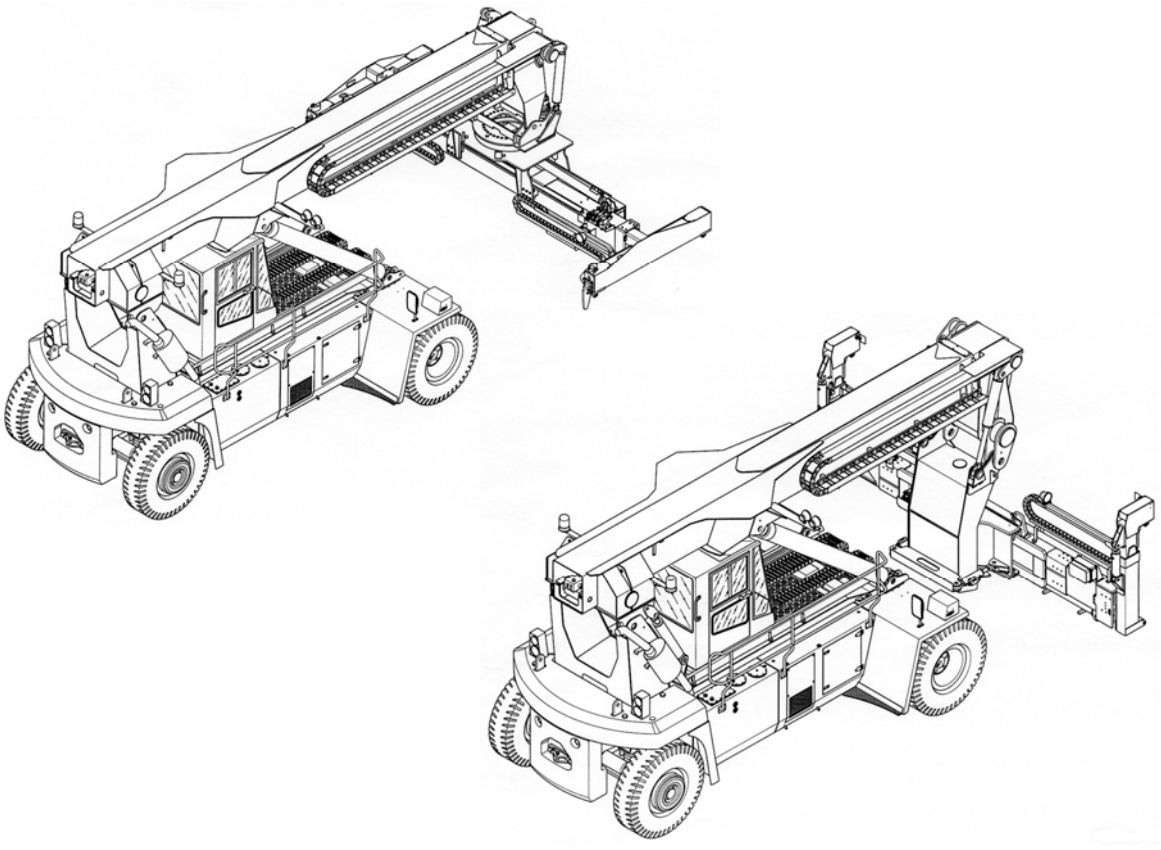
OPERATION AND MAINTENANCE MANUAL



REACH STACKER

F230-F240-F250 *Series*

Rev. 00 / 00.00
Cod. F234501ME/03.2009

CVS FERRARI S.r.l. reserves the right to make, at any time, changes to the vehicles due to technical or commercial character reasons; therefore the information, the descriptions and the illustrations contained in this publication are up-to-date till the moment of the approval for the printing out.

CVS FERRARI S.r.l.
Via Emilia - 29010 Roveleto di Cadeo – (PC) – Italy
Tel: +39.0523.503511 r.a. - - Telefax: +39.0523.500439
e-mail: aftersales@cvsferrari.com
Internet: http://www.cvsferrari.com

CONTENTS

Chapter 1

Chapter 2

Chapter 3

CONTENTS

Chapter 4

CONTENTS

Chapter 5

CONTENTS

Chapter 6

CONTENTS

Chapter 6 (cont'd)

CONTENTS

Chapter 6 (cont'd)

Chapter 7

CONTENTS

Chapter 8

Chapter 9

Chapter 10

ELECTRONIC OPERATING SYSTEM "*3B6 – MICMAC-RS.**"**

- Transmission automation device
- Load moment limiting device
- Load moment indicator
- Accelerator controlling device

LOAD MOMENT LIMITING SYSTEM "*3B6 Model U2-MIC*"

SPREADER :
- **"SS100*RSR*"** [F238]
- **"SS100RS"** [F248]
- **"SS100RSD"** [F248 Double Stacking]
- **"TS120RS"** [F258]

We wish to thank you for the preference given to C.V.S., it was a good choice; with your new REACH STACKER you receive a vehicle characterised by excellent performances, low consumption, high flexibility and working comfort.

Please read carefully and entirely following Operation and Maintenance Instructions concerning your new vehicle, because its good operation and long life depend upon an exact and consistent observance of the instructions contained hereinafter.

FOREWORD

This manual contains the Operating and Maintenance Instructions for the
REACH STACKERS F230 – F240 – F250 Series

Before operating your new vehicle, we recommend:

- To instruct the operator on its correct handling and the relevant safety regulations.
- To make sure that the operator has read and fully understood the instructions of this manual, in order to ensure that the vehicle is always operative and supplies best performances at any time.

IMPORTANT: Remember that it forms part of your responsibility to understand and to observe the manufacturer's instructions for the use of the vehicle.

This manual is divided into chapters, each of them is organised in a sequential, step-by-step-format, to provide the mechanic with an easy to read, handy reference containing comprehensive information on each part of the vehicle.

1) INTRODUCTION

2) SAFETY INSTRUCTIONS
This section contains information about all safety standards and devices.

3) DRIVER'S CAB
This section contains information about the main controls and instruments.

4) OPERATION OF THE VEHICLE'S CONTROLS
This section contains the detailed description of the static control devices of the vehicle.

5) START, DRIVE AND OPERATION OF THE VEHICLE
This section contains operating instructions to be always applied, but specially for new vehicles.

6) MAINTENANCE
This section contains basic instructions for inspection and maintenance, on whose observance depend the satisfactory operation, the economy and the long life of your vehicle.

IMPORTANT: All maintenance steps performed have to be recorded in the "MAINTENANCE REPORTS" OF CHAPTER 10.

7) LUBRICATION
This chapter contains figures, drawings and diagrams of the vehicle's systems *(hydraulic and electric diagrams, as well as any other possible diagram*.

8) DIAGRAMS
This chapter contains figures, drawings and diagrams of the vehicle's systems *(hydraulic and electric diagrams, as well as any other possible diagram).*

9) SPECIFICATIONS
This chapter contains all technical data of the various models of above-mentioned **Reach Stacker** series that must be read at least once to get some knowledge of the vehicle.

10) MAINTENANCE REPORTS
This chapter contains the reports in which all the performed maintenance steps must be recorded.

Attached to this manual you will also find specific manuals of the **ELECTRONIC CONTROL SYSTEMS** *(Throttle, Load Limiter, etc.)* and of the attachments installed, for example the **SPREADER**.

NOTE: *Concerning the engine, the transmission and the drive axle, this manual only contains general information; In any case, please refer to the relevant original use and maintenance manuals attached to the vehicle.*

IMPORTANT REMARKS

The **REACH STACKER** is suitable to handle containers between **20'** and **40'** with **10000 daN** or **12000 daN** lifting capacity, depending on the different models of the vehicles and to be verified on the lifting capacity plate inside the cab.
It may be operated *(with fixed hook)* as a crane with a lifting capacity of **15000 daN** *(to be verified on the lifting capacity plate inside the cab)*.
It is used in harbours and terminals for combined transport.
It must **NEVER** be used on public road or railway systems, and navigable waters.

WARNING :
- *NEVER* *use the Reach Stacker to handle cages for people or similar things.*
- *IT IS SEVERLY FORBIDDEN TO LIFT PEOPLE.*

Please read carefully the "SAFETY INSTRUCTIONS" before performing any lubrication and maintenance steps on the vehicle.

Any failure in the recommended lubrication and maintenance steps may cause serious problems.

Tools and methods NOT stated in this manual can only be used after making sure that they do not put at risk neither people's lives, nor the vehicle integrity and safety.

The terms WARNING, CAUTION and NOTE are used in this manual to highlight important and critical instructions:

WARNING : ***Failure to follow WARNING procedures, technical information and precautions could result in severe injury to people.***

CAUTION: ***Failure to follow CAUTION procedures, technical information and precautions could result in damages to the vehicle and/or to the equipment.***

NOTE: ***A NOTE provides key information on procedures, technical information and precautions.***

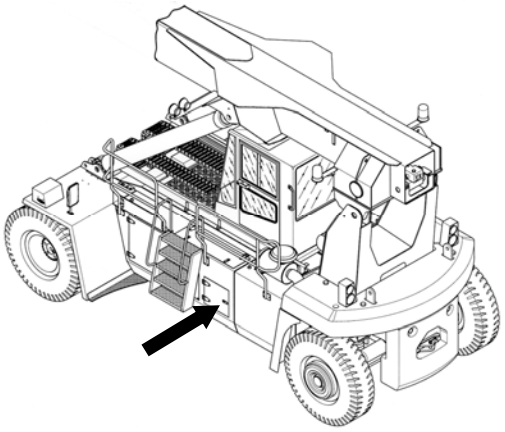
NOTES:

a) *The terms RIGHT, LEFT, FRONT and REAR in this manual are always referred to the direction of the vehicle's forward motion.*

b) *This manual only contains general information about the engine and the transmission. For more specific and detailed information, refer to enclosed operation and maintenance instructions of the relevant manufacturers*

CAUTION:
Before any step requiring the use of welding equipment, cut-off the power to the vehicle's electrical system with the main isolating switch located inside the left body side. Open the rear door *(the little one)**.***

NOTE: ***On request*** *(OPTIONAL)**, the vehicle may be equipped with a main electrical switch; in this case, to turn off the power just remove the ignition key from the ignition lock.***



SERVICE

SERVICE

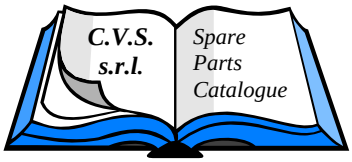
For all your service requirements, we recommend to contact the C.V.S.
Service Department, whose skilled staff and equipment is always at your complete disposal for any overhaul and/or repair, as well as for advice and explanations to achieve best performances from your vehicle.

SPARE PARTS

In case of replacement, we recommend to use only “GENUINE C.V.S. SPARE PARTS”, available from our stock or from our dealers and authorised C.V.S. repair workshops.

Failure to use genuine spare parts affects the validity of the warranty and relieves C.V.S. from any responsibility.

To order spare parts, we remember to specify following data:



- Type of vehicle
- Chassis serial number
- Code of the spare parts catalogue
- Number of the relevant tables of the spare parts catalogue of the ordered part
- Number, quantity and description of the part

NOTE: ***Ask directly C.V.S. S.r.l. or your DEALER for the spare parts catalogue.***

WARRANTY

As per the purchase agreement terms and conditions.
Failure of faulty performing of the maintenance procedures described in this manual may invalidate the warranty.

RESPONSIBILITY

The manufacturer’s responsibility is subordinated to the regular performance of the procedures contained in this use, inspection and maintenance manual.
To this purpose, the user should document the correct use of the vehicle and, moreover, the regular performance of the maintenance procedures at the intervals foreseen in the chapter -6- “MAINTENANCE and in the "MAINTENANCE CHARTS”, at chapter -7-.

IMPORTANT: This manual generally refers to the vehicle, some procedures have been described merely in a functional sense, in order to let the operator perform the normal operation and maintenance steps.

The performing mode of said instructions depends on the configuration of the controls and/or accessories fitted on the vehicle and to which the manual refers.

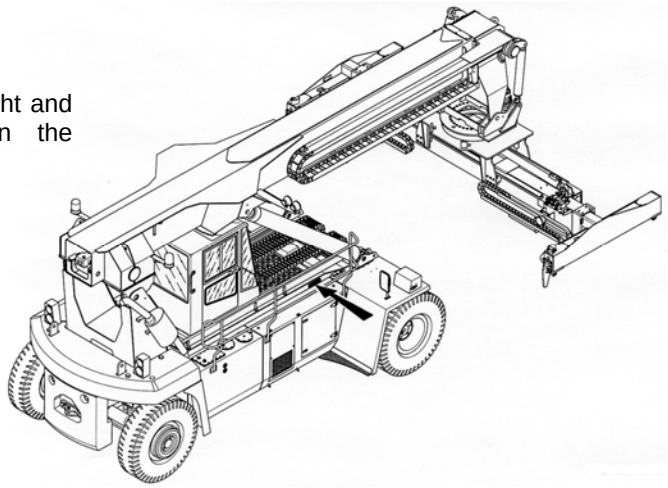
The manufacturer reserves the right to introduce at any time and without notice any modification for technical or economical reasons, or in order to adapt the vehicle to the laws of the destination country and declines all responsibility for possible faults or failures.

TRANSPORT **To transport the vehicle on road, railroad and navigable networks, follow the rules of the MINISTRY OF TRANSPORTATION in force in the transit-countries** (see separate description)**.**

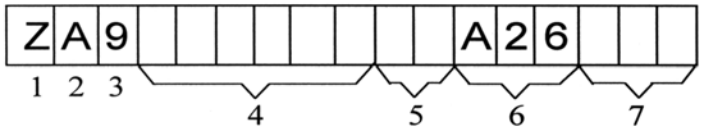
VEHICLE IDENTIFICATION DATA

The model name, chassis number, engine type and number and the manufacturer's plate are the identification data of the vehicle.

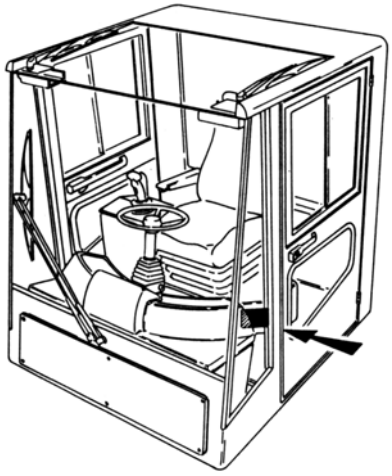
MODEL
The name of the model is shown on the right and left hand side of the boom and on the manufacturer's plate.



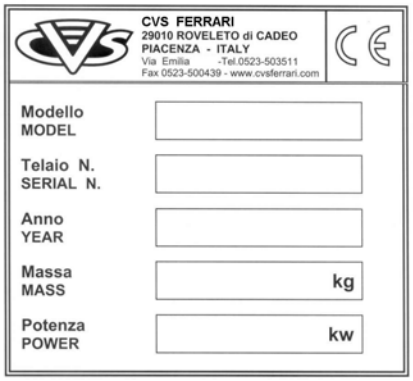
CHASSIS NUMBER
The chassis number is stamped on the right side member, on the outside upper side, near the lifting cylinder supports.



1. Europe
2. Italy
3. Manufacturer with a yearly production less than, or equal to 500 units
4. Vehicle type
5. Vehicle variants
6. World-wide ID-Code of the Manufacturer (C.V.S. S.r.l.)
7. Continuous chassis number from series start



MANUFACTURER'S PLATE
Fixed inside the cab, on the front left of the seat's rest.

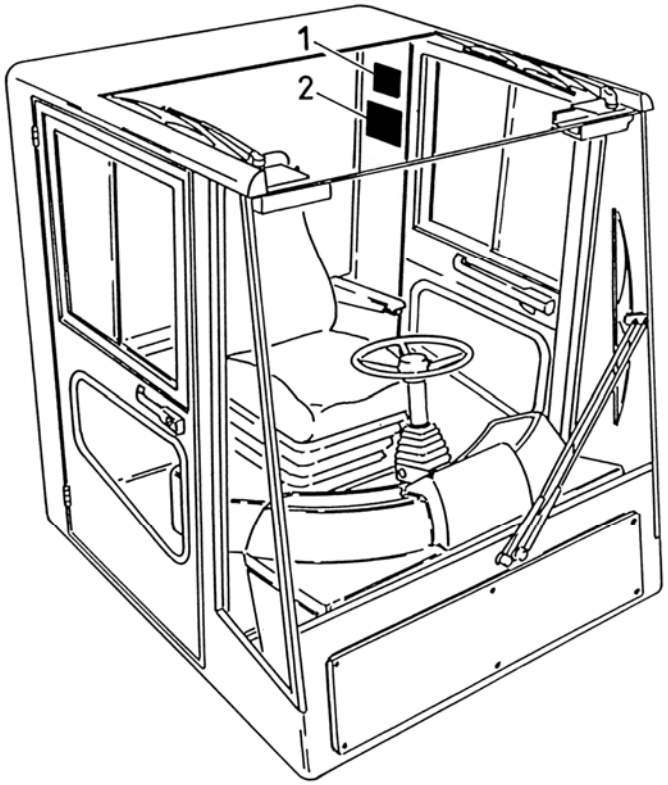


ENGINE TYPE AND NUMBER
(See the separate engine's Use and Maintenance handbook supplied for each vehicle).

LIFTING CAPACITY PLATES

The lifting capacity plates are fixed on the inner rear left standard of the cab.

Plates:
(1) Lifting capacity with fixed hook
(2) Lifting capacity with equipment



In this specific Chapter, in the Manual and on the vehicle, safety instructions are given. Each of them is introduced by a key word whose meaning is the following.

⚠ WARNING:

It points out an extremely high potential danger. Failure to follow WARNING procedures, technical information and precautions could result in severe injury, even fatal, to the operator and/or to other people.

⚠ CAUTION:

It signals a potential danger. Failure to follow CAUTION procedures, technical information and precautions could result in severe damages to the personnel as well as to the vehicle.

NOTE :

A NOTE provides key information on procedures, technical information and precautions in order to avoid damages to the vehicle.

Chapter 2 - SAFETY

Any working instrument may represent a potential danger.

Using the **C.V.S. REACH STACKER** in accordance with the operating rules and servicing it regularly, allow you to operate in safety conditions. The non-compliance with the operating, maintenance instructions makes the vehicle dangerous for the operator and for other people.

Carefully read the safety instructions written on the manual and on the vehicle: those instructions point out the potential dangers and suggest the precautions to adopt in order to avoid them.

If you do not understand fully the warning message, please ask the skilled staff or the C.V.S. Dealer for an explanation.

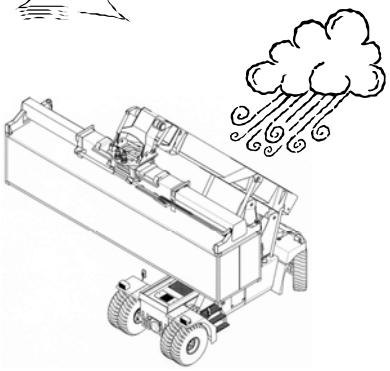
In order to work always in safety conditions, it is not sufficient for the operator to follow the safety instructions; when operating the vehicle it is necessary to anticipate every danger and to prevent it.

Do not use the Reach Stacker until you get the perfect mastery of it.

Before starting any work, make sure that your safety as well as that of other people are safeguarded.

Do not underestimate your doubts; if you are uncertain about the vehicle or the operation, please apply to a qualified person.

Always work with: CARE - ATTENTION - CAUTION



WARNING :
The stability of the reach-stacker is verified in conformity with the standard EN 1459, allowing wind speeds of 12,2 m/sec..
To operate with higher wind speeds, please contact the After Sales Service of C.V.S..

WARNING

In order to prevent accidents from occurring, ***carefully read this manual before performing*** *any operating and maintenance step on the* ***REACH STACKER****.*
Read with close attention all the instructions concerning safety.

For further information, apply to C.V.S. qualified personnel or Dealer.

Keep this manual with great care in good condition. This manual must always be kept inside the driver's cab when operating or servicing the vehicle.

Do not operate the REACH STACKER in case of doubts about the functioning of any of its parts.

NOTE:

- The REACH STACKER is supplied with a single work place.

- Nobody but the operator is allowed to stay inside the cab or in any other part of the vehicle during the normal working operations

- On demand, the Reach Stacker may be equipped with an additional seat inside the cab to transport another person.

⚠ BASIC SAFETY REMARKS:

- ☺ During the drive, always remain seated and DO NOT lean out of the window.
- ☺ The purpose of following instructions is to minimise the risks for people and properties with the vehicle operating or standing still.
- ☺ The vehicle must not be used for different purposes, than those declared by the manufacturer.

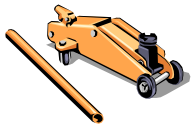
- ☺ NEVER transport people.
- ☺ During the work with/on the vehicle be very cautious and pay great attention, especially in order to avoid possible dangers.

- ☺ A lacking dialogue among workers may be the cause of accidents; if two or more people work on the same vehicle verify that each of them is informed on what the other ones are doing.
- ☺ Failure to observe all safety instructions written on labels may result in serious accidents. Keep labels clean and replace unreadable or lacking labels before starting operating.
- ☺ Tampering, modifications and the use of non-genuine spare parts may affect the safety of the vehicle.
- ☺ Before carrying out any repairs or checks, make sure that the Engine is Switched Off *(PARKING BRAKE ENGAGED)*, the gears are in neutral and the boom is completely lowered and retracted.
- ☺ For procedures, in which the boom has to remain lifted, precautionally put suitable stands between the boom and the chassis.

rBefore sliding/lifting/lowering the cab, make sure that there are no loose objects inside and properly close

- ☺ Before sliding/lifting/lowering the cab, make sure that there are no loose objects inside and properly close the doors.
- ☺ Before sliding/lifting/lowering the cab, make sure that there are no obstacles and persons on the return way of the cab in its operation position.
- ☺ For procedures, in which the cab has to remain lifted/tilted, precautionally put suitable stands between the cab and the chassis.
- ☺ DO NOT PERFORM any welding on the vehicle before having asked the Manufacturer's specialists *(C.V.S.)* for permission. Before welding, CUT OUT the electrical equipment of the vehicle.
- ☺ Before connecting or disconnecting an electric component, carefully consult the wiring diagram; a wrong connection may cause injuries and/or damages
- ☺ DO NOT tray to perform repairs or maintenance steps without consulting the C.V.S. skilled staff.
- ☺ In case of necessity of welding or of use the *oxyhydrogen flame*, always protect the flammable parts of the vehicle with fireproof materials *(e.g. tanks and fuel/oil system, electrical system, hoses etc.)*.
- ☺ Periodically check all the movable parts of the vehicle *(e.g. driving axle, steering axle, steering links, boom, cylinders, cab and any support structure, equipment, balance weights, etc.)*, making sure that all locking pivots are safely seated and do not show any defects. Moreover check the tightening of locking bolts.
- ☺ Periodically check that the tie rods of the counterweights and of the front driving axle are fully tightened.
- ☺ Avoid impacts and shocks to the vehicle *(do not use it as ram).*

- DO NOT try to remove the possible ballast of the vehicle.
- Securely sling and hold *(with chains or bands)* all parts of the vehicle before disassembling them.
- Before performing procedures on the hydraulic system *(e.g. on filters, hoses, valves, pumps, cylinders)* make sure that the system is not pressurised.
- Wheel changing: carefully observe the instructions given in the relevant section of this manual.
- To lift/raise the vehicle use cranes or hydraulic jacks with minimum load capacity greater than the weight to be lifted *(consult the specialists of C.V.S.)*.



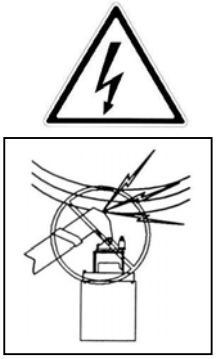
- **NEVER** leave the vehicle suspended; support it on suitable stands for safety.
- In any case, **NEVER** venture under the vehicle while it is suspended or only supported by jacks.
- To this purpose, use pits in specialised workshops.
- **NEVER** leave the cab without first applying the PARKING BRAKE or switched off the engine.
- Always park the vehicle on an even, solid ground, in order to prevent wheels from subsiding into the ground. In case the vehicle should be parked on a slope, place chocks under the wheels.
- To perform working steps on parts not reachable from the ground, use stable working platforms.

- Sling with personal safety devices the operators not working on the ground.
- Poor visibility may cause accidents; always keep windows, rear-view mirrors and light clusters clean and use lights to get a better visibility. Do not operate the vehicle in case of poor visibility.
- The vehicle is designed for outdoor operation. Do not use it in closed areas without adequate ventilation, or in potentially explosive atmosphere, that is in the presence of flammable materials, vapour, fumes and dusts. The exhaust system or the electrical equipment may generate sparks causing fires and explosions.
- The inhalation of the exhaust gases of the vehicle may be detrimental to health or even cause death by asphyxiation. Before using the vehicle in closed areas *(also for maintenance steps)*, it is necessary to ensure an adequate ventilation and possibly to fit an extension on the exhaust pipe. If you feel drowsy, immediately switch off the engine and go outdoors.

- **FIRE EXTINGUISHER:**
  If the vehicle is equipped with an extinguisher, make sure that it is regularly controlled by qualified personnel and possibly keep it in the driver's cab.

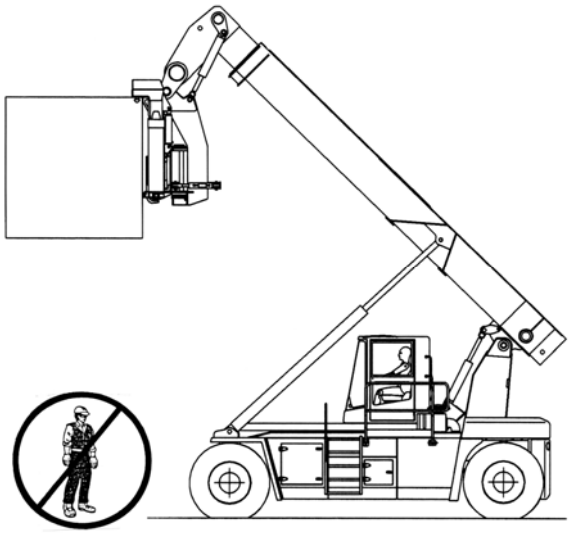
WARNING: *To operate any controls installed outside the cab (if fitted) may cause serious accidents, even fatal. Operate those controls exclusively in the highest safety conditions.*

WARNING: ***The vehicle is NOT electrically insulated***
Contact with electricity may cause severe damages to the vehicle and death to the personnel.
Electricity may be transmitted also without a direct contact with the energy source.
DO NOT operate the vehicle in an area with high-tension lines or sources.

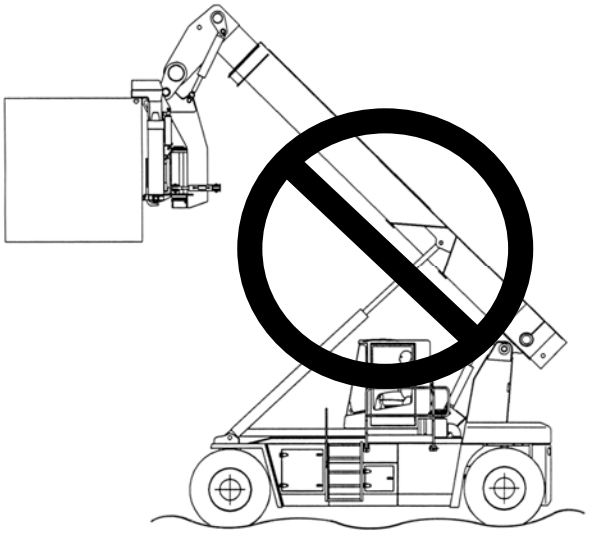


WARNING: ***Alcohol and drugs***
It is extremely dangerous to operate the vehicle's controls in state of drunkenness or under an influence of drugs.
Abstain from drinking alcohol or taking drugs before and during the work.
Never take drugs causing torpor.

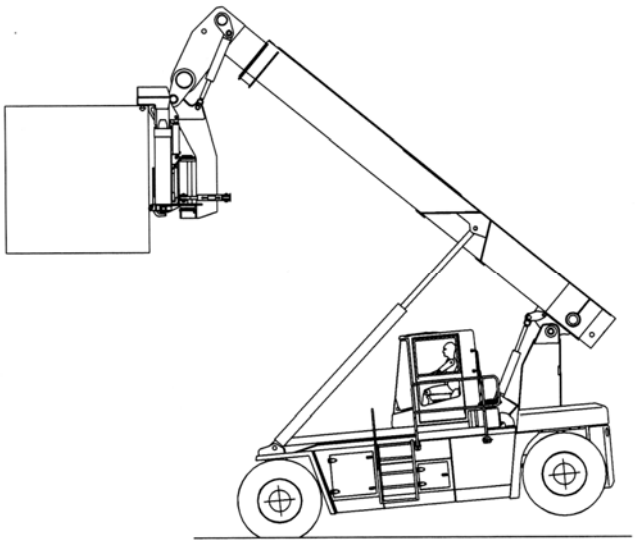
- Do not allow persons to remain *(either in front or behind)* near to the vehicle or to walk before it while it is operating.
- Do not allow persons to remain or pass beneath suspended loads or in the vicinity of the work area.
- Never leave the vehicle with suspended loads while it is moving or during work stages.



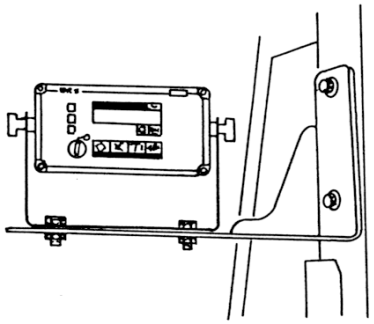
- Do not drive the vehicle on uneven or muddy ground, or loose earth.
  Only operate it on flat and compacted surfaces.



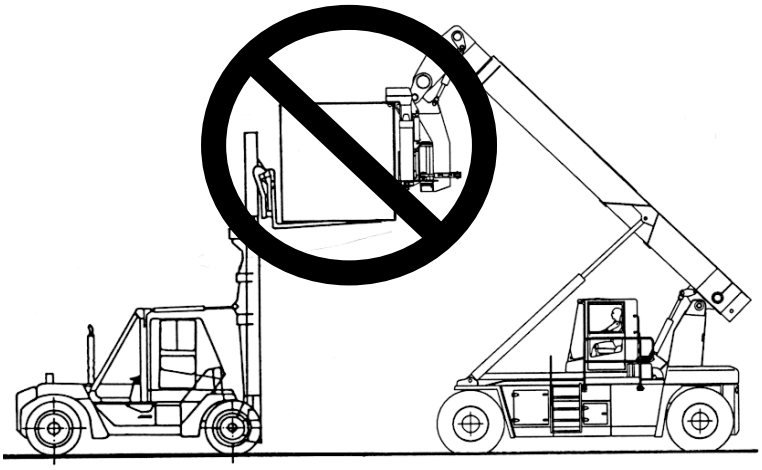
- Before lifting a load, always watch the load limiter installed in the driver's cab, that should never display higher loads, than the max. lifting capacity.
  Always avoid sudden braking.



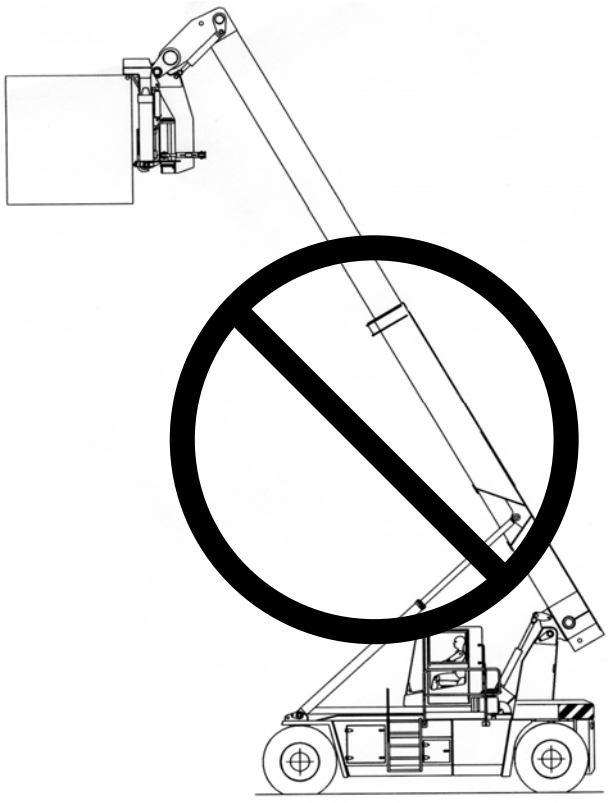
☹ Before lifting a load, always watch the load limiter installed in the driver's cab, that should never display higher loads, than the max. lifting capacity.
Always avoid sudden braking.



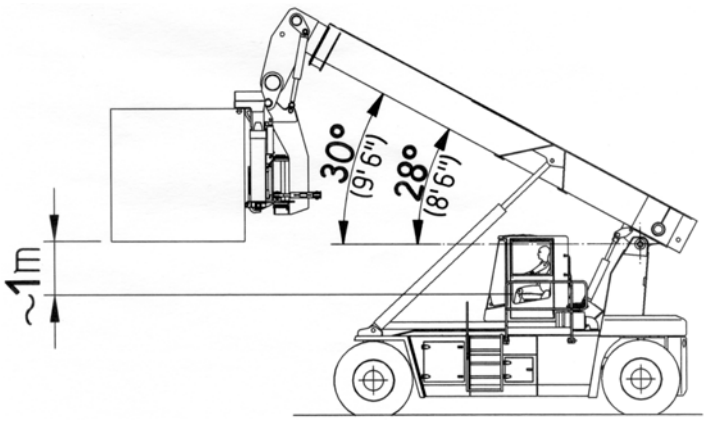
☺ Never use two vehicles to lift a load.



☺ Do not travel with the load in raised position.

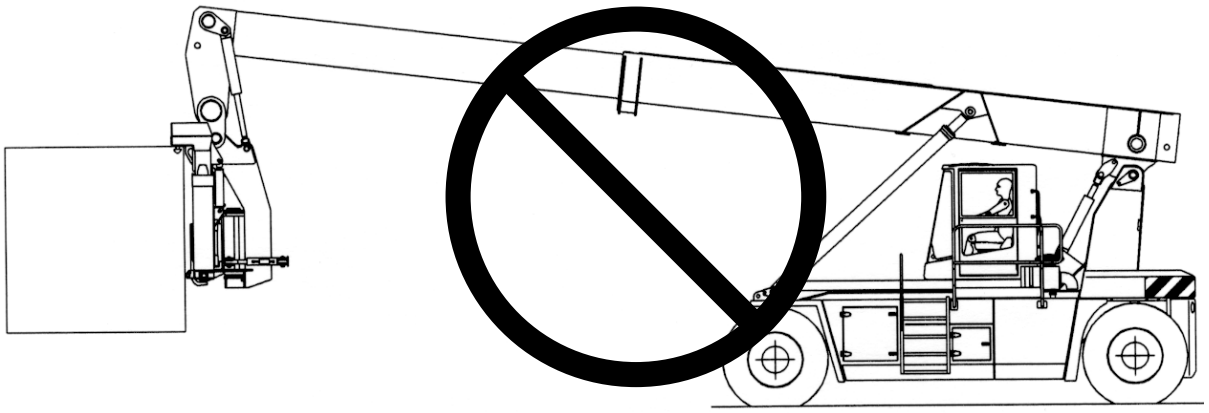


☹ During the drive ***(with or without load)***, with load center retract the boom and keep the load *(respectively, if void, keep the attachment)* at a max. height of approx. 1 m from the seating surface of the driver's seat compressed to the min. weight, especially when driving in high gears or on slopes.
With heavy loads *(we recommend, also without a load)*, drive very slowly and avoid sudden braking/turning, to avoid dangerous swinging.

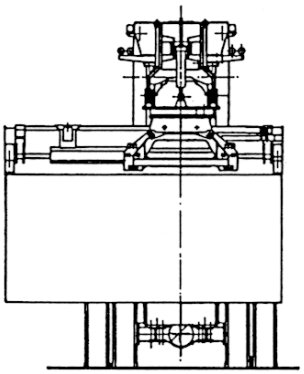


⚠ **CAUTION:**
With the vehicle in motion, do not lower, lift or side-shift the load.

☺ Do not fully extend the boom to engage or lay down loads.
Do no lift or lower loads with fully extended boom.



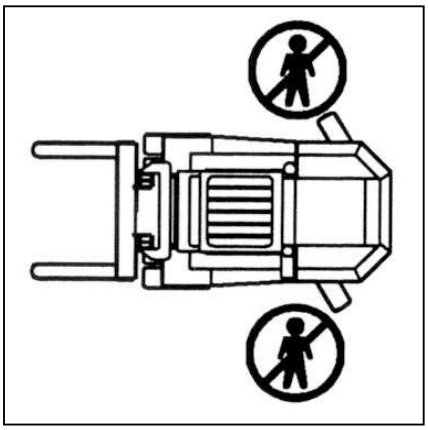
☺ Do not lift or lower with the load side-shifted with respect to the vehicle's centre line.
Only use the side-shifting with stationary vehicle.

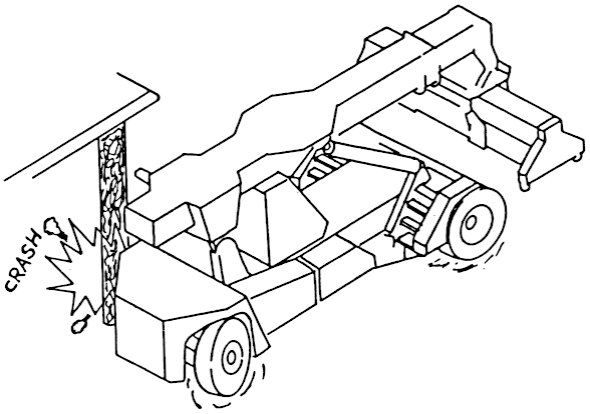


⚠ **CAUTION :**

- ***Do not lift, move or maneuver with the attachment*** *(with or without load)* ***rotated in longitudinal direction and shifted*** *(both forwards and backwards)* ***in respect to the centre position.***
- ***Rotate the load only with stationary vehicle and centred*** *(NOT shifted)* ***load.***

☺ Be especially careful when reversing to avoid collisions with people or objects.

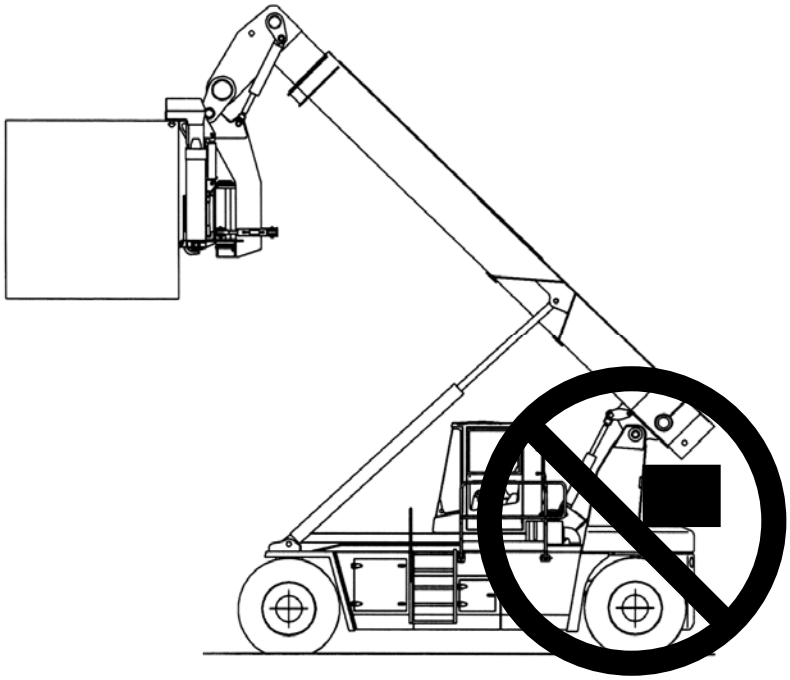




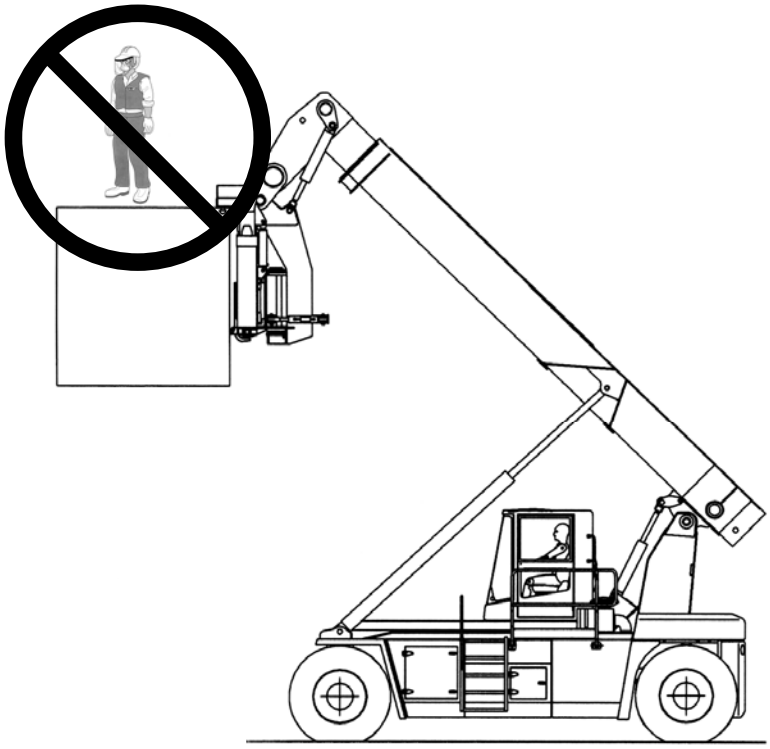
☺ Always obey the instructions of road signs.

☺ Slow down when approaching bends, ramps, downhill slopes and in all restricted visibility situations.

☹ **It is strictly prohibited (dangerous)** to add mobile balance weights to increase vehicle performance.



☹ **It is strictly prohibited to** lift and use persons for work manoeuvres.



SAFETY OF THE OPERATOR AND OF BYSTANDERS

- Your safety and that of bystanders near you depends on the proper use of the vehicle.
- Make sure to be perfectly familiar with the position and the use of the vehicle's controls.

BEFORE USING THE VEHICLE, TRY OUT ALL CONTROLS IN A CLEAR, SAFE AREA.

- Carefully read and fully understand all warning plates and labels.
- Always obey the instructions of road signs.
- Slow down when approaching bends, ramps, downhill slopes and in all restricted visibility situations.
- Do not allow persons to stay on the steps and on the vehicle, when this is operating or in motion, especially if it is equipped with a sliding or lifting cab.

- Do not allow persons to walk before the moving vehicle.

- Signalmen **NEVER** SHOULD STAY before or behind the vehicle.

- Do not transport persons.
- Always use proper and adequate tools to replace or repair worn or damaged equipment.
- Do not smoke when checking the level of the battery electrolyte: batteries generate flammable gases. Battery electrolyte contains sulphuric acid, which is harmful to skin and eyes.

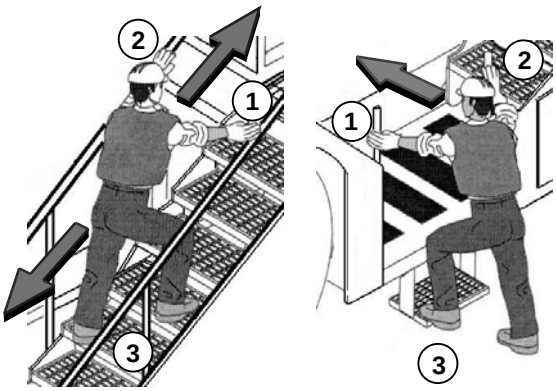
- When checking the battery charge level, never put metal objects between the terminals: sparks may cause an explosion. Use a voltmeter or a hydrometer to check the battery charge conditions.
- When the electrolyte is frozen, the battery may explode if you try to charge it or to start the engine. To prevent the electrolyte from freezing, the battery should be always kept at full charge.
- Do not smoke during refuelling. Fuel vapours are flammable.

- DO NOT use start spray, ether o similar products to facilitate the ignition while the engine pre-heating is active, these products may cause explosions.
- Do not pour fuel in the tank with running engine *(unless it is absolutely necessary and following specific instructions)*.
- Before draining the hydraulic fluid tank, retract the cylinders *(lower and retract the boom, etc.)*, then allow the oil to cool down.
- Do not start repairs you are unable to complete.
- Neither add lubricating oil, nor clean or tune up the engine while it is running.
- For your safety and long duration of your vehicle, carefully inspect it before working with it.
- Check it for leaks in the cooling and/or lubricating system. Check the conditions of the tyres and the links of the steering cylinder.
- Check screws and bolts for completeness and tightening.

- Observe local regulations and laws.
- **NEVER** use the vehicle if the braking, steering or lifting system are defective.
- **NEVER** leave the cab without first applying the parking brake.
- **NEVER** step-up/down from the vehicle in motion, always wait until it has completely stopped.

WARNING :
ALWAYS STEP-UP/DOWN FROM THE VEHICLE FACING THE STAIR.

Falls when going up or down to/from the cab or the vehicle are the most frequent causes of injuries.
When accessing/leaving the vehicle, always face the stair *(front position)* **and keep contact in three points with the steps and the handles, the railings and the handrails** *(one hand and booth feet, or both hands and one foot must always keep contact with the vehicle or the ground).*



- Always keep clean *(without grease)* all steps and handles/railings/handrails, especially those to access the cab.
- **NEVER** use the control levers in the cab and on the vehicle as handles.
- The failure of a component or a circuit could cause accidents. Before using the vehicle, check all oil levels. Make sure that all oil level glasses and all screwed plugs are fully tightened. Replace or repair any defective parts.
- Make sure that the accessible areas are free of oil, foreign matters or ice in winter.
- Before working at night, check that all lights are properly functioning.
- Before starting the engine, make sure that people get away from the vehicle.
- Before moving-off, make sure that no-one is standing near or underneath the vehicle.
- Always be alert when operating the vehicle. Never allow anybody to enter the vehicle operating area.
- Do NOT allow people to stand or pass under suspended loads.

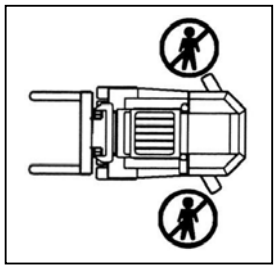
- Be aware of the limits of the vehicle. Keep it under full control during all manoeuvres.
- DO NOT TRY DOING TOO MUCH, TOO FAST.
- Before starting the engine, apply the parking brake and shift gearbox selector lever into neutral.
- Be especially careful when operating the vehicle in dusty, smoky or foggy conditions. It is extremely dangerous to operate the vehicle if you cannot see clearly.

- If the engine stops or the steering does not operate, immediately stop the vehicle.
- In case of malfunction or if parts are missing, stop the vehicle and carry out the necessary repairs. Failure in doing that may cause an accident.

- Consult the wiring diagram before connecting or disconnecting electrical parts. Incorrect connections could cause injury and damages.

- Keep clear of moving belts and fan blades to avoid injury.
- **NEVER** leave the vehicle with a suspended load.
- Do NOT lift, lower or side-shift the load with the vehicle in motion.
- Do NOT drive the vehicle on uneven or muddy ground, or loose earth; Only operate it on flat and compacted surfaces.
- Do note move-off, extend or retract or side-shift when the load is still in contact with the ground or another load.
- Do not drive with the load in raised position.
- During the drive, keep the load *(or, if void, keep the attachment)* as low as possible, the ground permitting, especially when driving in high gears or on slopes.
- With heavy loads *(we recommend, also without a load)*, drive very slowly and do not brake sharply, to avoid dangerous load swinging.
- Do not force the spreader onto the container to fit the twist-locks in. Never attempt to move a stacke container when the twist-locks are locked.
- Lower the spreader into position on the container, without applying excessive force.
  The weight of the spreader is sufficient to fit the twist-locks in the container corner seats.
- Use combined movements to stack the containers.
- If the indicator lamps of the spreader or piggy-back do not work correctly, they must be repaired immediately.
- Do NOT extend or retract the boom when the spreader is locked on a stacked load / container.
- Do NOT side-shift the spreader when they still locked on a stacked load / container.
- **Never use the vehicle with the safety devices disabled, or at least only in special circumstances, at the sole responsibility of the operator.**
- After the vehicle has been standing idle for a long period, check that ***all*** safety devices are in good working order.
- If it is impossible to lock the twist-locks *(spreader)* with all four sensors in contact, this means that the container is out of square.
- Before lifting a load, make sure that the spreader is correctly locked by checking the indicator lamps.
- Avoid sudden movements with the load lifted / clamped *(bends, downhill slopes, braking, high speed)*.
- The lifting capacity decreases as the distance between load centre and front axle increases.
  Do not forget that this distance increases also when the vehicle moves on a downhill slope.
- For operations outside the normal working area, the operator must know both the conditions of the vehicle and of the area *(like weight and lifting capacity of the vehicle, wheel loads, gradability, rolling resistance force etc.)*.

- Always keep in mind the dimensions and the weight of the vehicle when passing through areas where access is restricted *(bridges, hanging electric cables or lines, ground consistency etc.).*

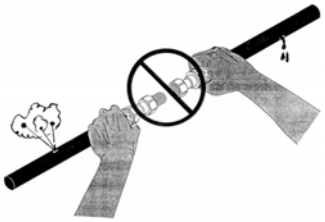


- When steering, bear in mind that the space occupied by the rear of the vehicle is different, than with other vehicles, because the rear wheels are steering wheels.
- After parking the vehicle, lock the wheels with chocks or similar devices.
- If the vehicle is to be left standing idle outdoors with the hydraulic cylinders extended, apply grease to the exposed cylinders rods to prevent corrosion.
- Dirt deposits on the cylinders may decrease their efficiency, therefore remove them regularly. To decrease the risk of corrosion, retract the cylinders each time the vehicle is parked.
- Cleaning metal parts with inadequate solvents may cause corrosion; use only suitable cleaning products and solvents.
- Do not use the vehicle in excessive winds.

To be continued ➔

- Improperly fitted, damaged or worn **gaskets and O-rings** may cause leaks or accidents: different instructions excepted, immediately replace the damaged parts.
  Do not use neither trichlorethylene, nor paint diluents near O-rings and gaskets.

- Damaged **hydraulic hoses** may even cause death. Regularly check them for :
  Damaged fittings
  Outer sheaths worn by rubbing
  Swollen external sheaths
  Bent or flattened hoses
  Hollowed reinforcement of the outer sheaths
  Shifted fittings.



  Always use a safety cage to pressure test any part; attach safety ropes to the sealing caps of the pressure tested fittings.

- Some gaskets and oil seals (*e.g. on the crankshaft*) of C.V.S. vehicles are made of elastomer, such as Viton, Fluorel and Technoflon. If these materials are submitted to high temperature, they may generate highly corrosive acids.

  THESE ACIDS MAY CAUSE SERIOUS BURNS.

  At room temperature, new components may be handled without special precautions.
  If elastomeric components have been exposed to temperatures up to 300°C, they require special precautions. In case of signs of decomposition (*e.g. signs of burning*), read following paragraph concerning the safety rules.

  DO NOT TOUCH THE COMPONENT OR THE SURROUNDING AREA.

  If the elastomeric components have been exposed to temperatures higher than 300° C, handle them as follows.
  First of all wear heavy rubber gloves and special protective glasses, then:

  Remove the part and put it inside a plastic bag.
  Wash the contaminated area with a solution containing 10% of calcium hydroxide [hydrated lime - $Ca(OH_2)$] or with another alkaline solution; use metal wool to scrub hard deposits on the metal.
  Afterwards wash with water and detergent.
  Put all the contaminated material used in this operation in plastic bags and arrange for the disposal in compliance with the law.

  NEVER BURN FLUOROELASTOMERIC COMPONENTS.

  In case of direct contact with your skin or eyes, flush with plenty of clear water or with a solution of calcium hydroxide for about 15-60 minutes and immediately seek for medical attention.

ATTENZIONE :
Only qualified and trained technicians must perform maintenance steps.
Before performing any service step, make sure that the vehicle is in maximum safety conditions.
Park the vehicle on flat, compact ground and stop the engine *(or engage the parking brake)**.***
In any case, refer to chapter- 6 "MAINTENANCE".

- **CLOTHING:**
  Failure to wear the suitable clothes could result in accidents *(e.g. flapping clothes may catch in the machinery).*
  Wear protective clothes suitable for the working operations, such as: helmet, safety shoes, protective glasses, overalls in the right size, ear plugs and protective gloves.
  Take care to button up your cuff, not to wear a tie or a scarf, to put up your hair *(if long)* and not to keep in your pocket oil or fuel or solvent impregnated rags.

- **The reach stacker operators must be adequately instructed.**

- **ONLY QUALIFIED AND TRAINED PERSONNEL MAY DRIVE AND OPERATE THE VEHICLE, INFORMED AND TRAINED.**

WARNING: ***Alcohol and drugs***
It is extremely dangerous to operate the vehicle's controls in state of drunkenness or under an influence of drugs.
Abstain from drinking alcohol or taking drugs before and during the work.
Never take drugs causing torpor.

NOTE : *For safety instructions for the attachments of the vehicle, please refer to the relevant enclosures.*

OPERATION WITH LIFTING HOOK

- When using the vehicle as a crane with the maximum load suspended to the boom, never exceed the speed of 3 Km/h [2. mph].

- Never lift loads that are side-shifted with respect to the crane's centre line.

LUBRICANTS – HYGIENE AND SAFETY INSTRUCTIONS

WARNING: ***It is extremely important to read carefully the information reported in this section and all mentioned documents. Make sure that all operators in contact with lubricants have a good knowledge of these prescriptions.***

WARNING: ***Oil***
Oil is toxic. If accidentally ingested, even in small quantity, do not cause vomiting and immediately seek for medical attention.
Engine oil contains dangerous contaminating agents that may cause skin tumour.
Handle oil as little as possible and protect your skin by means of creams and gloves.
Carefully wash with soap and warm water the skin contaminated by oil, never use petrol, diesel oil or petroleum.

Igiene

If properly used, lubricants employed by C.V.S. are not detrimental to health.

Nevertheless, an excessive or prolonged contact of lubricants with your skin may remove the epidermal natural fats causing dehydration and irritation.
Especially low viscosity oils cause these consequences, so take great care when handling waste oils that can be diluted after contamination with fuel.

Whenever handling oils, follow both personal and working care and hygiene rules.
As regards the detailed precautions, refer to the relevant publications issued by the local health service institution in addition to following directions.

Stocking

Keep lubricating materials out of reach of children and unauthorised people.

Never stock lubricating materials in open containers or without identification labels.

Disposal

Dispose of all waste materials accordingly to the local laws.

Local laws regulate collection and disposal of waste oils.
It is severely forbidden to discharge them in sewers, in drains or on the ground.

Furthermore, we remind that for the proper function of the vehicle and its components are necessary materials that may cause environmental damages, if not properly disposed.

WARNING: ***Following materials and fluids must be delivered to legal authorised waste disposals:***

- Starter batteries;
- Waste lubricating oils;
- Lubricating grease;
- Mixtures of water and antifreeze;
- Filters;
- Waste tyres;
- Auxiliary cleaning materials (e.g. greasy or fuel soaked rags).

WARNING: ***In compliance with the laws of the relevant countries, where the vehicles are operating, any breach of the disposal laws is severely punished.***

We remind that collection and disposal of waste oils and materials are regulated by law. All a.m. oils and components must be delivered to authorised waste materials collectors.

It is strictly forbidden to discharge them in indiscriminate dumps, in watercourses or in drains!

C.V.S. S.p.A. declines any liability if the safety and operating instructions described in this manual are not accurately observed.

Handling

New oil

No particular precautions may be taken when handling or using some new oil, but the common personal hygiene rules.

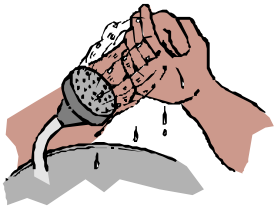
Used Oil

The lubricants of the crankcase contain harmful contaminating substances.

Observe following precautions to protect your health while handling waste oils:

1 Prevent oils from coming into long, excessive, repeated contact with your skin. Apply some protective cream on your skin before handling waste engine oils.

2 Remove oil from your skin as follows:



a) Flush the contaminated area with water and soap;
b) A nailbrush may be useful;
c) Use a specific hand cleanser to wash your hands;
d) Never use gasoline, diesel fuel or paraffin to wash the contaminated area of your skin.

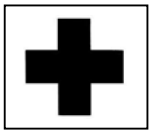
3 Clothes soaked in oil must never come in touch with your skin

4 Do not keep oil soaked rags in your pockets

5 Wash the dirty clothes before using them

6 Get rid of oil soaked shoes

First-Aid – Oil



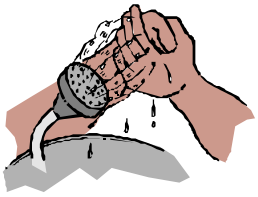
Eyes

In case of contact with your eyes, flush with plenty of water for 15 minutes.
If irritation persists, seek medical attention.

Swallowing

In case of swallowing do not cause vomiting, but seek medical attention.

Skin



In case of contact with your skin, flush the contaminated area with water and soap.

Spill out

Absorb by means of sand or another granular substance. Collect and carry at a disposal area for chemical substances.

Fire

Use a carbon dioxide, or powder or foam fire extinguisher.
Those who put out a fire must use a breathing set.

BEHAVIOUR IN EMERGENCY CASES

The users of our vehicles, manufactured according to the safety standards, which work observing the instructions of this manual, work safely.

If operating errors cause accidents, immediately call the first-aid staff.

In emergency cases and awaiting the arrival of the first-aid staff, we suggest following general first-aid steps:

In case of fire
Put out the fire with extinguishers.

WARNING:
If your vehicle is equipped with a fire extinguisher, have it regularly inspected.
Keep it inside the driver's cab and use it in case of need.
Never use water to put out a fire on the vehicle
You might widen the fire, if this is caused by oils, or get an electric shock, if the fire was caused by electricity.
Use a carbon dioxide, dry chemical or foam fire extinguisher.
Call the firemen immediately. They should wear breathing sets.

In case of burns

1. Put out the flames from clothing as follows:
   - with water
   - with a powder extinguisher; avoid directing the powder jet on the face of the injured person
   - with blankets or rolling the injured person on the ground.

2. Do not try to take off fabric shreds adhering to the skin.

3. If the scalding was caused by liquids, take away the wet clothing quickly, but cautiously.

4. Cover the injured part with a protective compress or a sterilised bandaging.

Carbon monoxide intoxication

Carbon monoxide contained in exhaust gases is odourless and dangerous, not only being poisoning, but also as it, in contact with the air, generates an explosive mixture.

Carbon monoxide is especially dangerous in closed areas, as it may soon reaches its critical concentration.

If case of first aid in a closed area, immediately ventilate the room in order to reduce the gas concentration.

Entering the room, wear a protective mask, do not light flames or switch lights on, do not use electric bells, telephones or any spark generating devices, in order to avoid explosions.

Carry the poisoned person in a well-ventilated area or outdoors and - if fainted - put him on his side.

Acid burns

The electrolyte of the battery causes skin burns In this case:

- Take away the clothing
- Flush with water, paying attention that the mixture of water and acid does not contact the parts of the skin that were not injured

Battery electrolyte, lubrication oil and diesel cause injury to the eyes. In these cases:

- Flush the eyes with water for at least 20 minutes, holding the eyelids open, to allow the water to flush the eyeball, and moving the eye in all directions.

Electric shocks

Following components may cause electric shocks:

1. Electrical system of the engine (12/24 V).

2. External electric systems.

In the first case, the low voltage does not cause strong current passage through the human body. In any case short circuits, caused for instance by metal tools, may generate flames and burns.

In the second case, the high voltage may generate strong and dangerous currents.

In these cases, always try to cut-off the power before touching the injured person.

If this is not possible, keep in mind that any attempt may be very dangerous also for the saver; so for any saving attempt always use proper insulating materials.

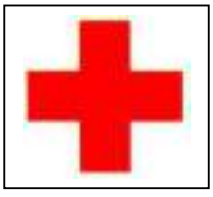
Oil

Read the relevant section "Lubricants – Hygiene and Safety Rules" in this chapter.

Injuries and fractures

The multiplicity of the cases and the specificity of the measures to be taken require in any case medical attention.

In case of bleeding, press externally the wound until arrival of the first-aid staff, avoiding direct contact with the blood.



In case of fractures, do not move the relevant body parts and move the injured person only if absolutely necessary and with extreme caution.

SAFETY SYSTEMS OF THE VEHICLE

ENGINE

- Engine start lock, if the gearbox is not shifted into neutral.

- Emergency engine stop *(red push-button Pos. 9 Control Panel) (OPTIONAL).*

- Signal alarm and/or Automatic engine stop:
  The vehicle may be equipped with an alarm system **"EMS"** *(OPTIONAL)* that automatically stops the engine in following cases:
  - Low engine oil pressure
  - High engine coolant temperature
  - Engine idle for a pre-set period of time *(~ 5 min.)*. When the engine is switched off, working lights can be automatically switched off.
  - W depending on the alternator
  - Air filter clogged
  - Low fuel level

- Engine start lock, if the engine is already started *(OPTIONAL)*

GEARBOX

- Signal alarm and/or Automatic engine stop:
  The vehicle may be equipped with an alarm system **"EMS"** *(OPTIONAL)* that automatically stops the engine in following cases:
  - Low transmission oil level
  - Low transmission oil pressure *(15 bar)*
  - High transmission oil temperature *(120°C)*
  - Transmission oil filters clogged

- Reverse lock: integrated in the 3B6 "MICMAC-RS.CMC" system, or in the "SHIFTRONIC" system

- Gear selection with stationary vehicle at engine speed of 1000÷1300 rpm *(integrated in the different systems).*

- Transmission automation disabling:
  It is possible to disable the transmission automation and all safety devices with the key on the door of the main electrical panel in the left front compartment of the vehicle; the disabling is signalled by the lighting of the red warning light near the key *(see section Miscellaneous electrical devices)*.

WARNING:
WHEN THE KEY IS TURNED ON MANUAL GEAR, ALL TRANSMISSION SAFETY DEVICES ARE CUT OFF.
USE THE MANUAL GEAR ONLY IN AN EMERGENCY CASE.

LOAD MOMENT LIMITING SYSTEM AND LOAD MOMENT INDICATOR

Model: 3B6 "MICMAC-RS.CMC" or 3B6 "U2-MIC"

The system monitors that the loading charge respects lifting, hydraulic and stability limits of the vehicle. Upon approaching the pre-set limits, the load moment indicator disables the telescoping, lifting and lowering movements.

Load moment indicator by-pass:
The load moment indicator by-pass key switch Pos. 10, is located on the instrument panel inside the cab.

- Load moment indicator by-pass buzzer.

- **Manual cab sliding:**

  - A sensor located at the rear end of the left side member allows to engage gear only if the sliding frame *(where the cab is fastened)* is hooked.

If provided

- **Hydraulic-controlled cab sliding by means of:**

  - Switch pos. ..... located on the instrument panel inside the cab
  - Gear in neutral
  - Closed doors

  Following switches complete the cab translation system:

  ▲ 2 red emergency push-buttons outside the cab, in the middle of both front and rear side. These switches de-energize a solenoid.

  ▲ 2 rod type limit switches, 0-1, that automatically stop the cab at the stroke end positions.

  ▲ 2 door jamb switches signalling “doors open”.

If provided

- **Hydraulic-controlled cab tilting by means of:**

  - Backlighted green push-button Pos. 7 located on the instrument panel inside the cab

  Following sensors complete the cab tilting system:

  ♦ A sensor located at the rear end of the right side member enables the cab tilting automatism provided that the cab is backwards.

  ♦ A sensor located at the rear end of the left side member signals that the cab is locked backwards.

  ♦ A sensor located at the right side of the boom over the cab, monitors the min. distance between the boom and the cab.

Operator control [from 01/01/2012]

If the operator is **NOT correctly sitting** in the driving position :

- The transmission *(gears)* will be set to neutral and it is inhibited forward / reverse of the vehicle, but the gear previously inserted is saved. **For this reason, when you restart you will have to pay attention to the possible movement of the vehicle.**

- Boom and Spreader manoeuvre controls inhibited.

- Miscellaneous devices

- Signal alarm and/or Automatic engine stop:
  The vehicle may be equipped with an alarm system **"EMS"** *(OPTIONAL)* that automatically stops the engine in following cases:
  - Brake oil filter clogged
  - Low brake oil pressure
  - High brake oil temperature
  - Hydraulic fluid filters clogged
  - High hydraulic fluid temperature
  - Low coolant level

- Boom rising stroke limit microswitch.

- Safety devices by-pass buzzer.

- Reverse gear buzzer.

- Emergency load lowering *(see the hydraulic diagram and the relevant detailed description).*

- Steering emergency device:
  on request the steering system may be equipped with an automatic emergency pump *(OPTIONAL)*.

- Parking brake:
  The vehicle may be equipped with a system that automatically applies the parking brake when the ignition key is in OFF position *(OPTIONAL)*.

- Alarm buzzer signalling the gear engaging with the parking brake applied *(OPTIONAL)*.

- As regards the safety devices of the equipments fitted on the vehicle *(Spreader, etc.)* consult the detailed enclosures.

WARNING:
The safety device by-pass key switches should be used with discretion, as their unwarranted use can result in loss of life, destruction of property and irreparable damage to the vehicle.
The operator using the by-pass keys in emergency must use sound judgement on his own responsibility.

NOTE: ***The Dealer/Customer and/or his agents are responsible for the custody of the by-pass keys. The choice of a responsible for this is does not form part of the liabilities of the manufacturer (C.V.S.).***

DRIVER'S CAB

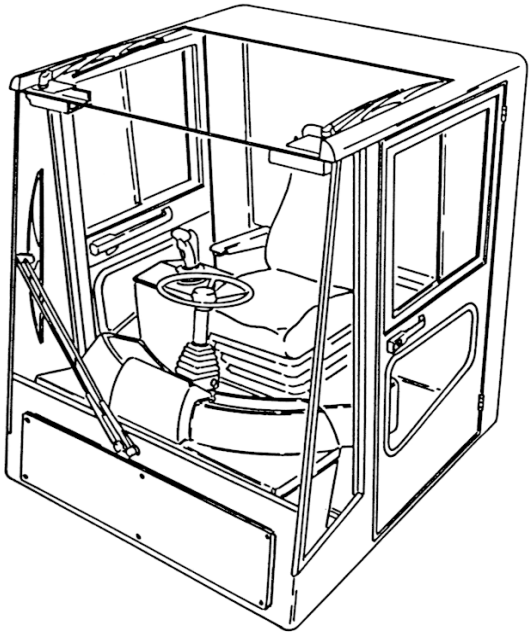
The cab of your REACH STACKER is designed to allow you to perform your daily work comfortably and safely.

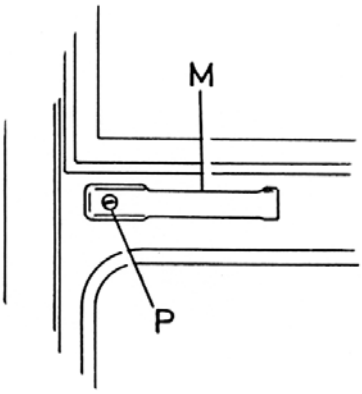
This section contains information about:

- Driver's cab
  - Doors
  - Main controls
  - Instrument panel
  - Control panel *(panels)*

DRIVER'S CAB

The cab consists of a steel reinforced one-piece aluminium frame that makes it absolutely indeformable.
The cab is supported on four vibration mounts and its sliding system can be operated by hand or hydraulically.
Athermic glasses ensure best visibility all around.



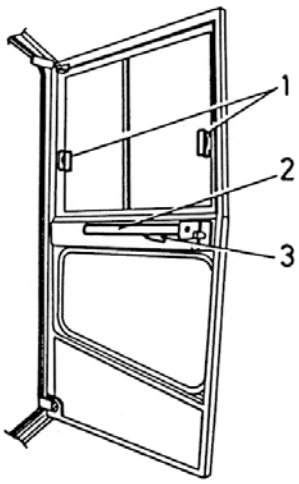


DOORS

The door handles (**M**) are equipped with a key lock to close the doors from the outside.
To open the door, push the button (**P**) on the handle.
At the door opening, the interior light is switched on automatically.

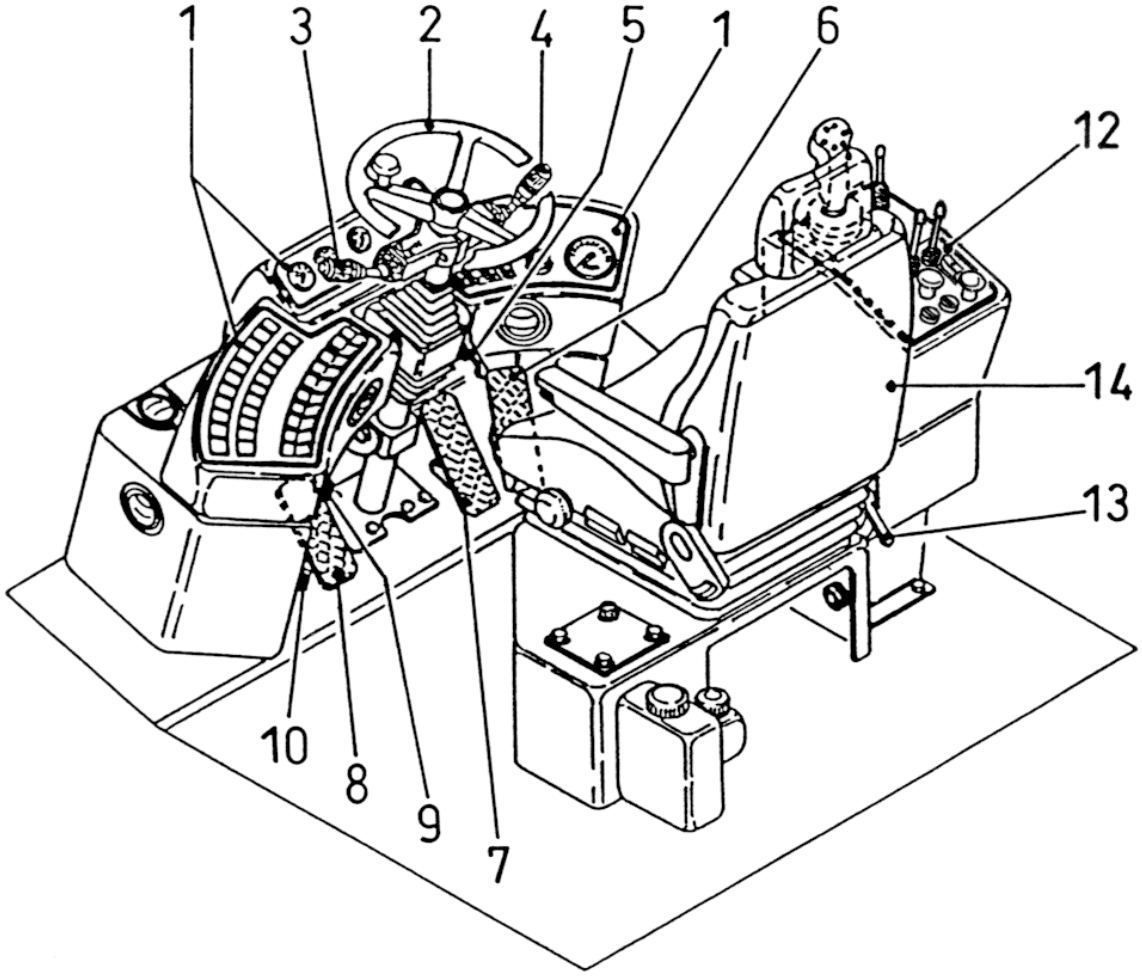
Inside the door there are following controls:

1. Glass sliders/stoppers
2. Door handle
3. Door opening push-button



NOTE: ***Periodically clean and lubricate the door key locks. To this purpose, use usual commercial specific corrosion inhibiting and wear protective products avoiding the sticking of the door and facilitating its sliding.***

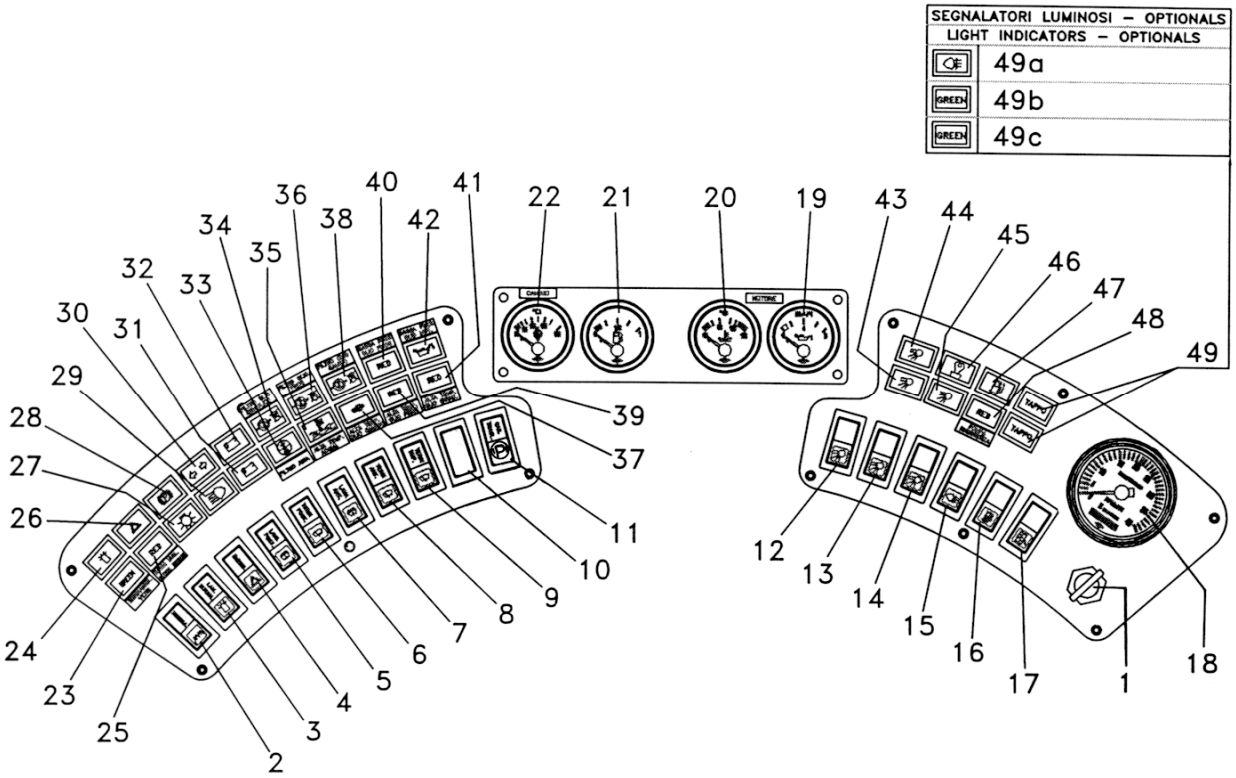
MAIN CONTROLS



1 - Instrument panel
2 - Steering wheel with horn
3 - Gearbox selector lever
4 - Multi-function control stalk for illumination, turn signals and horn
5 - Steering wheel position lock lever
6 - Accelerator pedal
7 - Brake pedal
8 - De-clutch pedal
9 - Air blower speed control switch
10 - Heater control
11 - Available
12 - Control panel
13 - Control panel lock lever
14 - Driver seat

INSTRUMENT PANEL

(Controls)

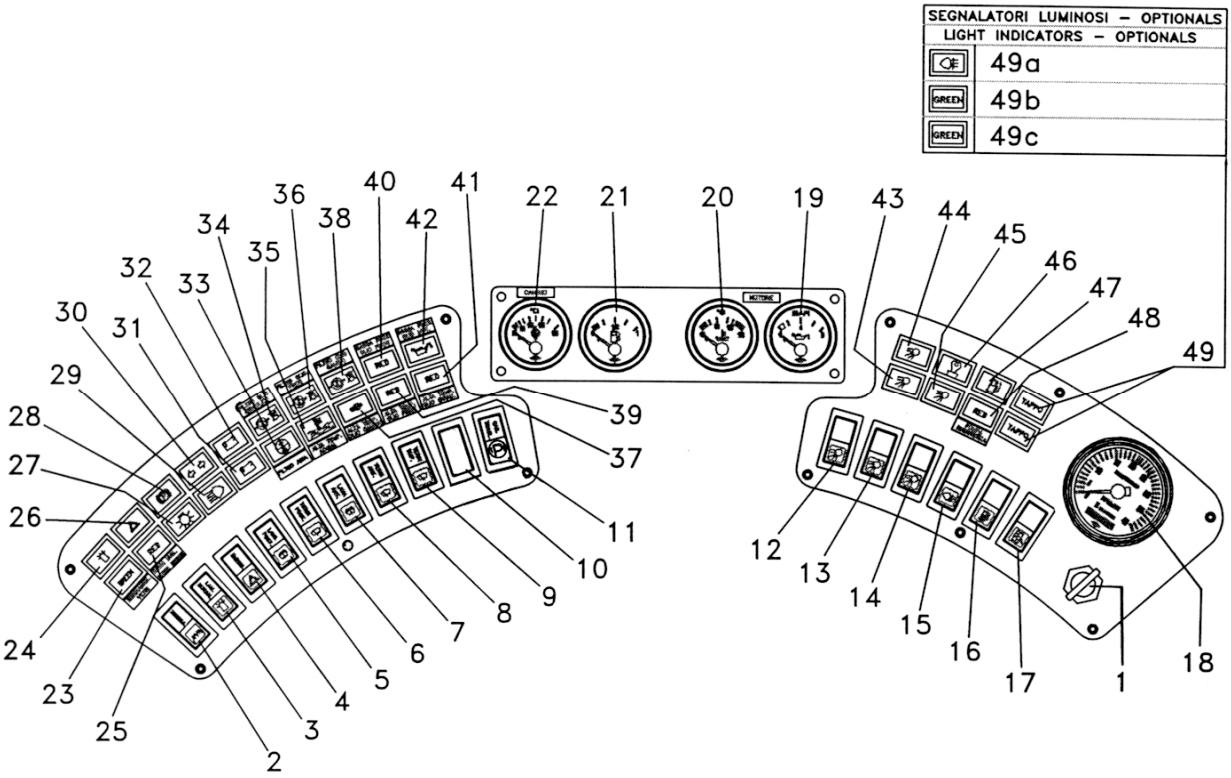


1 - Main switch
2 - Electric defogger switch *(green lens)*
3 - Yellow flashing light switch *(green lens)*
4 - Hazard warning lights switch *(red lens)*
5 - Rear window washer switch *(green lens)*
6 - Rear window wiper switch *(green lens)*
7 - Front window washer switch *(green lens)*
8 - Front window wiper switch *(green lens)*
9 - Roof window wipers switch *(green lens)*
10 - Available
11 - Parking brake control switch *(red lens)*
12 - Working light switch for 20' container *(orange lens)*
13 - Working light switch for 40' container *(orange lens)*
14 - Twist lock working light switch *(orange lens)*
15 - Fog tail lamp switch *(orange lens)*
16 - Fuel pre-heating switch *(green lens)*
17 - Mirror heating switch *(green lens)*

NOTE: ***The above drawing shows an instrument panel provided with every possible Optional.***

INSTRUMENT PANEL

(Gauges, warning and pilot lights)

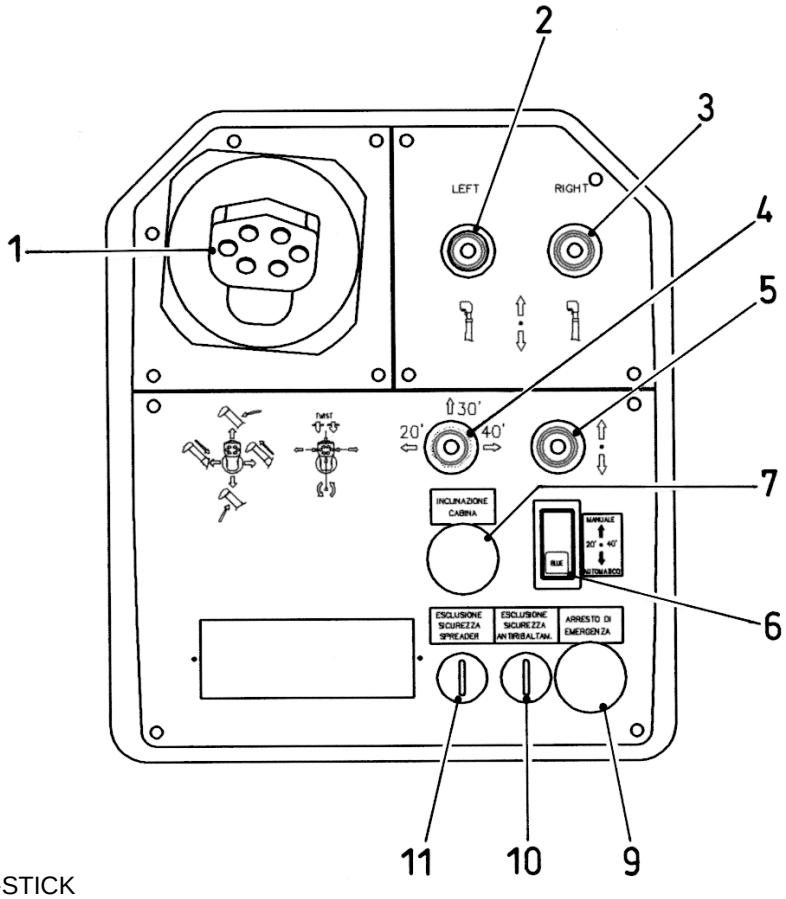


18 - Electronic rev-counter - Hour meter
19 - Manometer engine oil pressure
20 - Thermometer engine coolant temperature
21 - Fuel level gauge
22 - Transmission oil thermometer
23 - Pilot light electric defogger *(green)*
24 - Pilot light yellow flashing light *(blue)*
25 - Warning light engine coolant low level *(red)*
26 - Warning light hazard warning lights *(red)*
27 - Pilot light general illumination *(green)*
28 - Warning light parking brake applied *(red)*
29 - Pilot light high beams *(blue)*
30 - Pilot light turn signals *(green)*
31 - Warning light alternator charging *(red)*

32 - Warning light alternator charging *(red)*
33 - Warning light air filter clogged *(red)*
34 - Warning light hydr. fluid filter clogged *(red)*
35 - Warning light engine coolant overheating *(red)*
36 - Warning light brake fluid filter clogged *(red)*
37 - Warning light gearbox oil overheating *(red)*
38 - Warning light gearbox oil filter clogged *(red)*
39 - Warning light brake fluid overheating *(red)*
40 - Warning light low brake fluid pressure *(red)*
41 - Warning light hydraulic fluid overheating *(red)*
42 - Warning light low engine oil pressure *(red)*
43 - Pilot light 40' container working light *(orange)*
44 - Pilot light 20' container working light *(orange)*
45 - Pilot light twist-lock working light *(orange)*
46 - Pilot light engine glow-plug *(yellow)*
47 - Pilot light low fuel level *(orange)*
48 - Warning light steering emergency pump operating *(red)*
49 - Available
49a - Pilot light fog tail lamp *(orange)* Opt.
49b - Pilot light mirror heating *(green)* Opt.
49c - Pilot light fuel pre-heating *(green)* Opt.

NOTE: ***The above drawing shows an instrument panel provided with every possible Optional.***

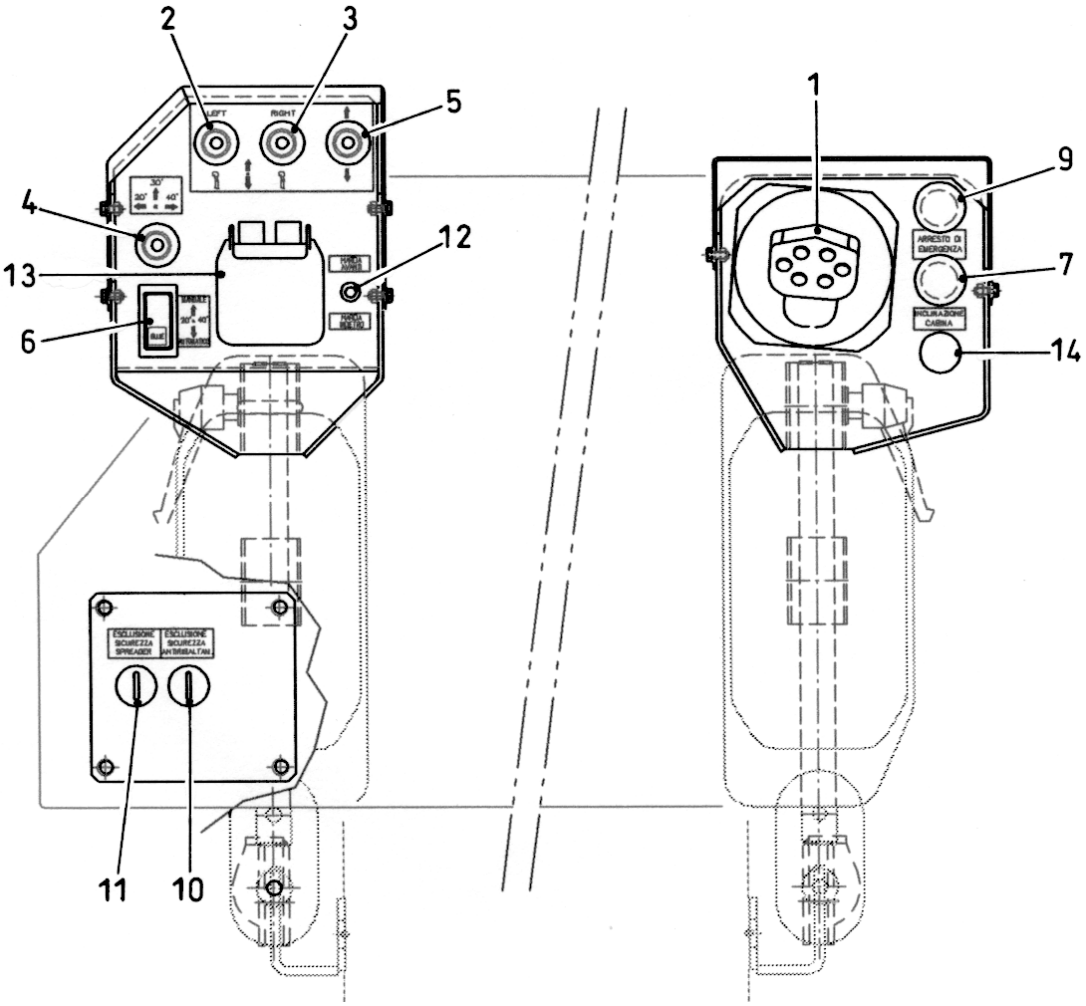
CONTROL PANEL



1 - JOY-STICK
2 - Hydraulic columns control lever *(spreaders "SS100RS" and "SS100RSR")*
- Left hydraulic column control lever *(spreader "SS100RSD")*
3 - Right hydraulic column control lever *(spreader "SS100RSD")*
4 - Spreader telescoping control lever
5 - Spreader tilting control lever
6 - Switch for spreader opening/closing selection from 20' to 40' automatically or by hand *(blue)*
7 - Mushroom-head push-button for cab tilting automatism/lock selection *(green)*
8 - Available
9 - Emergency engine cut-off mushroom-head push-button *(red)*
10 - By-pass key switch of the load moment indicator
11 - By-pass key switch of the spreader safety devices

NOTE: ***The above drawing shows a control panel provided with every possible Optional.***

CONTROL PANELS for VEHICLE MODEL with STEERING CONTROL LEVER



1 - JOY-STICK
2 - Hydraulic columns control lever *(spreaders "SS100RS" and "SS100RSR")*
- Left hydraulic column control lever *(spreader "SS100RSD")*
3 - Right hydraulic column control lever (spreader "SS100RSD")
4 - Spreader telescoping control lever
5 - Spreader tilting control lever
6 - Switch for spreader opening/closing selection from 20' to 40' automatically or by hand *(blue lens)*
7 - Mushroom-head push-button for cab tilting automatism/lock selection *(green)*
8 - Available
9 - Emergency engine cut-off mushroom-head push-button *(red)*
10 - By-pass key switch of the load moment indicator
11 - By-pass key switch of the spreader safety devices
12 - Forward/reverse gear control switch
13 - Steering control lever
14 - Available

NOTE: ***The above drawing shows the control panels provided with every possible Optional.***

VEHICLE'S CONTROLS

This section contains information about:

- Driver's seat
- Safety belts
- Steering wheel adjustment
- Side control panel adjustment
- Steering control lever *(if fitted)*
- Main switch
- External illumination control stalk
- Window washer system
- Heater and ventilation
- Auxiliary heater "EBERSPÄCHER" *(if fitted)*
- Air conditioner *(if fitted)*
- Cab sliding
- Cab tilting *(if fitted)*
- Right and left side compartment lights

DRIVER'S SEAT
(ISRINGHAUSEN)

Sprung driver seat with oleo-dynamic suspension for maximum driving comfort, adjustable to various different driving positions by way of levers and knobs provided.

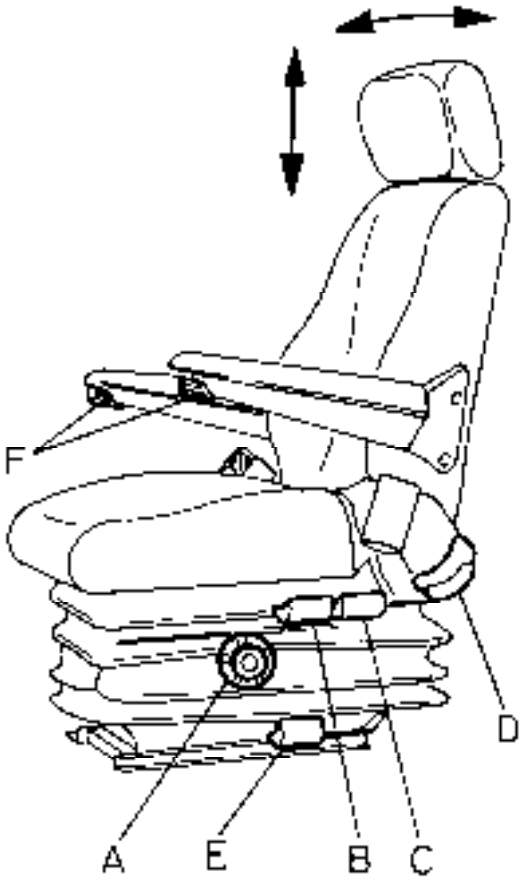
Weight setting
Turn the knob (**A**) to set the driver's weight.
Settings between 40 and 130 kg.

Height and slope adjustment of the driver's seat
After weight setting, pull the levers (**B**) and (**C**) to adjust the height and slope of the seat.
Height and slope may be adjusted separately.
Adjustment + 65 mm.

Tilt angle adjustment of the seat back
Pull the lever (**D**), adjust the desired tilt angle and release the lever.
Max. backward tilt angle 41,4°.

Horizontal adjustment *(forward-backward)*
Pull the lever (**E**) and slide the driver seat in the desired position.
After adjustment, check that the seat is correctly locked.
Stroke 150 mm.

Armrest adjustment
The armrests are tilting to facilitate the handling of the driver's seat.
They may be adjusted by means of the knob (**F**).



Headrest adjustment
It is possible to adjust the height and the tilt angle of the headrest.

PNEUMATIC DRIVER'S SEAT
(ISRINGHAUSEN)

Pneumatic driver seat with compressor, for maximum driving comfort, adjustable to various different driving positions by way of levers and knobs provided.

Weight setting
Use the push-button valve (**A**) to set the driver's weight *(up to 130 kg)*.

Lumbar region cushion adjustment
Adjust the lumbar region cushion with the push-button valves (**B**).
The lower and upper part of that cushion may be adjusted separately by means of the a.m. valves.

NOTE: ***To perform a.m. adjustments, the ignition key must be turned to ON.***

Seat back adjustment
Pull the lever (**D**), adjust the desired tilt angle and release the lever.

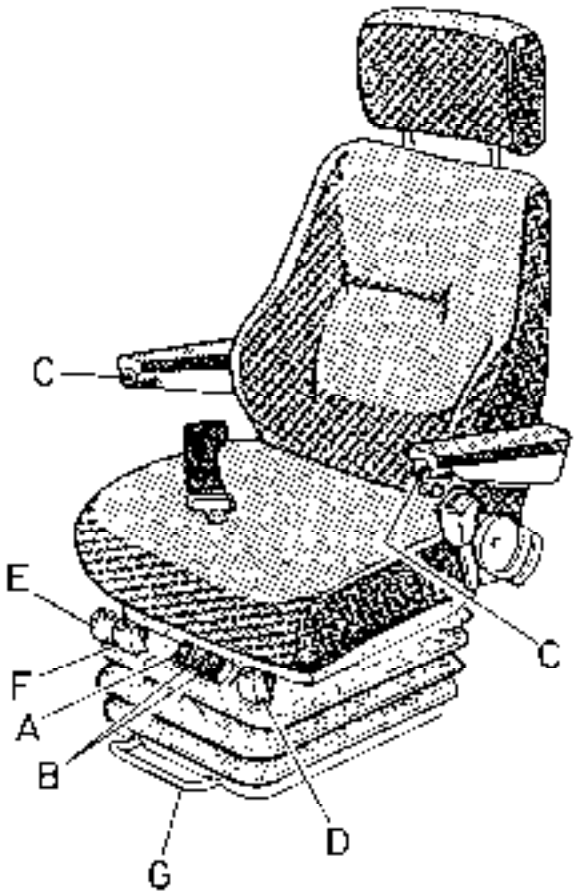
Height adjustment of the driver's seat
Pull the lever (**E**) to adjust the height of the seat in the desired position and release the lever.
Adjustment up to + 65 mm.

Slope adjustment of the driver's seat
Pull the lever (**F**) to adjust the slope of the seat in the desired position and release the lever.
Adjustment up to + 65 mm.

Horizontal adjustment [forward-backward]
Pull the lever (**G**) and slide the driver seat in the desired position *(stroke 180 mm)*.
After adjustment, check that the seat is correctly locked.

Armrest adjustment
The armrests are tilting to facilitate the handling of the driver's seat.
They may be adjusted by means of the knob (**C**).

Headrest adjustment
It is possible to adjust the height and the tilt angle of the headrest.

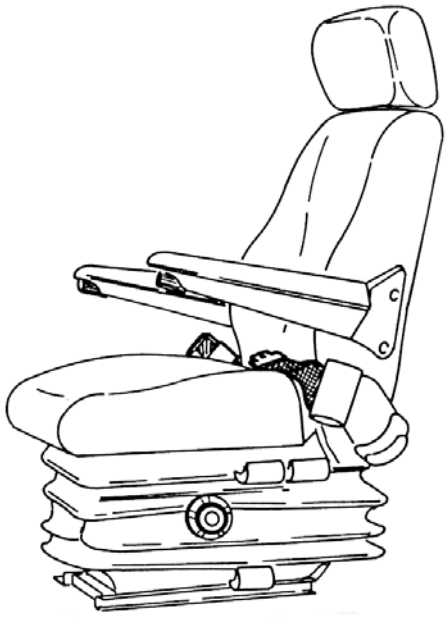


SAFETY BELTS

The driver's seat is equipped with 2 point safety belts with automatic belt winder.

WARNING:
Seat belts are of vital importance for the operator's safety.
If installed, they must always be used !

- To fasten the belt, insert the tang in the buckle until it is locked.
- To release the belt, depress the release key on buckle head.
- Every now and then check the fastening screws are not loose and the belt is not damaged or frayed.

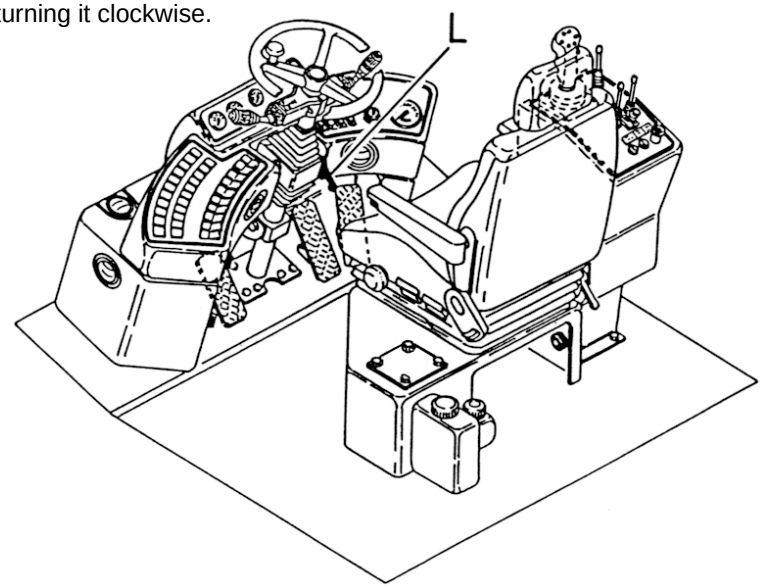


WARNING:
Do not perform modifications that could reduce the functionality of the safety belt.

STEERING WHEEL ADJUSTMENT

To adjust the tilt angle of the steering wheel, slacken the lock lever (**L**) on the steering column.

After the adjustment, lock the lever turning it clockwise.

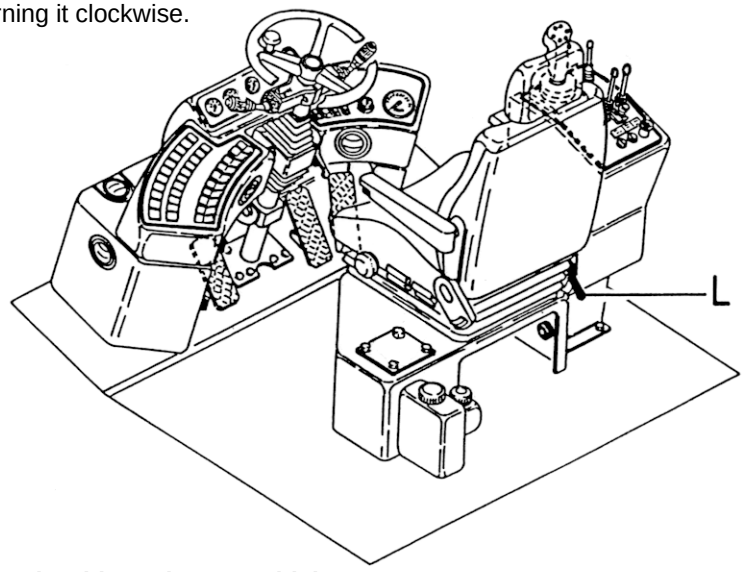


WARNING:
This adjustment may be performed only with stationary vehicle.

SIDE CONTROL PANEL ADJUSTMENT

To adjust the tilt angle of the side control panel, slacken the lock lever (**L**) on the control panel stand.

After the adjustment, lock the lever turning it clockwise.



WARNING:
This adjustment may be performed only with stationary vehicle

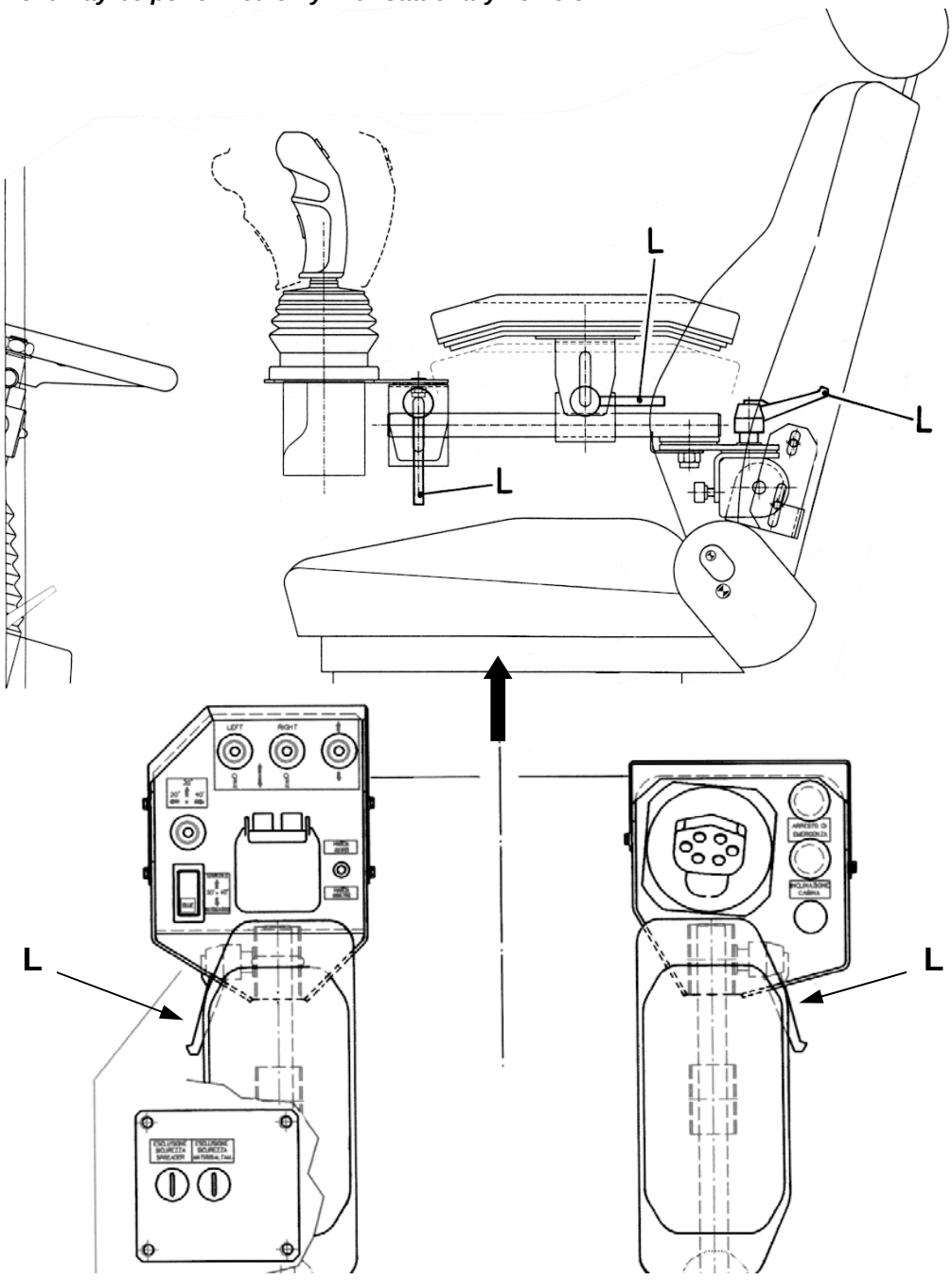
ADJUSTMENT OF CONTROL PANELS AND SIDE ARMRESTS

(For Vehicle Model with Steering Control Lever)

To adjust the longitudinal position, the height and the tilt angle of the side control panels and armrests, slacken the lock levers (**L**) on the armrest side supports.

After the adjustments, lock the levers.

WARNING:
This adjustment may be performed only with stationary vehicle.



STEERING CONTROL LEVER
(OPTIONAL)

Either the control lever (**M**) or the steering wheel may control the steering operation.

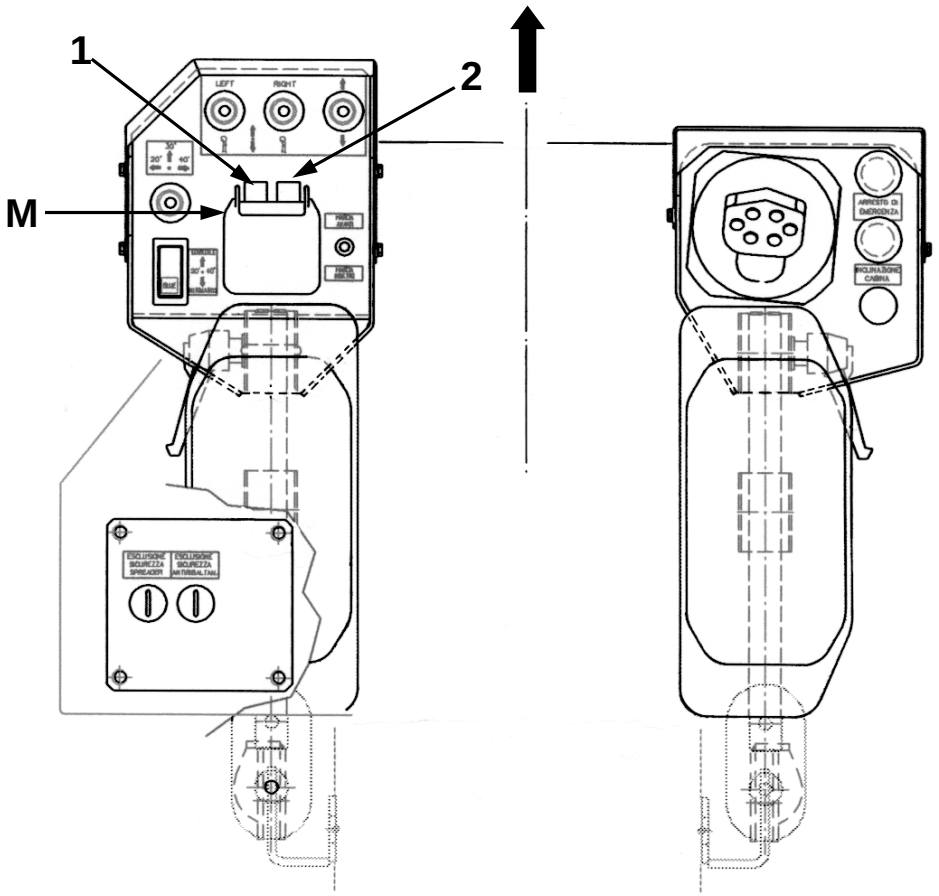
The control lever (**M**) is on the movable control panel, on the left-hand side of the driver.

Steering by means of the control lever (**M**): - **to the left**, press the button (**1**)

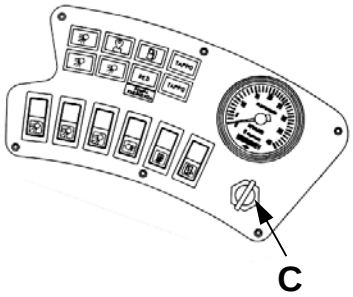
- **to the right**, press the button (**2**)

NOTES: - *Steering speed is related to the speed of the vehicle, and it is proportionate to the pressure exercised on the push buttons (**1**) and (**2**).*
(Reduced speed of the vehicle means a high speed in steering response;High speed of the vehicle means a low speed in steering response)

- *If both push buttons (**1**) and (**2**) are pressed simultaneously, the vehicle WILL NOT steer.*



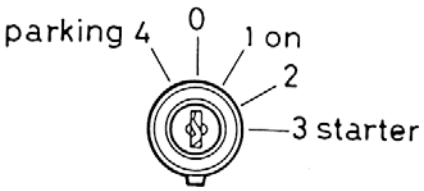
MAIN SWITCH



The main switch (**C**) is located on the right instrument panel.

Main switch key positions:

0 = All circuits OFF – it is possible to pull out the key
1 = Power applied – it is **not** possible to pull out the key
2 = Engine pre-heating/start – it is **not** possible to pull out the key
3 = Engine start
4 = Parking; parking light ON – it is possible to pull out the key



NOTE: ***To turn the key to position 2, 3 and 4, keep the key pushed in.***

EXTERNAL ILLUMINATION (MULTI-FUNCTION) CONTROL STALK

The multi-function control stalk is mounted on the light side of the steering column.

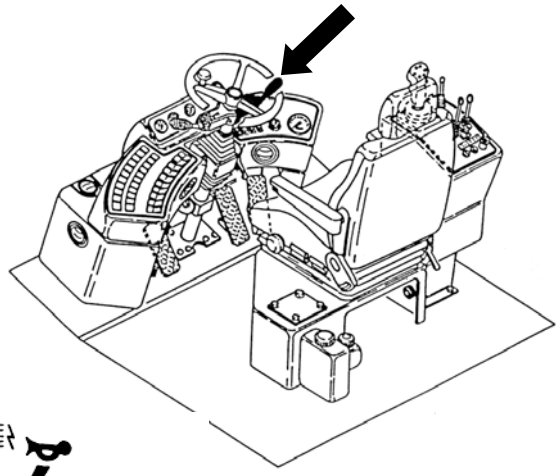
Multi-function control stalk positions:

0 = All circuits OFF
1 = Parking light
2 = Dipped beams

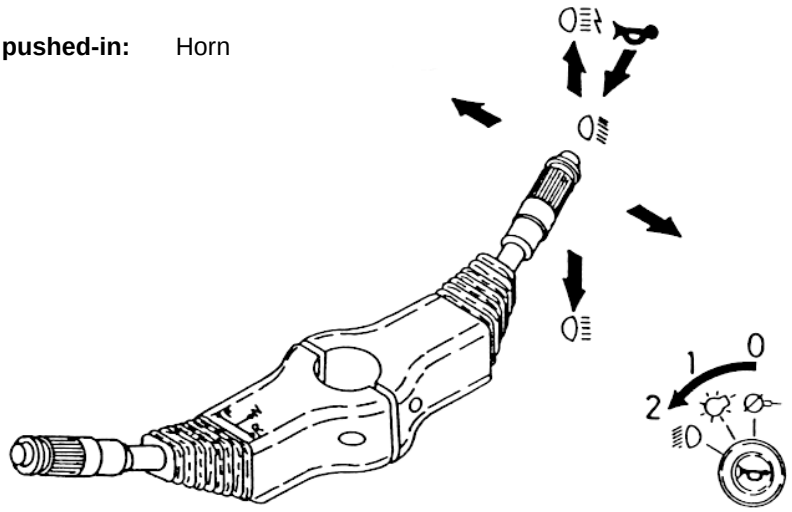
Stalk up: High beams *(the relevant blue pilot light comes on)*
Stalk up: Main beam flasher

Stalk backward: Right turn signal indicators
Stalk forward: Left turn signal indicators

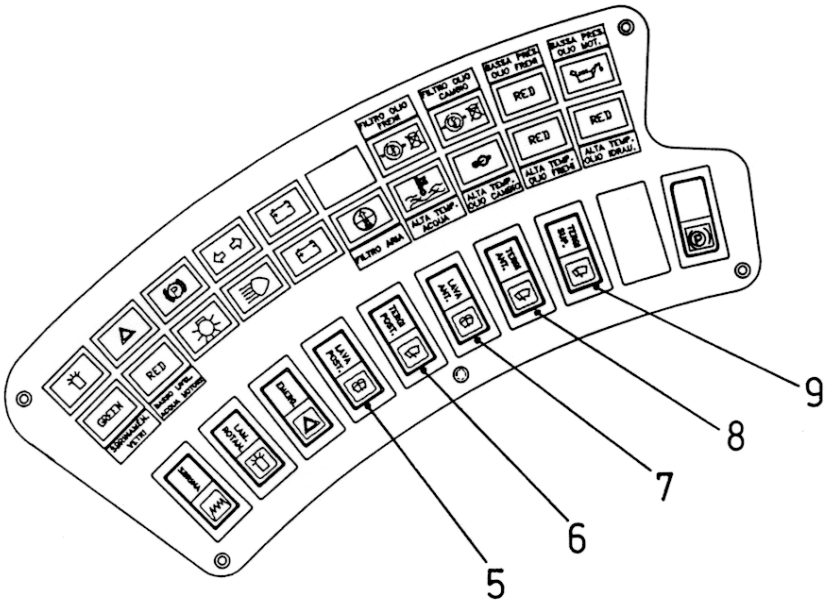
NOTE: ***The control stalk returns automatically to its home position after turn completion.***



stalk pushed-in: Horn



WINDOW WASHER SYSTEM



SWITCHES OF WINDOW WASHERS AND WIPERS

Clean the front, rear and roof windows as follows:

1. To spray fluid on the front or rear window, press the relevant switch:

switch **7** - front window washer
switch **5** - rear window washer

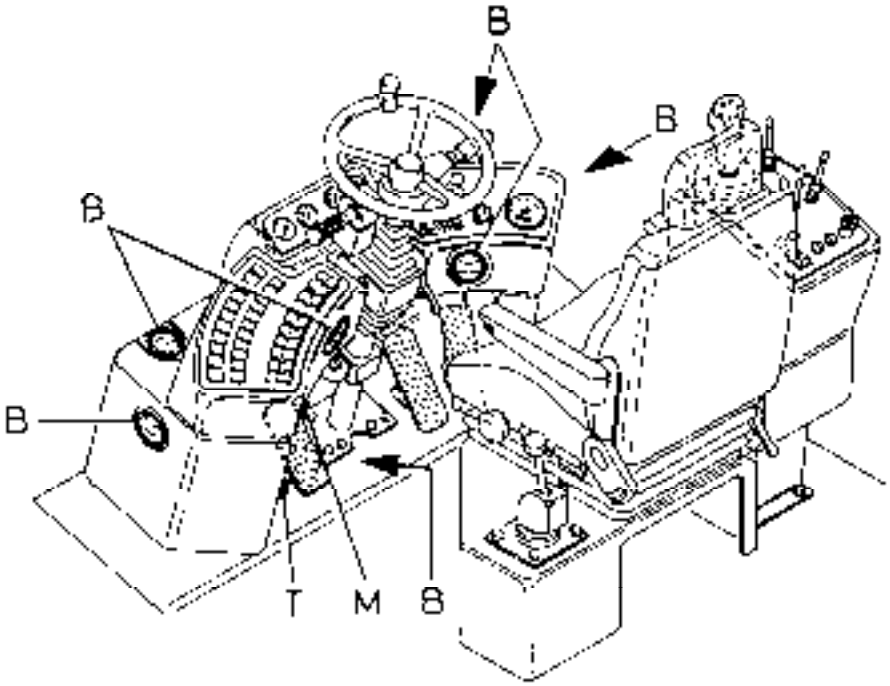
NOTE: *Being these non-locking switches, releasing it will interrupt the fluid spray.*

2. Switch-on the wipers pressing the relevant switches:

switch **8** - front window wiper
switch **6** - rear window wiper
switch **9** - roof window wiper

HEATER AND VENTILATION

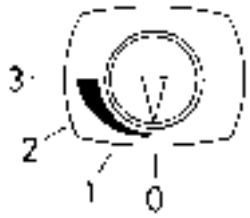
To achieve comfortable working conditions inside the cab according to the season, the vehicle is equipped with a basic heater ventilation that permits to obtain optimum temperatures by introducing warm air in the cab through the air inlets.



Ventilation

To switch the ventilation on, turn the ignition key to ON.
Open the air admissions (**B**).
With the knob (**M**) set the desired air speed.

Position **0** – switched-off **OFF**
Position **1** – low speed **LOW**
Position **2** – intermediate speed **MED**
Position **3** – high speed **HI**

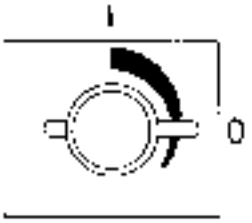


Heating

It is possible to switch the heater on only with the engine running.
The performances of the heater directly depend on the temperature of the coolant; for this reason, the heater is effective only after engine warm-up.
With the ventilation speed control knob (**M**) the operator adjusts the quantity of air blown in the cab.

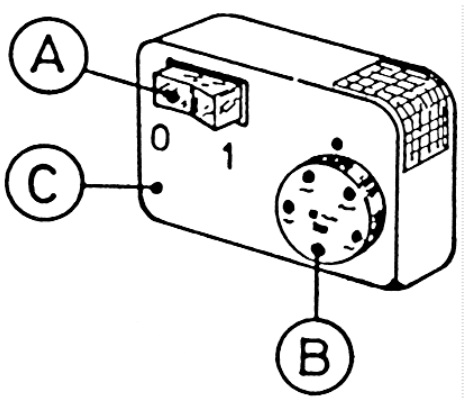
Temperature set-up knob (**T**)

Position **0** – Heater switched-off
Position **1** – Maximum temperature



AUXILIARY HEATER "EBERSPÄCHER" (if fitted)

For very cold climatic conditions, the vehicle may be equipped with an auxiliary heater functioning independently from the basic heater of the vehicle.



Controls *(in the cab)*

A. ON/OFF-switch
B. Temperature control knob
C. Thermostat

On request, the heater may be equipped with a TIMER to set-up the ON/OFF time *(OPTIONAL)*.

Mode of operation

Switch on: Set switch (**A**) to position **"1"**, the pilot light in the on/off switch comes on.

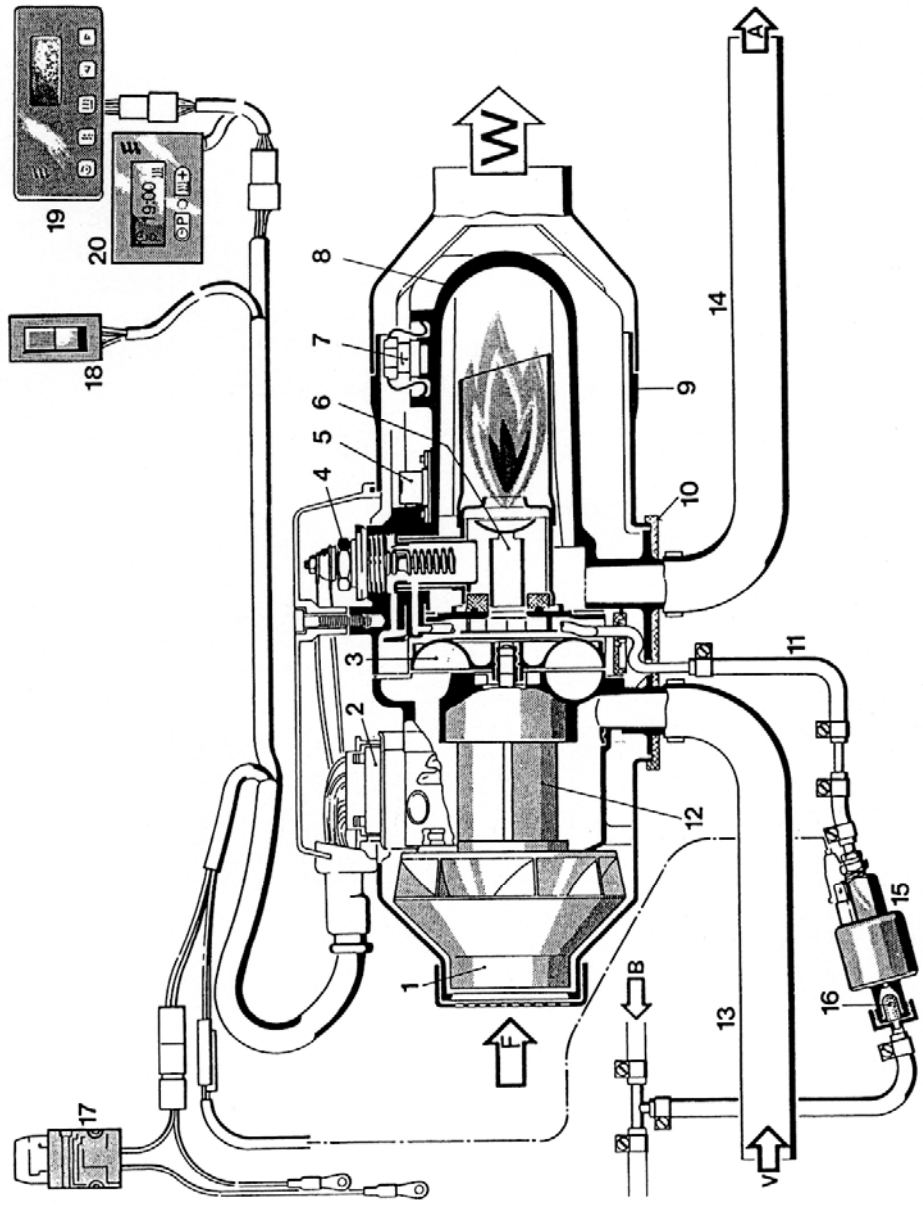
Further procedure is automatic: - after approx. 3 sec. start of the electric engine, glow plug ON
- after approx. 33 sec. Fuel conveying "on"

When a stable flame has been obtained: glow plug off.
The heater now operates at full heating capacity *(1.800 W)*, and the air heated by the heat exchanger passes through the air outlet into the space to be heated.

Set the desired temperature with the control knob (**B**).

To switch-off, turn the switch (**A**) to "**0**", the pilot light goes out.

The ventilation continues to operate to cool the heater down, and finally shuts down automatically after about 3 minutes.



Controls and safety equipment

The flame is monitored by the flame sensor (**7**), and the max. permissible temperature by the safety thermal cut-out switch (**5**).
Both affect the electronic control unit, which shuts down the heater in the event of faults.

1. If the heater fails to ignite within 180 seconds after start of fuel pumping, or if the flame goes out by itself during operation, a fault shutdown takes place, with the ventilation motor continuing to operate for about 3 minutes.
Here the glow plug is also “on” during the first 30 seconds.
The fault shutdown can be cancelled by switching off and then back on.

2. In the event of overheating, the safety thermal circuit switch (5) is operated, the fuel supply is interrupted and fault shutdown follows with the ventilation motor continuing to operate as described above.
Once the cause of the overheating has been removed, the heater can be restarted by switching it off and then back on again.

3. If during start or operation, a short circuit or interruption occurs in motor, glow plug, fuel metering pump or flame monitor, a fault shutdown takes place, possibly with the ventilation motor continuing to operate as described above.

4. The operation of the ventilation motor is monitored periodically.
If it fails to start, or if the motor speed is below the minimum value, fault shutdown takes place.

5. When the heater is switched off, the glow plug is switched on during the delayed shutdown for about 30 seconds *(after-glow)* to clear it of combustion residues.

⚠ **WARNING:** - *The heater must always be switched off when refilling the tank*
- *The heater must not be operated in garages*

In the event of trouble, first check the following:

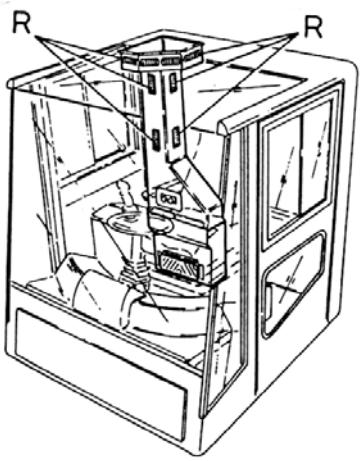
- Fuel in the tank ?
- When changing over to winter operation: is there still summer-quality diesel in the lines?
- Fuses OK?
- Electrical lines and connections OK?
- Combustion air and exhaust piping systems free?

When combustion produces soot:

- Combustion air and exhaust piping systems clogged? *Remove cause of clogging.*
- Fuel metering pump conveying too much? *Measure fuel quantity, replacing fuel metering pump if necessary.*
- Deposits in heat exchanger? *Clean heat exchanger, or replace it if necessary.*

AIR CONDITIONER (if fitted)

The air conditioner may operate only with the engine running.
The air is blown in the cab through adjustable admissions (**R**) located on the conditioned air duct, independently from the controls of the heater ventilation *(see section Heater ventilation)*.
To switch the air conditioner on and to set the desired temperature, use the knobs (**A**-**B**) on the conditioned air duct at the driver's right on the rear cab side.

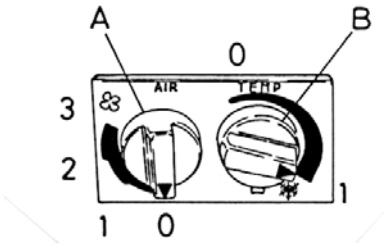


Controls:

A. ON/OFF and air speed control knob:
0 – Switched-off
1 – Switched-on – Low speed
2 – Switched-on – Intermediate speed
3 – Switched-on – High speed

B. Temperature set-up knob:
Select with the control knob the desired comfort grade.
0 – Low air temperature
1 – Max. air temperature

NOTE: ***If the coolant temperature is low, the temperature of the air blown into the cab cannot be changed even turning the temperature set-up knob to the maximum temperature.***



NOTES:
- For rapid window defogging, operate the heater and the air conditioner simultaneously.

- *Make sure that all air admissions and all windows are closed.*

- *If the vehicle is used after a prolonged stop in the sun, turn the control knob "**B**" to position 3 and let the windows open for some minutes, to accelerate the cab cooling.*

- *Do not direct the air flow directly towards you.*

WARNING:
- Too cool air could be unhealthy. The air temperatures setting in the cab should be only of 5-6 °C lower than external temperature.

- A thermostat controlled by a sensor in the cab maintains the cab temperature constant at the level selected by the operator.

- Any water leakage under the vehicle is caused by normal condensing due to the dehumidification performed by the system.

CAUTION:
Switch-on the air conditioner at least for five minutes every week, also in cold seasons, in order to ensure a good lubrication of the inner parts of the compressor and best performances of the air conditioner.

CAB SLIDING

Manual Cab Sliding

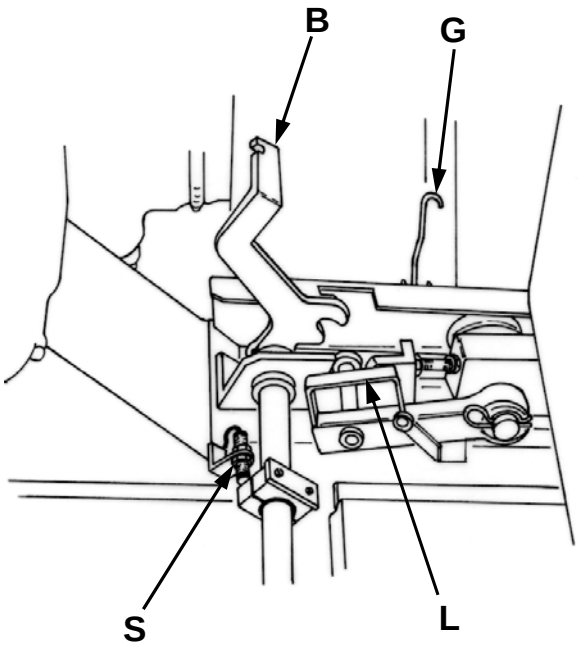
The cab may be slid forwards by hand to facilitate the access to the engine and to the systems located into the chassis.

Manual sliding steps:

1. Release the safety lock (**G**) on both right and left side of the cab, lift the locking lever (**B**) and unlock the slide frame with the lever (**L**).

   NOTE: *The levers (**B**) and (**L**) are located on both right and left sides of the cab.*

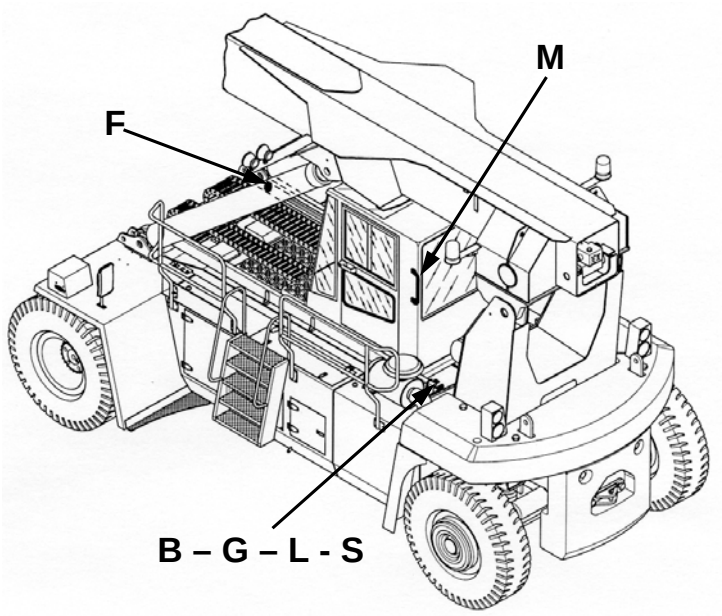
2. Slide the cab forwards with its handle (**M**).



The cab sliding system also includes:

- a limit switch (**F**) at the front end of the right side member that limits the max. stroke of the cab.
- a sensor (**S**) at the rear end of the left side member **that allows to engage gear only if the sliding frame** *(where the cab is fastened)* **is hooked**.

⚠ **WARNING:**
Before cab sliding, apply the parking brake and switch-off the engine.



HYDRAULIC CAB SLIDING (if fitted)

From the driver's seat

The cab may be slid from the driver's seat, operating as follows:

1. Close the doors

2. Shift the transmission lever in neutral position

NOTE: *The system is enabled only after making the steps listed above.*

⚠ **CAUTION:**
- *In any case, always stop the vehicle before sliding the cab.*
- ***Never remove** the metallic protections on the cab sliding glasses, in order to avoid accidents due to driver's leaning out of the cab during cab sliding.*

3. By operating the switch ..... *(located …….)* the cab will move forward ***(pos. 1)*** or backward ***(pos. 2)***.
Release the switch *(unsteady)* to stop sliding.

NOTE: *If a failure stops the cab in a place where the doors cannot be opened, it is possible **to move backward** the cab by pressing the emergency switch …… that allows the operator to make this operation even if the engine is off.*

From outside the cab

The cab may be slid by operating the key switch (**C**) on the control electrical box *(inside the rear right compartment)*, turning it clockwise/ counterclockwise to move the cab forward or backward respectively.
Do as follows:

NOTE: The key switch (**C**) allows the operator to slide the cab even if the engine is off.

⚠ **CAUTION:** *In any case, apply the parking brake.*

The hydraulic sliding system consists also of:

- No 2 stroke end switches (**D**) placed under the cab, delimiting the sliding stroke of the cab.
- No 2 push buttons (**E**), to stop immediately the cab sliding in an emergency case.
  (They are located outside the cab, in the middle of both front and rear sides of the cab).

CAB TILTING
(OPTIONAL)

The cab tilting system is automatic and actuated by means of a push button from the driving place.
The cab tilts upwards when the boom reaches an angle of ~45°, so as to improve the operator's comfort.

It is composed of the following components:

- 1 steady two-position, backlighted green push-button (**7**) [on the side control panel] to enable the cab tilting automatism;

- 1 sensor (**S**) located at the rear end of the left side member signals that the cab is locked backwards;

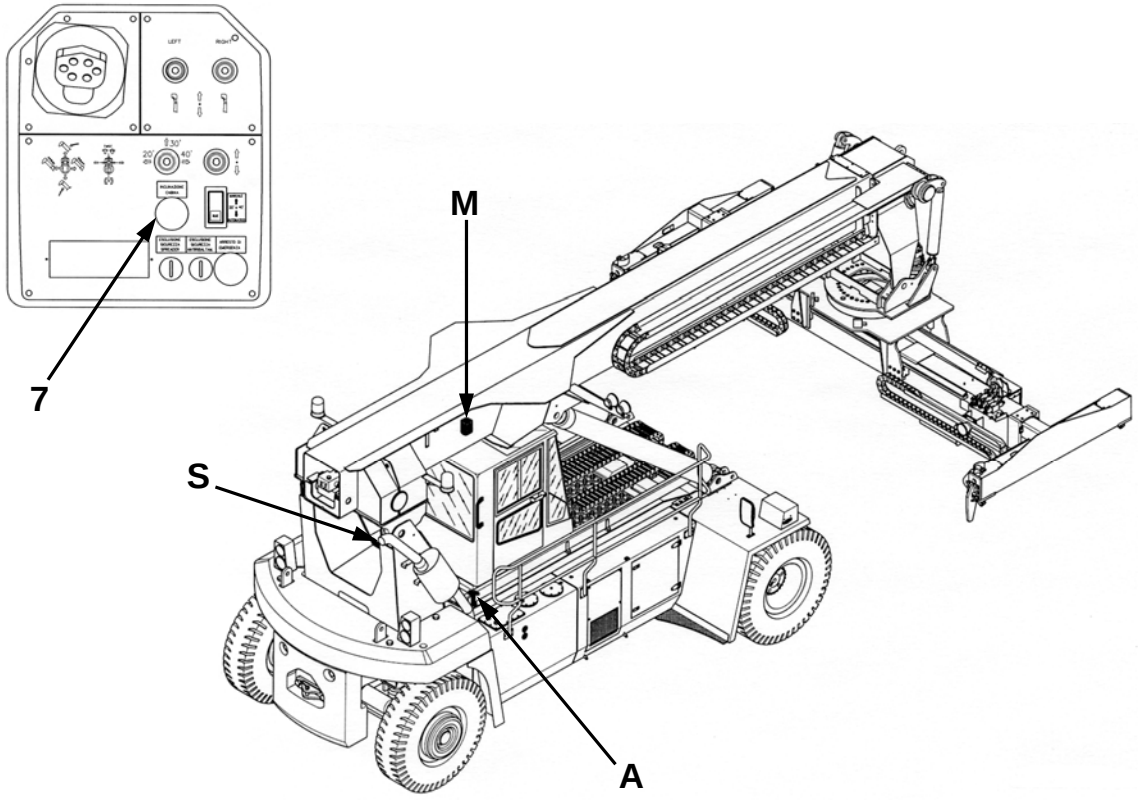
- 1 sensor (**A**) located at the rear end of the right side member enables the cab tilting automatism provided that the cab is backwards;

- 1 sensor (**M**) located on the right side of the boom over the cab, monitors the min. distance between the boom and the cab;

- 3 two-contact relays used for the system logic *(inside the main electric panel, located in the left body side of the vehicle);*

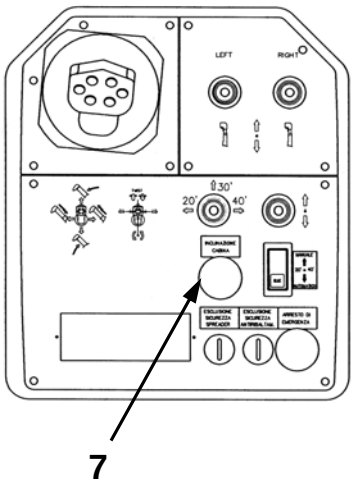
- 2 hydraulic cylinders *(located inside the chassis, under the front movable bonnet)*;

- 2 cab side protections.



OPERATING

The automatic cab tilting is actuated as follows:



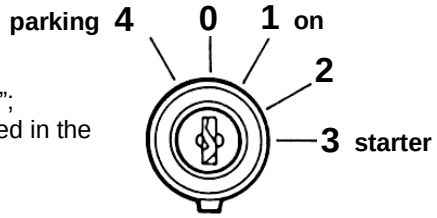
1. Lock the cab in the driving position *(backwards)* so that the sensors (**A**) and (**S**), located at the end of the right and left side members, signal this condition.

2. Operate on the relevant backlighted green push button (**7**), located on the panel at the at driver's right
- when the push button is in "**ON**" position *(up and lighted)*, the cab tilting automatism is enabled;

- when the push button is in "**OFF**" position *(down and off)*, the cab remains in driving position and cannot be tilted.

NOTES:
- *When the cab tilting is enabled, the control cylinders make the complete stroke;*
- *To take back the cab into its driving position from the tilted one, press the relevant push button (**7**);*
- *When the preset min. safety distance between the boom and the cab is reached, the sensor located on the boom, monitoring this distance, locks the boom lowering and makes the cab go down into its driving position.*

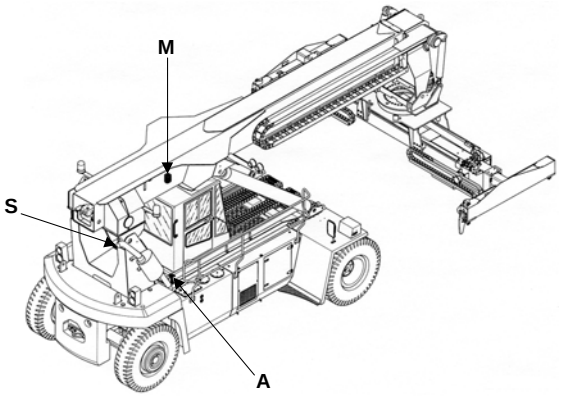
To restore the operation, do as follows:



1) Wait for the cab to descend into its driving position;
2) Stop the engine, by turning the ignition key into the pos. "**0**";
3) Restart the engine by acting on the ignition key as described in the chapter "Start, Drive and Operation of the Vehicle".

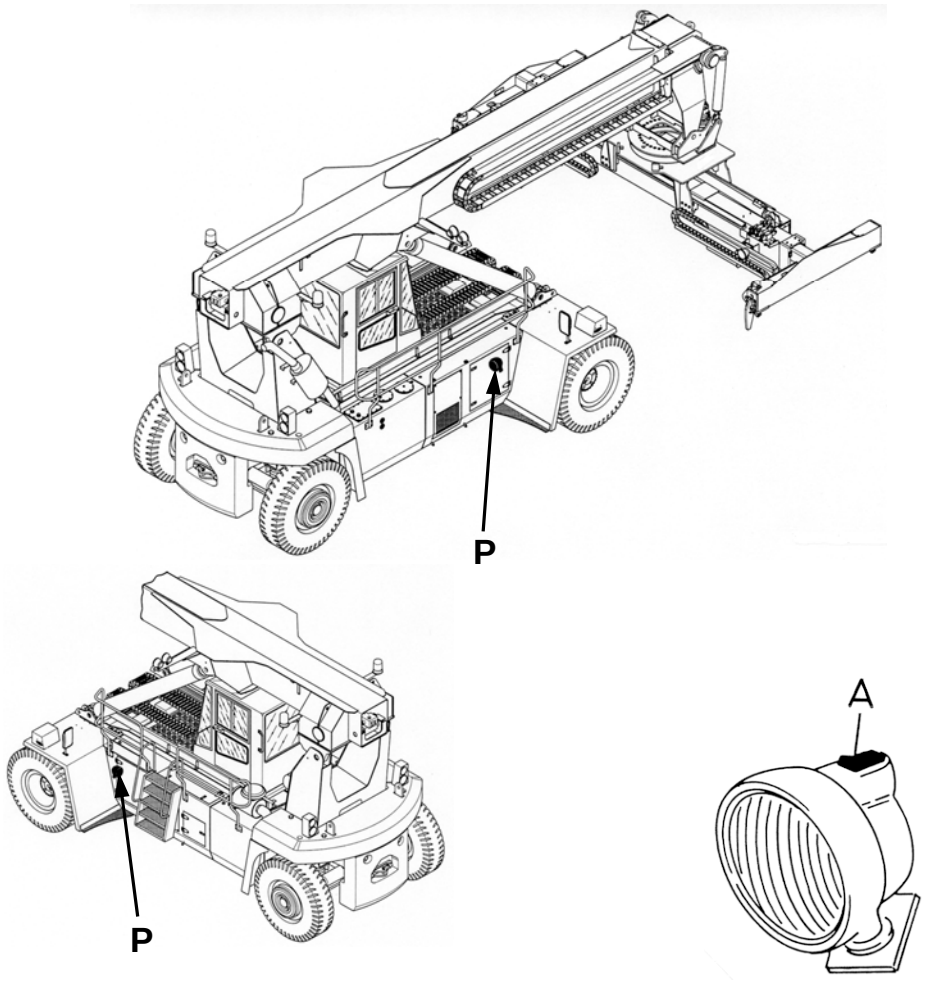
⚠ **CAUTION:**
In case of numerous interferences between the boom and the cab, contact the C.V.S. qualified personnel

⚠ **WARNING:**
- ***NEVER get below the cab when it is tilted up.***
- ***DO NOT use the vehicle without the side protections (P) of the cab.***



RIGHT AND LEFT SIDE COMPARTMENT LIGHTS

The right and left side compartments are equipped with internal lights (**P**) switched-on and off with the push button (**A**) on their top.



NOTE: ***The compartment lights can be switched on only if the ignition key is on its ON position.***

START, DRIVE AND OPERATION OF THE VEHICLE

This section contains information about:

- First operating hours
- Checks before starting the vehicle
- Engine
  - Engine start
  - Pre-heater system
  - Engine stop
- Use of the vehicle
  - Moving off
  - Stopping the vehicle
  - Gearbox selector lever
  - With vehicle moving
  - Parking brake
  - Use of the de-clutch pedal
  - Brake fluid reservoir
  - Boom/spreader joystick
  - Spreader control levers
  - Emergency steering pump
  - Transmission automation
  - Towing the vehicle
  - Towing and lifting components of the vehicle
  - Damping system charging *(F258)*
  - EMERGENCY boom lowering/rising
  - Levelling cylinders *(F238 – F248)*

⚠ **CAUTION:** **The first running of the vehicle (after delivery), will be carried out by C.V.S. skilled staff or by a C.V.S. Dealer.**

⚠ **WARNING:** **Only qualified, trained personnel may drive and use the tractor.**

INTRODUCTION

The purpose of this chapter is to lead the operator step by step to be familiar with the vehicle and to teach him how to operate it efficiently and safely.

Carefully read the whole chapter "**Start, drive and operation of the vehicle**".

Before starting the engine, sit on the driver's seat and look at the controls and at their positions.

By reading this manual, you can identify switches, indicators, push buttons, levers and pedals.

The operator must always be aware of what is happening inside and outside the cab.

Working in safety conditions must be the main aim of all operating steps.

When you are sure to be familiar with all positions and functions of controls, switches and indicators, practise them.

Drive the vehicle outdoors with nobody near the vehicle.

While using the vehicle, observe how the vehicle and the controls behave.

Finally, do not quicken the practice of the vehicle and make sure you have deeply learned the contents of this chapter "**Start, drive and operation of the vehicle**".

Operate calmly, work safely and efficiently.

Remember:

BE CAREFUL
LOOK OUT
WORK SAFELY

WARNING:
Before use the Reach Stacker, carefully read the chapter 2 "SAFETY".

FIRST OPERATING HOURS – BREAK-IN TIME

For a new vehicle, we recommend to respect a short break-in time of at least **200 operating hours**.

During the break-in time observe following precautions:

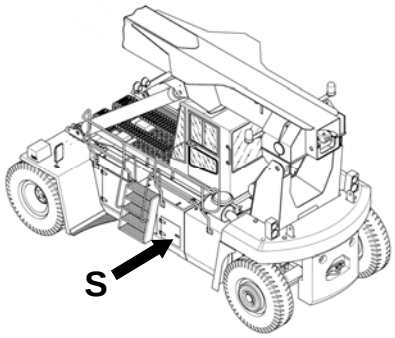
1) Do not ever run the engine at max. speed.
2) After each start, always allow the engine to warm up gradually and avoid immediately running it at high speed ranges.
3) Check the oil level frequently.

CHECKS BEFORE STARTING THE VEHICLE

The following checks concern the functionality of the vehicle and its safety.
Ask for a technician to check and repair any defect.

Verify that the main isolating switch (**S**) is switched off.
[It is located inside the left body side of the vehicle, behind the rear door *(the little one)*].

Level checks
- Fuel level.
- Engine oil level.
- Engine coolant level.
- Hydraulic fluid level.
- Fluid level in the reservoir of the washer system.



Cleaning checks
- Clogging of the engine air filter.
- Clean windows, lights and rearview mirrors.
- Check that the ladders and the cab handles are clean and dry.

Damage checks:
- Check that no piece of the vehicle is damaged or missing.
- Examine the windows for damage. The splinters of glass may blind.
- Check that under the vehicle there are no leakages of oil, fuel or coolant.
- Check the conditions of the tyres:

WARNING:
A burst of a tyre may cause even mortal injury, so never use a vehicle whose tyres are damaged, incorrectly inflated or excessively worn.

- Verify the inflation pressure of the tyres. For a correct inflating operation, see the paragraph **Wheel Changing** inside the chapter **Maintenance.**
- Check for cuts on the tyres or for something sharp got stuck in the tyres.
- Never use a vehicle whose tyres are damaged.

Further checks
- Verify that the plugs of the tanks are correctly tightened.
- Check that the cab is correctly locked by means of the locking device.
- Verify that all instruments of the vehicle are in good working order.

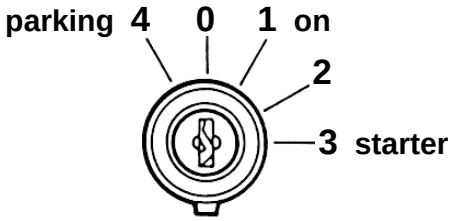
ENGINE

(in any case, please refer to the enclosed engine manufacturer's instructions)

WARNING:
Before starting the engine in closed areas, make sure that these are well ventilated, considering that exhaust fumes are toxic.

NOTE: *The engine may be switched on only if the gearbox selector lever is shifted into neutral "**N**". A safety device prevents the engine from starting if the vehicle is in gear "**N**".*

Engine Start



- Insert the ignition key in the ignition lock and turn it clockwise to pos. **1** "ON".

NOTE: *In position **1** the ignition lock tests the warning and pilot lights.*

- Push the ignition key, turn it to position **3** "STARTER" and release it immediately after engine start, WITHOUT pressing the accelerator pedal.
  If you press the accelerator pedal, black exhaust fumes at the engine start can be considered as normal.

- After engine start, with the manometer (**M**) check that the engine oil pressure is within the pre-set range [3,5/4 bar].

CAUTION:
If the engine does not start quickly, do not operate the starter longer than 30 sec., otherwise battery discharge or starter damages could occur.

Immediately after engine start, move slowly in order to let the engine run at low speed and to reach gradually its operating temperature *(above all at low temperatures)*.

Operating this way you will achieve:

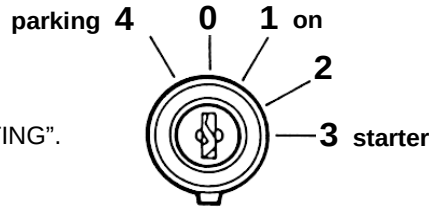
- A continuous and constant oil flow in the whole lubrication circuit.
- The respect of the law pollution limits.
- The control of consumption.

ENGINE (cont'd)

PRE-HEATER SYSTEM

The vehicle may be equipped with a pre-heater system to facilitate the engine start at low temperatures.

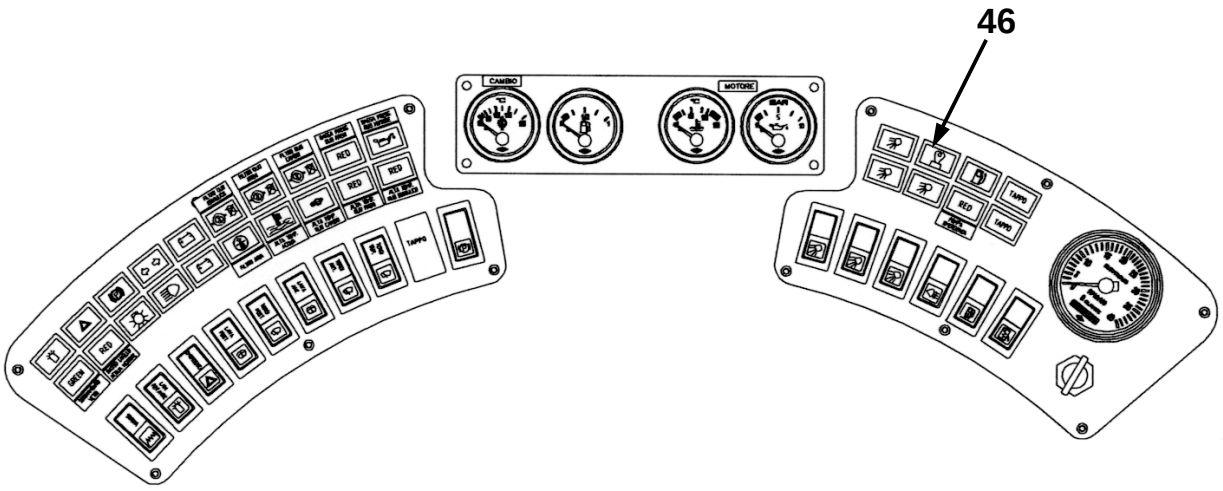
In this case, start the engine as follows:



- Insert the ignition key and turn it clockwise to pos. **1** "ON".

- Push the ignition key in and turn it to pos. **2** “ENGINE PRE-HEATING”. *(The yellow pilot light of the glow plugs item **46** lights up).*

- Hold the ignition key for approx. 20 sec. in position **2**, then push it in and turn it to pos. **3** “STARTER” and release it immediately after engine start, WITHOUT pressing the accelerator pedal. *(The yellow pilot light of the glow plugs item **46** goes out)*



Engine Stop

Stop the engine as follows:

- Run the engine at idle for some minutes to achieve a thermal balance and ensure the lubrication of the turbocharger.

- Turn the ignition key to pos. **0** and pull it out.

USE OF THE VEHICLE

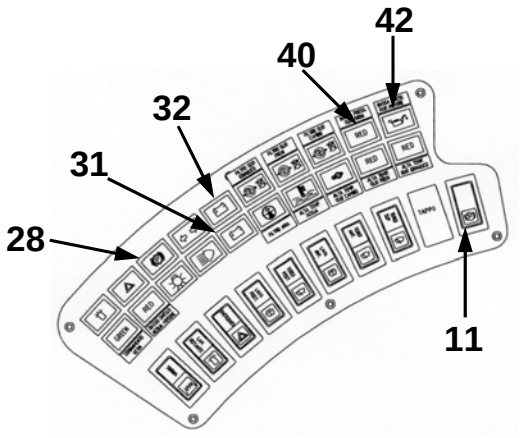
Moving Off

⚠ **CAUTION:**
Before moving off, wait for the engine to reach its best operating thermic running, above all at low temperatures, then slowly perform some operations *(lifting, extension, steering)****, in order to let the hydraulic fluid preheat.***

⚠ **WARNING:**
Before moving off, check that the warning lights for battery charging (31-32), low engine oil pressure (42) and low brake fluid pressure (40) are out.
If only one of a.m. warning lights comes on, this signals a failure. In this case, immediately contact the Service Department of C.V.S.

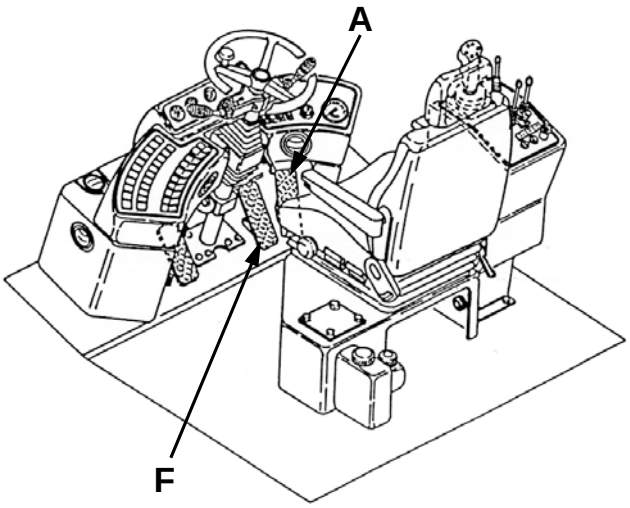
Start the vehicle as follows:

- Release the parking brake *(switch **11**)* holding down the brake pedal (**F**).
- Select the desired gear *(see section Gearbox selector lever)*, release the brake pedal (**F**) and gradually press the accelerator pedal (**A**).



NOTE:
Soon after the moving off, test the service brake and the parking brake; if one of them or both fail, contact immediately the Service Department of C.V.S.

⚠ **CAUTION:**
- ***The reverse gear can be selected only with stationary vehicle and with the engine running at low rpm.***
- ***Never move or drive on downhill slopes with the gearbox selector lever in neutral "N", this could seriously damage the transmission.***



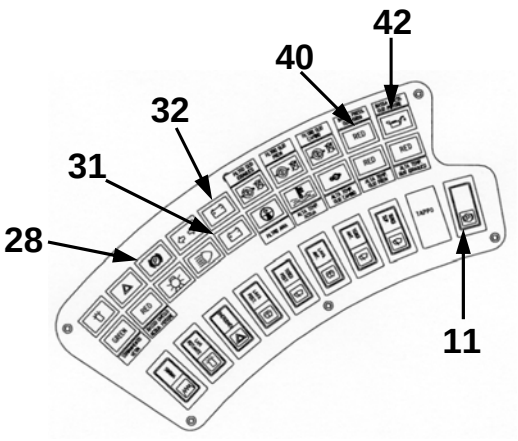
USE OF THE VEHICLE (cont'd)

Stopping the Vehicle

Stop the vehicle as follows:

- Release the accelerator pedal (**A**).

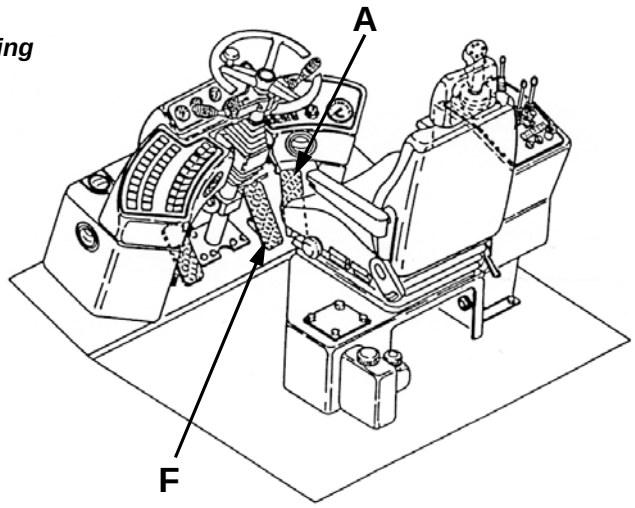
- Gradually press the brake pedal (**F**).



WARNING:
If stepping on the service brake pedal (F) the vehicle does not brake, use the parking brake *(switch 11)* ***as an emergency brake.***

- When the vehicle has almost come to a stop, shift the gearbox selector lever into neutral "**N**", apply the parking brake (switch **11**) and verify that the parking brake pilot light (**28**) lights up.

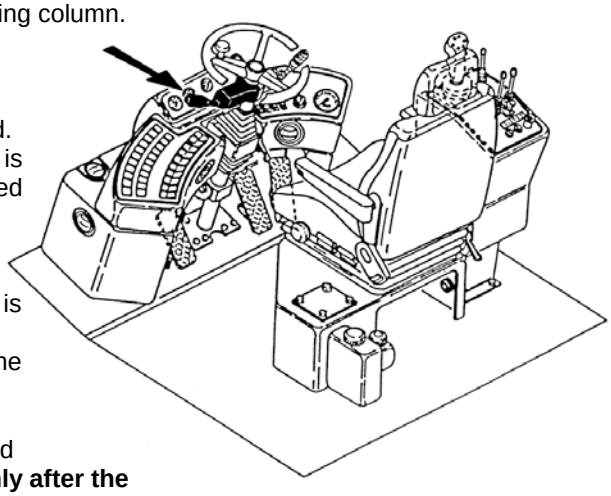
WARNING:
Always apply the parking brake before leaving the cab and after parking the vehicle.



USE OF THE VEHICLE (cont'd)

GEARBOX SELECTOR LEVER

The selector lever is located on the left side of the steering column.



Positions of the selector lever:

F = Forward gear - Lift up the lever and push it forward.
With the lever in this position it is possible to select the desired gears.

N = Neutral - Lever in neutral.
In this position the transmission is disengaged.
Use this position to start the engine.

R = Reverse gear - Lift up the lever and pull it backward
Shift the lever in this position only after the vehicle has completely stopped.
Vehicle is equipped with a rearward warning alarm, which can be engaged automatically or manually by the operator.

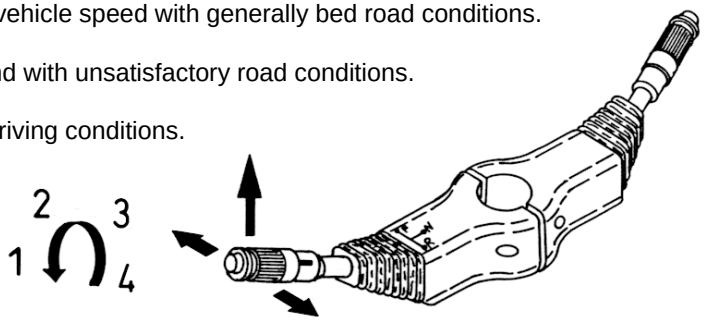
Positions of the selector lever hand grip:

"**1**" - Anti-skid gear.
This position supplies the maximum tractive power.

"**2**" - Position to use to control the vehicle speed with generally bed road conditions.

"**3**" - Position to use under load, and with unsatisfactory road conditions.

"**4**" - Position to use in all normal driving conditions.



NOTES:

- *Before starting, make sure that the selector lever is in neutral "**N**", otherwise the engine cannot start.*
- *Perform the gear shifting with the engine running at idle.*
- *It is not possible to downshift holding at the same time the accelerator pedal pressed.*
- *With stationary vehicle select the desired gear.*
  - *If the vehicle is equipped with a transmission automation, shift the selector lever to the highest gear. The transmission automation will optimise the engagement of the different speed ranges.*

WARNING: ***Never coast on slopes.***

USE OF THE VEHICLE (cont'd)

WITH VEHICLE MOVING

On normal operating conditions the **RED** warning lights must be switched off.
Should one or more warning lights come on, stop the vehicle and check for the cause.

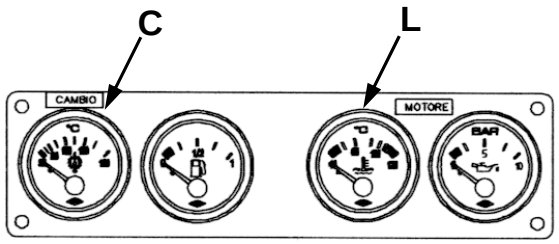
The engine speed must never exceed the max. rpm *(see engine technical data)*.

Reach the maximum engine speed gradually, in order to ensure a perfect combustion and operation of all engine components.

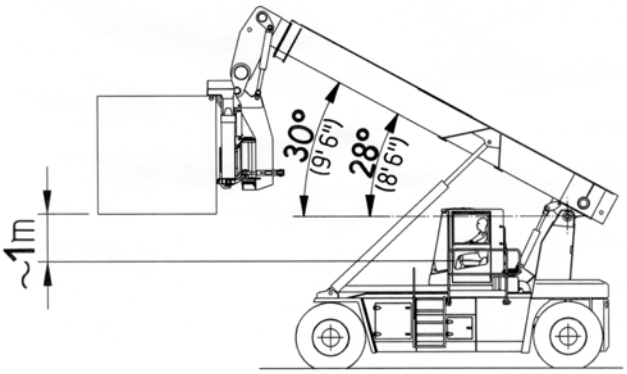
When downshifting, pay attention to the engine rpm.

Be careful not to use up all the fuel reserve to avoid air entering the fuel line and the penetration into the injectors of sediments or condensate from the tank bottom.

Check the temperature of the engine coolant with the thermometer (**L**).
The needle should not reach the RED range *(i.e. too high coolant temperature)*.



Check the torque converter oil temperature *(gearbox)* with the thermometer (**C**).
The permissible range of operating temperatures for the gearbox oil is 80-110°C *(up to short peaks of max. 120°C).*
If the temperature trends to exceed 120° C, stop the vehicle, shift the gearbox selector lever into neutral "**N**" and slow down the engine at a speed between 1200÷1500 rpm for 2 or 3 min.
In this conditions, the temperature should rapidly fall to the nominal value; if not, switch-off the engine and check for the causes.



WARNING:
When carrying out normal operating movements, it is good practice to hold the minimum limiting point of the load at a maximum height of 1 m from the completely lowered seat plane, the boom retracted and with the load positioned centrally, to avoid sharp braking due to unexpected obstacles affecting the stability of the vehicle.

CAUTION:
With the vehicle in motion, do not lower or extend the boom, and also do not side-shift the load.

USE OF THE VEHICLE (cont'd)

PARKING BRAKE

Parking brake control switch

The parking brake is controlled by a switch (**11**) located on the left instrument panel *(controls)*.

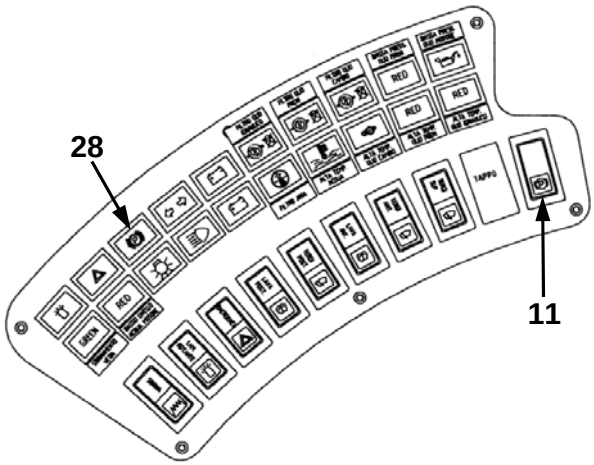
The parking brake works by a hydraulic action, of negative type.

The switch is a control locking one.

pos. **ON** - **Brake applied**, vehicle braked, warning light (**28**) on;

pos. **OFF**- **Brake released**, vehicle not braked warning light (**28**) off.

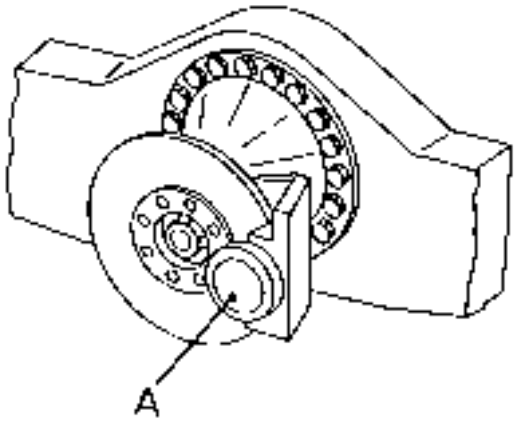
WARNING:
Always apply the parking brake if the vehicle has to stay parked for short or long time.



Parking brake

The parking brake (**A**) is a mechanical system consisting of a caliper acting on a flanged disk on the front driving axle.

KESSLER driving axle



USE OF THE VEHICLE (cont'd)

PARKING BRAKE (cont'd)

Parking brake operation with **KESSLER driving axle**

Activating the parking brake, the tangential force is transmitted, in accordance with the rotation direction, to one of the guide pins (**2**) bolted to the caliper (**1**).

Two identical brake pad plates (**3-4**) turn freely on the guide pins.

The clamping force generated by the inner springs (**5**) moves the piston (**6**) together with the adjusting screw (**7**), the thrust pin (**8**) and the brake pad (**3**) towards the brake disk.

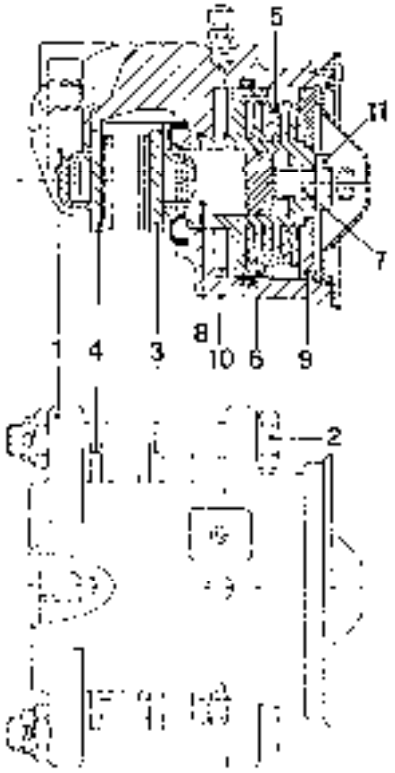
When the brake pad (**3**) contacts the brake disk, the reaction force on the thrust ring (**9**) let the caliper and the brake pad (**4**) slide on the guide pins (**2**) towards the brake disk until a full contact is created and the applied pressure is stabilised.

The brake is released by the pressure of the brake fluid in the piston chamber (**10**), that pushes outside the piston (**6**).

The piston overcomes the force of the inner springs (**5**) until it is stopped by the thrust ring (**9**).

The wear of the brake pads and of the disk material reduces the clamping force.

Adjust the brake slack turning clockwise the adjusting screw (**7**) that pushes the pin (**8**) and the brake pad (**3**) towards the brake disk, compensating this way the thickness reduction of brake pads and disk.



Brake slack adjustment

After the first installation, or in case of replacement due to the wear of the brake pads or of the disk material, adjust the brake slack as follows:

1. Loosen the lock nut (**11**) of the adjusting screw (**7**), apply the hydraulic pressure and turn clockwise the adjusting screw (**7**) until the brake pads (**3**-**4**) contact the brake disk.
2. Hold the lock nut (**11**) and turn. the fastening screw (**7**) in or out.
3. Lock the fastening screw (**7**) with the lock nut (**11**).

⚠ **CAUTION:**
In absence of hydraulic pressure, it is possible to release the brake loosing the lock nut (11) and turning the adjusting screw (7) counterclockwise until the brake is released.

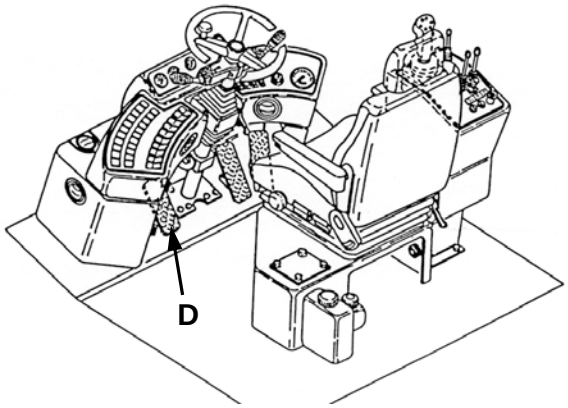
NOTES:
- For adjustments after brake repairs please contact the C.V.S. Service Department.

- We recommend in any case to contact the C.V.S. Service Department.

USE OF THE VEHICLE (cont'd)

USE OF THE DE-CLUTCH PEDAL

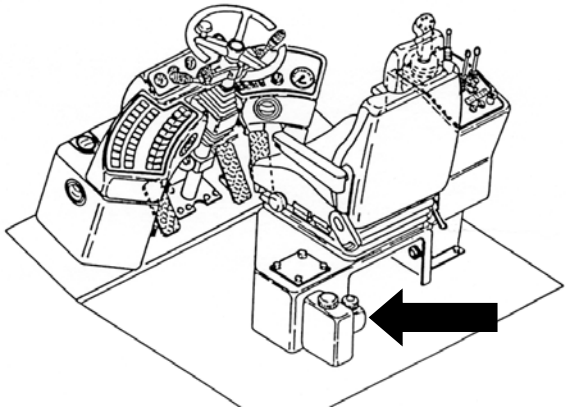
The de-clutch pedal **(D)** permits to brake without gearbox clutch overheating, and therefore to perform short movements with the vehicle.
The pressure of the de-clutch pedal uncouples immediately the mechanical drive to the gearbox, in practice the gearbox goes into neutral, while releasing the de-clutch pedal the gear is automatically re-engaged and the brake released.



Brake Fluid Reservoir

The brake fluid reservoir is located in the cab behind the driver's seat rest.

Check periodically the brake fluid level, fill-up if necessary.



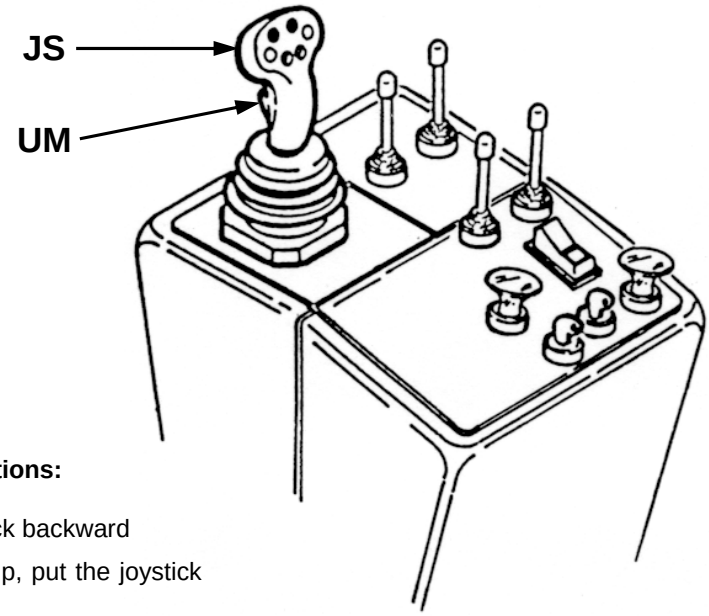
USE OF THE VEHICLE (cont'd)

BOOM/SPREADER JOYSTICK

The joystick (**JS**) contains all controls for the operations that may be performed with the boom and the spreader.

The joystick is equipped with a DEAD MAN'S push-button (**UM**) that, if not pressed, disables any boom operation *(derricking up/down, extending/retracting)*.

⚠ **CAUTION:**
Before starting operating, make sure that the DEAD MAN'S push-button (UM) is operating.



Joystick boom control positions:

Boom derricking up – joystick backward

N.B. - to stop the derricking up, put the joystick in zero position.

Boom derricking down – joystick forward

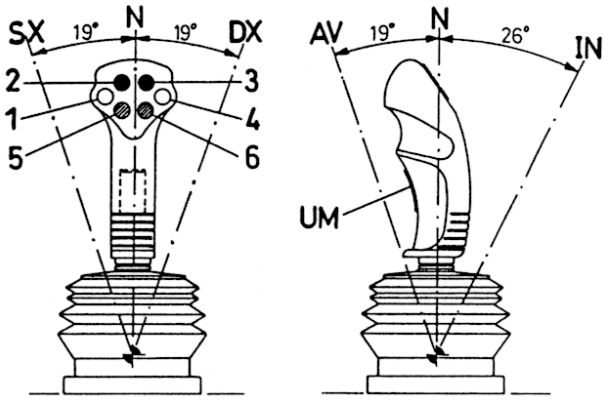
N.B. - to stop the derricking down, put the joystick in zero position.

Boom extending – joystick to the right

N.B. - to stop the extending, put the joystick in zero position.

Boom retracting – joystick to the left

N.B. - to stop the retracting, put the joystick in zero position.



Joystick push buttons for spreader control:

Side-shifting to the left - yellow push-button (**1**)
Side-shifting to the right - yellow push-button (**4**)

Clockwise slewing - green push-button (**5**)
Counterclockwise slewing - green push-button (**6**)

Twists or Locking Hooks unlock - blue push-button (**2**)
Twists or Locking Hooks lock - blue push-button (**3**)

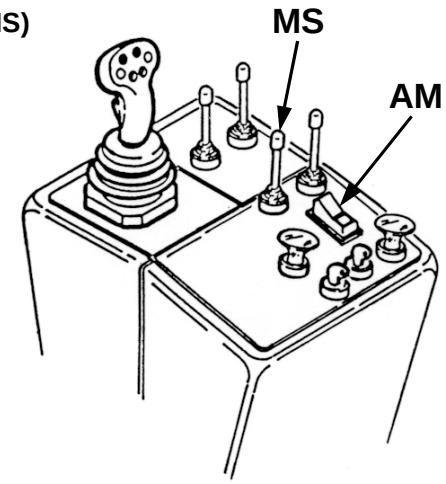
NOTE: ***The twist-locks may be unlocked/locked only with the spreader resting on the container.***

USE OF THE VEHICLE (cont'd)

SPREADER CONTROL LEVERS

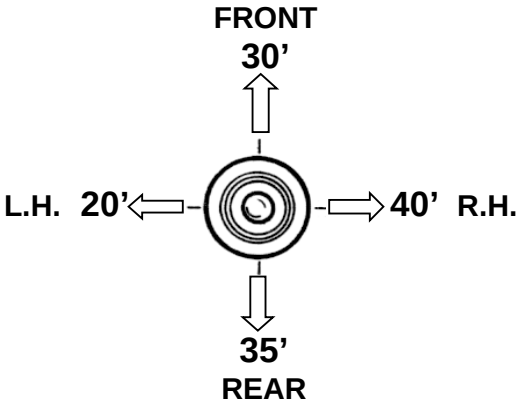
The spreader control levers are located on the control panel at the driver's right side.

Spreader opening/closing (20' ÷ 40') Control lever (MS)



Adjust the spreader length to the size of the containers to be handled as follows:

- Control lever to the **right**
  Spreader extension for **40'** container
- Control lever **forward**
  Spreader extension for **30'** container
  (if fitted)
- Control lever to the **left**
  Spreader retraction for **20'** container
- Control lever **backward**
  Spreader extension for **35'** container
  (if fitted)



Manual/Automatic Operation

Spreader opening (40') and closing (20') may be operated whether manually or automatically, by means of the switch "**AM**" *(at 2 steady positions)*.

The automatic opening or closing are obtained by a simple impulse control: shifting once the lever (**MS**) into the position 40' or into the position 20', the spreader extending cylinders will make their stroke totally.

NOTE: *It is possible to stop the spreader automatic opening or closing at any time in the following ways:*
*- By shifting again the control lever (**MS**).*
*- By pressing the switch (**AM**) on the position for the manual operation.*

Being also the manual operation enabled, the driver may choose the system he likes better and may operate the functions which would be barred by the only automatism.

The manual operation allows the spreader opening or closing in the traditional way, i. e. **by holding** the lever (**MS**) in the position 40' or in the position 20', till the end of the operation.

This system allows some operations which can be performed only manually, for instance the spreader opening to 30' without the automatic stop sensor: by releasing the lever (**MS**) the spreader stops in any position between 20' and 40'.

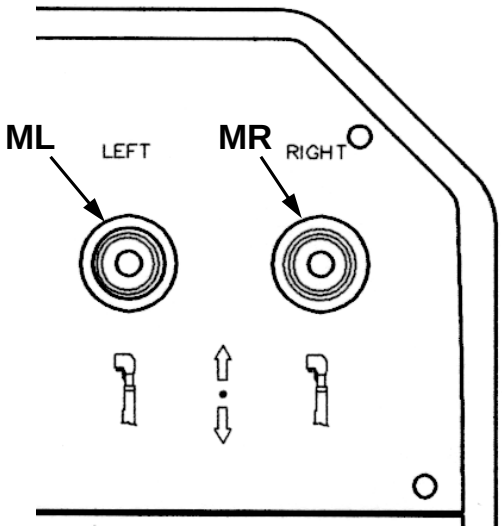
NOTE: ***As for detailed descriptions about the operation of the spreader controls*** *(handling of containers)**, see the relevant enclosure.***

USE OF THE VEHICLE (cont'd)

SPREADER CONTROL LEVERS (cont'd)

Spreader hydraulic columns (if fitted) **Control levers (ML) and (MR)**

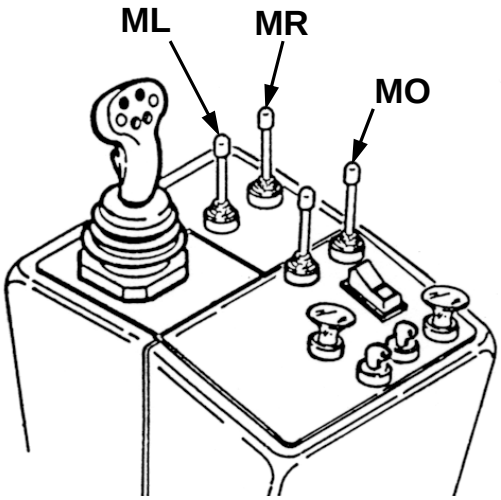
The reach stackers F238 and F248 are equipped with a spreader with hydraulic columns, to adjust the twists or the fixed hooks to the size of the containers to be handled on uneven grounds.
On spreaders "SS100RS" and "SS100RSR" the columns are controlled by means of a single control lever **"ML"**.
On spreader "SS100RSD" *(Double Stacking)*, the columns are controlled by means of two control levers, "**ML**" for the left column and "**MR**" for the right one.
The control levers are located on the control panel at the driver's right.



Operation

- Control lever **forward** - Column extending ↑
- Control lever **backward-** Column retracting ↓

NOTE:
*Being "**ML**" and "**MR**" non-locking control levers, releasing them will interrupt the operation.*



Spreader tilting *(if fitted)* **Control lever (MO)**

The control lever (**MO**) allows the operator to adjust manually the spreader tilting.

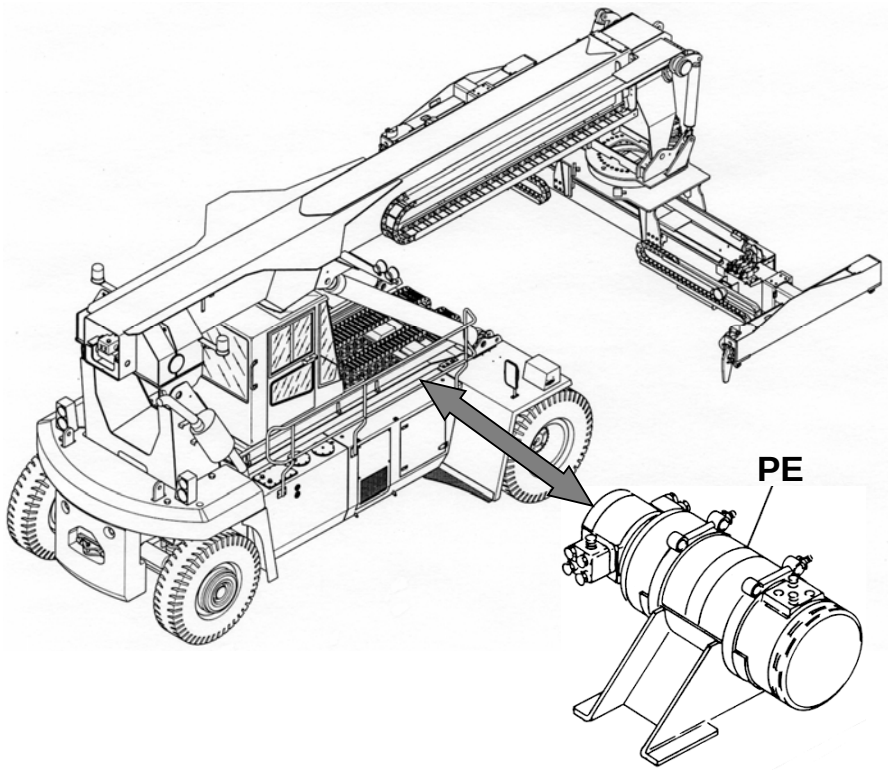
NOTE: ***As for detailed descriptions about the operation of the spreader controls*** *(handling of containers)****, see the relevant enclosure.***

USE OF THE VEHICLE (cont'd)

EMERGENCY STEERING PUMP

The vehicle may be equipped with an emergency steering pump (**PE**) *(located in the right side compartment of the vehicle)* that operates automatically if the pressure in the steering hydraulic circuit drops or lacks.

NOTE: *The motor pump starts up automatically in case the vehicle is in motion and at the same time the main steering pump is out of order (or in case of shutdown of the engine).*
The vehicle is considered in motion if the speed is higher than 0.7 km/h (70 rpm of the propeller shaft).
The pump failure is taken by a pressure switch located on the pump delivery.



⚠ **CAUTION:**
This pump is an emergency device only, and is not meant to be used continuously in place of the main steering pump.
Therefore it should be used EXCLUSIVELY to move the vehicle in case of failure of the steering system and just to allow the technicians to search and repair the failure.

NOTE: ***In case this condition should occur, in any case contact the C.V.S. Service Department for the necessary repairs.***

USE OF THE VEHICLE (cont'd)

TRANSMISSION AUTOMATION

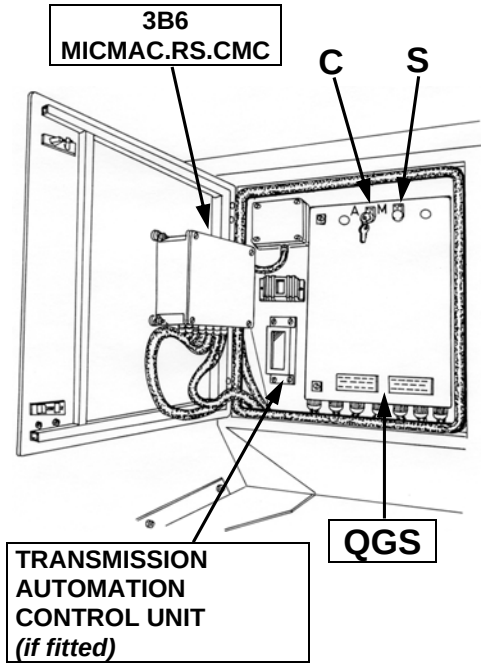
The transmission automation is assured by the "**3B6 – MICMAC.RS.CMC**" system.
This system considerably reduces the work required from the driver and allows optimum use of the vehicle on any conditions**.**

The vehicles may be equipped with the following transmission automation system, as an alternative:

● **SHIFTRONIC**

- This system is provided with a safety device that prevents any gear from engaging if a permanent or temporary failure on the speed sensor should occur. To restore this system to its normal operation mode, press on the "RESET" key on the display inside the cab.

NOTE: ***To activate the transmission automation, shift the gearbox selector lever into the highest gear*** *(see section Gearbox selector lever)****.***



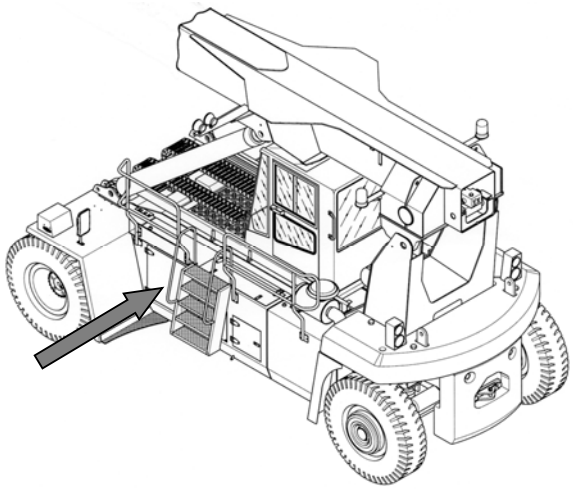
Operation

It is possible to disable the transmission automation and all safety devices with the key (**C**) on the door of the main electric panel (**QGS**) in the left compartment of the vehicle.

Key positions: **A -** Automatic operation
M - Manual operation

Turning the key to (**M**) the red warning light (**S**) lights up; in this case the operator must be extremely careful when operating the vehicle, as the transmission is no longer protected by any safety devices and incorrect handling could irreparably damage it.

⚠ **CAUTION:**
The vehicle must be stopped and the transmission lever in neutral position when shifting from the automatic operation to the manual one.



⚠ **WARNING:**
WHEN THE KEY IS IN MANUAL POSITION, ALL SAFETY DEVICES OF THE TRANSMISSION ARE DISABLED.
USE THE MANUAL OPERATION ONLY IN AN EMERGENCY CASE

USE OF THE VEHICLE (cont'd)

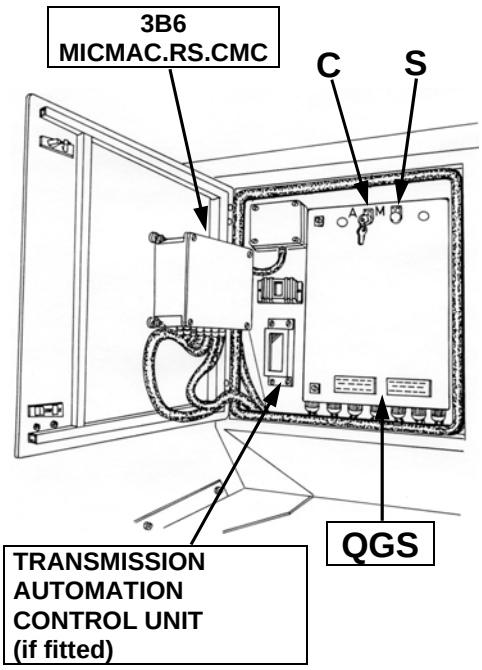
TRANSMISSION AUTOMATION (cont'd)

NOTE: *Besides managing the transmission automation, the "**3B6 – MICMAC.RS.CMC"** system also includes the management of the accelerator, of the load moment limiting system and of the load moment indicator.*

Its main features are:

- Limiting function with load moment limiting control by means of load cells
- Automatic transmission control
- Accelerator control
- Continuous monitoring of the actual load by means of a pressure transducer

For the detailed description of this system, see the relevant enclosure.



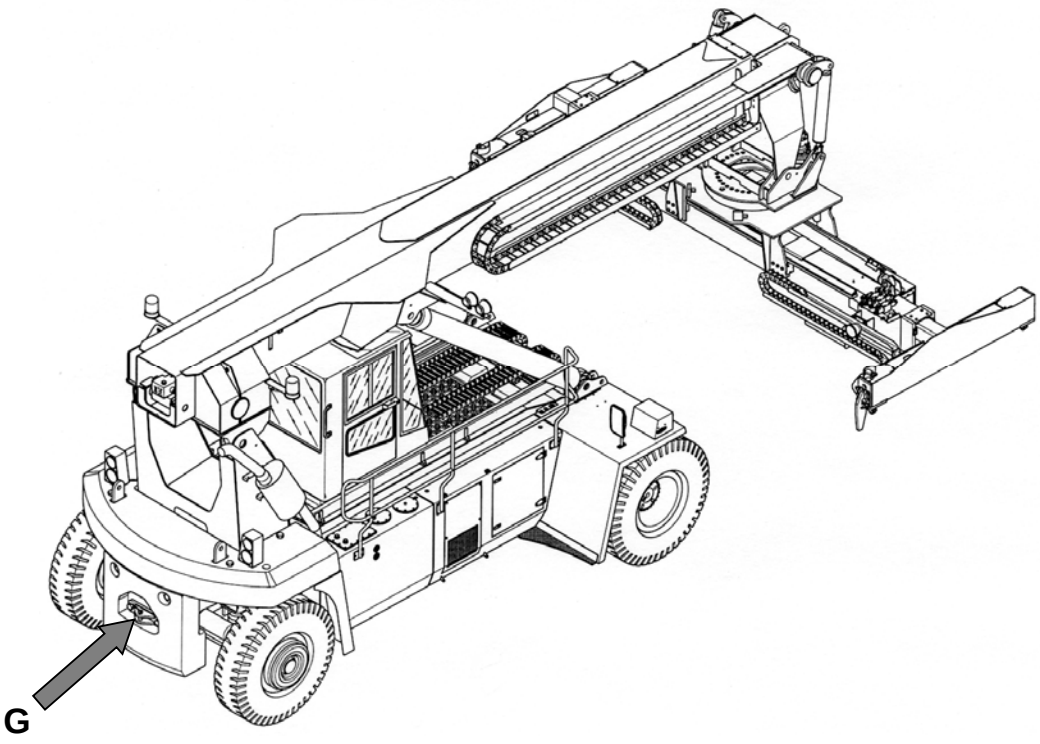
USE OF THE VEHICLE (cont'd)

TOWING THE VEHICLE

To tow the vehicle use the towing hook (**G**) available to this purpose.

⚠ **CAUTION:**

- *Before towing the vehicle, disconnect the propeller shaft between the gearbox and the driving axle on the flange side of the driving axle.*
  Above operation must be absolutely respected, otherwise, the gearbox and the torque converter would be seriously damaged.
- *Before towing the vehicle, make sure that the parking brake is not applied.*
- ***To tow faulty vehicles use a rigid tow bar.***



USE OF THE VEHICLE (cont'd)

TOWING AND LIFTING COMPONENTS OF THE VEHICLE

To tow a faulty vehicle, **we recommend**:

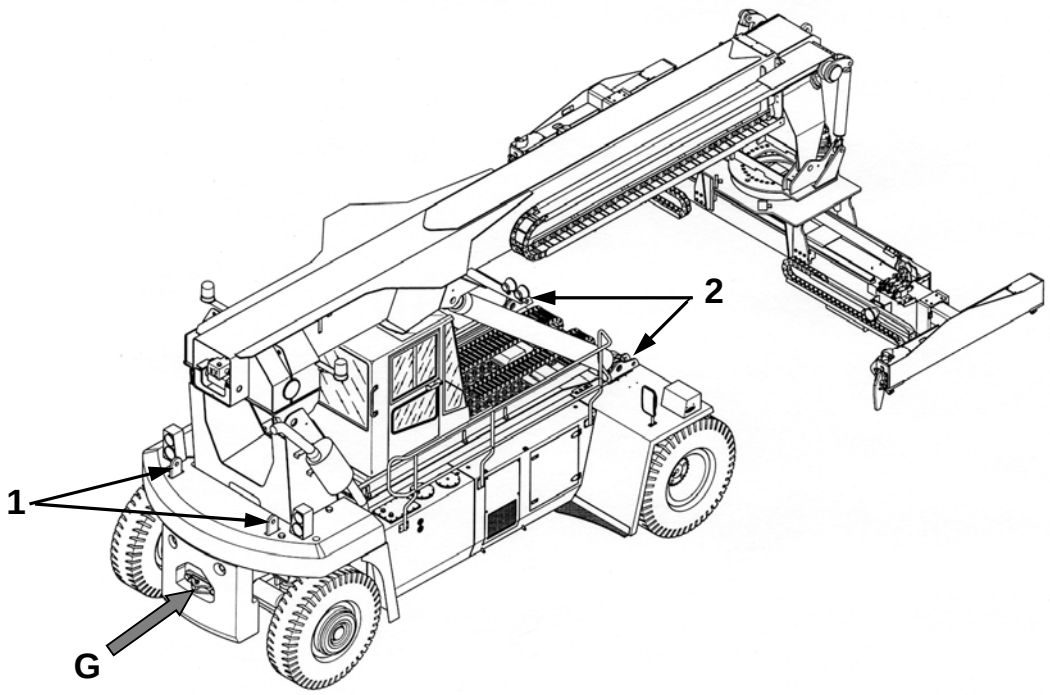
- To connect a **rigid tow bar** to the towing hook (**G**).

- To make sure that the parking brake is not applied on the faulty vehicle.

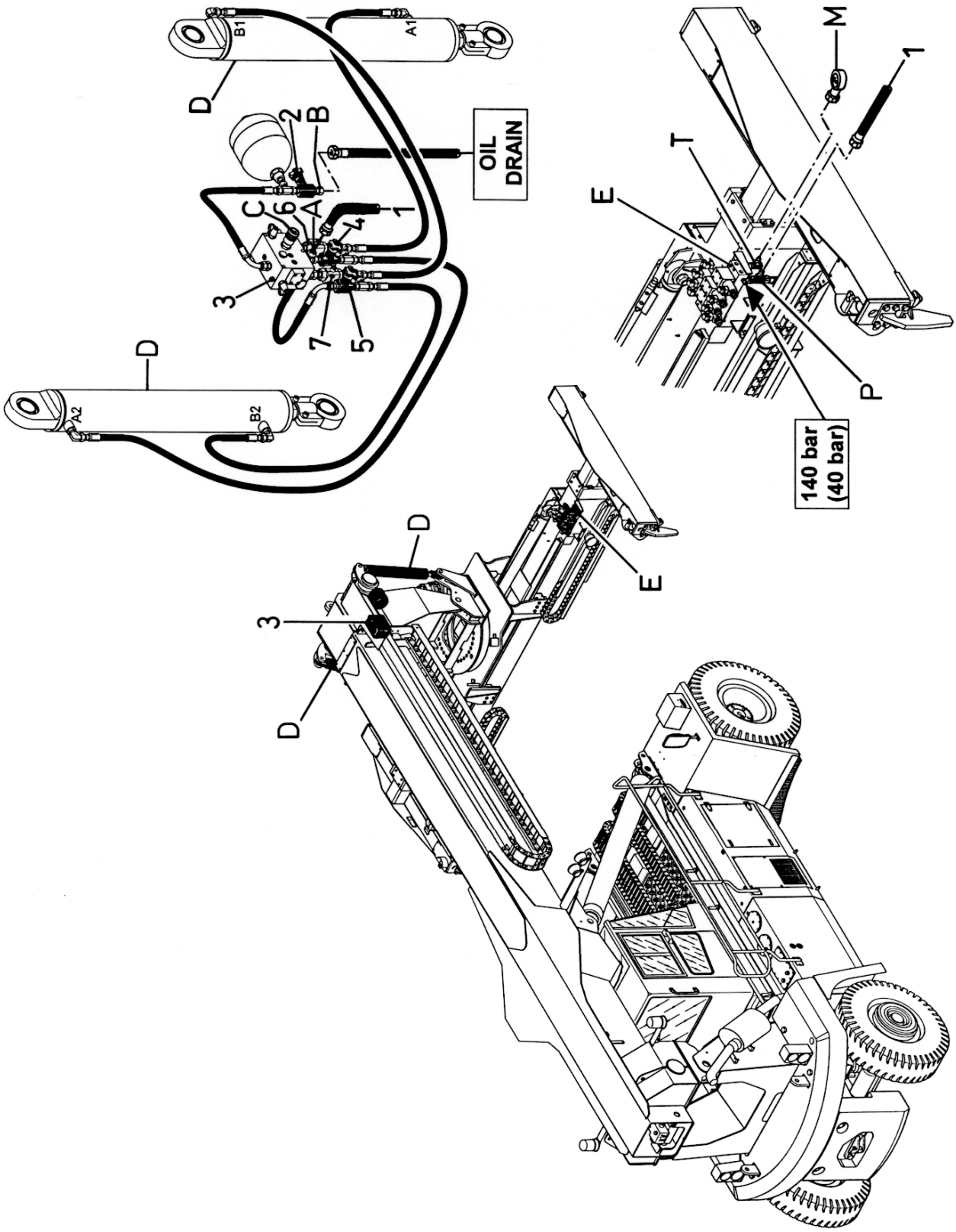
- To verify that the rigid tow bar has been correctly connected, as in this condition, **the towing vehicle is the only braking means**.

To lift the vehicle, use only the special lifting points prepared to this purpose.

1. **Rear lifting eyes.**
2. **Front hooking and lifting lugs.**



DAMPING CIRCUIT CHARGING
(Vehicle Model F258)



If the damping system needs charging, proceed as follows:

1. Adjust at **40 bar** the pressure relief valve [**140 bar**] on the plate of the spreader solenoid valve (**E**) [located in the right rear side of the spreader *(model **"TS"**)*].

2. Connect a manometer (**M**) to the 3-way-piece (**T**) connected under the solenoid valve (**E**) of the spreader.

3. With the engine at idle, rotate the twist locks by operating the relevant push-buttons on the joystick *(see relevant section)* and simultaneously operate the spreader safety bypass key *(on the left side control panel)*, then still operating the twist control adjust the pressure relief valve [**140 bar**] at the desired pressure [**40 bar**].

4. Connect the feeding hose (**1**) to the 3-way-piece (**P**) that supplies oil to the twist locks [near the 3-way-piece (**T**)] and to the 3-way-piece (**A**) of the closed circuit of the valve.

5. Connect a hose to the fitting (**B**) **to drain the oil in a suitable container**.

6. Turn on the cock (**2**).

7. Disconnect the damping cylinders (**D**) only from the spreader and turn on almost completely the knob (**C**) of the valve (**3**).

8. Turn on the cock (**4**) and turn out the cock (**5**).

9. Turn on the cock (**7**) and turn out the cock (**6**).

10. Push the damping cylinders (**D**) to stroke-end as follows:

11. With the engine at idle, rotate the twist locks by operating the relevant push-buttons on the joystick *(see relevant section)* and simultaneously operate the spreader safety bypass key *(on the left side control panel)*.

12. Turn on the cock (**5**) and turn out the cock (**4**).

13. Turn on the cock (**6**) and turn out the cock (**7**).

14. Push to stroke-end the damping cylinders (**D**) as described at **item 10**).

15. **NOTE:** ***Repeatedly push the damping cylinders to stroke-end to bleed completely the circuit from any air bubbles.***

16. Turn out the cock (**2**).

17. Turn on the cocks (**4**-**5**-**6**-**7**).

18. Pressurise the circuit *(activating any spreader function, as described at **item 11**)* for approx. **1 min**., then turn out the cocks (**4**-**5**).

19. Connect the damping cylinders (**D**) to the spreader, **WITHOUT** acting on the closed circuit.

20. Disconnect the hose (**1**) from the 3-way-piece (**P**) and the drain hose connected to the fitting (**B**).

21. Close the fittings (**A**-**P**-**B**).

22. Restore the original setting of **140 bar** of the pressure relief valve on the spreader solenoid valve (**E**), as described at item 1.

23. Turn the knob (**C**) of the valve (**3**) closing it completely, then turn it out **by 2 turns** *(standard adjustment)*.

24. Remove the manometer (**M**) from the 3-way-piece (**T**) and close it.

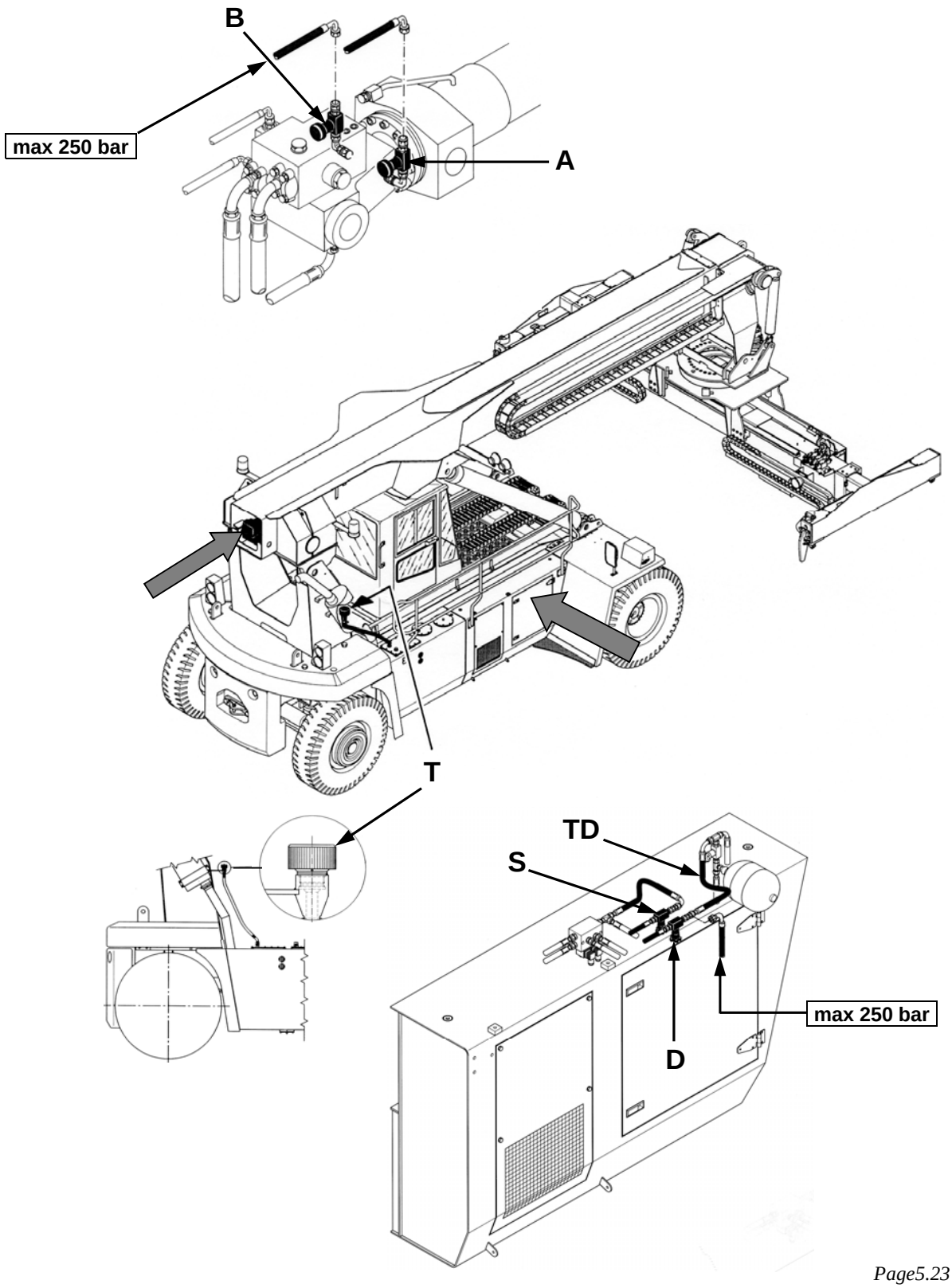
⚠ **CAUTION:**
Always drain the oil into a suitable container, NEVER waste it in the environment.

⚠ **WARNING:**
All the above mentioned steps must be performed only by skilled, trained personnel working in the maximum safety conditions.

⚠ **CAUTION:**
In any case, we recommend to contact the C.V.S. Service Department.

USE OF THE VEHICLE (cont'd)

EMERGENCY BOOM LOWERING/RISING
(With or without load)



USE OF THE VEHICLE (cont'd)

EMERGENCY BOOM LOWERING/RISING (cont'd)

Boom Lowering

If the boom, with or without load, cannot be lowered, it is possible to lower it in **EMERGENCY** as follows:

⚠ **WARNING:** ***Retract the telescoping cylinder before lowering the boom.***

1. Retract the telescoping cylinder as follows:

a. Connect to the drain cock (**A**) and to the cock (**B**) an oil drain hose to drain the oil in a suitable container *(or it may be returned to the tank)*; then turn the cocks on and unscrew the pressurised plug (**T**) of the hydraulic oil tank *(located on the upper side of the chassis, on the right side, behind the cab).*
If the cylinder still cannot be retracted due to the insufficient angle, pass to item **"b"**.

b. Feed pressurised oil [**max. 250 bar**] through the cock (**B**) into the telescoping cylinder until it is retracted, letting the oil flow out through the cock (**A**) and holding unscrewed the pressurised plug (**T**) of the hydraulic oil tank.

NOTE: *The cocks (**A**) - (**B**) are on the head of the telescoping cylinder (on the left and on the right).*

2. Lower the load *(lifting cylinders)* as follows:

c. Turn on the cocks (**D**) and (**S**) that are located inside the right side compartment *(fixed on the upper plane).*

⚠ **CAUTION:** ***Do not forget to turn out all cocks after a.m. steps.***

Boom rising

If the boom cannot rise and it is necessary to release the load, it is possible to intervene in **EMERGENCY** as follows:

⚠ **CAUTION:** ***Before raising the boom, release the load by rotating the twist locks.***

NOTE: *The cocks (**D**) and (**S**) are located inside the right side compartment, fixed on the upper plane.*

1. Turn on the drain cock (**S**);

2. Disconnect the flexible hose (**TD**) from the cock (**D**);

3. Connect a flexible hose to the cock (**D**) [where previously the flexible hose (**TD**) was disconnected];

4. Turn on the cock (**D**) and feed pressurised oil [**max. 250 bar**] through the flexible hose previously connected.

⚠ **CAUTION:** ***Do not forget to turn out all cocks and to re-connect the flexible hose (TD) after a.m. steps.***

⚠ **CAUTION:** ***Always drain the oil into a suitable container, NEVER waste it in the environment.***

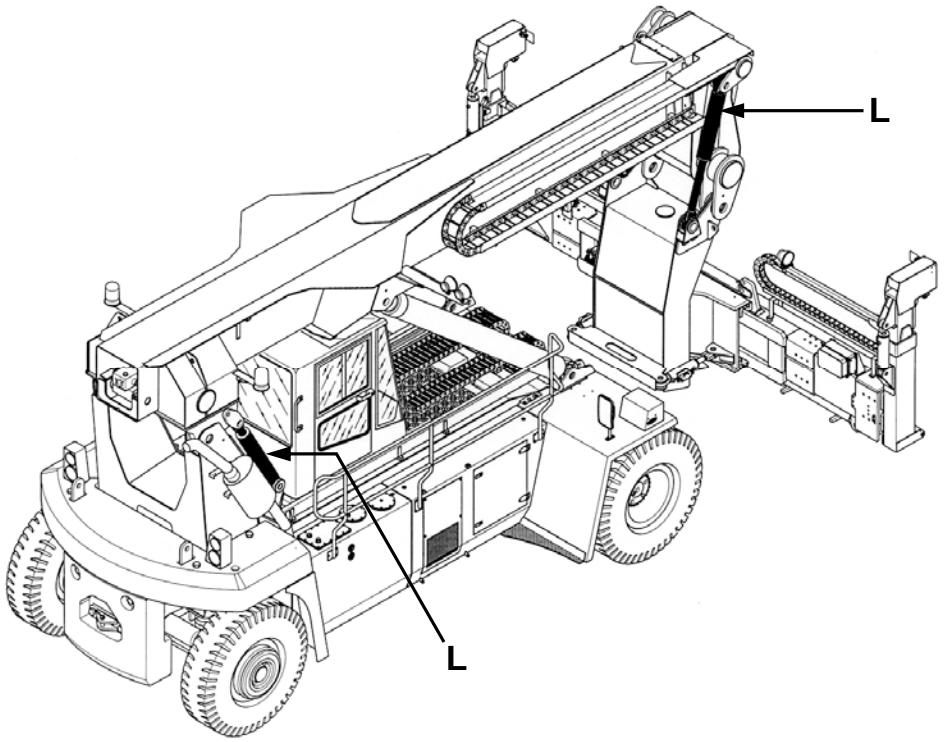
⚠ **WARNING:** ***All the above mentioned steps must be performed only by skilled, trained personnel working in good safety conditions.***
Switch off the engine and apply the parking brake.

⚠ **CAUTION:** ***In any case, we recommend to contact the C.V.S. Service Department.***

USE OF THE VEHICLE (cont'd)

LEVELLING CYLINDERS

The levelling cylinders (**L**) [no. 4] mounted on models F238 and F248 do not need a separate charging system, as they are connected to the main hydraulic circuit.



NOTE: *If the levelling cylinders (**L**) are disassembled and then assembled again, some air locks inside the levelling cylinders and inside the circuit may occur.*
To bleed completely the air, operate on pressure test fittings that are located on the upper end of the front cylinders and on the connecting hydraulic line of the rear cylinders, and push to stroke-end the cylinders several times.

MAINTENANCE

To ensure that your reach stacker is always in perfect working conditions, it is necessary to perform the maintenance procedures on its single parts and to the prescribed intervals, as described in the following pages; a regular service is the best warranty for safe function and to maintain the operating expenses to an optimum level.

These procedures have to be considered obligatory during the warranty period. Failure to perform them would invalidate the warranty benefits.

Only qualified and authorised technicians may perform maintenance procedures and they must confirm them with the date, signature and stamp in the Service Record Sheets at the end of this manual.

This chapter contains following sections:

- Maintenance prescriptions
- Spare parts and General maintenance information
- General safety rules
- During maintenance
- Hygienic safety rules
- Engine
- Air intake system
- Fuel system
- Cooling system
- Exhaust system
- Windshield washer system
- Transmission
- Propeller shaft
- Driving axle
- Steering axle
- Tyres and Wheels
- Boom
- Cab sliding and tilting system
- Hydraulic system
- Hydraulic system of the brakes
- Hydraulic system of the de-clutch pedal
- Hydraulic cylinders
- Air conditioning system
- Towing hook
- Counterweights
- Lubrication *(manual and centralised)*
- Electric system
- Cab
- General care and checks
- Equipment of the vehicle
- Tightening torques

MAINTENANCE PRESCRIPTIONS

Introduction

The REACH STACKER Series F230-F240-F250 have been designed and built to give the best performances, energy saving and easy operation in various working conditions.
Before delivery, the manufacturer tests the vehicle, in order to supply it with the best operating conditions.
In order to maintain these conditions and ensure a good working order, it is important to perform the scheduled maintenance at the prescribed intervals as specified in this Chapter.

Maintenance

This manual supplies all details for the necessary maintenance prescriptions in order to preserve the REACH STACKER and to perform the first-time service, after the first **100 operating hours**.
It is advisable to book the vehicle service at C.V.S. or at the Dealer in advance.

The **"Service Reports"** enclosed at the end of this Manual in chapter 10 are useful to record the maintenance works performed.
After each service intervention, the staff performing the relevant operation must complete the aforementioned service report in full and sign and/or stamp it.

Proper maintenance increases both reliability and service life.

Service to the owner / operator

C.V.S. and its Dealers want to meet full the customers' requirements. Therefore, in case of troubles, please apply to the Service Department of C.V.S. or of your Dealer.

In order to achieve an effective service, please:

1) Specify your name, address and telephone number.
2) State clearly the type of vehicle and the chassis serial number of the vehicle.
3) Specify the date of purchase and the operating hours of the vehicle.
4) Explain the trouble.

Please notice that only C.V.S. and its authorised Dealer may offer you a variety of contracts concerning warranty, maintenance and safety checks; all these contracts are in accordance with the legal and insurance prescriptions.

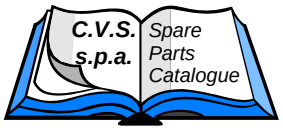
Service / Maintenance contracts

In order to schedule and share the maintenance costs of your vehicle, take advantage of the service and maintenance contracts that are available at C.V.S. or at your Dealer's. These contracts can be adapted to the peculiar requirements of the customer.

For further information apply to C.V.S. or to an authorised Dealer.

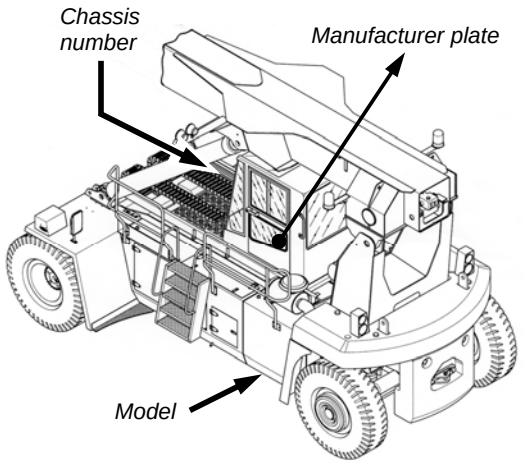
SPARE PARTS

We recommend using only genuine spare parts of C.V.S. S.p.A.
The spare parts catalogue of the vehicle makes it easier to identify the parts to be ordered to C.V.S..



WARNING:
Tampering, modifications or the use of non-genuine spare parts may prejudice the safety of the vehicle.

It is important for C.V.S. and for the Dealer to know the model name and the correct chassis serial number of the vehicle.
The name of the model is shown on the manufacturer's plate that is fixed inside the cab, on the front left of the seat's rest.
The chassis number is stamped on the front side of the right side member.
See paragraph "**Vehicle Identification Data**", chapter 1 "INTRODUCTION".



WARNING: ***Labels with safety instructions are provided on some parts of the vehicle. Before installing a spare part, make sure that the safety label is placed correctly. If the label is missing, ask C.V.S. or the Dealer for a new one.***

GENERAL MAINTENANCE INFORMATION

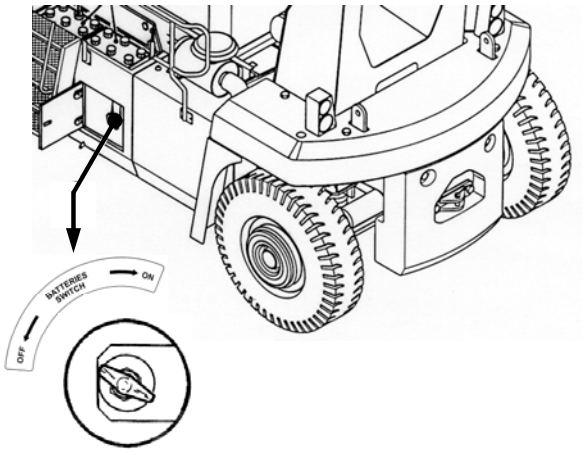
Fill the oil to the proper level in the various units; to this purpose, use the same oil type used previously.
The periodic maintenance intervals are referred to normal operating conditions and may therefore vary accordingly to the use of the vehicle, as well as the road surface and environmental conditions.
Before packing or checking the levels, carefully clean the lubrication nipples and the surfaces around the level and filler plugs, to hinder dirt from entering the units or the lines.
For all filling operations, it is necessary for the containers used to transfer oil and all liquids in general to be perfectly clean.

CAUTION:

- ***Disconnect the batteries before performing arc welding on the vehicle* [“OFF”]** *(the main current disconnecting switch is located on the left side of the vehicle, by the front steps)**.***

- ***DO NOT perform any welding on the vehicle without permission of the Manufacturer's specialist C.V.S., and in any case AFTER having CUT OUT the voltage supply to the equipment of the vehicle.***

- ***Before connecting or disconnecting an electric part, carefully consult the wiring diagram; a wrong connection may cause injuries and/or damages.***



GENERAL SAFETY RULES

⚠ **WARNING:** ***In any case, please refer to chapter 2 or to the "SAFETY INSTRUCTIONS" of the vehicle.***

- ☺ Before performing any maintenance step, put the vehicle in maximum safety condition.
- ☺ Before performing any repairs, servicing or inspections, set the gear to neutral, lower and fully retract the boom, engage the PARKING BRAKE, switch off the engine and remove the key from the ignition lock.
- ☺ NEVER leave the cab without first applying the PARKING BRAKE.
- ☺ For procedures requiring to hold the lifting structure lifted, remember to fit safety stands between the structure and the chassis.
- ☺ Always park the vehicle on an even, compact ground, in order to prevent wheels from subsiding into the ground.
  In case the vehicle should be parked on a slope, place chocks under the wheels.
- ☺ Before performing procedures on the hydraulic system (*e.g. filters, hoses, valves, etc*.) make sure that the system is NOT pressurised.
- ☺ Always use a safety cage to pressure test any part; attach safety ropes to the sealing caps of the pressure-tested fittings.
- ☺ Do not pour fuel into the tank with running engine (*or only if it is absolutely necessary*).
- ☺ Do not wash, add lubricant oil or adjust the engine speed with running engine (*unless you have been trained in this field, and also in this case operate very cautiously*).
- ☺ Do not wash a running or hot engine; the use of a cold washing fluid on a hot engine may cause serious damages to engine components.
- ☺ Do not start the engine with a removed protection.
  Danger! *Some moving parts may not be seen clearly during the running of the engine.*

- ☺ Sling and hold (*with chains or bands*) each part of the vehicle before its removal.
- ☺ To lift the vehicle, use cranes or hydraulic jacks with a greater minimum load capacity than the load to be lifted (*consult the specialists of C.V.S.*).

- ☺ **NEVER** leave the vehicle hanging - for safety reasons, support it on suitable pillow blocks.
- ☺ In any case, **NEVER** venture under the vehicle to perform working steps.
- ☺ To this purpose, use pits in specialised workshops.

- ☺ For procedures, in which the cab has to remain lifted/tilted, precautionally put suitable stands between the cab and the chassis.
- ☺ Before sliding/lifting/lowering the cab, make sure that there are no obstacles and persons on the return way of the cab in its operation position.

Continued ➔

GENERAL SAFETY RULES
(cont'd)

- To perform working steps on parts not reachable from the ground, use a stable working platform.
- Sling with personal safety devices the technicians not working on the ground.
- A lack of dialogue among workers may cause accidents; if one or more operators are working on the vehicle, make sure that they are informed about what bystanders are doing.

WARNING:

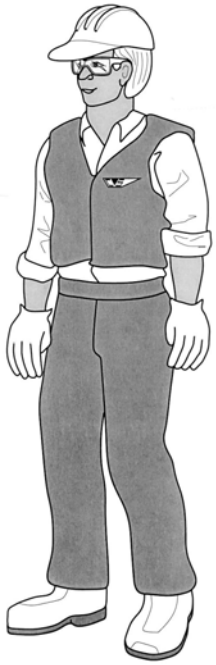
- Only skilled, trained technicians can perform maintenance steps.

- Before performing any maintenance step, make sure that the vehicle is in safety conditions.

- Park the vehicle on a level, compact ground.

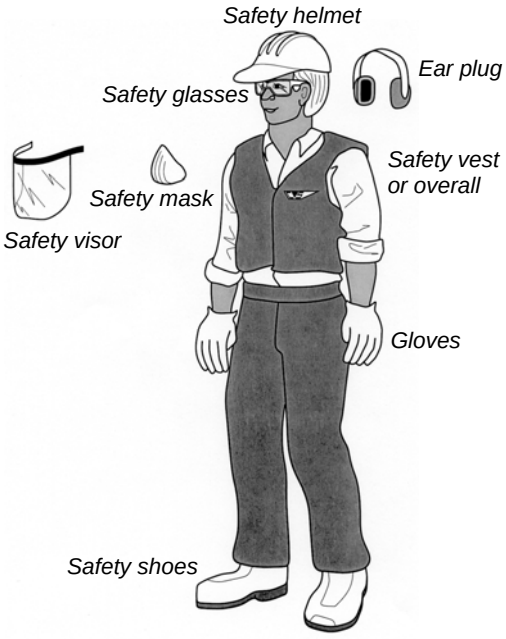
- During maintenance and repair procedures wear suitable work clothing; avoid loose clothing with large sleeves and open hosiery, rings, bracelets and chains.

- ALWAYS obey these instructions, for you own safety and the safety of your colleagues.



DURING MAINTENANCE

- Working near engines or moving components, **never** wear loose clothing, rings, bracelets, chains and bind long hair.
- Wear protective gloves and eye protections:
  - to refill anolyte in the batteries
  - to fill the radiator with corrosion inhibitors or antifreeze
  - changing or filling lubricating oil (*hot oil may cause burns during the drainage, let it cool down below 50°C*).
- Wear eye protections using compressed air (*the max. pressure of air used for cleaning purposes must be lower than 3 bar*).
- Always wear a hardhat, especially if working in an area with suspended loads or with systems at head height.
- Always wear protective shoes and an overall.
- Use protective creams for your hands.
- Change immediately wet overalls.



⚠ WARNING:
Avoid service steps in presence of voltage; in any case, check that the equipment is properly grounded.
During adjustments, verify that your hands and feet are dry and stand on insulated platforms.

- Do not try to perform repairs you are unable to complete; always follow the instructions and, in lack of these, contact the experienced C.V.S. technicians.
- Always keep the mechanical components clean, eliminate any trace of oil, fuel and/or coolant.
- Put oily rags in flameproof containers.
- Do not leave rags on the mechanical parts.
- Provide proper and safe containers for waste oil.

⚠ CAUTION: ***Whenever possible, we recommend to entrust qualified technicians with the service procedures.***

HYGIENIC SAFETY RULES

WARNING: ***It is extremely important to read carefully the information reported in this section and all mentioned documents. Make sure that all operators in contact with lubricants have a good knowledge of these prescriptions.***

WARNING: **Oil**

Oil is toxic. If accidentally ingested, even if in small doses, avoid vomiting and immediately apply to a doctor.
Engine oil contains dangerous contaminating agents that may cause skin tumour.
Handle oil as little as possible and protect your skin by means of creams and gloves.
Carefully wash with soap and warm water the skin contaminated by oil, never use petrol, diesel oil or petroleum.

Hygiene

Lubricants employed by C.V.S. are not detrimental to health if properly used.

Nevertheless, a prolonged contact of lubricants with your skin may remove the epidermal natural fats causing dehydration and irritation.
Especially low viscosity oils cause these consequences, so take great care when handling waste oils contaminated by fuel.

Whenever handling oils, follow both personal and working care and hygiene rules.
For more details about these precautions, read the relevant publications from your local health authority in addition to the following section.

Stocking

Keep lubricants out of reach of children and of people not qualified and authorised to handle them.

Never store lubricants in open containers or in containers without identification labels.

Disposal

Dispose of all waste materials according to the local laws.

Law regulates collection and disposal of waste oils.
It is severely forbidden to discharge them in sewers, in drains or on the ground.

Furthermore, we remind that for the proper function of the vehicle and its components are necessary materials that may cause environmental damages, if not properly disposed.

⚠ ***Following materials and fluids must be delivered to legal authorised waste disposals:***

- Starter batteries
- Waste lubricating oils
- Mixtures of water and antifreeze
- Filters
- Lubricating grease
- Waste tyres
- Auxiliary cleaning materials (*e.g. greasy or fuel soaked rags*)

⚠ ***In compliance with the laws of the relevant countries, where the vehicles are operating, any breach of the disposal laws is severely punished.***

⚠ ***We remind that collection and disposal of waste oils and materials are regulated by law. All a.m. oils and components must be delivered to authorised waste materials collectors.***

⚠ ***It is severely forbidden to discharge them in indiscriminate dumps, in watercourses or in drains!***

⚠ ***C.V.S. S.p.A. declines all responsibility if the safety and operating instructions described in this manual are not followed accurately.***

Handling

Fresh oil
No particular precautions may be taken when handling or using some new oil, but the common personal hygiene rules.

Waste oil
The lubricants of the crankcase contain harmful contaminating substances.

Respect the following precautions to protect your health while you are handling waste oils:

1) Prevent oils from coming into long, excessive, repeated contact with your skin.
Apply some protective cream on your skin before handling waste engine oil.

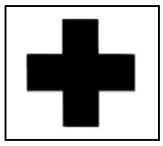
2) Remove oil from your skin as follows:
a - Flush the contaminated area with water and soap;
b - A nailbrush may be useful;
c - Use a specific skin cleanser;
d - Never use gasoline, diesel fuel or paraffin to wash the contaminated area of your skin.

3) Oil soaked clothes must never come in touch with your skin.

4) Do not keep oil soaked rags in your pockets.

5) Wash the dirty clothes before using them and get rid of oil impregnated shoes.

First-Aid - Oil



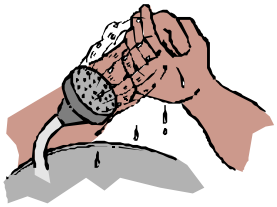
Eyes

In case some oil comes in touch with your eyes, flush with water for at least 15 minutes.
If irritation persists, apply to a doctor.

Swallowing

In case of swallowing do not lead the person to vomit but apply to a doctor.

Skin



In case of contact with your skin, flush the contaminated area with water and soap.

Spill out

Absorb by means of sand or another granular substance.
Collect and carry at a disposal area.

Fire

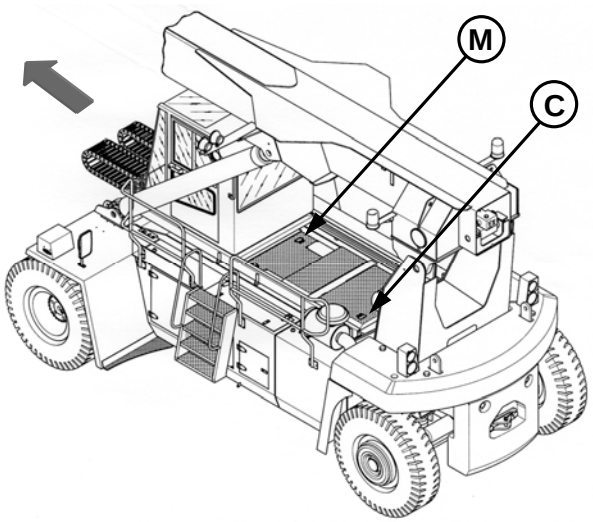
Use a carbon dioxide, or powder or foam extinguisher.
Firemen must use breathing sets.

WARNING:
In any case, carefully read chapter* 2 "SAFETY" *of the vehicle *(or the manual)**.***

ENGINE

NOTES:

- *Details concerning the engine maintenance are widely explained in the enclosed engine manufacturer's instructions* ***that must be read in any case****.*
- *We remind that RIGHT, LEFT, FRONT and REAR used to locate the various components are always referred to the motion direction of the vehicle.*



⚠ **CAUTION:**
Should it be necessary to replace a component of the engine, verify that the new component does not affect the engine settings.

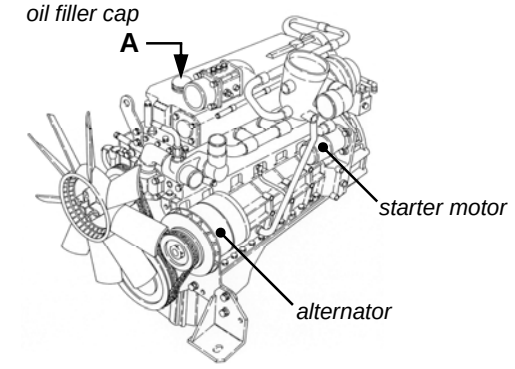
How to access the engine

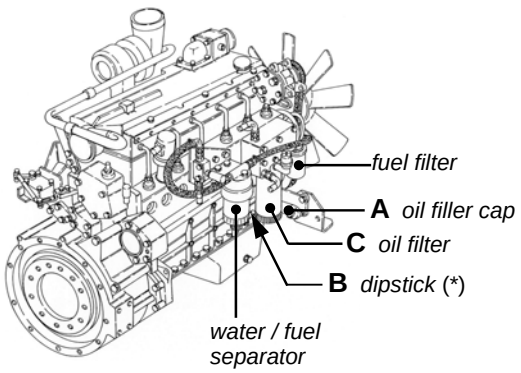
To access the engine, move the cab manually or if fitted to the vehicle, use the hydraulic system to perform this operation *(see chap. 4 "Use of the Controls")* then lift the movable bonnets "**C**" and "**D**".
There are handles on the sides of the cab to offer a good grip when moving it.

Location *(standard)* of engine components

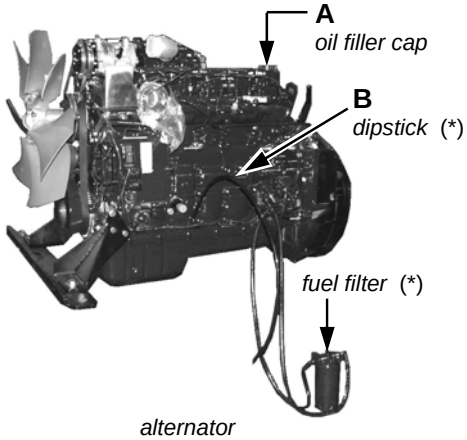
The following figures show and illustrate ***(for indicative purposes only)*** the positions, on the different engines, of the parts mentioned in the descriptions that follow.

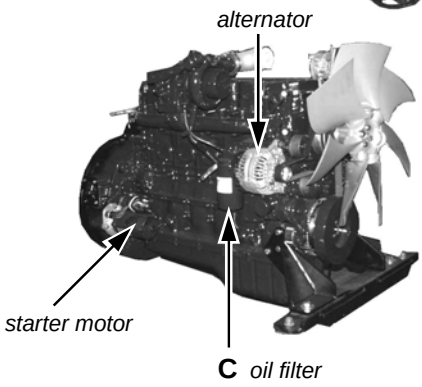
Volvo





Cummins

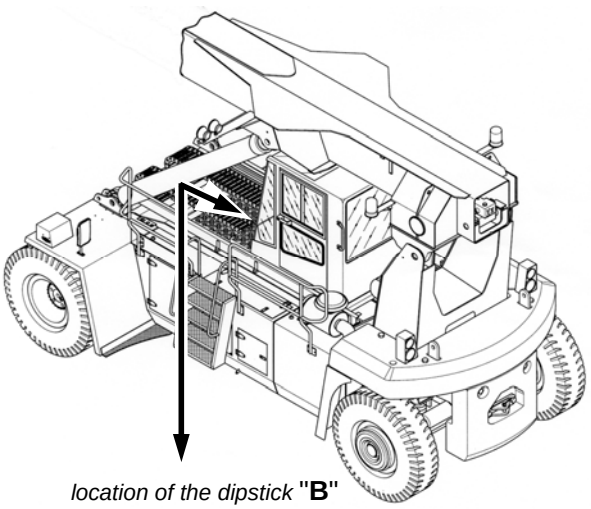




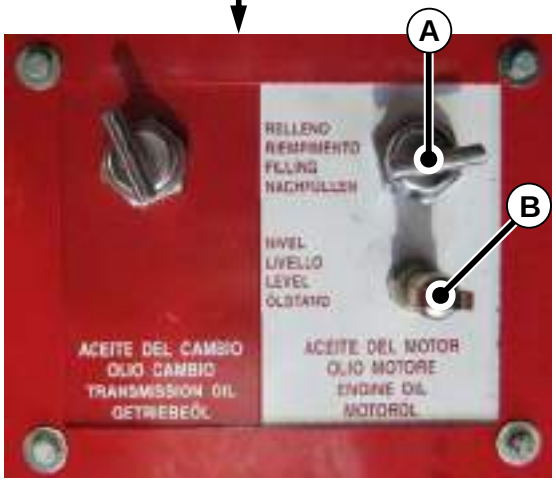
(*) = parts moved from the engine and placed on the chassis.

ENGINE (cont'd)

NOTE:
The dipstick "**B**" *and the oil filler cap* "**A**" *are located on the upper side of the chassis, in front of the engine hood and the driver's cab* [**for all the engine models**]



location of the dipstick "**B**" *and the oil filler cap* "**A**"



Lubrication

Daily:
Check that the oil level is between the **MIN** and **MAX** marks on the dipstick "**B**". If necessary, top up the oil through the oil filler cap "**A**".

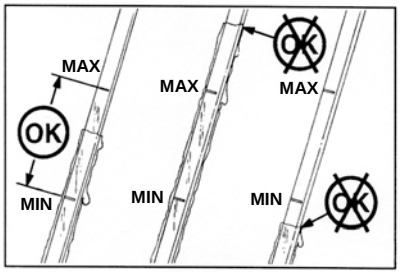
NOTE:
Perform this check with switched-off, cool engine and vehicle standing level.

⚠ **CAUTION:**

The oil level should be between the* "MAX" *and* "MIN" *level marks on the dipstick* "B".**

If necessary, discharge excess oil through the drain plug on the oil pan.

After the check, replace the dipstick "**B**" and tighten completely the cap "**A**" .

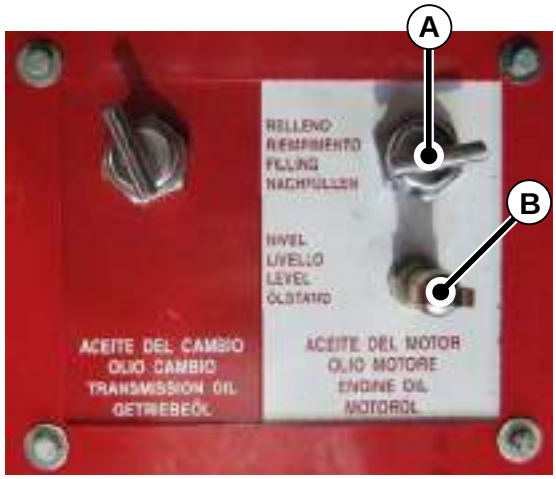


ENGINE (cont'd)

Lubrication (continuation)

Every 500 operating hours:
Change the engine oil and replace the engine oil filter.

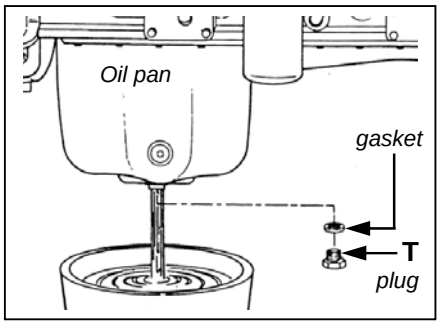
NOTE: ***Perform the oil change with hot engine.***



Replacement steps:

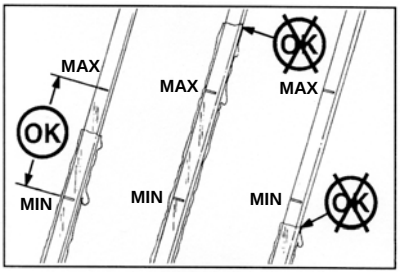
Engine oil

- Drain off the oil in a suitable container. To this purpose unscrew the drain plug "**T**" at the bottom of the oil pan*;*
- Pull out the dipstick "**B**";
- Let the oil flow out completely from the oil pan;
- Make sure that the gasket is not damaged and if it is, replace it;
- Clean the support seating of the filler cap gasket, as well as the threading and any magnet on the cap;
- Refit the drain plug "**T**" with its gasket;
- Pour new oil through the filler cap *(see chapter 7 "Lubrication", section "**Fuel and lubricant chart**")*, after first removing the cap "**A**".
- Refit the dipstick "**B**" and close the cap "**A**", then **start the engine for a short time and check to make sure that there are no oil leaks.**



⚠ **CAUTION:**

- ***When the engine is new, the first oil replacement is necessary after the first 100 hours of operation.***
- ***Each time that the engine oil is replaced, also replace the filter cartridges*** *(description follows).*



NOTE:
*To lengthen the intervals of replacement of engine oil and filters, and in case of extremely low temperatures, see Chapter 7 "Lubrication" section "**Fuel and lubricant chart**" of this manual.*

ENGINE (cont'd)

Lubrication (continuation)

Every 500 operating hours:
Replace the engine oil filter *(or filter cartridge)* [located on the left side of the engine *(with the engine fitted)*].

NOTE: ***Replacement of the filter*** *(or filter cartridge)* ***is necessary at every engine oil change.***

Replace as follows:

Engine oil filter

- Place a container under the filter to collect any lubricant oil;
- Unscrew the filter "**C**" using the relevant wrench and then carefully clean the filter seating on the support;
- Grease the gasket of the new filter with clean engine oil;
- Fill the new filter with new engine oil *(taking care not to allow any impurities to enter the circuit)*;
- **Manually screw on** the new filter until the gasket comes into contact with the support, taking care not to pinch it, then tighten a further ½ ± ¾ of a turn, and no more;
- Start the engine for a short time and make sure that there are no oil leaks.

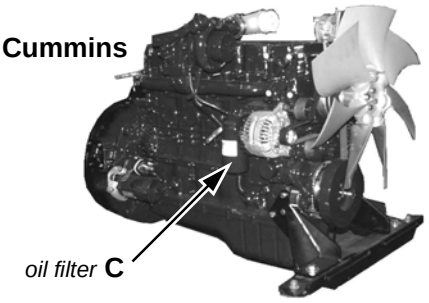
⚠ **CAUTION:**

- ***The filter*** *(or filter cartridge)* ***must be replaced NO LATER than the interval given; if the filter becomes clogged, none of the oil in the circuit would be filtered.***
- ***When the engine is new, the first replacement of the filter "C"*** *(or filter cartridge)* ***is necessary after the <u>first 100 hours</u> of operation.***
- ***The filter*** *(or filter cartridge)* ***may contain a valve and a special tube to ensure that the lubricant oil is not discharged from the filter; as a result, make sure to use original filters only.***

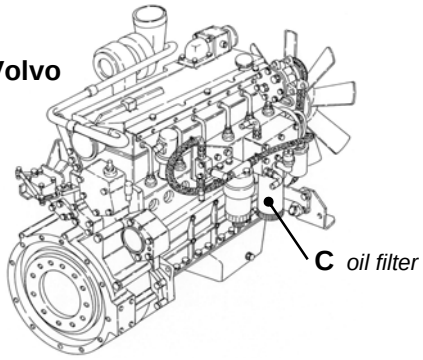
NOTES:

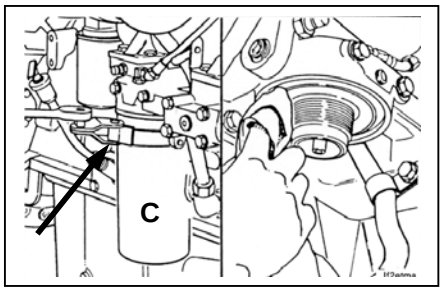
- *To increase the replacement intervals for the filter cartridges and in cases of extremely low ambient temperatures, see chapter 7 "*LUBRICATION*", "**Fuel and lubricant chart**" of this manual.*
- *The figures are purely indicative and may not actually reflect the parts fitted to the vehicle.*

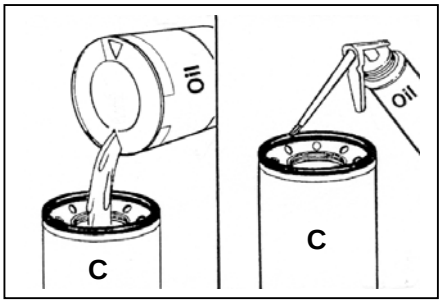
Cummins

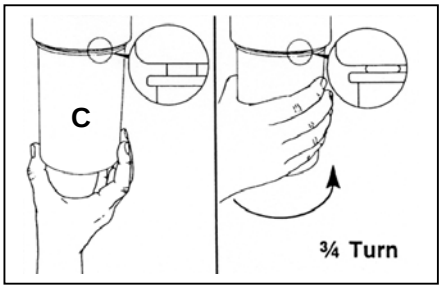


Volvo





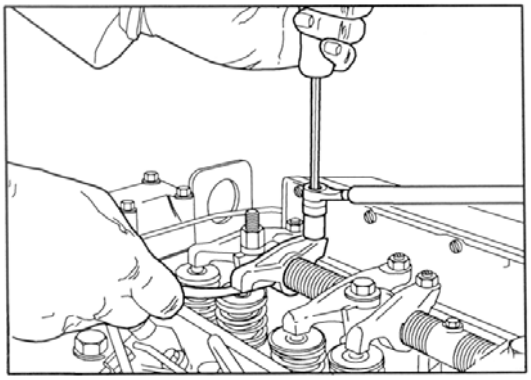




ENGINE (cont'd)

Timing system

Every 1000 operating hours:
In case of abnormal noise, check the clearance between valves and rocker arms *(valve timing settings: see the Operation and Maintenance manual of the installed engine).*



NOTE *Perform the check and the setting, if necessary, on a cold and switched-off engine.*

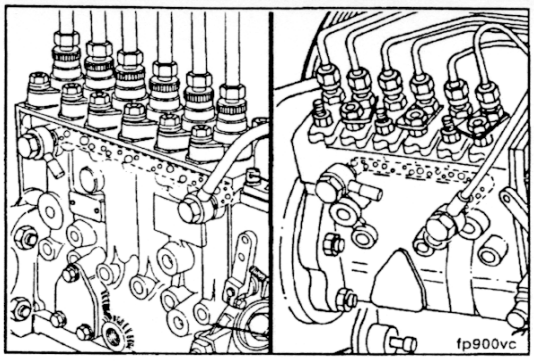
⚠ **CAUTION:**

- ***On new engines, perform the first check after the first 250 operating hours.***
- ***Above mentioned service step must be carried out at an authorised repair workshop or by qualified technicians.***

Above mentioned service steps must be performed by qualified technicians at authorised repair shops

Injection

Every 1000 operating hours:
Have the injectors cleaned and adjusted *(injector's settings: see the Operation and Maintenance manual of the installed engine).*



⚠ **CAUTION:**

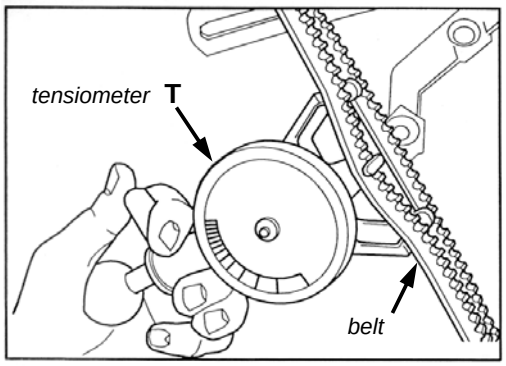
- ***On new engines, perform the first check after the first 250 operating hours.***
- ***This service step must be carried out at an authorised repair workshop or by qualified technicians.***

ENGINE (cont'd)

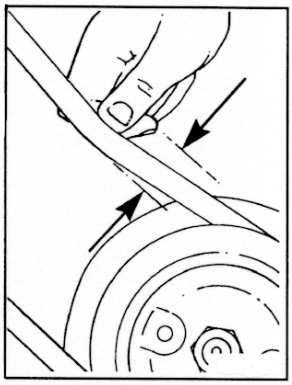
Accessory control belt

Every 500 operating hours:
Check belt tension and wear and tear.

To ensure maximum belt duration, use a belt tensiometer to measure the tension.
Fit the tensiometer (**T**) to the centre of the longest suspended part of the belt and measure the tension.
(for tension data, see the registration booklet for the engine installed).



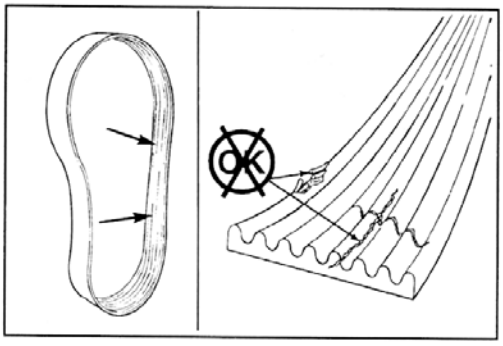
NOTES:
- *If no tensiometer is available, press the belt in the centre of the longest suspended part using your thumb and check the degree of flexure.*
  Average pressure form the thumb of – 45N (10 lbf) 4.5 kgf – *the correct belt flexure is approx.* 10 mm (3/8 in.) ***[in any case, see the original manual for the engine installed]****.*
- *If double belts are fitted, check/adjust the tension on the tightest belt.*



Belt replacement

Always replace a belt when worn or damaged; if double belts are fitted, replace them together. Remember the following advice:

- *To fit a belt without forcing it, reduce the distance between the pulley shafts;*
- *Do not turn the belt on the pulley to fit it in the groove, or do not try to prise it with a tool (e.g. a screwdriver), in order to avoid premature damage and cracks;*
- *Belts should not touch the bottom of the grooves or rub against near parts;*
- *All new belts slightly slack after few operation minutes, so it is necessary to readjust their tension.*



⚠ **CAUTION:**
Whenever possible, a.m. service steps should be carried out by qualified technicians.

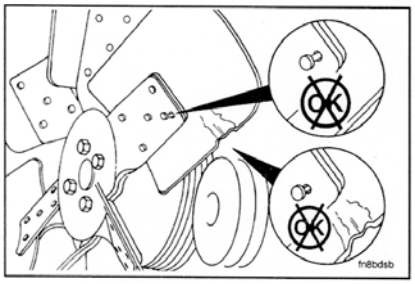
ENGINE (cont'd)

Cooling fan

Daily:

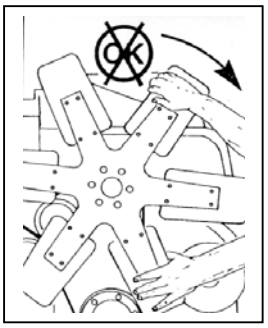
Make sure that there are no signs of breakage or flaking on the fan blades.

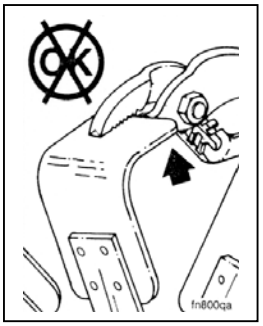
Make sure that the bolts fastening the fan to the engine have been correctly tightened.



WARNING:

- ***Never use the fan to turn the drive shaft.***
- ***Never bend the fan blades.***
- ***Do not operate close to the fan when the engine is switched on; there is a risk of serious accidents.***





NOTE: ***In any case, see the Operation and Maintenance manual of the installed engine.***

AIR INTAKE SYSTEM

Turbocharger

The turbocharger is part of the engine and should not considered like a simple accessory.
Often a perfectly functioning turbocharger is repaired, instead to search the causes of the fault in the engine or in another part of the system.
To avoid useless time losses and to increase life and functionality of the turbocharger, we list hereinafter some rules of fundamental importance.
Turbocharger damages may be mostly due to the following 3 causes:

a) lack of lubricant: it causes damages to the bearings with consequent seizing of the rotating parts;

b) penetration of foreign objects: a badly cleaned air cleaner causes the penetration of particles damaging the turbine blades with the risk that their splits get into the cylinders;

c) lubricant contamination: this causes scoring of the supports and the bearings, clogging of the oil lines, wear of the seal rings with consequent oil leaks and seizure risk.

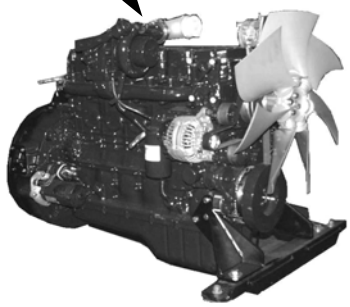
⚠ **CAUTION:**
The apparent simplicity of the turbocharger hides machining with tolerances of thousandths of millimetres; for this reason, any maintenance procedures on the turbocharger should be done by qualified technicians of the manufacturer, equipped with proper tools.
Fault prevention prolongs the life and increases the performances of the turbocharger. In case of lubricant lacks, vibrations or abnormal noise immediately switch-off the engine.
Engines with turbocharger request simply, but basic precautions at their start and stop:

START: ***After the start, run the engine at idle for at least 30 sec. before increasing its speed.***

STOP: ***Before stopping the engine, let it run at idle for at least one minute.***

Turbocharger

Cummins



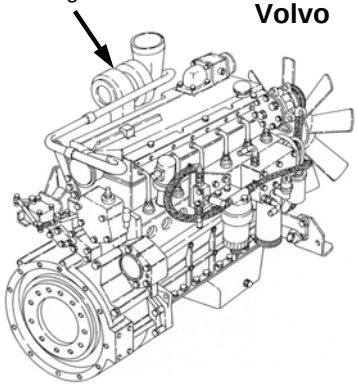
Every 1000 operating hours:
Check tightness of gaskets and screw fittings of the air inlet and outlet ducts and repair any leaking points.

Check the oil delivery and return lines and make sure that there are no problems that could cause a reduction of the supplied oil.

Considering the high operating speed of the turbocharger, any reduction of the oil flow would damage it.

Turbocharger

Volvo

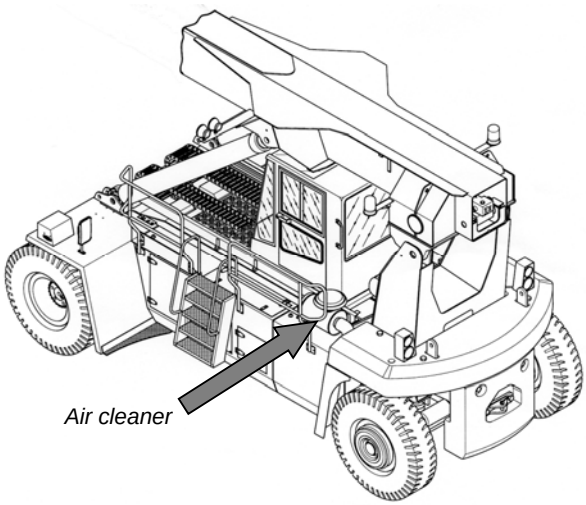


NOTE: *The images are for instance the turbochargers can be easily identified on each model of engine.*

AIR INTAKE SYSTEM (cont'd)

Air cleaner

Is located on the left side of the vehicle, over the fuel tank.



NOTES:

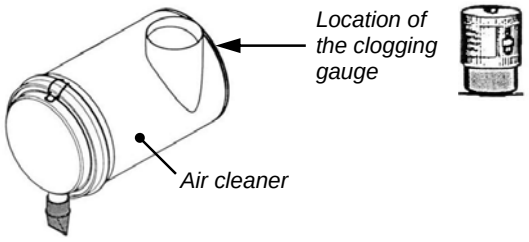
- *The maintenance and replacement intervals are indicative, because they greatly depend on the presence of suspension dust.*
  The life of filter elements can range from a minimum of 200 operating hours (desert) to a maximum of 1500 operating hours (paved yards).
- ***Normally the primary cartridge of the filter should be changed*** every 1000 operating hours***, and in any case at least*** once a year***, or in case of detection of tears, bends and/or holes during the normal cleaning steps.***

Care and check

Daily:
Check that the air cleaner of the air intake system is NOT clogged:

☺ the air filter is equipped with an *electric clogging gauge;* it indicates clogging immediately, switching on a specific alarm, which is visible in the inner of the cab *(see specific section in chapter* 3 "Driver's Cab");

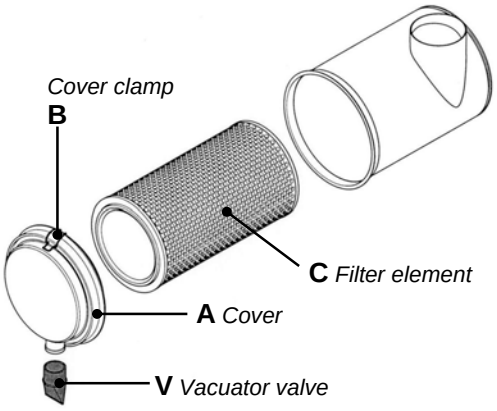
☺ if no *electric clogging gauge* is fitted, make a visual check of the *mechanical gauge* to make sure it does not show a "**red**" signal.



In any case *immediately clean the filter element* as follows:

- Release the cover clamps (**B**) and remove the air cleaner cover (**A**);
- Pullout the filter element (**C**) and clean it with one of the following methods:

NOTE: ***During the cleaning, pay attention that no dust enters the air cleaner housing*** *(or the fine mesh filter element, if fitted)****.***



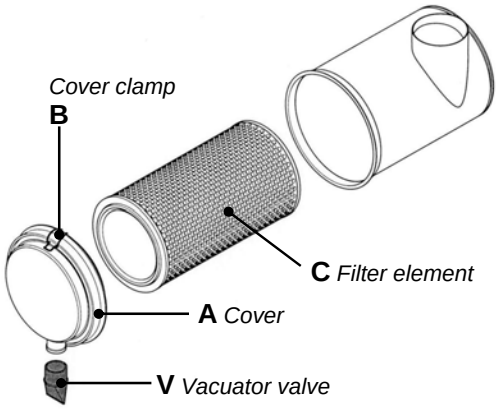
AIR INTAKE SYSTEM (cont'd)

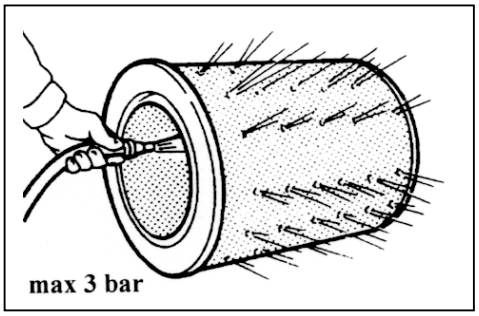
Air cleaner (continuation)

Filter element cleaning:

a) *Dust blowing*
Remove the dust with compressed air at a max. pressure of 3 bar, holding the nozzle some 5-cm away from the element, blowing it from inside towards outside.
Never clean the element beating it on hard surfaces.

b) *Washing with water and detergent*
If the clogging of the filter element is the consequence of soot or oil due to malfunctions of the intake or exhaust system, wash the filter element with a mixture of water and detergent.
Plunge the element in the cleaning solution for 15 minutes and turn it on its axis for at least 2 minutes.
Flush with plenty of water and dry the element with tepid air.



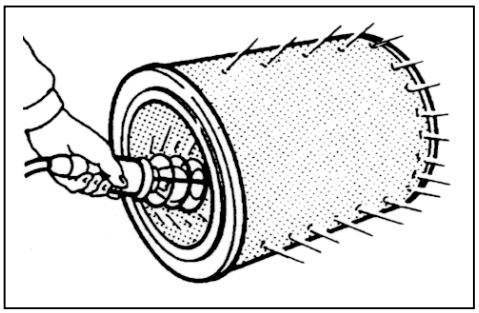


⚠ **CAUTION:**
The filter element should not be cleaned for more than 6 times, then it has to be replaced.

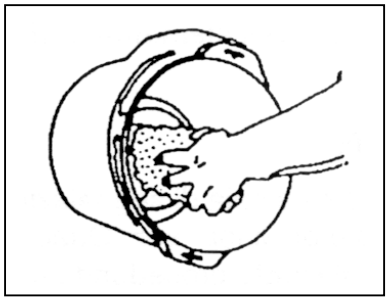
Before replacing the filter element, check the following:

1) condition of the gasket;
2) fins of the filter element;
3) the condition of the filter element inserting a lamp into it; the light beams will make visible also smallest cracks or tears;

NOTE: ***In presence of tears, deformations and/or perforations replace the filter element.***



4) the filter housing should not contain dust deposits;
5) the filter element should be properly positioned in the housing;
6) the vacuator valve (**V**), that has to be cleaned from any incrustations or dust residuals;
verify the presence of tearing or damages; if necessary replace it.



⚠ **CAUTION:**
Inaccurate assembly causes the penetration of not filtered air that may seriously damage the engine.
If possible, a.m. steps should be carried out by qualified technicians.

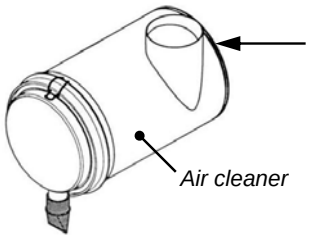
AIR INTAKE SYSTEM (cont'd)

Air cleaner (continuation)

NOTE:
With the gauge, once the cartridge has been serviced, the mechanical clogging gauge needs to be restarted; to do this, press the special button on the top of the gauge.

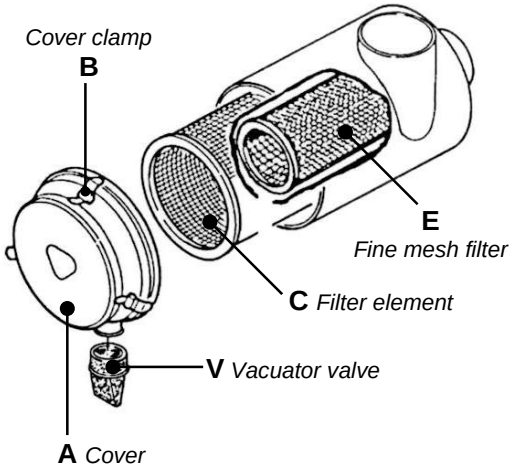
The electric transmitter does not need to be reset.

After servicing the filter, press the push button on the top of the gauge



IF FITTED:

- ☺ *The filter can be equipped with a fine mesh filter "**E**" (Optional), **that must never be cleaned;** instead, it must be replaced at least every three external filter replacements, **and always every 1500 hours (**yearly**).***
- ☺ *To access the fine mesh filter, slide out the filter element "**C**" as described previously.*
  Refer to the figure here opposite for more details.
- ☺ *When replacing the filter, use the utmost care and maximum cleanness.*



⚠ **CAUTION:**
If the elements are not perfectly assembled, air that has not been suitably filtered will enter the engine, which could cause serious damage.
If possible, a.m. steps should be carried out by qualified technicians.

AIR INTAKE SYSTEM (cont'd)

Air cleaner (continuation)

Cyclone precleaner (if fitted)

The air filter can be fitted with a cyclone precleaner (**Optional**), which is fitted on the filter.

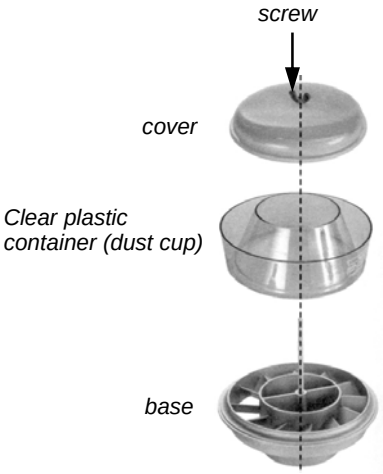
Cyclone precleaner

Every day:

Make a visual inspection to make sure that the dust in the clear plastic container *(Dust Cup)* of the precleaner, IS NOT over a thickness of 25 mm *(or if present, over the max. level indicator)* to prevent dust from entering the filter and causing serious damage to the engine.

To clean:

- remove the lid of the precleaner, after first removing the relevant screw;
- slide out the clear plastic container *(Dust Cup)* and clean it with care;
- refit the cyclone precleaner, acting with care and the utmost cleanness because **if assembly has not been performed correctly, dust can enter the filter causing serious damage to the engine**.

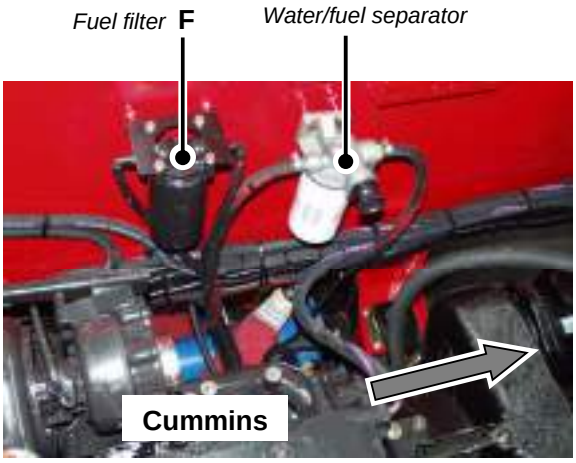


⚠ **CAUTION:**
If possible, a.m. steps should be carried out by qualified technicians.

FUEL SYSTEM

NOTES:

- *Use only fuel type recommended by international specification, and winter fuels (from **0°C**) supplied by oil companies (see chapter "Lubrication" section "**Fuel and lubricant chart**").*
- *Always operate with the maximum of cleanness during refuelling and servicing the fuel system.*
- *All service steps on the injection pump and the injectors must be carried out by an authorised workshop.*
  If the pump seal is broken, all warranties are invalidated.
- *In any case, refer to the Operation and Maintenance manual of the installed engine (available on the vehicle).*



⚠ **CAUTION: Fire risk.**
When you perform service steps on the fuel system, like filter replacement, make sure that the engine is cold. Pouring fuel on a hot surface or on an electric component can cause fire.
Keep fuel soaked rags in order to avoid any fire risk.

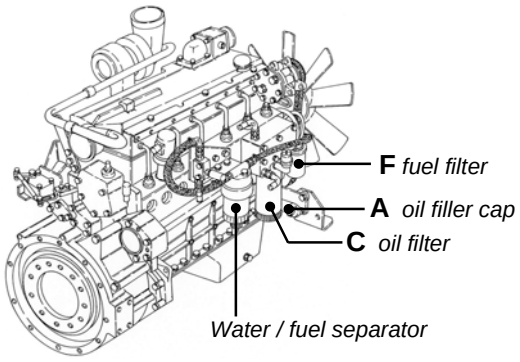
Engine fuel filter and water / fuel separator

They are located:

- "**CUMMINS**" engines,
  on the left side member of the frame, near the engine.

- "**VOLVO**" engine,
  on the left side of the engine;

Volvo



NOTE:
In any case, see the original manual for the engine fitted.

Continued ➔

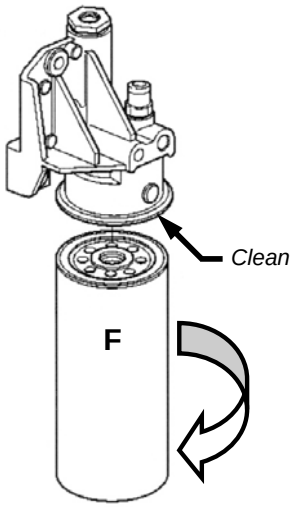
FUEL SYSTEM (cont'd)

Engine fuel filter (continuation)

Every 500 operating hours for "CUMMINS" engines

Every 1000 operating hours for "VOLVO" engines

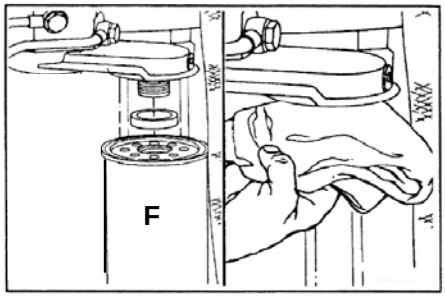
Replace the fuel filter.



Replacement steps:

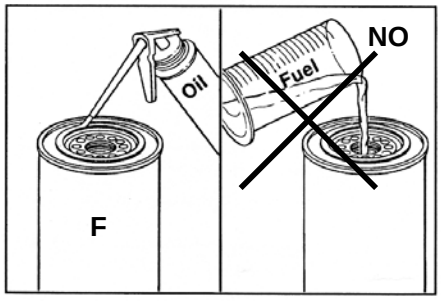
- Remove the fuel filter (**F**) with a filter wrench;
- Carefully clean the cartridge seating on the support and remove the gasket (*if present)*;
- Lubricate the gasket of the new filter with clean engine oil;

NOTE: ***Do not fill*** *the new filter with fuel before fitting it, since there is a risk that impurities may enter the system, leading to damage and malfunctioning.*



- **Hand-tighten** the new filter until the gasket contacts the sealing surface;
- Then **hand-tighten** of another ½ - ¾ turn, **not more!**

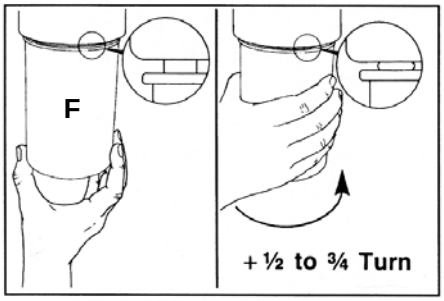
NOTE: *Tighten the fuel filter according to the instructions on the filter it self.*



⚠ **CAUTION:**
Overtightening the filter on the housing may damage the gaskets and strip the threads.

NOTES:

- *After the removal of the fuel filter, it could be necessary to bleed the fuel system (see relevant description).*
- *The figures are purely indicative and do not faithfully reproduce the parts fitted on the vehicle.*
- ***In any case, see the original manual for the engine fitted.***



FUEL SYSTEM (cont'd)

Bleeding of the fuel system [CUMMINS engines]

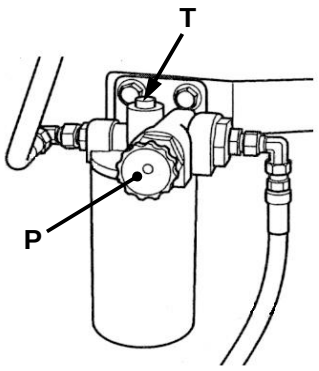
The fuel system needs to be bled after the change of the fuel filter or after the refilling *(if the tank has run out of petrol)*, and in any case if some air is circulating into the circuit.

Generally, **Cummins** engines, **ARE NOT** supposed to have an outer bleeding of the system, as this operation is carried out automatically during the engine start off.

NOTE: ***Consult in any case the original manual of the engine installed.***

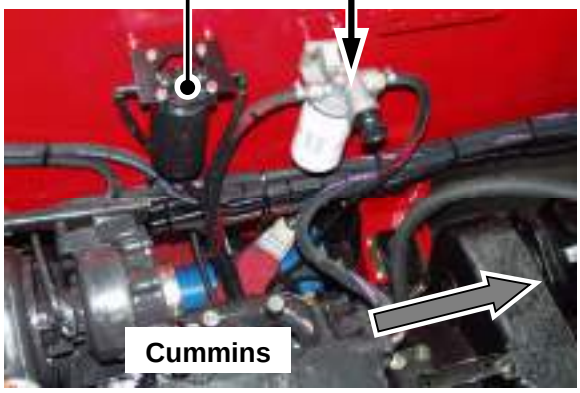
If necessary, bleed the air inside the fuel system, and then follow the operations hereafter described:

- ☺ Place a container under the water/fuel separator and under the fuel filter;
- ☺ Open the drain plug (**T**) on the separator support and release the **drain hose** of the fuel filter;
- ☺ Turn the hand pump (**P**) clockwise to open it;
- ☺ Keep on pumping until when the fuel without air is flowing either from the drain plug **(T)** or from the filter hose;
- ☺ Tighten, *while the fuel is flowing*, the plug (**T**) and the **drain hose** of the fuel filter, then close the hand pump (**P**);
- ☺ Start the engine and check that there are no leaks in the system.

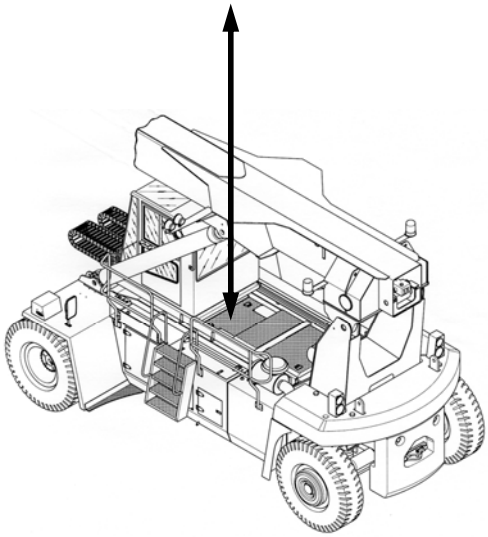


Water/fuel separator

Fuel filter **F**



NOTE:
Run the engine at low revs for at least 5 minutes just after bleeding the air from the fuel system to be sure that the pump is completely airless and prevent possible damages to the inner components of the injection pump due to the contact of metal coming into contact with metal.



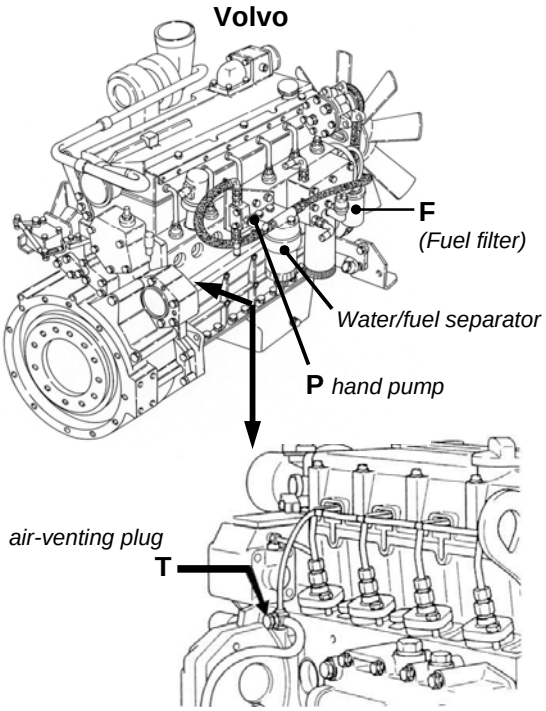
⚠ **CAUTION:**
The above mentioned operations must be carried out only by properly trained, skilled and qualified staff.

FUEL SYSTEM (cont'd)

Bleeding of the fuel system [VOLVO engines]

The fuel system could require to be bled after the filter replacement or after fuel refuelling *(if the tank had run out of fuel),* and in any case if air penetration in the system.

NOTE: ***In any case, please refer to original manual of the installed engine.***



To bleed the air from the fuel system, proceed as follows ***(if the engine is designed to this purpose)*** :

- Place a container beneath the fuel cleaner *(water/fuel separator)*;
- Check that the engine is running;
- Open the air-venting plug (**T**) in the overflow valve ;
- Pump repeatedly (by pressing) the fuel manual pump (**P**) until the fuel flows out without air bubbles;
- Re-tighten the or plug (**T**) while the fuel is flowing out;
- Pump again for 15-20 times with the pump (**P**);
- Check the fuel system for leaks.

⚠ **CAUTION:**

- ***If the engine stops due to fuel lack*** *(with consequent air penetration in the fuel lines),* ***loosen the fittings of the lines of at least two injectors. Simulate the engine start and re-tighten the fittings after new bleeding.***
- ***The operations described here above must only be performed by specially trained and qualified service engineers.***

FUEL SYSTEM (cont'd)

Water / fuel separator [CUMMINS engines]

The water/fuel separator is located in the fuel system *(intake)*.

Everyday:

- **Stop the engine and leave it to cool;**

⚠ **IMPORTANT:**
After switching off the engine, wait a few hours before draining the separator.

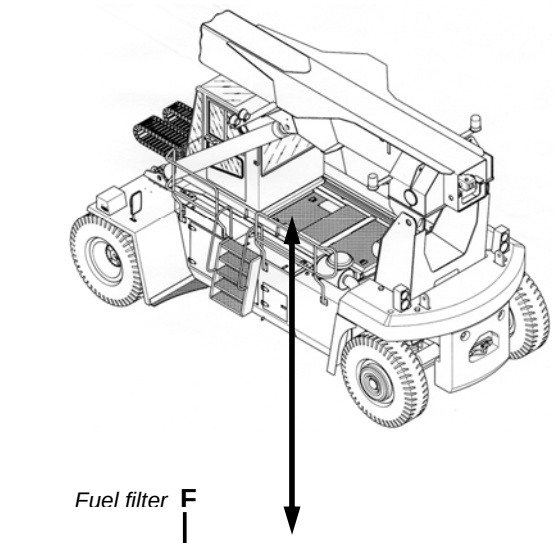
- Place a container under the separator;
- Unscrew the drain valve at the bottom of the separator;
- Let the water and the foreign matters flow away until when some new fresh fuel starts coming out;
- Screw the drain valve.

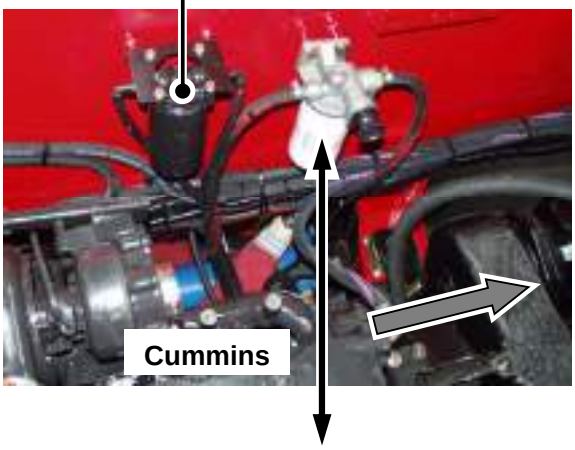
NOTA: ***DO NOT tighten excessively the drain valve,*** *to avoid damaging the thread.*

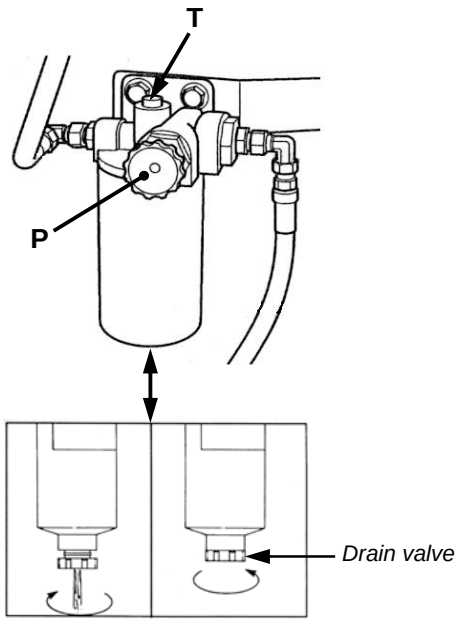
⚠ **CAUTION:**
Before draining the filter, place a container beneath the valve to collect the fuel.

- Bleed the system *(if necessary)*; then start the engine and check there are no leaks.

⚠ **CAUTION:**
The operations described above must be performed by suitably trained and qualified staff, who must operate in conditions of maximum cleanness and safety.







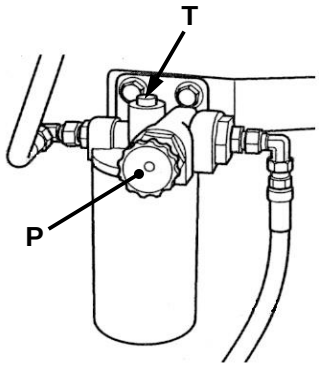
FUEL SYSTEM (cont'd)

Water / fuel separator [CUMMINS engines] (cont'd)

Every 500 operating hours

(at the same time as replacing the fuel filter)

Replace the cartridge of the water/fuel separator *(NOT integrated with the filter);*



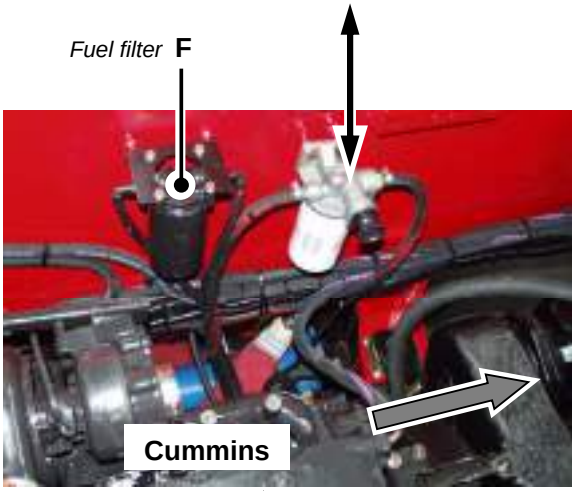
Water/fuel separator

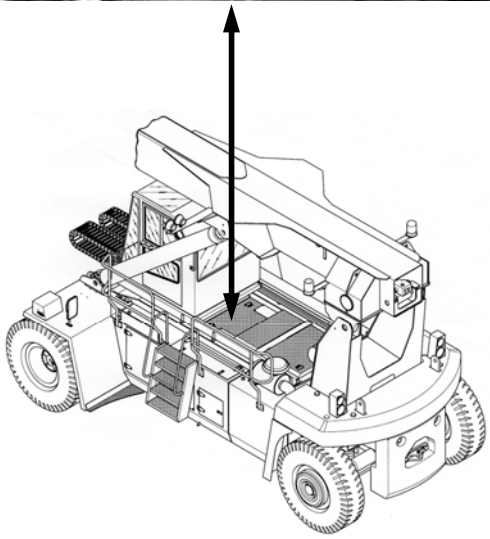
To replace the filter operate as follows:

- Stop the engine;
- Place a container under the separator;
- Disconnect the electric connection *(if fitted)*;
- Unscrew the filter cartridge;
- Make sure that the new cartridge is thoroughly clean and the gasket undamaged and well lubricated;
- Tighten the cartridge on the filter support;
- Check that the drain valve is closed;

  NOTE: ***DO NOT over tighten the drain valve,*** *to avoid damaging the threading.*

- Reconnect the electric connection *(if fitted)*;
- Bleed the circuit; then start off the engine and check there are no leaks.



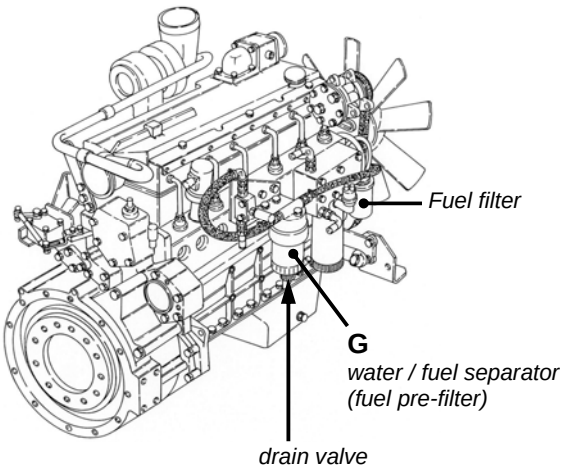


FUEL SYSTEM (cont'd)

Water / fuel separator [VOLVO engines]

The water/fuel separator "**G**" is inserted in the fuel circuit *(suction),* between the fuel tank and the engine.

Volvo



Every 100 hours:

Clean as follows:

- Stop the engine;
- Place a container below the separator "**G**";
- Unscrew the drain valve on the bottom of the separator "**G**";
- Let all water and impurities flow out until clear fuel can be seen;
- Make sure that the drain valve is closed.

  NOTE: ***DO NOT over tighten the drain valve*** *to avoid damaging the threading.*
- Bleed the circuit and then start the engine and make sure there are no leaks

⚠ **IMPORTANT:**
After switching off the engine, wait a few hours before cleaning the separator.

Every 1000 hours
(*at the same time as replacing the fuel filter****)***

Replace the cartridge of the water/fuel separator *(cleaner).*

To replace the cartridge, proceed as follows:

- Stop the engine;
- Place a container below the separator "**G**";
- Unscrew the filter cartridge;
- Make sure that the new cartridge is perfectly clean and that the gasket is undamaged and well lubricated;
- Screw the filter cartridge onto the water tank and fit them onto the filter support;
- Make sure that the drain valve is closed;

  NOTE: ***DO NOT over tighten the drain valve*** *to avoid damaging the threading.*
- Bleed the circuit and then start the engine and make sure there are no leaks.

FUEL SYSTEM (cont'd)

Water / fuel separator (continuation)

NOTE : ***The following cautions apply to every type of engine.***

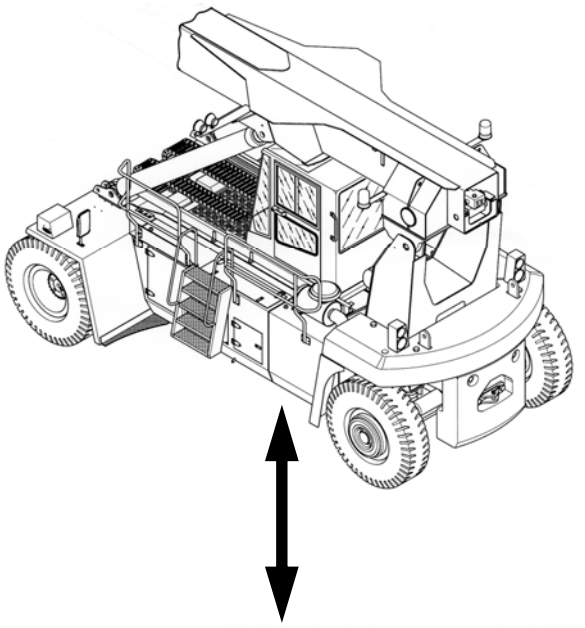
⚠ **CAUTION:**

- ***In any case, refer to the original manual for the engine fitted, which is attached to the vehicle.***
- ***After switching off the engine, wait a few hours before cleaning the separator.***
- ***Before draining or cleaning the separator, place a container beneath the value to collect any fuel.***
- ***The operations described above must be performed by suitably informed, trained and qualified staff, who must operate in conditions of maximum cleanness and safety.***

FUEL SYSTEM (cont'd)

Fuel tank

The fuel tank is located on the left side of the vehicle.



Every 500 operating hours:

- Place a container under the tank;
- Unscrew the drain plug "**S**" and let a small fuel quantity flow out to drain any impurities or water contained in the tank.

⚠ **CAUTION:**
If the fuel tank gets completely empty, bleed the fuel system.

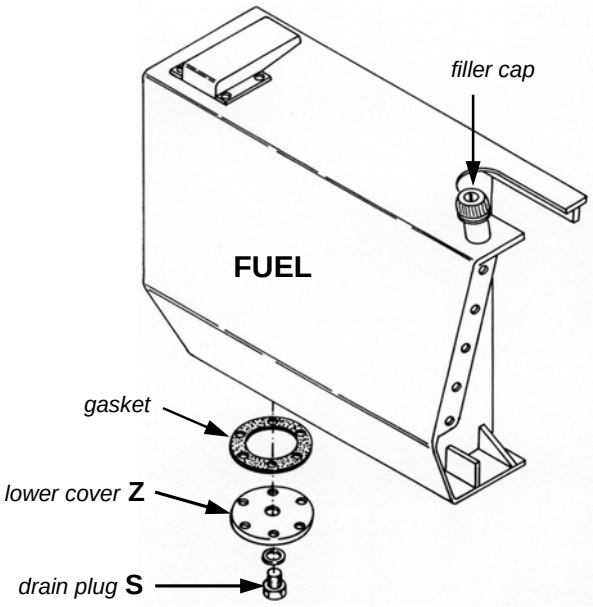
Every 3000 operating hours:

- Use up the fuel in the tank, then remove the lower tank cover "**Z**";
- Clean the tank, the cover and the gasket.

⚠ **CAUTION:**
Before removing the lower cover "Z" from the tank, place a container under the tank to collect any remaining fuel.

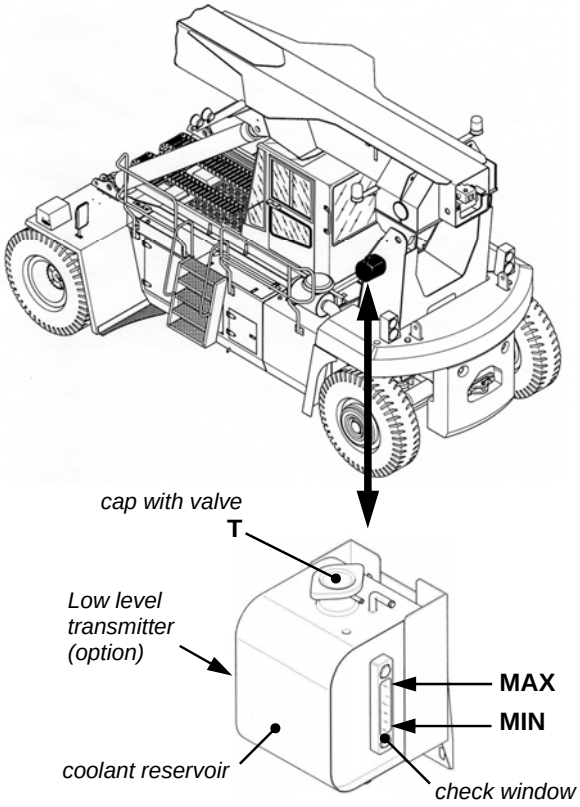
- Clean the inside of the tank, the cover and the gasket.
- Install the lower cover "**Z**" paying attention not to damage the gasket and the threads of the screws, then make sure that there are no fuel leaks.

NOTE:
Always replaced damaged gaskets.



COOLING SYSTEM

The coolant reservoir is located on the left side *(rear)* of the vehicle, fixed to frame, back the driver's cab.



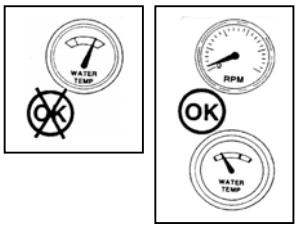
Daily:
Check the coolant level when the cooling system is **cold** and the engine is switched off. The coolant level must be between the **MIN.** and **MAX.** marks on the body of the reservoir.

NOTE: *On some reservoir types the level marks* MIN *and* MAX *may be stamped directly on the reservoir body.*

The coolant level must be up to the "**MAX.**" mark shown on the level indicator.
Never allow the coolant level to decrease under the "**MIN.**" mark.

NOTES:
- *If the reservoir is excessively filled, the coolant may overflow through the drain hose or the filler cap during the operation of the engine, this is not a malfunction.*
- ***Weekly** clean and check the function of the bleed alve on the cap.*

WARNING:
When the engine is hot, never unscrew the reservoir cap (T)**, *the bleeding plugs and the system cock; the cooling system is pressurised and scalding hot fluid and steam may be blown out under pressure, which could cause serious injury.***

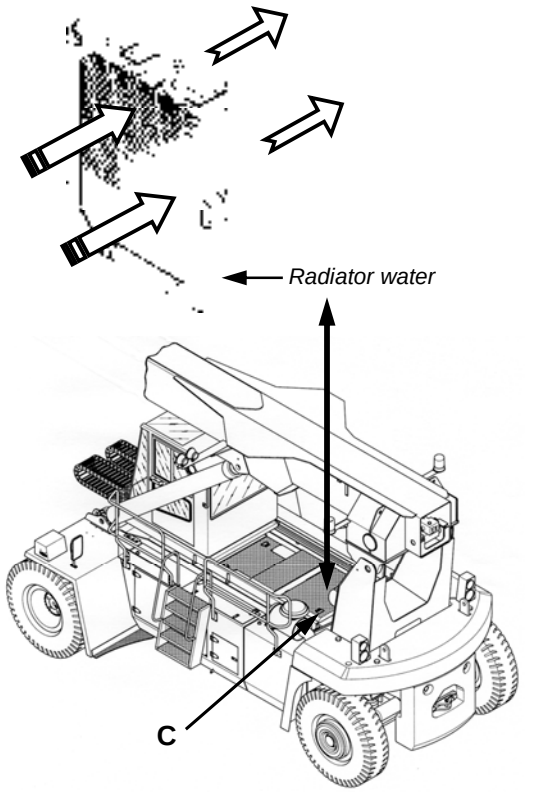


Radiator

Weekly:
Check that the radiator is not clogged, to this purpose make sure that there is no dust, mud, leaves etc. on the air inlet surface and, if necessary, clean it immediately with compressed air/steam.

NOTE: *The use of these cleaning methods requires proper safety protections for your hands, face and eyes (see chapter "**SAFETY**").*

To access the engine, move the cab manually or if fitted to the vehicle, use the hydraulic system to perform this operation *(see chap. 4 "Use of the Controls");* then lift the movable bonnet "**C**"**.**



COOLING SYSTEM (cont'd)

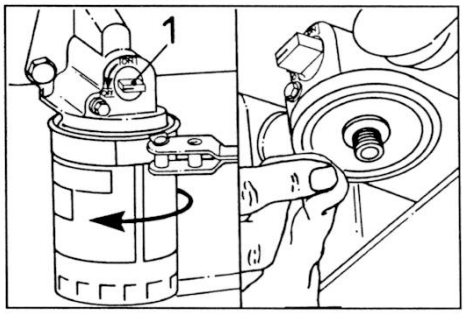
Coolant filter
(if fitted on the installed engine)

NOTE: *In any case refer to the Operation and Maintenance manual of the installed engine (available on the vehicle).*

The purpose of the coolant filter is to filter the coolant and to give a protection against rust.

⚠ **CAUTION:**
In order to avoid an excessive rust-protection action that can cause clogging, the filter must NOT be replaced together with the coolant.

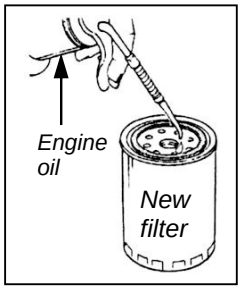
cock



remove the filter with a suitable tool — *clean the filter housing*

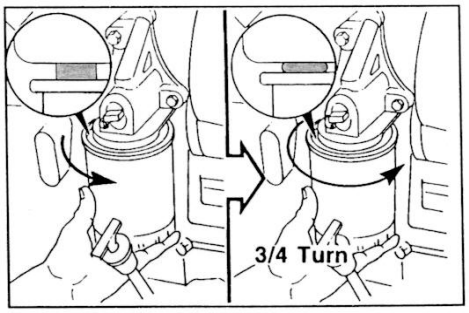
Every 500 operating hours:
Replace the coolant filter.

⚠ **WARNING:**
Do not replace the filter when the engine is hot; the cooling system is pressurised and scalding hot fluid and steam may be blown out under pressure, which could cause serious injury.



Replacement steps:

- Close the cock "**1**" of the system (*located on the filter housing*);
- Remove the filter with a suitable tool;
- Carefully clean the seat of the filter element on the housing;
- Lubricate the gasket of the new filter with engine oil;
- Hand-tighten the new filter until the gasket contacts the sealing surface;
- Then tighten it of another ½ - ¾ turn, **not more!**
- Open again the cock "**1**".



Hand-tighten the filter till contact, then tighten it of another ½ - ¾ turn

⚠ **CAUTION:**
These operations must be performed by qualified service engineers.

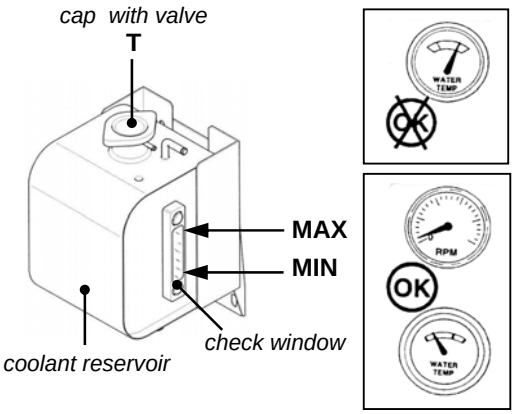
COOLING SYSTEM (cont'd)

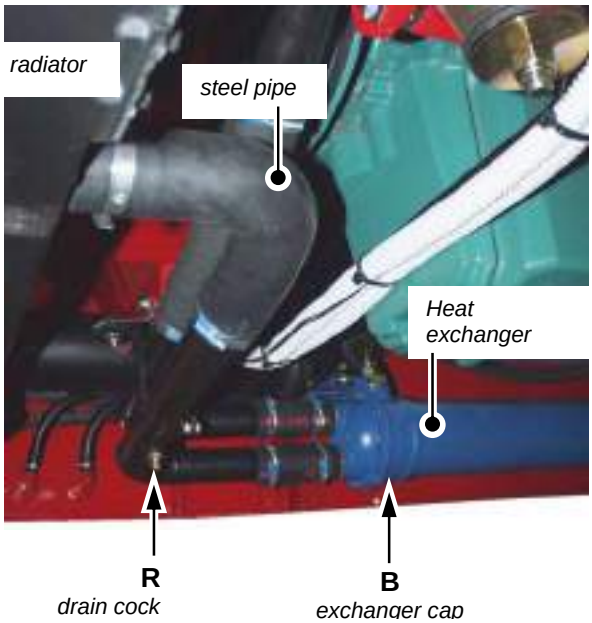
Engine coolant replacement

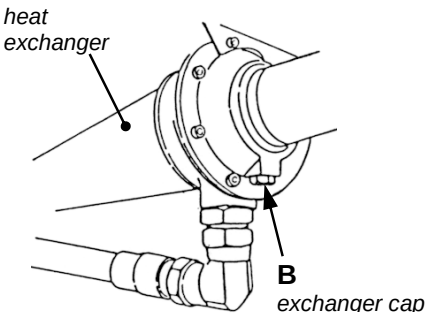
Every 2000 operating hours or **Yearly:**
Perform the replacement as follows:

WARNING:
When the engine is hot, never unscrew the reservoir cap "T"**,** ***the bleeding plugs and the system cock; the cooling system is pressurised and scalding hot fluid and steam may be blown out under pressure, which could cause serious injury.***

- Place the vehicle on flat firm ground;
- Remove the filler cap "**T**" on the coolant reservoir;
- *Drain the coolant from the system* **in a suitable container** opening the cock "**R**" on the steel pipe between radiator and heat exchanger; furthermore remove the exchanger cap "**B**" fastened to the right side member near the fuel tank *(the cock* "R" *and the cap* "B" *are located at the bottom of the cooling system)*;
- When the coolant is drained off, close the cock "**R**" on the steel pipe and install the cap "**B**" on the heat exchanger;
- Fill the system with a mixture of water and a descaling product in the ratio stated on the product container;
- Run the engine at mid-speed for *15 minutes*, then, without stopping it, drain off the descaling solution as previously described and at the same time flush with water through the heat exchanger for at least *40 minutes*.;
- Drain out the water from the whole circuit *(as described previously)* then turn off the cock "**R**" on the iron pipe and refit the cap "**B**" heat exchanger;
- Pour slowly the new coolant in the reservoir until the system is completely full;
- Start the engine and let it run until only coolant, without air, flows out from the coolant reservoir;
- Retighten the reservoir filler cap "**T**";
- Run the engine for a few minutes, then let the engine cool down and top up the coolant to the normal level.







CAUTION:
NEVER pour coolant fluid into a hot engine; this could damage the enbloc and the head.

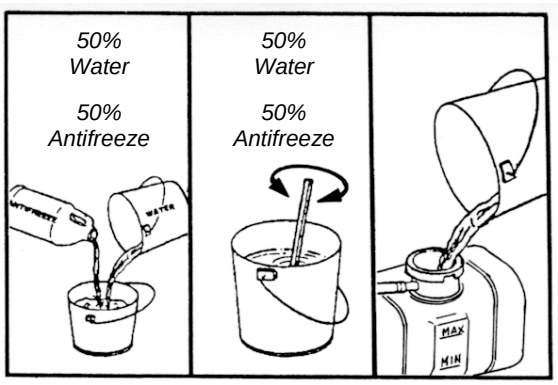
CAUTION:
These operations must be performed by qualified service engineers.

COOLING SYSTEM (cont'd)

Antifreeze percentage check

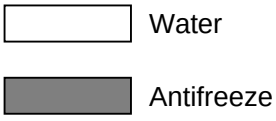
Every 500 operation hours :

Check the specific gravity of the coolant ***(in any case refer to the Operation and Maintenance manual of the installed engine).***



The coolants contains an ethylene glycol based corrosion inhibitor, for this reason it is necessary to change regularly the coolant to avoid that the parts in contact with it become rusty.
Considering that the coolant contains this corrosion inhibitor, **never** replace it by water alone, not even in summer, but with a **50% mixture of clean water and antifreeze**.

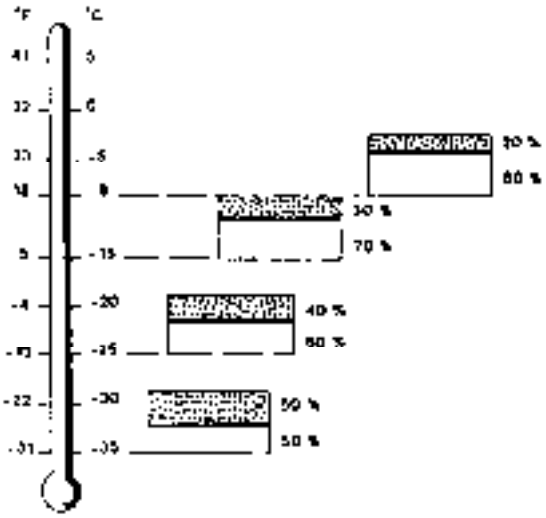
Mix glycol with clean water, meeting the ASTM D4985 requirement, in a separate container before filling the cooling system.



⚠ **WARNING:**
Glycol is detrimental to health (dangerous if swallowed).

⚠ **CAUTION:**
Do not use any alcohol in the cooling system.

⚠ **CAUTION:**
Never mix antifreeze (glycol) with corrosion inhibitors.
When mixed, these two substances form foam and reduce drastically the coolant efficiency.

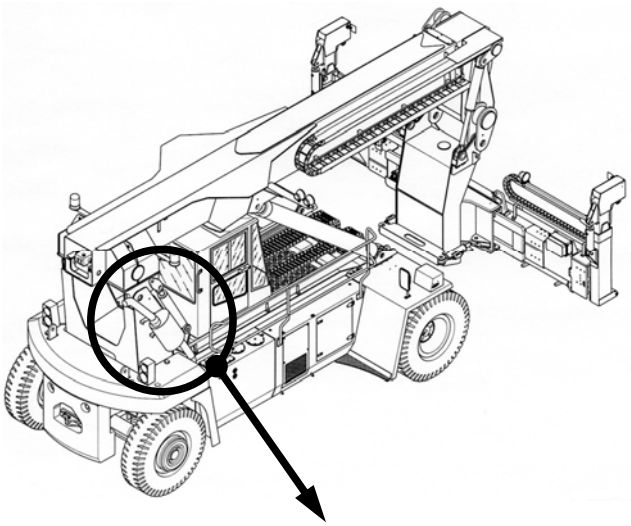


Check the antifreeze percentage in the engine coolant with a hydrometer through the filling cap.
The percentage of antifreeze/water depends on the ambient temperature in the working area of the vehicle, as shown in the figure aside.

EXHAUST SYSTEM

The muffler is located in the rear of the vehicle.

The exhaust pipe is located outside on the right side.



Exhaust pipe and muffler

Every 1000 operating hours:
Check the whole exhaust system for breaks or cracks in pipes and hoses, as well as the tightening of hose clamps.

NOTE:
On specific request only (Optional), it is possible to fit a Particulate Filter in place of the exhaust cleaner; in this case, see the specific documentation attached.

Catalytic converter (if fitted)

The catalytic converter is installed in the exhaust system, between the engine and the muffler.

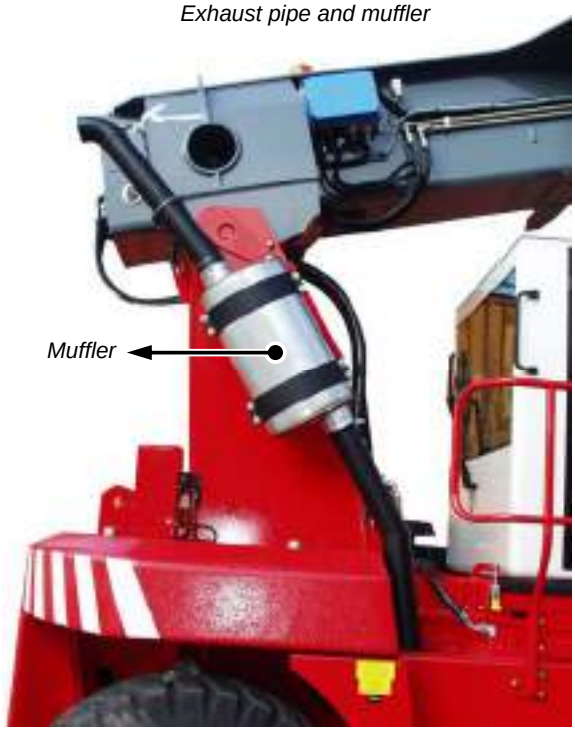
Every 2000 operating hours

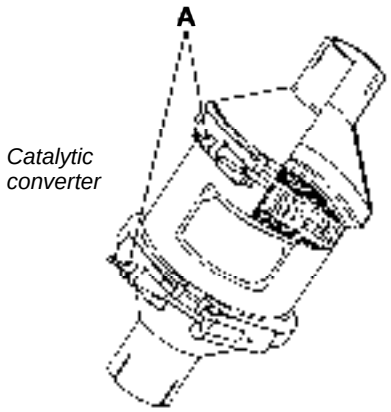
or

Yearly:
Plunge the catalytic converter in neutral detergent (for 8-9 hours) and then clean it by aspiration, or with steam.

NOTE:
To open the converter, release the retainers (**A**).

WARNING:
Before servicing the catalytic converter, let it cool down.





Catalytic converter

WINDOW WASHER SYSTEM

The wash fluid reservoir is located inside the cab, on the left-hand side of the driver seat rest.

Daily:
Check the wash fluid level inside the reservoir and, if necessary, top up removing the cap on the top of it.

NOTE:
The reservoir should always contain a sufficient quantity of wash fluid.

⚠ **CAUTION:**
Prevent dirt and impurities from entering the reservoir while topping up with the wash fluid, in order to avoid clogging the system.

We recommend using a mixture of the special antifreeze additive "AREXONS DPI" for windscreen washer and water as detailed below.

Temperature	-35°C (-30°F)	-20°C (-4°F)	-10°C (14°F)	0°C (32°F)	Summer
Additive	1	1	1	1	1
Water	0	1	2	6	10

NOTE:
Using other additives, respect the manufacturer's mixing instructions.

TRANSMISSION

⚠ **CAUTION:** *Details concerning the transmission maintenance are widely explained in the enclosed transmission manufacturer's instructions* ***that must be read in any case.***

NOTE: *The oil quantity in the gearbox is very important for its life and good functioning, because oil cools, lubricates and transmits power.*

- *If the level is too low, the torque converter and the clutches are not sufficiently fed with oil and this could damage the transmission or reduce the performances.*
- *If the level is too high, the oil foams, overheating the transmission.*

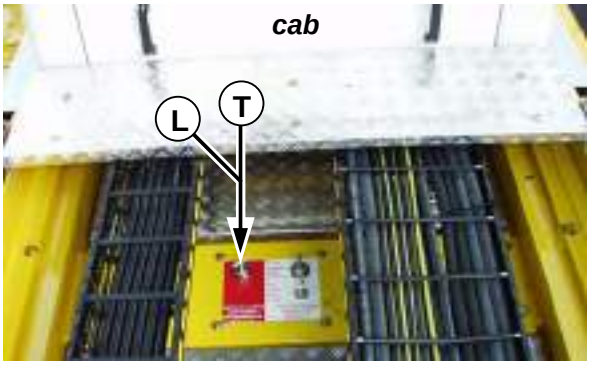
To access the transmission *(gearbox)*, slide the cab forwards *(cab sliding: see the chapter 4 "Operation of the vehicle controls")*, then lift the movable bonnet "**M**".

The dipstick "**L**" and the filler neck "**T**" are located on the upper side of the chassis, in front of the engine hood and the driver's cab *(running position)*.

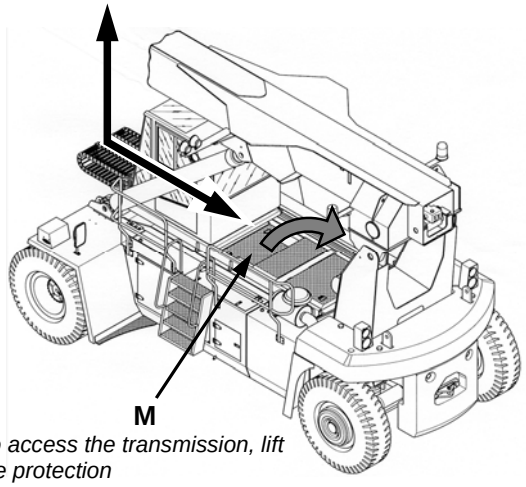
NOTE:

☺ *The filler neck* "**T**" *also houses the dipstick* "**L**".

💣 ***The operations described here below must be performed by suitably informed, trained and qualified staff, who must operate in conditions of maximum cleanness and safety.***



locations of the dipstick "**L**" *and the filler neck* "**T**"



To access the transmission, lift the protection

TRANSMISSION (cont'd)

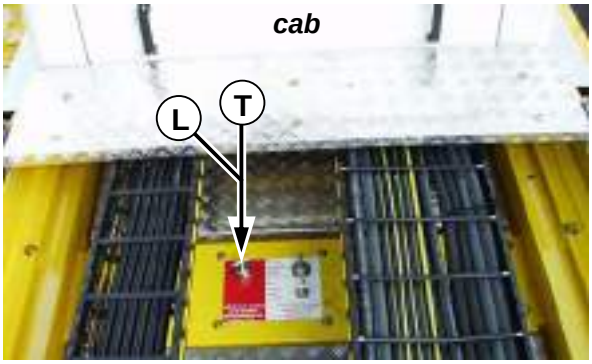
Weekly:

Check the oil level as follows:

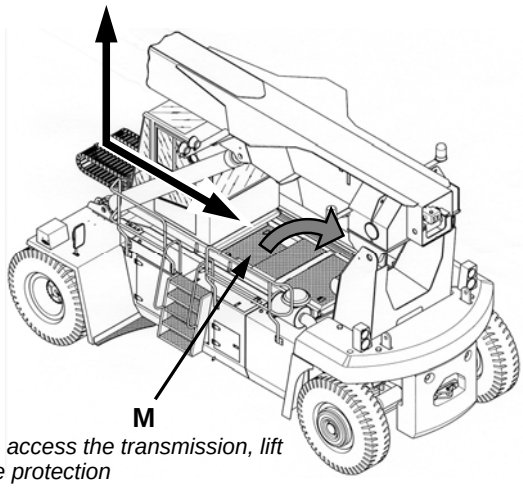
- **when the engine is running at minimum, bring the transmission (gearbox) to normal operating temperature [80 - 110 °C** (180-200 F)**];**
- Shift the gearbox selector lever into all its positions to fill the clutches and the oil passages;
- **Park the vehicle on a level ground, apply the parking brake and shift the gearbox selector lever into neutral "N".**

⚠ **CAUTION:** ***Let the engine run at idle;***

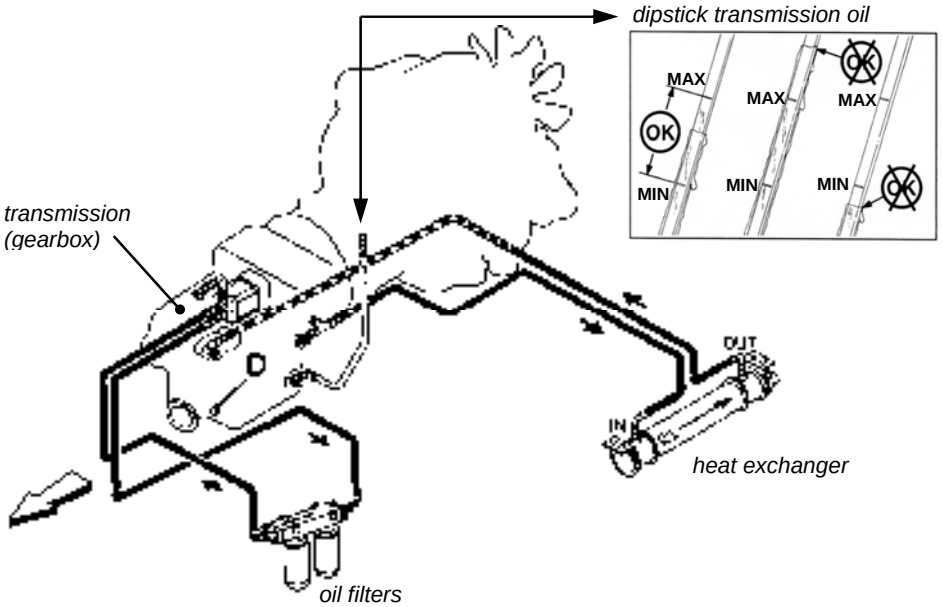
- Check on the dipstick (**L**) if the oil level reaches the **MAX** mark;
- If not:
  - Top up with oil through the filler neck "**T**" up to the **MAX** mark on the dipstick;
  - If the oil level is too high, **drain the oil into a suitable container** by unscrewing the drain plug "**D**" *(at the bottom of the gearbox)* down to the **MAX** mark on the dipstick, ***then retighten the drain plug***;
- After this check, insert the dipstick "**L**" into the filler neck "**T**" and tighten it definitively, since the top of the dipstick (**L**) serves as plug.



*locations of the dipstick "**L**" and the filler neck "**T**"*



To access the transmission, lift the protection



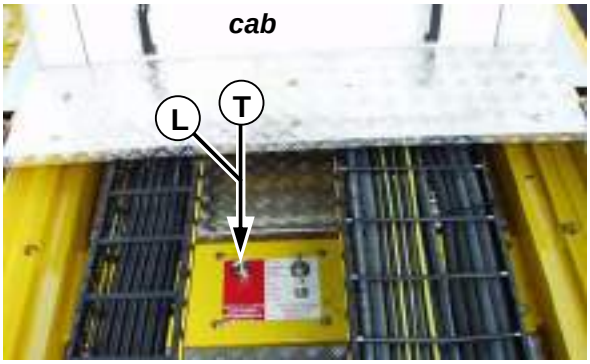
TRANSMISSION (cont'd)

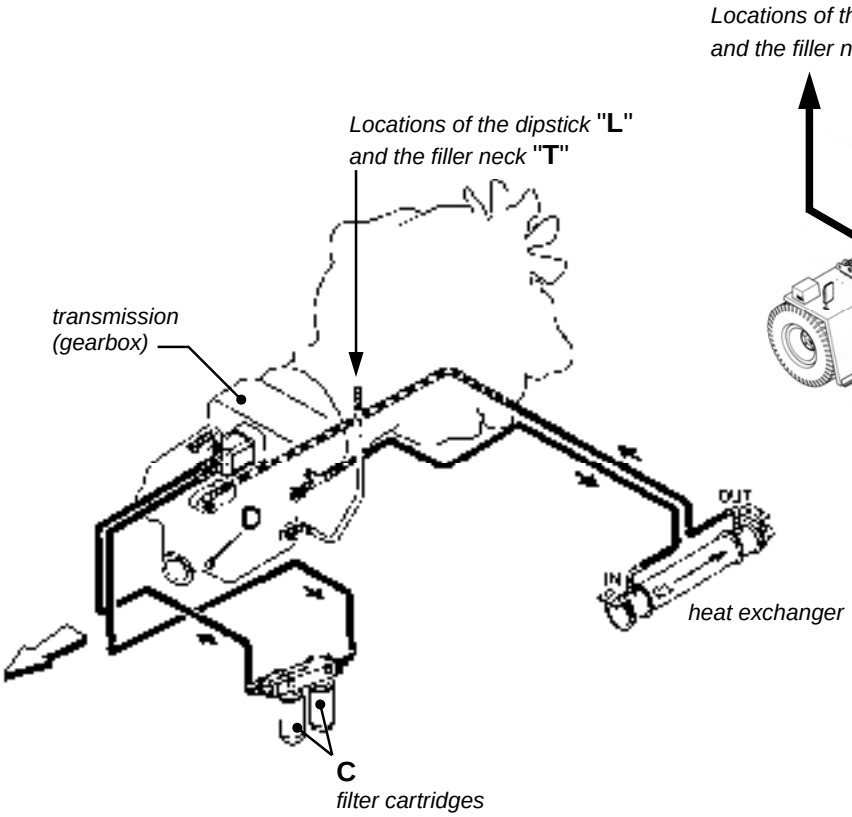
Every 500 operating hours:

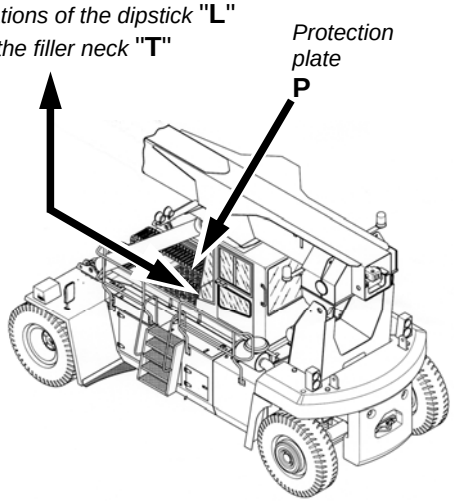
Replace the oil filter cartridges "**C**" as follows:

- **Switch-off the engine, apply the parking brake and shift into neutral "N";**
- Insert a suitable container beneath the filters to collect the oil;

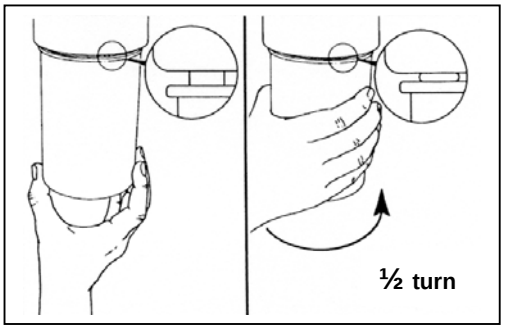
NOTE:
*To access the oil filters, from above, lift the shield "**P**" located in front of the oil dip stick support, when the cab is drawn back.*







- with a universal oil filter wrench unscrew the old oil filter cartridges "**C**";
- carefully clean the seat of the filter cartridges on their housings;
- lubricate with oil (same oil of the transmission) the seals of the new cartridges;
- **hand-tighten** the new cartridges until the seals contact the housing, paying attention not to pinch them, then tighten them of another ½ turn.



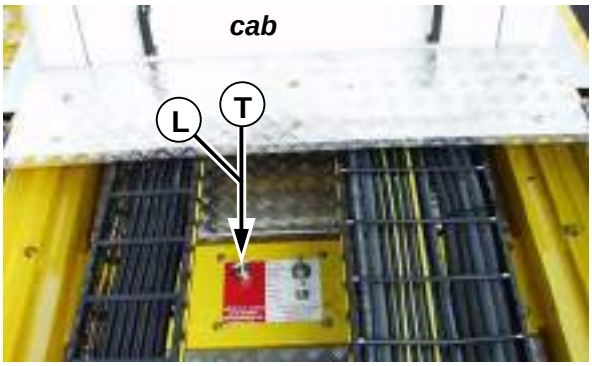
After the cartridge replacement, check the transmission oil level again **with the engine idling** and verify that there are no oil leaks.

TRANSMISSION (cont'd)

Every 1000 operating hours: Change the transmission oil.

⚠ **CAUTION:**
***Perform the replacement with the vehicle on a level ground, hot transmission, engine switched off, parking brake applied and gearbox selector lever shifted into neutral* "N".**

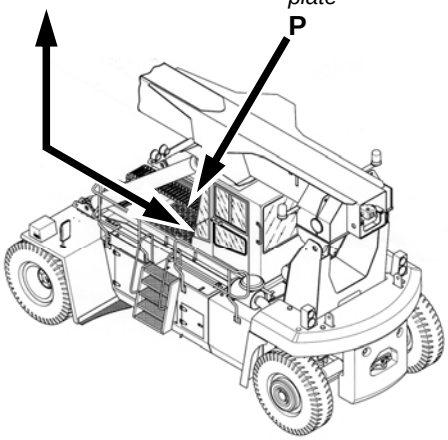
- drain the oil in a suitable container by loosening the drain plug "**D**" located at the bottom of the gearbox;
- pull out the dipstick "**L**" and disconnect a hose from the heat exchanger;
- completely drain the transmission oil , then re-tighten the drain plug "**D**" and re-connect the hose to the heat exchanger;
- pour fresh oil through the fitting of the filler neck "**T**" (*refer to chapter "Lubrication" section **"Fuel and Lubricant chart"***);
- after the filling, check the level as previously described, and make sure that there are no oil leaks.



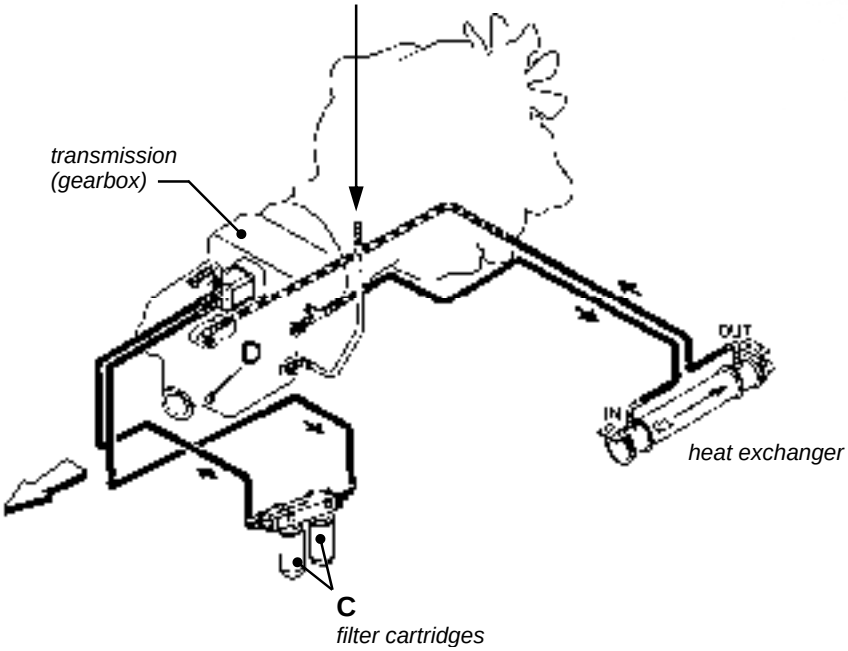
Locations of the dipstick "**L**" *and the filler neck* "**T**"

Protection plate

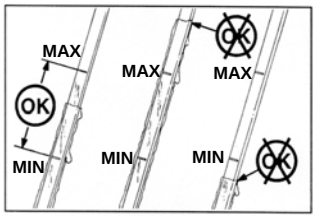
P



Locations of the dipstick "**L**" *and the filler neck* "**T**"



dipstick transmission oil



TRANSMISSION (cont'd)

⚠ **CAUTION:**

- ***In all cases, see the original manual for the transmission installed, which is found in the vehicle.***
- ***Perform the replacement of the filter cartridges WITHIN the specified intervals. In case of filter clogging, all the circulating oil would be no more filtered.***
- ***On new transmissions, perform the first oil change and replacement of the filter cartridges after the first 100 operating hours.***
- ***For transmission oil, NEVER use containers or filling devices used before for antifreeze or coolant; these products contain ethylene glycol that, if coming in contact with the transmission, could irreparably damage the clutch disks.***

NOTES:

- *To lengthen the replacement intervals for transmission oil and filters, and in case of extremely low temperatures, refer to chapter 7 "Lubrication" section **"Fuel and Lubricant chart"** of this manual.*
- *A.m. oil and filter replacement intervals are valid for normal climatic conditions and operating cycles. Prolonged operation at high temperatures and in very dusty conditions will contaminate and degrade the lubricant more quickly. It is necessary to establish whether these extreme conditions are met, to define the proper oil and filter replacement intervals.*

⚠ **WARNING:** ***Avoid to come in direct contact with waste oil and never dispose of it in the environment.***

PROPELLER SHAFT

To access the propeller shaft, lift the protection plate "**P**" located in front of the cab when this is drawn back *(running position).*

Every 100 operating hours:
With a manual grease gun ***(never use a high-pressure grease gun)***, inject grease in the lubricating nipples of the universal joints *(crosses)* and if fitted on the coupling.

These are full when grease starts to be forced out.

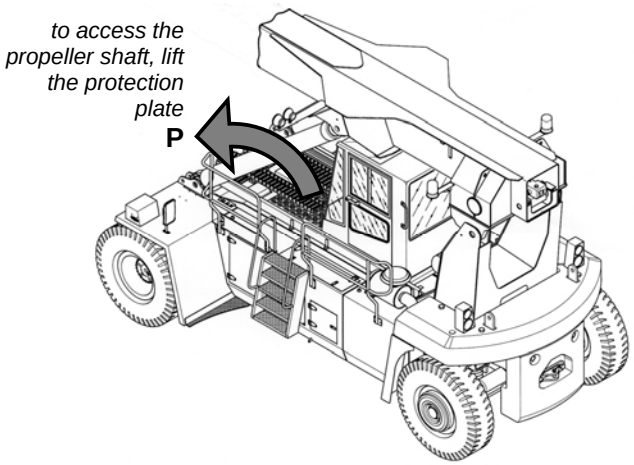
NOTE:
The propeller shafts should be greased in any case, *also if the vehicle is equipped with an automatic centralised lubricating system.*

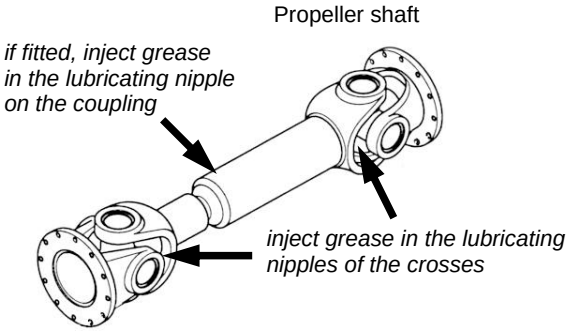
Every 500 operating hours:
Check the tightening torque of the screws fastening the propeller shaft to the driving axle and to the transmission.

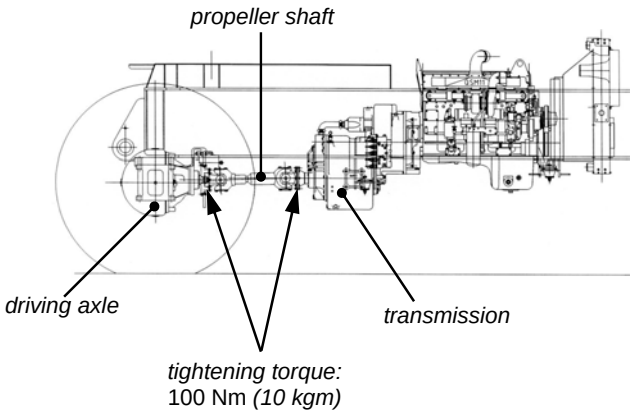
Tightening torque: **100 Nm** (10 kgm)

⚠ **CAUTION:**
Perform the first check after the <u>first 250 operating hours.</u>

⚠ **WARNING:**
Always switch off the engine before servicing the propeller shaft.







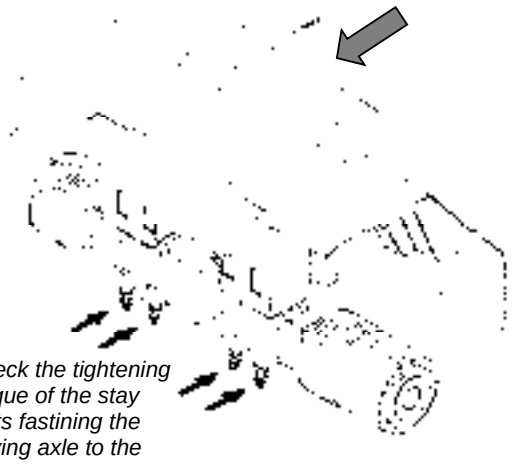
DRIVING AXLE

⚠ **CAUTION:**
All following service steps must be performed by qualified technicians, after having parked the vehicle on a <u>level and compact ground and switched-off the engine</u>.

The driving axle is fastened to the chassis *(on the front side)* by 8 stay bolts.

Every 500 operating hours:
Check the tightening torque of the stay bolts.

Tightening torque: **1000 Nm** (100 kgm)



Check the tightening torque of the stay bolts fastining the driving axle to the chassis

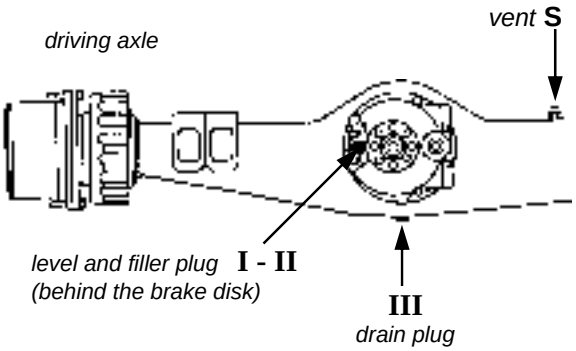
NOTE:
The driving axle is equipped with planetary wheel gears; ***therefore, at each oil change in the differential gear change the oil also in the wheel gears.***

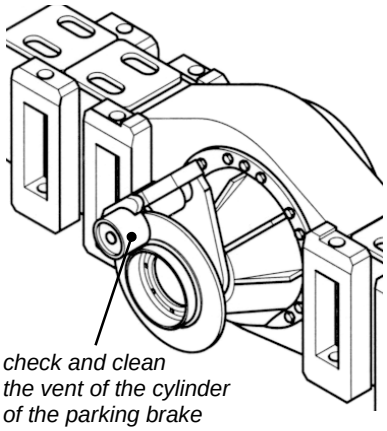
Differential gear

Every 100 operating hours:

- Let the oil cool down and settle, then check its level with **the vehicle on a level surface, the engine switched-off**.
- The level is correct when the oil flows out through the hole of the level plug (**I**).
- If necessary, top up with new oil as described in chapter 7 "*Lubrication*" section "***Fuel and Lubricant chart***", through the plug hole (**II**).
- Check the vent (**S**), it must be clean and properly working.

  NOTE: *Check and clean also the vent of the cylinder of the parking brake.*



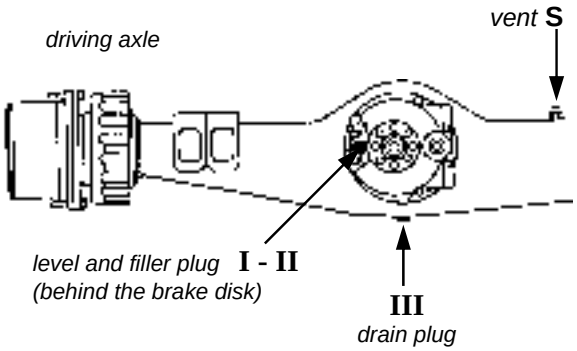


check and clean the vent of the cylinder of the parking brake

DRIVING AXLE (cont'd)

Differential gear (continuation)

Every 1000 operating hours:
Replace the differential gear oil as follows:



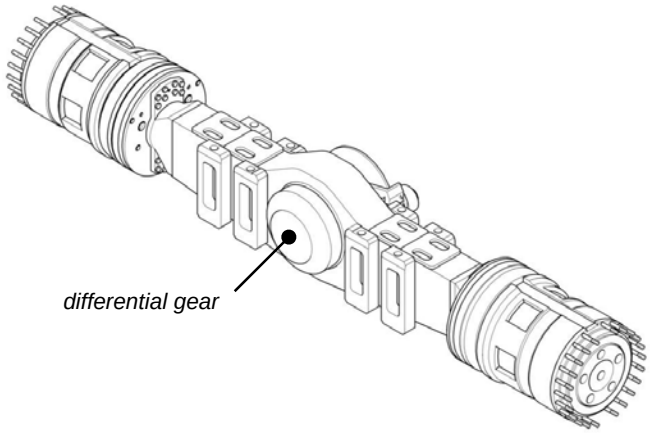
⚠ **CAUTION:**
The change must be performed with the engine switched-off.

- Loosen the drain plug (**III**) and the filler plug (**II**) and drain off the oil in *a suitable container*, checking that there are no metal particles.

  NOTE:
  We recommend performing the change with hot driving axle, as this facilitates the oil drainage.

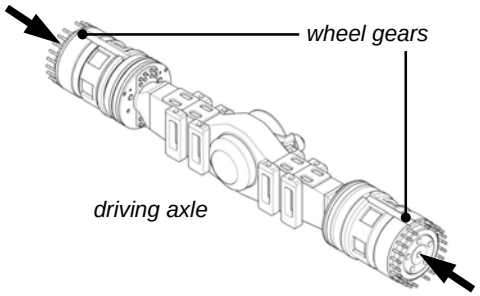
- Carefully wash with petroleum the box inside, then drain it completely before pouring fresh oil.
- Check that there are no metal particles on the drain plug (**III**), then re-tighten it.
- Fill with fresh oil as prescribed in chapter 7 "*Lubrication*" section "***Fuel and Lubricant chart***", through the filler plug hole (**II**) until the oil overflows.
- Re-tighten the filler plug (**II**).
- Re-check the level [through the plug hole (**I**)] after a test run, and make sure that there are no oil leaks.

⚠ **CAUTION:**
***On new vehicles, perform the first oil change after the* <u>first 100 operating hours.</u>**



DRIVING AXLE (cont'd)

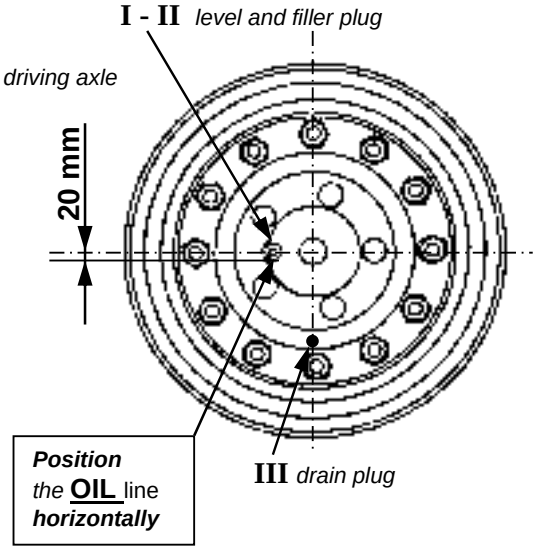
Wheel gears



Every 100 operating hours:

- Let the oil cool down and settle, then check its level with **the vehicle on a level surface, the engine switched-off**.
- Position the *(engraved)* "**OIL**" level line horizontally.
- The level is correct when the oil flows out through the hole of the level plug (**I**) *(in horizontal position).*
- If necessary, top up with fresh oil as prescribed in chapter 7 "LUBRIFICATION" section "***Fuel and Lubricant chart***", through the plug hole (**II**).

Every 1000 operating hours:
Change the wheel gear oil as follows:

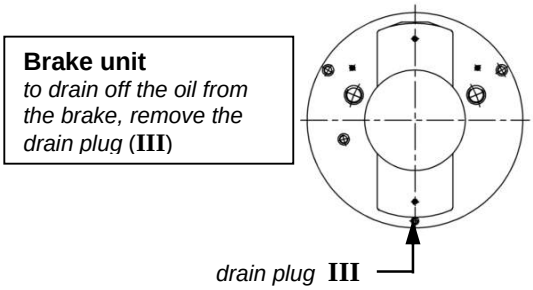


⚠ **CAUTION:**
The change must be performed with the engine switched-off.

- Align the (*engraved*) "**OIL**" level line horizontally, so that the **drain plug** (**III**) is at **its lowest position**.
- Loosen the drain plug (**III**) and the filler plug (**II**) and drain off the oil in *a suitable container*, checking that there are no metal particles.

  NOTE: ***We recommend performing the change with hot driving axle, as this facilitates the oil drainage.***

- Carefully wash with petroleum the box inside, then drain it completely before pouring fresh oil.
- Check that there are no metal particles on the drain plug (**III**), then re-tighten it.
- Fill with fresh oil as prescribed in chapter 7 "LUBRIFICATION" section "***Fuel and Lubricant chart***", through the filler plug hole (**II**) until the oil overflows.
- Re-tighten the filler plug (**II**).
- Re-check the level *[through the plug hole* (**I**)*]* after a test run, and make sure that there are no oil leaks.

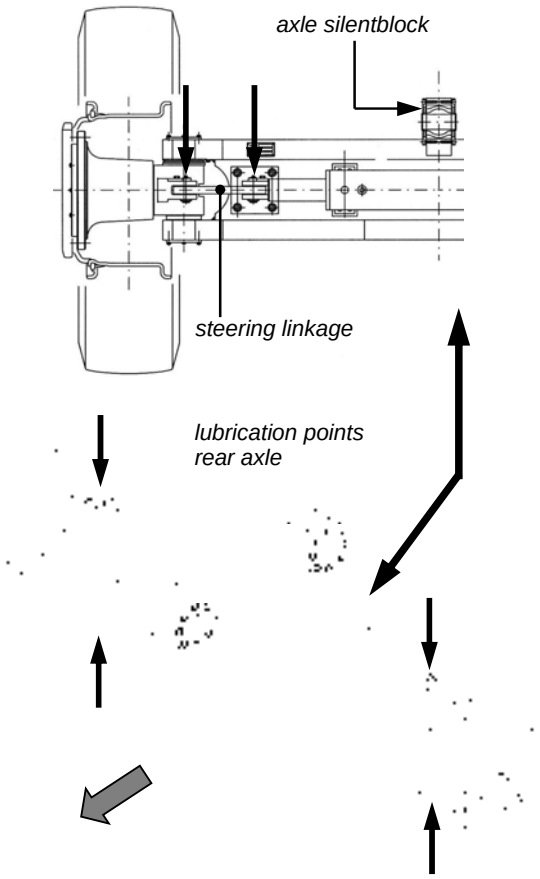


⚠ **CAUTION:**
On new vehicles, perform the first oil change after the first 100 operating hours.

STEERING AXLE

Every 100 operating hours:
With a manual grease gun ***(never use a high-pressure grease gun)***, inject grease in the lubricating nipples of the steering knuckles and of the steering linkage.

⚠ **CAUTION:**
All following service steps must be performed by qualified technicians, after having parked the vehicle on a level and compact ground and switched-off the engine.

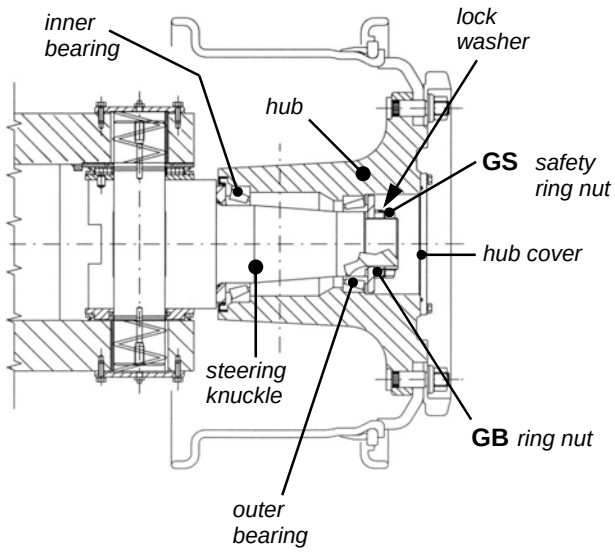


Every 500 operating hours:

- Check the structure for integrity, wear signs, bends and/or excessive clearances on pins and pivot, if necessary contact the qualified C.V.S. technicians.
- Check the fastening of the pins and the condition of the silent blocks between axle and chassis.
- Check the fastening of the wheel hub bearings, checking the tightening torque of the safety ring nut "**GS**" *(removing the hub cover)*, and verify the presence of grease.

Tightening of the wheel hub bearings:

- Tighten the ring nut "**GB**" forcefully [tightening torque **700÷800 Nm** (70-80 kgm)] till the hub resists; While tightening the ring nut, turn the hub and strike it lightly in order to let bearings settle properly.
- Loosen the ring nut "**GB**" of a ½ turn; then unlock the hub hitting with plastic mallet, or prying between the hub and the steering knuckle.
- Re-tighten the ring nut "**GB**" with a *tightening torque of* **500 Nm** (50 kgm); then forcefully tighten the safety ring nut "**GS**".
- Lock the two ring nuts "**GB**" and "**GS**" with the interposed lock washer.
- Fill the hub cover with a quantity of grease sufficient to fill the void spaces between ring nuts, bearing and cover, then place the hub cover in position.

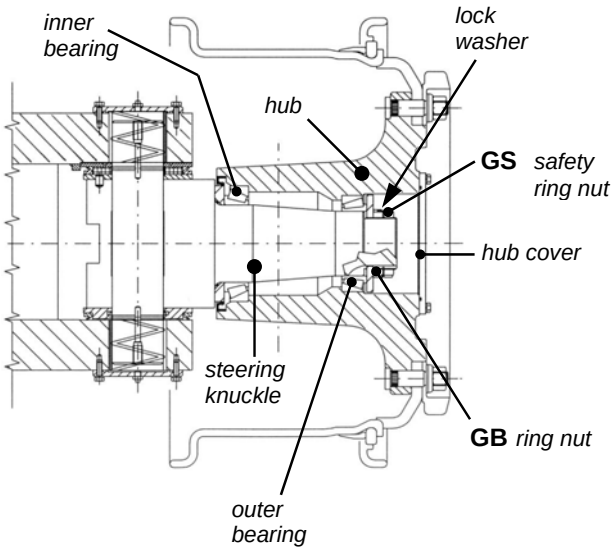


⚠ **CAUTION:**
Only skilled qualified technicians may perform the settings and adjustments.

STEERING AXLE (cont'd)

Every 1000 operating hours:

Check gap and wear of the wheel hub bearings, and replace them in case of cracks, blue discoloration and/or wear signs.



Servicing

The operating life of wheel hub bearings depends mainly on the way they are serviced.
The bearings are kept in good working order by replacing the grease regularly.
We recommend shortening the intervals of lubrication or of grease replacement if the vehicle operates under extreme climatic conditions, especially in case of leaks of water inside bearings or if they operate in desert areas.
To change the grease, pull out the hub with the whole outer bearing and with the cup of the inner bearing from the steering knuckle.
Before, clean the hub body to prevent dirt from entering the bearings or contaminating the new grease during the removal and especially the re-installation.
All used grease must be removed, or else lubricant capacity of the new grease may be compromised.
Then pull out the inner ring with rollers and the inner bearing cage from the steering knuckle.
Carefully wash all these parts with a suitable clean solvent, like for example oil of turpentine.
Carefully inspect the bearings checking for breaks, dents, etc. If the cage, races or rollers are damaged, replace the whole bearing: it is not worth reassembling a damaged bearing, as a collapsing bearing during operation would be more expensive than a new bearing.
Most of the wheel hub bearings are made so that pulling out the inner bearing cone also the seal is pulled out. But this means that, after long operating periods or in presence of contact rust on inner bearing, it will be necessary to apply a remarkable force on the cage and the rollers, inevitably bending the cage.
In this kind of use, the bearing needs always to be replaced, as the cage deformation cannot be noticed at sight.
Immediately after washing and drying, grease the bearings, or else they will get rusty shortly after, since many solvents eliminate any trace of rust inhibitors.
Perform the assembly and disassembly in the greatest clean condition: dirt and dust two to brake wear would considerably reduce the operating life of the bearings.

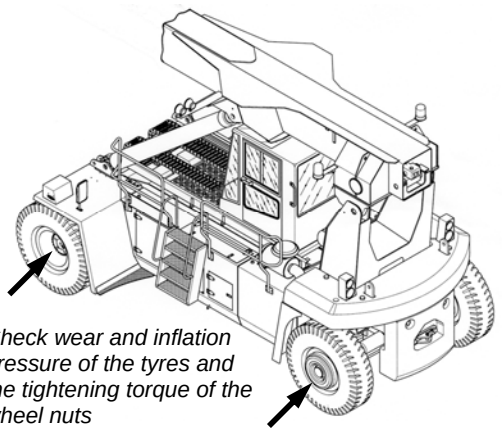
NOTE: *Perform the installation and the adjustment before installing the wheel.*

If the wheels have already been installed, we recommend using a vertically adjustable movable platform or a similar device. In this way it will be easier to centre the hub on the steering knuckle without damaging the seal or the inner bearing.
When adjusting, keep the bearings in rotation, so that all rollers of both bearings are against the guiding edges, preventing this way measurement errors.
During the servicing, if necessary replace the whole bearing, not only the cone.

⚠ **CAUTION:** **Only skilled qualified technicians may perform the servicing, setting and adjustment steps.**

TIRES AND WHEELS

⚠ WARNING:
Your safety as well as that of the load depends on tyres.



Check wear and inflation pressure of the tyres and the tightening torque of the wheel nuts

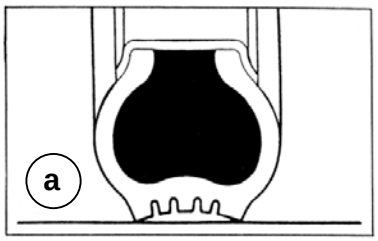
Tyre check

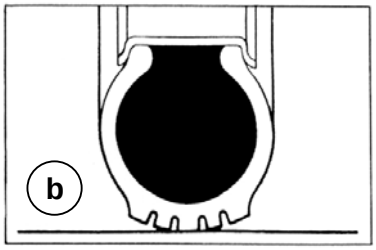
Every 100 operating hours:

☺ Check the wear and the inflation pressure of the tyres (*see section "**Tyre specifications**" in this chapter*).

⚠ CAUTION:
Inflate tyres and check pressure with cold tyres.

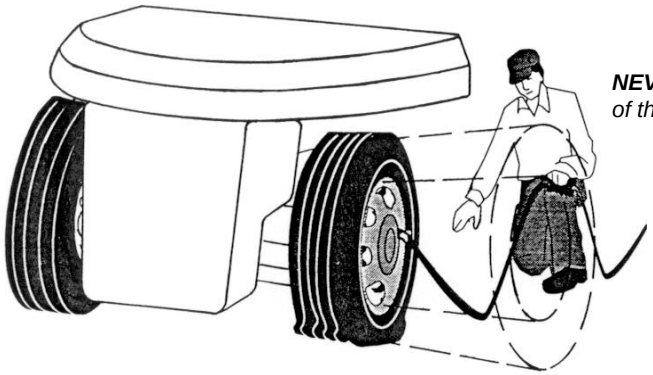
NOTE:
If the pressure is low, the tyres tend to wear on the external side of the tread (**a**) *during the drive. On the contrary, too high air pressure causes premature wear in the central area of the running tread* (**b**).
NEVER exceed the max. permissible load.





☺ Check the tightening torque of the wheel nuts as described in the section "***Wheel changing***" of this chapter.

⚠ WARNING:
NEVER stay before the rim during the inflation of the tyre and during the check of the tightening torque of the wheel nuts.



***NEVER** stand in the trajectory of the wheel*

TIRES AND WHEELS (cont'd)

Wheel changing

⚠ WARNING:
Change the wheels with the vehicle parked on a level and compact ground, without load, applying the parking brake and with the engine switched-off; additionally, chock the wheels in contact with the ground.

⚠ WARNING:
Excessively inflated or warm tyres may burst. To inflate tyres correctly, follow the instructions explained in this section.
Do not weld not cut rims; if necessary, entrust an authorised tyre repair workshop with any service steps.

Wheel removal:

- **⚠ WARNING:**
  Before starting any working procedure on the wheel, the wheel removal included, completely deflate the tyre.

  ⚠ WARNING:
  NEVER stand before the rim during the tyre deflating *(or inflating).*

- Partially loosen the wheel nuts with the wheel to be changed still in contact with the ground.

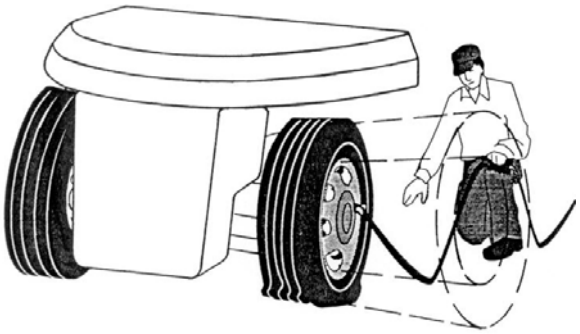
- Raise the wheel with a jack (min. lifting capacity **30** t) under the front driving axle ***(not in the middle***), or in the middle of the rear axle, making sure that the supporting and trust surfaces of the jack are level.
  After raising the wheel, for safety reasons we recommend placing suitable fixed stands under the vehicle.

  ⚠ CAUTION:
  - ***Never insert the jack under the middle of the front driving axle.***
  - ***For the proper use of the jack or of other lifting devices, carefully observe the instructions of the manufacturer of the product.***

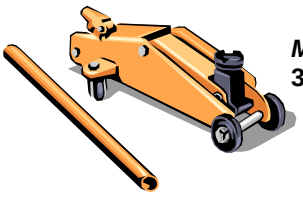
- Fully unscrew the wheel nuts.

- Before puling out the wheel from the hub, sling it with bands or chains and support the weight with a crane or similar lifting devices, to prevent it to fall on the ground.

  NOTE: ***Be careful not to damage the threads of the wheel bolts during the wheel removal.***



NEVER *stand in the trajectory of the wheel*



Min. capacity **30 ton.**

Work very ***carefully*** *when handling the wheels*

TIRES AND WHEELS (cont'd)

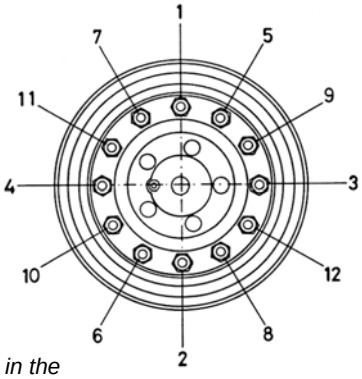
Wheel changing (continuation)

Wheel installation:

- Check the tyre for bulges or cracks and make sure that it is of the specified type (*refer to section "**Tyre specifications**" in this chapter*).
- Before fitting the wheel on the hub, carefully clean and check the wheel disk for cracks or damages ***(the use of penetrating liquids is recommended**).*
- Clean the hub, the wheel bolts and wheel nuts.
- Do not lubricate the nut seats and bolt threads.
- Before tightening the wheel nuts, make sure that the rims are properly matching with the surface contacting the hub.
- To lock the wheel safely and effectively use the originally fitted nut type, i.e. with the same thread and mating system (flat, round, tapered).
- Fit the new wheel paying attention not to damage the thread of the wheel bolts.
- Slightly tighten the nuts to ensure proper mating of the wheel with the hub.
- Tighten the wheel nuts in the illustrated sequence.
- Lower the wheel onto the ground and definitively tighten the nuts with following tightening torque.

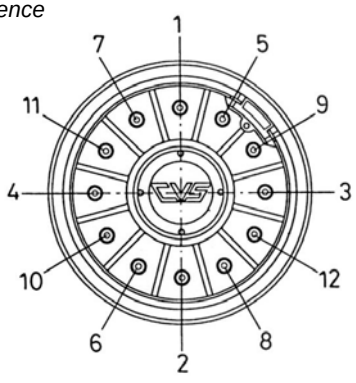
Tightening torque	Driving axle	C.V.S. Steering axle
Nm	**630 ÷ 650**	**630 ÷ 650**
kgm	**63 ÷ 65**	**63 ÷ 65**

driving axle



Tighten the nuts in the illustrated sequence

rear axle



⚠ CAUTION:

- *Excessive tightening may cause damage, there it is important to use to this purpose only proper tools, and **NOT** pipes or similar.*
- *On new vehicles, and after each wheel removal, re-tighten the wheel nuts for the **first time after 20 operating hours** and then **after 50 operating hours**.*
- *After which, check the tightening torque* **every 100 operating hours**.
- *For your safety and the safety of bystanders, **DO NOT** use other wheel or fasteners than those originally foreseen.*

NOTES:

- ☺ *In order to maintain the structural strength of rims and wheels, they must be properly used by the driver, which must regularly and constantly inspect them, for example at each tyre replacement.*
- ☺ *Wheels and rims with:*
  - *Irregular or distorted rim flanges or damaged seats of removable rings,*
  - *Cracks or breaks, even in non-critical zones;*
  - *Worn or out-of-run wheel bolt holes;*

  cannot be repaired and must be replaced in any case.

TIRES AND WHEELS (cont'd)

Wheel changing (continuation)

NOTES:

- ☺ *Rims and disks must **NEVER** be repaired by welding, or by repairs to existing welds, or by correction of wheel geometry by removal of material, as in all these cases the relevant, already fatigued zone, would certainly soon fail, two to the dynamic stresses to which it is subjected with vehicle in motion.*

- ☺ *When replacing the entire wheel, and especially when replacing detachable rings in multiple rims, make sure that the new parts are of the proper type.*
  They must be identical in size, type and shape with those being replaced.
  The marks stamped on the new parts, they should correspond with those on old parts.
  Check the suitability of the contact surfaces of the rim, in particular when tubeless tyres are to be fitted.

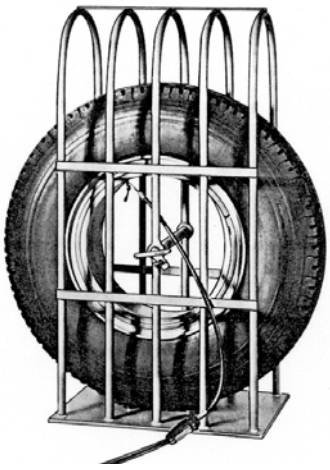
- ☺ *When fitting tyres, place wheel and tyre assembly in a **"safety cage"**, or adopt at least other equivalent safety measures.*
  When fitting new tyres to compound rims made up of separate rings, slightly inflate the tyre and then check that the rings are still correctly seated.

- ☺ *The prescriptions given above apply to any type of wheel and conform to the instructions given in the booklet **"Recommendations"** published by **ETRTO**, the European Association of Tyre and Wheel Manufacturers:*

⚠ **WARNING:**
Wheel fitting and removal procedures must only be carried out by qualified technicians, who will strictly obey the directions given above, as well as those written in the manuals supplied by the tyre manufacturers.

***NEVER** stand in the trajectory of the rim*

*Place wheel and tyre assembly in a **"safety cage".***



TIRES AND WHEELS (cont'd)

Tyre specifications

Tyres **14.00-24 PR24 o PR28** *(with tube)* *(tubeless)*

Inflating pressure *(cold tyre)* = **10 bar**

⚠ **CAUTION:** ***Tyre pressures must be checked and corrected on cold tyres.***

⚠ **CAUTION:** ***Upon tyre change, make sure that the manufacturer guarantees the following minimum load ratings.***
In any case, we recommend to contact the qualified C.V.S. personnel.

Vehicle speed (km/h)	Tyre load limit (kg)
Stationary	17.100
1	15.200
5	13.775
10	12.825
15	12.350
20	12.065
25	11.875

NOTE:

Recommendations when using tyres at temperatures under* 18° C** (0°F).***

Tyres may generally be used at temperatures up to ***-50° C*** *(-58°F).*
Anyway, following two starting conditions must be considered :

a) *Parking the vehicle and measure/correction of the inflating pressure in closed areas at room temperatures higher than* **0°C** (32°F).
In this case no particular precautions are necessary, just increase the pressure according to the external temperature as shown in the chart below.

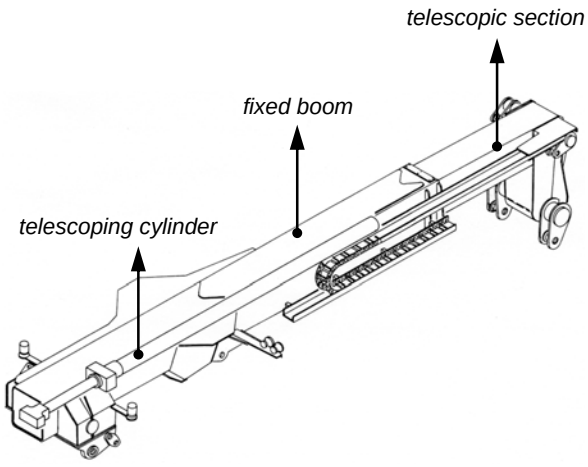
b) *Parking the vehicle and measure/correction of the inflating pressure outdoors.*
The pressure is the one normally prescribed for operation loads.
If the vehicle has been standing still for many hours (by night, over the weekend), after moving off, ***the vehicle speed must not exceed 5 km/h for at least* 15 minutes *of real movement of the vehicle.***

	OUTSIDE TEMPERATURES										
Rated pressure	10°C (50°F)	4°C (40°F)	-1°C (30°F)	-7°C (20°F)	-12°C (10°F)	-18°C (0°F)	-23°C (-10°F)	-29°C (-20°F)	-34°C (-30°F)	-40°C (-40°F)	-46°C (-50°F)
bar 10	10,8	10,9	11,1	11,3	11,5	11,7	11,9	12,1	12,4	12,7	12,9
psi 145	156	158	161	164	167	170	173	176	180	184	187

TELESCOPIC BOOM

The boom is made of very high strength steel, with an extremely functional design.

The complete boom structure consists of :
1 - Fixed boom
2 - Telescopic section
3 - Telescoping cylinder



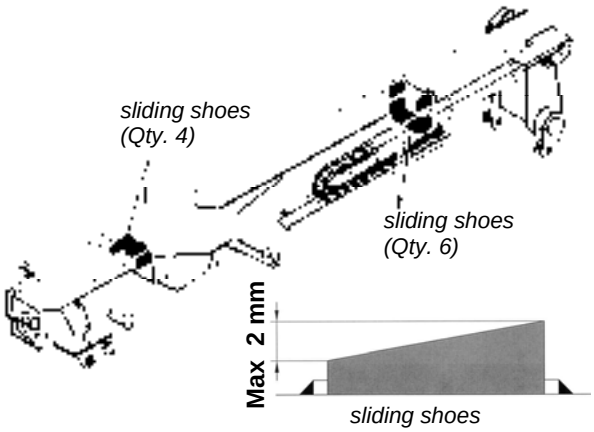
One proximity switch is belonging to the load limiter system and installed between the chassis and the boom *(on the rear left-hand side),* limit the boom lifting.

Every 100 operating hours:

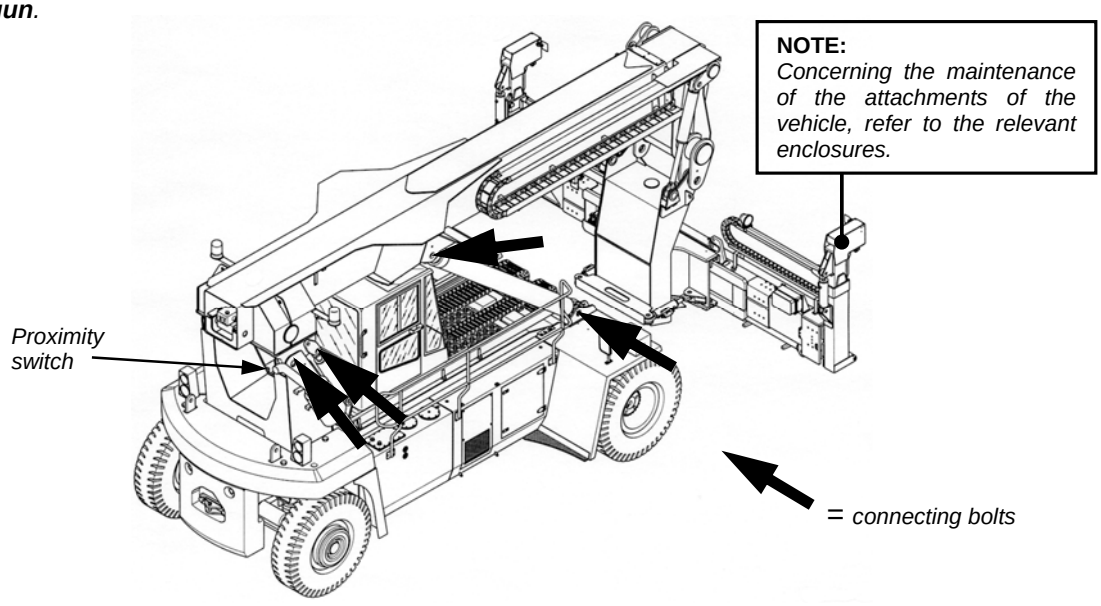
Carefully clean, check and lubricate following parts:

- the connecting bolts between boom and chassis;
- the connecting bolts of the lifting cylinders;
- the connecting bolts of the telescoping cylinder;
- the sliding shoes on the boom:
  - *front, after telescoping out the mobile boom;*
  - *rear, with the mobile boom retracted.*
- also check the sliding shoes for wear, which must be even; the maximum difference allowed *(in each direction)* is **2 mm**; **if this value is exceeded, the sliding shoes must be replaced**, otherwise this could lead to torsional stress with resulting damage to the structure *(See the description on the following page)*;

Furthermore, check, clean and if necessary, adjust the proximity switch of the boom *(lifting).*



NOTE:
To inject the grease in the lubricating nipples, use a manual grease gun, ***never use a high-pressure grease gun****.*

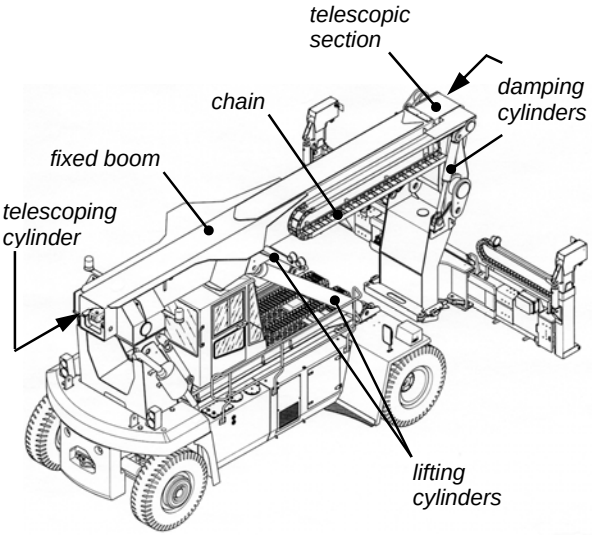


BOOM (cont'd)

Every 500 operating hours:

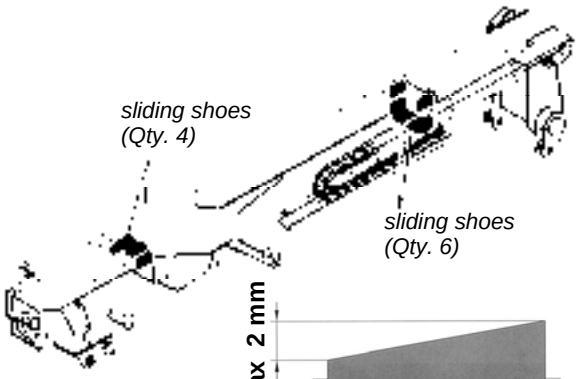
Carefully inspect the whole structure of the boom for integrity, signs of wear, bends and/or excessive clearances, especially:

- check the welds and the guides;
- check the fastening of the lifting and telescoping cylinders and their bases;
- make sure that the cylinders *(lifting, telescoping, damping)* connecting bolts, are properly seated;
- check the conditions of the bushings and of the sleeves;
- check the tightening of all fasteners *(screws, bolts etc.)*;
- check the integrity of the lifting, telescoping and damping cylinders;
- check the condition and tightening of the chain *(on the side boom)*;
- clean and make sure the lubrication of the whole boom structure.



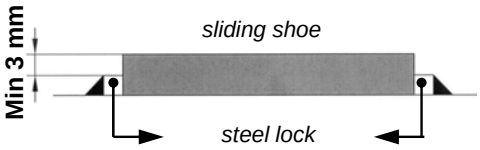
- check the condition of the sliding shoes *(replace them if necessary):*
  - *front, after telescoping out the mobile boom;*
  - *rear, with the mobile boom retracted;*

  the sliding shoes must be replaced when the difference between them and the steel lock is 3 mm.



Every 2000 operating hours:

If necessary, replace the slide shoes fitted on the boom
[Check for wear *(see previous page)* and clearance].



Continued on following page ➔

BOOM (cont'd)

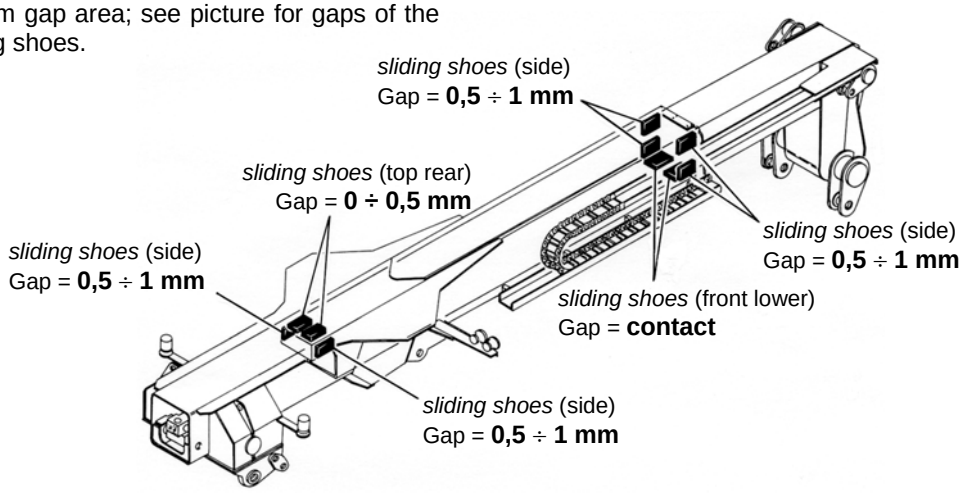
Sliding shoes adjustment

The front sliding shoes on the boom side have a centring function and should be adjusted after boom centring.

Purpose of this adjustment is to avoid the pre-stress of the sliding shoes (*maintaining adequate gaps as well*) and high loads in the boom material in the contact area between boom and shoe.

The gap between the wall of the telescopic section and the shoe surface should be between **0,5** and **1 mm**; check this gap with a thickness gauge at distances of 1 m on the boom telescoping length.

In case of larger gaps, due for example to boom bending in the checked area, the gap between the sliding parts may be reduced to a limit of **0,2 mm** in the minimum gap area; see picture for gaps of the other sliding shoes.



NOTES:

☺ *Check the clearance of the sliding shoes with the telescopic boom retracted (boom closed).*

☺ *It is only possible to use the shims with new sliding shoes.*

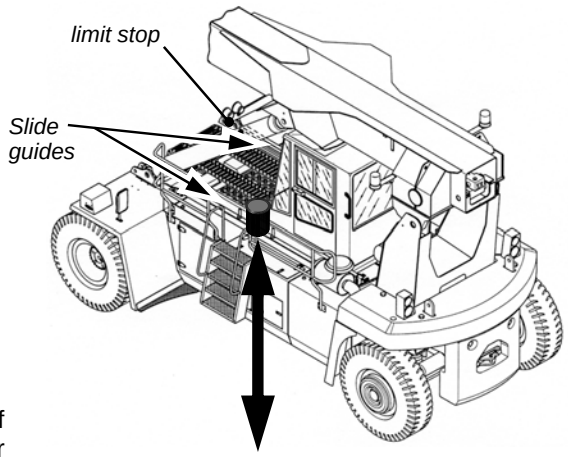
⚠ **CAUTION:**
All of the operations described here must be performed by suitably informed, trained and qualified staff, who must operate in conditions of maximum cleanness and safety.
Switch off the engine and make sure that the parking brake is engaged.

⚠ **CAUTION:**
For any doubts and further information, please contact the qualified staff at C.V.S.

CAB SLIDING SYSTEM

Every 100 operating hours:

- Check, clean and if necessary, adjust the sensors of the system *(refer to chapter 4 "Operation of the vehicle controls");*
- Check clean and grease the slide guides and the cab lock system;
- Verify the limit stop fixing;
- **If the cab sliding is controlled hydraulically:** Check, clean and grease the slide guides of the cab, the rack and the pinion.



cab sliding ydraulic brake

NOTE:

☺ *The sensors are located:*
(*refer to chapter 4 "Operation of the vehicle controls*").

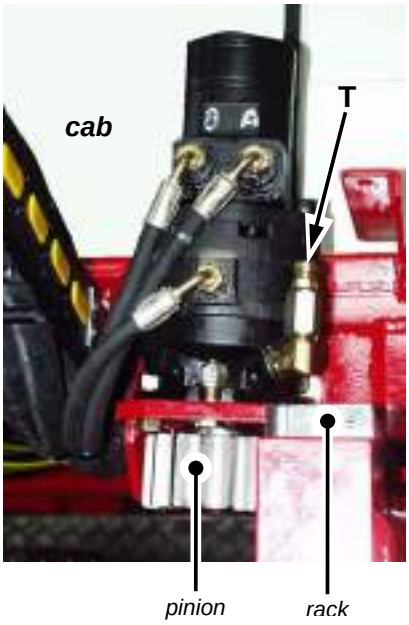
Every 500 operating hours:

- Carefully check the working order of the slide guides of the cab support structure and the lock pin and look for any signs of wear, deformation and/or excessive clearance; also check all of the welds.
- Check the integrity of the rack and the pinion.
- Check the tightening of all fasteners [screws, bolts etc.] *(See relevant charts at the end of this chapter).*

Cab sliding hydraulic braking system

(fitted if the cab sliding is controlled hydraulically)

The hydraulic brake is fixed to the sliding frame, which the cab is fastened to, on the front right part.

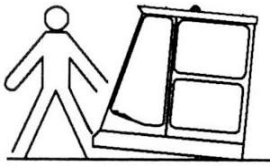


Every 1000 operating hours:

- Check the disc brake oil level after releasing the plug "**T**"; if necessary top up through the same hole with new oil *(see Fuel and Lubricants Chart)*.
- Check and clean also the bleed plug "**T**".
- Check that there are no leakages on the input and output shafts and flanges; if necessary replace worn-out seals.

⚠ **CAUTION:**

- ***Before any maintenance step on the braking system, disconnect all hydraulic and mechanical connections.***
- ***The braking system must never work dry.***



⚠ **WARNING:**
DO NOT allow anybody to stop in proximity of the driver's cab when it is working

⚠ **WARNING:**

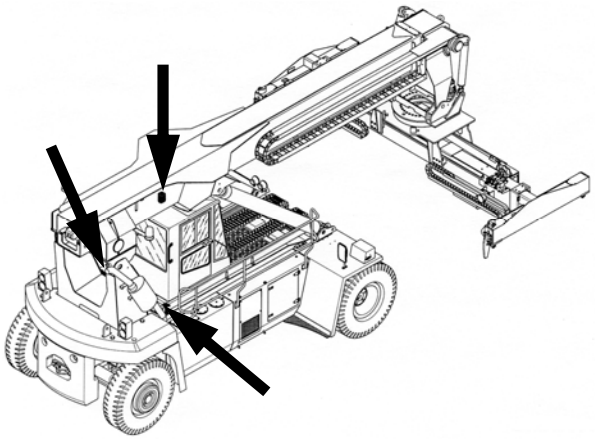
- ***Switch-off the engine and be sure to apply the parking brake before starting a maintenance or repair step.***
- ***Only skilled and trained technicians operating in maximum safety and cleanness conditions must perform all above described service steps***

TILTING CAB
(if fitted)

Every 100 operating hours:

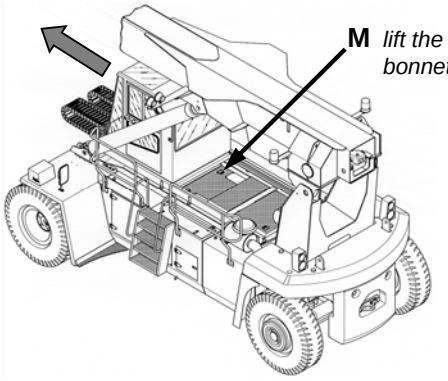
- Check, clean and if necessary adjust the sensors of the system *(see chapter* 4"Operation of the vehicle controls").
- Check and clean the guides of the tilting cylinders.

NOTE: *To access the tilting cylinders, slide the cab forwards (cab sliding: see the chapter 4 "Operation of the vehicle controls"), then lift the movable bonnet "**M**".*



Every 400 operating hours:

- Carefully verify the integrity of the tilting cylinder supports and of the cab carriage, checking for signs of wear, strains and/or excessive gaps; moreover check all welds.
- Carefully verify that all pivots and cylinders are securely seated and check for signs of wear, strains and/or excessive gaps.
- Verify the integrity of the tilting cylinders;
- Check the tightening of the bolts *(see relevant Tables at the end of this chapter).*



WARNING:

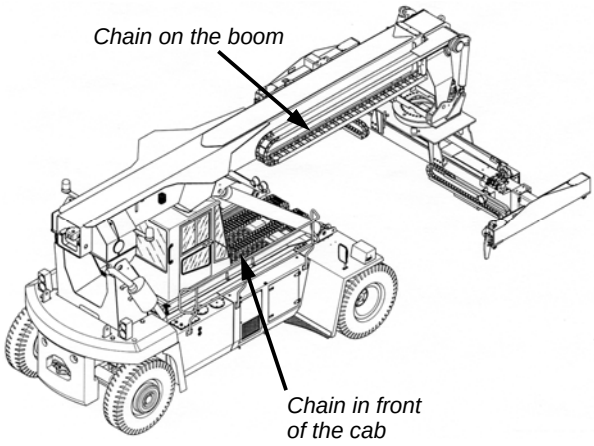
- ***Switch off the engine and apply the parking brake before any maintenance operation or repair.***
- ***NEVER venture under the cab when it is tilted up.***
- ***DO NOT use the vehicle without the side protections of the cab.***
- ***All the above mentioned steps must be performed only by skilled, trained personnel working in the maximum safety conditions.***

CHAIN/S
(if fitted)

The vehicle is equipped with chains on the boom and in front the cab.

Every 500 operation hours:

- carefully check the chains for integrity, wear signs, bends and/or excessive clearances;
- Check the chains slack due to wear:
- Carefully check that all bolts are firmly fastened in their seats and do not show wear signs, bends and/or excessive clearances;
- Carefully clean all chains pivots;
- Check the fastening of screwed joints.



WARNING:

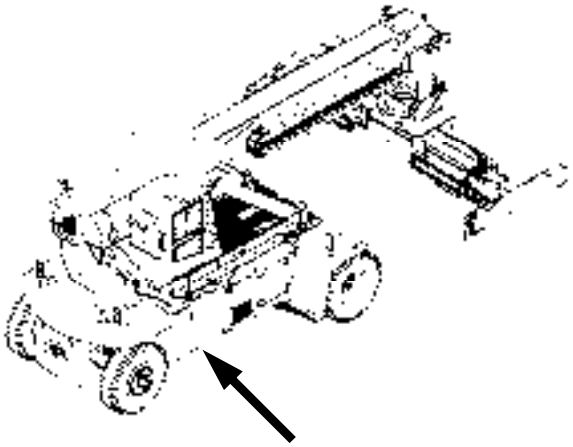
- ***Only skilled and trained technicians operating in maximum safety and cleanness conditions may perform above mentioned steps.***
- ***Before starting any maintenance or repair procedure, switch-off the engine and make sure that the perking brake is applied.***

HYDRAULIC SYSTEM

Hydraulic oil tank

This tank is located on the right-hand side of the vehicle.

The hydraulic oil in it has the function to feed simultaneously all the hydraulic systems of the vehicle *(lifting, telescoping, steering, brakes and if fitted the cab tilting system)*, as well as the hydraulic systems of the possible attachments of the vehicle.

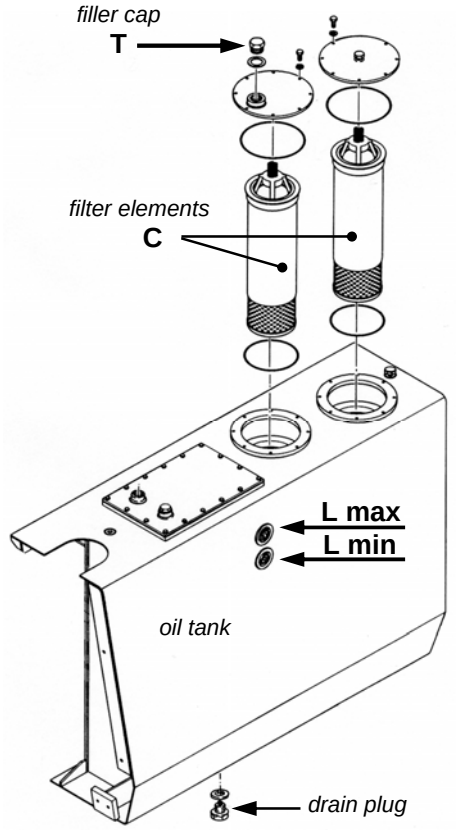


⚠ **CAUTION:**
Before performing all the following maintenance steps, park the vehicle on a <u>level, compact ground</u>, apply the parking brake, switch off the engine *(if not differently specified)* ***and place <u>the wheels in straight line</u>.***

Daily:

Park the vehicle as previously described, fully lower and retract the boom;
then check the oil level through the check windows "**Lmin**" and "**Lmax**".

If necessary, top up with fresh oil to the proper level through the filler plug "**T**", as indicated in chapter 7 "LUBRICATION" section "***Fuel and Lubricant chart***".



NOTE: ***Use only filtered and clean oil.***

⚠ **CAUTION:**
Always operate in condition of maximum cleanness when checking the oil level and refilling.

⚠ **CAUTION:**
On new vehicles:
- ***perform the replacement of the filter elements "C" after the <u>first 100</u> operating hours;***
- ***change the hydraulic oil after the <u>first 500</u> operating hours.***

Working procedures: see following descriptions.

HYDRAULIC SYSTEM (cont'd)

Every 500 operating hours:

- Replace the filter cartridges "**C**", **or in any case, when the relevant warning light switches on** in the alarms signal area inside the cab *(see the section in chapter* 3 "Driver's cab").

  Perform the replacement as follows :

  ☺ switch-off the engine;

  ☺ unscrew the screws "**1**" and remove the covers "**2**";

  ☺ remove the filter cartridges "**C**" and replace them with new ones;

  ☺ check all the seals and replace them if deteriorated or damaged;

  ☺ install the covers "**2**" and fasten them with the screws "**1**".

- Clean the pressurised cap "**P**" and check it for proper operation; replace it, if damaged.

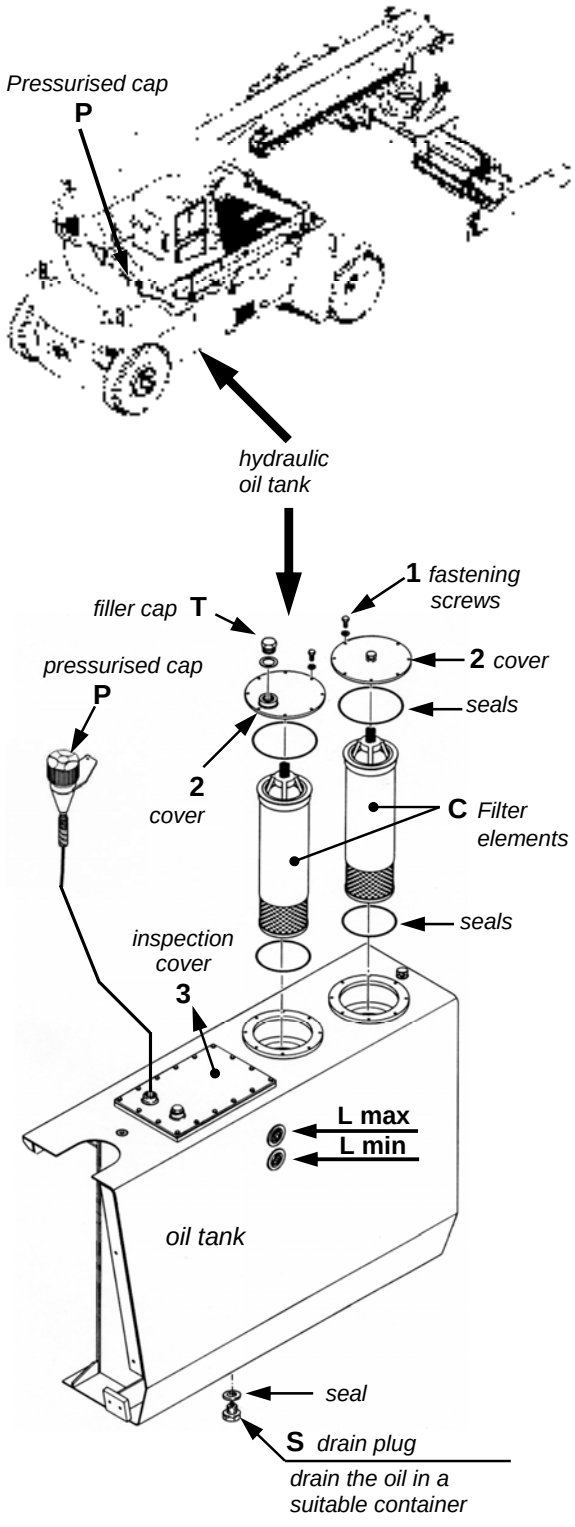
Every 3000 operating hours or at least yearly:

Change the hydraulic oil as follows:

- park the vehicle as previously described, fully lower and retract the boom, then switch-off the engine;
- remove the filler plug "**T**" and the pressurised cap "**P**" *(by loosening them)*;
- drain the oil in a ***suitable container*** by loosening the drain plug "**S**" located under the tank;

  NOTE: ***To drain completely the oil from the system, remove the drain plug on the brake unit of the front driving axle*** *(refer to "driving axle" section)****.***

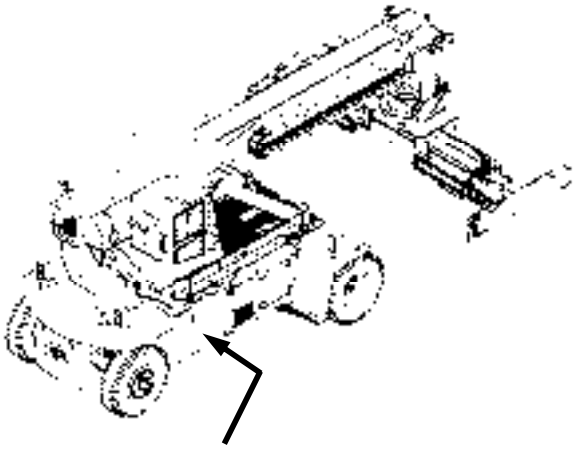
- drain off the oil, checking that there are no metal particles;
- remove the inspection cover "**3**" and check that the inside of the tank is clean, if necessary clean it;
- install the drain plug "**S**" making sure that the seal is not damaged, if necessary replace it;
- fill the tank with fresh oil, as prescribed in chapter 7 "LUBRICATION" section "***Fuel and Lubricant chart***", through the filler plug hole "**T**";
- Install again the cap "**T**" and the pressurised cap "**P**", start the engine and perform some boom lifting and telescoping manoeuvres, so that the pumps feed the whole system with oil;
- move the boom to the retracted/lowered position, the wheels in a straight-line movement position and, after switching off the engine, check the level again; if necessary, refill as described previously and check that there are no oil leaks.



HYDRAULIC SYSTEM (cont'd)

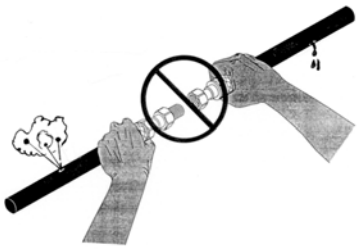
⚠ **CAUTION:**
Avoid the penetration of dirt and foreign particles in the tank while topping up the hydraulic oil, in order to prevent filters from clogging.

⚠ **CAUTION:**
When changing the hydraulic oil, check the condition of all hoses. If the hoses show signs of wear *(tears, swellings, oil sweating, frayed rubber or cracks in the fittings)****, they must be immediately replaced.***



hydraulic oil tank

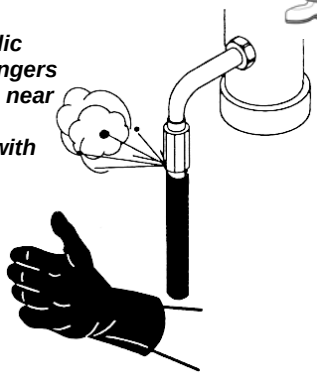
⚠ **WARNING:**
NEVER check hydraulic fluid leaks with you fingers.
Do NOT put your face near possible leaks.
Check the leaks with a piece of paperboard.
If the hydraulic oil penetrates into your skin, contact immediately a doctor.



*Check the condition of the hoses; do **NOT use** hoses with signs of wear.*

⚠ **WARNING:**
Only skilled and trained technicians operating in maximum safety conditions and cleanness must perform all above described service steps.

NEVER check hydraulic fluid leaks with you fingers
Do NOT put your face near possible leaks.
Avoid direct contact with oil.



PRESSURISED OIL MAY CAUSE SERIOUS INJURY OR DEATH

HYDRAULIC SYSTEM (cont'd)

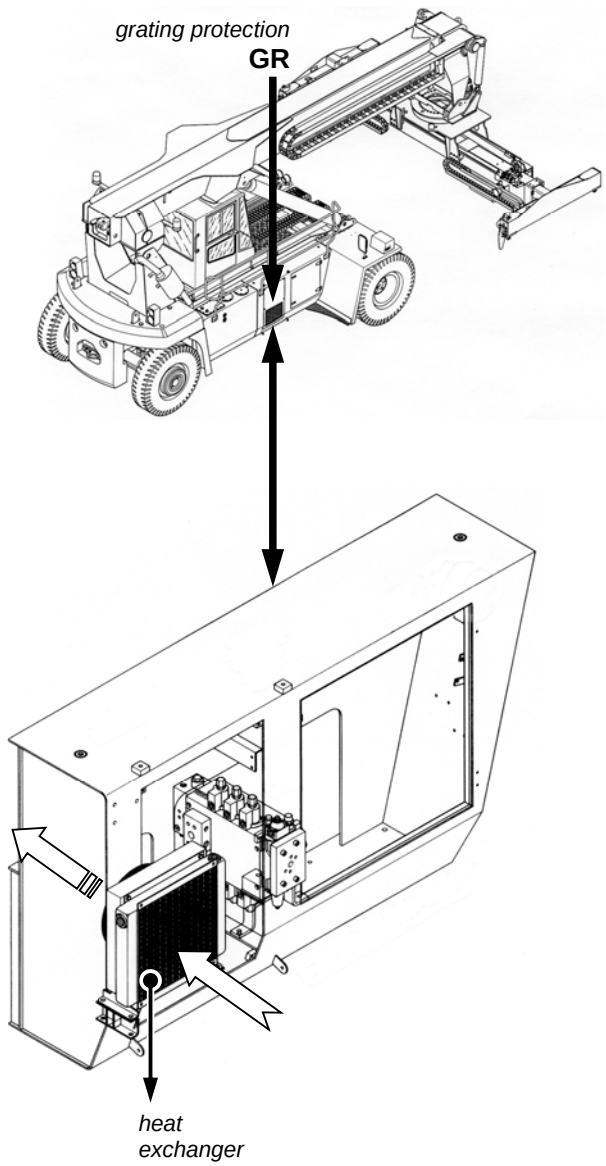
Air / Oil heat exchanger

To access the heat exchanger, unscrew the screws and remove the grating protection (**GR**), located on the right-side of the vehicle.

Weekly:

Check that the radiator is not clogged, to this purpose make sure that there is no dust, mud, leaves etc. on the air inlet surface and, if necessary, clean it immediately with compressed air/steam.

NOTE:
*The use of these cleaning methods requires proper safety protections for your hands, face and eyes (see chapter 2 "**SAFETY**").*



HYDRAULIC SYSTEM (cont'd)

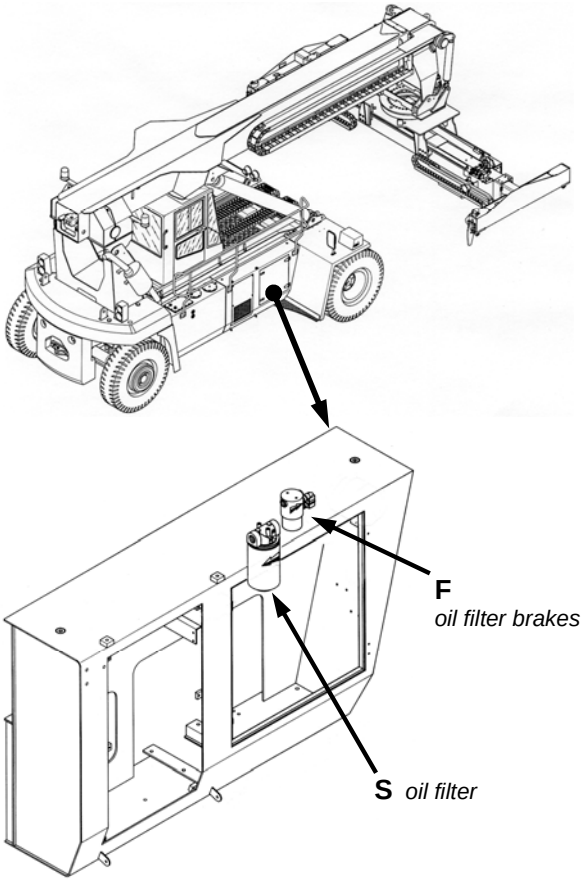
Braking System

Filters

The braking system is equipped with two filters:

- ☺ Brake fluid filter "**F**", on the *delivery line;*
- ☺ Oil filter "**S**", on the *return line*.

The filters are located inside the right body side of the vehicle.

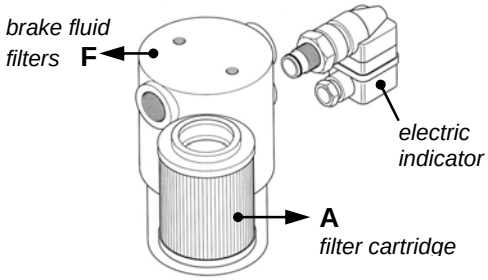


⚠ **CAUTION:**

- ***Before replacing the filters, make sure that the system is not pressurised.***
  To de-pressurise the system, switch-off the engine and brake several times.
- ***Before replacing the filters, place a suitable container under them to collect the oil, in order not to spill it on the ground.***

Every 500 operating hours:

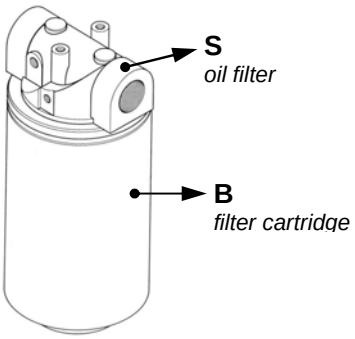
- Replace the filter cartridge "**A**" of the *brake fluid filter* "**F**", or **in any case at the lighting-on of the relevant warning light** in the alarm field, in the driver's cab *(refer to the relevant sections in chapters* 3 "Driver's cab")
- Replace the filter cartridge "**B**" of the oil filter "**S**".



NOTES:

- ☺ *Unscrew the filter cartridges or their cups with a filter wrench, then clean their seats, and lubricate the seals of the new cartridges.*
- ☺ *Check the condition of the seals, replace them, if damaged.*
- ☺ *After the replacement of the filters, start the engine for a short period of time, then check that there are no oil leaks and re-check the oil level in the tank as previously described.*

⚠ **CAUTION:**
Only skilled and trained technicians operating in maximum safety conditions and cleanness must perform all above described service steps.

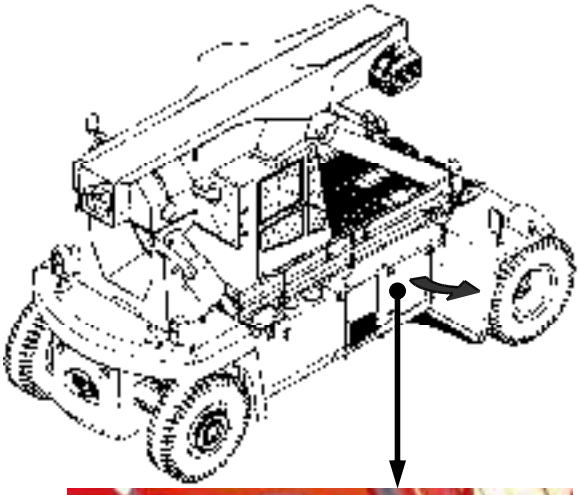


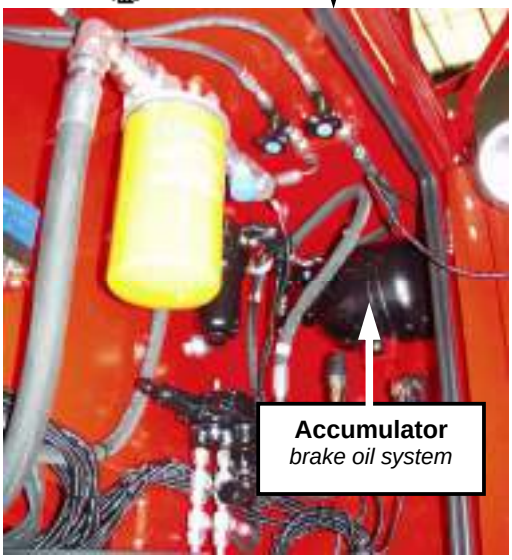
HYDRAULIC SYSTEM (cont'd)

Braking System (continuation)

Accumulator

The accumulator is located inside the right body side of the vehicle.





⚠ **CAUTION:**
Before servicing the accumulator, make sure that the system is not pressurised.
To de-pressurise the system, switch-off the engine and brake several times.

Operation check

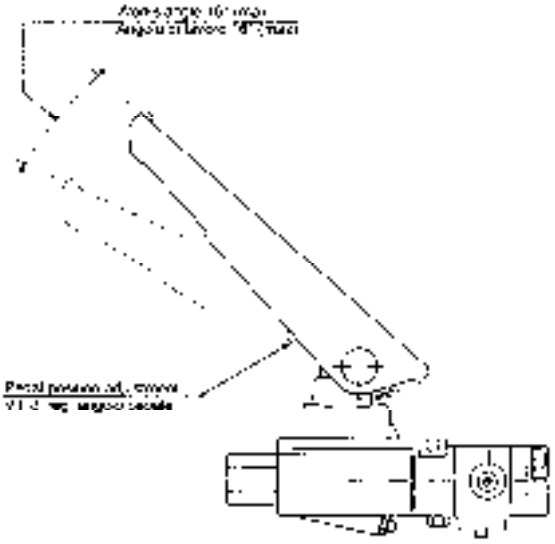
The accumulator is pre-charged with pressurised nitrogen gas.
It is possible to check the gas pressure in the accumulator with a manometer.
For this check drain off the hydraulic fluid from the accumulator.

The gas pressure may be checked by way of the hydraulic fluid pressure, as follows:

- ☺ fit a manometer on the fluid delivery pipe between the accumulator and the brake valve;
- ☺ with the accumulator pressurised, switch-off the engine and brake repeatedly to depressurise it, the pressure will drop slowly to a certain level, and then suddenly drop to zero;
- ☺ The last reading before the pressure-drop to zero corresponds to the preloading gas pressure.

Pedal angle adjustment *(in the cab)*

Loosen the screw underneath and adjust the angle with the grub screw located under the pedal footrest.
Tighten the grub screw and the screw in the desired position.



⚠ **CAUTION:**
Only skilled and trained technicians operating in maximum safety conditions and cleanness must perform all above described service steps.
If adjustments are needed, please contact the C.V.S. Service Department.

NOTE: ***Anyway*** *refer to the enclosed hydraulic diagram.*

HYDRAULIC SYSTEM (cont'd)

Hydraulic system for brake and declutch pedal compensation

This is supplied from an oil tank in the cab on the left side of the seat support, close to the fuse boxes.

Weekly
Check the level in the reservoir, if necessary, top-up with hydraulic oil *(same of the hydraulic oil tank)*.

Hydraulic oil tank of pedal compensation system

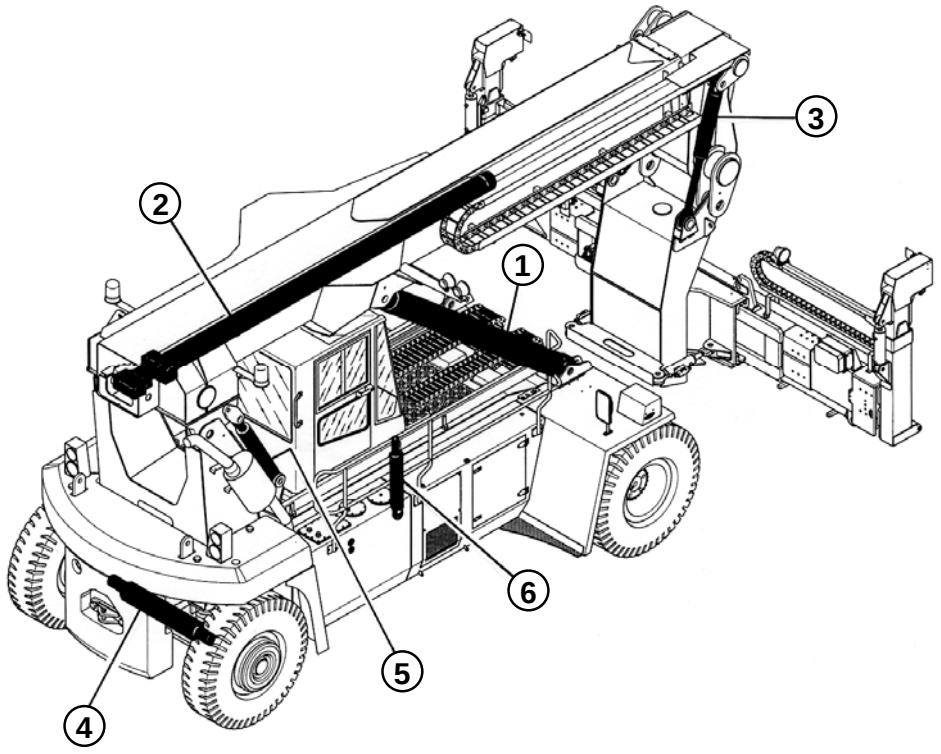
HYDRAULIC SYSTEM (cont'd)

Cylinders

Every 6000 operating hours:

Overhaul all the cylinders installed on the vehicle:

1 - Boom lifting *(2 cylinders)*
2 - Telescopic boom extension
3 - Damping *(2 cylinders)*
4 - Steering
5 - Rear levelling cylinders *(2cylinders)* [if fitted]
6 - Cab tilting [if fitted]



NOTE:
For the attachment cylinders refer to the relevant enclosed manual.

⚠ **CAUTION:**
When overhauling a cylinder, replace completely the seals, also if they do not show signs of wear.

⚠ **WARNING:**

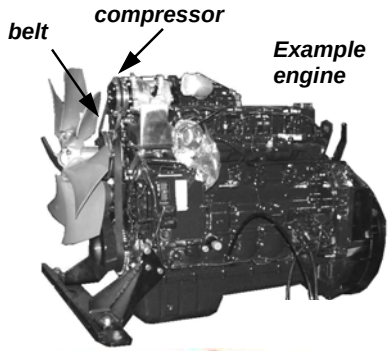
- ***Sling and hold the cylinders with chains or bands during their transport, to avoid them falling on the ground and damaging them and causing personal injury.***
- ***Only skilled and trained technicians operating in maximum safety conditions and cleaning must perform all above described service steps.***

AIR-CONDITIONING SYSTEM

Weekly:

- Check the tension of the compressor belt *(on the right or left engine side).*
- Inspect the condenser and clean it with compressed air *(max 8 bar)*; use the same procedure also for the filter in the cab.

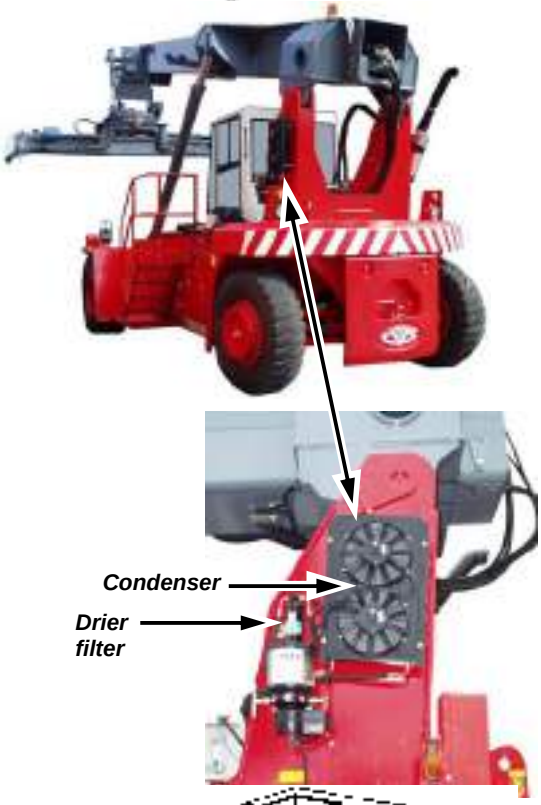
NOTES:
- *The **condenser** is fixed on the outside, on the back left upright of the frame.*
- *The **cab filter** is inside the cabt.*



Yearly:

- Check the gas filling.

NOTE:
- *In case of gas filling,* replace also the **hygroscopic filter**, *located near the condenser*.
- *The gas load connections are fitted on inlet/outlet compressor hoses.*



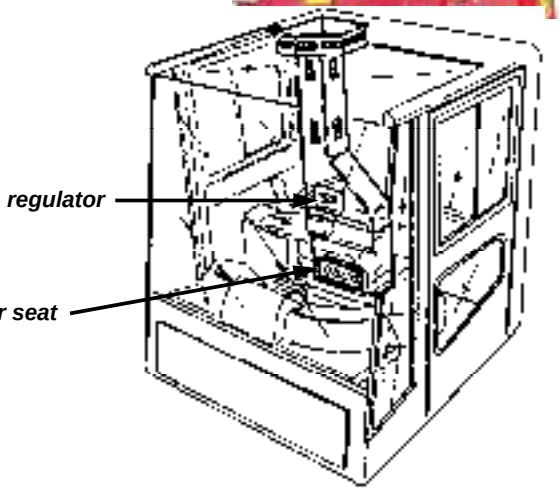
⚠ WARNING
To refill, use only following products:

- **Gas** **R134 biogas** *(1 Kg)*
- **Compressor oil** **PAG SP10** *(1 ounce when void)*

NOTE:
Perform the oil filling with proper equipment and only in case of gas leaking.

⚠ CAUTION:
To ensure full performances and proper function of the air conditioning system, it is necessary to switch it on at least once a week, also if only for a short time.

⚠ CAUTION:
For maximum performances and reliability of the system, these servicing steps should be carried out in specialised workshops.



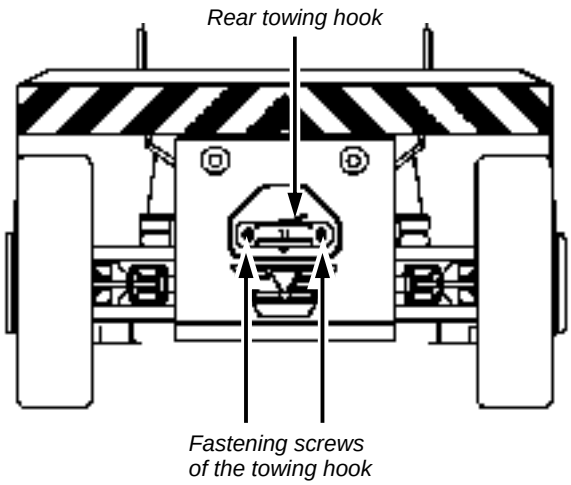
TOWING HOOK

Every 500 operating hours:

- Restore the tightening torque of the fastening bolts of the rear towing hook:

  Tightening torque = **2000 Nm** (200 kgm)

- Check the integrity of the towing hook, then clean and lubricate the bolt.



⚠ **CAUTION:**
Perform the first check after the <u>first 250 operating hours.</u>

⚠ **CAUTION:**
During the checks, always work in maximum cleanness conditions.

⚠ **WARNING:**
Before checking the tightening torques switch-off the engine and apply the parking brake.

COUNTERWEIGHTS

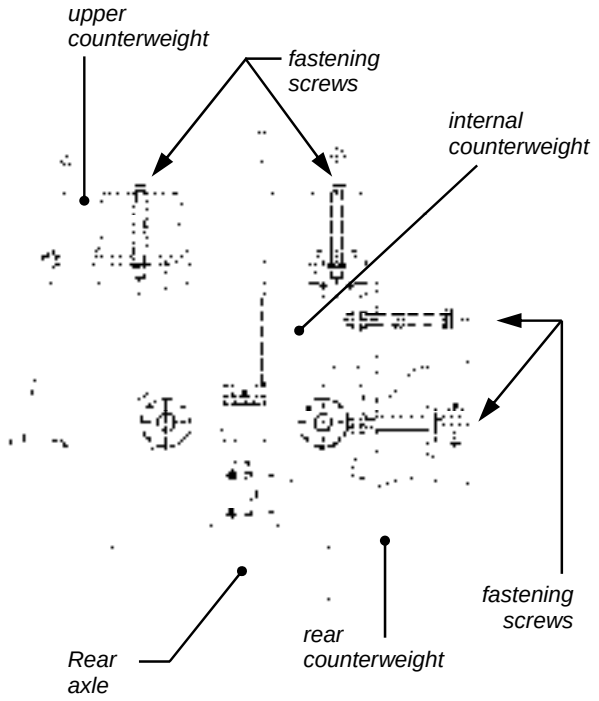
Every 500 operating hours:

- Restore the tightening torque of the fastening bolts of the all counterweights:

  Tightening torque = **2000 Nm** (200 kgm)

- Check the integrity of the counterweights, making sure that there are no cracks or breaks.

  ⚠ **WARNING:**
  DO NOT use the vehicle with cracked or damaged counterweights. DANGER!



⚠ **CAUTION:**

- ☺ ***Perform the first check after the <u>first 250 operating hours.</u>***
- ☺ ***During the checks, always work in maximum cleanness conditions.***

⚠ **WARNING:**
Before checking the tightening torques switch-off the engine and apply the parking brake.

LUBRICATION

Manual

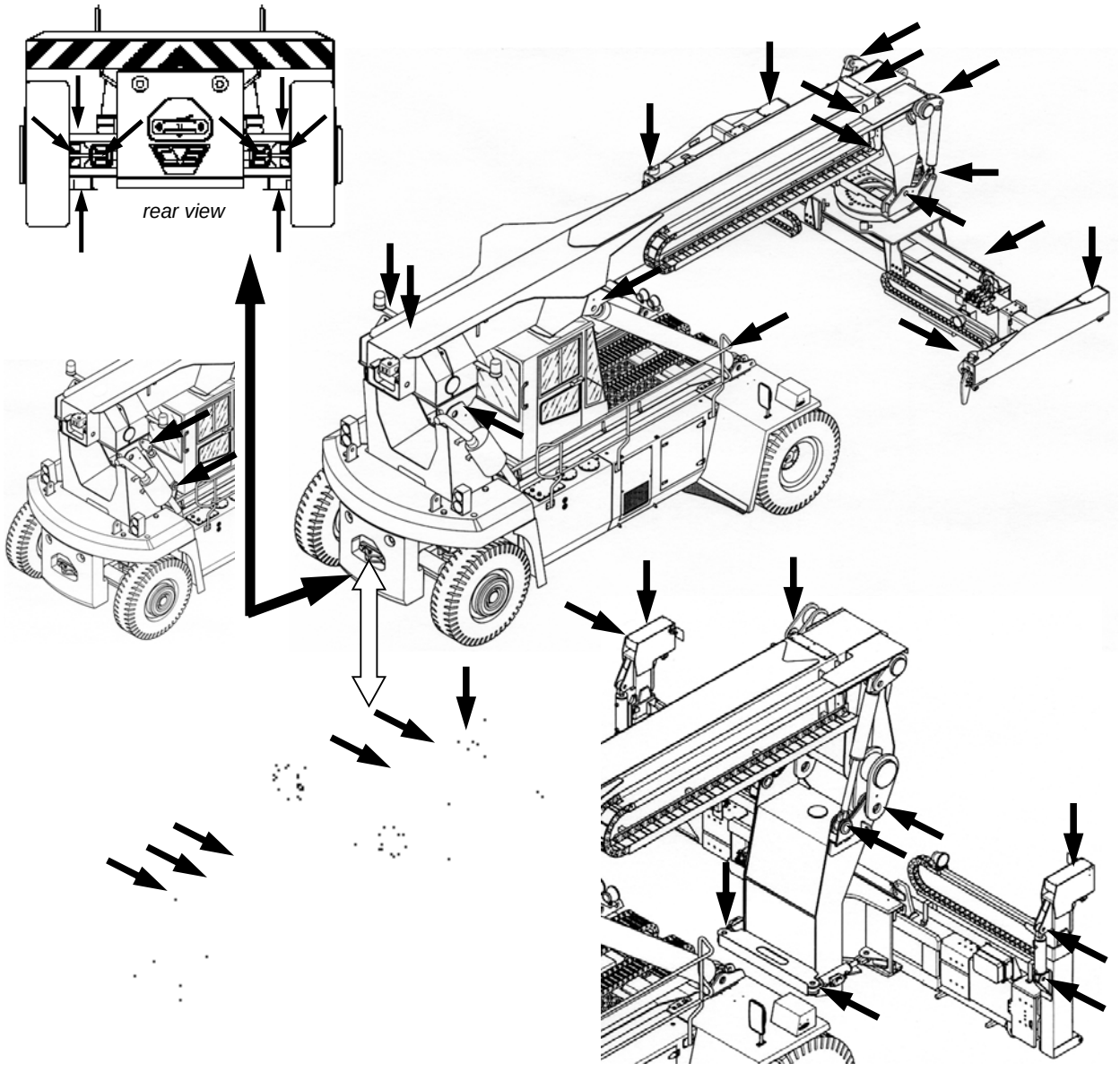
Greasing must be performed on each single lubricating point.

Every 100 operating hours:

Clean and then with a manual grease gun *(**never use a high-pressure grease gun**)* inject grease in the lubricating nipples.
Inject grease until the greased is forced out from the nipples.

NOTE: *Anyway, refer to the relevant descriptions in this chapter.*

WARNING:
All above described service steps must be performed only by skilled and trained technicians operating in maximum safety and cleanness conditions, after having parked the vehicle on a level, compact ground and applied the parking brake.



LUBRICATION (cont'd)

Automatic Centralised Lubrication System (option)

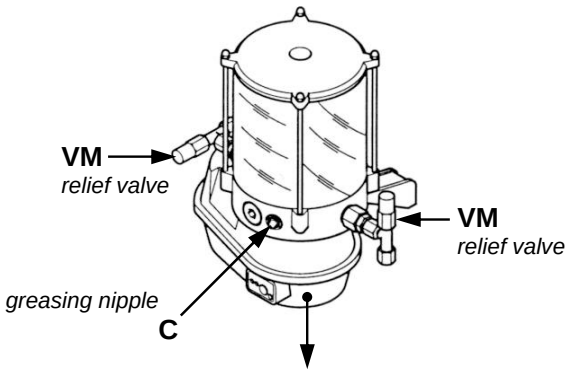
The automatic centralised *(progressive)* lubrication system allows to optimise the lubrication of all parts and to check the whole plant for proper function in only one step. It consists of:

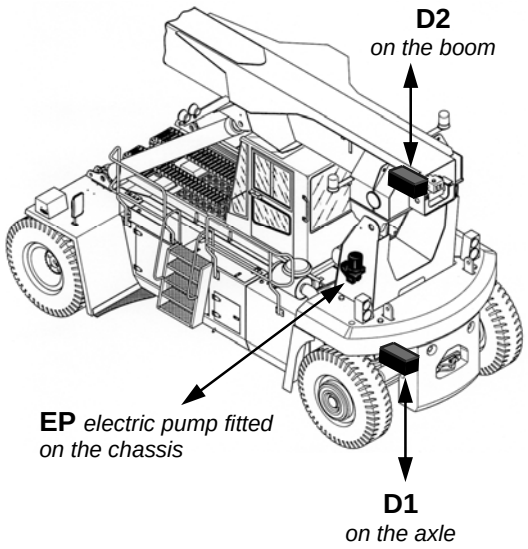
- **Electric piston pump(s) "EP"**
  The high-pressure pumps Mod. EP-1 feed grease to the system and are located:
  - On the chassis, behind the cab, on the left side of the water expansion tank;
  - On the fitted attachment *(spreader).*

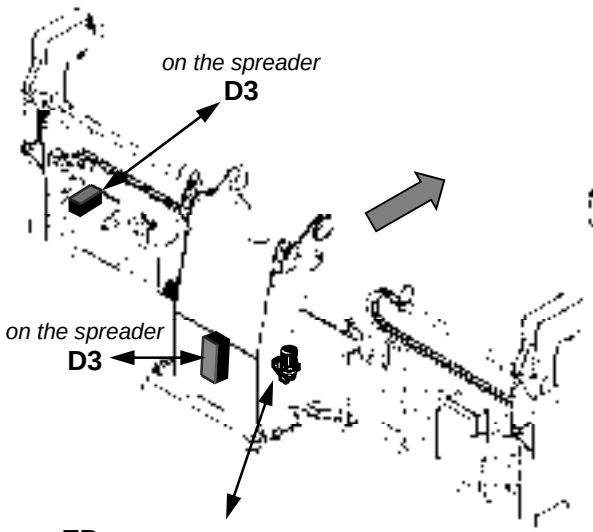
- **Main distributors "D"**
  These devices supply the grease in pre-set quantities to the various users and/or to the auxiliary distributors "**DS**" *(if fitted)*, and are located:
  - "**D1**" on the rear axle, to the left side;
  - "**D2**" on the rear middle side of the fixed boom *(lower)*;
  - "**D3**" on the fitted attachment *(spreader).*

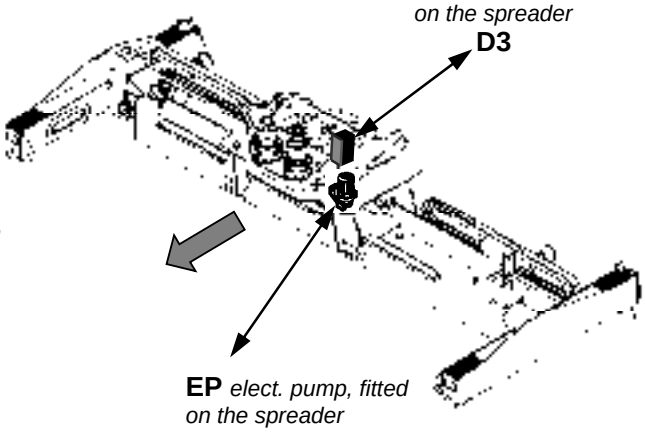
- **Auxiliary distributors "DS"** *(if fitted)*
  Supply the grease in pre-set quantities to the various users.

- **The Electronic control unit S-EP 5** *(integrated in the pump)* permits to set the intervals and the cycle time in minutes of the pump.









LUBRICATION (cont'd)

Automatic Centralised Lubrication System (continuation)

NOTE:

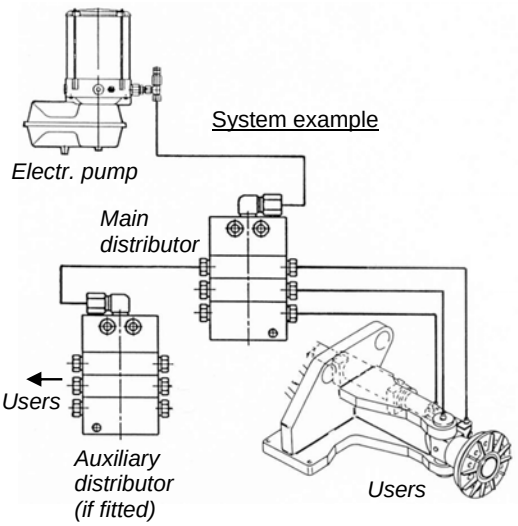
In any case, the centralised lubrication system does not reach some point, like for example the propeller shaft, which therefore should be manually lubricated at the intervals recommended in the relevant sections of this manual.

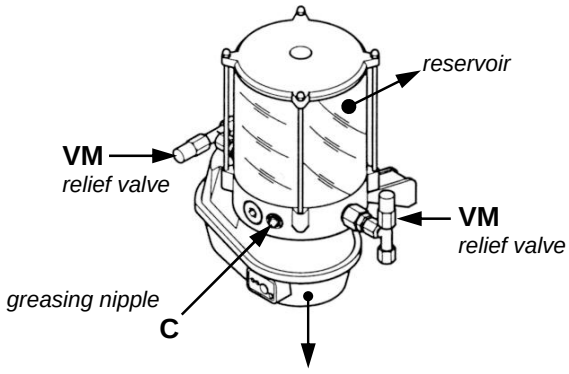
Daily:

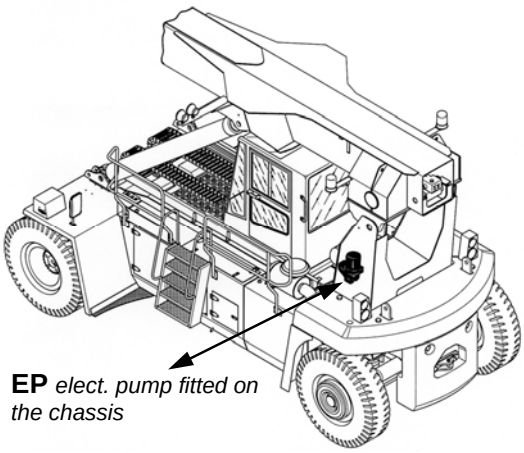
Check the grease level in the reservoir of the electric pump(s).
To fill the reservoir, inject grease through the grease nipples "**C**" by means of the grease guns.

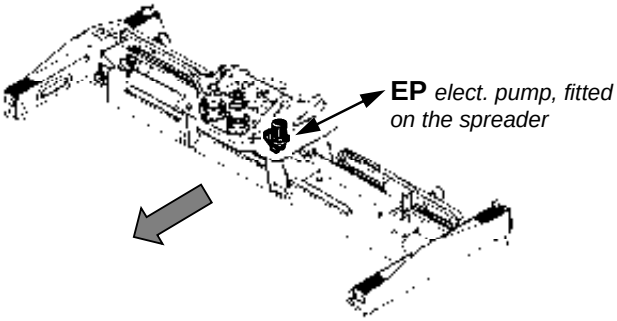
NOTES:

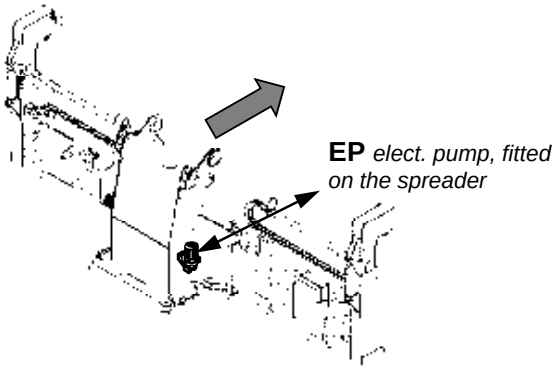
- ☺ *Never allow the reservoir of the electric pump to get completely empty, otherwise the air sucked in the system would prevent the grease to come out.*
- ☺ *Avoid the penetration of dirt in the reservoir of the electric pump that would inevitably clog the lubrication system.*
- ☺ *This progressive lubrication system supplies the grease to the users in sequence (in series), therefore the clogging of one nipple blocks the entire system and increases the pressure up to the set point of the relief valve (280 Bar).*
  This alarm condition is signalled by the forcing out of the from the relief valve(s) "**VM**".











LUBRICATION (cont'd)

Automatic Centralised Lubrication System (continuation)

Setting of the control unit integrated in the electric pump

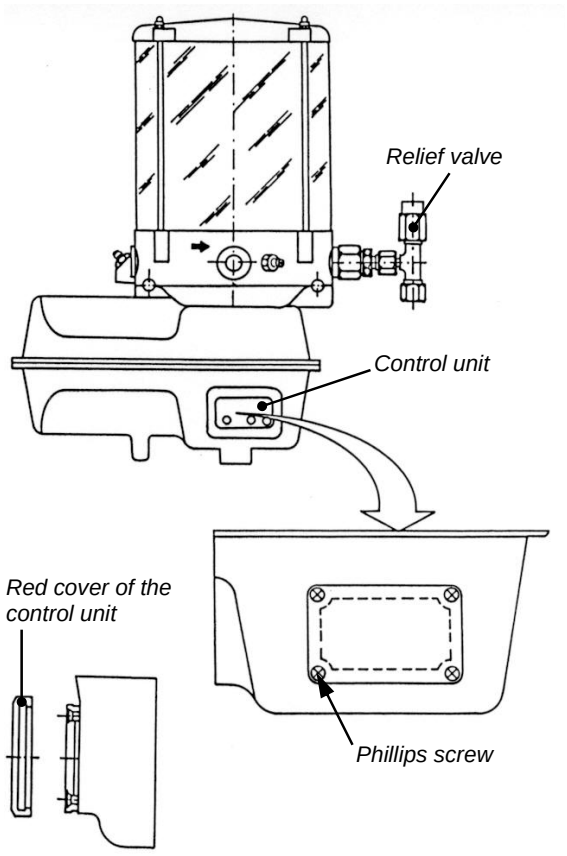
The electronic control unit has following functions :

- Setting of the pause time between 30' and 8 hours in increments of 30'.
- Setting of the operation time *(between 2 and 32 minutes of operation of the pump).*

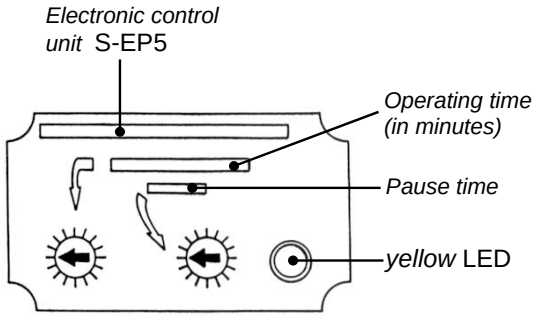
Setting of the pause and operation time:

1. *Remove the red snap cover levering with a screwdriver.*
2. *To remove the transparent cover, unscrew the 4 screws with a cross-head screwdriver.*
3. *With a screwdriver, set the operation time (pump operation minutes) and the pause time on the two snap switches.*

NOTE:
After the ignition has been turned on, the yellow LED will light for approximately 2 seconds *indicating that the system is now ready for operation.*
If there is a fault in the pump (faulty motor) or in the control unit, the yellow *LED flashes in* 1-sec. intervals*.*
After correction of the fault, cancel the alarm status by pressing the manual lubrication pushbutton; this pushbutton has also the function to start at any time a supplementary lubrication cycle. In this case the already stored pause time is reset.

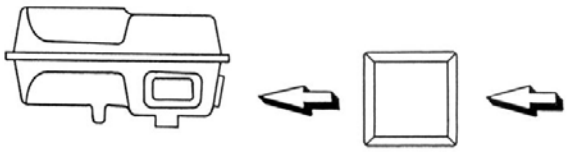


⚠ **CAUTION:**
After completion of the control unit setting, carefully secure *(with the 4 screws)* ***the transparent cover with its seal and the red cover, otherwise water may enter the control unit, invalidating the warranty.***



Troubles / Causes / Remedies:
Contact the C.V.S. Service Department.

⚠ **WARNING:**
Above mentioned maintenance steps must be performed only by qualified and trained personnel working in conditions of maximum safety and cleanness and after having parked the vehicle on a level and compact ground, switched-off the engine and applied the parking brake.

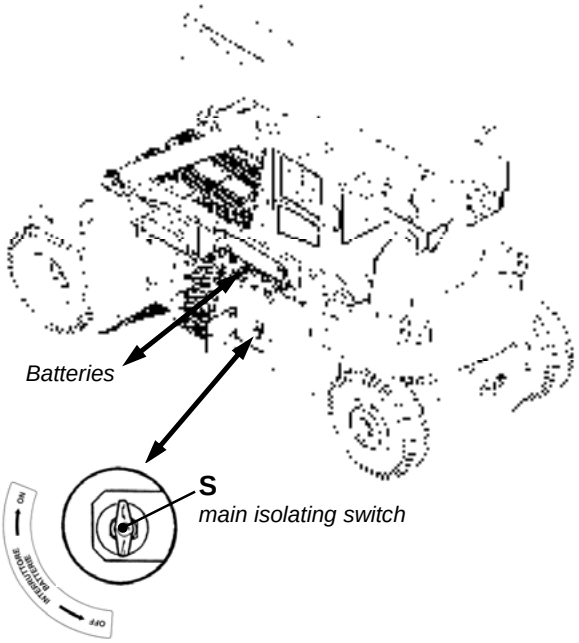


Manual lubrication pushbutton

ELECTRIC SYSTEM

⚠ **CAUTION:**
In case of service steps on the vehicle, disconnect the main isolating switch "S", *that is located on the right side of the vehicle, inside the access steps.*

NOTE:
On request (OPTION), the vehicle may be equipped with a main electrical switch; in this case, to turn off the power just remove the ignition key from the ignition lock.

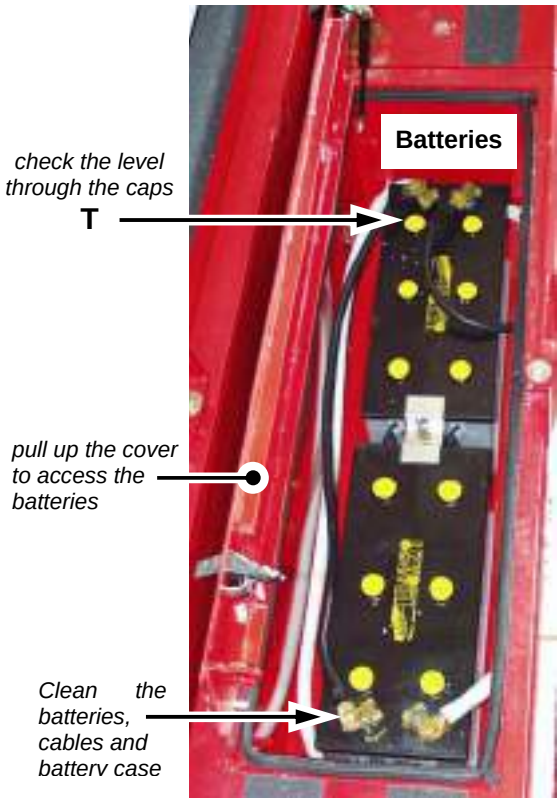


Batteries (unsealed)

The batteries are located inside the left body side of the vehicle, under the upper door, near the ladder.

Weekly:

- ☺ Carefully clean the batteries, the cables and the battery case, eliminating any traces of carbon oxide and contamination that may cause voltage drops;
- ☺ Through the caps "**T**" check that the electrolyte level in the battery is approx. *10÷12 mm* higher than the upper edge of the battery plates. If necessary, TOP UP ONLY WITH DISTILLED WATER through the special filling holes **with cold and calmed down batteries**.



Electrolyte specific gravity at full-charged battery:

TEMPERATURE	SPECIFIC GRAVITY (g/dm3)
+40°C (104°F)	1265
+20°C (68°F)	1285
0°C (32°F)	1300
-20°C (-4°F)	1365

NOTE:
Sealed [maintenance-free] *batteries do not require water fillings under normal operating conditions and in mild climates.*

⚠ **WARNING:**

- ***Do not smoke when checking the level of the battery electrolyte: batteries generate inflammable gases. Battery electrolyte contains sulphuric acid, which is dangerous for skin and eyes.***
- ***Use a voltmeter or a hydrometer to check the battery charge conditions and never put metal objects between the terminals: sparks may cause an explosion.***
- ***When the electrolyte is frozen, the battery may explode if you try to charge it or to start the engine. To prevent the electrolyte from freezing, the battery should be always kept at full charge.***

ELECTRIC SYSTEM (cont'd)

Batteries (continuation)

IMPORTANT information

Precautions for the use of the battery charger
- Connect and disconnect the batteries from the battery charger with the battery charger switched-off, in order to avoid sparks.
- Switch-on the battery charger and choose the desired voltage range *(watching carefully the ammeter display)*.

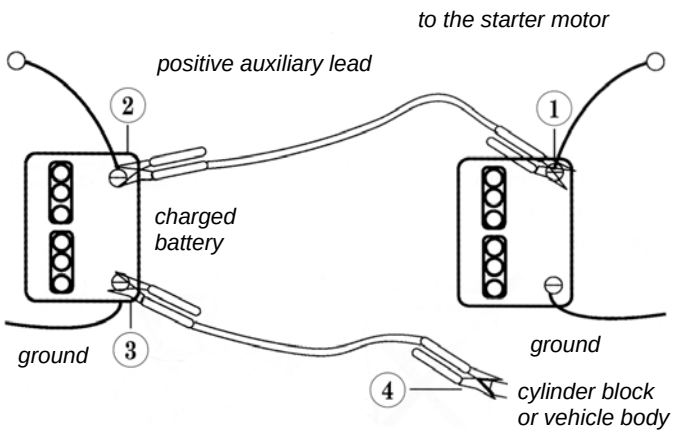
Recommended checks
With the voltmeter, check the correctness of the polarity; the measurement with a 2-decimals-voltmeter must be done some hours after the switching-off of the engine.
The voltage at the battery terminals should be at least 12.30 V; lower voltages are a sign of inadequate charge due insufficient km covered or regulator voltage lower than specified. Check the drive belt of the AC generator.
In case of abnormal water consumption (lever under the plate edges) check the regulation voltage.
With the engine at normal operation speed (approx. the half of the max. possible rpm), the voltage measured at the battery terminals should be between: [13.7-14.7V for 12V-system] , [26.9-28.8V for 24V-system] at a room temperature of 25°C.
Check that the min. value with switched-on loads (at least, with high-beams), respectively the max. value without load is respected.
Check the tightness of the cable terminals and that the positive terminal is not abnormally oxidized.

Safety instructions
Batteries contain *(corrosive)* sulphuric acid and generate explosive gases, especially during the charge. Therefore observe the precautions foreseen in the procedures and by law.
In fact, the law decree 629/94 art.40 and 46 prescribes personal protective devices to work with batteries (gloves, eyeglasses, etc.).
Keep flames and cigarettes away from the batteries, avoid any possible spark source. Do not bend your head on the batteries during the installation and the removal of the batteries.

NOTE: ***When installing a battery on the vehicle, always connect first the positive terminal. During the removal, always disconnect first the negative termin.***

Emergency starting procedure
If the battery is weak and the engine must be started with the battery of another vehicle, observe following precautions:

1. There must be no contact between the two vehicles.
2. On both vehicles, the keys are not inserted in the ignition block.
3. Connect the positive auxiliary lead to the positive terminal (+) of the weak battery.
4. Connect the other end of the positive auxiliary lead to the positive terminal of the charged battery.
5. Connect the negative auxiliary lead to the negative terminal of the charged battery.
6. **Finally:** connect the negative auxiliary lead to the cylinder block clear from the battery.
7. Start the vehicle with weak battery.
   Each start attempt should not exceed 5 seconds.
8. Disconnect reversing the connection procedure, starting from the negative lead to the cylinder block.



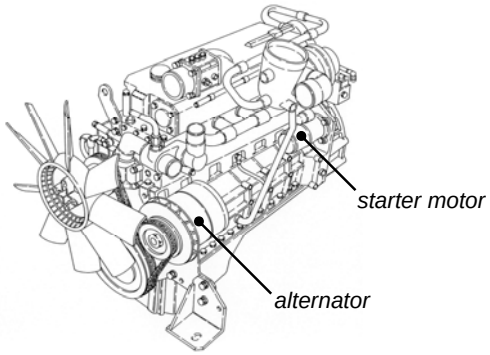
ELECTRIC SYSTEM (cont'd)

Alternator

NOTE:
Details concerning maintenance are widely explained in the enclosed engine manufacturer's instructions ***that must be read in any case****.*

Every 2000 operating hours:
Carefully clean the slip rings and check wear and contact of the carbon brushes.
If necessary, replace the brush holders as a set using the originally installed type.

Volvo

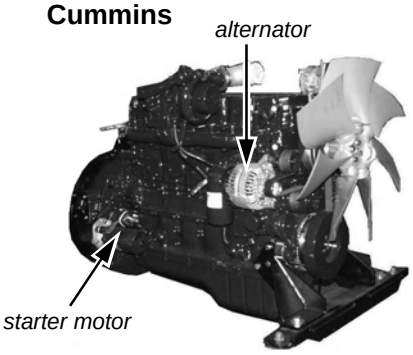


Starter motor

NOTE:
Details concerning maintenance are widely explained in the enclosed engine manufacturer's instructions ***that must be read in any case****.*

Every 2000 operating hours:
Carefully clean the commutator and check wear and contact of the carbon brushes.
If necessary, replace the brush holders as a set using the originally installed type.

Cummins



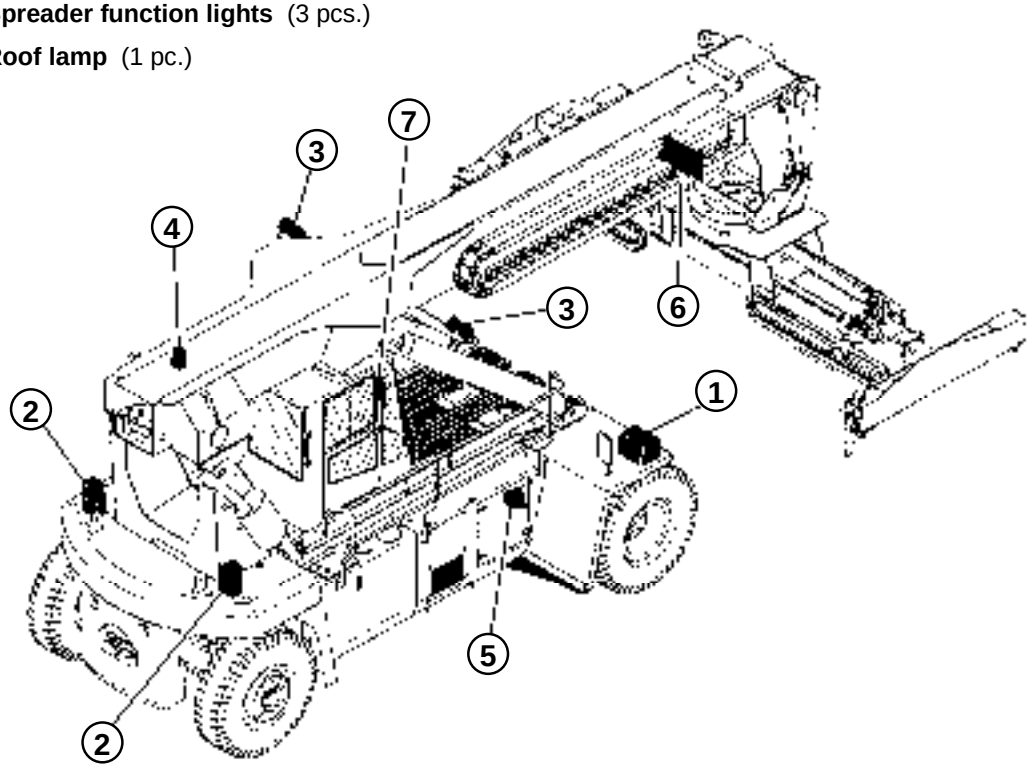
⚠ **CAUTION:**
Maintenance steps on the AC generator and the starter motor must be performed only by skilled, trained technicians working in maximum safety and cleanness conditions; we recommend to contact authorised workshops.

ELECTRIC SYSTEM (cont'd)

Lighting system

⚠ **CAUTION:**
Before using the vehicle, make sure that the complete lighting system is properly functioning. Always keep clean beams, head lamps and reflectors *(if fitted).*

1. **Front light cluster** (2 pcs.)
2. **Rear light cluster** (2 pcs.)
3. **Working lights [20'-40']** (4 pcs.)
4. **Yellow flashing light** (1pc.)
5. **Side box lights** (2 pcs.)
6. **Spreader function lights** (3 pcs.)
7. **Roof lamp** (1 pc.)



ELECTRIC SYSTEM (cont'd)

⚠ **CAUTION:**
Fit halogen bulbs without direct contact with your hands, otherwise the function of the bulbs would be affected.

1. Front light cluster

A - Fastening screws

B - Beam alignment adjusting screws

C - Low/high beam headlight
["**c**" halogen bulb JOD H5 70-75 W]

D - Auxiliary light
["**d**" ball bulb 5 W]

E - Front turn indicator light
["**e**" ball bulb 21 W]

F - Side turn indicator light
[" **f** " ball bulb 5 W]

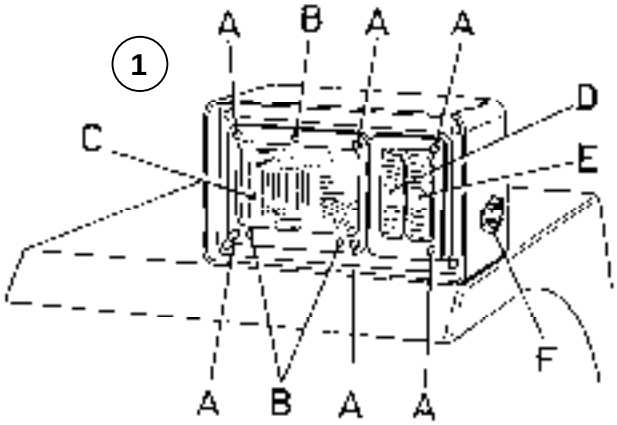
Bulb replacement

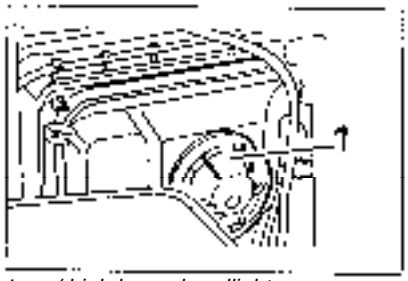
C. *Low/high beam headlight:*
- ☺ unscrew the fastening screws "**A**" and remove the headlight;
- ☺ unscrew the cover "**1**";
- ☺ remove the clamps of the bulb holder "**2**" and pull-out all parts from the headlight;
- ☺ remove connecting pin "**3**";
- ☺ replace the halogen bulb "**c**";
- ☺ insert the connecting pin "**3**";
- ☺ insert all parts in the headlight and also the clamp of the bulb holder "**2**";
- ☺ install the cover "**1**" (*screwing it in)*;
- ☺ install the headlight and tighten the fastening screws "**A**".

D. *Auxiliary light and* **"E"** *front turn indicator light:*
- ☺ unscrew the fastening screws "**4**" and remove the lens;
- ☺ replace the ball bulb "**d**" (*auxiliary light*);
- ☺ replace the ball bulb "**e**" (*front turn indicator light*);
- ☺ install the lens and tighten again the fastening screws "**4**".

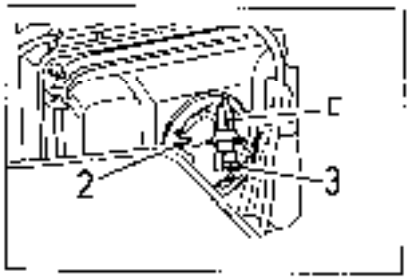
F. *Side turn indicator light:*
- ☺ unscrew the lens screws "**5**" and remove the lens;
- ☺ replace the ball bulb " **f** ";
- ☺ install the lens and tighten again the fastening screws "**5**".

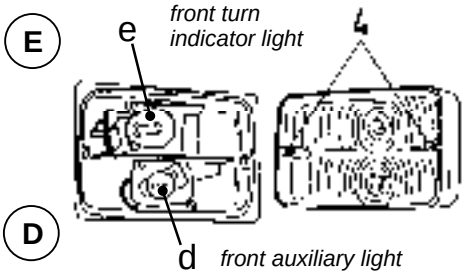
NOTE:
Do not overtighten the fastening screws of the lens, in order not to break it.

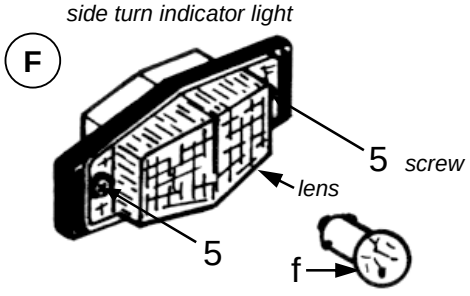




C *Low / high beam headlight*



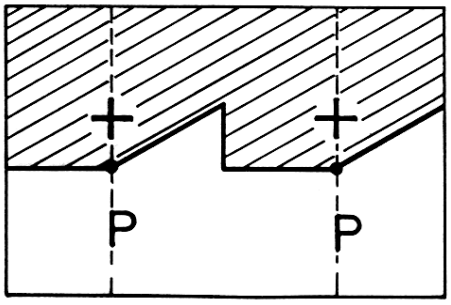




ELECTRIC SYSTEM (cont'd)

Headlight beam alignment :

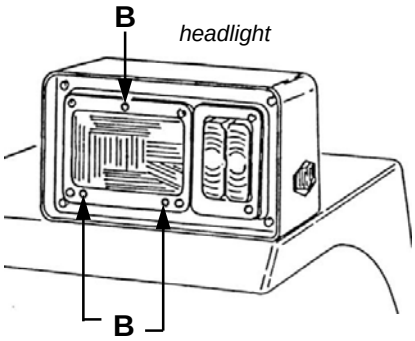
If the headlights have been completely disassembled, they must be re-aligned as follows.



NOTE:
Qualified technicians using proper equipment must perform this service step; we recommend contacting an authorised workshop.

Nevertheless, following procedure allows achieving a satisfactory alignment:

- park the vehicle with the tyres inflated at the specified pressure on a level ground, direct facing a light wall;
- mark two crosses on the wall corresponding to the centres of the two headlights;
- move the vehicle backward of about *10 metres* and switch on the dipped headlights. The distance between the crosses and the reference points **P-P** must correspond to 10% of the distance between the cross centres and the ground.



Perform any necessary correction with the headlight alignment screws "**B**".

ELECTRIC SYSTEM (cont'd)

2. Rear light cluster

G. The **"Standard"** rear light cluster contains:

- **G1.** auxiliary light ["**g1**" ball bulb 5 W]
- **G2.** brake light ["**g2**" ball bulb 21 W]
- **G3.** turn indicator light ["**g3**" ball bulb 21 W]

I. Reverse light ["**i**" JOD H3 halogen bulb 70 W]

L. Side turn indicator light ["**l**" ball bulb 5 W]

⚠ **CAUTION:**
Fit halogen bulbs without direct contact with your hands, otherwise the function of the bulbs would be affected.

Bulb replacement

G. *"**Standard**" rear light cluster:*

- ☺ unscrew the lens screws "**6**" and remove the lens;
- ☺ replace the lamp (*the lamps*) as necessary: "**g1**" (*auxiliary light*), "**g2**" (*brake light*), "**g3**" (*turn indicator light*);
- ☺ install the lens and tighten again the fastening screws "**6**".

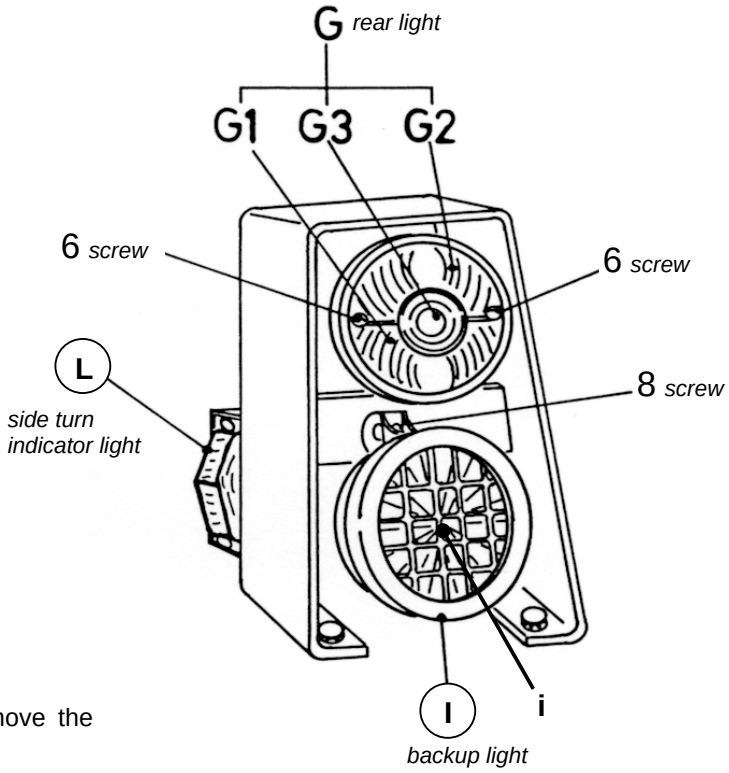
I. *Backup light :*

- ☺ remove the lens rubber protection;
- ☺ unscrew the lens screws "**8**" lens screws and pull down the lens;
- ☺ replace the halogen bulb JOD "**i**";
- ☺ position the lens tightening the fastening screw "**8**" and install the lens rubber protection.

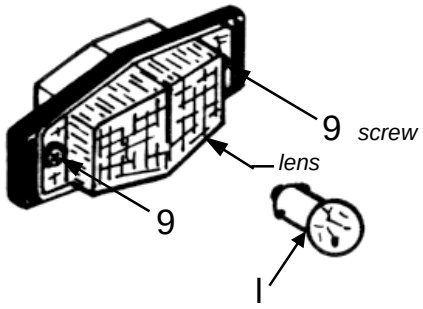
L. *Side turn indicator light :*

- ☺ unscrew the lens screw "**9**" and remove the lens;
- ☺ replace the ball bulb " **l** ";
- ☺ install the lens and tighten again the fastening screws "**9**".

2 *Rear light cluster **"Standard"***



L *side turn indicator light*



NOTE: *Do not overtighten the fastening screws of the lens, in order not to break it.*

ELECTRIC SYSTEM (cont'd)

3. Working lights (20' – 40')

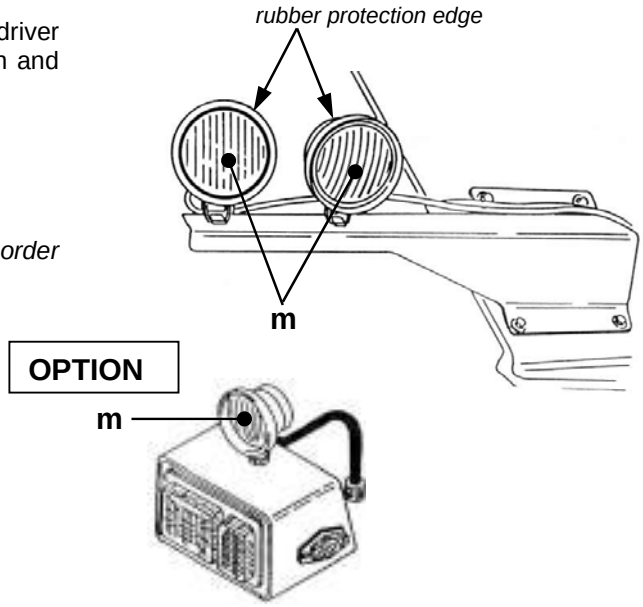
m - Halogen bulb JOD H3 70 W

Bulb replacement

- ☺ remove the lens levering with a screwdriver between the edge of the rubber protection and the lens;
- ☺ replace the bulb "**m**";
- ☺ install the lens in the rubber protection.

NOTE:
Do not force the lens with the screwdriver, in order not to break the lens.

3 *Working lights 20' – 40'*



⚠ **CAUTION:**
Fit halogen bulbs without direct contact with your hands, otherwise the function of the bulbs would be affected.

4. Yellow flashing light

n - Halogen bulb JOD H1 70 W

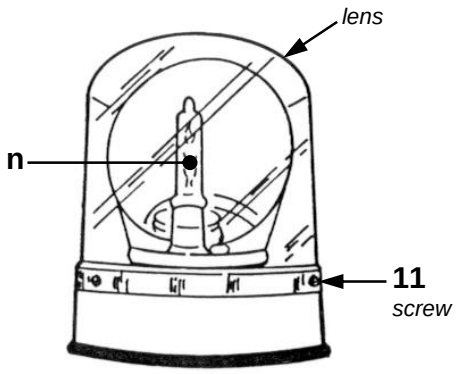
11 - Lens fastening screws

Bulb replacement

- ☺ remove the lens unscrewing the screws "**11**";
- ☺ replace the bulb "**n**" ;
- ☺ install the lens and tighten again the fastening screws "**11**".

NOTE:
Do not overtighten the fastening screws of the lens, in order not to break it.

4 *Yellow flashing light*



ELECTRIC SYSTEM (cont'd)

5a. Side box light

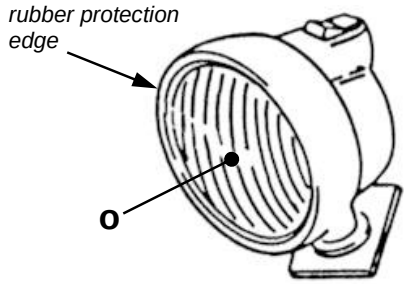
o - Ball bulb 21 W

Bulb replacement

- ☺ remove the lens levering with a screwdriver between the edge of the rubber protection and the lens;
- ☺ replace the bulb "**o**";
- ☺ install the lens in the rubber protection.

NOTE:
Do not force the lens with the screwdriver, in order not to break the lens.

5a *Side box*



5b. Side box and additional cab light [Optional]

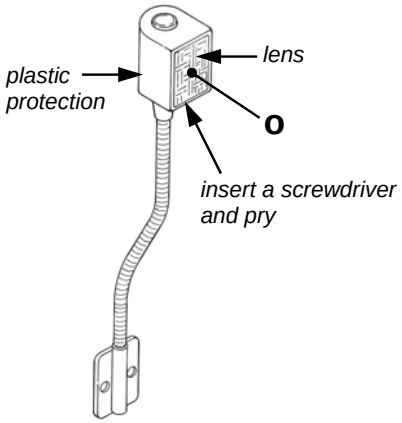
o - Cylindrical bayonet bulb 7.5 W

Bulb replacement

- ☺ remove the lens, levering with a screwdriver *(or similar)* between the edge of the plastic protection and the lens;
- ☺ replace the bulb "**o**";
- ☺ install the lens in the plastic protection, pressing down on same.

NOTE:
Do not force the lens with the screwdriver, in order not to break the lens.

5b *Side box and additional cab light*



ELECTRIC SYSTEM (cont'd)

6. Spreader function lights

r - Bayonet ball bulb 25 W

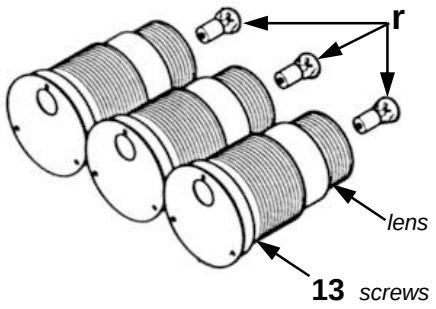
13 - Lens fastening screws

Bulb replacement

- ☺ Remove the lens unscrewing the screws "**13**";
- ☺ Replace the bulb "**r**";
- ☺ Install the lens and tighten again the fastening screws "**13**".

NOTE:
Do not overtighten the fastening screws of the lens, in order not to break it.

6 *Spreader function lights*



7. Roof lamp

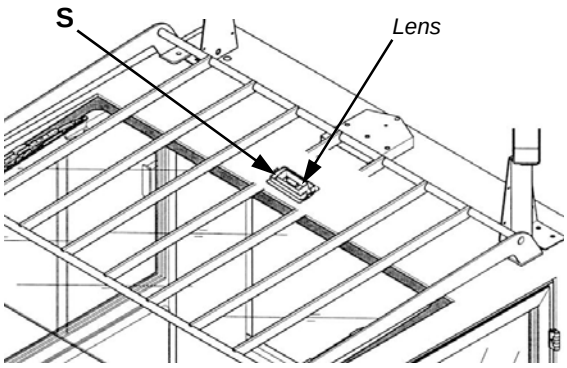
s - Cab light
[cylindrical bulb 5 W]

Bulbs replacement

- ☺ Remove the roof lamp by inserting a screwdriver between the side edge of the fitting and the roof covering, then press gently to prise the lens off;
- ☺ Insert a screwdriver *(or similar)* between the lens "**s**" and the body of the roof lamp;
- ☺ Lever with the screwdriver and remove the lens, paying attention not to break it;
- ☺ Replace the bulb of light "**s**";
- ☺ Position the lens and fit it on the courtesy light "**s**", lightly pressing it;

  NOTE:
  Do not press the lens excessively, in order not to break it.
- ☺ Fit the roof lamp into its seating on the roof covering, making sure that it snaps properly into place.

7 *Roof lamp (inside the cab)*



ELECTRIC SYSTEM (cont'd))

NOTE: ***All above mentioned steps must be performed only by skilled, trained technicians working in maximum safety and cleanness conditions, after having parked the vehicle on a level, compact ground, switched-off the engine and applied the parking brake.***
In any case we recommend to contact an authorised workshop.

Bulb table

Description	Type	Watt
Headlight :		
- Low / high beam	Dual filament halogen bulb JOD H 5	70 – 75
- Front auxiliary light	Spheric bulb	5
- Front turn indicator light	Spheric bulb	21
*"**Standard**" rear light cluster*:		
- Turn indicator light	Spheric bulb	21
- Brake light	Spheric bulb	21
- Auxiliary light	Spheric bulb	5
Backup light	Halogen bulb JOD H 3	70
Side turn indicator light	Spheric bulb	5
Working lights (20' – 40')	Halogen bulb JOD H 3	70
Yellow flashing light	Halogen bulb JOD H 1	70
Side box lights	Spheric bulb	21
Additional working lights	Halogen bulb JOD H 3	70
Spreader function lights	Bayonet spheric bulb	25
Roof light (inside cab) (light fitting)		
- Roof light	Bayonet spheric bulb	21
- Courtesy light	Cylindrical bayonet bulb	5
Instrument panel lighting:		
- Pilot, warning lights *(if fitted)*	Behind glass	5
- Switches	Behind glass	1,2

ELECTRIC SYSTEM (cont'd)

Fuses [in the cab]

The fuses that protect the equipment of the electric system are located in 2 boxes [**A** and **B**] on the door of the main electric cabinet, inside the left compartment; a further fuse is installed inside the main electric cabinet [**105F1**].

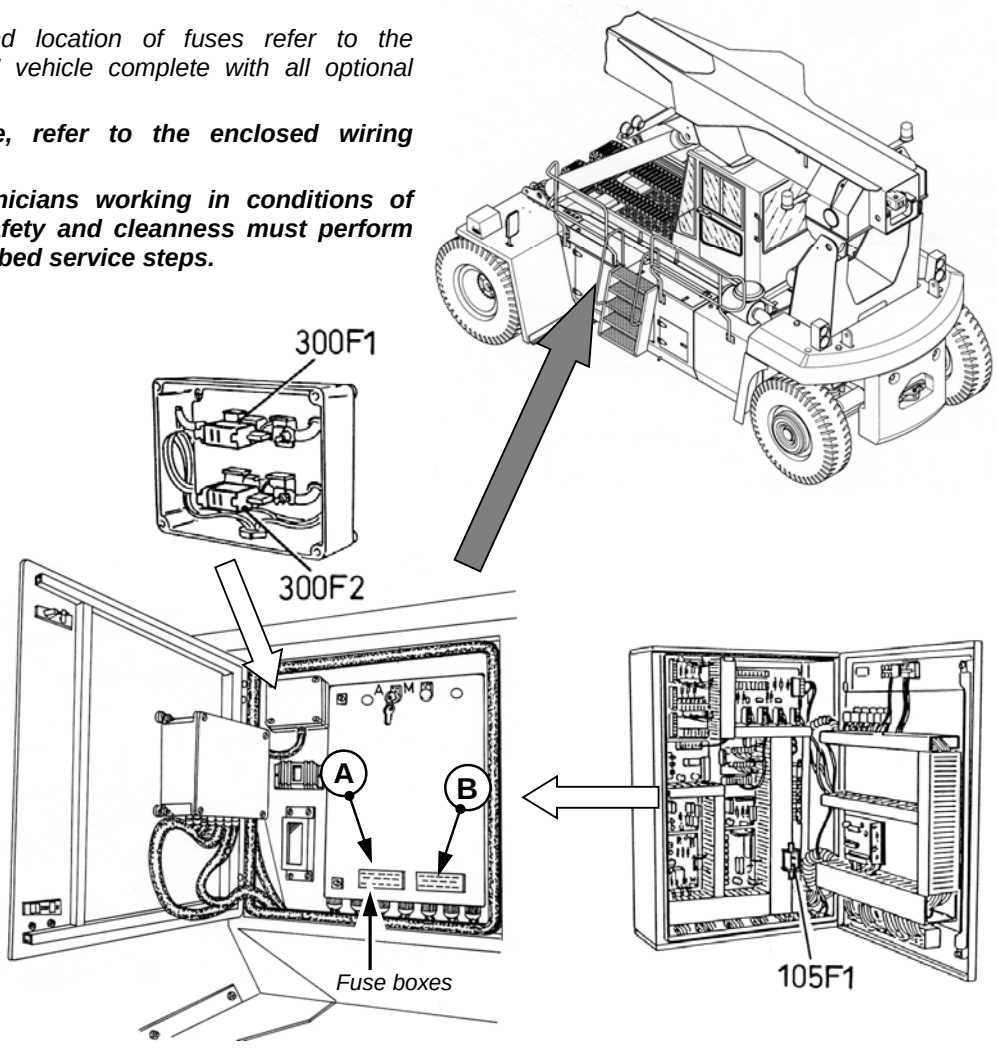
Two further fuses [**300F1** and **300F2**] are installed in a box inside the left compartment.

⚠ **CAUTION:**
Restorable fuses are equipped with a manual disconnecting function; under normal operating conditions, pressing the pushbutton they are disconnected, with consequent interruption of the function. Press the pushbutton again to restore the function.

NOTE:
Before restoring or replacing the fuses, find and correct the cause of their intervention.

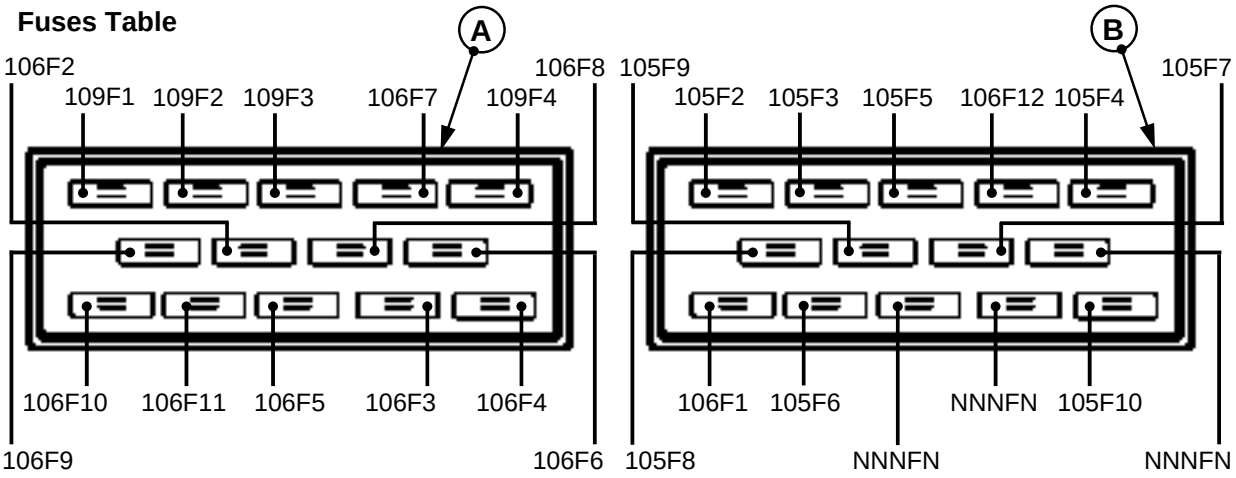
⚠ **CAUTION:**
- *If necessary**, replace the fuses with new ones with the same amperage, otherwise the electric system could be irreparably damaged.***
- ***If a fuse blows more than once, search for the cause in the electric system.***

NOTES:
- ☺ *Functions and location of fuses refer to the "STANDARD" vehicle complete with all optional accessories.*
- ✪ ***In any case, refer to the enclosed wiring diagram.***
- ✪ ***Skilled technicians working in conditions of maximum safety and cleanness must perform all the described service steps.***

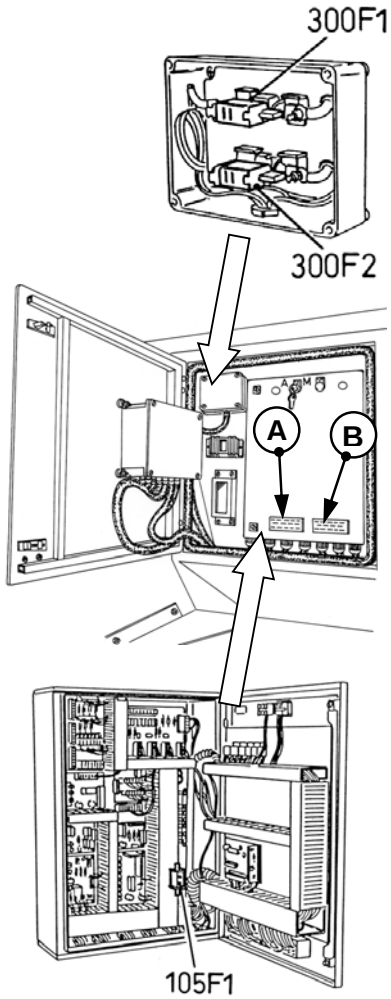


ELECTRIC SYSTEM (cont'd)

Fuses Table



Ref.	A	Protection
109F1	10	Hazard warning lights Blinker line LD
109F2	5	Right parking lights
109F3	5	Left parking lights
106F7	5	Hazard warning lights Blinker line LQ
109F4	15	Starter motor
106F9	5	Roof window wiper
106F2	5	Accelerator microswitch, instruments, alternator warning lights
106F8	10	Heater ventilation
106F6	5	Parking brake switch
106F10	15	Front window wiper
106F11	15	Rear window wiper
106F5	10	Yellow warning light switch, defroster, side compartment lights
106F3	10	Spreader sensors, pneumatic seat
105F4	5	Hydraulic fluid cooling fan
105F2	10	Ignition key
105F3	5	Interior light
105F5	15	Defroster
106F12	15	External illumination *(multi-function)* control stalk
105F4	15	Heater
105F8	10	Fog tail lamp
105F9	20	Working lights
105F7	15	Auxiliary lights
NNNFN	10	Available
106F1	15	Power supply to the printed circuit boards
105F6	20	Air conditioner
NNNFN	10	Available
NNNFN	10	Available
105F10	20	Utilities, 12V adapter
105F1	100	Main power supply
300F1	100	Alternator output
300F2	100	Alternator output



NOTES:

☺ *Functions and location of fuses refer to the* "STANDARD" *vehicle complete with all optional accessories.*

✪ ***In any case, refer to the enclosed wiring diagram.***

✪ ***Skilled technicians working in conditions of maximum safety and cleanness must perform all the described service steps.***

ELECTRIC SYSTEM (cont'd)

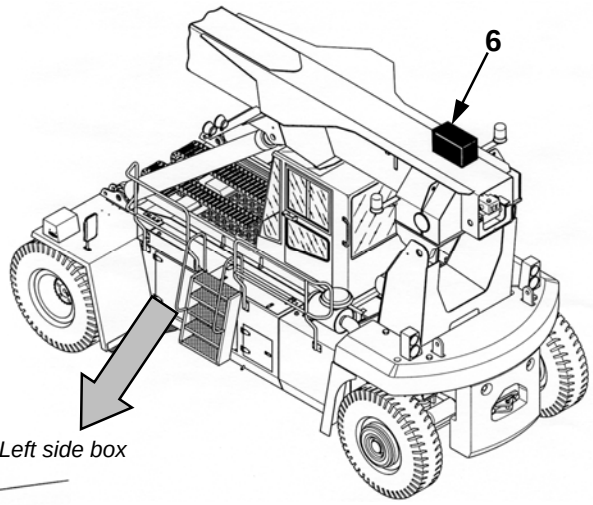
Location of electrical and electronic equipment

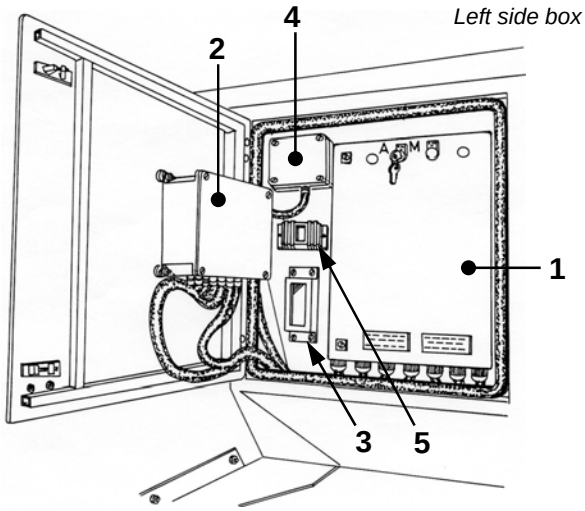
NOTE:

☺ *The illustrated locations are referred to a "STANDARD" vehicle, complete with all optional accessories.*

✪ ***In any case, refer to the enclosed wiring diagram.***

1.	**QGS Box** main electric cabinet
2.	"**MICMAC-RS.CMC**" Load Moment Limiting system control unit, Autoshift Transmission, Accelerator control
3.	Control unit of the Autoshift Transmission, alternative to the standard
4.	**PF1000** fuses box *(Alternator/s protection)*
5.	**24V – 12V** Transformer
6.	Electronic control unit lighting system





ELECTRIC SYSTEM (cont'd)

Relays

They are located inside the main electric cabinet "**QGS Box**", on the cover panel.

NOTE:

☺ *For the function of the relays, refer to the wiring diagram enclosed to the manual.*

☺ *Before replacing a relay, find and correct the fault that caused its intervention.*

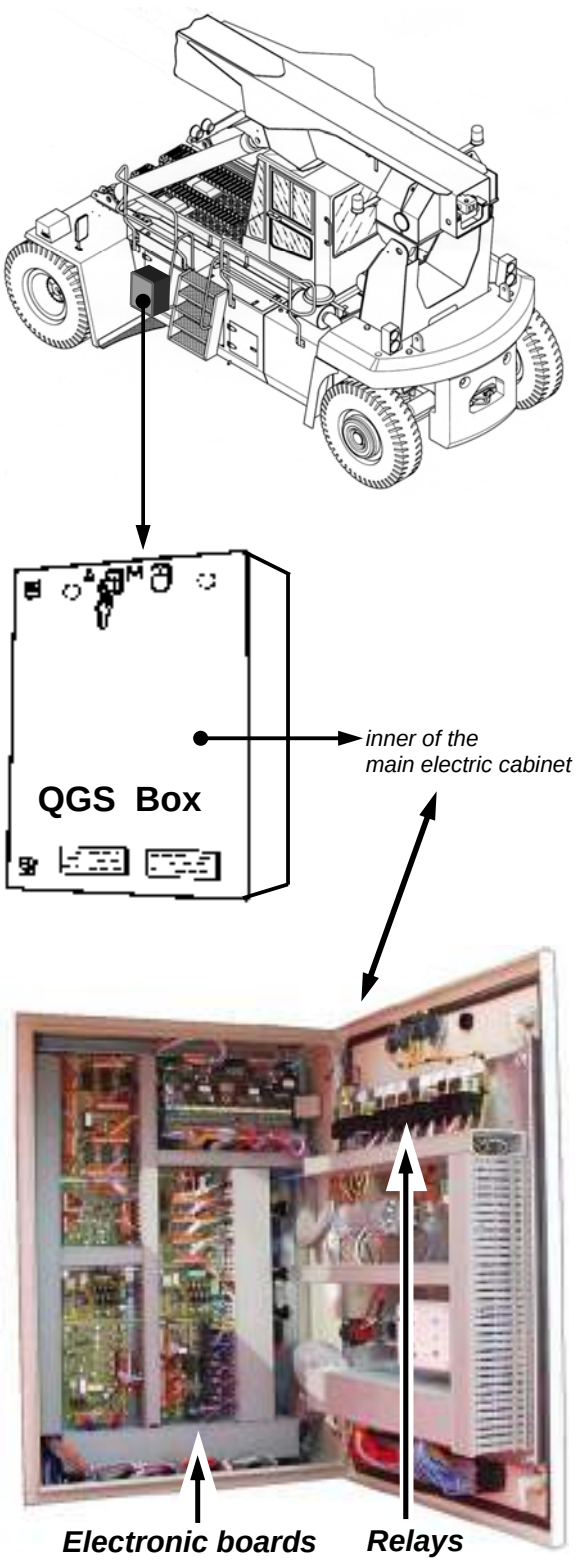
✪ ***In any case, refer to the enclosed wiring diagram.***

⚠ **CAUTION:**
*If necessary**, replace the relays with new ones with the same features, otherwise the electric system could be irreparably damaged.***

⚠ **CAUTION:**
If a relay is repeatedly damaged, search for the cause on the electric system.

⚠ **CAUTION:**
All above described service steps must be performed only by skilled and trained technicians operating in maximum safety and cleanness conditions and having a good knowledge of the electric / electronic system of the vehicle.

Anyway, we recommend contacting the qualified C.V.S. After Sales Service.



Electronic boards

They are located inside the main electric cabinet "**QGS Box**" and on the cover panel.

NOTE: *Concerning their function and arrangement, see the wiring diagram enclosed to this Manual*.

ELECTRIC SYSTEM (cont'd)

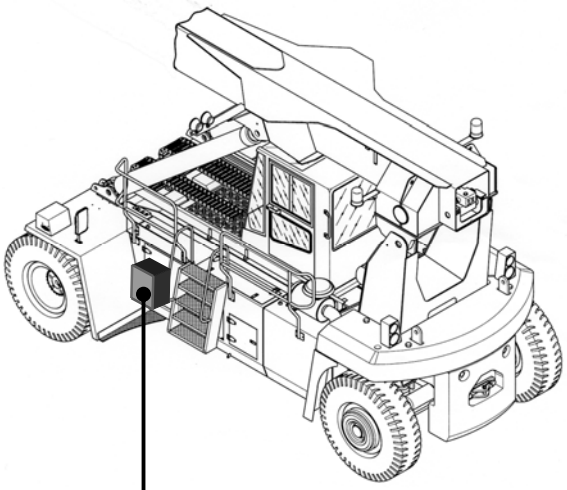
"KitLed" box and "Cummins" engine control device

If installed, it is located in the "QGS"-Box.

NOTE: *Installation only with "Cummins" engines.*

The following switches and leds *(fixed to the box cover)* are meant as engine control devices:

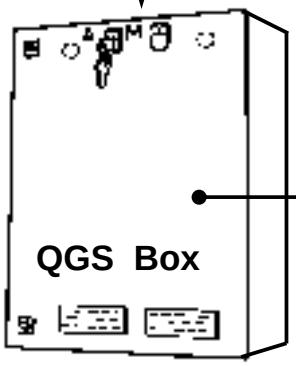
- **C1** - Engine diagnosis switch;
- **C2** - Switch to change the engine rotation at idle;
- **C3** - *Red* led warns off an engine alarm;
- **C4** - *Yellow* led is meant as en engine pre-alarm.
- **C5** - *Green* led is meant to warn off an engine maintenance operation;



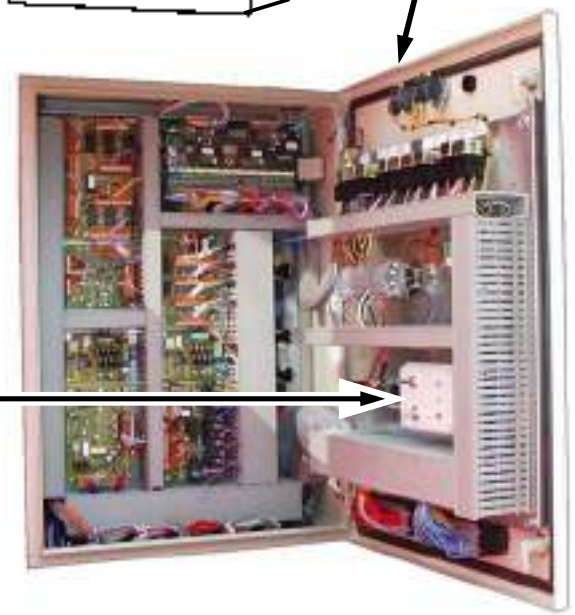
NOTE:

- ☺ *As for detailed description and operation, please refer to the relevant engine diagnosis booklet attached to this manual*
- ☺ *Either the operation or the locations of the mentioned components are referred to the* "STANDARD" *version of the vehicle.*
- 💣 ***The use of the described components must be carried out only by qualified, trained and experienced staff, that must operate in the maximum safety and cleaning conditions; as well as having a special skill on the electric/electronic system of the vehicle and the engine.***

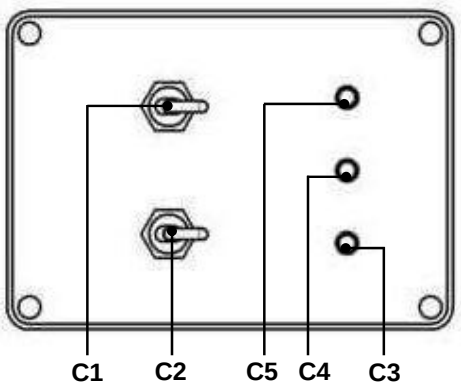
In any case, contact the specialized C.V.S. staff.



inner of the main electric cabinet



box "**Kitled**" *in "QGS"*



ELECTRIC SYSTEM (cont'd)

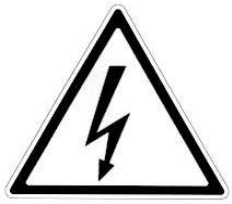
Precautions with installed electronic control units and boards

Not to perform incorrect operations that may damage irreparably the control units and the electronic boards installed on the vehicle (see previous pages), we recommend following precautions :

- During works on the chassis, involving arc welding, disconnect the connectors of the electronic control units/boards;
  if welding have to be done near an electronic control unit/a board, remove it first.
- After any maintenance procedure requiring disconnection of the batteries, when reconnecting pay attention that the battery terminals are safely connected to the poles.
- Do not use a battery charger to start the engine.
- During the charge, disconnect the batteries from the electrical system of the vehicle.
- Do not connect or disconnect the connectors of the electronic control units/boards with running engine or with alive electronic control units/boards.
- Do not disconnect the batteries with running engine.
- Remove the electronic control units/boards for procedures in which are generated temperatures over 80°C *(coat oven drying etc.).*

⚠ **CAUTION:**
All above described service steps must be performed only by skilled and trained technicians operating in maximum safety and cleanness conditions and having a good knowledge of the electric / electronic system of the vehicle.

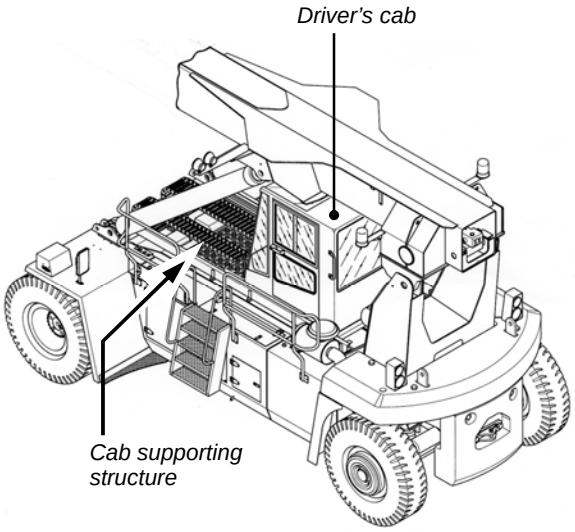
Anyway, we recommend to contact the qualified C.V.S. after sales service.



CAB

Every 500 operation hours :

- Carefully check the cab body for cracks and/or bends;
- Carefully check the cab supporting structure for signs of wear, bends and/or excessive backlashes;
- Check all welds;
- Carefully check that all fastening bolts and/or similar parts are steady seated, and do not show signs of wear, bends and/or excessive backlashes;
- Check condition and fastening of the silent blocks;
- Check the condition of the doors and of their hinges.;
- Check the tightening of all fasteners
  (See relevant charts at the end of this chapter).

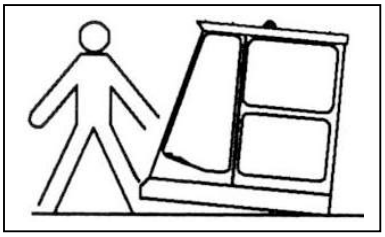


NOTE:
For cab tilting systems, see the specific section in this chapter.

⚠ WARNING:
Before performing any checks and/or repairs, switch-off the engine and verify that the parking brake is applied.

⚠ WARNING:
If the cab has to be lifted from the chassis, sling it with bands, paying attention not to damage it. NEVER stand between the cab supporting structure and the lifted cab.

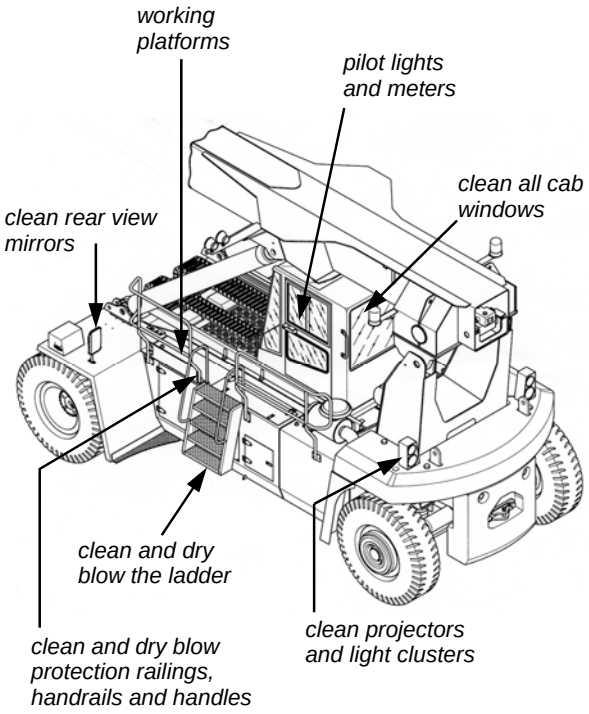
⚠ WARNING:
All above described service steps must be performed only by skilled and trained technicians operating in maximum safety and cleanness conditions.



GENERAL CARE AND CHECKS

Daily

Clean the windows, rear view mirrors, projectors and light clusters, indicator lights, the meters and/or the display *(if fitted)* with neutral detergents and water, to eliminate any trace of corrosive substances *(salt, sand, etc.)*.
Carefully dry blow with compressed air in order to eliminate any trace of water.



Weekly

Thoroughly clean the vehicle with neutral detergents and water, to eliminate any trace of corrosive substances (*salt, sand, etc.*). Carefully dry blow with compressed air to eliminate any trace of water.
Check and clean electric connections *(fixed and mobile outlets)*.

NOTE: *Clean and lubricate door locks and hinges.*

⚠ **CAUTION:**
After washing the vehicle, check the tightening of bolts and nuts of the whole vehicle body:
- ladders and steps; - protection railings;
- handles; - handrails; - fenders;
- working platforms; - hood;
- covering footboards.

Plastic parts

Clean plastic parts with the normal washing procedure.
If any traces of dirt still remain, we recommend to use specific detergents, carefully observing the instructions of the manufacturer.

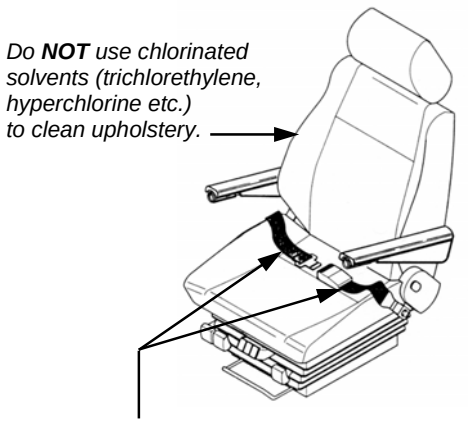
To clean painted parts, do **NOT** use detergents containing aromatics, methanol or hydrocarbons.

*To clean painted parts, do **NOT** use detergents containing aromatics, methanol or hydrocarbons*

CLEANING AND GENERAL CHECKS (cont'd)

Fabric upholstery

Clean fabric upholstery with dry foam and solvents.
By using these product, follow the relevant precautions, as they are inflammable and generate fumes.
After the cleaning, provide for a good ventilation of the cab, until drying-up of the detergents.
Absolutely do not use chlorinated solvents *(trichlorethylene, hyperchlorine etc.).*



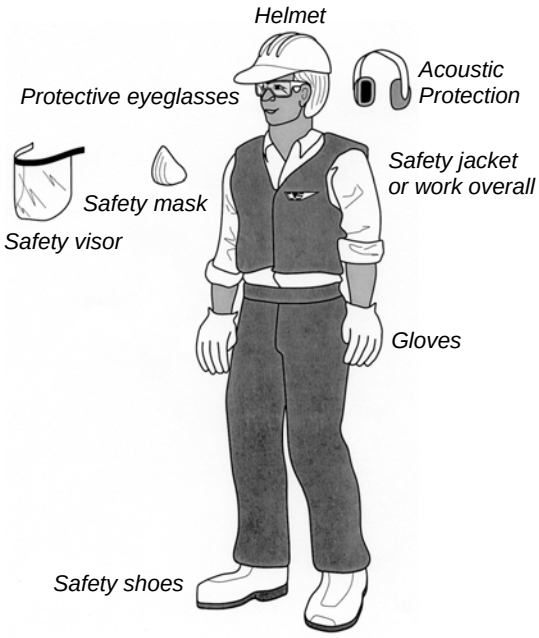
Safety belts

Manually wash the safety belts with warm water and neutral soap, rinse them and let them dry in the shade.
Absolutely do not use aggressive detergents, bleaches or stains, avoid any chemical substance that may weaken fibres.

⚠ **CAUTION:**
Entrust skilled and trained technicians with the cleaning procedures.
Before starting this procedures, make sure that the vehicle is in maximum safety conditions.
Park it on a level a compact ground, switch-off the engine and apply the parking brake.

USE AUTHORISED WASHING AREAS.

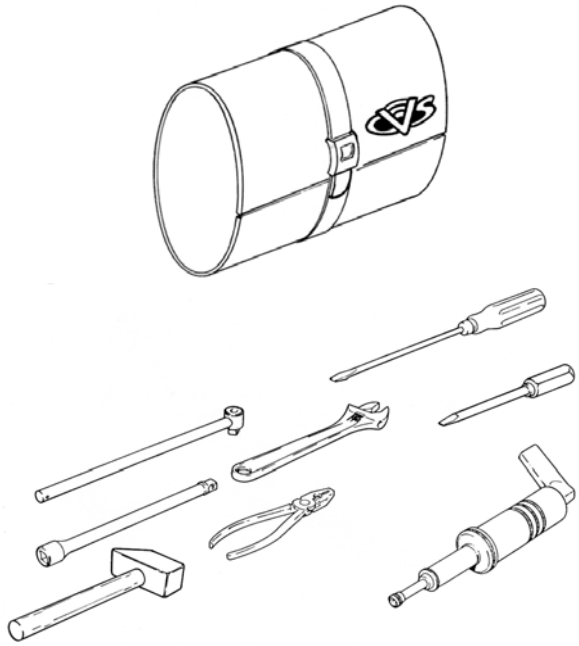
During these service steps, wear suitable clothing. Anyway, refer to the chapter "SAFETY INSTRUCTIONS" in this manual.



TOOL KIT

Each vehicle is equipped with a set wrenches, tools and accessories that allow the user to perform normal operation and maintenance steps:

Description	P/N	Q.ty
Bag	901536	1
Grease gun	900848	1
Grease gun extension	900849	1
Pliers	900883	1
Hammer	900886	1
Wheel nut wrench (size …) **for "MERITOR" driving axles**	/	/
Wheel nut wrench (size27) **for "KESSLER" driving axles**	903004	1
Wheel nut wrench extension	903006	1
Adjustable wrench	900844	1
Chisel	900885	1
Screwdriver	900884	1



As well as : - Door keys set

- Ignition keys set

COPPIE DI SERRAGGIO **(Nm)**
TIGHTENING TORQUES

NOTE: ***The values of following tables apply if not diversely specified in the Manual.***

FILETTATURE METRICHE STANDARD **/ Metric standard thread**						
Filettature **Thread**	Vite**/screw** Dado**/nut** **Class 8.8 Class 8**		Vite**/screw** Dado**/nut** **Class 10.9 Class 10**		Vite**/screw** Dado**/nut** **Class 12.9 Class 12**	
∅ x pitch	black	galvanised	black	galvanised	black	galvanised
3 x 0,5	1,53	1,37	1,93	1,73	2,34	2,1
4 x 0,7	3,16	2,84	4,38	3,94	5,3	4,77
5 x 0,8	6,12	5,5	8,67	7,8	10,3	9,27
6 x 1	10,6	9,54	14,8	13,3	17,8	16
8 x 1,25	25,1	22,5	35,4	31,8	42,4	30,2
10 x 1,5	51,1	46	71,9	64,7	86,3	77,6
12 x 1,75	86,5	77,8	121,4	109,2	145,9	131,3
14 x 2	137,7	123,9	193,8	174,4	232,6	209,3
16 x 2	209,1	188,2	293,8	264,4	353	317,7
18 x 2,5	288,7	259,8	406,1	365,5	487,7	436,9
20 x 2,5	408,1	367,3	573,4	516,1	687,7	618,9
22 x 2,5	542,3	488,5	763,2	686,9	915,3	823,7
24 x 3	705,1	634,5	990,8	891,7	1193,3	1074,4
27 x 3	1036	927,5	1448,9	1304	1734,6	1561,2
30 x 3,5	1307,9	1258,1	1989,3	1772,4	2357,1	2021,4

FILETTATURE METRICHE FINI **/ Metric fine pitch thread**						
Filettature **Thread**	Vite**/screw** Dado**/nut** **Class 8.8 Class 8**		Vite**/screw** Dado**/nut** **Class 10.9 Class 10**		Vite**/screw** Dado**/nut** **Class 12.9 Class 12**	
∅ x pitch	black	galvanised	black	galvanised	black	galvanised
8 x 1	26,5	23,8	37,3	33,5	44,7	40,3
10 x 1,25	53,4	48,1	75,1	67,5	90,2	81,1
12 x 1,5	89	80	125	112,5	150	135
12 x 1,25	92,4	83,2	129,5	116,6	156,1	140,5
14 x 1,5	145,9	131,3	206,1	185,5	246,9	222
16 x 1,5	218,3	196,5	308,1	277,3	369,3	332,4
18 x 1,5	314,2	282,8	442,8	398,5	530,6	477,5
20 x 1,5	439,7	395,8	619,3	557,4	742,8	662,5
22 x 1,5	582,6	524,3	819,3	737,4	983,6	885,3
24 x 2	745,3	671,3	1051	945,9	1255,1	1129,5
27 x 2	1091,8	982,6	1530,6	1377,5	1836,7	1653
30 x 2	1510,2	1359,1	2122,4	1910,2	2540,8	2286,7

LUBRICATION

To facilitate the tasks of the user of the vehicle, the maintenance works to be performed, as well as the recommended lubricants that are necessary to achieve best performances from your Reach Stacker are illustrated in the following in form of clear, easy to read charts.

This chapter contains information about :

- Refuelling table
- Lubricants and fluids
- Maintenance summary
- Lubrication chart

FUEL AND LUBRICANTS CHART

DESCRIPTION	CAPACITY		SPECIFICATIONS	SAE
	LITRES	KG	(1)	NUMBER
Fuel tank	**330**	**/**	Diesel (2)	
Engine coolant	**75**	**/**	-35°C +35°C 50/50 Antifreeze/Water (3)	
Engine oil *(with filters)*				
• VOLVO TWD 731 VE	**29**	**26,5**	ACEA E7 - E5 API CI-4/CH-4/SL (4)	15W/40 (4)
• VOLVO TAD 720 VE	**22**	**20**		
• CUMMINS – 6CTA8.3-230	**22**	**20**		
• CUMMINS – QSB 6.7 – T3	**19**	**17**		
• IVECO-aifo 8361 SRE10	**20**	**18**		
Transmission oil • CLARK “HR32000 Series”	**40**	**36**	Caterpillar TO-4 Allison C-4 John Deer J20C,D MIL-PRF-2104G (5)	15W/40 (5)
Driving axle oil • KESSLER - Differential gear - Wheel gears • MERITOR - Differential gear - Wheel gears	**48** **2,5x2**	**43** **2,2x2**	MIL-L-2105 C API GL-5 SAE J306 MAY81	80W/90 (6)
Hydraulic fluid - Derricking, brakes, steering; - Cab tilting *(if fitted)* - Cab sliding *(if fitted)*	**600**	**540** (7)	MIL-L-2104 E MIL-L-46152 C API CD/SF Mixed with additive "LUBRIZOL" type 6270 or 9990A with a ratio of 5%	10W/20
Cab sliding braking system *(if fitted)*	**0,07**	**0,063**	(7)	
Air conditioning compressor oil	**0,03**	**0,028**	PAG SP10 (8)	
Air conditioner	**/**	**1**	BIOGAS R134 (8)	
Lubricating grease	**/**	**/**	EP/NLGI-2 (9)	

NOTES: **-** (1 ÷ 9) *see on following pages.*

- The a.m. quantities are just as an indication; in any case check all levels.

- The oil grade SAE indicated in the table, are those suggested by manufacturers
(In any case read following Notes).

FUEL, FLUIDS AND LUBRICANTS (cont'd)

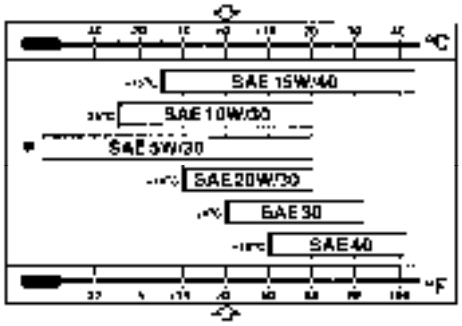
NOTES:

(1) *Before using, always carefully read and completely understand the oil specifications and ask the product manufacturers or dealers for accurate use and mixing (if applicable) instructions and replacement intervals basing on the different operating conditions, especially in case of use of different oil types, as instructed in our chart.*

(2) ***DIN51601, ASTM D975, BS28689, W-F-800C**. Cetane number bigger than 45.*
*Sulphur content: **max 0,05%** (0,3% stable).*
With ambient temperature below 0°C, use winter fuels.
*With ambient temperatures below **-20°C**, use **dewaxed ARTICO** type fuels*.

(3) *To protect the system against corrosion, the whole year long (also in summer) add to the coolant the antifreeze "**AGIP ANTIFREEZE EXTRA**" (freezing point -**35°C**) with a ratio of **50%.** Using other products, observe the manufacturer's instructions.*

(4) *For the correct function of the engine, the SAE oil viscosity must correspond to the indicated values in relation with the outdoor temperature. If the tractor is used less, as herein indicated, the oil engine must be changed in any case at least yearly.*
In case of use of fuels containing more than 0,5% sulphur, halve the number of miles to be covered for the engine oil change.



NOTE :

☺ *The replacements intervals of engine oil and filter may be considerably lengthened using specific oils, i.e. long-drain multigrade oils designed and produced to meet the requirements of heavy-duty diesel and turbo-diesel engines, and at the same time of the user.*

Oil and filter replacement intervals may vary between **100** and **1000** operating hours*, depending on the quality of the lubricant and on the sulphur content in the fuel.*

☺ *As for Army Departments engine oil shall also comply with following specifications :*
MIL-L-2104 E , MIL-L-46152 E

⚠ **CAUTIONS:**

- ***The intervals of oil and filter replacement must never be longer than 12 months.***
- ***In any case read the lubricant specifications stated in the original handbook of the installed engine. Not all the manufacturers suggest extending the maintenance intervals.***
- ***If longer intervals are required than those listed above, the oil manufacturer has to check the state of the lubricating oil by doing regular oil analyses on every engine.***

FUEL, FLUIDS AND LUBRICANTS (cont'd)

NOTES:

(5) *In C.V.S., the first filling of the transmission will be done using the oil "**AGIP ROTRA CT SAE 30**", an oil that has the following characteristics:*

* ALLISON C-4 , * CATERPILLAR TO-4 , * DANA ,
* EATON , * ZF TE-ML01,03 , * KOMATSU , * KOMATSU DRESSER.

*The oil gradation **SAE 30** "**AGIP ROTRA CT**" is indicated for a range of temperature between **-15°C** and **+35°C**; the gradation **SAE 50** is indicated for higher temperatures, between **-5°C** and **+50°C**.*

*For lower temperatures between **-15°C** and **-35°C**, please use the lubricant "**Artic**" as defined in the standard **MIL-L-46167B SAE 0W/20**.*

IMPORTANT:
Do not use the following lubricant: DEXRON (II-III), engine oil and GL-5 oils.
We suggest to use only lubricant approved in the specifications "Allison C4 and Caterpillar TO-4"

⚠ **CAUTION:** ***In case of extreme state of atmosphere the intervals of maintenance have to be halved***

(6) *For the use with outdoor temperatures below **-10°C** use oils with **SAE number 75W/85**.*

(7) *The first time, the hydraulic system is filled with the "**AGIP ROTRA JD/F SAE 80W**" oil, an oil with additives corresponding to the following specifications:*

* ALLISON C-4 , * API GL-4 , * CAT TO-2 , * FORD M2C 134-D ,
* J.1.CASE MS1206 , * JOHN DEER J20C , * MASSEY FERGUSON M-1141.

*For the use with outdoor temperatures up to **-10°C** use **VG22** oils mixed with additive **"LUBRIZOL"** type **6270** or **9990A** with a ratio of 3% ÷ 6%.*

*For the use with outdoor temperatures up to **-20°C** use **VG10** oils mixed with additive **"LUBRIZOL"** type **6270** or **9990A** with a ratio of 3% ÷ 6%.*

⚠ **CAUTION:** ***When the outdoor temperature is -15°C it is necessary to preheat automatically the hydraulic oil.***

NOTE: *The quantity shown in the chart means the TOTAL volume of the system.*
Observe the oil level gauge while filling up the system.

(8) *For the change, we recommend to contact an authorised **DIAVIA** workshop.*

(9) *Use anti-rust lithium based grease with EP features, containing molybdenum disulphide and with high viscosity base oil.*

*For the use with outdoor temperatures up to **-10°C** use **NLGI- 0** consistency grease.*

*For the use with outdoor temperatures up to **-30°C** use **NLGI-000** consistency grease **"AGIP ROCOL"**, Normative Sapphire.*

*For the use with outdoor temperatures up to **-50°C** use grease **"AGIP ROCOL"**, Normative Sapphire Low-Temp2.*

⚠ **WARNING:**
We remind that the collection and disposal of waste oils is ruled by law.
All a.m. materials and components must be delivered to authorised waste materials collectors.
It is severely forbidden to discharge them in indiscriminate dumps, in water courses or in drains.

MAINTENANCE CHART

A badly serviced vehicle represents a danger for the operator and the people around him.
Make sure that the maintenance and lubrication operations are carried out according to the intervals prescribed on the following charts, in order to keep the vehicle in good and sure operating conditions.

WARNING: ***Only skilled, trained personnel may carry out the maintenance operations.***
Before servicing the vehicle, make sure that the vehicle is in the maximum safety conditions.
Park the vehicle on a level, solid ground and apply the parking brake *(if not diversely instructed)**.***
In any case consult the chapter "SAFETY INSTRUCTIONS" of this manual.

Servicing and maintenance operations depend on the operating hours of the vehicle.
Check the hour-meter *(this must always be in good working order)* to decide the servicing intervals.
Never use a vehicle that needs to be serviced.
If faults are found during the maintenance, make sure that all these faults are repaired immediately.

First Maintenance Operations

OPERATIONS

I = Inspect **C** = Clean **G** = Grease **A** = Adjust **R** = Replace

Interval	Description	I	C	G	A	R
After the first **100 operating hours**	Engine oil					R
	Engine oil filter					R
	Transmission oil					R
	Transmission oil filters					R
	Driving axle oil					R
	Hydraulic oil filters					R
After the first **250 working hours**	Timing system	I			A	
	Injectors	I				
	Tightening of propeller shaft bolts	I			A	
	Tightening of counterweights bolts	I			A	
	Tightening of towing hook bolts	I			A	
	Visual inspection and tightening of vehicle components *(axle and drive axle, boom, cab and supporting structure, ladders, mudguards, etc.)*	I			A	
After the first **500 working hours**	Hydraulic oil					R

MAINTENANCE CHART (cont'd)

OPERATIONS

I = Inspect **C** = Clean **G** = Grease **A** = Adjust **R** = Replace

Interval	Description	I	C	G	A	R
Daily	Engine oil level	I			A	
	Engine oil pressure	I				
	Engine fan	I				
	Air cleaner clogging gauge	I				
	Fuel level	I			A	
	Water/fuel separator [prefilter] (✪)	I	C			
	Coolant level	I			A	
	Window washer level	I			A	
	Hydraulic oil level	I			A	
	Grease level in the pump reservoir (*) *(automatic centralised lubrication system)*	I	C		A	
	Windows, rear view mirrors, headlights and working lights	I	C			
	Indicator lights, Instruments	I	C			
	Parking brake	I				
Weekly	Transmission oil level *(gearbox)*	I			A	
	Coolant reservoir	I	C		A	
	Radiator	I	C			
	Cab sliding guides, pinion and rack (*)	I	C	G		
	Air/Oil heat exchanger	I	C			
	Oil level "Declutch and Brake" pedal system	I			A	
	Batteries	I	C			
	Air conditioner drive belt (*)	I	C		A	
	Air-conditioner condenser (*)	I	C			
	Body	I	C			
	- Tightening of screws and bolts	I			A	
Every **100 working hours**	Fuel filter cup (*)		C			
	Water/fuel separator (😐)	I	C			
	Propeller shaft	I	C	G		
	Driving axle oil levels *(differential/wheel gears)*	I			A	
	Air vent driving axle	I	C			
	Air vent parking brake cylinder	I	C			
	Steering axle *(bolts, links and cylinder)*	I	C	G	A	
	Tyre pressure *(on cold tyres)*	I			A	
	Wheel nuts tightening	I			A	
	Lifting cylinders and fastening bolts	I	C			
	Extension cylinder and fastening bolts	I	C	G		
	Boom *(guides, bolts, sliding shoes*)	I	C	G		
	Boom proximity switches	I	C		A	
	Boom fastening to the chassis	I		G		
	Continuation on next page ➔					

(*) = if fitted (✪) "**CUMMINS**" engines (😐) "**VOLVO**" engines

MAINTENANCE CHART (cont'd)

OPERATIONS

I = Inspection **C** = Clean **G** = Grease **A** = Adjust **R** = Replace

Interval	Description	I	C	G	A	R
Every **100 working hours**	Damping cylinders and fastening bolts	I	C	G		
	Sliding cab or Tilting cab *(guides, rack, pinion, shoes, cylinders and bolts)*	I	C	G		
	Sensors and limit switches *(all fitted)*	I	C		A	
	Lubrication of all lubrication points of the vehicle		C	G		
Every **500 working hours**	Chains *(all chains fitted)*	I	C	G		
	Engine oil					R
	Engine oil filter					R
	Oil cleaner (*)		C			
	Slack of all drive belts	I			A	
	Fuel filter (✪)					R
	Water/fuel separator [prefilter] (✪)					R
	Fuel tank	I	C			
	Coolant filter (*)					R
	Water pump	I				
	Water hoses and lines	I				
	Engine lines and fittings	I	C			
	Engine electric cables and connections	I				
	Transmission oil filter *(cartridges)*					R
	Hydraulic oil filter					R
	Brake fluid filter *(feeding line)*					R
	Brake fluid filter *(return line)*					R
	Tightening of propeller shaft bolts	I			A	
	Tightening anchor bolts driving axle/chassis	I			A	
	Axle: clearances of bolts/pivots/links and structure	I				
	Tightening of ring nuts of the wheel hub bearings	I			A	
	Wheel hubs	I		G		
	Pressurised cap of the oil tank	I	C			
	Lifting structure *(boom, etc.)* :					
	- Welds, guides, cylinders	I				
	- Sliding shoes, bolts, sleeves	I				
	- Tightening of bolts	I	C		A	
	- Chains	I	C		A	
	Cab :					
	- Supports, slide guides, structure, rack, pinion,	I				
	- Lifting cylinders and slide shoes (*)	I		G		
	- Chains and tightness of chain tightener nuts (*)	I	C		A	
	- Tightening of bolts	I			A	
	Towing hook *(as well as tightening of bolts)*	I	C	G	A	
	Counterweights *(as well as tightening of bolts)*	I			A	

(*) = if fitted (✪) "**CUMMINS**" engines (😐) "**VOLVO**" engines

MAINTENANCE CHART (cont'd)

OPERATIONS

I = Inspect **C** = Clean **G** = Grease **A** = Adjust **R** = Replace

Interval	Description	I	C	G	A	R
Every **1000 working hours** and ***in any case*** **yearly**	Fuel filter (☺)					R
	Water/fuel separator [fuel pre-filter] (☺)					R
	Timing system	I			A	
	Injectors	I	C			
	Turbocharger and intake line	I				
	Transmission oil					R
	Cab sliding braking system [oil level] (*)	I	C		A	
	Exhaust lines	I			A	
	Air cleaner (△)		C			R
	Fine-mesh cartridge of the air cleaner (△) (*)	I	C			R
	Drive axle oil *(differential and wheel gears)*					R
	Steering axle bearings	I	C		A	
	Air conditioner gas (*)	I				
	Air conditioner compressor oil (*)	I				
Every **2000 working hours**	Telescopic boom shoes	I				R
	AC Generator	I	C		A	
	Starter motor	I	C		A	
	Coolant					R
	Catalytic converter (*)	I	C			
	Pipes and hoses of all systems	I				
Every **3000 working hours**	Fuel tank	I	C			
	Hydraulic oil					R
Every **6000 working hours**	Hydraulic cylinders:					
	- overhauling	I	C			
	- gaskets					R

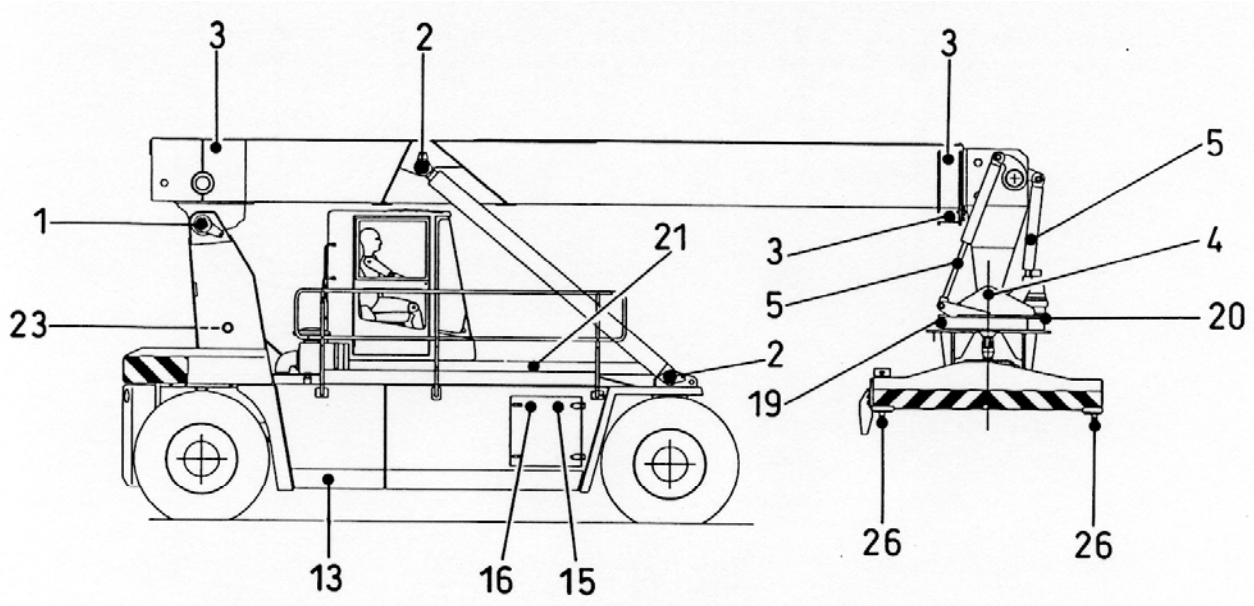
(*) = if fitted (✪) "**CUMMINS**" engines (☺) "**VOLVO**" engines

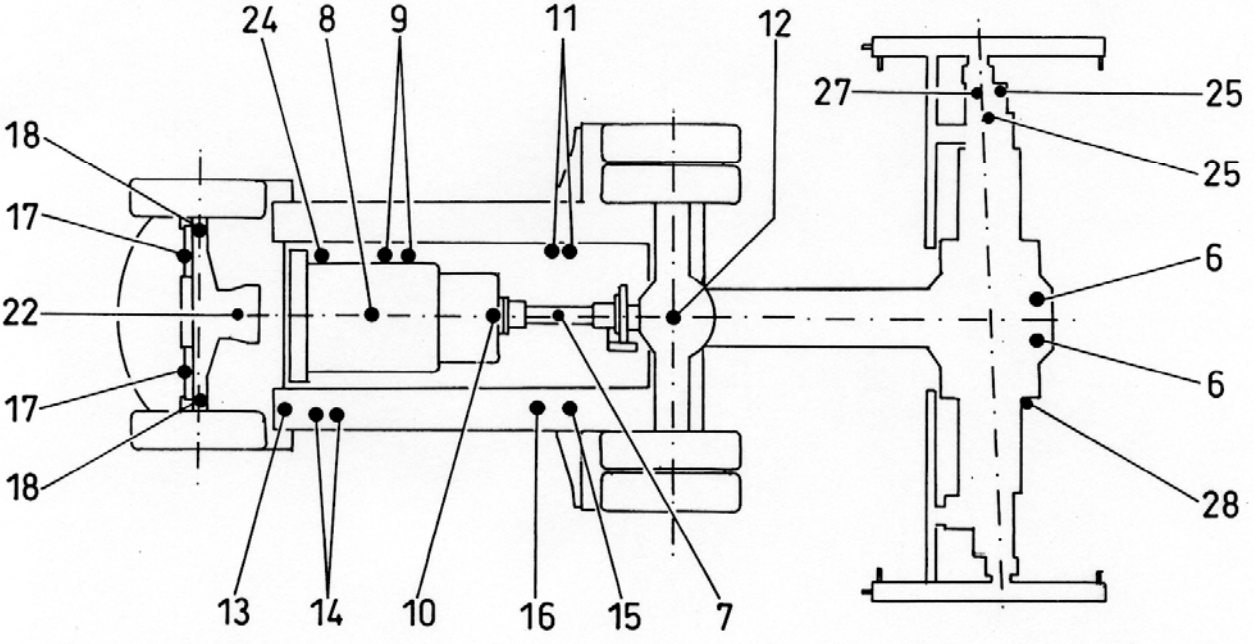
(△) **CAUTION:** *This is an indication and greatly depends on the presence of dust in suspension. When the clogged air filter warning light (on the control panel inside the cab)* [or when the clogging gauge on the air cleaner shows the "**red**" signal]*, comes on, immediately clean the filter, bearing in mind that it should not be cleaned for more than 6 times, then it has to be replaced (see the relevant section of the chapter "MAINTENANCE"). Filter life cycle can range from 200 operating hours (in a desert), up to max. 1500 operating hours (on paved yards).*

⚠ **CAUTION:** ***In any case consult the relevant section of the chapter*** **"MAINTENANCE".**

Intentionally blank page

LUBRICATING POINTS





MAINTENANCE CHART

SERVICING STEPS

I = Inspect **L** = Lubricate **R** = Replace

Pos.	Description	Daily	Weekly	Intervals [working hours]				
				100	500	1000	2000	3000
1	Boom pivots			**I/L**				
2	Lifting cylinders			**I/L**				
3	Boom shoes			**I/L**				
4	Spreader pivots			**I/L**				
5	Damping cylinders or Levelling cylinders			**I/L**				
6	Spreader gearmotors				**I**			
7	Propeller shaft			**I/L**				
8	Engine oil	**I**			**R**			
9	Engine oil filter/s				**R**			
10	Transmission oil		**I**			**R**		
11	Transmission oil filters				**R**			
12	Driving axle oil *(differential gear and wheel gears)*			**I**		**R**		
13	Hydraulic oil	**I**						**R**
14	Hydraulic oil filters				**R**			
15	Brake fluid filter *(feeding line)*				**R**			
16	Brake fluid filter *(return line)*				**R**			
17	Steering linkages				**I/L**			
18	Steering bearings and pivots				**I/L**			
19	Spreader slewing rim *(if fitted)*			**I/L**				
20	Pinions and gear reducers *(if fitted)*			**I/L**				
21	Cab sliding guides			**I/L**				
22	Axle *(fastening bolts, links /levers and steering cylinder)*			**I/L**				
23	Electric pump of the automatic lubrication system *(if fitted)*	**I**						
24	Conditioner compressor oil *(if fitted)*					**I**		
25	Spreader cylinder supports			**I/L**				
26	Spreader twists-locks			**I/L**				
27	Spreader shoes			**I/L**			**I/R**	
28	Spreader side-shifting guides			**I/L**				
29								
30								

⚠ **CAUTION:**

- ***These intervals depend on the type of lubricant used and on the operating conditions. For longer intervals, the type of oil to be used must be checked by the manufacturer or dealer of the product.***
- ***In any case, refer to the relevant sections of the chapter "MAINTENANCE".***

INTRODUCTION

This chapter contains figures with dimensions, indications and *(hydraulic and electric)* diagrams of the systems of the vehicle

Figures :

- ☺ Warning and information plates *(standard vehicle)* Draw. **1449**
- ☺ Dimensions "F238" *(with Spreader)* Draw. **1383**
- ☺ Dimensions "F248" *(with Spreader)* Draw. **1381**
- ☺ Dimensions "F248" *(Double Stacking)* Draw. **1382**
- ☺ Dimensions "F258" *(with Spreader)* Draw. **1380**

Diagrams :

- ♦ Hydraulic Draw. **583436**
- ♦ Hydraulic system *"Optionals"* Draw. **572190**
- ♦ Hydraulic system *"Brakes"* Draw. **568486**

- ✪ Electric system *(and fault diagnosis)* Draw. **DW1M207**

SOSTITUISCE DIS.563019

	N°	DESCRIZIONE / Description	DIS.N° / DWG N.	Q.ta' / Q.ty	RIF. / Ref.	NOTA / Note
	39	VALVOLA DI RITEGNO / Valve	571702	1		
	38	VALVOLA UNIDIREZIONALE / Valve	100503	1		
	37	VALVOLA DI NON RITORNO / Valve	100502	2		
	36	TRASMETTITORE / Transmitter	561236	1		
	35	CENTRALINA INSERIMENTO / By-pass oil flow c.u.	546779	1		
	34	PRESSOSTATO / Pressure switch	530947	1		F. 258
				2		F. 248
	33	VALVOLA DI MAX / Valve	549802	4		F. 248
	32	VALVOLA / Valve	545763	2		F. 248
	31	CIL. LIVELLAMENTO SUL BRACCIO / Cylinder	567492	2		F. 248
	30	CIL. LIVELLAMENTO SUL TELAIO / Cylinder	567491	2		F. 248
	29	VALVOLA UNIDIREZIONALE / Unidirectional valve	552462	1		F. 248
	28	VALVOLA UNIDIREZIONALE / Unidirectional valve	568464	1		
4	27	PRESSOSTATO / Pressure switch	591391	1		
	26	PRESA PROVA PRESSIONE / Test fitting	101163	7		F. 248
				3		F. 258
	25	DISTRIBUTORE / Distributor	568467	1		F. 248
	24	TAPPO PRESSURIZZATO / Pressurized plug	561438	1		
	23	CILINDRO SOLLEVAMENTO / Lifting cylinder	572215	2		
	22	VALVOLA CONT. DISCESA S. / Valve	568466	1		
	21	VALVOLA CONT. DISCESA D. / Valve	568465	1		
	20	VALVOLA UNIDIREZIONALE / Unidirectional valve	568463	1		
	19	BLOCCO DISTRIBUTORE / Distributor ass.Y	583465	1		
	18	FILTRO / Filter	562258	2		
	17	TAPPO / Plug	534636	1		
	16	SCAMBIATORE DI CALORE / Air-oil cooler	530950	1		
	15	VALVOLA UNIDIREZIONALE / Unidirectional valve	552439	1		
	14	UNITA DI ALIMENTAZIONE / Control valve	552438	1		
	13	ELETTROVALVOLA C. / Solenoid valve ass.Y	557858	1		
	12	VALVOLA CONTROLLO RIENTRO / Valve	568459	1		
	11	PACCO ELETTROVALVOLE C. / Solenoid valve ass.Y	556065	1		
	10	PACCO ELETTROVALVOLE C. / Solenoid valve ass.Y	552435	1		
	9	VALVOLA COMANDO DISTRIBUT. / Hydraulic pilot valve	552433	1		
	8	UNITA DI STERZATURA / Steering unit	564218	1		
	7	BLOCCO VALVOLA / Valve lock	557636	1		
	6	CILINDRO STERZO / Steering cylinder		1		Φ125 xΦ 90 C. 218+218
			559878	1		
	5	RUBINETTO / Cock	101050	4		
1	4	POMPA DOPPIA / Pump	591049	1		
1	3	POMPA / Pump	591048	1		
	2	POMPA / Pump	568461	1		
	1	CILINDRO DI SFILO / Extension cylinder		1		F. 248.8
			592510	1		F. 258.6
2			592511	1		F. 248.6 D.S.
			592512	1		F. 248.6

N°	MODIFICHE	MOD.5431 17-09-04 MERICO	MOD. 5558 15-03-05 MERICO
1	VAR. PART. 3-4-27		
2	VAR. PART. 1		

C.V.S. S.p.A.
29100 ROVELETO DI CADEO
Via Emilia (PIACENZA)

Tipo veicolo	Quantita'
F. 248	1
F. 258	1

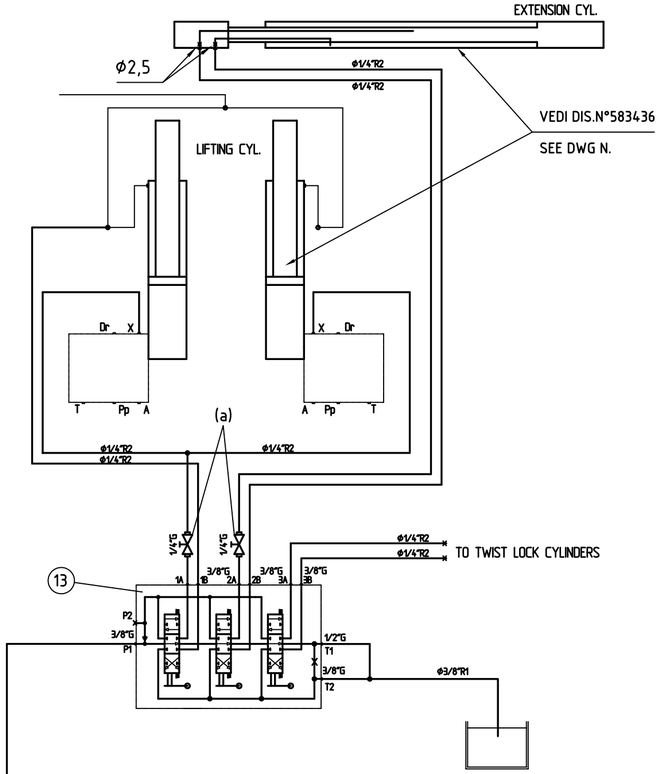
FERRARI 248 - 258

DESIGNAZIONE
SCHEMA IDRAULICO
Hydraulic scheme

DISEGNATO	VERIFICATO E APPROVATO	SCALA	DATA	CLASSE IMP.	DIS. N°
MERICO	Agosti		27-02-03	I	583436 CB

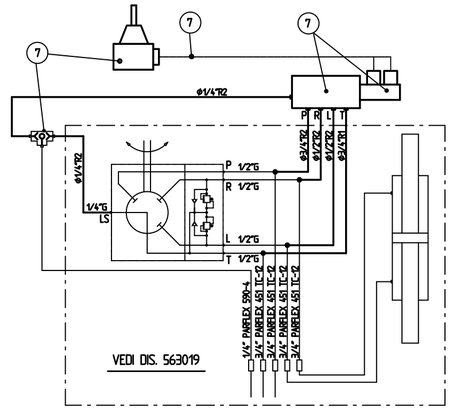
ABBASSAMENTO , SOLLEVAMENTO , RIENTRO E ROTAZIONE TWIST LOCK IN EMERGENZA
Lowering , lifting , retracting and twist lock rotation in emergency

VALIDO PER COMMESSA N°132/04



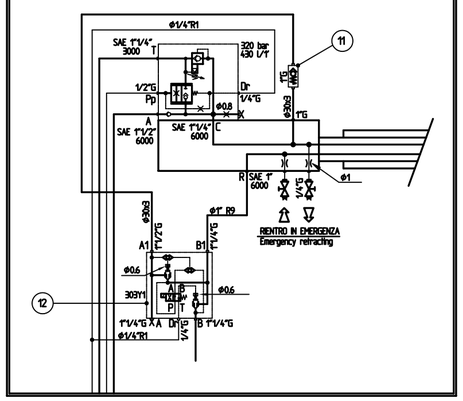
STERZATURA CON LEVA O PULSANTI PROPORZIONALE
Steering with lever or push button

7.02 e 7.03



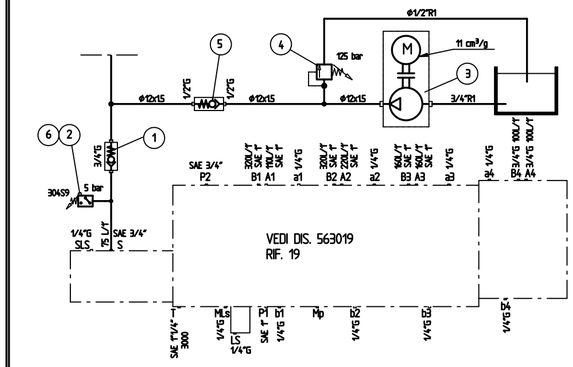
OPTIONAL
RIGENERATIVO SFILAMENTO
Extension speed boster

5.01



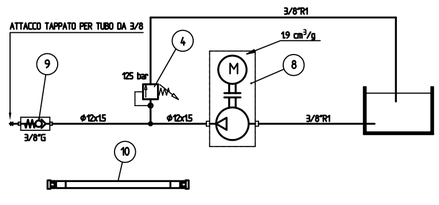
IMP. EMERGENZA STERZO
Steer. emergency scheme

7.01



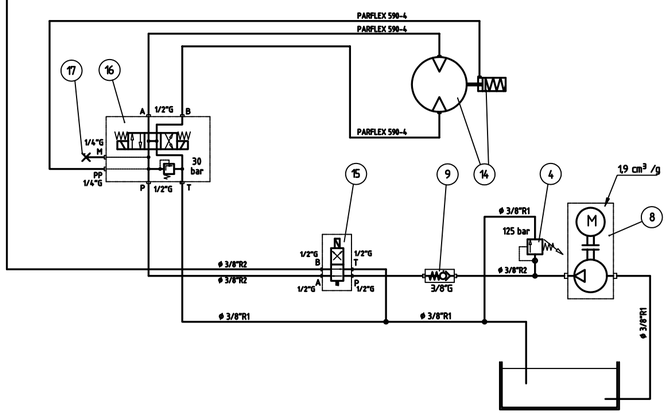
KIT PER ABBASSAMENTO , SOLLEVAMENTO , RIENTRO E ROTAZIONE TWIST LOCK IN EMERGENZA
Kit for lowering , lifting , retracting and twist lock rotation in emergency

5.02



SCHEMA TRASLAZIONE CABINA
Cab side-shifting scheme

VALIDO PER COMMESSA N°132/04



NOTA (a)

UTILIZZARE RUBINETTI 1/4" RIF. 5 DIS. 583436

	N°	DESCRIZIONE / Description	DIS.N° / DWG N.	Q.ta' / Q.ty	RIF. / Ref.	NOTA / Note
1	17	PRESA PROVA PRESSIONE / Test fitting	101163	1		
1	16	ELETROVALVOLA / Solenoid valve	538907	1		
1	15	ELETTROVALVOLA / Solenoid valve	101209	1		
1	14	MOTORE IDRAULICO / Hydraulic engine	550243	1		
1	13	DISTRIBUTORE / DISTRIBUTOR	579624	1		
	12	VALVOLA RIGENERATIVO / Valve	559436	1		
	11	VALVOLA DI NON RITORNO / Valve	100502	1		
	10	KIT-TUBOFLEX / Hose	564754	1		
	9	VALVOLA UNIDIREZIONALE / Unidirectional valve	552462	1		
	8	ELETTROPOMPA / Electric pump	581516	1		
	7	KIT LEVA STRZO / Kit Lever steer.	565696	1		(PULSANTI)
			557738	1		(LEVA)
	6	CONNETTORE / Connector	555437	1		
	5	VALVOLA UNIDIREZIONALE / Unidirectional valve	101216	1		
	4	VALVOLA DI MAX / Valve	543871	1		KIT PER EMERGENZE
				1		EMERGENZA STERZO
	3	ELETTROPOMPA / Electric pump	543863	1		
	2	PRESSOSTATO / Pressure switch	555436	1		
	1	VALVOLA UNIDIREZIONALE / Unidirectional valve	100503	1		

1 AGGIUNTO PART. 13-14-15-16-17 MOD. 5573 28-12-04 MERICO

MODIFICHE

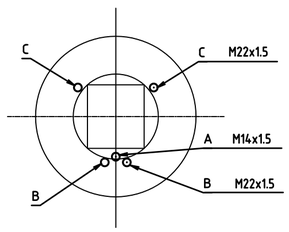
C.V.S. S.p.A.
29100 ROVELETO DI CADEO
Via Emilia (PIACENZA)

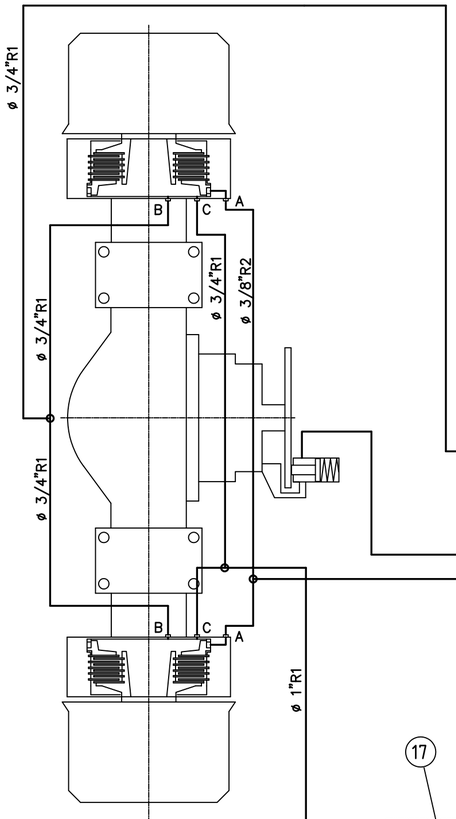
Tipo veicolo / Quantita'

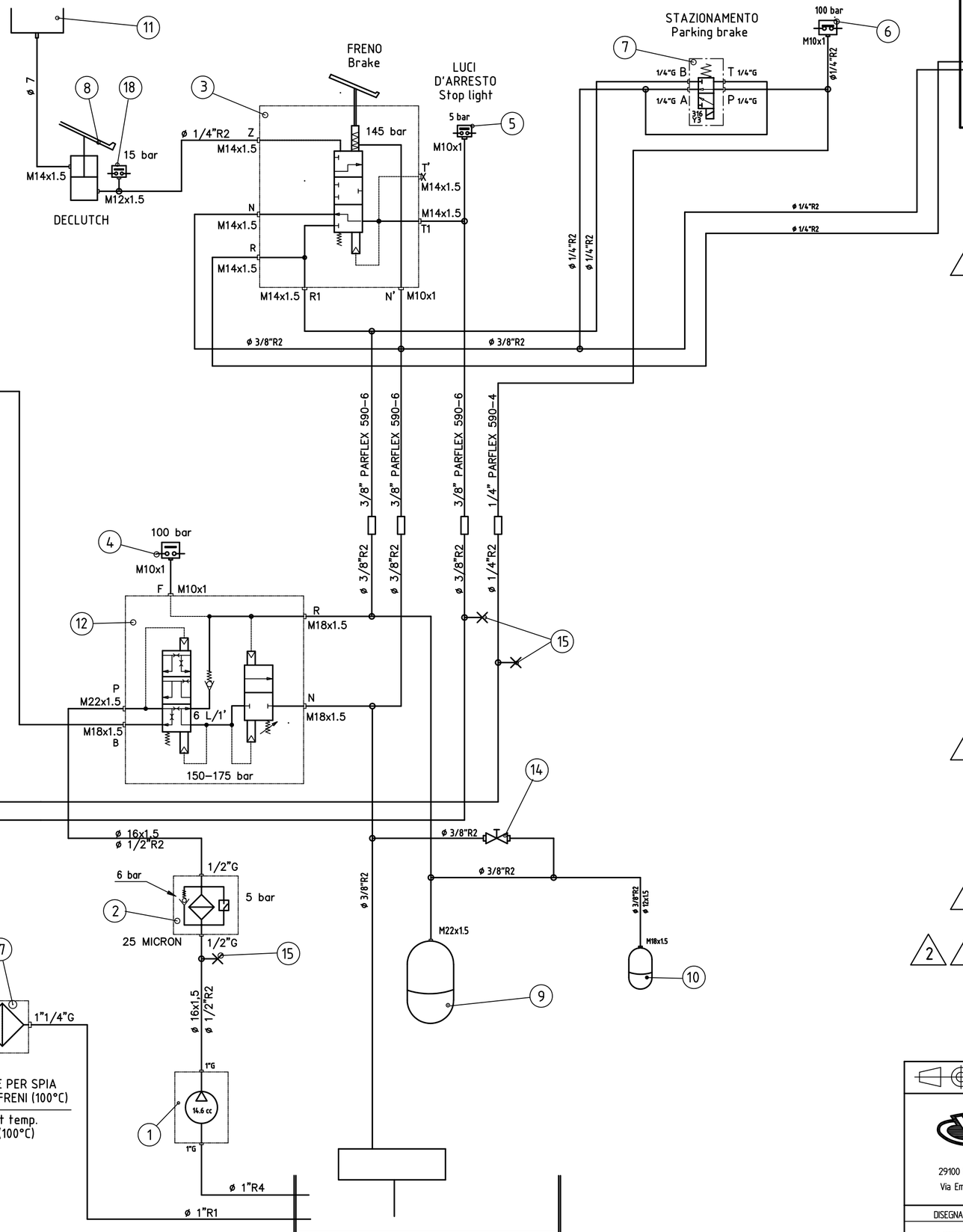
FERRARI 248 - 258

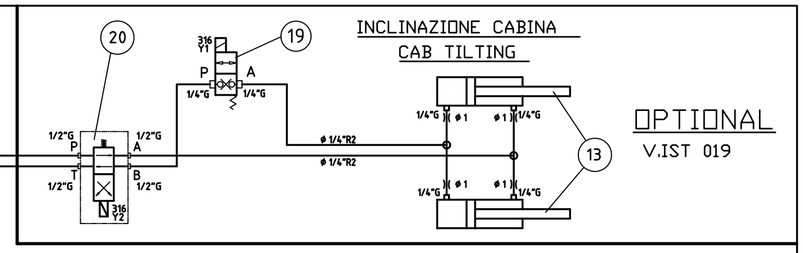
DESIGNAZIONE
SCHEMA IDRAULICO OPTIONALS
Optionals hydraulic scheme

DISEGNATO	VERIFICATO E APPROVATO	SCALA	DATA	CLASSE IMP.	DIS. N°
TRENCHI	Agosti		04-05-00	I	572190 CB









OPTIONAL
V.IST 019

22					
21					
1 20	ELETTROVALVOLA / Solenoid valve	101209	1		SOLO CON INCL. CABINA
19	ELETTROVALVOLA / Solenoid valve	510146	1		SOLO CON INCL. CABINA
18	PRESSOSTATO / Pressure switch	540055	1		
17	FILTRO / Filter	532619	1		
16	TRASMETTITORE / Transmitter	531469	1		
15	PRESA PROVA PRESSIONE / Test fitting	101163	3		
14	RUBINETTO / Cock	101050	1		
13	CILINDRO / Cylinder	568487	2		SOLO CON INCL. CABINA
12	VALVOLA FRENO / Brake valve	557710	1		
11	VASCHETTA / Oil bag	530949	1		
10	ACCUMULATORE / Accumulator	547015	1		SOLO CON INCL. CABINA
9	ACCUMULATORE / Accumulator	552262	1		
8	PEDALE FRENO / Brake pedal	530943	1		
1 7	ELETTROVALVOLA / Solenoid valve	557858	1		
6	PRESSOSTATO / Pressure switch	530945	1		
5	PRESSOSTATO / Pressure switch	530947	1		
4	PRESSOSTATO / Pressure switch	530946	1		
2 3	VALVOLA A PEDALE / Brake pedal valve	568410	1		
2 1 2	FILTRO / Filter	530953	1		
		589526	1		
1	POMPA / Pump	VEDI/SEE DIS / DWG. N. 563019			
N.	DESCRIZIONE / Description	DIS.N / DWG.N.	Q.ta' / Q.ty	RIF. / Ref.	NOTE / Notes

	MODIFICHE
1	VARIATI " PARTICOLARI 2, 7, 20 " MOD. 3699 18/04/00 TRENCHI
2	VARIATI PARTICOLARI 2, 3 MOD. 5216 29-03-04 MERICO
3	VAR. COLLEGAMENTO INCLINAZ. CABINA MOD. 5436 17-09-04 MERICO

S.p.A.
29100 ROVELETO DI CADEO
Via Emilia (PIACENZA)

Tipo veicolo	Quantita'
F. 238	1
F. 248	1
F. 258	1

FERRARI 238 - 248 - 258

DESIGNAZIONE
SCHEMA IMP. FRENI E INCLINAZ. CABINA
Brake and cab tilting scheme

DISEGNATO	VERIFICATO E APPROVATO	SCALA	DATA	CLASSE IMP.	DIS. N°
MERICO	Agosti		29-09-99	I	568486 CC

Rev	Date	Description	Made by
02	17-12-09	DISEGNI AGGIORN.	MF
0	10.3.09	VERSIONE SCHEMA COMPLETA	MF

APPARECCHIATURA PER:
Equipment for:

C.V.S ® IMPIANTO ELETTRICO

BLACK STACKER E20B 24B - 25B

NOTES
Remarks : QGS200

CAE - CAD SYSTEM

REV DESCRIZIONE | DATE | BY | DATA 17-3-2010 | DIS MF | CONTR | APPROV. CERTIFIC.

CLIENTE/Client: C.V.S. S.P.A.

TITOLO/Title: IMPIANTO ELETTRICO E-20B-24B-25B

PRODOTTO/Product: XPG 1M207

SCHEMA FUNZIONALE / Circuit Diagram

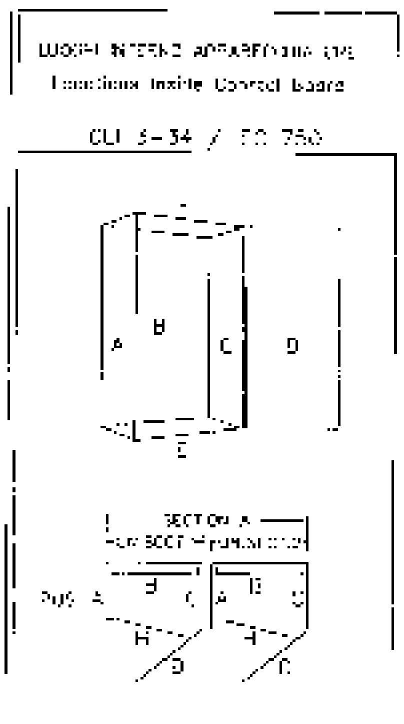
DIS / DWG: DW 1 V207

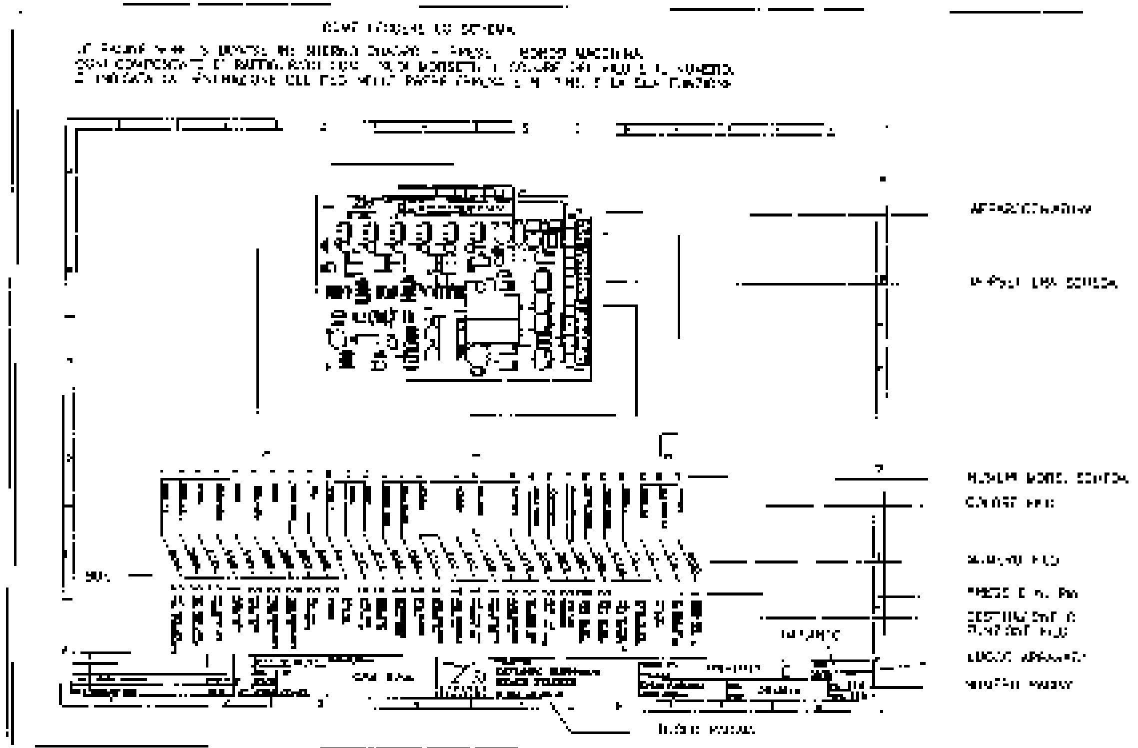
ATTENZIONE !!

PER LA VERIFICA DELL'IMPIANTO OPPURE PER LA RICERCA
DI GUASTI, ATTENERSI ESCLUSIVAMENTE ALLA NUMERAZIONE DEI CAVI.

LUOGHI STANDARD
Standard Locations

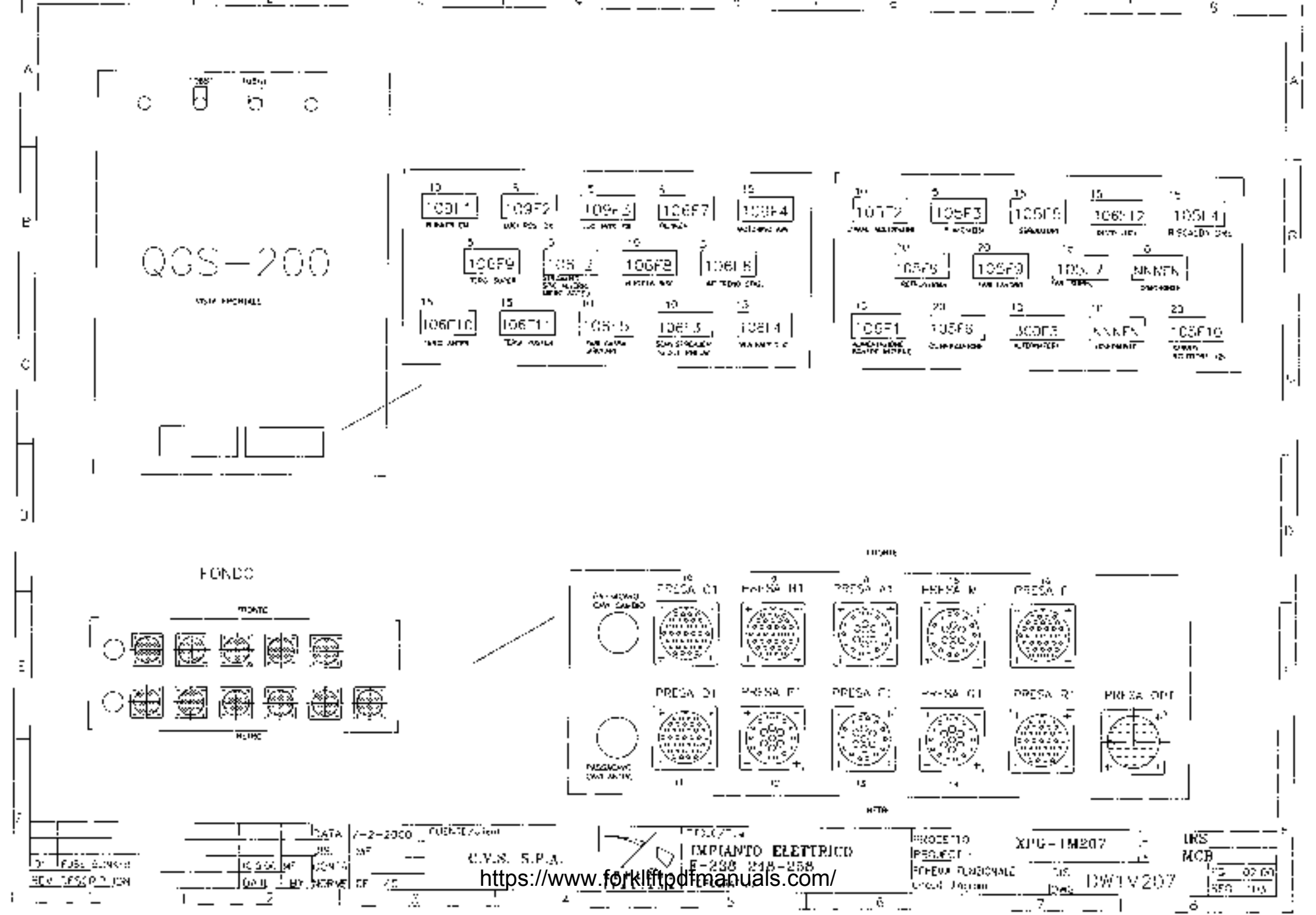
ITEM / Sigla	DESCRIPTION / Descrizione
+CDU	CONSOLE AND DESK UNIT / Leggio con Avalle
+CP	CONTROL PANEL / Pannello Comandi
+CR	CONTROL ROOM / Sala Comandi
+CU	CONSOLE UNIT / Pulpito Completo
+DU	DESK UNIT / Leggio
+JB	JUNCTION BOX / Cassetta di Derivazione
+LP	LOCAL PANEL / Pannello Locale
+MCB	MAIN CONTROL BOARD / Quadro Principale
+MCC	MOTOR CONTROL CENTER / Quadro Partenze Motori
+MD	UNIT DIAGRAM / Specifico
+OTM	ON THE MACHINE / A Bordo Macchina
+OTS	ON THE SITE / In Campo
+PLC	PROGRAMMABLE LOGIC CONTROL / Logica Programmabile
+TB	TERMINAL BOX / Cassetta Morsettiera

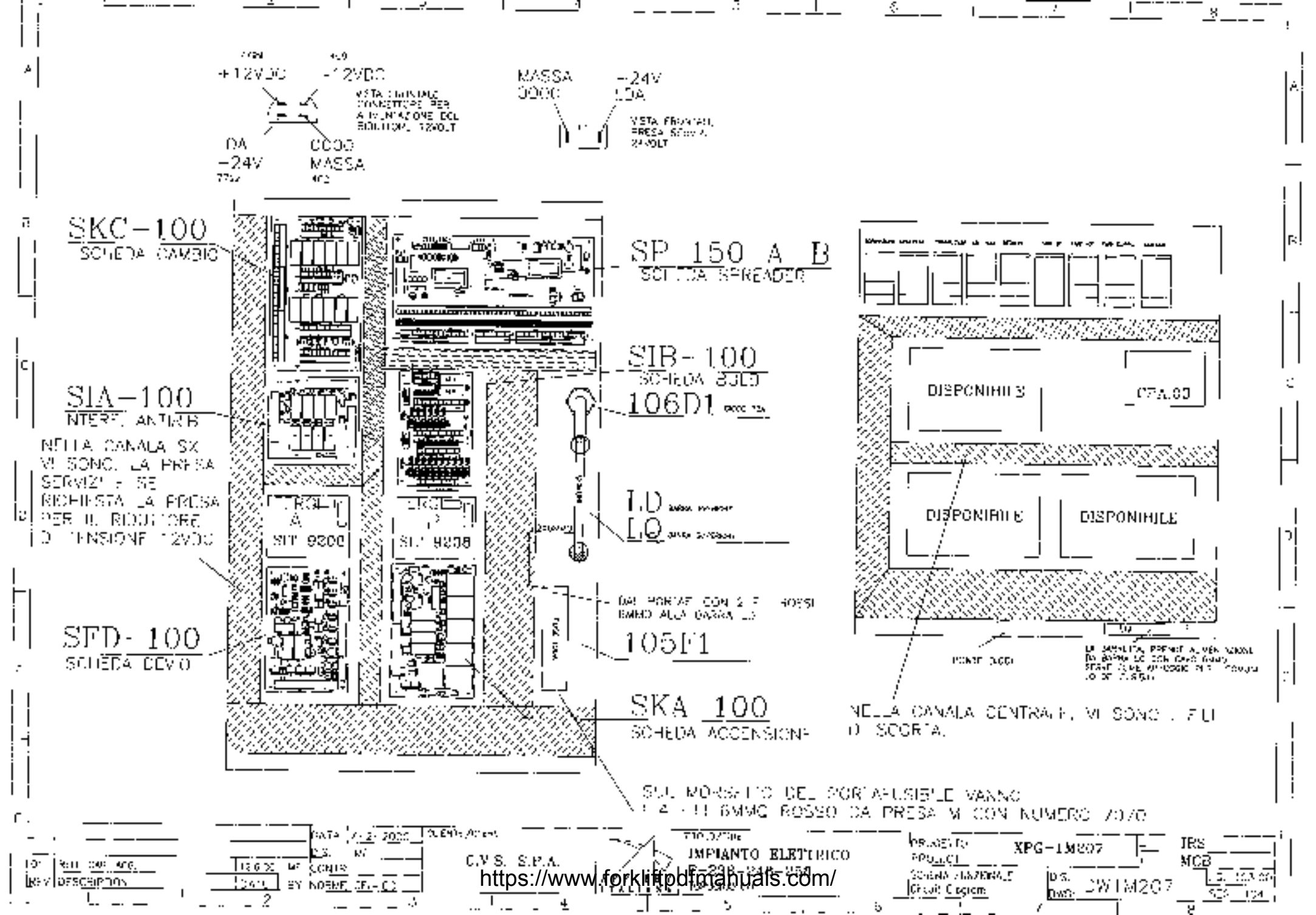


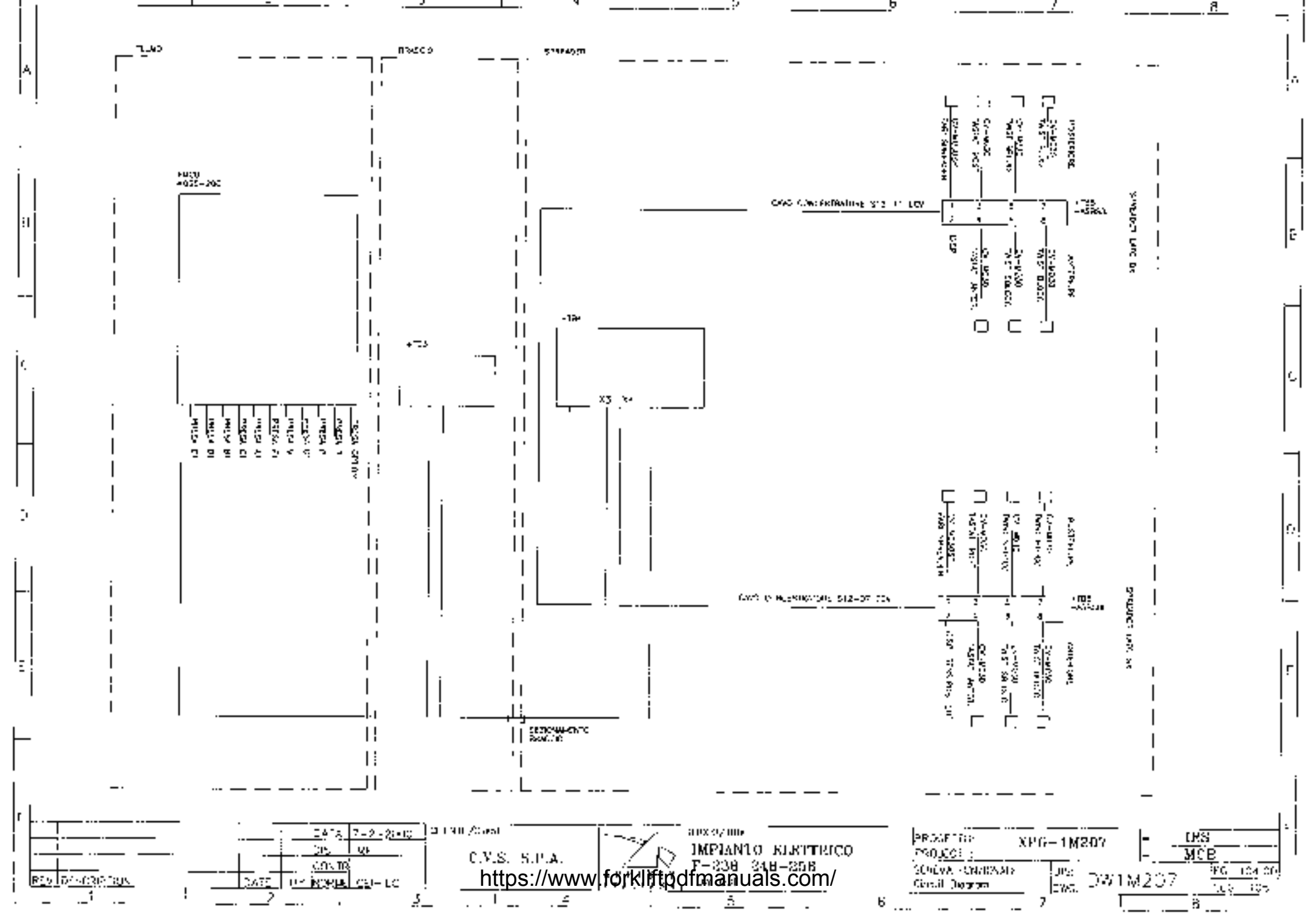


DATA 7-2-2000
C.V.S. S.P.A.
IMPIANTO ELETTRICO
F-238-240-250
SCHEMA FUNZIONALE
Circuit Diagram
PRODOTTO / PROJECT
XPG-1M207
IBS
MCB
DIS. / DWG. SW1M207
REV. DESCRIPTION

PAG N	DESCR.	F256	F248
001.00	COPERTINA	X	X
100.00	GENERALITA	X	X
101.00	SOMMARIO	X	X
102.00	LAYOUT	X	X
103.00	TOPOGRAFICO	X	X
104.00	LAY-OUT	X	X
105.00	FUSE LD	X	X
106.00	FUSE LO	X	X
107.00	MASSE	X	X
108.00	RELAYS	X	X
109.00	FUSE	X	X
110.00	SKA100	X	X
111.00	SIB100	X	X
112.00	SIA100	X	X
113.00	SKC100	X	X
114.00	SID100	X	X
115.00	SP152 IN	X	
115.01	SP153 IN		X
116.00	SP152 OUT	X	
116.01	SP153 OUT		X
117.00	SIT9208	X	X
118.00	CABIN	X	X
119.00	CPA00	X	X
120.00	RELAYS	X	X
121.00	FUSE	X	X
200.00	PRESA P	X	X
201.00	PRESA G1	X	X
202.00	PRESA M	X	X
203.00	PRESA F	X	X
204.00	PRESA A1	X	X
205.00	PRESA E1	X	X
206.00	PRESA B1	X	X
207.00	PRESA D1	X	X
208.00	PRESA C1	X	X
209.00	PRESA R1	X	X
300.00	MOTORE	X	X
301.00	POSTERIORE	X	X
302.00	CABINA	X	X
303.00	CHASSIS	X	X
304.00	CHASSIS	X	X
305.00	JOY-STICK	X	X
306.00	JOY-STICK	X	X
307.00	CRUSCOTTO	X	X
308.00	CABINA	X	X
309.00	CRUSCOTTO	X	X
310.00	CRUSCOTTO	X	X
311.00	CABINA	X	X
312.00	JOY-STICK	X	X
313.00	SPREADER	X	X
314.00	SPREADER	X	X
315.00	DISPONIBILE	X	X
316.00	CABINA	X	X
317.00	FC SAL.COL.	X	X
318.00	STF420	X	X







C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-238 248-256

PROGETTO: XPG-1M207
PROJECT:
SCHEMA UNIFILARE
Circuit Diagram

DWG. DW1M207

DRS
MCB

C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-IM207

MASSA

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-230-240-250

XPG-EM207

DW1M207

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-236-248-258

XPG-1M207

SCHEMA FUNZIONALE
Circuit Diagram

DWG. DW1M207

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-230-240-250

XPG-1M207

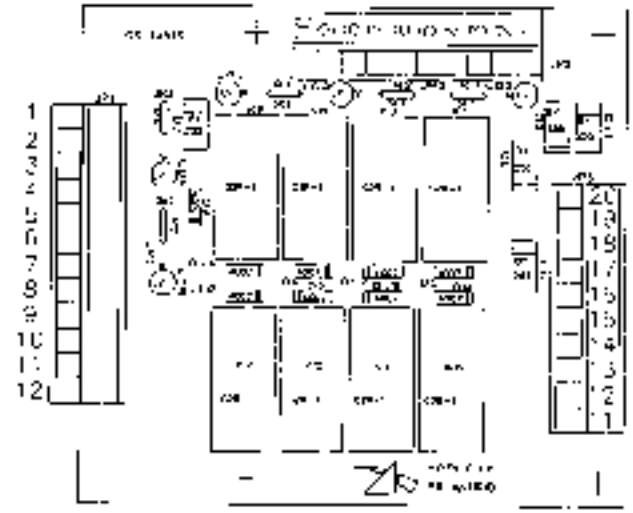
DW1M207

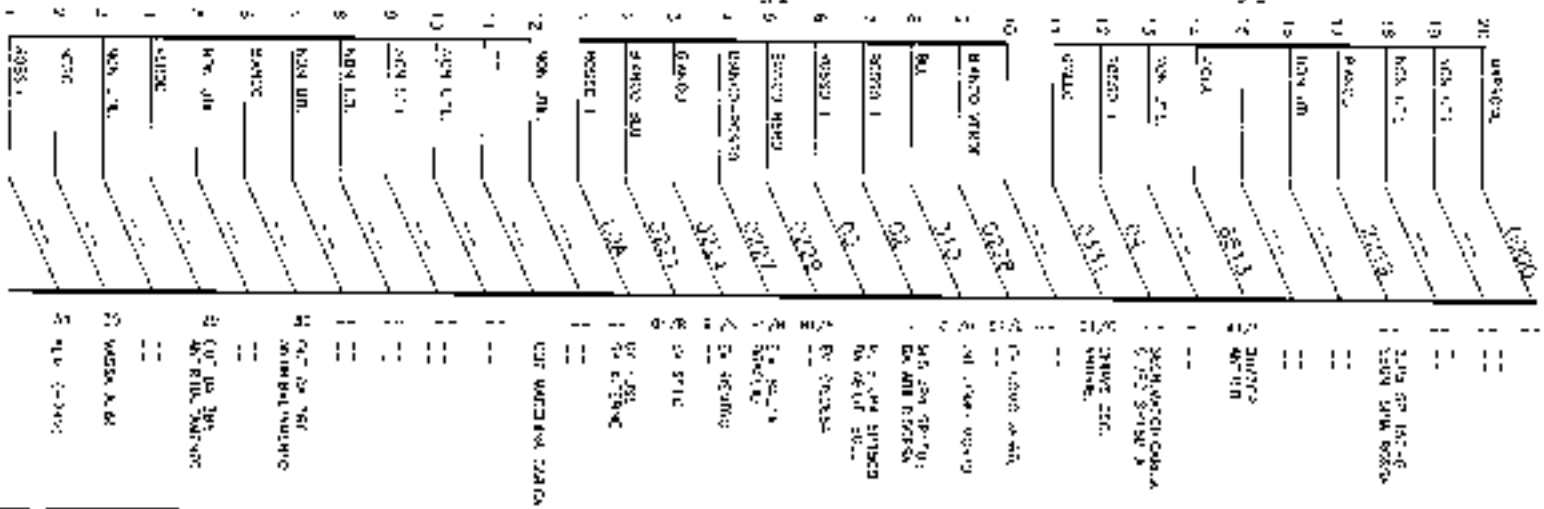
C.V.S.E. S.P.A.

IMPIANTO ELETTRICO

XPG-1M207

CABLAGGIO CON
TUTTI CV-CV





C.V.S. S.P.A.

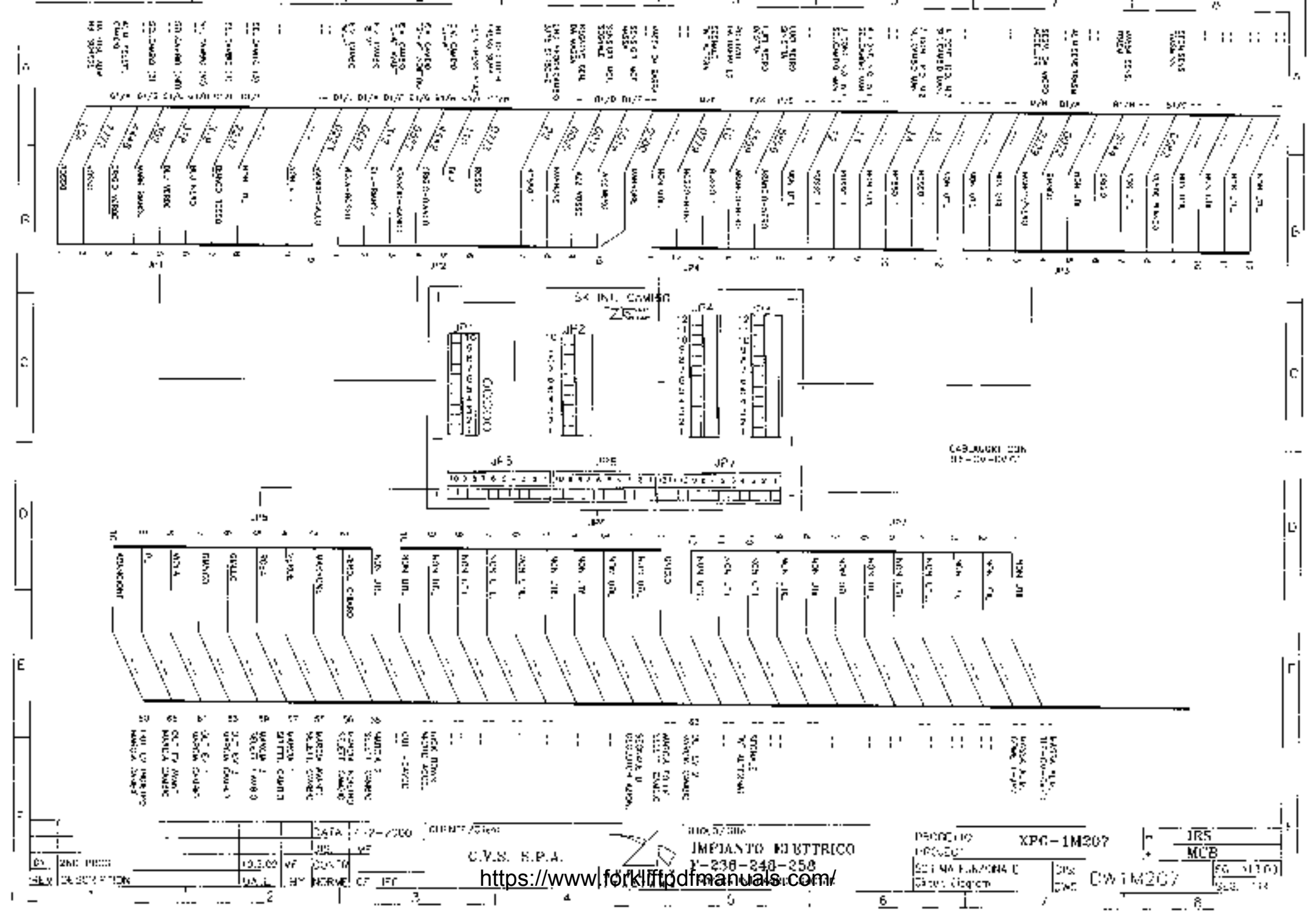
IMPIANTO ELETTRICO

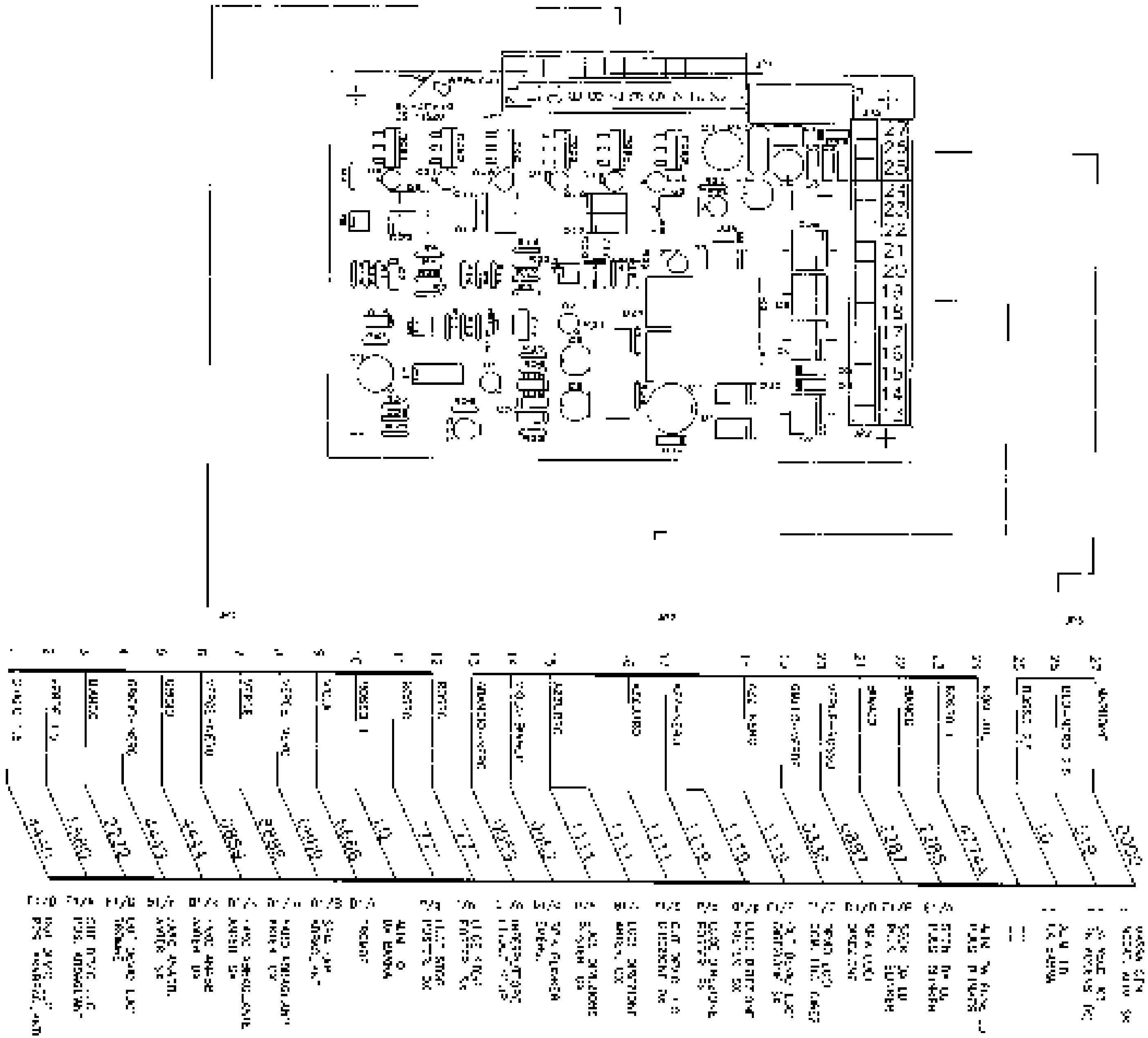
E-250-240 25A

XPG DM207

IRS

MCB


C.V.S. S.P.A.
IMPIANTO ELETTRICO
XPG-1M207
DW1M207
IRS
MCB
https://www.forkliftpdfmanuals.com/



DATA	7-2-2000
DIS.	VF

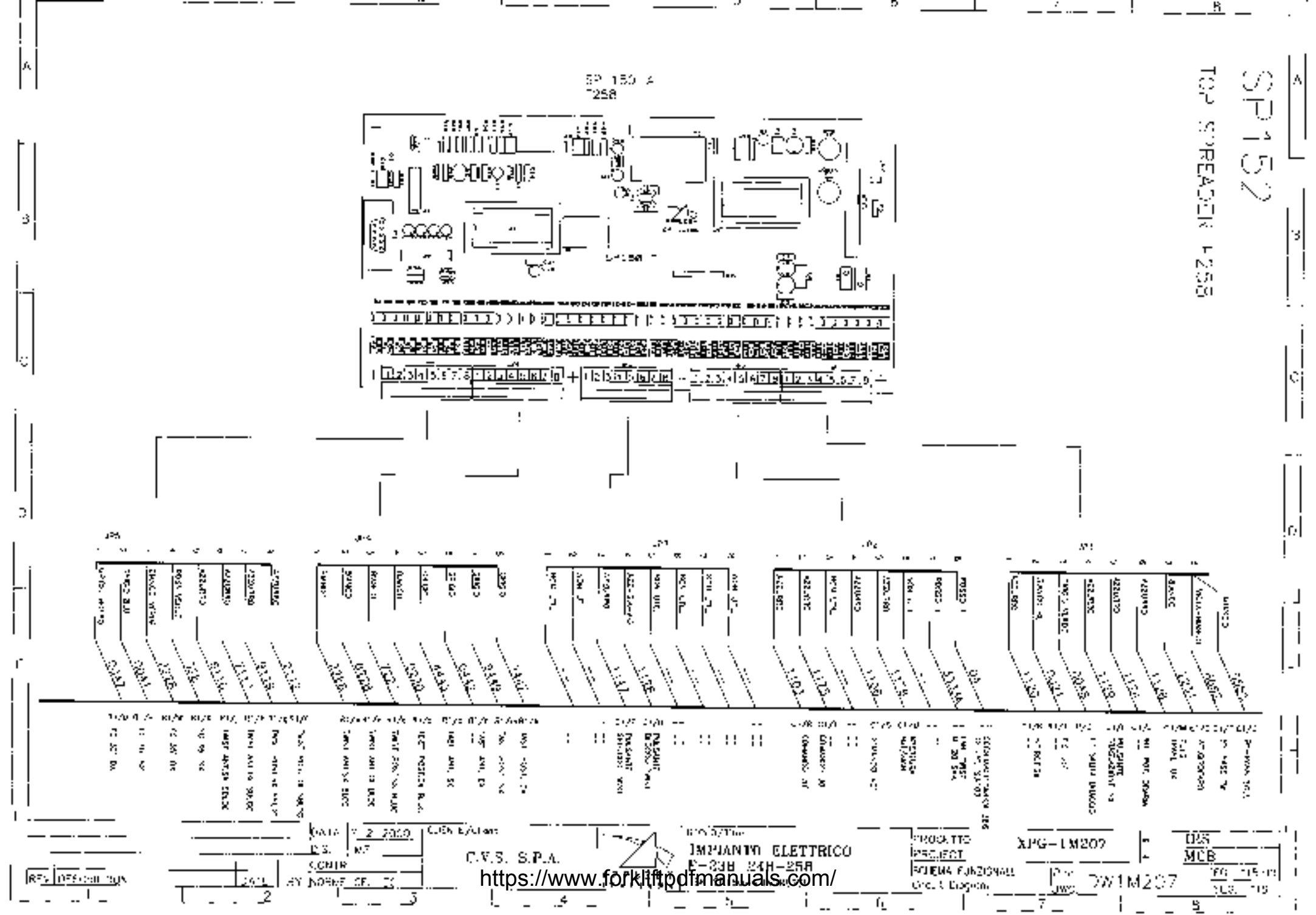
C.V.S. S.P.A.

IMPIANTO ELETTRICO
E-23H-24B-25B

PRODOTTO / PRODUCT: XPG-1M207

SCHEMA FUNZIONALE
Circuit Diagram

DW 1M207



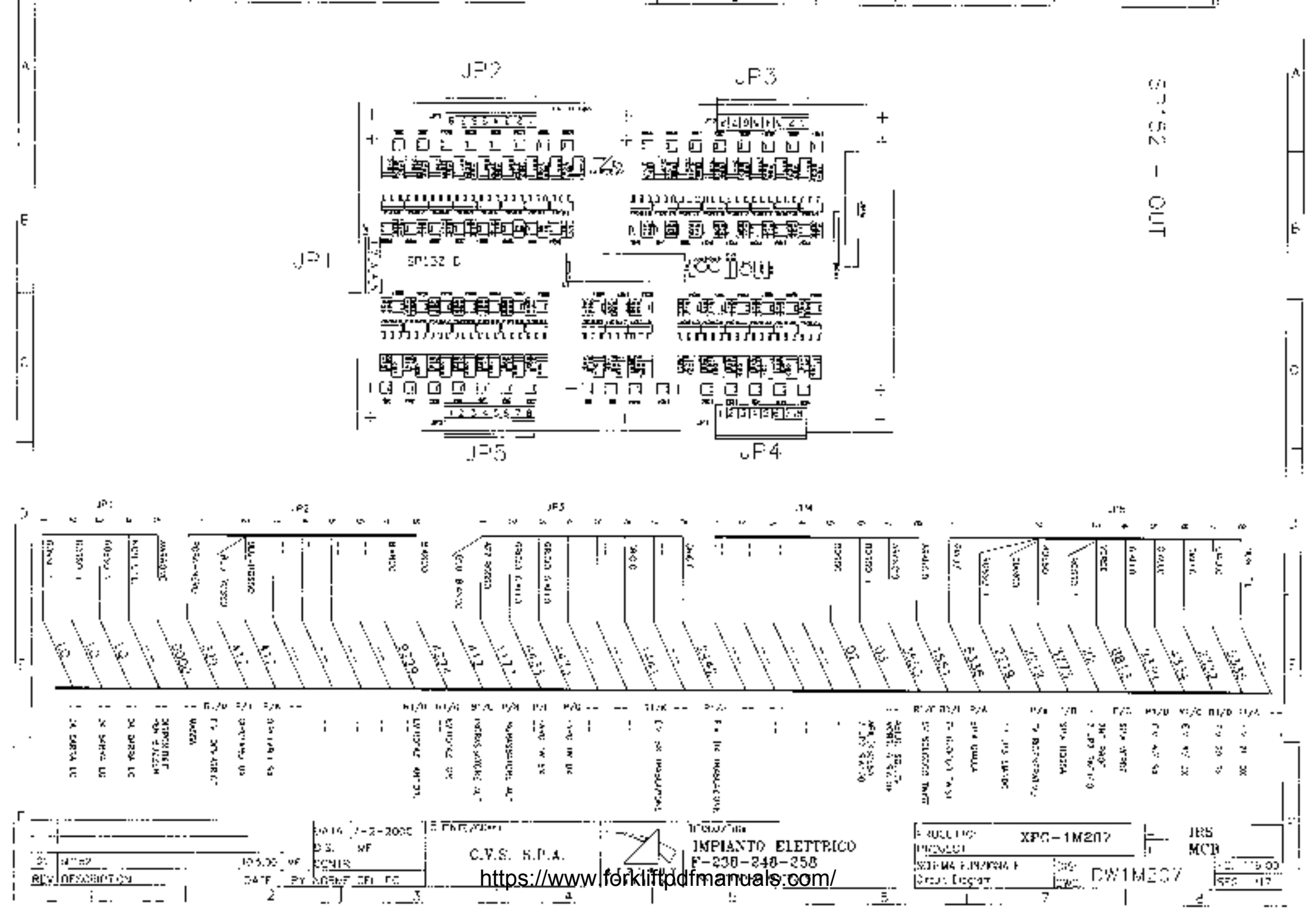
SIDE SPREADER DOUBLE STACKING F248

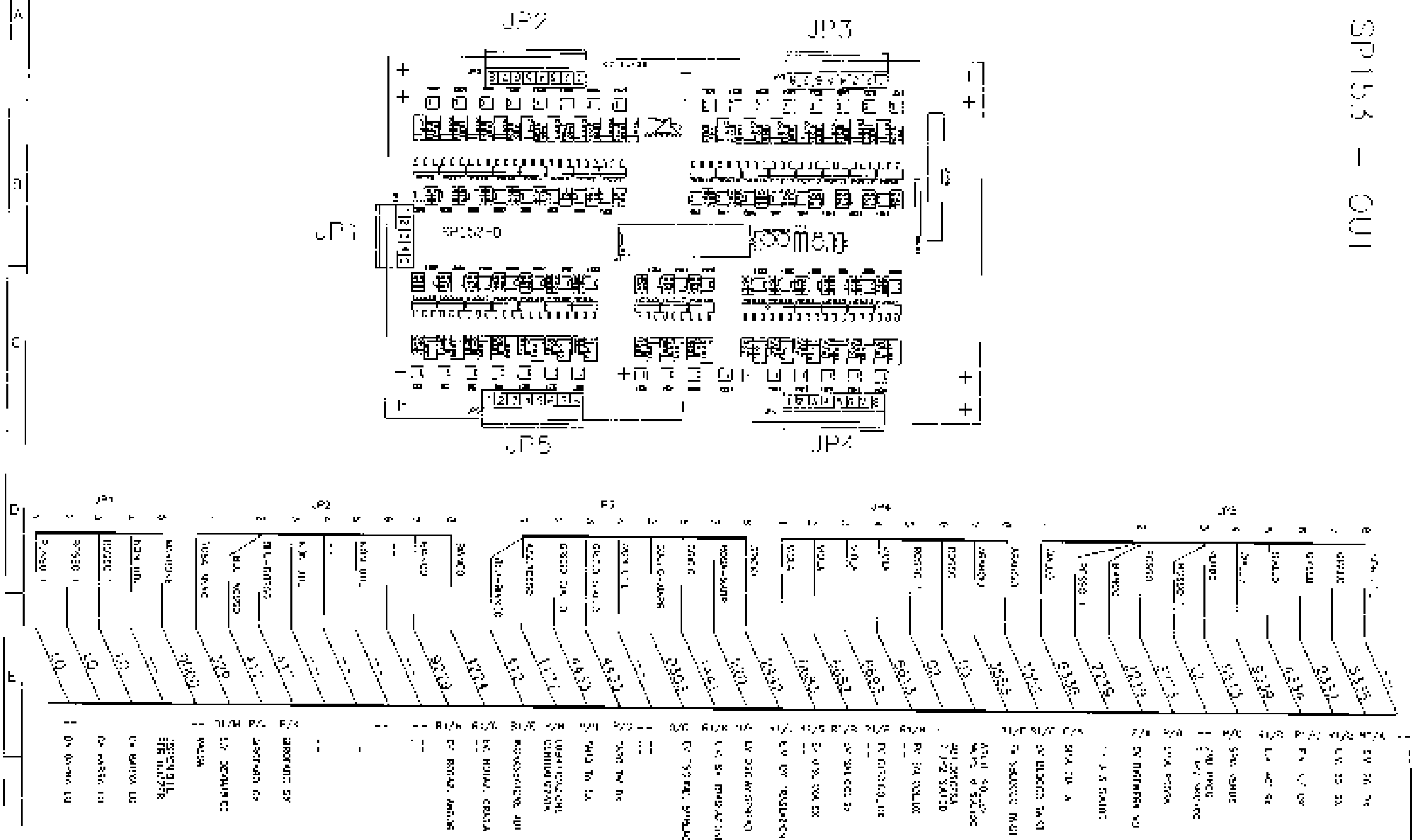
C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-238-240-258

XPG-1M207

DW1M207



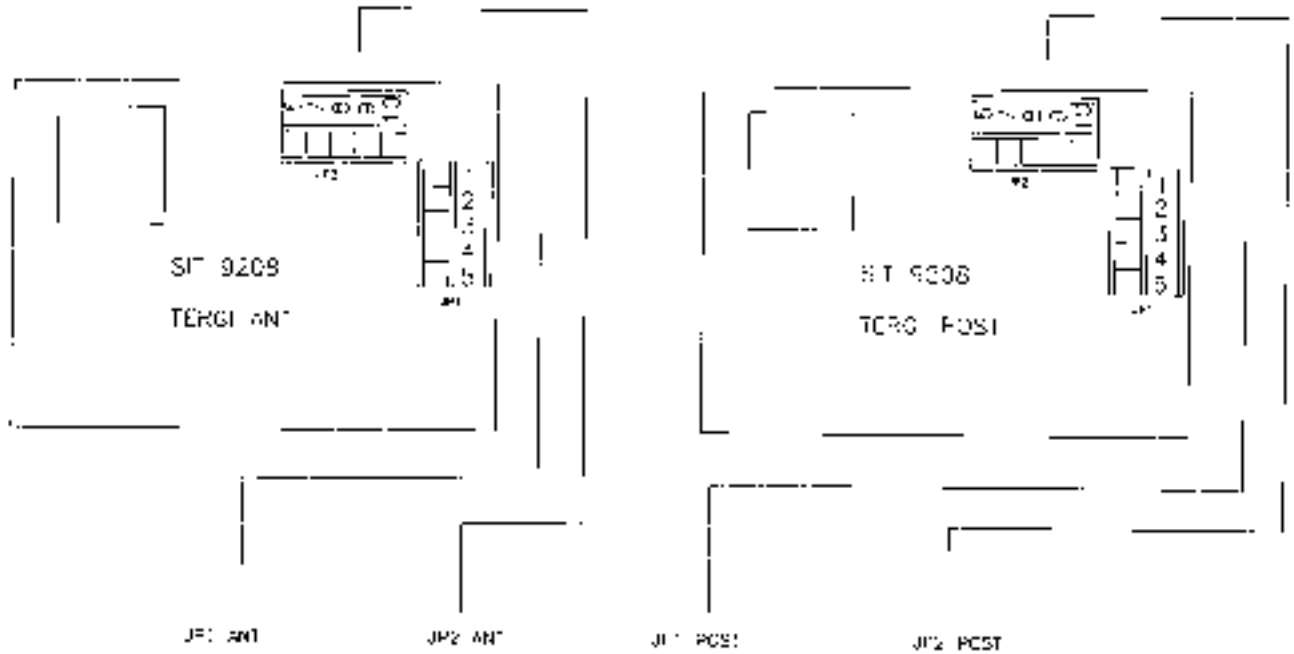


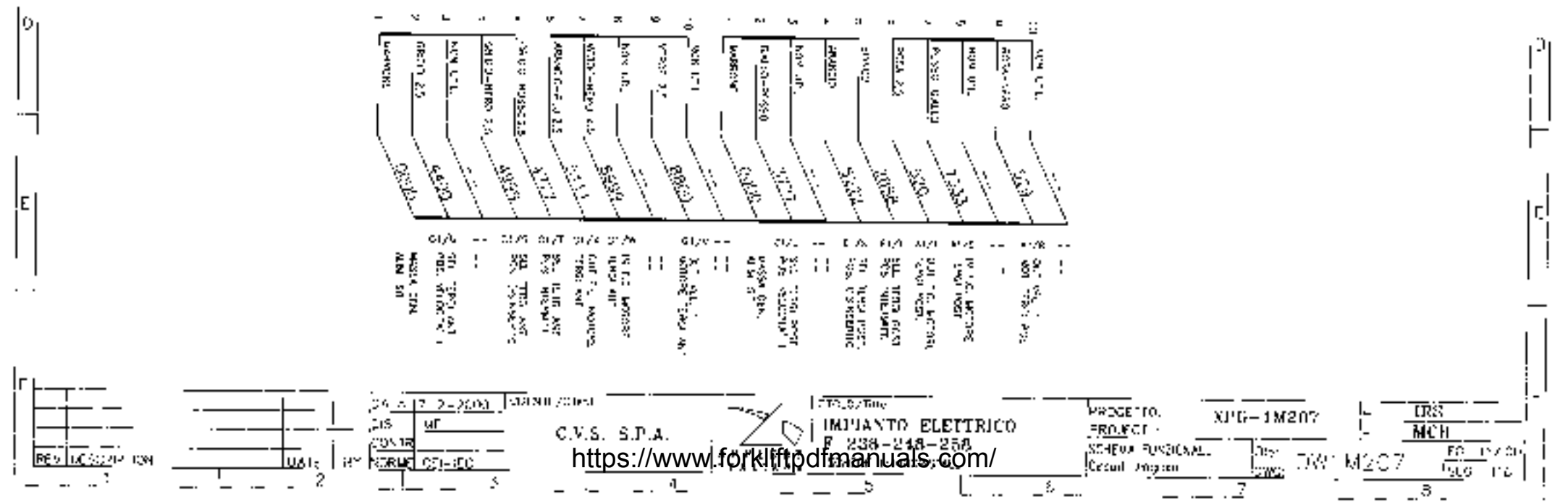
C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-LM807

SCHEMA FUNZIONALE
Circuit Diagram





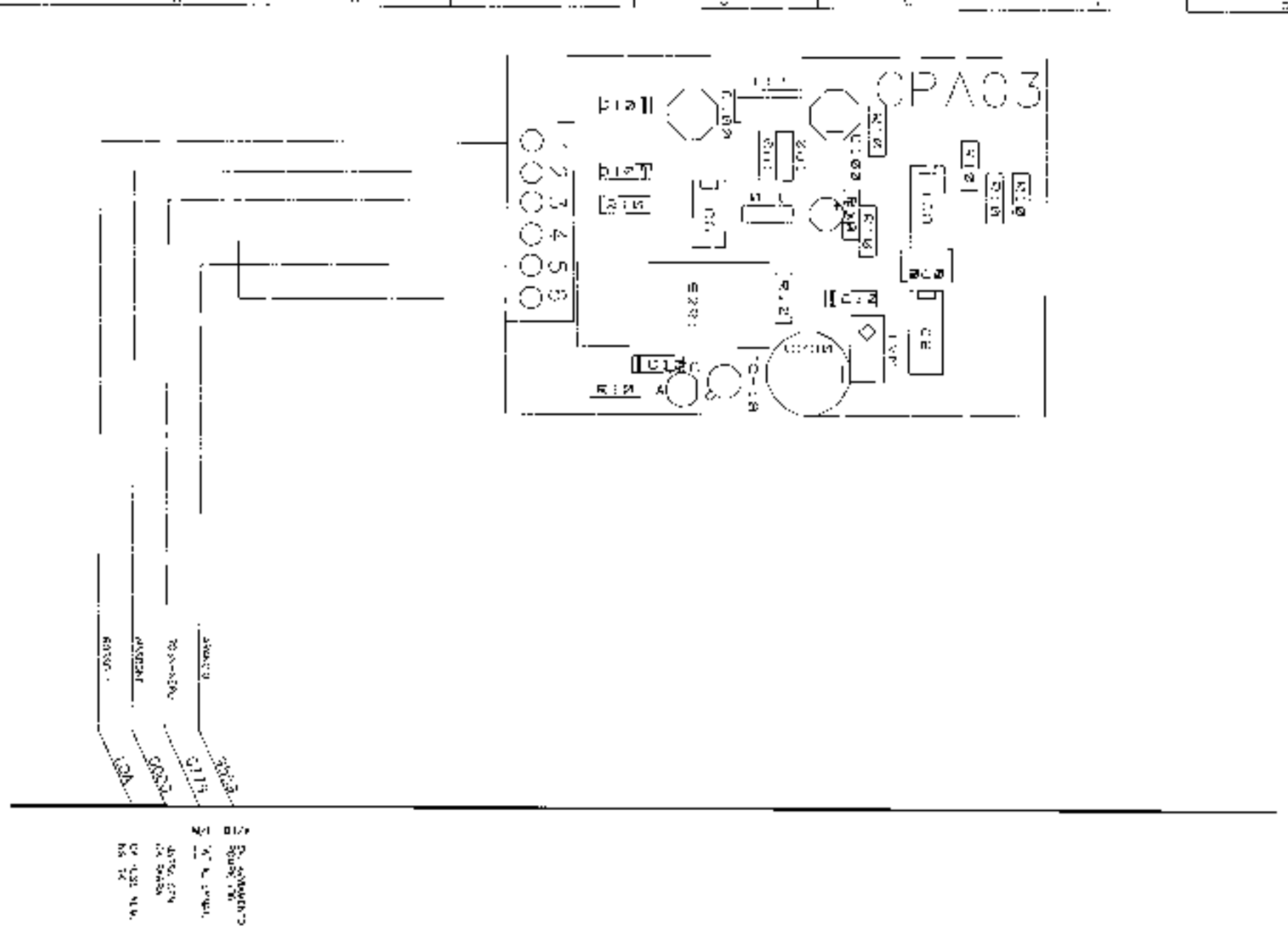
C.V.S. S.P.A.

IMPIANTO ELETTRICO

T-250-240-250

XPG-1M207

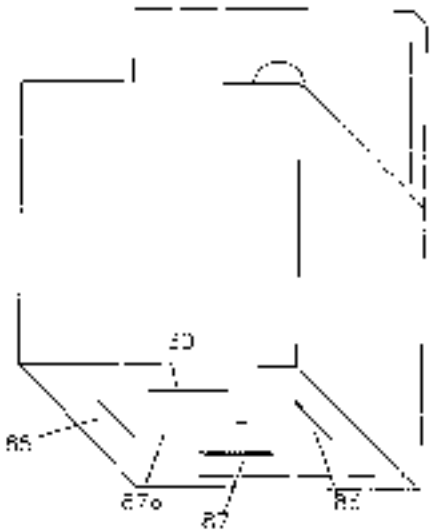
DWG. 2W1M207



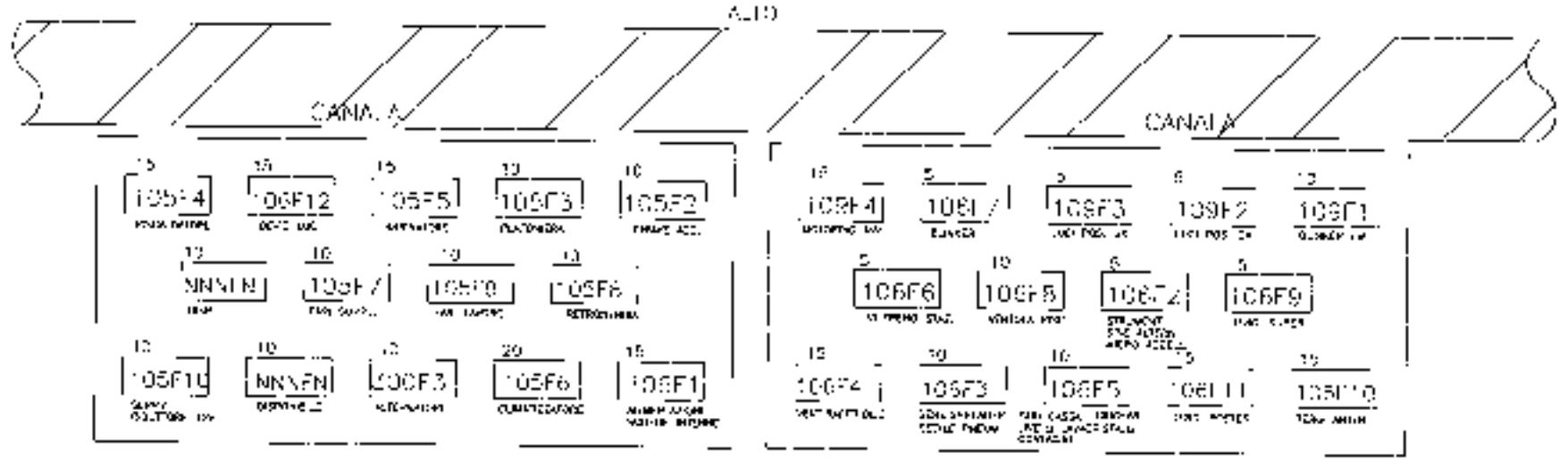
C.V.S. S.P.A.

IMPIANTO ELETTRICO

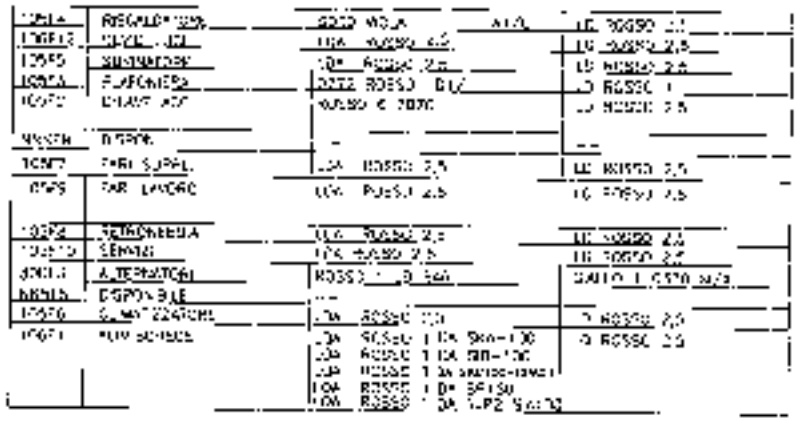
XPG-1M207

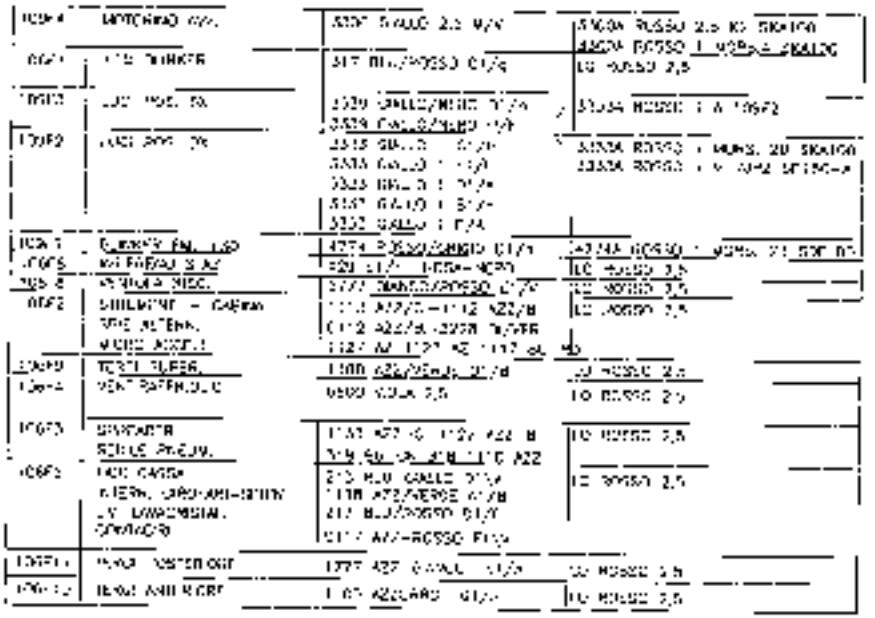


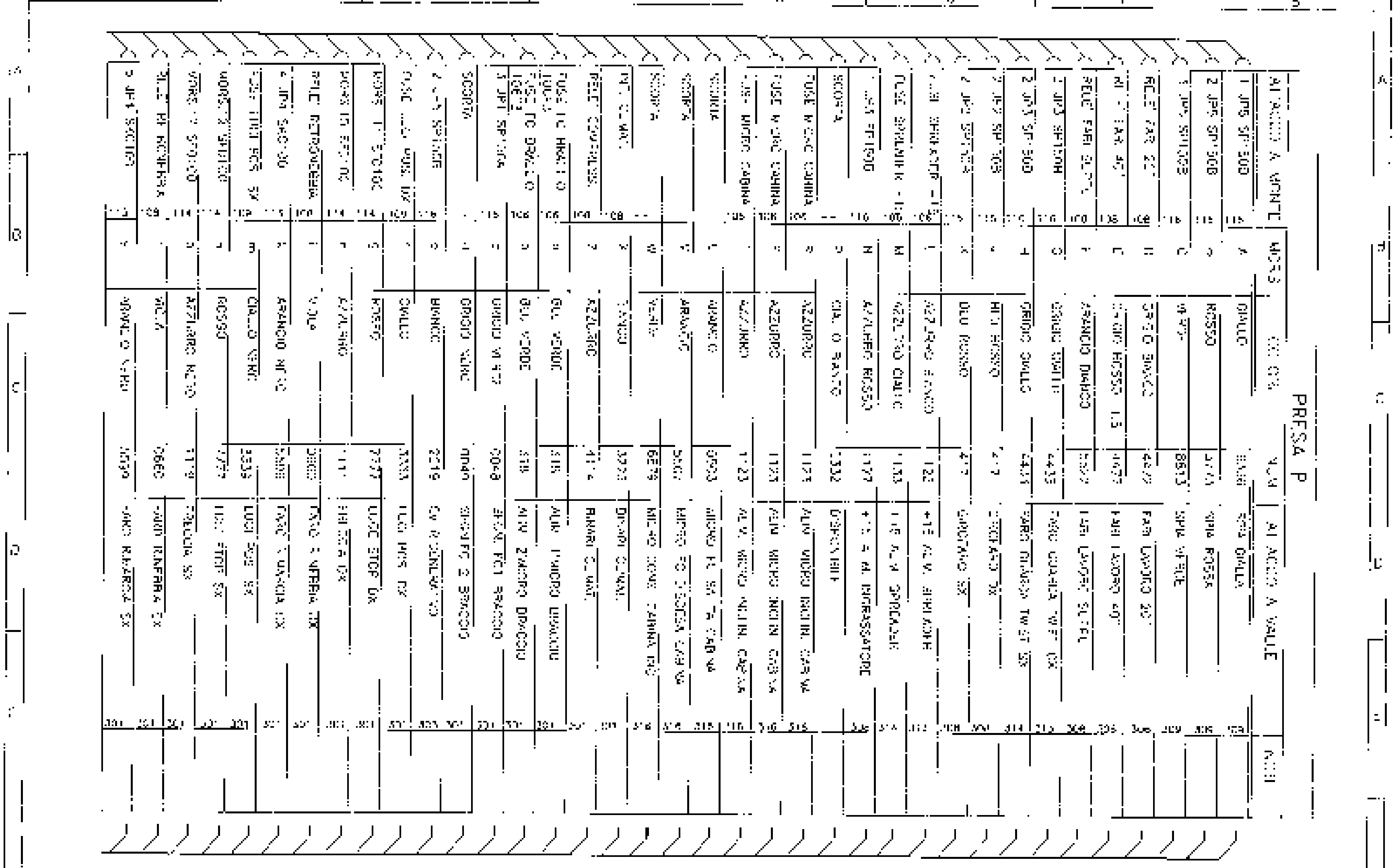
VISTA INTERNO PORTELLA
RETRO (105 BL)



BASSO







DATA	7-2-2002
DIS.	MI
CONTR.	

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F 238 248-258

PROGETTO / PROJECT: XPG-1M207

SCHEMA FUNZIONALE / Circuit Diagram

IRS / MCB

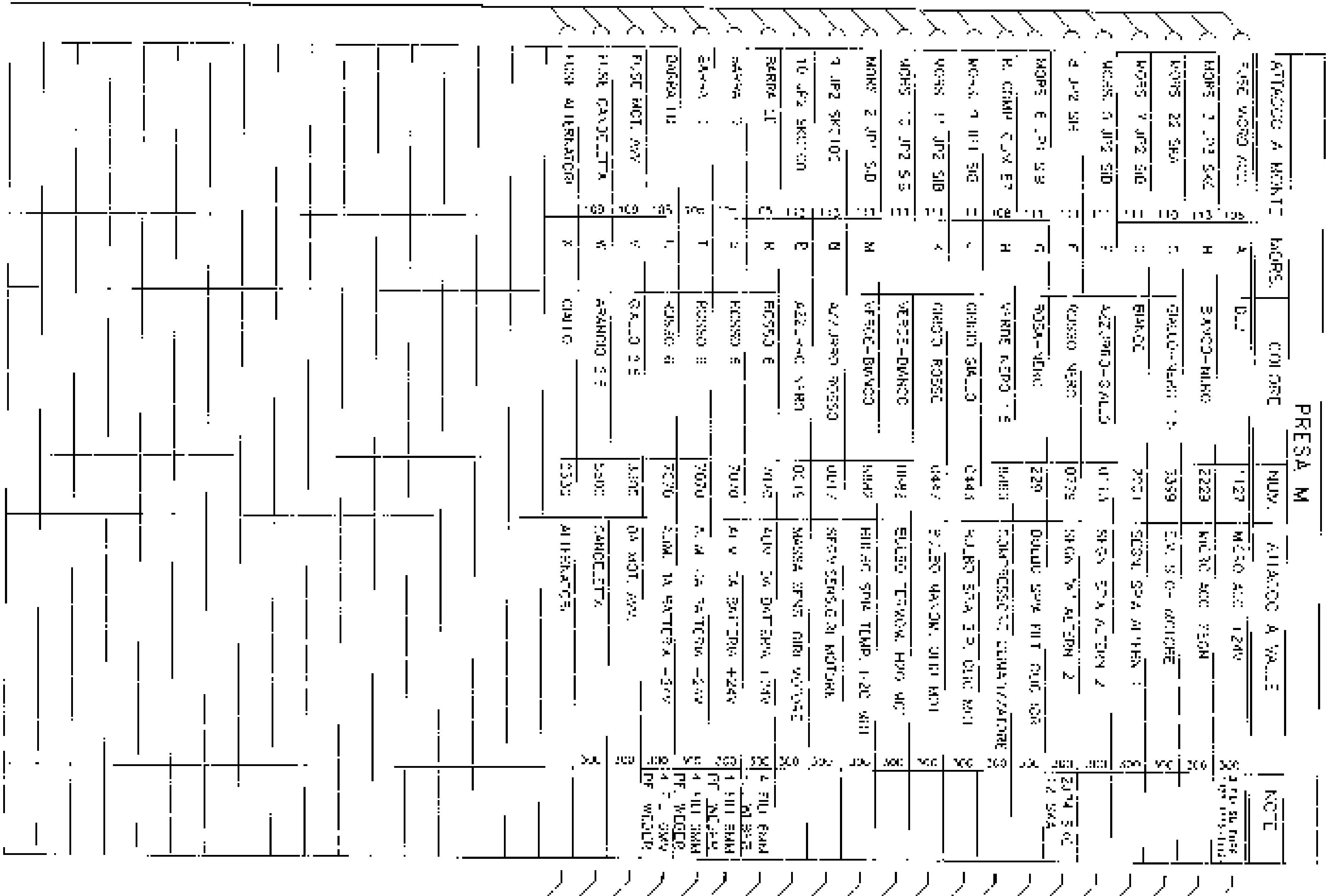
DIS. DW1M207

PRESA G1

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-238-240-250

XPG 1M207



DATA 7-2-2000

DIS. MF

CLIENTE/Client: C.V.S. S.P.A

TITOLO/Title: IMPIANTO ELETTRICO F-238 24H-26H

PROGETTO/PROJECT: XPG 1M207

SCHEMA FUNZIONALE / Circuit Diagram

DWG: DW1M207

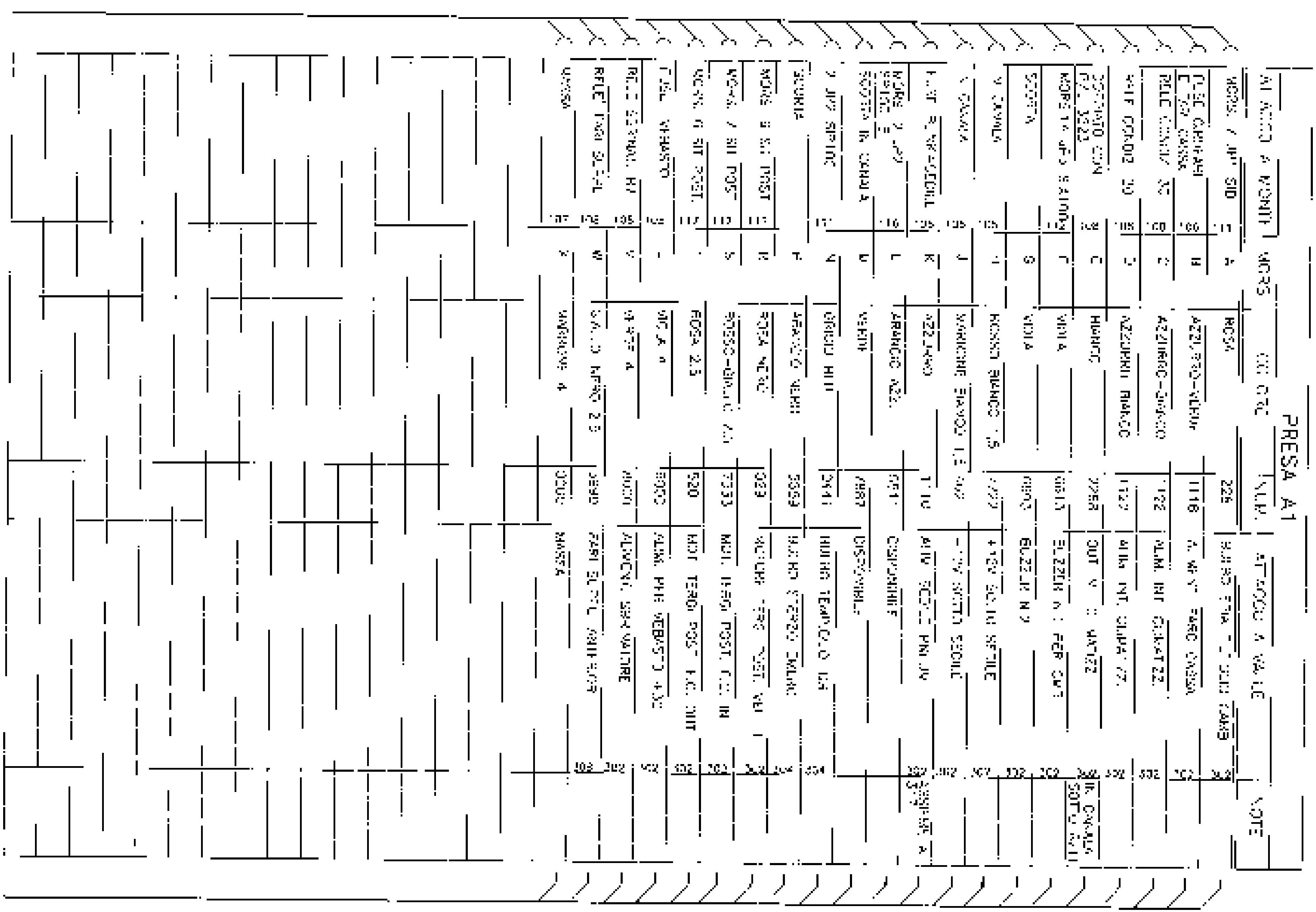
JBS MCB

PRESA F1

C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-1M207



DATA

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-2RR-240-25A

NORME CE-IEC

PROGETTO
PRODUCT
XPG-1M207

SCHEMA FUNZIONALE
Circuit Diagram

DWG DW1V207

IRS
MCB

PRESA E1

ATTACCO A MONTE		MORS.	COLORE	NUM.	ATTACCO A VALLE		NOTE
MORS. 22 24 DEVIO	114	A	BIANCO	2265	SEGN. INT. BUNKER 1.15	304	
MORS. 21 30 DEVIO	114	B	BIANCO	2267	SEGN. INT. BUNKER 4.25	308	
MORS.A7 JP1 SH350-A	115	C	BIANCO	2231	INTERRUT. CRUSCOTTO	307	
RETE SERRAT. 58	115	D	ARANCIO	5512	INTERRUT. VARIATORE	303	
ASSIEME 4524 VERDE	103	E	ROSA GIALLO 1.5	425	SEGN. INT. FRENO STAZ.	318	
A FUSE FRENO STAZ.	106	F	ROSA NERO 1.5	429	ALIM. INTER.NO STAZ. OPUSO	316	
SCORTA IN CANALA		G	ARANCIO	5561	DISPONIBILE		
SCORTA IN CANALA		H	ROSSO	7762	DISPONIBILE		
SCORTA IN CANALA		J	VERDE	8814	DISPONIBILE		
SCORTA IN CANALA SINISTRA		K	VERDE	8659	DISPONIBILE		
SCORTA IN CANALA SINISTRA		L	ROSSO GRIGIO	7773	GUIDO 30G		
SCORTA IN CANALA		M	VERDE	1981	GUIDO 38G		
MORS. 9 JP2 SIB	111	N	ARANCIO-BIANCO	0502	SEGN. MANOM. LIT. OLIO CAMB.	300	
MORS. 10 JP1 SIB	111	P	ARANCIO	0056	SEGN. SPIA LIT. OLIO CARRO	300	
FUSE TERGI POST.	106	R	AZZURRO	1777	ALIM. SEL. TERG. POSTERIORE	309	
MORS. 4 ST POST	112	S	ARANCIO	5222	SEL. TERGI POST. POS. DISINS.	309	
MORS. 3 ST POST	112	T	BIANCO	2806	SEL.TERGI POST POS. INT.	309	
MORS. 2 SIT POST	112	U	GIALLO-ROSSO	3777	MOT. TERG. POST. POS. VEL. 1	301	
FUSE VENT.	103	V	BIANCO-ROSSO	2777	24V SEL. VENTOLA RISCA. 0	301	
SCORTA IN CANALA		W	BIANCO NERO	2895	DISPONIBILE		
		X	--	--	--		

DATA	2-2000
DIS.	MF
CONTR.	
NORME	EN-EC

REV. | DESCRIPTION | DAT. | BY

CLIENTE/CLIENT: C.V.S. S.P.A.

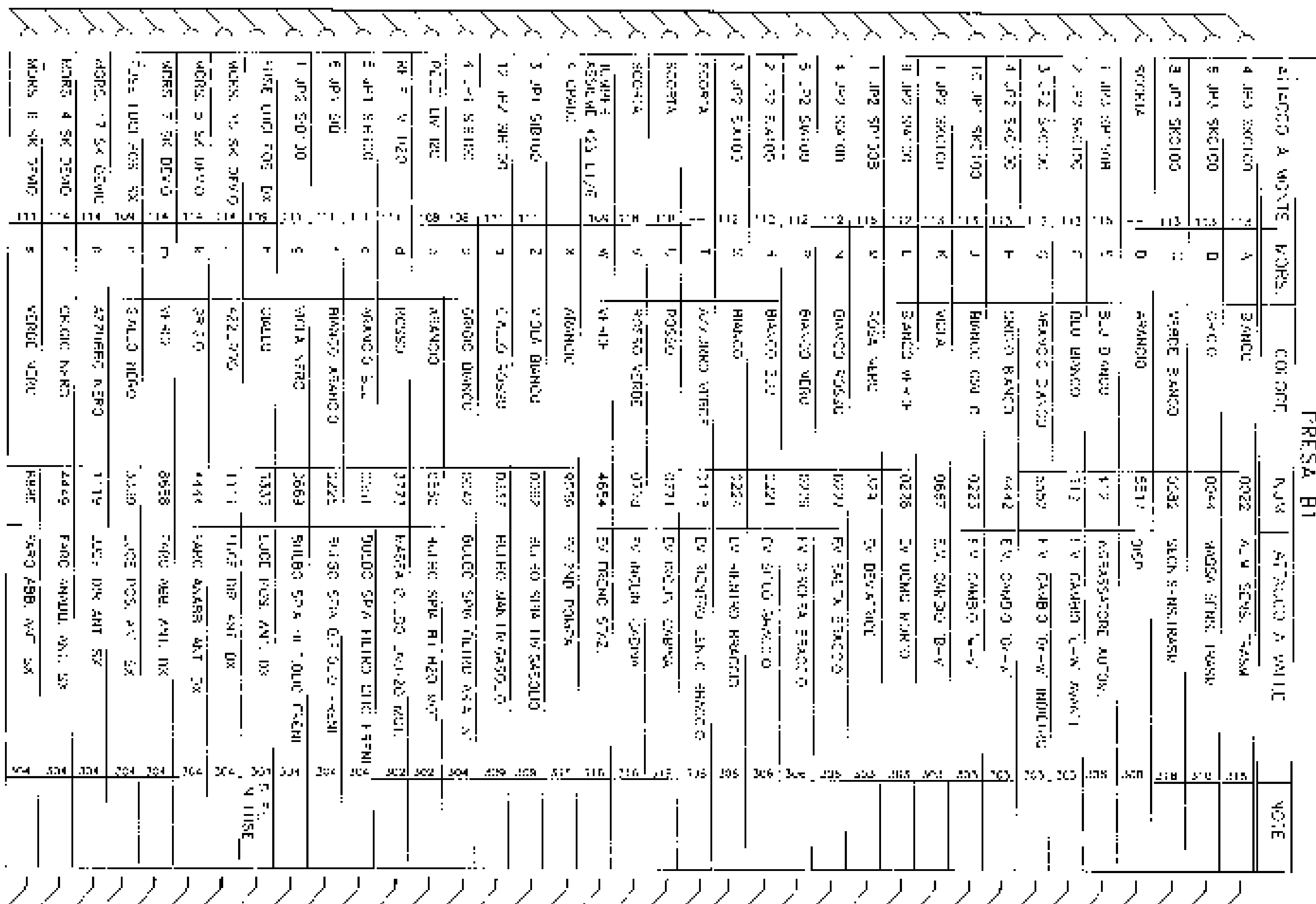
DESCRIZIONE: IMPIANTO ELETTRICO
F 2H8-24R-25R

PROGETTO / PROJECT: XPG-1M207

SCHEMA FUNZIONALE / Circuit Diagram

DIS. DWG. DW1M207

IBS MCB



DATA 3-2-2000

C.V.S. S.P.A.

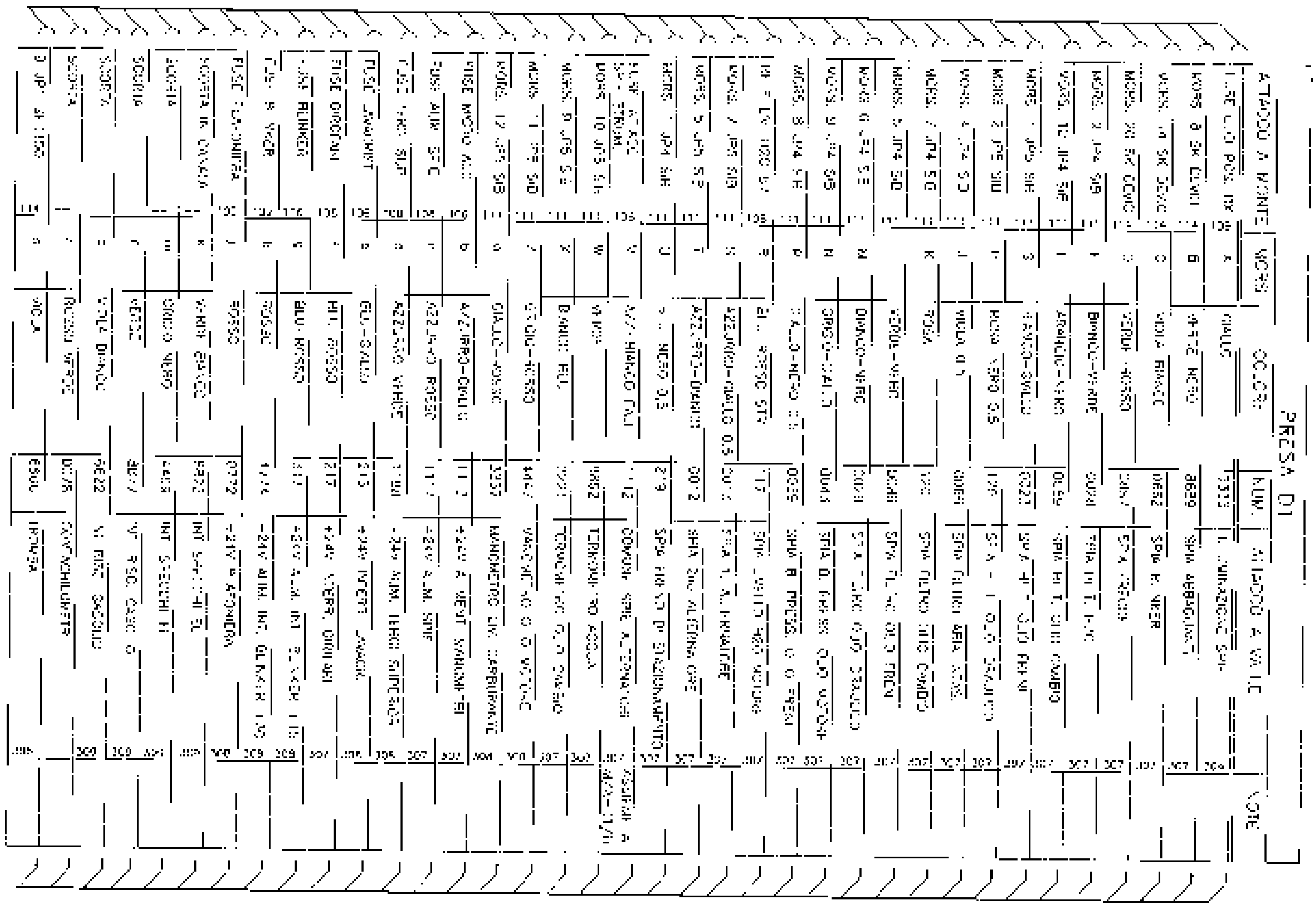
IMPIANTO ELETTRICO

F 238-248-258

XPG-1M807

ERS

MEH



C.V.S. S.P.A.

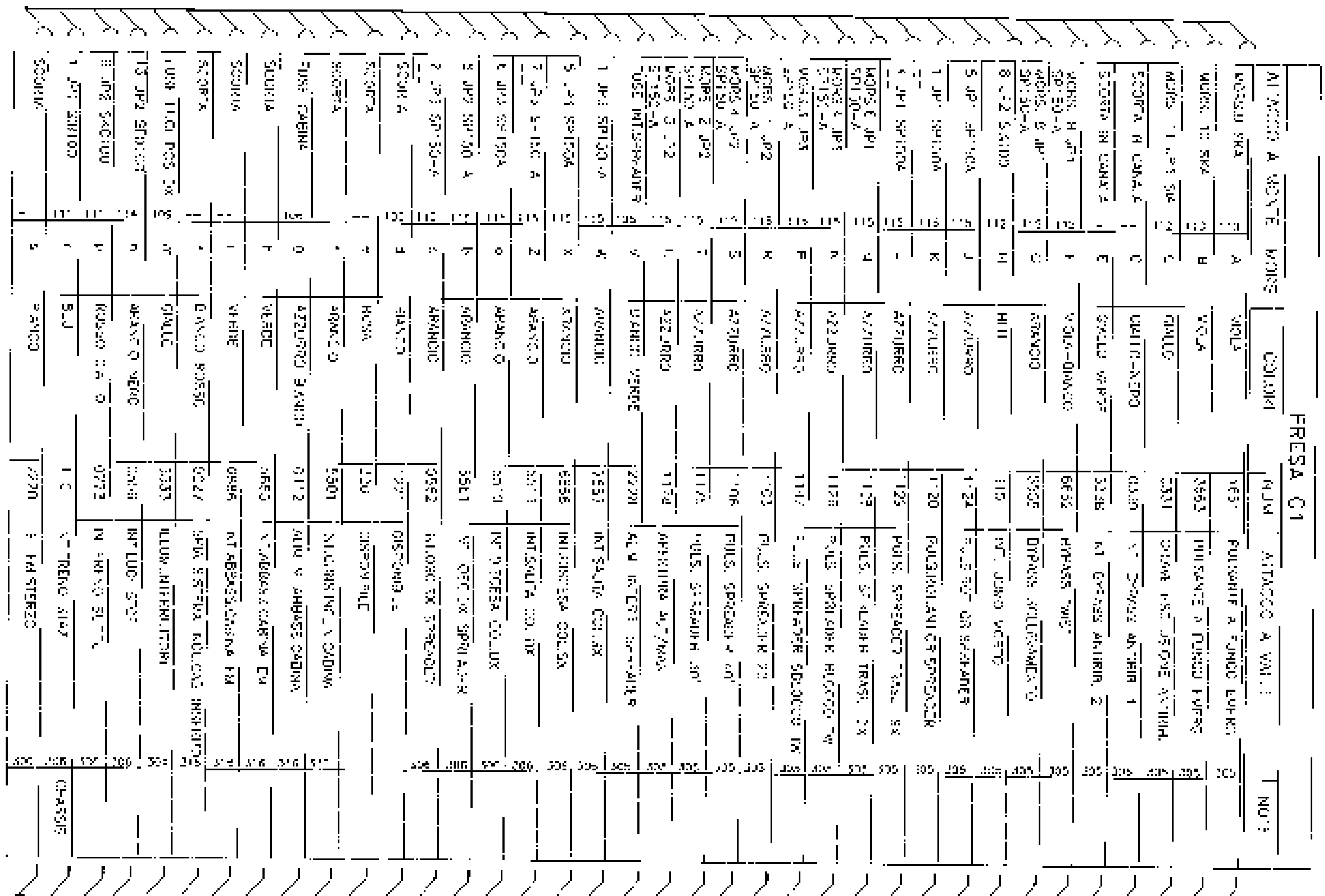
IMPIANTO ELETTRICO

PROGETTO
PROJECT

XPC-1M207

IRS
MCB

DWG



C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-230-248 208

PROGETTO / PROJECT: XPG-1M207

SCHEMA FUNZIONALE / Circuit Diagram

DW1M207

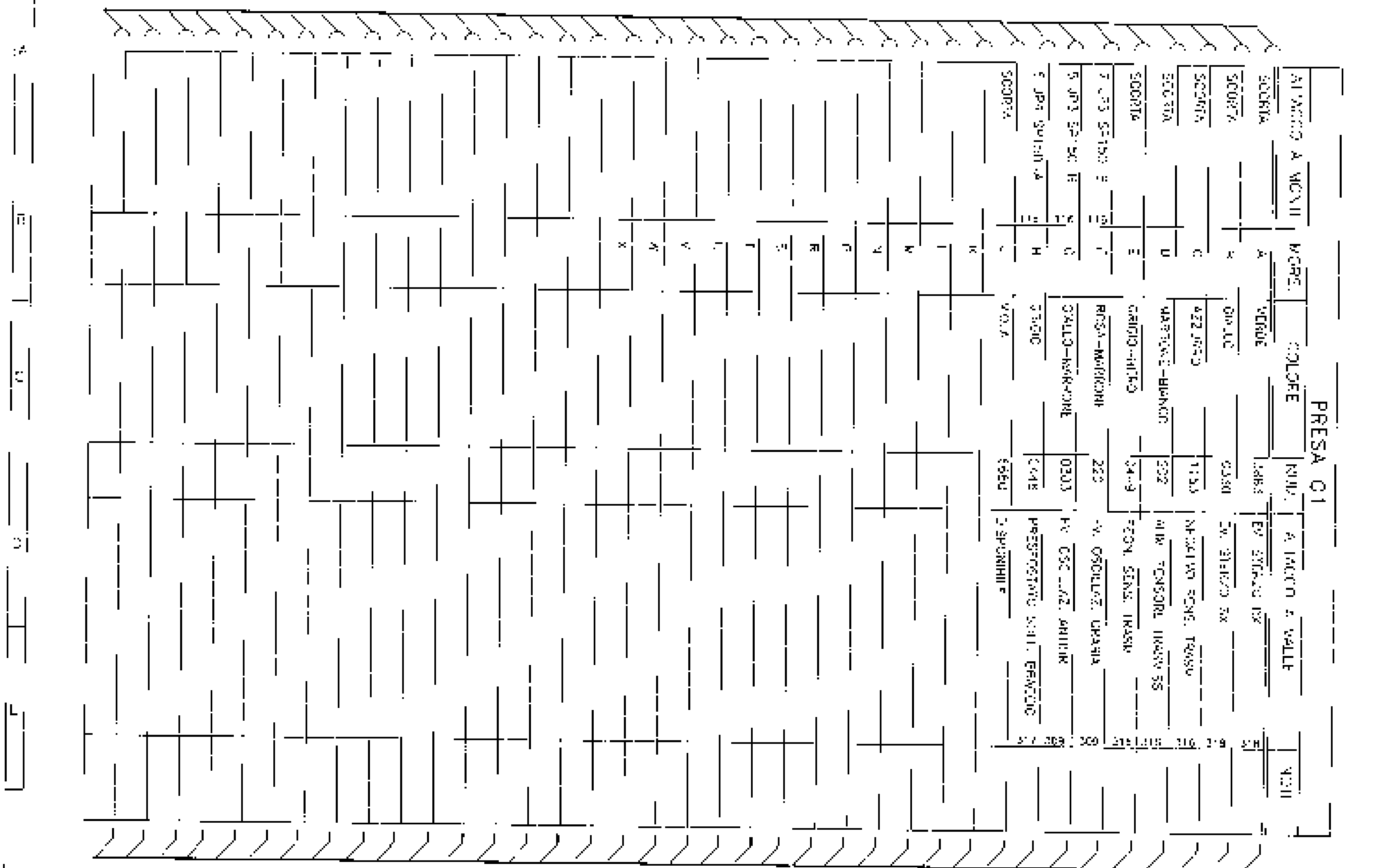
URS
MCD

NORME CE - CS

C.V.S. S.P.A.

IMPIANTO ELETTRICO

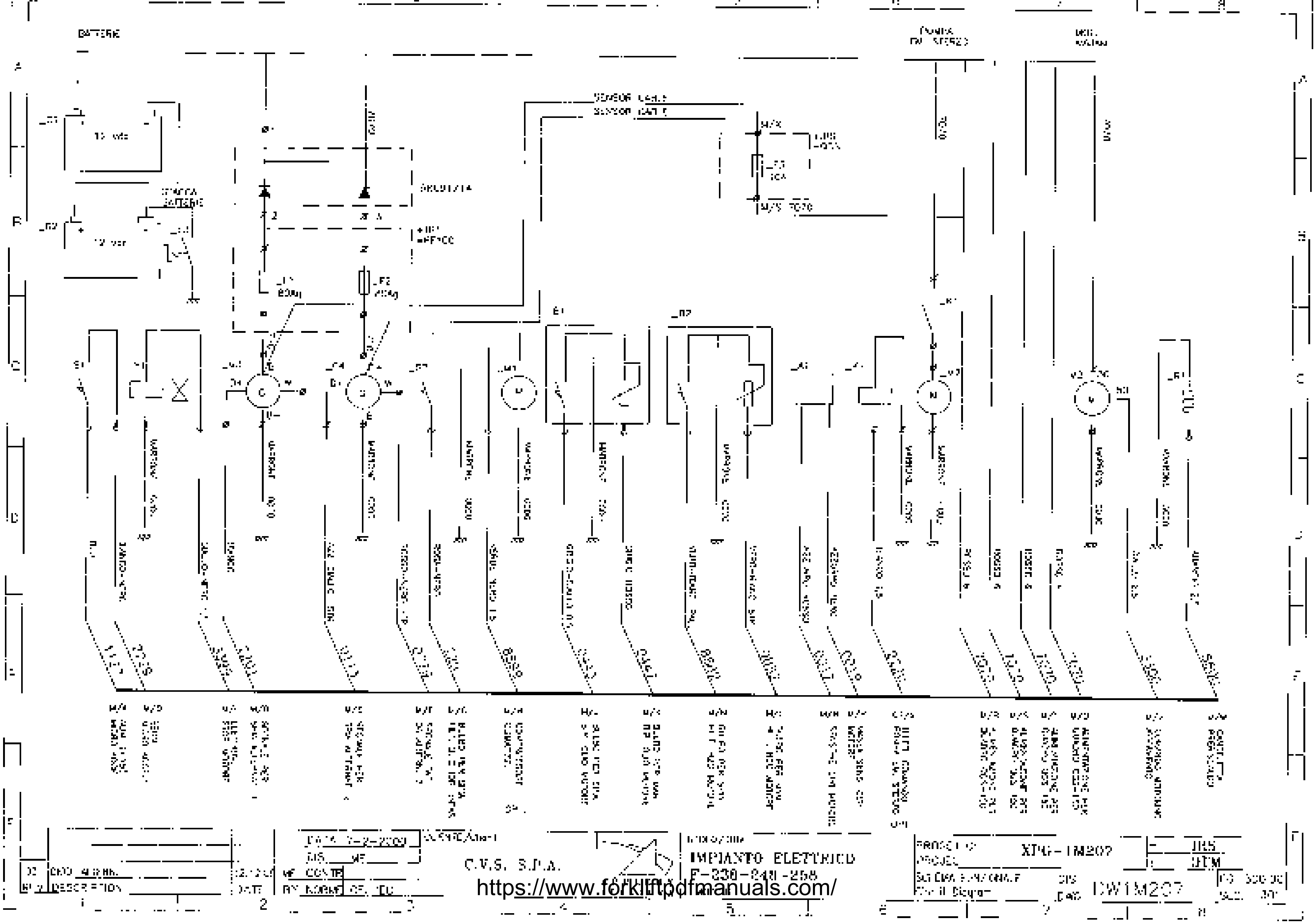
XPG-LM207



C.V.S. S.P.A.

IMPIANTO ELETTRICO

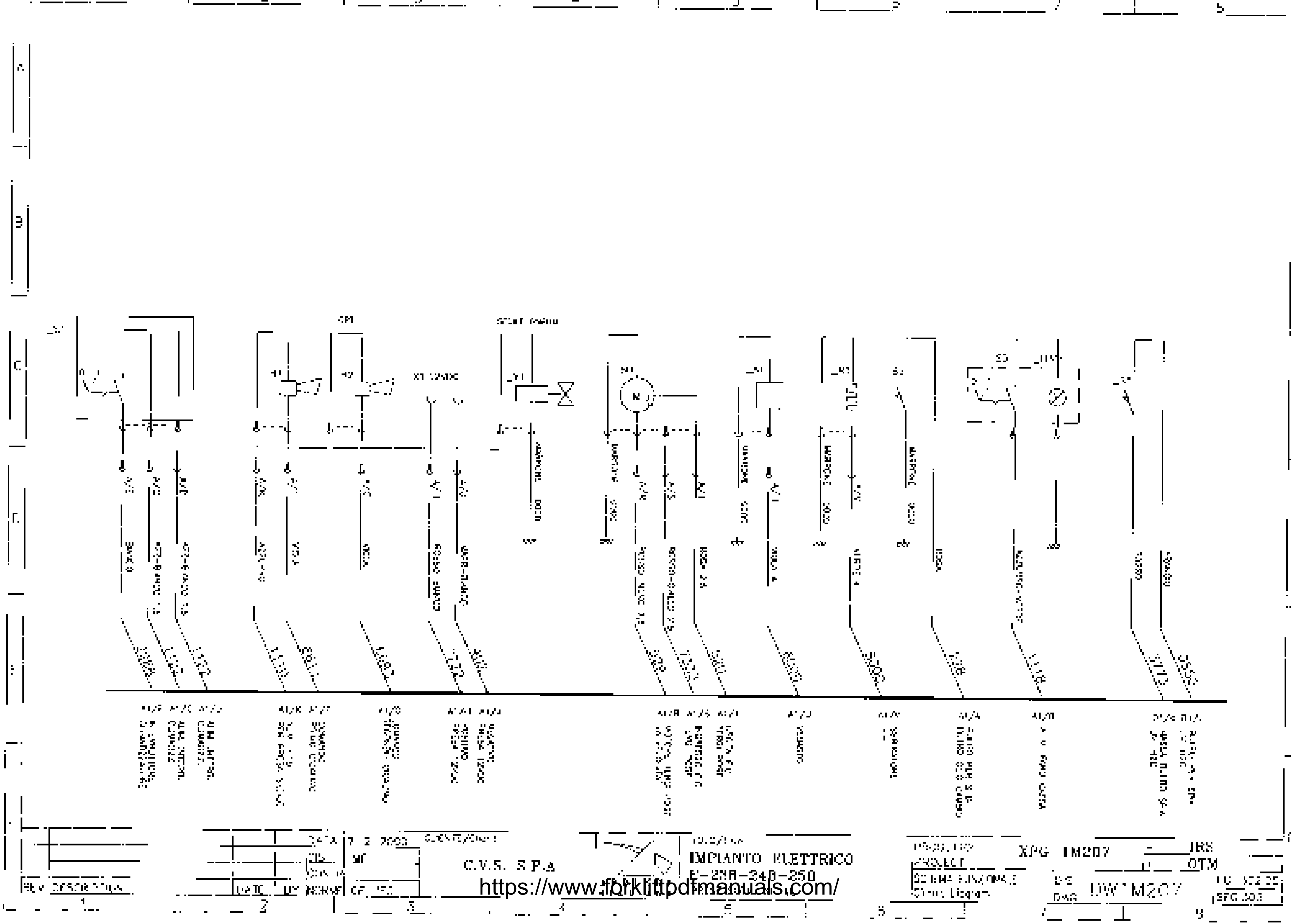
SCHEMA FUNZIONALE
Circuit Diagram



C.V.S. S.P.A.

IMPIANTO ELETTRICO
E 238-248-258

XPG 1M207



C.V.S. S.P.A.

IMPIANTO ELETTRICO
F 25R-24R-25S

XPG-1M307

C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-M207

C.V.S. S.P.A.

IMPIANTO ELETTRICO

DW1M207

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-238-248-258

XPG-1M207

DW V207

C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-1M207

DW1M207

C.V.S S.P.A.

IMPIANTO ELETTRICO
F-230 218-268

XPG-1M207

C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-1M207

C.V.S. S.P.A.

IMPIANTO ELETTRICO

E-230-240-250

XPG-1M207

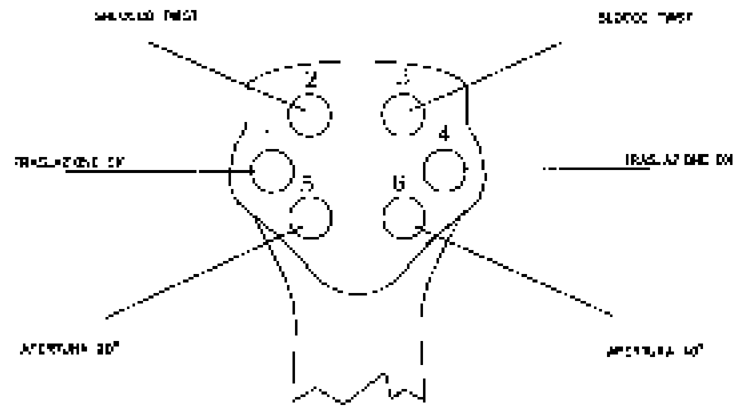
DW1M207

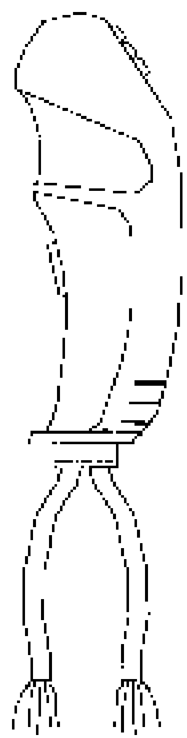
C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-1M207

TRS
OTM





REV	DESCRIPTION	DATE	BY

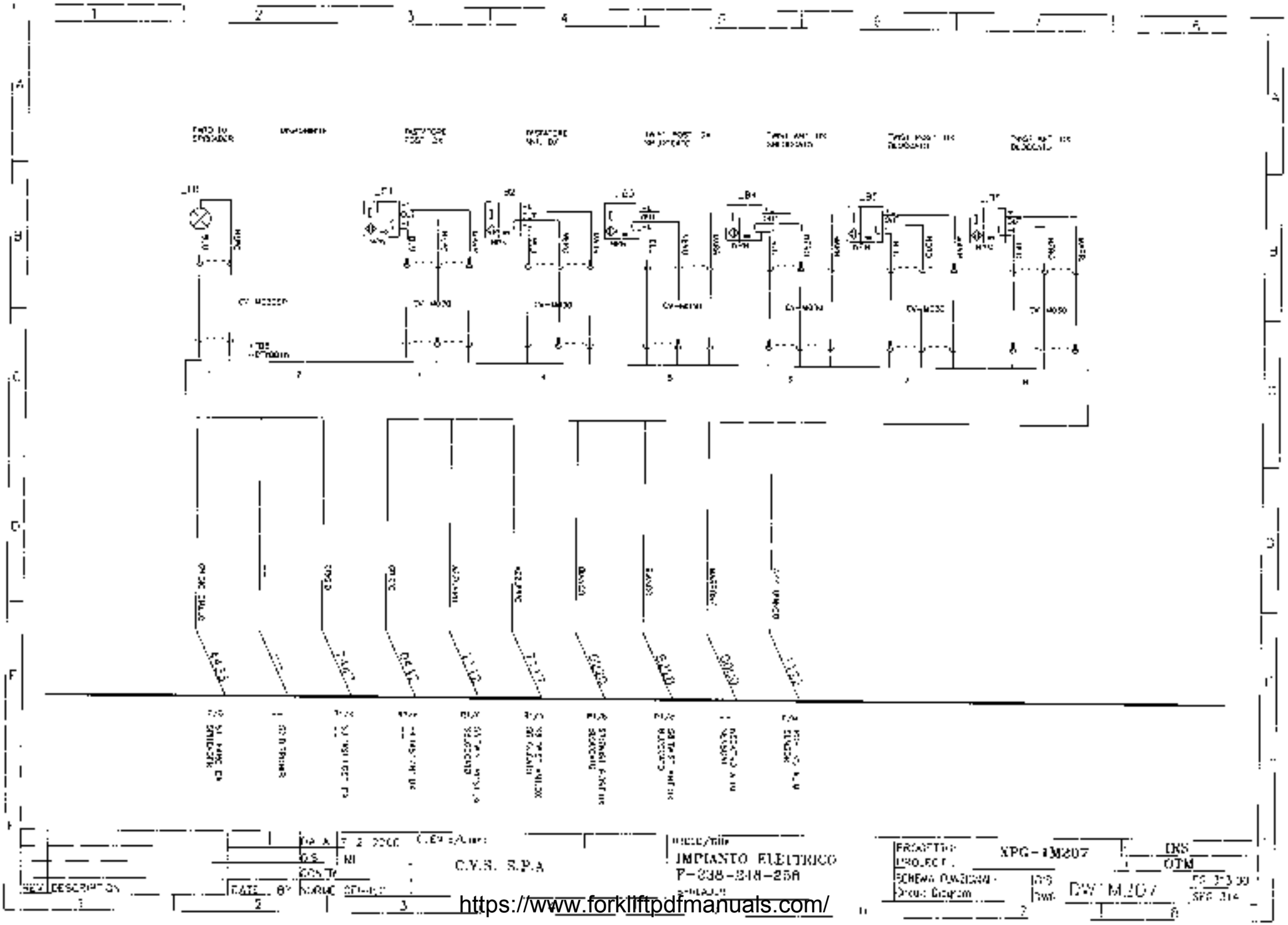
DATA 7-2-2000
DIS.
NORME CE-LC

C.V.S. S.P.A.

IMPIANTO ELETTRICO
F-230-246-258

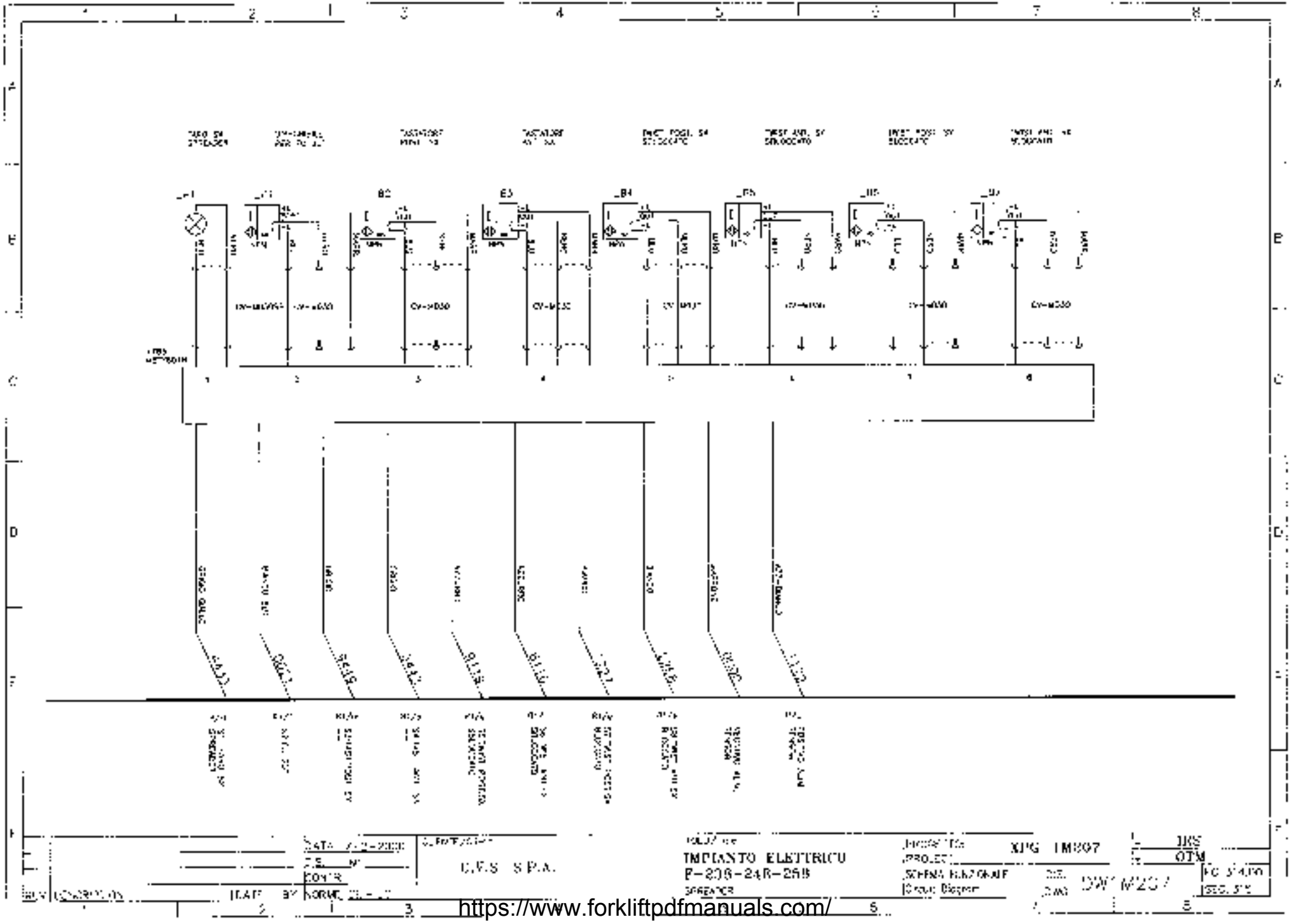
PROGETTO: XPC-1M207
SCHEMA FUNZIONALE
Circuit Diagram
DIS. DWG: DW1M207

ORS
OTM



C.V.S. S.P.A.

IMPIANTO ELETTRICO
P-238-218-25A



DATA 7-2-2003	C.V.S. S.P.A.	IMPIANTO ELETTRICO	PROGETTO / PROJECT: XPG-IM207	IBS
DIS. MF			SCHEMA FUNZIONALE / Circuit Diagram	OTM
CONSER.			DIS. / DWG.: DWIM207	

REV DESCRIPTION — DATE — BY — NORME — CEI UFO

C.V.S. S.P.A.

IMPIANTO ELETTRICO

XPG-1M207

DW V207

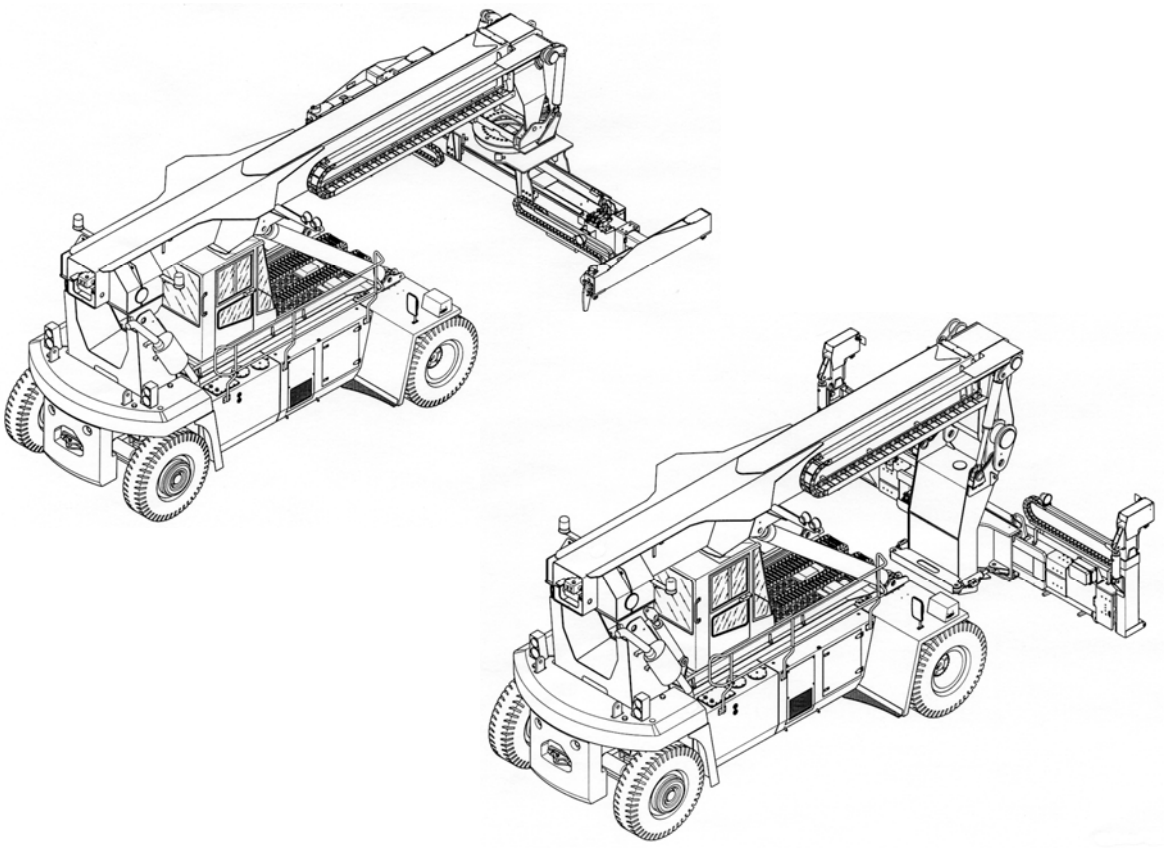
REACH STACKER SERIES "F238"

The reach-stackers Series F238 have been conceived, developed and made by C.V.S. S.p.A. expressly to handle containers from 20' to 40', special loads, etc., in order to optimise the compromise among maximum operational functionality and comfort for the operator.

They are used in port and interport terminals.

NOTES:

- *The main technical data of the various models are described (in a mere indicative way) in the following pages.*
- ***C.V.S. S.p.A.** reserves the right to introduce at any time modifications of the vehicles for technical or commercial reasons; therefore, the information in this technical document is updated to the date of approval for the publication.*
- *For further information, contact the qualified C.V.S. technicians.*



C.V.S. s.p.a. Costruzioni Veicoli Speciali
Via Emilia, 20/22 - 29010 Roveleto di Cadeo – (PC) – Italy
Tel: +39.0523.503511 r.a. - - Telefax: +39.0523.500439
e-mail: aftersales@cvsferrari.com
Internet: http://www.cvsferrari.com

Rev. 0.1
08/07

STANDARD FEATURES

Engine

For series **F238**

Manufacturer	*VOLVO*	*VOLVO*	*CUMMINS*
Model	TWD 731 VE	TAD 720 VE	QSB 6.7 T-3
Type	Diesel	Diesel	Diesel
Induction	Superch./Intercooled	Superch./Intercooled	Superch./Intercooled
Cylinder no.	6 in line	6 in line	6 in line
Displacement (cm3)	6730	7150	6700
Bore x stroke (mm)	105 x 130	108 x 130	107 x 124
Gross pow. (kW at rpm) (1)	(*) 175 / 2400	174 / 2300	164 / 2200
Max. torque (Nm at rpm)	949 / 1250	854 / 1400	949 / 1500
Compression ratio	17.7 : 1	19 : 1	---
Lubrication system	Oil forced	Oil forced	Oil forced
Cooling system	Water cooling	Water cooling	Water cooling
Oil sump capacity (litres)	29	20	22

(1) ISO 3046 for engines VOLVO and IVECO
SAE J1995 for engine Cummins

(*) Engine rpm limitation: 2200 rpm

Transmission

Manufacturer	*DANA Spicer (Clark)*
Model	32000
Type	13.5 HR 32412 Power shift with torque converter built-in in the transmission with 4 forward and 4 reverse gears.
Reduction ratios	5.18 – 2.45 – 1.41 – 0.82
Conversion ratio	1.82
Gearbox	Fully automatic electronic controlled gearbox, it can be bypassed in an emergency case
PTO	2 pcs on the converter case
Oil capacity	40 litres

Front Driving Axle

Manufacturer	*KESSLER*
Model	D81
Reduction	Central bevel gear with planetary gear in the hubs
Total reduction ratio	27.75 : 1
Central reduction	4.625 : 1
Final reduction	6.0 : 1
Service brakes	Wet multi-disk brake
Parking brake	Dry disk-brake on the motion input flange

STANDARD FEATURES (cont'd)

Steering Axle

Manufacturer	*C.V.S.*
Model	564258
Steering cylinder	Single double-acting cylinder
Construction	Axle body made of steel welded structure. Connection to the chassis by means of 2 lubrication free pivots on rubber mounts.

Tyres

Front dual tyres	14.00-24 24PR or 28PR
Rear single tyres	14.00-24 24PR or 28PR

Steering

Fully hydrostatic steering made of a piston pump driven by the power takeoff on the transmission, Orbitrol driven by the steering wheel and by a double acting cylinder fitted on the axle.
Number of turns of the steering wheel lock-to-lock = 4.1
The optional emergency steering pump starts up automatically in case the vehicle is in motion and at the same time the main steering pump is out of order, or in case of shutdown of the engine.

Braking System

Service brake: hydraulic pedal controlled wet multi-disk brakes on the hubs of the front drive axle.
Parking brake: dry disk brake (Ø 380 mm), fitted on the motion input flange of the front drive axle, actuated by a spring device controlled electrically from inside the cab.
The parking brake is automatically engaged when the ignition key is on "OFF" position.
On applying the parking brake, the engaged gear is disengaged.

Hydraulic System

Piston pumps with variable flow rate, driven by two power takeoff of the transmission, feed the boom lifting and telescoping circuits through hydraulically controlled proportional distributing valves.
Solenoid valves control all other spreader operations *(slewing, side-shifting, 20'÷40', twist-lock)*.
The main controls of the boom and of the spreader are grouped in a multi-function joystick.
The circuit is equipped with a cooling system consisting of an air-oil heat exchanger with blower driven by an electric motor.

An optional system, the speed booster, increases the boom extension speed without load.

STANDARD FEATURES (cont'd)

Cab

The cab is made of aluminium to avoid maintenance operations to remove some oxide due to salt spray fog.
The aluminium cab is supported on silent blocks that isolate it from the vibrations of the chassis.
Central driver's seat, a main door on the left side and an emergency door on the right side, both with sliding glasses.
Front and rear window with 2-speed screen wiper and screen washer.
Roof window with 1-speed screen wiper.
Laminated glass front window, all other windows with toughened glasses, all glasses are heat protective shade-light type glasses.
Driver seat with pneumatic suspension adjustment accordingly to the driver weight, and with horizontal and vertical adjustment. Safety lap belts.
Adjustable steering wheel position.
Hot water heating system with admissions for windshield defrosting and for front and side windows defogging.

Chassis

Box-type rolled steel structure made of two rectangular side members and jointing transversal girders.
In the rear end of the chassis are provided connections for the steering axle and to fasten the counterweights.

Boom

The basic boom and the telescopic section are made of a welded structure of high strength steel.

Spreader

Model : **SS100RSR**
Single-beam with rectangular section, 20'÷40' automatic extension actuated by double-acting hydraulic cylinders.
Fixed twist-locks with lamps and flags showing their locked / unlocked position.
Automatic twist locking after the signalling that the spreader is resting on the container.
Safety lock to prevent twist locks from rotating when a container is loaded.
Safety sensors on the two corners where the twist-locks are installed.
A hydraulic gearmotor, with negative brake, rotates the spreader between –95° and + 185°.
The lateral inclination is obtained by the extension of the twist columns; max. stroke 250mm.
Side-shifting: stroke ± 500 mm.
Two double-acting cylinders keep the container in the same position at any angle of inclination of the boom.
However, with the special control it is possible to change the inclination of the spreader up to the max. limits allowed by an electronic control system.

STANDARD FEATURES (cont'd)

Electric System

Voltage	24 V.
Generator	*Volvo* 24V/60+60A - *Iveco* 24V/80A - *Cummins* 24V/100A
Starter motor	Volvo 5,4 kW – Iveco 4kW
Batteries	2 pcs. 12V-155A connected in series
Battery disconnecting switch	manual

Tank Capacities

Fuel	330 litres
Hydraulic oil	460 litres

Performances

F238

As regard the load capacities, refer to the load capacity plates inside the cab

Lifting speed 1-high (m/s)	without load :	0.47
	with load :	0.33
	without load with speed booster :	0.57
Load lowering speed 1-high (m/s)	0.39	

Driving condition	Max. drive speed (km/h)	Max. gradeability (%) with load max :
1st gear	4.0	36.0
2nd gear	8.0	15.0
3rd gear	14.0	8.0
4th gear	23.0	3.5

Max. drive speed without load (km/h) : 24

Max. towing stress (kN) : 195

Gradeability, without load: about 25%

STANDARD FEATURES (cont'd)

Stability factor

Driving condition	4.7
1-high	2.35 min.
2-high	1.7 min
3-high	1.45 min

Noise (prEN 12053)

Motor :	Average value outside the cab - db(A)	Average value outside the cab - db(A)
VOLVO	74	74
IVECO		
CUMMINS		

Masses (kg)

Without load :	
Total	43100
Front axle	25300
Rear axle	17800

Dimensions

See drawings enclosed to the section "Diagrams" of the Operation and Maintenance Manual.

Engineering Design Specifications

Standard	CEE 98/37
Structures	DIN 15018
Safety	EN 1459
Pollution	ISO 8178 and EU off-road for engine IVECO CARB, EPA and EU off-road for engine VOLVO and CUMMINS
Cab	ISO 6055 static load test

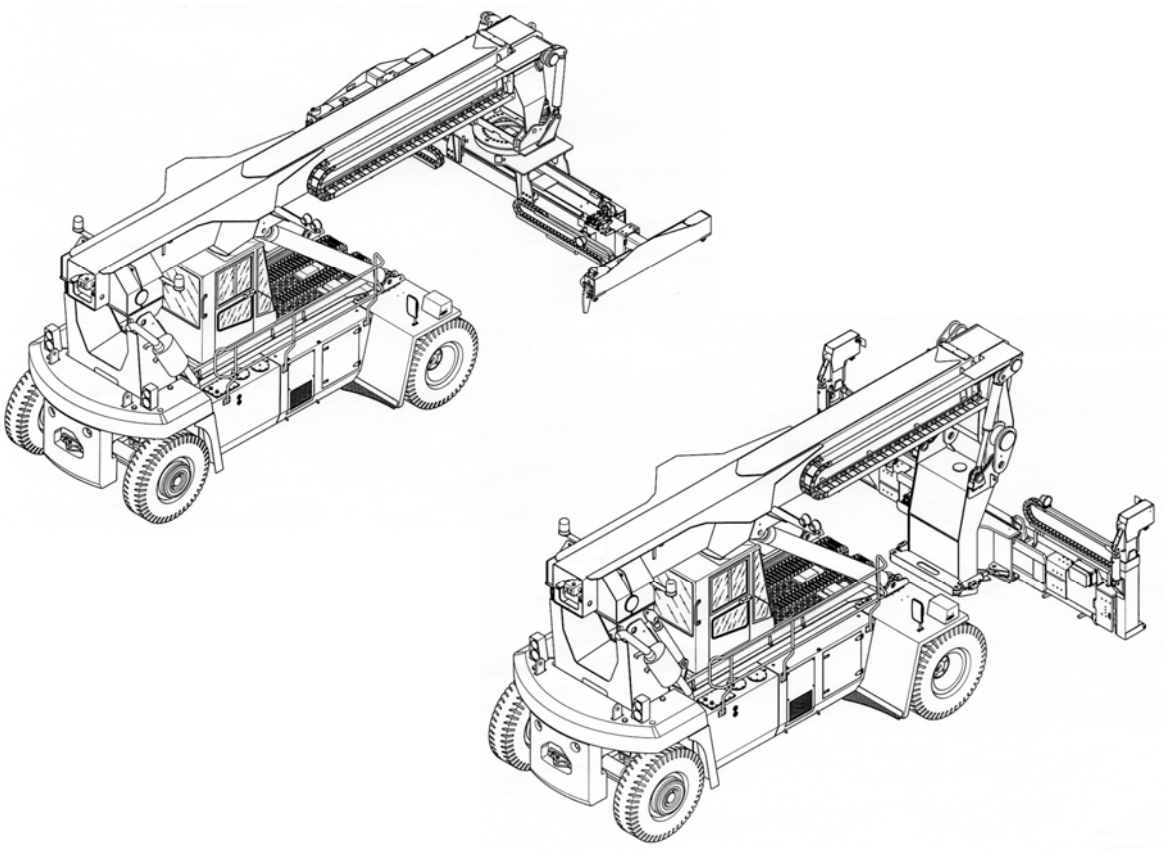
REACH STACKER SERIES "F248"

The reach-stackers Series F248 have been conceived, developed and made by C.V.S. S.p.A. expressly to handle containers from 20' to 40', special loads, etc., in order to optimise the compromise among maximum operational functionality and comfort for the operator.

They are used in port and interport terminals.

NOTES:

- *The main technical data of the various models are described (in a mere indicative way) in the following pages.*
- ***C.V.S. S.p.A.** reserves the right to introduce at any time modifications of the vehicles for technical or commercial reasons; therefore, the information in this technical document is updated to the date of approval for the publication.*
- *For further information, contact the qualified C.V.S. technicians.*



C.V.S. s.p.a. Costruzioni Veicoli Speciali
Via Emilia, 20/22 - 29010 Roveleto di Cadeo – (PC) – Italy
Tel: +39.0523.503511 r.a. - - Telefax: +39.0523.500439
e-mail: aftersales@cvsferrari.com
Internet: http://www.cvsferrari.com

Rev. 0.1
08/07

STANDARD FEATURES

Engine

For series **F248**

Manufacturer	*VOLVO*	*VOLVO*	*CUMMINS*
Model	TWD 731 VE	TAD 720 VE	QSB 6.7 T-3
Type	Diesel	Diesel	Diesel
Induction	Superch./Intercooled	Superch./Intercooled	Superch./Intercooled
Cylinder no.	6 in line	6 in line	6 in line
Displacement (cm3)	6730	7150	6700
Bore x stroke (mm)	105 x 130	108 x 130	107 x 124
Gross pow. (kW at rpm) (1)	(*) 175 / 2400	174 / 2300	164 / 2200
Max. torque (Nm at rpm)	949 / 1250	854 / 1400	949 / 1500
Compression ratio	17.7 : 1	19 : 1	---
Lubrication system	Oil forced	Oil forced	Oil forced
Cooling system	Water cooling	Water cooling	Water cooling
Oil sump capacity (litres)	29	20	22

(1) ISO 3046 for engines VOLVO
SAE J1995 for engine Cummins

(*) Engine rpm limitation: 2200 rpm

Transmission

Manufacturer	*DANA Spicer (Clark)*
Model	32000
Type	13.5 HR 32412 Power shift with torque converter built-in in the transmission with 4 forward and 4 reverse gears.
Reduction ratios	5.18 – 2.45 – 1.41 – 0.82
Conversion ratio	1.82
Gearbox	Fully automatic electronic controlled gearbox, it can be bypassed in an emergency case
PTO	2 pcs on the converter case
Oil capacity	40 litres

Front Driving Axle

Manufacturer	*KESSLER*
Model	D81
Reduction	Central bevel gear with planetary gear in the hubs
Total reduction ratio	27.75 : 1
Central reduction	4.625 : 1
Final reduction	6.0 : 1
Service brakes	Wet multi-disk brake
Parking brake	Dry disk-brake on the motion input flange

STANDARD FEATURES (cont'd)

Steering Axle

Manufacturer	*C.V.S.*
Model	564258
Steering cylinder	Single double-acting cylinder
Construction	Axle body made of steel welded structure. Connection to the chassis by means of 2 lubrication free pivots on rubber mounts.

Tyres

Front dual tyres	14.00-24 24PR or 28PR
Rear single tyres	14.00-24 24PR or 28PR

Steering

Fully hydrostatic steering made of a piston pump driven by the power takeoff on the transmission, Orbitrol driven by the steering wheel and by a double acting cylinder fitted on the axle.
Number of turns of the steering wheel lock-to-lock = 4.1
The optional emergency steering pump starts up automatically in case the vehicle is in motion and at the same time the main steering pump is out of order, or in case of shutdown of the engine.

Braking System

Service brake: hydraulic pedal controlled wet multi-disk brakes on the hubs of the front drive axle.
Parking brake: dry disk brake (Ø 380 mm), fitted on the motion input flange of the front drive axle, actuated by a spring device controlled electrically from inside the cab.
The parking brake is automatically engaged when the ignition key is on "OFF" position.
On applying the parking brake, the engaged gear is disengaged.

Hydraulic System

Piston pumps with variable flow rate, driven by two power takeoff of the transmission, feed the boom lifting and telescoping circuits through hydraulically controlled proportional distributing valves.
Solenoid valves control all other spreader operations (slewing, side-shifting, 20'÷40', twist-lock).
The main controls of the boom and of the spreader are grouped in a multi-function joystick.
The circuit is equipped with a cooling system consisting of an air-oil heat exchanger with blower driven by an electric motor.

An optional system, the speed booster, increases the boom extension speed without load.

STANDARD FEATURES (cont'd)

Cab

The cab is made of aluminium to avoid maintenance operations to remove some oxide due to salt spray fog.
The aluminium cab is supported on silent blocks that isolate it from the vibrations of the chassis.
Central driver's seat, a main door on the left side and an emergency door on the right side, both with sliding glasses.
Front and rear window with 2-speed screen wiper and screen washer.
Roof window with 1-speed screen wiper.
Laminated glass front window, all other windows with toughened glasses, all glasses are heat protective shade-light type glasses.
Driver seat with pneumatic suspension adjustment accordingly to the driver weight, and with horizontal and vertical adjustment. Safety lap belts.
Adjustable steering wheel position.
Hot water heating system with admissions for windshield defrosting and for front and side windows defogging.

Chassis

Box-type rolled steel structure made of two rectangular side members and jointing transversal girders.
In the rear end of the chassis are provided connections for the steering axle and to fasten the counterweights.

Boom

The basic boom and the telescopic section are made of a welded structure of high strength steel.

Spreader

a) Model: **SS100RS**

Single-beam with rectangular section, 20'÷40' automatic extension actuated by double-acting hydraulic cylinders.
Fixed twist-locks with lamps and flags showing their locked / unlocked position.
Automatic twist locking after the signalling that the spreader is resting on the container.
Safety lock to prevent twist locks from rotating when a container is loaded.
Safety sensors on the two corners where the twist-locks are installed.
Two double-acting hydraulic cylinders and a limit stop allow the spreader rotation between –10° and + 10°.
The lateral inclination is obtained by the extension of the twist columns; max. stroke 350mm.
Side-shifting: stroke ± 500 mm.
Two double-acting cylinders keep the load in the same position at any angle of inclination of the boom. However, with the special control it is possible to change the inclination of the spreader up to the max. limits allowed by an electronic control system.

b) Model: **SS100RSD**

It is different from the model SS100RS for the container engaging system.
Two hooks in place of the twist-lock system and a load lateral holding device allow to engage at the same time two containers, one on another.
Different controls actuate the two columns engaging the load.

STANDARD FEATURES (cont'd)

Electric System

Voltage	24 V.
Generator	*Volvo* 24V/140A - *Cummins* 24V/100A
Batteries	2 pcs. 12V-180A connected in series
Battery disconnecting switch	manual

Tank Capacities

Fuel	330 litres
Hydraulic oil	460 litres

Performances

F248

As regard the load capacities, refer to the load capacity plates inside the cab

Lifting speed 1-high (m/s)	without load :	0.51
	with load :	0.33
	without load with speed booster :	0.60
Load lowering speed 1-high (m/s)	0.43	

Driving condition	Max. drive speed (km/h)	Max. gradeability (%) with load max :
1st gear	4.2	35.0
2nd gear	8.6	15.0
3rd gear	14.6	8.1
4th gear	24.6	4.1

Max. towing stress (kN) : 185

STANDARD FEATURES (cont'd)

Stability factor

Driving condition	6.3
1-high	2.15 min.
2-high	1.80 min
3-high	1.60 min

Noise (prEN 12053)

	Average value outside the cab - db(A)	Average value outside the cab - db(A)
Motor :	74	74

Masses (kg)

Without load with Spreader :	"SS100RS"	"SS100RSD"
Total	40400	41100
Front axle	22500	24000
Rear axle	17900	17100

Dimensions

See drawings enclosed to the section "Diagrams" of the Operation and Maintenance Manual.

Engineering Design Specifications

Standard	CEE 98/37
Structures	DIN 15018
Safety	EN 1459
Pollution	CARB , EPA and EU off-road
Cab	ISO 6055 static load test

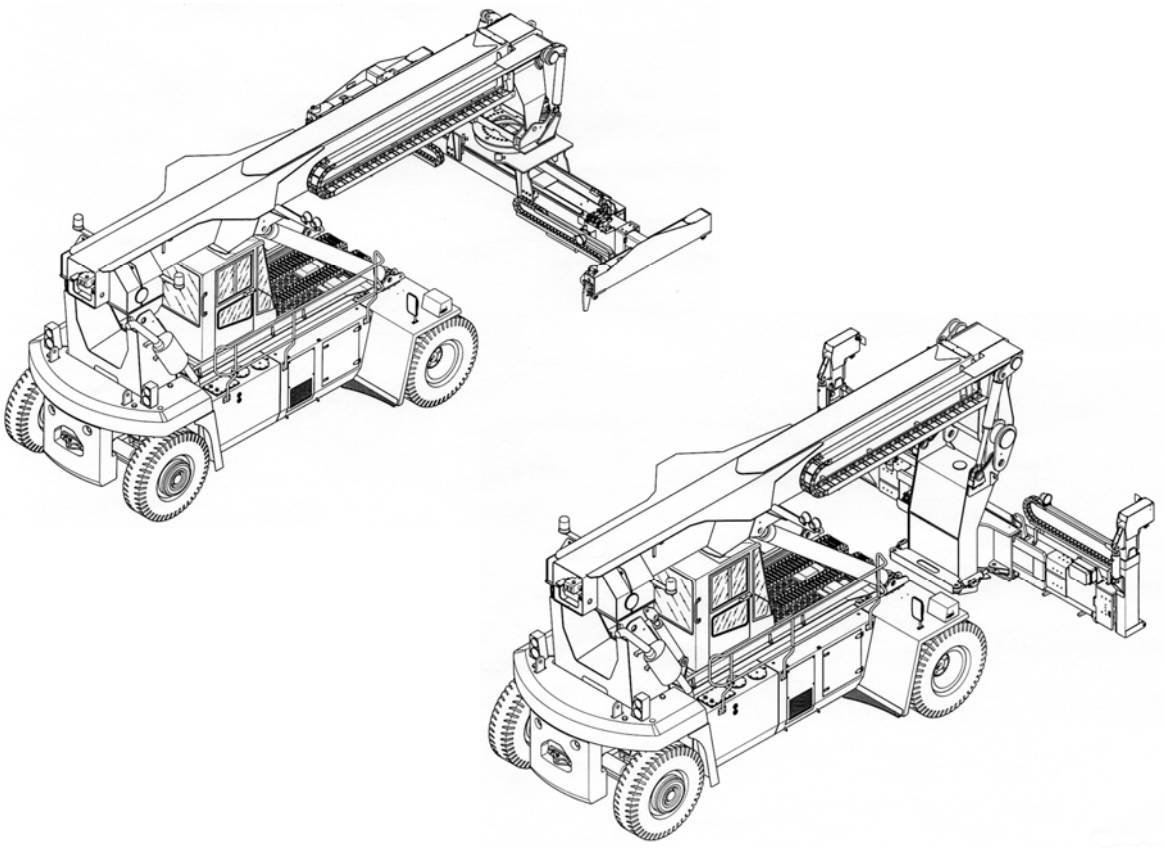
REACH STACKER SERIES "F258"

The reach-stackers Series F258 have been conceived, developed and made by CVS FERRARI expressly to handle containers from 20' to 40', special loads, etc., in order to optimise the compromise among maximum operational functionality and comfort for the operator.

They are used in port and interport terminals.

NOTES:

- ☺ *The main technical data of the various models are described (in a mere indicative way) in the following pages.*
- ☺ ***CVS FERRARI** reserves the right to introduce at any time modifications of the vehicles for technical or commercial reasons; therefore, the information in this technical document is updated to the date of approval for the publication.*
- ☺ *For further information, contact the qualified CVS technicians.*



CVS FERRARI S.r.l.
Via Emilia - 29010 Roveleto di Cadeo – (PC) – Italy
Tel: +39.0523.503511 r.a. - - Telefax: +39.0523.500439
e-mail: aftersales@cvsferrari.com
Internet: http://www.cvsferrari.com

Rev. 0.1
08/07

STANDARD FEATURES

Engine

For series **F258**

Manufacturer	*VOLVO*	*VOLVO*	*CUMMINS*
Model	TWD 731 VE	TAD 720 VE	QSB 6.7 T-3
Type	Diesel	Diesel	Diesel
Induction	Superch./Intercooled	Superch./Intercooled	Superch./Intercooled
Cylinder no.	6 in line	6 in line	6 in line
Displacement (cm3)	6730	7150	6700
Bore x stroke (mm)	105 x 130	108 x 130	107 x 124
Gross pow. (kW at rpm) (1)	(*) 175 / 2400	174 / 2300	164 / 2200
Max. torque (Nm at rpm)	949 / 1250	854 / 1400	949 / 1500
Compression ratio	17.7 : 1	19 : 1	---
Lubrication system	Oil forced	Oil forced	Oil forced
Cooling system	Water cooling	Water cooling	Water cooling
Oil sump capacity (litres)	29	20	22

(1) ISO 3046 for engines VOLVO
SAE J1995 for engine Cummins

(*) Engine rpm limitation: 2200 rpm

Transmission

Manufacturer	*DANA Spicer (Clark)*
Model	32000
Type	13.5 HR 32412 Power shift with torque converter built-in in the transmission with 4 forward and 4 reverse gears.
Reduction ratios	5.18 – 2.45 – 1.41 – 0.82
Conversion ratio	1.82
Gearbox	Fully automatic electronic controlled gearbox, it can be bypassed in an emergency case
PTO	2 pcs on the converter case
Oil capacity	40 litres

Front Driving Axle

Manufacturer	*KESSLER*
Model	D81
Reduction	Central bevel gear with planetary gear in the hubs
Total reduction ratio	27.75 : 1
Central reduction	4.625 : 1
Final reduction	6.0 : 1
Service brakes	Wet multi-disk brake
Parking brake	Dry disk-brake on the motion input flange

STANDARD FEATURES (cont'd)

Steering Axle

Manufacturer	*C.V.S.*
Model	568516
Steering cylinder	Single double-acting cylinder
Construction	Axle body made of steel welded structure. Connection to the chassis by means of 2 lubrication free pivots on rubber mounts.

Tyres

Front dual tyres	14.00-24 24PR or 28PR
Rear single tyres	14.00-24 24PR or 28PR

Steering

Fully hydrostatic steering made of a piston pump driven by the power takeoff on the transmission, Orbitrol driven by the steering wheel and by a double acting cylinder fitted on the axle.
Number of turns of the steering wheel lock-to-lock = 4.1
The optional emergency steering pump starts up automatically in case the vehicle is in motion and at the same time the main steering pump is out of order, or in case of shutdown of the engine.

Braking System

Service brake: hydraulic pedal controlled wet multi-disk brakes on the hubs of the front drive axle.
Parking brake: dry disk brake (Ø 380 mm), fitted on the motion input flange of the front drive axle, actuated by a spring device controlled electrically from inside the cab.
The parking brake is automatically engaged when the ignition key is on "OFF" position.
On applying the parking brake, the engaged gear is disengaged.

Hydraulic System

Piston pumps with variable flow rate, driven by two power takeoff of the transmission, feed the boom lifting and telescoping circuits through hydraulically controlled proportional distributing valves.
Solenoid valves control all other spreader operations (slewing, side-shifting, 20'÷40', twist-lock).
The main controls of the boom and of the spreader are grouped in a multi-function joystick.
The circuit is equipped with a cooling system consisting of an air-oil heat exchanger with blower driven by an electric motor.

An optional system, the speed booster, increases the boom extension speed without load.

STANDARD FEATURES (cont'd)

Cab

The cab is made of aluminium to avoid maintenance operations to remove some oxide due to salt spray fog.
The aluminium cab is supported on silent blocks that isolate it from the vibrations of the chassis.
Central driver's seat, a main door on the left side and an emergency door on the right side, both with sliding glasses.
Front and rear window with 2-speed screen wiper and screen washer.
Roof window with 1-speed screen wiper.
Laminated glass front window, all other windows with toughened glasses, all glasses are heat protective shade-light type glasses.
Driver seat with pneumatic suspension adjustment accordingly to the driver weight, and with horizontal and vertical adjustment. Safety lap belts.
Adjustable steering wheel position.
Hot water heating system with admissions for windshield defrosting and for front and side windows defogging.

Chassis

Box-type rolled steel structure made of two rectangular side members and jointing transversal girders.
In the rear end of the chassis are provided connections for the steering axle and to fasten the counterweights.

Boom

The basic boom and the telescopic section are made of a welded structure of high strength steel.

Spreader

Model: **TS120RS**
Single-beam with rectangular section, 20'÷40' automatic extension actuated by double-acting hydraulic cylinders.
Fixed twist-locks with lamps and flags showing their locked / unlocked position.
Automatic twist locking after the signalling that the spreader is resting on the container.
Safety lock to prevent twist locks from rotating when a container is loaded.
Safety sensors on the two corners where the twist-locks are installed.
A hydraulic gearmotor, with negative brake, and a slewing rim rotate the spreader between –95° and + 185°.
Lateral inclination: ± 3°.
Side-shifting: stroke ± 800 mm.
Two double-acting cylinders cushion the load oscillations.

STANDARD FEATURES (cont'd)

Electric System

Voltage	24 V.
Generator	*Volvo* 24V/140A - *Cummins* 24V/100A
Batteries	2 pcs. 12V-180A connected in series
Battery disconnecting switch	manual

Tank Capacities

Fuel	330 litres
Hydraulic oil	460 litres

Performances

F258

As regard the load capacities, refer to the load capacity plates inside the cab

Lifting speed 1-high (m/s)	without load :	0.47
	with load :	0.32
	without load with speed booster :	0.57
Load lowering speed 1-high (m/s)	0.40	

Driving condition	Max. drive speed (km/h)	Max. gradeability (%) with load max :
1st gear	4.2	35.0
2nd gear	8.6	15.0
3rd gear	14.6	8.1
4th gear	24.6	4.1

Max. towing stress (kN) : 185

Gradeability, without load: about 40%

STANDARD FEATURES (cont'd)

Stability factor

Driving condition	5.1
1-high	2.2 min.
2-high	1.73 min
3-high	1.53 min

Noise (prEN 12053)

	Average value outside the cab - db(A)	Average value outside the cab - db(A)
Motor :	74	74

Masses (kg)

Without load :	
Total	41700
Front axle	23800
Rear axle	17900

Dimensions

See drawings enclosed to the section "Diagrams" of the Operation and Maintenance Manual.

Engineering Design Specifications

Standard	CEE 98/37
Structures	DIN 15018
Safety	EN 1459
Pollution	CARB , EPA and EU off-road
Cab	ISO 6055 static load test

DIAGNOSTIC SYSTEM FOR REACH STACKER 238-248-258

1.0 *Description*

The RS-238-248-258 series electric / electronic system has been designed in such a way as to identify the part to be replaced in case of failure in the shortest time possible.

Each card carries out one only function. Below is a list of the cards in the basic system board:

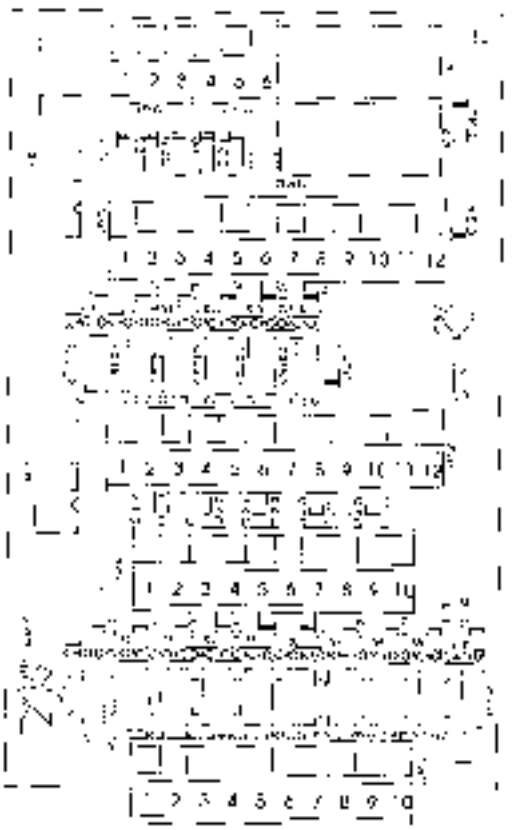
- Bulbs interface card SIB-100
- Transmission interface card SKC-100
- Overload interface card SIA-100
- Starting (ignition) card SKA-100
- Light switch interface card SFD-100
- Windshield wipers cards SIT-9208
- Ignition Pump Exclusion Card CPA-03
- Spreader control unit SP-150xx

Any failures can be easily identified, thanks to LEDs on the cards signalling the status both on the inputs and the outputs. With a PC it is possible to connect to the SP-15x control unit and execute spreader diagnostics.

- Diagnostics software DIS_SW

This software makes it possible to check the I/O of the spreader, directly from the PC.

2.0 Bulb interface card SIB-100



All the signals coming from the various bulbs reach this card; here, the signals are "elaborated" and sent over to warning lights and/or manometers.

No diagnostics warning lights are given here as they would turn out to be a copy of those already present in the cab. The only signal provided is for LED D37 showing, if fit, the operation of the hydraulic oil cooling solenoid valve.

The components which are shown in greater detail on the topographic drawing, are fitted only if the signal coming from the bulb needs to be inverted, i.e. if we take input 1 of JP1, if Q1-R1-D1 are not fitted and if A is short-circuited on S1, the warning light connected to terminal 1 of JP4 will light up when the bulb closes towards mass. On the contrary, if Q1-R1-D1 are fitted and B is short-circuited on S1, the warning lights will light up when the bulb is open.

A tester may be used to check all of the bulbs for this card. The procedure is as follows:

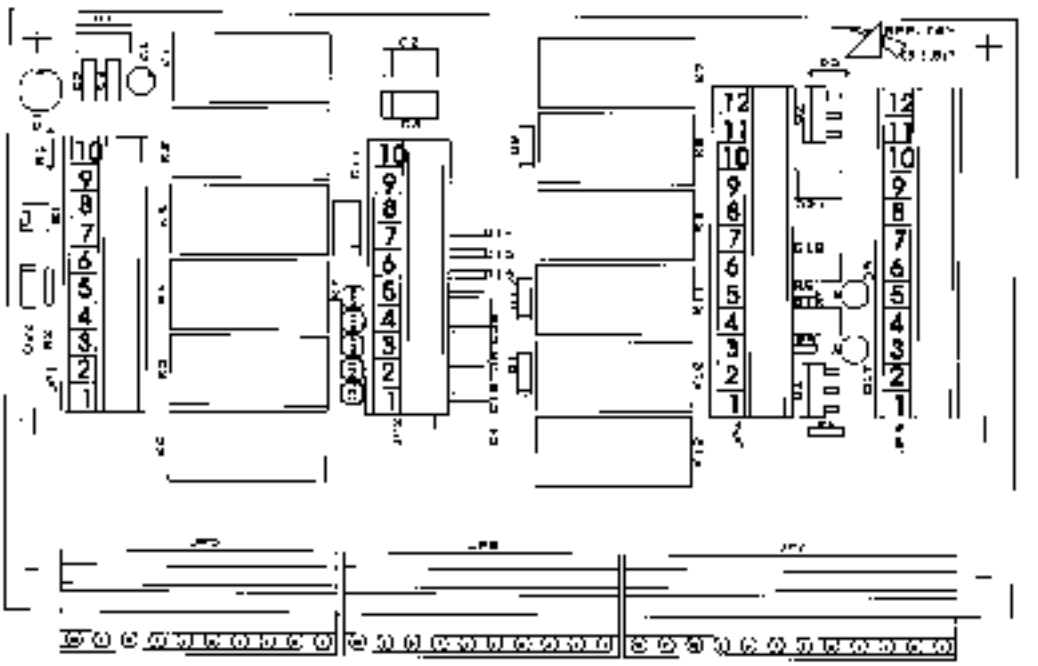
The tester must be set for measuring DC voltage with a capacity greater than 30 Vdc; the positive cap must be connected to terminal 5 of JP3; the negative cap must be connected to the input that we want to check; if the tester shows a voltage that is close to 0Vdc, then the bulb is open; if the tester shows a voltage that is close to battery 1, then the bulb is closed.

The test lamp is automatic at startup.

Below is a list of the inputs and corresponding outputs:

TERMINAL N°	TERM. BOARD	DESCRIPTION
1	JP1	PARKING BRAKE BULB
2	JP1	BULB FOR WATER HIGH TEMP. W.L.
3	JP1	BULB FOR FUEL LEVEL W.L.
4	JP1	BULB FOR AIR FILTER CLOGGED W.L.
5	JP1	BULB FOR BRAKE OIL FILTER CLOGGED W.L.
6	JP1	BULB FOR HYDR. OIL FILTER CLOGGED W.L.
7	JP1	BULB FOR TRANS. OIL FILTER CLOGGED W.L.
8	JP1	BULB FOR BRAKE OIL LOW PRESSURE W.L.
9	JP1	BULB FOR ENGINE OIL LOW PRESSURE W.L.
10	JP1	BULB FOR TRANS.OIL HIGH TEMP. W.L.
1	JP2	BULB FOR BRAKE OIL HIGH TEMP. W.L.
2	JP2	BULB FOR HYDR.OIL HIGH TEMP. W.L.
3	JP2	NOT USED
4	JP2	NOT USED
5	JP2	SIGNAL FOR ALTERNATOR 2 W.L.
6	JP2	BULB FOR HYDR.OIL COOLING FAN
7	JP2	SIGNAL FOR ALTERNATOR 1 W.L.
8	JP2	"W" SIGNAL FOR ALTERNATOR 1
9	JP2	PROBE FOR TRANS.OIL TEMP. THERMOMETER
10	JP2	PROBE FOR ENGINE WATER TEMP. THERMOMETER
11	JP2	SENSOR FOR ENGINE OIL LOW PRESSURE MANOMETER
12	JP2	SENSOR FOR FUEL LEVEL GAUGE
1	JP4	PARKING BRAKE W.L.
2	JP4	WATER HIGH TEMP.W.L.
3	JP4	FUEL LOW LEVEL W.L.
4	JP4	AIR FILTER CLOGGED W.L.
5	JP4	BRAKE OIL FILTER CLOGGED W.L.
6	JP4	HYDR.OIL FILTER CLOGGED W.L.
7	JP4	TRANS.OIL FILTER CLOGGED W.L.
8	JP4	BRAKE OIL LOW PRESSURE W.L.
9	JP4	ENGINE OIL LOW PRESSURE W.L.
10	JP4	TRANS.OIL HIGH TEMP. W.L.
1	JP5	BRAKE OIL HIGH TEMP. W.L.
2	JP5	HYDR.OIL HIGH TEMP. W.L.
3	JP5	NOT USED
4	JP5	NOT USED
5	JP5	SECOND ALTERNATOR W.L.
6	JP5	HYDR. OIL COOLING FAN CONTROL EV
7	JP5	FIRST ALTERNATOR W.L.
8	JP5	RPM COUNTER
9	JP5	TRANS.OIL THERMOMETER
10	JP5	WATER THERMOMETER
11	JP5	ENGINE OIL MANOMETER
12	JP5	FUEL LEVEL GAUGE

2.1 Transmission interface card SKC-100



This card has been designed in such a way as to permit the connection of three different versions of automatic speed control:

- SHIFTRONIC
- 3B6
- Anti-inversion IRF-300 Appleby

This automatism may be excluded simply by means of a key switch located on the general electric board (a red w.l. will light up for the manual gearbox mode), in this way the vehicle may be operated even in the case of failure of the transmission control unit.

WARNING:

The transmission may be put in manual mode, only if the gear selector is in neutral position; when the gearbox automation is excluded the protection against inversion and gear engagement at a low rpm are no longer active.

The card also has some LEDs that signal the status of solenoid valves, the LED functions are as follows:

LED	Function
D22	ev forward
D23	ev reverse
D21	ev 1
D24	ev 2
D25	ev 3

The chart below indicates the various sequences for each gear:

pos.of gear selector	LEDs lit
N	D21-D24-D25
F1	D22-D21-D24-D25
F2	D22-D24-D25
F3	D22-D25
F4	D22
R1	D23-D21-D24-D25
R2	D23 -D24-D25
R3	D23 -D25
R4	D23

The sequence indicated refers to when the gearbox is in manual mode; when the gearbox is in automatic mode, position N may change and the corresponding LEDs may be all out. In addition to these 5 LEDs, there are two more LEDs that are marked D17 and D9 whose functions are as follows:

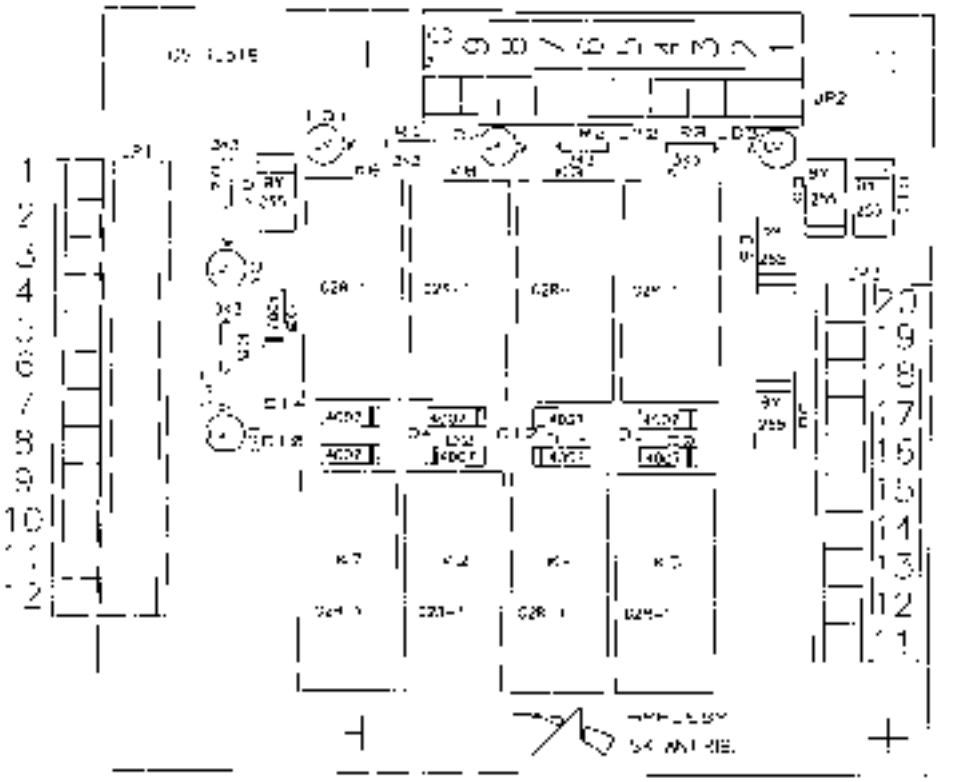
LED	Function
D17	right rear light
D9	left rear light

These two outputs are not protected by normal fuses, but rather by self-settable active components.

After they have intervened, and the cause has been eliminated, all that is needed is to shut down the vehicle or disengage the control.

Hereinafter, this type of output will be referred to as "profet output" for short.

2.2 Overload interface card SIA-100



This card makes it possible to connect two kinds of overload devices, the 3B6 BIG SHIPPER and KRUEGER MARK 3E/1. It also controls the "DEAD MAN" solenoid valve and the boom movement blocks coming from the spreader.

Five LEDs are used for diagnostics:

LED	Function
LD1	dead man ev relay. Not used
LD2	descent block relay. Not used
LD3	lifting block relay
LD4	overload relay
LD5	overload relay

The LD1 LED must light up whenever the corresponding button on the manipulator is pressed.

The LD2 LED should normally be lit; it goes out when the four spreader proximity switches are active, indicating the correct spreader laid-down, or for the partial rotation of the twists. These situations consequently cause the boom lowering to block.

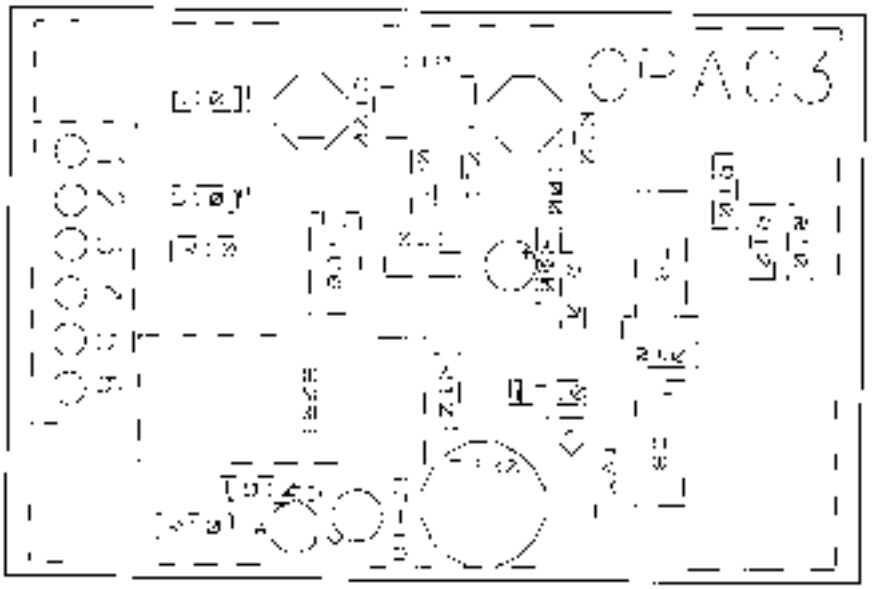
The LD3 LED should normally be lit; it goes out when the twists are partially activated, thus blocking the boom lifting.

The LD4 LED should normally be lit; it goes out when the load limiting device is activated.

The LD5 LED should normally be lit; it goes out when the the load limiting device is activated.

The LEDs refer to the controls, not to the outputs. At any rate, on solenoid valves there is a red LED that indicates, if lit, that the solenoid valve itself is activated.

2.25 CPA-03 card for pump exclusion at startup



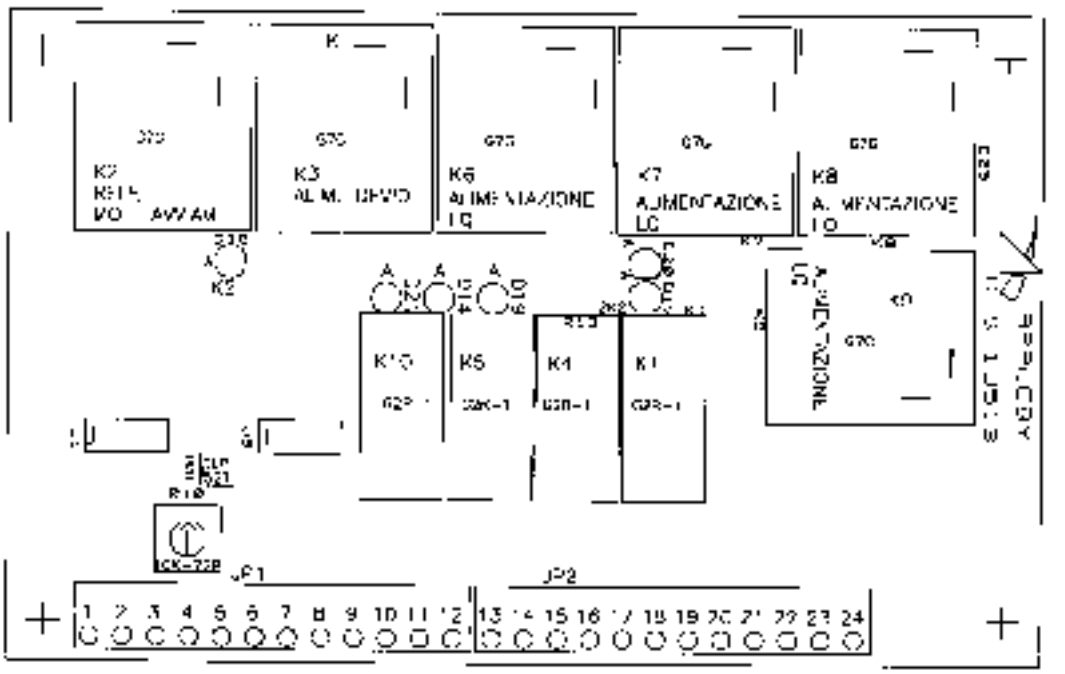
The CPA-03 card makes it possible to keep the hydraulic pumps excluded until the engine has exceeded a certain number of resettable rotations. This makes it possible for the starter to activate the engine with the minimum possible load, thus avoiding overloads and excessive input. The card is connected by means of a six-pole terminal board.

Below is a list of the various terminals for the card.

TERMINAL N°	TERM.BOARD	DESCRIPTION
1	JP1	POWER INPUT TO CARD AQL (acceptable quality level)
2	JP1	NEGATIVE INPUT (MASS)
3	JP1	"W" SIGNAL FOR ALTERNATOR
4	JP1	NOT USED
5	JP1	SOLENOID VALVE FOR PUMP EXCLUSION
6	JP1	POSITIVE INPUT SOLENOID VALVE (AQL)

Once the engine has started up, it should be kept at approximately 1200 rotations while rotating the multiple rotation trimmer clockwise or counter clockwise until the red LED goes out. If the number of rotations decreases, the LED will light up and the exclusion valve will excite.

2.3 Startup card SKA-100



The electronic part is protected by a resettable fuse, mounted directly on the board.

The board will run all the functions relative to the power key. The diagnostics is shown by six LEDs with the following functions:

LED	Function
D18	Protection start with gear in neutral
D21	switch power and shut-off EV
D14	start motor protection (opt.)
D19	power disengaged by start
D17	battery disengaged relay (optional)
D20	board power relay

Protection startup with gear in neutral

When the D18 LED is out, it means that the gear is engaged. It is therefore not possible to start up the engine. To start the engine the D18 LED must be lit.

The gear manipulator in cab may be used to put the gear in neutral. The voltage on terminal n.°8 of JP1 should be 24Vdc when the gear is in neutral.

Switch power and engine shutdown

When the D21 LED is lit, it means that the power relay of the light switch as well as of the solenoid valve for engine shutdown is activated. This relay can be activated under the following conditions :

-board key is in drive position

-emergency pushbutton has not been pressed

-Continuity of connection between terminals 17 and 18 of JP2.

In case the alarm card SAC-100 is not fitted, check for presence of a bridge between terminals 17 and 18 of JP2.

Starting motor protection relay (optional)

This function makes it possible to protect the starting motor from re-starting the engine when the latter has already started.

To adjust this function, do as follows:

-with the engine shut down and electric board lit, adjust the trimmer R10 completely clock wise,

-start the engine and run it at idle speed.

-in this condition, slowly turn trimmer R10 counter clockwise until LED D14 goes out.

-shut down the engine and restart it.

If everything has been done correctly, once the engine has started, the starter can no longer be engaged.

Power disengaged by start

If some devices cannot function at power levels that are lower than 16Vdc or if these devices are particularly disturbed, they can be disconnected when the vehicle is started. In fact, the output from terminal 6 of JP1 is interrupted as long as the engine is being started.

When the output is activated, the D19 LED is lit; it will go out during engine startup.

In the standard system, the only control unit powered by this output is the load limiting device (3B6 or Kruger).

Battery disengaged relay (optional)

Terminal 15 of JP2 is provided with an output to connect an electrical battery cut-off. The line is protected by a self-settable polyswitch fuse.

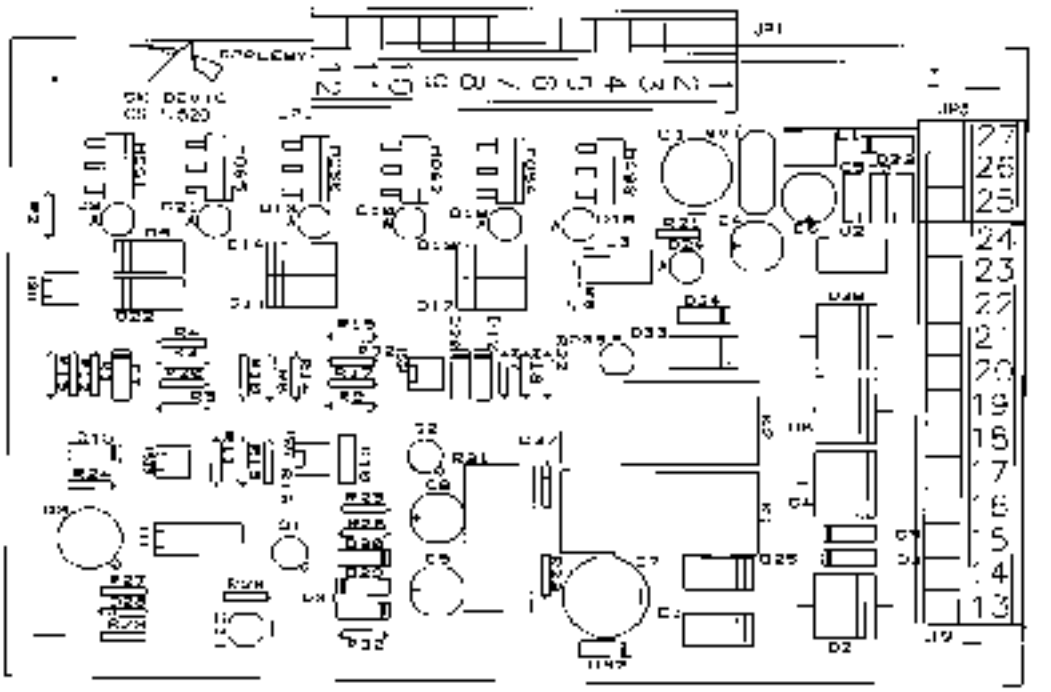
This output is activated when the board key is in drive or parking position and it is signalled by the lighting up of D17 LED.

Board power relay

In reality, there are four relays fitted in parallel. This type of connection reduces the contact resistance four-fold, thus allowing for a drastic reduction of heat.

The relays are excited when the ignition key is turned to the drive position and the emergency pushbutton has not been pressed (the D20 LED is lit). In this situation, voltage is supplied to the LO line (Board line), and, consequently, to all the users.

2.4 Switch interface card SFD-100



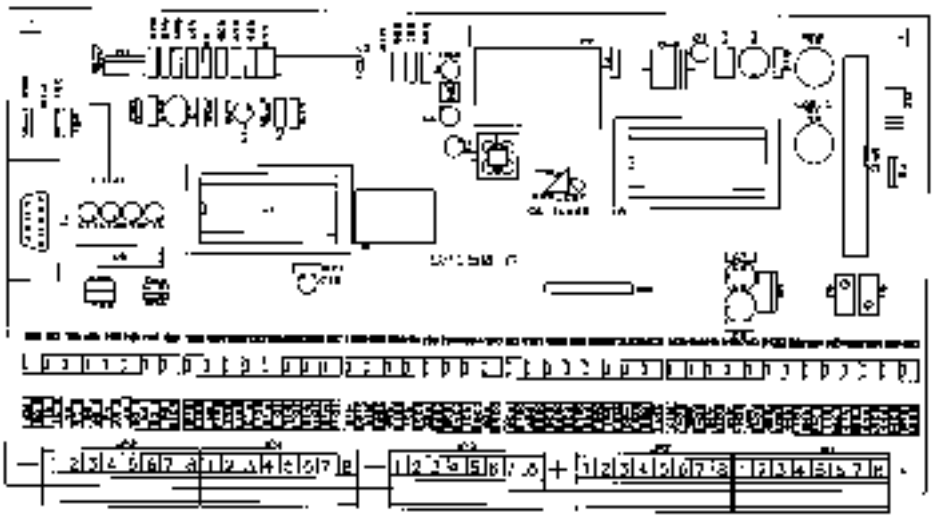
The electronic part is protected by a resettable fuse, fitted directly onto the board.

The LEDs on this card are used for the diagnostics of the following functions:

LED	function
D35	Direction & hazard lights
D16	Left main beam
D18	right main beam
D8	Left low beam
D10	right low beam
D13	Trumpets
D21	Stop lights
D24	card power w.l.

The outputs are active when the relevant LEDs are lit, all outputs are activated by profet (see par.2.1)

2.5 Terminal board to control spreader SP-15x



The electronic part is protected by a resettable fuse mounted directly on the board .

All the commands to the arm and the spreader as well as the commands from the spreader to the chassis converge on this board. The diagnostics software makes it possible to check the I/O by connecting to the serial port RS-232 with a PC.

3.0 Diagnostics software DIS_SW

3.1 Introduction

The diagnostics software provides all the information needed by the technician who must intervene in the event of machine breakdown. The software may be used to check:

THE FOLLOWING OUTPUTS :

- SOLENOID VALVE OF SWITCH
- ROTATING LAMPS
- SOLENOID VALVE FOR LIFTING/LOWERING OF SPREADER COLUMNS
- SOLENOID VALVE FOR CLOCKWISE/COUNTER CLOCKWISE OSCILLATION
- OUTPUT FOR CENTRALISED LUBRICATION
- TWIST WARNING LIGHTS
- SOLENOID VALVE FOR RI-LE TRANSLATION
- SOLENOID VALVE FOR TWIST LOCK
- SOLENOID VALVE FOR TWIST UNLOCK
- SPREADER YELLOW WARNING LIGHT
- SPREADER RED WARNING LIGHT
- SPREADER GREEN WARNING LIGHT
- SOLENOID VALVE 20' RI-LE
- SOLENOID VALVE 40' RI-LE

THE FOLLOWING FAILURES :

- SENSOR 20' (OPT)
- SENSORS 30' (OPT)
- SENSORS 35' (OPT)
- TWIST LOCKED IN SHORT-CIRCUIT SENSORS
- INTERRUPTED UNLOCKED TWIST SENSORS
- UNLOCKED TWIST IN SHORT-CIRCUIT SENSORS
- INTERRUPTED LOCKED TWIST SENSORS
- TRACER POINTS OPEN SENSORS
- TRACER POINTS IN SHORT-CIRCUIT SENSORS (POSSIBLE WITH SIGNAL OF LOADED MACHINE 3B6)

There is a green LED D56 on the SP150 terminal board which, when flashing, indicates a failure. Once again, the software makes it possible to visualise the type of alarm by clearly showing which sensor is malfunctioning or which output is out of order. The number of alarms is counted (one for each light-up).

IT IS POSSIBLE TO SHOW ALL COMMANDS:

- BY-PASS TWIST/LIFTING
- SWITCH FOR ROTATING LAMP
- RIGHT TRANSLATION
- LEFT TRANSLATION
- L.S. LIFTING ARM
- L.S. 20' (OPT)
- SIGNAL 3B6 LOADED MACHINE
- SWITCH FOR CLOCKWISE ROTATION
- SWITCH FOR TWIST LIGHTS
- SWITCH FOR COUNTER CLOCKWISE ROTATION

- SWITCH FOR AUTOM./MAN OPENING/CLOSING
- POSITION 20'
- POSITION 40'
- POSITION 30' (OPT)
- POSITION 35' (OPT)
- SWITCH FOR TWIST LOCK
- SWITCH FOR TWIST UNLOCK

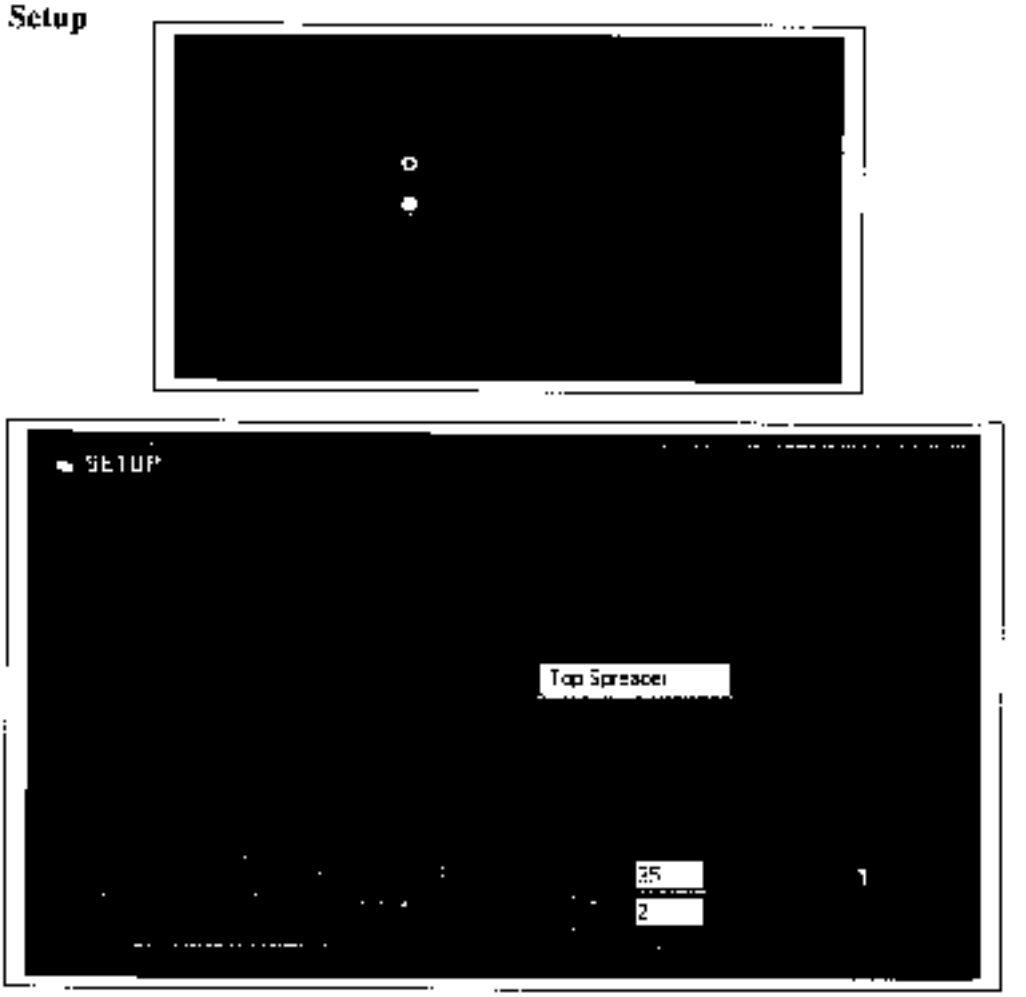
THE FOLLOWING SENSORS :

- RIGHT TRACER PIN
- LEFT TRACER PIN
- LOCKED RIGHT TWIST
- UNLOCKED RIGHT TWIST
- LOCKED LEFT TWIST
- UNLOCKED LEFT TWIST
- L.S. 30' RIGHT (OPT)
- L.S. 30' LEFT (OPT)
- L.S. 35' RIGHT (OPT)
- L.S. 35' LEFT (OPT)

AND ALL THE OUTPUTS LISTED ABOVE IN REAL TIME, THAT IS, WHILE THE MACHINE IS RUNNING. IT IS ALSO POSSIBLE TO USE THE SOFTWARE TO FORCE THE OUTPUTS.

THE SOFTWARE OPERATES ON A IBM COMPATIBLE PC PLATFORM WITH A 32 BIT PENTIUM PROCESSOR AND WINDOWS 95.

3.2 Machine Setup



In the Setup window you must enter the type of spreader used (the model of the terminal board being used is automatically displayed) and the serial port used to communicate (Com 1 by default). Once the parameters have been entered, the function bar buttons become active. It will then be possible to select the Real Time function, the Diagnostics function, and the Forcing function. You will also be able to set the timeout for the automatic opening of the spreader and set the number of twists on the spreader (2 per side 4 per top). To exit, click on the EXIT button using your mouse.

3.3 Real Time

By clicking on the start button, the Real Time function will display all the active inputs (green) and outputs (red) once they have been connected. If an input is lit, it means that the signal reaches the terminal board. If an output is lit, it means that the terminal of the board is under voltage.

This function allows you to see whether or not the signals are correct while using the machine.

3.4 Diagnostics

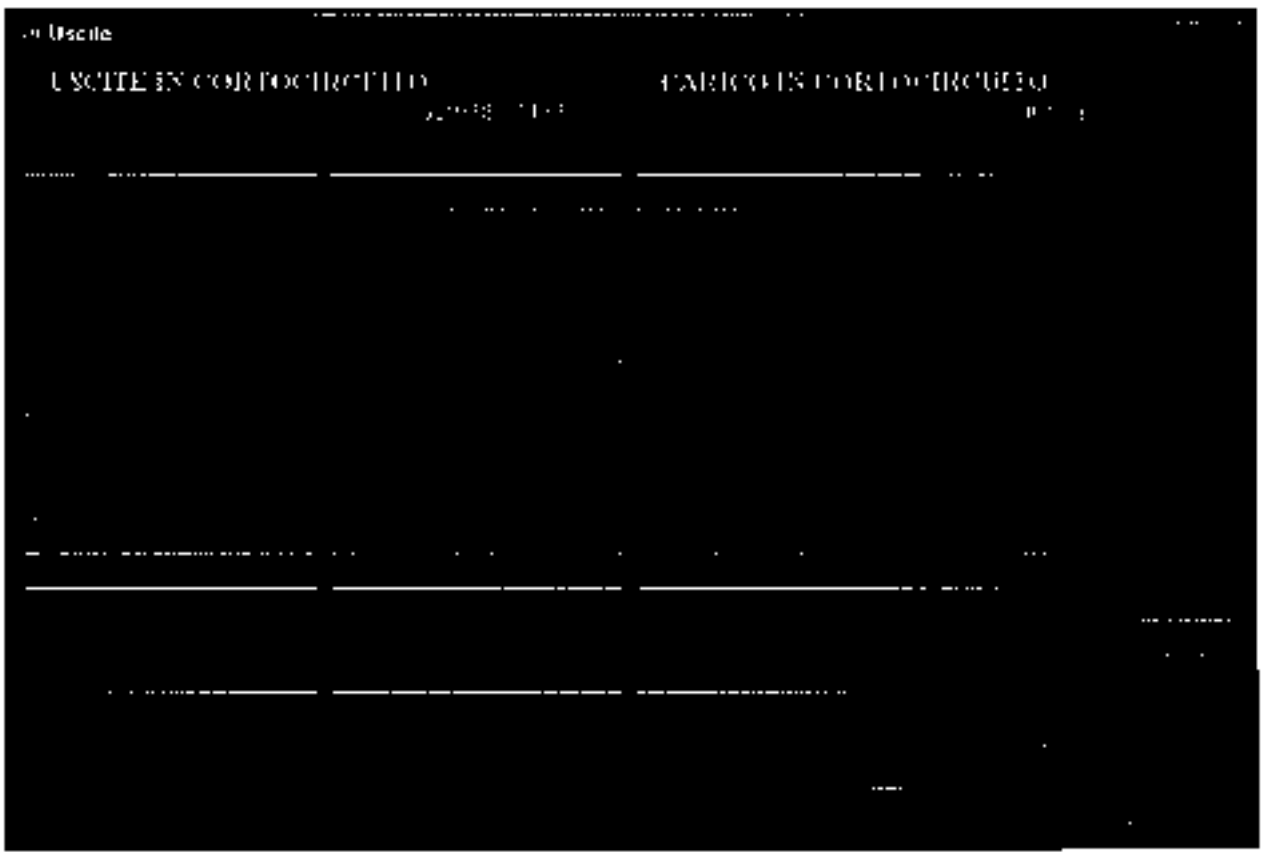
This function allows the system to notify the user of any anomalies during normal operation. In order to be connected, click on the Reading Alarms button. The alarms will be read directly from the memory and shown in the following manner:

The upper part shows six lines indicating the type of sensors and failure (ex. locked twist in short circuit sensors). Next to each line, a little window shows a number. If the number is zero, it means that there are no anomalies. Otherwise, the window will show the result of the decimal conversion of the byte that has been examined. At any rate, it is not necessary to make any calculation because the software automatically checks the result and shows, next to it, which sensor is out of order (by giving four messages: OK - RE sensor is out of order – LE sensor is out of order – both sensors are out of order). Another small window, next to the first one, will show how many times the anomaly has occurred (if no anomaly has occurred, the number zero will appear. The number will increase in the event of an error at machine startup).

The correct functioning of the sensors can be checked by hooking the container, lifting it up and unhooking it (complete cycle). This should be done according to the

instructions shown in the central part of the Diagnostics window. Once the cycle has been completed, if the sensors have not shown any error, everything will remain unchanged. Otherwise, the reading will show which sensor was out of order. If the function has been activated, then a message will appear below the six lines in the event of an anomaly at the limit switch 20"-30"-35" (optional).

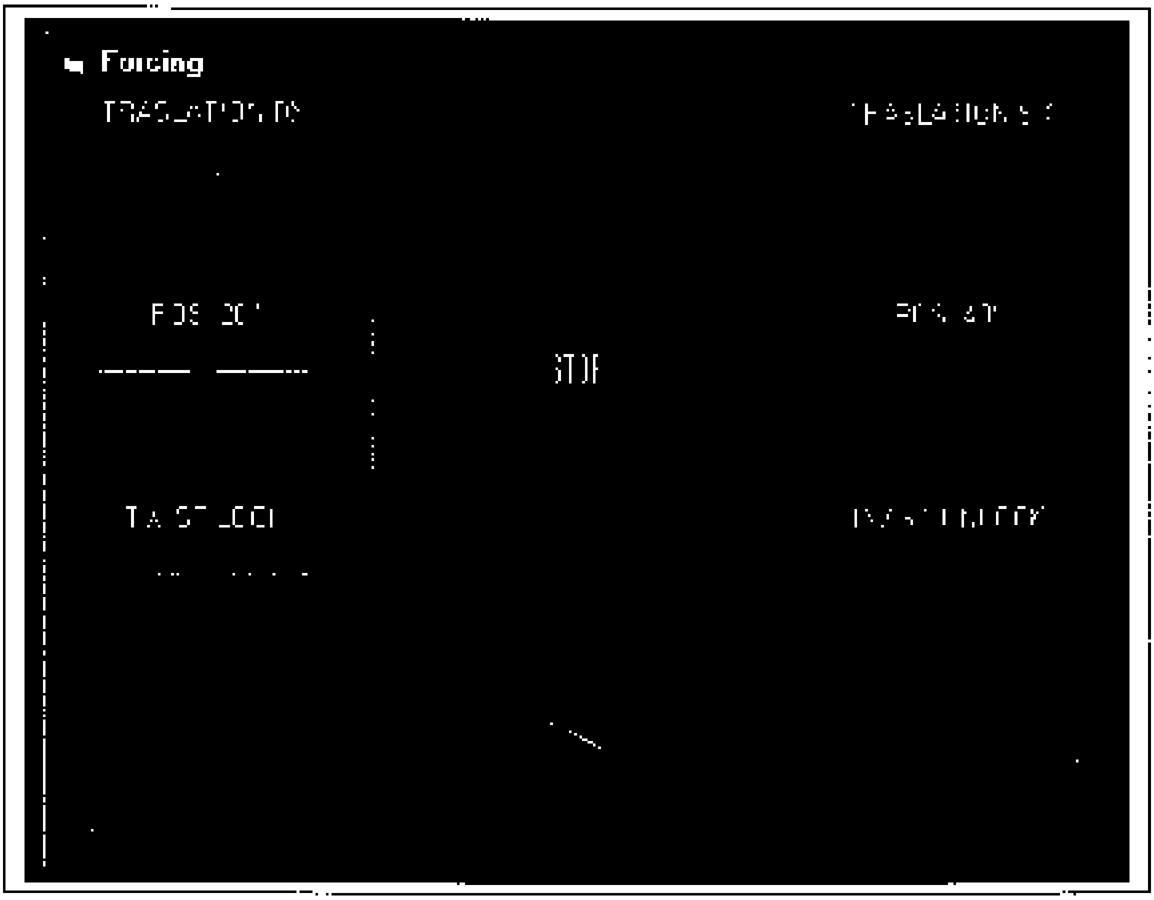
The lower part shows four output bytes with two windows for each byte. If, after the alarm reading, the number shown in the windows is zero, it means that the outputs function properly. If a number appears (decimal result of the situation of the corresponding byte), it means that there are some anomalies in the outputs. In this case, clicking on the "check output" button will display the window :



If the windows corresponding to the four output bytes show zero, then all the outputs are OK. Otherwise, the window will show which output is out of order. The system recognises whether the output is always active (probably, a card out of order or a cable touching the positive pole). In this case, the output is described on the left hand side. If the output is in short circuit (probably, a load cable in mass) it will be described on the right hand side.

Clicking on the "Back" button will show the previous window. On the bottom right hand side of this window a small window will show the number of twists.

3.5 Forcing



Whenever the above window appears, six spreader commands are available. By clicking on the corresponding "Start" button, the spreader will execute the manoeuvre indicated even without the consent of the sensors. To end the manoeuvre, click on the corresponding "Stop" button.

⚠ DANGER!

Failing to comply with safety measures can cause serious personal injuries and possibly death. The spreader forces the various movements. It is therefore important to pay close attention to the manoeuvre that is being carried out and to be in such a position as to be able to activate, if necessary, the emergency pushbutton in the cab to stop the machine.

In the middle of the window there is a spreader stop button that, by means of the software, removes all the outputs involved in the manoeuvres. Do not, however, use this software button as an emergency stop because the software could be blocked.

The output forcing function allows to check whether the solenoid valves function properly independently of the sensors.

TABLE OF CONTENTS

DIAGNOSTIC SYSTEM FOR REACH STACKER 238-248-258