FUNCTION :

- Quick decompression (therefore immediate actuation of the brakes) of the brake release circuit when an emergency stop switch is activated.
- Automatic decompression of the brake release circuit 3 to 4 seconds after the release of the drive controls.

Solenoid valves [EVC] & [EVF]

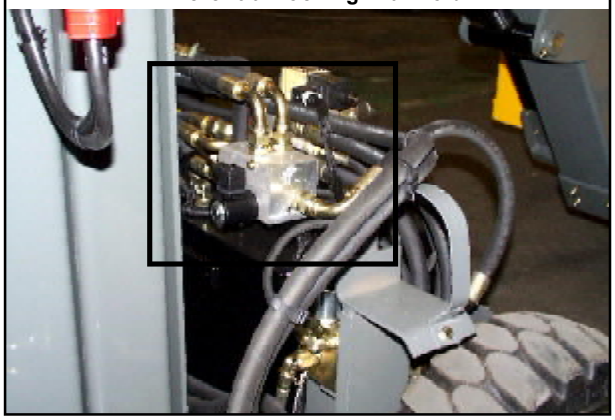


Solenoid valve [EVC] for operation relief valve [PR8]

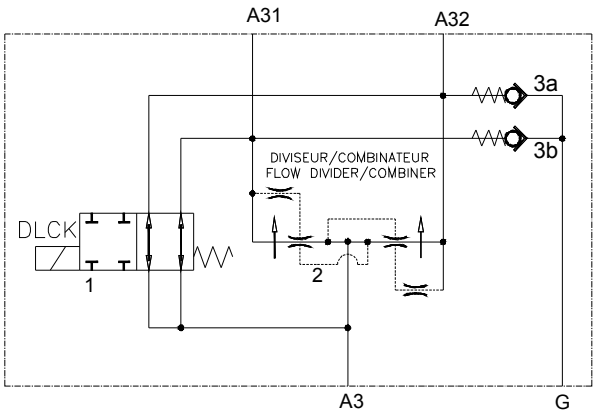
FUNCTION : When the machine is driven at slow speed ( ), supply to the solenoid is cut off and the pressure relief valve [PR8] comes in.

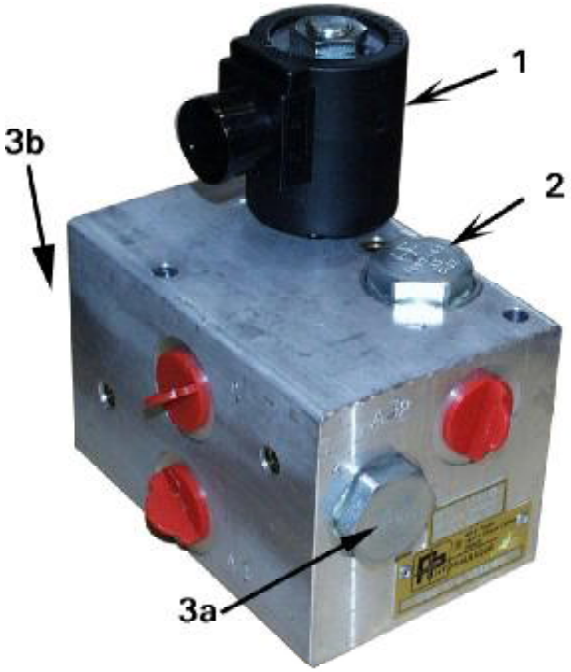
3.9 Differential locking manifold

Differential locking manifold



Manifold schematic :





1 : By-pass solenoid valve

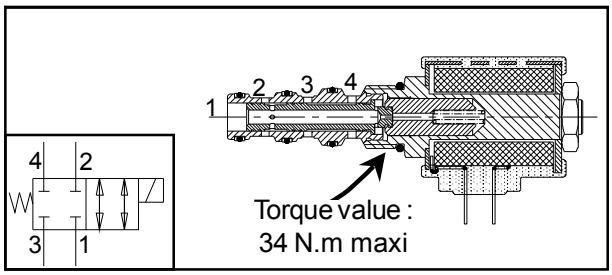
2(a) : Flow divider / Combiner

3(a) :
3(b) : } Make up flow check valves

By-pass solenoid valve - 4-way, 2-position

FUNCTION :
When the solenoid is not actuated :

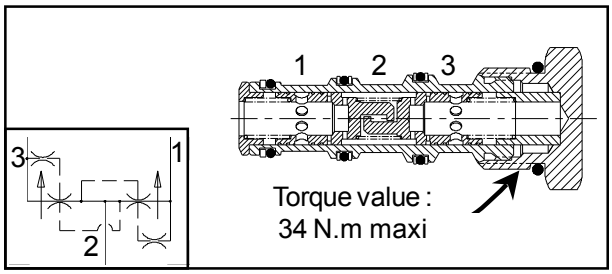
- Allows free flow between the motors and the wheel motor distribution manifold.
- When the solenoid valve is actuated () : blocks flow between the motors and the distribution manifold : the flow divider/combiner is operating.



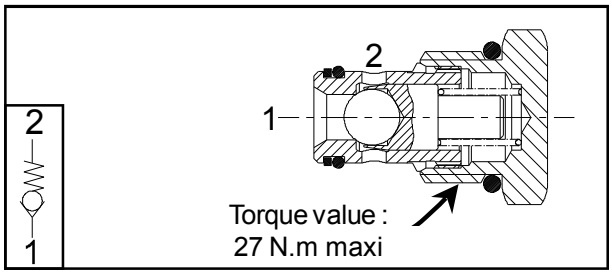
Flow Divider / Combiner

FUNCTION :
When the by-pass solenoid valve is actuated () :

- Divides equally the oil flow delivered to each wheel motor (in forward drive).
- Combines equally the oil return flow from each wheel motor (in reverse drive).



Make up flow check valve [3 (a)(b)]



3.10 Wheel motors

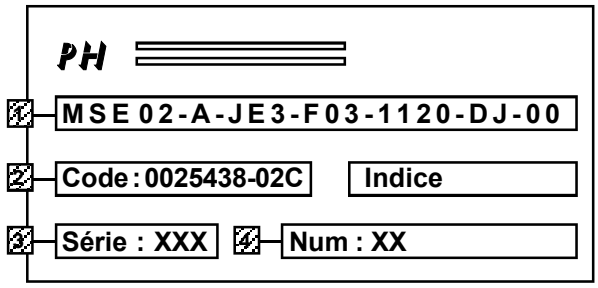
Technical characteristics :
(Radial piston motors)

- Motor 332 cc/rev. :

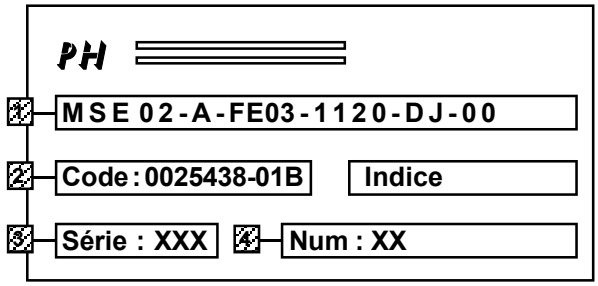
Minimum displacement (Cyl. A)	133 cm³/rev.
Maximum displacement (Cyl. A + B)	332 cm³/rev.
Braking torque	250 daN.m
Max. operating pressure	40 MPa (400 bar)
Brake release pressure	Mini : 1,2 Mpa (12 bar) Maxi : 3,0 Mpa (30 bar)
Studs	M14 x 150 (Qty : 5)

Motor identification 332 cc/rev. :

Left motor :



Right motor :



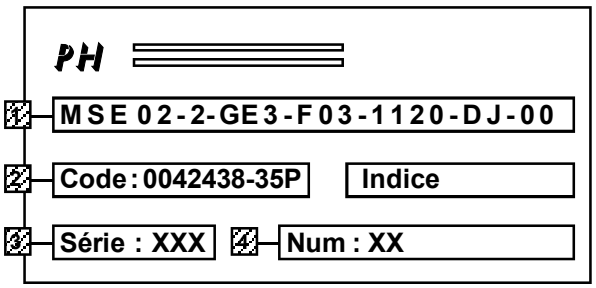
1. Commercial description
2. Code = Part number
3. Série = Production batch number
4. Num = Chronological serial number

- Motor 398 cc/rev. : (Option gradeabillity 15%)

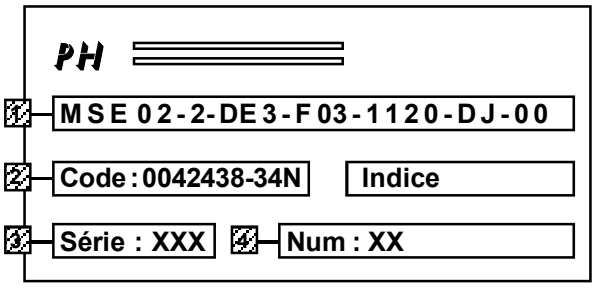
Minimum displacement (Cyl. A)	199 cm³/rev.
Maximum displacement (Cyl. A + B)	398 cm³/rev.
Braking torque	250 daN.m
Max. Operating pressure	40 MPa (400 bar)
Brake release pressure	Mini : 1,2 Mpa (12 bar) Maxi : 3,0 Mpa (30 bar)
Studs	M14 x 150 (Qty : 5)

Motor identification 398 cc/rev. :

Left motor :



Right motor :

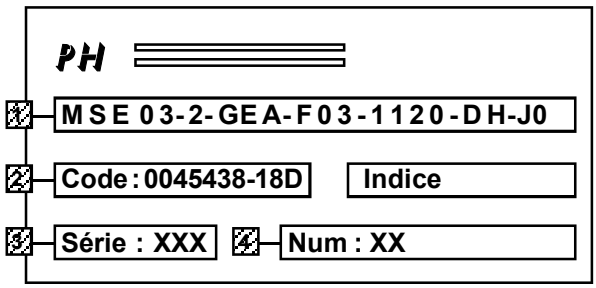


- Motor 500 cc/rev. : ("Power plus" option)

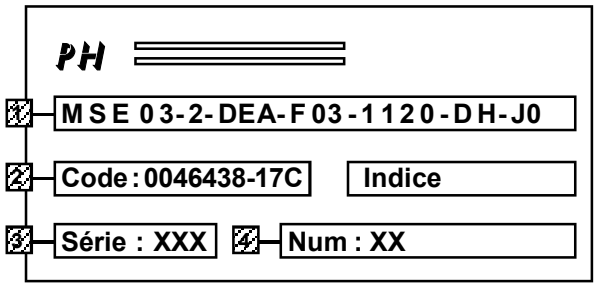
Minimum displacement (Cyl. A)	250 cm³/rev.
Maximum displacement (Cyl. A + B)	500 cm³/rev.
Braking torque	250 daN.m
Max. operating pressure	40 MPa (400 bar)
Brake release pressure	Mini : 1,2 Mpa (12 bar) Maxi : 3,0 Mpa (30 bar)
Studs	M14 x 150 (Qty : 5)

Motor identification 500 cc/rev. :

Left motor :

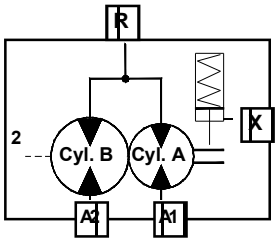


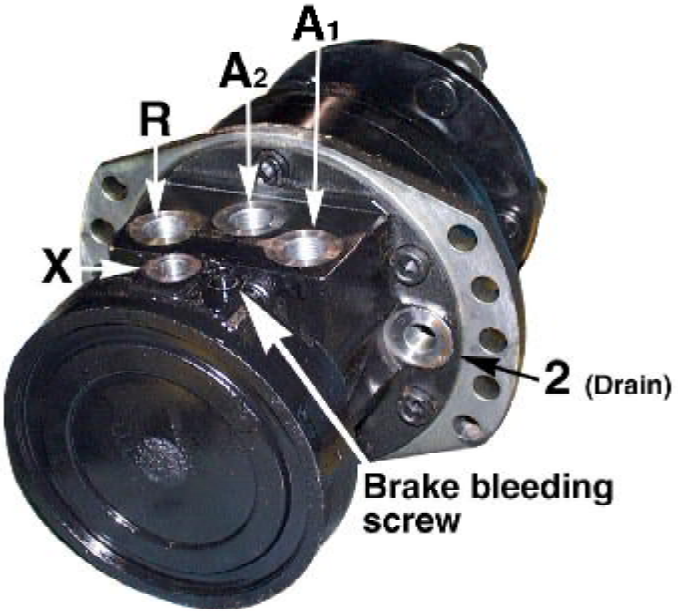
Right motor :



Ports identification :

Port A1 :
Supply port corresponding to the preferential rotation direction (Cyl. A).
Port A2 :
Supply port corresponding to the preferential rotation direction (Cyl. B).
Port R :
Return port corresponding to the preferential rotation direction.
Port X :
Brake pilot port.
Port 2 :
Housing drain port.





⚠ CAUTION

The brake pilot pressure should not exceed 3,0 MPa (30 bar) continuous.

⚠ CAUTION

The pressure in the motor housing should not exceed 0,1 MPa (1 bar) after the stabilisation of hydraulic fluid temperature (0,3 MPa (3 bar) max. when cold).

⚠ CAUTION

Do not operate the motors without any load and at maximum speed.

⚠ CAUTION

Repeated use of the brakes as emergency brakes (action on the emergency stop during a drive movement) will reduce the braking torque. The brakes must be tested for efficiency after emergency braking.

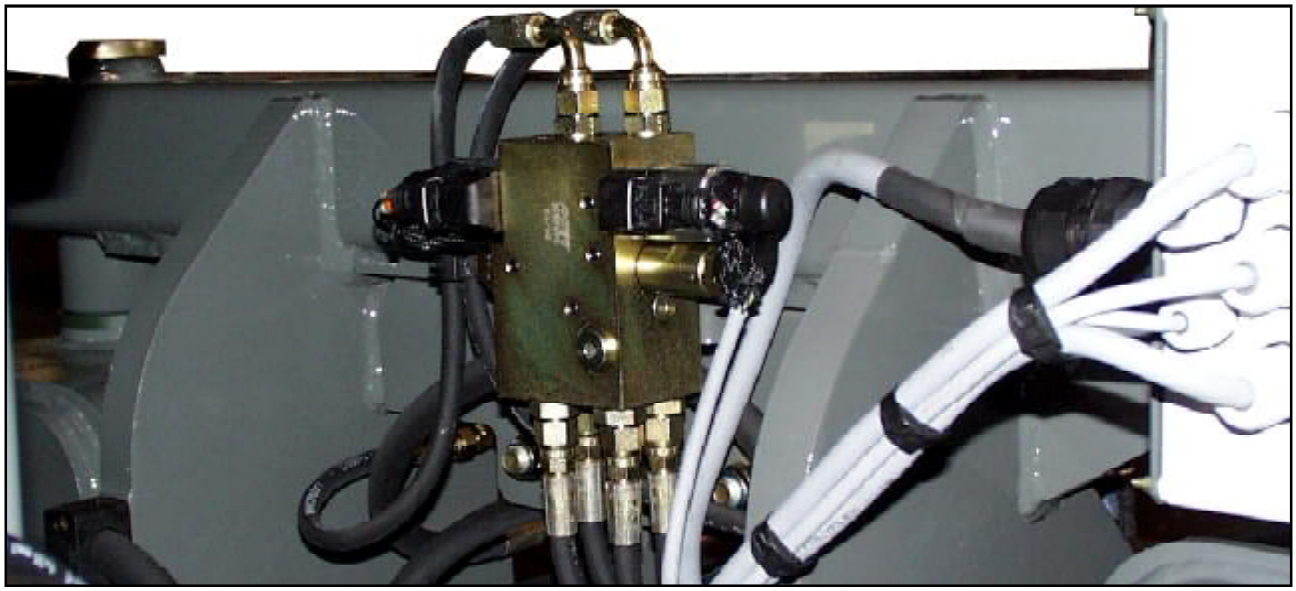
NOTE
Before starting a motor, the housing must be filled with hydraulic oil through Port "2".

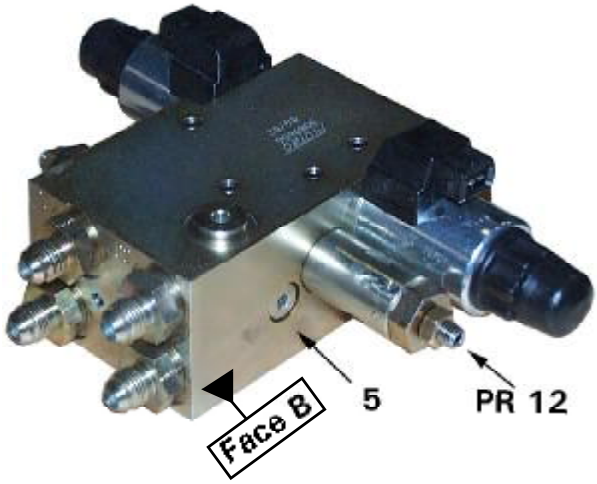
NOTE
Disassembly of the wheel motors requires specific competences and tooling. Contact JLG Product Support.

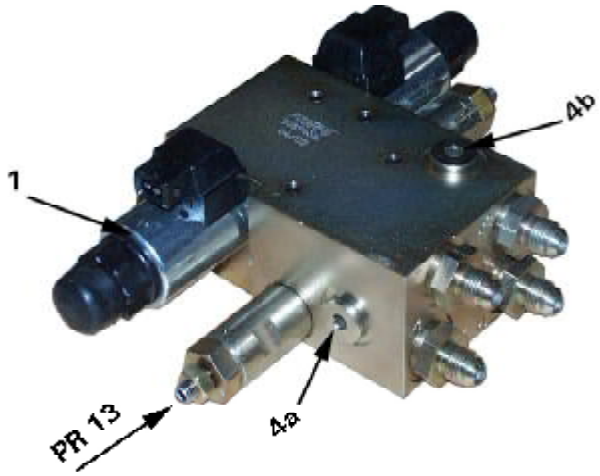
Troubleshooting

SYMPTOMS			PROBABLE CAUSE	SOLUTIONS
NOISY MOTOR	Without load	Regular rumbling	Worn bearing support	Replace the bearing support
		Vibrations	Mounting and/or hydraulic piping becoming loose	Tighten to torque
	Under load	Clattering	Boost pressure too low	- Check the pressure setting and condition of the counterbalance valves (Wheel motor distribution manifold) - Check boost pressure. Check for any leak in the drive circuit.
		Cavitation	Internal leaks too important	Replace the cylinder block and the distribution valve assembly : Contact JLG Product Support
THE MOTOR DOES NOT REVOLVE			No supply to the motor	Check the pump drive and pump inlet
			The circuit does not reach working pressure	- Check the position of the motor release valve. - Check the condition of the pressure relief valve [PR1] - Check the supply and condition of the solenoid valve [EVC] (Brake manifold).
			Excessive internal leaks	Replace the cylinder block and the distribution valve assembly : Contact JLG Product Support
			The brake stays engaged	- Check the brake pilot circuit. - Check the brakes bleeding screws, - Check the supply and condition of the solenoid valve [EVF] (Brake manifold).
THE MOTOR DOES NOT REVOLVE AT ITS NORMAL SPEED UNDER LOAD			The pump flow is too low	- Check the condition of the gear pump. - Check the acceleration input received by the electronic controller.
			Excessive internal leaks	Check the condition of the cylinder block and of the distribution: Contact JLG Product Support.
			Working pressure is too low	- Check setting and condition of the counterbalance valves (wheel motor distribution manifold) - Check the drive circuit for leaks. - Check the supply and condition of the solenoid valve [EVC] (Brake manifold). - Check the condition of the motor release valve. - Check the condition of the piloted 2 way spool (Brake manifold).
THE MOTOR REVOLVES IRREGULARLY			Irregular flow	- Check the oil level in the reservoir. - Check the pump flow.
			Excessive leaks	Check the condition of the cylinder block and of the distribution valve assembly : Contact JLG Product Support.
EXTERNAL OIL LEAKS			Too high housing pressure	Check the drain circuit
			Damaged seals	Replace the seals : Contact JLG Product Support.
			Incorrect assembly	Tightening of motor mounting screws, of bleeding screws and hydraulic fittings.

3.11 Steering manifold







1 : Solenoid valve, 4-way, 3-position

2 : Pressure relief valve [PR 12] :
Steering to the right.

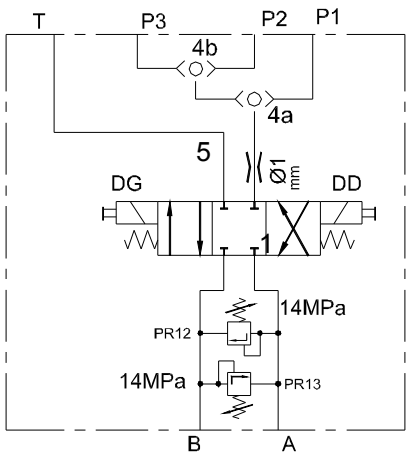
3 : Pressure relief valve [PR 13] : See § 3.4
Steering to the left.

4a :
4b : } Shuttle valve

5 : Jet Ø 1 mm

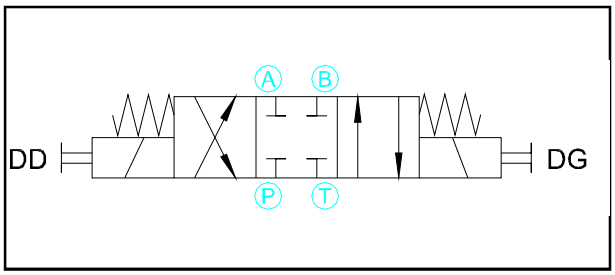
Manifold schematic :

DG : Steer LEFT
DD : Steer RIGHT



Solenoid valve 4-way, 3-position - Steering movement

Function :
- Selection of the steering movement direction.



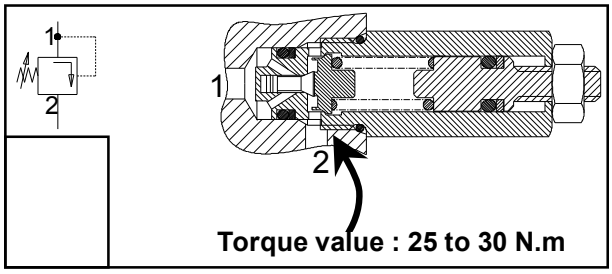
4-way, 3-position "close center spool".
Spool 4/3 + sleeve 06E.
Ref. : 952033

Removal / Installation procedure for the 4/3 spool

See § 3.4.

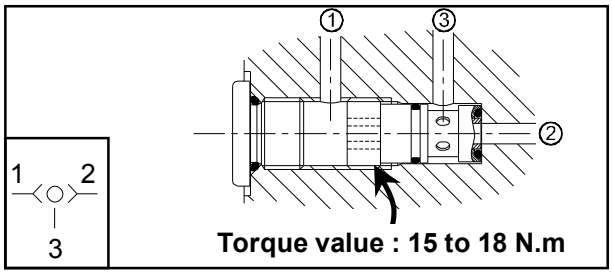
Pressure relief valves [PR 12] [PR 13]

Setting of the pressure relief valves : See § 3.19.



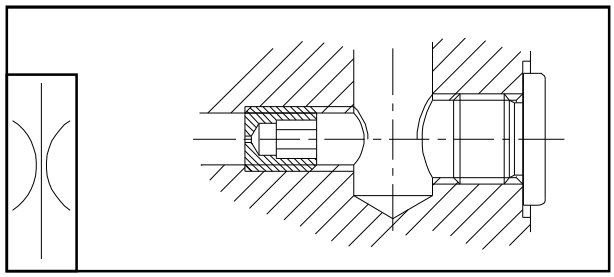
Shuttle valve

Function : Directs oil from the highest pressure circuit to the steering cylinder supply circuit.



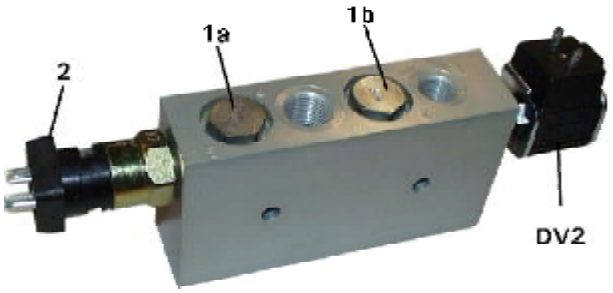
Jet Ø 1 mm

Function : Restricts the oil flow taken for the steering cylinder supply (limitation of speed reduction of the drive movement when a steering movement is controlled simultaneously).



NOTE
The jet is installed with glue : cannot be removed.

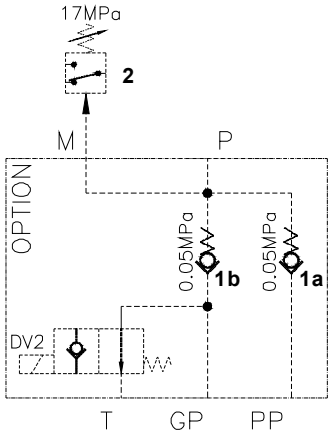
3.12 Check valves manifold ("power plus" option)



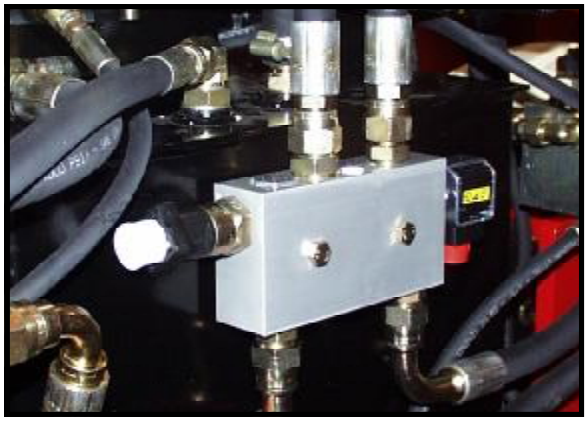
DV2 : Solenoid valve (NO).
1a : Check valve
1b : Check valve
2 : Pressure switch

FUNCTION : Combines the flow from both pumps when the "power plus" option is installed.

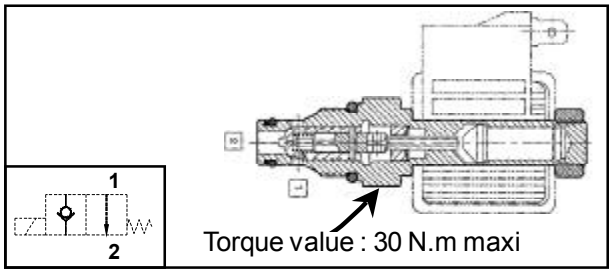
Manifold schematic



PORT GP :
auxilliary pump inlet
PORT PP :
Main pump inlet



DV2 : Solenoid valve (NO).



FUNCTION : Dumping of the oil flow supplied by the secondary hydraulic power unit.

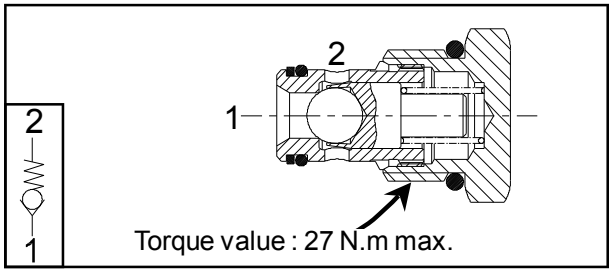
Check valve (1a)

FUNCTION : Prevents the return of the oil flow supplied by the main hydraulic power unit through the pump of the auxilliary power unit.

Check valve(1b)

FUNCTION : Prevents the return of the oil flow supplied by the auxilliary hydraulic power unit through the pump of the main power unit.

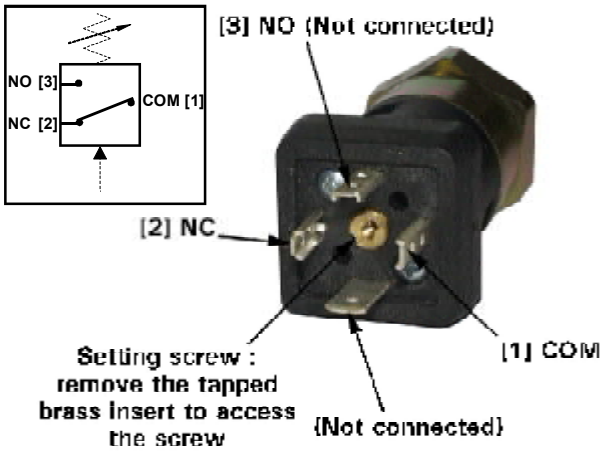
Check valves (1a) (1b)



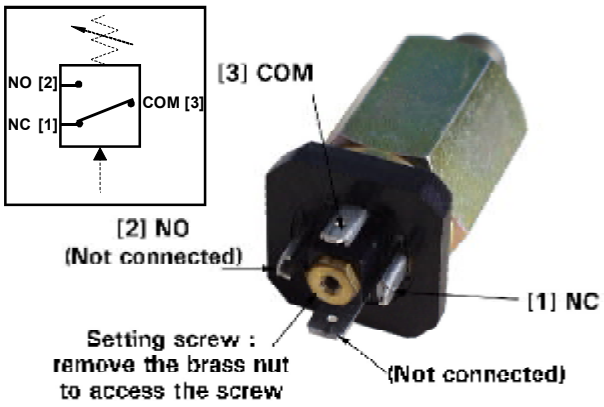
Pressure switch

Function : Cuts automatically the auxilliary hydraulic power unit as soon as the pressure in the circuit reaches the pressure switch setting : (17 ± 1 MPa / 170 ± 10 bar).

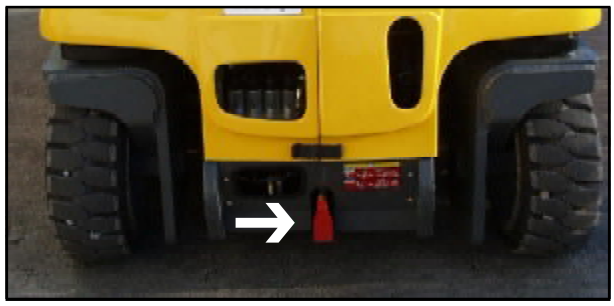
Electrical connections : "PDAH" models



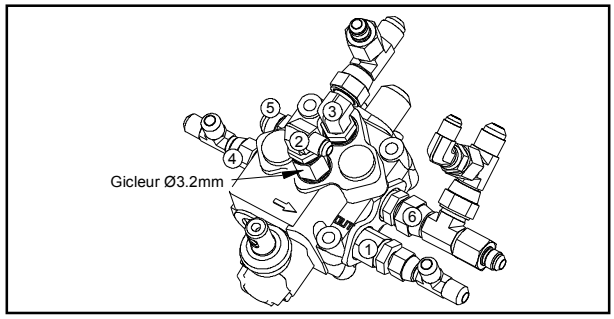
Electrical connections : "PSP" models



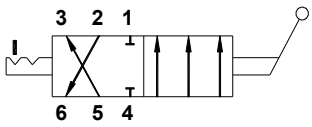
3.13 Release control valve



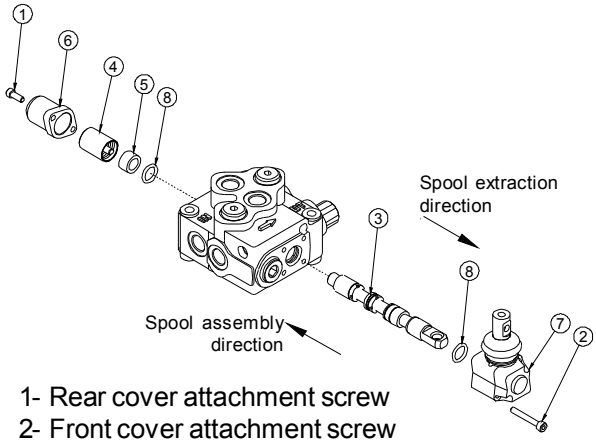
Function :
- Release of the wheel motors (free wheel).
- Diverts the hand pump flow to the brake release circuit.
- Return the oil from the hydraulic power unit(s) to the tank.



Control valve schematic :

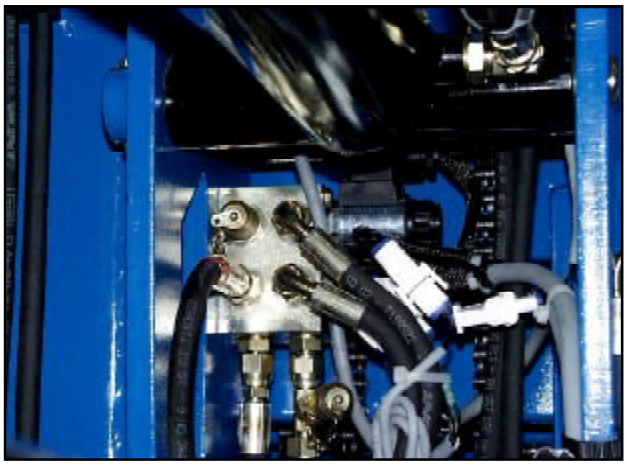


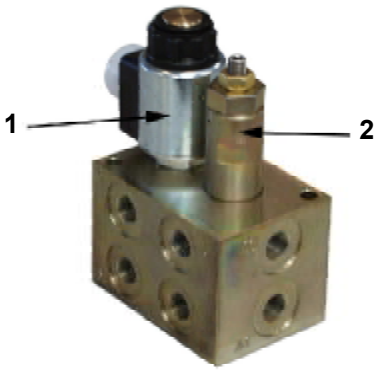
Control valve exploded view :



1- Rear cover attachment screw
2- Front cover attachment screw
3- Spool
4- Index
5- Spacer
6- Rear cover
7- Front cover
8- O-ring

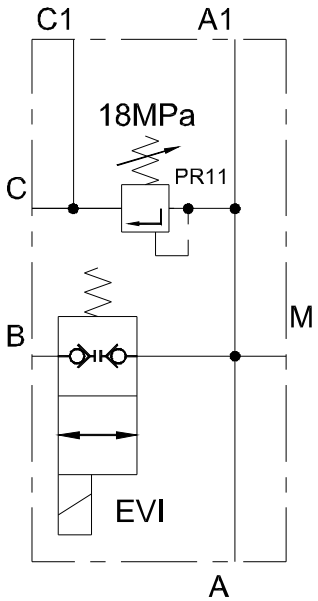
3.14 Trim correction manifold





1. Poppet solenoid valve [EVI]
2. Pressure relief valve [PR11]

Manifold schematic



Function : Enables the adjustment of the horizontality of the work platform :

- When a movement to tilt the platform to the rear is controlled :

  - The solenoid valve [EVI] is actuated.
  - The coil [MB] (Jib elevation) on the function manifold is supplied.

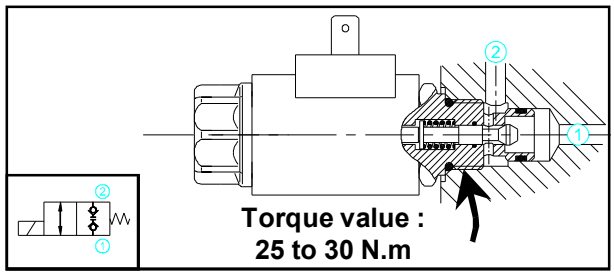
An additional volume of fluid is admitted in the trim circuit between the master cylinder (rod side) and the slave cylinder (piston side) : the work platform tilts rearwards.

- When a movement to tilt the platform to the front is controlled :

  - The solenoid valve [EVI] is actuated.
  - The coil [DB] (Jib lowering) on the function manifold is supplied.

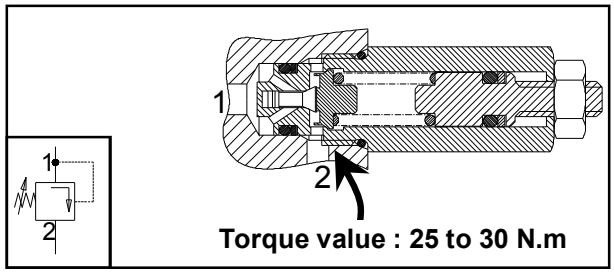
A volume of fluid is extracted from the trim circuit between the master cylinder (rod side) and the slave cylinder (piston side) : the work platform tilts forwards.

Solenoid poppet valve [EVI]



Pressure relief valve [PR1]

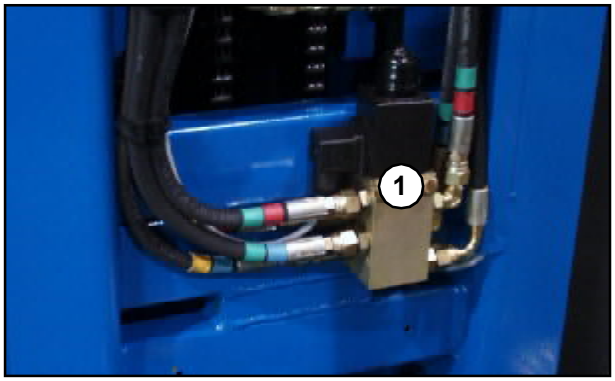
Function : Protects the trim circuit against excessive pressure during the jib elevation movement.

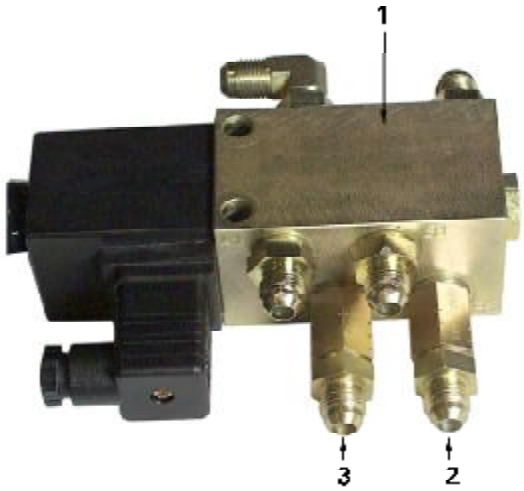


Setting of the pressure relief valve : see § 3.19.

3.15 7-way, 3-position flow diverter (option)

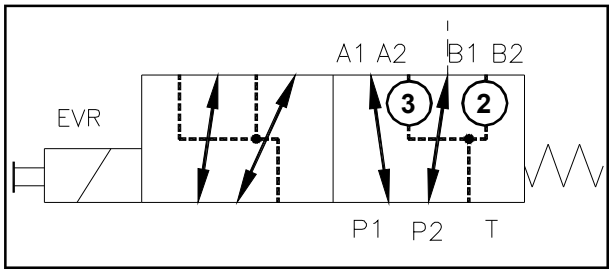
Function : Diverts the supply circuit for the telescope cylinder to the cylinder ensuring the work platform rotation. The diverter coil [EVR] is supplied when a rotation movement is controlled. The direction of the rotation movement is determined by the solenoid valve ST/RT on the function manifold (see § 3.4). Port "T" enables the decompression of the cylinder circuit that is not used.





Diverter 7-way, 2-position

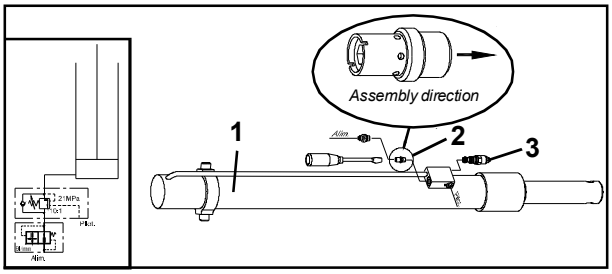
1. 7-way, 2-position flow diverter
2. Jet Ø 0.6 mm on port B2



3. Jet Ø 1.0 mm on port A2

3.16 Cylinders supply manifold

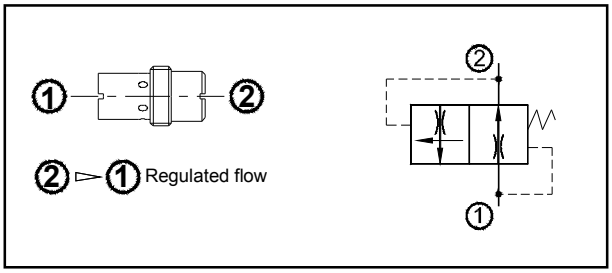
3.16.1 Mast cylinder



1. Single effect cylinder wet rod Ø80 - stroke 1005mm (T1210) and 1175mm (T1310).
2. Pressure compensated flow regulator : 9 l/mn.
3. Counterbalance valve : pilot ratio : 10:1.

Pressure compensated flow regulator

Function : Ensures a constant lowering speed whatever the load in the work platform.



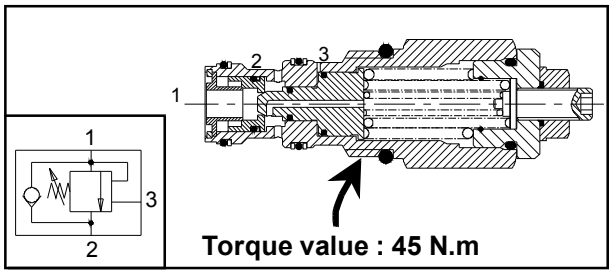
⚠ CAUTION

Respect the assembly direction of the flow regulator. Use a screwdriver of appropriate dimension to prevent damage to the regulator recess.

Counterbalance valve

FUNCTION :

- Load holding in the event of hose failure.
- Allows pressure relief in case of overload.
- Allows thermal expansion relief of the hydraulic fluid.

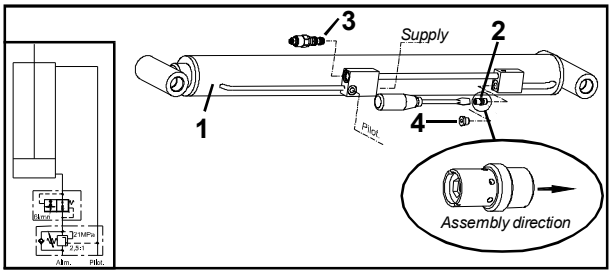


Pilot ratio : 10:1.
Setting : 21MPa (210 bar) at 4 l/mn (factory setting).

NOTE

The locknut must be tight to prevent any external leak.

3.16.2 Jib cylinder

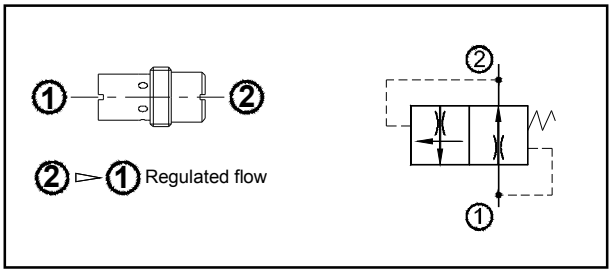


1. Double effect cylinder Ø80-60 - stroke 783 mm
2. Pressure compensated flow regulator : 9 l/mn
3. Counterbalance valve : pilot ratio : 2,5:1
4. Male cap Ø3/8" BSPP

Pressure compensated flow regulator

FUNCTION :

- Ensures a constant lowering speed whatever the load in the work platform.



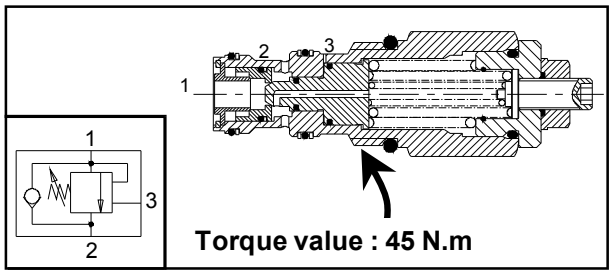
⚠ CAUTION

Respect the assembly direction of the flow regulator. Use a screwdriver of appropriate dimension to prevent damage to the regulator recess.

Counterbalance valve

FUNCTION :

- Load holding in the event of hose failure.
- Allows pressure relief in case of overload.
- Allows thermal expansion relief of the hydraulic fluid.

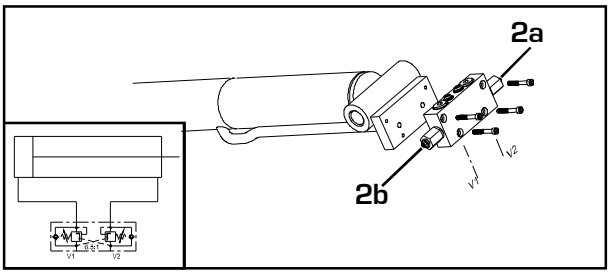


Pilot ratio : 2,5:1
Setting : 21MPa (210 bar) at 4 l/mn (Factory setting)

NOTE

The locknut must be tight to prevent any external leak.

3.16.3 Telescope cylinder



1. Double effect cylinder Ø70-45 - stroke 1205 mm
2. Dual overcenter valves
2a. Counterbalance valve rod side
2b. Counterbalance valve piston side.

Dual overcenter valves

FUNCTION :

- Load holding in the event of hose failure.
- Allows pressure relief in case of overload.
- Allows thermal expansion relief of the hydraulic fluid.

Pilot ratio : 6,5:1.

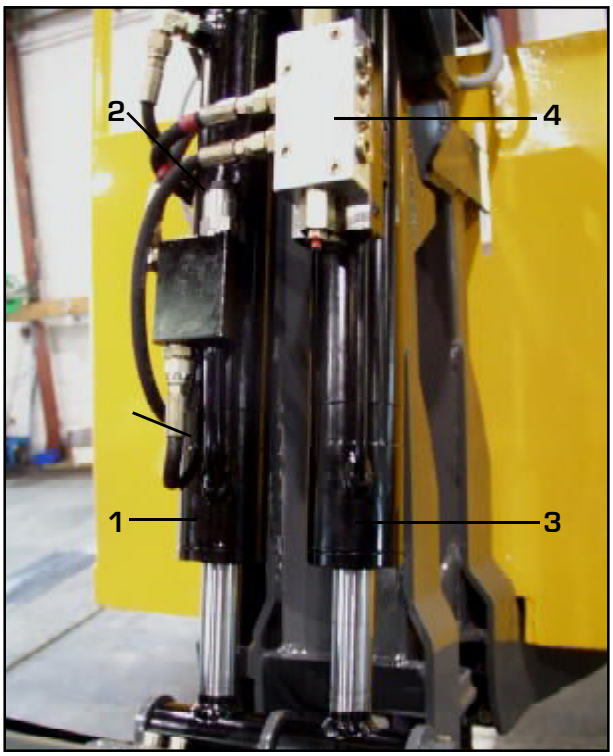
Setting of the counterbalance valve (2a) rod side

- Lower the jib, telescope retracted.
- Fully tighten the valve setting screw.
- Place a 250 kg load evenly distributed on the work platform floor.
- Slowly loosen the valve setting screw until the telescope starts to extend, then tighten the screw again by a 1 turn ½. Tighten the locknut.

Setting of the counterbalance valve (2b) piston side

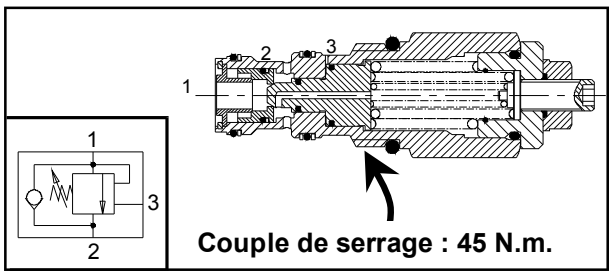
- Place a 250 kg load evenly distributed on the work platform floor.
- Fully tighten the valve setting screw.
- Fully raise the jib. Extend the telescope by approximately 50 cm.
- Slowly loosen the valve setting screw until the telescope starts to retract, then tighten the screw by a turn ½. Tighten the locknut.

3.16.4. Assistance cylinder - Master cylinder - Slave cylinder



1. Assistance cylinder :
   double effect Ø60-30 - stroke 319 mm.
2. Counterbalance valve
3. Slave cylinder :
   double effect Ø60-30 - stroke 319 mm.
4. Dual overcenter valves
   4a. Counterbalance valve rod side.
   4b. Counterbalance valve piston side.
5. Pressure compensated flow regulator : 3 l/mn.
6. Male cap Ø 3/8" BSPP.
7. Master cylinder :
   double effect Ø 70-35 - stroke 323 mm.
8. Bleeding screws.

Counterbalance valve

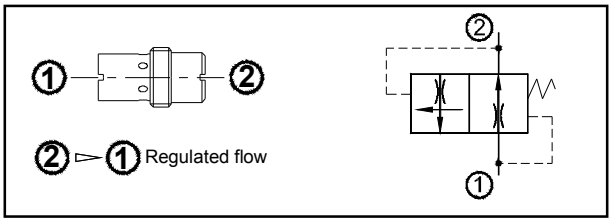


Pilot ratio : 2,5:1

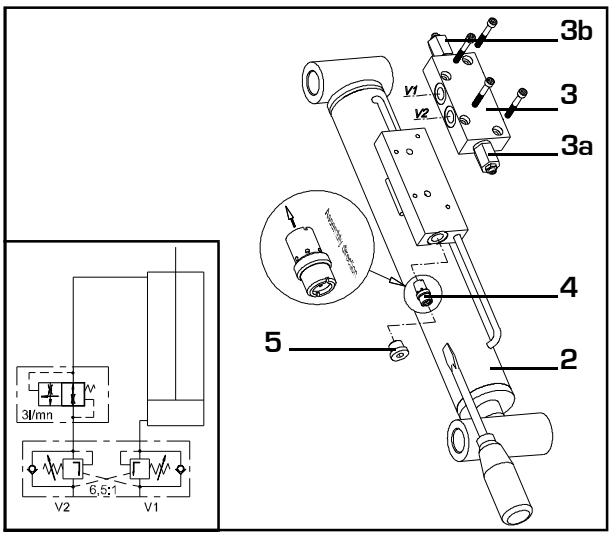
NOTE
The locknut must be tightened to prevent any external leak.

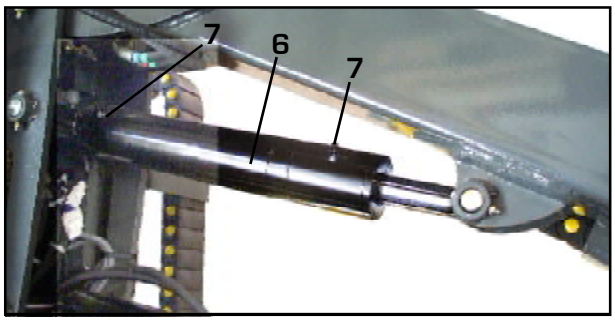
Pressure compensated flow regulator

Function : Ensures a constant extension speed of the cylinder whatever the load in the work platform.



Pilot ratio : 2,5:1





⚠ CAUTION

Respect assembly direction of the flow regulator. Use a screwdriver of appropriate dimension to prevent damage to the regulator recess.

Dual overcenter valves

FUNCTION :

- Load holding in the event of hose failure.
- Allows pressure relief in case of overload.
- Allows thermal expansion relief of the hydraulic fluid.

Pilot ratio : 6,5:1.

Setting of the counterbalance valve (4a) rod side

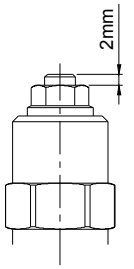
- Lower the jib with the work platform floor horizontal.
- Fully tighten the valve setting screw (4a). Loosen without removing it the counterbalance valve (2) setting screw and tighten the locknut.
- Place a 250 kg load evenly distributed on the work platform floor.
- Loosen slowly the setting screw until the platform starts to tilt rearwards, then tighten the screw again by 1 turn. Tighten the locknut.

Setting of the counterbalance valve (4b) piston side :

- Loosen the valve setting screw (4b).
- Tighten the valve setting screw until it contacts the valve spring, then tighten the screw by 2 turns. Tighten the locknut.

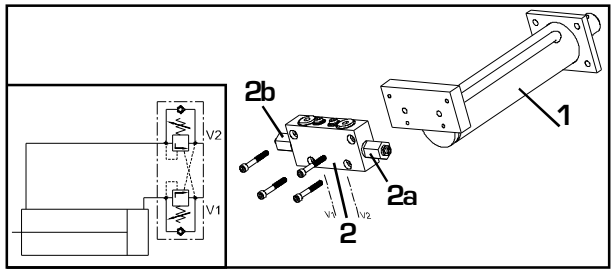
Setting of the counterbalance valve (2) :

- Tighten the setting screw and the locknut until the screw juts out over the locknut by 2mm.



- Lower the jib. Position the speed adjustment potentiometer for the structure movements on maximum speed ( ).
- With one person only in the platform, perform a trim correction movement towards the rear.
- The platform must recline to the rear and the jib not rise. Otherwise, loosen the setting screw by $^{1}/_{8}$ turn.

3.16.5 Rotation cylinder (optional)



1. Double effect cylinder Ø 50-30 - stroke : 130 mm.
2. Dual overcenter valves
2a. Counterbalance valve rod side
2b. Counterbalance valve piston side

Dual overcenter valves

FUNCTION :

- Keep the cylinder in position in the event of hose failure.
- Allow pressure relief in case of overload.
- Allow thermal expansion relief of the hydraulic fluid.

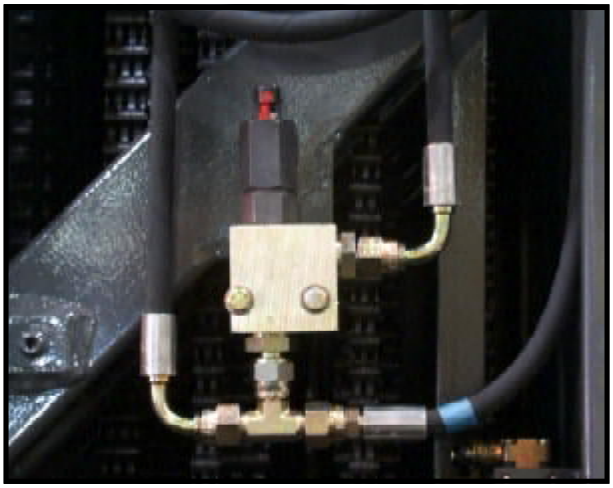
Pilot ratio : 6,5:1.

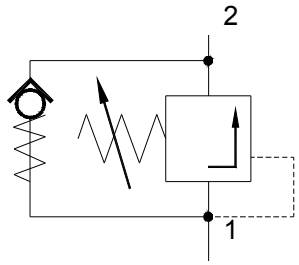
Setting of the counterbalance valves (2a & 2b) :

- Loosen the valve setting screw.
- Tighten the setting screw until it contacts the valve springs, then tighten the screw by 1 turn. Tighten the locknut.

3.17 Sequence valve

Function : Authorizes the counterbalance valve on the jib cylinder (jib lowering) to be piloted only once the necessary pressure in the chambers of the slave and assistance cylinders has been reached (necessary pressure to keep the work platform with its load horizontal during the jib lowering movement). Decompression of the counterbalance valve pilot circuit is performed through the check valve incorporated to the valve.

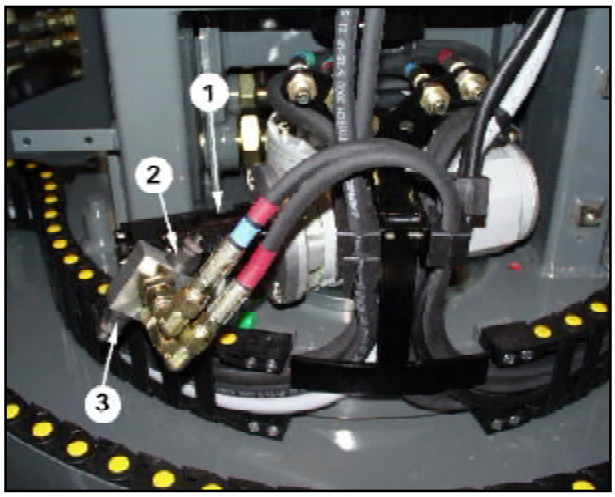




Control of the sequence valve setting

- Connect a pressure gauge on the pressure plug "M" on the function manifold (see § 3.4).
- Fully raise the jib, telescope retracted.
- Position the speed adjustment potentiometer on minimum and lower the jib. The jib should start to lower only when a pressure of 12 ± 0,5 MPa (120 ± 5 bar) is reached.

3.18 Slewing hydraulic motor



1. Hydraulic motor 32 cc/rev.
2. Pressure relief valve [PR9] (slewing to the right)
3. Pressure relief valve [PR10] (slewing to the left)

Pressure relief valves setting : see § 3.19.

3.19 Pressure relief valves

The pressure relief valves are used to protect the hydraulic system against excessive pressures (within the circuit in which they are used) by returning the hydraulic oil to the reservoir when the setting pressure is reached.

NOTE

Adjustement of a pressure relief valve setting should only be performed by qualified mechanics using the correct equipment - only after the need for adjustment has been established.

The table titled ***Relief Valve Pressure Settings*** lists main and circuit relief valve pressure settings. If the pressure setting of any relief valve is not ± 5 bars of the setting listed in the table, adjust valve as necessary (unless otherwise specified).

Identification of the pressure relief valves on the function manifold : see § 3.4.
Identification of the pressure relief valves on the brake manifold : see § 3.6.
Identification of the pressure relief valves on the steering manifold : see § 3.11.
Identification of the pressure relief valves for the slewing movement : see § 3.18.

⚠ CAUTION

For the adjustment of the pressure relief valves, the movements must be performed at MAXIMUM SPEED.

NOTE

For a correct verification of a relief pressure, the locknut of the relief valve adjustment screw must be tightened.
To adjust a pressure relief valve, turn the adjustment screw until the correct setting is reached (tighten to increase the pressure).

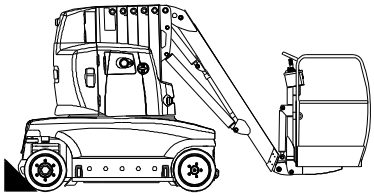
Preparation

Before performing any adjustment on relief valves, warm the oil between 25°C and 50°C.
Use a pressure gauge from 0 to 40,0 MPa (400 bar) to adjust pressure relief valves. For pressures below 3 MPa (30 bar), use a pressure gauge from 0 to 6 MPa (60 bar).

PRESSURE RELIEF VALVE SETTINGS T1210 - T1310			
Function	Opening pressure	Pressure relief valve	Check at port "M" on
General pressure	23 Mpa (230 bar)	PR1	Function manifold
Telescope extension	15 Mpa (150 bar)	PR2	Function manifold
Telescope retraction	18 Mpa (180 bar)	PR3	Function manifold
Mast elevation	18 Mpa (180 bar)	PR4	Function manifold
Jib elevation	16 Mpa (160 bar)	PR5	Function manifold
Jib lowering	18 Mpa (180 bar)	PR6	Function manifold
Brake piloting max pressure	35 bar Max. peak pressure	PR7	Brake manifold
Drive at low speed	11 Mpa (110 bar)	PR8	Function manifold
Slewing to the left	11 Mpa (110 bar)	PR9	Function manifold
Slewing to the right	11 Mpa (110 bar)	PR10	Function manifold
Trim correction	18 Mpa (180 bar)	PR11	Trim correction manifold
Steering to the right	14 Mpa (140 bar)	PR12	Function manifold
Steering to the left	14 Mpa (140 bar)	PR13	Function manifold

3.19.1. Brake release circuit pressure check

1- Chock both front wheels as indicated below :



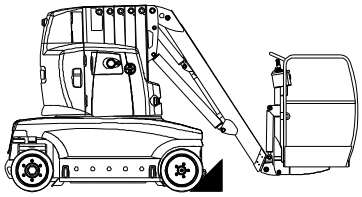
2- Connect the pressure gauge to the pressure plug "M" on the BRAKE MANIFOLD;
3- Position the DRIVE SPEED selector to ( ).
4- Actuate a FORWARD drive movement by pushing the joystick forward. If the pressure indicated by the pressure gauge is not between 15 and 21 bar, refer to BRAKE RELEASE MAXIMUM PRESSURE § 3.19.2.7. If the maximum pressure is higher than 21 bar, consult your local JLG distributor.
5- Disconnect the pressure gauge.

3.19.2. Pressure relief valve setting

Setting values : See table § 3.19.

3.19.2.1. Main pressure [PR1]

1- Chock both rear wheels as indicated below :



2- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
3- Position the DRIVE SPEED selector to ( ).
4- Actuate a REVERSE DRIVE movement by pulling the joystick rearwards. Adjust the pressure relief valve setting if necessary.
5- Disconnect the pressure gauge.

3.19.2.2. Telescope extension [PR2]

1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- EXTEND THE TELESCOPE until the cylinder is at the end of its course. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.3. Telescope retraction [PR3]

1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- RETRACT THE TELESCOPE until the cylinder is at the end of its course. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.4. Mast elevation [PR4]

1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- RAISE THE MAST until the mast cylinder is at the end of its course. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.5. Jib elevation [PR5]

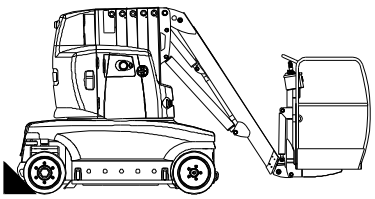
1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- RAISE THE JIB until the jib cylinder is at the end of its course. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.6. Jib lowering [PR6]

1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- LOWER THE JIB until the jib cylinder is at the end of its course. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.7. Brake release maximum pressure [PR7]

1- Chock both wheels as indicated below :



2- Disconnect and cap the brake supply hoses (see §3.10).
3- Connect a pressure gauge to the pressure plug "M" on the BRAKE MANIFOLD.
4- TIGHTEN FULLY the setting screw for the pressure relief valve [PR7].
5- Position the DRIVE SPEED selector on ( ).
6- Push the joystick forward to actuate a FORWARD DRIVE movement. The maximum pressure reading on the pressure gauge must be between 15 and 21 bar corresponding to the setting of the pressure reducing valve. Record the exact value indicated by the pressure gauge.

⚠ CAUTION

If the pressure is below 15 bar or higher than 21 bar, consult your JLG distributor.

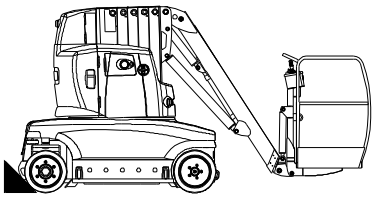
7- LOOSEN the setting screw on the pressure relief valve [PR7] until the pressure drops just under the value recorded previously, then TIGHTEN the setting screw by ¼ turn.
8- Remove the pump handle and push the lever of the release control valve to the released position ( ).
9- Insert the handle in the hand pump and actuate the handle vigorously. Note the pressure peak on the pressure gauge. If the pressure peak exceeds 35 bars, loosen the setting screw on the pressure relief valve PR7 by 1/8 of a turn and check the pressure peak again.
10- Disconnect the pressure gauge.
11- Reconnect the brake supply hoses.

⚠ CAUTION

Maximum brake supply pressure = 30 bar. Maximum admissible pressure peak during use of the hand pump to release the brakes = 35 bar.

3.19.2.8 Drive at low speed [PR8]

1- Chock both wheels as indicated below :



2- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
3- Position the speed selector to ( ).
4- Push the joystick forward to actuate a FORWARD DRIVE movement. Adjust the pressure relief valve setting if necessary.
5- Disconnect the pressure gauge.

3.19.2.9 Slewing to the left [PR9]

1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- SLEW fully the structure to the LEFT. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.10 Slewing to the right [PR10]

1- Connect the pressure gauge to the pressure plug "M" on the FUNCTION MANIFOLD.
2- SLEW fully the structure to the RIGHT. Adjust the pressure relief valve setting if necessary.
3- Disconnect the pressure gauge.

3.19.2.11. Trim correction [PR11]

1- Connect the pressure gauge to the pressure plug "M" on the trim correction manifold.
2- Fully raise the jib.
3- Fully tighten the pressure relief valve, [PR5] on the function manifold.
4- Disconnect the [EVI] solenoid connector on the trim correction manifold (see § 3.14).
5- Connect a direct 24 VDC supply to the coil [EVI].

DANGER

Connect a direct supply to [EVI] only when the jib is at the end of its high course and when no movement is performed.

6- Control a JIB ELEVATION movement. Adjust the pressure relief valve setting if necessary.

DANGER

Do not control any other movement than the jib elevation movement as long as the coil [EVI] is supplied directly and only when the jib is at the end of its high course.

7- Disconnect the direct supply from the coil and reconnect the connector to the solenoid.
8- Adjust the relief valve [PR5] : see § 3.19.2.5.
9- Disconnect the pressure gauge.

3.19.2.12. Left steering

1- Connect the pressure gauge to the pressure plug "M" on the function manifold.
2- STEER the wheels fully to the LEFT. Adjust the pressure relief valve in necessary.
3- Disconnect the pressure gauge.

3.19.2.13. Right steering

1- Connect the pressure gauge to the pressure plug "M" on the function manifold.
2- STEER the wheels fully to the RIGHT. Adjust the pressure relief valve in necessary.
3- Disconnect the pressure gauge.

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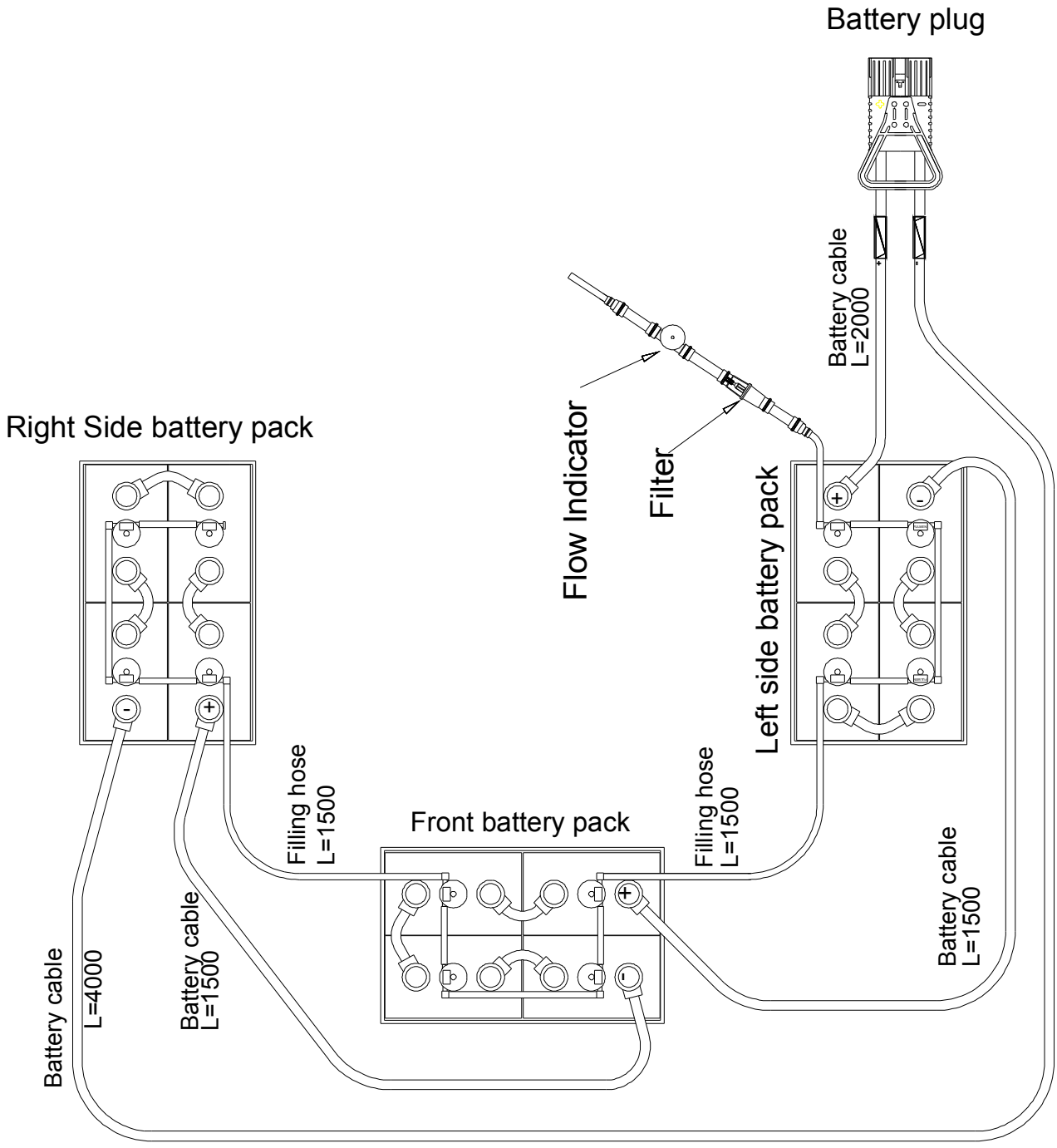
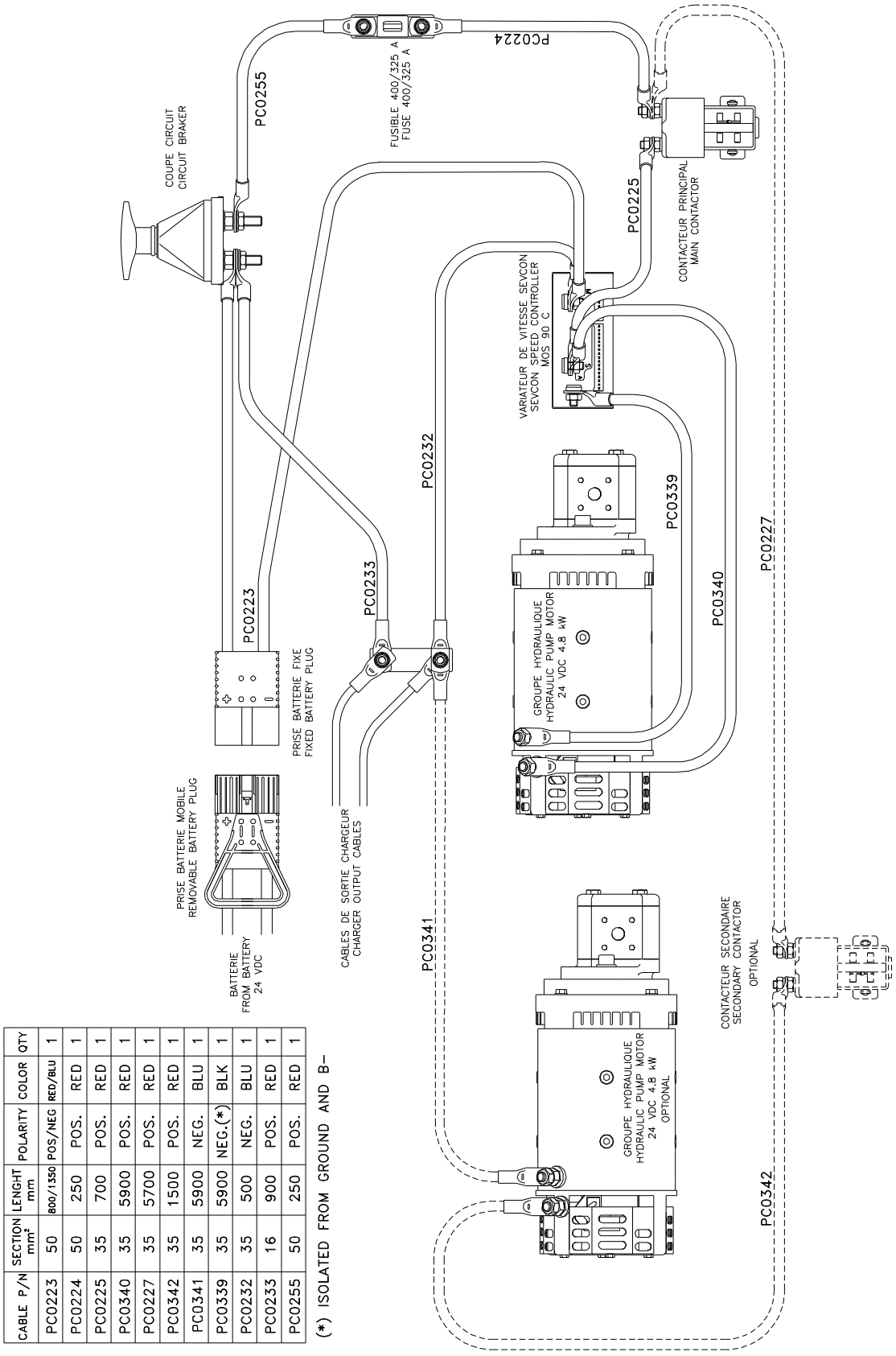
4.1 Wiring diagrams

4.1.1. Battery wiring



4.1.2 Power circuit wiring

PC0338

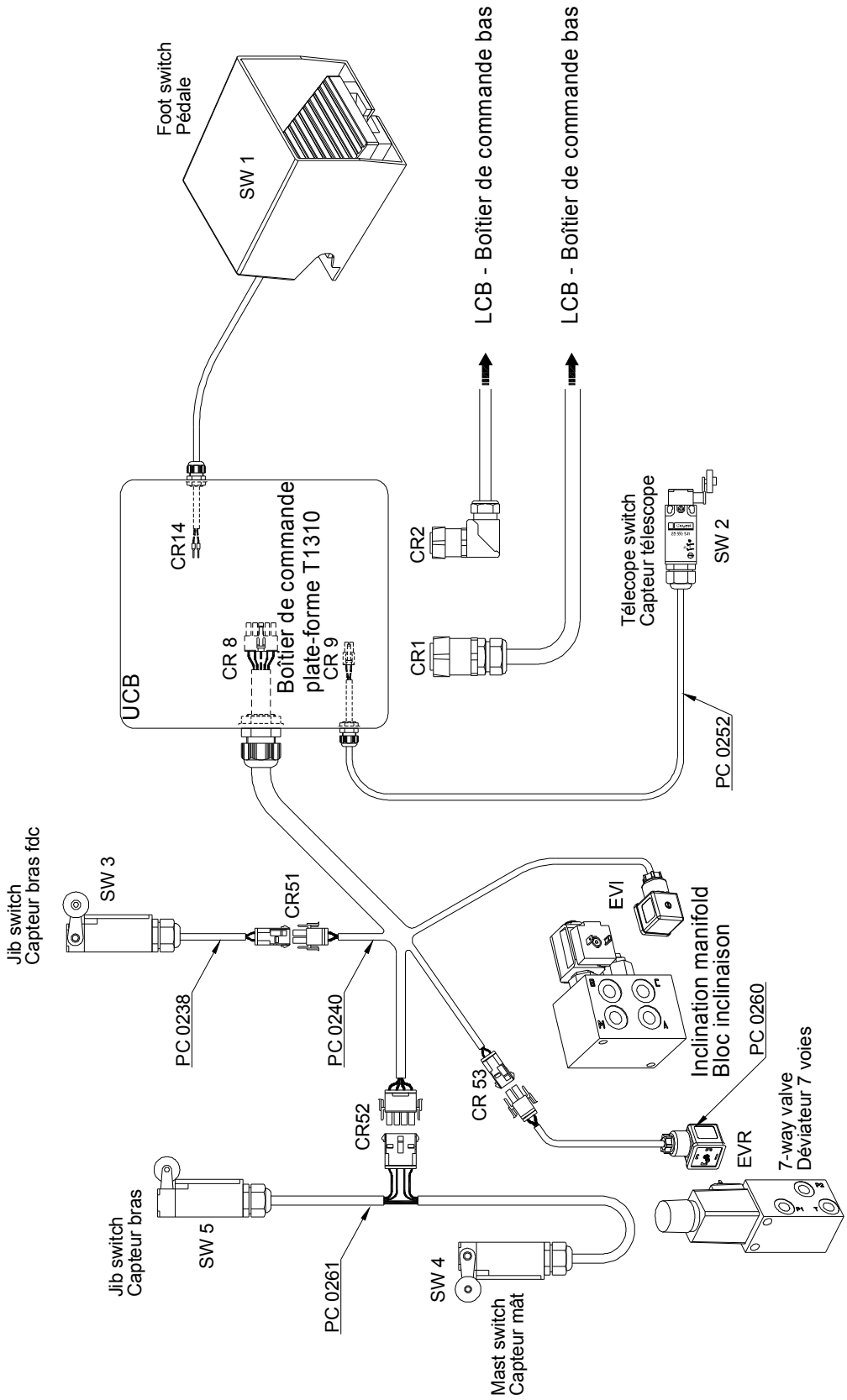


CABLE P/N	SECTION mm²	LENGHT mm	POLARITY	COLOR	QTY
		800/1350	POS/NEG	RED/BLU	
PC0223	50	250	POS.	RED	1
PC0224	50	700	POS.	RED	1
PC0225	35	5900	POS.	RED	1
PC0340	35	5700	POS.	RED	1
PC0227	35	1500	POS.	RED	1
PC0342	35	5900	NEG.	BLU	1
PC0341	35	5900	NEG.(*)	BLK	1
PC0339	35	500	NEG.	BLU	1
PC0232	35	900	POS.	RED	1
PC0233	16	250	POS.	RED	1
PC0255	50				

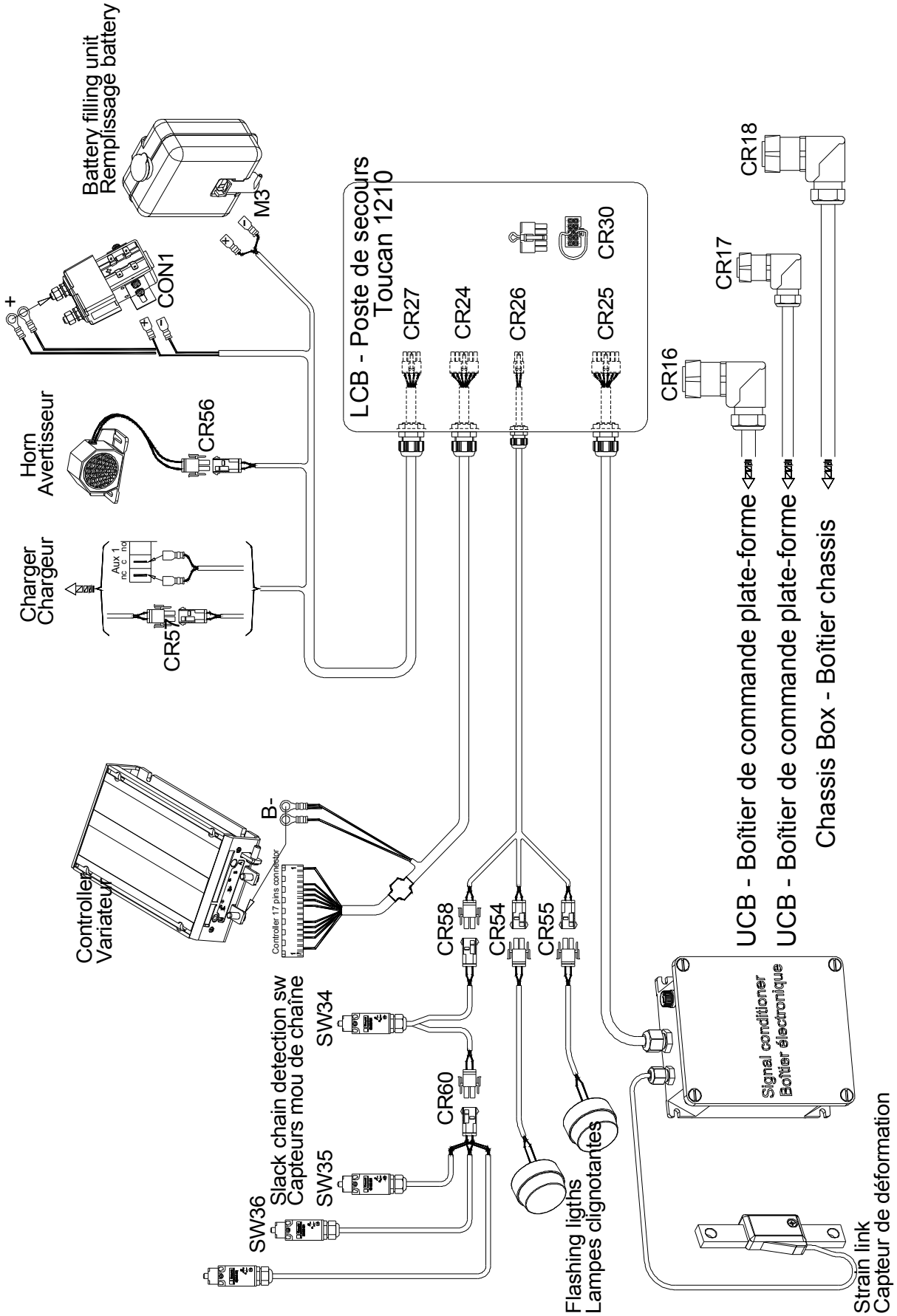
(*) ISOLATED FROM GROUND AND B–

4.1.3 Components location

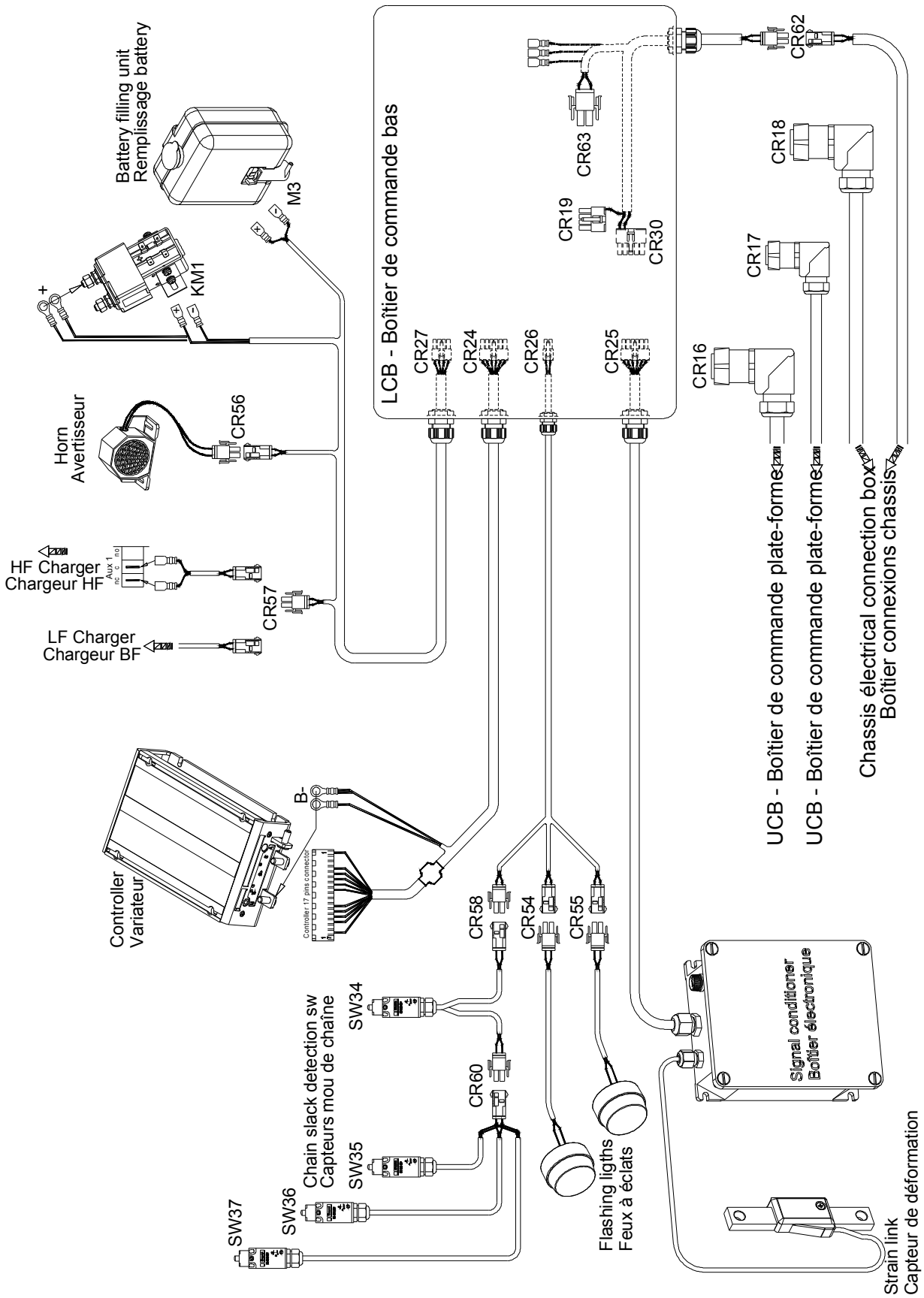
Linked to the platform control box Toucan 1210 and Toucan 1310



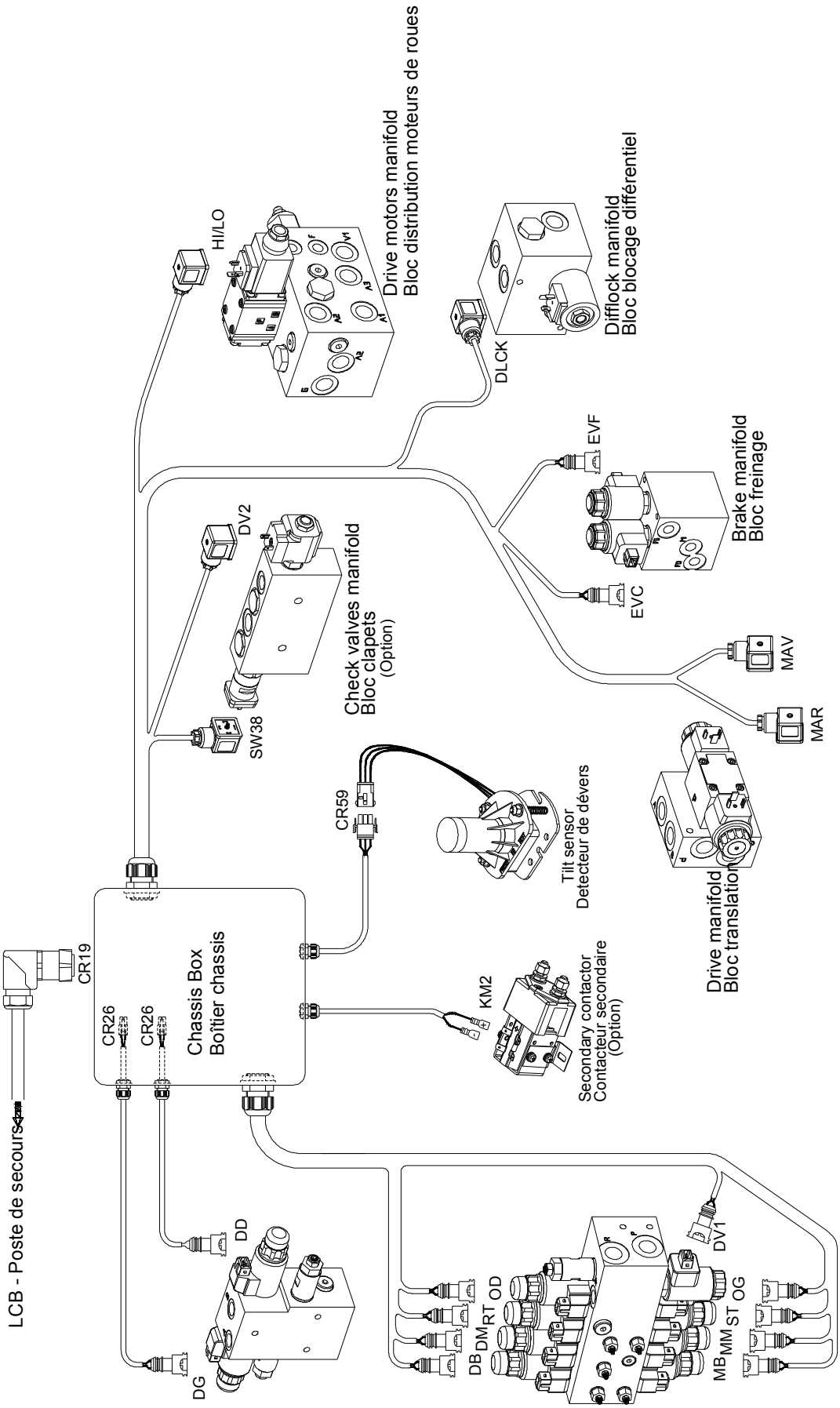
Linked to the emergency control panel Toucan 1210



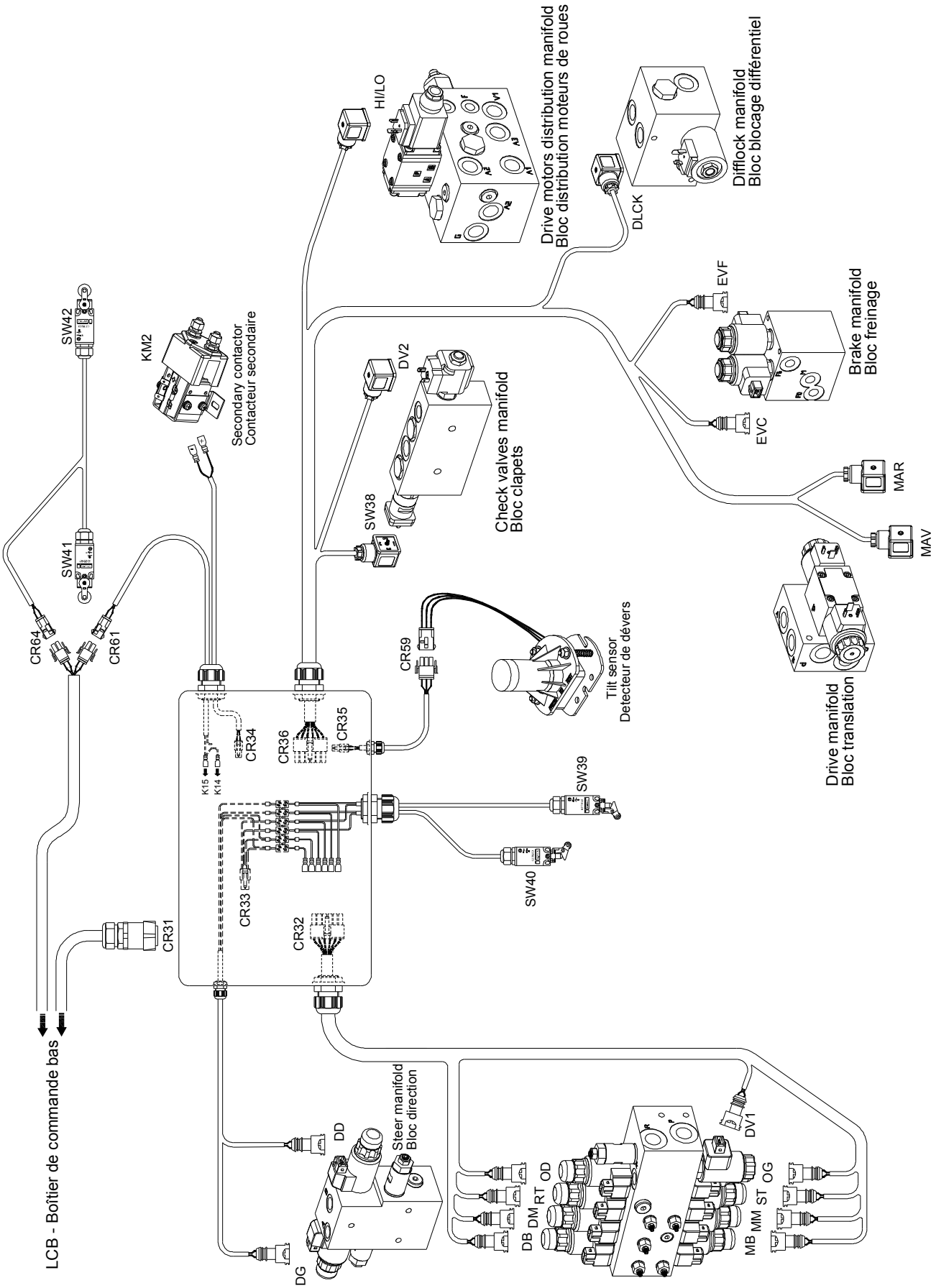
Linked to the emergency control panel Toucan 1310



Linked to the chassis box Toucan 1210

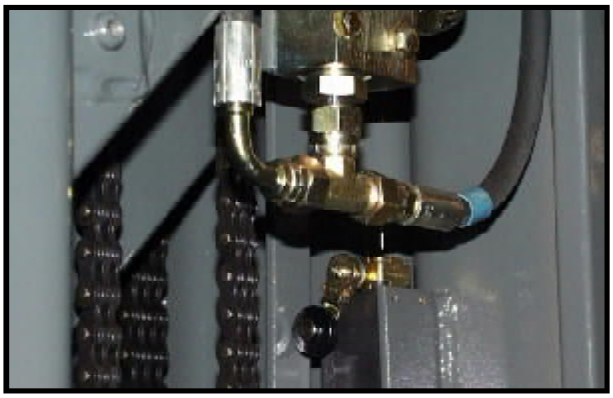


Linked to the chassis box Toucan 1310



4.2. Sensors

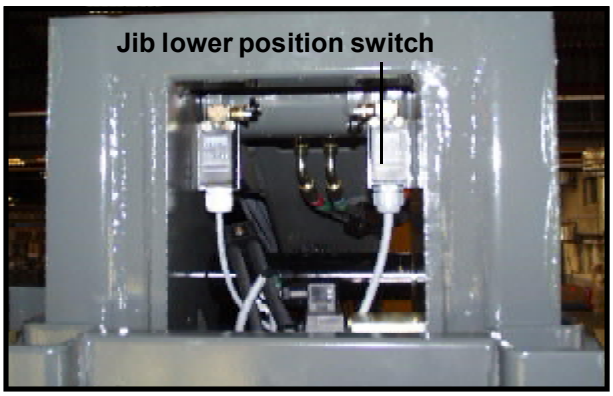
4.2.1 Mast position switch [SW4]



When the telescopic mast leaves its lowered position, the switch is actuated and provides :

- Supply cut (+) to the coil [HI/LO] of the distribution manifold for the wheel motors.
- Supply cut (+) to the coil [EVC] of the brake manifold.
- Actuation of the selective cut of movements when the aerial work platform is tilting (See § 4.1.6).
- The automatic switch to slow drive speed (parameter "Test 3" on controller =CL when a drive movement is controlled - see § 4.5).

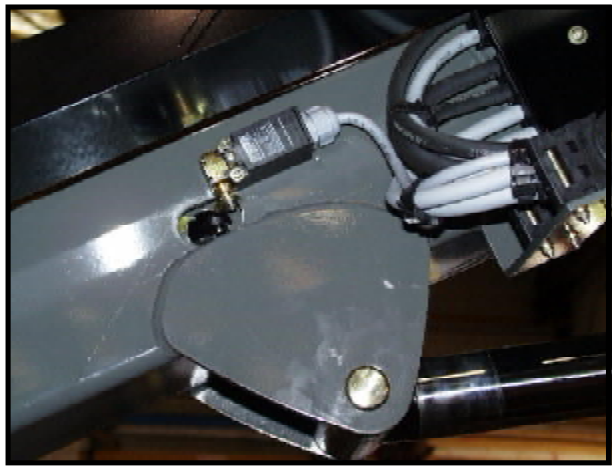
4.2.2. Jib lower position switch [SW5]



When the jib is raised, the switch is actuated and causes :

- The supply cut (+) to the coil [HI/LO] of the distribution manifold for the wheel motors.
- The supply cut (+) to the coil [EVC] of the brake manifold.
- Actuation of the selective cut of movements when the aerial work platform is tilting (See § 4.2.6).
- The automatic switch to slow drive speed (parameter "Test 3" on controller =CL when a drive movement is controlled - see § 4.5).

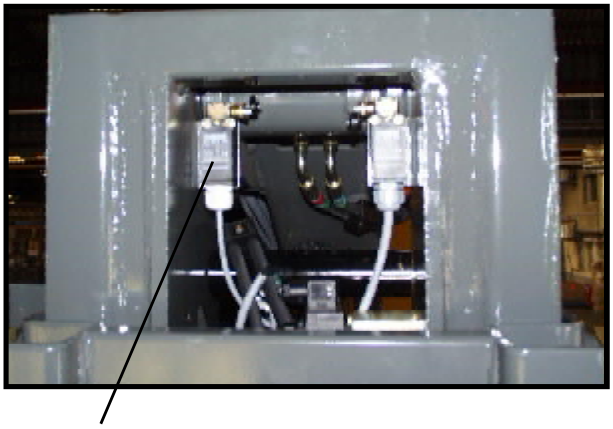
4.2.3. Telescope position switch [SW2]



When the telescope is extended, the switch is actuated and causes :

- The supply cut (+) to the coil [HI/LO] of the distribution manifold for the wheel motors.
- The supply cut (+) to the coil [EVC] of the brake manifold.
- Actuation of the selective cut of movements when the aerial work platform is tilting (See § 4.2.6).
- The automatic switch to slow drive speed (parameter "Test 3" on controller =CL when a drive movement is controlled - see § 4.5).

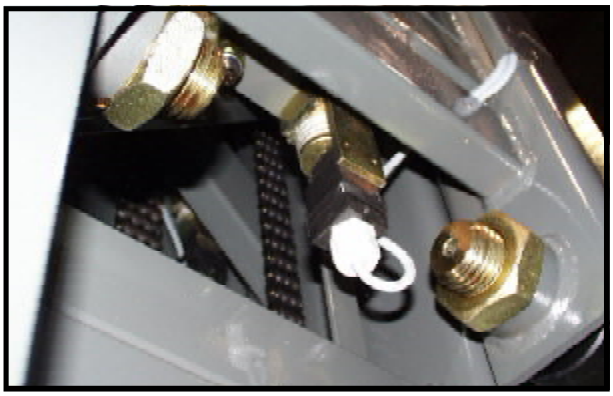
4.2.4. Jib higher position switch [SW3]



Jib higher position switch

During an elevation movement of the jib, the switch is actuated before the jib reaches the end of its higher course and causes a reduction in the speed of the movement (Reduction of the acceleration input delivered to the controller). When the switch has been actuated, and a jib lowering movement is controlled, it will be performed also at low speed till the switch is released.

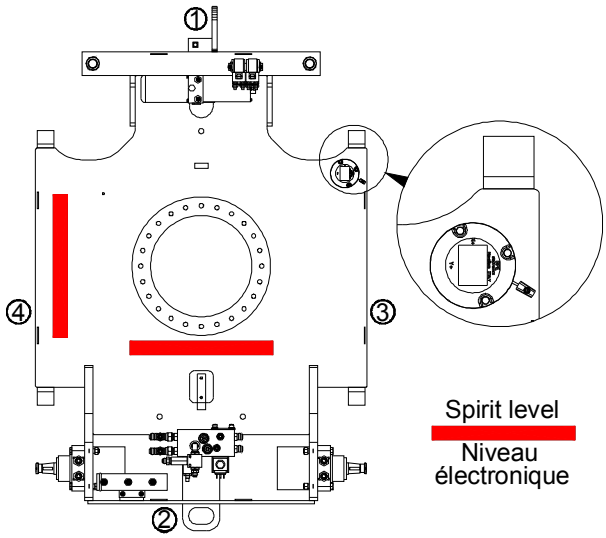
4.2.5. Slack chain sensors [SW34 to 37]



The 4 slack chain sensors are wired in series. When a slack chain appears, one (or several) sensor is actuated and causes :

- Actuation of an alarm.
- Cut off all movements except jib and mast raising movements :
  - Supply cut (+) to the coil [DV1] on the function manifold.
  - Actuation of the "Pump Inhibit" function of the controller when a non authorized movement is controlled (parameter "Test 10 of the controller = CL - see § 4.5).

4.2.6. Control-Adjustment of the tilt indicator



Control :

Ensure the detector rests correctly on the support capnuts.

1- Position the control panel selector on ( ).
2- Chock the rear wheels.
3- Place a spirit level (digital display) on the chassis in the direction **(1)** - **(2)**.
4- Using a jack of sufficient capacity, lift the front of the chassis in **(1)** :
   - ◗ Stop as soon as the green light indicator on the sensor switches off (jerks linked to the manoeuvre stopped). Read the chassis angle : value **(a)**.
5- Chock the front wheels.
6- Using a jack of sufficient capacity, lift the rear of the chassis in **(2)**.
   - ◗ Stop upon extinction of the indicator: value **(b)**.
7- Place the spirit level on the chassis in the direction **(3)** - **(4)** .
8- Using a jack of sufficient capacity, lift the right hand side of the chassis in **(3).**
   - ◗ Stop upon extinction of the indicator: value **(c)**.
9- Using a jack of sufficient capacity, lift the left hand side of the chassis in **(4)** .
   - ◗ Stop upon extinction of the indicator: value **(d)**.

Recordings	Values admitted	Otherwise see
a + b	(c+d) ± 0.2°	PB1
a + b	3.6° to 4.4°	PB2
c + d		
a	1.8 to 2.2°	PB3
b		
c		
d		

PB1 : Tilt indicator to replace.
PB2 : Tilt indicator to replace.
PB3 : Adjust

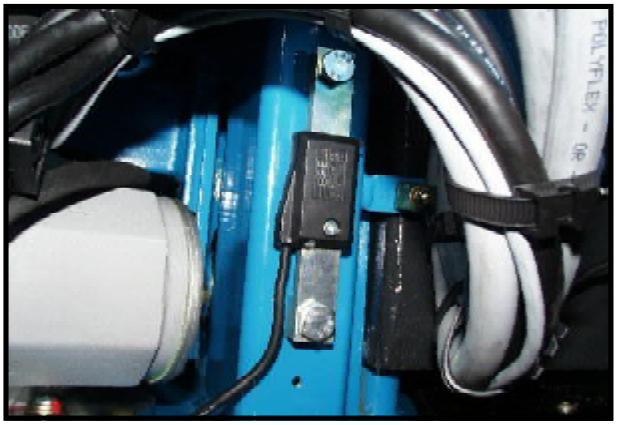
Adjustment:

- Position the machine with chassis horizontal in all directions **(1) (2)** & **(3) (4)** (Blocks under the wheels) : installation tolerance : ± 0,1°.
- Remove the protection on the calibraion wire. Link the latter to the ⊖on the battery until the detector green indicator flashes.
  - ◗ The detector is set. Install the protection.

NOTE

If a symetry fault is corrected, the setting must be checked again in both directions before the machine is returned to service.

4.2.7. Strain link (Stability control device)



The factors acting upon the work platform stability (tilt, overload, wind, outside forces....) induce in the structure mechanical stresses that are expressed by an elastic deformation measured by the extensiometric sensor. The sensor output signal is treated by an electronic box equipped with a relay output that opens the circuit when the signal reaches a predetermined value. Opening of the circuit causes:

- Actuation of an alarm.
- Reduction in speed of the mast and jib elevation movements (parameter Test 4 of the controller = CL - see § 4.5).
- The cut off of the following movements :
  - drive
  - slewing
  - telescope extension
  - jib lowering as long as the telescope is not retracted [SW2]

Movement cut off is obtained by :

- Supply cut (+) to the coil [DV1] on the function manifold.
- Actuation of the "Pump Inhibit" function of the controller when a non authorized movement in controlled (parameter Test 10 of the controller = CL - see § 4.5).

NOTE

Actuation of this safety feature occurs only when the enable pedal is released. The structure must be retracted until the alarm stops for all the work platform functions to be restored.

Installation of the adjustment system

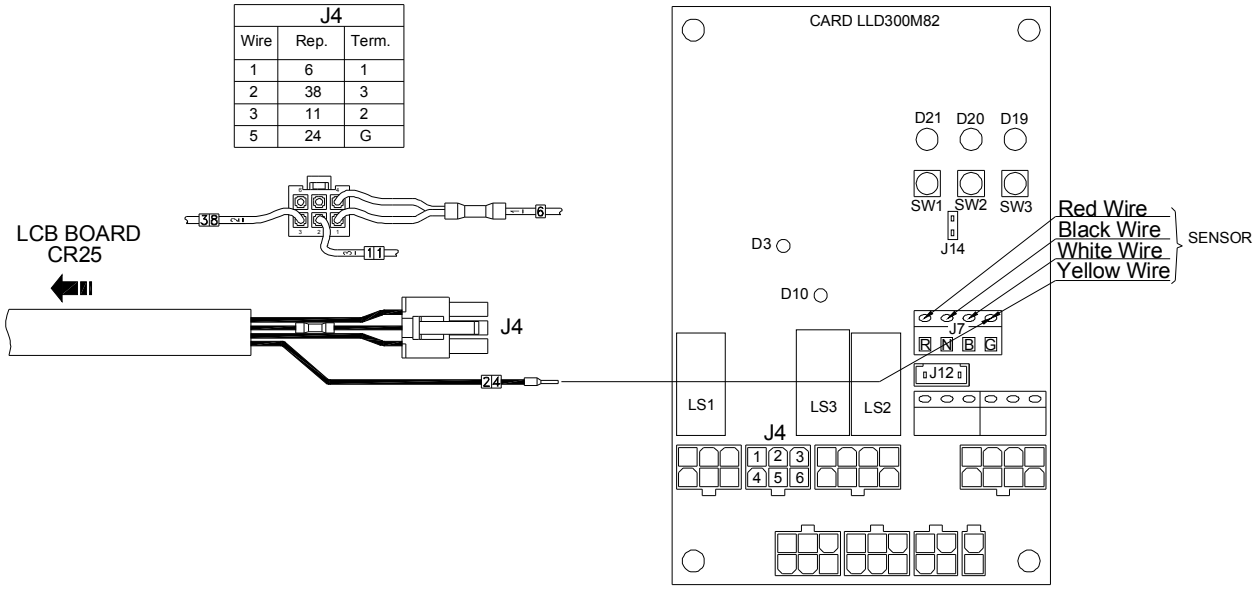
⚠ CAUTION

Any operation on the sensor fixation screws implies a new adjustment of the system.

NOTE

Adjustment of the system requires parametrization of the electronic card microprocessor using a computor equipped with "Hyper terminal windows®" software via RS-232 serial link. Software configuration as well as the controls to communicate with the microprocessor are described at the end of this chapter.

Sensor installation - Wiring

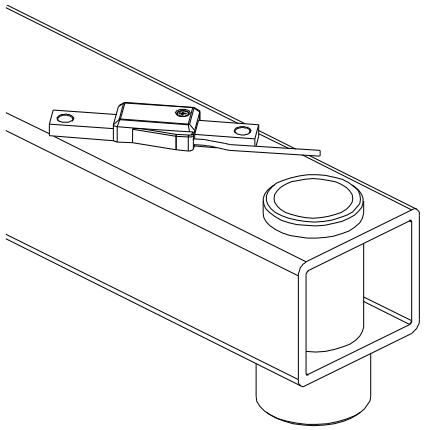


- Connections on microprocessor card
- Sensor installation

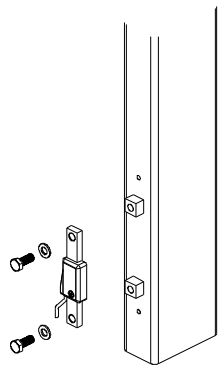
NOTE

The sensor bearing surfaces must be free from paint or grease. The fixation tapped holes must be free from grease or foreign bodies. The sensor must be approximately at the same temperature as the structure it will be installed on.

1. Read this procedure completely before applying it.
2. Connect the sensor to the electronic card (machine switched off).
3. Switch the machine on.
4. Place the sensor flat on the steering bar (no stresses) as indicated opposite:



5. Measure and record voltage U1 in millivolts at the sensor's white (signal +) and yellow (signal -) terminals.
6. Lower the machine, telescope retracted, structure at 90°, work platform empty.
7. Install the sensor on the structure as indicated below. Install the screws using Loctite® 243. Torque the screws to 60 Nm.



8. Install the charger protection cover.
9. Return the structure in line with the chassis, measure and record the voltage U2 in millivolts at the sensor's white (signal +) and yellow (signal -) terminals. The voltage U2 must be within ± 4 millivolts of the value of voltage U1 recorded previously.
10. Wait for 45 mn (time for the Loctite to set) before adjusting the threshhold for alarm set off.

NOTE

The alarm may be triggered during the installation of the sensor (the system is not adjusted yet) : switch the machine off once the voltages U1 and U2 have been recorded.

Adjustment of threshhold for setting off

⚠ CAUTION

Do not cut the power off from the electronic card during the adjustment phase to prevent loss of data.

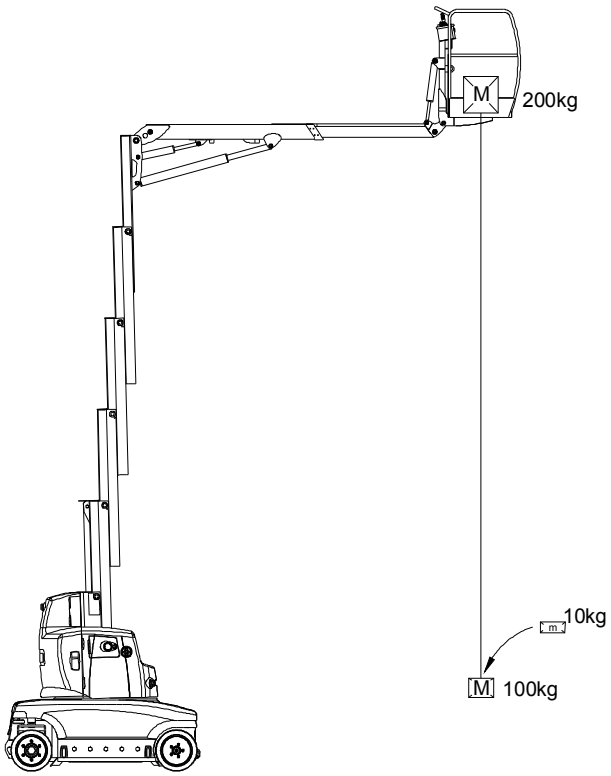
1. Read this procedure completely before applying it.
2. Position the machine on flat and horizontal ground. Fully lower the machine, telescope retracted, superstructure in line, work platform empty.
3. Switch the machine off and install the jumper J14. Plug the serial cable RS-232 on the J12 connector.
4. Switch the machine on (select the ground control panel).
   - ◗ the green led [D3] comes on
   - ◗ the red led [D20] may come on.
5. Start the adjustment phase : depress the SW1 button.
   - ◗ the yellow [D21] and red [D20] led light up.
6. Determine the "zero" of the system: Depress the SW2 button.
   - ◗ the red led [D20] is more luminous when the SW2 button is depressed.

⚠ CAUTION

The platform must be in the same position as described in step 2.

7. Place a 200 kg load evenly distributed on the work platform floor.
8. Perform the following cycle twice using the ground control panel:
   - Raise the jib to the horizontal.
   - Fully extend the telescope.
   - Fully raise the mast.
   - Retract the telescope.
   - Lower the mast.
   - Lower the jib.
9. Position the machine in the following configuration:
   - Jib horizontal.
   - Telescope fully extended.
   - Mast fully raised.

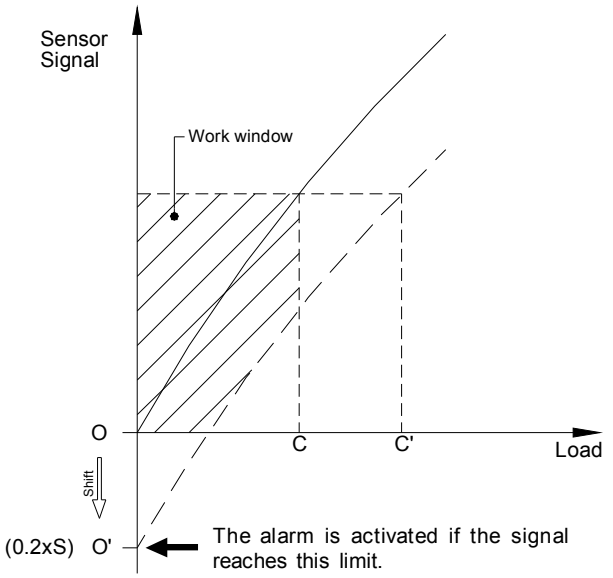
Suspend a 100 kg load then a removable 10 kg load as indicated below. Wait for the complete stabilisation of the structure.



10. Record voltage U3 in millivolts at the sensor's white (signal +) and yellow (signal -) terminals. The voltage should not have varied by more than 12 millivolts in relation to the voltage U1 previously recorded.
11. Set the setting off threshhold : depress on the SW3 button.
    - the green led [D19] flashes once.
12. Quit the adjustment phase: depress on the SW1 button.
    - the yellow led [D21] switches itself off.
    - the red led [D20] stays lit.
    - the acoustic alarm sounds.
13. Remove the 10 kg load.
    - the red led [D20] switches off.
    - the acoustic alarm stops.
14. Remove the suspended 100 kg load and return the platform to its lowered position.
15. Verification of the adjustment: place the machine in the configuration as described in step 9. Suspend the 100 kg load and wait for the complete stabilisation of the structure.
    - the red led [D20] should not light up.
    - the alarm should not be triggered.
16. Add the 10 kg removable load.
    - the red led [D20] lights up.
    - the acoustic alarm sounds.
17. Record the signal value (in microprocessor units) on the Hyper Terminal: enter "IN=" then "enter".
18. Calculate the value to enter for "USPAN" parameter by multiplying the signal value previously recorded (in microprocessor units) by 0,2.
19. Enter the value of the "USPAN" parameter: type "USPAN = [value]" then enter.
20. Return the plaform to its lowered position and remove the loads.
21. Switch the machine off before removing the jumper J14 (stick the jumper J14 inside the box with an adhesive).

Parameter "USPAN"

The adjustment of the extensiometric sensor may move following important vibrations or repeated shocks on the structure : the sensor's zero drifts. The alarm is actuated when the shift reaches 20% of the signal value (in microprocessor units) when loaded. The threshhold for alarm activation in case the sensor's adjustement shifts is determined by the "USPAN" parameter. the green led [D19] flashes when the signal value is below the value determined by the "USPAN" parameter: refer to § Error codes. Actuation of the alarm when the machine is lowered and the work platform empty is a revealing sign the sensor's adjustment has moved.



O : sensor's zero determined during adjustment phase 6.
C_o : load corresponding to the alarm activation during adjustment phase 11.
S : value of the sensor's signal (in microprocessor units) corresponding to the activation of the alarm.
C' : load corresponding to the alarm activation in case the zero shifts.
O' : Shift limit determined by the "USPAN" parameter.

Should the sensor shift, it is possible to recalibrate the system automatically and to restore the initial work window by determinating a new zero for the sensor: refer to the autocalibration procedure below.

Autocalibration

NOTE
Autocalibraion is always possible except with a faulty sensor (indicated by the green led [D19] flashing : refer to § error codes).

1. Read this procedure completely before applying it.
2. Position the machine on flat and horizontal ground. The machine must be lowered, telescope retracted, superstructure in line, work platform empty.
3. Switch the machine off and install the jumper J14.
4. Switch the machine on again.
5. Autocalibration : Depress the SW2 button.
   - the red led [D20] is more luminous when the SW2 button is depressed.

⚠ CAUTION

The platform must be in the position described in step 2.

6. Switch the machine off before removing jumper J14 (stick jumper J14 inside the box with an adhesive).
7. It is recommended to check the good working order of the system. To do so, follow steps 15 to 16 of the adjustment procedure described in paragraph "Adjustment of the threshhold for setting off".

Error codes

The sensor errors are indicated by the green led [D19] flashing:

Number of flash	Meaning
-	No error
1	Error on sensor line
2	-
3	Signal value below the value authorized by "USPAN"

The card errors are indicated by led [D21] flashing:

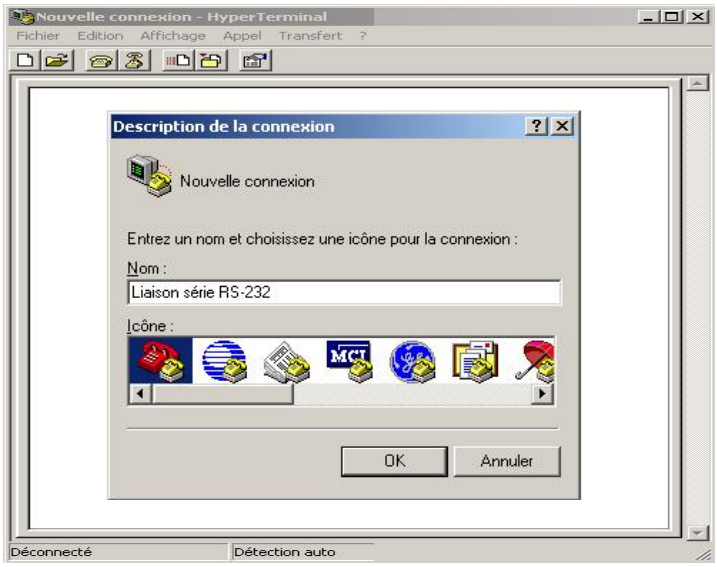
Number of flashes	Meaning
-	No error
1	Card error : contact JLG Product Support
2	Card error : contact JLG Product Support
3	J4 connector wiring incorrect
4	J4 connector wiring incorrect
5	Replace the card

Meaning of the green led [D3] : card supplied.

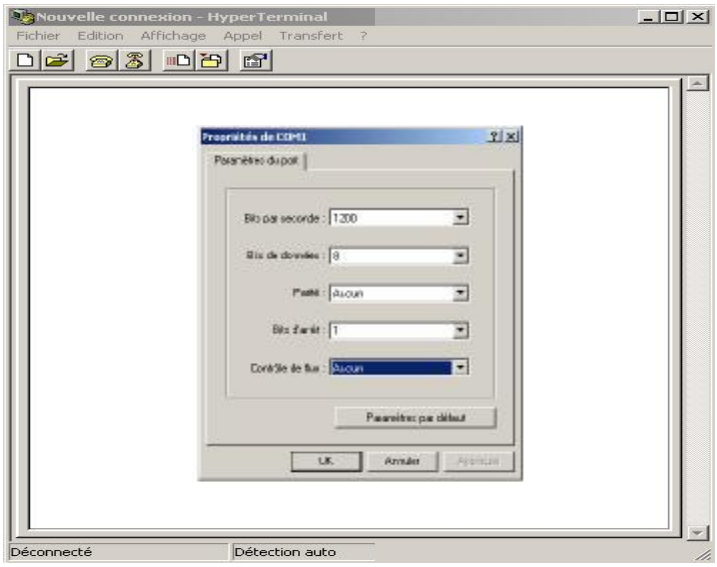
Meaning of the green led [D10] : sensor supplied.

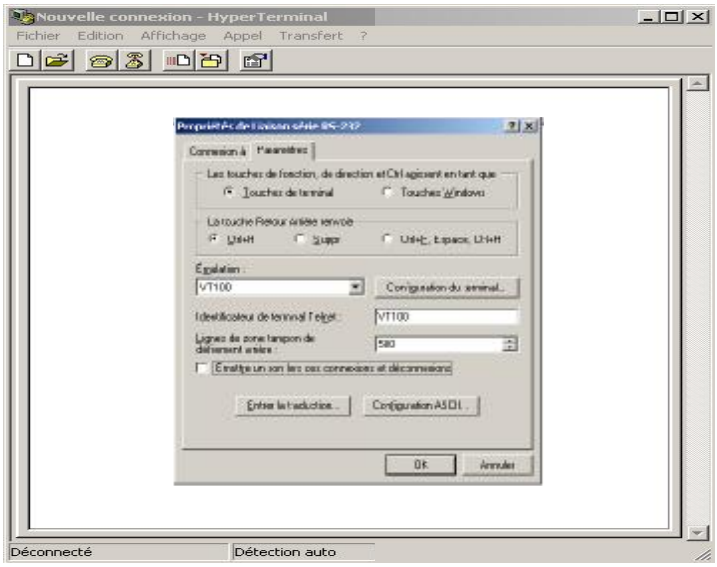
Configuration of the Windows® Hyper Terminal

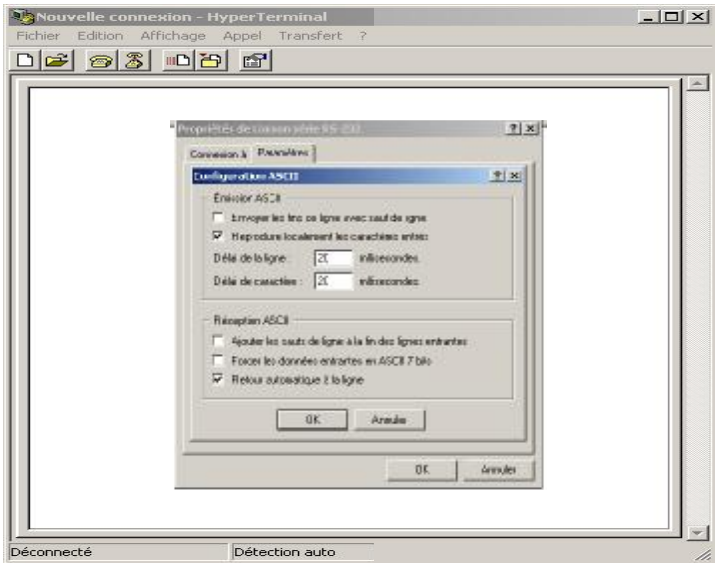
Start ➤ Programs ➤ Accessories ➤ Communications ➤ Hyper Terminal



NOTE
If COM1 corresponds to the computor serial port.







Record the configuration once all the parameters are installed.

Utilisation of the Windows® Hyper Terminal

- Type "IN=", then ENTRÉE (in capital letters) to display the signal value (in microprocessor units) and the percentage in relation ot the alarm threshhold.

Example :

00055	**17%**
Signal value	Percentage in relation with the alarm threshhold

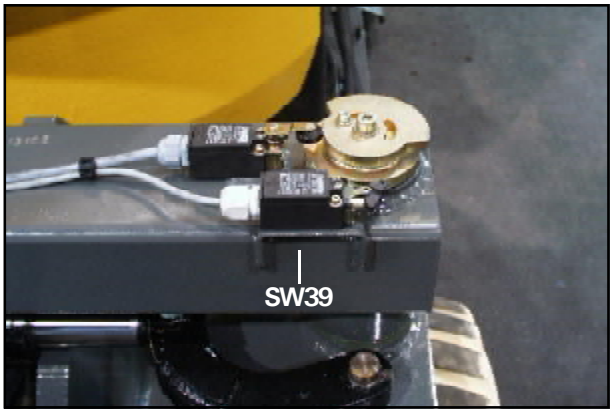
- Type "USPAN:", then ENTRÉE (in capital letters) to display the "USPAN" parameter value.

- type "USPAN=[valeur]", then ENTRÉE (in capital letters) to determine the new value for the "USPAN" parameter.

4.2.8 Steering sensors (Toucan 1310 only)

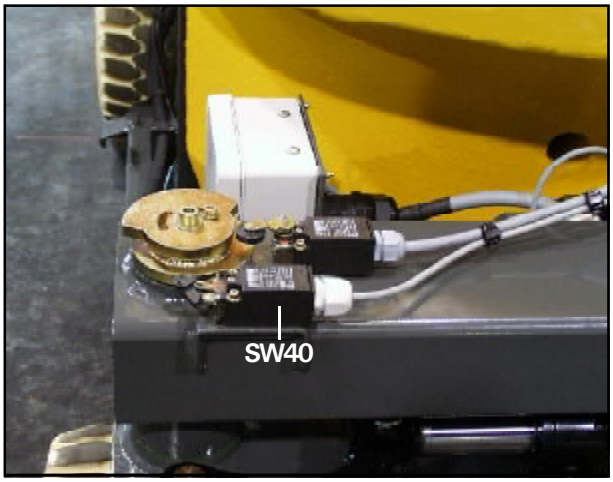
4.2.8.1 Sensor for left steering limitation [SW39]

When the platform leaves its transport position, the relay [K15] coil on the chassis junction box is no longer supplied and the sensor [SW39] starts to work. When the left wheel reaches a steering angle of 45° to the left, the cam installed on the steering bracket pin actuates the sensor and causes the supply (+) cut to the coil [DG] on the steering manifold.



4.2.8.2 Sensor for right steering limitation [SW40]

When the platform leaves its transport position, the relay [K14] coil on the chassis junction box is no longer supplied and the sensor [SW40] starts to work. When the right wheel reaches a steering angle of 45° to the right, the cam installed on the steering bracket pin actuates the sensor and causes the supply (+) cut to the coil [DD] on the steering manifold.



4.2.8.3 Steering angle sensors [SW41 & 42]

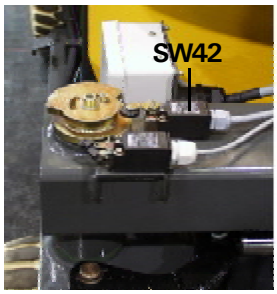
The sensor NC contacts are wired in series. The sensor NO contacts are wired in parellel.

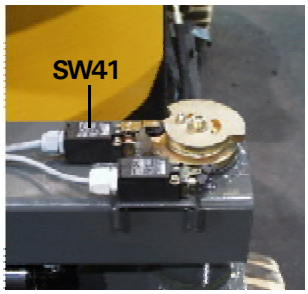
During a high speed drive (), steering the wheels at more than 45° actuates one of the sensors, causing a NO contact to close. Entry [E12] of the temporisation module is then supplied (see § 4.9). Supply to this entry causes the desactivation of the output [E11] : supply cut to the coil [HI-LO] - switch to 2nd drive speed ().

When the platform has left its transport position, the relay K13 coil on the emergency control panel is no longer supplied and the NC contacts of the sensors [SW41] and [SW42] start to function : opening of one of the NC contacts causes the signal between the entry/output [E5] and [E7] on the temporisation module to be cut (see § 4.9).
The drive movements are no longer available if the wheels are steered at an angle above 45° before the platform leaves its transport position (one of the NC contact open) :

- Supply (+) to the coil [DV1] is cut
- The function "Pump Inhibit" of the controller is actuated when a drive movement is controlled (parameter TEST 10 of the controller = CL - see §4.5).

NOTE
The sensors [SW39] AND [SW40] must be actuated before the sensors [SW41] and [SW42].





4.3 Safety features - Movement cut out

Operation of safety features

The operating principle is identical for all safety features in case a non authorized movement is controlled :

- Orange indicator lit to indicate the prohibition to the operator.
- piloting of the "Pump Inhibit" function of the controller : the pump does not turn whatever the condition of the others controller inputs (parameter "Test 10" of the controller = CL - see § 4.5).
- Supply cut to the coil [DV1].

NOTE
Tilt and slack chain : continuous detection.
Stability control : static detection.

	Slack chain	Tilt	Stability control
Drive	Θ	Θ	Θ
Mast elevation		(1)	(1)
Jib elevation		(1)	(1)
Telescope extension	Θ	Θ	Θ
mast lowering	Θ		
Jib lowering	Θ	Θ (2)	Θ (2)
Telescope retraction	Θ		
Slewing	Θ		Θ
Rotation (Option)	Θ		
Inclination	Θ		
Relay(s) not supplied in the corresponding situation	**k7**	**k8**	**k9-k10-k8**

Θ : **Non authorized movement.**
(1) : Movement speed reduction.
(2) : As long as the telescope is not retracted.

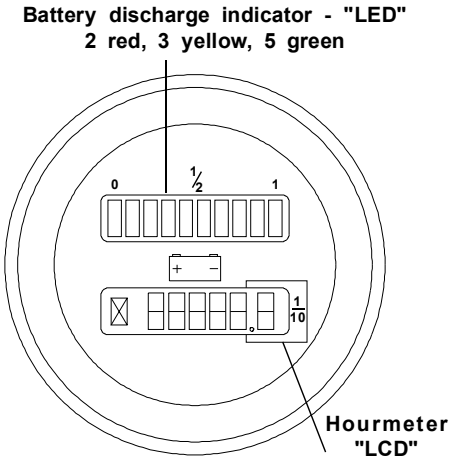
Operation of the relays

- Normal situation :
  - relay(s) supplied, corresponding Led lit.

Additional relay (k6) : supplied when a non authorized movement is controlled.
FUNCTION : cuts the supply to the coil [DV1].

Relay k9 : authorizes static detection of the stability control.

4.4 Adjustment of the battery discharge indicator



Indication of the discharge condition of the battery is ensured by a series of 10 coloured LEDs.

As the battery discharges, the green LEDs (5) the the yellow LEDs (3) light up in succession from the right to the left.

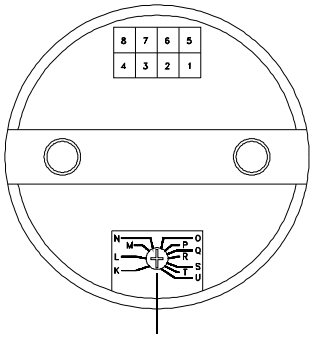
When a red LED flashes, the battery has reached a discharge depth of 70% : the machine must be driven to its charging station to recharge the battery.

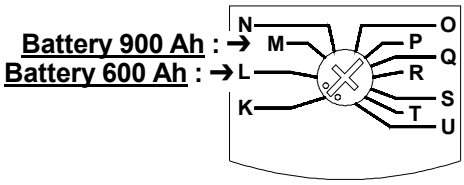
When both red LEDs flash alternately, the battery has reached a discharge depth of 80% of its capacity and the electrical power to the platform control panel is cut automatically (the orange indicator is lit permanently to indicate the inhibition of all movements) : the battery must imperatively be recharged (a push button allows the power to be reset to reach the charging station : see the Operator and Safety Handbook).

The battery discharge state if determined by comparing the battery voltage when the work platform operates at a predetermined reference voltage, then by integration of the time period during which the battery voltage is below the reference voltage.

The most important function of the discharge indicator is to cut the electrical circuit when the battery has reached a discharge depth of 80% in order to protect the battery.

The power cut off threshold depends from the battery capacity and from the discharge conditions it is submitted to. This cut off threshold can be adjusted with the potentiometer at the back of the indicator, where a **K** to **U** scale allows a precise adjustment.





The potentiometer is set according to the battery capacity for "normal" discharge conditions.

In certain operating cases, these discharge conditions are not respected, therefore making it necessary to adjust the potentiometer.

For example, in quick discharge conditions, the power cut will occur when the battery is still charged. To adjust power cut threshold, proceed as follows :

- Measure battery electrolyte specific gravity when the power cut occurs (both red LEDs flash in alternance).
- Adjust the power cut threshold using the potentiometer knowing that each letter corrects the battery specific gravity by 0.020 points.

For example, if the potentiometer is set on the letter **L** and the electrolyte gravity is 1,170 kg/l when the power was cut :

- The electrolyte gravity will be 1,150 kg/l on the next discharge cycle if the setting is modified to the letter **K**.
- The electrolyte gravity will be 1,190 kg/l on the next discharge cycle if the setting is modified to the letter **M**.

4.5 Speed electronic controller

The motor speed controller installed on the platform enables the variation of the rotation speed of the main hydraulic power unit, therefore the modification of the speed of the work platform movements.
The controller presents 8 programmable speeds :

- Six variable speeds.
- Two fixed speeds (only one is used).

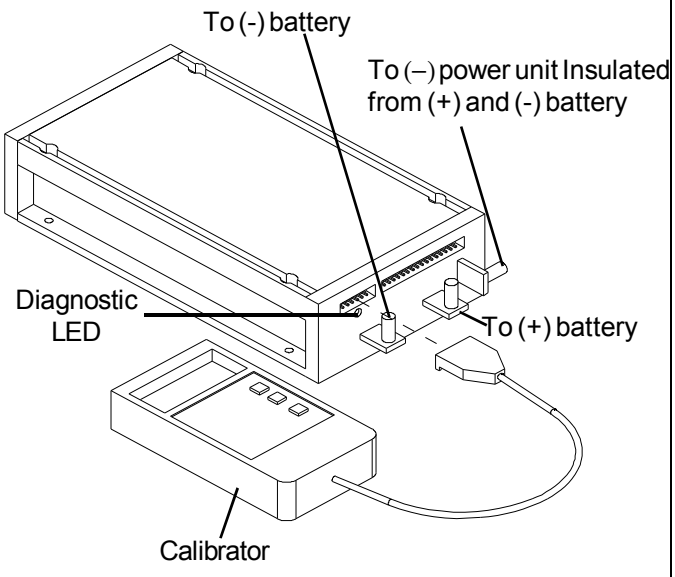
The controller parameters can only be adjusted with an appropriate SEVCON calibrator (Ref. : 920021).

DANGER

No parameter or variable can be modified without prior written approval from the elevating work platform manufacturer.

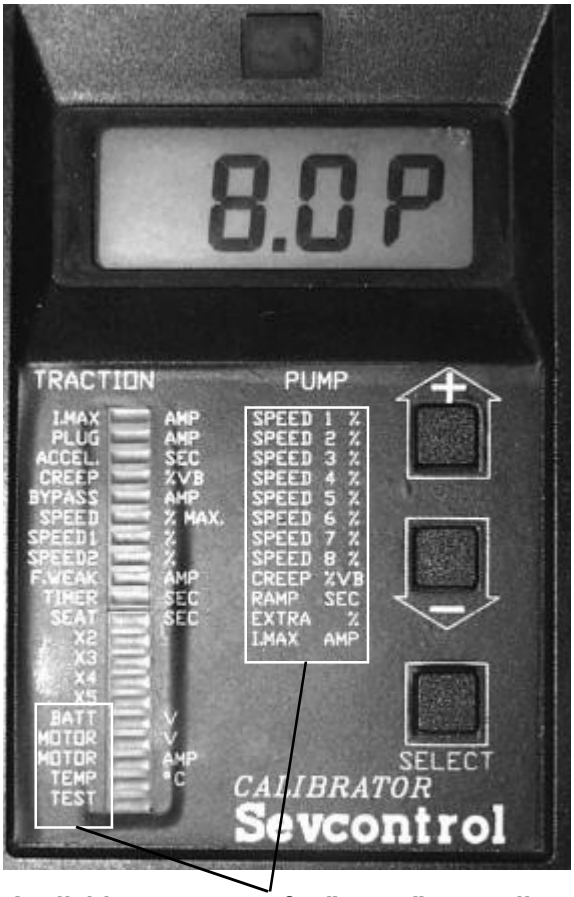
Controller variable settings

1- Position the control panel selector either to "platform controls" or "ground controls". Ensure the lower emergency stop switch is not activated.
2- Connect the calibrator to the controller.



When the calibrator is connected to the controller, the operating time is displayed on the screen.

- Press on the arrow ⇩ to display the operating hours.
- Press on the arrow ⇧ to display 1000's of operating hours.



Available parameters for "pump" controller

Example :
For an operating time of 1436 hours 27 minutes and 20 seconds, the screen will display :

- Display on connection to the calibrator : 27.2 (meaning 27 minutes and 20 seconds).
- Button ⇩ depressed, display : 436 (meaning 436 hours).
- Button ⇧ depressed, display : 1 (meaning 1000 hours).

NOTE
The meter is reset to 0 after 65500 hours of operation.

3- Press on the "**select**" button. A red LED lights up opposite the first parameter : "**speed1**". The parameter value is displayed on the screen.
Press on the arrow ⇧ to increase the value of this parameter.
Press on the arrow ⇩ to decrease the value of this parameter.

Each time the "**select**" button is depressed, a red LED lights up opposite the next parameter, the value of this parameter is displayed on the screen and can be modified with the ⇧ and ⇩ buttons.

Description and values of parameters for models **Toucan 1210 and Toucan 1310.**

Parameter	Description	Unit	Pitch	Values Toucan 1210 / 1310	Observations
Speed 1	Speed n°1 (variable)	%	1%	**30%**	Mast lowering movement. Make up flow to the wheel motors. Platform inclination movements. Platform rotation movement.
Speed 2	Speed n°2 (variable)	%	1%	**40%**	Slewing movement.
Speed 3	Speed n°3 (variable)	%	1%	**38%**	Low speed drive - motors displacement 332 cc/rev.
				40%	Low speed drive - motors displacement 398 cc/rev.
				43%	Low speed drive - motors displacement 500 cc/rev.
Speed 4	Speed n°4 (variable)	%	1%	**80%**	Jib elevation movement (tilt - stability control). Mast elevation movement (tilt - stability control).
Speed 5	Speed n°5 (variable)	%	1%	**100%**	Jib elevation movement. Jib lowering movement. Mast elevation movement. Telescope retraction / extension movements.
Speed 6	Speed n°6 (variable)	%	1%	**100%**	High speed drive
Speed 7	Speed n°7 (fixed)	%	1%	**45%**	Steering movement (joystick in neutral position).

Calibrator use as measuring instrument :

BATT V :
The measure of battery voltage can be done at any time, even when the work platform is in operation, thus enabling analysis, if necessary, of the battery voltage fluctuations.

MOTOR V :
The measure of the motor voltage in operation enables the determination, for a chosen speed, of the voltage to be applied at the motor terminals. The value of this voltage calculated in percentage of the battery voltage determines the speed setting.

MOTOR AMP. :
The measure of the current at the motor enables the determination of the current limit value to which the controller must be set when the machine is driven on a ramp.

TEMP °C :
The measure of the temperature enables the analysis of the controller temperature increases, therefore the operating conditions of the work platform.

Calibrator use as operating control instrument (test mode) :

- Position the control panel selector either to "platform controls" or "ground controls".
- Ensure the lower emergency stop switch is not activated.
- Connect the calibrator to the controller and depress the "select" button until "TEST" is displayed.

NOTE
When "TEST" is selected, the work platform can operate normally.

The value displayed on the screen corresponds to the value of the acceleration input received by the motor speed controller.

- When the joystick controller is activated at platform controls, the acceleration input varies from 0 to 100%.

Test sequence	Function	Display
-	Accelerator	0 to 100%
1	Speed n°1	CL or OP
2	Speed n°2	CL or OP
3	Speed n°3	CL or OP
4	Speed n°4	CL or OP
5	Speed n°5	CL or OP
6	Speed n°6	CL or OP
7	Speed n°7	CL or OP
8	Speed n°8	CL or OP
9	Not used	
10	Pump inhibit	CL or OP

- When controlling a superstructure function and using the rotary potentiometer, the acceleration input varies from 40/45% to 100%.

- The ⇧ or ⇩ buttons step through the other tests.

- **CL** : (closed) means that the selected speed is active.
- **OP** : (open) means that the speed is not selected or is not active.

Diagnostic Led :

The controller is equipped with a diagnostic system using a green LED located near the calibrator socket. At connection the LED must light up and stay lit.
If the green LED is off :

- The controller is out of order.
- The controller circuit is faulty.
- Controller supply fault (fuses faulty in the control circuit).

The green led may also flash a certain number of times at connection :

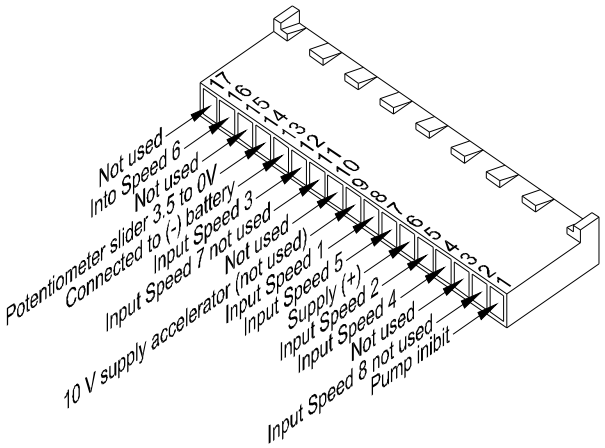
- **2** flashes : "Pump inhibit" function active (parameter Test 10 of controller = CL - see § 4.3)

- **3** flashes : Short circuit across mosfets or motor open circuit.

- **7** flashes : Battery discharged. (Voltage below 13V).

- **8** flashes : Activation of thermal cutback (overheat).

Connections on 17 pin connector "SEVCON - MOS" 90 - "PUMP" controller :
To avoid any corrosion, the connections must be kept well greased.



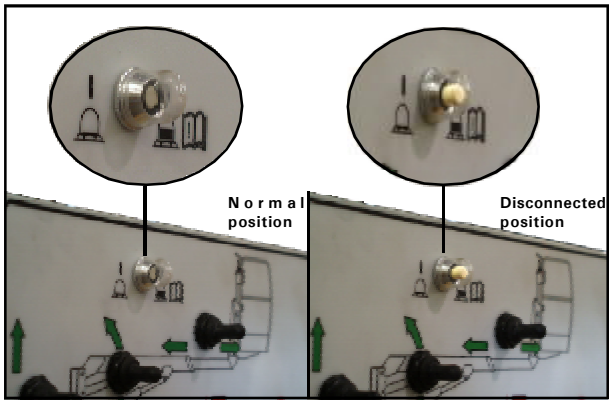
A 3,5 V voltage on pin 14 of the controller connector corresponds to a 0% input (speed null).

A 0 V voltage on pin 14 of the controller connector corresponds to a 100% input (max. speed).

4.6 Circuit breakers - Fuses

4.6.1 Circuit breakers

Panel mounted circuit breakers 5-7A (depending on models)



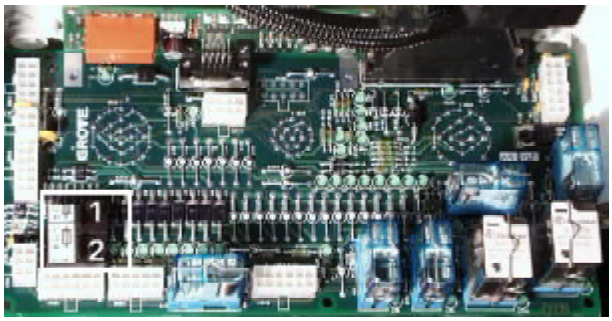
FUNCTION : General protection of the control circuit.
LOCATION : Face of the emergency control panel (Lower control box).

Circuit breakers on electronic card

LOCATION : Emergency control panel electronic card (inside the box).

1- Circuit breaker 3,15A
FUNCTION : Protection of the centralized filling pump circuit (push to reset).

2- Circuit breaker 0,63A
FUNCTION : Protection of the battery discharge indicator circuit (push to reset).



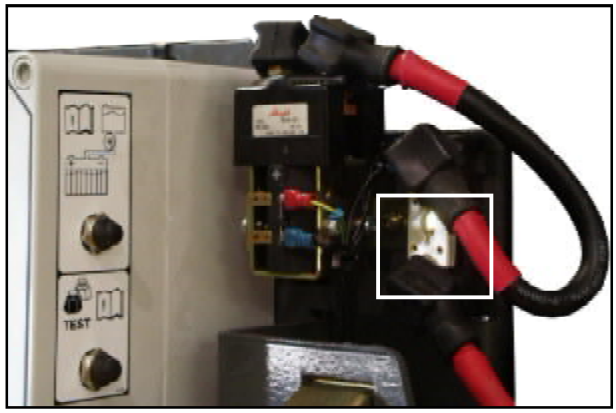
4.6.2 Fuses

Power circuit fuse

⚠ CAUTION

Never replace a faulty protection device by another one of different characteristics.

LOCATION :

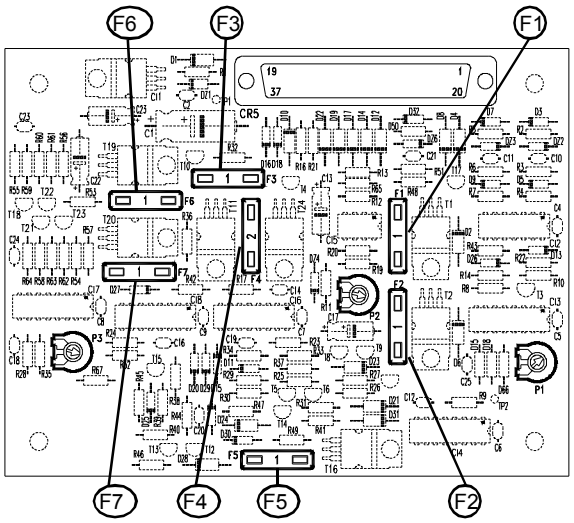


Forked fuse 325A type C20

Fuses for time delay module

Toucan 1310

Location : Inside the emergency control panel.



Function : Protection of the coil supply circuit for :

[MAV]	**F1**
[MAR]	**F2**
[DV1]	**F3**
[HI/LO]	**F4**
[EVF]	**F5**
[DB]	**F6**
[DM]	**F7**

F1, F2, F3, F5, F6, F7 : Quick acting pluggable fuses type ATO 1A.
F4 : Quick acting pluggable fuse type ATO 2A.

Toucan 1210

Equiped with resetable fuses. See § 4.6.3.

4.6.3. Resetable fuses (PolySwitch®)

Principle of operation

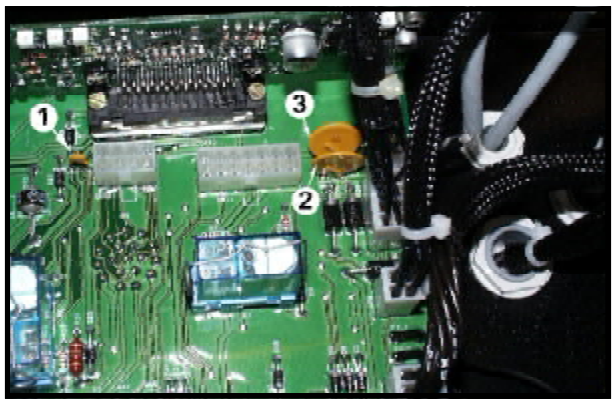
These components, welded on the electronic cards of the control circuit are acting as protections dedicated to parts of the circuit.
This type of component is a plastic composite charged with carbon particles that, under the influence of a fault current, are submitted to a temperature increase resulting in a separation of these particles and thus increasing greatly the internal resistance of the component.
This great temperature increase may help in locating a cut out component.

DANGER

The component temperature under the influence of a fault current may reach 125°C.

When the fault current disappears, the component's initial capacities are restored automatically after approximately 30 seconds.

Location : Electronic card in the platform control panel.



1. PolySwitch® 0,25A

Function : Protection of the supply circuit to the controls module.

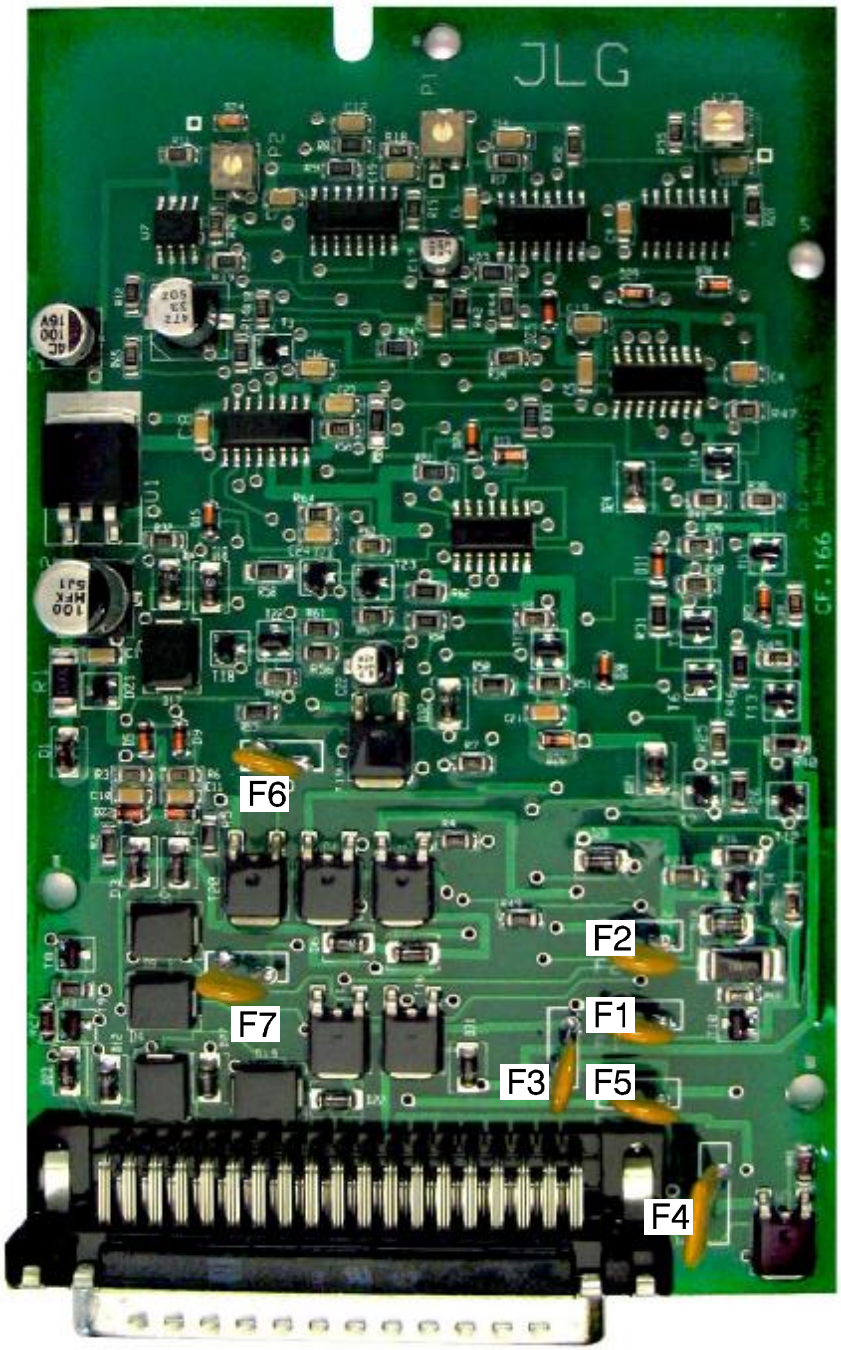
2. PolySwitch® 1,85A.

Function : Protection of the supply circuit to the coil [EVI] (platform inclination - see § 3.14).

3. PolySwitch® 1,85A.

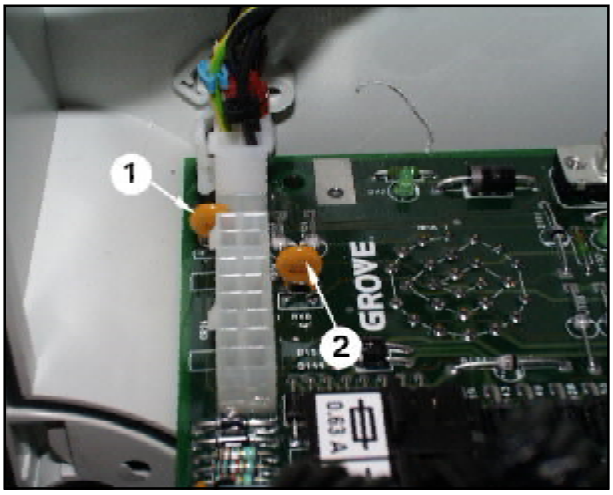
Function : Protection of the supply circuit to the coil [EVR] (platform rotation - see § 3.15).

Resetable fuses on the Drive management Module



F1	1.1 A	Coil [MAV] supply (drive FWD circuit)
F2	1.1 A	Coil [MAR] supply (drive RWD circuit)
F3	1.1 A	Coil [DV] supply (dump valve circuit
F4	1.85 A	Coil [HI / LO] supply (-) (drive speed circuit)
F5	1.1 A	Coil [EVF] supply (-) (brake circuit quick release)
F6	1.1 A	Coil [DB] supply (jib lift down circuit)
F7	1.1 A	Coil [DM] supply (mast lift down circuit)

Location : Electronic card in emergency control panel.



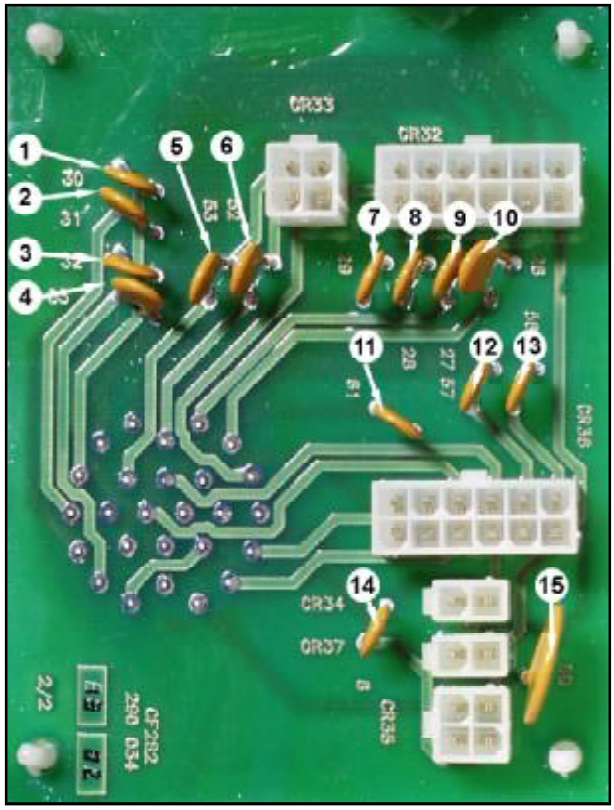
1. PolySwitch® 0,5A

Function : Protection of the supply circuit to the line contactor [KM1].

2. PolySwitch® 0,5A

Function : Protection of the "Pump Inhibit" input circuit of the electronic controller.

Location : Electronic card in chassis box.

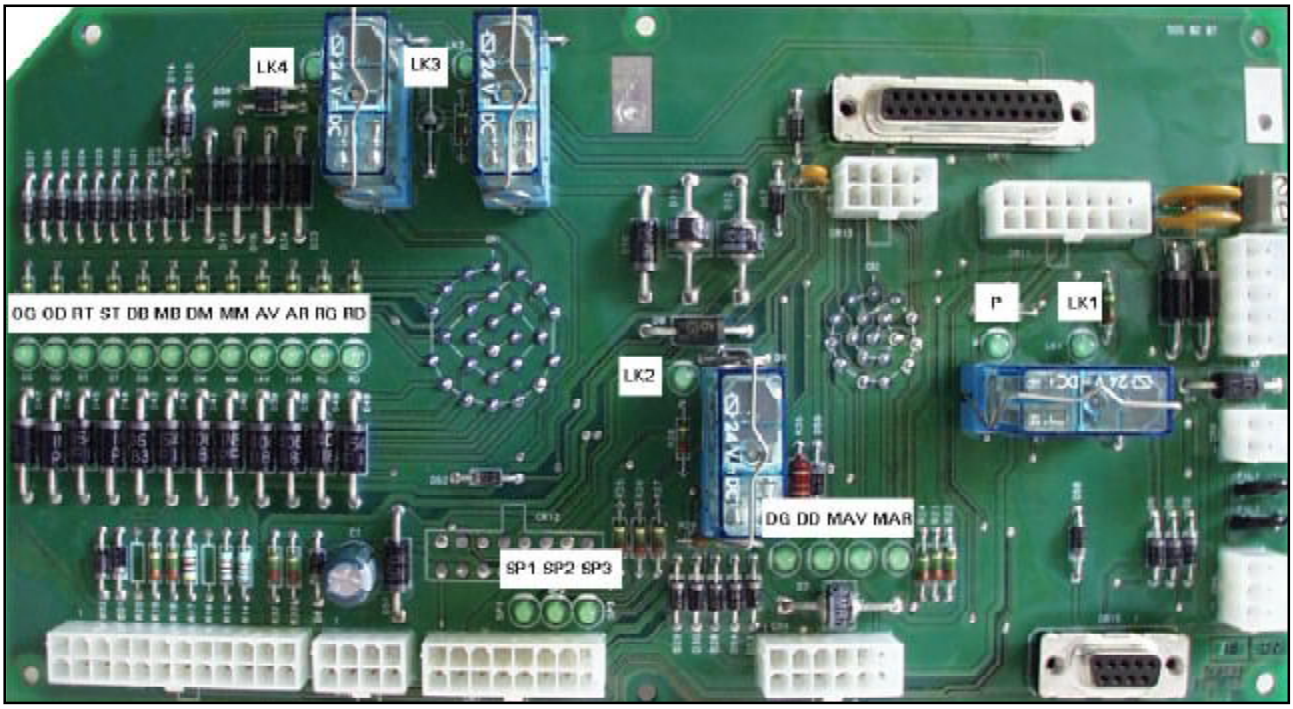


Rep.	Value	Protection of the supply line to :	Line n°
1	1,1A	Coil [RT] (Telescope retraction)	30
2	1,1A	Coil [OD] (Slewing to the right)	31
3	1,1A	Coil [OG] (Slewing to the left)	32
4	1,1A	Coil [DM] (Mast lowering)	33
5	1,1A	Coil [DD] (Steering to the right)	53
6	1,1A	Coil [DG] (Steering to the left)	52
7	1,1A	Coil [ST] (Telescope extension)	29
8	1,1A	Coil [MB] (Jib elevation)	28
9	1,1A	Coil [MM] (Mast elevation)	27
10	1,1A	Coil [DB] (Jib lowering)	26
11	1,1A	Coil [HI/LO] (Gear change)	58
12	1,1A	Coil [EVC] (Torque limitation)	57
13	1,1A	Pressure switch	61
14	1,1A	Tilt indicator	6
15	1,85A	Coil [DV2] and contactor [KM2] (Option)	60

4.7 Help with the diagnosis

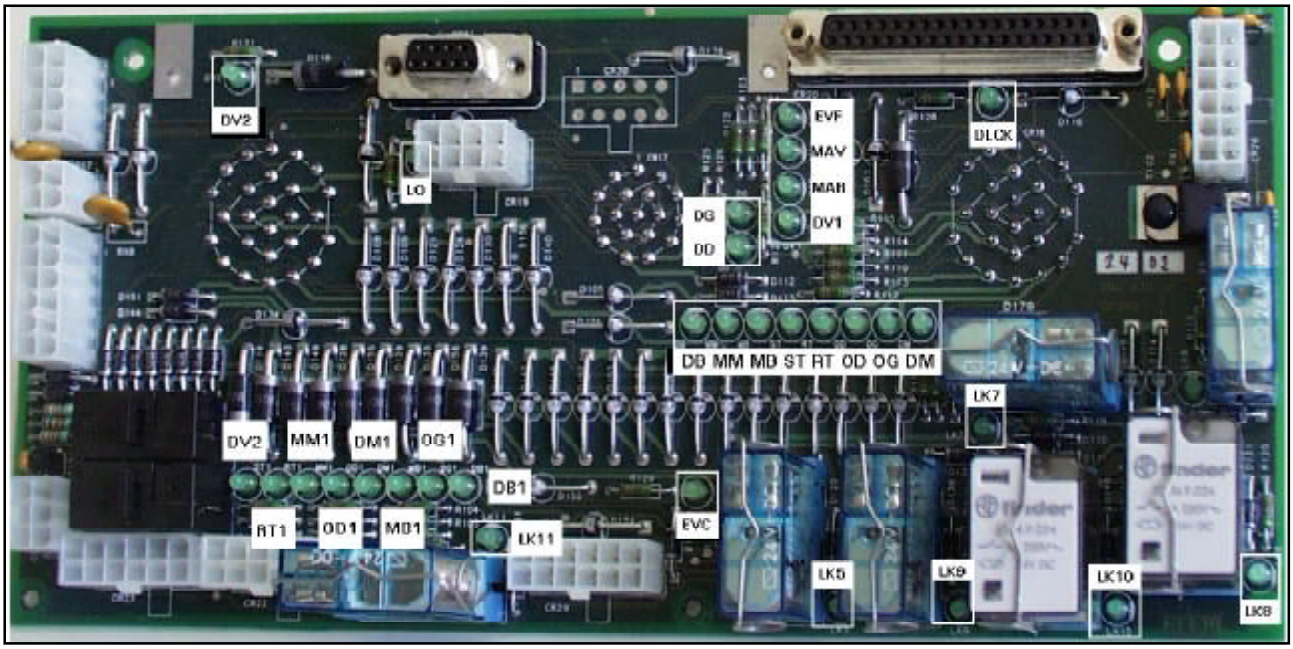
LEDs to help with the diagnosis

Location : Electronic card of the platform control panel.



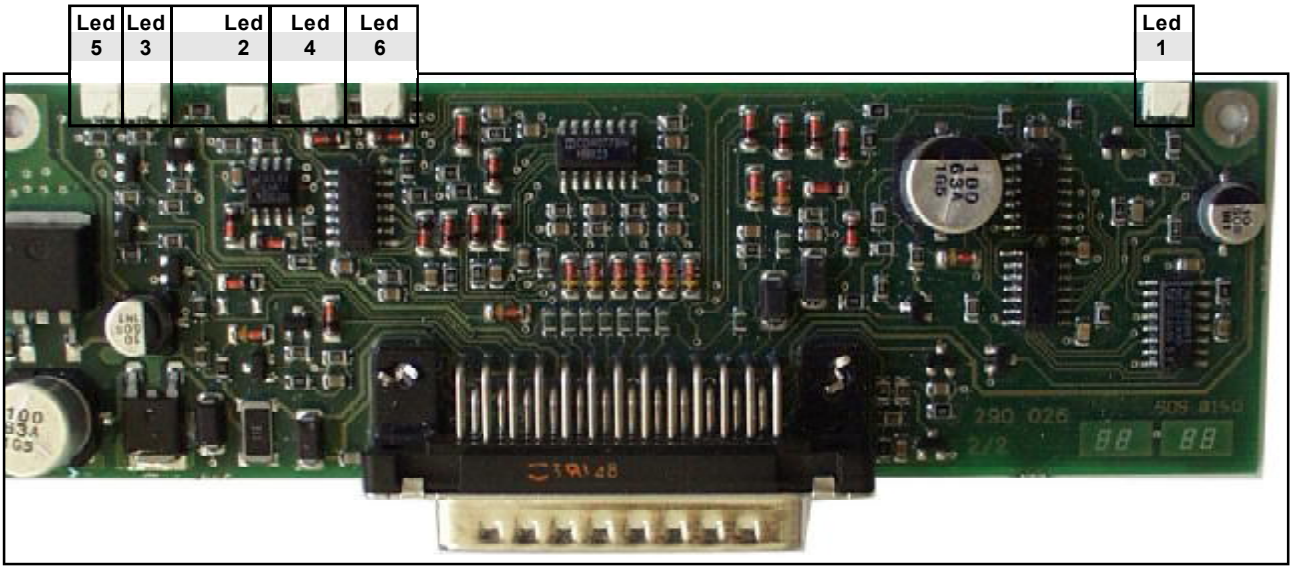
Marking	Component or function	Input	State	Output
LK1	Relay K1		×	
LK2	Relay K2		×	
LK3	Relay K3		×	
LK4	Relay K4		×	
P	Dead man pedal / trigger	×		
I.Av	Platform inclination - forward	×		
I.Ar	Platform inclination - rearward	×		
MM	Mast elevation	×		
DM	Mast lowering	×		
MB	Jib elevation	×		
DB	Jib lowering	×		
ST	Telescope extension	×		
RT	Telescope retraction	×		
OD	Structure slewing - right	×		
OG	Structure slewing - left	×		
RD	Platform rotation - right	×		
RG	Platform rotation - left	×		
MAv	Drive - Forward	×		
MAr	Drive - Reverse	×		
DG	Steering left	×		
DD	Steering right	×		
SP1	Selection Drive speed 1		×	
SP2	Selection Drive speed 2		×	
SP3	Selection Drive speed 3		×	

Location : Electronic card emergency control panel.



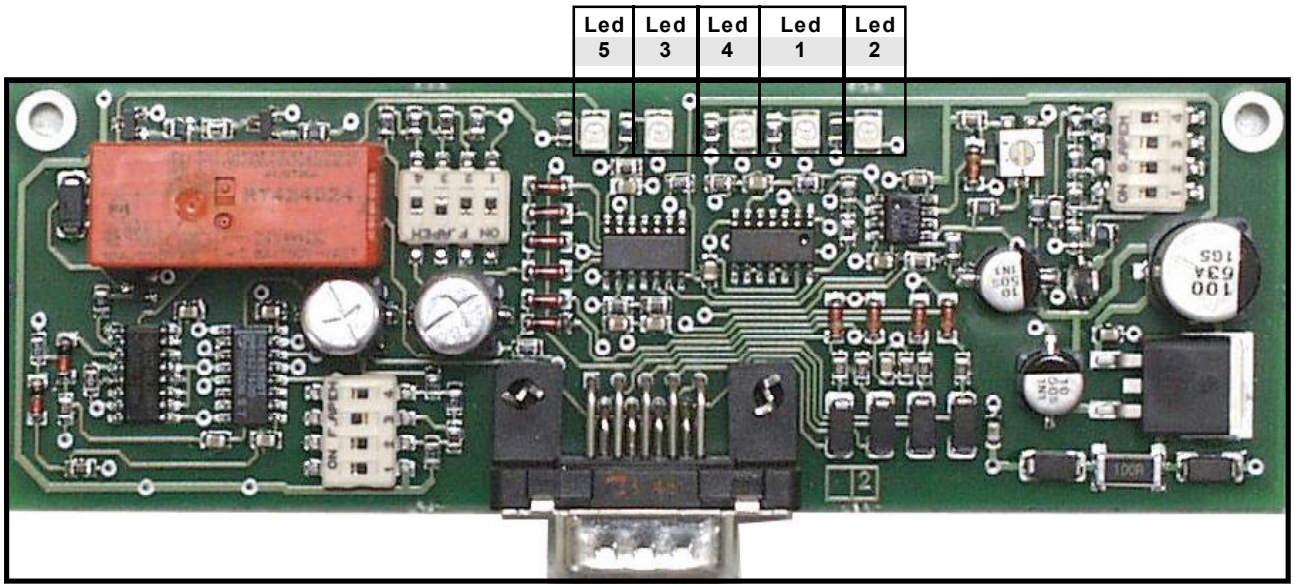
Marking	Component or function	Input	State	Output
LK5	Relay K5		×	
LK6	Relay K6		×	
LK7	Relay K7		×	
LK8	Relay K8		×	
LK9	Relay K9		×	
LK10	Relay K10		×	
LK11	Relay K11		×	
MM1	Mast elevation	×		
DM1	Mast lowering	×		
MB1	Jib elevation	×		
DB1	Jib lowering	×		
ST1	Telescope extension	×		
RT1	Telescope retraction	×		
OD1	Structure slewing - Right	×		
OG1	Structure slewing - Left	×		
MM	Mast elevation			×
DM	Mast lowering			×
MB	Jib elevation			×
DB	Jib lowering			×
ST	Telescope extension			×
RT	Telescope retraction			×
OD	Structure slewing - Right			×
OG	Structure slewing - Left			×
MAv	Drive - Forward			×
MAr	Drive - Reverse			×
DG	Steering left			×
DD	Steering right			×
EVF	Decompression of braking circuit off			×
EVC	Torque limiter off			×
LO	Gear change (high speed)			×
DLCK	Differential locking			×
DV1	Hydraulic power units oil return			×
DV2	Auxillary power unit oil return			×

LOCATION : Controls verification module

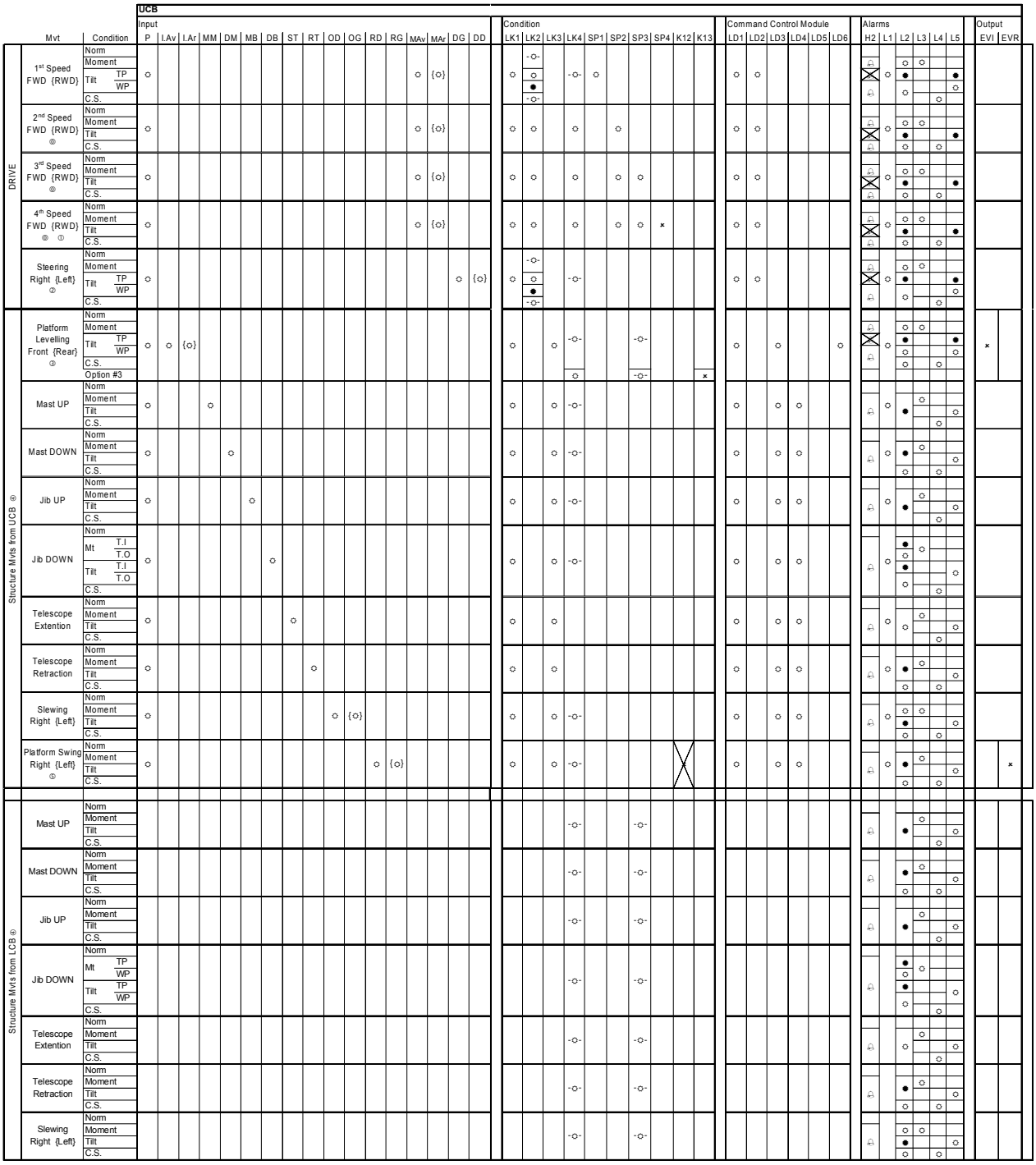


Led 1 : Movement authorization
Led 2 : Drive movements
Led 3 : Inverse of Led 2
Led 4 : Structure movements
Led 5 : Pump Inhibit
Led 6 : Platform inclination

LOCATION : "Power plus" Module



Led 1 : Selection 3rd gear
Led 2 : Drive movements
Led 3 : Led condition of pressure switch
Led 4 : Selection 4th gear
Led 5 : Led condition of module output



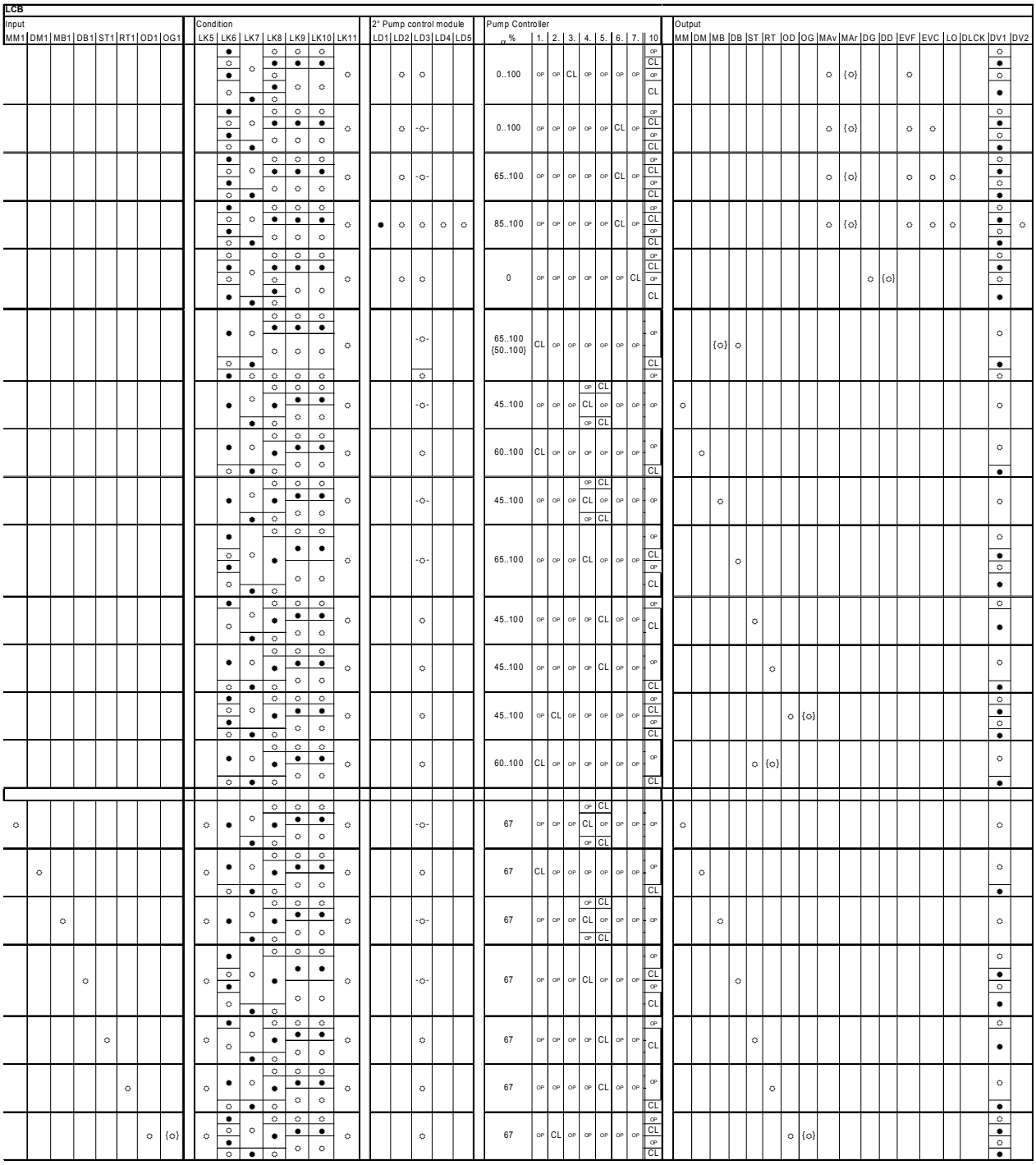
Legend :
- ☼ : Led Lit
- ● : Led not Lit (important to notice)
- -☼- : Led lit / not lit depending on limit switch - without influence on the movement
- {☼} : Led Lit (depending on reading choice)
- × : Input / output activated (no corresponding led)
- ⨯ : Input / output de-activated (important to notice)
- 🔔 : Alarm buzzer on
- ⨯ : Alarm buzzer off (important to notice)

TP : Travel position (Mast and Telescope fully retracted, Jib under the first 1/3 of its stroke)
WP : Work position (out of travel position)
T.I : Telescope In (fully retracted)
T.O : Telescope Out (extented)

⑩ : Function accessible only in transport position (none of the sensors [SW2], [SW4], [SW5] must be actuated)
① : Option "Power Plus"
② : Steering movement only (joystick in neutral)
③ : Relay K13 to disable platform tilting movements outside the transport position connected
④ : Movements controlled when the platform has left the transport position
⑤ : Option Rotation

NOTE

The accelerator values are indicated for information only (they can vary slightly from one machine to another).


LCB
Input
MM1 DM1 MB1 DB1 ST1 RT1 OD1 OG1
Condition
LK5 LK6 LK7 LK8 LK9 LK10 LK11
2° Pump control module
LD1 LD2 LD3 LD4 LD5
Pump Controller
% 1. 2. 3. 4. 5. 6. 7. 10
0..100
65..100
85..100
0
65..100 {50..100}
45..100
60..100
67
Output
MM DM MB DB ST RT OD OG MAv MAr DG DD EVF EVC LO DLCK DV1 DV2

4.8. Electronic modules

4.8.1 Controls verification module

FUNCTION :
- Authorization of the control movement execution if and only if the "Dead man" device (enable pedal) is actuated before the control of the desired movement : the controls must be in neutral before the action on the enable pedal.
- Surveillance of the "Dead man" device : if the enable pedal is kept actuated and no movement has been controlled within a time scale of 5 seconds, the valid state of the controls is cancelled : the enable pedal must be released and actuated again to be able to control a movement.
- Prohibition of the simultaneous control of a structure / drive / platform levelling movement.
- Authorization of restarting a drive movement without having to return the joystick to neutral once the enable pedal has been released at the condition that the pedal is actuated again within 5 seconds.
- Detection of the power cut out by the battery discharge indicator.

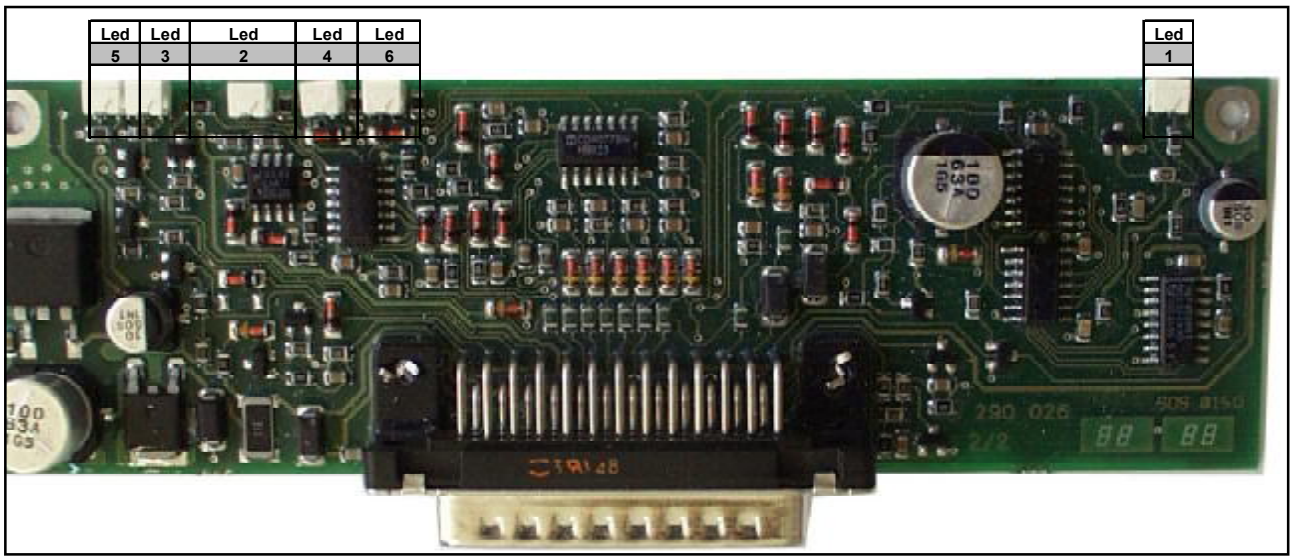
Symbols used to represent the module's Inputs / Outputs on the machine's electrical schematic.

E x — Inputs / Outputs for control validation.

N x — Verification of controls condition (Detection of controls in neutral).

LOCATION : The module is connected to the plug [CR10] of the electronic card of the platform control panel.

Led 1 : Movement authorization
Led 2 : Drive movements
Led 3 : Inverse of Led 2
Led 4 : Structure movement
Led 5 : Pump Inhibit
Led 6 : Platform levelling



Description of entries / outputs of the module :

Inputs	Outputs	Pin n°	Function	Remarks
E1		15	Supply + 24V	
E2		16	Supply 0 V	
E3		11	Auxillary	Not used
E4		12	Enable pedal (+)	
	E5	17	12 Vcc regulated output	
	E6	13	Supply "Enable" relay [K1] (-)	
	E7	4	Supply "Enable" relay [K1] (+)	Not used
	E8	3	Supply "Pump Inhibit" function	
E9		2	Reset module 0 (V)	Not used
E10		1	Reset module (24 V)	
N1		18	Detection drive movements in neutral	
N2		6		
N3		19	Detection structure movements in neutral (except levelling)	
N4		7		
N5		20	Detection platform levelling movements in neutral	
N6		8		
N7		5	Movement selection	Not used
C1		23	Movement detection	Not used
	C2	24	Accelerator 100%	Not used
	C3	25	Supply to speed reduction relay (-)	Not used

Detection controls in neutral :

Drive movements

- When the movement control joystick for drive and/or a steering control button is actuated :
  - ◗ Inputs [N1] and [N2] are in the same state :
    - 0 to 4 V if the control has not been authorized- Led [LD1] off.
    - 24 V if the control has been authorized - Led [LD1] on.
  - ◗ LED [LD2] lights up.
  - ◗ LED [LD3] goes off.

Structure movements (except platform levelling)

- When a structure movement control switch is actuated :
  - ◗ Inputs [N3] and [N4] are in the same state :
    - 0 to 4 V if the control has not been authorized- Led [LD1] off.
    - 24 V if the control has been authorized- Led [LD1] on.
  - ◗ LED [LD4] lights up.

Platform levelling movements

- When the levelling control movement is actuated :
  - ◗ Inputs [N5] and [N6] are in the same state :
    - 0 to 4 V if the control has not been authorized- Led [LD1] off.
    - 24 V if the control has been authorized- Led [LD1] on.
  - ◗ LED [LD6] lights up.

Combination of movements

- If at least two of the Input groups [N1 - N2], [N3 - N4] and [N5 - N6] are in the same condition :
  - ◗ The control is not authorized or the authorization of the control in progress is cancelled (Led [LD1] goes out in the case where the authorization is cancelled).
  - ◗ Output [E8] goes to 24 V ("Pump Inhibit" function of the controller actuated - see § 4.5 - and orange indicator on).
  - ◗ Led [LD5] lights up (indicates the state of the output [E8]).

Detection of discharge indicator power cut

When the power is cut out by the discharge indicator, the input [E10] is no longer supplied : the controls can no longer be enabled [RESET]. Input [E10] must be supplied before input [E4] for the controls to be authorized. The reset push button on the platform control panel allows to "force" entry [E10] to 24 V ; it must be actuated and held before the enable pedal is depressed.

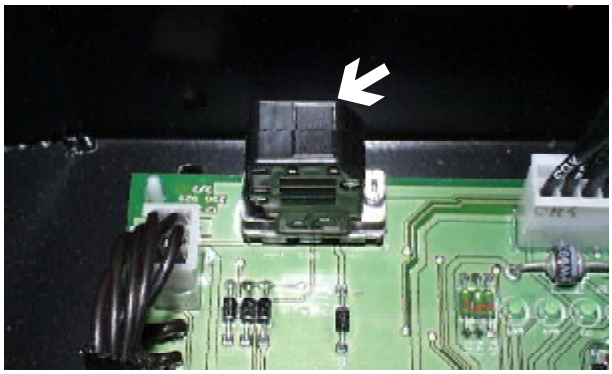
4.8.2. Speed control module for the jib (build-in electronic plug)

FUNCTION : Reduction of the speed for the jib Elevation / lowering movements when reaching the end of its higher travel.

Jib higher position switch [SW3] : see § 4.2.4.

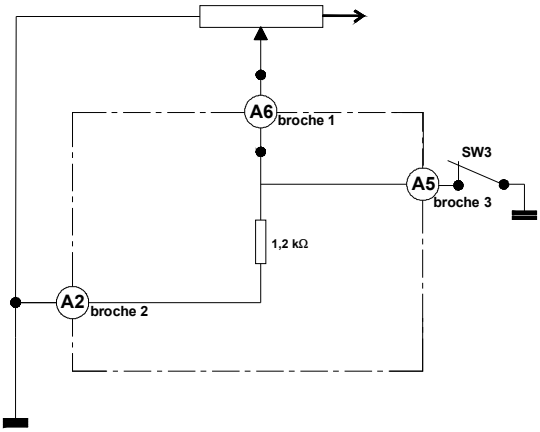
Symbol used to represent Inputs / Output of the module on the electrical schematic of the machine : (Ax)

LOCATION : The module is connected to the plug [CR15] on the electronic card of the platform control panel.



Operating principle

The speed reduction is obtained by placing a 1,2 kΩ resistance between the 0 V and the cursor of the potentiometer for structure movements :



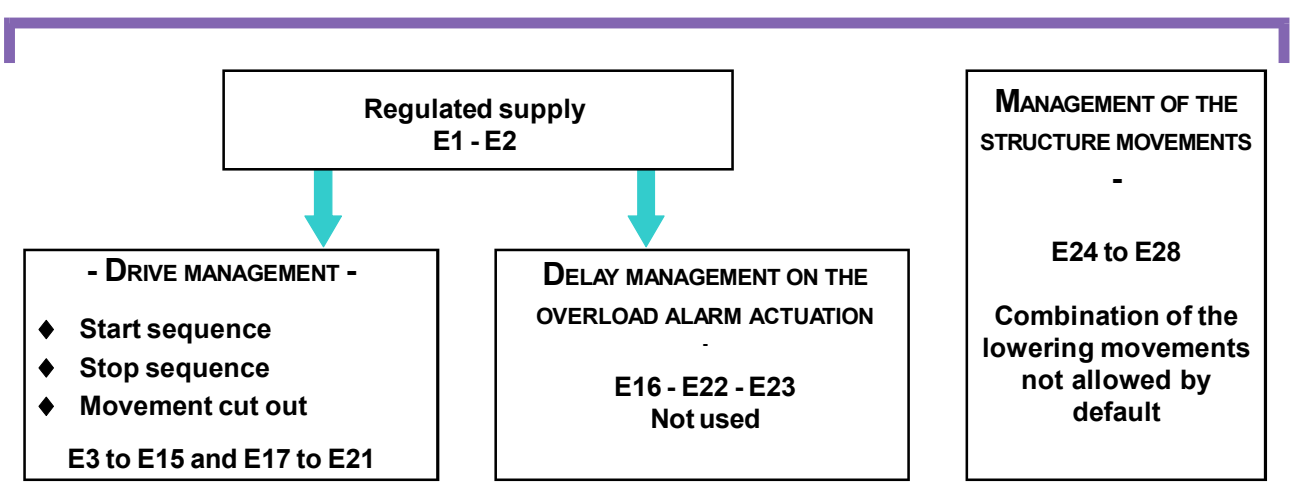
The speed reduction depends from the position of the structure movement potentiometer :

- No speed reduction if the potentionmeter is on minimum.
- Reduction of the maximum speed if the potentiometer is on maximum.

During a jib lowering movement from its higher position, the release of the switch [SW3] restore the movement normal speed.

4.9. Time delay module

Architecture of the module



Symbols used to represent Inputs / Outputs of the module on the machine's electrical schematic : 

FUNCTIONS :

- Management of start sequences :
When the joystick is actuated for a drive movement (speed selector on ( )), the work platform starts at ( ) speed and switches automatically to ( )speed. The delay to switch to ( ) speed can be adjusted using the potentiometer (P1).

- Management of progressive start / stop sequences : When the joystick is actuated slowly for a drive movement (speed selector on ( )), the platform starts at ( ) speed and should switch to ( ) speed only when the value of the acceleration signal (of the joystick potentiometer) has reached approximately 70%. The automatic switch from ( ) speed to ( ) speed, during a slow reduction of the acceleration signal, is done for a signal value of 40%. The speed change threshold can be adjusted using the potentiometer (P2).

- Management of stop sequences and sudden reversal of the drive direction :
In the event of sudden reversal of the drive direction, the platform slows down then stops before restarting in the opposite direction (as described in the start sequence). The delay for the platform to restart in the opposite direction can be adjusted using the potentiometer (P3). During this delay, the hydraulic power unit turns at low speed, supplying the make up flow to the wheel motors.

- Automatic switch to ( ) speed during the use of differential locking.

When the differential lock is actuated, input [E12] of the module is supplied and causes the deactivation of output [E11] (power cut to the coil [HI-LO] - switch to 2nd drive speed ( )).

- Management of the drive movement cut out - see § 4.3.

- When the circuit linking Inputs / Outputs [E5] and [E7] is cut - see § 4.3 :
  - Output [E6] is actuated : supply to the "Pump Inhibit" function of the controller - see § 4.5.
  - The output [E19] is desactivated : the supply is cut to ⊕ of the coil [DV1].

- Management of the combination of lowering movements :
The combination of the mast lowering and jib lowering movements is prohibited : the first controlled lowering movement (input E25 : jib, E26 : mast) is performed (input E27 : jib, E28 : mast).
In case the mast lowering and jib lowering movements are controlled simultaneously (possible from the emergency control panel), the mast lowering movement has priority.

Input	Output	Pin n°	Function	Remarks
E1		16-34	Supply 24 V	
E2		19-33-37	Supply 0 V	
E3		1	Input Drive Control forward	
E4		20	Input Reverse Control forward	
	E5	27	Input signal Drive Cutout	
	E6	18	Supply to function "Pump Inhibit"	
E7		22	Input signal Drive Cutout	
	E8	11	Supply to coil [MAV]	
	E9	29	Supply to coil [MAR]	
E10		24	Input Acceleration order	Analogic Entry [1]
	E11	12	Supply to coil [HI/LO] (-)	
E12		8	Input Differential lock control	
	E13	36	Supply "Speed 1" controller acceleration order ar 100%	
E14		3	Input fast drive speed cutout	
	E15	17	Supply "Speed 6"	
E16		4	Input overload sensor	Not used
	E17	30	Supply to coil [EVF] (-)	
E18		5	Input structure movement control	
	E19	28	Supply to coil [DV1] (+)	
	E20	10	Supply to coil [DV1] (-)	
E21		26	Input for forced supply to [DV1]	Not used
E22		2	Input signal of structure in lowered position	Not used
	E23	23	Forced supply to overload relay	Not used
E24		21	Input auxiliary sensor for authorization of simultaneous lowering	Connected to 0V
E25		25	Input Jib lowering control	
E26		6	Input Mast lowering control	
E27		13	Supply to coil [DB]	
E28		32	Supply to coil [DM]	

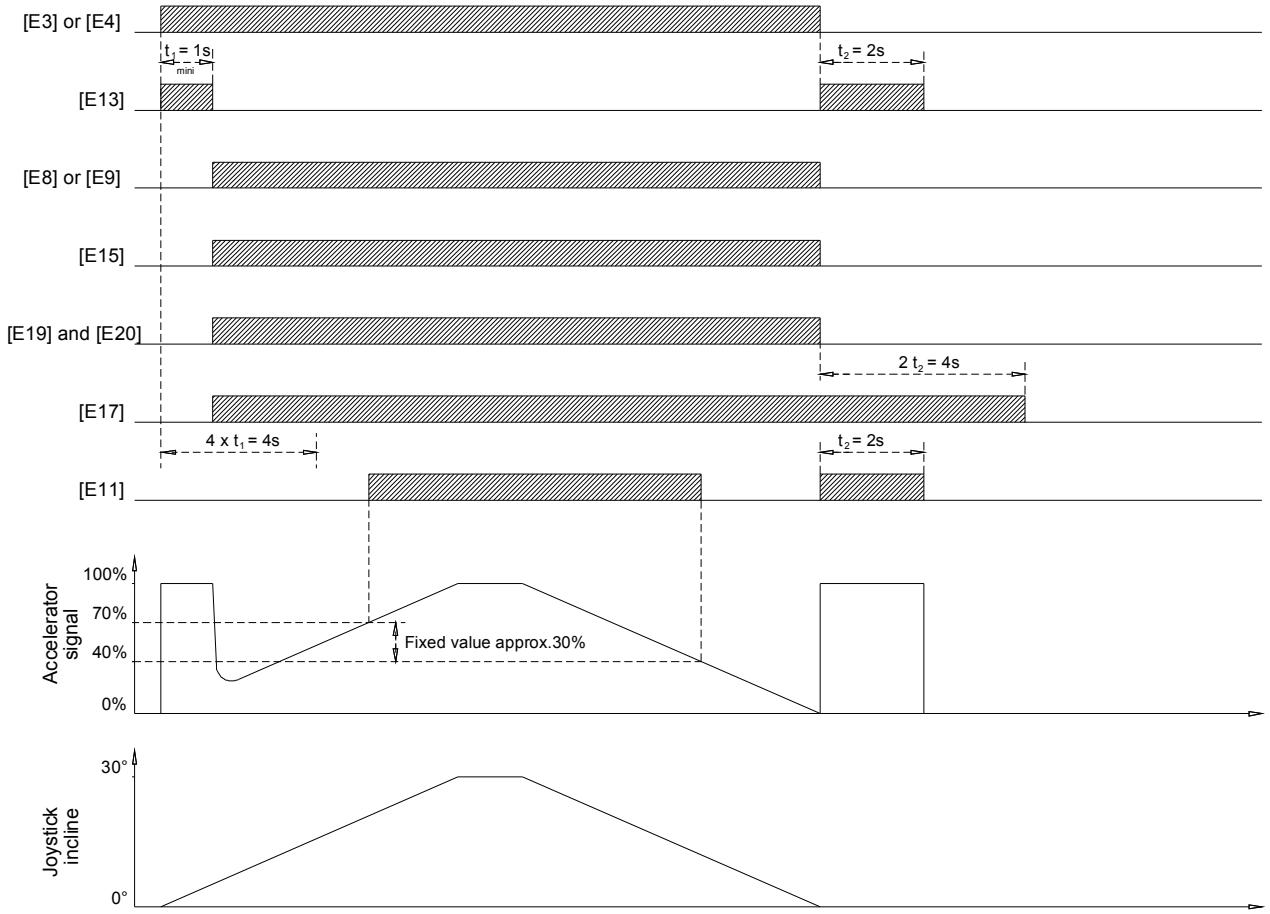
a. 7V < voltage < 9V
   Power turned on. Platform controls or ground controls selected. All controls in neutral position.
b. 3.5V < voltage < 4V
   Joystick controller out of neutral position but at the beginning of its course. Acceleration value will still 0% as long as the voltage is over 3.5V.
c. Voltage < 150 mV
   Joystick controller at the end of its course. Acceleration value nearing or equal to 100%.
d. 0.75V < voltage < 1.10V
   Voltage threshold for the automatic switch to 3rd gear (0.75 V corresponds to an acceleration value near 80% - 1.10V corresponds to an acceleration value near 70%).

NOTE

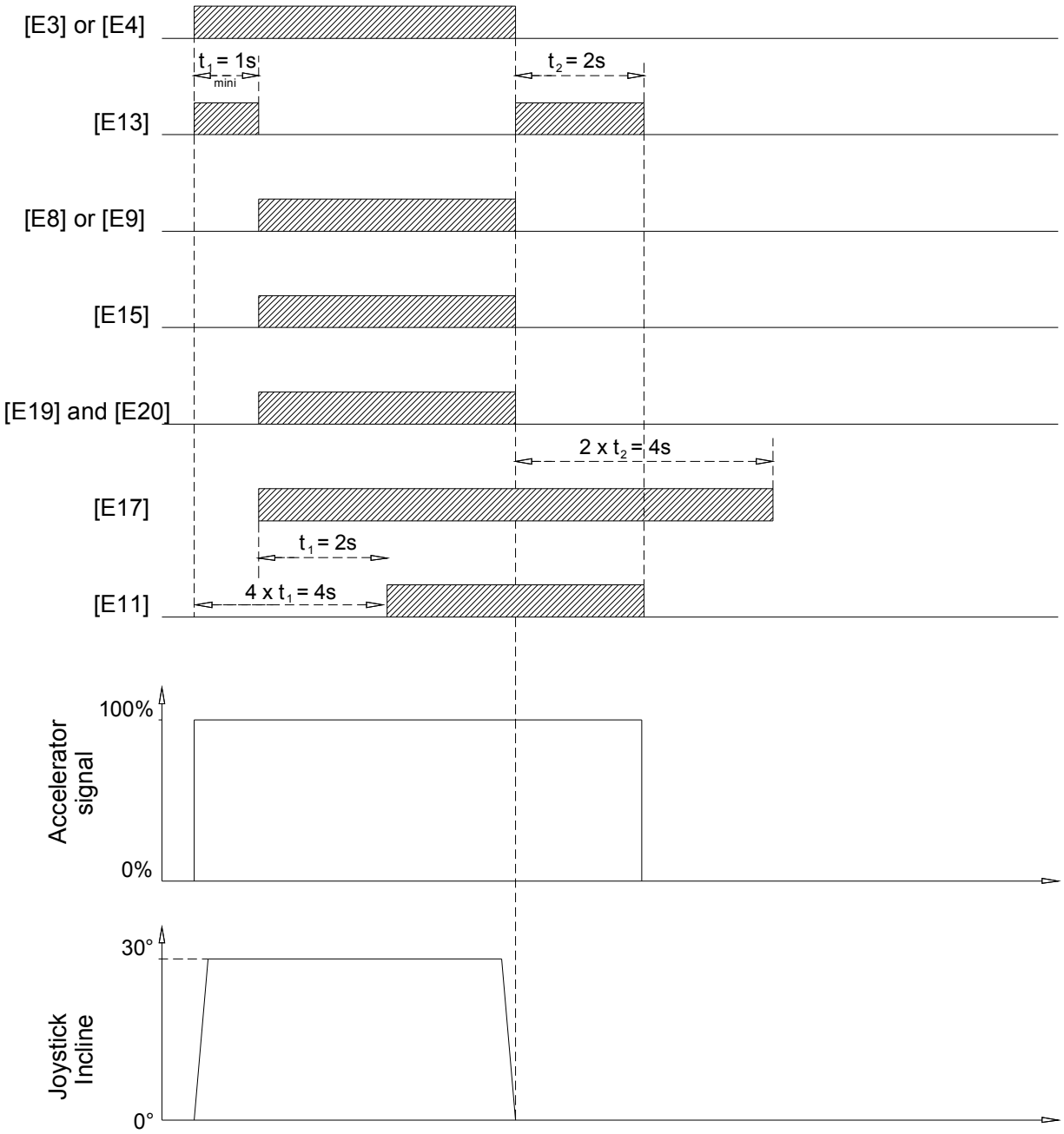
[1] : Following typical values of the analogical input [E10] can be measured between battery negative terminal and pin #14 of the motor speed controller connector (connector must still plugged to the controller socket).

Progressive start / stop sequence ( ) :

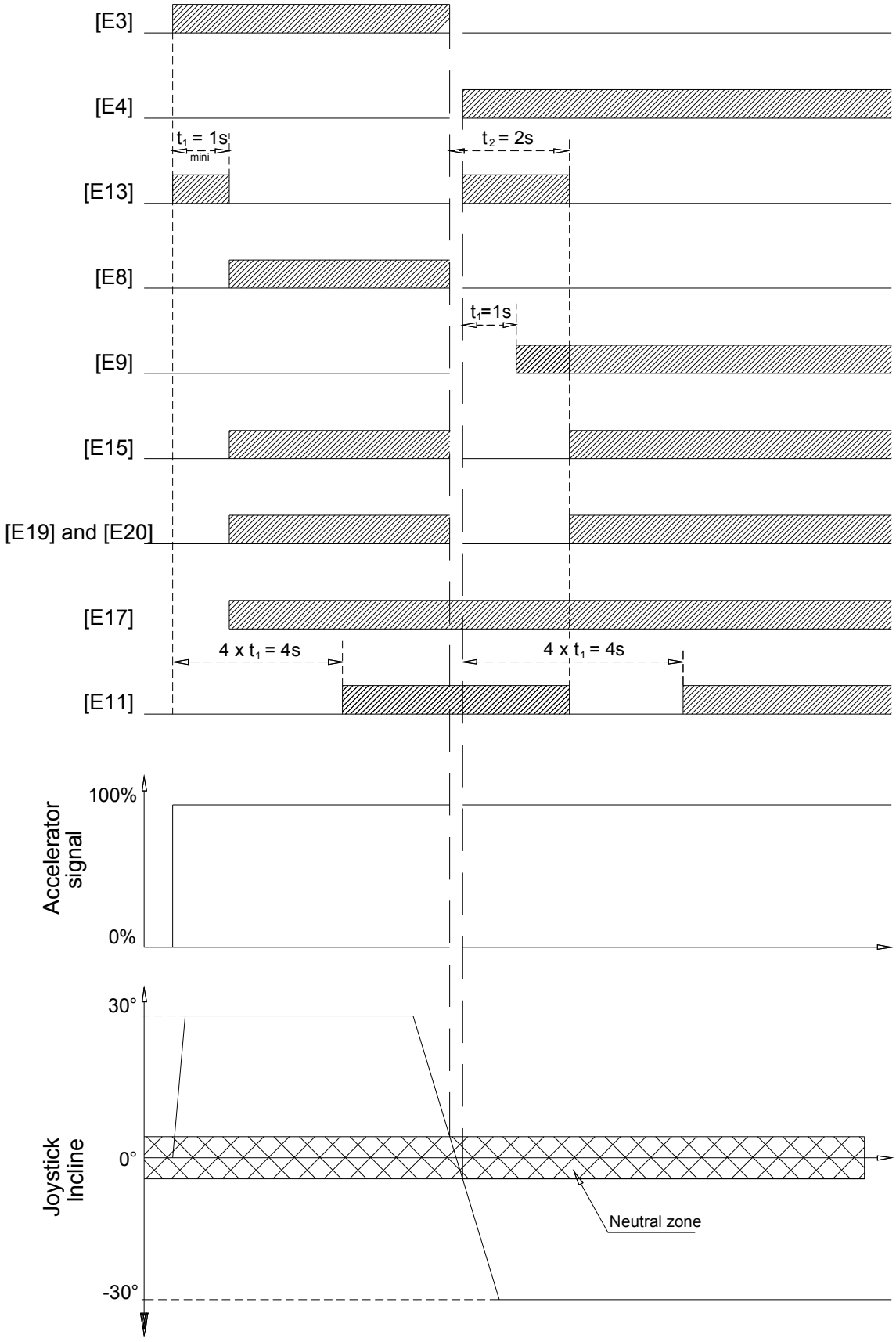
STARTING SEQUENCE / PROGRESSIVE STOPS



Starting sequence/ Sudden stop ( ) :



Starting sequence / sudden reversal of drive direction ( ) :



Typical values of the analogic input [E10]

The typical voltages indicated below can be measured between the battery ⊖ and the pin 14 of the controller connector. The connector must be plugged into the controller socket.

Voltage = 7 to 9 V

- Platform control panel or emergency control panel selected. All controls in neutral.

3,5 V < Voltage < 4 V

- Joystick at the very beginning of its course (acceleration signal of the controller starts to increase only when the voltage reaches just under 3,5V. Above 3,5V, the calibrator displays a signal of 0% - see § 4.5).

Voltage < 150 mV

- Joystick at the end of its course (accelerator on maximum : signal nearing 100% on the calibrator - see § 4.5).

0,75 V < Voltage < 1,10 V

- Voltage threshold for the automatic switch to 3rd gear (🐢) after temporisation t1 is over (A 0,75 V voltage corresponds to a signal near 80% on the calibrator. A 1,10 V voltage corresponds to a signal near 70% on the calibrator - see § 4.5).

Potentiometers adjustment

⚠ CAUTION

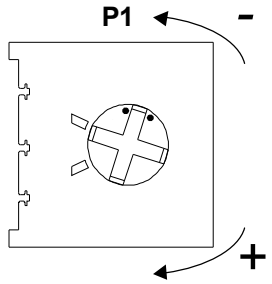
The course of the potentiometers used on the electronic module is 3/4 turn. Do not attempt to turn the setting screws more than their course allows. Use a screwdriver of appropriate dimension.

⚠ CAUTION

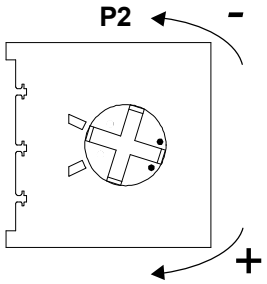
The potentiometers settings must be completed by a qualified personnel.

- Approximate adjustment :

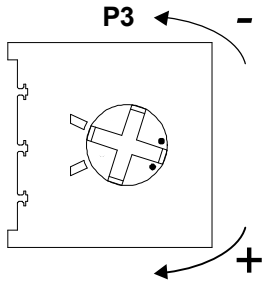
Potentiometer P1 : Temporisation for switching to fast gear (🐢) [t1]



Potentiometer P2 : Speed change threshold (🐇/🐢)



Potentiometer P3 : Temporisation for make up flow and braking [t2]



NOTE

A small jerk occurs when the machine switches from (🐇) gear to (🐢) gear or from (🐢) gear to (🐇) gear.

- Finer adjustments :

Potentiometer (P1) :

1. Position the drive speed selector to ( ).
2. Drive the machine in reverse by pulling the joystick as quickly as possible.
3. The work platform should start in ( ) gear and switch to ( ) gear within approximately 4 seconds.
   - If the delay for the platform to switch to ( ) gear is superior to 4 seconds, turn slightly the potentiometer P1 setting screw (by a 1/32 turn) anti clockwise.
   - If the platform switches too fast to ( ) gear or does not start, turn slightly the potentiometer P1 setting screw (by a 1/32 turn) clockwise.

Potentiometer (P2) :

1. Connect the calibrator to the SEVCON controller. Using the "SELECT" key, select the test sequence "acceleration signal". see § 4.5.
2. Position the drive speed selector to ( ).
3. Perform a drive movement slowly actuating the joystick. The platform should switch to ( ) gear when acceleration signal value (displayed by the calibrator) reaches approximately 70%.
4. Reduce the platform speed by letting the joystick return slowly to neutral. The platform should switch to ( ) gear when the acceleration signal value goes under 40% and before the movement stops.
   - If the movement stops before the platform switches to ( ) gear, (the machine stops and cannot start again), turn slightly the potentiometer P2 setting screw (by a 1/32 turn) anti clockwise.
   - If the platform switches to ( ) gear with an acceleration signal value too high (important jerk), turn slightly the potentiometer P2 setting screw (by a 1/32 turn) clockwise.

Potentiometer (P3) :

1. Place the drive speed selector to ( ).
2. Perform a forward drive movement at maximum speed.
3. Release the enable pedal. The platform should stop smoothly. The platform should not stop before the hydraulic power unit stops turning (the hydraulic power unit turns at reduced speed to supply the make up flow to the wheel motors).
4. Perform a forward drive movement at maximum speed and reverse the movement quickly. The platform should stop smoothly before starting in the opposite direction :
   -If the platform starts again in the opposite direction before starting completely and / or if the wheel motors click, turn slightly the potentiometer P3 setting screw clockwise.
   -If the time during which the hydraulic power unit turns at reduced speed (make up flow) is superior to 1 second, turn slightly the potentiometer P3 setting screw (by a 1/32 turn) anti clockwise.

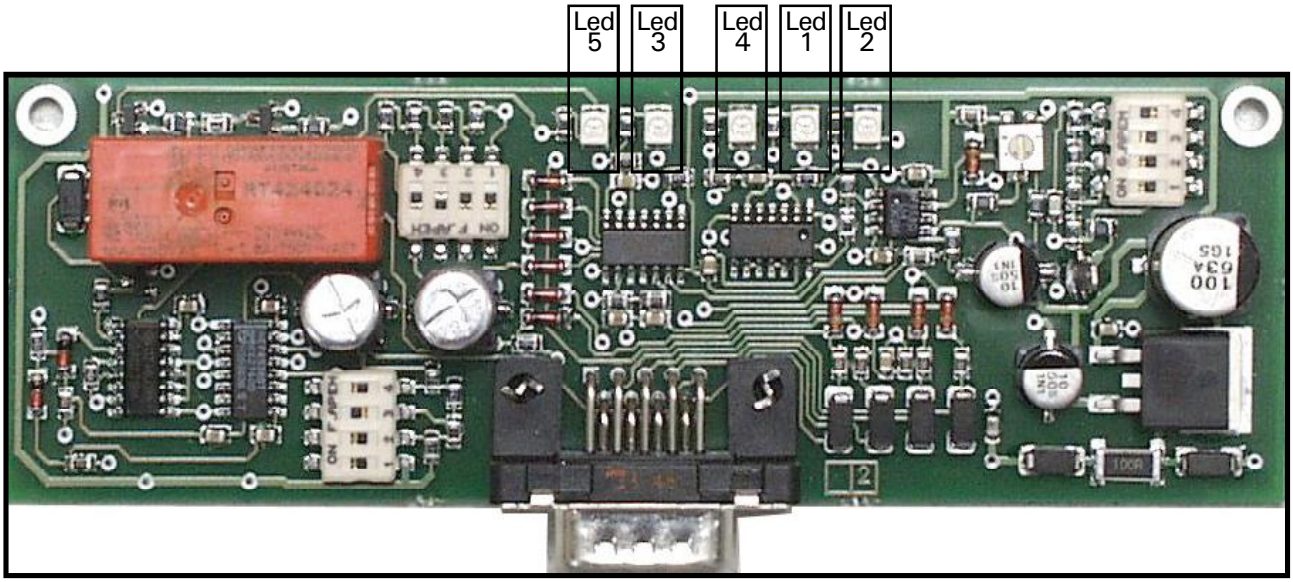
4.10 "Power Plus" module (option)

FUNCTION : Management of the starting up of the auxilliary power unit - see § 3.1.

Symbols used to represent Inputs / Outputs of the module on the machine electrical schematic : 

LOCATION : The module is connected to pin [CR21] on the electronic card of the emergency control panel.

Description of module Inputs / Outputs



Input	Output	Pin N°	Function	Remarks
X1		8	Supply + 24 V	
X2		7	Supply 0 V	
X3		4	Coil [HI / LO] supply detection	
X4		6	Input Pressure switch (+)	
X5		3	Input 4th gear selection (+)	
X6		1	Input acceleration order	Analogic entry
	X7	5	Contactor [KM2] - Coil [DV2] supply	
X8		—	—	Not used
X9		9	Drive movement detection	

Conditions for starting the auxilliary power unit

The auxilliary power unit starts when output [X7] is actuated :

- Led [LD5] lights up
Output [X7] is actuated 2 to 3 seconds after the necessary conditions for the starting up of the power unit are met.

The necessary conditions for starting up the unit are :

- When a drive movement is controlled :
Input [X9] is supplied
Led [LD2] lights up

- When the 4th gear is selected (+) :

Input [X5] is supplied
Led [LD4] lights up

- When the machine is already driven in 3rd gear (coil [HI / LO] supplied) :
Input [X3] stops being supplied.
Led [LD1] goes off.

- If the acceleration signal is higher than 90% :

The voltage on input [X5] is lower than 450 mV.

- When the pressure in the hydraulic circuit is inferior to the pressure switch setting pressure :
Input [X4] is supplied.
Led [LD3] lights up.

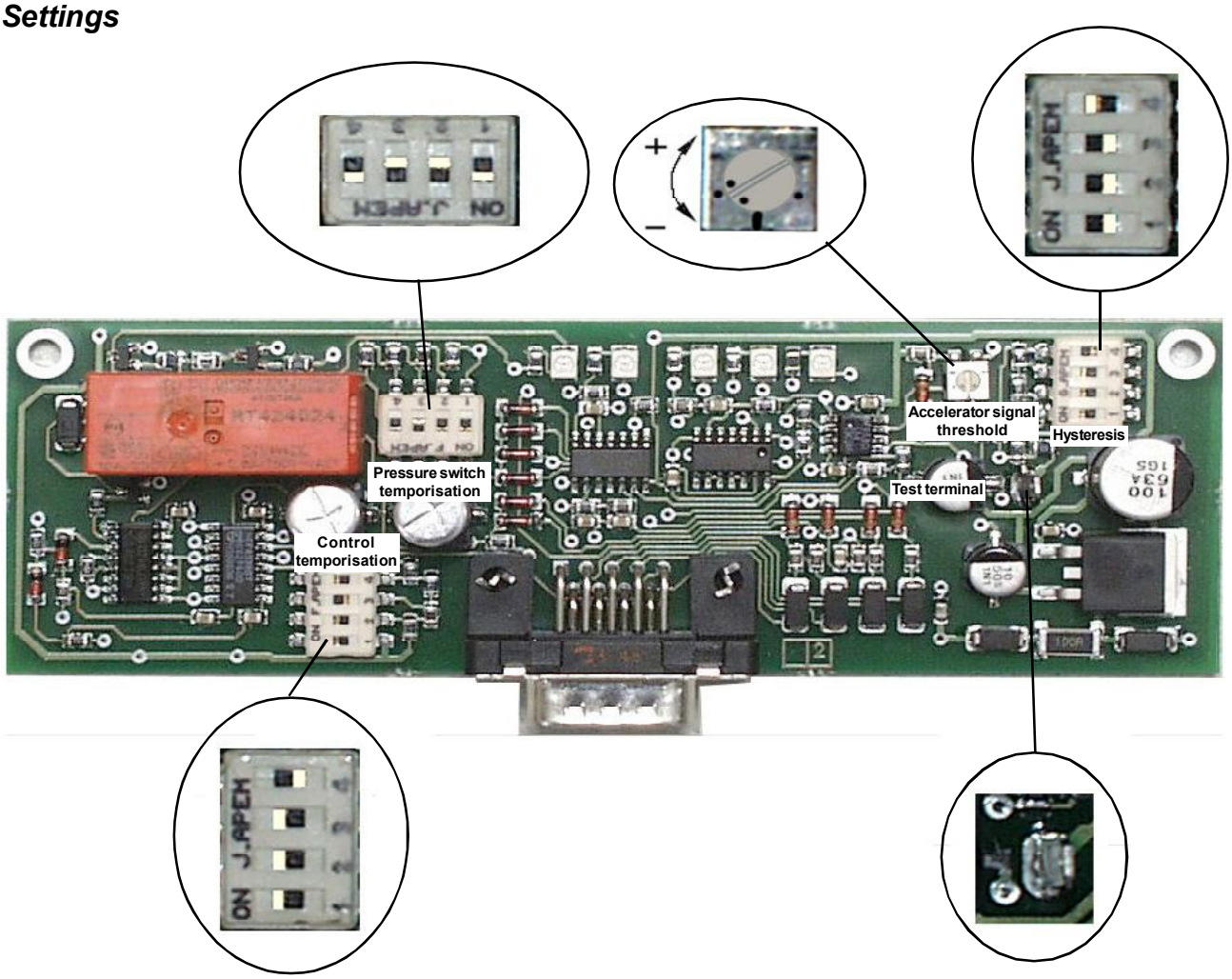
NOTE
Selection of the 4th gear starts the control temporisation.

NOTE
The switch to 3rd gear starts the control temporisation.

NOTE
Led LD1 is :
- **lit when 3rd gear is selected but not active.**
- **off when 3rd gear is not selected or is selected and active.**

NOTE
Closing of the pressure switch starts the pressure switch temporisation.

Settings



Position of switches				Temporisation	Hysteresis
1	2	3	4		
ON	**ON**	**ON**	**ON**	**0 s**	+
OFF	**ON**	**ON**	**ON**	**0,3 s**	
ON	OFF	**ON**	**ON**	**0,7 s**	
OFF	OFF	**ON**	**ON**	**1,0 s**	
ON	**ON**	OFF	**ON**	**1,3 s**	
OFF	**ON**	OFF	**ON**	**1,6 s**	
ON	OFF	OFF	**ON**	**2,0 s**	
OFF	OFF	OFF	**ON**	**2,3 s**	
ON	**ON**	**ON**	OFF	**2,6 s**	
OFF	**ON**	**ON**	OFF	**3,0 s**	
ON	OFF	**ON**	OFF	**3,3 s**	
OFF	OFF	**ON**	OFF	**3,7 s**	
ON	**ON**	OFF	OFF	**3,9 s**	
OFF	**ON**	OFF	OFF	**4,2 s**	
ON	OFF	OFF	OFF	**4,6 s**	
OFF	OFF	OFF	OFF	**4,9 s**	–

- Control temporisation :

The machine must be at stabilised speed when the auxilliary power unit starts.
Standard setting : temporisation from 2,3 to 2,6 s.

- Pressure switch temporisation :

When the circuit pressure goes down below the setting threshold and when the pressure switch contact closes, the auxilliary power unit should not be started again before a certain delay.
The start of the auxilliary power unit causes a pressure peak in the hydraulic circuit. If the power unit starts too early (pressure in the circuit still very near the value at which the pressure switch is triggered), the resulting peak will cause a succession of stop / start of the unit.
Standard setting : temporisation from 3,0 to 3,3 s.

- Accelerator signal threshold :

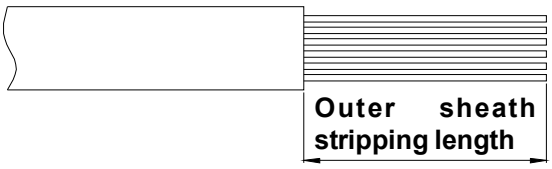
The auxilliary power unit should start for an acceleration signal near 90% and before the joystick reaches the end of its course. When the joystick is returned to neutral, the auxilliary power unit must stop before the automatic switch from 3rd gear () to 2nd gear () (supply to the coil [HI / LO]) cut off).
The signal threshold for the start of the auxilliary power unit can be adjusted using the potentiometer welded on the module. The adjustement of the potentiometer is performed by measuring the voltage between the module test terminal and the battery ⊖. The start threshold of the unit for a 90% signal corresponds to a 320 mV voltage.

- When the potentiometer is turned clockwise :
  - ◗ the threshold is lowered = voltage increases
- When the potentiometer is turned anticlockwise :
  - ◗ The threshold is raised = voltage decreases.

4.11.Clipper connector installation procedure.

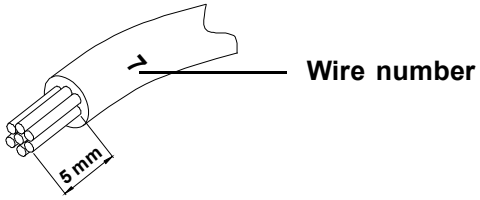
Cable preparation

1.Strip the cable outer sheath over the length indicated in the table below.



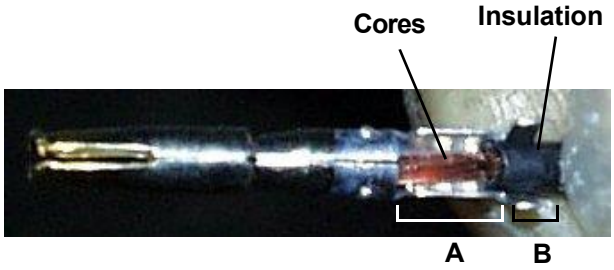
Connector model	Sheath stripping length
19 pin connector	mm (ins)
26 pin connector	mm (ins)

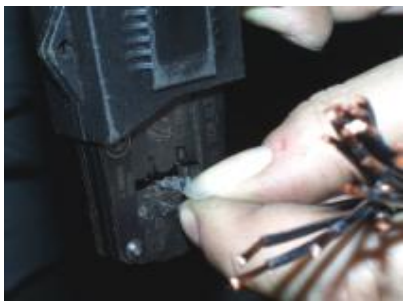
2. Strip each wire insulation over 5 mm (0.19 ins).



Contact crimping :

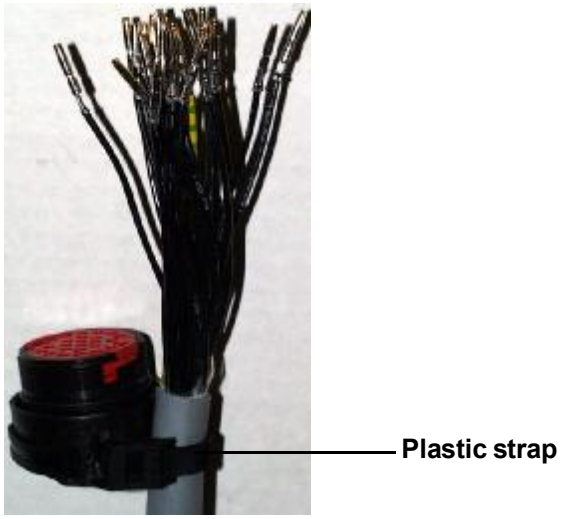
1. Place the bare wire on the terminal to :
   - crimp the copper in part A
   - crimp copper + insulation in part B
2. Crimp with tooling CLIPPER ref. Y16SCM-GL3 or similar



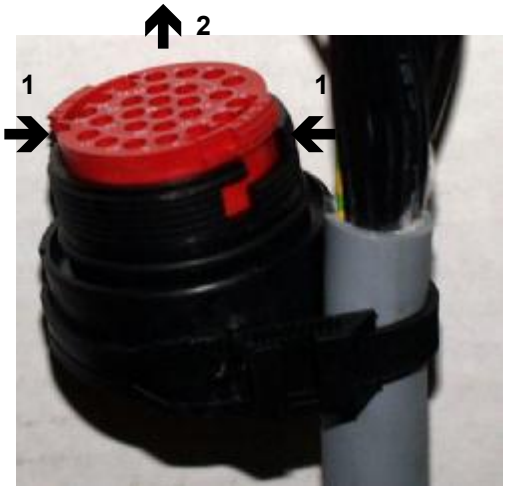


Putting the contact in place

1. Tie the cable and connector assembly with a plastic strap



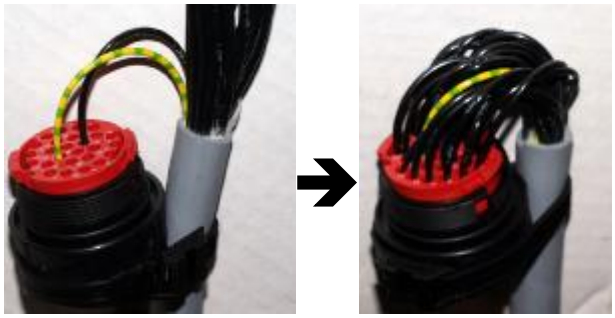
2. Pull the red retaining plate



3. Insert the contacts in their housing

NOTE
The contact is correctly inserted after going through a notch.

Order of insertion :
Green / yellow wire ➔ Not used
Wire n° 26 ➔ housing n° 26
... / ...
Wire n° 1 ➔ housing n° 1

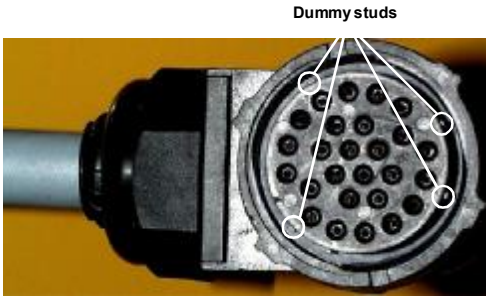


4. Push in the contact red retaining plate.

NOTE
Pinch the holding clips of the blocks to facilitate insertion.
TERMINAL BLOCK LOCKING MUST BE DONE WITHOUT EFFORT !
Check the red plate is correctly inserted in the black connector body.

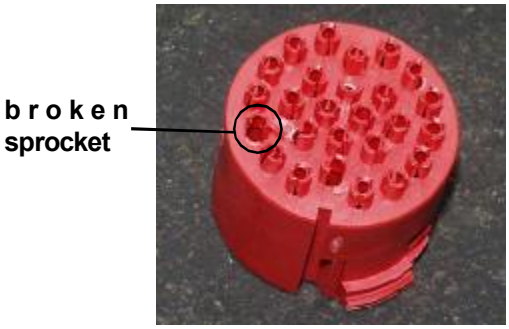
If the terminal is hard or impossible to push in :
- check the contacts are correctly inserted in their housing with rounded pliers. (see below)

5. Closing the connector.
- screw in the rear part of the connector while holding the red terminal block in place (a).
- check that the orientation of the dummy studs is similar to the one shown in picture below (b).
- lock the elbow (if present) (c).
- push in the cable towards the inside of the connector (d).
- tighten the gland (e).
- ensure the contacts are flush with the top of the connector.



Faulty connector

If impossible to correctly wire the connector, remove the red retaining plate : locating sprockets should not be broken.



5.1 Batteries

The electrical energy of the platform is supplied by a 24 VDC battery. The battery is composed of 12 two volt cells distributed in 3 packs.

DANGER

The batteries are integral part of the machine's counterweight. Replacing these batteries by lighter or heavier batteries will modify the stability of the machine and cause the machine to tip over.

CAUTION

New batteries used on electrical vehicles do not reach their full capacity until they have been charged/discharged a few times (between 5 and 40 cycles). For at least the first five cycles, it is recommended not to discharge the battery beyond 70% of its capacity. To obtain maximum service life, do not discharge the battery beyond 80% of its capacity.

Location of batteries

Front pack

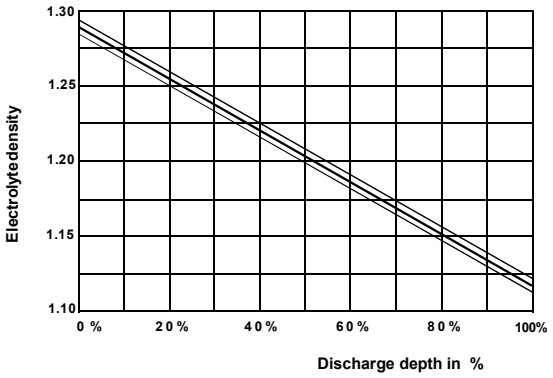
Side right pack

Side left pack

Battery wiring : **see § 4.1.1.**

5.1.1 Electrolyte specific gravity and battery voltage

Specific gravity and voltage measure is the most important check to be performed on a battery. A hydrometer is supplied with the work platform.
Specific gravity and voltage readings must be performed at least once a month and recorded in a battery service log.
The state of charge of the battery can be checked by measuring the specific gravity of the electrolyte. This value decreases as the battery discharges.
When the battery is fully charged, the specific gravity is 1.280 kg/l.
When the battery is 80% discharged, the specific gravity is 1.150 kg/l.
The following graphic shows the correspondence between specific gravity and battery discharge.



Checking electrolyte specific gravity :

DANGER

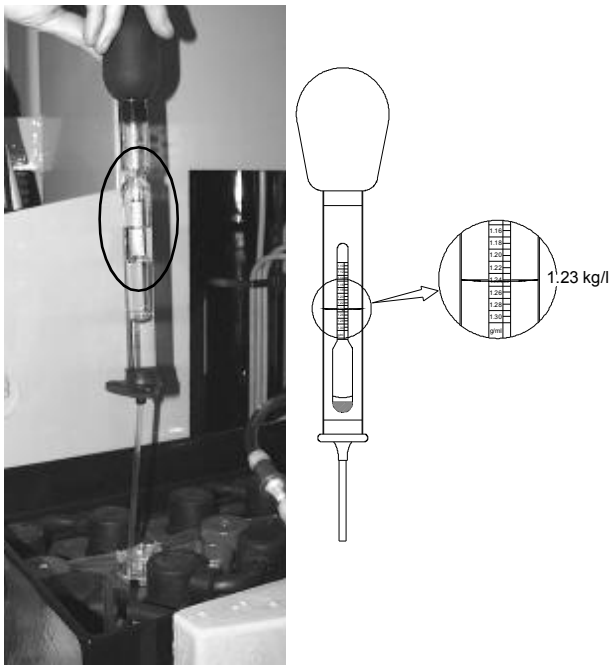
Battery electrolyte must not be allowed to contact the skin or eyes. If it does occur, flush the contacted area with water and consult a doctor immediately. Appropiate equipment must be worn (GLOVES, GOGGLES, RUBBER APRON) to prevent the electrolyte from contacting the skin or any other part of the body during any servicing operation on the battery.

DANGER

During maintenance or any servicing operation on the battery, rings, watches or any other jewellery must be removed.

NOTE
Specific gravity measure must not be performed after battery cell filling.

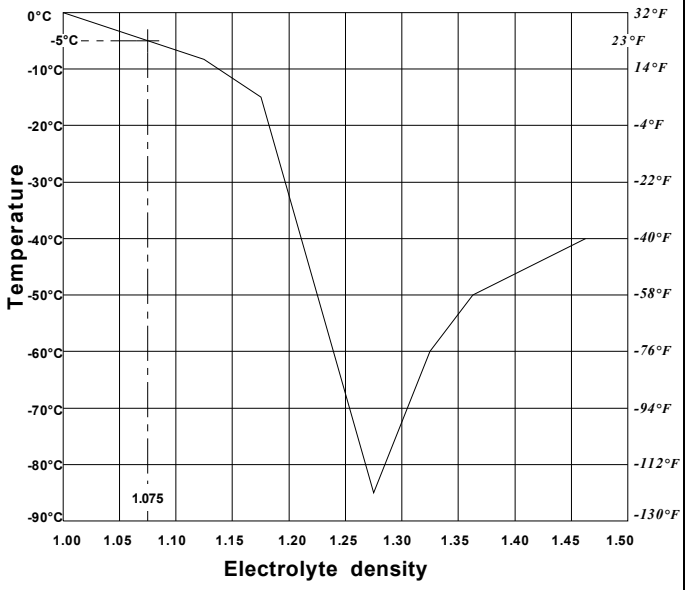
1- Open the battery cell filling cap.
2- Using the hydrometer, take a sufficient quantity of electrolyte so that the float emerges. Ensure the float top does not touch the rubber bulb or that the foat does not stick by capillarity to the glass walls.
3- Read the value as indicated on the example below :



4- Return the electrolyte in the cell and record cell electrolyte specific gravity on the battery service log.
5- Repeat operation for each battery cell.

5.1.2 Storage of a battery at temperatures below 0°C (32°F)

Prior to battery storage at temperatures below 0°C (32 °F), electrolyte specific gravity must be verified in each cell. Refer to ELECTROLYTE SPECIFIC GRAVITY AND BATTERY VOLTAGE in this section for electrolyte specific gravity measurement operating mode.
Electrolyte specific gravity measures enable to determine the electrolyte freezing point using the chart below :



NOTE

When the battery is fully charged (1.280 kg/l), the electrolyte freezing point is –85°C. The freezing point of a battery 80% discharged (1.150 kg/l) is –12°C.

5.1.3 Use of a battery in a cold chamber or in a cold climate

⚠ CAUTION

The battery must be fully charged when the work platform is operated in a cold chamber or in cold weather conditions.

Temperature affects battery autonomy : the battery looses 1% of its capacity per Celcius degree below +25°C (temperature of the electrolyte).

C°	20°C	10C°	0C°	-10C°	-20C°	-30C°
F°	68°F	50°F	32°F	14°F	-4°F	-22°F
% lost	5%	15%	25%	35%	45%	55%

5.1.4 Battery not working continuously or inactive battery

A battery that is not used or used intermittently must be stored charged in a dry area away from freezing temperatures. An equalization charge must be performed once a month.(In these conditions battery storage is possible at temperature of 30°C for a 12 months period.

⚠ CAUTION

Storing a discharged battery will result in irreversible damage to the battery.

- Unplug the battery to insulate it electrically.
- Keep the top of the battery clean and dry to prevent self discharge : during inactivity periods, batteries loose their charge progressively (self-discharge). Self-discharge causes battery plates corrosion, which increases with time, resulting in battery malfunction.

⚠ CAUTION

If the battery is not used continously, it must be recharged at least once a month, even if the electrolyte specific gravity measures are high.

⚠ CAUTION

Before placing in service a battery which remained inactive for a long period of time you must recharge the battery and check the electrolyte level in the cells.

5.1.5. Troubleshooting

Serious accidents resulting in complete destruction of a traction battery are relatively rare. If small problems encountered on a battery in use are rapidly and correctly determined, battery life and operation can be improved.

PREVENTION = AUTONOMY AND LONG LIFE

Symptoms	Probable causes	Solutions
Electrolyte overflow.	Filling done before the charge. Cells overfilled. Overcharge.	Fill battery cells after the charge. Never charge battery if electrolyte specific gravity is above 1,240 kg/l.
Inequal electrolyte specific gravity or electrolyte specific gravity too low.	Filling done before the charge. Loss of electrolyte due to overflow. Stratification of the electrolyte.	Fill battery cells after the charge. Perform an equalization charge. Contact your JLG Distributor/Product Support.
Low voltage in the cells in open circuit.	Electrolyte specific gravity too low. Short-circuit.	Refer to "electrolyte specific gravity too low".
Battery cells temperature too high.	Problem with the charger. Bad air circulation during charge. Cell weak or faulty Cells shorted.	Get the charger checked by a technician. Open access doors to batteries during charge. Leave the battery to cool down when disconnected before charge. Reduce temperature of the area where the battery is charged (artificial ventilation). Change battery c
Battery incapable of supporting regular operation.	Battery under charged. Cell faulty. Faulty cable or connection. Battery at the end of its service life.	Perform an equalization charge. Replace faulty cell. Check wires condition and connections. Replace the battery.

5.2 Chargers

5.2.1 High frequency charger "Zivan NG3"

Supply

Supply voltage	230 ± 10% V eff.	
Frequency	50 / 60 Hz	
Absorbed current	F7 BTTR 17 V eff.	F7 BSTR 15 V eff.
Absorbed maximum current (P = P max.)	20 A eff.	
Absorbed maximum power (P = P max.)	3 kW	

Protections

Input fuse F1	Inside the equipment	20 A
Output fuse F2	Inside the equipment	125 A
Minimum output voltage of operation (Battery detector)	Equipment turn on	1,5 V/cell.
Reversal of output polarities	At the connection to the battery	Protection provided by fuse F2
Thermal protection of semi conductors (Temperature of thermal alarm)	TA = 55°C	100°C

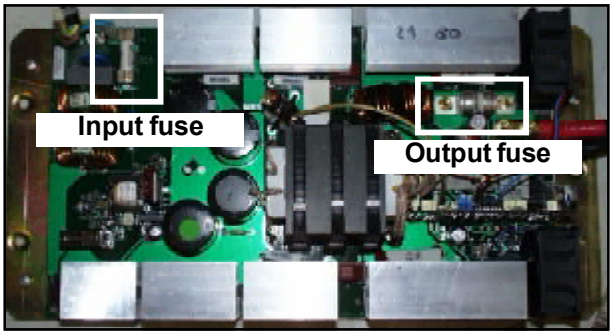


Photo with cover open

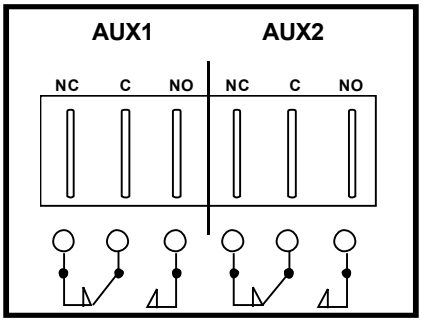
DANGER

Prior to any operation requiring charger cover removal, the charger must be disconnected from the battery and from the AC source. Failure to do so could result in death or serious injury to personnel.

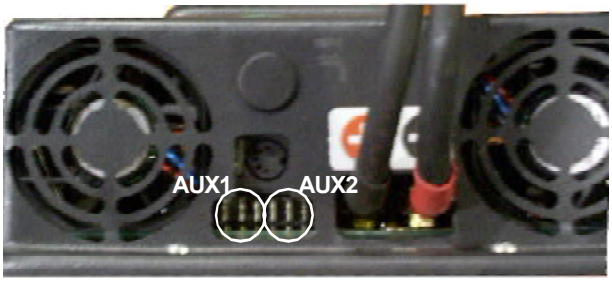
Auxilliary contacts

Technical features : changeovers contacts
0,3 A : 125 VAC
0,3 A : 110 VDC
1 A : 30 VDC

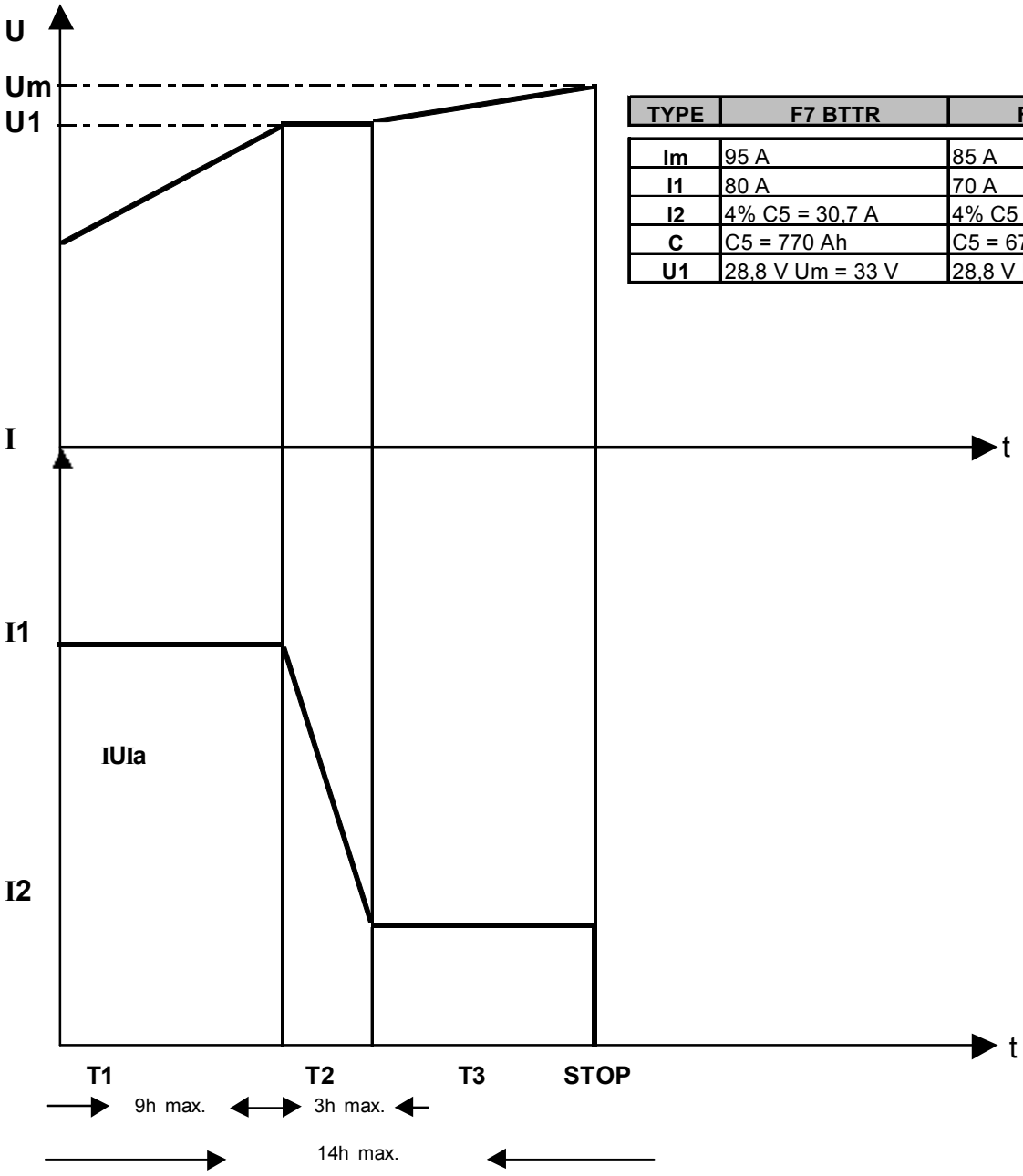
Connector : Faston 6,3 x 0,8 mm.



SECTION	FUNCTION	DESCRIPTION
AUX 1	Main presence	When the equipment is switched on, the contact Normally Open (NO) CLOSES and instead the contact Normally Closed (NC) OPENS.
AUX 2	End of charge or Trickle Phase	When the Stop Phase or the No Stop Phase is reached, the contact Normally Open (NO) CLOSES and instead the contact Normally Closed (NC) OPENS.

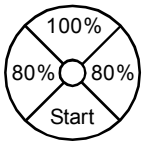


Charge curve (Type : TR)



TYPE	F7 BTTR	F7 BSTR
Im	95 A	85 A
I1	80 A	70 A
I2	4% C5 = 30,7 A	4% C5 = 26,8 A
C	C5 = 770 Ah	C5 = 670 Ah
U1	28,8 V Um = 33 V	28,8 V Um = 33 V

Led indicator



Red Led : The charger is in the initial phase (T1 + T2)
Yellow Led : The battery 80% charged (T3)
Green Led : The battery is 100% charged

Troubleshooting

The flashing LED and an intermittent acoustic signal indicate an alarm. In case of alarm, the charger stops supply current.

CONDITION OF THE FLASHING LED	ALARM TYPE	DESCRIPTION (Action)
RED	Battery presence	- Battery not connected to the charger (disconnect the charger and check battery connection) - Battery too discharged (disconnect the charger and let the battery stand half a day before resuming the charge procedure. If the problem persists contact JLG.
YELLOW	Temporisation	- The charge phase 1 and/or 2 have a duration exceeding the maximum allowed (check the voltage of each battery cell. Contact JLG Product Support).
RED / YELLOW	Battery current	- Loss of output current control (fault on the control logic : Contact JLG Product Support).
RED / GREEN	Battery voltage	- Loss of output voltage control (check the battery connections. Fault of the control logic : Contact JLG Product Support).
RED / YELLOW / GREEN	Thermal safety	Overheating of the semi conductors (check the fan's operation).

5.2.2 Electronic charger "Oldham-Hawker" CP IV

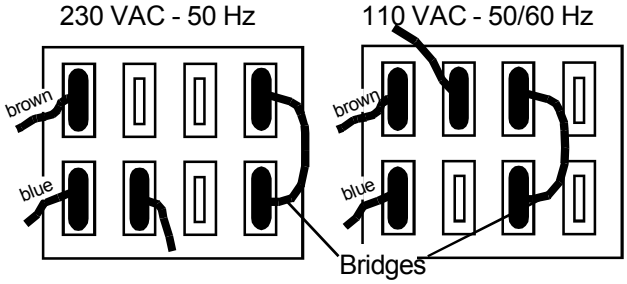
Supply

Supply voltage	230 V eff.	110 V eff.
Frequency	50 / 60 Hz	
Current absorbed	11 A eff.	22 A eff.

Adaptation to the network voltage

DANGER

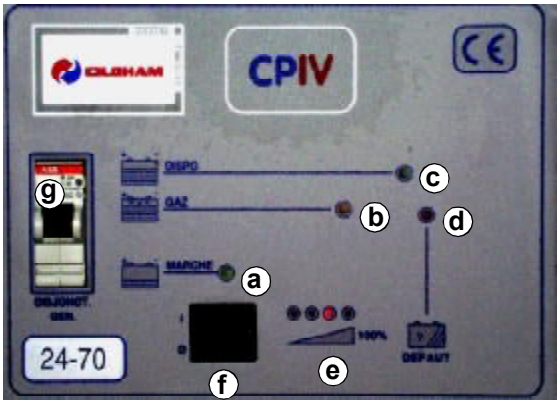
Prior to any operation requiring charger cover removal, the battery must be disconnected and the charger must be unplugged from the AC source. Failure to do so may result in serious or lethal injuries.



Protections

Entry circuit breaker	On panel	32 A
Output fuse	Inside machine	100 A
Protection electronic card	Inside machine	—

Display panel



- **a.** Normal charge indicator (green).
- **b.** Second charging rate indicator (yellow).
- **c.** End of charge indicator (green).
- **d.** Default led indicator (red).
- **e.** Ah applied into the battery : 4 LEDs (from right to left : 100% - 75% - 50% - 25%).
- **f.** Switch ON/OFF.
- **g.** Circuit breaker.

Troubleshooting

If a fault occurs during the charge, the charger stops, the Led "" lights up and the bar chart Rep. E indicates an error code.
Refer to the charger's documents.

SIGNALLING CURRENT LEDs INDICATOR		CAUSE	SOLUTION
Default LED lights up	The first LED flashes	Voltage still below 1,7 V per cell = 20.4 V for batteries after 1 minute of charge	Battery too discharged, contact Product Support.
	The 2nd LED flashes	Voltage still below 2,05 V per cell = 24.6 V for batteries after 1 hour of charge	Problem with the charger , or battery too discharged. Switch the charger off, disconnect the charger from the battery, wait for approx. 15 mn. Reconnect the charger to the battery and switch the charger on. If the problem persists the charger is faulty.
	The 3rd LED flashes	Voltage per cell still below the required gazing voltage after 10 hours of charge.	Battery too discharged. Switch the charger off, disconnect the charger from the battery, wait for approx. 15 mn. Reconnect the charger to the battery and switch the charger on.
	The 4th LED flashes	Charging safety time exceeded (16 hours).	
Default LED flashes		Charge interruption due to a power cut. The charge will be resumed as soon as the power returns.	Check power supply.
	The 4 LEDs flash	Voltage per cell 140% above the nominal values.	Battery already charged.

6.1. General

Unless otherwise indicated, the torque values to be applied must correspond to the grade of bolts, studs and nuts used.

Special attention should be given to the existence of lubricant, plating or other factors that might require variation from standard torque values.

When maximum recommended torque value has been exceeded, the fastener should be replaced. If the excess torque was applied to an fastener installed in a tapped hole, the thread must be checked with a gauge and the bolt or stud must be replaced.

Torque values for bolts, nuts and studs

Grade	Tensile strength N/mm²	Unit	M4 x70	M5 x80	M6 x100	M8 x125	M10 x150	M12 x175	M14 x200	M16 x200	M18 x250	M20 x250	M22 x250	M24 x300	M27 x300	M30 x350
8.8	785	N.m	2,66	5,2	9,1	22	44	76	121	189	261	370	509	637	944	1280
10.9	981	N.m	3,91	7,7	13,4	32	64	111	178	278	384	544	748	936	1386	1880
12.9	1177	N.m	4,57	9	15,7	38	75	130	209	325	449	637	875	1095	1622	2200

Torque values for fittings

JIC	N.m	BSPP	N.m	Metric	N.m
JIC 7/16	15	BSPP 1/4	20	M14x150	38
JIC 9/16	30	BSPP 3/8	34	M18x150	51
JIC 3/4	50	BSPP 1/2	60		
JIC 7/8	69	BSPP 3/4	115		

6.2 Wheel nut torque values

CAUTION

Do not use an impact wrench to torque wheel nuts.

Front wheels (steering wheels) = 250 N.m (5 studs)
Rear wheels (driving wheels) = 170 N.m (5 studs)

6.3 Torque value of slewing ring attachment bolts

CAUTION

It is mandatory to replace systematically all fasteners used to secure the turntable (bolts, nuts and washers) if they were removed.

Attachment bolts of the slewing ring to the chassis.

• M12 x 125-65 Socket head capscrew (with thrust washer) Grade 10-9 (Qty : 16)
- First torque all the bolts alternately to 80 N.m
- Torque all the bolts alternately to a final torque of 117 N.m

Attachment bolts of the slewing ring to the superstructure

• M12 x 150-65 Hexagonal head capscrew Grade 10.9 (Qty : 8)
• M12 x 150-90 Hexagonal head capscrew Grade 10.9 (Qty : 8)
• Locknuts M12 Grade 10-9 (Qty : 8)

- First torque all the bolts alternately to 80 N.m
- Torque all the bolts alternately to a final torque of 117 N.m

7.1 General

7.1.1 System malfunction

When analyzing a system malfunction, use a systematic procedure to locate and correct problems :

- Determine the problem.
- List all possible causes.
- Devise checks.
- Conduct checks in a logical order to determine the cause.
- Consider the remaining service life of the components against the cost of parts and labour necessary to replace them.
- Make necessary repairs.
- Recheck to ensure that nothing has been overlooked.

7.1.2 Cleanliness

It is important to keep dirt out of working parts to preserve the long life of the machine. Packing of seals and filters guarantees the cleanliness of the content. Whenever hydraulic lines are disconnected, clean the adjacent area as well as the point of disconnection, cap the openings to prevent entry of foreign material in the circuit. The same conditions on cleanliness apply to mechanical parts.

Clean and inspect all parts. Make sure :

- All passages and holes are open.
- Parts are covered to keep them clean.
- Parts are clean when they are installed.
- New parts are left in their packing until they are ready for assembly.
- Rust preventive compound has been removed from all machined surfaces of new parts before they are installed (except leaf chains).

7.1.3 Removal and installation

When performing maintenance, do not attempt to manually lift heavy parts when hoisting equipment should be used. Never place or leave heavy parts in an unstable position. When raising a portion of a work platform - or a complete work platform - securely block the work platform and support the weight of the machine on blocks (rather than by lifting equipment).

When using hoisting equipement :

- Follow hoist manufacturer's recommendations
- Use lifting devices that will allow you to achieve the proper balance of the assemblies being lifted and ensure safe handling.

Unless otherwise specified, all removals requiring hoisting equipment should be accomplished using an adjustable lifting attachment. All supporting members (chains and cables) should be parallel to each other and as near perpendicular as possible to the top of the object being lifted.

⚠ CAUTION

The capacity of an eybolt diminishes as the angle between the cable and the vertical increases. Eyebolts should only have stress in tension.

Some removals require the use of lifting fixtures to obtain proper balance.

If a part resists removal, make sure :

- All nuts and bolts have been removed.
- Adjacent parts are not interfering.

7.1.4 Disassembly / Assembly

When assembling or disassembling a component or system, complete each step in turn :

- Do not partially assemble one part and then start assembling another part.
- Make all adjustments as recommended.
- Always check the job after it is completed to ensure that nothing has been overlooked.
- Recheck various adjustments by operating the machine before returning it to the job.

7.1.5 Parts replacement

Parts found damaged or out of tolerance during maintenance should be replaced. Refer to the corresponding Spare Parts Manual for proper replacement parts.
When a structural component has been replaced, the machine must be submitted to an overload test.

7.1.6 Wires and cables

Always disconnect the batteries prior to working on the electrical system

When removing or disconnecting a group of wires or cables, tag each one to ensure proper identification during assembly.

7.2 Platform cleaning

⚠ CAUTION

Prior to platform cleaning, always disconnect the battery from the platform circuit, the charger from the power supply, the 110V or 220V power in the work platform (optional equipment) must be off.

Cleaning externally :

Clean the platform with a detergent mixed with water (water spray, sponge, cloths).

⚠ CAUTION

High pressure cleaners should only be used at a maximum pressure of 50 bars and a maximum water temperature of 70° C.

Do not direct jets onto :
- The electrical boxes and components,
- The electronic controller,
- The battery,
- The charger,
- The electrical motors,
- The cylinder rods and seals,
- The lifting chains.

Dry carefully the platform (compressed air, cloths...) and lubricate the machine as indicated in paragraph 7.12 prior to returning it to service.

7.3 Maintenance and installation of guide rings

Bushings

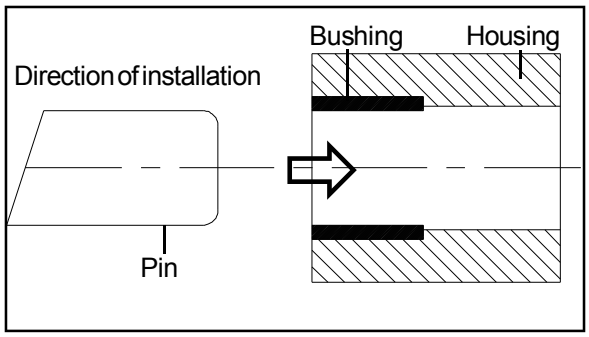
- Do not use a reamer or abrasives on teflon coated bushings.
- Once the coating of the bushing is damaged, it cannot be used and must be replaced.
- Coat the bushing, the pin and the bearing surfaces with grease before their assembly.

Pin

- Any rough or damaged surface on the pin will damage the teflon coating of the bushing which will have to be replaced.
- Any rush or paint residue must be cleaned from the pin before installation.

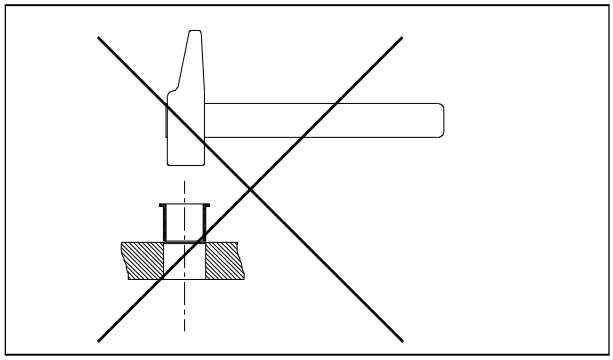
Bushings and pins

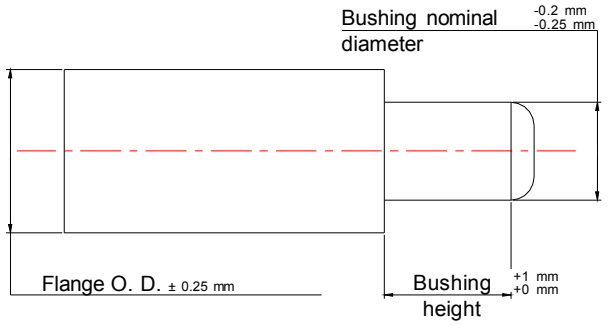
- When installing a pin, ensure the bushing and the pin are properly aligned.
- Coat the inside diameter of the bushing with clean grease before installing the pin.
- Pins have a chamfered or rounded end to prevent the teflon coating on the bushing from being damaged during pin installation.



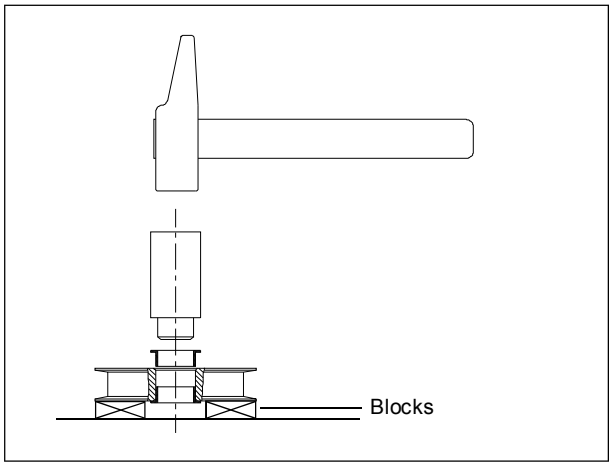
Installation of bushing

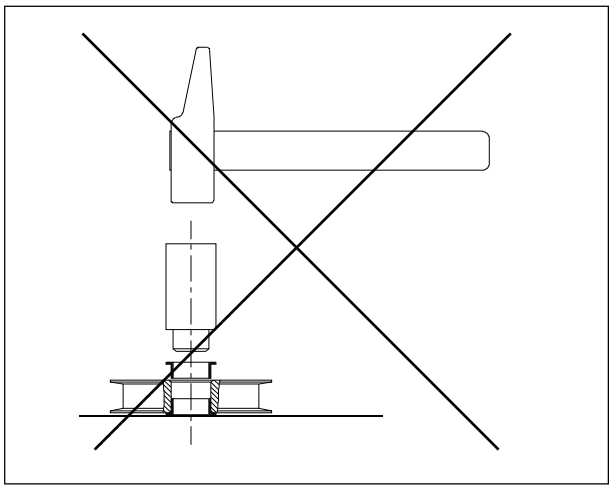
Bushings must be inserted in their housing with an appropriate driver with a smooth flat end (preferably in soft steel).
The outside diameter of the bushing must be slightly oiled to facilitate assembly.
Bushing, driver and housing must be correctly aligned during assembly.



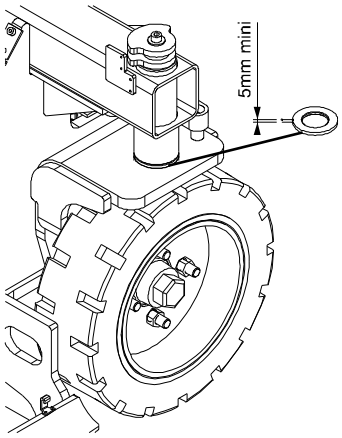


Blocking must be used on parts that will receive two bushings to prevent damage to the flange of the lower bushing.





7.4 Steering bracket thrust washers



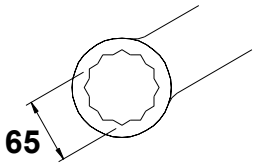
Check the thickness of the thrust washers on both steering brackets.
Replace the washers if their thickness is below 5 mm.

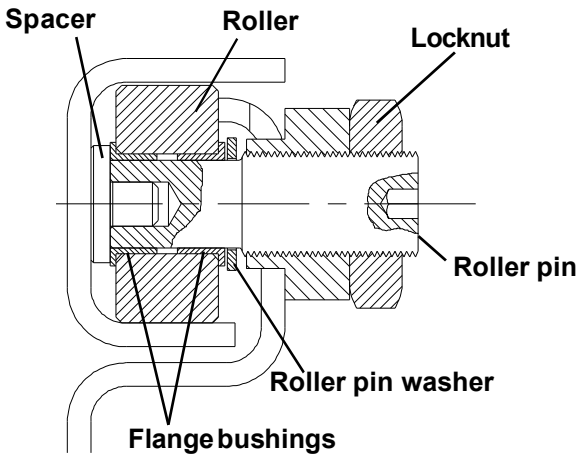
7.5 Mast roller removal

NOTE
The mast rollers (Qty 20) can be removed one by one without removing the telescopic mast.

- Upper rollers

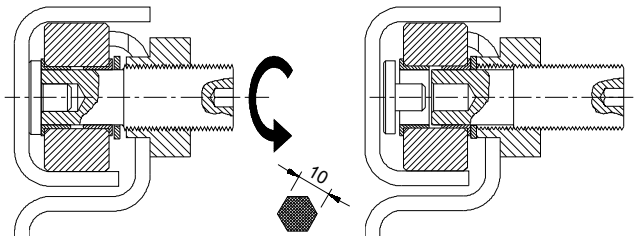
1- Retract the mast.
2- Unscrew the locknut from the roller pin using a polygonal spanner.
3- Unscrew the roller pin to release the bronze spacer as indicated below.





⚠ CAUTION

Hold on to the bronze spacer and the washer to prevent them from falling to the bottom of the mast profile.



⚠ CAUTION

Install the roller before removing another one.

- Lower rollers

NOTE

Prior to removing the lower rollers, ensure the upper rollers are installed.

Using the ground controls :

1- Raise the telescopic mast to access the roller to be removed.
2- Unscrew the locknut from the roller pin to be removed with a polygonal spanner.
3- Unscrew the roller pin to release the bronze spacer and the roller as indicated previously.

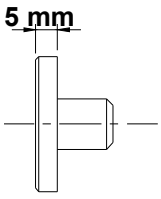
⚠ CAUTION

Install the roller before removing another one.

- Rollers

⚠ CAUTION

The bronze spacer must be replaced if its thickness is below 5 mm. Check the condition of the roller pin, bushing and roller before their installation. Replace damaged parts by original parts. Grease the bushing before its installation.

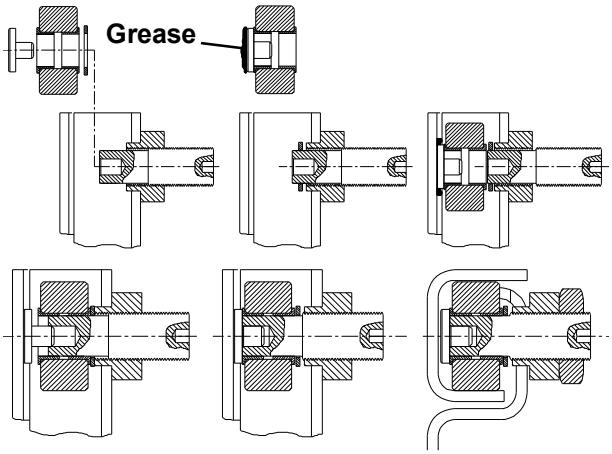


Minimum thickness of the bronze spacer

The rollers pins are generally delivered fitted. To remove the bronze spacer, screw a locknut on the pin until the roller and the spacer are separated.

Roller installation tips :

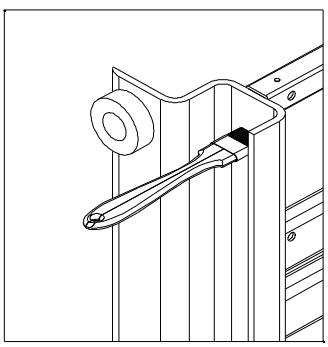
- Partly tighten the pin on the mast section and insert the washer on the pin.
- Apply grease on the spacer so that it "sticks" to the mast and does not fall to the bottom of the profile.
- Press the spacer on the mast profile and slide it. The roller, spacer and pin must be in line.



- Tighten the pin so that the roller slides on the pin.
- Reposition the spacer in line with the pin. Tighten the pin completely until the spacer is fully inserted.
- When the spacer is correctly inserted, loosen the pin by 1 turn to prevent the mast from jamming during the alignment adjustment. Install the locknut without tightening it (tightening of the locknut after mast alignement adjustment).

⚠ CAUTION

Mast profiles must be clean before replacing the bronze spacers. Mast profiles must be greased after the spacers have been replaced. The telescopic mast alignement must be ajusted.



7.6 Adjustment of telescopic mast alignment

DANGER

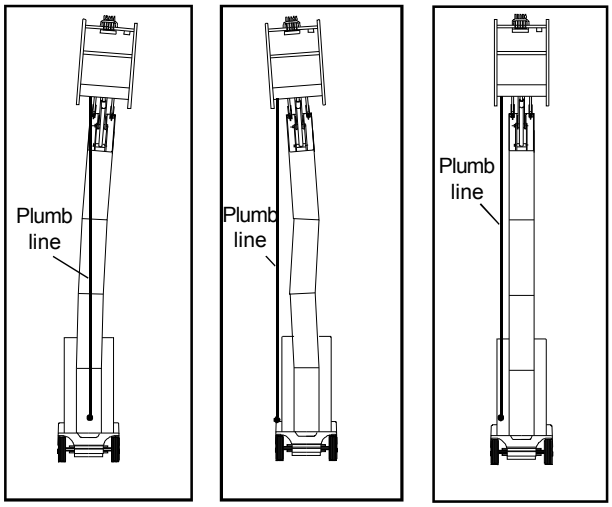
Alignment of the mast sections and adjustment of the transversal play between the mast sections must be performed by trained and qualified personnel.

1- Clean the inside walls of the mast sections to remove old grease.
2- Loosen the roller pin locknuts.
3- Reduce the transversal play by tightening the roller pins in succession.

CAUTION

Do not suppress the play completely : a minimum play is necessary for the mechanism to work.

4- Use a plumb line to ensure the vertical alignment of the mast sections is kept.



INCORRECT **CORRECT**

5- Torque the locknut of the roller pins.
Torque value : 1000 N.m approximately.

CAUTION

If during adjustement one of the mast sections jams, stop the lowering movement and raise the mast to retension the chains. Loosen slightly the roller pins of the jammed section.

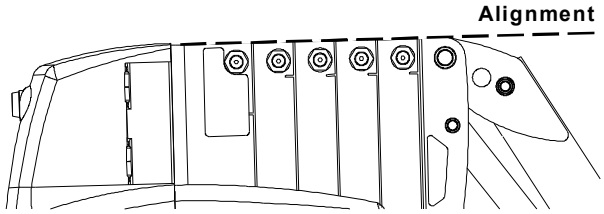
Controls after adjustment

- Raise and lower the mast two or three times with the rated load distributed in the work platform.
- If the mast does not jam, raise and lower the telescopic mast with one person in the platform.
- If the mast jams during the lowering movement, loosen slightly the roller pin of the jammed mast section.
- Check the torque of all roller pin locknuts.

Do not hesitate to contact your JLG approved distributor for more information.

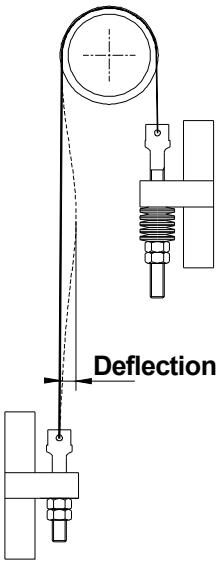
7.7 Lifting chains adjustment

The lifting chains of a same stage must have an identical tension.
The chains must always be tensioned so that the top of the mast sections are aligned when the rated load is in the work platform.



Control of tension :

1- Fully raise the telescopic mast.
2- Lower the mast by approximately 50 cm.
3- Press on each chain between the pulley and the chain yoke. Each chain must have the same deflection.
4- Fully lower the mast.
5- Raise the mast by approximately 50 cm. Ensure each chain of a same stage has the same deflection.



Tighten the nut on the anchor of the chain that is too slack or loosen the nut of the anchor of the chain that is too tight, ensuring the final alignment of the mast sections is kept.

6- Check the presence and correct tightening of the locknut on each chain anchor.

7.8 Verification and lubrication of the lifting chains

Service life of a lifting chains depends from the operating conditions of the platform and from the environment in which the machine is stored or used. Service life is reduced if the chains are exposed to important temperature variations, acid or corrosive products or vapours or abrasive dust.

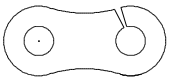
⚠ CAUTION

Because of the high resistance level of their components, chains can be weakened by hydrogen.

7.8.1 Verification of chain wear

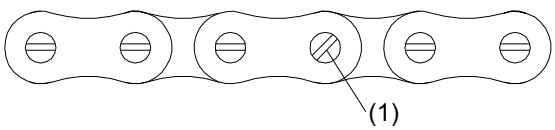
Inspect thoroughly each chain over its entire length :

- Chains, anchors, clevis pins and split pins should not be corroded.
- Plates should not be cracked.

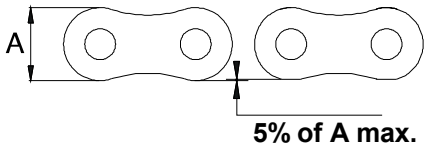


Cracked plate

- The plate clevis pins should not present excessive play. Pins should not have turned in their housing.**(1)** :

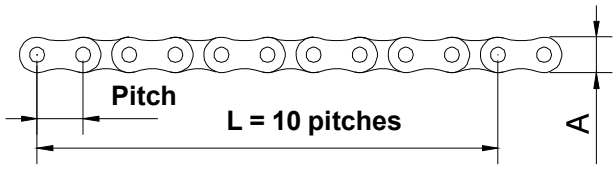


- Plates should not be worn above 5% of their total height (See chart below).



Pitch	5/8" (15,875 mm)	3/4" (19,05 mm)
A min	11,5 mm	13,6 mm

- Chain should not have stretched the values indicated in the chart below :



Pitch	5/8" (15,875 mm)	3/4" (19,05 mm)
L max.	163,5 mm	196 mm

If a chain appears faulty or worn, it must be replaced; the condition of the pulleys and the telescopic mast alignment must be checked.

7.8.2 Chain lubrication.

⚠ CAUTION

Do not use grease to lubricate the lifting chains.

⚠ CAUTION

Do not remove the lubricant from the chains. Do not use acid or detergent to clean the lifting chains.

Chains can be lubricated manually with a paint brush or by spraying.
Chain lubrication intervals must be established with care, depending on the environment in which the work platform is operated or stored (dusty or agressive environment).
The lubricant must be adapted to the machine's operating conditions.
In general, a non detergent mineral oil is sufficient.
Its viscosity must be adapted to the temperature according to the chart below :

Temperature (C°)	Recommended viscosity grades ISO - VG
-15 < T <= 0	15 to 32
0 < T <= 50	46 to 150
50 < T < 80	220 to 320

⚠ CAUTION

A viscosity too low facilitates draining of the lubricant by gravity. A viscosity too hight prevents the lubricant from reaching the friction surfaces.

Lubricant must be applied :

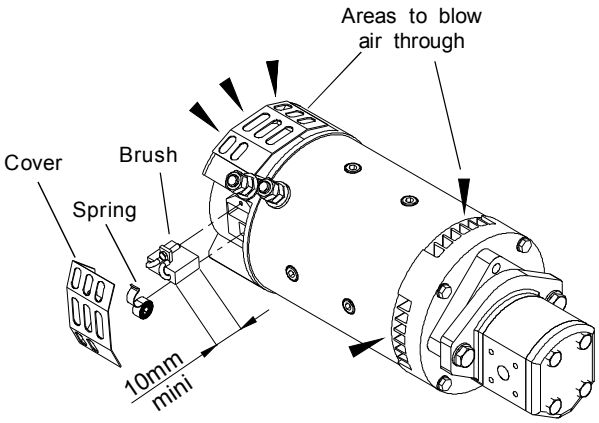
- Longitudinally : in areas where joints are under small load to facilitate penetration of the lubricant.
- Transversally : between the plates to enable the lubricant to reach the joint and between the internal plates and rollers (lubricant type see § 7.12).

7.9 Hydraulic power unit

The brushes (Qty 4) of the hydraulic power unit motor(s) must be checked regularly. The ventilation holes of the motor(s) must be cleaned regularly with compressed air as indicated below :

Brush removal :

1- Disconnect the battery plug.
2- Remove the protection covers.
3- Remove the brushes attachment screws.
4- Lift the spiral springs and remove the brushes from their housing.



⚠ CAUTION

All 4 brushes must be replaced if their length is below 10 mm.
During removal / assembly, do not interchange the brushes.

Brush installation :

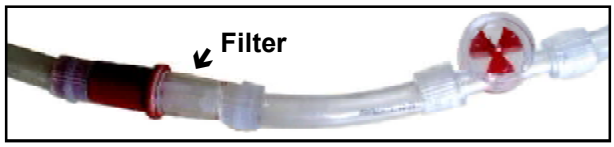
1- Lift the spiral spring and install the brush.
2 Install the brush fixation screws.
3- Install the protection covers.

7.10 Battery

7.10.1 Maintenance of the centralised filling system

It is necessary to service the centralised filling system once a year. Cleaning intervals must be shortened in case of premature clogging of the filter or reduction in the water flow.

- Disconnect and clean the filter by reversing the water flow.



- Check the hose for flexibility. In case of hardening in the connection area, replace the hose.
- Check all the fittings are tight and do not leak.
- Check the caps individually. Ensure of the perfect mobility of the floats. In case of excessive clogging, replace the cap. It is recommended to replace the caps every 2 or 3 years.

7.10.2 Cleaning - Battery maintenance

It is necessary to clean the battery regularly to prevent salt formation and current arcing that could damage the machine.

- Clean the battery with a damp cloth.
- Allow to dry and wipe the battery top with a non fluffy cloth.
- Ensure the connections are clean and tightened correctly.

NOTE
Coat the terminals and connections with a grease or anti corrosion compound.

- Keep metallic containers clean. In case of corrosion, clean, neutralise the corrosion and apply anti-acid paint on the affected area.
- Drain the water that can accumulate at the bottom of the container (electrolyte overflow, leak of the centralised filling system, battery cleaning...).

DANGER

Drained water may have contacted acid and be corrosive. Avoid any contact with the skin or eyes. Should this happen, clean with water and consult a doctor immediately. To prevent the drained water to contact the skin or any other part of the body, wear glasses, gloves and a rubber apron.

NOTE

Water that contacted a battery is classified industrial waste and must be disposed of in accordance with regulations in force.

7.11 Preventive maintenance and inspection

(See the Operator's and Safety Manual).

⚠ CAUTION

Control and service intervals must be respected to ensure safe operation of the work platform. The platform must not be used unless it works PERFECTLY : it must be repaired and checked by competent and qualified personnel before resuming operation.

NOTE

If the platform remained idle for a long period of time, all the cleaning, control and lubrication procedures described below must be performed before the machine is used again.

7.11.1 Daily preventive maintenance and inspection

Daily preventive maintenance / inspection must include verification of the following points :

- Presence and legibility of the Operator's and Safety Manual.
- Presence and legibility of decals - warnings and instructions.
- Good working order of controls/indicators/safety devices
- State of charge of the battery on the discharge indicator
- Condition of tyres
- Hydraulic oil level
- Condition of the jib and of its fixations
- Presence of bolts and pins

7.11.2 Weekly preventive maintenance and inspection

Weekly preventive maintenance / inspection must include verification of the following points :

- Presence of wheel nuts
- Hydraulic hoses and fittings (leaks)
- Electrolyte level in the battery (see § 5.1.1)
- Cylinders
- Verification / water drainage from the battery container (see § 7.10)
- Lubrication (see § 7.12)

7.11.3 Monthly preventive maintenance and inspection

Monthly preventive maintenance / inspection must include verification of the following points :

- Lubrication of lifting chains (see § 7.8)
- Battery electrolyte gravity (see§ 5.1.1)
- Lubrication (see § 7.12)

7.11.4 Preventive maintenance and inspection every 125 hours

Preventive maintenance / inspection must include verification of the following points :

- Cylinders (leak, rod, load holding valves)
- Condition of the lifting chains (see § 7.8)
- Condition of the batteries (see § 5.1)
- Wheel nut torque (see § 6.2).
- Stability control adjustment (see § 4.2.7)
- Tilt indicator setting (voir § 4.2.6)
- Cleaning of the motor ventilation holes (see § 7.9)
- Steering bracket thrust washers (see § 7.4)
- Release pressure of the brakes
- Condition of the bushes on the jib and steering system
- Lubrication (see § 7.12).

7.11.5 Preventive maintenance and inspection every 250 hours

Preventive maintenance / inspection must include verification of the following points :

- Replacement of the hydraulic filters (see § 3.3)
- Motor brushes of the hydraulic power unit's (see § 7.9)
- Lubrication (see § 7.12)

7.11.6 Preventive maintenance and inspection every 500 hours

Preventive maintenance / inspection must include verification of the following points and must be performed by a technician approved by JLG :

- Turntable bolt torque(§ 6.3)
- Lifting chain wear (see § 7.8.1)
- Telescopic mast alignment / bronze spacers on the roller pins (see § 7.6)
- Pressure relief valve adjustment (see § 3.9.12)
- Lubrication (see § 7.12)

NOTE

The platform must be controlled by an authorized body or an authorized technician in accordance with the local or national regulations in force.

NOTE

Extinguishers (optional equipment) must be checked in accordance with the regulations in force.

NOTE

The turntable attachment bolts must be tightened after the first 50 hours of operation.

Maintenance record

*	Daily	Weekly	Monthly	After the first 50 hours of operation	125 hours	250 hours	500 hours	1000 hours	50 hours after oil change
Operator's and Safety Manual	O		O	■	■	■	■	■	
Decals - Instructions	O		O	■	■	■	■	■	
Platform	O		O	■	■	■	■	■	
Controls - Indicators	O		O	■	■	■	■	■	
Tilt alarm	O		O	■	■	■	■	■	
Motion alarm	O		O	■	■	■	■	■	
Telescopic mast limit switch	O		O	■	■	■	■	■	
Telescope limit switch	O		O	■	■	■	■	■	
Jib limit switches	O		O	■	■	■	■	■	
Stability control device	O		O	■	■	■	■	■	
Battery state of charge	O		O	■	■	■	■	■	
Oil level	O		O	■	■	■	■	■	
Jib and fixations	O		O	■	■	■	■	■	
Pin locking bolts and split pins (presence)	O		O	■	■	■	■	■	
Wheel nuts (presence)			O	■	■	■	■	■	
Hydraulic hoses and fittings		■	■	■	■	■	■	■	
Electrolyte level		■	■	■	■	■	■	■	
Mast / jib cylinders		■	■	■	■	■	■	■	
Lifting chains (lubrication)			(■)	■	■	■	■	■	
Batteries (Voltage / gravity recording)			■	■					
Lifting chains - Pulleys (inspection)				■	■	■	■	■	
Wheel nuts (torque)				■	■	■	■	■	
Tilt indicator (setting)					■	■	■	■	
Motor brushes of the hydraulic power unit(s) (inspection)					■	■	■	■	
Motor ventilation holes					■	■	■	■	
Steering bracket thrust washers (inspection)					■	■	■	■	
Brake release pressure (control)					■	■	■	■	
Bushings (inspection)					■	■	■	■	
Telescope greasing					■	■	■	■	
Mast profile greasing					■	■	■	■	
Wheel hubs (greasing)						■	■	■	
Hydraulic filters (replacement)				■		■	■	■	■
Turntable bearing track (greasing)						■	■	■	
Turntable teeth (greasing)								■	
Turntable attachment bolts				■			■	■	
Telescopic mast alignment / Bronze spacers on roller pins							■	■	
Pressure relief valves							■	■	

O : Operator
■ : Maintenance technician
(■) : Depending on the frequency of the operation of the machine

7.12 Lubrication

Regular lubrication must be performed on all lubrication points. Normally, its frequency is based on the components operating time. The most efficient method to keep track of lubrication intervals is to maintain an operating log for the machine. The log must include the hourmeter readings which can be used to determine the lubrication points that will require attention.

Lubricants or grease types as well as lubrication intervals must be adapted to operating conditions, storage and operation environments (temperature, dusty or corrosive atmosphere, humidity...).

Check the oil levels and lubricate only when the platform is on level ground in transport position.

Unless otherwise indicated, components not equipped with grease fittings (such as knuckles, pins, levers, etc...) must be lubricated with oil once a week. Motor oil applied sparingly will supply the necessary lubrication and will prevent formation of rust.

If rust or corrosion is present, the component must be thoroughly cleaned before the lubricant is applied.

Worn grease fittings (or those whose check ball is stuck) must be replaced.

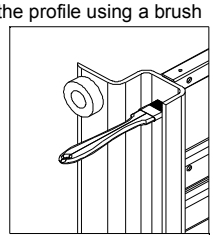
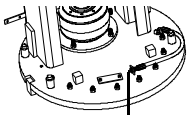
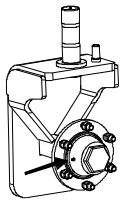
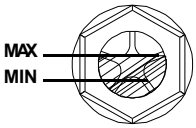
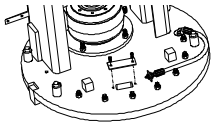
The following chart titled ***Lubrication chart*** describes the lubrication points and indicates types and quantities of lubricant, intervals and application of each.

⚠ CAUTION

Use lubrication intervals as a guideline only. Intervals must correspond to operating conditions such as continuous duty cycles and/or aggressive environments.

NOTE
Check all fluid levels at ambiant temperature.

LUBRICATION CHART

LOCATION	LUBRICANT TYPE See table	LUBRICANT INTERVAL	LUBRICANT QUANTITY	APPLICATION
1. Mast profiles	**B**	Every 125 hours of operation or each time the machine is cleaned or more often if the platform is used or stored in a dusty or corrosive environment.	N/A	1. Clean the inside of the profile to remove the old grease 2. Lubricate the inside of the profile using a brush  3. Cycle the mast and lubricate again
2. Lifting chains	**D**	Every 125 hours or once every 30 days of operation or more often is the platform is used in a very dusty or corrosive environment.	N/A	The lubricant can be applied manually with a brush or by spraying. Apply the lubricant : - Longitudinally = in areas where the joints are under small load to facilitate penetration of the lubricant - Transversally = to enable the lubricant to get to the joint.
3. Telescope	**B**	Every 125 jours of operation	N/A	1- Clean the telescope tube to remove the old grease (telescope extended). 2 - Lubricate the 4 faces of the tube with a paint brush. 3 - Retract / Extend the telescope a few times. Clean the excedent.
4. Turntable bearing track	**E**	Every 250 hours of operation	N/A	Grease nipple on the turntable plate.  Grease nipple
5. Wheel hubs	**B**	Every 250 hours of operation	N/A	Grease nipple on each hub 
6. Main hydraulic reservoir	**A**	- Check every day - Change the oil after 1000 hours of operation or at least every 2 years.	approx. 35 l	Fill through the return filter. Check the level through the gauge on the reservoir.  MAX MIN
7. Return filter	Filter replacement intervals : after the first 50 hours of operation and every 250 hours thereafter.			
8. Pressure filter	Filter replacement intervals : after the first 50 hours of operation and every 250 hours thereafter.			
9. Turntable bearing teeth	**C**	Every 1000 hours of operation	Coat the teeth	 1- Remove the cover plate 2- Apply a thick coat of grease with a brush through the grease inspection hole. Turn the turntable to reach all the teeth.

TYPE OF LUBRICANT

	STANDARD	LOW TEMPERATURE UP TO -35°C	FOOD COMPATIBLE	FOOD COMPATIBLE LOW TEMPERATURE
B				
	COMPLEX EP2	NERVOL - CRYOGREASE		
	MOBILUX EP2	MOBILITH SHC 220		

	STANDARD
C	NERVOL SPECIALE
	MOBILTAC 81

	STANDARD	LOW TEMPERATURE UP TO -35°C
D		
	MOBIL DTE 16M	HYDRELF XV 32
	CHAÎNE FILANTE	

	STANDARD
E	
	MOBILUX EP2
	COMPLEX EP2

A Reservoir
B Mast / Wheel hub / Telescope
C Turntable teeth
D Lifting chains
E Turntable bearing track

NOTES