1 – INTRODUCTION

1.1 BASIC INFORMATION

This manual holds the information and prescriptions to be respected in order to install correctly the MAXILIFT cranes on vehicles, as well as to check the correct mounting when the work is finished. For further evidence and better readability, in such manual are used the following symbologies:

⚠️ DANGER: this symbol is used with reference to activities which can involve risk or danger for people.

⚠️ ATTENTION: this symbol is used with reference to activities which can involve risk or danger for things.

⚠️ IMPORTANT: it indicates useful suggestions or hints for crane installation

⚠️ NOTE: it indicates information which can facilitate crane mounting and installation.

⚠️ ATTENTION

Read carefully this manual before starting each operation related to crane installation.

⚠️ ATTENTION

Read carefully the “INSTALLATION INSTRUCTIONS” manual of the vehicle’s manufacturer before starting crane installation.
The **Maxilift** cranes can be installed only by workshops expressly authorised by **Next Hydraulics** S.r.l. for this purpose.

Such workshops must be equipped with the devices, machinery, tools and implements proper and in order with the Accident Prevention Norms in force.

Mounting must be carried out by trained and qualified staff, with a good knowledge of the technical state-of-the-art, which must cling to the prescriptions of this manual and the Installation Instructions of the vehicle’s Manufacturer while executing the work.

Such staff must have a specific competence in the safety devices installed on **Maxilift** cranes, even availing itself of the free Training Courses held, periodically or on request, at **Next Hydraulics** S.r.l..

⚠️ **ATTENTION**

In case of doubts or uncertainty always consult **Next Hydraulics** s.r.l..

The installation of the crane or other options must in no way change or affect negatively the functionality of the different vehicle’s parts. As a simple and not exhaustive example, we remind that:

1 - the installation must not change the breathing and ventilation conditions foreseen by the vehicle’s manufacturer for the different parts or services (motor, batteries, brakes, heat exchangers, etc.)
2 - the installation must not compromise the accessibility to the several parts and systems of the vehicle, nor compromise their easy maintenance, inspections, repair interventions
3 - the installation must not compromise duration and endurance to the corrosion of the different vehicle’s parts; in case of modifications or workings, provide for the restoration by the proper treatments
4 - special attention must be used when working with welding machines or other tools near to the hoses of brakes, air and electricity system. Such parts must be always adequately protected and, if necessary, temporarily removed
5 - the interventions on vehicle’s electric system (for instance: additions, shunts, etc.) must be carried out with cables and water-tight joints of the same type of those original. The cables are to be protected by sheaths and steadily fixed on safe points. Do not change the original ground connections of vehicle’s system
6 - for further information consult the Installation Instructions manual of vehicle’s manufacturer.

⚠️ **ATTENTION**

During the installation, always keep within reach this manual and the “INSTALLATION INSTRUCTIONS” manual of the vehicle’s manufacturer. Should you notice on both manuals some clashing data or instructions on a same matter, always apply the most conservative ones in terms of safety.

In accordance with the policy of steady improvement of its products, **Next Hydraulics** S.r.l. reserves the right to bring to them modifications at any time. Therefore, in some points this manual could not exactly suit what noticed on the crane during mounting.

Always make sure to have received (and to be using) the last release of the manual!

In case of doubt, always apply to **Next Hydraulics** s.r.l.
1.2 “MACHINE DIRECTIVE”

All the machines sold inside the European Union’s territory must fulfil the regulations of the 2006/42/CE ("MACHINE DIRECTIVE") in the version in force. Therefore, each Maxilift crane is fitted with the safety devices required, it bears a plate carrying the CE mark in a visible position, and is delivered accompanied by relevant Conformity Declaration. The installer carrying out mounting, by incorporating the Maxilift crane in the vehicle produces a new machine: a truck loader, ready to be put into service. Therefore, he becomes the manufacturer of this new machine and must comply with the Directive’s provisions concerning design, building, safety in functioning and use. He must keep all of this recorded in the Technical Dossier he is compelled to draw up. After having made sure, by proper tests and practical exams, of the correspondence to the requirements, the installer places his own CE plate and releases his own Conformity Certificate.

NOTE

We remind that the non-fulfilment to the above involves, in case of accidents:
- criminal sanctions
- fines (compensation for economic damage caused by defective product)
- withdrawal from the market of the machine itself, and eventually also others of the same series.

1.3 REFERENCE NORMS

Directives 2006/42/CE, 2004/108/EG
Norm EN 12999 in the version in force
Norm CUNA NC 034-05 (Release. 1984), Norm DIN 15019
INSTALLATION AND MOUNTING INSTRUCTIONS, Manufacturers of various industrial vehicles
Use manuals of hydraulic hoses, from various Manufacturers
Use manuals of hydraulic steel pipes and fittings, from various Manufacturers.
Use manuals of pumps and PTO’s, from various Manufacturers.
### 2.1 STARTING PREPARATION

Each Maxilift crane is delivered protected and wrapped up in a transparent nylon bag, placed on short timbers of proper size and sturdiness, even in order to allow moving by transpallet or forklift. Along with each crane the following are delivered:

<table>
<thead>
<tr>
<th>Materials</th>
<th>Documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>- For cranes with outrigger base:</td>
<td>- Warranty certificate</td>
</tr>
<tr>
<td>- brackets, tie bolts fitted with nuts and lock nuts, relevant support</td>
<td>- Use and maintenance manual</td>
</tr>
<tr>
<td>- nuts, relevant support plates for fixing to the vehicle’s frame</td>
<td></td>
</tr>
<tr>
<td>- For cranes in standard version:</td>
<td>- Spare parts manual</td>
</tr>
<tr>
<td>- tie bolts, nuts and lock nuts</td>
<td></td>
</tr>
<tr>
<td>- Grease cartridge gr. 400, type recommended for slewing gears lubrication</td>
<td>- CE conformity declaration</td>
</tr>
<tr>
<td>- A second loading capacity plate (the first is applied on the crane boom)</td>
<td>- Fac-simile of Installer’s CE Conformity</td>
</tr>
<tr>
<td>- to be placed in the most proper position by the crane control place</td>
<td>Conformity Declaration</td>
</tr>
<tr>
<td>- Hydraulic power pack (only for electric cranes)</td>
<td>- Certificate of origin (only Italy)</td>
</tr>
<tr>
<td>- Two keys for the main board switch.</td>
<td>- other certificates when compulsory in the</td>
</tr>
<tr>
<td></td>
<td>destination Country, or expressly requested</td>
</tr>
<tr>
<td></td>
<td>by the Customer.</td>
</tr>
</tbody>
</table>

⚠️ ATTENTION

Check that the above equipment is delivered complete. If not, get in touch with Next Hydraulics for the restoration of the missing items.

### 2.2 CRANE MOVING AND STORAGE

Each Maxilift crane is equipped with a lifting connection placed on the upper side of main boom. For lifting the crane, cut the upper part of the nylon package, in order to release such connection. This is adequately marked by stickers and allows a safe crane lifting in case it is handled by a steel shackle of proper dimensions and capacity.
DANGER

The lifting connection has a sturdiness suitable to the crane weight, whatever the version is. Pay attention, instead, that the position of the connection is exactly barycentric only for cranes in standard version (without outrigger base). For cranes fitted with base, the centre of gravity can vary according to the version and the options chosen for the stabilizers.

2.3 Table of crane masses and sizes

Here are listed masses and overall dimensions of Maxilift cranes in standard version (see pict. 1).

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MASS [kg] standard crane</th>
<th>MASS [kg] base and stabiliz. (variable according to the options chosen)</th>
<th>DIM. B L x B [mm]</th>
<th>HEIGHT H [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 110 M</td>
<td>105</td>
<td></td>
<td>670 x 390</td>
<td>1210</td>
</tr>
<tr>
<td>ML 110 E</td>
<td>100</td>
<td></td>
<td>670 x 390</td>
<td>1210</td>
</tr>
<tr>
<td>ML 110.1 H</td>
<td>105</td>
<td></td>
<td>670 x 390</td>
<td>1210</td>
</tr>
<tr>
<td>ML 110.1 ERS</td>
<td>125</td>
<td></td>
<td>64÷88 (vers. B)</td>
<td>1210</td>
</tr>
<tr>
<td>ML 110.2 H</td>
<td>125</td>
<td></td>
<td>670 x 390</td>
<td>1210</td>
</tr>
<tr>
<td>ML 110.2 ERS</td>
<td>145</td>
<td></td>
<td>730 x 390</td>
<td>1220</td>
</tr>
<tr>
<td>ML 110.3 H</td>
<td>155</td>
<td></td>
<td>730 x 390</td>
<td>1220</td>
</tr>
<tr>
<td>ML 110.3 ERS</td>
<td>175</td>
<td></td>
<td>730 x 390</td>
<td>1220</td>
</tr>
<tr>
<td>ML 150.1 H</td>
<td>165</td>
<td></td>
<td>690 x 360</td>
<td>1320</td>
</tr>
<tr>
<td>ML 150.1 E</td>
<td>185</td>
<td></td>
<td>690 x 360</td>
<td>1320</td>
</tr>
<tr>
<td>ML 150.2 H</td>
<td>175</td>
<td></td>
<td>690 x 360</td>
<td>1320</td>
</tr>
<tr>
<td>ML 150.2 E</td>
<td>195</td>
<td></td>
<td>690 x 360</td>
<td>1320</td>
</tr>
<tr>
<td>ML 150.3 H</td>
<td>185</td>
<td></td>
<td>790 x 360</td>
<td>1340</td>
</tr>
<tr>
<td>ML 150.3 E</td>
<td>205</td>
<td></td>
<td>790 x 360</td>
<td>1340</td>
</tr>
<tr>
<td>ML 180.2 H</td>
<td>180</td>
<td></td>
<td>102+109</td>
<td>1340</td>
</tr>
<tr>
<td>ML 180.2 E</td>
<td>200</td>
<td></td>
<td>102+109</td>
<td>1340</td>
</tr>
<tr>
<td>ML 180.3 H</td>
<td>190</td>
<td></td>
<td>790 x 360</td>
<td>1340</td>
</tr>
<tr>
<td>ML 180.3 E</td>
<td>210</td>
<td></td>
<td>790 x 360</td>
<td>1340</td>
</tr>
<tr>
<td>ML 230.2 H</td>
<td>225</td>
<td></td>
<td>102+109</td>
<td>1450</td>
</tr>
<tr>
<td>ML 230.2 E</td>
<td>245</td>
<td></td>
<td>102+109</td>
<td>1450</td>
</tr>
<tr>
<td>ML 230.3 H</td>
<td>255</td>
<td></td>
<td>790 x 400</td>
<td>1450</td>
</tr>
<tr>
<td>ML 230.3 E</td>
<td>275</td>
<td></td>
<td>790 x 400</td>
<td>1450</td>
</tr>
<tr>
<td>MODEL</td>
<td>MASS [kg]</td>
<td>MASS [kg]</td>
<td>DIM. B [mm]</td>
<td>HEIGHT H [mm]</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>standard crane</td>
<td>base and stabliz.</td>
<td>L x B</td>
<td></td>
</tr>
<tr>
<td>ML 270.2 H</td>
<td>225</td>
<td>790 x 400</td>
<td>1420</td>
<td></td>
</tr>
<tr>
<td>ML 270.2 E</td>
<td>245</td>
<td>790 x 400</td>
<td>1420</td>
<td></td>
</tr>
<tr>
<td>ML 270.3 H</td>
<td>255</td>
<td>790 x 400</td>
<td>1450</td>
<td></td>
</tr>
<tr>
<td>ML 270.3 E</td>
<td>275</td>
<td>790 x 400</td>
<td>1450</td>
<td></td>
</tr>
<tr>
<td>ML 270L.2 H</td>
<td>235</td>
<td>1130 x 400</td>
<td>1510</td>
<td></td>
</tr>
<tr>
<td>ML 270L.2 E</td>
<td>255</td>
<td>1130 x 400</td>
<td>1510</td>
<td></td>
</tr>
<tr>
<td>ML 270L.3 H</td>
<td>270</td>
<td>1130 x 400</td>
<td>1520</td>
<td></td>
</tr>
<tr>
<td>ML 270L.3 E</td>
<td>290</td>
<td>1130 x 400</td>
<td>1520</td>
<td></td>
</tr>
<tr>
<td>ML 330.2 H</td>
<td>270</td>
<td>820 x 440</td>
<td>1550</td>
<td></td>
</tr>
<tr>
<td>ML 330.2 E</td>
<td>290</td>
<td>820 x 440</td>
<td>1550</td>
<td></td>
</tr>
<tr>
<td>ML 330.3 H</td>
<td>295</td>
<td>820 x 440</td>
<td>1550</td>
<td></td>
</tr>
<tr>
<td>ML 330.3 E</td>
<td>315</td>
<td>820 x 440</td>
<td>1550</td>
<td></td>
</tr>
<tr>
<td>ML 330.4 H</td>
<td>325</td>
<td>930 x 440</td>
<td>1570</td>
<td></td>
</tr>
<tr>
<td>ML 330.4 E</td>
<td>345</td>
<td>930 x 440</td>
<td>1570</td>
<td></td>
</tr>
<tr>
<td>ML 380.2 H</td>
<td>310</td>
<td>870 x 450</td>
<td>1630</td>
<td></td>
</tr>
<tr>
<td>ML 380.2 E</td>
<td>330</td>
<td>870 x 450</td>
<td>1630</td>
<td></td>
</tr>
<tr>
<td>ML 380.3 H</td>
<td>345</td>
<td>870 x 450</td>
<td>1630</td>
<td></td>
</tr>
<tr>
<td>ML 380.3 E</td>
<td>365</td>
<td>870 x 450</td>
<td>1630</td>
<td></td>
</tr>
<tr>
<td>ML 380.4 H</td>
<td>375</td>
<td>940 x 450</td>
<td>1650</td>
<td></td>
</tr>
<tr>
<td>ML 380.4 E</td>
<td>395</td>
<td>940 x 450</td>
<td>1650</td>
<td></td>
</tr>
<tr>
<td>ML 400.2</td>
<td>460</td>
<td>1505 x 1250</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>ML 400.3</td>
<td>500</td>
<td>1505 x 1250</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>ML 400L.2</td>
<td>490</td>
<td>1675 x 1250</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>ML 400L.3</td>
<td>540</td>
<td>1675 x 1250</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>ML 400L.4</td>
<td>570</td>
<td>1715 x 1250</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>ML 500.2</td>
<td>470</td>
<td>1505 x 1250</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>ML 500.3</td>
<td>510</td>
<td>1505 x 1250</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>ML 500L.2</td>
<td>500</td>
<td>1675 x 1250</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>ML 500L.3</td>
<td>550</td>
<td>1675 x 1250</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>ML 500L.4</td>
<td>580</td>
<td>1715 x 1250</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>ML 510.2</td>
<td>465</td>
<td>1380 x 545</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>ML 510.3</td>
<td>500</td>
<td>1380 x 545</td>
<td>1830</td>
<td></td>
</tr>
<tr>
<td>ML 510L.2</td>
<td>485</td>
<td>1510 x 545</td>
<td>1790</td>
<td></td>
</tr>
<tr>
<td>ML 510L.3</td>
<td>530</td>
<td>1510 x 545</td>
<td>1790</td>
<td></td>
</tr>
<tr>
<td>ML 510L.4</td>
<td>565</td>
<td>1510 x 545</td>
<td>1790</td>
<td></td>
</tr>
</tbody>
</table>
ATTENTION

When a forklift is not available, only the above mentioned connection must be used for crane lifting.

ATTENTION

Before moving the crane, make sure to have a lifting device with proper capacity. Relevant options (shackles, chains, hooks, ropes, etc.) must have a suitable capacity and be in good working order.

ATTENTION

The crane moving area must be cleared, delimited by proper signals or by a staff specially charged for such purpose. Nobody is to be in such area, so that accidental falls of the crane itself, or its parts, or its options, due to mistakes in movement, impacts or floors unevenness can occur without consequences for people.

The crane is to be cautiously moved, in order to avoid damages to its parts, especially to the components of the electric and hydraulic circuits, and the safety and protection systems. Should it be noticed that, during transport or moving, some damages have occurred, the parts concerned are to be replaced by original Next Hydraulics spare parts before putting the crane into operation.

ATTENTION

Check carefully the external state and aspect of valves and safety components. In case of some doubts on their efficiency and functioning, remove and return them to Next Hydraulics s.r.l. for the necessary inspections.

ATTENTION

Should the crane need to be stored for some times placed on timbers, take care of securing it in a safe way by ropes or other means suitable to ensure its protection and prevent its overturning.

The crane is to be stored in a covered and dry place. The nylon bag must be removed only when mounting the crane on the vehicle.

IMPORTANT

After long storage periods (for instance: 12 months or more, even depending on the environmental conditions), when putting the crane into service for the first time you could notice some anomalies due to the seals sticking on rods, sliders, valves, etc. because of long inactivity. In case of some doubts, consult Next Hydraulics.
2.4 PRECAUTIONS TO BE RESPECTED

As a simple and not exhaustive example, we hereby report some basic precautions regarding the installation operations:

1 - locate and delimit the area appointed for mounting, keeping it clear from the transit of other machines, equipments, personnel

2 - it is forbidden to carry out any welding operation, or involving flames, in narrow or not adequately vented places, or close to inflammables

3 - be careful when entering narrow spaces (or slipping in some parts of the body)

4 - pay attention to dangers and risks coming from parts in motion, corrosives or toxicants (for instance: batteries acids), fluids under pressure

5 - apparel must be composed by clothes conform to the accident preventing norms

6 - all the machines or some of their parts, or other equipments lifted from the ground, or which might cause crushing or shearing, must be safely locked in their position

7 - operate in healthy environments, well aired, with clean and dry floors. Avoid using inflammable or toxic detergents.
3 – CRANE - VEHICLE MESHING

3.1 Minimum vehicle

A well-chosen crane-vehicle coupling emphasizes the installer’s professional qualities, and assures Customer’s satisfaction, as it contributes to ensure the safety of working operations, the reduction of truck wear and tear and, consequently, the economy of use during the years.

As a simple indicative example, to be used only for a first very indicative evaluation, we hereby report in the following tables the vehicle’s “minimum wheelbase” and “minimum pitch” rates required for the Maxilift crane models.

Such couplings are always, and in any case, to be first verified with calculation, and then with practical test according to the procedures indicated in following paragraphs.

MOUNTING WITHOUT SUPPLEMENTARY OUTRIGGERS Table [A]

<table>
<thead>
<tr>
<th>Crane model</th>
<th>Vehicle’s minimum tare [Kg.] (vehicle’s tare when completely fitted, except the crane itself and its stabilizing system)</th>
<th>Vehicle’s minimum wheelbase (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 110</td>
<td>1400</td>
<td>2000</td>
</tr>
<tr>
<td>ML 150</td>
<td>1400</td>
<td>2450</td>
</tr>
<tr>
<td>ML 180</td>
<td>1840</td>
<td>2800</td>
</tr>
<tr>
<td>ML 230</td>
<td>2000</td>
<td>2800</td>
</tr>
<tr>
<td>ML 270-ML 330</td>
<td>2200</td>
<td>2800</td>
</tr>
<tr>
<td>ML 380</td>
<td>1850</td>
<td>3200</td>
</tr>
<tr>
<td>ML 510</td>
<td>3200</td>
<td>3690</td>
</tr>
</tbody>
</table>

MOUNTING WITH SUPPLEMENTARY OUTRIGGERS Table [B]

<table>
<thead>
<tr>
<th>Crane model</th>
<th>Vehicle’s minimum tare [Kg.] (vehicle’s tare when completely fitted, except the crane itself and its stabilizing system)</th>
<th>Vehicle’s minimum wheelbase (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 110</td>
<td>1200</td>
<td>1800</td>
</tr>
<tr>
<td>ML 150</td>
<td>1200</td>
<td>2200</td>
</tr>
<tr>
<td>ML 180</td>
<td>1450</td>
<td>2200</td>
</tr>
<tr>
<td>ML 230</td>
<td>1450</td>
<td>2450</td>
</tr>
<tr>
<td>ML 270-ML 330</td>
<td>1750</td>
<td>2450</td>
</tr>
<tr>
<td>ML 380</td>
<td>1750</td>
<td>2800</td>
</tr>
<tr>
<td>ML 510</td>
<td>2800</td>
<td>3100</td>
</tr>
</tbody>
</table>
3.2 CHECKING THE CRANE - VEHICLE MESHING

1st CHECK: Check of loads on the axles. The installation on a vehicle of a crane, a body, a supplementary outrigger, etc., involves a new distribution of such loads on vehicle's axles. Therefore, the manufacturer states some limit rates which must respected:
- the maximum admissible load on each axle
- g.v.w., i.e., the maximum total vehicle's weight when fully loaded
- the ratio between the maximum load on each axle when fully loaded and empty all of this in respect not only of materials' life, rather also of vehicle's order when travelling, and of its guidability.

Therefore, it must be checked that the foreseen installation respects such limits. The different existing loads, among which we mention as an example:
- body's mass when empty
- crane's mass
- supplementary outriggers' mass, if any
- reinforcing counter frame's mass (for its determination refer to following par. 3.5)

are resumed in a scheme by assuming the masses concentrated in their centre of gravity, and are applied, considering as acting one at a time, to the static scheme of a the beam, on two simple supports, whose length is equal to vehicle's wheelbase. Repeating this calculation for every mass and summing these contributions, will give the resultant load on each axle.
Legend:

- **Pg** = Crane’s Mass
- * * **Ta** = Distribution Van Chassis’ Tare – Front Axle
- **Pc** = Body’s Mass
- **Tt** = Total Tare
- **Ptt** = Compl. Mass with Full Load
- **Z** = Distance Rear Axle – Final Body Part
- **D** = Distance Front Axle – Initial Body Part
- **Lq** = Body Barycentre Feed (=P-D-W/2)
- * **T** = Van Chassis Tare
- * **Tp** = Distribution Van Chassis’ Tare – Rear Axle
- **Ps** = Mass Front Supplementary Outrigger (if present)
- **Q** = PTT-TT = Remaining Payload
- **P** = Wheelbase
- **W** = Body Length
- **Lg** = Distance Rear Axle – Crane Barycentre
- **Ls** = Distance Supplementary Outriggers from Rear Axle

* Rates drawn from the homologation booklet of the vehicle or by “Direct Weighing”.

N.B. The crane centre of gravity is considered in the retreated or extended foreseen transport position.

As a further and final check, check that, always studying on the same static scheme, when the crane is working with the loads mentioned on the loading chart:
- the overload on the front axle does not exceed 25% of its maximum allowed rate
- the overload on the rear axle does not exceed 50% of its maximum allowed rate.

The maximum allowed rates on axles are mentioned on the homologation booklet of the vehicle.

The lifting moment rates to be used for the verification are mentioned in the following Tab [E].

If the check is not fulfilled, it is necessary to mount a supplementary outrigger system.

**2nd CHECK**: Safety against overturning.

The calculation check, to be carried out according to the EN 12999 Norms, is based on the only geometric installation’s data. Factors such as suspensions’ elasticity, flexions and torsions of vehicle’s chassis, etc., are not considered, because of their uncertain evaluation. The result obtained, even if higher than the prescribed minimum safety coefficient, must be considered only as an indication of the actual stability, and this is the more true the more the obtained value is close to the minimum fixed rate.

⚠️ **ATTENTION**

For the above mentioned reasons, it is always compulsory to carry out the practical stability test with completely installed vehicle, and using the prescribed test loads. (see EN 12999 – point 6.2.5.1)

The results of the stability checks, both theoretic and practical, are to be recorded and reported on the Technical Dossier which the installer (see par. 1.2) is obliged to draw up for each installation.

### 3.3 SAFETY CALCULATION AGAINST OVERTURNING

When drawn the scheme concerning the installation made (see following drawings and relevant legend), you place the masses related to the vehicle, the crane, the different existing options/equipment, considered as point-shaped and applied to relevant barycentres. According to the installation made and the considered boom’s working position, you single out the vehicle’s upsetting axle.

All of the masses located on the outside of such axle have an overturning effect.

All of the masses located on the inside of such axle have a stabilising effect.

The “effect” is drawn from the product: mass by its distance from the overturning axle.
The EN 12999 Norm – point 6.2.5 establishes that it must be considered as applied to the hook a test load equal to:

\[
Pt = Ks \times P + 0.2 \times F \quad [\text{kg}]
\]

where: 
- \( P \) = load chart capacity of the crane at the considered outreach
- \( F \) = equivalent dead weight of boom system, applied on hook distance (it is shown in the table [D] for each crane and each outreach).
- \( Ks = 1.2 \) for all MAXILIFT cranes

The stability is assured if, for each load chart capacity and relevant outreach it results:

\[
\frac{\text{sum stabilising effects}}{\text{sum overturning effects}} \geq 1.25
\]

The check is to be carried out for all the 360 degrees of the horizontal slewing arc. If the above calculation is not satisfied, you must reduce such arc (for instance, only the rear 180 degrees of the vehicle), or \( Pt \) by reducing the load chart capacity at that outreach. The different rates of masses’ distances from the upsetting axle are analytically drawn by trigonometric way, or by quoting in scale the installation scheme on graph paper and taking them directly.

<table>
<thead>
<tr>
<th>Model</th>
<th>Outreach [mt]</th>
<th>rate F mobile parts [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 50</td>
<td>0.98</td>
<td>21.00</td>
</tr>
<tr>
<td></td>
<td>1.70</td>
<td>20.00</td>
</tr>
<tr>
<td></td>
<td>2.42</td>
<td>16.00</td>
</tr>
<tr>
<td>ML 110.1</td>
<td>1.05</td>
<td>25.70</td>
</tr>
<tr>
<td></td>
<td>1.93</td>
<td>29.20</td>
</tr>
<tr>
<td></td>
<td>2.80</td>
<td>25.90</td>
</tr>
<tr>
<td></td>
<td>3.73</td>
<td>19.00</td>
</tr>
<tr>
<td>ML 110.2</td>
<td>1.05</td>
<td>29.30</td>
</tr>
<tr>
<td></td>
<td>1.93</td>
<td>34.10</td>
</tr>
<tr>
<td></td>
<td>2.80</td>
<td>30.10</td>
</tr>
<tr>
<td></td>
<td>3.73</td>
<td>25.20</td>
</tr>
<tr>
<td></td>
<td>4.50</td>
<td>21.60</td>
</tr>
<tr>
<td>ML 110.3</td>
<td>1.10</td>
<td>31.60</td>
</tr>
<tr>
<td></td>
<td>1.98</td>
<td>38.30</td>
</tr>
<tr>
<td></td>
<td>2.85</td>
<td>35.10</td>
</tr>
<tr>
<td></td>
<td>3.73</td>
<td>30.00</td>
</tr>
<tr>
<td></td>
<td>4.50</td>
<td>25.60</td>
</tr>
<tr>
<td>ML 150.1</td>
<td>1.16</td>
<td>36.00</td>
</tr>
<tr>
<td></td>
<td>2.08</td>
<td>41.30</td>
</tr>
<tr>
<td></td>
<td>3.01</td>
<td>36.30</td>
</tr>
<tr>
<td></td>
<td>4.00</td>
<td>30.60</td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>25.70</td>
</tr>
<tr>
<td>ML 150.2 - ML 180.2</td>
<td>1.16</td>
<td>42.80</td>
</tr>
<tr>
<td></td>
<td>2.08</td>
<td>50.60</td>
</tr>
<tr>
<td></td>
<td>3.01</td>
<td>44.30</td>
</tr>
<tr>
<td></td>
<td>4.00</td>
<td>36.60</td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>30.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Outreach [mt]</th>
<th>rate F mobile parts [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 230.2 - ML 270.2</td>
<td>1.20</td>
<td>61.20</td>
</tr>
<tr>
<td></td>
<td>2.20</td>
<td>71.50</td>
</tr>
<tr>
<td></td>
<td>3.20</td>
<td>63.60</td>
</tr>
<tr>
<td></td>
<td>4.20</td>
<td>53.50</td>
</tr>
<tr>
<td></td>
<td>5.20</td>
<td>44.90</td>
</tr>
<tr>
<td>ML 230.3 - ML 270.3</td>
<td>1.26</td>
<td>67.70</td>
</tr>
<tr>
<td></td>
<td>2.26</td>
<td>81.60</td>
</tr>
<tr>
<td></td>
<td>3.26</td>
<td>75.20</td>
</tr>
<tr>
<td></td>
<td>4.20</td>
<td>64.90</td>
</tr>
<tr>
<td></td>
<td>5.20</td>
<td>54.00</td>
</tr>
<tr>
<td>ML 270L.2</td>
<td>1.40</td>
<td>66.90</td>
</tr>
<tr>
<td></td>
<td>2.60</td>
<td>78.40</td>
</tr>
<tr>
<td></td>
<td>3.80</td>
<td>69.40</td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>58.40</td>
</tr>
<tr>
<td></td>
<td>6.00</td>
<td>50.10</td>
</tr>
<tr>
<td>ML 270L.3</td>
<td>1.46</td>
<td>74.50</td>
</tr>
<tr>
<td></td>
<td>2.66</td>
<td>90.00</td>
</tr>
<tr>
<td></td>
<td>3.86</td>
<td>82.70</td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>71.10</td>
</tr>
<tr>
<td></td>
<td>6.00</td>
<td>60.60</td>
</tr>
<tr>
<td>ML 330.2</td>
<td>1.30</td>
<td>82.20</td>
</tr>
<tr>
<td></td>
<td>2.30</td>
<td>92.10</td>
</tr>
<tr>
<td></td>
<td>3.30</td>
<td>83.00</td>
</tr>
<tr>
<td></td>
<td>4.36</td>
<td>70.50</td>
</tr>
<tr>
<td></td>
<td>5.36</td>
<td>60.70</td>
</tr>
<tr>
<td></td>
<td>6.36</td>
<td>52.30</td>
</tr>
<tr>
<td>Model</td>
<td>Outreach [mt]</td>
<td>Mobile parts [kg]</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td>ML 330.3</td>
<td>1.36</td>
<td>88.20</td>
</tr>
<tr>
<td></td>
<td>2.36</td>
<td>100.80</td>
</tr>
<tr>
<td></td>
<td>3.36</td>
<td>93.40</td>
</tr>
<tr>
<td></td>
<td>4.36</td>
<td>80.80</td>
</tr>
<tr>
<td></td>
<td>5.36</td>
<td>69.00</td>
</tr>
<tr>
<td></td>
<td>6.36</td>
<td>59.40</td>
</tr>
<tr>
<td>ML 330.4</td>
<td>1.43</td>
<td>93.30</td>
</tr>
<tr>
<td></td>
<td>2.43</td>
<td>109.20</td>
</tr>
<tr>
<td></td>
<td>3.43</td>
<td>103.60</td>
</tr>
<tr>
<td></td>
<td>4.43</td>
<td>91.80</td>
</tr>
<tr>
<td></td>
<td>5.36</td>
<td>80.10</td>
</tr>
<tr>
<td></td>
<td>6.36</td>
<td>68.70</td>
</tr>
<tr>
<td>ML 380.2</td>
<td>1.45</td>
<td>81.10</td>
</tr>
<tr>
<td></td>
<td>2.55</td>
<td>103.50</td>
</tr>
<tr>
<td></td>
<td>3.65</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td>4.72</td>
<td>86.00</td>
</tr>
<tr>
<td></td>
<td>5.79</td>
<td>75.00</td>
</tr>
<tr>
<td></td>
<td>6.79</td>
<td>65.70</td>
</tr>
<tr>
<td>ML 380.3</td>
<td>1.52</td>
<td>86.20</td>
</tr>
<tr>
<td></td>
<td>2.62</td>
<td>112.10</td>
</tr>
<tr>
<td></td>
<td>3.72</td>
<td>107.60</td>
</tr>
<tr>
<td></td>
<td>4.72</td>
<td>97.10</td>
</tr>
<tr>
<td></td>
<td>5.79</td>
<td>84.00</td>
</tr>
<tr>
<td></td>
<td>6.79</td>
<td>73.40</td>
</tr>
<tr>
<td>ML 380.4</td>
<td>1.59</td>
<td>92.40</td>
</tr>
<tr>
<td></td>
<td>2.69</td>
<td>122.50</td>
</tr>
<tr>
<td></td>
<td>3.79</td>
<td>120.30</td>
</tr>
<tr>
<td></td>
<td>4.79</td>
<td>111.10</td>
</tr>
<tr>
<td></td>
<td>5.79</td>
<td>97.80</td>
</tr>
<tr>
<td></td>
<td>6.79</td>
<td>85.10</td>
</tr>
<tr>
<td>ML 400-500-510.2</td>
<td>1.44</td>
<td>109.80</td>
</tr>
<tr>
<td></td>
<td>2.54</td>
<td>128.40</td>
</tr>
<tr>
<td></td>
<td>3.64</td>
<td>116.40</td>
</tr>
<tr>
<td></td>
<td>4.70</td>
<td>100.80</td>
</tr>
<tr>
<td></td>
<td>5.70</td>
<td>87.70</td>
</tr>
<tr>
<td></td>
<td>6.70</td>
<td>76.20</td>
</tr>
<tr>
<td>ML 400-500-510.3</td>
<td>1.50</td>
<td>115.10</td>
</tr>
<tr>
<td></td>
<td>2.60</td>
<td>137.40</td>
</tr>
<tr>
<td></td>
<td>3.70</td>
<td>127.30</td>
</tr>
<tr>
<td></td>
<td>4.70</td>
<td>112.20</td>
</tr>
<tr>
<td></td>
<td>5.70</td>
<td>97.10</td>
</tr>
<tr>
<td></td>
<td>6.70</td>
<td>84.20</td>
</tr>
<tr>
<td>ML 400-500-510L.2</td>
<td>1.69</td>
<td>122.30</td>
</tr>
<tr>
<td></td>
<td>3.04</td>
<td>139.10</td>
</tr>
<tr>
<td></td>
<td>4.39</td>
<td>123.70</td>
</tr>
<tr>
<td></td>
<td>5.75</td>
<td>104.80</td>
</tr>
<tr>
<td></td>
<td>6.75</td>
<td>92.00</td>
</tr>
<tr>
<td>ML 400-500-510L.3</td>
<td>1.75</td>
<td>129.50</td>
</tr>
<tr>
<td></td>
<td>3.10</td>
<td>151.10</td>
</tr>
<tr>
<td></td>
<td>4.45</td>
<td>138.00</td>
</tr>
<tr>
<td></td>
<td>5.75</td>
<td>119.00</td>
</tr>
<tr>
<td></td>
<td>6.75</td>
<td>104.00</td>
</tr>
</tbody>
</table>
3.4 DIMENSIONING OF REINFORCING CHASSIS FRAME

As the crane is to be solidly fixed to the vehicle’s chassis (see following Chapt. 4), this one comes to be subjected to very high stresses, not foreseen by the truck Manufacturer. Therefore, it is generally essential to stiffen the chassis by a supplementary reinforcing structure called “reinforcing chassis counter-frame”. Apart from its constructive conditions for the moment (see following par. 3.5), first it is to be determined:

1 - size of the section (and its mass for line meter)
2 - material

that the reinforcing chassis must have to avoiding damaging of vehicle’s chassis, and in order to estimating the additional reinforcing chassis’ mass (necessary for the calculation of loads on the axles and vehicle’s stability). The following calculation is conform to CUNA NC 034-05 Regulation.

ATTENTION

The following calculation method does not replace the prescriptions of the truck Manufacturer, which are indicated on its “INSTALLATION INSTRUCTIONS”. Such prescriptions must anyway be respected. May a discordance arise between “INSTALLATION INSTRUCTIONS” and the following calculation, always apply the most conservative results.

3.4.1 Reinforcing chassis calculation

Simbology:

\[ \begin{align*}
J_t & : \text{bending moment of inertia of chassis’ section [mm}^4]\n\J_c & : \text{bending moment of inertia of reinforcing chassis’ sect. [mm}^4]\nW_t & : \text{bending module of resistance of chassis’ sect. [mm}^3]\nW_c & : \text{bending module of res. of reinforcing chassis’ sect. [mm}^3]\nM & : \text{max. crane lifting moment (dynamic) [daNmm] as mentioned on Tab. [E]}\nM_t & : \text{max. admissible moment on chassis [daNmm]}\nM_c & : \text{max. admissible moment on reinforcing chassis [daNmm]}\nst & : \text{max. admissible stress for the material of the chassis [daN/mm}^2]\nsc & : \text{max. admissible stress for the material of the reinforcing chassis, see Tab. [F] [daN/mm}^2]\n\end{align*} \]

Max. dynamic lifting moments MAXILIFT crane. Table [E]

<table>
<thead>
<tr>
<th>Crane model</th>
<th>Lifting moment [daN*mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M50</td>
<td>678.695</td>
</tr>
<tr>
<td>ML 110</td>
<td>1.275.027</td>
</tr>
<tr>
<td>ML 150</td>
<td>1.762.935</td>
</tr>
<tr>
<td>ML 180</td>
<td>2.042.262</td>
</tr>
<tr>
<td>ML 230</td>
<td>2.870.777</td>
</tr>
<tr>
<td>ML 270</td>
<td>3.061.536</td>
</tr>
<tr>
<td>ML 330</td>
<td>3.806.322</td>
</tr>
<tr>
<td>ML 380</td>
<td>4.585.821</td>
</tr>
<tr>
<td>ML 400</td>
<td>5.845.420</td>
</tr>
<tr>
<td>ML 500 - 510</td>
<td>6.833.974</td>
</tr>
</tbody>
</table>
### 3.4.2 Materials for reinforcing chassis

Use exclusively structural steel. Make sure that the quality chosen is actually supplied, even asking the milling certificates.

#### STEEL TYPES COMMONLY USED FOR REINFORCING CHASSIS Tab. [F]

<table>
<thead>
<tr>
<th>Standard</th>
<th>EN 10025</th>
<th>Standard UNI 7070</th>
<th>Ultimate strength sc [daN/mm²]</th>
<th>Admissible stress sc [daN/mm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe E 235</td>
<td>Fe 360</td>
<td>&gt;= 36</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Fe E 275</td>
<td>Fe 430</td>
<td>&gt;= 43</td>
<td>18.3</td>
<td></td>
</tr>
<tr>
<td>Fe E 355</td>
<td>Fe 510</td>
<td>&gt;= 52</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

For other steel types ask previously Next Hydraulics.

### 3.4.3 Reinforcing chassis calculation

First it is to be checked that the reinforcing chassis is actually needed in the specific case. When the crane is very small in relation to the truck where it is mounted, the vehicle’s chassis may suffice to bear crane stresses. If:

\[
 s = \frac{M}{2*Wt} < st
\]

then we are in such case. The vehicle’s chassis is in itself sufficient, only a stress distribution plate of proper length between crane and chassis is required (see par. 3.5).

Otherwise, the verification takes two different ways according to the fact that:

A) the crane is installed behind the cab
B) the crane is installed rear body.

**A) CRANE INSTALLED BEHIND THE CAB**

The dynamic moment of the crane is to be split up in parts proportional to the moments of inertia of the chassis’ and reinforcing chassis’ sections, by imposing the following equations:

\[
 Mt = 2st*Wt \quad Mc = M-Mt
\]

The following relations must be simultaneously verified:

\[
 Jc >= \frac{Mc*Jt}{Mt} \quad Wc >= \frac{Mc}{2sc}
\]

If not so, the calculation is to be repeated by adopting a different reinforcing chassis’ section (with bigger thickness or height).
B) CRANE INSTALLED REAR BODY (= on the rear overhang of the truck)

The building of the reinforcing chassis is more complicated and exacting, because it is to be carried out so that it forms one only structure with the vehicle’s chassis, with a suitable contrast in bending and torsion (see foll. par. 3.5).

Considering:  
\[ J = \text{bending moment of inertia of the global section formed by the chassis’ and reinforcing chassis’ sections, considered as all in one [mm}^4\]  
\[ Z_{\text{sup}}, Z_{\text{inf}} = \text{distances of the extreme borders of the reinforcing chassis and the chassis from the centre of gravity of the global section [mm]} \]

\[ W_{\text{sup}} = \frac{J}{Z_{\text{sup}} [\text{mm}^3]} \quad , \quad W_{\text{inf}} = \frac{J}{Z_{\text{inf}} [\text{mm}^3]} \]

The calculation is verified if:

\[ W_{\text{sup}} >= M / (2*st) \quad , \quad W_{\text{inf}} >= M / (2*sc) \]

If not so, the calculation must be repeated choosing a different reinforcing chassis’ section (with bigger thickness or height).

3.5 BUILDING A REINFORCEMENT CHASSIS

Before starting any mounting operation, it is necessary to make sure that the vehicle’s chassis is quite flat, with parallel and not warped side-members. Check by levels and other tools, in case arrange jacks or wood wedges where necessary.

We also advise against the construction and mounting of the reinforcing chassis directly on vehicle’s chassis; instead, make use of proper supports, adjustable so that a firm and safe planarity reference is ensured.

The counter-frame is then to be protected and painted before its installation on the vehicle. We draw your attention on the fact that, while travelling on roads, such structure shall be subjected to the continuous action of water, mud, sprinkles, sand and crushed stones abrasions, etc.. In the meantime, it is placed in a not very accessible position, therefore not easy to inspect and restore. Take care then of its careful protection including:

- sand-blasting
- painting by products of the same kind of those used by the vehicle’s Manufacturer to protect the chassis, in suitable thicknesses (at least 60-80 microns)
- the open tubular parts of the reinforcing chassis are to be closed by welding some steel
plates (see pict. 4) (where not possible, close with sealing beads, or apply inside of the tubular parts oil-wax or bituminous bodywork products). Should be present some plates, markings, or other identifications signs, these are to be adequately protected and highlighted, too, in order to guarantee their locatability and readability some times later.

Since it is a structural part, the construction welding of the reinforcing chassis is to be carried out only by skilled staff, trained for such purpose, provided with proper machinery, equipment and materials. The joints are to be worked in flat, properly orientating the pieces to weld. The edges to weld are to be adequately prepared and cleaned from rust, grease, paint, etc.

The shelves and fixing plates of the reinforcing chassis are to be welded on the whole of their external perimeter with continuous beads, as shown in pict. 5. When mounting and fixing the reinforcing chassis on the chassis, the complete leaning of the surfaces must be guaranteed. If there are rivetings on the upper side of the chassis (pict. 6), a plane is to be prepared by placing in the way a drilled iron plat-band in correspondence of the rivets’ heads, with thickness bigger than the protrusions. The plat-band is to be welded to the lower profile of the reinforcing chassis, and will have the same width of the chassis’ wing. Should the result of the size calculations of the reinforcing chassis demonstrate that this is not necessary, it is enough to place in the way between the crane support base and the chassis a plate (pict. 7) as wide as the chassis’ wing (eventually drilled as shown in pict. 6 if there are rivetings), for a length at least equal to the crane support base. Its function is to simply split up the concentrated stresses due to tightening of tie rods. The plate can be properly L-shaped, in order to allow the safe fixing even by bolts. The reinforcing chassis’ section, with dimensions and thickness drawn by the dimensioning calculations seen before, must be a closed profile in the bearing area of the crane.

The length of the reinforcing chassis must comply with the following points:
Crane behind driver’s cab, without rear supplementary outriggers

Constant close-section (pict. 8) with length at least equal to \(2^*B\) (= twice the length of the crane support base). The side-members of the reinforcing chassis are to come forward as much as possible, by tapering, up to the connection of the front shock absorbers, whilst in the back they are to connect to the frame chassis of the body, compulsorily ending after one of the connection beams of the chassis’ side members.

Crane behind driver’s cab, with rear supplementary outriggers

As for previous case, but the reinforcing chassis is to extend in the back until it connects to the rear outrigger beam (pict. 9). The reinforcing chassis’ profile is compulsorily close-section for the part \(2^*B\) where the crane leans. Then it can become open-section, without changes in height and thickness, up to the stabilizers. Otherwise, if you wish to reduce the height in the body leaning area, the section can be gradually lowered by a tapering; in such case, check that the new section is suitable making a check calculation in the critical section 1-1. (Proceed as already seen in previous paragraph Checking of reinforcing chassis with crane behind the cab, employing in the calculation, instead of the total crane moment \(M\), the bending moment acting in the section 1-1:

\[
M_{[1-1]} = \frac{M \cdot D}{E}
\]
Crane mounted rear-body (or in other middle position)

The reinforcing chassis is to be close-section for a length \( L \geq 2B \) in the crane support area, with proper rear tapering (pict. 10). The reinforcing chassis section must extend forward keeping a constant section (even not close), up to:
- the supplementary front stabilizers, if installed
- the front shock absorbers’ connection.

Generally, it is very important to carry out in the reinforcing chassis some gradual and progressive section variations, in order to avoid localized stiffenings or weakenings. This can be achieved by proper taperings (pict. 11) (simple, or tail-shaped when the existing spaces are very narrow), for whose carrying out we give some principles in the pictures nearby.

Would you remark that also initial and final parts of chassis’ and reinforcing chassis’ tubular sections are to be subordinated to the same principle.

As well as the side-members of the vehicle’s chassis, also those of the reinforcing chassis are to be connected each other by cross connecting parts. Such parts are to be made of the same material used for the reinforcing chassis and can be welded or bolted to the side-members according to the normal rules of metal constructions (pict. 12).

You can use open C-shaped section bars, or close tubular sections, in case you wish to give the reinforcing chassis a higher stiffness to torsion.
The connection parts can be of two sorts (pict. 13):
- simple beams, in equal or higher number than chassis' beams, depending on the relation crane power/truck dimensions
- cross-welded diagonals, which give high torsional stiffness, are required when the crane is not mounted behind the cab.

3.6 REINFORCING CHASSIS FIXING ON THE VEHICLE

The reinforcing chassis prepared according to the principles just described is to be properly and effectively fixed to the vehicle’s chassis, otherwise it would fail just that of chassis’ strengthening effect which justifies its existence.

The connection ways are strongly conditioned by the prescriptions of the vehicles’ Manufacturing Companies which, for safety reasons, put several limits to the operations which can be carried out on the chassis.

Generally, it is forbidden to carry out any welding on the vehicle’s chassis, as well as to make holes on its wings. Sometimes drillings on the core of the chassis’ section are allowed, but only in the areas and in the ways mentioned on the Installation Instructions Manuals of Manufacturers.

⚠️ DANGER

While fixing the reinforcing chassis to the chassis, follow the prescriptions mentioned in the “INSTALLATION INSTRUCTIONS” of the vehicle’s manufacturer.

To come to the point, the fixing ways of the reinforcing chassis are reduced to 3:
1 - fixing by shelves and tie bolts
2 - fixing by screwed flanges
3 - a combination of the previous two.

All of these are suitable to cover the general installations, but more particularly we can say that:
the way 1 - (pict. 14) shelves plus tie bolts is the one which allows a slight flexibility, with a beneficial shading effect of the swingings of the whole unit.
Moreover, it is the quickest one, as a big part of the vehicles' chassis is already fitted with such shelves. Therefore, it is enough to screw or weld on the reinforcing chassis the respective counter-shelf. The elasticity is got by placing the upper shelf in a way that, between the two shelves' sides (even placing in the way some steel thicknesses) a 1-2 [mm] opening is left over, which shall be recovered by the bolt tightening. Number and diameter of the fixing bolts can be drawn by the mechanic equations. Normally, a 700-1000 [mm] constant pitch between the bolts is sufficient, with the first bolt placed not more than 300 [mm] far from the beginning of the reinforcing chassis in the crane supporting area.

The way 2 - (pict. 15) by screwed flanges is the one which ensures the highest connection stiffness, and therefore the best exploitation of the endurance of the side members' sections, as well as a higher stability of the vehicle. The flanges are to be screwed on the holes existing on the chassis, and welded or screwed on the reinforcing chassis.

The way 3 - (pict. 16) combination of flanges and shelves, joins together the advantages of each one, provided that it is correctly carried out, that is:
- fixing shelves in the crane support area in order to exploit its elasticity
- fixing by flange for the remaining length of the reinforcing chassis, to advantage of connection’s stiffness and stability.

As further solution, we specify that several truck Manufacturers, in order to minimize the mutual shifts between chassis and reinforcing chassis, allow the connection between their rear ends by making holes, only in such area, on the wings of the chassis’ side members. To that purpose, check on the Installation Instructions of the vehicle in object.

General advice:
- for all of the screws employ material class 8.8 or higher; the nuts have to be one class lower than respective screw
- for the flanges use the same material and thickness of those employed for the vehicle’s chassis
- the nuts are to be fitted with proper devices against unscrewing.
4 - CRANE FASTENING ON THE VEHICLE

4.1 GENERAL INSTRUCTIONS

When the position of the crane on the vehicle has been decided, according to one’s requirements (for instance: behind the cab, rear body, driver’s side, passenger’s side, etc.) as well as the kind of mounting chosen (for instance: on the body, between cab and body, etc.) go on checking the following points:

1 - the crane must have space around enough to allow its maintenance, its operations, as well as the unfolding and folding manoeuvres. Refer also to the overall dimensions showed nearby in pict. 17

2 - the arrangement chosen is not to involve modifications to vehicle’s systems and shifts of its units or options (for instance: batteries, spare wheels, fuel and compressed air tanks) which are not allowed or foreseen by the vehicle’s Manufacturer

3 - the stop-point of crane slewing (dead point position) is not to fall in an area where, on the contrary, the free slewing movement is required.

NOTE

To such purpose we remind that, unless something different is expressly requested when placing the order to Next Hydraulics, the standard dead point position is the following:

Cranes fitted with outrigger base (picts. 18-19-20-21)

ML 110 - 150 - 180
dead point in the position shown, which means, crane on the left side behind the cab

\[ \alpha = 330^\circ \] for models:
ML110 (pict.18)
ML150 (pict.19)
ML 180 (pict. 20)

<table>
<thead>
<tr>
<th>Mod.</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 110</td>
<td>270</td>
<td>1130</td>
</tr>
<tr>
<td>ML 150</td>
<td>290</td>
<td>1230</td>
</tr>
<tr>
<td>ML 180</td>
<td>360</td>
<td>1380</td>
</tr>
<tr>
<td>ML 230</td>
<td>400</td>
<td>1540</td>
</tr>
<tr>
<td>ML 270</td>
<td>385</td>
<td>1710</td>
</tr>
<tr>
<td>ML 330</td>
<td>430</td>
<td>1570</td>
</tr>
<tr>
<td>ML 380</td>
<td>410</td>
<td>1610</td>
</tr>
<tr>
<td>ML 400-500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ML 400L-500L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ML 510</td>
<td>445</td>
<td>1565</td>
</tr>
<tr>
<td>ML 510 L</td>
<td>445</td>
<td>1610</td>
</tr>
</tbody>
</table>
\( \alpha^\circ = 360^\circ \) for models:
ML 230-270-330-380
(pict. 21)

Standard cranes without outrigger base
\( \alpha^\circ = 330^\circ \) for models:
ML 110-150-180
\( \alpha^\circ = 360^\circ \) for models:
ML 230-270-330-380

For all the cranes ML range dead point as shown, which means
(pict. 22) that it is on the hydraulic motor side

Cranes with rack and pinion slewing ML 400-500:
dead point as shown, that is (pict. 23) opposite side of the boom

Gru ML 510 (Pict. 24)
4.2 CHANGING THE DEAD POINT POSITION

If necessary, the dead point can be changed from its original position.

⚠️ ATTENTION

Before starting to change the dead point position, read carefully the following instructions and make sure to have fully understood the whole procedure.

NEXT HYDRAULICS DOES NOT ACKNOWLEDGE ANY WARRANTY FOR DAMAGES CAUSED BY NON-CORRECT OR CLUMSY RE-POSITIONING OF THE DEAD POINT.

4.2.1 Worm gear operated cranes

For the cranes with slewing by worm gear the dead point can be adjusted only every 180 degrees, this can be carried out in 2 different ways:

1 - Change of the dead point by re-positioning of the slewing stop screw (pict. 25):

unscrew the column screw A) and lift the column from its base completely. This way two threaded holes, one of which is already engaged by the screw B), become visible on the lower side of the worm gear. Remove this slewing stop screw B) from its hole on the lower part of the gear, carefully clean and take the grease off it, then screw it again in the opposite hole, where some Loctite 242 has been previously applied. Slip again the column on the crane pivot and put the stop screw A) back with its tightening lock nut.

⚠️ ATTENTION

While slipping the column on the pivot, proceed cautiously, so that the gear teeth slip into the vanes of the screw thread without causing dents (pict. 26).

To that purpose, while lowering the column to slip it on, give it also at the same time a slight rotation (helical movement).

⚠️ ATTENTION

The slewing stop screw must be placed exclusively in the 2 countersunk holes, opposites to 180 degrees, specially provided for that.

In pict. 27 are shown the starting conditions and the results after the transformation.
VARIATION OF THE SLEWING DEAD POINT BY SHIFTING OF THE STOP SCREW

Crane on the right behind the cab

Crane on the left behind the cab

Motor

Folded boom

$\theta_1$

$\theta_2$

Motor

Folded boom

$\theta_1$

$\theta_2$

Motor

Folded boom

$\theta_1$

$\theta_2$

Pict. 27
2 - Variation of the dead point by shifting of the slewing support

ATTENTION

Changing the dead point in this way, the hydraulic motor will protrude the overall width of the crane outrigger base. Check that this does not cause any problem.
- Unscrew the 4 fixing tie bolts of the slewing support (pict. 28)
- Lift the crane and turn it of 180°
- Screw again the fixing tie bolts
- Then rotate the crane column of 180° to have the boom toward the inner side of the truck.

DANGER

The fixing tie bolts must be tightened by means of dynamometric spanner according to the prescribed torques (see par. 7.2.3). Restore the products against loosening on relevant nuts.
4.2.2 MAXILIFT rack and pinion models (pict. 29)
The dead point can be placed in any position.
- Lead the crane to rack stroke end (dead point)
- after having loosened relevant counter-nuts, unscrew completely the column stop screws
- loosen relevant lock nuts, then unscrew almost completely the adjustment screws of the rack’s sliding pads
- lift the column completely from its support
- before slipping again the column on its support, turn the racks of some degrees, opening their teeth wide upwards. This way the column pinion will find less resistance while slipping down
- slip again the crane column on its support, keeping the booms oriented in the position where you want to fix the new dead point
- screw and tighten the column screws and the rack’s sliding pads adjusters.

⚠️ ATTENTION
While slipping on the column, proceed cautiously, so that the pinion’s teeth engage in the openings of the racks’ vane without reciprocal dents.
Restore the correct pressure of the rack’s adjusters sliding pad: for such purpose, the sliding pads’ adjustment screws are not to be completely tightened, rather you have to stop when you feel a slight resistance, and then stop the screw in such position by definitely tightening the lock nut.

4.3 CHECKS AND VERIFICATIONS

⚠️ DANGER
Check the proper tightening of the column screw.
Such screws fulfil its purpose by engaging in a circular groove while screwing. Between screw and groove is to remain a 1-2 [mm] G clearance (pict. 30), which is achieved by tightening the screw until you feel some resistance, then unscrewing it of one turn and locking it by lock nut.
After the mounting, check such tightening:
 a) when making the column turn you must hear no creeping or feel no resistance
 b) if trying to lift the column by pulling it upwards, it must not lift up.
Danger of hoses’ break. After carrying out the shifting of the dead point, check that the way of the hoses’ bundle from the crane base to the column originally provided by Next Hydraulics for the standard configuration is still suitable to the new position of the column. The check is to be carried out by rotating, slowly and cautiously, up to the dead point, in both ways, and verifying that the hoses’ bundle regularly rolls and unrolls without getting entangled or creeping.

ATTENTION

All of the parts getting damaged during such operations (for instance: tie bolts, nuts, hoses, etc.) are to be replaced with original parts.
5 - CRANE CONNECTION

5.1 General information

The crane’s electric system is divided into two different parts:
1 - one part concerning controls
2 - one part <of power>, not always present, for which we refer to following par. 5.2.

The electric power, 12V or 24V, required for the supply of the safety devices’ electrovalves and the switchboard components (warning lights, key-switches, etc.) is to be drawn in the points, and according to the conditions stated by the vehicle’s Manufacturer in the relevant “Installation instructions”.

Before starting work, make sure that the voltage of the vehicle’s electric system and the crane’s one are the same.

IMPORTANT

On all of the covers and wrappings of the components of the crane’s electric system a plate showing the working voltage is applied in a visible position.

⚠️ DANGER

Before starting work, make sure that the vehicle and the crane have the same working voltage.

The damages caused to the crane’s electric system, and to its components, by the connection with a wrong supply voltage are not acknowledged under warranty. The wiring diagrams of the different crane models and versions are shown in their relevant use and maintenance manuals. We hereby recall some basic points:
1 - the current withdrawal is to be placed under the vehicle’s ignition key, properly protected by a suitable fuse
2 - the fuse must be placed in a position easily accessible for its checking and replacement. It is to be clearly marked and identifiable, and its position must be made known to the user
3 - the supply cables of crane’s circuit are clearly marked by the (+) and (-) symbols. Before the connection, make sure of the polarities’ correspondence.

⚠️ DANGER

Before carrying out the connections, make sure of the polarities of the cables.

The damages to the crane electric plant, and to its parts, caused by the inversion of the polarities are not acknowledged under warranty.

⚠️ DANGER

Each welding operation or working by electro-tools is to be carried out with disconnected supply and ground cables, in order to avoid the serious damaging of the existing electric and electronic main parts.
NOTE
Some Maxilift crane models are fitted with electronic load limiter.
Description, wiring diagrams and instructions for load limiting device and its components’ setting: see the instructions booklet MD0219.

5.2 CRANE’S POWER SUPPLY

As far as the service operation period of the crane is concerned, there are basically two possibilities:

A - the typical working cycle foreseen for the crane is continuative, and therefore not limited to short periods
B - the working cycle is not regular and short, with frequent interruptions whose duration are longer that the working periods.

It is important that a correct identification of the kind of service is made when ordering the crane to Next Hydraulics, as to the two above mentioned possibilities correspond two different versions of a same crane model:

A - crane in hydraulic version (with P.T.O. and pump) for working cycle not limited to short periods
B - crane in electro-hydraulic version (with electric pump) for working cycle limited to short periods.

⚠️ ATTENTION

In case of any doubt about the choice, ask Next Hydraulics, supplying the data about the foreseen usage.

5.2.1 Crane with working cycle not limited to short periods

The power is to be supplied preferably from the vehicle’s gearbox, on whose casing there is a screwed lid prepared for such purpose.

⚠️ ATTENTION

Before carrying out any operation on the vehicle’s gearbox, always consult the “INSTALLATION INSTRUCTIONS” manual of the manufacturer.

The power is obtained by removing the lid and applying a gear set, called “power take off”, which drives an hydraulic pump that delivers the crane the hydraulic oil required for its operation, drawing it from the relevant oil tank.
5.2.2 Selection of the pump and the PTO

The following is known:

\[ Q = \text{oil flow required by the crane [litres/min.]} \]
\[ p_{\text{max}} = \text{max. crane working pressure [bar]} \]
\[ N_{\text{pto}} = \text{max. PTO admissible torque [daN*m]} \]
\[ N_{c} = \text{max. torque which can be drawn from vehicle's gearbox [daN*m]} \]
\[ e = \text{pump efficiency} \]

The calculation is carried out by considering the vehicle’s motor idling speed, normally

\[ n = 800-1000 \text{ [rev/min.]} \]

On the PTO’s catalogue you choose, according to the vehicle, a certain PTO model, with a gear ratio

\[ i = \frac{\text{rev. number on PTO outlet}}{\text{motor rev. number}} \]

Then, you find the pump displacement required to supply, with vehicle’s motor idling, the required oil flow, and this will be:

\[ s = \frac{Q \times 1000}{n \times i} \text{ [cm}^3\text{/rev]} \]

From the pumps’ catalogue you choose the model with a \( C_p \) displacement as closer as possible to the \( C \) rate found (besides checking, obviously, that it can stand the max. pressure required by the crane). Once this \( C_p \) is known, check that the \( Q_p \) oil capacity obtained is close enough to the one required:

\[ Q_p = \frac{C_p \times n \times i}{1000} \text{ [lt/min.], must be very close to } Q \]

Small differences can be adjusted by raising or lowering a little the min. motor speed. Instead, should the capacity be too high (or too low), choose a smaller (or bigger) pump and repeat the calculation.

When done, there are two further final verifications to carry out:

a - that the max. torque required by the pump can be supplied by the PTO:

\[ \frac{C_p \times p_{\text{max}}}{628 \times e} < N_{\text{pto}} \text{ [daN*m]} \]

b - that the torque required at the inlet of the PTO is lower than the max. torque which can be drawn from the vehicle’s gearbox:

\[ \frac{C_p \times p_{\text{max}}}{i \times 628 \times e} < N_{c} \text{ [daN*m]} \]
DANGER

If the pump flow is not the prescribed one (see chapt. 10 – technical data Use and maintenance manual), the crane will not work correctly. Specifically, an oil flow greater than the prescribed one, besides causing a bad functioning of the hydraulic circuit (oil overheating), vibrations and counter-pressures on valves and motors, causes too fast crane movements, and therefore dangers such as:

- crane structure's overloading because of dynamic effects
- lower metering of the loads
- lower stability of the vehicle.

NOTE

In some cases, the vehicle’s gearbox is not prepared for the application of the PTO. Anyway, if there is enough room in the motor space, it is still possible to draw some mechanical energy from the vehicle, provided that the energy required is not too much (that is: the crane is to be small in comparison with the vehicle). As shown in pict. 31, on one of the auxiliary services of the motor you have to mount a pulley with multiple grooves, connecting it by a V-belt to an electromagnetic clutch mounted on the pump shaft itself in the same motor space.
- The pump support is to be adjustable, so that it is possible to take care of periodical tensioning of the belt
- it is important to try and reduce to the minimum the overhang of the belt pulleys on the axles' bearings where they are mounted, as well as not to strain excessively the belt.

ATTENTION

Before proceeding to such operation, check that the stresses transferred to the motor and pump axles are compatible with the resistance of relevant mechanical parts (consult the manufacturers).

5.2.3 Installation of pumps and PTO's

ATTENTION

During the installation always follow the instructions mentioned in the “INSTALLATION MANUAL” of vehicle's Manufacturer.
Installation with direct coupling (pict. 32)
In this system, pump and PTO coupled by a stiff joint form one only body, and such unit is directly flanged on the proper gearbox lid.
Without exhausting the matter, we hereby recall some points worthy of particular attention:

a - before opening the PTO lid on the gearbox, remove the oil inside of it
b - screw the pump+PTO unit on the flange, tightening well the screws with the recommended torque. Such screws

c - check that the box gears and the PTO gears engage with a correct clearance, by making turn dry, for a very short time, gear and PTO
d - make sure that the pump+PTO unit has a weight that does not compromise the endurance of the screws or some other parts of the gearbox
e - after the work is finished, restore the oil level inside the gearbox.

Installation with indirect flanging (pict. 33)
The PTO is flanged on the gearbox lid, but the motion is transmitted to the pump, at a distance, by cardan shaft.
The pump is fixed to the vehicle’s reinforcing chassis on a proper support. You resort to this sort of installation when there is not enough space for the installation with direct flanging, or when the pump+PTO unit is too heavy.

ATTENTION

When choosing and mounting the cardan shaft, follow the data and the prescriptions of the shaft’s manufacturer.
We hereby recall some basic points:
- the pump is to be fixed to the reinforcing chassis in a way that its shaft has the same slope, referring to the horizontal line, of the gear outlet shaft
- when preparing the installation consider that, in order to prevent the pump damaging, the max. slope of the cardan shaft compared with the pump axle must not exceed 9-10 degrees
- the end forks of the cardan shaft are to lie on the same level (ALIGNED JOINTS), and to be leaning of the same angle compared with the horizontal line (with reference to pict. 30: ALFA1 angle = ALFA2 angle).

General instructions concerning the installation of pumps and PTO’s

1 - The pump inlet must always be installed <under oil level>, that is, its suction plug is to lie always at a lower level than the hydraulic oil MINIMUM one in the tank
2 - While mounting, make sure that the outlet shaft of the PTO is subject only to a torsional stress. Avoid to mount on such shaft gears or pulleys, which would cause bendings. Use grooved joints axially sliding, in order to prevent axial loads
3 - Make sure that the insertion times in full service given by the pump and PTO manufacturers are compatible with the working periods foreseen for the crane
4 - While connecting the pump to the hydraulic system, follow the warnings mentioned in following paragraph.

5.2.4 Controls of the pump-PTO operation

⚠️ ATTENTION

Pump and PTO must stay engaged exclusively for the only period of time strictly required for operating the crane.

This is in order to prevent overheating of the hydraulic oil and the pump and PTO gears, early wear and tear of such parts and useless energy absorption from the vehicle’s motor.

Therefore, it is always necessary to install a control device for the engagement and release of the clutch, and must be possible for the vehicle’s driver to check easily whether it is active or not.

There are 3 kinds of devices generally used:

Mechanical clutch (pict. 34): it controls the coupling of the PTO and gearbox gears by a flexible cable operated by a lever placed in the vehicle’s cab.
Air clutch (pict. 35):
the coupling is made by a pneumatic cylinder with an operating push button placed in the cab.
The air required is to be drawn exclusively by the compressed air tank of the vehicle, paying attention not to compromise in any way the functioning of the braking system.
Some rules to follow while preparing such plant:
a - the air from the tank is NOT to be drawn by the condensation exhaust plug, rather from the hole already arranged on one of the bottoms
b - prepare the connection piping only with connected pipes (and NOT welded)
c - the pipes' fixing and their way is to be carefully decided and carried out, in order to prevent eventual losses which could compromise the correct working even of the other pneumatic services.

- DANGER -

Absolutely avoid each tampering of the braking system.

Electromagnetic clutch (pict. 36):
it is used in case of pump operated by the vehicle's motor by belt drive. In the picture is shown a typical control circuit.

As a general rule, valid for all sorts of clutches, the control is to be connected to a warning light placed in a good visible position on the vehicle driver's seat. This is (see what said before) in order to avoid that the vehicle remains with the pump and the PTO engaged while travelling on the road.
5.2.5 Electric connection for “H” version crane (picts. 37-38)

Crane without remote control

- Blue
- Ignition switch
- Warning light
- Fuse 8A

Crane with remote control

- Blue
- Brown
- Remote control
- Warning light
- Fuse 8A

Yellow/Green and -TL(brown): Cut and insulate
5.3 CRANE WITH WORKING CYCLE LIMITED TO SHORT PERIODS OF TIME (crane in electro-hydraulic version)

In this case the crane is supplied already fitted with electro-hydraulic power pack, consisting of an integrated unit pump+CC electric motor, therefore the installation is completed by properly carrying out the electric and hydraulic connections. For the hydraulic connections refer to following paragraph. As far as the electrical connections are concerned, it will not be insisted enough on the fact that the crane performance is heavily influenced both by the way such connections are carried out and, along the time, by the constant and correct maintenance of the electric system made by the user.

**ATTENTION**

On receipt of the electro-hydraulic unit, always check to have received the whole of the material mentioned on the list price and on the shipping document. Check also the integrity of the goods received. Immediately report any difference to Next Hydraulics.

Make sure that the application foreseen for the crane is compatible with the presence of the important electric circuit which it is connected to, therefore, for instance, that there are no fuels vapours, chemical vapours or fumes, corroding substances.

**ATTENTION**

When working on the electric system of the vehicle, look up and follow what prescribed in relevant “INSTALLATION INSTRUCTIONS”.

5.3.1 General advice

a - On a few Maxilift crane models the power packs are already fixed to the crane and with all relevant connections already operating. In most of the cases, instead, the electro-hydraulic power packs are delivered loose, and are provided only for horizontal mounting. They are all fitted, in the most suitable areas, with openings or threaded holes, which we recommend to use to carry out relevant fastening. Such fastening is to be made by the support of a proper resistance solidly connected to the vehicle’s chassis or chassis reinforcement frame. Check the horizontal position of the unit after the mounting. Bear in mind that vibrations, shoves, vehicle’s bumps during the transport can cause the break or the detachment of such support, if not enough sturdy. Avoid the installation of the power pack in positions where it could be used as step, or where metal tools or other parts could fall on it.

**DANGER**

The detachment or unsteady fastening of the electro-hydraulic unit on the vehicle could cause breaking or damaging of the electric cables connected to the battery, with following danger of crane bad functioning, short circuits, electrocution and fires.

b - The wiring between battery terminals and power pack’s motor poles are to be carried out EXCLUSIVELY by electric cables of proper section. It is forbidden to carry out the return from motor negative pole to battery’s negative by using as conductive the vehicle’s chassis/reinforcing chassis (“ground on the chassis”). To such purpose use EXCLUSIVELY the cable pair supplied along with each crane; such cables have a length suitable to most part of the installations. Should their length be
insufficient (keep anyway their length as reduced as possible, in order to minimize voltage drops), ask Next Hydraulics’ Technical Department, giving the length required, in order to make sure that the section originally foreseen for such cables is still suitable.

**ATTENTION**

Due to the serious damages which can come about, the non-fulfilment of what prescribed on previous point 5.3.1 involves the warranty forfeiture from Next Hydraulics on all of the crane’s electric parts.

c - Electric connections of the electro-hydraulic power packs. Follow the connection schemes shown below for the different crane models. However, each power pack is delivered complete with attached copy of relevant connection scheme.

**ATTENTION**

The power packs are to be connected by following the schemes provided for each of them. The non-fulfilment can cause serious damages to the circuit parts.

In particular, **Next Hydraulics** does not acknowledge warranties on components damaged by polarity inversion when connecting the cables.

**Power pack “metal case” type**

Remove the cover, connect the battery cables as shown in pict. 39.

To lead the cables inside the case, do not make any further hole, rather use those already existing on the case bottom itself, by piercing the rubber grommets fitted on them.

- Put again the cover on the case, making sure that no cable is crushed during such operation.
- Tighten the cover stop screws, and check that it is well closed.
With reference to the schemes shown in picts. 41 – 42 – 43, it is strongly recommended to fit a general main switch for the crane in the truck cabin, and its relevant warning light placed in a visible position.

Also, this general switch for the crane should be placed “under truck’s ignition key”.

e - We urge the insertion in the electric circuit of a “battery-cut off” device, to be placed as close as possible to the battery and in accessible position.

f - The battery terminals are to be kept well cleaned, greased with vaseline, with clips well tightened and protected by the proper boots.

g - **The crane performance is proportional to the battery performance.**

Therefore, especially for 12V vehicles we urge the additional installation of a second battery like the first one and connected to this in parallel (or replace the existing battery with a heavy "traction" type one). For the above reasons, the battery is to be kept in perfect working order. During the crane working, check that the voltage to the terminals never drops below 10.5 V (for 12V vehicles), or 19 V (for 24V vehicles), both for reducing the current in the motor and its overheating, and because below this rate the electro-valves’ solenoids will not be operated.

h - Check the efficiency of the vehicle’s alternator considering the crane installed. In many cases it is advisable to replace the original alternator by a bigger one, even because the actual power produced by the alternator is always lower than the nominal one, due to the high temperature inside of the motor space.

i - Avoid to spill or overflow the oil while filling the power pack tank up. In particular, avoid that such oil can fall on the electric motor’s brushes, damaging them.

j - The electro-hydraulic units supplied along with the Maxilift cranes are fitted with a protection against the atmospheric agents suitable to the use the cranes are foreseen for. We advise against the arrangement of further protections or casings, as a proper ventilation is to be ensured to the electric motor. Besides, it is necessary to avoid subjecting the units and the other electric boards to strong direct jets of water or steam under pressure, in order to prevent water seepage, for instance inside the electric motor. Therefore, eventual breaks, holes, cracks in the protection casings of the electro-hydraulic units are to be promptly eliminated, by restoring or, if necessary, replacing the parts concerned.
ATTENTION

Water seepage inside the motors are obviously due to oversights in following what above described, therefore Next Hydraulics does not acknowledge any warranty on electric motors damaged because of seepage.

5.3.2 Electric connection for cranes “E” version without remote control (picts. 41-42)

Crane with ECI, without limiting device

Pict. 41
Crane with limiting device

Warning light

---

**ML 150 12V**

<table>
<thead>
<tr>
<th>L [m]</th>
<th>S [mm²]</th>
<th>I [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ÷ 5</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>5 ÷ 6.8</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>6.8 ÷ 9.9</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>9.9 ÷ 13.8</td>
<td>95</td>
<td></td>
</tr>
</tbody>
</table>

---


<table>
<thead>
<tr>
<th>L [m]</th>
<th>S [mm²]</th>
<th>I [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ÷ 3.2</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>3.2 ÷ 4.4</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>4.4 ÷ 6.4</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>6.4 ÷ 8.8</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>8.8 ÷ 11.2</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

---

**ML 150 24V**

<table>
<thead>
<tr>
<th>L [m]</th>
<th>S [mm²]</th>
<th>I [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ÷ 20</td>
<td>35</td>
<td>100</td>
</tr>
</tbody>
</table>

---


<table>
<thead>
<tr>
<th>L [m]</th>
<th>S [mm²]</th>
<th>I [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ÷ 11.2</td>
<td>35</td>
<td>180</td>
</tr>
</tbody>
</table>

*
5.3.3. Electric connection for cranes “E” version with remote control (pict. 43)

Yellow/Green and -TL(brown): Cut and insulate

! PNG Image of a wiring diagram showing connections between various components such as Ignition switch, Remote control, Warning light, Fuse 8A, and labels for Brown, Blue, ECI / LME / LLC, and Ignition switch.
5.4 CONNECTION OF CRANE’S HYDRAULIC SYSTEM
The crane’s good working is ensured only if the sizing and the installation of its hydraulic system are correctly carried out.

5.4.1 Hydraulic oil
The Maxilift crane is delivered with cylinders and piping filled up with oil and plugged. We employ hydraulic oil ISO 46 grade, with additives against emulsion and wear and tear, suitable for use in temperate climates. After the work, fill up the system through the proper plug on the tank, adding only fresh hydraulic oil, of good rate and same grade.

ATTENTION
Look up the lubricants table on the crane’s use and maintenance manual.
In case of special requirements or applications consult Next Hydraulics.

5.4.2 Carrying out of the hydraulic system
The plant to be built may be more or less complicated, depending on crane version or eventual other hydraulic equipments present on the vehicle, for instance tip-bodies, etc.
1 - Crane in electro-hydraulic version 12/24 V DC: the system is very simple; it is only necessary to carry out the hoses’ connection:
   - inlet, from port P of the pump to port P of the control valve bank
   - outlet, from port T of the control valve bank to the oil tank

Pict. 44 - In case of electro-pump unit metal-case type, once the cover is removed, the pump port P is directly accessible, the control valve outlet to the tank is to be connected to the filter on the tank. The hoses are to be let go through the holes on the case bottom and protected by rubber grommets.
2 - Crane in hydraulic version, PTO-driven: the piping parts to carry out are (pict. 45):
- hose from pump port P to port P on control valve bank
- connection hose from control valve outlet port T to filter on tank
- hose from inlet pump port T to tank intake.
When the space is enough, it is advisable to mount a tap on the tank intake, in order to make the system maintenance easier.

5.4.3 Piping carrying out
The hoses are to allow to the oil a flowing wide and free from hindrances. Their way is to be as short as possible, and in the meantime are to be avoided, as far as possible, the sudden bendings and the localized restrictions (such as, for instance, eye-fittings of the hoses). Maximum attention is to be paid in cleaning all the parts and components used. Before assembling the different parts and components, clean and carefully blow them by compressed air.
Absolutely avoid:
- hoses’ twisting
- circuits conformed, so that they presents parts where solid particles and other impurities (which can then become free and re-enter the circulation owing to pressure blows or turbulences) are at a standstill.

PIPING TYPES AND THEIR MATERIALS
You can use steel pipes or hydraulic hoses. For the circuit stretches under pressure it is always advisable, for their higher intrinsic safety, to carry out steel piping, using the St 37.4 type certified for hydraulic employment according to DIN 1630 (or equivalents). The pipe is to be properly protected against corrosion. Such piping is to be solidly fastened by proper collars to the fixed truck structure points not very subject to vibrations.

⚠️ ATTENTION

On cutting and bending the steel pipes, follow the instructions of the pipe manufacturer.

⚠️ ATTENTION

For the steel pipe-fittings follow the instructions of the fittings’ manufacturers.
The steel piping minimum recommended sizes to be used for the circuit parts under pressure are the following:

- Diameter 10 thickness 1.5 mm
- Diameter 12 thickness 1.5 mm
- Diameter 16 thickness 2 mm

The choice of the size is to be made in conformity to the oil capacity, according to what stated in the following paragraph 5.4.4.

The hoses' type is to be the one for hydraulic circuits, and is to meet following requirements:
- for the parts under pressure: SAE 100 R2 types, or SAE 100 R2T, or COMPACTFLEX DIN 20022, all with steel double string
- for the inlet or outlet parts: SAE 100 R4.

The choice of the diameter is to be made in conformity to the oil capacity, according to what stated in the following paragraph 5.4.4.

Concerning the correct mounting systems, the mistakes to prevent, the bend radius to give to the hoses, refer to the manufacturers’ manuals.

We hereby wish to point out only that the hoses are by their own nature less rough than steel piping, and it is necessary to prevent their abrasions, rubbings, contact or close exposure to heat sources. Avoid also that, due to mounting, the hose is crushed or flattened: in such case, the actual section for the oil flow will be narrower that the nominal one, with all the consequent problems.

⚠️ ATTENTION

On connection and mounting of the hoses, follow the prescriptions of the hose’s manufacturer.

### 5.4.4 Piping sizing

The inner diameters of the hoses must be adequate to the circulating oil flow, both to prevent the excessive oil heating, and to limit counter-pressures (or cavitations) which can affect the functioning of some components of the system. Recommended oil speeds:

- intake line 0.6-1.5 mt/sec
- inlet line 3-6 mt/sec
- outlet line 1.2-1.8 mt/sec.

The hoses’ manufacturers supply the diagrams from which you draw the diameter required to achieve such speeds according to the capacity.

As a first reference, the following sizes can be used (*):

<table>
<thead>
<tr>
<th>line</th>
<th>oil capacity lt/min</th>
<th>pipes or hoses diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>intake</td>
<td>0 - 15</td>
<td>3/4 “</td>
</tr>
<tr>
<td></td>
<td>15 - 30</td>
<td>1”</td>
</tr>
<tr>
<td>inlet</td>
<td>0 - 15</td>
<td>12 x 1.5 or 3/8”</td>
</tr>
<tr>
<td></td>
<td>15 - 30</td>
<td>16 x 2 or 1/2”</td>
</tr>
<tr>
<td>outlet</td>
<td>0 - 15</td>
<td>16 x 2 or 1/2”</td>
</tr>
<tr>
<td></td>
<td>15 - 30</td>
<td>3/4 “</td>
</tr>
</tbody>
</table>

(*) Attention! Sizes valid for most common crane fittings. When oil piping is very long, consult Next Hydraulics.
5.4.5 General advice

- The oil temperature, after a normal working period, must not exceed 70°C with environmental temperatures around 20°C. Higher oil temperatures can mean that the hoses' diameters are insufficient, or that there are localized narrowings. In case of special requirements (very high environmental temperatures, very complicated hoses' way, continuous pump working for long periods), which need further adjustments to keep the oil temperature within the foreseen limits, pass to the immediately higher hose diameter. It could be necessary to install an oil tank with bigger capacity. Consult Next Hydraulics.

- When you expect to use the crane very often with temperatures below –5/-10°C, replace the oil by one with proper ISO grade. Consult Next Hydraulics about this, in order to make sure of its compatibility with the seals. It could be necessary to apply to the tank a heater with electric resistance, in order to lead the oil to a sufficient temperature before the operations' starting. This heater is to be disconnected as soon as the purpose is achieved. Provide proper devices and instructions to avoid that the user let it plugged in more than necessary.

- Oil tank position: even with minimum oil level, the intake pump port must always be minimum 100-150 mm below this level; its position must allow the easy level checking and maintenance (topping up and filter replacement on the outlet line, if present).

- Keep the intake piping as short and straight as possible. We advise against the installation of a filter on such line.

- The counter-pressure on the outlet line, gauged by applying a T-shaped fitting on the port T of the hydraulic control valve must not exceed 15 bar. If required, modify the line to re-enter within such limit.

⚠️ DANGER

The non-fulfilment of the prescribed precautions for the different hoses' lines involves crane bad functioning and damaging of the circuit components.

- When the installation is finished, check the arrangement and the way of the hoses in all of the crane’s conditions and working positions. In particular, the hoses lying within 1 meter from the user’s position are to be properly shielded, in order to protect him from pressure oil leaks.
5.5 CIRCUITS

The hydraulic circuits of every crane version are shown in the relevant use and maintenance manual. We hereby give some advice concerning some particular cases.

1 - Hydraulic connection of supplementary outrigger beam

- 1st solution (pict. 46).
  The oil is drawn by the line supplying the main crane stabilizers. All the legs are lifted/lowered by the same valve bank lever. The selection is made by operating the valves with tap mounted on each leg.

- 2nd solution (pict. 47)
  The installation of a 4 ways flow divider is required. The extension/re-entry of all the legs is operated by the control valve lever, the leg selection is made from the control place by properly operating the flow divider.
2 - **Connection to the tipping body circuit** (pict. 48).

A single pump can supply oil to both circuits, not simultaneously, if you put in the circuit a three ways flow divider.

Pay attention to the fact that tipping cylinder and crane have opposite requirements: the cylinder requires big oil flows at a low pressure, the crane needs lower oil flows at a high pressure. Therefore, it is necessary to install a pump which can work to the max. crane pressure and with an oil flow suitable for the tipping cylinder, but at the same time you have to mount a valve which exhausts a part of the oil when you choose to operate the crane. The valve is to be a three ways compensated flow regulator, adjustable type, to allow the delivery of the right flow to the crane (for the reasons explained in previous par. 5.2.2 PUMP SELECTION).

Further instructions:
- the capacity of the crane tank is generally insufficient for the tipping service. Use the tank supplied with the tipping body, if it has a bigger capacity
- it must be avoided that, when changing over the functions by acting on the flow divider lever, the pump inlet line is unlimitedly pressurized (damages to the pump and the circuit). Therefore, the flow divider is to be a type with communicating ports with lever in central position
- in case of crane installation with connection to an already existing tipping body circuit, check its cleaness and suitability to stand the new conditions.
5.6 INFORMATION ON VALVES

We hereby give some information on functioning and (when possible) setting of the valves of crane’s hydraulic circuit.

**Pict. 49** Main relief valve: it can be seen by removing the control valve casing. It is on the inlet head (port P) of the control valve bank, and it is sealed by Next Hydraulics before the delivery. It must not be tampered with in any way.

⚠️ **DANGER**

The tampering of the general maximum valve is considered as a serious alteration of the hydraulic circuit, and involves the automatic forfeiture of warranty.

**Pict. 50** - Sequence valve (present only on some models in the versions with more hydraulic extensions): it is line-mounted on the boom extension cylinders’ piping, and allows their correct extension sequence. It is not adjustable.
**Pict. 51** Lifting cylinder’s overcenter valve
The valve is already set by Next Hydraulics before the delivery, so that it correctly opens slowly and progressively when the crane overloading exceeds of 30% the nominal rate.

**Pict. 52** Extension cylinder’s holding valve.
The valve fulfils safety functions on the extension cylinders, but it is not adjustable.
Pict. 53 Outrigger cylinders' holding valve with tap.
The tap fulfils the line hydraulic closing. The valve is not adjustable.
6 – DIFFERENT WAYS OF INSTALLING MAXILIFT CRANES

All Maxilift cranes are suitable to be installed in the following ways:
MOUNTING ON THE FLAT BODY (inside the flat body)
MOUNTING ON THE CHASSIS FRAME.
In both cases, once a specific position for the crane on the vehicle is chosen, even according to what already explained in previous par. 4.1, you have to check that, after the installation, the crane keeps within the limits foreseen for the vehicle’s shape as far as the road traffic is concerned. Keep also in mind possible special requirements of the user, for instance vehicle’s storage in quite low garages, etc.

⚠️ DANGER

When carrying out the dismantling and reassembling, always restore the devices against unscrewing. For the torque tightening values, follow table [O] and, for the not mentioned sizes, refer to the tables of bolts’ manufacturers.

6.1 MOUNTING ON THE FLAT BODY

This installation exploits the limited overall dimensions of the slewing supports, leaving the remaining part of the body clear for loading. The crane can be placed in any point of the body, preferably in one of the 4 corners, so that the volume occupied is very small.

⚠️ DANGER

While moving the crane, follow the prescriptions mentioned in the paragraph “TRANSPORT/PACKING”.

6.1.1 Crane fitted with base (pict. 55)

Put the crane with its base on the vehicle fitted with reinforcing chassis frame. Leave the crane hooked to the lifting equipment, keeping it slightly in traction, in order to prevent its possible overturning. Go on separating the crane from the base by unscrewing the 4 tightening bolts.
Then lift crane and valve bank, in order to leave the vehicle clear. Put the body on the surface formed by reinforcing chassis and crane base (before carrying out the mounting, you will previously have taken care of dimensioning them, so that, at least locally, they have the same height). Put the crane in the position required on the body, then adjust as far as possible the position of the base, by leading the holes of the slewing base to coincide with those of the stabilizer base below. In correspondence to them, make on the body the 4 drillings for the bolts, and tighten them again.

Then arrange for the stable fastening in proper position (protected and accessible) of the valve bank support, checking that neither the valve bank nor the crane interfere with the body edges, and allow its easy opening and closing.

About the cranes with manual rotation (pict. 56), check that the crank rotation is possible with the edge down.

**IMPORTANT**

The working place of crane operator is to be carried out with care and attention, keeping to the prescriptions of the mentioned “Machine Directive”, and is to allow a free view on the whole crane operating area.

Generally, the control levers should be at a height between 1100 and 1400 [mm] from trampling plan, in an easily accessible position, without risks of clothes’ entangling. The plates with the prescriptions for crane use and the additional capacity plate delivered separately by Next Hydraulics are to be applied in a clearly visible position.

Moreover, the operator position while working is not to involve risks of inhalation of exhaust gas from the vehicle’s motor, or shearing or crushing risks for any part of his body. In particular, consult prEN 349 about this matter.
6.2 MOUNTING ON THE CHASSIS

The mounting on the chassis provides the installation of the crane between cab and body, or on the rear overhang. In both cases it could be necessary to shorten the body. Proceed as described in previous par. 6.1, referring to the below table Tab. [L] concerning the room which is to be left available for the crane (cross volume).

<table>
<thead>
<tr>
<th>Crane model</th>
<th>ML 110-150</th>
<th>ML 180-230-270</th>
<th>ML330-380</th>
<th>ML 400-500</th>
<th>ML 510</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension I</td>
<td>320/500</td>
<td>400/500</td>
<td>450/500</td>
<td>440/480</td>
<td>530/600</td>
</tr>
</tbody>
</table>

Note: (1) the space “I” required for the crane is always larger than the crane supporting width on the reinforcing chassis, that is I > B (it is marked by B in pict. 7 – 8 – 9 par. 3.5).

Note: (2) the space required for the crane (cross volume) varies according both to the shape of the truck cab (see par. 4 - pict. 17), and to the position chosen for the slewing dead point (see par. 4 – pict. 18-19-20-21)
7 – CRANE FASTENING ON THE VEHICLE

7.1 GENERAL ADVICE

The crane is to be solidly and safely fixed to the vehicle by using the tie bolts kits included in the supply. With reference to pict. 59, in following Tables [M] - [N] are listed the materials composing the tie bolts kit according to crane model and version.

![Diagram of tie bolt kit](image)

Table [M] Tie bolt kit Maxilift standard crane

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>Material</th>
<th>ML 110</th>
<th>ML 150</th>
<th>ML 180 - ML 230</th>
<th>ML 510</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tie bolt M16x2 L. 250</td>
<td>8.8</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tie bolt M20x1.5 L. 250</td>
<td>10.9</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>Tie bolt M27x3 L. 250</td>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Plate</td>
<td>Fe 360</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hex. nut M16x2</td>
<td>8G</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hex. nut M20x1.5</td>
<td>8G</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Hex. nut M27x3</td>
<td>8G</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Hex. nut M16x2</td>
<td>6S</td>
<td>8</td>
<td>8</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Hex. nut M20x1.5</td>
<td>6S</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Hex. nut M27x3</td>
<td>6S</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Washer 16x28</td>
<td>Fe 360</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>
Table [N] Tie bolt kit Maxilift version fitted with outriggers base

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>Material</th>
<th>ML 110</th>
<th>ML 150</th>
<th>ML 180 - ML 230</th>
<th>ML 270 - ML 330</th>
<th>ML 380</th>
<th>ML 510</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tie bolt M16x2 L. 500</td>
<td>8.8</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>Tie bolt M20x1.5 L. 500</td>
<td>8.8</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tie bolt M20x1.5 L. 800</td>
<td>10.9</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Plate 50x40 th. 10</td>
<td>Fe 360</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bushing D.28 th. 6</td>
<td>Fe 360</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hex. nut M16x2</td>
<td>8G</td>
<td>12</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hex. nut M20x1.5</td>
<td>8G</td>
<td></td>
<td>16</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hex. nut M16x2</td>
<td>6S</td>
<td>12</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hex. nut M20x1.5</td>
<td>6S</td>
<td></td>
<td>16</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bracket 50 th. 25</td>
<td>Fe 510</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

⚠️ **DANGER**

Never carry out any welding operation on the tie bolts.

⚠️ **DANGER**

The tie bolts must always be only tensioned or compressed. It is absolutely forbidden any curving or bending operation, even if carried out with the aid of heating.
7.2 BOLTING PROCEDURE

7.2.1 Crane fitted with outrigger base

Once the crane fixing position has been settled according to what described in previous chapt. and the crane is simply put on the reinforcing chassis in such position, before its fastening, it is necessary to weld, on the upper wing of the reinforcing chassis, as shown in pict. 61, some steel plates with function of base containment stops against sliding and slewing. These stops, in number of 4, that is one for each side and for each side-member, can be either flat (for instance, 30x10) or square with 10-12 [mm] thickness and with proper length.

Then, the tie bolts are to be slipped into the proper openings made in the base, with following cares:
- Always use two tie bolts for each opening

In case of fastening on three points (ML 110-150 only) you can use two tie bolts for each point (see pict. 60) and as lower brackets two steel plates Fe360, 40mm width with 15mm thickness and properly drilled.

The tie bolts tightening is made by nuts and lock nuts, which lean as shown in pict. 61 on relevant plates on the openings’ side, and on the drilled brackets on the lower side.

ATTENTION

For the reasons explained on previous par. 7.1, make sure that the nuts’ support area (brackets and plates) are parallel to the plane of the vehicle’s reinforcement frame chassis.

ATTENTION

For the tie bolts tightening, follow the rates mentioned in table. [O]. Depending on the position chosen and the vehicle, the fastening can be carried out in one of the following ways.
7.2.2 Direct fastening
The tie bolts join and tighten completely together crane chassis, reinforcement chassis frame and crane. In order to prevent the wings’ crashing, owing to the tie bolt tightening, it is essential to fit in the vehicle’s chassis a localized stiffener of proper solidity and such thickness that it can precisely slip inside the chassis. Then the stiffener is to be kept in such position someway, for instance by a guide bushing in which the tie bolt is to slip as shown in pict. 62.

7.2.3 Indirect fastening (picts. 63 and 64)
The fastening of the crane to the reinforcement chassis frame, and the reinforcement chassis frame to the crane chassis are carried out independently. It is more complicated than previous one, but it could become essential because of narrow available spaces.

Instructions:
- the chassis/reinforcement chassis frame tie bolts are to be always external in comparison with the crane/reinforcing chassis ones
- always use 2 tie bolts for each opening when connecting crane and reinforcement chassis frame
- any additional part (additional tie bolts, nuts, bushings, etc.), and also weldings are to be calculated according to resistance of materials methods

Table [O] Tightening torque for crane’s tie bolts and screws

### IMPORTANT
Nominal tightening torques, that is, drawn in the following conditions: threads slightly lubricated and dry nut’s and screw's support areas.

<table>
<thead>
<tr>
<th>Crane model</th>
<th>Threading</th>
<th>Position</th>
<th>Torque daN*m</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 110 - 150</td>
<td>M16x2 - 8.8</td>
<td>Screws or tie bolts basic flange to base or base to counter-frame</td>
<td>12</td>
</tr>
<tr>
<td>ML 180-230-270-330-380</td>
<td>M20x1.5 - 10.9</td>
<td>Tie bolts for basic flange</td>
<td>25</td>
</tr>
<tr>
<td>ML 180</td>
<td>M20x1.5 - 8.8</td>
<td>Screws basic flange to base</td>
<td>20</td>
</tr>
<tr>
<td>ML 180-230-270-330-380</td>
<td>M20x1.5 - 8.8</td>
<td>Tie bolts crane base to counter-frame</td>
<td>20</td>
</tr>
<tr>
<td>ML 230-270-330-380</td>
<td>M20x1.5 - 10.9</td>
<td>Tie bolts basic flange or screws basic flange to base</td>
<td>25</td>
</tr>
<tr>
<td>ML 510</td>
<td>M20x1.5 - 10.9</td>
<td>Tie bolts crane base to counter-frame</td>
<td>25</td>
</tr>
<tr>
<td>ML 510</td>
<td>M27x3 - 8.8</td>
<td>Tie bolts for basic flange or screws basic flange to base</td>
<td>55</td>
</tr>
</tbody>
</table>

Pict. 63

Pict. 64
7.3 STABILIZER LEG EXTENSION

When required because of the height of the chassis from the ground, it is possible to apply an extension to the stabilizer cylinder rod.

⚠️ ATTENTION

Before carrying out any welding on the stabilizer cylinder rod, extend completely the rod up to its stroke end, in order to prevent seals burning.

Next Hydraulics does not acknowledge any warranty on cylinders leaking because of burned seals due to the non-fulfilment of such elementary caution.

It is possible to extend the leg rod by welding to its free tip an extension prepared according to the following features (see pict. 65):
- its length must not exceed 400 mm for stabilizer with rod D=40 and 300 mm for stabilizer with rod d.30
- it is to be carried out preferably by using a tube of at least 54 mm outer diameter and at least 14 mm thickness for rod D.40, and a round bar of at least 40 mm in case of rod D.30.

Always make sure that the material is weldable
- draw in the extension a guide chamfer entrance for the rod for a length of at least 30-40 mm
- draw a chamfer of about 8 mm at the other end for the welding of the plate.

⚠️ DANGER

The plate is to be welded with 8 mm fillet weld, checking by means of a proper tool that it is aligned with the rod.
CONTENTS

1 INTRODUCTION ........................................................................................................Page .. 1
  1.1 Basic information ...................................................................................................... 1
  1.2 Machine Directive .................................................................................................... 3
  1.3 Reference norms .................................................................................................... 3

2 MOUNTING PREPARATION ......................................................................................... 4
  2.1 Starting preparation .................................................................................................. 4
  2.2 Crane moving and storage ....................................................................................... 4
  2.3 Table of crane masses and sizes ............................................................................. 5
  2.4 Precautions ............................................................................................................ 8

3 CRANE/VEHICLE MESHING ..................................................................................... 9
  3.1 Minimum vehicle .................................................................................................... 9
  3.2 Checking the crane - vehicle meshing .................................................................... 10
  3.3 Safety calculation against overturning ................................................................... 11
  3.4 Dimensioning of reinforcing chassis frame ............................................................ 14
  3.4.1 Reinforcing chassis calculation ......................................................................... 14
  3.4.2 Materials for reinforcing chassis ...................................................................... 15
  3.4.3 Reinforcement chassis calculation .................................................................. 15
  3.5 Building a reinforcement chassis ......................................................................... 16
  3.6 Reinforcing chassis fixing on the vehicle ............................................................... 20

4 CRANE FASTENING ON THE VEHICLE .................................................................. 22
  4.1 General instructions ............................................................................................... 22
  4.2 Changing the dead point position ......................................................................... 24
    4.2.1 Worm gear operated cranes .......................................................................... 24
    4.2.2 Rack and pinion models .................................................................................. 27
  4.3 Checks and verifications ....................................................................................... 27

5 CRANE CONNECTION ............................................................................................. 30
  5.1 General information ............................................................................................. 30
  5.2 Crane’s power supply ........................................................................................... 31
    5.2.1 Crane with working cycle not limited to short period ...................................... 31
    5.2.2 Selection of the pump and the PTO ................................................................. 32
    5.2.3 Installation of pumps and PTO’s ................................................................. 33
    5.2.4 Controls of the pump-PTO operation .............................................................. 35
    5.2.5 Electric connection for “H” version crane ....................................................... 37
  5.3 Crane with working cycle limited to short periods of time ..................................... 38
5.3.1 General advice ................................................................. " .... 38
5.3.2 Electric connection for “E” version crane without remote conrol ........................................ " .... 41
5.3.3 Electric connection for “E version crane with remote control ............................................ " .... 43
5.4 Connection of crane’s hydraulic system ........................................................................... " .... 44
5.4.1 Hydraulic oil ................................................................................................................... " .... 44
5.4.2 Carrying out of the hydraulic system ............................................................................. " .... 44
5.4.3 Piping carrying out......................................................................................................... " .... 45
5.4.4 Piping sizing .................................................................................................................. " .... 46
5.4.5 General advice .............................................................................................................. " .... 47
5.5 Circuits ................................................................................................................................... " .... 48
5.6 Information on valves ........................................................................................................... " .... 50

6 DIFFERENT WAYS OF INSTALLING MAXILIFT CRANE .............................................. Page ........................................ 53
6.1 Mounting on the flat body .............................................................................................. “ .... 53
6.1.1 Crane fitted with base .................................................................................................. “ .... 53
6.1.2 Crane without base (= standard crane) ....................................................................... “ .... 54
6.2 Mounting on the chassis ................................................................................................. “ .... 56

7 CRANE FASTENING ON THE VEHICLE ........................................................................ Page ........................................ 57
7.1 General advice ................................................................................................................ “ .... 57
7.2 Bolting procedure ............................................................................................................ “ .... 59
7.2.1 Crane fitted with outrigger base ................................................................................ “ .... 59
7.2.2 Direct fastening ........................................................................................................... “ .... 60
7.2.3 Indirect fastening ......................................................................................................... “ .... 60
7.3 Welding of the stabilizer leg extension ........................................................................ “ .... 61