TEREX®

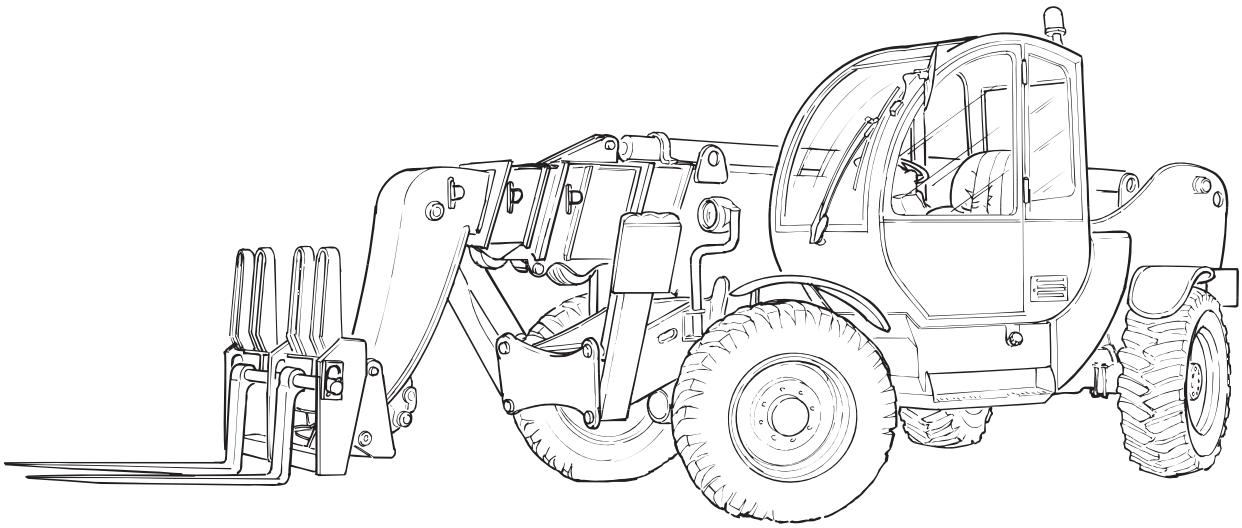
SERVICE MANUAL

Code 57.4403.1200 - 1st Edition 01/2007

Handler with telescopic boom

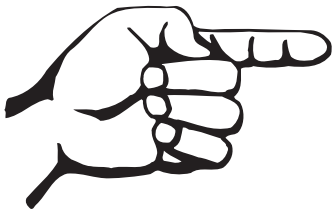
Telelift 4017 *(From serial n. 14867)*

Telelift 4514 *(From serial n. 15125)*



English
Edition

INDEX



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SERVICE MANUAL

Code 57.4403.1200 - 1st Edition 01/2007

Number: .....

Consigned to: .....

DECLARATION

I, the undersigned.....

declare that I have received the ***Workshop manual for TEREXLIFT lifts series Telelift 4017 - 4514.***

Copies consigned: n° ..... on paper

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LThe undersigned is obliged to use the manual in their workshop, without disclosing the information in the same in any way, to unauthorised workshops and third parties in general, and not to photocopy or reproduce this manual or parts of the same in any way without the prior written authorisation of TEREXLIFT to do so.

If business relations between the undersigned and TEREXLIFT should come to an end, the undersigned is obliged to return the copies received without charges for TEREXLIFT.

Yours sincerely

Date .....

For acceptance

The consignee

Company stamp
and signature of the Legal representative

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Copy to return stamped and signed for acceptance by the Legal representative of the company receiving the copies of the manual.

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LIST OF REVISED PAGES

Revision		Revised pages	Notes	Issued by
No.	Date			
1	01-2007		Publication	
2				
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MANUAL CONTENTS

Machine denomination	Literature valid up to serial number
Telelift 4017	14867
Telelift 4514	15125

INTRODUCTION

Important
Read, understand and obey the safety rules and operating instructions in the **Telelift 4017 - 4514 Operator's Handbook** before attempting any maintenance or repair procedure.
This manual provides the machine owner and user with detailed information on the scheduled maintenance. It also provided qualified service technicians with infromation on troubleshooting and repair procedures.
Basic mechanical, hydraulic and electrical skills are required to perform most procedures. However, several procedures require specialized skills, as well as specific tools and equipment.
In these instances, we strongly recommend letting service and repair the machine at an authorized TEREXLIFT service center.

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Contact Us
http://www.terexlift.com
e-mail: info@terexlift.it

DESCRIPTION OF THE MACHINE OPERATION

The source of mechanical energy of this machine is a Perkins turbo-compressed diesel engine **(pos. 1)**, model 1104C-44T, which supplies 74.5 kW at 2300 rev/min and with a max torque of 412 Nm at 1400 rev/min.
On the flywheel side of the engine, and connected to this engine by a Technodrive coupler with elastic joint and with a 1-to-1 ratio, there is Bosch-Rexroth closed-loop pump for hydrostatic drives, model A4VG71 **(pos. 2)** with adjustment valve of DA type. The max displacement of this swashplate pump is 71 cm^3 and the max calibration pressure is 420 bar. This pump is used to supply hydraulic power under form of pressure and flow rate which is then used for moving the machine.
On the through-shaft of such drive pump there is a Casappa open-loop gear pump (with fixed displacement) **(pos. 3)** with priority valve integrated in the housing. The displacement of this pump is 43 cm^3. Its function is to provide hydraulic power, under form of pressure and flow rate, to the steering cylinder of the machine (priority side) and to the telescopic boom movement cylinder (secondary side).
The assembly of the two pumps involves they have a rotation velocity equal to the speed of the diesel engine.
A third Casappa open-loop gear pump (with fixed displacement) **(pos. 4)** with a displacement of 25 cm^3, is installed on the PTO of the engine located to the distribution side. This pump feeds the servo-assisted braking system **(pos. 24)**, the control block operating the outriggers and the sway function **(pos. 28)** and the cooling fan **(pos. 34)** of the heat exchanger **(pos. 33)** used to cool down the diesel engine and the hydraulic circuit.
The suction lines of the open-loop pumps **(pos. 3)** and **(pos. 4)** are protected by an immersed filter **(pos. 9)**, placed inside the hydraulic fluid tank **(pos. 10)** whose capacity is 120 litres.
The drive pump **(pos. 2)** is protected by another cartridge-filter **(pos. 8)**, located on the suction line of the boost pump, such pump being integral part of the drive pump.
The one-way valve **(pos. 11)** set at 2.5 bar protects the pump housing against high pressures and guarantees a certain circulation of the drain oil to the hydrostatic motor reducing, in this way, the temperature.
From port “G” of the drive pump **(pos. 2)** low-pressure oil is taken (25-30 bar) and used for the anti-cavitation circuit of the automatic levelling system of the forks and for feeding the control circuit of the electro-proportional distributor **(pos. 16)** which controls the movements of the telescopic boom.

The hydraulic energy produced by the drive pump **(pos. 2)** is converted into mechanical power by a closed-loop hydrostatic motor, model Bosch-Rexroth A6VM80 **(pos. 5)** equipped with adjustment valve of DA1 type and with flush valve for reducing the max temperatures inside the drive circuit.
The motor is flanged to a two-speed mechanical gearbox, model 357 **(pos. 6)** manufactured by Dana. Speeds are engaged by a special oil-dynamic cylinder located inside the gearbox, while the selection of the first and second speed is controlled by a 4-way/3-position solenoid valve **(pos. 7)** of the on/off type.
The mechanical torque at the gearbox output is transmitted to the front axle **(pos. 26)** and the rear axle **(pos. 25)**, both model 212 manufactured by Dana, through Cardan shafts.
The hydraulic drive **(pos. 12)** of "load sensing" type with a displacement of 315 cm^3, receives oil from the priority line of the pump **(pos. 3)** in relation to the "load sensing" signal sent by the hydraulic drive and connected to such pump with function of pilot signal. In this way, the input flow to the hydraulic drive will be exactly the one needed for the instantaneous steering functions; any excess flow of the pump will be available for the functions of the telescopic boom.
The steering circuit is protected against input overpressures by a pressure reducing valve set at 140 bar. On the two delivery lines, there are other two reducing valves with anti-shock function set at 200 bar. The scope of these two valves is limiting possible shocks on the steering wheel due to overstress on the steering cylinders. The three pressure reducing valves are installed in the hydraulic drive **(pos. 12)** and cannot be regulated from the outside.
The steering circuit is completed by the front steering cylinder **(pos. 14)**, the rear steering cylinder **(pos. 15)** [these cylinders being integral part of the front axle **(pos. 26)** and the rear axle **(pos. 25)** respectively] and by a 4-way/3-position solenoid valve **(pos. 13)** for the selection of the three different steer modes (rear wheels straight, co-ordinate front/rear steering and independent front/rear steering). When the solenoid valve **(pos. 13)** is not energised, the front steering cylinder is fed by the hydraulic drive and the rear cylinder is blocked. When one magnet or the other of the solenoid valve **(pos. 13)** is energised, the chambers of the cylinders are connected in a different manner thus causing the desired effect on the steering mode.

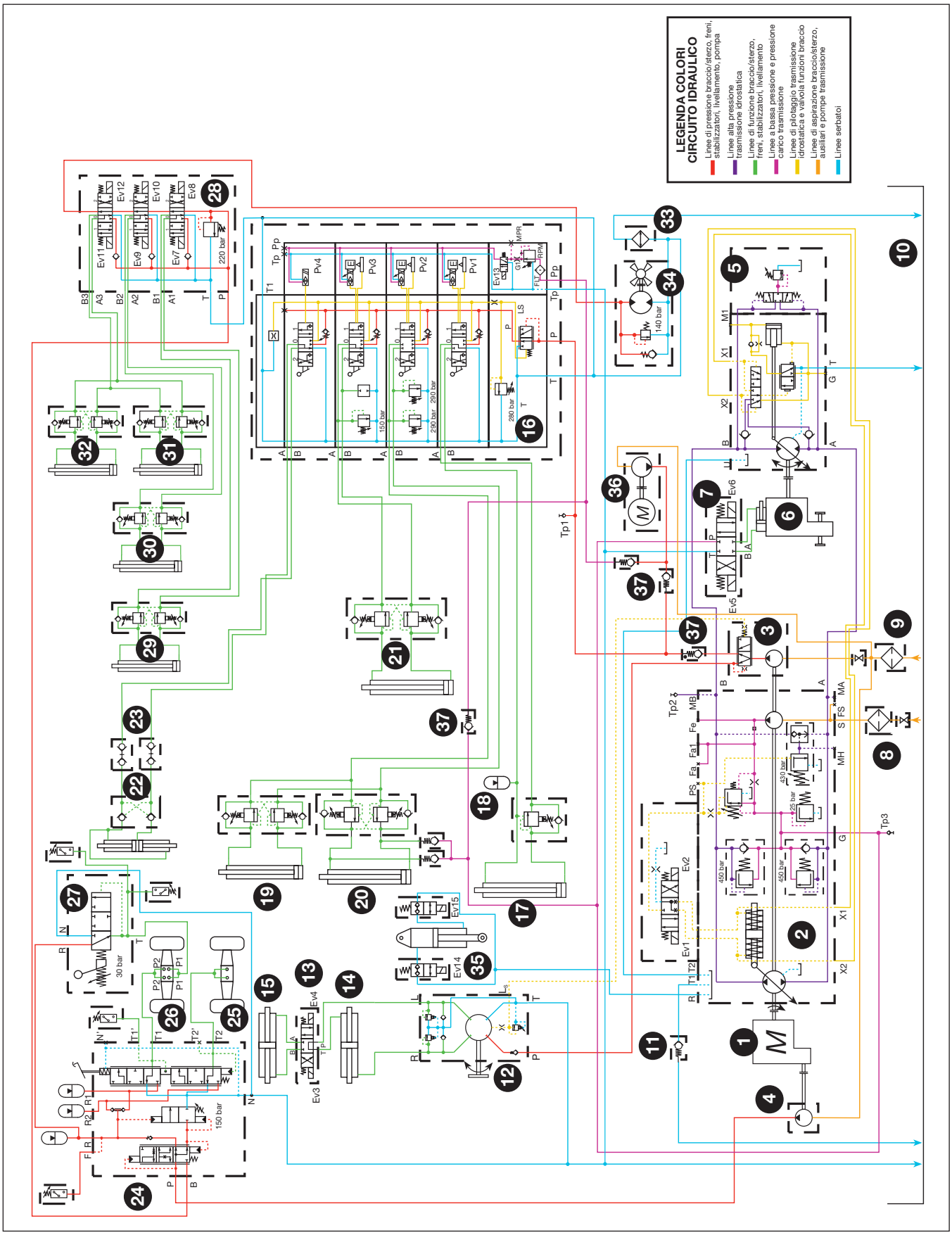
The Bucher/Tecnord electro-proportional distributor **(pos. 16)**, with 4 modular sections, receives oil from the secondary line of the pump **(pos. 3)** and feeds all of the movements of the telescopic boom. This distributor consists of an input head with 3-way pressure compensator used as a flow regulator for the user which works at max load (load sensing), and as a discharge valve when the pump flow is not used for the boom movements, and of 4 modules each one of them controlling a specific function of the telescopic boom, that is lifting/lowering, attachment holding plate rotation, boom extension/retraction, attachment locking/unlocking.
In the head there is a pressure relief valve set at 280 bar which, acting on the line of the “load sensing” signal, limits the maximum pressure at the inlet of the distributor through such 3-way compensator.
On the main inlet head of the distributor, there is the pilot line head which includes an inlet safety filter, a pressure relief valve acting on the pilot line, and a safety solenoid valve which, when de-excited, discharges the input pilot pressure, thus preventing the distributor from working. This solenoid valve is used as a “dead man” control and is activated by the relevant button on the joystick in the driving cab. The pilot head delivers oil at pressure to the 4 control modules of the distributors, such modules operating the relevant main sliders in relation to the command signal they receive from such joystick via the control unit.
Module 1 of the distributor controls the telescopic boom lifting cylinder **(pos. 17)**. This cylinder has one single-acting compensation valve with safety function. The control module of element 2 of the distributor is the electro-proportional type with electrical feed-back and integrated electronics. The 0.33-lt. accumulator prefilled at 50 bar **(pos. 18)** and located on the line of the differential chamber of the lifting cylinder **(pos. 17)**, allows for damping the boom swings when the same boom is moved down.
Module 2 of the distributor controls the cylinder operating the attachment holding plate of the telescopic boom **(pos. 19)**. This cylinder is equipped with a double-acting compensation valve with safety function. Paralleled to this cylinder we find the fork levelling cylinder **(pos. 20)** (or balancing cylinder) equipped with a special double-acting compensation valve. Inside this valve, the one-way valves are installed in a reverse manner with respect to the normal position to avoid the pressurisation of the cylinder when the rotation command of the attachment holding plate is operated. Again inside this valve, there are other two one-way valves set at 5 bar with anti-cavitation function. These are used to deliver oil, sucked from the low pressure line coming from the drive pump **(pos. 2)**, to the compensation circuit of the fork levelling function, when such circuit cannot do it alone.

The control module of element 2 of the distributor is the electro-proportional type with electrical feed-back and integrated electronics. On the two control lines of the cylinder **(pos. 19)**, and integral to module 2, there are two pressure relief valves set at 295 bar which protect the automatic levelling system of the forks when the boom is moved up and down and in case of overload on the attachment holding plate (ex. use of the bucket).
Module 3 of the distributor controls the boom telescopes extension cylinder **(pos. 21)**. This cylinder is equipped with a double-acting compensation valve with safety function. The control module of this element of the distributor is the electro-proportional type with electrical feed-back and integrated electronics.
On the control line of the circular chamber of the cylinder **(pos. 21)** and integral to module 3, there is a pressure relief valve set at 150 bar which limits the load when the boom is extended in those working zones where the electronic overturning control system cannot detect overload conditions with respect to the load chart of the machine.
Module 4 of the distributor controls the attachment locking cylinder **(pos. 22)**. This cylinder has a double one-way valve with hydraulic release and safety function. The control module of this element of the distributor is the ON/OFF electrical type with integrated electronics.
On the feeding lines of this cylinder, there are two quick-fit connectors **(pos. 23)** for the connection of the hydraulic lines to the optional attachments which need hydraulic power for their operation (ex. hydraulic winch and maintenance jib, mixing bucket, etc.).
The SAFIM S6 servo-assisted braking system with pedal **(pos. 24)** receives oil from the pump **(pos. 4)** and uses this oil to pressurise 3 hydraulic accumulators connected to the same system. The oil at pressure contained in these accumulator is then used to operate the service brakes of the two axles **(pos. 25)** and **(pos. 26)** and to release the parking brake located inside the front axle **(pos. 26)**.
The fill valve inside the braking system takes the flow from the feeding line so the pressure on the line of the accumulators reaches the calibration value of the cutout valve set at 150 bar. When this pressure is reached, the valve gradually releases all the flow to line B for other uses.

The brake pedal located in the driving cab, which is an integral part of the braking system S6, is connected to two proportional sliders which control the two separated lines of the service brake, one for each axle. In relation to the stroke of these sliders, a gradual communication between the feeding line, connected to two accumulators which, at their turn, are connected to ports R1 and R2 (the accumulators have 0.5-lt. capacity and 50 bar fill pressure), and the service brake lines is established so the flow is distributed to such lines and the discharge line increasing, in this way, the pressure (and as a result the braking force) on the lines of the service brakes. When the sliders are in the rest position, the lines of the service brakes are connected to the discharge.
The pressure switch set at 2-10 bar, paralleled to on of the two lines of the service brake, sends an electrical signal when this brake is engaged.
The pressure switch set at 70 bar and connected to port F, sends an electrical warning signal when the pressure inside the feeding circuit of the brake lines is too low to guarantee the minimum braking efficiency.
The accumulator with 1.5-lt. capacity and 35 bar fill pressure is connected to port R of system S6 and is used to unlock the parking brake of the front axle **(pos. 26)**.
The command of the parking brake is controlled by a special valve with lever control **(pos. 27)** located in the driving cab. In relation to the position of the lever, the release line of the parking brake is connected to the pressure line (parking brake unlocked) or the discharge line (parking brake locked).
The two pressure switches set at 10-20 bar send an electrical warning signal when the parking brake is activated (brake locked).
The Bucher electro-hydraulic modular distributor of the ON/OFF type for open loops **(pos. 28)** drives the movements of the outriggers and the sway function of the machine. It receives oil from port B of the braking system **(pos. 24)** and uses this to operate the cylinder of the left outrigger **(pos. 29)**, the cylinder of the right outrigger **(pos. 30)** and the right and left sway cylinders **(pos. 31)** and **(pos. 32)**. These two cylinders **(pos. 31)** and **(pos. 32)** are cross-connected, say the annular chamber of one cylinder is connected to the annular chamber of the other and vice versa. This connection is consistent with the operation of the cylinder which move out and in an opposite way one respect to the other. All of these cylinders are equipped with double-acting compensation valves with safety function.
On the inlet head of this control block there is a pressure relief valve set at 220 bar. The oil flow which is not used by the control block to operate the outriggers and the machine sway function, is sent to the Casappa 20 cm^3 hydraulic gear motor **(pos. 34)** for the operation of the cooling fan of the heat exchanger **(pos. 33)**. Inside the motor housing, there are an anti-cavitation valve and a pressure relief valve with by-pass function set at 140 bar.

The heat exchanger **(pos. 33)** is divided in two sectors; one absorbs heat from the cooling circuit of the diesel engine and the other absorbs heat from the hydraulic circuit of the machine. The flows of pumps **(pos. 3)** and **(pos. 4)** are conveyed in the latter. The oil cooled down by the heat exchanger is sent back to the tank **(pos. 10)**.
When the machine is equipped with man-platform, a motor-driven pump **(pos. 36)** powered by the battery, is installed to be used in an emergency when the main circuit of the telescopic boom is faulty. To work correctly, this circuit uses one-way valves **(pos. 37)** with different opening pressures.

Telelift 4017 - 4514 hydraulic schematic



Section 1
SAFETY INFORMATION

SECTION INDEX

1.1 SAFETY RULES

1.1-1 Personal Safety

In this manual, any important information is preceded by a **SPECIAL SYMBOL**.
All operators who work or service the machine must know the exact meaning of these safety symbols.

There are six special (or safety) symbols in this manual, always combined with keywords that class the situations according to their danger degree.
The symbols are always followed by a text explaining the situation taken into account, the attention to be paid to such situation, the method and the behaviour to be adopted. When necessary, it stresses prohibitions or supplies instructions to prevent dangers.
Sometimes, it can be followed by illustrations.

We list below the special (or safety) symbols according to the relative seriousness of the hazard situation:

Draws the attention to situations that involve your own as well as the others' safety and that can result in serious or lethal injury.

DANGER

Draws the attention to situations that involve your own as well as the others' safety and that can result in serious or lethal injury.

WARNING

Draws the attention either to situations that involve your own as well as the others' safety and that can result in minor or moderate injury or to situations that involve the machine efficiency.

CAUTION

Draws the attention either to situations that involve your own as well as the others' safety and that can result in minor or moderate injury or to situations that involve the machine efficiency.

CAUTION

Draws the attention to important technical information or practical advice that allows for a safer and more efficient use of the machine.

NOTICE

Draws the attention to important environment-related information.

Be sure to wear protective eye wear and other protective clothing if the situation warrants it.

Be aware of potential crushing hazards such as moving parts, free swinging or unsecured components when lifting or placing loads. Always wear approved steel-toed shoes.

1.1-2 Workplace Safety

Be sure to keep sparks, flames and lighted tobacco away from flammable and combustible materials like battery gases and engine fuels. Always have an approved fire extinguisher within easy reach.

Be sure that all tools and working areas are properly maintained and ready for use. Keep work surfaces clean and free of debris that could get into machine components and cause damage.

Be sure that your workshop or work area is properly ventilated and well lit.

Be sure any forklift, overhead crane or other lifting or supporting device is fully capable of supporting and stabilizing the weight to be lifted. Use only chains or straps that are in good condition and of ample capacity.

Be sure that fasteners intended for one time use (i.e., cotter pins and self-locking nuts) are not reused. These components may fail if they are used a second time.

Be sure to properly dispose of old oil or other fluids. Use an approved container. Please be environmentally safe.

1.2 GENERAL REMARKS

Most accidents occurring while working, servicing or maintaining operation machines, are caused by not complying with the basic safety precautions.
Therefore, it is necessary to pay steady attention to the potential hazards and the effects that may come of operations carried out on the machine.

CAUTION

If you recognise hazardous situations, you can prevent accidents!

For instance, this handbook makes use of special **safety symbols** to highlight potentially hazardous situations.

⚠CAUTION

The instructions given in this handbook are the ones established by GENIE. They do not exclude other safe and most convenient ways for the machine commissioning, operation and maintenance that take into account the available spaces and means.

If you decide to follow instructions other than those given in this manual, you must:

- be sure that the operations you are going to carry out are not explicitly forbidden;
- be sure that the methods are safe and in compliance with the indications given in this section;
- be sure that the methods cannot damage the machine directly or indirectly or make it unsafe;
- contact GENIE Assistance Service for any suggestion and the necessary written permission.

CAUTION

Do not hesitate to pose questions if you are in doubt! Contact GENIE: the assistance service is at your disposal. Addresses, phone and fax numbers are given in the cover and in the title-page of this manual.

1.3 SERVICEMEN'S REQUISITES

The operators who use the machine regularly or occasionally (e.g. for maintenance or transport) shall have the following requisites:

health:
before and during any operation, operators shall never take alcoholic beverages, medicines or other substances that may alter their psycho-physical conditions and, consequently, their working abilities.

physical:
good eyesight, acute hearing, good co-ordination and ability to carry out all required operations in a safe way, according to the instructions of this manual.

mental:
ability to understand and apply the rules, regulations and safety precautions. They shall be careful and sensible for their own as well as for the others' safety and shall desire to carry out the work correctly and in a responsible way.

emotional:
they shall keep calm and always be able to evaluate their own physical and mental conditions.

training:
they shall read and familiarise with this handbook, its enclosed graphs and diagrams, the identification and hazard warning plates. They shall be skilled and trained about the machine use.

CAUTION

It is recommended to take part in at least one technical training course organised by GENIE Assistance Office.

CAUTION

Ordinary and extraordinary maintenance of the machineare quite complex from a technical point of view and should be performed by an authoirsed service centre.

1.3-1 PERSONAL PROTECTIVE EQUIPMENT

During work, but especially when maintaining or repairing the machine, operators must wear suitable protective clothing and equipment:

- Overalls or any other comfortable garments. Operators should wear neither clothes with large sleeves nor objects that can get stuck in moving parts of the machine
- Protective helmet when working under or in the vicinity of suspended load
- Protective gloves
- Working shoes
- Breathing set (or dust mask)
- Ear-protectors or equivalent equipment
- Goggles or facial screen.

CAUTION

Use only type-approved protective equipment in good condition.

1.4 SAFETY PRECAUTIONS

⚠DANGER

Read and understand the following safety instructions before servicing the machine.
The following list contains safety rules which must absolutely be obeyed to prevent accidents and injuries.

1.4-1 WORKING AREA

- Make sure the area all around the machine is safe. Always be aware of potential risks.
- During work, keep the working area in order. Never leave objects scattered: they could hinder the machine movements and represent a danger for personnel.

1.4-2 PRECAUTIONS DURING WORK

- Do not walk or stop under raised loads or machine parts supported by hydraulic cylinders or ropes only.
- Keep the machine handholds and access steps always clean from oil, grease or dirt to prevent falls or slips.
- When entering/leaving the cab or other raised parts, always face the machine; never turn the back.
- When carrying out operations at hazardous heights (***over 3 meters from the ground***), always use type-approved safety belts or fall preventing devices.
- Do not enter/leave the machine when it is running.
- Before servicing the engine, let its parts cool down.
- Do not leave the driving place when the machine is running.
- Neither stop nor carry out interventions under or between the machine wheels when engine is running. When maintenance in this area is needed, stop the engine, engage the parking brake and chock the wheels to prevent accidental movements.
- Do not carry out maintenance or repair works without a sufficient lighting.
- When using the machine lights, the beam should be oriented in order not to blind the personnel at work.
- Before applying voltage to electric cables or components, ensure they are properly connected and efficient.
- Do not carry out interventions on electric components with voltage over 48V.

- Do not connect wet plugs or sockets.
- Signs and stickers shall never be removed, hidden or become unreadable.
- Except for maintenance purposes, do not remove safety devices, covers, guards,. Should their removal be necessary, stop the engine, remove them with the greatest care and always remember to refit them before starting the engine and using the machine again.
- Aleays stop the engine and disconnect the batteries before maintenance or service.
- Do not lubricate, clean or adjust moving parts.
- Do not carry out operations manually when specific tools are provided for this purpose.
- Absolutely avoid to use tools in bad conditions or in an improper way.
- Before carrying out operations on hydraulic lines under pressure (hydraulic oil, compressed air) and/or before disconnecting hydraulic components, ensure the relevant line has been previously depressurised and does not contain any hot fluid.

⚠ DANGER

Any intervention on the hydraulic or pneumatic circuit must be carried out by authorised personnel. Before any operation on lines under pressure, release any residual pressure from the circuit.
Do not use your fingers to check for pressure leaks. Fine jets of air, oil or fuel can injure you.

- Neither smoke nor use open flames if there is a risk of fire or close to fuel, oil or batteries.
- Do not leave fuel cans or bottles in unsuitable places.
- Do not empty catalytic mufflers or other vessels containing burning materials without taking the necessary precautions.
- Carefully handle all flammable or dangerous substances.
- After any maintenance or repair work, make sure that no tool, cloth or other object has been left within compartments with moving parts or in which suction and cooling air circulates.
- Never give orders to several people at a ime. Instructions and signs must be given by one person only.
- Always pay the due attention to the instructions given by the foreman.
- Never distract the operator during working phases or crucial manoeuvres.
- Do not call an operator suddenly, if unnecessary.
- Do not frighten an operator or throw objects by no means.
- After work, never leave the machine under potentially dangerous conditions.

NOTICE

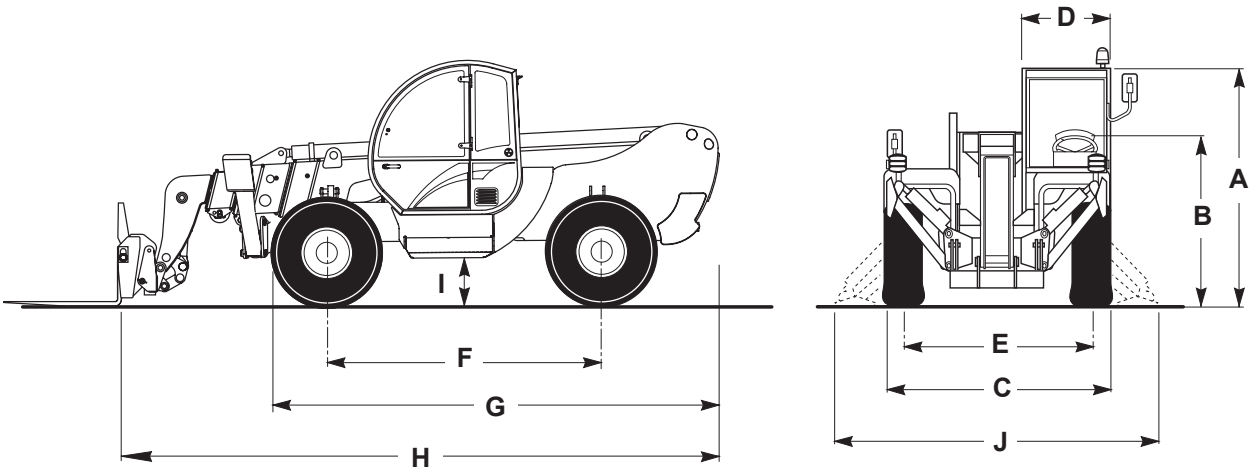
Treatment and disposal of used oils is subject to federal, national and local laws and regulations. Collect and deliver these wastes to authorised centres.

- Use the assistance of a second person to handle loads weighing 30 to 50 kg.
- For loads over 50 kg, the use of special hoisting equipment in good condition and equipped as per enforced regulations is mandatory.

Section 2
TECHNICAL SPECIFICATIONS

SECTION INDEX

2.1 MAIN DIMENSIONS



			Telelift 4017	Telelift 4514
A	Overall height	mm	2550	2630
B	Height to the steering wheel	mm	1920	1980
C	Overall width	mm	2330	2330
D	Cab width	mm	850	850
E	Track	mm	1920	1920
F	Wheel-base	mm	2850	2850
G	Length to the front tyres	mm	3910	3910
H	Length to the attachment holding plate	mm	5610	6290
I	Ground clearance	mm	460	460
J	Max width with extended outriggers	mm	2930	2930
•	Internal steering radius	mm	1300	1300
•	External steering radius	mm	3990	3990

2.2 TYRES

		Telelift 4017 - 4514	
		Standard	**Optional**
- Dimensions (front and rear)		400/70 R20	405/70 R24
- P. R. (or load index)		14 pr	14 pr / 151 D
- Rim		13x20	13x24
- Wheel disc		8 holes DIN 70361	8 holes DIN 70361
- Pressure	bar/Psi	4/58	4.25/61.6

2.3 LIMIT OF USE

			Telelift 4017	Telelift 4514
•	Angle of approach (with/without outriggers)	°	39	39
•	Departure angle	°	45	45
•	Min/max ambient temperature	°C	-20÷+40	-20÷+40

2.4 WEIGHT

			Telelift 4017	Telelift 4514
•	Weight in working order	kg	11900	10900

2.5 SPEED

			Telelift 4017	Telelift 4514
•	Working speed (*)	km/h	0÷8	0÷8
•	Travel speed (*)	km/h	0÷37	0÷35
•	Max. slope with full load	%	54	50

(*) either forward or reverse motion.

2.6 PAYLOAD AND REACH

			Telelift 4017	Telelift 4514
•	Max lifting height:			
	with outriggers	mm	12640	16700
	without outriggers	mm	12470	16600
•	Reach at max height without outriggers	mm	1290	1320
•	Max reach forward with outriggers	mm	8740	12700
•	Attachment holding plate rotation	°	145	145
•	Maximum payload with outriggers	kg	3700	3500
•	Payload at max height with outriggers	kg	2500	2200
•	Payload at max reach with outriggers	kg	700	100

2.7 FORKS (floating type)

			Telelift 4017 - 4514
•	Dimensions	mm	1200x130x50
•	Weight	kg	70
•	Fork holding frame - class		FEM III

2.8 DIESEL ENGINE

			Telelift 4017 - 4514
•	Make		PERKINS
•	Model/Type		1104C-44T
•	Features		Diesel 4 cylinders in line 4 strokes direct injection
•	Bore x Stroke	mm	105 x 127
•	Total displacement	cc	4400
•	Power at 2300 rpm	kW	74,4

2.9 ELECTRICAL SYSTEM

			Telelift 4017	Telelift 4514
•	Voltage	V	12	12
•	Battery	Ah	100	100

2.10 MACHINE SOUND LEVELS

			Telelift 4017	Telelift 4514
•	Guaranteed sound power level (in accordance with the Directive 2000/14/CE)	dB	Lwa = ...	Lwa = ...
•	Measured sound pressure level (in accordance with the Directive 98/37/CE)	dB	Lpa = 84	Lpa = 84

2.11 VIBRATION LEVELS

			Telelift 4017	Telelift 4514
•	Mean assessed vibration level transmitted to arms	m/s^2	< 2.5	< 2.5
•	Mean assessed vibration level transmitted to body	m/s^2	< 0.5	< 0.5

Values calculated in accordance with standard prEN13059

CAUTION

This is a Class A device. In a residential environment, such device can cause radio disturbance. In such cases, the operator is required to take suitable measures.

2.12 REFUELLING

			Telelift 4017	Telelift 4514
•	Diesel engine	l	11,5	11,5
•	Engine cooling system	l	15	15
•	Fuel tank	l	135	135
•	Hydraulic system tank	l	150	150
•	Gearbox	l	1,5	1,5
•	Differential gears	l	8,7	8,7
•	Wheel reduction gears	l	0,75	0,75

Products:
Engine oil: **SHELL RIMULA SAE 15W-40 (API CH-4 / CG-4 / CF-4 / CF, ACEA E3, MB 228.3)**
Power divider-Differential gears-Reduction gears: **FUCHS TITAN GEAR LS 85 W-90 (API GL-5 LS / GL-5)**
Hydraulic system and brakes: **SHELL TELLUS T 46 (DENISON HF-1 DIN 51524 part. 2 e 3)**

2.13 TIGHTENING TORQUES

Thread diameter	Pitch	Wrench measure mm				Tightening torques Material class					
		S	S			8.8		10.9		12.9	
			UNI	UNI	UNI	Normal	Galvanized	Normal	Galvanized	Normal	Galvanized
mm	mm		5931/32	5933÷36	5923÷30	Nm	Nm	Nm	Nm	Nm	Nm
4	0,7	7	3	2,5	2	3,2	2,8	4,4	3,9	5,3	4,8
5	0,8	8	4	3	2,5	6,1	5,5	8,7	7,8	10,3	9,3
6	1	10	5	4	3	10,6	9,5	14,8	13,3	17,8	16,0
8	1,25	13	6	5	4	25,1	22,5	35,4	31,8	42,5	30,2
	1	13	6	5	4	26,5	23,8	37,3	33,5	44,7	40,3
10	1,5	17	8	6	5	51,1	46,0	71,9	64,7	86,3	77,6
	1,25	17	8	6	5	53,4	48,1	75,1	67,5	90,2	81,1
12	1,75	19	10	8	6	86,5	77,8	121,4	109,2	145,9	131,3
	1,25	19	10	8	6	92,4	83,2	129,5	116,6	156,1	140,5
14	2	22	12	10	6	137,7	123,9	193,8	174,4	232,6	209,3
	1,5	22	12	10	6	145,9	131,3	206,1	185,5	246,9	222,0
16	2	24	14	10	8	209,1	188,2	293,8	264,4	353,0	317,7
	1,5	24	14	10	8	218,3	196,5	308,1	277,3	369,3	332,4
18	2,5	27	14	12	8	288,7	259,8	406,1	365,5	487,7	436,9
	1,5	27	14	12	8	314,2	282,8	442,8	398,5	530,6	477,5
20	2,5	30	17	12	10	408,1	367,3	573,4	516,1	687,7	618,9
	1,5	30	17	12	10	439,7	395,8	619,3	557,4	742,8	662,5
22	2,5	32	17	-	12	542,3	488,5	763,2	686,9	915,3	823,7
	1,5	32	17	-	12	582,6	524,3	819,3	737,4	983,6	885,3
24	3	36	19	-	12	705,1	634,5	990,8	891,7	1193,3	1074,4
	2	36	19	-	12	745,3	671,3	1051,0	945,9	1255,1	1129,5
27	3	41	19	-	-	1036,0	927,5	1448,9	1304,0	1734,6	1561,2
	2	41	19	-	-	1091,8	982,6	1530,6	1377,5	1836,7	1653,0
30	3,5	46	22	-	-	1307,9	1258,1	1989,3	1772,4	2357,1	2121,4
	2	46	22	-	-	1510,2	1359,1	2122,4	1910,2	2540,8	2286,7
33	3,5	50	24	-	-	2000,0	1800,0	2800,0	2520,0	3400,0	3060,0
	2	50	24	-	-	1610,0	1450,0	2300,0	2070,0	2690,0	2420,0
36	4	55	27	-	-	2600,0	2340,0	3700,0	3330,0	4300,0	3870,0
	3	55	27	-	-	2800,0	2520,0	3900,0	3510,0	4600,0	4140,0
39	4	60	27	-	-	3400,0	3060,0	4800,0	4320,0	5600,0	5040,0
	3	60	27	-	-	3600,0	3240,0	5100,0	4590,0	5900,0	5310,0

Thread diameter	Pitch	Standard nuts		Low nuts	
		5S	8G	5S	8G
		Nm	Nm	Nm	Nm
4	0,7	5,5		3,5	
5	0,8	5,5		3,5	
6	1	9,5	13,0	6,0	8,0
8	1,25	23,0	32,0	14,0	20,0
	1	25,0	35,0	16,0	22,0
10	1,5	46,0	64,0	29,0	40,0
	1,25	49,0	68,0	31,0	42,0
12	1,75	80,0	110,0	50,0	69,0
	1,25	88,0	125,0	55,0	78,0
14	2	125,0	180,0	78,0	110,0
	1,5	140,0	195,0	88,0	120,0
16	2	195,0	275,0	120,0	170,0
	1,5	210,0	295,0	130,0	185,0
18	2,5	270,0	390,0	170,0	245,0
	1,5	305,0	425,0	190,0	265,0
20	2,5	305,0	540,0	190,0	340,0
	1,5	425,0	600,0	260,0	375,0
22	2,5	510,0	720,0	320,0	450,0
	1,5	570,0	800,0	360,0	500,0
24	3	660,0	930,0	410,0	580,0
	2	720,0	1000,0	450,0	630,0
27	3	980,0	1400,0	610,0	880,0
	2	1050,0	1500,0	660,0	940,0
30	3,5	1350,0	1850,0	850,0	1160,0
	2	1450,0	2050,0	910,0	1280,0
33	3,5	1650,0	2310,0	1050,0	1470,0
	2	1980,0	2770,0	1270,0	1780,0
36	4	2120,0	2970,0	1360,0	1900,0
	3	2550,0	3570,0	1630,0	2280,0
39	4	2730,0	3820,0	1750,0	2450,0
	3	3250,0	4550,0	2080,0	2910,0

2.14 DRILL DIAMETERS FOR THREADS

Thread x pitch	DRILL DIAMETER LIMITS		DRILL BIT DIAMETER
	max	min	
M 4 x 0,7	3,42	3,24	3,30
x 0,5	3,60	3,46	3,50
M 5 x 0,8	4,33	4,13	4,20
x 0,5	4,60	4,46	4,50
M 6 x 1	5,15	4,92	5,00
x 0,75	5,38	5,19	5,20
M 8 x 1,25	6,91	6,65	6,80
x 1	7,15	6,92	7,00
M 10 x 1,5	8,87	8,38	8,50
x 1,25	9,38	9,19	9,20
M 12 x 1,75	10,44	10,10	10,20
x 1,5	10,68	10,38	10,50
M 14 x 2	12,21	11,83	12,00
x 1,5	12,68	12,38	12,50
M 16 x 2	14,21	13,84	14,00
x 1,5	14,68	14,38	14,50
M 18 x 2,5	15,74	15,29	15,50
x 1,5	16,68	16,38	16,50
M 20 x 2,5	17,74	17,29	17,50
x 1,5	18,68	18,38	18,50
M 22 x 2,5	19,74	19,29	19,50
x 1,5	20,68	20,38	20,50
M 24 x 3	21,25	20,75	21,00
x 2	22,21	21,83	22,00
M 27 x 3	24,25	23,75	24,00
x 2	25,21	24,83	25,00
M 30 x 3,5	26,77	26,21	26,50
x 3	27,25	26,75	27,00
M 33 x 3,5	27,77	29,21	29,50
x 2	31,21	30,83	31,00
M 36 x 4	32,27	31,65	32,00
x 3	33,25	32,75	33,00
M 39 x 4	35,27	34,67	35,00
x 3	36,25	35,75	36,00

2.15 STANDARD TIGHTENING TORQUES FOR FITTING SEALS

■ 60° CONICAL SEALS

Thread diameter		TIGHTENING TORQUES (0+10%)
inc.	mm	60° CONICAL SEALS Nm
G 1/8"		15
G 1/4"	M 10 x 1	20
9/16"-18		25
11/16"-16		40
13/16"-16		55
3/4"-16		62
1"-14		80
7/8"-14		80
1.1/16"-12		110
1.3/16"-12		115
1.5/16"-12		160
1.7/16"-12		130
1.11/16"-12		190
1.5/8"-12		225
1.7/8"-12		270
2"-12		245
2.1/4"-12		360

■ FRONT O-LOK (Parker) SEALS

Thread diameter		TIGHTENING TORQUES (0+10%)
inc.	mm	FRONT O-LOK (Parker) SEALS Nm
9/16"-18		25
11/16"-16		40
13/16"-16		55
1"-14		80
1.3/16"-12		115
1.7/16"-12		130
1.11/16"-12		190
2"-12		245

■ 37° COUNTER-SUNK CONICAL SEALS (JIC)

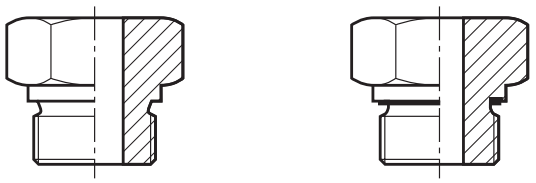
Thread diameter		TIGHTENING TORQUES (0+10%)
inc.	mm	37° CONICAL SEALS (JIC) Nm
7/16"-20	M10x1	15
1/2"-20	M12x1.5	20
9/16"-18	M14x1.5	28
	M16x1.5	62
3/4"-16	M18x1.5	62
7/8"-14	M22x1.5	80
1.1/16"-12	M27x2	110
1.3/16"-12		141
1.5/16"-12	M33x2	160
1.5/8"-12	M42x2	225
1.7/8"-12	M48x2	270
2.1/4"-12	M10x1	360

■ SEALS WITH GRIP-RING

Thread diameter		Fitting Series	Pipe ø mm	TIGHTENING TORQUE (0+10%) SEALS WITH GRIP-RING Nm
inc.	mm			
G 1/8"	M10x1	LL	4	10
G 1/8"	M10x1	LL	6	10
G 1/8"	M10x1	L	6	25
G 1/4"	M12x1.5	L	8	50
G 1/4"	M14x1.5	L	10	50
G 1/8"	M20x1.5	L	12	130
G 1/8"	M20x1.5	L	15	190
G 1/8"	M20x1.5	L	18	245
G 1/8"	M20x1.5	L	22	130
G 1/8"	M20x1.5	L	28	190
G 1/8"	M20x1.5	L	35	245
G 1/8"	M20x1.5	L	42	245
G 1/4"	M12x1.5	S	6	50
G 1/4"	M14x1.5	S	8	50
G 3/8"	M16x1.5	S	10	80
G 3/8"	M18x1.5	S	12	80
G 1/2"	M22x1.5	S	16	105
G 3/4"	M27x2	S	20	220
G 1"	M33x2	S	25	370
G 1.1/4"	M42x2	S	30	500
G 1.1/2"	M48x2	S	38	600

■ FITTING ASSEMBLY

Thread diameter		TIGHTENING TORQUES (0+10%) JOINTS	
		A	B
inc.	mm	Nm	Nm
G 1/8"	M10x1	25	12
	M12x1.5	30	18
G 1/4"		40	18
	M14x1.5	50	20
	M16x1.5	60	35
	M18x1.5	80	50
G 3/8"		95	40
	M20x1.5	140	60
G 1/2"	M22x1.5	140	75
	M26x1.5	220	85
G 3/4"		250	110
	M27x2	250	100
G 1"		400	190
	M33x2	400	150
G 1.1/4"		600	240
	M42x2	600	260
G 1.1/2"		800	300
	M48x2	800	350



A B

A Male face
Mechanical seal or copper washer

B Male face
Soft seal with O-ring

2.16 LOCKING MATERIAL

THREAD LOCKERS

Product	*APPLICATION*	*Characteristics Temp. °C*	*Thread*	*Locking speed*	*Resistance*
Loctite 290	Thread locking	to 150°	M 12	Rapid	Medium
Loctite 222	Thread locking	to 150°	M 20	Moderate	Low
Loctite 243	Thread locking	to 150°	M 20	Rapid	Medium
Loctite 262	Thread locking	to 150°	M 20	Moderate	High
Loctite 270	Thread locking	to 150°	M 20	Moderate	Very high
Loctite 277	Thread locking	to 150°	M 36	Slow	High
Loctite 272	Thread locking	to 200°	M 36	Slow	High

THREAD SEALANT *For hermetic sealing. Not suitable for thermoplastic materials*

Product	*APPLICATION*	*Characteristics max °C*	*Thread max*	*type*	*Locking speed*	*Disassembly difficulty*
Loctite 511	Fitting sealant	150°	M80	Con./Cyl.	Rapid	Low
Loctite 542	Fitting sealant	150°	M36	Con./Cyl.	Rapid	Moderate
Loctite 545	Fitting sealant	150°	M36	Con./Con.	Moderate	Low
Loctite 565	Fitting sealant	150°	M80	Con./Cyl.	Instantaneous	Low
Loctite 572	Fitting sealant	150°	M80	Con./Cyl.	Moderate	Low
Loctite 577	Fitting sealant	150°	M80	Con./Cyl.	Rapid	Moderate

GASKETS *Total sealing in 24-72 hours*

Product	*APPLICATION*	*Characteristics max °C*	*Play max mm*	*Formation time*	*Resistance to fluids*
Loctite 518	Formed-in-place gasket	150°	0,5	Moderate	Excellent
Loctite 509	Formed-in-place gasket	150°	0,2	Moderate	Excellent
Loctite 573	Formed-in-place gasket	150°	0,2	Slow	Excellent
Loctite 574	Formed-in-place gasket	150°	0,5	Rapid	Excellent
Loctite 510	Formed-in-place gasket	200°	0,2	Moderate	Excellent
Loctite 5699	Formed-in-place gasket	200°	6,0	Rapid	Excellent
Loctite 5999	Formed-in-place gasket	200°	6,0	Instantaneous	Excellent
Loctite 5910	Formed-in-place gasket	200°	6,0	Rapid	Excellent
Loctite 5900	Formed-in-place gasket	200°	6,0	Instantaneous	Excellent
Loctite 5920	Formed-in-place gasket	250°	M 36	Slow	Good

2.17 HOISTING INSTRUCTIONS

⚠ DANGER

All parts weighing more than 25 kg MUST COMPULSORILY be handled with suitable hoisting means.
In the Disassembly and Assembly section there is a clear indication of the weight of the part to handle, while chapter A.12 contains a summary table with the weight of the single components.

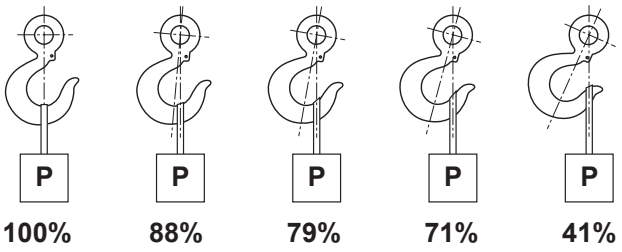
Before removing parts of the machine, make sure that:
- all fixing bolts have been removed
- all hydraulic and electrical parts have been disconnected
- the part to be removed is not blocked.

STRANDED ROPES
- Use ropes or other hoisting accessories suitable to the weight of the part to be handled. For ropes, refer to the following table:

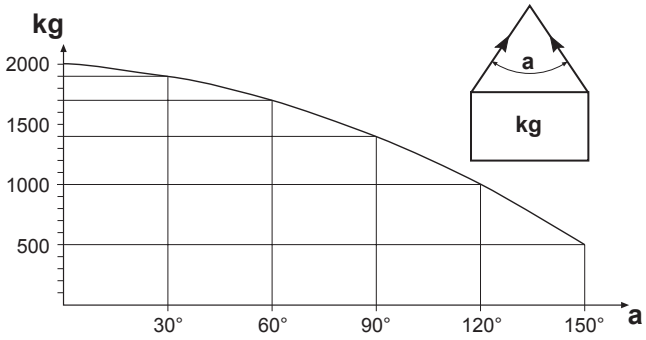
STRANDED ROPES	
Rope diameter mm	Max admissible load kg
10	1000
11.2	1400
12.5	1600
14	2200
16	2800
18	3600
20	4400
22.4	5600
30	10000
40	18000
50	28000
60	40000

The value of the admissible load has been considered as equal to 1/6 the rope breaking load.

- Attach the load to the natural seat of the hook. Attaching a load to an end can cause the load to fall down during raising and result in serious injury.



- Do not attach a heavy load to ropes forming a wide suspension angle. The total capacity of the ropes reduces proportionally to the angle as shown in the following chart.



2.18 ADVICE TO RENEW FLEXIBLE HOSES

NOTICE

Before disconnecting a hydraulic pipe, place containers of suitable size underneath to prevent oil spillage.

CAUTION

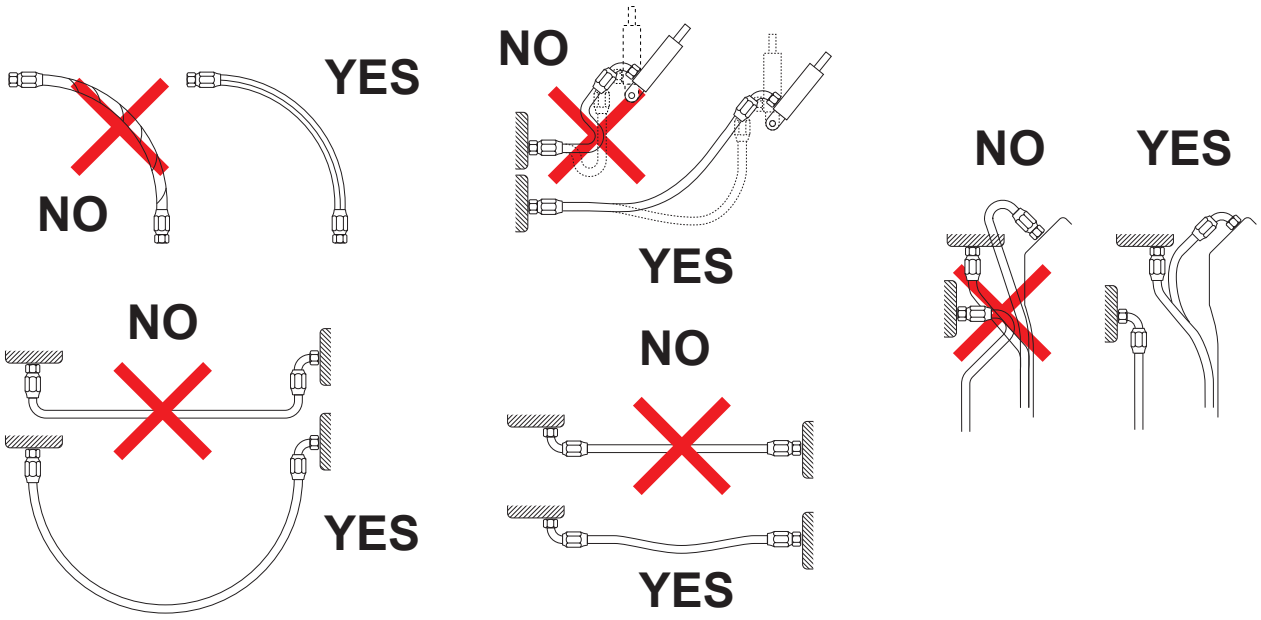
Plug all disconnected parts to prevent dust or impurities from entering the circuit. They can cause serious damage.

⚠DANGER

Before disconnecting the hydraulic pipe, check that there is no residual pressure. In case, eliminate the pressure operating the control levers with the engine stopped.
In any case, disconnect the hydraulic pipe with extreme caution and always wear suitable personal protection equipment -e.g. goggles, gloves, facial screen, etc.
Wrap up the end of the pipe to be disconnected with some rags and slowly loosen the pipe connector so that air comes out as slow as possible.

1 Before disconnecting or refitting a flexible hose, carefully clean the area all around.
2 Blow some compressed air to remove any impurity.
3 For an easier renewal of the hoses, whose run is not clearly visible, proceed as follows:
- disconnect the hose to be replaced from both sides
- tie a cord to one end of the hose
- remove the hose pulling the cord until it comes out completely
- untie the cord and tie it to the new hose
- pull the cord from the other side to refit the hose until reaching the connecting point to the line.

Useful advice for mounting flexible hoses:



2.19 LISTS OF RECOMMENDED SPARE PARTS

Telelift 4017

Code	Description	Q.ty
06.0401.0219	Pump and drive motor O.R.	2
54.0702.0021	Boom section sliding pad	2
695959	Boom section sliding pad	2
695970	Boom section sliding pad	2
695971	Boom section sliding pad	4
54.0200.0000	Pad locking bushing on boom sections	10
695957	Boom section sliding pad	2
695960	Boom section sliding pad	2
07.4529.0093	Seals kit - rear axle locking cylinder	1
07.4529.0063	Seals kit - balancing cylinder	1
07.4529.0065	Seals kit - extension cylinder	1
07.4529.0092	Seals kit - lifting cylinder	1
07.0741.0016	Seals kit - main control block	1
639395	Seals kit - attachment locking cylinder	1
53.3000.8100	Exhaust manifold	1
637452	Seals kit - balancing cylinder	1
07.0738.0000	Cardan joint spider	1
640537	Outrigger cylinder kit	1
07.0741.0000	Outriggers and sway control block solenoid	1
56.0012.0009	Outriggers limit switch	1
640536	Seals kit - fork pitching cylinder	1
637650	Fuse - 3A	2
07.0709.0419	Steering cylinder kit	1
07.0703.0193	Fuse - 5A	2
634972	Fuse - 7,5 A	2
634973	Fuse - 15 A	2
07.0703.0148	Fuse - 10 A	5
07.0703.0060	Maxi fuse 50 A	1
07.0703.0485	Ciam board relay	2
632696	Valve solenoid	1
07.0703.0531	NC contact	1
07.0703.0532	Mount + NO contact	1
07.0703.0533	NC contact	1
07.0703.0183	Telemecanique NC contact	1
07.0703.0419	Outriggers and balancing switch	1
07.0700.0000	Hydromatik oil filter cartridge	1
09.4604.0000	Tank internal filter	1
07.0740.0066	Cab ventilation filter	1
07.0741.0015	Seals kit - outriggers control block	1
07.0741.0004	Bucher control block electrical module	1
54.0001.0001	Attachment locking cylinder pin	1
05.4239.0000	Boom lowering line cylinder accumulator	1
56.0012.0000	Proximity sensor	1
638243	Engine oil filter	2
639399	Internal engine air filter cartridge	1
639400	External engine air filter cartridge	2
07.4501.0057	Fuel filter	2
07.0700.0000	Hydromatik oil filter cartridge	2

Telelift 4514

Code	Description	Q.ty
637452	Seals kit - balancing cylinder	1
07.4529.0093	Seals kit - rear axle locking cylinder	1
56.0012.0009	Outriggers limit switch	1
640537	Outrigger cylinder kit	1
07.0741.0000	Outriggers and sway control block solenoid	1
07.0741.0015	Outriggers and sway control block kit	1
54.0200.0000	Pad locking bushing on boom sections	6
695971	Boom section sliding pad	4
54.0702.0023	Boom section sliding pad	2
695970	Boom section sliding pad	2
695959	Boom section sliding pad	2
06.0401.0219	Pump and drive motor O.R.	2
695960	Boom section sliding pad	2
54.0702.0019	Boom section sliding pad	2
04.0602.0501	Boom internal flex hose for attachment locking cylinder	1
04.0602.0502	Boom internal flex hose for fork pitching cylinder	1
640536	Seals kit - forks pitching cylinder	1
07.4529.0063	Seals kit - balancing cylinder	1
07.4529.0094	Seals kit - boom extension cylinder	1
07.4529.0092	Seals kit - lifting cylinder	1
07.0741.0016	Seals kit - main control block	1
05.4329.0000	Boom lowering line cylinder accumulator	1
05.4329.0001	Pressure switch	1
639395	Seals kit - attachment locking cylinder	1
53.3000.8100	Exhaust manifold	1
637650	Fuse - 3A	3
07.0703.0193	Fuse - 5A	2
634972	Fuse - 7,5 A	3
634973	Fuse - 15 A	3
07.0703.0148	Fuse - 10 A	6
07.0703.0485	Ciam board relay	2
632696	Valve solenoid	1
07.0741.0000	Coil	1
07.0741.0004	Bucher control block electrical module	1
07.0703.0060	Maxi fuse 50 A	1
07.0703.0531	NC contact	1
07.0703.0532	Mount + NO contact	1
07.0703.0533	NC contact	1
07.0703.0183	Telemecanique NC contact	1
638004	Seal kit - braking pump	1
05.4239.0004	Parking brake pressure switch	1
07.0709.0419	Steering cylinder kit	1
07.0738.0000	Cardan joint spider	1
638243	Engine oil filter	2
639399	Internal engine air filter cartridge	1
639400	External engine air filter cartridge	2
07.4501.0057	Fuel filter	2
07.0700.0000	Hydromatik oil filter cartridge	2
07.0700.0000	Hydromatik oil filter cartridge	1
09.4604.0000	Tank internal filter	1
07.0740.0066	Cab ventilation filter	1
54.0001.0001	Attachment locking cylinder pin	1

2.20 MACHINE PAINT COLOUR

STANDARD machines

GREY RAL 7012

WHITE RAL 1013

MAT BLACK RAL 9005 (from June 2004 for cylinders)

AUSA machines

ORANGE RAL 2004

GENIE machines

BLUE GENIE

GREY GENIE

BLACK RAL 9500

MZ IMER machines

ORANGE RAL 2010

2.21 CHECKING THE CYLINDER MOVEMENT TIMES

CAUTION

The check of the movement times of the cylinders shall be done with the hydraulic oil at a temperature of 60°.

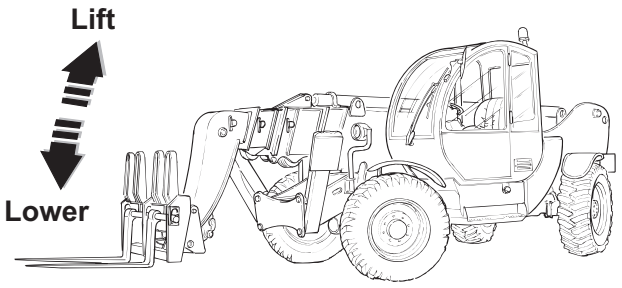
CAUTION

To check the engine speed, the area easy to reach is the external pulley of the output shaft.

BOOM LIFTING/LOWERING

Telelift 4017	Time (s)	
	up	down
Max engine speed	16”	13”
Min. engine speed	41”	29”

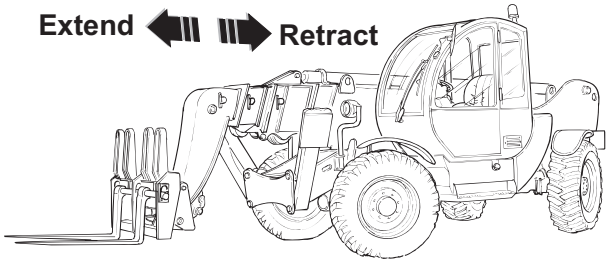
Telelift 4514	Time (s)	
	up	down
Max engine speed	16”	12”
Min. engine speed	40”	30”



BOOM EXTENSION/RETRACTION

Telelift 4017	Time (s)	
	out	in
Max engine speed	26”	15”
Min. engine speed	55”	35”

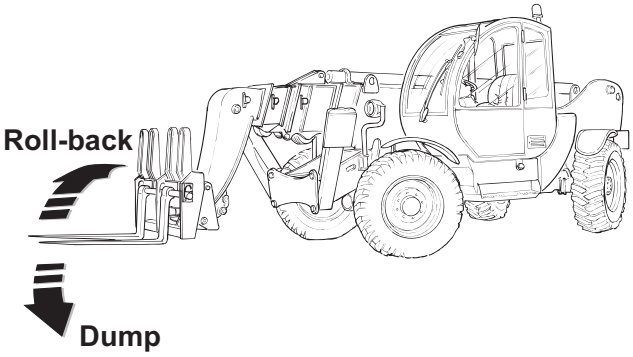
Telelift 4514	Time (s)	
	out	in
Max engine speed	24”	17”
Min. engine speed	60”	37”



ATTACHMENT DUMPING

Telelift 4017	Time (s)	
	roll-back	dumping
Max engine speed	4”	4”
Min. engine speed	9”	7”

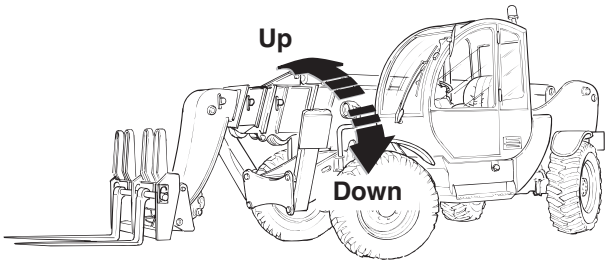
Telelift 4514	Time (s)	
	roll-back	dumping
Max engine speed	4”	4”
Min. engine speed	9”	6”



OUTRIGGERS MOVEMENT

Telelift 4017	Time (s)	
	up	down
Max engine speed	6”	7”
Min. engine speed	13”	16”

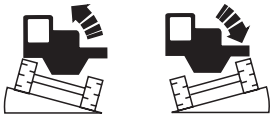
Telelift 4514	Time (s)	
	up	down
Max engine speed	5”	6”
Min. engine speed	10”	14”



MACHINE SWAY

Telelift 4017	Time (s)	
	right to left	left to right
Max engine speed	10”	10”
Regime motore min.	11”	11”

Telelift 4514	Time (s)	
	right to left	left to right
Max engine speed	9”	9”
Min. engine speed	12”	12”



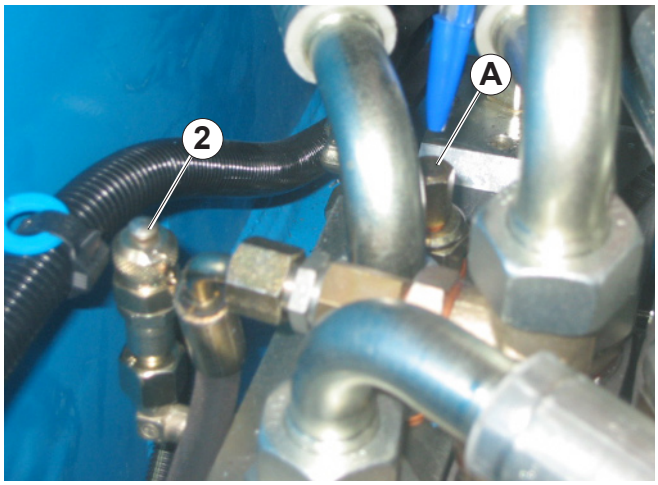
2.22 HYDRAULIC CALIBRATIONS

1. PRELIMINARY OPERATIONS

Warm up the hydraulic oil to 60°C by keeping one of the elements of the boom distributor to full stroke under pressure.
To reach this temperature in a faster way, cover the oil core of the radiator with a carton in the case of a water-oil combined cooler, or the oil radiator if the machine is equipped with a separate oil radiator.

2. SETTING THE BOOM DISTRIBUTOR

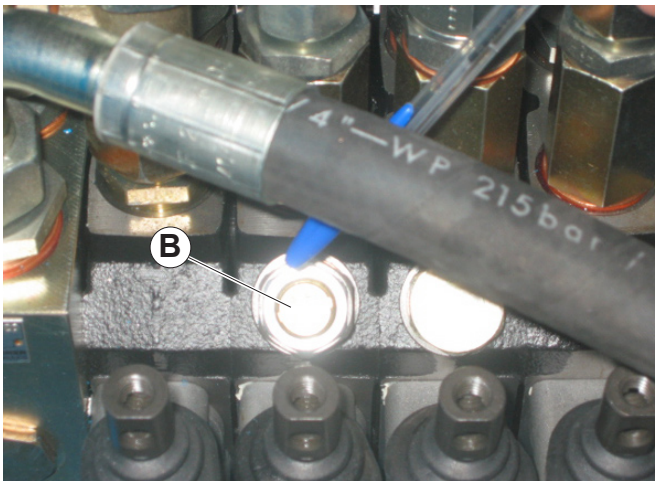
Find the manometer mini-socket **ref. 2** on the **Bucher** distributor.



2.1 SETTING THE DISTRIBUTOR PRESSURE CONTROL VALVE

Connect a 0-400 bar manometer to the mini-socket **ref. 2**. Fully raise the boom to stroke end.
Calibrate valve **A** (annexes 1) of the Tecnord distributor to 280 bar while keeping the lifting cylinder at end of stroke and under pressure and the thermal engine fully accelerated.
In order to check the setting of the safety valve of the bucket tilting cylinder **B** (annexes 1), proceed as follows:

- By means of valve **A** set the distributor pressure to 300 bar while moving one of the cylinders to stroke end.
- With the engine running at maximum speed, tilt the forks to one direction by means of the joystick and act on one of the two valves **B** until reaching a pressure of 290 bar.
- Proceed in calibrating the second valve **B** by tilting the forks to the opposite direction.
- When both fork inclination safety valves have been calibrated, reset the pressure control valve **A** to 280 bar by adjusting the register.



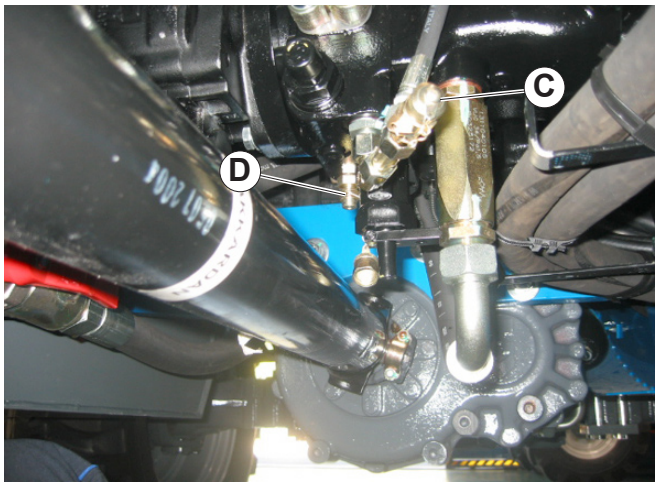
3 SETTING THE BLOCK VALVES OF THE FORK BALANCE CYLINDER (annexes 2)

- Loosen the lock nuts of the valve and tighten the two registers of cartridges **S**.
- Re-loosen of one turn and a half both valves and re-tighten the lock nuts.

4. SETTING THE HYDROMATIK PUMP HYDROSTATIC TRANSMISSION

Do the calibration of the hydrostatic transmission with the hydraulic oil at a temperature of 80°C and with the 2nd mechanical speed engaged.

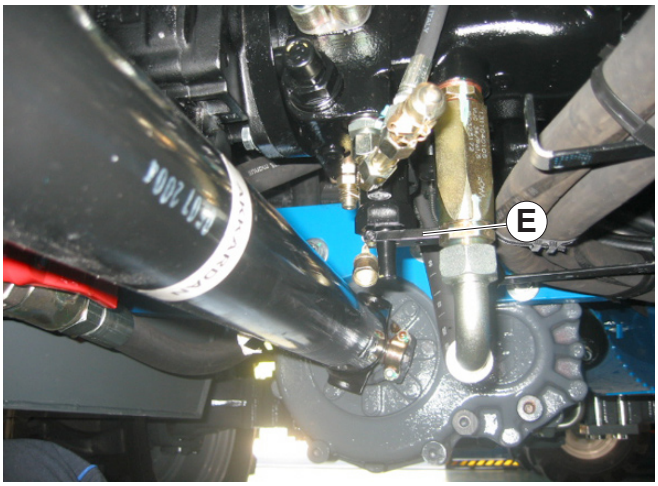
- Connect a 0-60 bar manometer to the mini-socket **ref. C** (annexes 3) to read the low-pressure value.
- Connect a 0-600 bar manometer to the mini-socket **ref. D** to read the high-pressure value.



- Hold the selector to neutral position and make sure the maximum speed of the engine does not exceed 2500 rpm. The engine must run at a idle speed of 900 rpm. Otherwise, adjust the minimum speed.
- Measure the boost pressure and ensure it is 30 bar with the engine running at max speed (2400 rpm). If this value is not reached, act on valve **M**.
  Note: In these machines, the low pressure is also used for the re-sequencing cylinder and for the distributor.
- Engage the 2nd mechanical speed and fully depress the brake pedal with the left foot to bring the machine to a stop. Do not use the parking brake.

STARTING THE CALIBRATION

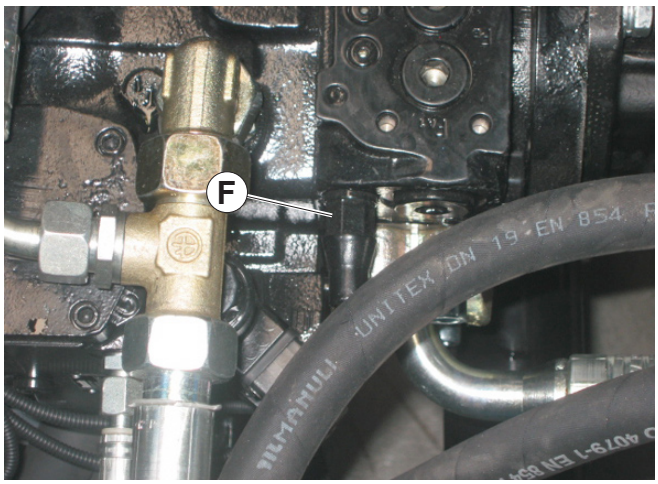
- Set the forward-neutral-reverse selector to the forward position.
- Run the engine at 1000 rpm. Check the value on the tachometer.
- Adjust the shutter **E** by means of the register until reading a value of 50 bar on the high-pressure manometer **D**.



4.1 CALIBRATION OF THE "DA" CURVE

Do this operation with extreme caution. The proper functioning of pump and transmission depends on this calibration.

- Set the forward-neutral-reverse selector to the forward position.
- Run the engine at maximum speed and check the high-pressure value. If this value is less than 430 bar, increase the pressure to 425-430 bar by means of the pressure cut-off valve **F**.



- Gradually increase the engine rpm and steadily check the high-pressure manometer. As soon as the value of 400 bar is reached, hold the gas pedal fully depressed and attempt to keep the pressure on this value.
- If, with the engine running at 1950 rpm, the value of 400 bar is not reached, adjust the spark advance valve **G** (annexes 3).

⚠WARNING

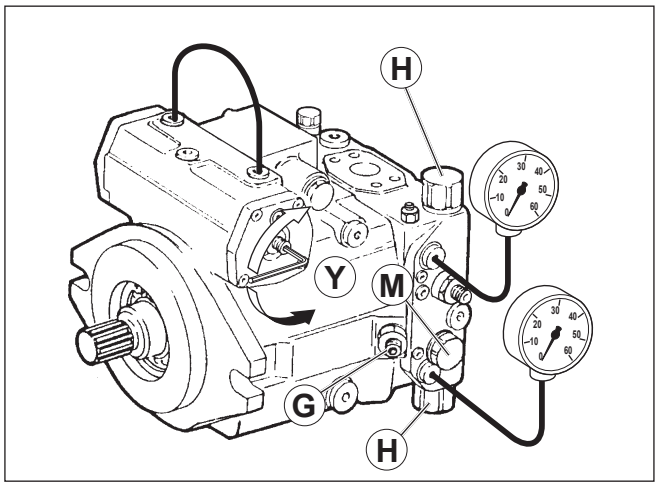
The spark advance screw must never be rotated beyond the vertical axis of the pump (observe the reference mark on the screw).

Model	Pump pressure	Diesel engine rpm
Telelift 4017	400 bar	1950
Telelift 4514	400 bar	1950

4.2 CHECKING THE SAFETY VALVE

- With the engine running at maximum speed and the forward speed engaged, set the pressure cut-off valve **F** at 430 bar.

  The two pressure control valves **H** are the cartridge type and already set at 450 bar by Rexroth; therefore they do not require any calibration.



4.3 CALIBRATING THE MECHANICAL ZERO

The calibration of the mechanical zero **I** is required if the machine moves when the forward/reverse speed lever is in the neutral position.

- Turn the speed selector to neutral.
- With the engine running at idle, adjust the mechanical zero screw **Y** by rotating it until the high-pressure manometer reads the same value measured by the boost pressure manometer.

5. CALIBRATING THE BRAKING SYSTEM PRESSURE (encl. 4)

- Connect a 0-250 bar pressure gauge to position **T** (encl. 4).
- Depress the foot brake some times until the value shown on the pressure gauge starts increasing. When the pressure gauge stops, the value shown corresponding to the calibration value of valve **R** should be 140 bar. If the value is below 140 bar, loosen valve **R**; if the value is above 140 bar, tighten the valve.

  Note: To check the pressure, it is necessary to depress the foot brake some times until the pressure gauge restarts increasing; when it stops in stable position, it shows the calibration value.
  Pay special attention while disconnecting the hose from the accumulator. Oil can splash all around. First of all, release any residual pressure from the accumulators.

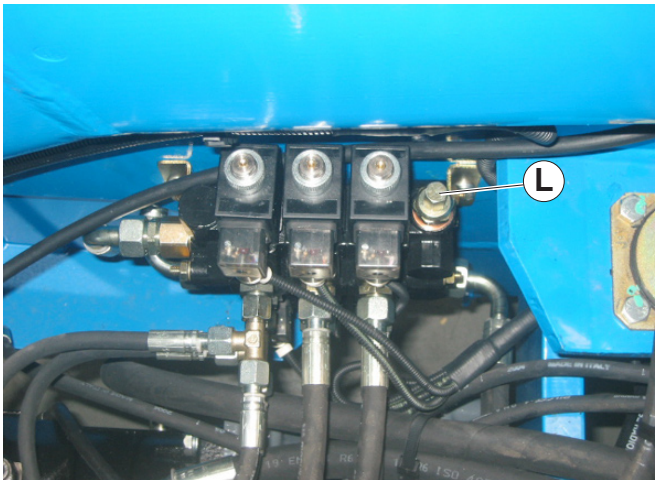
6. CALIBRATING THE POWER STEERING

- Connect a 0-250 bar pressure gauge to position **Z** (encl. 5).
- Select the front-wheel steering mode.
- Move the steering cylinder to end of stroke and make sure the value of the power steering **A** is 140 bar. If the value is below 140 bar, tighten valve **X**; if the value is above 140 bar, loosen the valve.

  Note: To reach valve **X**, remove the protection cap (encl. 5).

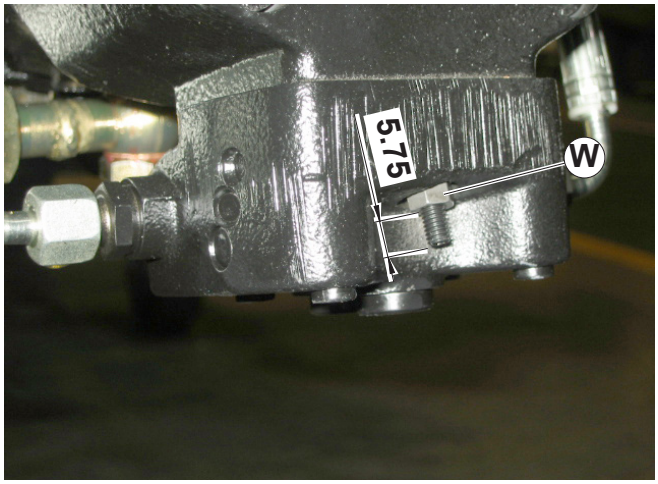
7. CALIBRATING THE MAIN VALVE OF THE THE STABILISERS

- Connect a 0-400 bar manometer to position **V** (encl. 6).
- Run the diesel engine to max speed and make sure the pressure reaches a value of 220 bar with the stabilizer to end of stroke.
- If the pressure value isn't correct, adjust valve **L** of the main valve.

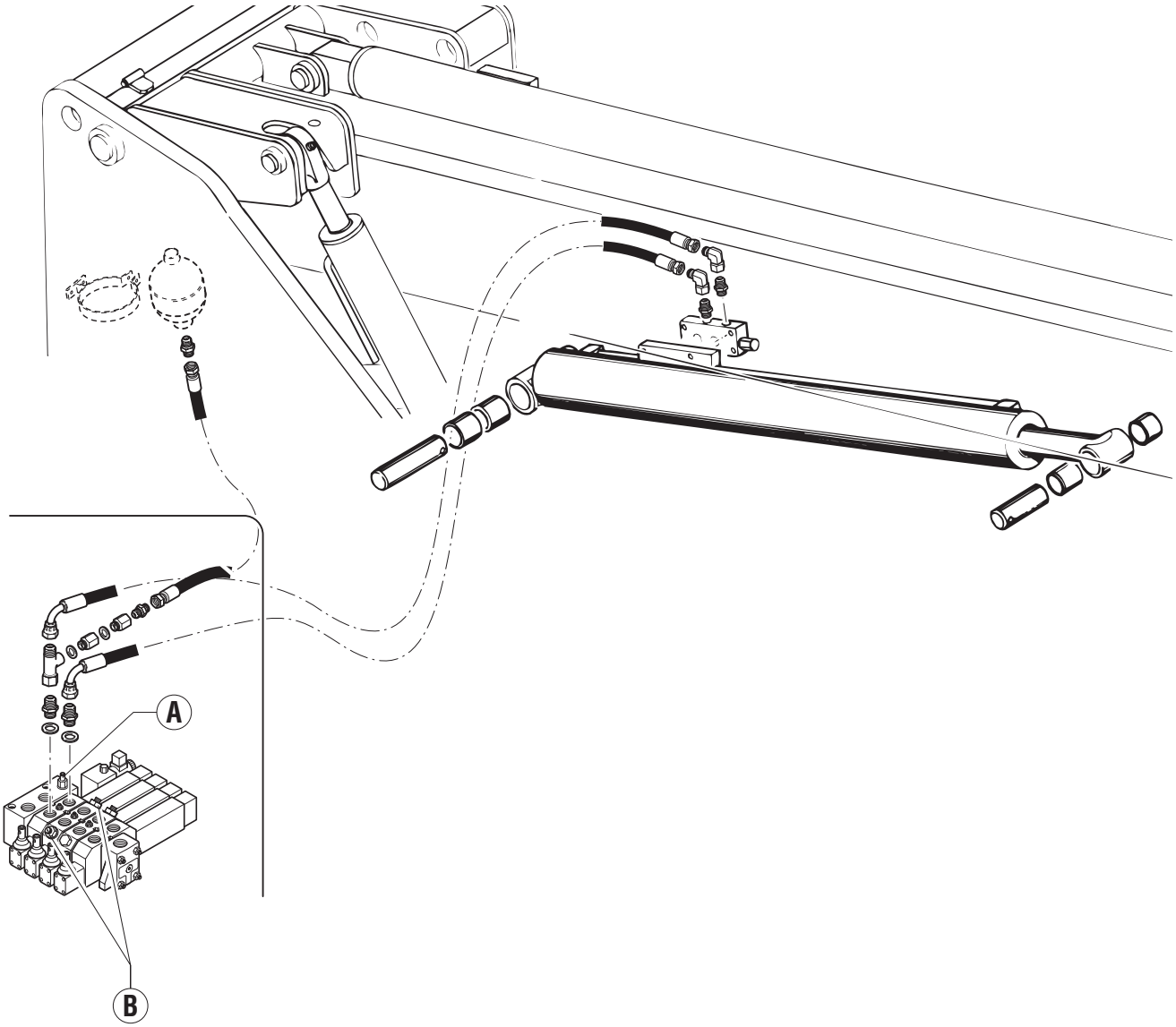


8. CHECKING THE ADJUSTMENT SCREW OF THE DRIVE MOTOR GEARBOX

- Check that the bottom face of the adjustment screw **W** of the drive motor gearbox protrudes 5.75 mm with respect to the bottom face of the relevant locknut.

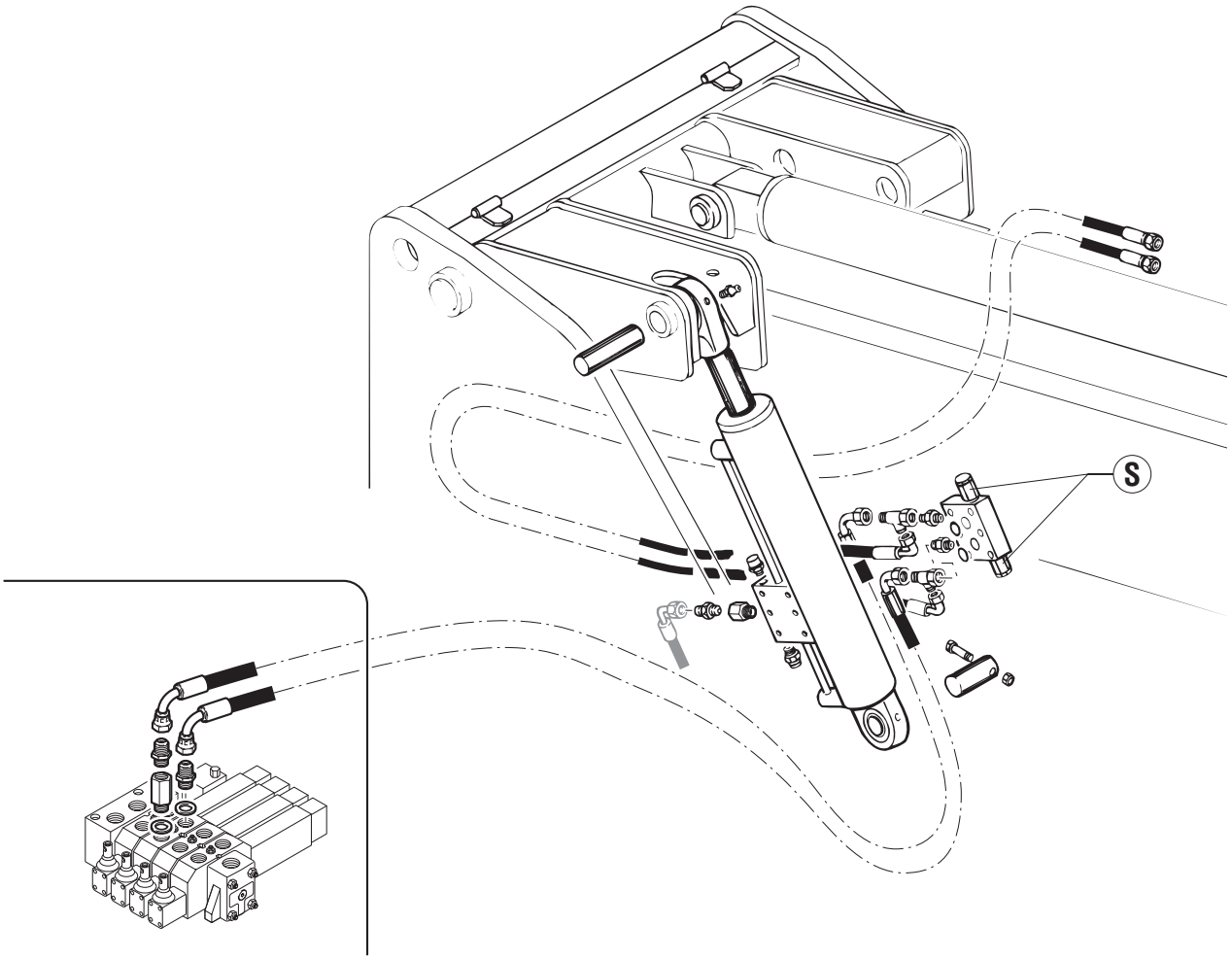


HYDRAULIC SYSTEM - LIFTING	Encl. 1

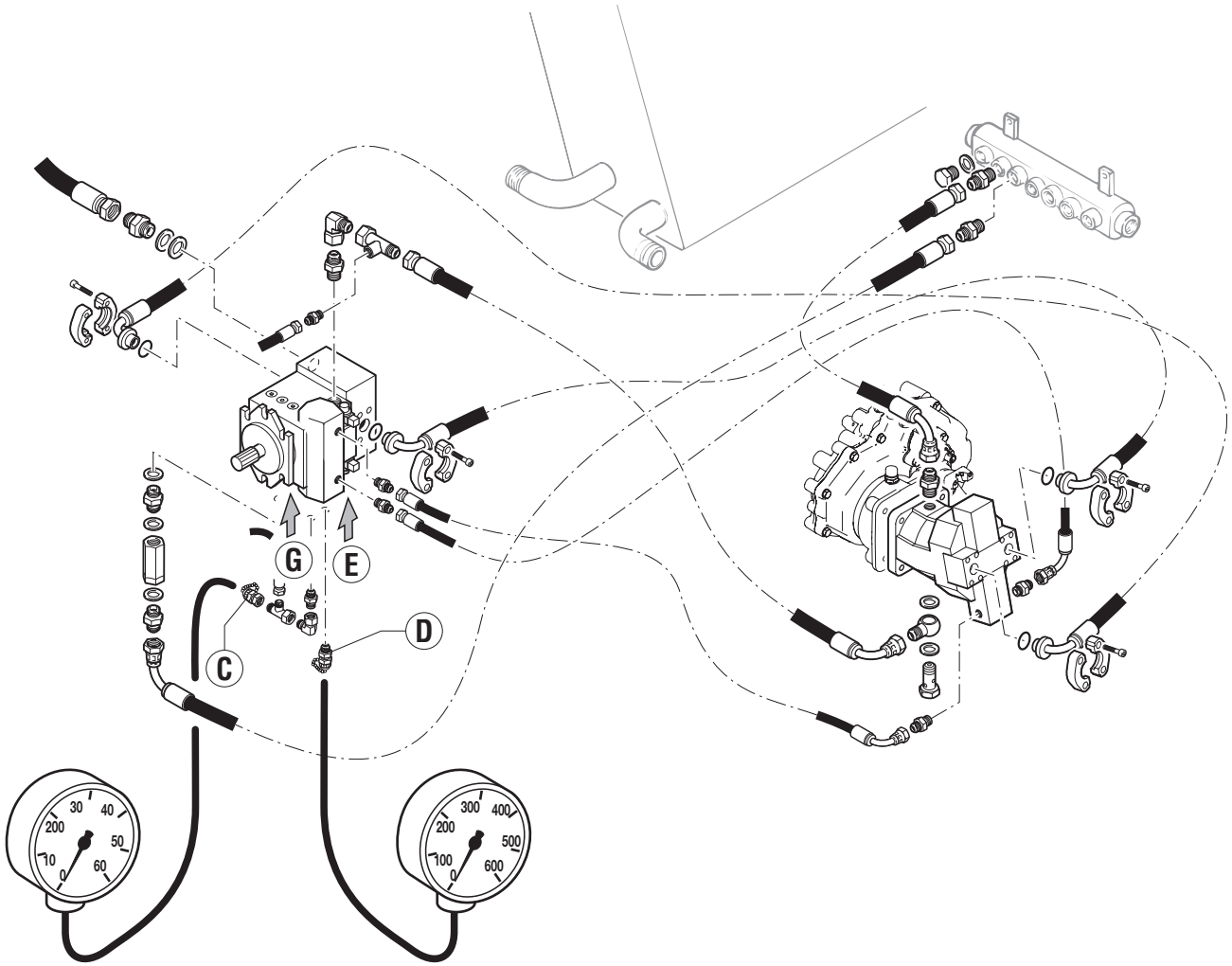


HYDRAULIC SYSTEM - FORK BALANCE

Encl. 2

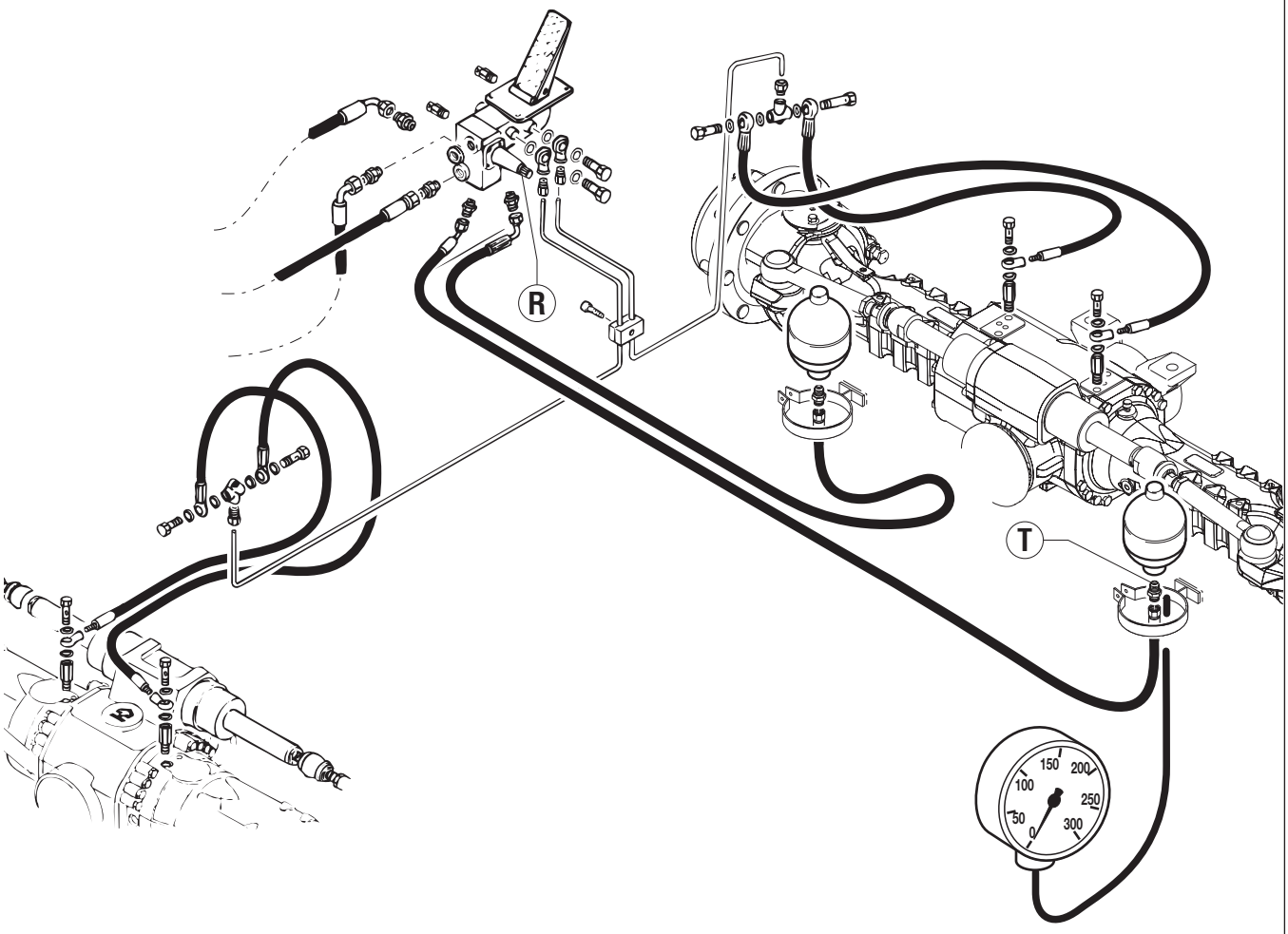


HYDRAULIC SYSTEM - TRANSMISSION	Encl. 3

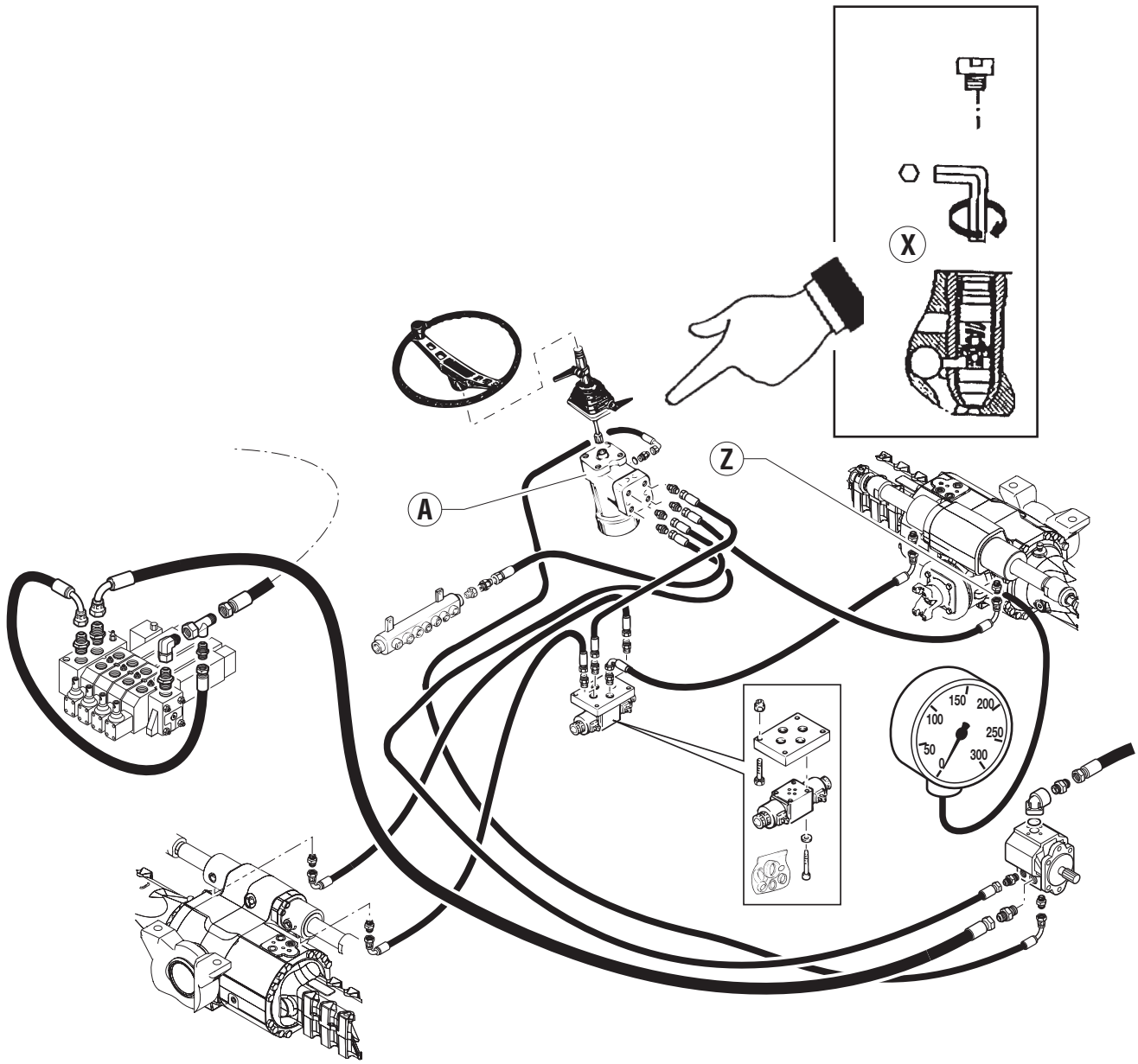


HYDRAULIC SYSTEM - SERVICE AND PARKING BRAKES

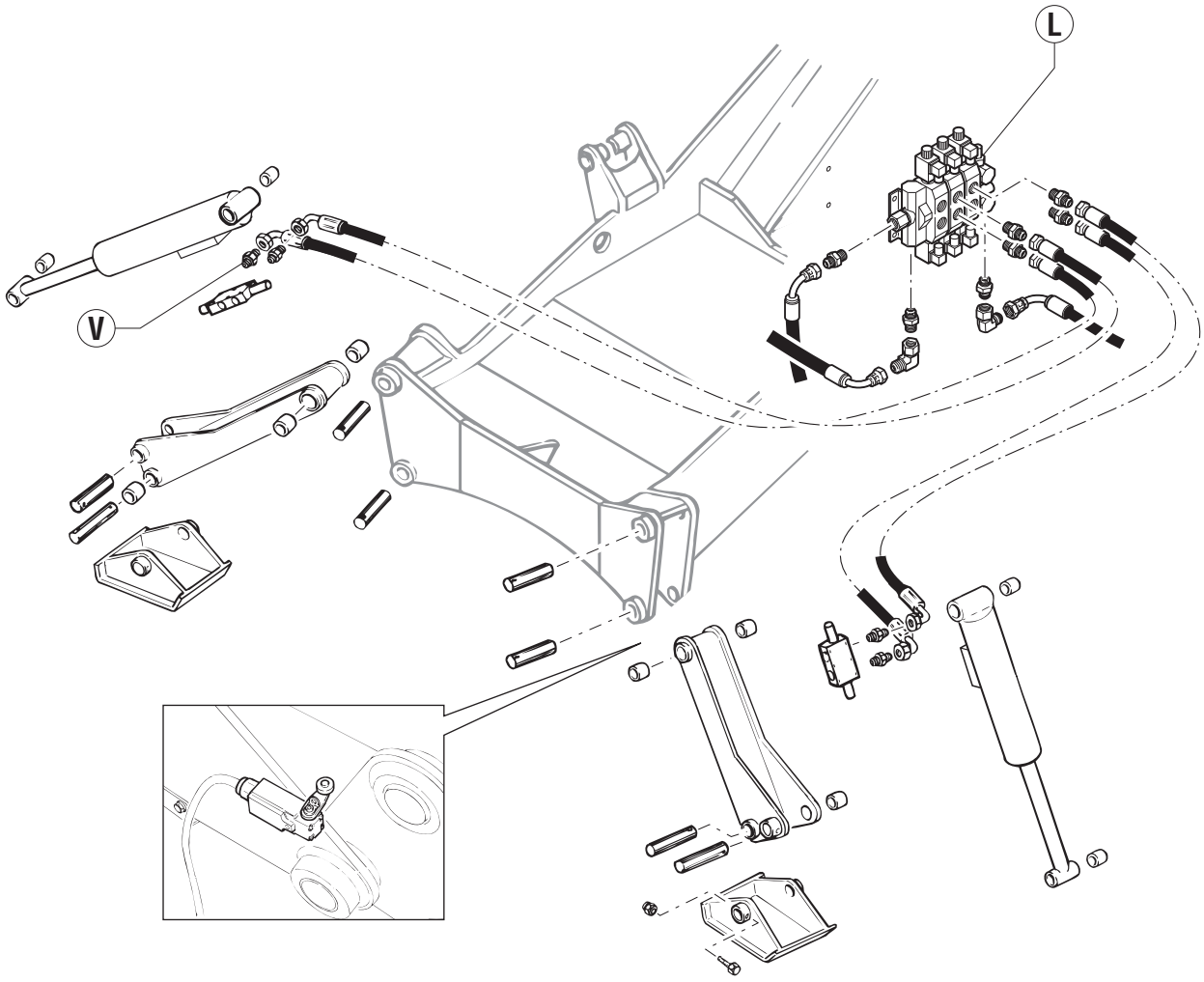
Encl. 4



HYDRAULIC SYSTEM - POWER STEERING	Encl. 5

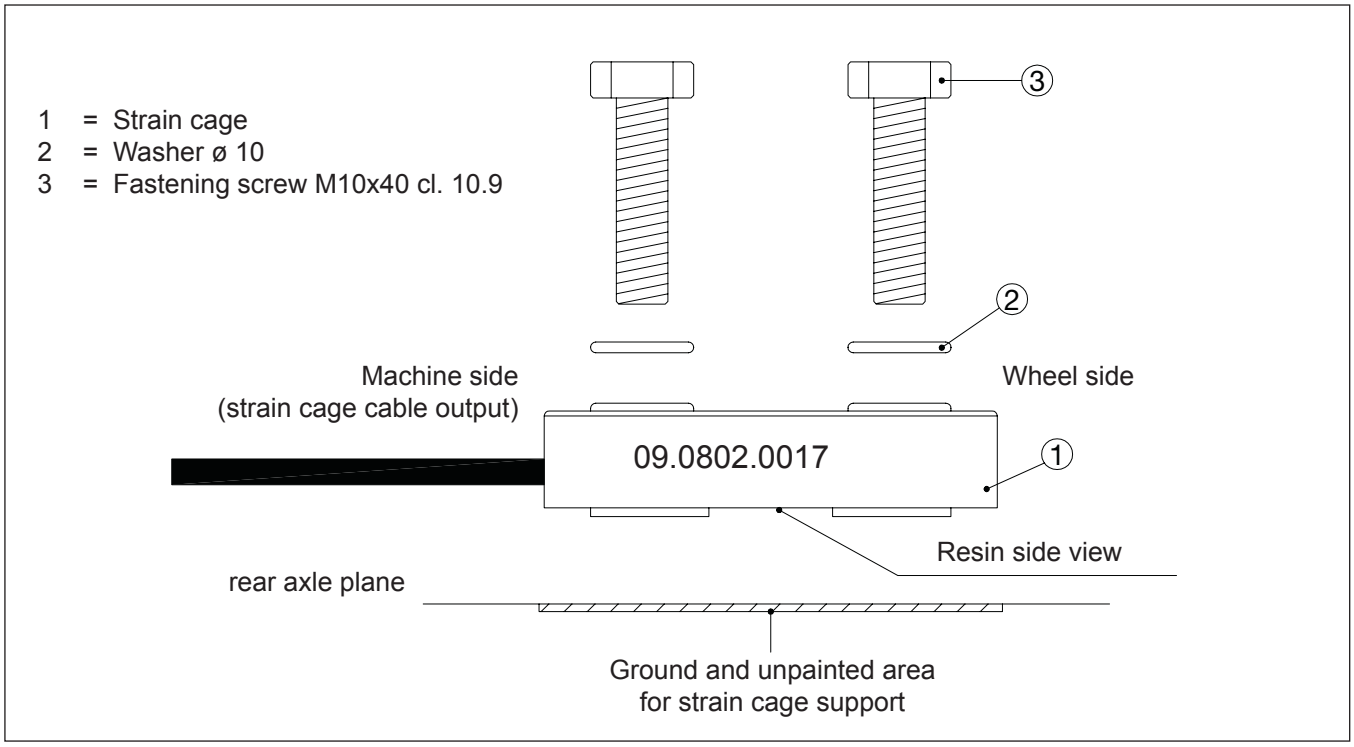


HYDRAULIC SYSTEM - STABILIZERS	Encl. 6

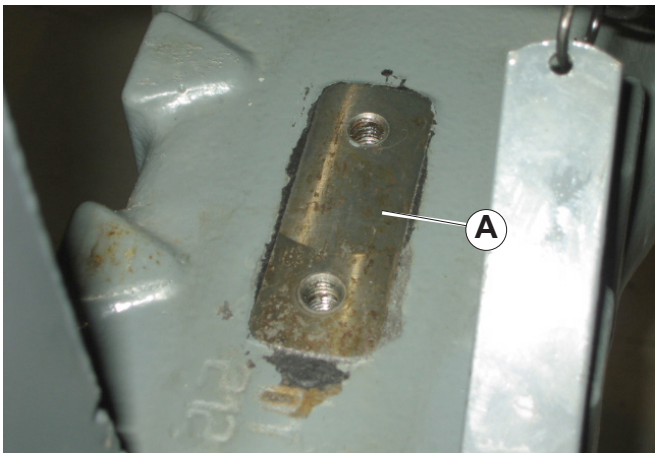


2.23 DLE SYSTEM

INSTALLING THE EXTENSIMETRIC CELL



In order to get the best results and avoid damaging the strain cage, follow these precautionary measures:

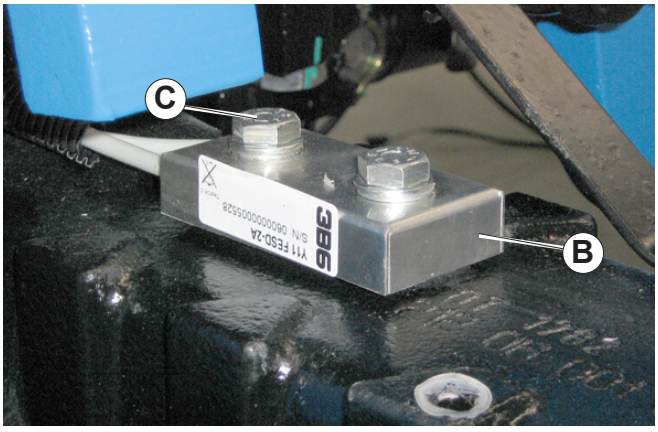


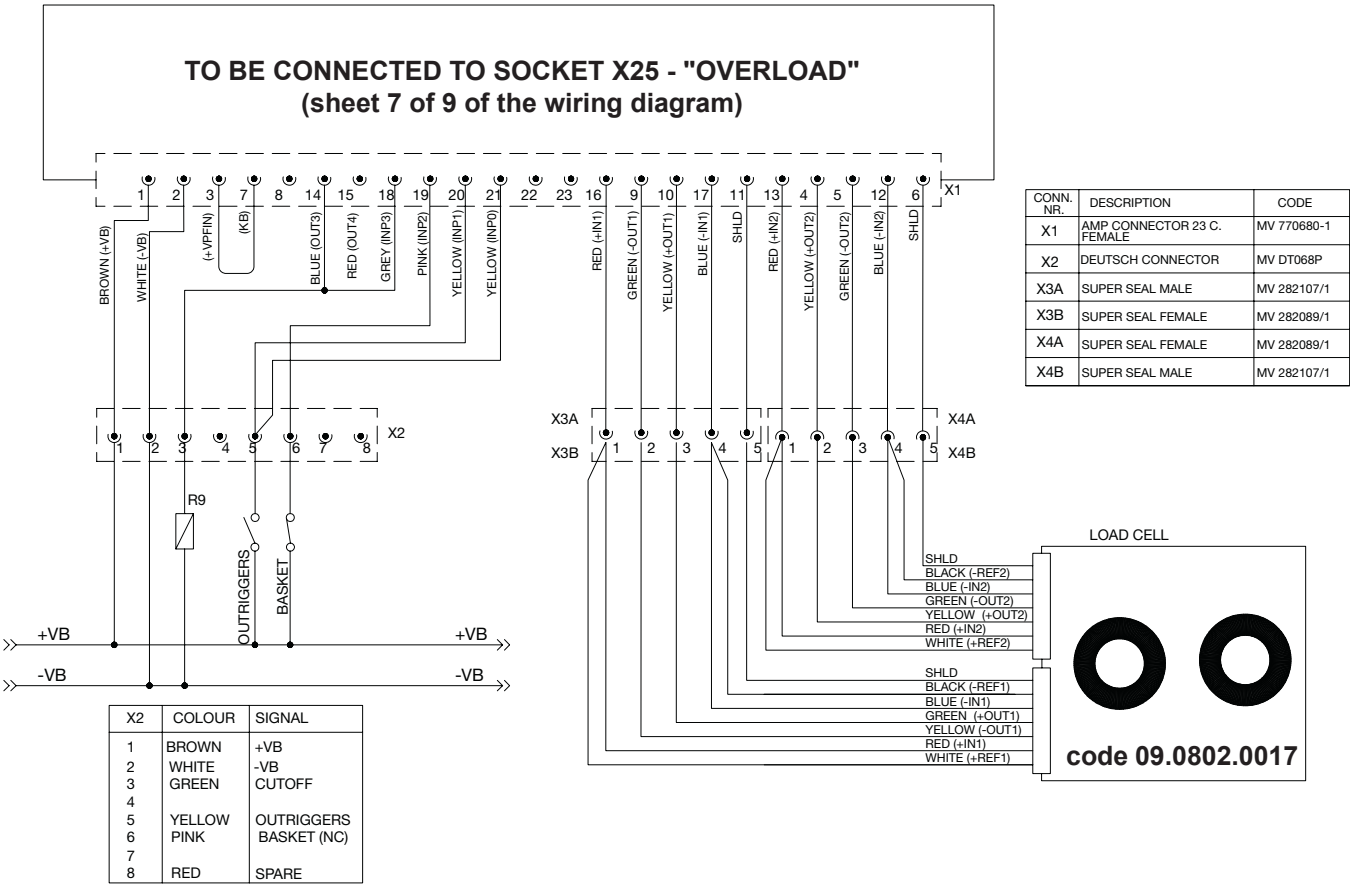
1 - PREPARATION:

- Thoroughly clean the whole tightening system, especially the ground unpainted zone **A** of the rear axle

2 - ASSEMBLY:

- Apply the strain cage **B** with its resinated side facing the axle and holding the cable(s) toward the machine.
- Tighten the two screws **C** with a torque wrench at **70 Nm**.
- Mark the position of the screws with paint in order to make possible loosening visible to the eye.





CONN. NR.	DESCRIPTION	CODE
X1	AMP CONNECTOR 23 C. FEMALE	MV 770680-1
X2	DEUTSCH CONNECTOR	MV DT068P
X3A	SUPER SEAL MALE	MV 282107/1
X3B	SUPER SEAL FEMALE	MV 282089/1
X4A	SUPER SEAL FEMALE	MV 282089/1
X4B	SUPER SEAL MALE	MV 282107/1

X2	COLOUR	SIGNAL
1	BROWN	+VB
2	WHITE	-VB
3	GREEN	CUTOFF
4		
5	YELLOW	OUTRIGGERS
6	PINK	BASKET (NC)
7		
8	RED	SPARE

CONNECTOR X1 FOR CHECKS WITH TESTER

Electrical power to control unit (DLE)
Pin 1: 12 V
Pin 2: ground

Overload signal
Pin 14: 12 V normal conditions, 0 V alarm overload
Pin 18: re-reading overload signal

Cab/platform switch signal
Pin 19: 0 V if switch is on “platform”, 12 V if switch is on “cab”

Stabilizers signal
Pin 20/21: 12 V if the machine is on stabilizers, 0 V if it is on wheels

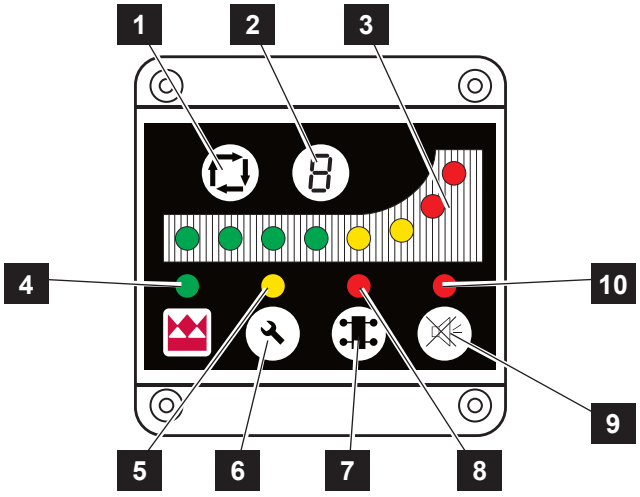
Electrical power to load cell equal to 5 V
Channel 1: Pin 16: positive Pin 17: negative
Channel 2: Pin 13: positive Pin 12: negative

Load cell signal in range 0,1 - 2,5 mV
Channel 1: Pin 10: positive Pin 9: negative
Channel 2: Pin 4: positive Pin 5: negative

CALIBRATING THE DLE LOAD LIMITER

CAUTION

- ***During the calibration mode the limiter device <u>doesn't</u> block any manoeuvres so the calibration can be done.***
- ***If the machine is equipped with stabilisers, you shall lower the stabilisers to the ground and calibrate the system with the machine "empty" and "loaded" . Therefore, we recommend keeping the load of known weight in the range of action of the machine.***
- ***The calibration of the machine should be done after a few minutes of use, in other words with the machine "warm".***



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- Enter the calibration mode:

<u>Within 5 seconds</u> from when the instrument is activated (even if the display is still off) you should press the keys on the front panel in the right sequence.
The keys to use and the relevant meaning are shown below:

Press  to enter number 0

Press  to enter number 1

Press  to confirm the sequence entered.

The access code currently used is **<u>1001</u>**. Therefore you should enter the following sequence:

1 0 0 1  CONFIRM 

If the sequence is correct the confirmation of the instrument functioning in the calibration mode is given by the LED near  lighting with a fixed light.
The display shows a number that ISN'T blinking, starting from "0".

- Description of the controls:

1 Calibration selection button
2 Display
3 Stability indicator with LED-bar
4 Green light - power OK
5 Yellow light - calibration mode
6 Calibration confirmation button
7 Not used
8 Red light - outrigger position
9 Buzzer ON/OFF pushbutton
10 Red light - overload pre-alarm / alarm

The digit on display **2** shows the selected attachment. The user can choose among:

0: Generic
1: Platform

The system recognises the attachment fitted to the machine automatically.

DISPLAY	FUNCTION
0	The LED bar indicates the type of machine in use: 2 LEDs on - Telelift 4017 / Telelift 4514 To select the machine to be calibrated press to increase the number of LED's lit or press to reduce the number of LED's lit. If you are doing the first calibration, press to reset the system and load the default parameters of the selected machine. **If you are re-calibrating the instrument, directly jump to point 1.** Press to proceed to the next point (1).
1	Lower the stabilisers to the ground, fully retract the boom holding it slightly above the horizontal with respect to the ground. **DON'T** lift loads. Press to confirm the **EMPTY** calibration of the machine. The audible alarm will sound to confirm the command has been executed. Press to proceed to the next point (2).
2	Again with the stabilisers lowered to the ground, place a load on the forks with a weight corresponding to the table on next page - in relation to the model -, extend the boom while holding it horizontal till reaching the overturning limit. Ex: Telelift 4017 with outriggers down 1000 kg at 8,60 m (overturning distance = distance from the front part of the wheels to the centre of the load). Press to confirm the **LOADED** calibration of the machine and check that the alarm triggers. The audible alarm will sound to confirm the command has been executed. Raise the stabilisers, place a load on the forks with a weight of 1500 kg, and extend the boom up to a distance of 4.80 metres (measured from the front part of the wheels to the centre of the load placed on the forks). Hold this position till the end of the procedure explained in point 3. Press to proceed to the next point (3).
3	Press some times to switch off the LED's showing the load percentage and press to switch them on. By the end of the operation, all LED's from the left to the right must be lit, but for the last red LED. To do this, we recommend starting with the LED's bar on the green area and then press to increase the number of LED's lit. No confirmation is required as the operation is automatically saved at the end of the adjustment. Press several times to proceed to the next point (F).
F	Press to exit calibration and SAVE the changes made (the zero flashes). The limiter is no longer in the calibration mode. The LED is not lit fixed any more. You should turn the machine off and then on again to eliminate any alarm messages (display blinking). When the instrument is turned on, a "0" should appear on the display. Now you can start working.

To test the machine with different weights after a calibration, strictly respect the values shown on the load diagram (lengths are referred to the distance between the front part of the wheels and the centre of the load on the forks).

	load (kg)	activation of the overload warn.system (m)	
		on outriggers	on wheels
Telelift 4017	1000	8,60	6,30
Telelift 4514	1500	8,70	5,50

DIAGRAM - TELELIFT 4017 WITH STABILISERS LOWERED TO THE GROUND

1000 kg at 8.60 metres

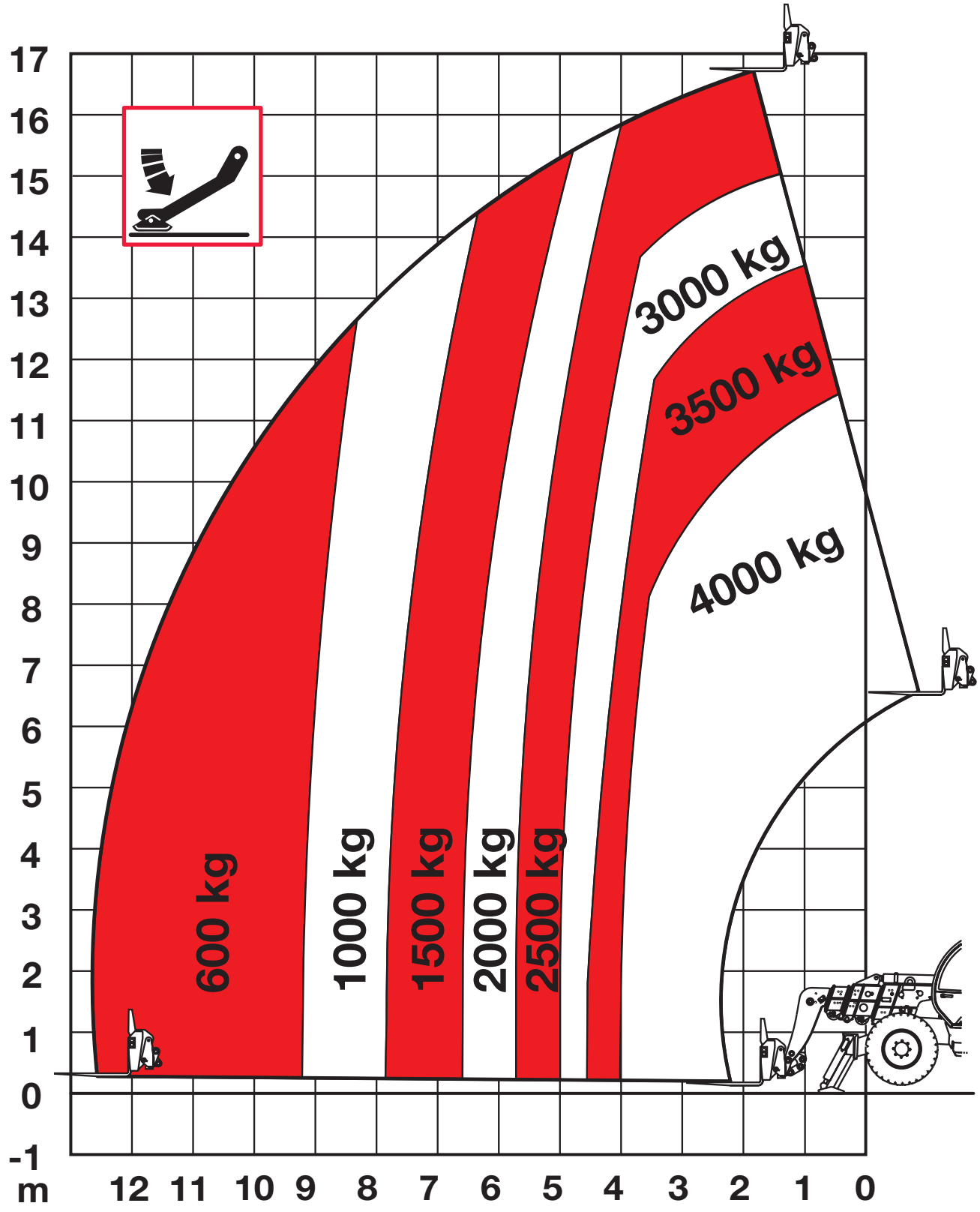


DIAGRAM - TELELIFT 4017 ON WHEELS

1000 kg at 6.30 metres

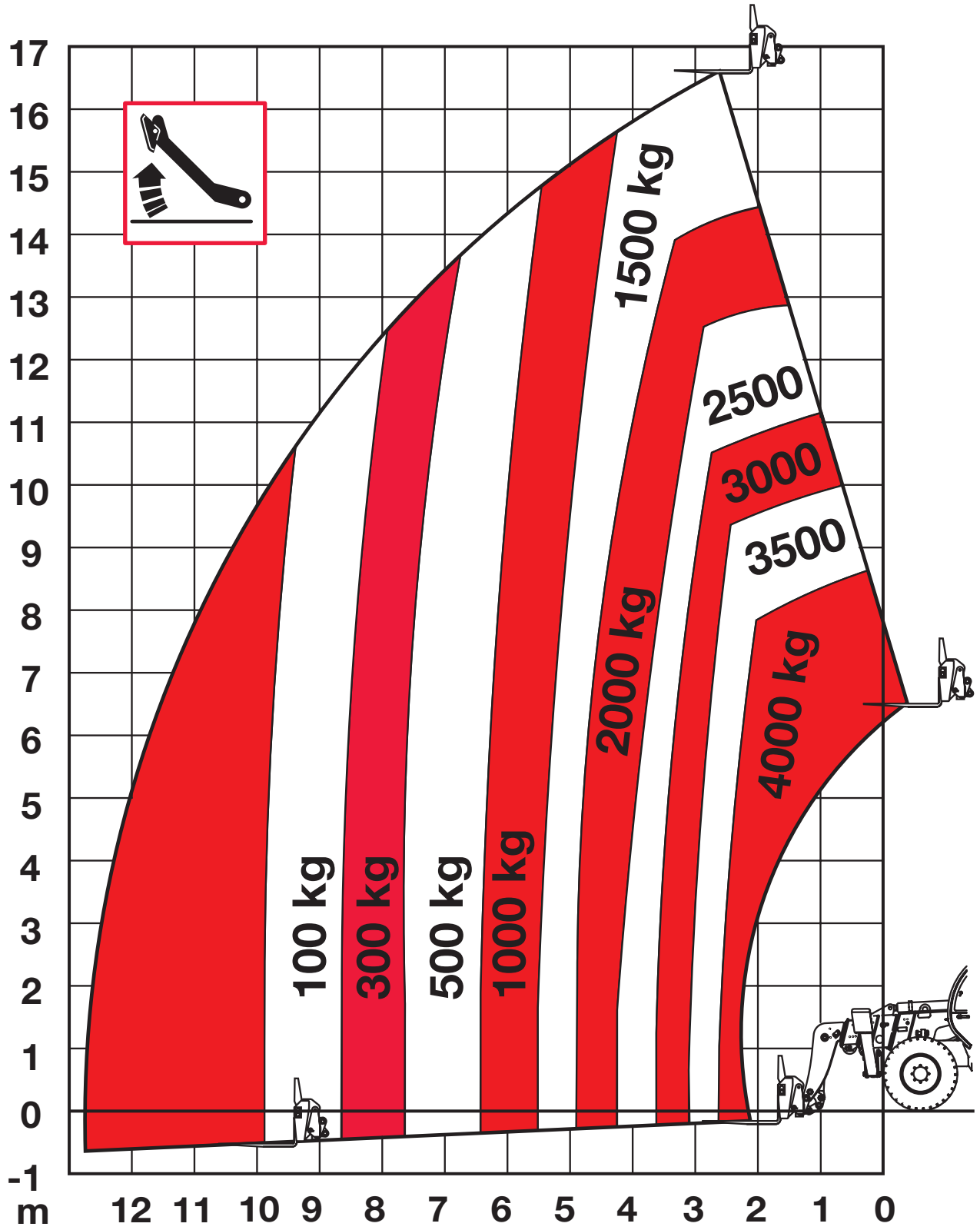


DIAGRAM - TELELIFT 4514 WITH STABILISERS LOWERED TO THE GROUND

1500 kg at 8.70 metres

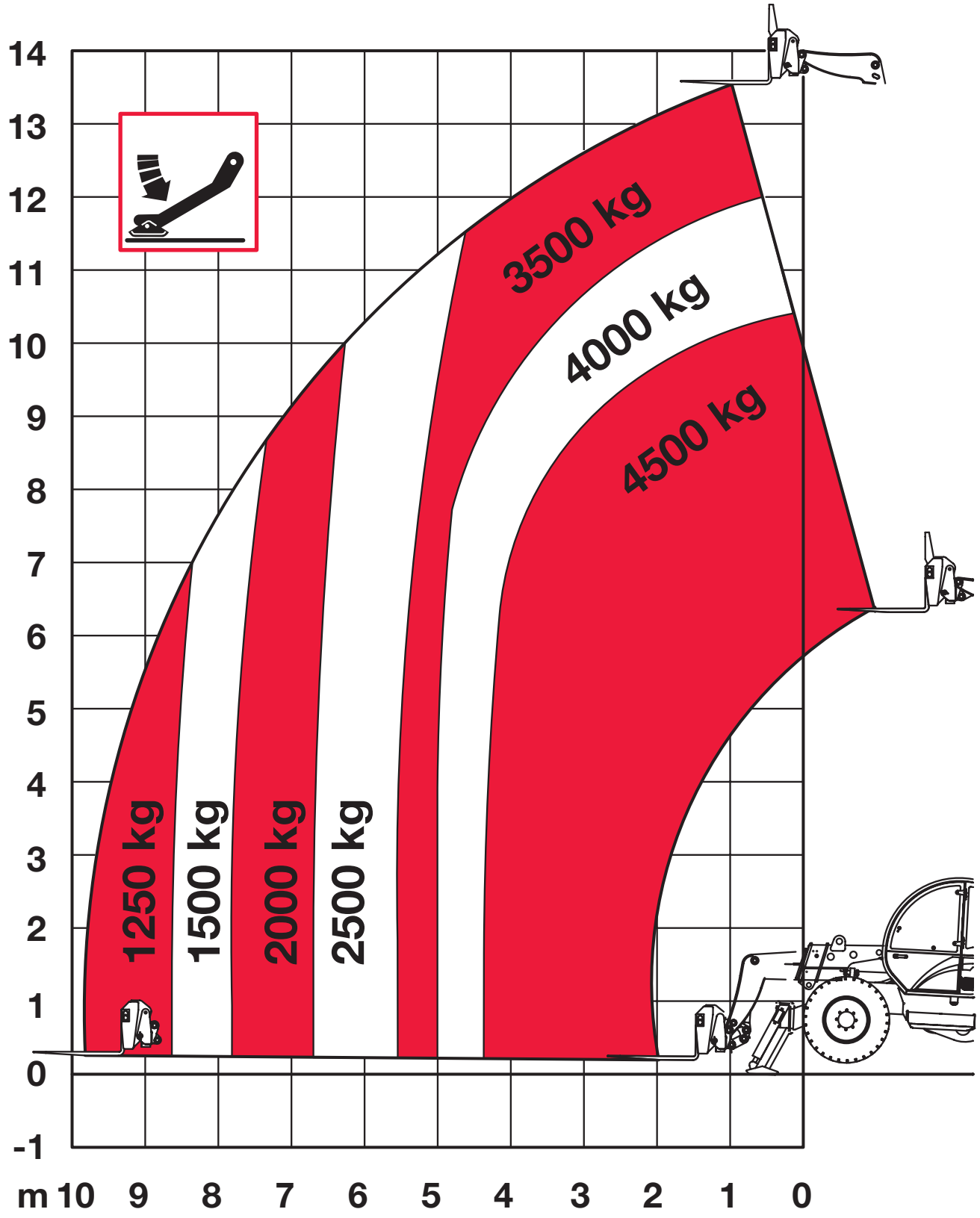
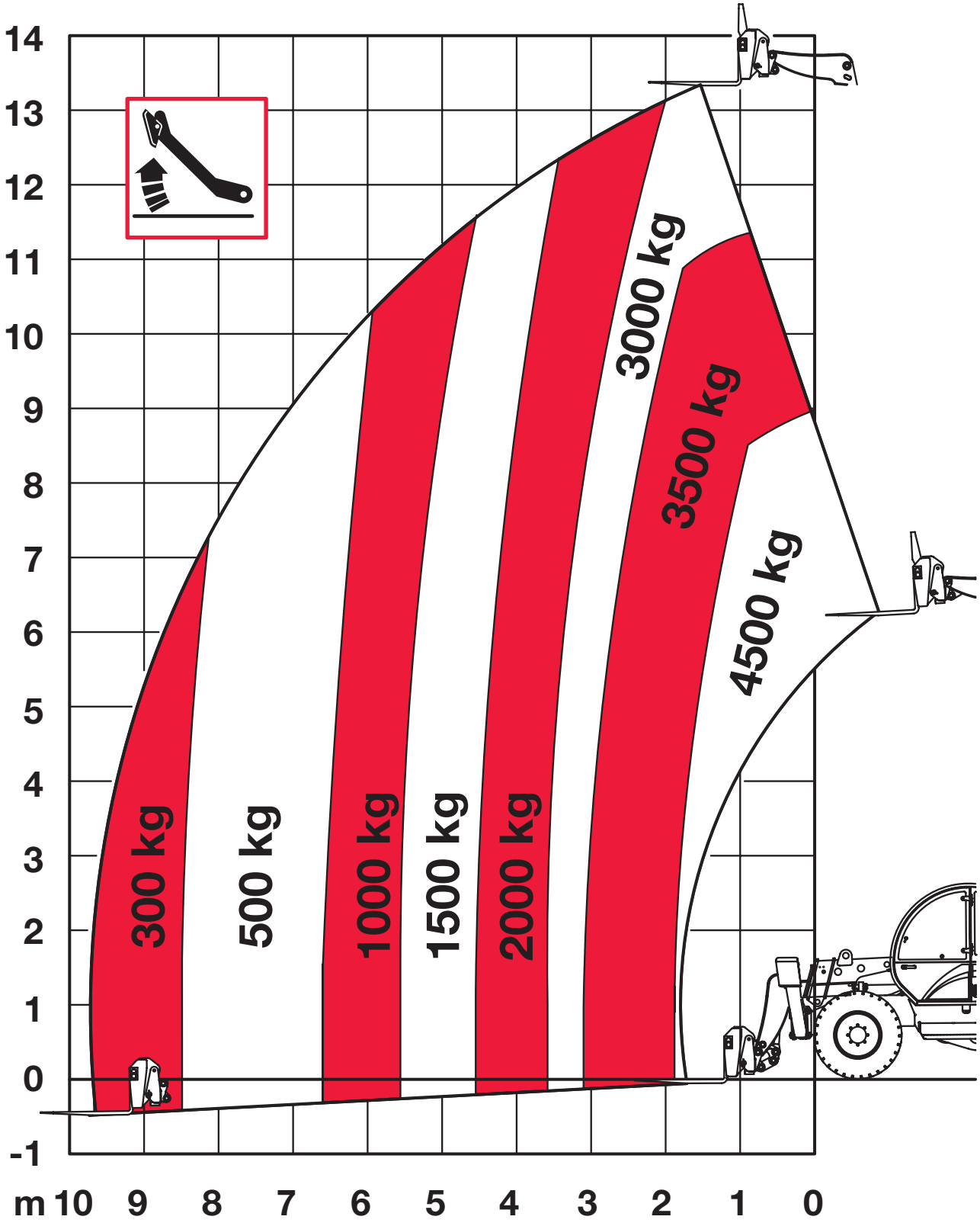


DIAGRAM - TELELIFT 4514 ON WHEELS

1500 kg at 5.50 metres



DIAGNOSTIC FUNCTION IN CALIBRATION MODE

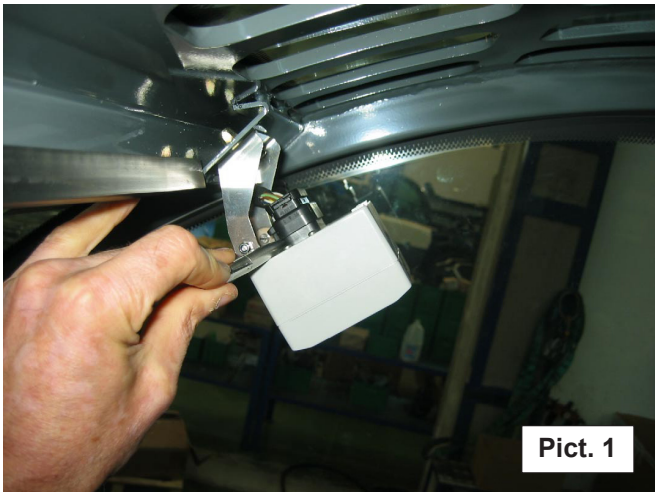
FUNCTION	DISPLAY
A-B	Display of the value read by the ADC converter-cell channel 1 (A) and cell 2 (B). This diagnosis function allows you to check proper reading of the load cell. As you move the boom, you can see the LEDs of the load bar progressively go on/off (valid if calibration has already been done). Position the machine for a calibration without load. If the function **A** is setted, the LEDs of the load bar progressively have to go off, moving out the boom while in the function **B** the same LEDs progressively have to go on. If it is completely ON or OFF, there could be a problem with the connection or in the cell thereof; If it is partly lit but there is no movement in the boom, make sure the cell is fixed.
C	Digital Inputs display: this function allows you to see if the following signals are properly delivered to the DLE device according to the lighted LEDs of the load bar: LED1 and LED2: ON when the machine is stabilized. LED3: the Telelift 4017/4514 will be active if the nacelle is not installed. LED4: ON if the interlock relay is active (machine safe without alarms).
D	Software version existing in the DLE unit: this function allows you to see the software version included in the DLE unit according to the lighted LEDs of the load bar No LED: software 0 One LED: software 1…… Four LEDs: software 4
E	No function.
F	Press to escape from the calibration and **SAVE** all changes. (the buzzer and the LED activate to confirm storage). The limiter has now escaped from the calibration mode. The LED is no longer ON steadily. It is necessary to turn off and turn on the machine to eliminate all alarm messages (display flashing).

ALARM CODES

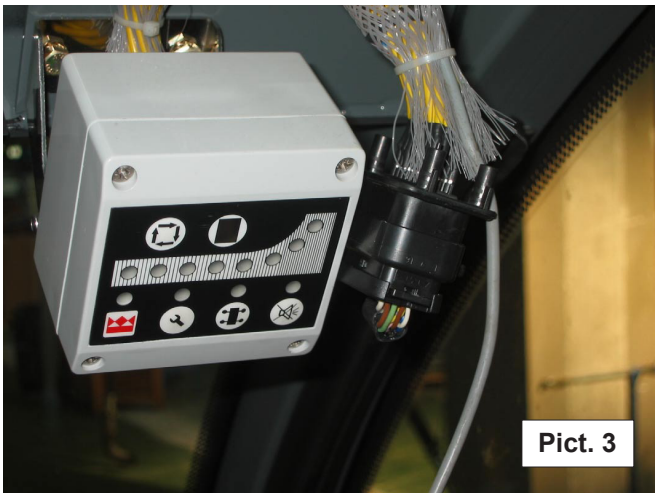
Alarm code **Description** **Action**	**1** **E2PROM Error.** Internal comparison of data read from E2PROM failed. Switch off and switch on the machine. If the alarm continues, recalibrate the machine, otherwise replace DLE.
Alarm code **Description** **Action**	**2** **CELL 1 reading out of range.** Check if the load cell is fixed well. Check the connection between DLE and sensor for short circuits or signal interruptions due to a broken cable. Check the DLE connector for signs of oxidation, short circuits or absence of electrical contact in some pins. If the alarm persists, check if the cell is intact.

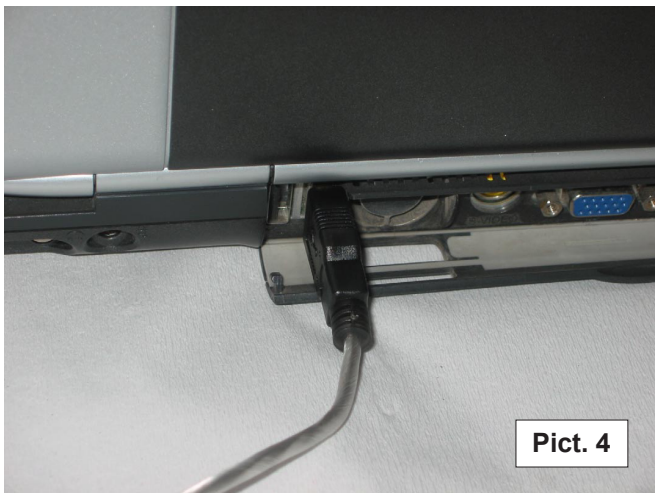
Alarm code	**3**
Description	**CELL 2 reading out of range.**
Action	Similar to alarm 2, but referred to the second analog channel (Cell 2).
Alarm code	**4**
Description	**Block Relay check error during work.** Check through.re-reading of the block output of the congruence with the current state of the limiter. ***The alarm triggers even in the absence of malfunctions if the load limiter cutout key is usedo***.
Action	The relay or the cable can be shorted; check. The limiter's outputs do not deactivate. Switch off and on the machine and run a complete test of the outputs. If the alarm persists, replace the DLE.
Alarm code	**5-6-7-8**
Description	**Block Relay check error at start**. When the instrument is started, the re-reading of the block output is always OFF except when the two outputs of the DLE are connected in series. **5** - output 1 off and output 2 off **6** - output 1 off and output 2 on **7** - output 1 on and output 2 off **8** - output 1 on and output 2 on ***The alarm triggers even in the absence of malfunctions if the load limiter cutout key is used when the instrument is started.***
Action	The relay or the cable can be shorted; check. The limiter's outputs do not deactivate. Switch off and on the machine and run a complete test of the outputs. If the alarm persists, replace the DLE.
Alarm code	**9**
Description	**CELL1 and CELL2 reading correspondence.** From the continuous comparison of the value read from analog channel 1 and analog channel 2, an alarm is triggered if the difference exceeds the preset threshold.
Action	Check the integrity and fastening of the load sensor and the relevant connections. If the alarm persists, attempt to re-calibrate or replace the load sensor.
Alarm code	**A**
Description	**RAM data error.** Checks that the parameters load in the RAM at start-up remain unaltered.
Action	Switch off and on the limiter.
Alarm code	**B**
Description	**Outrigger congruence.** During operation, the signal of stabilised machine is congruent between the two inputs used for reading.
Action	Check connections and DLE connector. If the alarm continues, replace DLE.
Alarm code	**C**
Description	**A.D.C. reading control error.** If the analog/digital converter works fine after special re-reading of the DLE board.
Action	Switch off and on the limiter. If the alarm continues, replace DLE.

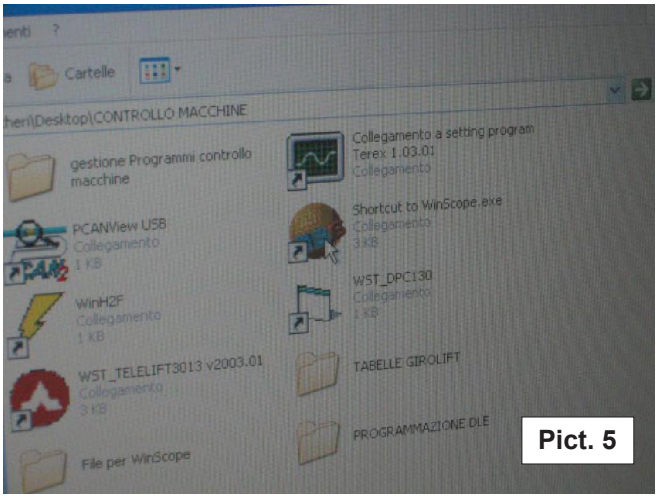
PC CONNECTION (WINSCOPE)


Pict. 1

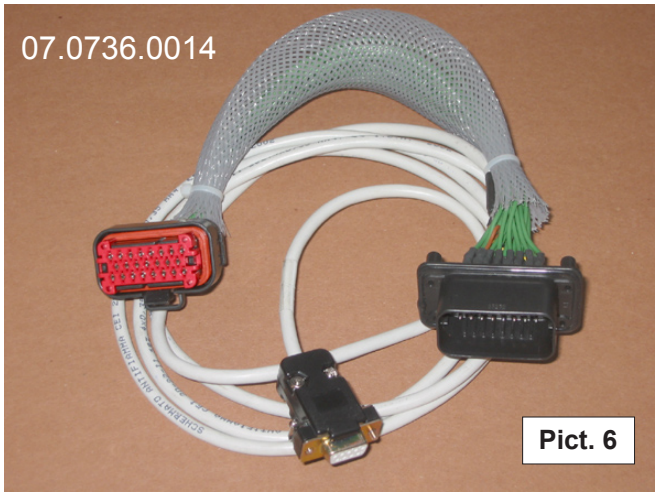

Pict. 2


Pict. 3


Pict. 4



Pict. 5



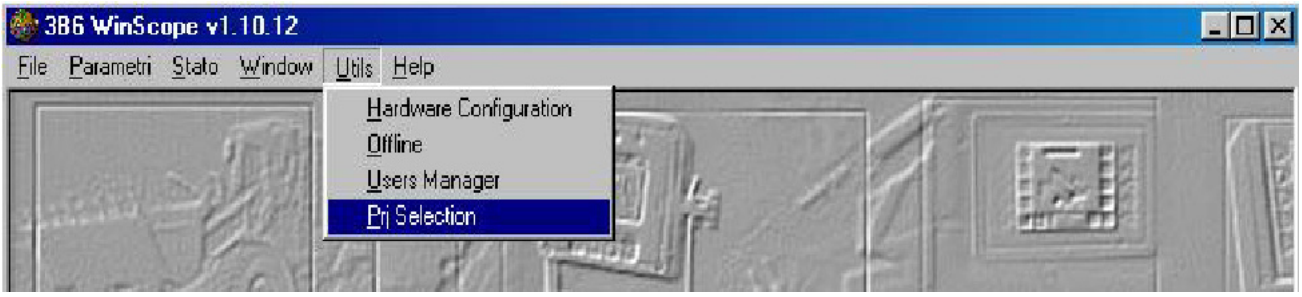
Pict. 6

If you want to check or save the system parameters and variables, you have to open the relevant windows and check the values contained in these.

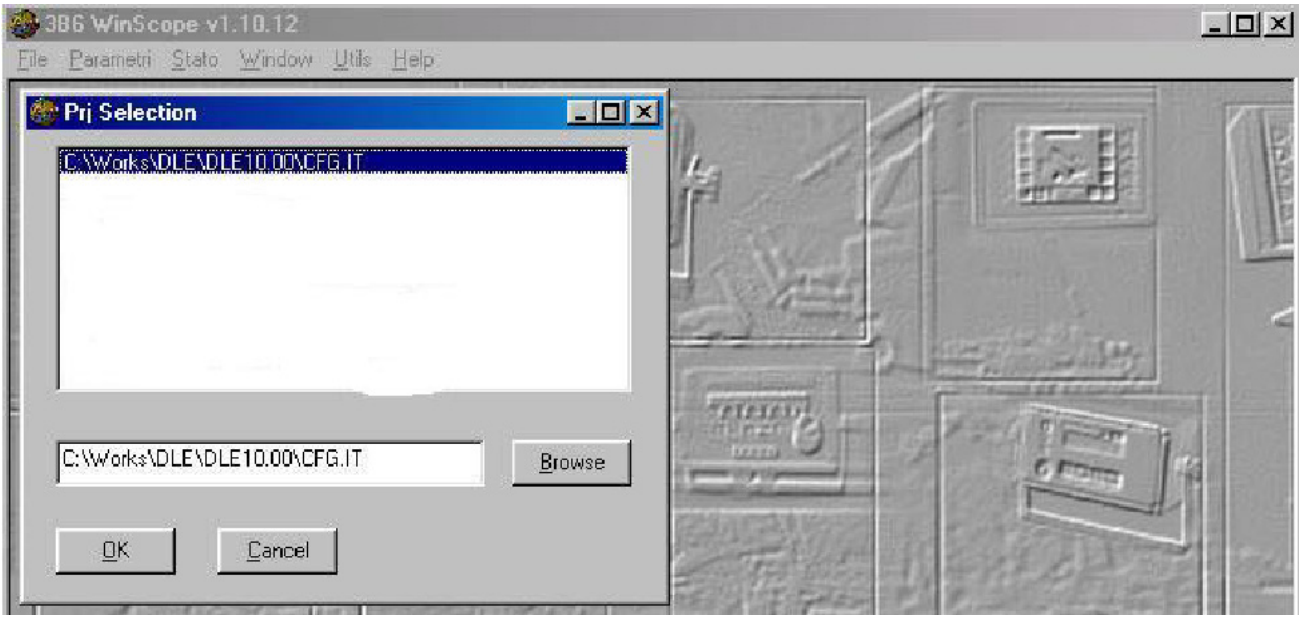
SAVING OR UPLOADING SETTINGS WITH WINSCOPE

When you launch the program the first time, you have to configure some options to guarantee a correct dialogue with the hardware (the machine) used.

Turn on the board to connect the PC and the unit aboard the machine.
From the "**Utils**" menu, select "**Prj Selection**".

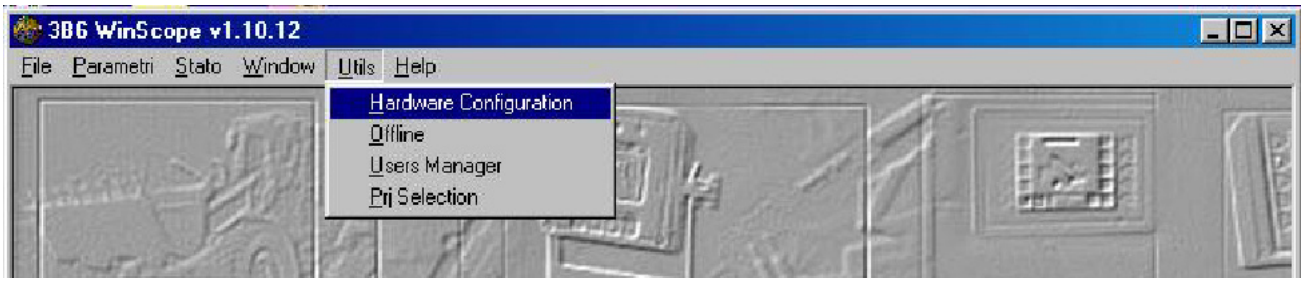


Type in the correct path of file **CFG.IT** or look for the same in the Windows folders suing the "Browse" function. The file must not necessarily be in the path shown in the following example as it is at the user's discretion.
It contains the menus and the name of the parameters corresponding to the hardware (and therefore to the machine) in use. Presently, we have the following folders, each of them corresponding to specific configuration files:
• DLE_00 (first DLE version)
• DLE_01 (current DLE version)

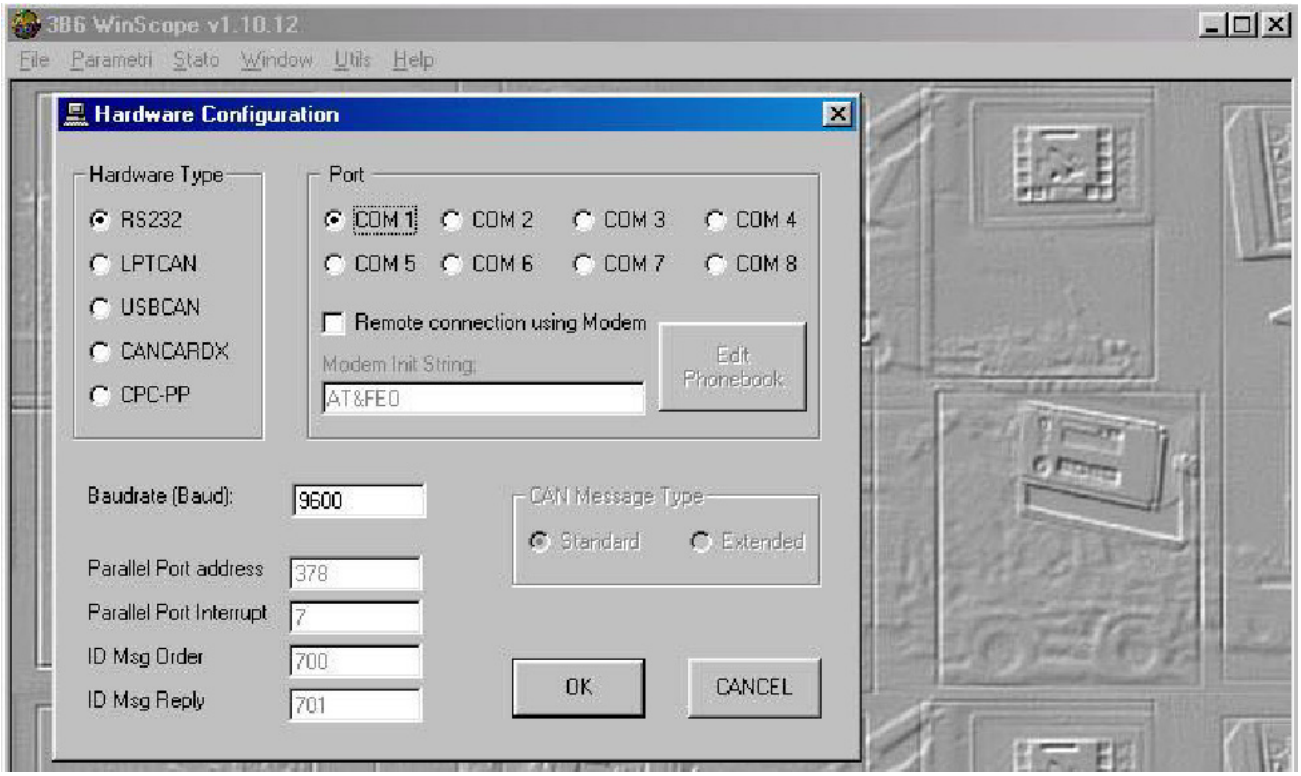


Press OK to close the window.

Now highlight “Hardware Configuration” in the “Utils” menu.



The following window will appear:



For each type of machine, you must select adequate parameters, that is:

DLE_01 (current)

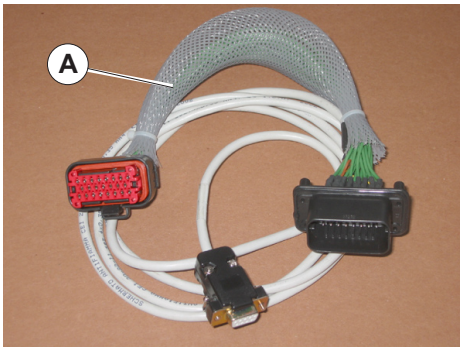
- Hardware Type **RS232**
- Port **COM1** (usually this is the port, but it can change in relation to the connected PC)
- Baudrate **19200**

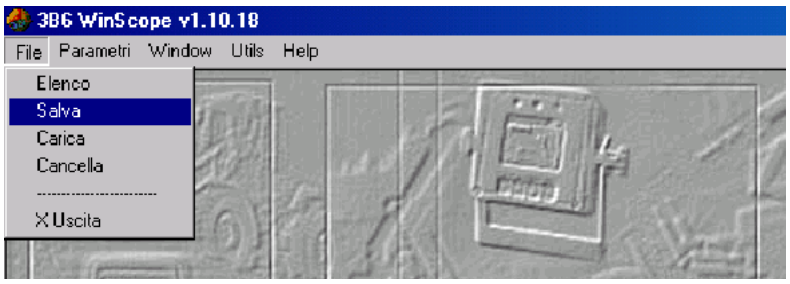
DLE_00

- Hardware Type **RS232**
- Port **COM1** (usually this is the port, but it can change in relation to the connected PC)
- Baudrate **9600**

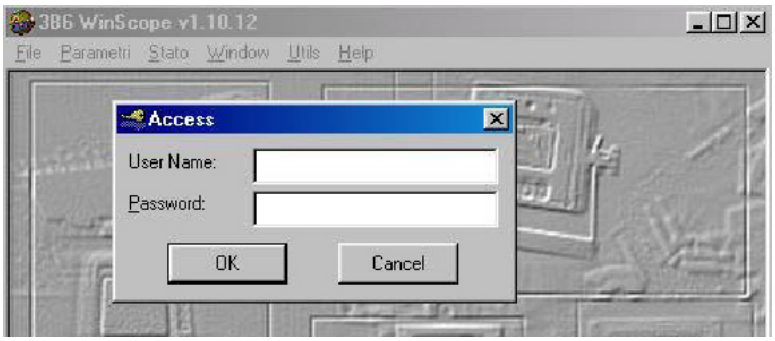
If these parameters are wrongly configured, it won’t be possible to connect the units.
Press OK to confirm and close the window.
Now **close** and re-open the program.

Check that the PC is correctly connected to the relevant serial port and to the DLE unit with the special cord **A** (code 07.0736.0014), and that the unit is supplied with power.
In the “File” menu, select “Salva” (Save) if you want to download a setting of the machine onto a PC or “Carica” (Load) if you want to transfer a setting saved in the PC into the machine.

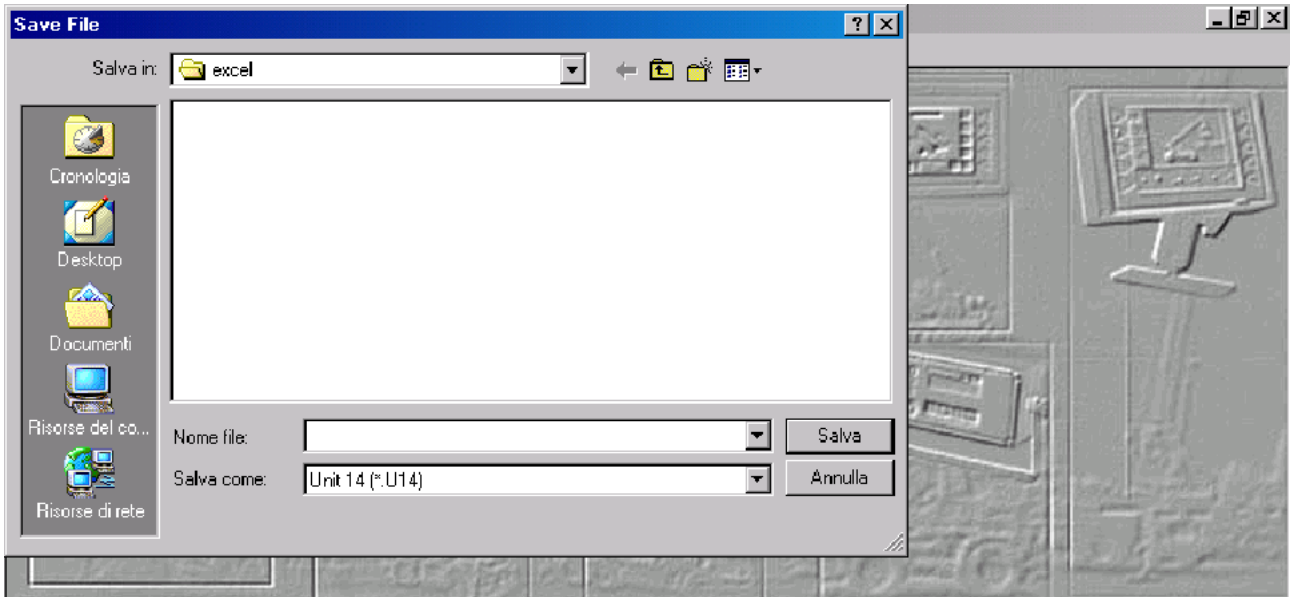




The following window will be displayed so you can type in the password.
For any changes, you must enter the following data:
User Name: ...(contact the TEREXLIFT Service Centre to get your ID-code)
Password: ....(contact the TEREXLIFT Service Centre to get your ID-code)

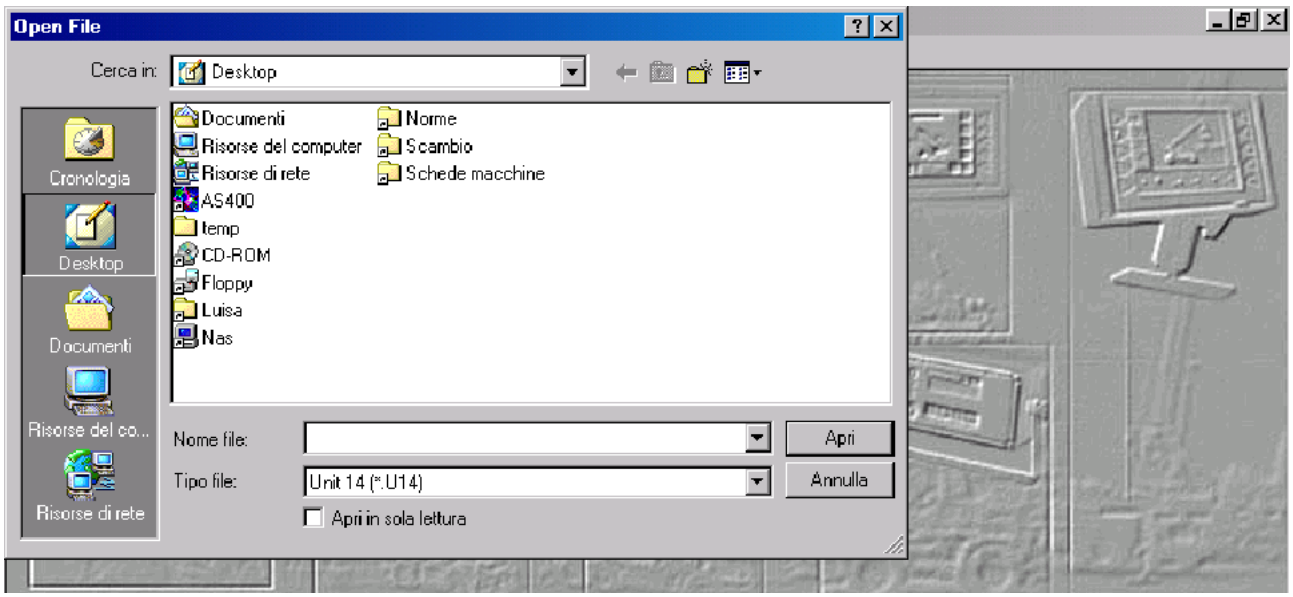


Enter the correct data and press OK. If you have selected “Salva” (Save), the following window will be displayed:



Choose the folder where to save the setting and save the file with a name showing the serial number of the machine (e.g. T4017 sn 10578).
Premere il pulsante Salva per concludere.

If you have chosen to upload a setting previously saved in memory, select the “Carica” (Load) command from the File menu. The following window will be displayed:



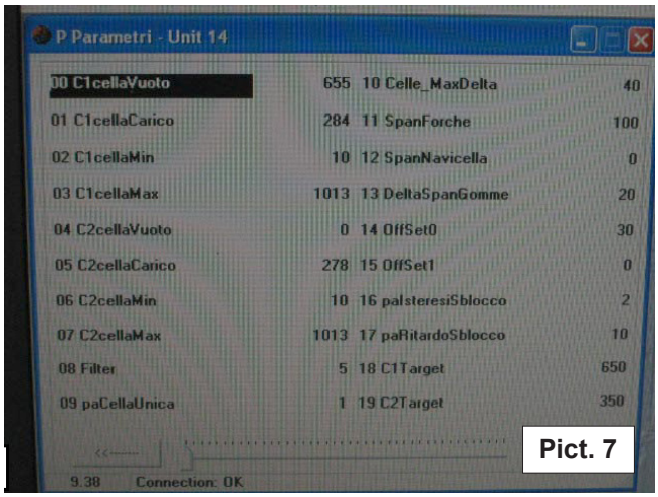
Choose the setting file you want to upload on the machine and press “Apri” (Open).
Save the setting as explained below:

DLE

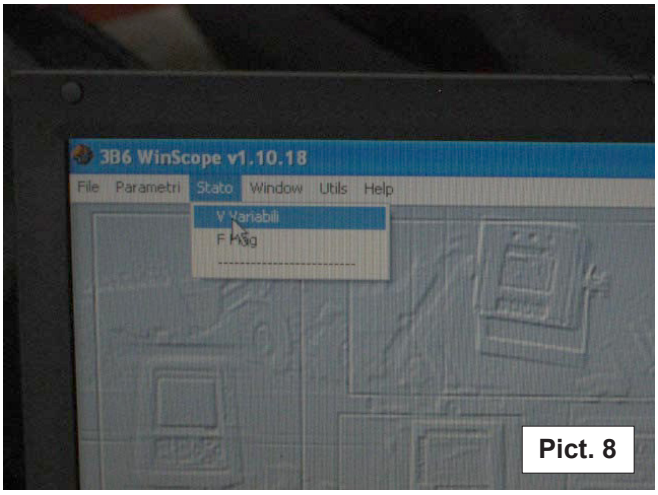
- If you want to save the setting, contact the TEREXLIFT Service Centre to get more information and be registered as an authorised user of the system.
- To gain access to the parameters and variables, no password is needed. All you have to do is connecting the DLE display with the power cord supplied by TEREXLIFT (code 07.0736.0014) and proceed as explained below.
- Connect the DLE connecting cable to the electrical system of the machine - see Pict. 1.
- Connect the PC power cord to the DLE and the computer - see Pict. 2 – 3 – 4.
- Turn the ignition key of the machine to position I “board ON” and launch the Winscope program (see Pict. 5). If this is the very first time you use the system, follow the instructions described from the first page of this document. If you want to upload or download the setting from/to the machine DLE, you need a password which must be asked to TEREXLIFT (to avoid any tampering with the system).
  TEREXLIFT has also a database with all the values of the settings saved ordered by serial numbers which can be provided at any time for comparson purposes.

DISPLAYING/CHANGING THE PARAMETERS

A window appears (pict. 7) with the parameters within which the machine can work.

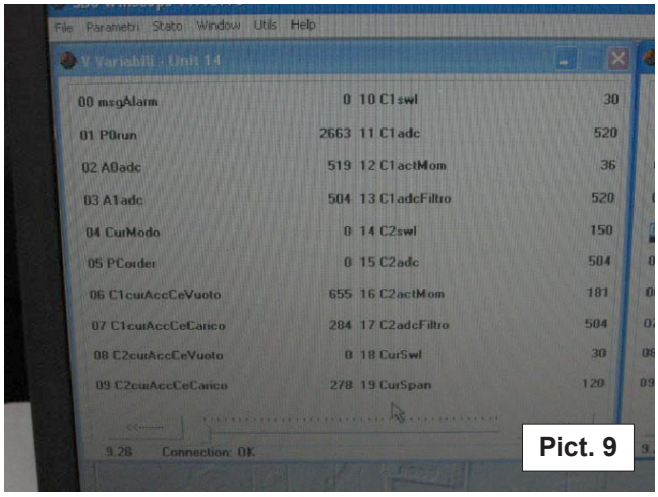


Pict. 7



Pict. 8

If you want to check the variables on the machine, open the “variables” window as shown in picture 8.
Clicking with the mouse, another window opens (see picture 9) which will display the real variations on the machine so you can compare the same with the parameters.

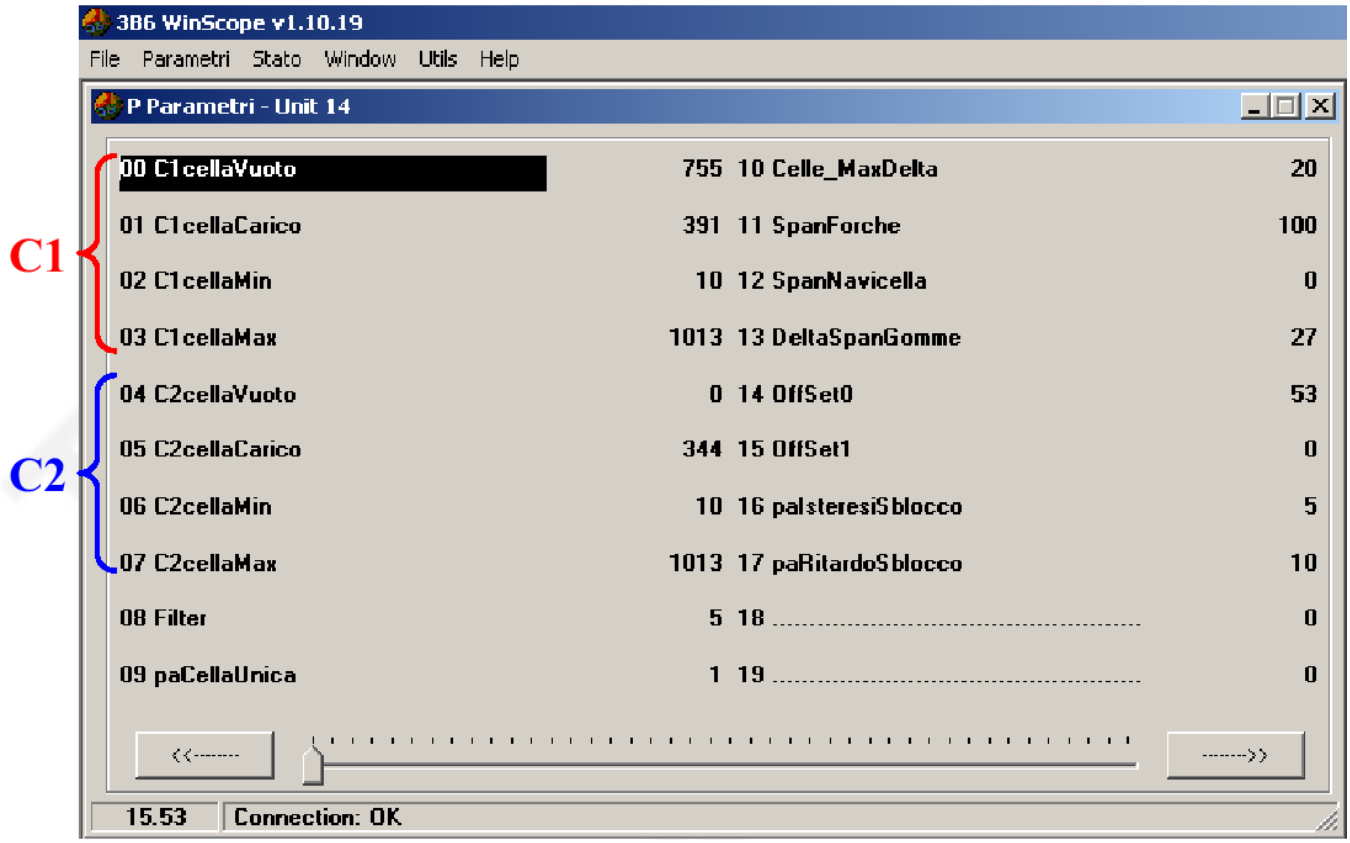


Pict. 9

If, during work, the variables keep within the limits set by the calibration parameters, the system is in efficient order; otherwise, an error message with the relevant identification code is displayed by the DLE.

DLE - MONITORING WITH 3B6 WINSCOPE - PARAMETERS

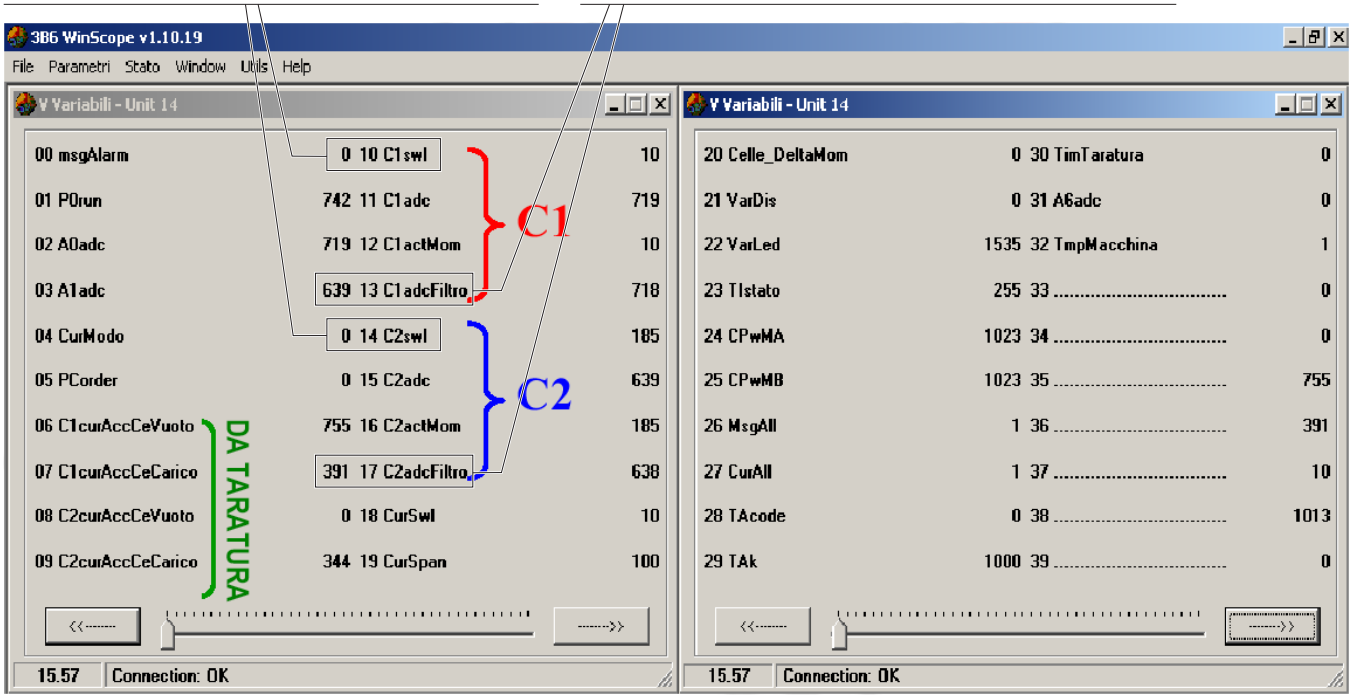
Displaying the parameters



Simulation of the variables

load % calculated in relation to the calibration

value of the analog signal read and converted into bits



LIST OF THE DLE PARAMETERS

N°	Winscope Name	Default	Description
00	C1cellaVuoto	0	Value of cell 1 saved during calibration with empty machine
01	C1cellaCarico	0	Value of cell 1 saved during calibration with loaded machine
02	C1cellaMin	10	Min admissible value for cell 1 (if actual value is below: alarm 2)
03	C1cellaMax	1013	Max admissible value for cell 1 (if actual value is above: alarm 2)
04	C2cellaVuoto	0	Value of cell 2 saved during calibration with empty machine
05	C2cellaCarico	0	Value of cell 2 saved during calibration with loaded machine
06	C2cellaMin	10	Min admissible value for cell 2 (if actual value is below: alarm 3)
07	C2cellaMax	1013	Max admissible value for cell 2 (if actual value is above: alarm 3)
08	Filter	5	Number of filter samples, with mobile mean. Load cells read max 5.
09	paCellaUnica	0 / 1	Sets to 1 automatically (during the machine selection) when the DLE is used in single channel mode
10	Celle_MaxDelta	20	Max admissible delta between readings of analog channels 1 and 2, expressed as a %
11	SpanForche	100	Limiter intervention percentage in case of work with stabilised machine and forks. Default: 100 (as per calibration)
12	SpanNavicella	100 / 110	Limiter intervention percentage in case of work with stabilised machine and platform. (changed by the relevant procedure during calibration)
13	DeltaSpanGomme	15	Limiter intervention percentage in case of work with non-stabilised machine. (changed by the relevant procedure during calibration)
14	OffSet0	0	Command given to the digital potentiometer for cell 1 (value from 0 to 255) to set the reading scale during calibration with unloaded machine to a certain pre-set value. (650 bit – value shown in C1Target)
15	OffSet1	0	Command given to the digital potentiometer for cell 2 (value from 0 to 255) to set the reading scale during calibration with unloaded machine to a certain pre-set value. (350 bit – value shown in C2Target)
16	paIsteresiSblocco	2 / 3 / 5	Load % for the reset of the movements once the block condition has been rectified

N°	Winscope Name	Default	Description
17	paRitardoSblocco	10	Value expressed in tenths of second corresponding to the time that must elapse between the block condition and the movement reset (default 10 = 1 second)
18	C1Target	650	“Target” value of the analog channel 1 during calibration with empty machine
19	C1Target	350	“Target” value of the analog channel 2 during calibration with empty machine
20	C1NavicellaVuoto	0	Parameters 20, 21, 22 and 23 are usually equivalent to parameters 0, 1, 4 and 5. They shall be used for a new calibration of the platform not depending on the proportional % calibration done with the forks (which therefore will remain 100 when this function is used). These parameters only apply to the platform. Value saved in analog channel 1 during calibration with empty machine
21	C1NavicellaCarico	0	Value saved in analog channel 1 during calibration with loaded machine
22	C2NavicellaVuoto	0	Value saved in analog channel 2 during calibration with empty machine
23	C2NavicellaCarico	0	Value saved in analog channel 2 during calibration with loaded machine
24	CurMacchina	0 / 1 / 2	Machine selected on point “0” of the calibration
28	CODEsum		Code memory zone CHECKSUM used by the safety functions
29	WPsum		Parrameters' memory zone CHECKSUM used by the safety functions

LIST OF THE DLE VARIABLES

N°	Winscope Name	Default	Description
04	CurModo		Actual work mode 0: forks - attachment 1: platform
05	PCorder	0	You can save changes effected to the parameters by setting this variable to “1”. The variable will return to 0 once the value has been saved.
10	C1swl		Load percentage of cell 1 (0% = calibration without load; 100% = calibration under load).
13	C1adcFiltro		Current value of cell 1 (analog, converted into bits 0 - 1023).
14	C2swl		Load percentage of cell 2 (0% = calibration without load; 100% = calibration under load)
17	C2adcFiltro		Current value of cell 2 (analog, converted into bits 0 - 1023)
20	Celle_DeltaMom		Load % measured between cell 1 and cell 2

2.24 CHECKING THE TECNORD CONTROL UNIT

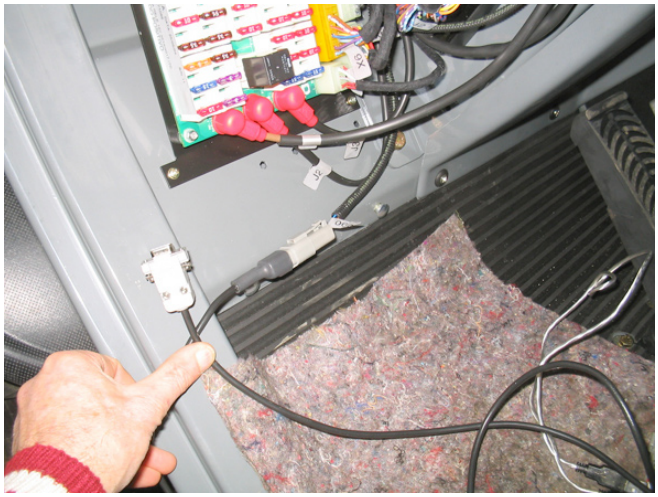
To check the operation data of the TECNORD control unit, proceed as follows:

- Go to the driving place and remove the cover located at the left bottom with respect to the steering wheel.
- Prepare the electrical cable code 55.0602.0203.

- Find socket X90.

- Remove the socket's protection cap and connect the end of the cable for the connection of the PC.

- Connect the other end of the cable to the special socket on the PC.



- Proceed with the checks and settings using the control and management program.

POWER UNIT CHARACTERISTICS

The electronic power unit is turned on by turning the ignition key to ON.

It reads the following analog signals:
- X-axis position of the cab joystick
- Y-axis position of the cab joystick
- Position of the proportional pushbutton located on the handle of the cab joystick

- Position of the joystick on the platform buttons panel used for the control of the boom movement
- Position of the joystick on the platform buttons panel used for the control of the boom telescopes

It reads the following ON/OFF buttons:
- Dead man on the handle of the cab joystick
- Activation button for the locking/unlocking function
- Activation button for the up-movement of the left outrigger
- Activation button for the down-movement of the left outrigger
- Activation button for the up-movement of the right outrigger
- Activation button for the down-movement of the right outrigger
- Left sway activation button
- Right sway activation button

- Dead man on the platform buttons panel

It reads the following alarm and state signals:
- Overturning moment
- Boom up
- Stabilised machine
- Jobsite position of the Jobsite/OFF/Platform selector

- Platform position of the Jobsite/OFF/Platform selector
- Overload on platform

It drives the following outputs:
- ON/OFF solenoid valve for up-movement of the left outrigger
- ON/OFF solenoid valve for down-movement of the left outrigger
- ON/OFF solenoid valve for up-movement of the right outrigger
- ON/OFF solenoid valve for down-movement of the right outrigger
- ON/OFF solenoid valve for left sway
- ON/OFF solenoid valve for right sway
- ON/OFF solenoid valve for locking function
- ON/OFF solenoid valve for unlocking function

- Activation of the control module for the boom movement
- Activation of the control module for the boom telescopes movement
- Activation of the control module for the forks movement (up/down pitching)

- Warning buzzer on platform
- Warning light on platform

The control unit also supplies the 5VDC power signal to the joystick/proportional button (+/- 5%).

When the joystick/proportional button is in the central neutral position, the relevant analog signal is 50% of the power signal.

The dynamics of the joystick signal changes from max 87.5% (joystick/pushbutton to one end) to min. 12.5% (the opposite end) for the joystick installed in the driving cab, and from max 90% to min. 10% for the joystick installed on the platform's buttons panel (the percentages are referred to the power signal of the joysticks/proportional button).

During normal operation (no anomalous condition detected), the red LED of the control unit flashes with a sequence of 3 seconds ON and 0.25 seconds OFF (say it switches off for a short instant every 3 seconds).

The control unit can detect the following malfunctions:

- Joystick and/or proportional button not in the central neutral position when the Jobsite/OFF/Platform selector is on Jobsite or Platform **(Alarm code 1)**
- ON/OFF buttons in the ON position when the Jobsite/OFF/Platform selector is on Jobsite or Platform **(Alarm code 1)**

Such conditions would activate the manoeuvres associated to the button without control if the signal were not OFF when the Jobsite or Platform mode is selected. Therefore,until the control unit does not detect a neutral position, the function is inhibited and the malfunction is signalled.

- Joystick and/or proportional button with analog signal below the minimum threshold (this case also includes the disconnection of the joystick/porportional button connection or the short circuit to ground of the proportional signal or the short circuit to ground of the power signal of the joysticks/proportional button) **(Alarm code 2)**

- Joystick and/or proportional button with analog signal above the maximum threshold (this case includes the short circuit to VBATT of the power signal or the ground disconnection in the joystick or proportional button connector) **(Alarm code 3)**

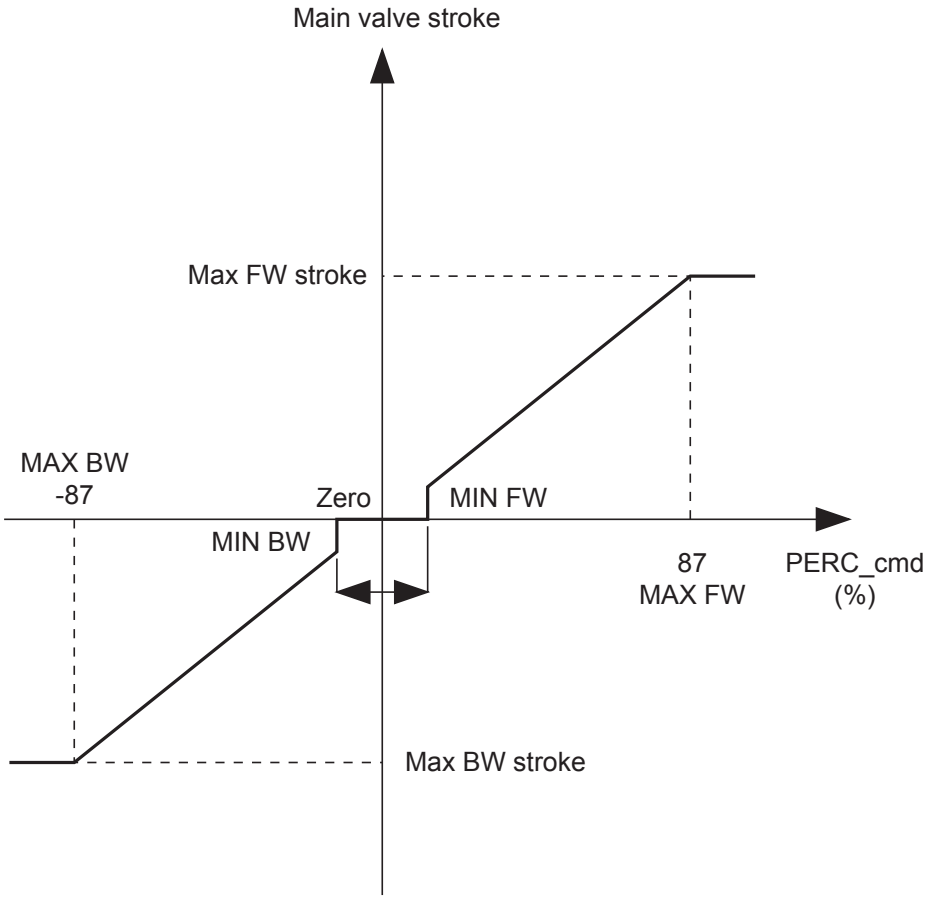
The malfunctions detected by the power unit are signalled by the red LED which remains OFF for about 2 seconds then flashes for a number of times equal to the code number associated to the detected alarm. The more the LED flashes, the more serious is the alarm and serious alarms have priority with respect to the "soft" alarms. In presence of more alarms, the most serious one is displayed first and, as soon as this is solved, the next one (whose seriousness was lower) is displayed.

Alarm code 1

Alarm code 2

Alarm code 3

The analog command signals of the control modules of the boom, telescopes and inclination movements are signals between 0.9V (-84.2%) and 4.1V(+84.2%) with rest position at 2.5V (0%).



REMARK

- PERC_cmd = (Vcontrol – 2.5)/1.9
- Max FW stroke and max BW stroke mean the maximum stroke in one direction and the maximum stroke in the opposite drection.
- With the calibration program, you can change the piloting percentages of MAX FW, min FW, MAX BW and min BW for the three proportional manoeuvres.

DIAGNOSTIC CONTROL PROGRAM

Starting the application, you'll find the following window and a dialog box which says to push the CONNECT button after choosing a serial port.

CAUTION

Please note that this software doesen't work in offline.

In fig.1 you can see the setting windows. In the "**movements selector**" box you can choose the movement you want to set among "**braccio**" (boom raising and lowering), "**telescopico**" (boom extension and retraction) and "**movim. forche**" (fork forward/back pitching).

Once you've chosen the movement, you can set in the "**MIN**" and "**MAX**" boxes the value (in percentage) of the movement speed you desire:
Min means the minimum speed you can have for that movement
MAX means the maximum speed.

"**RAMP UP**" and "**RAMP DOWN**" represent the acceleration in increasing and decreasing the movement speed.

As you can see from the pictures, using the man platform you can set different values from standard use in jobsite.

The "**LOAD SETTINGS FROM FILE**" is the button used to load in the machine a previous setting configuration saved in the PC and "**STORE SETTINGS INTO FILE**" button is the button used to save the current machine configuration in the PC.

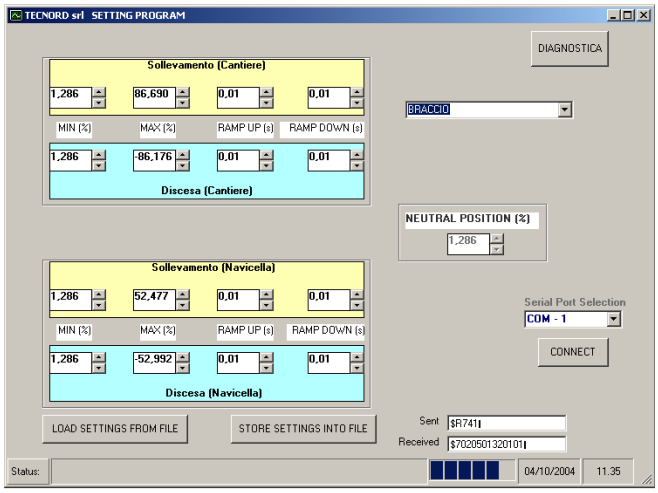


Fig. 1

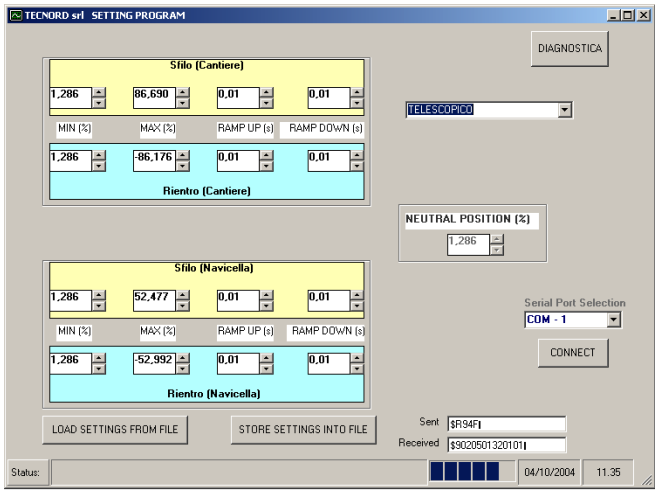


Fig. 2

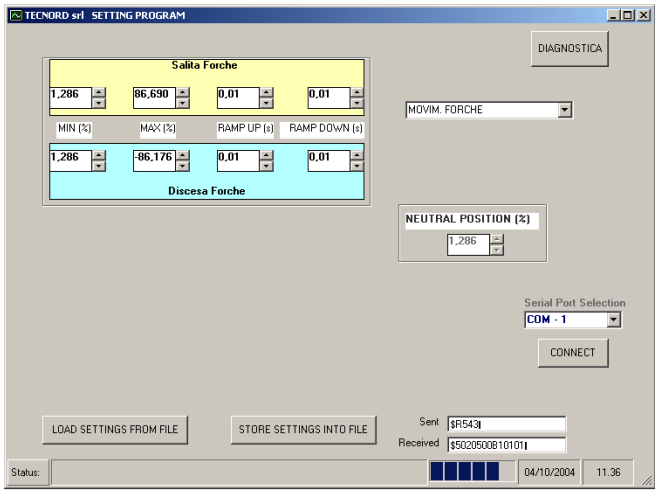


Fig. 3

In fig. 4 you'll find the window showed when you push the "**DIAGNOSTICA**" button.

In this page you'll find the system signals diagnostic. The graduated bars show you the movements of the boom and forks in real time, according to their effective speed.

The joystick control button and the 4th function button become ON and OFF depending if they are pushed or not.

The same is for outriggers and leveling UP and DOWN movements.

Regarding the Alarms, CHIUSO means OFF, APERTO means ON, in fig.4 you have, for example, an overload alarm while the outriggers are down.

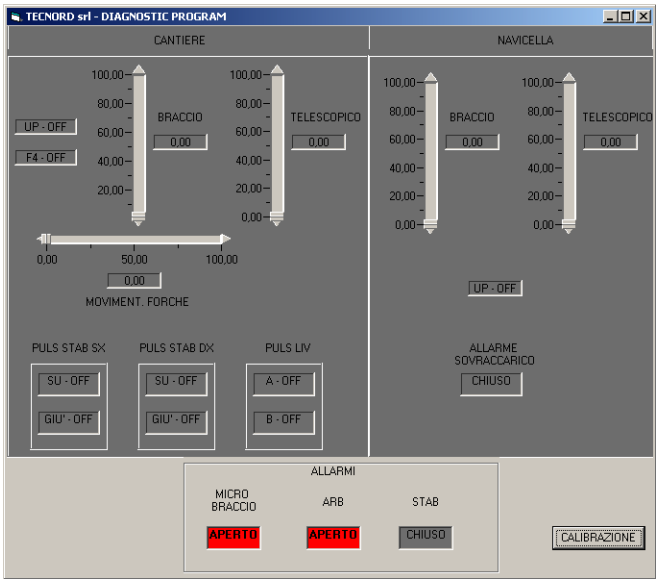
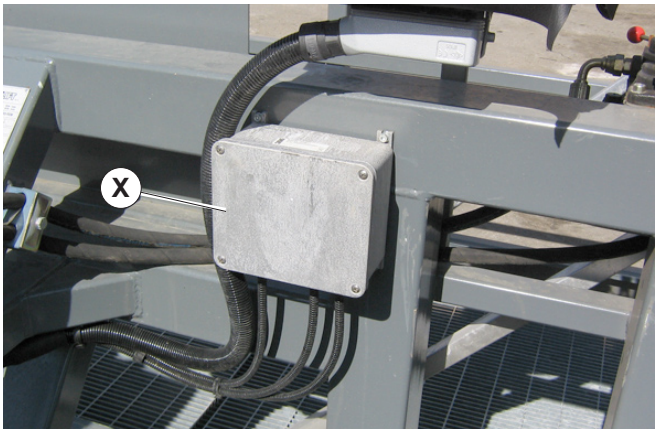


Fig. 4

2.25 CALIBRATING THE PLATFORM EXCEL BOARD

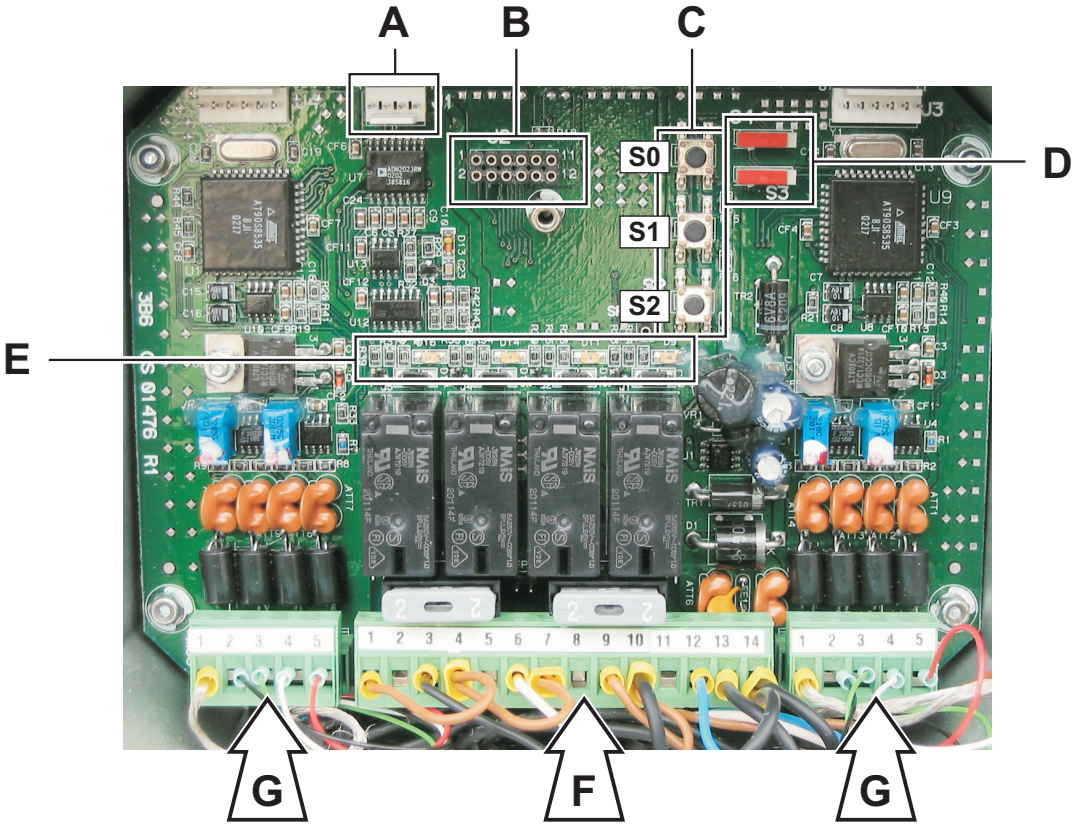


CAUTION

This calibration procedure only applies to machines equipped with man-platform.

BOARD DESCRIPTION

The EXCEL board is installed in the man-platform, inside a protective box **X**.
Removing the box cover, the board appears as follows:



The photo shows the parts involved in the calibration and a view of the board.

- **J1** (ref. **A**): connector for the PC power cable.
- **J2** (ref. **B**): monitor connector.
- Pushbuttons **S0**, **S1** and **S2** (ref. **C**): used for the quick calibration of the cell.
- Trimmers **S3** and **S4** (ref. **D**): used to view the parameters of one of the sensors of the load moment cell in the platform.

- LEDs (ref. **E**): signal a pre-alarm or alarm condition.
  - During regular operation, the LED's are all lit when in the platform there is a load ranging from 0% to 90% of the maximum admissible charge.
  - When the load ranges from 90% to 120% of the maximum admissible, the platform enters in pre-alarm and 2 of the 4 LED's are lit.
  - When the load is higher than 120%, all LEDS's are off and the alarm is activated.

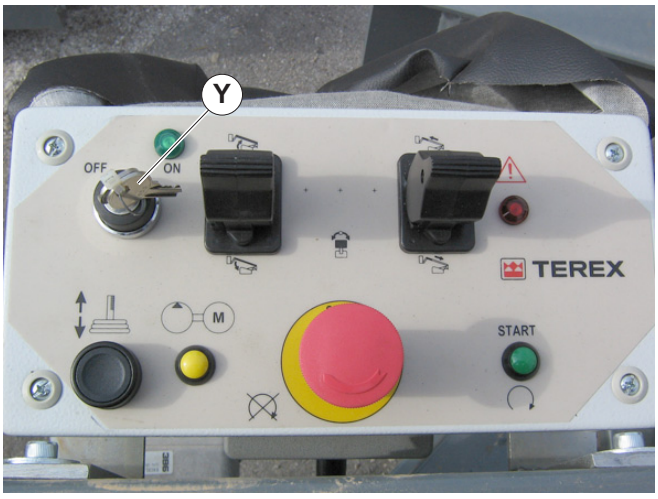
- Connectors at the bottom of the card:
  - the arrow (ref. **F**) shows the power connector.
  - the arrows (ref. **G**) show the connectors of the two sensors of the platform's load moment cell.

PLATFORM CALIBRATION

Properly stabilise the machine, lower the boom to the horizontal position, attach the man-platform and then switch the controls to the platform by turning the Road-Jobsite-Platform selector to "Platform" (the green light to one side of the key will come one).
Turn the engine ignition switch to the left (position P).

Remove the he Road-Jobsite-Platform key, leave the driving cab and connect the electrical plug of the platform to the socket on the handler nose.

Switch on the platform pushbutton pendant using the key removed from the driving cab and turning this key **Y** to **I - ON**.
Now you can start the calibration.



- Open the box cover removing the four screws and gain access to the EXCEL board.

ZERO SETTING

1 Make sure there is no load on the platform.
2 Power down by removing connector ref. **F**.
3 Reconnect the power connector, ensure all LED's come on and, using buttons ref. **C**, type in the following sequence:

S1 S0 S0 S1 S2

Type in the code within 10 seconds after reconnecting the power connector.

CAUTION

Keep the code within reach before reconnecting the power connector.

CAUTION

When the zero has been set, ensure the procedure has been done correctly by checking that all LED's are off.

MAXIMUM LOAD SETTING

1 Load the platform with the maximum admissible load.

2 Power down by removing connector ref. **F**.

3 Reconnect the power connector and, using buttons ref. **C**, type in the following sequence:

S1 S1 S0 S1 S2

Type in the code within 10 seconds after reconnecting the power connector.

CAUTION

Keep the code within reach before reconnecting the power connector.

CAUTION

When the maximum load has been set, ensure the procedure has been done correctly by checking that the second and fourth LED on the left come on. After removing the load, all LED's must go off.

Now the platform calibration procedure has ended.

CAUTION

Before switching the controls back to the driving cab, disconnect the 24-pole ILME socket at the top of the boom.

LED BEHAVIOUR DURING WORK

ALL LED'S ON: the loaded weight is within the accepted limits, **correct functioning**.

2 LED'S ON: the loaded weight is close the maximum admissible weight, **pre-alarm condition**.

ALL LED'S OFF: machine in **alarm condition** and platform movements blocked.

CHECKING OPERATION

Once the max load setting has been performed, follow the instructions below:

1 With the machine properly stabilised, the boom lowered, the ignition key turned to the left (pos. P), the platform controls enabled (key of the Road-Jobsite-Platform selector turned to "Platform" and the green light next to the selector on), load the max authorised load on the platform. Operate the boom extension and using the load charts in the driving cab as a reference, check the system stops the boom at the correct distance. If the systems works properly, proceed with your work. If the system doesn't stop the boom extension at the correct distance, re-adjust the DLE system according to the following instructions.

2 Switch the controls to the Platform.

3 Start the engine of the machine operating the platform controls and have a second operator in the driving cab enter the calibration mode of the DLE system.

The second operator shall turn on the instrument (no matter if the display is still off) and within five seconds press the keys on the front panel in the given sequence. The keys to be used and their meaning are the following:

Press  to input digit 0

Press  to input digit 1

Press  to confirm the input sequence.

The access code actually used is **1001**. Therefore, you shall input the following sequence:

1 0 0 1 CONFIRM

If the sequence is correct, the LED next to comes on with a solid light to confirm the proper operation of the instrument in the calibration mode.

The display shows a FIXED digit starting from “0”.

4 Press key to go to point 4.

Calibration of the machine for operation with the MAN-PLATFORM.

With the stabilisers lowered to the ground, move to a limit point of the load chart **and load the max authorised load on the platform**.

Pres key some times to switch off the LED's of the load percent bar; or press key to switch these LED's on. By the end of the operation, all LED's from the left to the right must be lit, but for the last red LED. To do this, we recommend starting with the LED's bar on the green area and then press to increase the number of LED's lit.

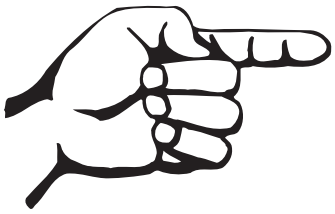
5 Press key several times to go to the next point. The systems enters point A automatically. If no problems have been found during calibration, press till reaching point F.

6 Press to quit the calibration mode and **SAVE** the changes done (the "zero" flashes).

7 Stop the engine.

8 Restart the engine (the DLE system shows the work mode automatically).

9 Re-attempt to extend the boom as explained in point 1 and check that the system enters the alarm mode when the max authorised value shown in the load chart is exceeded.



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Section 3
SCHEDULED MAINTENANCE INSPECTIONS

SECTION INDEX

3.1 INTRODUCTION

- ***Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.***
- ***Scheduled maintenance must be carried out at the intervals indicated in the MAINTENANCE REPORT.***

⚠WARNING

Failure to properly complete each inspection when required may cause death, serious injury or substantial machine damage.

- ***Immediately tag and remove from service a damaged or malfunctioning machine.***
- ***Repair any machine damage or malfunction before operating machine.***

3.2 ABOUT THIS SECTION

Intervention times

Maintenance interventions have been divided into 6 different groups in relation to the time at which they must be carried out, say daily, weekly, monthly, every 6 months, yearly or every two years.

For ease of use, the service intervals have been grouped in different tables, as explained below:

Inspection	Table
Daily	A
Weekly	A+B
Monthly	A+B+C
Six month	A+B+C+D
Yearly	A+B+C+D+E
Two years	A+B+C+D+E+F

Maintenance table

The maintenance table contains general information on the type of intervention to be carried out at a certain interval.

For the explanation of the maintenance jobs to be done, please refer to chapter 4 “Maintenance Procedures”.

Maintenance inspection report

The maintenance report summarises all of the interventions to be carried at a given interval and lets the maintenance technician note the result of the check or intervention carried out.

This card can be photocopied to be used at the different service intervals and to keep a trace of all interventions carried out.

3.3 MAINTENANCE TABLE

TABLE A

During the first 10 working hours:

A-1	Check the oil level within reduction gears, differential gears and gearbox.
A-2	Check the tightening of the wheel bolts.
A-3	Check the tightening of all bolts and nuts.
A-4	Check the couplings for oil leaks.

Every 10 working hours or daily:

A-5	Inspect the Operator Manual.
A-6	Inspect the decals and placards.
A-7	Check the engine oil level.
A-8	Clean the air suction filter.
A-9	Check and clean the radiator.
A-10	Check the hydraulic oil level in the tank.
A-11	Check the greasing of the boom section pads.
A-12	Grease the forks.
A-13	Grease all joints of the boom, the rear axle shaft joint, the transmission shafts, the front and rear axles and any equipment of the machine.
A-14	Check the efficiency of the lighting electric system.
A-15	Check the efficiency of braking system and parking brake.
A-16	Check the efficiency of the steering selection system.
A-17	Check the efficiency of the fork balancing system.
A-18	Make sure the safety devices installed are in efficient working order.
A-19	Check the engine coolant level.
A-20	Check the efficiency of the overload warning system.

TABLE B

Within the first 50 working hours:

B-1	Change the engine oil and renew the fuel filter.

Every 50 working hours or weekly:

B-2	Check the tension of the alternator belt.
B-3	Check the tyre inflation.
B-4	Check the tightening of the wheel nuts.
B-5	Check the tightening of the cardan shaft screws.
B-6	Clean the radiator fins.
B-7	Check the operation of the emergency pump (if it is installed).

TABLE C

Within the first 100 working hours:

C-1	Change the oil of the differential casing, the wheel reducer and the gearbox.

Every 250 working hours or monthly:

C-2	Change the engine oil and relevant filter.
C-3	Check the oil level in the front and rear differential gears.
C-4	Check the oil level in the four wheel reduction gears.
C-5	Check the main filtering element of the engine air filter. Replace, if necessary.
C-6	Check the clamping of the cableheads to the battery terminals.
C-7	Check the air suction hose between engine and filter.
C-8	Check the cylinder chromium-plated rods.
C-9	Check the hydraulic lines are not worn because of rubbing against the frame or other mechanical components.
C-10	Check the electric cables do not rub against the frame or other mechanical components.
C-11	Check the wear of the sliding pads of the boom sections.
C-12	Adjust the play of the sliding pads of the boom sections.
C-13	Remove any grease from the boom, then re-grease the sliding parts of the boom sections.

C-14	Check the level of the battery electrolyte.
C-15	Check the efficiency of the block valves.

TABLE D

Every 500 working hours or every six months:

D-1	Visually check the smoke quantity evacuated from the engine exhaust.
D-2	Check the tightening of the engine fixing screws.
D-3	Check the tightening of the cab fixing screws.
D-4	Check the backlash between pins and bushings in all joints.
D-5	Change the hydraulic oil filter in the tank.
D-6	Have the hydraulic system checked by a skilled technician.
D-7	Change the main cartridge of the engine air filter.
D-8	Renew the cartridge of the engine oil filter and the fuel filter.
D-9	Change the hydraulic oil filter of the transmission.
D-10	Change the oil of the front and rear differential casings.
D-11	Clean the air filter in the cab.

TABLE E

Every 1000 working hours or yearly:

E-1	Change the safety element of engine air filter.
E-2	Change the oil of the gearbox.
E-3	Change the oil in the four wheel reduction gears.
E-4	Change the hydraulic oil.

TABLE F

Every 2000 working hours or every two years:

F-1	Change the engine coolant.

3.4 MAINTENANCE INSPECTION REPORT

Model

Serial number

Date

Hour meter

Machine owner

Inspected by

Inspector signature

Inspector title

Inspector company

Instructions:

- *Make copies of this page to use for each inspection.*
- *Select the appropriate checklist(s) for the type of inspection to be performed.*

☐ ***Every 10 hours: A***

☐ ***Every 50 hours: A+B***

☐ ***Every 250 hours: A+B+C***

☐ ***Every 500 hours: A+B+C+D***

☐ ***Every 1000 hours: A+B+C+D+E***

☐ ***Every 2000 hours: A+B+C+D+E+F***

- *Place a check in the appropriate box after each inspection procedure is completed.*
- *Use the maintenance tables in this section and the step-by-step procedures in section 4 to learn how to perform these inspection.*
- *If any inspection receives an "N", tag and remove the machine from service, repair and re-inspect it. After repair, place a check in the "R" box.*

Legend:

Y = yes, acceptable

N = no, remove from service

R = repaired.

Table A		Y	N	R
During the first 10 working hours:				
A-1	Oil level within reduction gears, differential gears and gearbox.			
A-2	Tightening of the wheel bolts.			
A-3	Tightening of all bolts and nuts.			
A-4	Check the couplings for oil leaks.			
Every 10 working hours:				
A-5	Operator Manual.			
A-6	Decals and placards.			
A-7	Engine oil level.			
A-8	Air suction filter.			
A-9	Radiator.			
A-10	Hydraulic oil level in the tank.			
A-11	Check the greasing of the boom section pads.			
A-12	Grase the forks.			
A-13	Grease all joints of the boom, the rear axle shaft joint, the transmission shafts, the front and rear axles and any equipment of the machine.			
A-14	Lighting electric system.			
A-15	Efficiency of braking system and parking brake.			
A-16	Steering selection system.			
A-17	Fork balancing system.			
A-18	Safety devices.			
A-19	Engine coolant level.			
A-20	Overload warning system			

Table B		Y	N	R
Within the first 50 working hours:				
B-1	Change the engine oil and renew the fuel filter.			
Every 50 working hours:				
B-2	Alternator belt.			
B-3	Tyre inflation.			
B-4	Tightening of the wheel nuts.			
B-5	Tightening of the cardan shaft screws.			
B-6	Radiator fins.			
B-7	Emergency pump.			

Table C		Y	N	R
Within the first 100 working hours:				
C-1	Oil of the differential casing, the wheel reducer and the gearbox.			
Every 250 working hours:				
C-2	Engine oil and relevant filter.			
C-3	Oil level in the differential gears.			
C-4	Oil level in the wheel reduction gears.			
C-5	Main filtering element of the engine air filter.			
C-6	Clamping of the cableheads to the battery terminals.			
C-7	Air suction hose between engine and filter.			
C-8	Cylinder chromium-plated rods.			
C-9	Hydraulic lines.			
C-10	Check the electric cables do not rub against the frame or other mechanical components.			
C-11	Wear of the sliding pads of the boom sections.			
C-12	Play of sliding pads.			
C-13	Sliding parts of the boom sections.			
C-14	Level of the battery electrolyte.			
C-15	Block valves.			

Table D		Y	N	R
Every 500 working hours:				
D-1	Smoke quantity evacuated from the engine exhaust.			
D-2	Tightening of the engine fixing screws.			
D-3	Tightening of the cab fixing screws.			
D-4	Backlash between pins and bushings.			
D-5	Hydraulic oil filter in the tank.			
D-6	Check the hydraulic system.			
D-7	Main cartridge of the engine air filter.			
D-8	Cartridge of the engine oil filter and the fuel filter.			
D-9	Hydraulic oil filter of the transmission.			
D-10	Oil of the differential casings.			
D-11	Cab air filter.			

Model

Serial number

Date

Hour meter

Machine owner

Inspected by

Inspector signature

Inspector title

Inspector company

Instructions:

- *Make copies of this page to use for each inspection.*
- *Select the appropriate checklist(s) for the type of inspection to be performed.*

☐ ***Every 10 hours: A***

☐ ***Every 50 hours: A+B***

☐ ***Every 250 hours: A+B+C***

☐ ***Every 500 hours: A+B+C+D***

☐ ***Every 1000 hours: A+B+C+D+E***

☐ ***Every 2000 hours: A+B+C+D+E+F***

- *Place a check in the appropriate box after each inspection procedure is completed.*
- *Use the maintenance tables in this section and the step-by-step procedures in section 4 to learn how to perform these inspection.*
- *If any inspection receives an "N", tag and remove the machine from service, repair and re-inspect it. After repair, place a check in the "R" box.*

Legend:

Y = yes, acceptable

N = no, remove from service

R = repaired.

Table E		Y	N	R
Every 1000 working hours:				
E-1	Safety element of engine air filter.			
E-2	Oil in the gearbox.			
E-3	Oil in the wheel reduction gears.			
E-4	Hydraulic oil.			

Table F		Y	N	R
Every 2000 working hours:				
F-1	Change the engine coolant.			

Section 4
SCHEDULED MAINTENANCE PROCEDURES

SECTION INDEX

4.1 INTRODUCTION

- ***Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.***
- ***Scheduled maintenance must be carried out at the intervals indicated in the MAINTENANCE REPORT.***

  ⚠WARNING

  Failure to properly complete each inspection when required may cause death, serious injury or substantial machine damage.
- ***Immediately tag and remove from service a damaged or malfunctioning machine.***
- ***Repair any machine damage or malfunction before operating machine.***
- ***Unless otherwise specified, perform each procedure with the machine in the following configuration:***
  - ***machine parked on a flat level surface;***
  - ***boom in the stowed position;***
  - ***key switch in the OFF position with the key removed.***

4.2 ABOUT THIS SECTION

This section describes the maintenance interventions to be carried out on the machine according to the indications of the maintenance inspection report (see chapter 3).

Safety symbols:

Draws the attention to situations that involve your own as well as the others' safety and that can result in serious or lethal injury.

⚠DANGER

Draws the attention to situations that involve your own as well as the others' safety and that can result in serious or lethal injury.

⚠WARNING

Draws the attention either to situations that involve your own as well as the others' safety and that can result in minor or moderate injury or to situations that involve the machine efficiency.

⚠CAUTION

Draws the attention either to situations that involve your own as well as the others' safety and that can result in minor or moderate injury or to situations that involve the machine efficiency.

CAUTION

Draws the attention to important technical information or practical advice that allows for a safer and more efficient use of the machine.

NOTICE

Draws the attention to important environment-related information.

4.3 TABLE A PROCEDURES

A-1 CHECK THE OIL LEVEL WITHIN REDUCTION GEARS, DIFFERENTIAL GEARS AND GEARBOX

To check the oil level within the wheel **reduction gears**:

- Stop the machine on a level ground and ensure the parking brake is engaged and plug **A** finds on the horizontal axis.
- Clean the plug all around, then remove it and check if oil is level with the hole.
- If necessary, add new oil through hole **A** until it is level.
- Refit the plug.

NOTICE

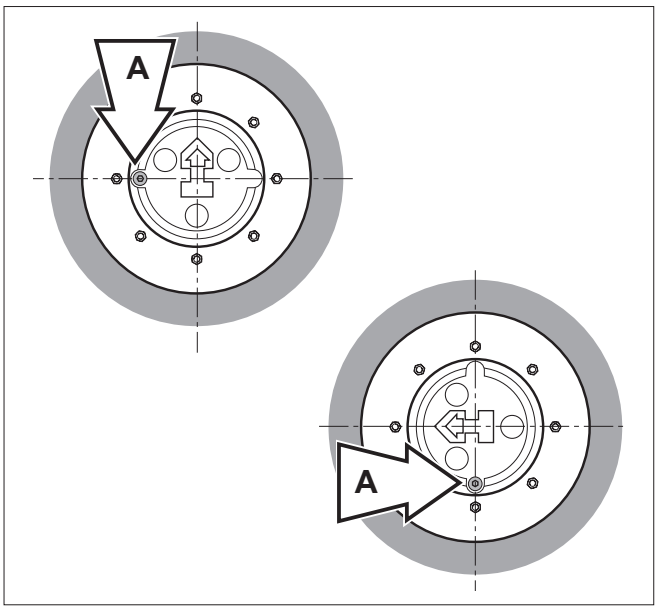
Place a container of suitable size under the plug.

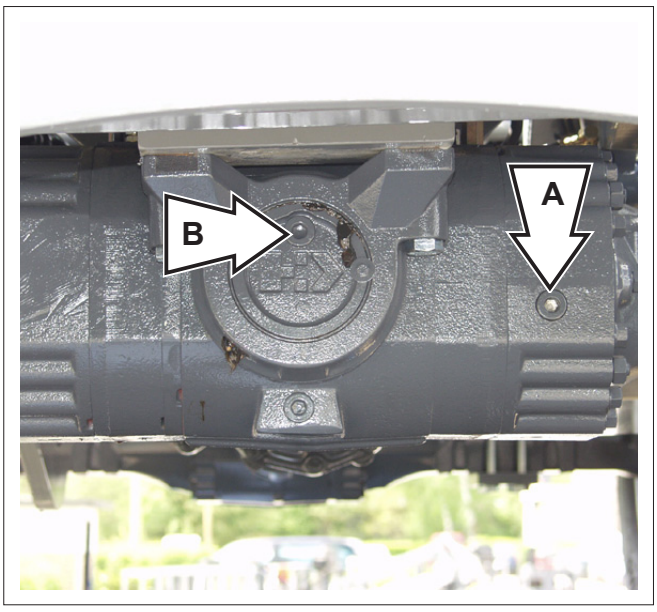
To check the oil level in the front and rear **differential gears**:

- Stop the machine on a level ground and engage the parking brake.
- Loosen level plug **A** and check if oil is level with the hole.
- If necessary, top-up through hole **B** until oil comes out from hole **A**.
- Refit and tighten plugs **A** and **B**.

NOTICE

Place a container of suitable size under the plug.



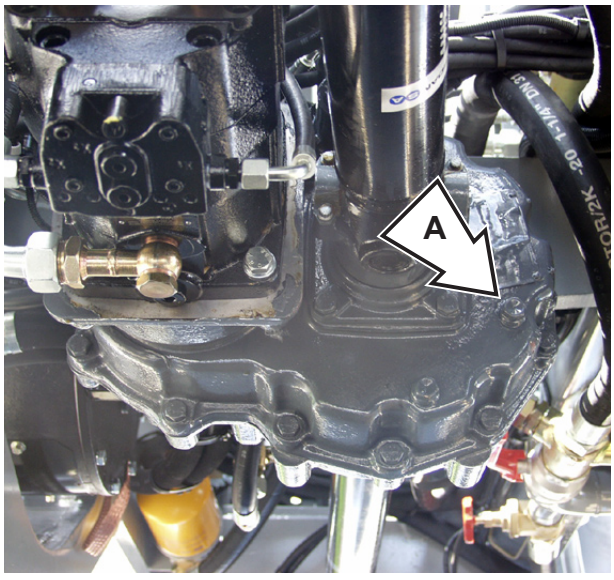


To check the oil level in the **gearbox**:

- Stop the machine on a level ground and engage the parking brake.
- Clean the plug **A** all around, then remove it and check if oil is level with the hole.
- If necessary, add new oil through hole **A** until it is level.
- Refit the plug.

NOTICE

Place a container of suitable size under the plug.

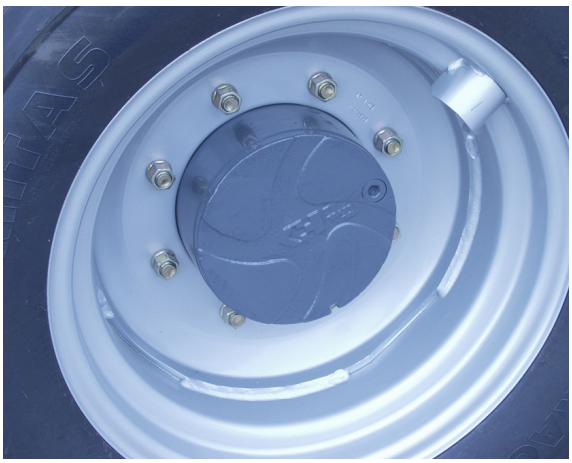


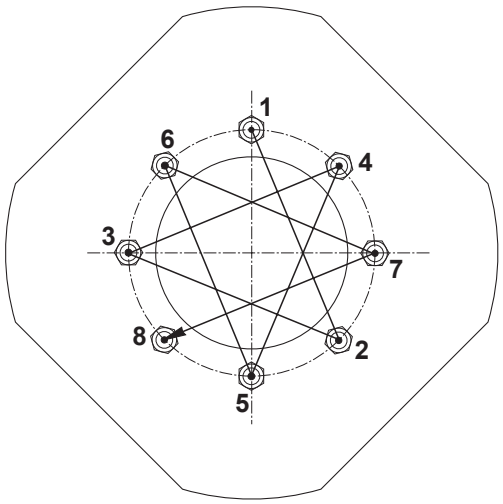
A-2 CHECK THE TIGHTENING OF THE WHEEL BOLTS

If you have to check the tightening of the wheel bolts or replace a wheel, proceed as follows:

- Raise the machine using a hydraulic jack.
- Remove the wheel rolling it on the ground.
- Line up the wheel with the axle and fit the 8 nuts.
- Tighten the nuts following the alternate sequence shown in the picture with a pneumatic screwdriving machine.
- Raise the outrigger and lower the machine to the ground.

Re-tighten all nuts to a torque 440 Nm.





AWARNING

Check the tightening of wheels one hour after the job. They might get loose until they do not stay correct.

AWARNING

On new machines, and when a wheel has been disassembled or replaced, check the nut torque of the wheels every 2 hours until they stay correct.

AWARNING

Always use tyres having the dimensions indicated in the vehicle registration card.

	STANDARD Telelift 4017 - 4514	OPTIONAL Telelift 4017 - 4514
Dimensions (front and rear)	400//70 R20	405/70 R24
P.R. (or load index)	14 pr	14 pr / 151 D
Rim	13x20	13x24
Wheel disc	8 holes DIN 70361	8 holes DIN 70361
Pressure bar/Psi	4/58	4.25/61.6

A-3 CHECK THE TIGHTENING OF ALL BOLTS AND NUTS

Before starting your daily work, proceed with a random check of the bolts.

For the correct tightening torques, please refer to par. 2.13 in section 2 “Technical Specifications”.

A-4 CHECK THE COUPLINGS FOR OIL LEAKS

Before starting your work, do a walk-around inspection and check for oil leaks.

If you find them, rectify before starting using the machine.

A-5 INSPECT THE OPERATOR MANUAL

Maintaining the operator manual in good condition is essential to safe machine operation.

Manual are included with each machine and should be stored in the cab. An illegible or missing manual will not provide safety and operational information necessary for a safe operating condition.

In particular:

- check to be sure the storage container is in good condition.
- check to make sure that the operator manual are present, complete and in the storage container in the cab.
- examine the pages of each manual to be sure that they are legible and in good condition.
- always return the manual to the storage container after use.

CAUTION

Contact TEREXLIFT Service Centre if replacement manuals are needed.

A-6 INSPECT THE DECALS AND PLACARDS

Maintaining all of safety and instructional decals and placards in good condition is mandatory for safe machine operation. Decals alert operators and personnel to the many possible hazards associated with using this machine.

An illegible decal will fair to alert personnel of a procedure or hazard and could result in unsafe operating conditions.

- refer to the “labels and warning plates applied on the machine” section in the Operator Manual and use the decal list and illustrations to determine that all decals and placards are in place.
- inspect all decals for legibility and damage. Replace any damaged or illegible decal immediately.

CAUTION

Contact TEREXLIFT Service Centre if replacement decals are needed.

A-7 CHECK THE ENGINE OIL LEVEL

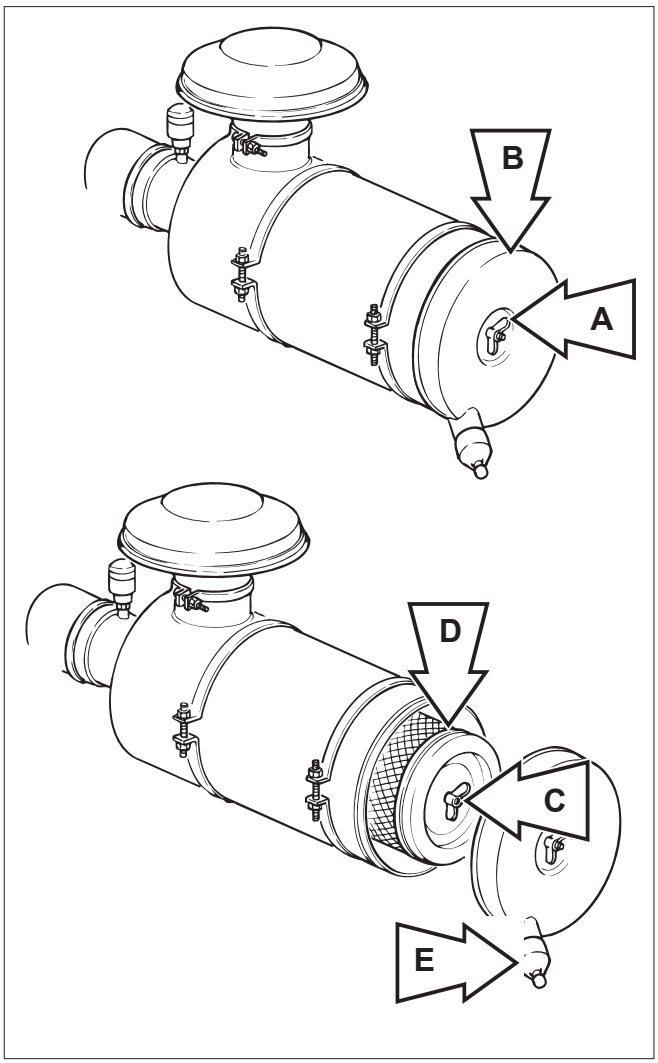
CAUTION

For the engine maintenance, please refer to the specific Operator handbook supplied with the machine.

A-8 CLEAN THE AIR SUCTION FILTER

Clean the engine air filter every 10 hours:

- Stop the engine and engage the parking brake.
- Unscrew wingnut **A** and remove cover **B**.
- Unscrew wingnut **C** and remove the outer element **D**.
- Clean the filter bowl.
- Dry clean the cartridge (max. pressure: 6 bar) and direct the air jet from inside to outside.
- Check for cracks in the filtering element by introducing a lamp inside.
- Smear the seal with grease, then refit the element.
- Tighten wingnut **C**, close cover **B** and tighten with wingnut **A**.



⚠WARNING

As soon as the warning lamp on the cab dashboard switches on, replace the outer element.

⚠WARNING

Daily remove any dust collected in the filter by pressing the rubber cap E.

⚠WARNING

Never wash the cartridge with water or solvents.

A-9 CHECK AND CLEAN THE RADIATOR

DANGER

When using a steam-washer, always wear protective clothes. Hot steam may cause serious injury.

- Open the radiator panel.
- Check the fins of radiator for sediments.
- If necessary, prepare a compressed air nozzle (max. 2 bar) or a nozzle distributing water under pressure or steam.

Cleaning using compressed air

- Direct a jet of compressed air toward radiator paying attention not to damage its fins.
- Remove any loose particles of dirt with some water.

Cleaning using water under pressure or steam

- Spray radiator with a cold commercial detergent and wait for at least 10 minutes to allow the detergent to react.
- Wash radiator using a jet of water or steam.

CAUTION

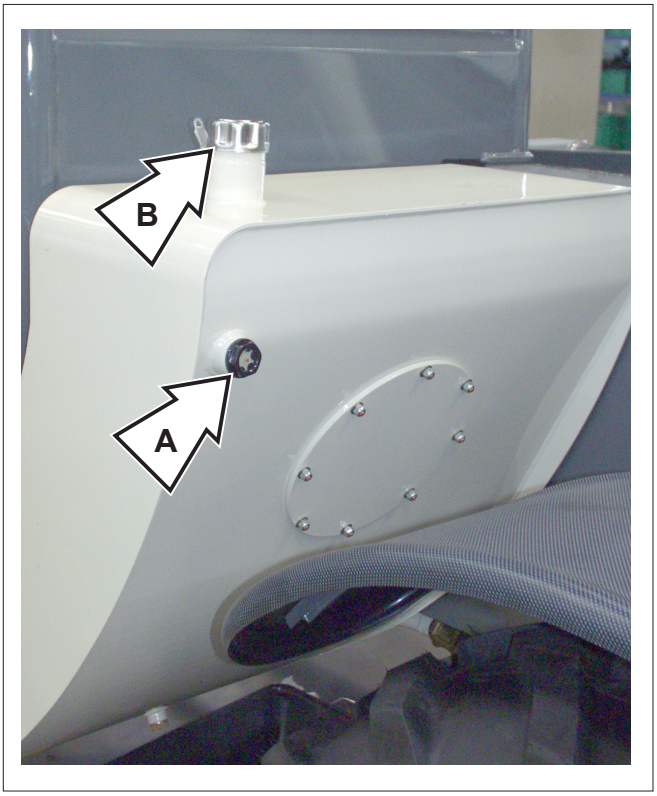
The core fouling depends on the dust of the outside environment and the presence of oil and fuel leaks in the motor area. It is therefore advisable to remove oil and fuel leaks immediately in case of very dusty environments.

A-10 CHECK THE HYDRAULIC OIL LEVEL IN THE TANK

DANGER

Fine jets of hydraulic oil under pressure can penetrate the skin. Do not use your fingers, but a piece of cardboard to detect oil leaks.

Check the hydraulic oil level (visually) through the special level **A** fitted into the tank.
When necessary, add new oil through filler **B**.



WARNING

Check the oil level with the machine in the travel position, tha is boom lowered and telescopes fully in.

NOTICE

The handling and disposing of used oils can be ruled by local or national regulations. Address to authorised centres.

A-11 CHECK THE GREASING OF THE BOOM SECTION PADS

Any boom section is fitted with adjustable pads located on the four sides of the profile. These pads are secured to both fixed and mobile part of every section.

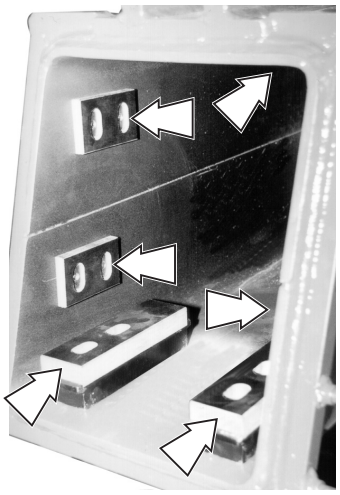
At regular intervals, check that the telescopes are well greased in correspondence of the sliding pads.

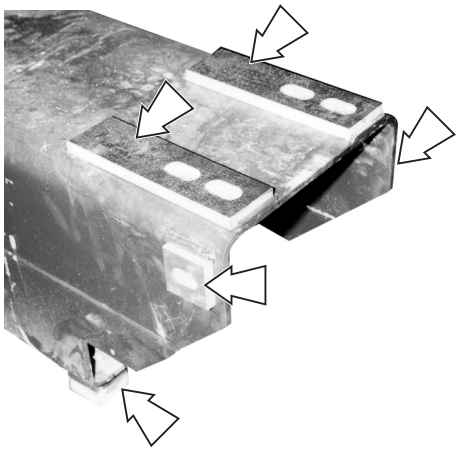
If necessary, scrape off the old grease and brush new grease. We recommend using:

- **PTFE INTERFLON grease FIN GREASE LS 2**

CAUTION

Avoid mixing greases of different type or features and do not use greases of lower quality.





A-12 GREASE THE FORKS

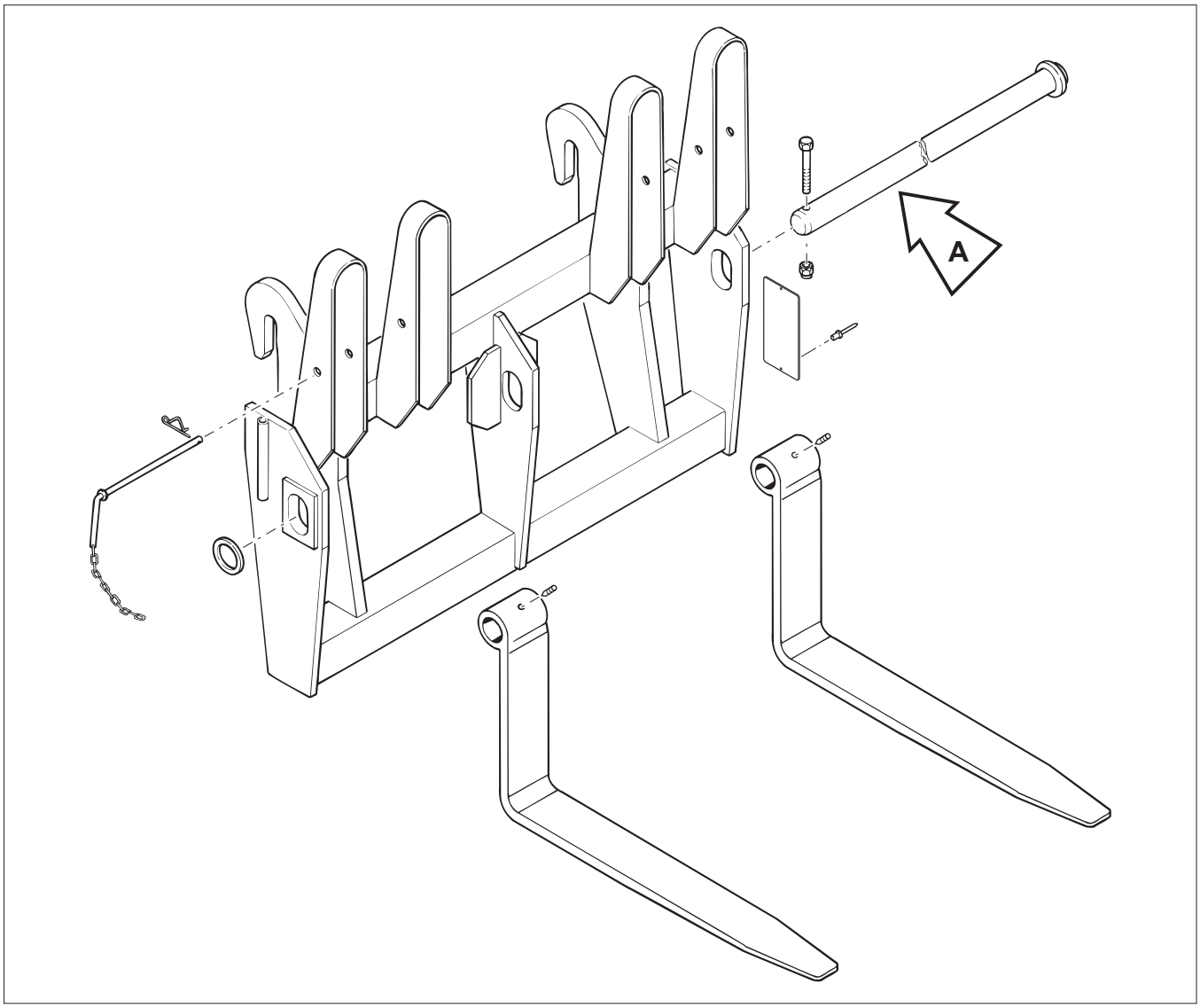
CAUTION

Before use grease, thoroughly clean the intervention zone to avoid that mud, dust or other matters can mix with the lubricant and reduce or annihilate the lubrication effect.
Remove any old grease with a degreaser from the telescopes before smearing them with new grease.

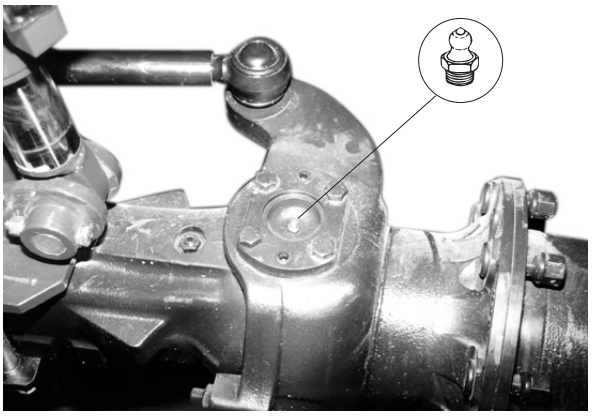
Smear pin **A** with grease to help the forks slide on it.

Recommended grease:

- **AGIP graphitized grease type GR NG 3**



A-13 GREASE ALL JOINTS OF THE BOOM, THE REAR AXLE SHAFT JOINT, THE TRANSMISSION SHAFTS, THE FRONT AND REAR AXLES AND ANY EQUIPMENT OF THE MACHINE



CAUTION

Before injecting grease into the greasers, thoroughly clean them to avoid that mud, dust or other matters can mix with the lubricant and reduce or annihilate the lubrication effect.
Remove any old grease with a degreaser from the telescopes before smearing them with new grease.

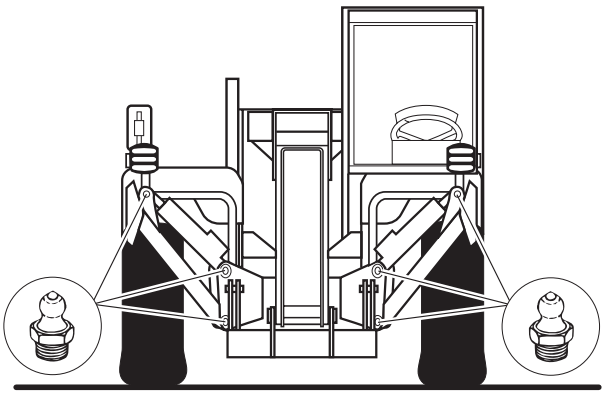
Regularly grease the machine to grant it efficient conditions and a long life.

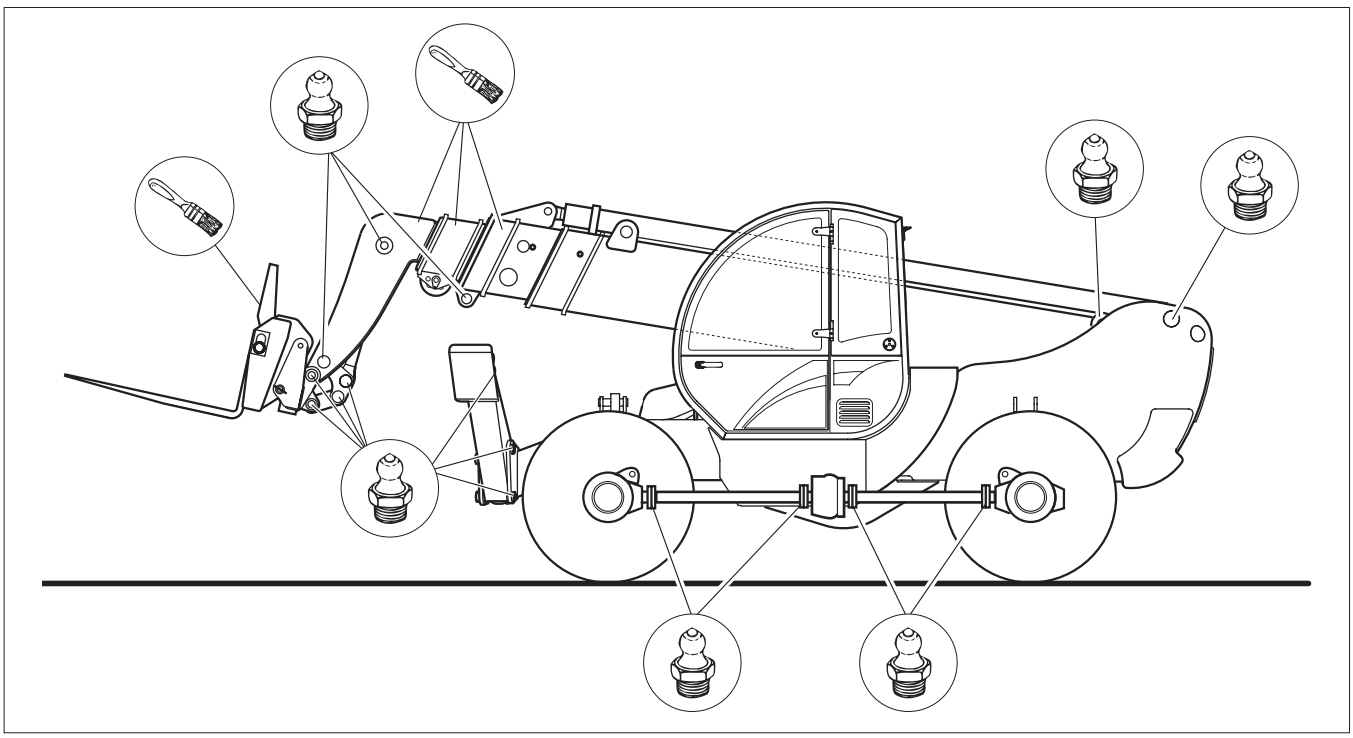
By means of a pump, inject grease into the special greasers.

As the fresh grease comes out, stop the operation.

The greasing points are shown in the following figures:

- the symbol  represents the points to be greased by a pump
- the symbol  represents the points to be greased by a brush.





A-14 CHECK THE EFFICIENCY OF THE LIGHTING ELECTRIC SYSTEM

Check every day that the electrical system powering the lights of the machine is in efficient working order.

Use the assistance of a second technician to check that the front lights **A** (position lights, low and high beams and turn signals) and the rear lights **B** (position lights, stop/tail lights and turn signals) are in excellent state of repair.

Also check beacon **C** located on the cab roof.

If one lamp or more must be replaced, use the table below as a reference.

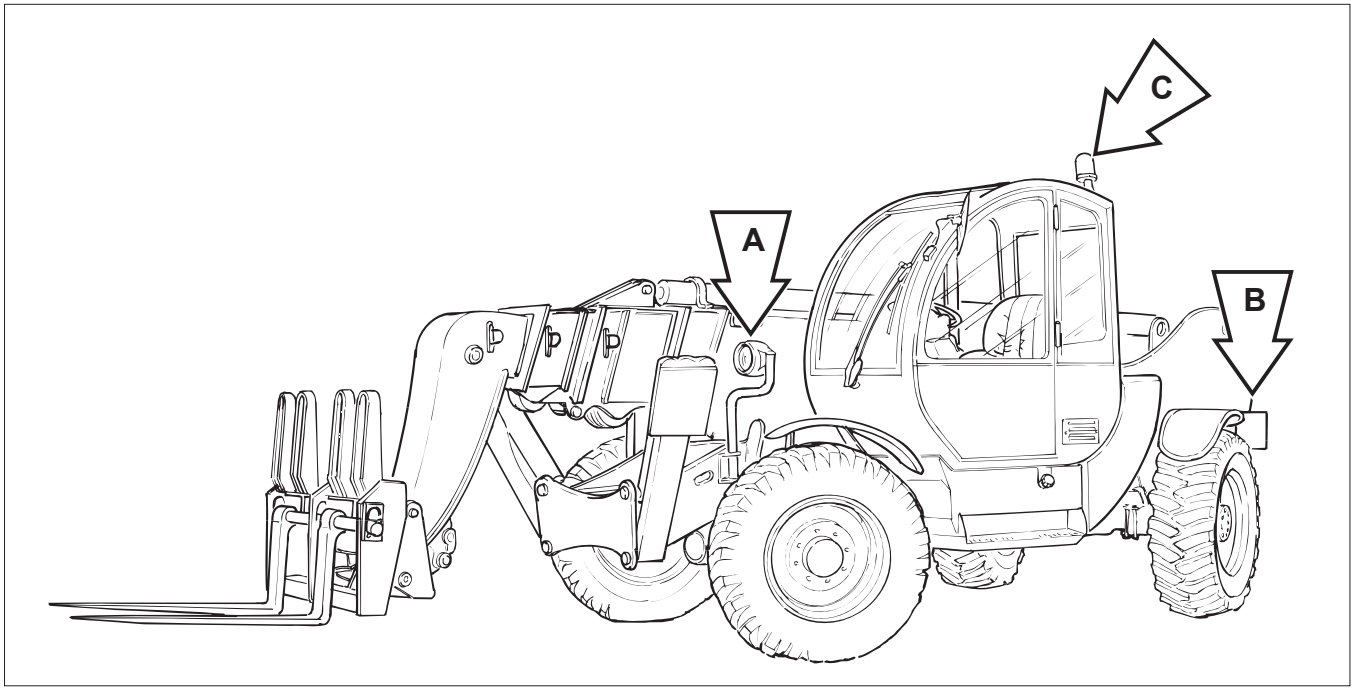
⚠WARNING

When switched on, lamps get hot. Before touching a lamp with your fingers, let it cool down.

⚠CAUTION

Never touch the bulb of halogen lamps (mount type H3) with your fingers: this may damage the lamp (use of a clean cloth or a paper tissue). If you touch it accidentally, thoroughly clean with a paper tissue and some ethyl alcohol.

Use	Voltage	Mount type	Power
• Front low/high beam	12 V	P45t	45/40 W
• Front position lights	12 V	BA 9s	3 W
• Side/tail turn signals	12 V	BA 15s	21 W
• Stop lights and rear position lights	12 V	BAY 15d	21/5 W
• Beacon - Work lights (OPTIONAL)	12 V	H3	55 W
• Dashboard indicators and cab lighting	12 V	W 2x4,6d	1,2 W
• Interior lamp	12 V	SV 8,5-8	5 W
• License plate lights	12 V	BA 15s	5 W
• Back-up lamps	12 V	BA 15s	21W



A-15 CHECK THE EFFICIENCY OF BRAKING SYSTEM AND PARKING BRAKE

For any intervention on the braking system (adjustment and/or substitution of the brake discs) address to the TEREXLIFT Technical Service Centre or the nearest TEREXLIFT authorised workshop.

The malfunctioning of the braking system may depend on the presence of air within the hydraulic circuit.

The braking system has some valves to bleed the air in the circuit.

There are 2 valves per side on the front axle to bleed the service brake and the parking brake circuits, and other 2 valves (one per side) on the rear axle to bleed the service brake circuit.

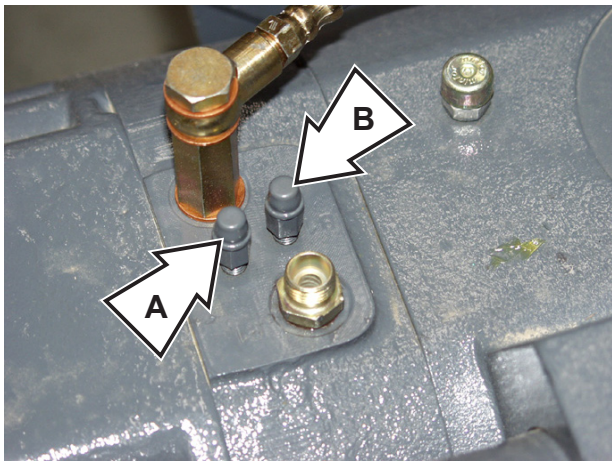
Valve **B** is used for the service brake circuit; valve **A** for the negative parking brake circuit.

To bleed the circuit of the service brake:

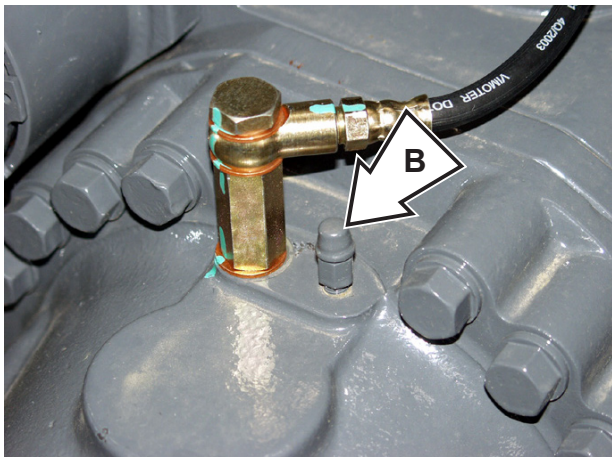
- Step on the brake pedal repeatedly.
- Slowly unscrew valve **B** and re-close it as soon as oil mixed with air bubbles comes out.
- Repeat the operation until bubble-free oil comes out.

To bleed the circuit of the negative parking brake:

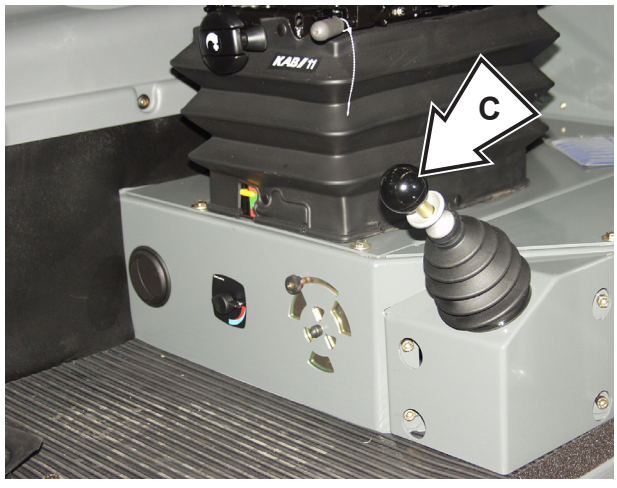
- Pull the brake lever **C** to engage the brake and start bleeding operating valve **A** until bubble-free oil starts flowing out.
- Repeat the same procedure for both sides of the axles.



FRONT AXLE



REAR AXLE



A-16 CHECK THE EFFICIENCY OF THE STEERING SELECTION SYSTEM

During operation, the alignment of the front and rear axles of the machine can be subject to variations. This can depend on an oil blow-by from the steering control circuit, or on a steering of both axles when front and rear wheels are not perfectly aligned.

To fix this problem, rather than checking the alignment visually, follow the procedure below:

1 Move to a solid and level ground.

2 Set the steering selection switch **A to** “four-wheel steer” (pos. **2**).

3 Rotate the steering up to its stop (either to the right or to the left).

4 Set the steering selection switch to “two-wheel steer” (pos. **0**).

5 Rotate the steering up to its stop (turn in the same direction as above).

6 Reset the steering selection switch to “four-wheel steer” (pos. **2**).

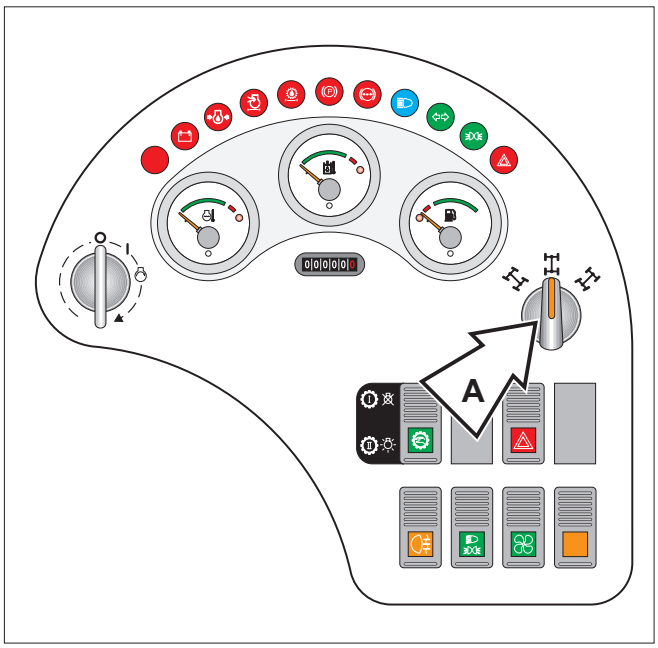
7 Rotate the steering (to the side opposite to point **3**) so that the rear axle reaches its stop.

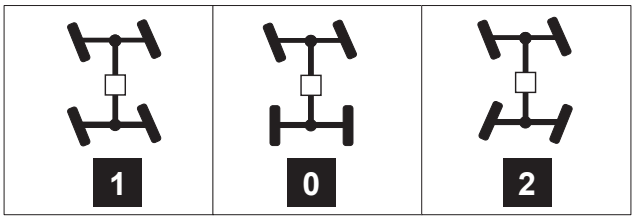
8 Reset the steering selection switch to “two-wheel steer” (pos. **0**).

9 Rotate the steering (to the same side as in point **7**) so that the front axle reaches its stop.

10 Reset the steering selection switch to “four-wheel steer” (pos. **2**).

Now the wheels should be re-aligned.





A-17 CHECK THE EFFICIENCY OF THE FORK BALANCING SYSTEM

WARNING

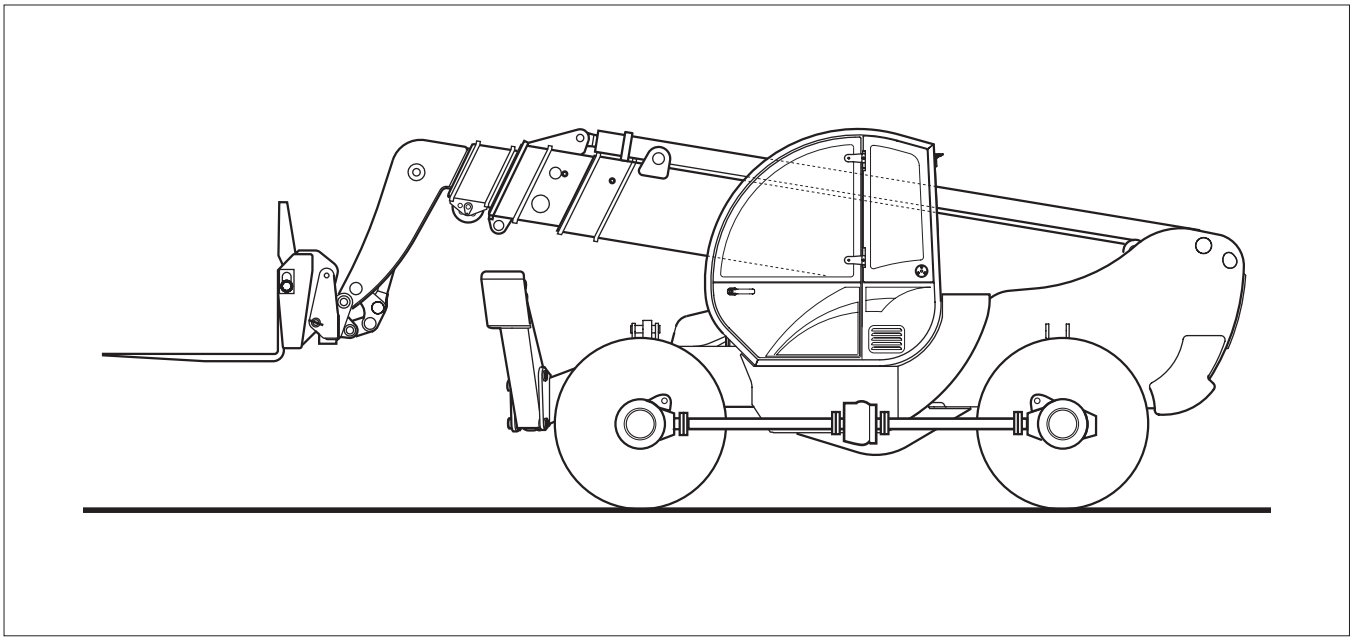
Test the system without any load on the machine's forks.

To check the efficiency of the fork balancing system, obey the instructions below:

- Drive the machine to a flat, smooth ground.
- Move the retracted boom fully down and align the forks with the ground.
- Start lifting the boom and check that the forks remain parallel to the ground.

CAUTION

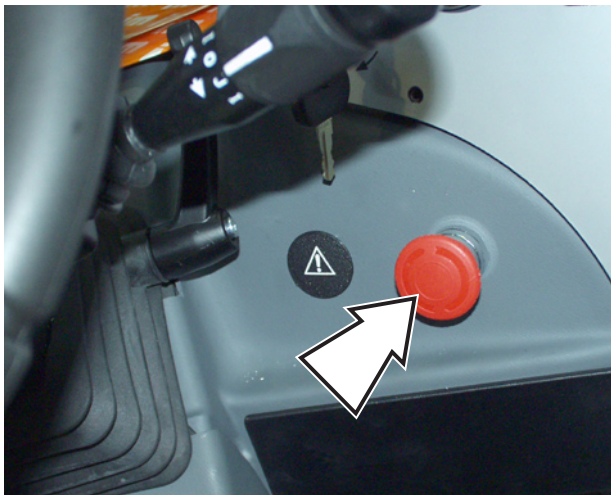
If the forks do not remain parallel to the ground, consult section 5 "Problems - causes - Solutions".



A-18 MAKE SURE THE SAFETY DEVICES INSTALLED ARE IN EFFICIENT WORKING ORDER

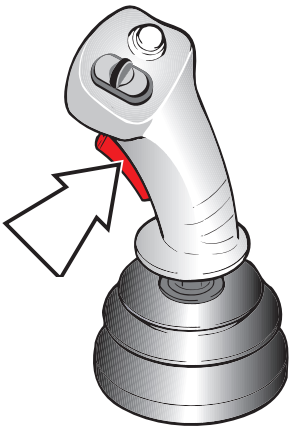
Checking the emergency stop pushbutton
(at every use)

To check the efficiency of this pushbutton, simply press it down during a movement. The pressure of the push-button shall cause the movement to stop and the engine to shut down.



Checking the joystick pushbutton
(at every use)

To check if the pushbutton on the control lever is in efficient working order, it will be enough to attempt to operate the lever without pressing this button.
In this condition, the lever shall not operate any movement. Should that not be the case, contact the TEREXLIFT Technical Service.



Checking the machine start control
(at every use)

Attempt to start the engine with the forward or reverse gear put.
The engine must not start. If the engine starts, contact the TEREXLIFT Technical Service.
Repeat the operation putting first one gear, then the other.

Checking the limit switches of the outriggers
(at every use)

To check the limit switches of the outriggers:

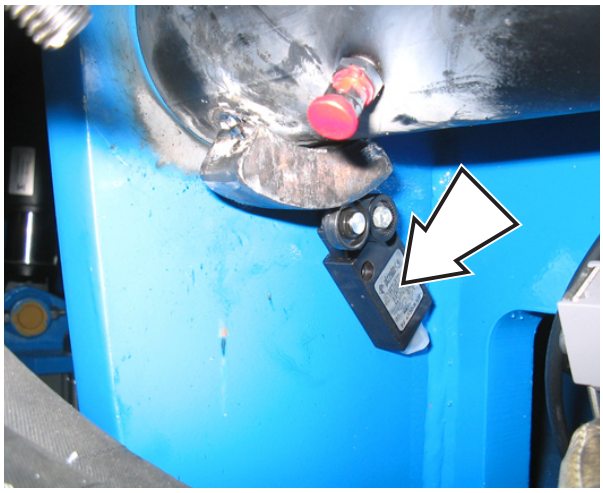
- Lower the outriggers to the ground and attempt to engage a gear.
  If the gear can be engaged, contact the TEREXLIFT Technical Assistance Service.

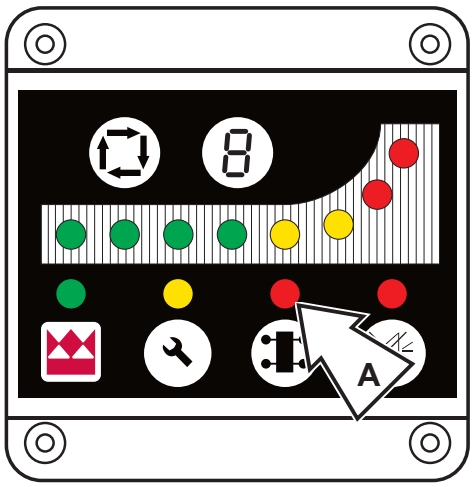
Proceed on one outrigger at a time.

- With the outriggers up, light **A** on the load limiter panel must be off; with the outriggers down to the ground, the same light must be on. Should it not be the case, contact the TEREXLIFT Technical Service.

DANGER

If a limit switch is faulty or a lever is deformed, immediately replace the part.





Checking the proximity switches
(at every use)

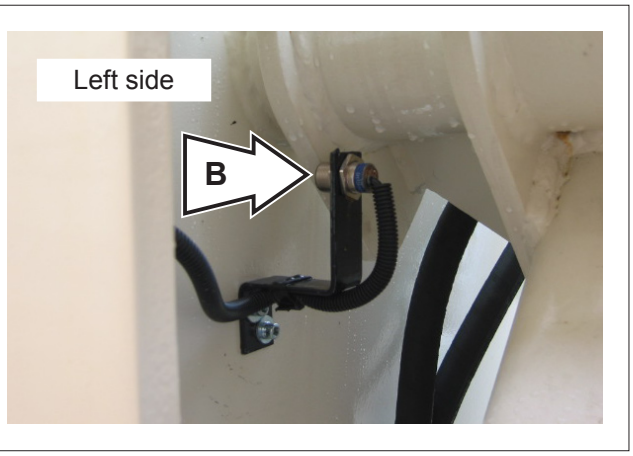
Sensor B on the boom

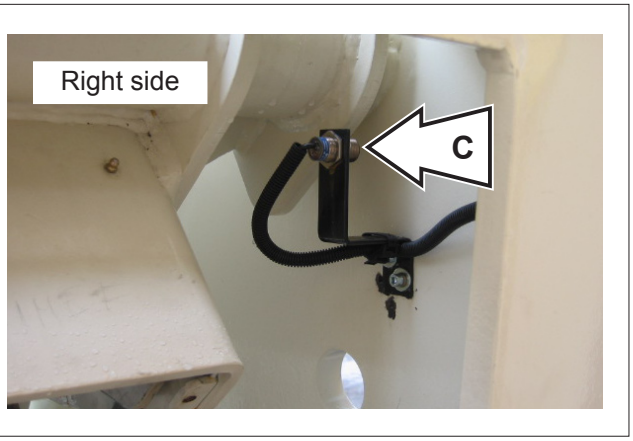
- Raise and tilt the boom more than 40° and check if the rear axle is blocked.
  Should this not be the case, contact the TEREXLIFT Technical Assistance Service.

Sensor C on the boom

- Raise the boom beyond the horizontal and ensure the sway control and the outrigger conttrol are blocked.
  Should this not be the case, contact the TEREXLIFT Technical Assistance Service.

If the trouble does not depend on the sensor adjustment, contact the TEREXLIFT Technical Service Centre.

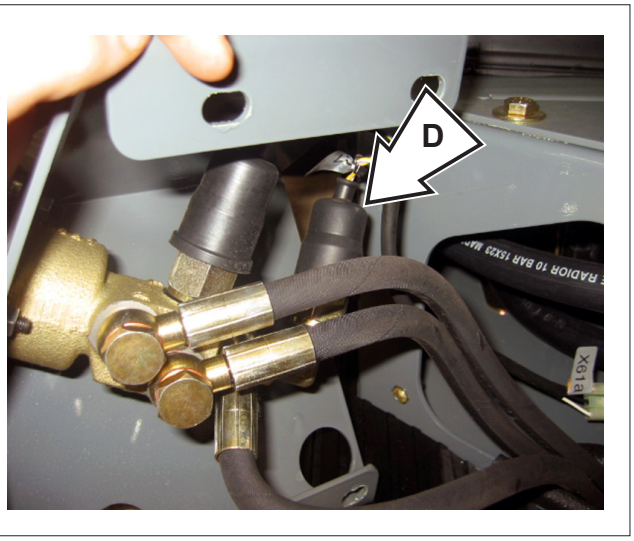




Checking the pressure switch D on the parking brake (at every use)

To check the efficiency of the pressure switch on the parking brake, proceed as follows:

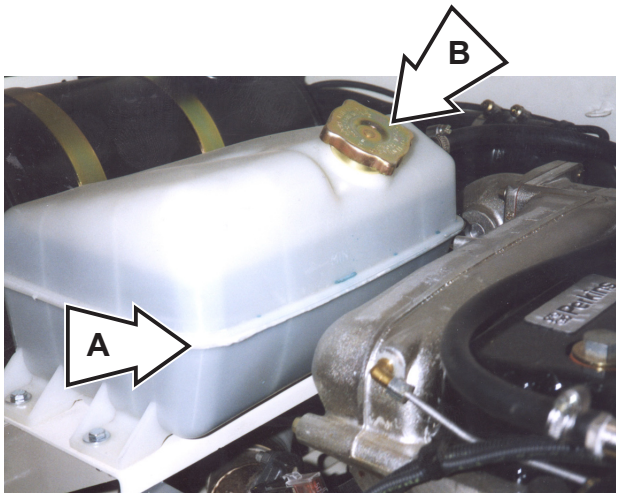
- sit on the driving place, put the parking brake and attempt to move with the machine. The machine must stand still.
  Should this not be the case, contact the TEREXLIFT Technical Assistance Service.



A-19 CHECK THE ENGINE COOLANT LEVEL

DANGER

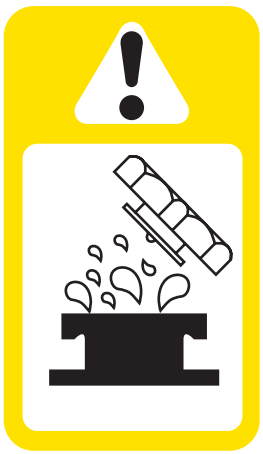
When the coolant is hot, the cooling system is under pressure. With warm engine, loosen the radiator plug slowly and carefully, without removing it, to drain the pressure. Use protection gloves and keep your face at a safe distance.

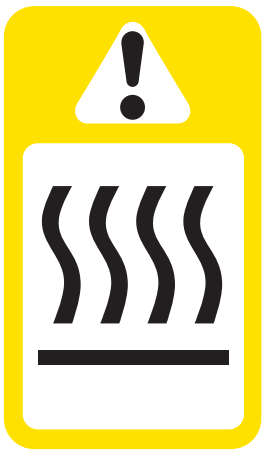


- Weekly check the coolant level within pan **A** before starting working (when coolant is cold).
- When necessary, add clean water or an antifreeze mixture through cap **B**.

On delivery, the machine is filled with a cooling mixture consisting of 50% water and 50% anti-freeze.

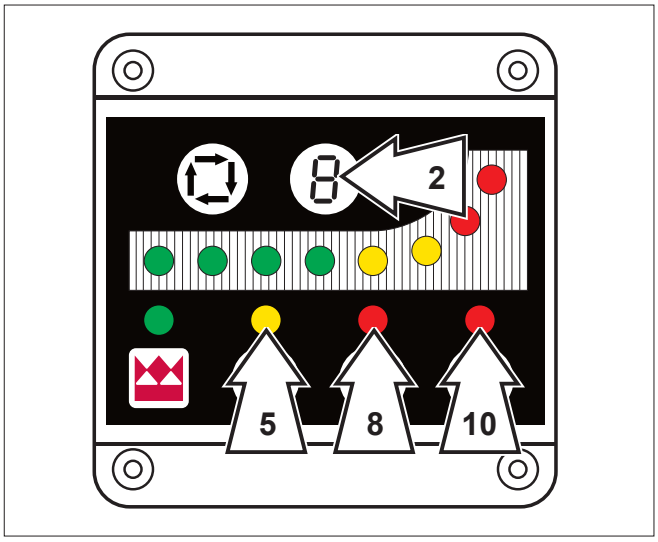
TEREX PRO COOL Protection against boiling / freezing		
Product %	Freezing point	Boiling point
33	-17 °C	123 °C
40	-24 °C	126 °C
50	-36 °C	128 °C
70	-67 °C	135 °C





A-20 CHECK THE EFFICIENCY OF THE OVERLOAD WARNING SYSTEM

When power is turned on, the DLE load limiting system runs a self-test. In the case of troubles, LED's **5**, **8** and **10** start flashing, the buzzer sounds, an error code is shown on the display **2** and the machine enters the alarm mode and cannot be operated.
The meaning of the error messages is shown in Section 2.
To do a manual check, it will be enough to load a weight exceeding the maximum permitted with the boom fully out and attempt to lift it. The system shall enter in alarm.
If the system does not warn of the alarm, please contact the TEREXLIFT Service Centre.



4.4 TABLE B PROCEDURES

B-1 CHANGE THE ENGINE OIL AND RENEW THE FUEL FILTER

B-2 CHECKTHETENSIONOFTHEALTERNATOR BELT

CAUTION

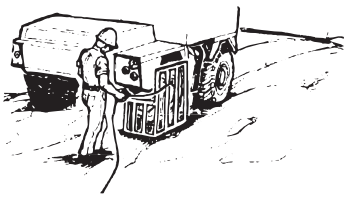
For the engine maintenance, please refer to the specific Operator handbook supplied with the machine.

B-3 CHECK THE TYRE INFLATION

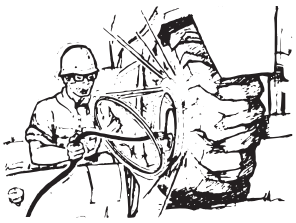
⚠DANGER

Over-inflated or overheated tyres can burst. Do not flame-cut or weld the wheel rims. For any repair work, call in a qualified technician.

OKAY



WRONG



For the tyre inflation or substitution, please refer to the table below:

	STANDARD Telelift 4017 - 4514	OPTIONAL Telelift 4017 - 4514
Dimensions (front and rear)	400//70 R20	405/70 R24
P.R. (or load index)	14 pr	14 pr / 151 D
Rim	13x20	13x24
Wheel disc	8 holes DIN 70361	8 holes DIN 70361
Pressure bar/Psi	4/58	4.25/61.6

On new machines, and when a wheel has been disassembled or replaced, check the nut torque of the wheels every 2 hours until they stay correct.

⚠WARNING

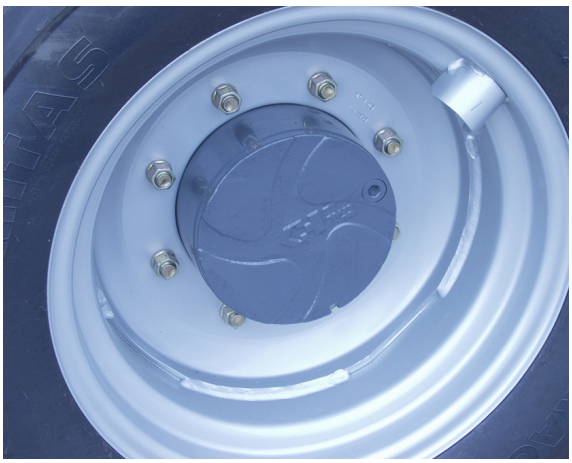
Always use tyres having the dimensions indicated in the vehicle registration card.

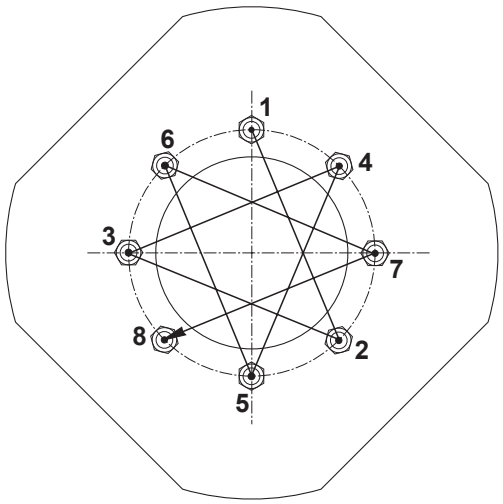
B-4 CHECK THE TIGHTENING OF THE WHEEL NUTS

If you have to check the tightening of the wheel bolts or replace a wheel, proceed as follows:

- Raise the machine using a hydraulic jack.
- Remove the wheel rolling it on the ground
- Line up the wheel with the axle and fit the 8 nuts.
- Tighten the nuts following the alternate sequence shown in the picture with a pneumatic screwdriving machine.
- Raise the outrigger and lower the machine to the ground.

Re-tighten all nuts to a torque 440 Nm.





AWARNING

Check the tightening of wheels one hour after the job. They might get loose until they do not stay correct.

AWARNING

On new machines, and when a wheel has been disassembled or replaced, check the nut torque of the wheels every 2 hours until they stay correct.

AWARNING

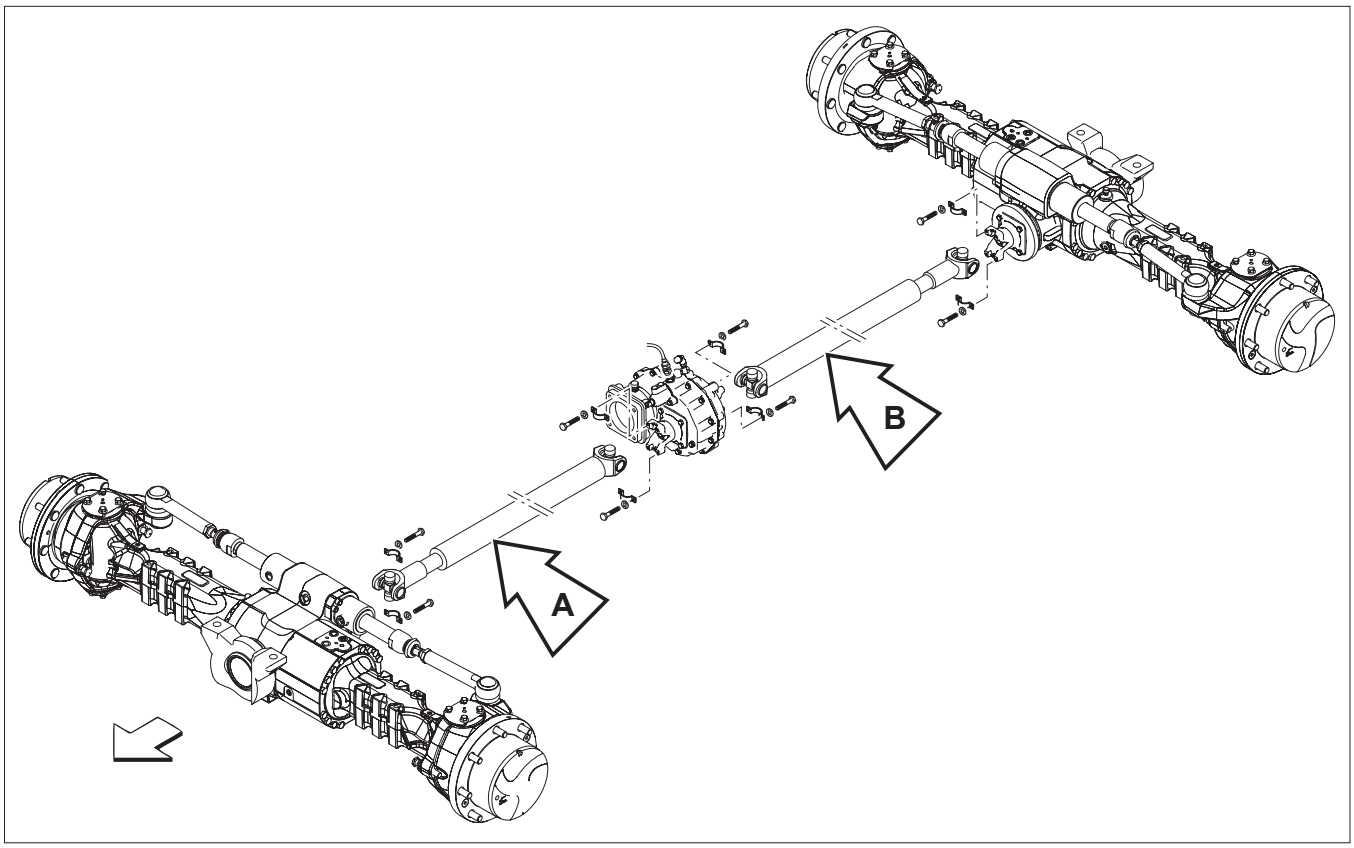
Always use tyres having the dimensions indicated in the vehicle registration card.

	STANDARD Telelift 4017 - 4514	OPTIONAL Telelift 4017 - 4514
Dimensions (front and rear)	400//70 R20	405/70 R24
P.R. (or load index)	14 pr	14 pr / 151 D
Rim	13x20	13x24
Wheel disc	8 holes DIN 70361	8 holes DIN 70361
Pressure bar/Psi	4/58	4.25/61.6

B-5 CHECK THE TIGHTENING OF THE CARDAN SHAFT SCREWS

Check every week that the screws of the Cardan shafts **A** and **B** are tight.

For the correct tightening torques, please refer to par. 2.13 in section 2 “Technical Specifications”.



B-6 CLEAN THE RADIATOR FINS

DANGER

When using a steam-washer, always wear protective clothes. Hot steam may cause serious injury.

- Open the radiator panel.
- Check the fins of radiator for sediments.
- If necessary, prepare a compressed air nozzle (max. 2 bar) or a nozzle distributing water under pressure or steam.

Cleaning using compressed air

- Direct a jet of compressed air toward radiator paying attention not to damage its fins.
- Remove any loose particles of dirt with some water.

Cleaning using water under pressure or steam

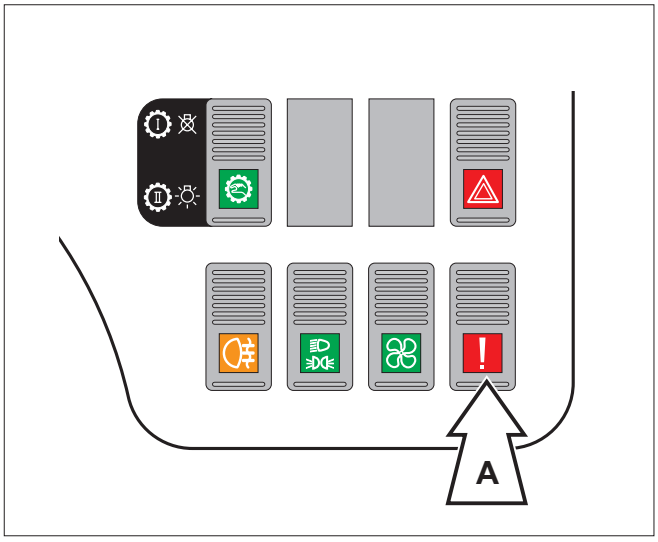
- Spray radiator with a cold commercial detergent and wait for at least 10 minutes to allow the detergent to react.
- Wash radiator using a jet of water or steam.

CAUTION

The core fouling depends on the dust of the outside environment and the presence of oil and fuel leaks in the motor area. It is therefore advisable to remove oil and fuel leaks immediately in case of very dusty environments.

B-7 CHECK THE OPERATION OF THE EMERGENCY PUMP

If the machine is equipped with an emergency pump, check it is in efficient working order every week.
This pump is not used regularly and, as a result, it could get damaged and be out of order in case of need.
To check that the pump is in efficient order, stop the engine, press the on-off button **A** for some seconds and check that the pump works regularly.



CAUTION

If the emergency pump does not work fine, consult section 5 "Problems - causes - Solutions".

4.5 TABLE C PROCEDURES

C-1 CHANGE THE OIL OF THE DIFFERENTIAL CASING, THE WHEEL REDUCER AND THE GEARBOX

To change the oil in the **wheel reduction gears**:

- Stop the machine on a level ground and ensure the parking brake is engaged and plug **A** is oriented along the vertical axis.

NOTICE

Place a container of suitable size under the plug.

- Unscrew plug **A** and drain any oil from the reduction gear.
- Rotate the wheel by 90° until the plug finds again on the horizontal axis.
- Add new oil through hole **A**.
- Refit and tighten plug **A**.

Recommended oil:

- **FUCHS TITAN GEAR LS 85 W-90**
  API GL-5 LS / GL-5

To change the oil in the **front and rear differential gears**:

- Stop the machine on a level ground and engage the parking brake.

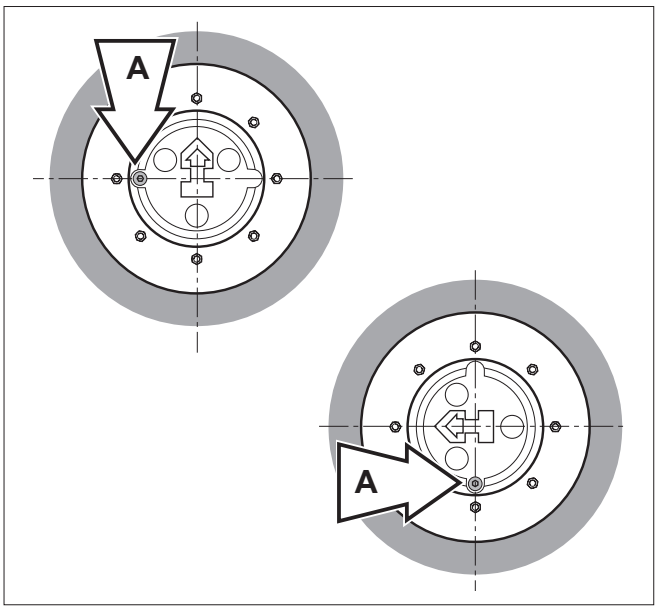
NOTICE

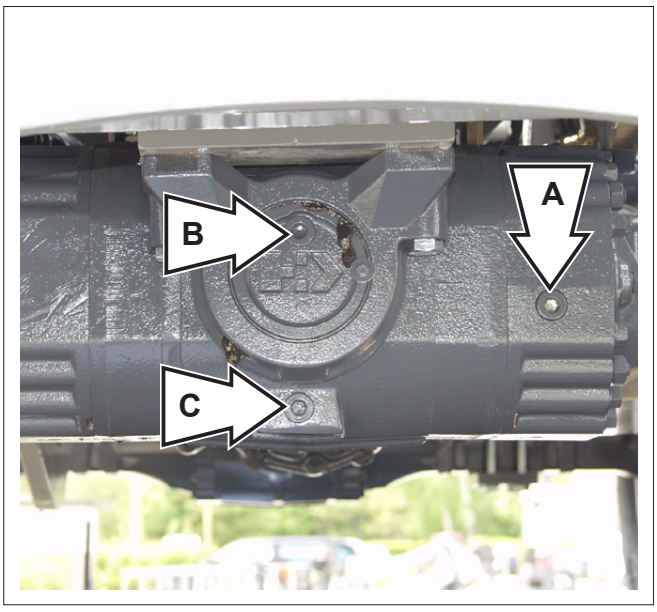
Place a container of suitable size under the plug.

- Loosen the drain plug **C**, the level plug **A** and the filler **B** and allow oil to flow out from the reduction gear.
- Refit and tighten drain plug **C**.
- Add new oil through the filler until it is level with hole **A**.
- Refit and tighten plugs **A** and **B**.

Recommended oil:

- **FUCHS TITAN GEAR LS 85 W-90**
  API GL-5 LS / GL-5





To change the oil in the **gearbox**:

- Stop the machine on a level ground and make sure the parking brake is engaged.

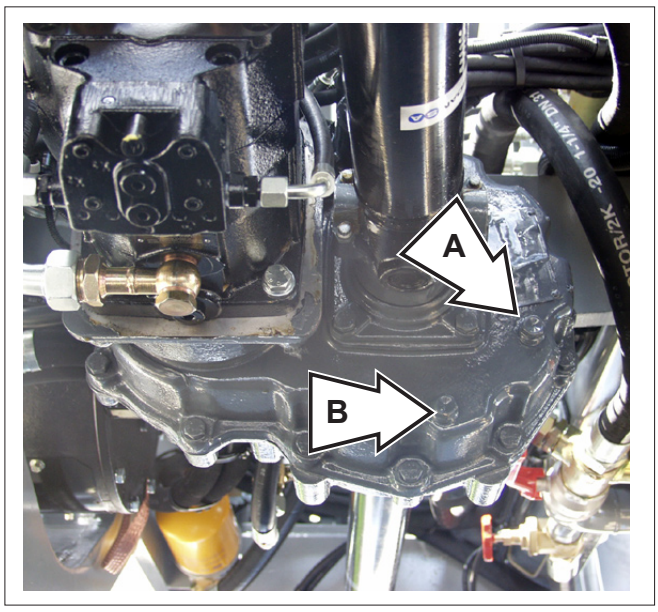
NOTICE

Place a container of suitable size under the plug.

- Remove the level plug **A** and the filler.
- Remove the drain plug **B** and empty the gearbox.
- Refit and tighten the drain plug **B**.
- Add new oil through the filler until it is level with hole **A**.
- Refit and tighten filler/level plug **A**.

Recommended oil:

- **FUCHS TITAN GEAR LS 85 W-90**
  API GL-5 LS / GL-5



C-2 CHANGE THE ENGINE OIL AND RELEVANT FILTER

CAUTION

For the engine maintenance, please refer to the specific Operator handbook supplied with the machine.

C-3 CHECK THE OIL LEVEL IN THE FRONT AND REAR DIFFERENTIAL GEARS

To check the oil level in the **front and rear differential gears**:

- Stop the machine on a level ground and engage the parking brake.
- Loosen level plug **A** and check if oil is level with the hole.
- If necessary, top-up through hole **B** until oil comes out from hole **A**.
- Refit and tighten plugs **A** and **B**.

NOTICE

Place a container of suitable size under the plug.

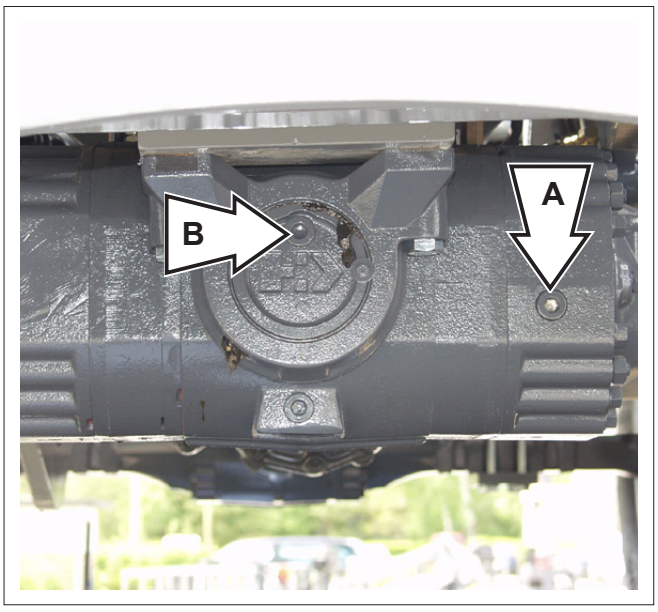
C-4 CHECK THE OIL LEVEL IN THE FOUR WHEEL REDUCTION GEARS

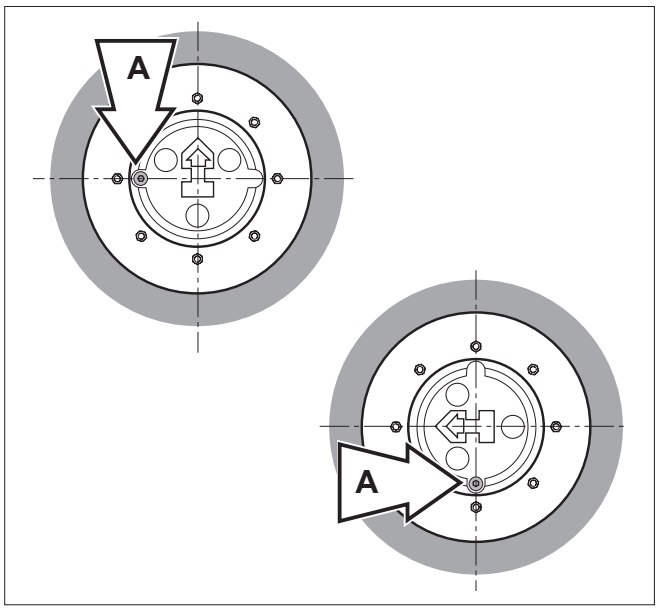
To check the oil level within the **wheel reduction gears**:

- Stop the machine on a level ground and ensure the parking brake is engaged and plug **A** finds on the horizontal axis.
- Clean the plug all around, then remove it and check if oil is level with the hole.
- If necessary, add new oil through hole **A** until it is level.
- Refit the plug.

NOTICE

Place a container of suitable size under the plug.

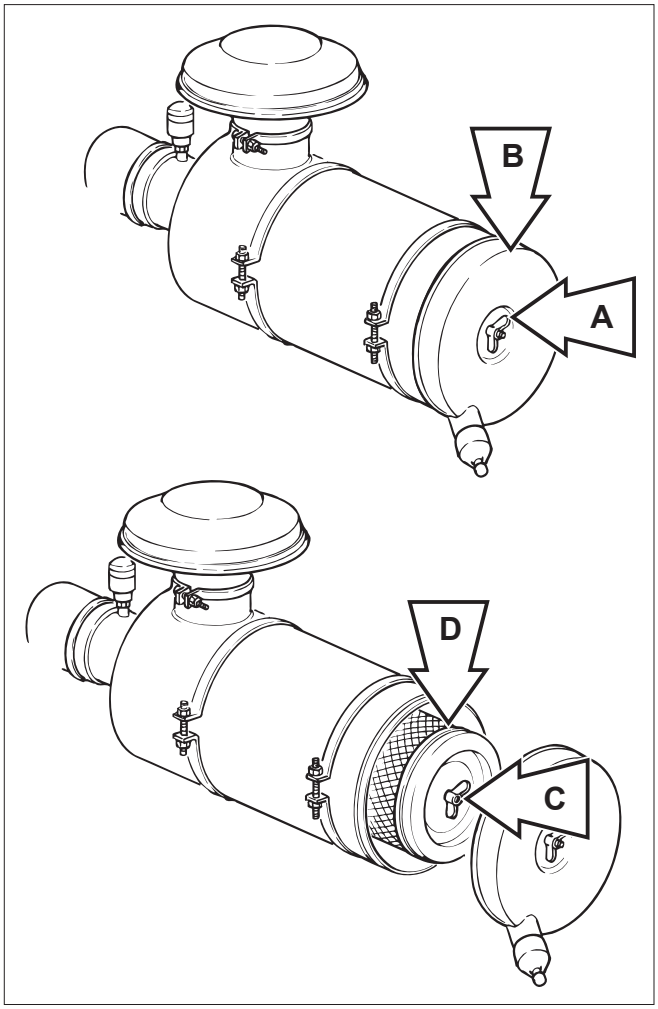




C-5 CHECK AND CLEAN THE ENGINE AIR FILTER

To check and clean the engine air filter:

- Stop the engine and engage the parking brake.
- Unscrew wingnut **A** and remove cover **B**.
- Unscrew wingnut **C** and remove the outer element **D**.
- Clean the filter bowl.
- Dry clean the cartridge (max. pressure: 6 bar) and direct the air jet from inside to outside.
- Check for cracks in the filtering element by introducing a lamp inside.
- Smear the seal with grease, then refit the element.
- Tighten wingnut **C**, close cover **B** and tighten with wingnut **A**.



⚠WARNING

As soon as the warning lamp on the cab dashboard switches on, replace the outer element.

⚠WARNING

Never wash the cartridge with water or solvents.

C-6 CHECK THE CLAMPING OF THE CABLEHEADS TO THE BATTERY TERMINALS

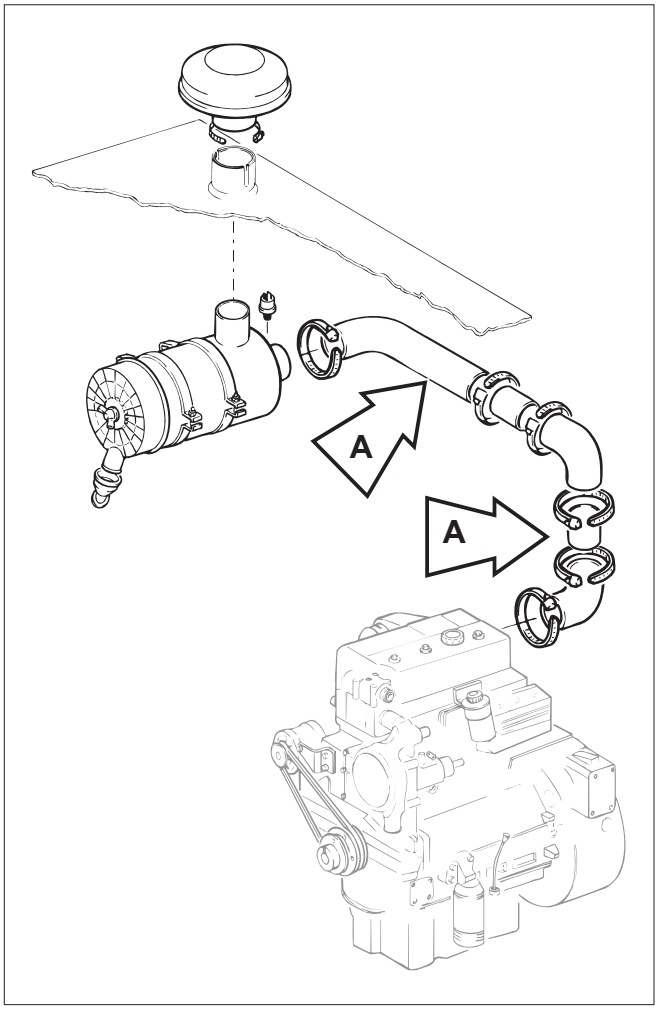
Check the cable clips are well secured to the battery terminals. To tighten the clips, always use a box wrench, never pliers.

⚠ DANGER

- ***Keep out of items which can produce sparks, of naked flames or lit cigarettes.***
- ***Do not rest metal objects onto the battery. This can result in a dangerous short especially during a recharge.***

C-7 CHECK THE AIR SUCTION HOSE BETWEEN ENGINE AND FILTER

Check the state of sleeves **A** forming the air suction line between engine and filter every month.



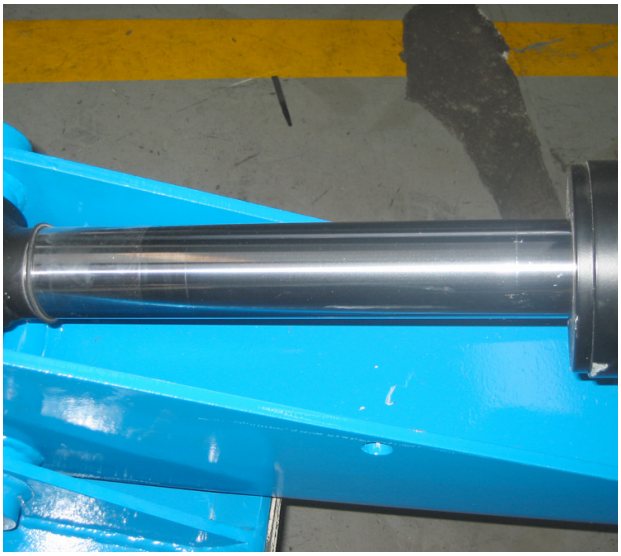
CAUTION

If you use the machine continuously for several days, check these sleeves, as well as the hose clamps more frequently.

C-8 CHECK THE CYLINDER CHROMIUM-PLATED RODS

Visually check the cylinder rods for scoring every month.

For this operation, fully extend all of the cylinders and check that their rods are intact.

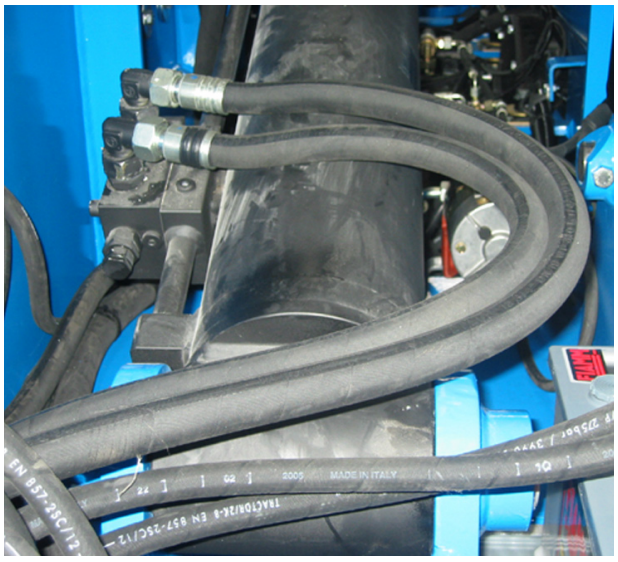


C-9 CHECK THE HYDRAULIC LINES

Every month, do a random check of the oil-dynamic hoses to be sure they are not worn. In particular, we recommend checking the hoses located near moving mechanical parts as they could rub against such parts and get damaged.

CAUTION

Replace any worn hoses immediately before using the machine again.

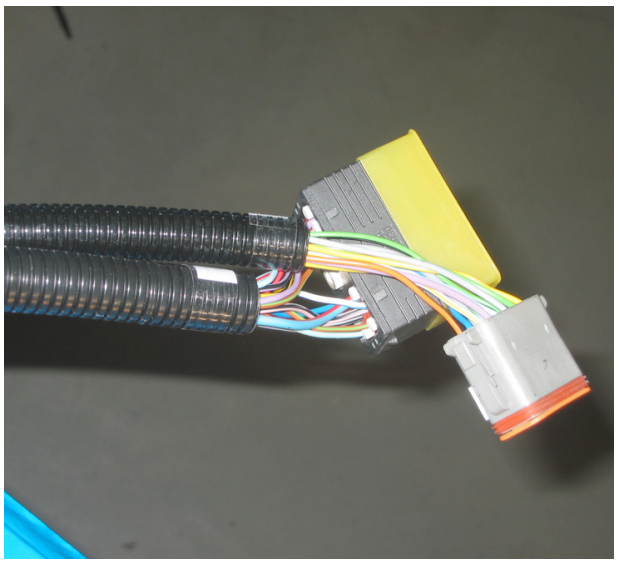


C-10 CHECK THE ELECTRIC CABLES

Every month, do a random check of the electrical cables to be sure they are not damaged. In particular, we recommend checking the cables located near moving mechanical parts as they could rub against such parts and get damaged.

CAUTION

Replace any worn cables immediately before using the machine again.



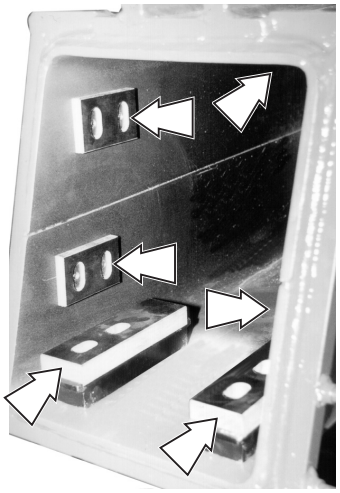
C-11 CHECK THE WEAR OF THE SLIDING PADS OF THE BOOM SECTIONS

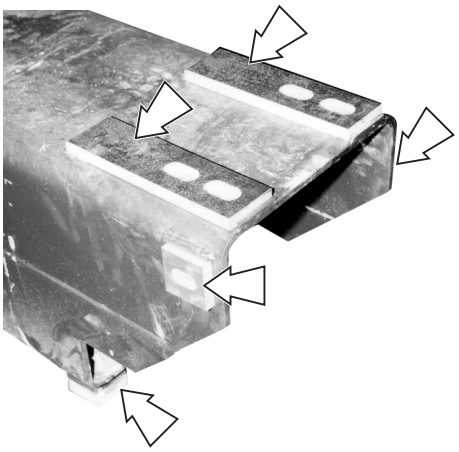
Any boom section is fitted with adjustable pads located on the four sides of the profile. These pads are secured to both fixed and mobile part of every section.

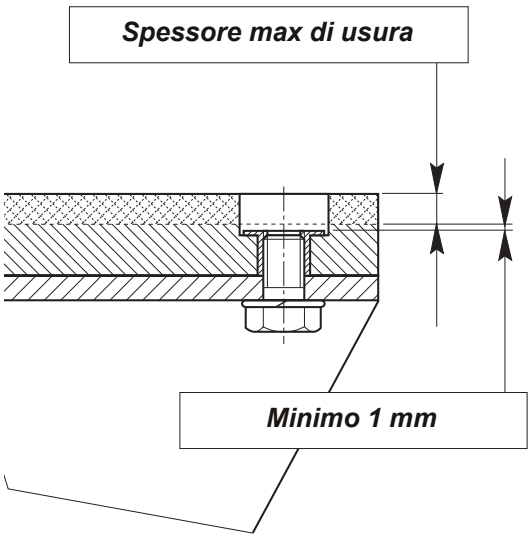
All pads can be adjusted by the special shims not supplied by TEREXLIFT.

CAUTION

Pads must compulsorily be replaced if the residual thickness of the plastic layer with respect to the iron bush fixing the block is equal or inferior to 1 mm.







C-12 ADJUST THE PLAY OF THE SLIDING PADS OF THE BOOM SECTIONS

Any boom section is fitted with adjustable pads located on the four sides of the profile. These pads are secured to both fixed and mobile part of every section.

All pads can be adjusted by the special shims.

Adjusting the pads:

- Remove or loosen the screws fixing the pads in relation to type of shims used (with or without slots).
- Fit the necessary amount of shims.
- If the residual thickness of the pad is insufficient or near the maximum wearing limit, renew the pad.
- Tighten the screws fixing the pads at the recommended torque (see below). Use a dynamometric wrench.

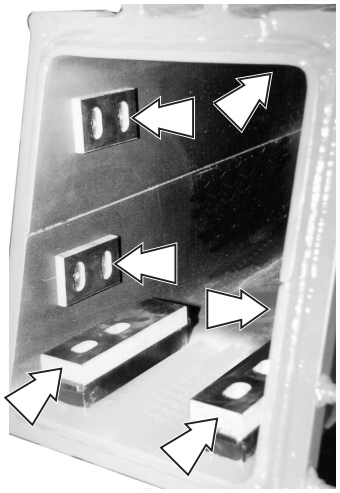
Tightening torques of the pad screws in relation to the screw diameter

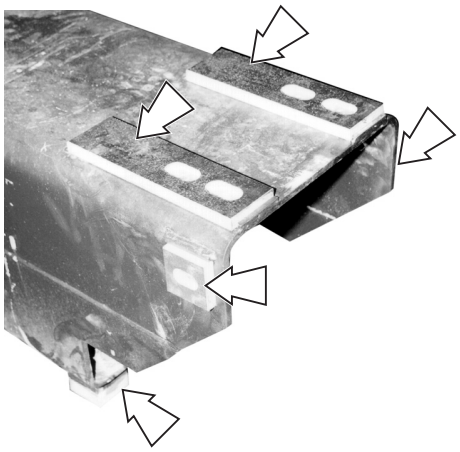
Screws M10	Nm 30
Screws M14	Nm 50

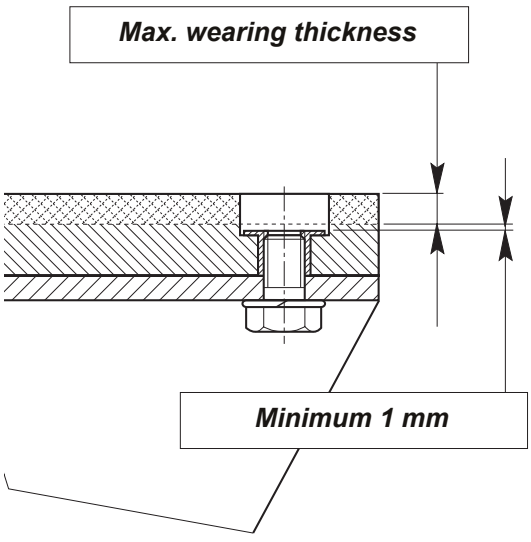
Tightening torques higher than those recommended can cause the break of the pad or of the locking threaded bush.

CAUTION

Pads must compulsorily be replaced if the residual thickness of the plastic layer with respect to the iron bush fixing the block is equal or inferior to 1 mm.







C-13 GREASE THE SLIDING PARTS OF THE BOOM SECTIONS

Check every month that the telescopes are well greased in correspondence of the sliding pads.

If necessary, scrape off the old grease and brush new grease. We recommend using:

- **INTERFLON grease code 640772** **FIN GREASE LS 2**

CAUTION

Avoid mixing greases of different type or features and do not use greases of lower quality.

C-14 CHECK THE LEVEL OF THE BATTERY ELECTROLYTE

- Check the electrolyte level every 250 working hours; if necessary, add distilled water.
- Ensure the fluid is 5÷6 mm above the plates and the cell levels are correct.
- Protect the terminals smearing them with pure vaseline.
- Remove the battery and store it in a dry place, when the machine is not used for a long time.

⚠DANGER

Battery electrolyte contains sulphuric acid. It can burn you if it touches your skin and eyes. Always wear goggles and protective gloves, and handle the battery with caution to prevent spillage. Keep metal objects (watch straps, rings, necklaces) clear of the battery leads, since they can short the terminals and burn you.

⚠DANGER

- ***Before disconnecting the battery, set all switches within the cab to OFF.***
- ***To disconnect the battery, disconnect the negative (-) lead from the frame earth first.***
- ***To connect the battery, connect the positive (+) lead first.***
- ***Recharge the battery far from the machine, in a well-ventilated place.***
- ***Keep out of items which can produce sparks, of naked flames or lit cigarettes.***
- ***Do not rest metal objects onto the battery. This can result in a dangerous short especially during a recharge.***
- ***Because the electrolyte is highly corrosive, it must never come in contact with the frame of the handler or electric/electronic parts. If the electrolyte comes in contact with these parts, contact the nearest authorised assistance centre.***

⚠DANGER

Risk of explosion or shorts. During the recharge, an explosive mixture with release of hydrogen gas forms.

⚠DANGER

Do not add sulphuric acid; add only distilled water.

C-15 CHECK THE EFFICIENCY OF THE BLOCK VALVES

The piloted blocking valves allow to held the load in position in case of burst of a flexible hose.

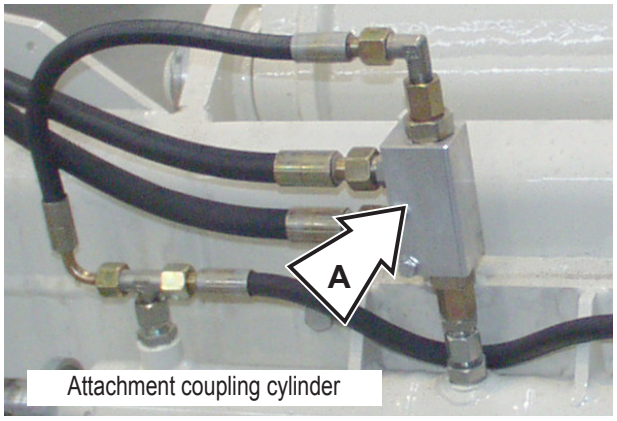
To check the efficiency of a valve, proceed as follows:

- Load a weight near the maximum payload onto the boom.
- Raise the load some centimetres above the ground (max 10 cm). To check the valve on the telescope extension cylinder move the boom to maximum height and extend it some centimetres.
- Loosen the oil hoses to the cylinder of which you are checking the valve with caution.
- To check the efficiency of the block valves of the outriggers, lower them to the ground and unload the weight of the tyres without raising them. Loosen the cylinder hoses to check the efficiency of the valve.

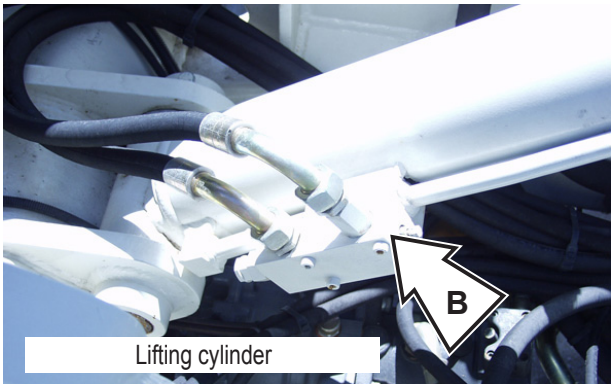
During the check, the oil will flow out of the hoses and the load shall remain blocked in position.
Should that not be the case, the valve must be replaced. Contact TEREXLIFT Technical Service.

NOTICE

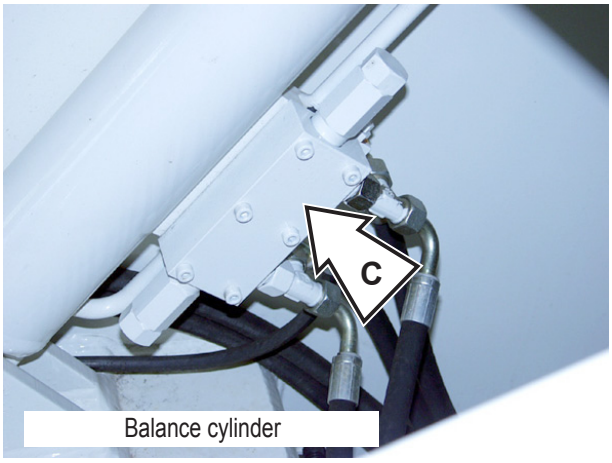
Place a container of suitable size under the hoses.



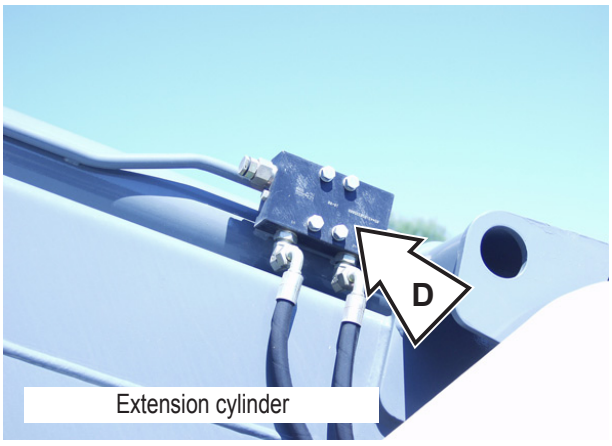
Attachment coupling cylinder



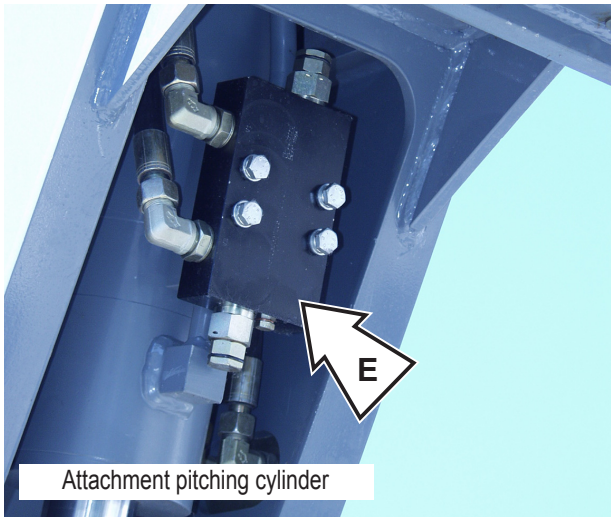
Lifting cylinder



Balance cylinder



Extension cylinder



Attachment pitching cylinder

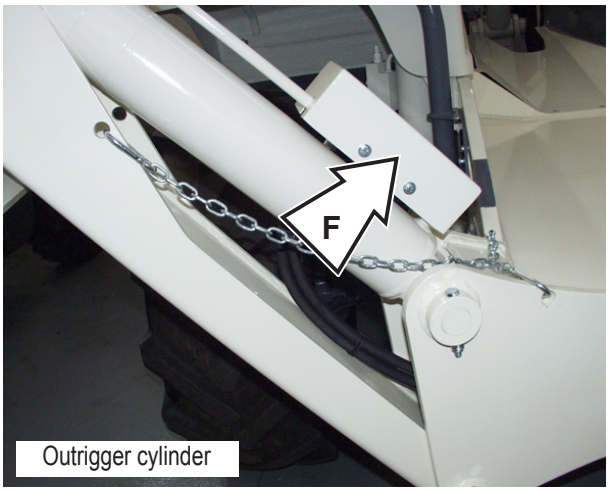
⚠ DANGER

Do the check of the valves taking all the possible precautionary measures:

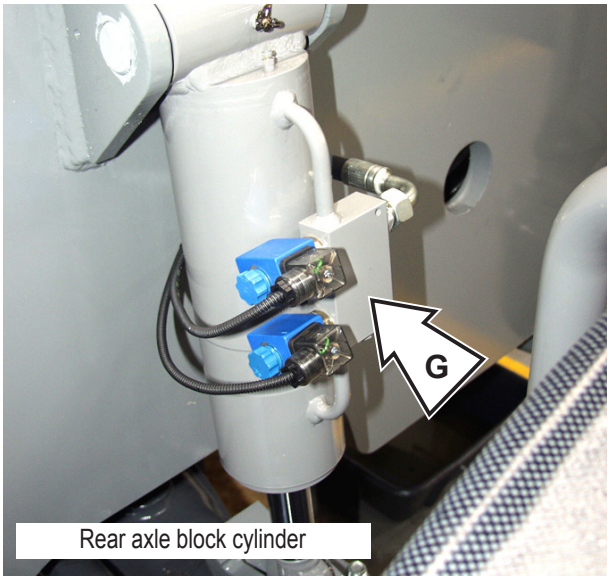
- ***Wear safety glasses***
- ***Wear safety gloves***
- ***Wear safety shoes***
- ***Wear suitable working clothes***
- ***Use guards against leaks of oil at high pressure***
- ***Do the check in a free space with barriers all around to keep non-authorised people away***
- ***Ensure that the part to be checked is in safe condition and that the action generated does not result in an uncontrolled movement of the machine.***

TO REMOVE THE BLOCK VALVES OR THE CYLINDERS

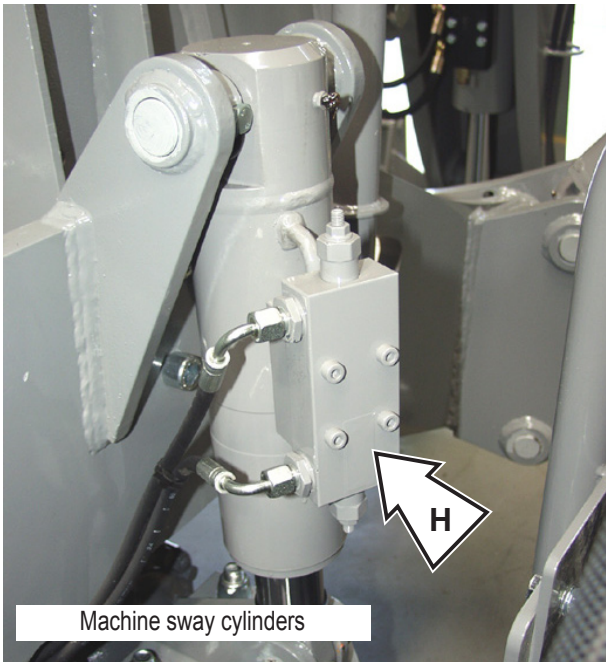
- ***Lower the boom to the ground in a firm way since the removal of the block valve or the cylinder can cause an uncontrolled down-movement.***
- ***After refitting the valve or the cylinder, replenish the circuit and eliminate any air before starting working. To eliminate the air from the circuit, move the involved cylinders to end-of-stroke in the two directions (opening/closing. To eliminate the air from the fork balance cylinder, move the boom up and down and tilt the fork plate forwards/back.***



Outrigger cylinder



Rear axle block cylinder



Machine sway cylinders

4.6 TABLE D PROCEDURES

D-1 VISUALLY CHECK THE SMOKE QUANTITY EVACUATED FROM THE ENGINE EXHAUST

To check the quantity of smoke evacuated from the engine exhaust, proceed as follows:

- Start the engine of the machine.
- Wait for a few minutes so the engine can warm up correctly.
- Visually check that the amount of smoke coming out of the exhaust is normal; repeat the check while accelerating the engine.

⚠CAUTION

Do this check outdoors or use an adequate smoke extraction system.

CAUTION

In case of excess smoke, strictly obey the instructions provided in the relevant Use and maintenance manual enclosed with the technical literature of the machine.

D-2 CHECK THE TIGHTENING OF THE ENGINE FIXING SCREWS

Every 6 months, check that the screws fixing the engine to the machine chassis are tight.

For this operation, use a torque wrench and tighten the screws to a torque of **146 Nm**.

D-3 CHECK THE TIGHTENING OF THE CAB FIXING SCREWS

Every 6 months, check that the screws fixing the cab to the machine chassis are tight.

For this operation, use a torque wrench and tighten the screws to a torque of **218 Nm**.

D-4 CHECK THE BACKLASH BETWEEN PINS AND BUSHINGS IN ALL JOINTS

Every 6 months, check the machine randomly to be sure the backlash between pins and relevant bushings on the joints is not too high.

CAUTION

If you have to change some parts, please refer to the spare parts catalogue enclosed with the technical literature of the machine.

D-5 CHANGING THE HYDRAULIC OIL FILTER

To change the hydraulic oil filter element, proceed as follows:

- Stop the machine on a level ground and engage the parking brake.
- Place a container of suitable size under the tank, then allow oil to flow out until its level is under the inspection hatch **A** (90 litres approx).
- Remove the inspection hatch and unscrew the oil filter fitted inside the tank.
- Check the tank is clean, then fit a new filtering element and refit the inspection hatch.
- Check the oil level within the tank. Add new oil, if necessary.

NOTICE

The handling and disposing of used oils may be ruled by local or national regulations. Address to authorised centres.

CAUTION

Hydraulic oil filter canisters cannot be cleaned or washed and refitted.
They must be replaced with new ones of the type recommended by the manufacturer:

Flow rate l/1' = 100
Filtering = 60 µ
Coupling = 2" NPT

CAUTION

When changing the oil, drain it when it is still hot and the polluting substances are in suspension.

D-6 HAVE THE HYDRAULIC SYSTEM CHECKED BY A SKILLED TECHNICIAN

Every 6 months, we recommend have the efficiency of the hydraulic system checked by a skilled technician.

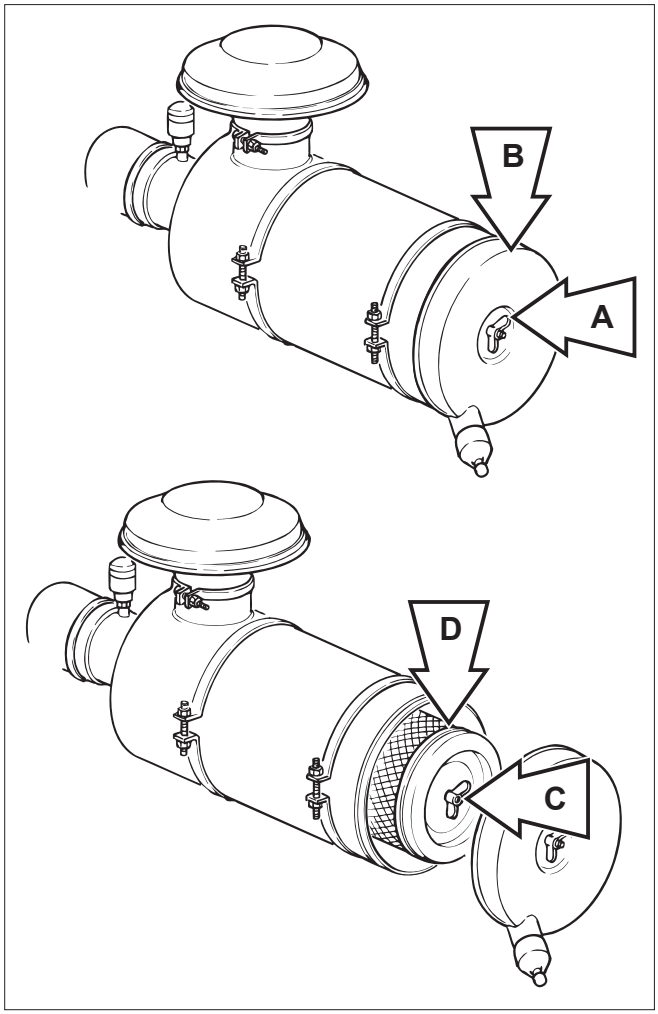
CAUTION

In case of need, please contact the TEREXLIFT Service Centre.

D-7 CHANGE THE MAIN CARTRIDGE OF THE ENGINE AIR FILTER

To change the cartridge of the engine air filter:

- Stop the engine and engage the parking brake.
- Unscrew wingnut **A** and remove cover **B**.
- Unscrew wingnut **C** and remove the outer element **D**.
- Clean the filter bowl.
- Smear the seal with grease, then mount the new element **D** and make sure it is correctly positioned.
- Tighten wingnut **C**, close cover **B** and tighten with wingnut **A**.



WARNING

As soon as the warning lamp on the cab dashboard switches on, replace the outer element.

WARNING

Never wash the cartridge with water or solvents.

D-8 RENEW THE CARTRIDGE OF THE ENGINE OIL FILTER AND THE FUEL FILTER

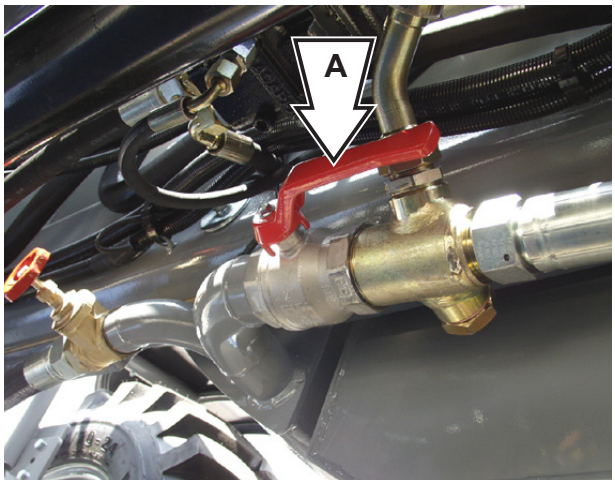
CAUTION

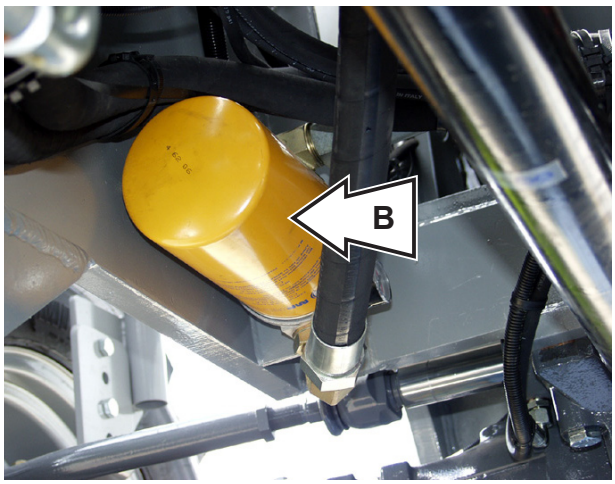
For the engine maintenance, please refer to the specific Operator handbook supplied with the machine.

D-9 CHANGE THE HYDRAULIC OIL FILTER OF THE TRANSMISSION

To change the hydraulic oil filter of the transmission, proceed as follows:

- Stop the machine on a level ground and engage the parking brake.
- Place a container of suitable size under the filter to collect any oil leaks, then close cock **A**.
- Remove the filter canister **B** with the special wrench provided.
- Renew the canister. Before fitting a new canister, thoroughly clean and grease both bowl and gasket.
- Hand-tighten and re-open cock **A**.





CAUTION

Hydraulic oil filter canisters cannot be cleaned or washed and refitted.
They must be replaced with new ones of the type recommended by the manufacturer:
Flow rate l/1' = 150
Filtering = 10 µ
Coupling = 1" 1/4 BSP

NOTICE

The handling and disposing of used oils may be ruled by local or national regulations. Address to authorised centres.

CAUTION

When changing the oil, drain it when it is still hot and the polluting substances are in suspension.

D-10 CHANGE THE OIL OF THE FRONT AND REAR DIFFERENTIAL CASINGS

To change the oil in the **front and rear differential gears**:

- Stop the machine on a level ground and engage the parking brake.

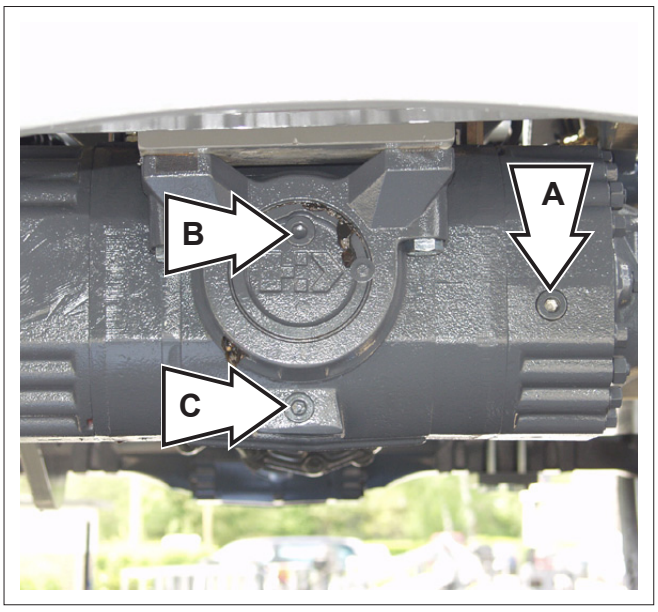
NOTICE

Place a container of suitable size under the plug.

- Loosen the drain plug **C**, the level plug **A** and the filler **B** and allow oil to flow out from the reduction gear.
- Refit and tighten drain plug **C**.
- Add new oil through the filler until it is level with hole **B**.
- Refit and tighten plugs **A** and **B**.

Recommended oil:

- **FUCHS TITAN GEAR LS 85 W-90**
  API GL-5 LS / GL-5



D-11 CLEAN THE CAB AIR FILTER

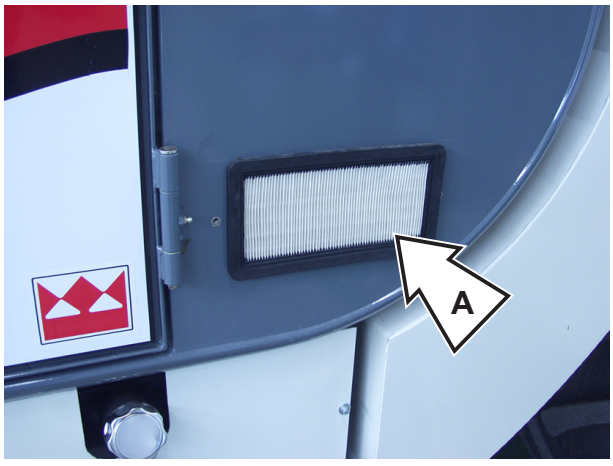
Every six months clean the air filter in the cab. Replace the cartridge if the filtering cloth is damged.

Cleaning and changing the cartridge:

- Shut the engine down and engage the parking brake.
- Pull filter **A** out of the housing accessible from the outside of the cab.
- Clean the filter bowl.
- Clean the filter cartridge by beating it against a piece of wood. Replace the cartridge if damaged.

CAUTION

Paper filters must never be cleaned using compressed air or washed with water and/or solvents.

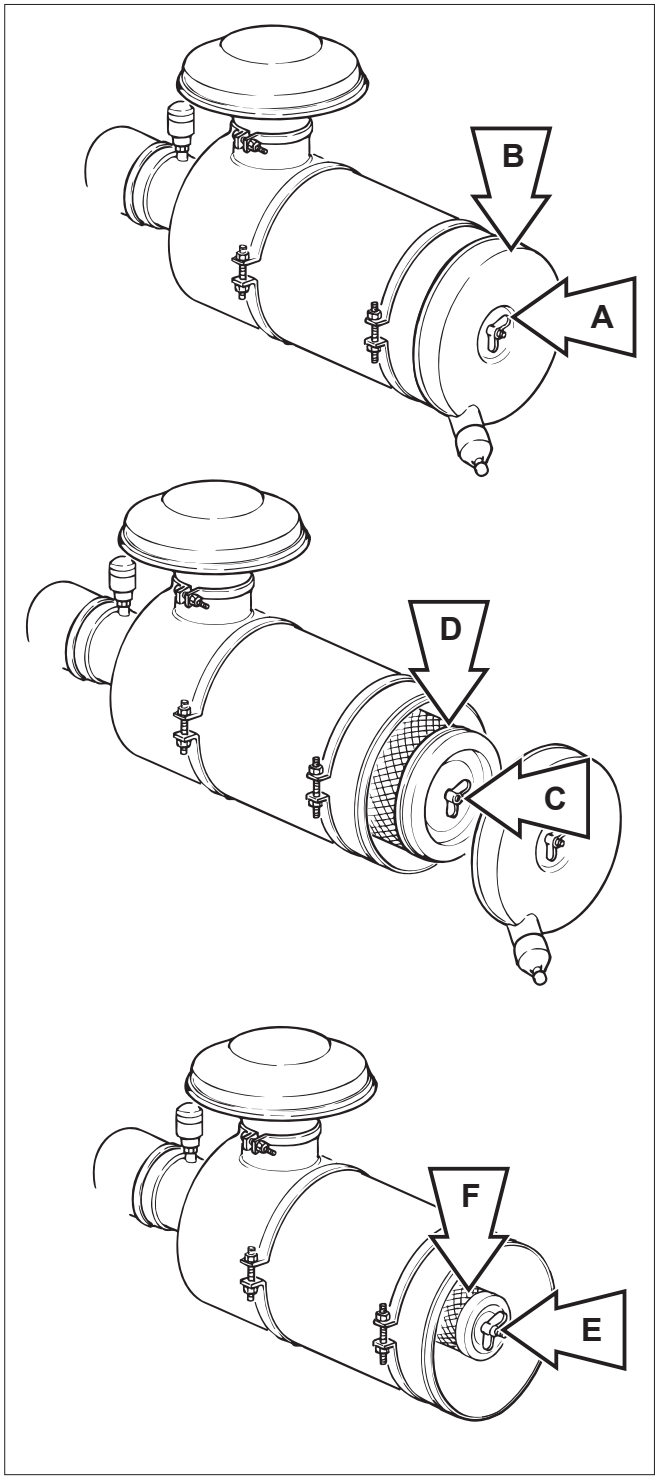


4.7 TABLE E PROCEDURES

E-1 CHANGE THE SAFETY ELEMENT OF ENGINE AIR FILTER

To change the safety element:

- Stop the engine and engage the parking brake.
- Unscrew wingnut **A** and remove cover **B**.
- Unscrew wingnut **C** and remove the outer element **D**.
- Unscrew wingnut **E** and remove the inner element **F**.
- Clean the filter bowl.
- Smear the seal with grease, then mount the new element and make sure it is correctly positioned.
- Tighten wingnut **E**.
- Refit the outer element **D**.
- Close cover **B** and tighten with wingnut **A**.



⚠WARNING

The inner element should be replaced every two times the outer element is replaced.

⚠WARNING

Never wash the cartridge with water or solvents.

E-2 CHANGE THE OIL OF THE GEARBOX

To change the oil in the **gearbox**:

- Stop the machine on a level ground and make sure the parking brake is engaged.

NOTICE

Place a container of suitable size under the plug.

- Remove the level plug **A** and the filler.
- Remove the drain plug **B** and empty the gearbox.
- Refit and tighten the drain plug **B**.
- Add new oil through the filler until it is level with hole **A**.
- Refit and tighten filler/level plug **A**.

Recommended oil:

- **FUCHS TITAN GEAR LS 85 W-90**
  API GL-5 LS / GL-5

E-3 CHANGE THE OIL IN THE FOUR WHEEL REDUCTION GEARS

To change the oil in the **wheel reduction gears**:

- Stop the machine on a level ground and ensure the parking brake is engaged and plug **A** is oriented along the vertical axis.

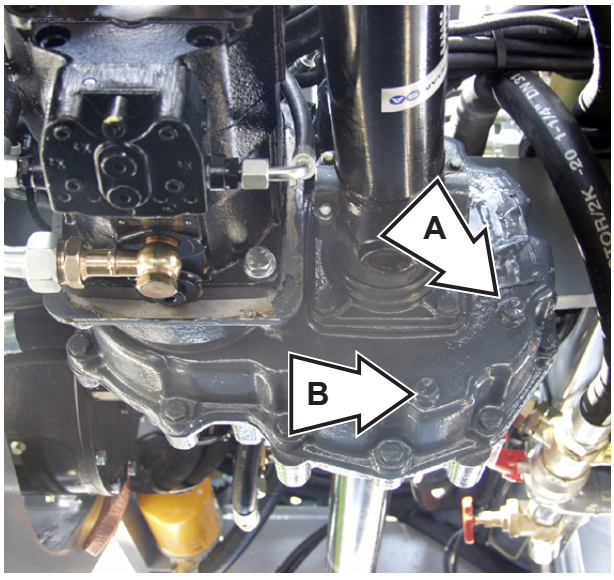
NOTICE

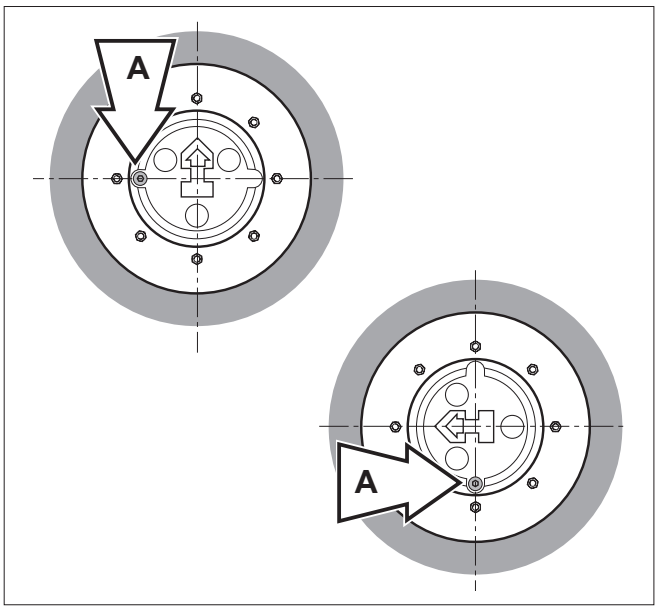
Place a container of suitable size under the plug.

- Unscrew plug **A** and drain any oil from the reduction gear.
- Rotate the wheel by 90° until the plug finds again on the horizontal axis.
- Add new oil through hole **A**.
- Refit and tighten plug **A**.

Recommended oil:

- **FUCHS TITAN GEAR LS 85 W-90**
  API GL-5 LS / GL-5

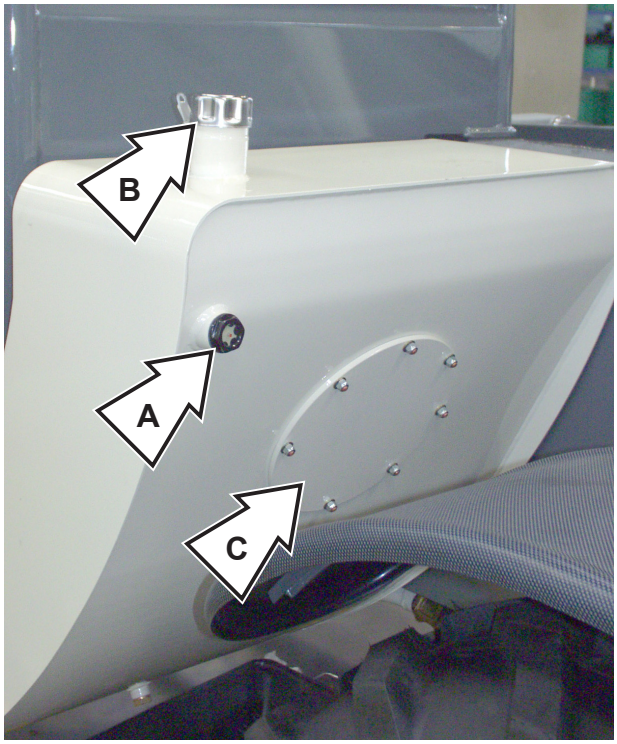




E-4 CHANGE THE HYDRAULIC OIL

To change the hydraulic oil:

- Stop the machine on a level ground and make sure the parking brake is engaged.
- Release the pressure from the hydraulic circuit.
- Place a container of suitable size under the drain plug, placed in the lower part of the reservoir, and collect any oil leaks.
- Remove the drain plug and allow oil to flow out into the container.
- Remove the inspection cover **C** of tank.
- Carefully wash the tank with Diesel oil and blow a jet of compressed air.
- Refit the drain plug and the inspection cover **C**.
- Add new oil by making sure that it matches the recommended type indicated until it is level with **A**.



Recommended oil:

- **SHELL TELLUS T22 (Temperatures below -10° C)**
- **SHELL TELLUS T46 (Temperatures from -15° C to +45° C)**
- **SHELL TELLUS T68 (Temperatures above +30° C)**

NOTICE

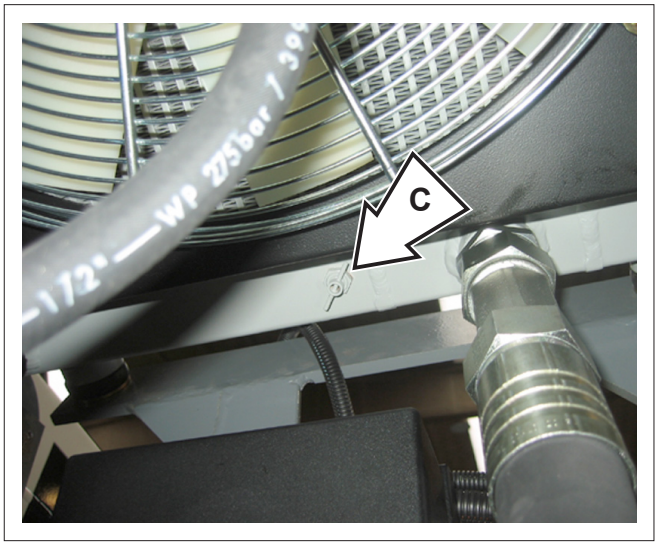
The handling and disposing of used oils can be ruled by local or national regulations. Address to authorised centres.

4.8 TABLE F PROCEDURES

F-1 CHANGE THE ENGINE COOLANT

⚠DANGER

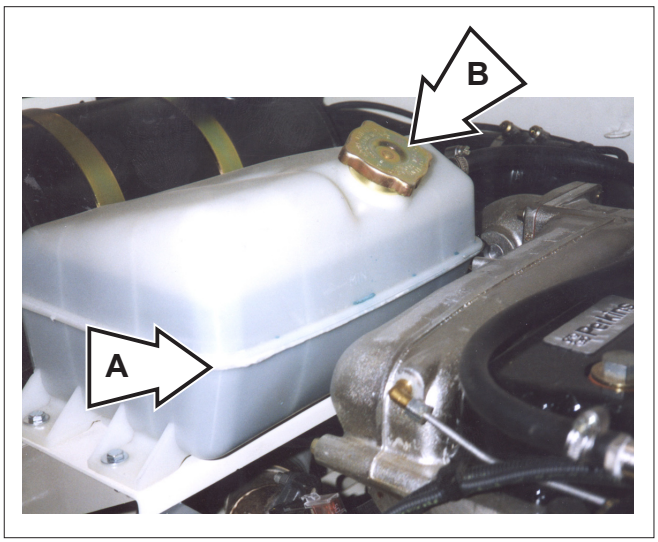
When the coolant is hot, the cooling system is under pressure. With warm engine, loosen the radiator plug slowly and carefully, without removing it, to drain the pressure. Use protection gloves and keep your face at a safe distance.



To drain the antifreeze:

- Unscrew the plug **C** at the bottom of the radiator or disconnect the rubber hose, if no plug is present. Allow the coolant to flow out into a special container.
- Refit the hose and pour new antifreeze (50% water-antifreeze). This proportion will provide protection up to -38°C.

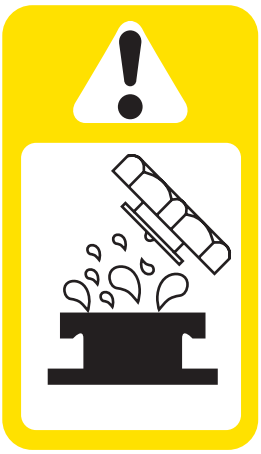
On delivery, the machine is filled with a cooling mixture consisting of 50% water and 50% anti-freeze.

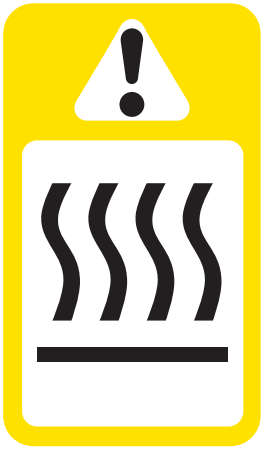


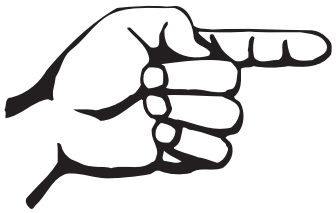
TEREX PRO COOL Protection against boiling / freezing		
Product %	Freezing point	Boiling point
33	-17 °C	123 °C
40	-24 °C	126 °C
50	-36 °C	128 °C
70	-67 °C	135 °C

⚠WARNING

Use an antifreeze mixture in the proportions recommended by the manufacturer in relation to the ambient temperature of the jobsite.







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Section 5
TROUBLESHOOTING

SECTION INDEX

5.1 INTRODUCTION

- *Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.*
- *Immediately tag and remove from service a damaged or malfunctioning machine.*
- *Repair any damage or malfunction before operating machine.*
- *Unless otherwise specified, perform each procedure with the machine in the following configuration:*
  - *machine parked on a flat level surface;*
  - *boom in the stowed position;*
  - *key switch in the OFF position with the key removed.*

Before troubleshooting:

- *Read, understand and obey the safety rules and operating instructions printed in the Operator Manual of the machine.*
- *Be sure that all necessary tools are available and ready for use.*
- *Read each appropriate flow chart thoroughly.*
- *Pay special attention to the following warnings:*

⚠DANGER

Crushing hazard. When testing or replacing any hydraulic component, always support the structure and secure it from movement.

⚠WARNING

Electrocution hazard. Contact with electrically charged circuits may result in death or serious injry. Remove all rings, watches and other jewerly.

⚠WARNING

Spraying hydraulic oil can penetrate and burn skin; loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

CAUTION

Perform all troubleshooting on a firm level surface.

CAUTION

Two person will be required to safely perform some troubleshooting procedures.

5.2 ABOUT THIS SECTION

The tables on the following pages should be used to find and rectify problems that can occur when using the machine.

Prepare adequate tools, and especially a voltmeter and a pressure gauge to carry out the checks explained on next pages.

The initials of the electrical and hydraulic parts indicated in the following tables are given to help you find such parts on the schemes and diagrams in chapter 6.

The tables should be read as follows:

- once you have identified the problem, search this problem in the "**problem**" column;
- analyse the possible causes explained in the "**causes**" column;
- proceed with the check or replacement according to the instructions provided in the "**solutions**" column;
- check that the machine runs well;
- if the problem cannot be eliminated, check again all indications in the "**causes**" column and proceed accordingly.

CAUTION

For any further information, contact the TEREXLIFT Service Centre.

5.3 ELECTRIC FAULTS

Problem	Cause	Solution
When key is turned to 1, the dashboard is not powered	Battery discharged	Check the battery, replace if necessary.
	Battery coutout switch	Check that the switch is in the correct position and it works fine. Replace if damaged.
	Ground	Check that the ground braid between chassis and engine is correctly connected and intact.
	50A fuse **F2G** blown.	Check the fuse; replace if necessary.
	Ignition key block	Check that contact **30** of the ignition key is powered; if you have not 12V on contact **15/54**, change the key.
	Fuses-relays board damaged	Check you have 12V on connector **J2** of the board, or replace the board.
	Relay **K05** damaged.	Check the 50A **F3G**, the connections and, if necessary, replace the relay.
The machine cannot be started from the driving cab	Ignition key	Check that contact **50a** of the key supplies 12V when the key is in the start position (turned right).
	Relay **K11** damaged	Check the relay; replace if necessary.
	Speed selector **SX12**	Check if the speed is engaged or change the speed selector.
	15A fuse **F5G**	Check the fuse; replace if necessary.
	Socket **X17** on fuses board	Check if you have 12V on pin **8** of connector **X17** when the key is turned to the start position.
	Problem on the line from dashboard to engine box	Check the continuity between pin **8** of connector **X17** and pin **85** of relay **K01** located in the engine box.

Problem	Cause	Solution
	Inputs-outputs of relay **K01**	Check that contact **86** of the relay is ground connected, you have 12V on contact **30** and there is power on contact **87** when the key is turned to the start position.
	Starting motor relay damaged	Check the starting motor coil is powered. If the coil is powered and the motor does not work, change the motor.
	Starting motor damaged	Check and replace if necessary.
	Efficiency of the grounding system	Check and, if necessary, reconnect the rgounding system to the chassis.
	50A fuse **F2G** blown.	Change the fuse.
	Electrostop solenoid valve and fuel pump damaged	Check the efficiency of the solenoid valves, replace if necessary.
The machine cannot be started from the platform	Ignition key	Check you have 12V on contact **58** when the ignition key is fully turned to the left.
	Road/jobsite selector	The key must be in the "platform" position; check that the two ends of contact **S35** are powered and you have 12V on contact **3** on the platform socket.
	Platform ignition key	Check that key is turned to position 1. Check you have 12V on contact **4** of the platform socket. Check you have 12V on connector **X7** to pins **6**-**7**-**12**, on connector **X4** to pin **6**, and on contact **+15** of the relays board.
	Platform start button	With the button pressed down, check you have 12V on pin **13** of the boom socket, on connector **X17** to pins **8**-**9**, on contact **85** of relay **K01**.
	Boom line interrupted	Check the continuity of the 24 poles of the boom line.
	Reel on platform damaged	Check the efficiency of the reel and replace, if necessary.

Problem	Cause	Solution
	Control pedals on platform damaged	Check the activation key and the emergency button; replace the button if necessary. Check you have 12V on output contact **12** of the pushbuttons panel.
	Fuses blown	Check fuses **F2G**-**F5G**–**F20**; replace if necessary.
	Electrostop solenoid valve and fuel pump damaged	Check the efficiency of the solenoid valves; replace if necessary.
The starting motor runs but the engine does not start	No fuel	Refuel.
	Fuse **F20** blown.	Check the fuse; replace if necessary.
	Electrostop and fuel pump damaged	Check and replace if necessary.
The battery gets discharged too fast	Internal elements broken	Change the battery.
	The alternator does not recharge.	Check the efficiency of the alternator and replace if necessary.
The machine does not move	Parking brake engaged	Disengage the parking brake.
	Outriggers down	Raise.
	Fuse **F14** blown	Check and replace, if necessary.
	Parking brake micro-switch **S6b** damaged	Check the micro-switch and replace, if necessary.; with the parking brake released, you must have 12V on the pink-yellow wire.
	Outrigger limits switches **S51** and **S52** damaged	Check you have 12V on connector **X5** to pin **4** and on connector **X26** to pin **3**. Check the mechanical parts of the limit switch and replace the switch if necessary.
	Speed selector **SX12** damaged	Check you have 12V on connector **X12** to pin **1**. By shifting the selector forwards, you must have 12V on connector **X5** to pin **3**, while, by shifting the selector back, you must have 12V on connector **X5** to pin **2** ci siano 12V. Change the selector, if necessary.

Problem	Cause	Solution
	No mechanical gear put	Check that micro-switch **B54** lets the signal enter through pin **8** of connector **X16** of the fuses and relays board and power the coils of relays **K9** and **K10** which supplies relays **K7** and **K8** with power (forward and reverse speed).
	The solenoid valves of the forward and reverse speeds are damaged	Check you have 12V on solenoid **Y01-A**, when the forward gear is put, and, 12V on solenoid **Y02-B** when the reverse gear is put. If necessary, change the coils of the solenoid valves.
	Relays **K7** and **K8** damaged	Check the relays and replace if necessary.
	Relays **K9** and **K10** damaged	Check the relays and replace if necessary.
	Relays board damaged	Check you have 12V on connector **X16** on pins **4** and **8**; if necessary replace the board.
No shifting between first and second mechanical gear	Relays board damaged	Check you have 12V on connector **X16** on pins **9** and **11**; if necessary replace the board.
	Fuse **F14** blown.	Check the fuse and replace if necessary.
	Speed change button **S14** damaged	Check you have 12V on contact **5** and, 12V on contact **1** with the button pressed down; change the button if necessary.
	Speed change sensor damaged	Check the sensor and replace if necessary.
	Speed change control unit **S24** damaged	Check the inputs of the control unit: you must have 12V on connector **X17** to pin **17** when the button is pressed, and 0V on connector **X16** to pin **13** with the machine stopped. If necessary, change the board.
	Speed change control unit **S24** damaged	Check the control unit's output to **86** of relay **K5** and, if necessary, replace.

Problem	Cause	Solution
	Relays board damaged	Check the outputs of the control unit: you must have 12V on connector **X16** to pin **6** when the first gear is put, and 12V on pin **7** with the second gear is put. If necessary, change the board.
	The coils of the speed change solenoid valves are damaged	Check coils **Y8-B** and **Y9-A** and replace, if necessary.
The boom does not move	Fuse **F24** blown.	Check the fuse and replace if necessary.
	Road/Jobsite selector turned to a wrong position	The key-selector must be turned to "Jobsite".
	Road/Jobsite/Platform selector damaged	Check the contacts and replace, if necessary. Check you have 12V on contact **S33** and on connector **XJ1** on pin **7A**.
	Dead man switch on joystick damaged.	Check you have 12V on connector **X10** on pin **E** and there is power on connector **J1** on pin **2A**; change the joystick, if necessary.
	Tecnord control unit damaged	Change the control unit.
	Solenoid **Y43** damaged	Check you have 12V between the coil contacts when the joystick is moved; or change the solenoid.
The boom cannot be moved up	Fuse **F24** blown	Check the fuse and replace if necessary.
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 4.25V on pin **B** with the joystick in "boom up" position: If necessary, replace the joystick.
	Tecnord control unit damaged	Check you have 4.25V on connector **J1** on pin **1B** with the joystick in the "boom up" position and about 4.25V on connector **J2** on pin **5B** with the joystick in the same position. If necessary, change the control unit.

Problem	Cause	Solution
	Relays board damaged	Check the inputs of the control unit: you must have 12V on connector **X18** to pins **3** and **10** and about 4.25V on pin **6**. Change relay **K16** or the relays board.
	Solenoid **Y46-1** damaged	Check you have 12V on contact **1** of the coil, that there is continuity between contact **2** and the ground and you have about 4.25V on conrtact **3**. If necessary, change the solenoid.
The boom cannot be moved down	The machine could be in alarm	Check on the display in the driving cab that the overload warning system is not active.
	Fuse **F24** blown	Check the fuse and replace if necessary.
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 0.70V on pin **B** with the joystick in the "boom down" position; if necessary, change the joystick.
	Tecnord control unit damaged	Check you have 0.70V on connector **J1** on pin **1B** with the joystick in the "boom down" position and about 0.70V on connector **J2** on pin **5B** with the joystick in the same position. If necessary, change the control unit.
	Relays board damaged	Check the inputs of the control unit: you must have 12V on connector **X18** to pins **3** and **10** and about 0.70V on pin **6**. Change relay **K16** or the relays board.
	Solenoid **Y46-1** damaged	Check you have 12V on contact **1** of the coil, that there is continuity between contact **2** and the ground and you have about 0.70V on contact **3**. If necessary, change the solenoid.
The boom cannot be moved out	The machine could be in alarm	Check on the display in the driving cab that the overload warning system is not active.
	Fuse **F24** blown	Check the fuse and replace if necessary.

Problem	Cause	Solution
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 4.25V on pin **F** with the joystick in the "boom out" position; if necessary change the joystick.
	Tecnord control unit damaged	Check you have about 4.25V on connector **J1** on pin **1A** with the joystick in the "boom out" position and about 4.25V on connector **J2** on pin **8C** with the joystick in the same position. If necessary, change the control unit.
	Relays board damaged	Check the inputs of the control unit: you must have 12V on connector **X18** to pins **3** and **10** and about 4.25V on pin **5**. Change relay **K15** or the relays board.
	Solenoid **Y45-3** damaged	Check you have 12V on contact **1** of the coil, that there is continuity between contact **2** and the ground and you have about 4.25V on contact **3**. If necessary, change the solenoid.
The boom cannot be moved in	Fuse **F24** blown	Check the fuse and replace if necessary.
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 0.70V on pin **F** with the joystick in the "boom in" position; if necessary change the joystick.
	Tecnord control unit damaged	Check you have about 0.70V on connector **J1** on pin **1A** with the joystick in the "boom in" position and about 0.70V on connector **J2** on pin **8C** with the joystick in the same position. If necessary, change the control unit.
	Relays board damaged	Check the inputs of the control unit: you must have 12V on connector **X18** to pins **3** and **10** and about 0.70V on pin **5**. Change relay **K15** or the relays board.
	Solenoid **Y45-3** damaged	Check you have 12V on contact **1** of the coil, that there is continuity between contact **2** and the ground and you have about 0.70V on contact **3**. If necessary, change the solenoid.

Problem	Cause	Solution
The forks cannot be rotated (retraction)	Fuse **F24** blown	Check the fuse and replace if necessary.
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 0.70V on pin **C** with the joystick in the "forks retracted" position; if necessary, replace the joystick.
	Tecnord control unit damaged	Check you have about 0.70V on connector **J1** on pin **1C** with the joystick in the "forks retracted" position and about 0.70V on connector **J2** on pin **5B** with the joystick in the same position. If necessary, change the control unit.
	Solenoid **Y44-2** damaged	Check you have 12V on contact **1** of the coil, that there is continuity between contact **2** and the ground and you have about 0.70V on contact **3**. If necessary, change the solenoid.
The forks cannot be rotated (extension)	Fuse **F24** blown	Check the fuse and replace if necessary.
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 4.25V on pin **C** with the joystick in the "forks extended" position; if necessary, replace the joystick.
	Tecnord control unit damaged	Check you have about 4.25V on connector **J1** on pin **1C** with the joystick in the "forks extended" position and about 4.25V on connector **J2** on pin **5B** with the joystick in the same position. If necessary, change the control unit.
	Solenoid **Y44-2** damaged	Check you have 12V on contact **1** of the coil, that there is continuity between contact **2** and the ground and you have about 4.25V on contact **3**. If necessary, change the solenoid.
The attachment cannot be locked	Fuse **F24** blown	Check the fuse and replace if necessary.

Problem	Cause	Solution
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 12V on pin **G** when the white button is pressed; if necessary, replace the joystick.
	Tecnord control unit damaged	Check you have about 12V on connector **J1** on pin **3C** with the white button pressed and 12V on connector **J2** on pin **1B** with the joystick in the "attachment locked" position. If necessary, change the control unit.
	Solenoid **Y47-4** damaged.	Check there is continuity between contact **2** of the coil and the ground and you have 12V on contact **3** with the joystick in the "attachment locked" position. If necessary, change the solenoid.
The attachment cannot be unlocked	Fuse **F24** blown.	Check the fuse and replace if necessary.
	Joystick damaged	Check you have 5V on connector **X10** on pin **A** and about 12V on pin **G** when the white button is pressed; if necessary, replace the joystick.
	Tecnord control unit damaged	Check you have about 12V on connector **J1** on pin **3C** with the white button pressed and 12V on connector **J2** on pin **1C** with the joystick in the "attachment unlocked" position. If necessary, change the control unit.
	Solenoid **Y47-4** damaged	Check there is continuity between contact **2** of the coil and the ground and you have 12V on contact **3** with the joystick in the "attachment unlocked" position. If necessary, change the solenoid.
The left outrigger does not move down	Low boom sensor (**B38**) damaged	Check the sensor ; check you have 12V on connector **J1** on pin **3A**; change the sensor, if necessary.
	Outrigger switch **S1** damaged	Check you have 12V on contact **3** of the switch, and 12V on contact **1** of the switch when the movement is done. Change the switch, if necessary.

Problem	Cause	Solution
	Tecnord control unit damaged	Check you have 12V on connector **J1** on pin **5B** and on connector **J2** to pin **2A** when the movement is done; if necessary, change the control unit.
	Solenoid **Y13-E** damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.
The left outrigger does not move up	Low boom sensor (**B38**) damaged	Check the sensor ; check you have 12V on connector **J1** on pin **3A**; change the sensor, if necessary.
	Outrigger switch **S1** damaged	Check you have 12V on contact **3** of the switch, and 12V on contact **7** of the switch when the movement is done. Change the switch, if necessary.
	Tecnord control unit damaged	Check you have 12V on connector **J1** on pin **4A** and on connector **J2** to pin **1A** when the movement is done; if necessary, change the control unit.
	Solenoid **Y12-D** damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.
The right outrigger does not move down	Low boom sensor (**B38**) damaged	Check the sensor ; check you have 12V on connector **J1** on pin **3A**; change the sensor, if necessary.
	Outrigger switch **S2** damaged	Check you have 12V on contact **3** of the switch, and 12V on contact **1** of the switch when the movement is done. Change the switch, if necessary.
	Tecnord control unit damaged	Check you have 12V on connector **J1** on pin **6C** and on connector **J2** to pin **4A** when the movement is done; if necessary, change the control unit.
	Solenoid **Y11-C** damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.

Problem	Cause	Solution
The right outrigger does not move up	Low boom sensor (**B38**) damaged	Check the sensor ; check you have 12V on connector **J1** on pin **3A**; change the sensor, if necessary.
	Outrigger switch **S2** damaged	Check you have 12V on contact **3** of the switch, and 12V on contact **7** of the switch when the movement is done. Change the switch, if necessary.
	Tecnord control unit damaged	Check you have 12V on connector **J1** on pin **5A** and on connector **J2** to pin **3A** when the movement is done; if necessary, change the control unit.
	Solenoid **Y10-F** damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.
No sway to the right	Low boom sensor (**B38**) damaged	Check the sensor ; check you have 12V on connector **J1** on pin **3A**; change the sensor, if necessary.
	Sway switch **S3** damaged	Check you have 12V on contact **3** of the switch, and 12V on contact **7** of the switch when the movement is done. Change the switch, if necessary.
	Tecnord control unit damaged	Check you have 12V on connector **J1** on pin **6A** and on connector **J2** to pin **6A** when the movement is done; if necessary, change the control unit.
	Solenoid **Y15-B** damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.
No sway to the left	Low boom sensor (**B38**) damaged	Check the sensor ; check you have 12V on connector **J1** on pin **3A**; change the sensor, if necessary.

Problem	Cause	Solution
	Sway switch **S3** damaged	Check you have 12V on contact **3** of the switch, and 12V on contact **1** of the switch when the movement is done. Change the switch, if necessary.
	Tecnord control unit damaged	Check you have 12V on connector **J1** on pin **6B** and on connector **J2** to pin **5A** when the movement is done; if necessary, change the control unit.
	Solenoid **Y14-A** damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.
The rear steering axle of the machine remains locked	Fuse **F18** damaged	Check the fuse and replace if necessary.
	Proximity sensor **B41** damaged	With the sensor excited, check you have 12V on connector **X18** to pin **9**; or change the sensor.
	Relay **K21** damaged	Check you have 12V on connector **X18** to pin **1**; or change the relay.
	Solenoids **Y50** and **Y51** damaged	Check you have 12V between the two contacts of the coils; or change the coils.
The 4-wheel steer does not function	Steering solenoid valve damaged	During movement, check you have 12V between the two contacts of the coil; or change the solenoid.
	Fuse **F13** damaged	Check the fuse and replace if necessary.
	Road/Jobsite key-selector damaged	Check that the selector is in the "Jobsite" position. Check you have 12V on contact **S22**; if necessary, change the selector.
	Steering selector **S22** damaged	Check you have 12V on pins **A** and **C** on the selector; or change the selector.

Problem	Cause	Solution
	Solenoid **Y20-A** damaged	Check you have 12V between the two contacts of the coil; or change the solenoid.
The crab steer does not function	Fuse **F13** damaged	Check the fuse and replace if necessary.
	Road/Jobsite key-selector damaged	Check that the selector is in the "Jobsite" position. Check you have 12V on contact **S32**; if necessary, change the selector.
	Steering selector **S22** damaged	Check you have 12V on pins **A** and **B** on the selector; or change the selector.
	Solenoid **Y21-B** damaged	Check you have 12V between the two contacts of the coil; or change the solenoid.
The horn does not function	Fuse **F21** damaged	Check the fuse and replace if necessary.
	Fuse **F3** damaged	Check the fuse and replace if necessary.
	Horn button damaged	Check you have 12V on connector **X11** to pin **1** of the selector and 12V on connector **X11** to pin **13** with the button pressed down; or change the selector.
	Relay **K3** damaged	With the button pressed, check you have 12V on connector **X9** to pin **4** and connector **X17** to pins **14** and **17**; or change the relay.
	Horn **H20** damaged	Check you have 12V between the two wires connected to the horn; if there is power, change the horn.
The position lights do not function	Fuses **F7**, **F8**, **F10** and **F17** damaged	Check the fuses and replace if necessary.
	Switch **S19** damaged	Check you have 12V on contacts **2**, **3** and **6** of the switch; or replace the switch.
	Lamps damaged	Check the lamps and replace if necessary.

Problem	Cause	Solution
The low beams do not function	Fuse **F10** damaged	Check the fuse and replace if necessary.
	Switch **S19** damaged	Check you have 12V on contact **1**, **2** and **3** of the switch; or replace the switch.
	Lights selector **SX11** damaged	Check you have 12V on connector **X11** to pins **3** and **4**; or change the lights selector.
	Fuse **F15** damaged	Check the fuse and replace if necessary.
	Relay **K1** damaged	Check you have 12V on connector **X17** to pins **16** and **4**; or change the relay.
	Lamps damaged	Check the lamps and replace if necessary.
The high beams do not function	Fuse **F10** damaged	Check the fuse and replace if necessary.
	Switch **S19** damaged	Check you have 12V on contact **1**, **2** and **3** of the switch; or replace the switch.
	Lights selector **SX11** damaged	Check you have 12V on connector **X11** to pins **4** and **5**; or change the lights selector.
	Fuse **F6** damaged	Check the fuse and replace if necessary.
	Relay **K2** damaged	Check you have 12V on connector **X17** to pins **15** and **11**; or change the relay.
	Lamps damaged	Check the lamps and replace if necessary.
The turn signals do not function	Fuse **F1** damaged	Check the fuse and replace if necessary.
	Lights selector **SX11** damaged	Check you have 12V on connector **X11** to pin **1**, then activate the turn signals and check that pins **9** and **10** are powered intermittently. If necessary, change the lights selector.

Problem	Cause	Solution
	Turn signals' lamps damaged	Check the lamps and replace if necessary.
The beacon does not function	Fuse **F4** damaged	Check the fuse and replace if necessary.
	Beacon (**X101**) damaged	Check you have 12V on connector **X26** to pin **6**; or change the beacon.
	Beacon lamp (**X101**) damaged	Check the lamp and replace if necessary.
The engine water temperature indicator does not function	Fuse **F9** damaged	Check the fuse and replace if necessary.
	High water temperature thermostat (**B13**) damaged	Check the thermostat and replace if necessary.
	High water temperature indicator (**P1**) damaged	Check you have 12V between pins **6** and **3** of connector **XP1**. Or change the indicator.
The hydraulic oil temperature indicator does not function	Fuse **F9** damaged	Check the fuse and replace if necessary.
	Hydraulic oil temperature thermostat (**B16**) damaged	Check the thermostat and replace if necessary.
	Hydraulic oil temperature indicator (**P2**) damaged	Check you have 12V between pins **6** and **3** of connector **XP2**. Or change the indicator.
The fuel gauge does not function	Fuse **F9** damaged	Check the fuse and replace if necessary.
	Fuel level float (**B12**) damaged	Check the float and replace if necessary.
	Fuel level indicator (**P3**) damaged	Check you have 12V on connector **XP3** to pin **1** and there is continuity between pins **3** and **4** and the ground; if necessary, change the indicator.
The emergency pump do not work	Fuses **F4G** and **F20** damaged	Check the fuses and replace if necessary.

Problem	Cause	Solution
	Emergency stop switch (**S13**) damaged	With the emergency switch pressed, check you have not 12V on pin **6** of connector **X6**; or change the switch contact.
	Relay **K13** damaged	Check you have 12V on pins **5** and **6** of connector **X6**; or change the relay.
	Emergency pump button (**S17**) damaged	Check you have 12V on contact **5** and that 12V reach contact **1** when the button is pressed. If necessary change the button.
	Relay **K04** damaged	Check you have 12V on connector **X29** to pin **13** and on the relay to contact **87**; or change the relay.
	Electropump **M2** damaged	With the button pressed, check you have 12V between the two contacts of the coil; or change the coil.
The heating fan does not function	Fuse **F2** damaged	Check the fuse and replace if necessary.
	Switch **S20** damaged	Check you have 12V on contact **3**, 12V on contact **5** when the switch is on the first step and 12V on contact **1** when the switch is pressed down. If necessary change the switch.
	Fan body **M5** damaged	With the fan to first speed, check you have 12V between pins **4** and **1** of connector **XM5**. Wit the fan to second speed, check you have 12V between pins **3** and **1** of connector **XM5**; if necessary, change the fan.
The battery warning light remains lit	Alternator **A1** damaged	Check the efficiency of the alternator and replace, if necessary.
Hourmeter P4 does not function	Alternator **A1** damaged	Check you have 12V on pin **13** of connector **X19**; if necessary, change the alternator.

Problem	Cause	Solution
	Hourmeter **P4** damaged	Check you have 12V between the two contacts of the hourmeter; if necessary, change the hourmeter.
The warning light of the parking brake does not function	Fuse **F2G** damaged	Check the fuse and replace if necessary.
	Contact **S6a** damaged	With a continuity tester, check that the contact is closed, or replace.
	The lamp of the parking brake light is damaged	Check there are 12V between pins **1** and **2**; or change the lamp.
The air filter restriction warning light does not function	Fuse **F2G** damaged	Check the fuse and replace if necessary.
	Air filter restriction bulb (**B15**) damaged	Check the efficiency of the bulb and replace, if necessary.
	The lamp of the warning light is damaged	Check you have 12V between pins **1** and **5**; or change the lamp.
The light warning of a low engine oil pressure does not function	Fuse **F2G** damaged	Check the fuse and replace if necessary.
	Low engine oil pressure bulb (**B11**) damaged	Check the efficiency of the bulb and replace, if necessary.
	The lamp of the warning light is damaged	Check you have 12V between contacts **7** and **2** of connector **X1**; or change the lamp.
The light warning of a low pressure in the braking system does not go off	Sensor **B56** damaged	Check the efficiency of the bulb and replace, if necessary.
The windscreen wiper does not function	Fuse **F1** damaged.	Check the fuse and replace if necessary.
	Wiper control **SX11** damaged	Check you have 12V on connector **X11** to pin **1**. With the wiper to first speed, check you have 12V on connector **X11** to pin **2**, and with the wiper to second speed, check you have 12V on pin **8**. If necessary, change the wiper control.

Problem	Cause	Solution
	Wiper motor **M13** damaged	Check you have 12V on connector **X13** to pin **3**, and, with selecting the two speeds one at a time, check there is power on pins **2** and **4** of connector **X13**. If necessary, change the motor.
The windscreen washer does not function	Fuse **F1** damaged	Check the fuse and replace if necessary.
	Washer control **SX11** damaged	Check you have 12V on connector **X11** to pin **1** and, with the button pressed, check that pin **7** is powered; or change the button.
	Washer motor **M91** damaged	With the button pressed, check you have 12V between the two contacts of the motor; or change the motor.
The cab interior lights do not function	Fuse **F23** damaged	Check the fuse and replace if necessary.
	Lamps damaged	Check you have 12V on pin **5** of connector **X8**; or change the lamp.
The display of the overload warning system does not turn on	Fuse **F25** damaged	Check the fuse and replace if necessary.
	Display damaged	Check you have 12V between pins **1** and **2** of the connector; or change the display.
The machine is in alarm and lets you operate only the lowering and retraction movements (without displaying any alarm codes)	Display damaged	Check you have 12V between pins **1** and **2** of the connector; or change the display.
	Tecnord control unit damaged	Check you have 12V on pin **4B** of connector **XJ1**; or change the control unit.
The display does not change the reading scale when you switch from machine on wheels to machine on outriggers	Outrigger limit switches (**S51** and **S52**) damaged	Lower the outriggers to the ground and, with a tester, check that the two NO contacts of the limits switches are closed. Check you have 12V on pin **10** of connector **X22**. If necessary, change the limit switches.

Problem	Cause	Solution
	Display damaged	With the outriggers down to the ground, check you have 12V between pins **2** and **5** of connector **X29**. If necessary, change the display.

5.4 HYDRAULIC FAULTS

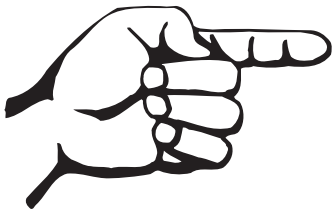
Problem	Cause	Solution
The machine does not move	Drive pump maladjusted	Re-adjust as per enclosed instructions.
	DA valve damaged	Check and replace, if necessary.
Poor boost pressure	Booster pump damaged	Change the pump.
	Suction filter restricted	Change the filter.
	Hydraulic motor damaged	Change the motor.
The machine drive is low	Hydraulic oil filter restricted	Change the hydraulic oil filter.
	Low oil level	Top up.
	Hydraulic oil soiled	Clean the tank and the pipes, empty the pumps and add new oil.
	Pump and motor worn (serious leakage)	Change pump and motor.
No shifting between 1st and 2nd mechanical gear	Boost pressure low	Check the boost pressure.
	Mechanical gear selection solenoid valve ref. **EV5-B-Y8** - **EV6-A-Y9** damaged	Check the mechanical movement of the pin of the solenoid valve and the coil.
	Mechanical gear hydraulic actuator damaged	Check the efficiency of the actuator.
	Gearbox gears damaged	Check and replace the gears if necessary.
No steering selection	Steering seelction solenoid valve ref. **EV3-B-Y21** - **EV4-A-Y20** damaged	Check the movement of the pin inside the solenoid valve and the coil.
Poor action of the parking brake	Negative parking brake ref. **P1** damaged	Check the brake is in efficient working order or replace.
	Parking brake hand-control damaged	Check the parking brake control; replace if necessary.

Problem	Cause	Solution
The right - left sway does not work	Sway cyilinders damaged	Check or replace the internal seals, if necessary
	Block valves damaged	Check the sliders and the coils of the solenoid valves.
	Solenoid valves **EV11-A-Y14** - **EV12-B-Y15** do not work.	Check the sliders and the efficiency of the solenoid valves.
The outriggers do not work	Outrigger cylinders damaged	Check the efficiency and the internal seals of the cylinder.
	Outrigger cylinders' block valves damaged	Check the efficiency of the valves and that the internal pistons slide correctly.
	Outriggers' solenoid valves (**EV7-D-Y12** - **EV8-E-Y13** - **EV9-F-Y10** - **EV10-C-Y11**) damaged	Check the efficiency of the solenoid valves.
The machine does not steer	Main pump damaged	Check the max pressure.
	Load-sensing priority valve damaged	The priority valve does not deliver hydraulic oil to the hydraulic drive; change the valve unit.
	Hydraulic drive damaged.	Check the efficiency of the hydraulic drive and if the pilot activates the priority valve.
	Steering cylinders damaged	Check the efficiency and the internal seals of the cylinders.
	Steering selection valve (**EV3-B-Y21** - **EV4-A-Y20**) damaged	Check that the internal piston of the solenoid valve and the coil are in efficient working order.
The boom does not move	Main gear pump damaged	The pump does not deliver oil. Check the max output pressure of the pump
	Load-sensing priority valve damaged	Valve restricted or damaged; remove and check the seals and the efficiency of the slider.
	Tecnord control block damaged	Check the efficiency of the control block (see par. 2 - sect. "Technical Specifications"). Remove the pressure relief valve and eliminate any dirt.

Problem	Cause	Solution
When the brake pedal is stepped down, the machine does not brake	Auxiliary pump damaged	Check the pump thoroughly.
	Brake pump damaged	Check the pump thoroughly.
	Brakes damaged or worn out	Check the efficiency of the disks; replace, if necessary.
	Accumulators **R1**-**R2** damaged	Check and replace, if necessary.
The attachment locking cylinder does not work	Attachment locking cylinder damaged	Check the efficiency of the cylinder; replace the internal seals, if necessary.
	Quick couplings damaged	Check and replace, if necessary.
	The hydraulic line between control block and quick couplings is defective	Check and replace any damaged or restricted hose.
The forks cannot be pitched perfectly	Fork cylinder damaged	Change the seals and check the tightness of the cylinder.
	Fork cylinder block valve damaged	Remove and clean the valve; check its seals and replace if necessary.
	The hydraulic line between control block and block valve is defective	Check and replace any damaged or restricted hose.
	Safety valves maladjusted or damaged	Check the efficiency of the safety valves fitted to ports A and B of the control block; adjust or replace.
The boom cannot be moved out	Extension cylinder outside the boom damaged	Check the state of the seals on cylinder and rod; if necessary, repair or replace the cylinder.
	Control block maladjusted	Check the max pressure.
	Mechanical jamming	Check the boom. In case of mechanical jamming, rectify.
	Block valve damaged	Remove and clean the valve; check its seals and replace if necessary.

Problem	Cause	Solution
	The hydraulic line feeding the boom is defective	Check and replace any damaged or restricted hose.
	Boom extension valve on control block damaged	Check the calibration of the valve to be sure it opens at 150 bar.
The boom cannot be moved up	Lifting cylinder damaged	Change the seals and check the tightness of the cylinder.
	Block valve damaged	Remove and clean the valve; check its seals and replace if necessary.
	Control block maladjusted	Check the max pressure.
The boom jerks when moved down	Accumulator damaged	Carefully check the accumulator (1.5 litres), the fill pressure and, if necessary, replace.
When the boom is moved up or down, the forks cannot be levelled	Balancing cylinder damaged	Check the cylinder efficiency and the state of the internal seals.
	Control blocksafety valves damaged	Check the efficiency of the safety valves fitted to ports A and B of the control block; adjust or replace.
	Check valve dirty or damaged	Remove and clean the valve; check its seal and replace if necessary.
	Pressure relief valve damaged	Remove and clean the valve; check its seal and replace if necessary.
	Block valves damaged	Remove and clean the valves; check their seals and replace if necessary.
	Hydraulic line defective	Check and replace any damaged or restricted hose.
The booms swings when moved out	Pads worn	Check the pads for wear and replace if necessary.
	Poor lubrication of the boom	Smear the sliding zone of the pad with grease.
	Paint or abrasion on the pad sliding rail	Grind and polish the pad's sliding zone on the boom, then grease.

Problem	Cause	Solution
The boom moves hardly in when fully extended and horizontal	Pads worn	Carefully check all of the front and rear pads of the boom; lubricate with the special grease.
	Control block maladjusted	Check the max pressure.
The radiator fan does not work	Bushing between engine/radiator damaged.	Check and replace the bushing if necessary.
	Fan motor damaged.	Check and replace the motor if necessary.
	Reducer between engine and radiator fan damaged.	Check and replace the reducer if necessary.
The cylinder locking the rear axle does not unlock when the boom is high	Cylinder damaged.	Check the internal kit and the rod for wear.
	Solenoid valves **EV14-Y50** - **EV15-Y51** defective.	Remove the solenoid valves, check any mechanical parts and repair or replace those defective.
The cylinder locking the rear axle does not unlock when the boom is low	Solenoid valves **EV14-Y50** - **EV15-Y51** defective.	Remove the solenoid valves, check any mechanical parts and repair or replace those defective.



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Section 6
SCHEMATICS

SECTION INDEX

6.2 HYDRAULIC SYMBOLS

MOTORS


Fixed motor with one direction of flow


Fixed motor with two directions of flow


Variable motor with two directions of flow


Reversible fixed motor with two directions of flow

PUMP


Fixed displacement pump with one direction of flow


Fixed displacement pump with two directions of flow


Variable displacement pump with one direction of flow

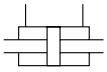

Variable displacement pump with flow regulator

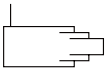
CYLINDERS


Single-acting cylinder


Single-acting cylinder with spring return


Double-acting cylinder


Double-acting cylinder with bilateral rod


Telescopic cylinder

COMMANDS AND CONTROLS


Shaft rotating in one direction


Shaft rotating in two directions


Hand-operated control


Hand-operated control with pushbutton


Hand-operated control with lever

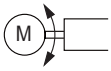

Hand-operated control with pedal


Mechanical control with pushbutton


Mechanical control with spring


Mechanical control with roller


Electro-magnetic control with winding (solendoid)



Control with electric motor


Direct pressure control


Indirect (piloted) pressure control


Control with electromagnet and piloted distributor

PIPES AND CONNECTIONS

Induction and return pipe

Piloting pipe

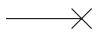
Blow-by pipe


Flexible hose

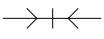

Connecting point

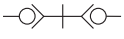

Pipe cross without connection


Breather


Closed pressure fitting


Pressure fitting with connected pipe


Quick fitting


Quick fitting with check valves

DISTRIBUTION - SETTING ELEMENTS


Non-return valve


Calibrated non-return valve

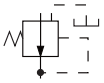

Unlockable non-return valve


Combined non-return and throttle valve


Switching valve


Pressure relief valve with direct control


Pressure relief valve with hydraulic control


Pressure reducing valve


Sequence valve


Adjustable throttle valve


Two-way flow regulator


Cut-out cock

POWER SOURCES

Electric motor


Thermal engine

OTHER EQUIPMENT


Accumulator


Water tank


Compressor


Filter


Cooler


Pressure gauge

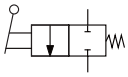

Thermometer

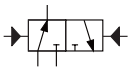

Flowmeter

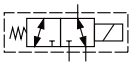

Pressure switch

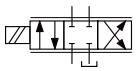

Drain to tank indication

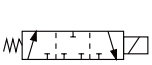
DISTRIBUTION - SETTING ELEMENTS

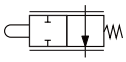

Two-position and two-way distributor, with manual lever control and spring return

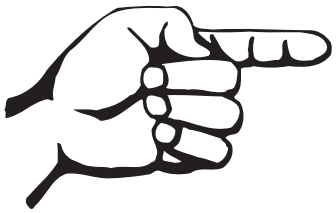

Three-way and two-position distributor, with hydraulic control


Two-position, three-way distributor, with electro-magnetic control and spring return


Distributor with mechanical control and span proportional to the action of the same control


Two-position, three-way distributor, with representation of transient connection during passage phase


Electro-hydraulic single-acting servo valve



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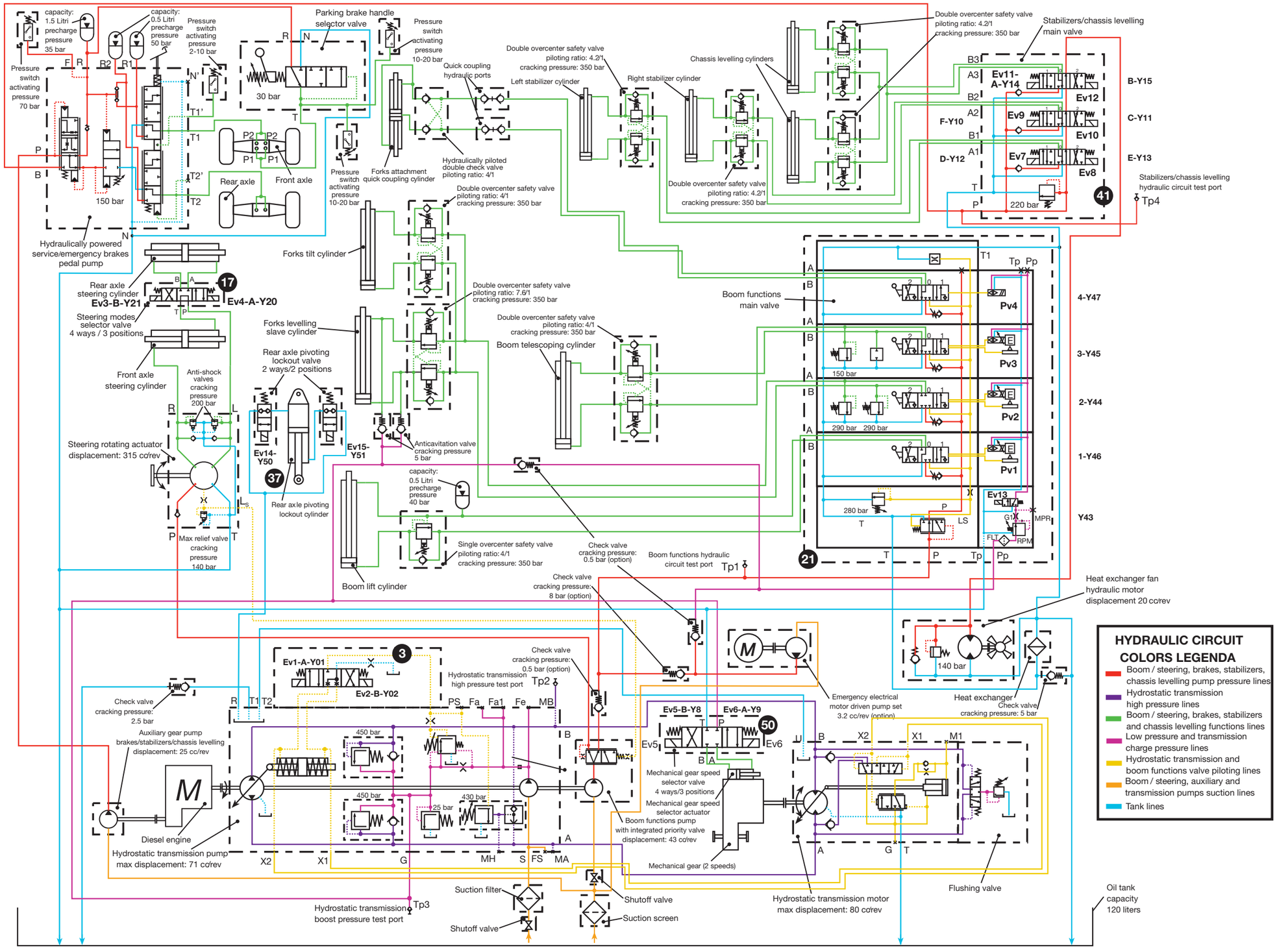
6.2 HYDRAULIC SCHEMES

6.2.1 Telelift 4017-4514



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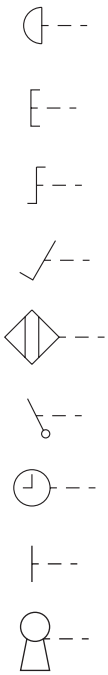
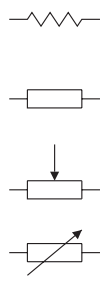
6.3 ELECTRICAL SYMBOLS

ACTUATORS



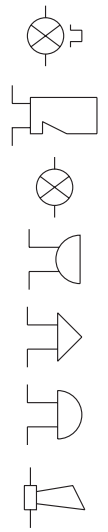
Emergency controls
Pushbutton control
Rotary control
Pedal control
Proximity control
Lever control
Timed control
Mechanical/manual control
Key control

RESISTANCES



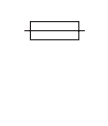
Resistance
Resistor
Potentiometer
Variable resistance

SIGNALS



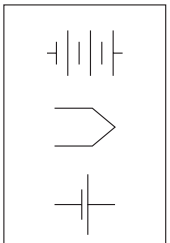
Intermittent lamp
Whistle
Lamp
Buzzer
Siren
Bell
Horn

FUSES AND RELAYS



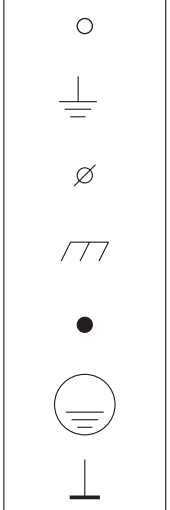
Horizontal fuse
Relay

ACCUMULATORS



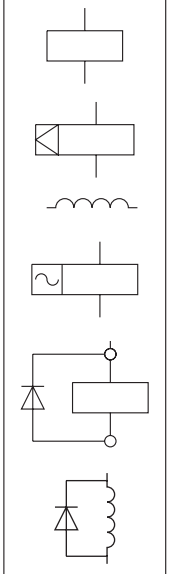
Battery
Thermocouple
Element

TERMINALS AND GROUNDS



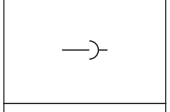
Ring
Ground
Terminal
Ground to frame
Knot
Protection ground
Frame ground 2

COILS



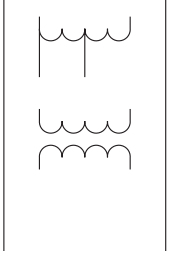
Coil
Mechanical coupling coil
Winding
A/C coil
Coil with diode
Winding with diode

CONNECTORS



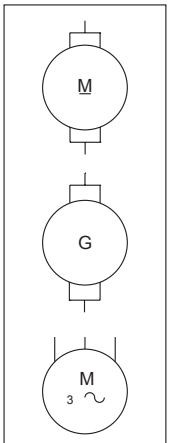
Connector

STATIC APPLICATIONS



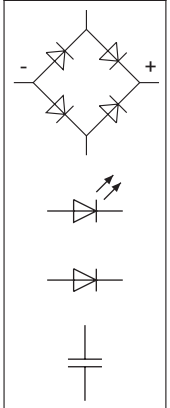
Auto-transformer
Transformer

DYNAMIC APPLICATIONS



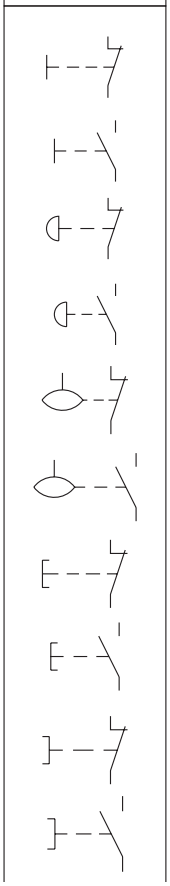
Motor
Generator
As_3p_motor

ELECTRONIC PARTS



Rectifier
Light-emitting diode
Diode
Condenser

PUSHBUTTONS



Manual NC contact
Manual NO contact
NC mushroom-head pushbutton
NO mushroom-head pushbutton
NC level
NO level
Pushbutton with NC return
Pushbutton with NO return
NC tie-rod
NO tie-rod

CONTACTS


Thermal


Normally open (NO)


Normally closed (NC)


NO limit switch


NC limit switch


Contactor

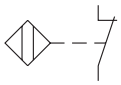

Magneto-thermal closure


Magneto-thermal opening

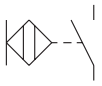

Thermal closure

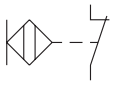

Thermal opening


Exchange


NC proximity


NO proximity

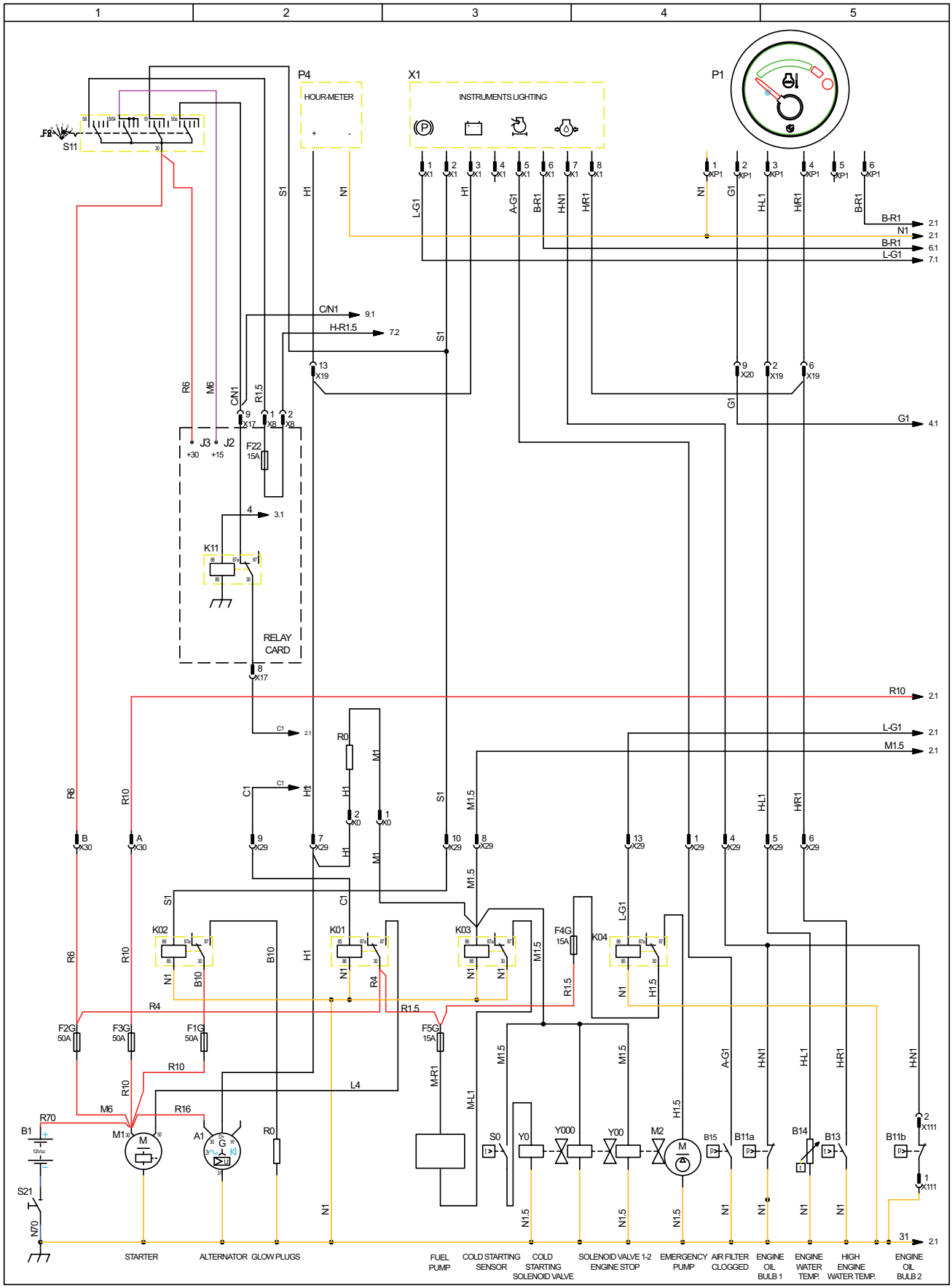

NO mechanical


NC mechanical

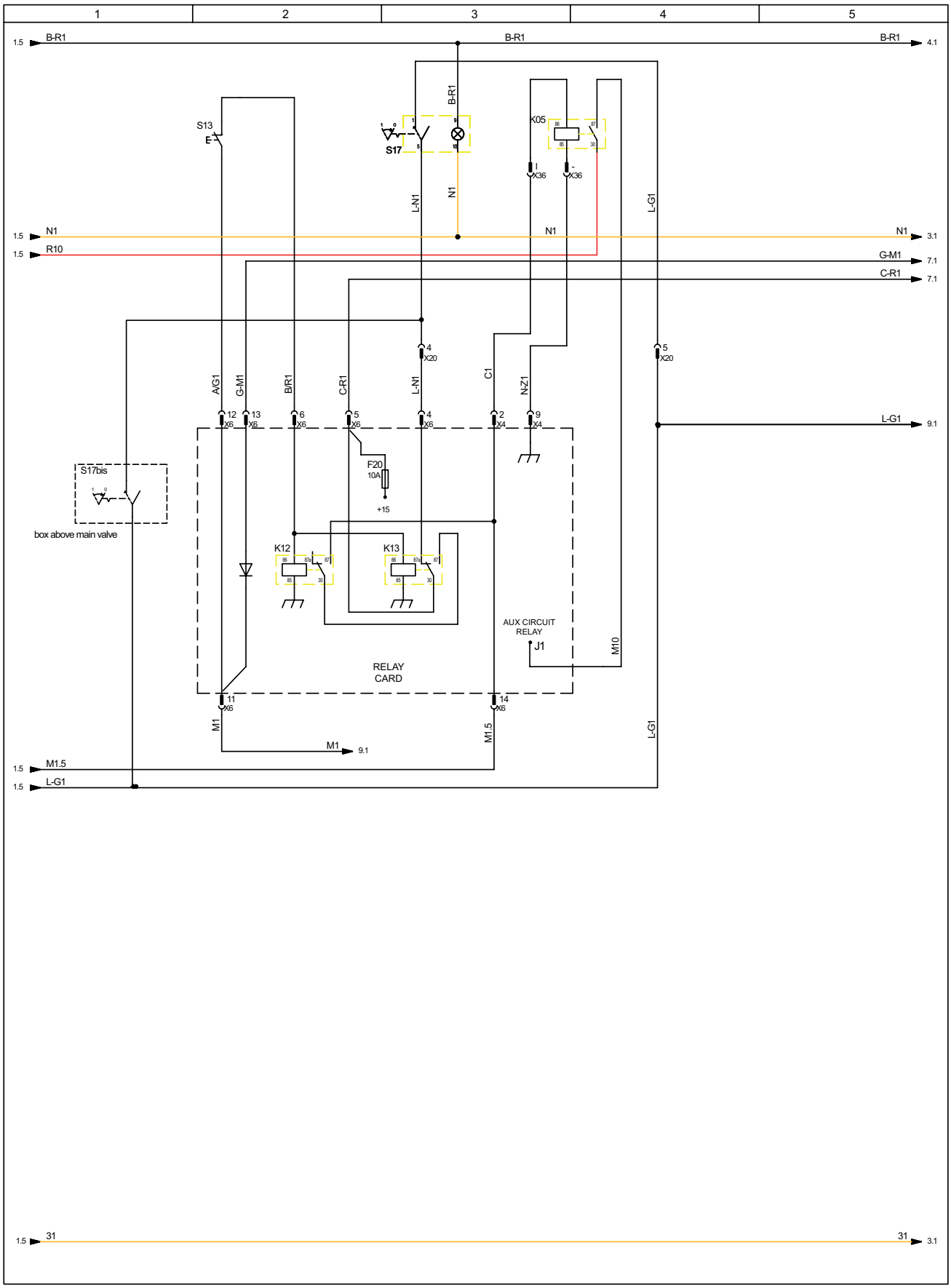

Selector


Selector2

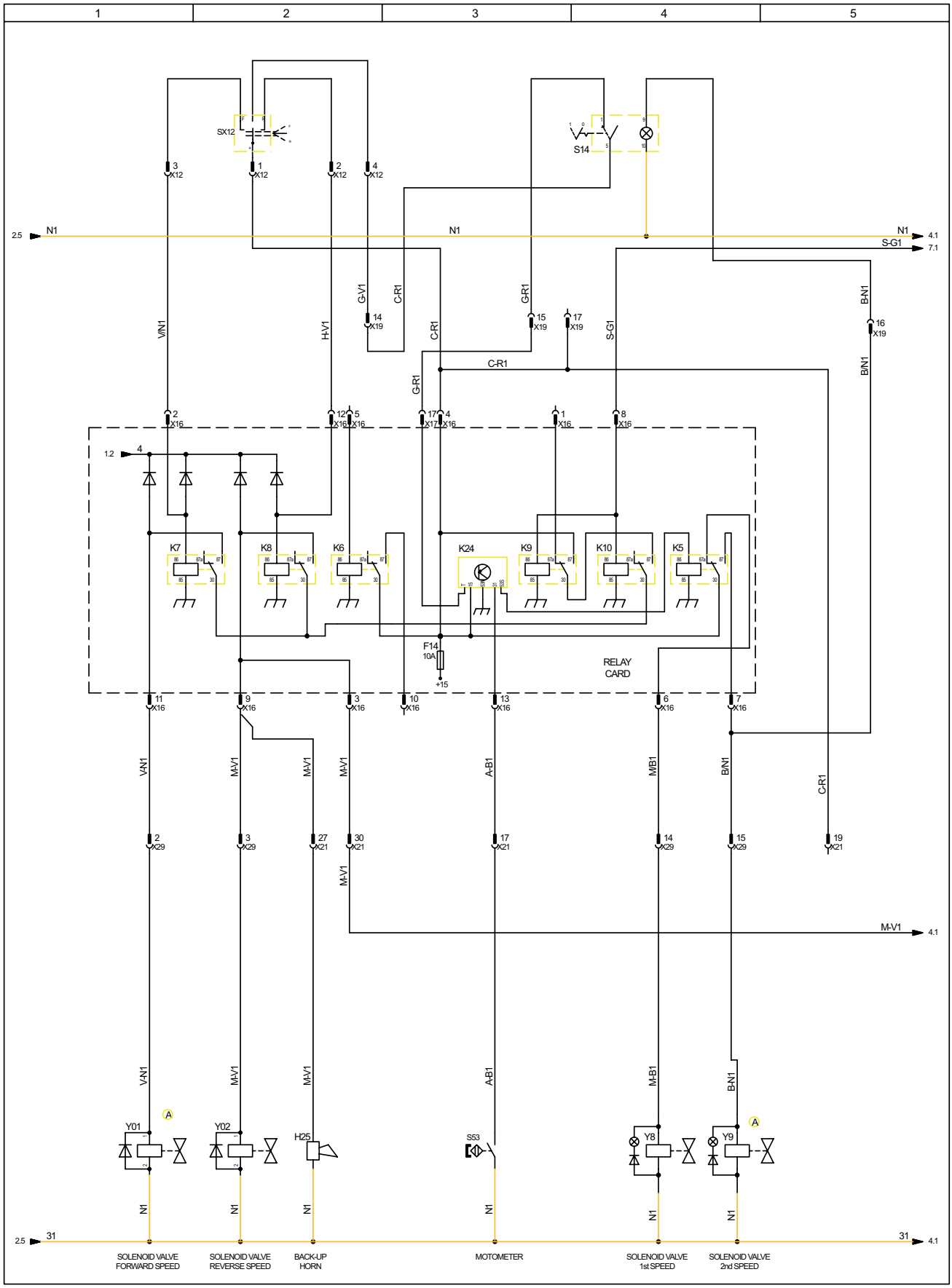
6.4 TELELIFT 4017-4514 WIRING DIAGRAM
Sheet 1 of 9



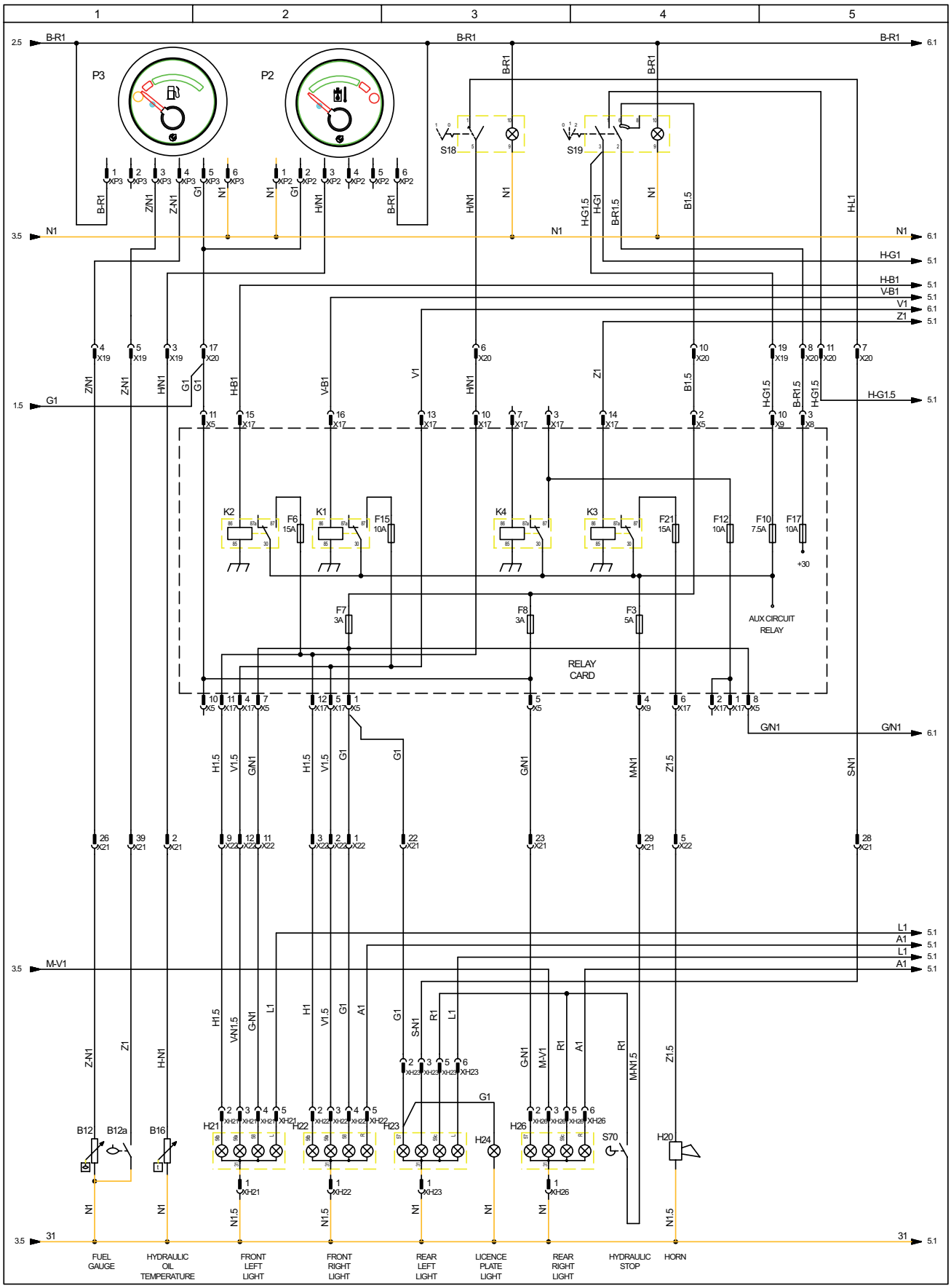
Sheet 2 of 9


1
2
3
4
5
B-R1
N1
R10
M1.5
L-G1
31
G-M1
C-R1
S13
S17
S17bis
box above main valve
K05
K12
K13
F20
10A
+15
RELAY CARD
AUX CIRCUIT RELAY
J1
M10
A/G1
B/R1
C-R1
L-N1
C1
N-Z1
M1
M1.5

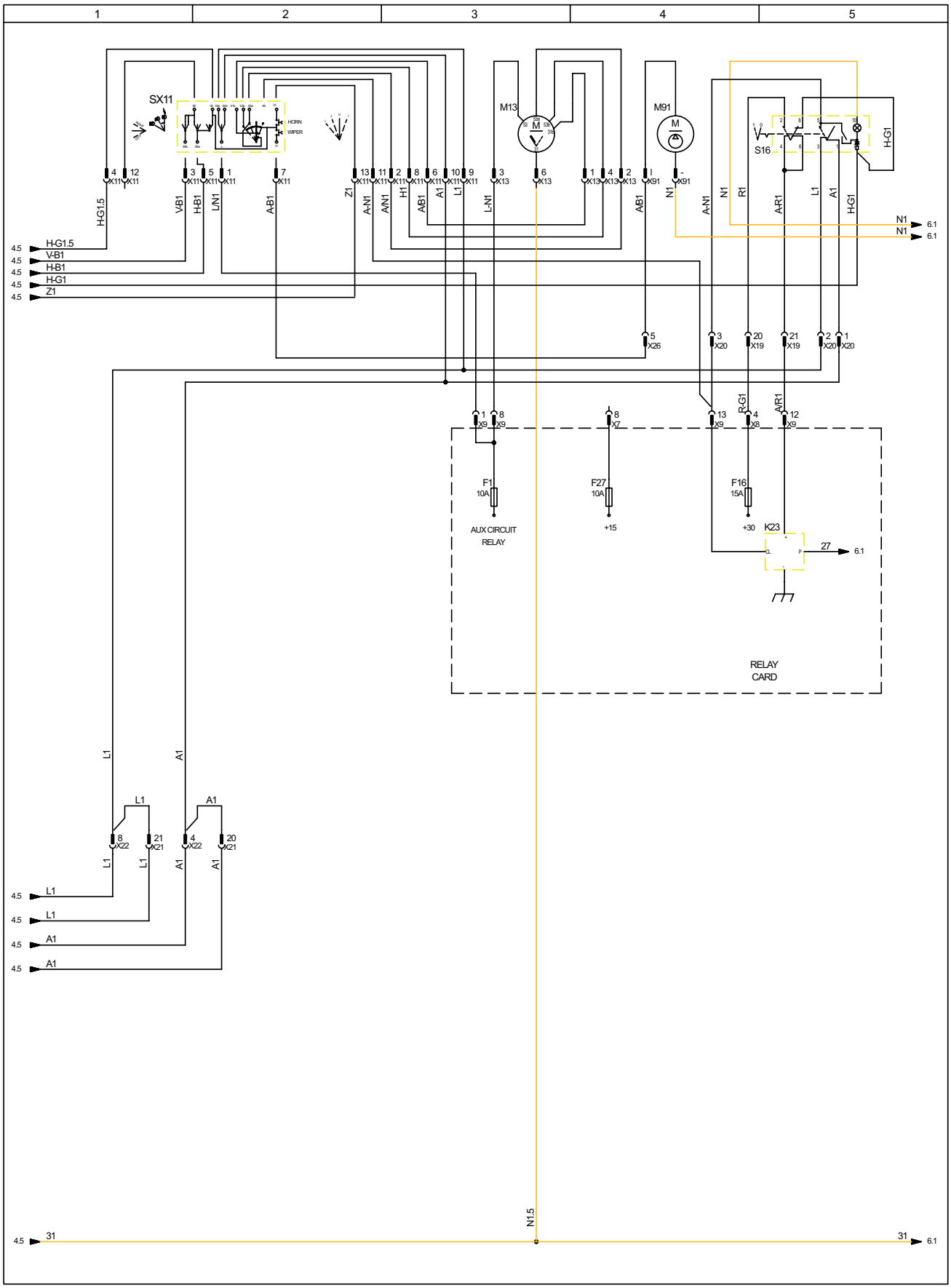
Sheet 3 of 9


1
2
3
4
5
SX12
S14
N1
S-G1
V-N1
H-V1
G-V1
C-R1
G-R1
B-N1
K7
K8
K6
K24
K9
K10
K5
F14
10A
+15
RELAY
CARD
M-V1
A-B1
M-B1
B-N1
Y01
Y02
H25
S53
Y8
Y9
SOLENOID VALVE
FORWARD SPEED
SOLENOID VALVE
REVERSE SPEED
BACK-UP
HORN
MOTOMETER
SOLENOID VALVE
1st SPEED
SOLENOID VALVE
2nd SPEED

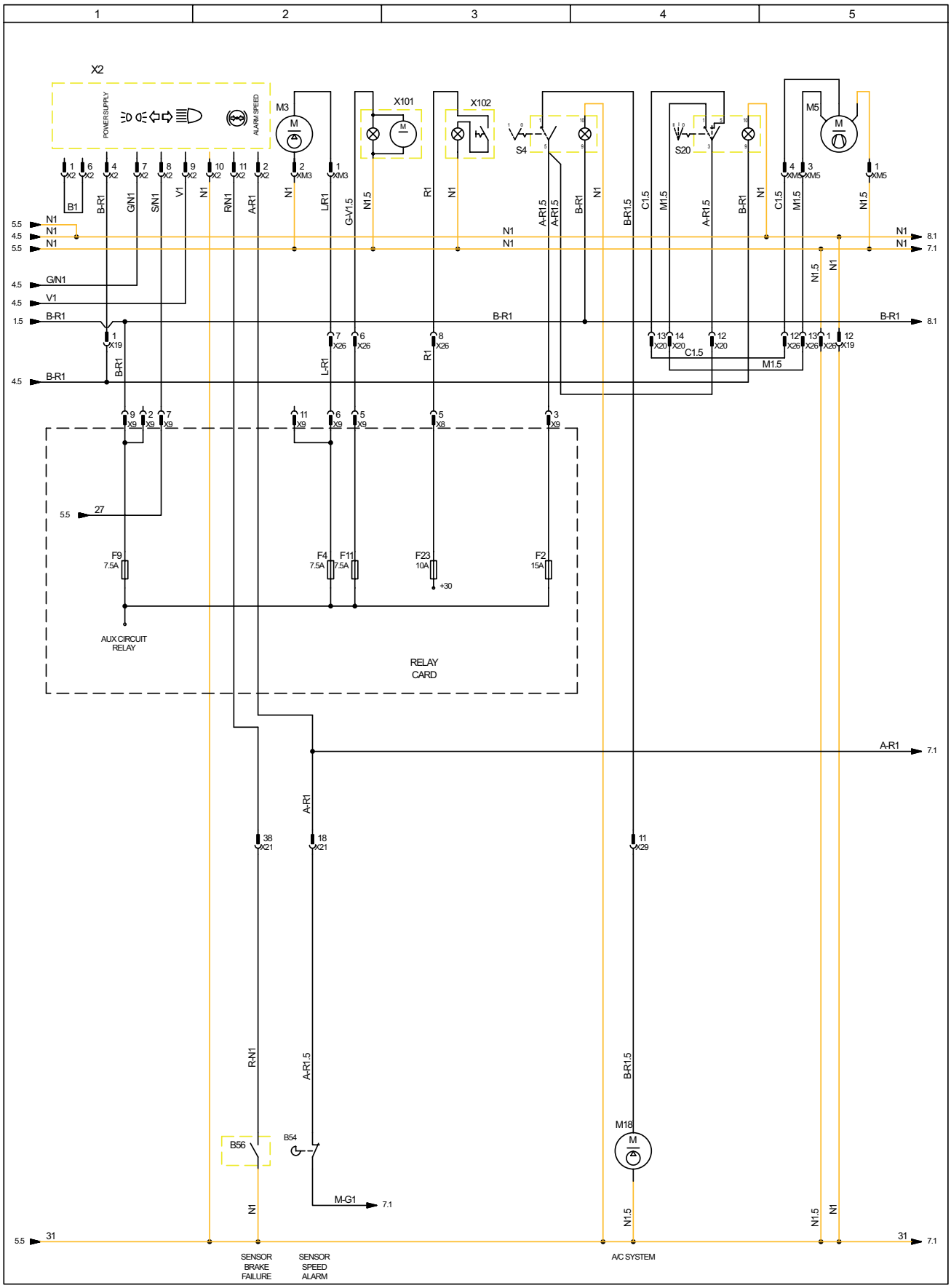
Sheet 4 of 9


1
2
3
4
5
P3
P2
S18
S19
B-R1
N1
G1
H-G1
H-B1
V-B1
V1
Z1
H-G1.5
G/N1
L1
A1
M-V1
31
K2
K1
K4
K3
F6 15A
F15 10A
F21 15A
F12 10A
F10 7.5A
F17 10A
F7 3A
F8 3A
F3 5A
+30
AUX CIRCUIT RELAY
RELAY CARD
B12
B12a
B16
H21
H22
H23
H24
H26
S70
H20
FUEL GAUGE
HYDRAULIC OIL TEMPERATURE
FRONT LEFT LIGHT
FRONT RIGHT LIGHT
REAR LEFT LIGHT
LICENCE PLATE LIGHT
REAR RIGHT LIGHT
HYDRAULIC STOP
HORN

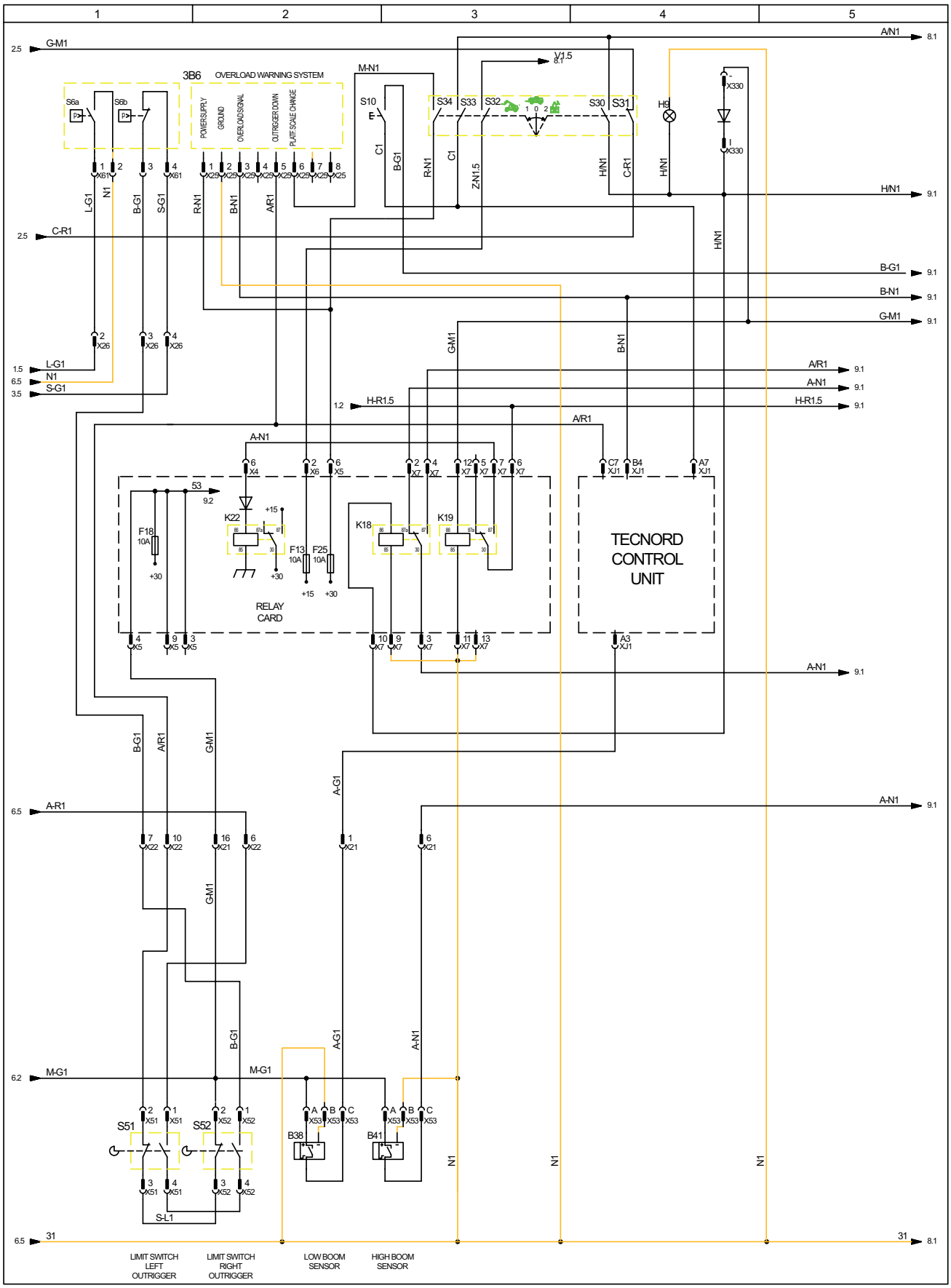
Sheet 5 of 9


1
2
3
4
5
SX11
HORN
WIPER
M13
M91
S16
H-G1
H-G1.5
V-B1
H-B1
L/N1
A-B1
Z1
A-N1
A/N1
H1
A/B1
A1
L1
L-N1
A/B1
N1
R1
A-R1
L1
A1
H-G1
N1
N1
6.1
6.1
H-G1.5
V-B1
H-B1
H-G1
Z1
4.5
X26
X20
X19
X19
X20
X20
R-G1
A/R1
F1
10A
AUX CIRCUIT
RELAY
F27
10A
+15
F16
15A
+30
K23
27
6.1
RELAY
CARD
L1
A1
X22
X21
L1
A1
4.5
31
N1.5
31
6.1

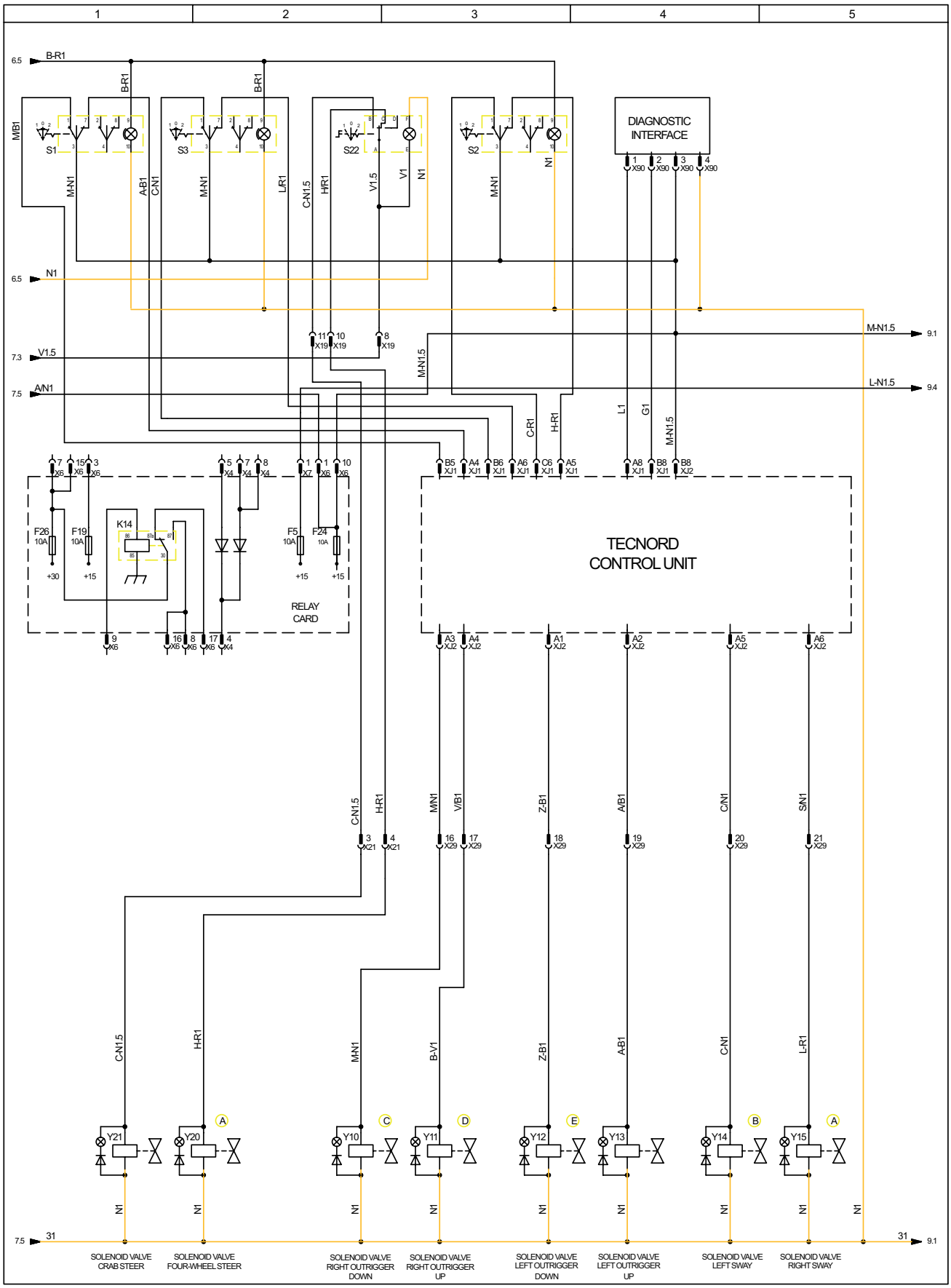
Sheet 6 of 9


1
2
3
4
5
X2
POWER SUPPLY
ALARM SPEED
M3
X101
X102
S4
S20
M5
B1
B-R1
G/N1
S/N1
V1
N1
R/N1
A-R1
LR1
G-V1.5
M1.5
R1
A-R1.5
C1.5
5.5
4.5
1.5
27
F9
7.5A
F4
7.5A
F11
7.5A
F23
10A
+30
F2
15A
AUX CIRCUIT RELAY
RELAY CARD
B56
B54
M-G1
7.1
8.1
M18
31
SENSOR BRAKE FAILURE
SENSOR SPEED ALARM
A/C SYSTEM

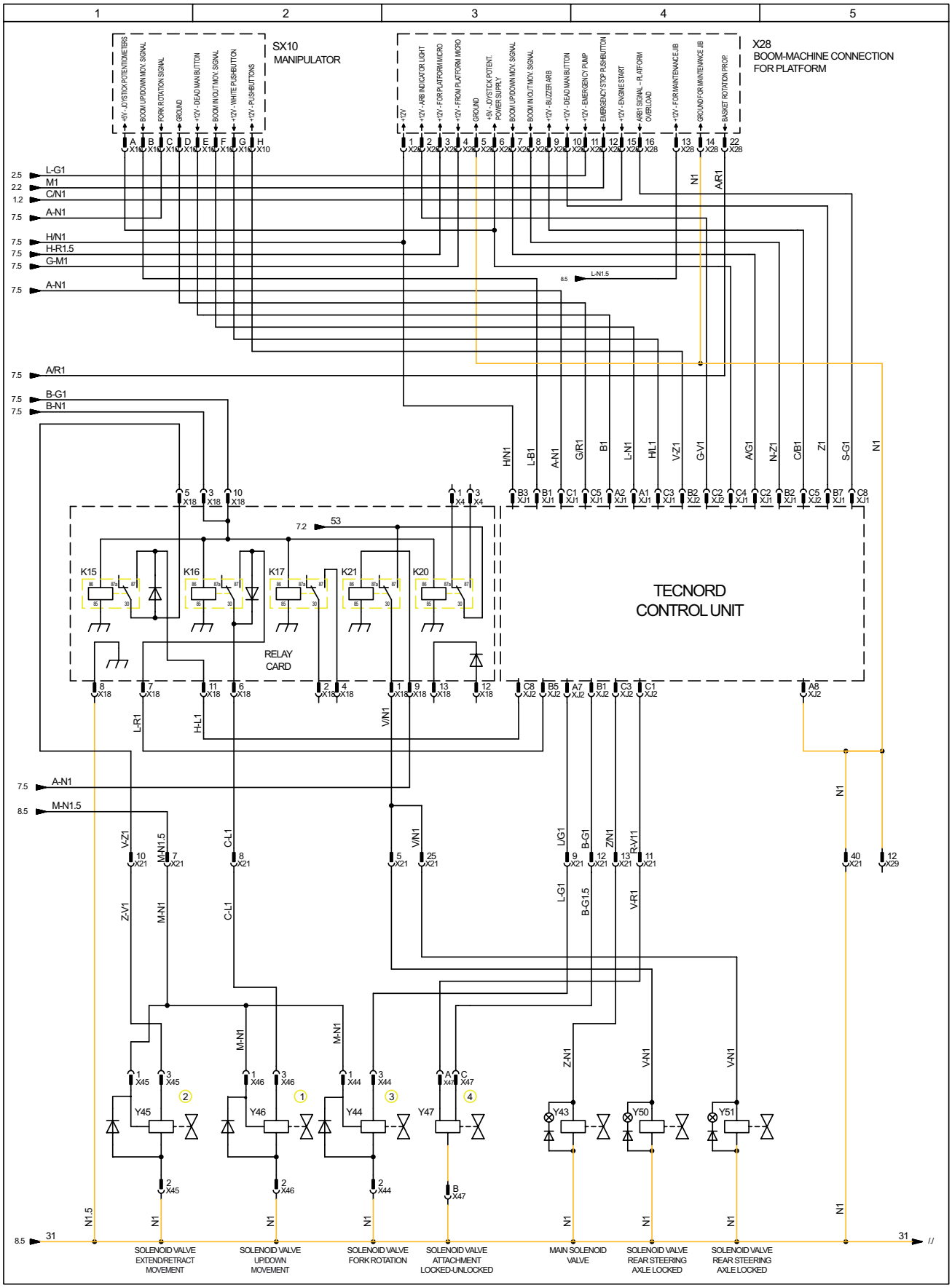
Sheet 7 of 9


1
2
3
4
5
3B6 OVERLOAD WARNING SYSTEM
POWER SUPPLY
GROUND
OVERLOAD SIGNAL
OUTRIGGER DOWN
PLATE SCALE CHANGE
TECNORD CONTROL UNIT
RELAY CARD
LIMIT SWITCH LEFT OUTRIGGER
LIMIT SWITCH RIGHT OUTRIGGER
LOW BOOM SENSOR
HIGH BOOM SENSOR

Sheet 8 of 9


1
2
3
4
5
B-R1
M/B1
S1
S3
S22
S2
DIAGNOSTIC INTERFACE
N1
V1.5
A/N1
M-N1.5
L-N1.5
TECNORD CONTROL UNIT
RELAY CARD
F26 10A
F19 10A
K14
F5 10A
F24 10A
SOLENOID VALVE CRAB STEER
SOLENOID VALVE FOUR-WHEEL STEER
SOLENOID VALVE RIGHT OUTRIGGER DOWN
SOLENOID VALVE RIGHT OUTRIGGER UP
SOLENOID VALVE LEFT OUTRIGGER DOWN
SOLENOID VALVE LEFT OUTRIGGER UP
SOLENOID VALVE LEFT SWAY
SOLENOID VALVE RIGHT SWAY

Sheet 9 of 9


SX10
MANIPULATOR
X28
BOOM-MACHINE CONNECTION
FOR PLATFORM
TECNORD
CONTROL UNIT
RELAY
CARD
K15
K16
K17
K21
K20
Y45
Y46
Y44
Y47
Y43
Y50
Y51
SOLENOID VALVE
EXTEND/RETRACT
MOVEMENT
SOLENOID VALVE
UP/DOWN
MOVEMENT
SOLENOID VALVE
FORK ROTATION
SOLENOID VALVE
ATTACHMENT
LOCKED-UNLOCKED
MAIN SOLENOID
VALVE
SOLENOID VALVE
REAR STEERING
AXLE LOCKED
SOLENOID VALVE
REAR STEERING
AXLE LOCKED

6.4.1 Wiring diagram - Component description

Ref.	Description	Sheet
A1	ALTERNATOR	1
B1	BATTERY	1
B11a	PRESSURE SWITCH - ENGINE OIL FILTER	1
B11b	PRESSURE SWITCH - ENGINE OIL FILTER	1
B12	FUEL GAUGE	4
B12a	FUEL RESERVE	4
B13	THERMOSTAT - HIGH ENGINE WATER TEMPERATURE	1
B14	THERMOMETER - HIGH ENGINE WATER TEMP.	1
B15	PRESSURE SWITCH - AIR FILTER CLOGGED	1
B16	THERMOSTAT - HIGH TEMPERATURE HYDRAULIC OIL	4
B38	LOW BOOM SENSOR	7
B41	HIGH BOOM SENSOR	7
B54	SWITCH - GEAR NOT ENGAGED	6
B56	BRAKE FAILURE SENSOR	6
F1	10A FUSE - EMERGENCY LIGHT	5
F1G	50A MAIN FUSE	1
F2	15A FUSE - HEATING	6
F2G	50A MAIN FUSE	1
F3	5A FUSE - STOP LIGHTS MICRO-SWITCH	4
F3G	50A MAIN FUSE	1
F4	7.5A FUSE - REAR WINDSCREEN WIPER	6
F4G	15A MAIN FUSE	1
F5	10A FUSE - OPTIONAL	8
F5G	15A MAIN FUSE	1
F6	15A FUSE - LOW BEAM	4
F7	3A FUSE - RIGHT POSITION LIGHTS SWITCH	4
F8	3A FUSE - INSTRUMENTS LIGHTING	4
F9	7.5A FUSE - INDICATOR LIGHTS POWER SUPPLY	6
F10	7.5A FUSE - LIGHTS SWITCH	4
F11	7.5A FUSE - BEACON	6
F12	10A FUSE - WORK LIGHTS	4
F13	10A FUSE - STEER MODE ACTIVATION	7
F14	10A FUSE - DRIVE SWITCH	3
F15	10A FUSE - HIGH BEAM	4
F16	15A FUSE - EMERGENCY	5
F17	10A FUSE - LIGHTS AND FLASHING	4
F18	10A FUSE - OUTRIGGERS	7
F19	10A FUSE - OPTIONAL	8
F20	10A FUSE - PLATFORM EMERGENCY BUTTON 10A	2
F21	15A FUSE - HORN	4
F22	15A FUSE - MAN-PLATFORM POWER SUPPLY	1
F23	10A FUSE - CAB LIGHTS	6
F24	10A FUSE - WORK MODE POWER SUPPLY	8
F25	10A FUSE - 3B6 CONTROL UNIT	7
F26	10A FUSE - OPTIONAL	8
F27	10A FUSE - OPTIONAL	5
H9	LIGHT INDICATOR - BASKET ENABLED	7
H20	HORN	4
H21	FRONT LEFT LIGHT	4
H22	FRONT RIGHT LIGHT	4
H23	REAR LEFT LIGHT	4
H24	LICENCE PLATE LIGHT	4

Ref.	Description	Sheet
H25	BACK-UP HORN	3
H26	REAR RIGHT LIGHT	4
K01	RELAY - START-UP	1
K02	RELAY - PRE-HEATING	1
K03	RELAY - ENGINE STOP	1
K04	RELAY - EMERGENCY PUMP	1
K05	RELAY - AUX CIRCUIT MAIN LINE	2
K1	RELAY - HIGH BEAM	2
K2	RELAY - LOW BEAM	4
K3	RELAY - HORN	4
K4	RELAY - OPTIONAL	4
K5	RELAY - 1ST-2ND SPEED	3
K6	RELAY - OPTIONAL	1
K7	RELAY - FORWARD SPEED	3
K8	RELAY - REVERSE SPEED	3
K9	RELAY - TRANSMISSION DISCONNECTED	3
K10	RELAY - TRANSMISSION DISCONNECTED	3
K11	RELAY - START-UP ENABLING COMMAND	1
K12	RELAY - CONTROL UNIT	2
K13	RELAY - CONTROL UNIT	2
K14	RELAY - OPTIONAL	8
K15	RELAY - FORK IN/OUT	9
K16	RELAY - ATTACHMENT UP/DOWN	9
K17	RELAY - OPTIONAL	9
K18	RELAY - OPTIONAL	7
K19	RELAY - FORK COUPLING	9
K20	RELAY - OPTIONAL	9
K21	RELAY - BOOM LIFTING	9
K23	INTERMITTENCE	5
K24	MECH. GEARBOX CONTROL UNIT	3
M1	STARTING MOTOR	1
M2	EMERGENCY PUMP	1
M3	REAR WINDSCREEN WIPER/WASHER MOTOR	6
M5	HEATING	6
M13	WINDSCREEN WIPER/WASHER MOTOR	5
M18	A/C SYSTEM	6
M91	PUMP MOTOR	5
P1	ENGINE WATER TEMPERATURE INSTRUMENT	1
P2	HYDRAULIC OIL TEMPERATURE INSTRUMENT	4
P3	FUEL GAUGE	4
P4	HOUR-METER	1
R0	GLOW PLUGS	1
R0	RESISTANCE	1
S0	COLD STARTING TEMPERATURE SENSOR	1
S1	SWITCH - FRONT LH OUTRIGGERS	8
S2	SWITCH - FRONT RH OUTRIGGERS	8
S3	SWAY FUNCTION SWITCH	9
S4	SWITCH - A/C SYSTEM	6
S6A	PRESSURE SWITCH - PARKING BRAKE	7
S6B	PRESSURE SWITCH - PARKING BRAKE	7
S10	OVERLOAD CUTOUT	7
S11	START-UP PANEL	1

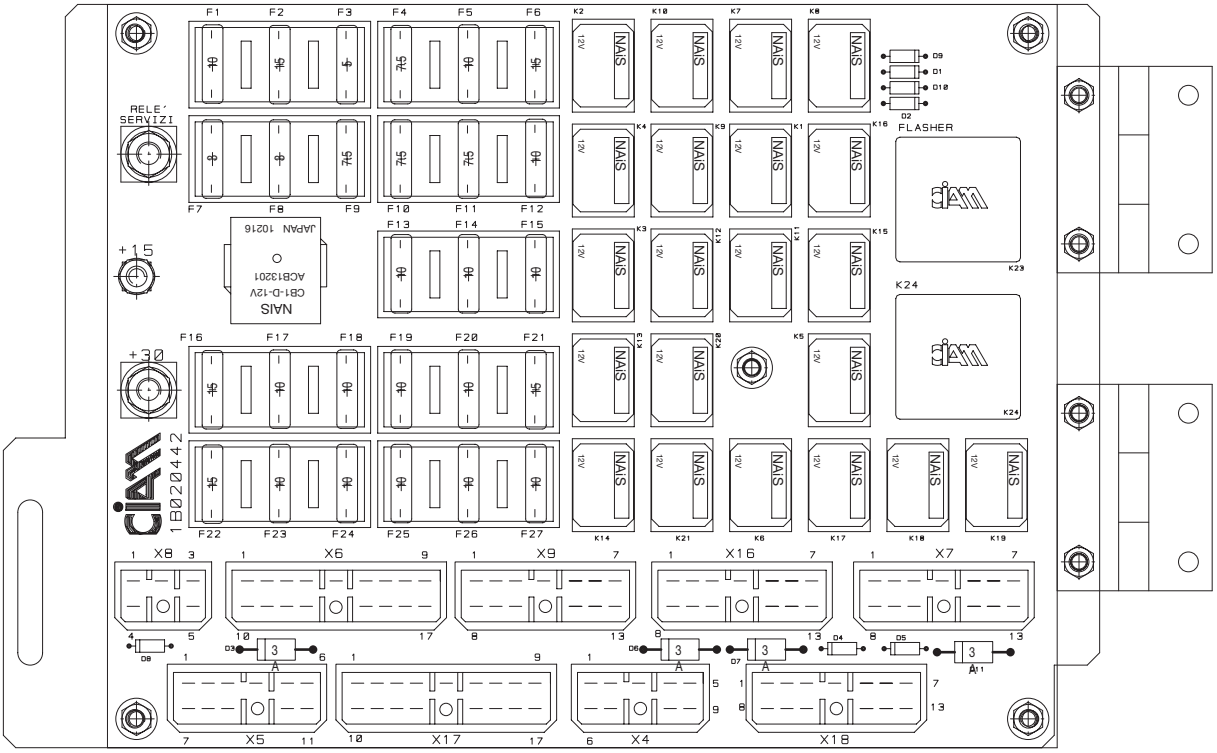
Ref.	Description	Sheet
SX11	LIGHT SWITCH-WIPERS-HORN	5
SX12	SPEED SWICTH	3
S13	EMERGENCY MUSHROOM-HEAD PUSHBUTTON	2
S14	SWITCH - SPEED CHANGE	3
S16	WARNING SWITCH	5
S17	SWITCH - EMERGENCY PUMP	2
S18	FOG LAMP SWITCH	4
S19	SWITCH - LIGHTS	4
S20	SWITCH - HEATER	6
S21	BATTERY CUTOFF	1
S22	STEERING SELECTOR	8
S30	N.O. CONTACT - PLATFORM ENABLED	7
S31	N.C. CONTACT - PLATFORM EMERG. BUTTON POWER SUPPLY	7
S32	N.O. CONTACT - STEER SELECTOR	7
S33	N.O. CONTACT - WORK MODE	7
S34	N.O. CONTACT - PLATFORM SCALE CUTOUT	7
S53	MOTOMETER	3
S70	HYDRAULIC STOP	4
Y0	SOLENOID VALVE - COLD STARTING	1
Y00	SOLENOID VALVE - ENGINE STOP	1
Y000	SOLENOID VALVE - ENGINE STOP	1
Y01	SOLENOID VALVE - FORWARD SPEED	3
Y02	SOLENOID VALVE - REVERSE SPEED	3
Y8	SOLENOID VALVE - 1st SPEED	3
Y9	SOLENOID VALVE - 2nd SPEED	3
Y10	SOLENOID VALVE - RIGHT OUTRIGGER DOWN	8
Y11	SOLENOID VALVE - RIGHT OUTRIGGER UP	9
Y12	SOLENOID VALVE - LEFT OUTRIGGER DOWN	9
Y13	SOLENOID VALVE - LEFT OUTRIGGER UP	9
Y14	SOLENOID VALVE - LEFT SWAY	8
Y15	SOLENOID VALVE - RIGHT SWAY	8
Y20	SOLENOID VALVE - FOUR-WHEEL STEER	8
Y21	SOLENOID VALVE - CRAB STEER	8
Y43	MAIN SOLENOID VALVE	9
Y44	SOLENOID VALVE - FORK ROTATION	9
Y45	SOLENOID VALVE - FORK IN/OUT MOV.	9
Y46	SOLENOID VALVE - UP/DOWN MOV.	9
Y47	SOLENOID VALVE - ATTACHMENT LOCKED-UNLOCKED	9
Y50	SOLENOID VALVE - STEERING AXLE LOCKED	9
Y51	SOLENOID VALVE - STEERING AXLE LOCKED	9
X00	2-WAY CONNECTOR	
X1	CONNECTOR - LIGHT INDICATORS	
X2	CONNECTOR - LIGHT INDICATORS	
X4	9-WAY MARK CONNECTOR	
X5	11-WAY MARK CONNECTOR	
X6	17-WAY MARK CONNECTOR	
X7	9-WAY MARK CONNECTOR	
X8	5-WAY MARK CONNECTOR	
X9	13-WAY MARK CONNECTOR	
X10	TECNORD CONTROL LEVER	9
X11	13-WAY MARK CONNECTOR	
X12	5-WAY MARK CONNECTOR	
X13	6-WAY CONNECTOR	
X16	13-WAY MARK CONNECTOR	
X17	17-WAY MARK CONNECTOR	
X18	13-WAY MARK CONNECTOR	
X19	21-WAY MARK CONNECTOR	
X20	17-WAY MARK CONNECTOR	
X21	40-WAY DEUTSCH CONNECTOR - TYPE B	
X22	12-WAY DEUTSCH CONNECTOR	
X25	8-WAY CONNECTOR	
X26	17-WAY MARK CONNECTOR	
X28	MAN PLATFORM CONNECTOR	9
X29	24-WAY DEUTSCH CONNECTOR	
X30	2-WAY CONNECTOR	
X34	2-WAY 90° CONNECTOR	
X44	4-WAY CONNECTOR Y44	9
X45	4-WAY CONNECTOR Y45	9
X46	4-WAY CONNECTOR Y46	9
X47	4-WAY CONNECTOR Y47	9
X51	4-WAY DEUTSCH CONNECTOR	
X52	4-WAY DEUTSCH CONNECTOR	
X53	3-WAY DEUTSCH CONNECTOR	
X90	DIAGNOSTIC INTERFACE	8
X91	2-WAY 90° CONNECTOR	
X101	BEACON	6
X102	CAB INTERIOR LIGHTS	6
X111	2-WAY CONNECTOR	
XH21	6-WAY DEUTSCH CONNECTOR	
XH22	6-WAY DEUTSCH CONNECTOR	
XH23	6-WAY DEUTSCH CONNECTOR	
XH26	6-WAY DEUTSCH CONNECTOR	
XJ1	TECNORD CONTROL UNIT CONNECTOR	
XJ2	TECNORD CONTROL UNIT CONNECTOR	
XM3	2-WAY CONNECTOR	
XM5	4-WAY CONNECTOR	
XP1	6-WAY CONNECTOR	
XP2	6-WAY CONNECTOR	
XP3	6-WAY CONNECTOR	
XV1	3-WAY CONNECTOR	

WIRE COLOURS

A - LIGHT BLUE	**M** - BROWN
B - WHITE	**N** - BLACK
C - ORANGE	**R** - RED
G - YELLOW	**S** - PINK
H - GREY	**V** - GREEN
L - BLUE	**Z** - PURPLE

REMARK: Two-colour wires are indicated through a combination of the aforesaid initials as follows:
G/V = YELLOW/GREEN (crosswise colouring)
G-V = YELLOW-GREEN (lengthswise colouring)

6.4.2 Fuses and relays card



X5 - MARK 21

POS.	FUNCTION DESCRIPTION	COL
1	Front/rear RH light	G
2	Power supply - Pos. lights fuse	B
3	Power supply - Danfoss power unit Power supply - Danfoss power unit	2R-V
4	Power supply - Danfoss power unit	R-V
5	Front LH pos.light	G-N
6	Power supply - 3B6 control unit	2R-N
7	Rear LH pos.light	G-N
8	Position light indicator	G-N
9	Outriggers switch Sensor power supply	2R-V
10	N.C.	
11	Instruments warning light	G

X6 - MARK 17

POS.	FUNCTION DESCRIPTION	COL
1	N.C.	R
2	Power supply - steer. accum. SV	S/N
3	Power supply - differential locking switch	Z/N
4	Power supply - emergency pump	L-N
5	Power supply - platform mushroom-head button	C-R
6	Platform mushroom-head button out.	B-R
7	Power supply - work mode selector	B-R
8	N.C.	S/N
9	N.C.	G-N
10	N.C.	H-R
11	Power supply - platform mushroom-head button	M
12	Power supply - cab mushroom-head button	A/G
13	Electrostop from jobsite	G-M
14	Electrostop	M
15	N.C.	N
16	N.C.	M-V
17	Rear axle locking SV	H-R

X7 - MARK 17

POS.	FUNCTION DESCRIPTION	COL
1	Power supply - left high beam	V
2	Stab. sig. - overload warning system	L-R
3	Power supply - outriggers sensor	R-V
4	Stab. signal - drive disengagement	B-G
5	Cardan sensor	A-B
6	1st speed sensor	A-V
7	2nd speed sensor	A-R
8	Low beam	H
9	Low beam	H
10	High beam	V
11	Power supply - displacement change SV	V
12	Left turn signals	L
13	Right turn signals	A
14	Optional	L-G
15	Left position lights	G-N
16	Power supply 30 relay kc9-kc10 axle leveling unlocking	H-R
17	Right position lights	2 G

X9 - MARK 13

POS.	FUNCTION DESCRIPTION	COL
1	Power supply - wiper switch	L/N
2	N.C.	
3	Power supply - A/C system switch	A
4	Power supply - stop lights switch	R
5	Power supply - beacon	G-V
6	Power supply - rear wiper switch	L-R
7	Spia luci direzione	S/N
8	Power supply - front wiper switch	L/N
9	Power supply - switches lamps Power supply - instruments	2B-R
10	Power supply - hazard warning lights	H-L
11	N.C.	
12	Power supply - flashing	A-R
13	49	A-N

X18 - MARK 13

POS.	FUNCTION DESCRIPTION	COL
1	Power supply - Platform potentiometer	G-R
2	Turret rotation SV. signal	L/G
3	Overload warning signal	B-N
4	Turret rotation signal	L-G
5	Boom out/in signal	M/B
6	Boom up/down signal	A/V
7	Boom up/down signal	A-V
8	GND	N
9	86 Basket relay	N-Z
10	Overload warning signal	B-N
11	Boom out/in signal	M-B
12	Locking/unlocking signal	R-G
13	Attachment locking/unlocking signal	G-R

X17- MARK 17

POS.	FUNCTION DESCRIPTION	COL
1	Work light	G-N
2	Work light	G-V
3	Power supply - work light switch	G/R
4	LH high beam	V
5	RH high beam	V
6	Horn	Z
7	Work lights switch	L/G
8	Start enabling command	C-B
9	Start from platform 50 Board	2B-R
10	Power supply - fog lamp switch	H/N
11	Left low beam	H
12	Right low beam	H
13	High beam warn. light	V
14	Horn Horn	2Z
15	Low beam switch common line	H-B
16	High beam common line	V-B
17	Mechanical gear	G-R

X8 - MARK 5

POS.	FUNCTION DESCRIPTION	COL
1	58 BOARD	R
2	Power supply - basket	R-N
3	Power supply - position lights switch	B-R
4	Power supply - hazard warn.lights switch	R
5	Power supply - cab interior lights	R

X7 - MARK 13

POS.	FUNCTION DESCRIPTION
optional for all positions	

X4 - MARK 9

POS.	FUNCTION DESCRIPTION	COL
1	Power supply - Overload warning system	L-G
2	86 aux. circuits relay	M
3	N.C.	C
4	Slewing locking/unlocking switch	A-G
5	Jobsite function enabled	A-V
6	Platform enabled Platform enabled	A-N
7	Slewing locking/unlocking	Z
8	N.C.	
9	86 aux. circuits relay	G-R

X16 - MARK 13

POS.	FUNCTION DESCRIPTION	COL
1	N.C.	
2	Forward speed	S-N
3	Back-up horn	H-R
4	Power supply - Gear select./change	H/R
5	2nd hydr. speed	A-G
6	1st mech. speed SV	M-B
7	2nd mech. speed SV	H-N
8	Drive disengagement	2 H
9	Reverse speed solenoid	H-L
10	Displacement change solenoid	C-N
11	Forward speed solenoid	H-R
12	Reverse speed	S-G
13	Cardan sensor	L-G

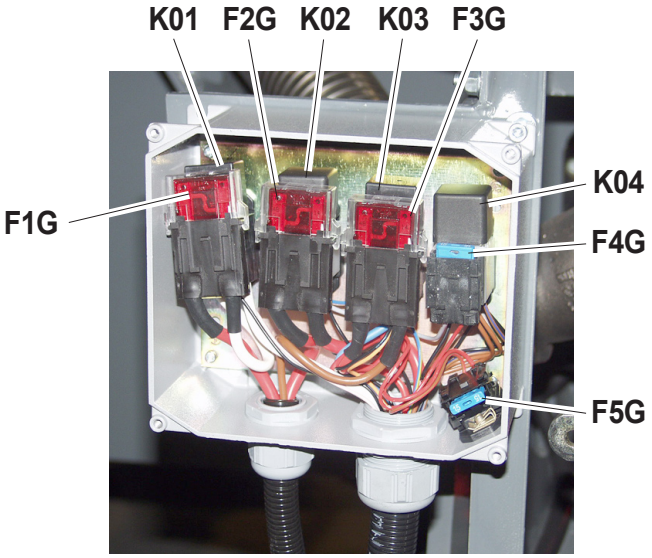
WIRE COLOURS

A	LIGHT BLUE	M	BROWN
B	WHITE	N	BLACK
C	ORANGE	R	RED
G	YELLOW	S	PINK
H	GREY	V	GREEN
L	BLUE	Z	PURPLE

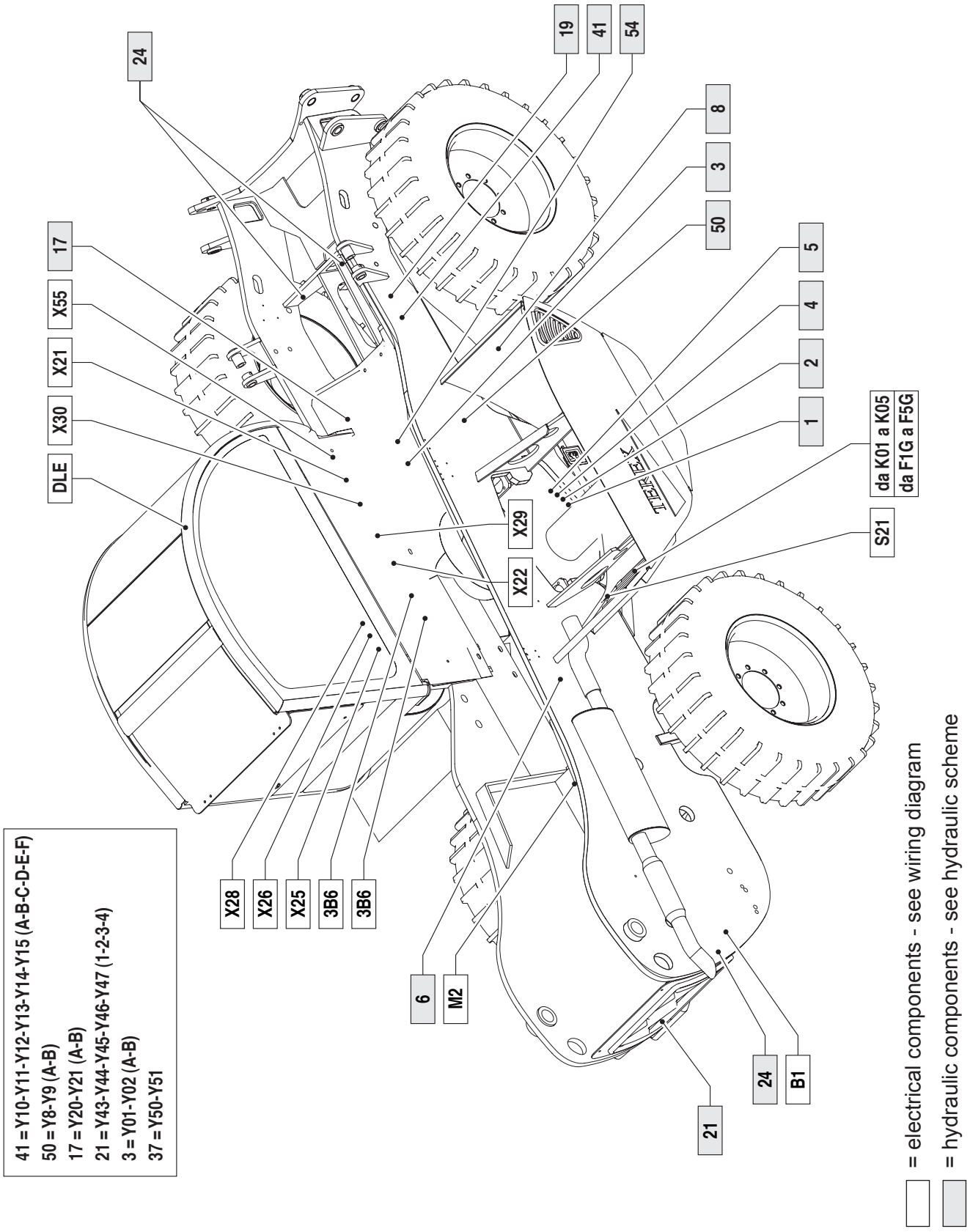
REMARK: TWO-COLOUR WIRES ARE INDICATED THROUGH A COMBINATION OF THE AFORESAID INITIALS
EXAMPLE:
G/V ->YELLOW/GREEN (CROSSWISE COLOURING)
G-V ->YELLOW-GREEN (LENGTHSWISE COLOURING)

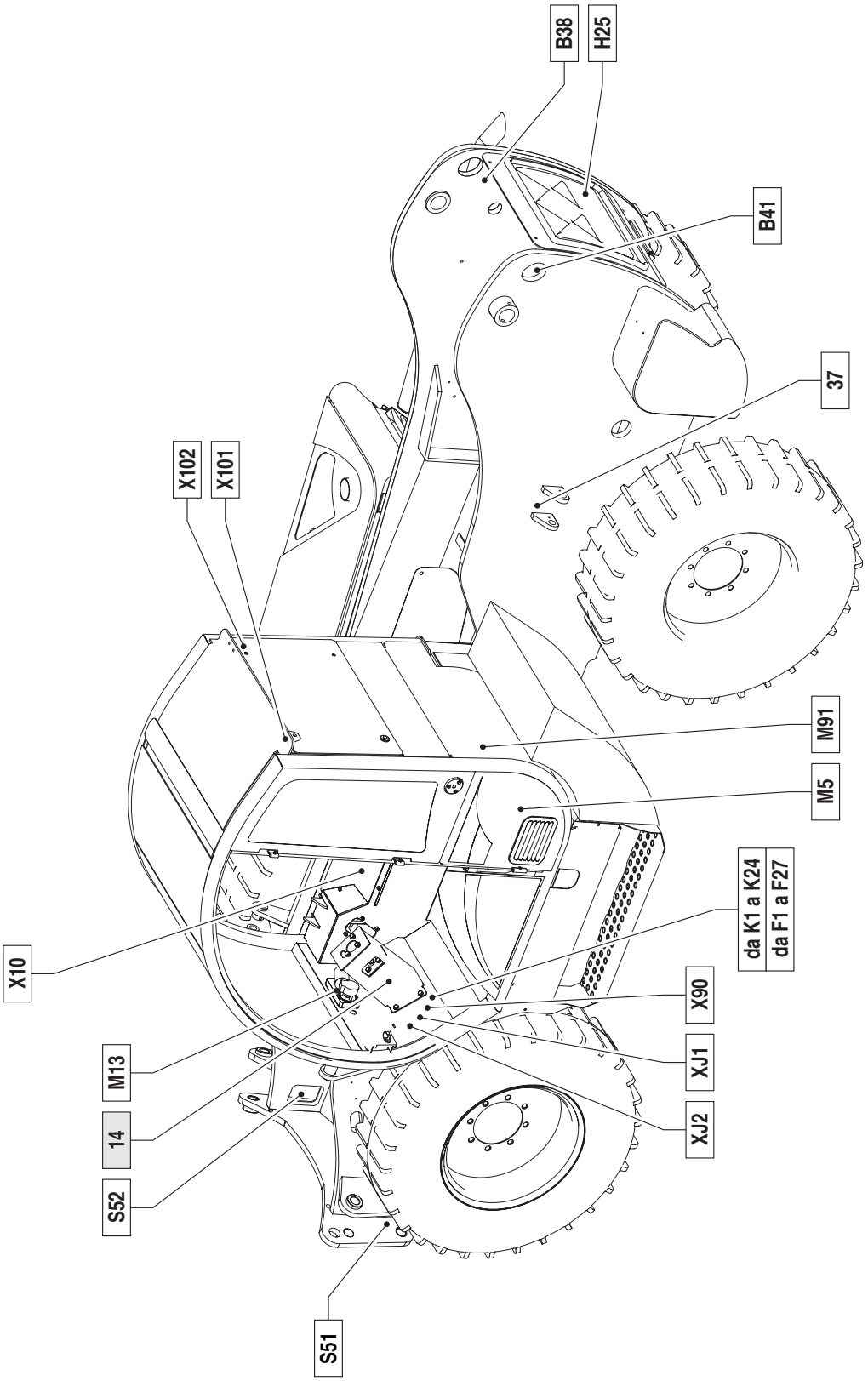
6.4.3 Engine compartment fuses and relays

Ref.	Circuit	Amp.
F1G	Main fuse	50
F2G	Main fuse	50
F3G	Main fuse	50
F4G	Main fuse	15
F5G	Main fuse	15
K01	Start-up relay	
K02	Pre-heating relay	
K03	Engine stop relay	
K04	Emergency pump relay	
K05	Aux circuit main line (Fuse compartment)	



6.5 POSITION OF THE ELECTRIC AND HYDRAULICAL COMPONENTS ON THE MACHINE



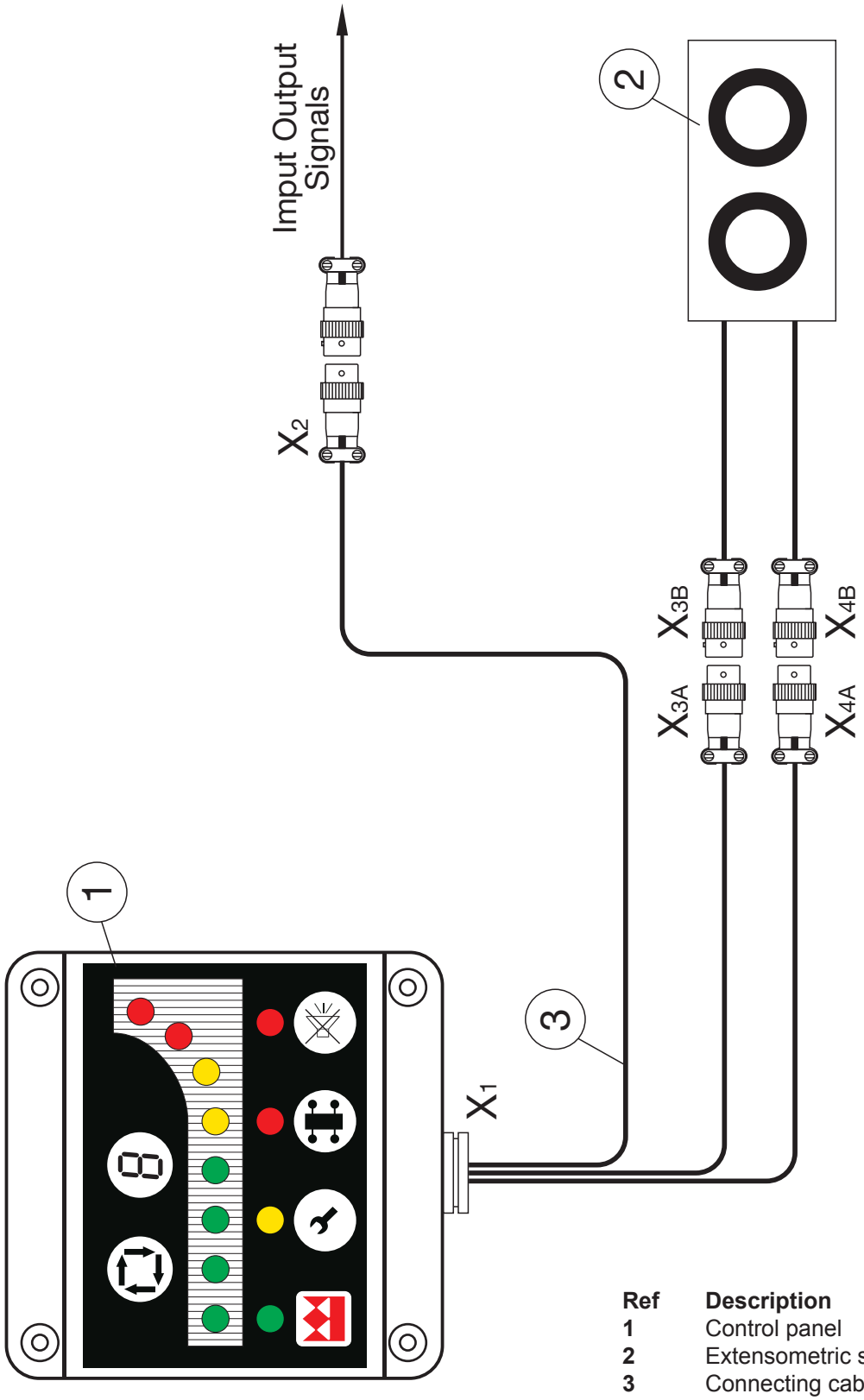


= electrical components - see wiring diagram

= hydraulic components - see hydraulic scheme

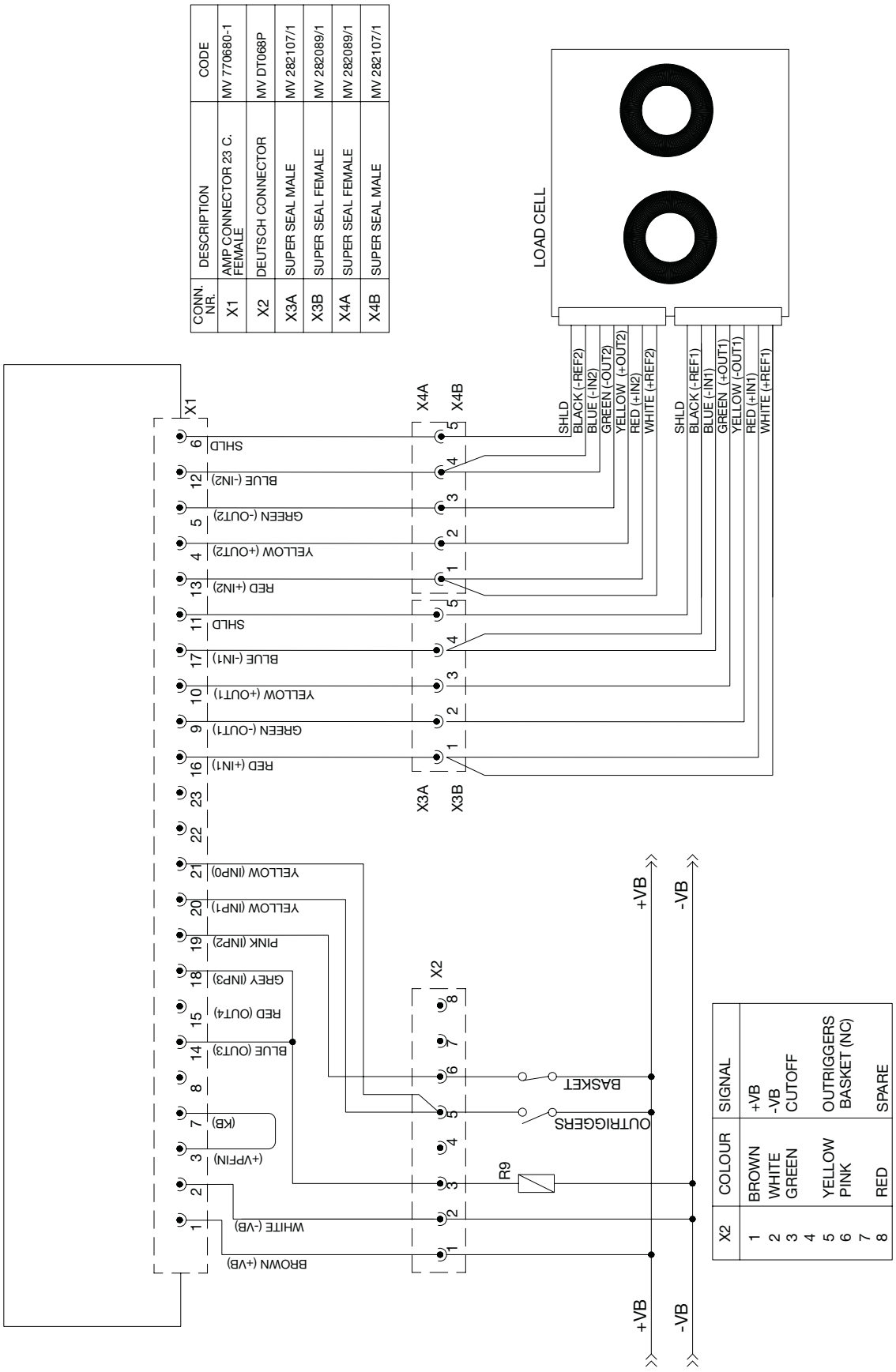
6.6 LOAD LIMITING SYSTEM

6.6.1 Wiring diagram - lay-out



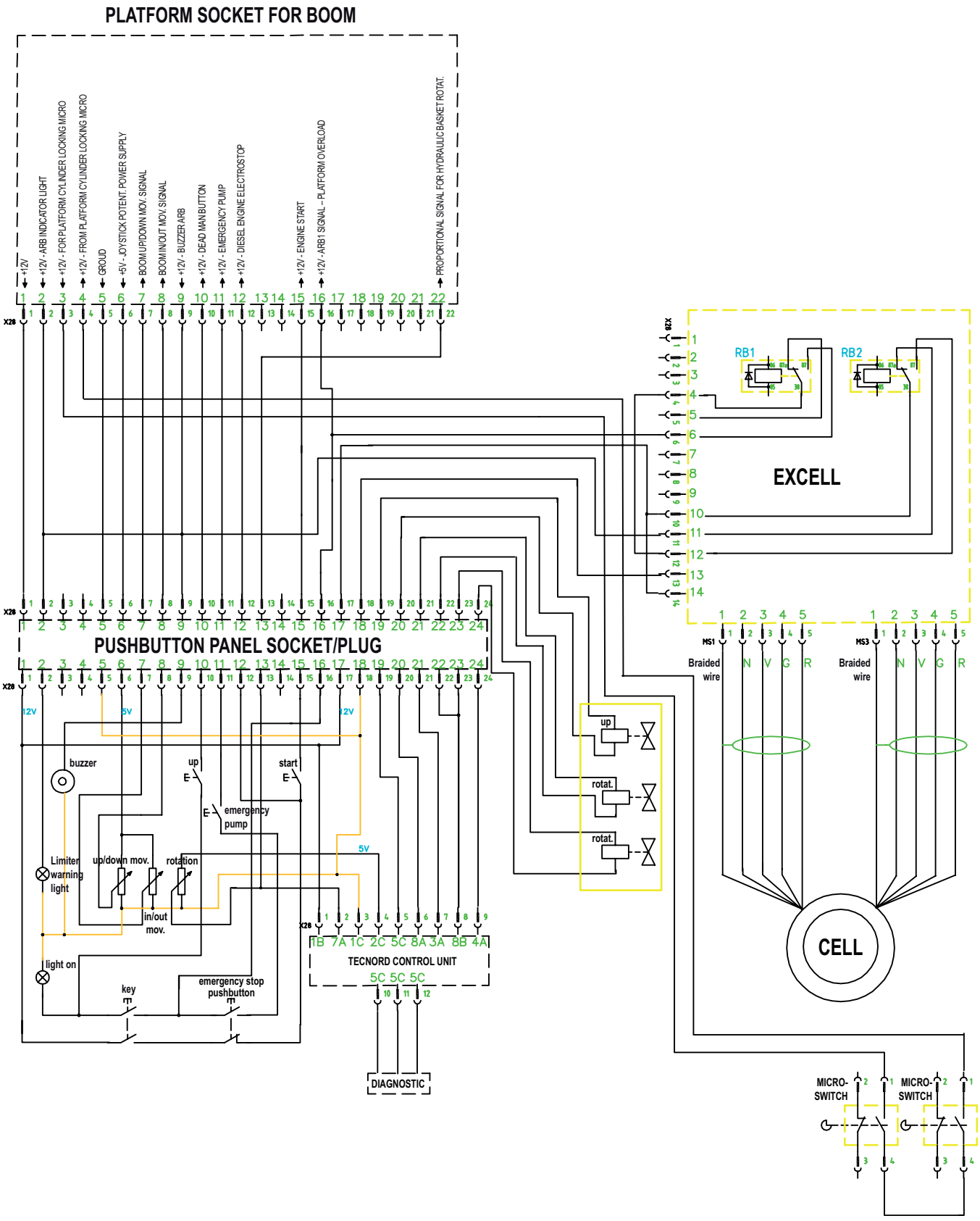
Ref	Description
1	Control panel
2	Extensometric sensor - double bridge
3	Connecting cable

6.6.2 Wiring diagram - External connections

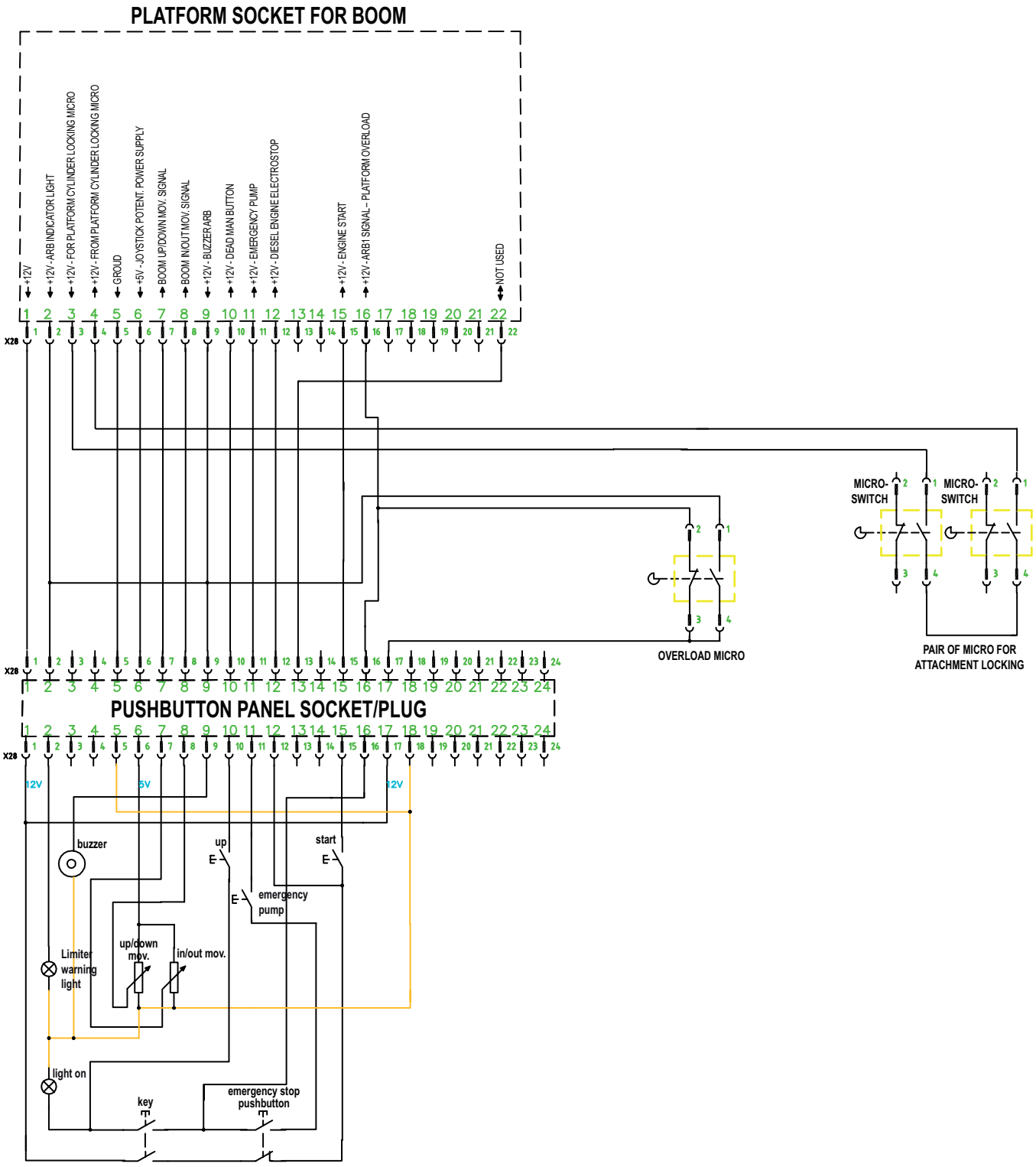


6.7 MAN-PLATFORMS

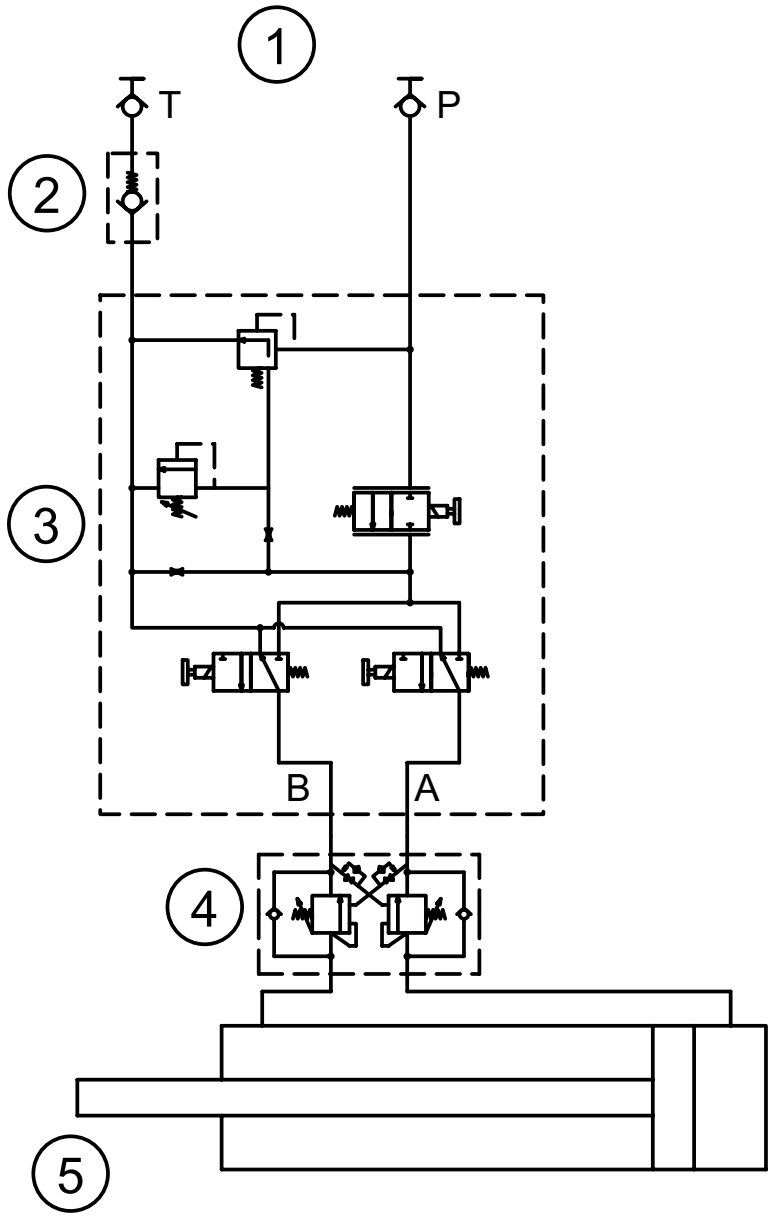
6.7.1 Wiring diagram - man-platform with hydraulic basket rotation



6.7.2 Wiring diagram - fixed man-platform



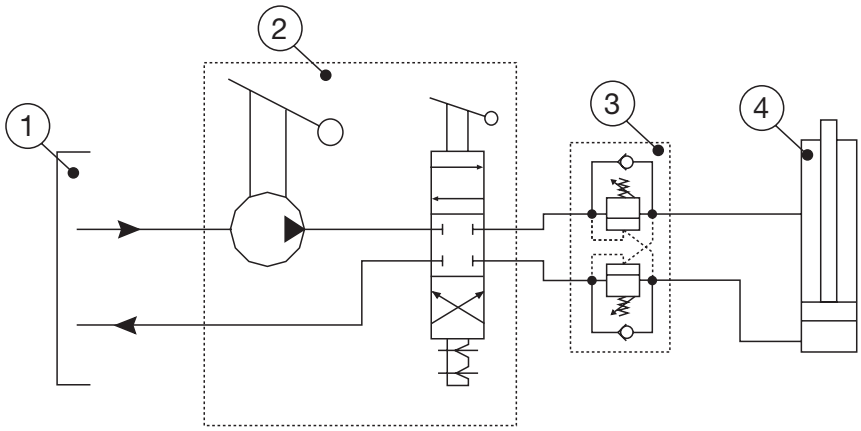
6.7.3 Hydraulic scheme - man-platform with hydraulic basket rotation



Ref.	Description
1	Quick couplings
2	Non-return valve
3	Proportional/directional valve
4	Compensation valve
5	Rotation cylinder

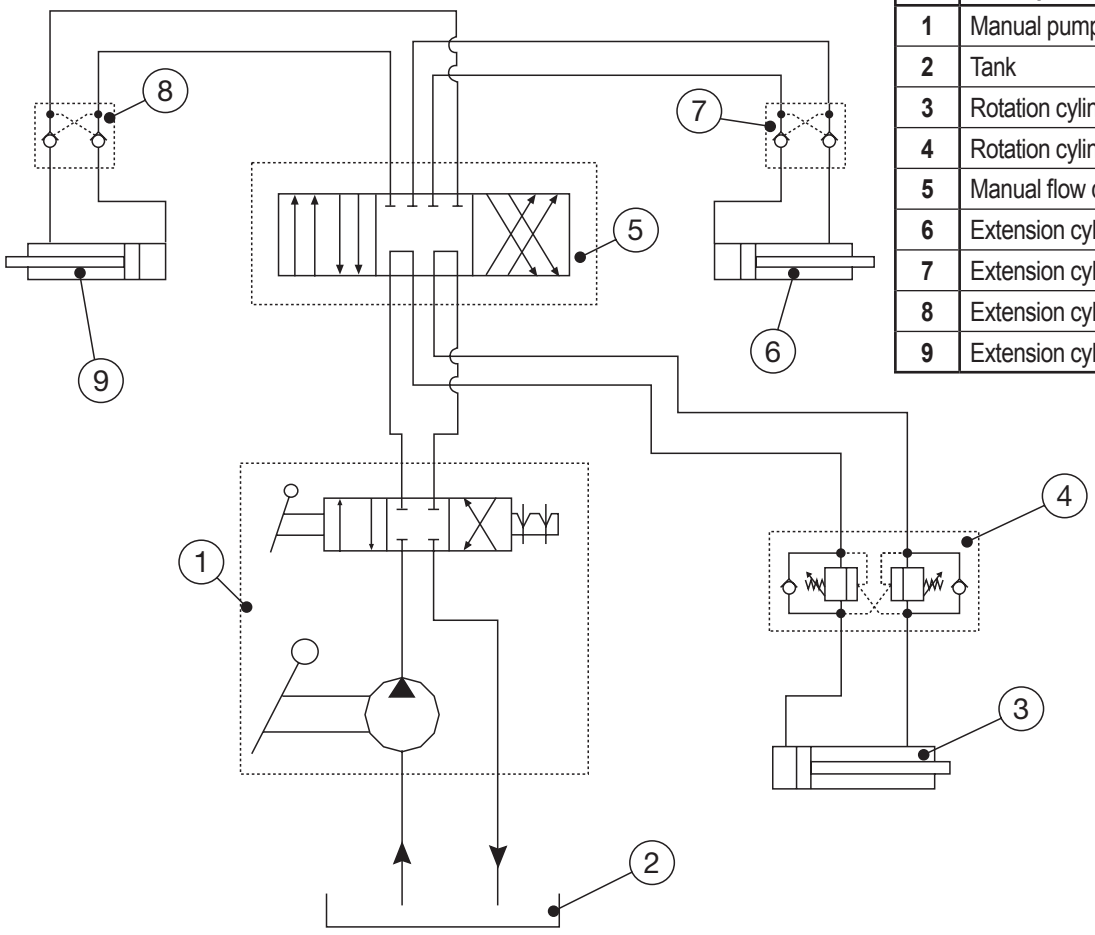
6.7.4 Hydraulic scheme - man-platform with manual basket rotation

Mod. RNE - REM 4400



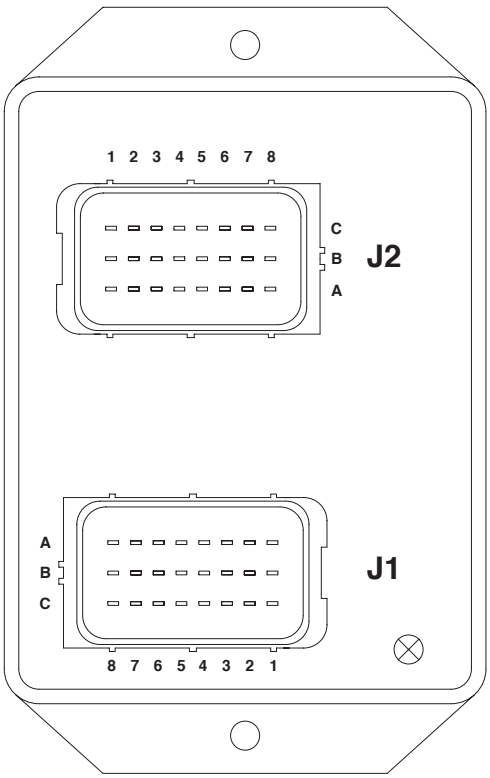
Ref.	Description
1	Tank
2	Manual pump
3	Block valve
4	Rotation cylinder

Mod. REM 5500



Ref.	Description
1	Manual pump
2	Tank
3	Rotation cylinder
4	Rotation cylinder block valve
5	Manual flow divider
6	Extension cylinder
7	Extension cylinder block valve
8	Extension cylinder block valve
9	Extension cylinder

6.8 TECNORD CONTROL UNIT CONNECTIONS



Connector J1 - input signals

1A = boom out/in signal
2A = dead man from cabin (+12 V with button pressed down)
3A = low boom signal (+12 V with boom at less than 2 metres and sensor excited)
4A = left outrigger up
5A = right outrigger up
6A = sway right
7A = road/site selector (+12V with selector turned to site)
8A = TX RS232

1B = boom up/down signal
2B = boom out/in signal from platform
3B = road/site selector (+12V with selector turned to platform)
4B = overload signal (+12 V when the machine is not in alarm)
5B = left outrigger down
6B = sway left
7B = dead man from platform
8B = RX RS232
1C = fork rotation signal
2C = boom up/down signal from platform
3C = movement selector button (+12 V with white button pressed down)
4C = potentiometer common line (+5V)
5C = ground
6C = right outrigger down
7C = feet down signal (+12V with outriggers lowered to the ground)
8C = platform overload signal

Connector J2 - output signals

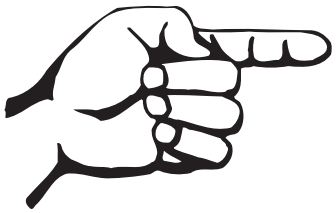
1A = left outrigger up
2A = left outrigger down
3A = right outrigger up
4A = right outrigger down
5A = sway left
6A = sway right
7A = boom out/in signal
8A = ground

1B = attachment locking/unlocking signal
2B = joystick button common line (+12 V)
3B = N.C.
4B = N.C.
5B = fork rotation signal
6B = N.C.
7B = N.C.
8B = +12 V battery

1C = attachment unlocking signal
2C = +12 V for alarm indicator on platform
3C = +12 V with operated joystick
4C = N.C.
5C = +12 V for sound alarm on platform
6C = N.C.
7C = N.C.
8C = boom lift/lower signal

Summarising table of the voltage values of the boom movements

	Up	Down	Out	In	Fork rotation - Open	Fork rotation - Close
Joystick in rest position (2.5 V)	•	•	•	•	•	•
0.7 V		•		•		•
4.25 V	•		•		•	



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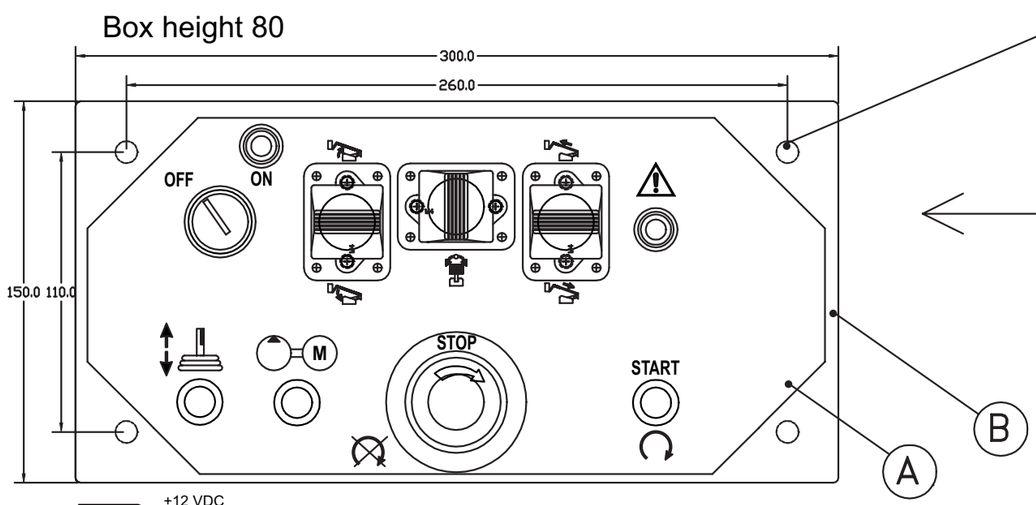
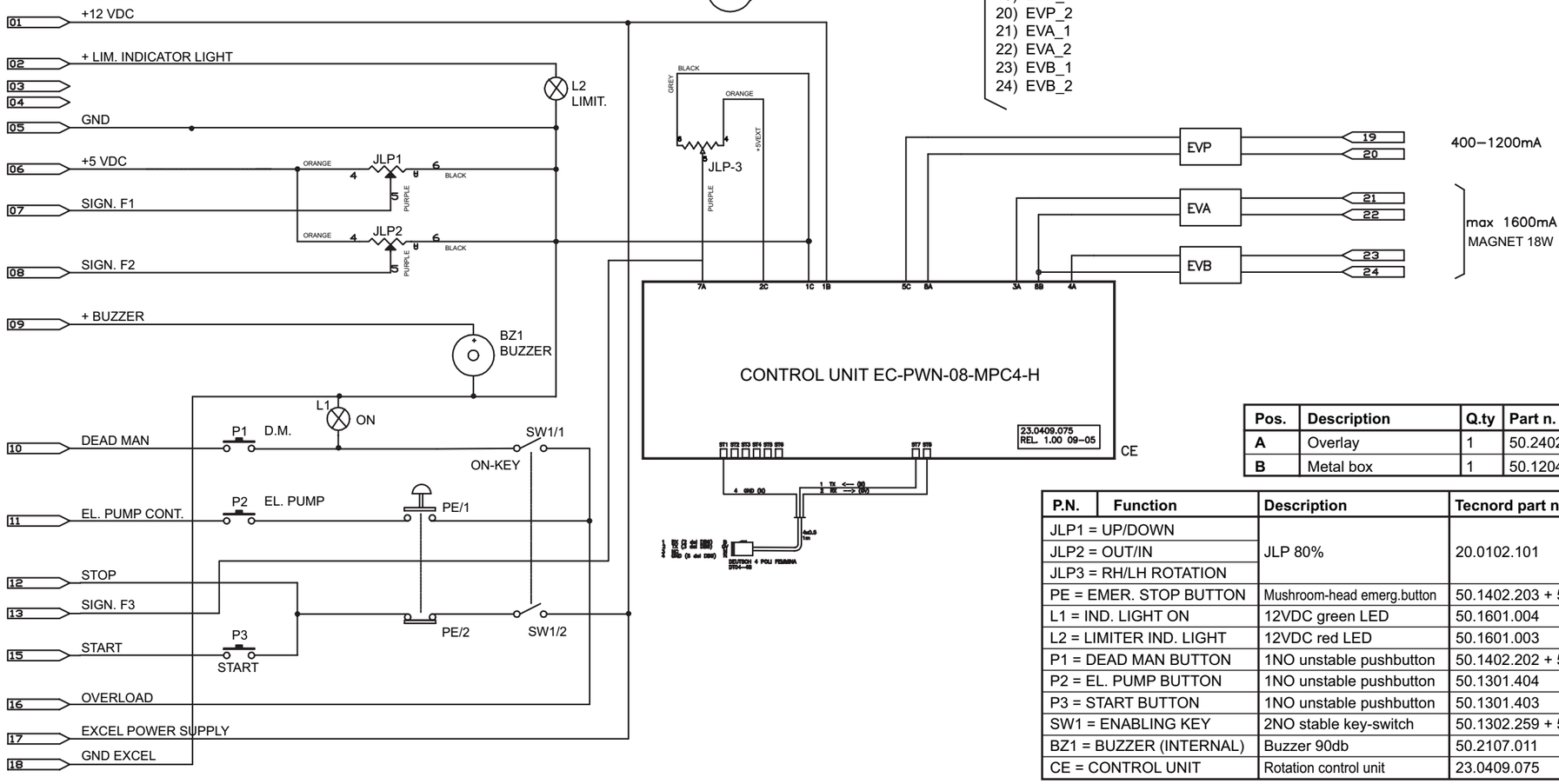
6.9 PUSHBUTTON PANEL WIRING DIAGRAM

6.9.1 Pushbutton panel for man-platform with hydraulic basket rotation



4 x screws M8x35 + nut M8 - Useful depth M8x25

CONNECTIONS
1) +POWER SUPPLY (+12VDC)
2) LOAD LIMITER INDICATOR LIGHT
3) NOT USED
4) NOT USED
5) GND (0Vdc)
6) + POTENTIOMETER (+5VDC)
7) SIGNAL FUNCTION 1
8) SIGNAL FUNCTION 2
9) BUZZER
10) DEAD MAN
11) ELECTRIC PUMP CONTROL
12) STOP CONTROL
13) SIGNAL FUNCTION 3
14) NOT USED
15) START CONTROL
16) OVERLOAD (SIGNAL FROM EXCEL)
17) EXCEL POWER SUPPLY
18) GND EXCEL
19) EVP_1
20) EVP_2
21) EVA_1
22) EVA_2
23) EVB_1
24) EVB_2



Pos.	Description	Q.ty	Part n.
A	Overlay	1	50.2402.075
B	Metal box	1	50.1204.068+069

P.N. Function	Description	Tecnord part n.:
JLP1 = UP/DOWN	JLP 80%	20.0102.101
JLP2 = OUT/IN		
JLP3 = RH/LH ROTATION		
PE = EMER. STOP BUTTON	Mushroom-head emerg.button	50.1402.203 + 50.1410.102
L1 = IND. LIGHT ON	12VDC green LED	50.1601.004
L2 = LIMITER IND. LIGHT	12VDC red LED	50.1601.003
P1 = DEAD MAN BUTTON	1NO unstable pushbutton	50.1402.202 + 50.1410.103
P2 = EL. PUMP BUTTON	1NO unstable pushbutton	50.1301.404
P3 = START BUTTON	1NO unstable pushbutton	50.1301.403
SW1 = ENABLING KEY	2NO stable key-switch	50.1302.259 + 50.1310.064
BZ1 = BUZZER (INTERNAL)	Buzzer 90db	50.2107.011
CE = CONTROL UNIT	Rotation control unit	23.0409.075

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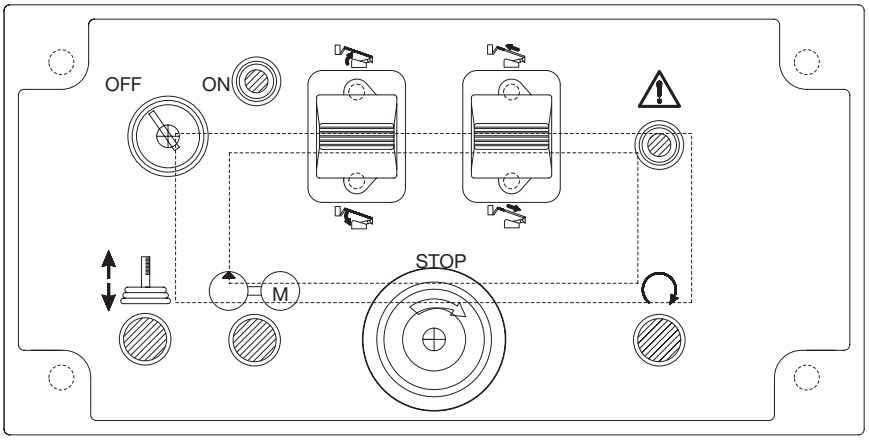
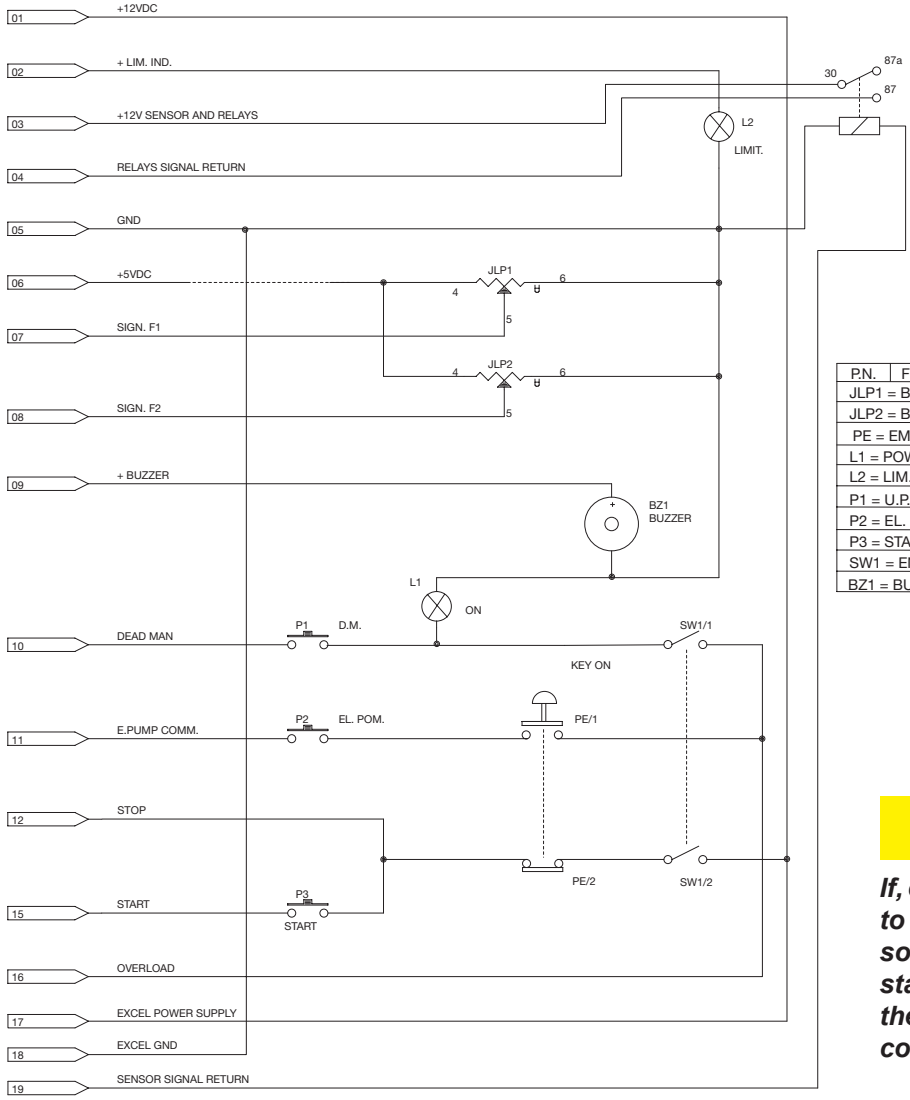
6.9.2 Pushbutton panel for man-platform with manual basket rotation



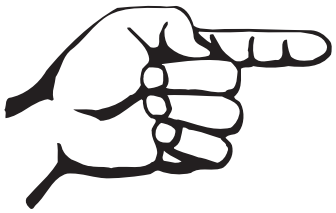
CONNECTIONS:
1) +POWER (+12VDC)
2) LIMITER INDICATOR
3) +12V SENSOR AND RELAYS
4) RELAYS SIGNAL RETURN
5) GND (0VDC)
6) + POTENT. (+5VDC)
7) FUNCTION 1 SIGNAL
8) FUNCTION 2 SIGNAL
9) BUZZER
10) DEAD MAN
11) EL. PUMP COMMAND
12) STOP COMMAND
15) START COMMAND
16) OVERLOAD (SIGNAL FROM EXCEL)
17) EXCEL POWER SUPPLY
18) EXCEL GND
19) SENSOR SIGNAL RETURN



P.N. Function	Description
JLP1 = BOOM UP/DOWN	JLP 80%
JLP2 = BOOM OUT/IN	
PE = EMERGENCY STOP	Mushroom-head emerg.button
L1 = POWER WARNING LIGHT	Green LED indicator 12VDC
L2 = LIM. WARNING LIGHT	Red LED indicator 12VDC
P1 = U.P. BUTTON	Button, instable, 1NO
P2 = EL. PUMP BUTTON	Button, instable, 1NO
P3 = START BUTTON	Button, instable, 1NO
SW1 = ENABLING KEY	Key-switch, stable, 2NO
BZ1 = BUZZER (INTERNAL)	Buzzer 90db

CAUTION

If, once the platform has been coupled to the machine, the audible alarm still sounds and the engine cannot be started, disconnect pins 15-16 from the power socket on the boom and connect pins 13-14.



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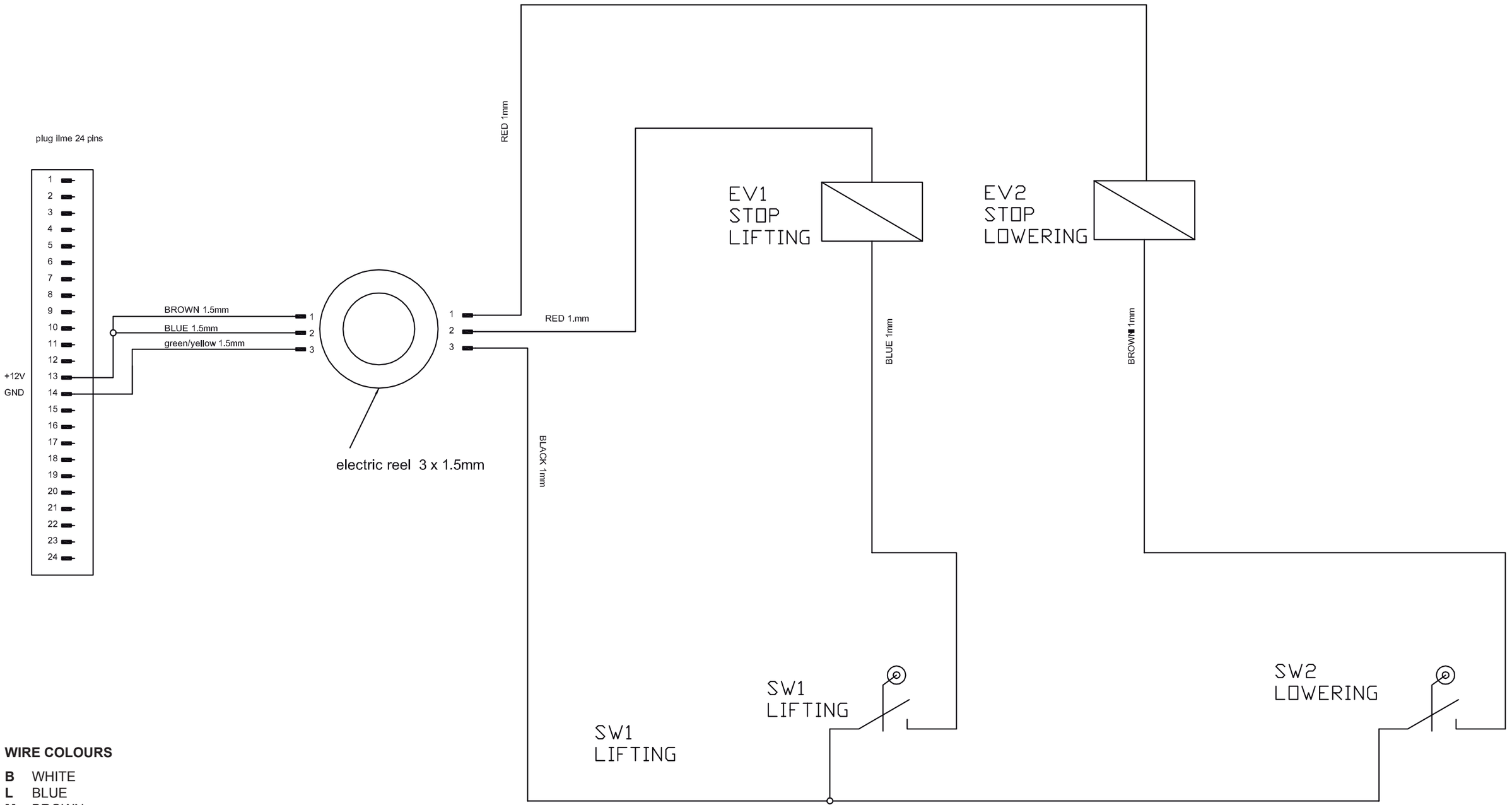
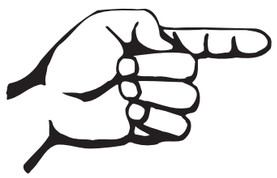
6.10 EXTENSION JIBS AND WINCHES

6.10.1 Wiring diagram - extension jibs and winches



WIRE COLOURS

B WHITE
L BLUE
M BROWN
N BLACK
GV YELLOW-GREEN



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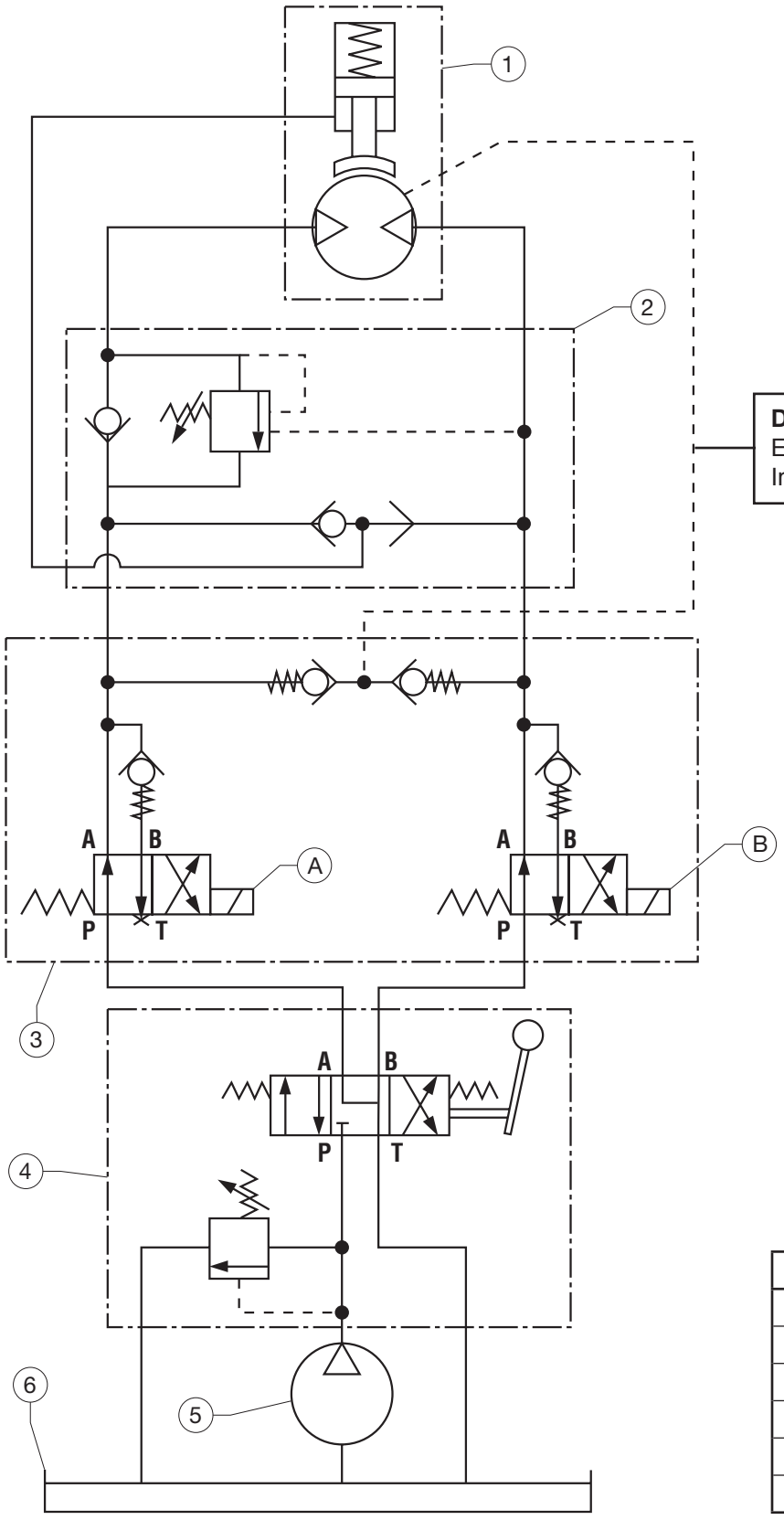
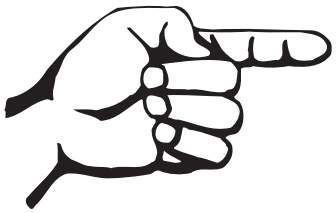
6.10.2 Hydraulic scheme - winches



Discharge line
External for S25 winches
Internal for P9 and P15 winches

Ref.	Description
1	Hydraulic motor
2	Valve
3	Cock
4	Main valve
5	Hydraulic pump
6	Oil tank



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Section 7
REPAIR PROCEDURES

SECTION INDEX

7.1 TIME SCHEDULE

Job	Operators needed	Expected time (h)
change the ignition key	1	1,00
change the speed switch	1	0,30
change the lights and horn switch	1	0,30
change the overload warning system display	1	0,15
re-calibrate the 3B6 system	1	1,00
change the load cell	1	2,00
change the overload warning system displayand calibrate	1	1,00
change the joystick	1	1,30
change the deadman button	1	0,30
change the joystick movement switch pushbutton	1	0,30
change the brake pump	1	1,00
change the 2 gearbox sensors	1	0,30
change the cardan shaft sensor	1	0,15
change the low boom sensor (only Telelift 4017)	1	0,15
change the high boom sensor (only Telelift 4017)	1	0,15
change the boom lifting cylinder	1	2,15
change the boom lifting cylinder kit (complete overhaul)	1	1,30
change the block valve of the boom lifting cylinder	1	0,30
change the extension cylinder on the boom	1	1,00
change the extension cylinder kit on the boom	1	1,30
change the valve of the extension cylinder on the boom	1	0,30
change the fork pitching cylinder	1	1,30
change the fork pitching cylinder kit	1	1,30
change the valve of the fork pitching cylinder	1	0,30
change the attachment locking cylinder	1	1,00
change the attachment locking cylinder kit	1	1,15
change the block valve of the attachment locking cylinder	1	0,30
change the outrigger up/down mov. cylinder	1	1,30
change the outrigger up/down mov. cylinder kit	1	1,30
change the valve of the outrigger up/down mov. cylinder	1	0,30
change the fork compensation cylinder	1	2,00
change the fork compensation cylinder kit	1	1,30
change the valve of the fork compensation cylinder	1	0,45
check the one-way valves of the fork compensation cylinder	1	0,20

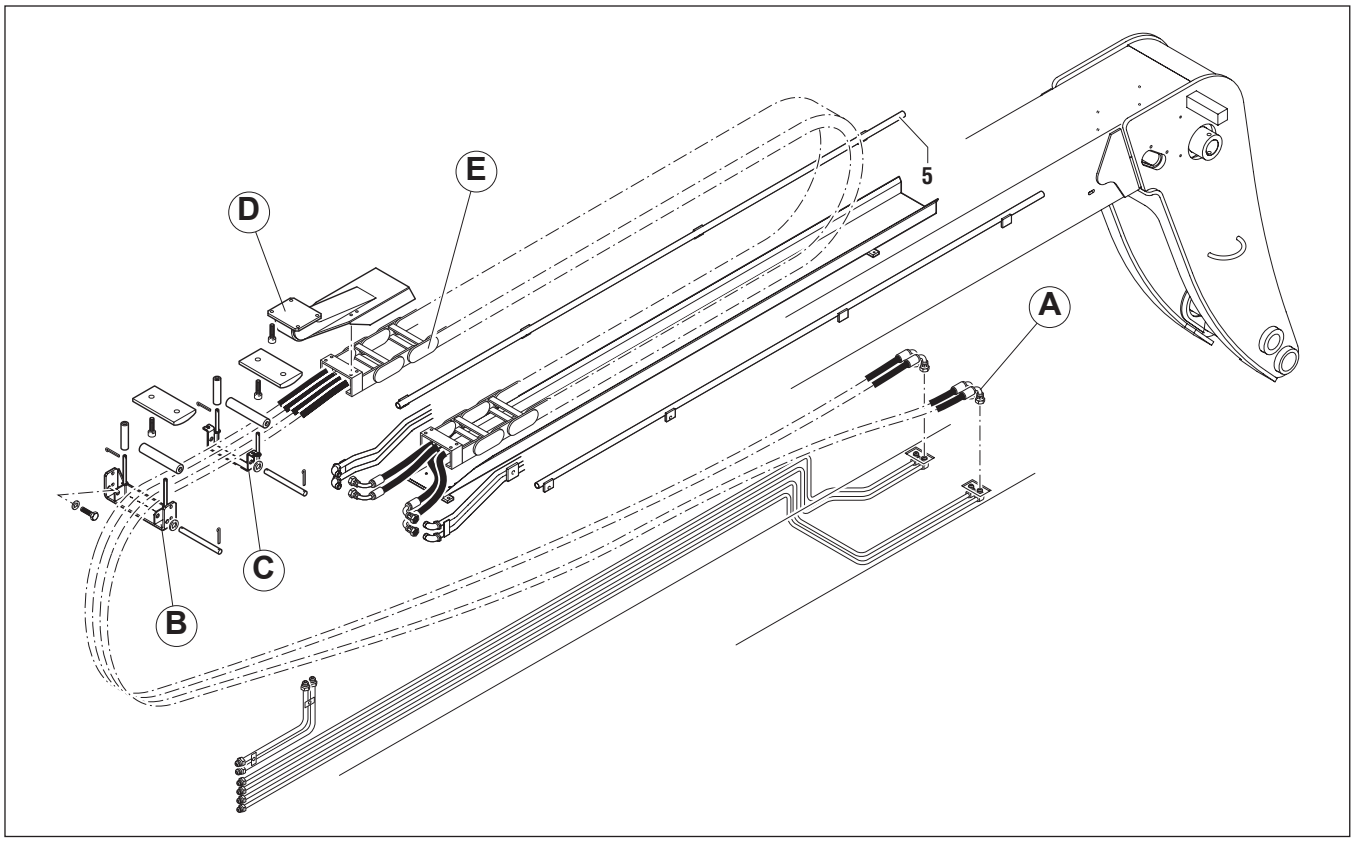
Job	Operators needed	Expected time (h)
change the machine sway cylinder	1	1,30
change the machine sway cylinder kit	1	1,30
change the machine sway cylinder valve	1	0,30
change the boom internal line for the fork pitching (Telelift 4514)	1	1,30
change the boom internal line for the fork locking (Telelift 4514)	1	1,30
change the boom slide pads (Telelift 4514)	1	3,00
change the boom slide pads (Telelift 4017)	1	1,30
check the pressure of the drive pump	2	0,20 each
check the pressure of the main actuator operating the boom movements	2	0,20 each
check the pressure of brake pump and hydrostatic steering unit	1	0,15
check the safety valves	1	0,15
change the drive pump	1	2,00
change the drive motor	1	2,00
change and test motor, pump and transmission lines	1	5,00
change the actuator control pump	1	1,30
change and calibrate the actuator	1	2,00
change the pump on the engine injection line	1	1,00
change the electrical flow divider	1	0,30
change relays and fuses	1	0,10
change the windscreen wiper motor	1	1,00
change and test the emergency pump coil	1	0,30
change the emergency pump	1	1,00
change the boom chain (Telelift 4017)	2	8,00
change a solenoid valve	1	0,20
change the gas pedal complete with cord	1	1,00
change the manual throttle complete with cord	1	0,30
change the front axle shaft	1	3,00
change the rear axle shaft	1	3,00
change 1 cardan joint	1	1,00
change the cardan joints	1	2,00
change the axle shaft hub	1	1,30
change the boom assy	2	5,00 each
change the boom anchoring pin	2	1,00 each
change the attachment locking cylinder pins	1	0,30

Job	Operators needed	Expected time (h)
change the outrigger cylinder pin	1	0,20
change the platform power socket at the top of the boom	1	0,20
change the platform joystick	1	0,20
change a cab pushbutton	1	0,30
change the platform pushbuttons	1	0,10
change and test the actuator pressure relief valve or the sliders	1	0,30
change and test the actuator safety valve	1	0,30
change the one-way valve	1	0,20
change the maxi-fuses and search for troubles	1	0,10
bleed the braking system	2	0,15 each
change the hydraulic oil filter of the drive pump injection line	1	0,20
change the hydrostatic steering unit	1	1,30
change the beacon	1	0,20
change the battery	1	0,10
change the exhaust pipe	1	0,30
change the mud-guard supports	1	0,20
change the mud-guards	1	0,10
change the parking brake cord	1	0,30
change the steering wheel	1	0,10
dismantle the hydraulic oil tank	1	2,00
dismantle the fuel tank	1	2,00
change a wheel (n° 1)	1	0,15
change the rear axle locking cylinder	1	1,00
change the outriggers	1	1,00
change flexible hoses	1	0,15
change the parking brake lever	1	0,30

7.2 DISASSEMBLY AND REASSEMBLY

7.2.1 Dismantling the hose guiding chain - Telelift 4017

If you have to remove the hose guiding chain from the boom, proceed as follows:

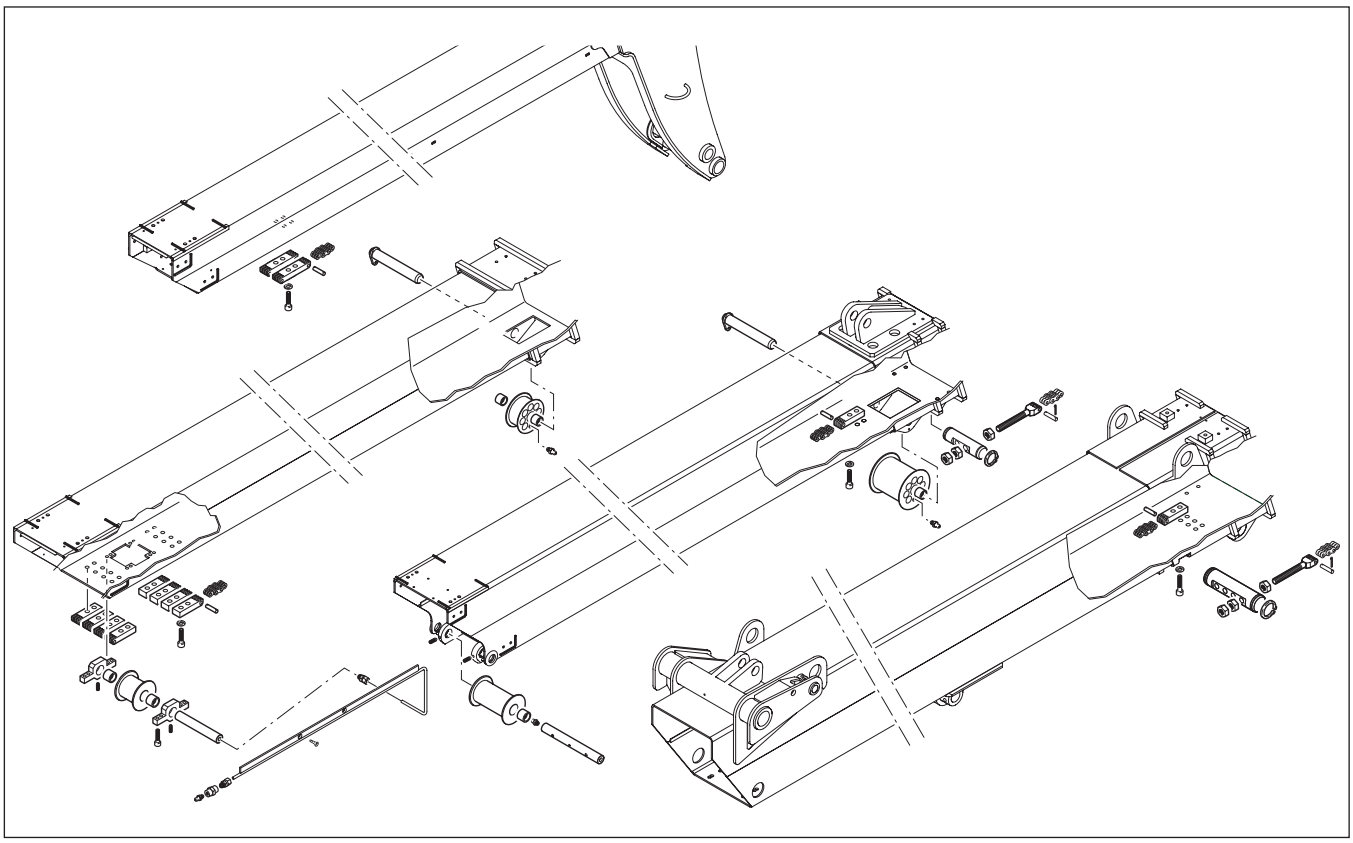


NOTICE

Before disconnecting the hydraulic piping, place containers of suitable size underneath to avoid oil spillage.

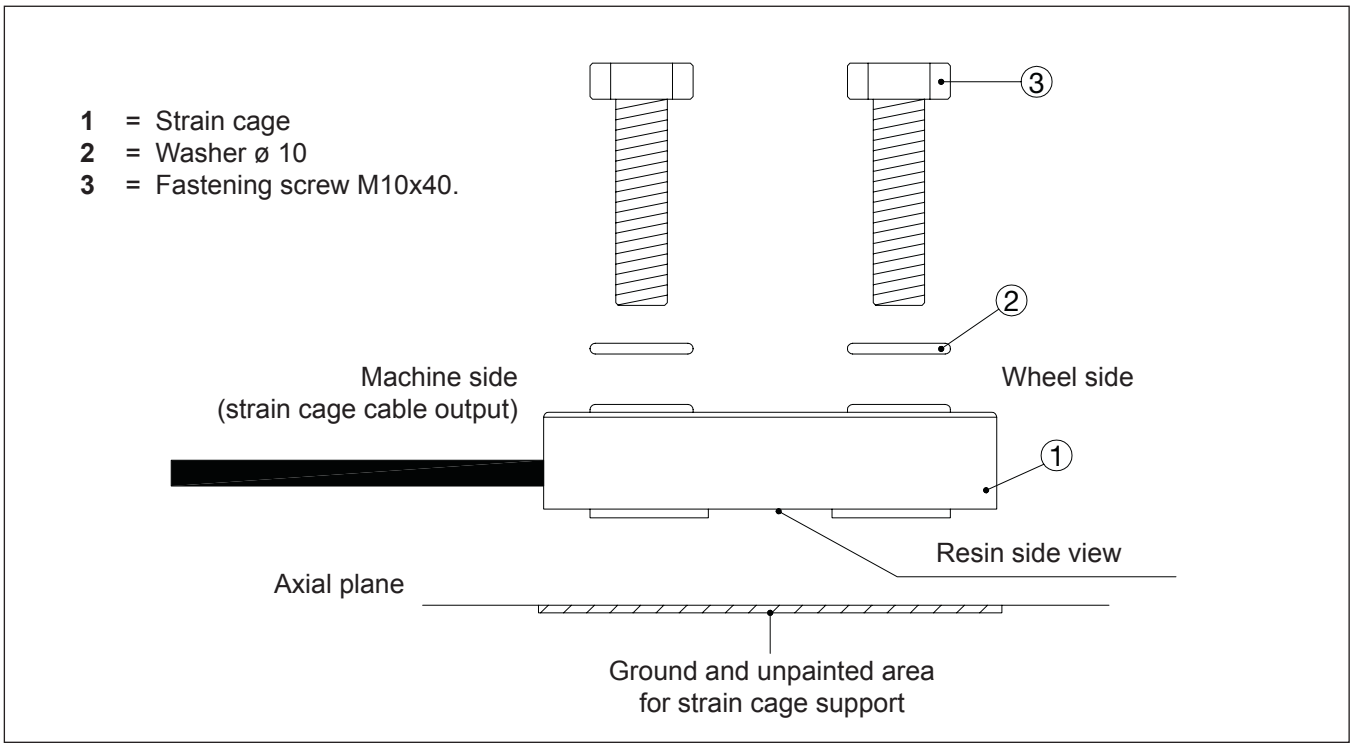
- Remove the 4 coupled hoses **A** connected to the iron pipes under the boom and place 4 plugs so you can move the machine without oil leaking.
- Remove the rear cover and extend the boom until the second telescope is beyond the two openings under the boom.
- Move to the rear side of the machine and pull the 4 hoses off the boom.
- Remove the first chain sliding roller **B** located on the third telescope, then remove the second roller **C** located on the fourth telescope.
- Disconnect the flex hoses from the pipes being careful to mark their position to help reassembly.

- Plug the fittings of the pipes to avoid that dirt and dust can enter the circuit.
- Remove the four fixing screws of the plastic chain from the raceway.
- Remove the three screws of bracket **D** supporting the chain.
- Pull the terminals of the hydraulic hoses outwards to pull the chain off the boom.
- Place the unwound chain on the ground and remove all crosspieces **E**.
- Replace any damaged hose.
- Space the internal spacers of the chain.
- Replace all of the crosspieces removed.
- Bend and prepare the chain for the assembly in the boom.
- Insert the holding chain into the boom so the four terminals are aligned with those of the fourth telescope.
- Connect the hoses to the pipes using the marks previously done as a reference.
- Replace the two sliding rollers **B**-**C** inside the boom.
- Connect the plastic chain to the raceway.
- Lock the chain bracket to the second telescope.
- Extend the boom so the four hoses can pass between the first and the second telescope.



- Place the hoses into the boom.
- Remove the four plugs from the iron pipes and reconnect the hoses.
- Start the machine and check for oil leaks, then refit the rear cover.

7.2.2 Strain load cell tightening



In order to get the best results and avoid damaging the strain gage, follow these precautionary measures:

1 - PREPARATION:

- Thoroughly clean the whole tightening system, especially the ground and unpainted area.

2 - ASSEMBLY:

- Apply the strain gage with its resinated side facing the axle and holding the cable(s) toward the machine.
- Tighten the two screws with a torque wrench at 70 N/m.
- Mark the position of the screws with paint in order to make possible loosening visible to the eye.