

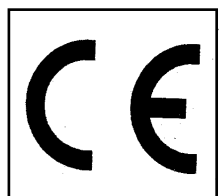


TEREX | COMEDIL

**Self-Erecting
Tower Crane
CBR 40H-4**

REV.000-1

**Operating Instructions - Installation
Maintenance**



This publication must be read carefully by the personnel assigned to the crane before taking any action.

Only by meticulously following the instructions given in this manual will the crane be able over time to provide the high performance for which it has been designed and constructed.

The manual highlights important information for the safety of persons and conservation of the machine with the following wording:

WARNING: When failure to observe or incorrect observation of the prescribed instructions can put the safety of persons at risk and cause mortal accidents.

CAUTION: When failure to observe or incorrect observation of the prescribed instructions can cause damage to the machine.

NOTICE: This is used to draw attention to particular technical aspects or to refer to other available information.

The manual is split into 4 sections:

- 1 MAIN CHARACTERISTICS
- 2 SITE PREPARATION - TRANSPORT
- 3 ERECTION - USE - DISMANTLING
- 4 MAINTENANCE

The **Comedil** After-Sales Service Organization is at the customer's disposal for any problems relating to use of the crane and for any necessary advice.

Edition 2010 - Gru Comedil s.r.l.

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Self-Erecting

Tower Crane

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REV.000-1

1

- MAIN CHARACTERISTICS

1.1 MARKING

1.1.1 MANUFACTURER

Gru Comedil srl – via delle innovazioni 17– 33074 Fontanafredda (PN) ITALY

Phone +39. 0434 989 111

Fax +39. 0434 565 137

Internet E-mail: info@comedil.com

Internet home page: <http://www.terexcranes.com>

IMPORTER / RESELLER



1.1.2 TYPE OF MACHINE

TOWER CRANE: equipment with discontinuous operation for professional use intended to hoist off a rigid surface and move through the air an unguided unit load hanging directly from the hook with the permissible hoisting or slinging accessories in between.

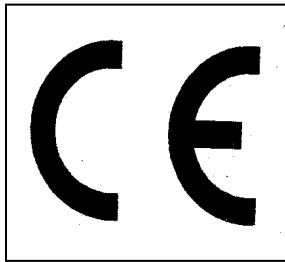
MODEL.....**CBR 40H-4**

SERIAL No.....

YEAR OF MANUFACTURE.....

1.1.3 CE MARKING

The crane bears the CE marking for conformity with the Machinery Directive 98/37/EC and subsequent amendments.



The marking is on the data plate on the door of the electric box

The original signed "EC Declaration of Conformity" is delivered with the crane. This document is an integral part of the machine; it must be kept with care in order to be able to be shown at the request of the authorities and to be handed over to the new owner if the crane is sold.

1.1.4 NOISE EMISSION MARKING

The crane bears the marking for noise emission in the environment in conformity with Directive 2000/14/EC



The data plate is on the door of the electric box




















The original signed "Certificate of Conformity" is delivered with the crane. The certificate states the actual value measured on a sample machine; this value is **90 dB(A)**.

This document is an integral part of the machine; it must be kept with care in order to be able to be shown at the request of the authorities and to be handed over to the new owner if the crane is sold.

1.1.5 IDENTIFICATION PLATE

The data plate shown below is on the door of the electric box.

It bears the crane's specifications as well as its identification data. The data plate is an integral part of the machine and must not be removed until the machine is dismantled.

 TEREX®		<div style="border: 1px solid black; padding: 2px;">COD. 8-46100268-1</div>																																																																															
GRU COMEDIL S.R.L. VIA DELLE INNOVAZIONI 17 - FONTANAFREDDA - PN - ITALIA TEL. 0434 989111 FAX 0434 565137																																																																																	
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1.2 FOREWORD

1.2.1 SCOPE AND LIMITS OF THE MANUAL

This manual is mainly intended for the owners of cranes and their site managers and in general all operators involved in moving, installing, using and servicing the crane.

The purpose of this manual is to provide information on:

- the intended use of the crane in the project
- the crane's technical characteristics
- site preparation
- towing and travelling
- installation, erection and dismantling
- the safety devices and their settings
- use and maintenance
- training personnel
- final demolition of the crane
- availability of spare parts

This manual can in no way substitute the specific experience of the fitter and operator. For demanding operations, such as erection, this manual is only an aid to memory for operators who have specific knowledge of this model.

Comedil disclaims all responsibility deriving from using fitters who do not belong to its After-Sales Service organization.

Use of the crane is anyhow subordinate to not only the prescriptions of this manual, but also to observance of all the safety standards required by the current specific legislation in the nation where the equipment is installed.

The instructions manual is an integral part of the equipment and must be **conserved for future reference** until the crane is scrapped.

1.2.2 WHERE AND HOW TO CONSERVE THE MANUAL

The instructions manual must always be available for reference at the site where the crane operates. It is advisable to entrust it to the care of the site manager who will keep it in a place well protected from the weather; for this purpose it is possible to use the inside pocket of the door of the electrical equipment.

In the event of damage that even partially impairs its reference, the user must acquire a new copy to be requested solely from **Comedil**.

1.2.3 SUPPLEMENTS AND UPDATES TO THE MANUAL

This manual represents the state of technology at the time of marketing the crane to which it refers; it must not be considered inadequate just because it has been subsequently updated in the light of new experience.

Comedil reserves the right to modify its production and associated manuals without moreover being bound to update what was previously delivered. Any supplements to the manual that **Comedil** may deem fit to send out to users must be kept together with the manual of which they will be an integral part.

1.2.4 USER COOPERATION

Comedil is at the disposal of its Clientele to provide further information and to consider proposals to improve the manual.

If the crane is sold, the user is invited to notify **Comedil** of the address of the new owner in order to facilitate sending any supplements to this manual.

1.2.5 EXCLUSION OF RESPONSIBILITY

Comedil disclaims all direct and indirect responsibility deriving from:

- improper use of the crane
- use by personnel that have not been trained
- use not in conformity with the current regulations in the country of installation
- preparation of the site not conforming to the instructions and regulations
- unsuitable characteristics of the ground
- supply defects
- lack of maintenance
- unauthorized modifications or repairs
- use of non-genuine spare parts or ones that are not specific for the crane model
- total or partial inobservance of the prescriptions contained in the manual
- extraordinary events

NOTICE: Failure to observe the above shall make the contractual warranty conditions null and void.

1.3 INTENDED CONDITIONS OF USE

1.3.1 DESCRIPTION OF THE EQUIPMENT

The tower crane described in this manual is a device for hoisting and transportation **intended solely for professional use**.

General characteristics:

- slewing: at the bottom
- installation method: in fixed position
- supporting members: 4 stabilizers with screw adjustment
- type of erection: hydraulic self-erecting
- load-handling device: single hook
- mobility: on axles equipped with tyred wheels

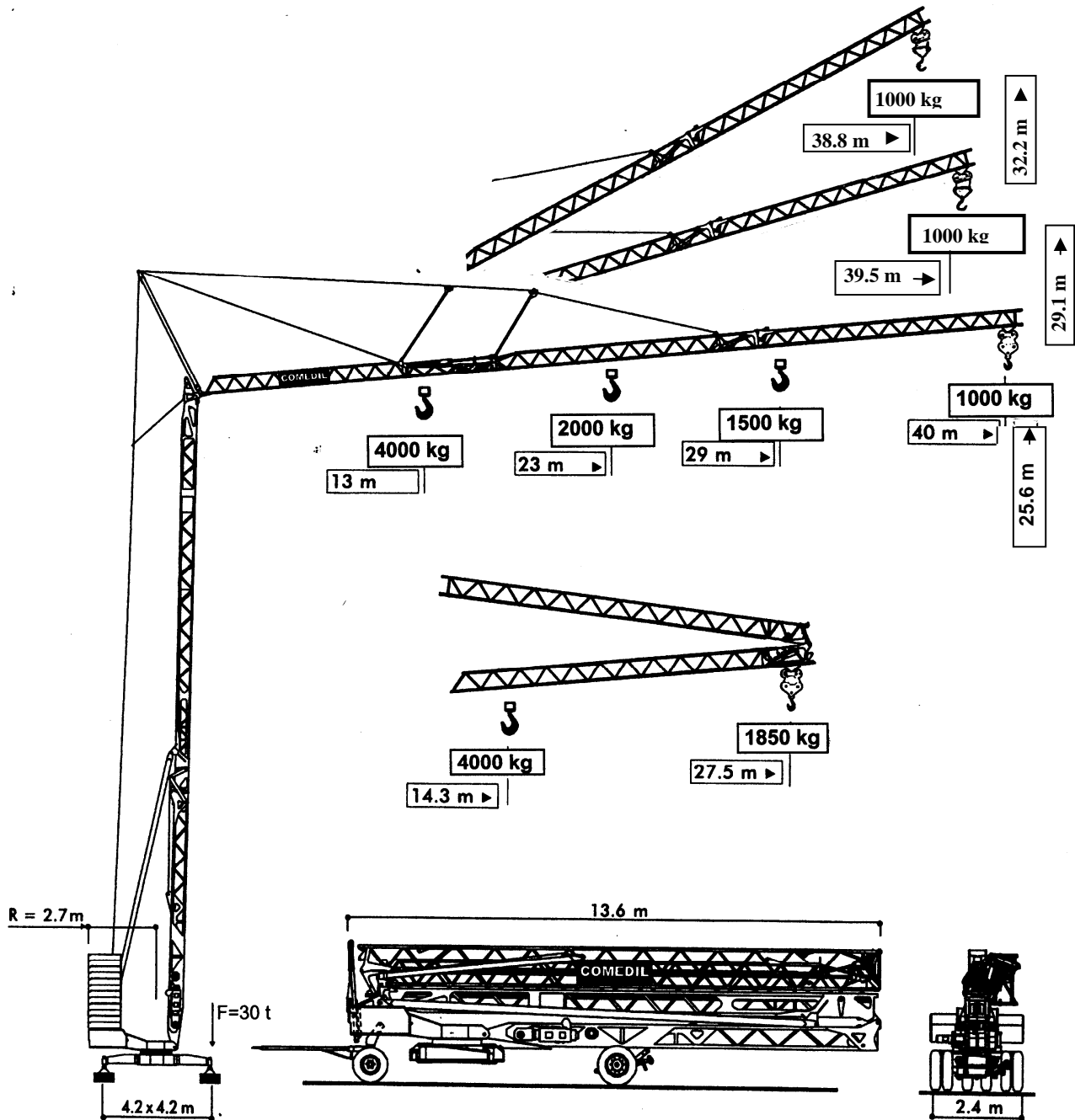
NOTICE: *The hoisting accessories, the supports to place between the stabilizers and the ground and any anchorages are not considered as belonging to the crane and therefore are not mentioned in the manual.*

1.3.2 CLASSIFICATION ACCORDING TO THE CALCULATION STANDARD

calculation standard for the structures	DIN 15018 pt 1
hoisting class	H1
stress group	B3 - (B2 for the jib)
maximum number of operating cycles	200.000
stability calculation standard	DIN 15019
calculation standard for the ropes	DIN 15020 pt 1
standard referring to the electrical parts	CEI-EN 60204
classification standard for the mechanisms	UNI ISO 4301-3
calculation standard for the effects of the wind	DIN 1055 pt 4

1.3.3 RANGE OF CONTEMPLATED SET-UPS

The contemplated working set-ups are illustrated on the following pages with the main performance and specifications of the crane indicated.



WARNING: When the jib is raised by 10° and 15° it is permissible to use the 2-part line only.

CAPACITY DIAGRAMS**Radius 40 m****2/4-part line**

4000	3000	2500	2000	1850	1600	1200	1000	kg
13.0	16.5	19.2	23.0	24.5	27.6	34.7	40	m

raised 10° (2-part line only)

2000	1850	1600	1200	1000	kg
22.7	24.2	27.3	34.3	39.5	m

raised 15° (2-part line only) : 1000 kg constant**Jib folded: radius 27.5 m****2/4-part line**

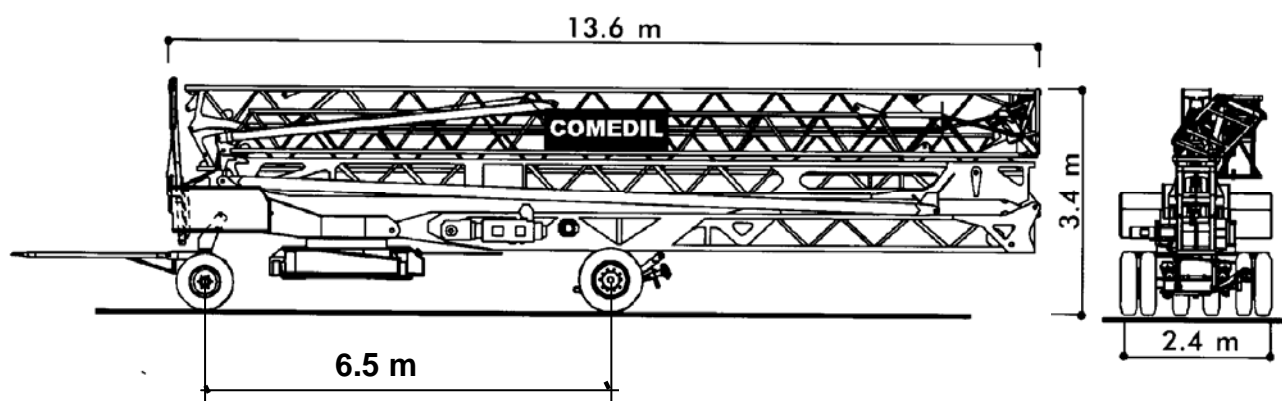
4000	3000	2500	2000	1850	kg
14.5	18.4	21.4	25.8	27.5	m

raised 10° (2-part line only)

2000	1850	kg
25.5	27.2	m

raised 15° (2-part line only): 1000 kg constant

movement	speed (m/min)	capacity (kg)	power (kW)
HOISTING	micro 6	2000	8.8
	slow 23	2000	
	fast 46	1000	
	micro 3	4000	8.8
	slow 11.5	4000	
	fast 23	2000	
TROLLEY TRAVERSING	16 / 46	4000/2000	3
SLEWING	0.3 - 0.9 rpm		1.1 (6 daNm)
ERECTION			2.2
Necessary electric power at 400 V - 50Hz			20
Ballast 25,680 kg		Crane weight	15,400 kg



1.3.4 OPERATING ENVIRONMENT

The recommended operating environment is the following:

temperature	- 5 to 40 °C
maximum relative humidity	90%
maximum wind speed:	
• in operation	72 km/h
• during erection	30 km /h
• out of service	102 km/h on the ground 151 km/h above 20 m in height

1.3.5 PERMITTED MOVEMENTS AND THEIR SIMULTANEITY

The crane has the following working movements:

- Hoisting with three speeds
- Slewing with two speeds
- Trolley traversing with two speeds

CAUTION: *The working movements can be performed simultaneously provided they are not started or stopped at the same time.*

1.3.6 POSSIBILITY OF INTERFERENCE WITH OTHER EQUIPMENT OR FIXED OBSTACLES

Crane installation is not permissible if there are any of the following conditions:

- interference of the revolving part with any fixed or movable obstacle that may be in the crane's range of action.
- interference between the ropes, hoisting accessories and loads with other cranes nearby.
- vicinity of an electric power line, if the minimum distance between the most protruding rotating part of the crane, including the load, and the nearest cable of the line is 5 m (Italian Presidential Decree DPR No. 164/56 art.11). Contact the electricity company to check the required safety distance for the power of the line.

1.3.7 CONTROL STATION

The control station must be on the ground or at a point on the construction judged by the operator to be suitable.

It is not permissible for the operator or anyone else to be in the area covered by the rotation of the platform that must be made off limits by setting up appropriate barriers (see point 2.1.9).

1.3.8 OPERATIONAL CONTROL

The operator must always have a direct view of both the load, from gripping to depositing, and the sling.

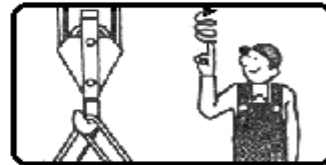
In addition, all the movable parts of the equipment must be visible.

If the load is not visible, the operator must receive the operating instructions from an appointed person trained for this function who can see the load. The signals used must be known to both operators; for this purpose it is advisable to use the signals illustrated here.

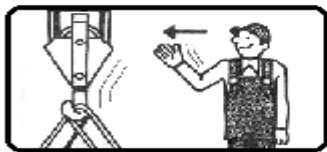
It is recommended to precede the start of operations with an audible warning.



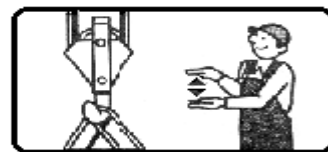
LANDING: balancing and tensioning of ties



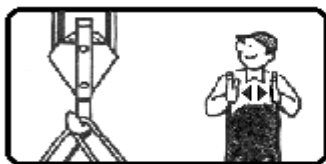
LIFTING: upward movement of the hand in the direction of the spiral



TRAVELLING: movement of the arm in the desired travelling direction



MINIMAL LOWERING OR LIFTING: upward-downward vertical movements of the hands according to the required operation



POSITIONING: horizontal movement of both hands corresponding to the required displacement



LOWERING: downward movement of the arm towards the ground



STOP: horizontal movement of the arm at chest level



EMERGENCY STOP: double horizontal movement of the arm at chest level

1.3.9 CONTROL ELEMENTS

1.3.9.1 Pushbutton panel with cable

The pushbutton panel is equipped with recessed operating buttons bearing the symbol of the control and an emergency (mushroom-head) button, equipped with an automatic shutdown and reset device with intentional operation.

NOTE: *The crane can also be operated with a radio-controlled pushbutton panel or manipulator.*

1.3.9.2 Main switch

The main switch is used to cut off power to the equipment for maintenance work: the control knob is on the outside of the electric box.
In case of danger the main switch can also be used as an emergency stop.

WARNING: *To cut off the electric power supply to the crane completely, you need to extract the plug from the socket on the fixed undercarriage or cut off the power supply to the site's distribution board.*

1.3.10 OPERATING MODE SELECTORS

The crane is equipped with an operating mode selector located inside the electric box.

The selector can only be operated when the box is open, therefore with the machine stationary and the components not powered.

Work/erection selector: sets the electrical equipment in the required modes during work or erection and activates the safety devices necessary for these two operations.

1.3.11 STOPPING MOVEMENTS

The movements are intentionally stopped by releasing the respective control buttons or operating the emergency stops.

The up and down movements and the movements of trolley traversing and slewing are progressively stopped in a preset time controlled by an inverter; the mechanical brake only triggers after the movement has stopped.

Erection is stopped by a check valve (on the tower opening piston and on the jib opening piston) that prevents the oil from flowing out.

The crane is equipped with two emergency stops: one on the pushbutton panel and the other on the electric box.

The emergency stop applies the mechanical brakes immediately, considerably reducing the time for stopping the movements.

CAUTION: *Since shorter stopping times generate dynamic overstresses in the structures, the emergency stop must only be used in situations of danger.*

1.3.12 CHARACTERISTICS OF PERMISSIBLE LOADS

The crane is suited for hoisting unit loads, equipped with specific hooking devices. Loose or bulk materials must be contained in specific containers preventing them from accidentally falling.

It is prohibited to handle loads whose chemical or physical characteristics classify them as hazardous.

The permissible surface area exposed to the wind for the hoisted load is **4.0 m²**. Payload means anything hanging from the hook of the hoisting block assembly.

1.3.13 PERMISSIBLE HOISTING ACCESSORIES

The hoisting accessories must have a suitable capacity for the extent of the loads to hoist.

Hoisting accessories that are simply, in a passive manner, placed between the hook and the load are generally permissible, such as for example: manual opening grabs, forks for pallets, baskets, etc.

Use must conform to the prescriptions provided by the manufacturer.

The weight of the accessories must be subtracted from the value of the crane's nominal capacity in order to determine the payload that can be hoisted.

Hoisting accessories are not permissible when they permit immediately releasing the load, are able to cause dynamic overstresses and accidental overloading, limit the free movement of the load, depend on manoeuvring cables, are equipped with their own motors, are self-loading, etc.

1.3.14 DECOMMISSIONING THE CRANE

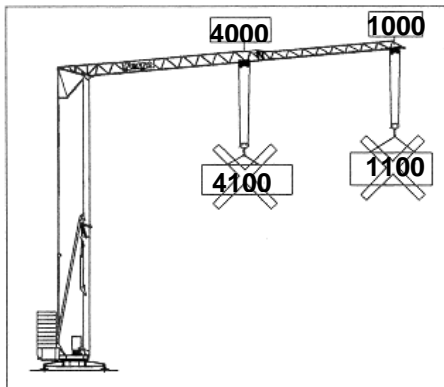
At the end of each work shift or when the wind exceeds 72 km/h it is mandatory to release the slewing brake so that the revolving part of the crane can turn freely with the wind without meeting any obstacles.

WARNING: *Leaving the slewing brake locked when there is a stormy wind puts the crane in danger of tipping over.*

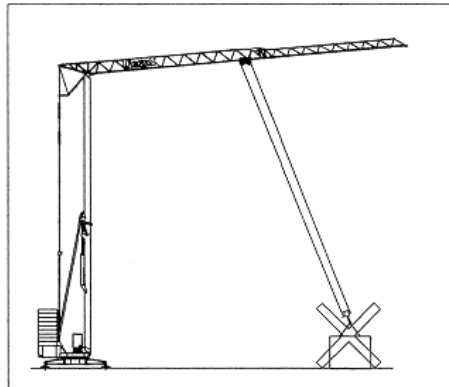
This should be done as indicated in point 3.4.3.

The electric power supply to the crane must be cut off.

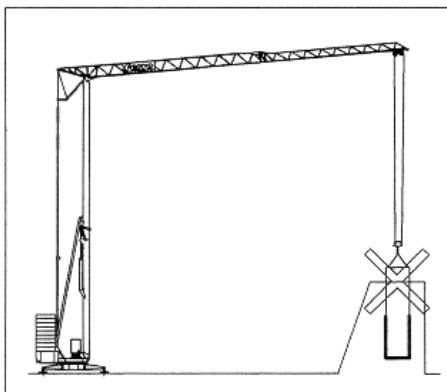
1.3.15 POTENTIAL NON-PERMISSIBLE USES OF THE CRANES (see attached diagrams)



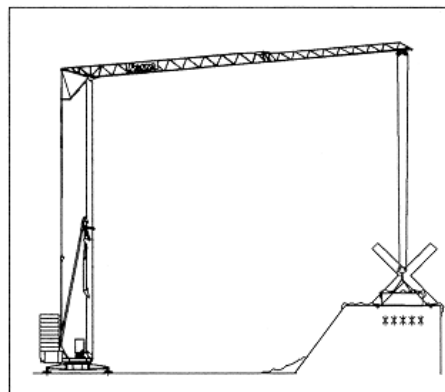
Do not hoist loads that exceed the crane's capacity.
Do not use "rapid" hoisting for loads greater than the permissible ones.



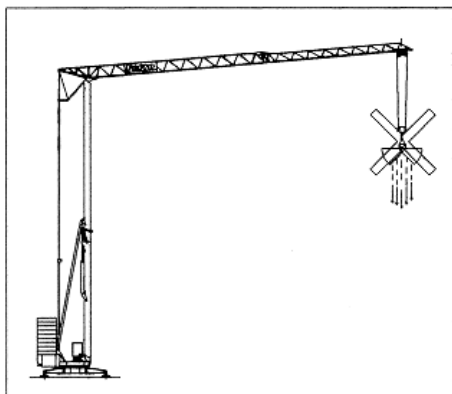
Do not hoist at an angle or tow the load.



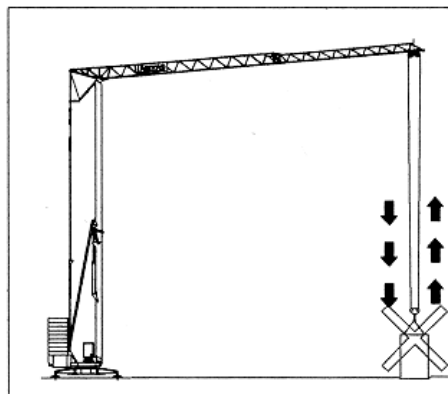
Do not hoist loads secured to the ground (uprooting trees, poles, dismantling items made of reinforced concrete, etc).



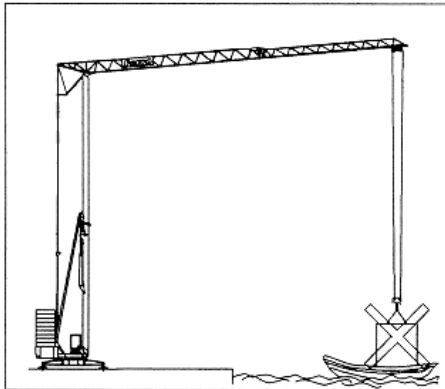
Do not hoist loads potentially anchored to the ground by frost.



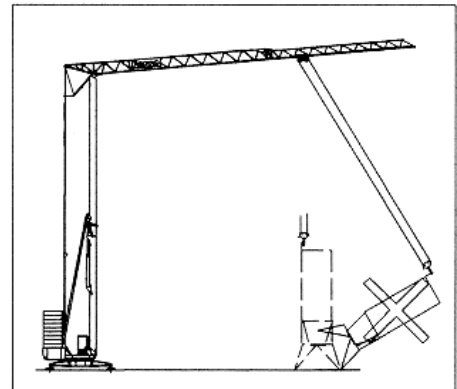
Do not suddenly drop the load (with accessories permitting instant release, by cutting the slinging, etc).



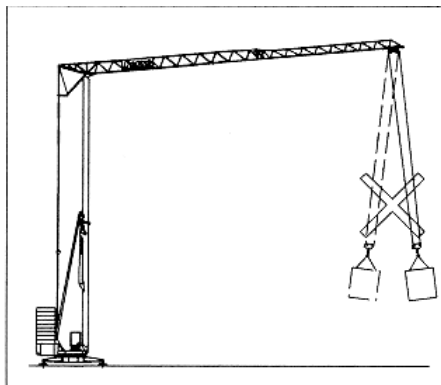
Do not sharply dump the load making it hit the ground at high speed.
Do not sharply hoist the load off the ground at high speed.



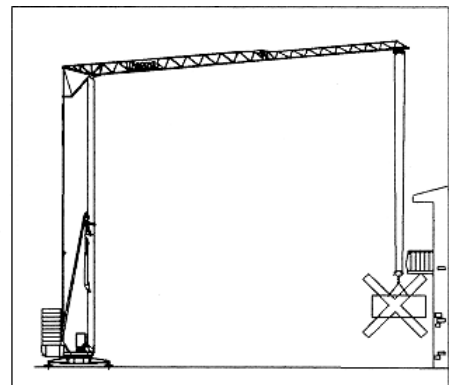
Do not lift the load off unstable supporting surfaces (dangerous scaffolding, watercraft etc).



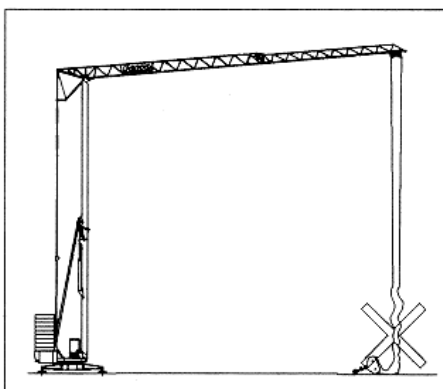
Do not lift loads hooked outside the axis of the centre of gravity when there may be tipping over or wild swinging of the load



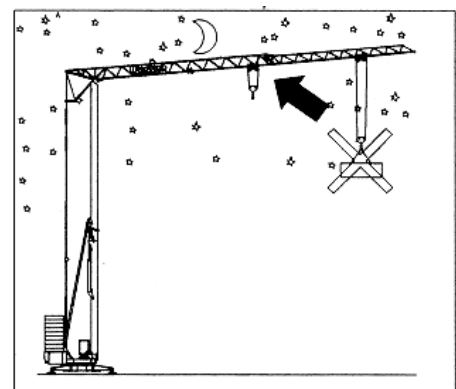
Do not swing a hanging load to deposit it outside the crane's range of action.



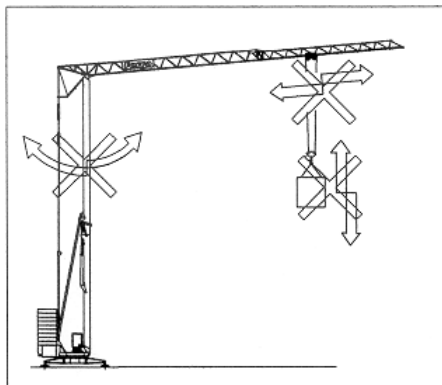
Do not make any up or down movements when there is a risk of getting entangled with obstacles of any nature.



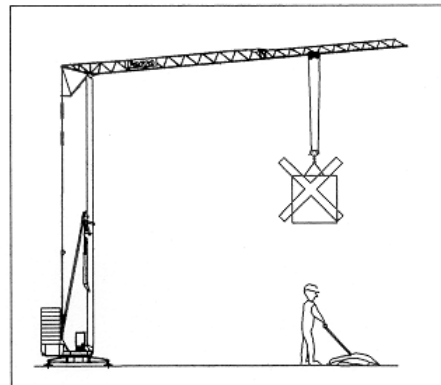
Do not rest the block on the ground.



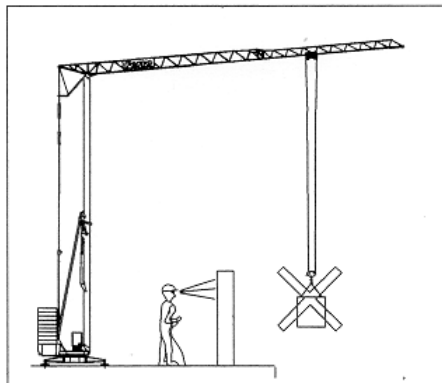
Do not leave any loads hanging when the crane is out of service.



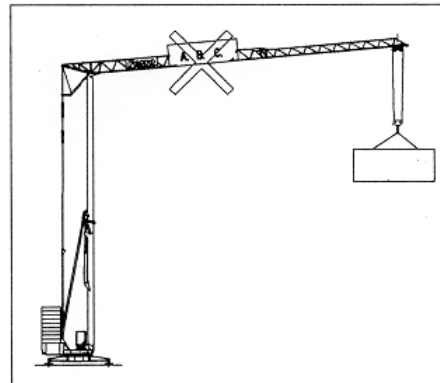
Do not use the counter-manoeuvre (do not start a manoeuvre if the dynamic effects of the opposite preceding manoeuvre have not ended).



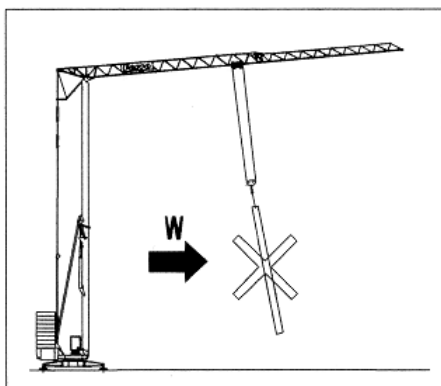
Do not pass the load over work areas or passageways.



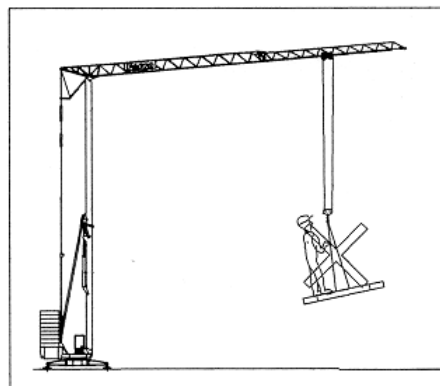
Do not make any manoeuvres with the load in a position where it is not visible.



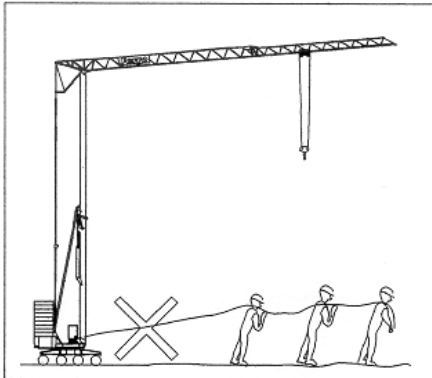
Do not affix on the equipment any banners, signs, or any other object not contemplated, such as to increase the surface area exposed to the wind.



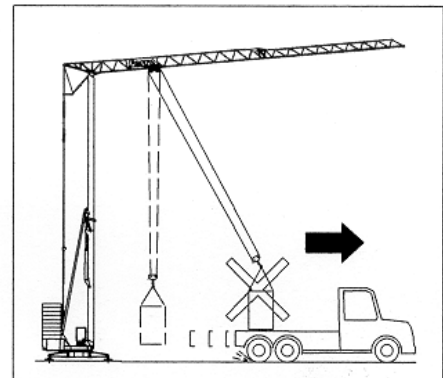
Do not hoist loads with a greater exposed surface area than permitted.



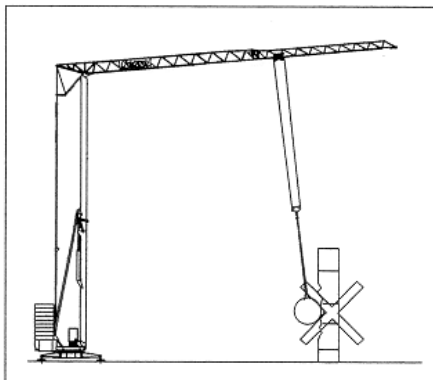
Do not lift any persons.



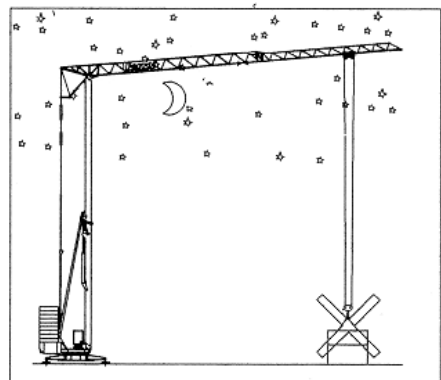
Never tow the crane (on rollers or the like) when erected (for working requirements in larger areas)



Do not unload from vehicles any weights greater than those permitted by utilizing the forward movement of the vehicle.



Do not use the crane for demolition in general.



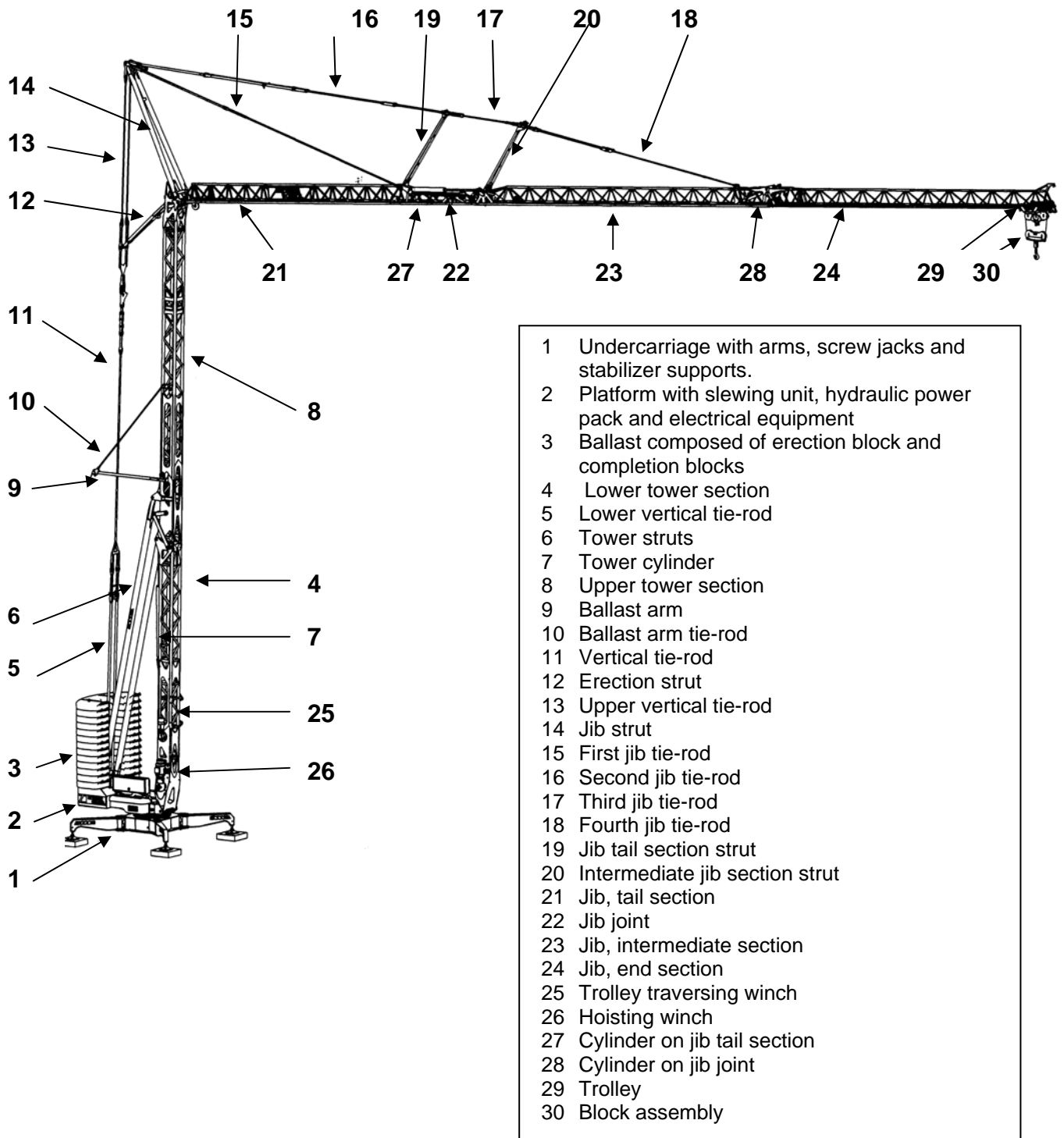
Do not leave the hook constrained to a weight resting or stuck on the ground when the crane is out of service.

- Do not use the limit switches as manoeuvring elements to systematically stop the load in set positions.
- Do not persist in hoisting loads very near to the maximum permissible loads if the limiters trip too frequently and too often.
- Do not use the stop button to stop the crane movements as common practice.
- Do not use the equipment if it is not fully efficient.
- Do not allow inexperienced personnel to use the crane.

1.4 TECHNICAL DESCRIPTION

1.4.1 MAIN COMPONENTS

The main components of the crane are listed and identified in the following diagram



1.4.2 DESCRIPTION OF THE STRUCTURE

The fixed undercarriage and revolving slewing platform are composed of electric welded plates and sections and are constrained together by the slewing ring. The surfaces are protected by painting composed of a rustproofing coat on which a coat of synthetic paint is applied.

The tower, with a square cross-section lattice, is composed of two elements hinged together. The top of the tower is hinged with the jib, with a triangular cross-section lattice, formed by square and round tubular sections and round drawn elements. The jib is supported by a system of tie-rods and struts fastened to the slewing platform. All these structures are protected by hot galvanization.

1.4.3 LOAD-HANDLING DEVICE

It is composed of a hook, type UNI ISO 4779 with a capacity of **4000** kg, connected to the block assembly by an eyebolt with a thrust bearing in between that enables slewing. The hook is equipped with a spring anti-unhooking device.

1.4.4 ROPE CHARACTERISTICS

The trolley traversing and hoisting ropes are made of galvanized steel and have the following specifications:

	HOISTING	TROLLEY
diameter (mm)	10	7
formation	168 (24 x 7)	114 + AT
unitary strength (daN/mm ²)	216	177
breaking strength (daN)	8,600	2,958
length (m)	170	77 + 101

The erection diagrams are shown on the following page.

1.4.4.1 Rope diagram

TROLLEY ROPE

HOISTING ROPE

**Rope
socket**

2-PART LINE

4-PART LINE

Hoisting rope drum

Trolley rope drum

1.4.5 MECHANISMS

1.4.5.1 Hoisting

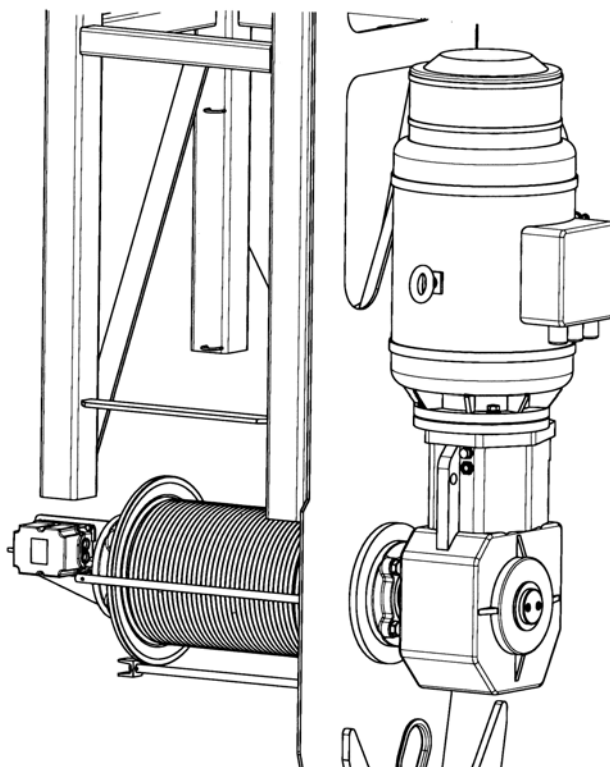
The hoisting winch is fitted on the lower tower section and comprises:

motor , three-phase, asynchronous, self-braking, 4 poles, 8.8 kW, with twin disc with two braking surfaces;

reduction gear, with orthogonal axes and cylindrical gears in cast-iron casing, with hollow shaft and flange at motor input and output shaft for drum, reduction ratio 1/30;

drum, grooved, pitch diam. 272 mm, flange diam. 350 mm, length 410 mm;

limit switch, up and down, coaxial with the drum, rotary type, ratio 1/200 with 2 electrical contacts normally closed and with positive opening.



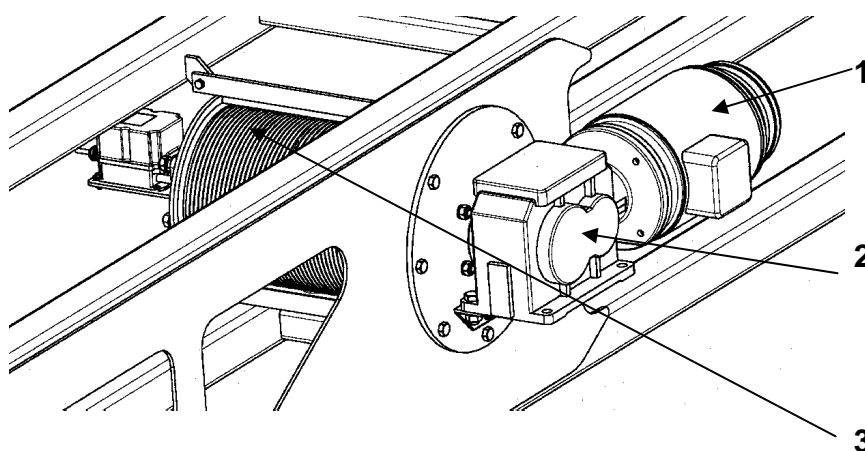
1.4.5.2 Trolley traversing

The trolley traversing winch is fitted on a frame bolted onto the jib structure and comprises:

Motor (1), three-phase, asynchronous, self-braking, 4 poles, 3 kW, with disc brake with two braking surfaces;

reduction gear (2), orthogonal with gears in cast-iron casing, with hollow shaft and flange at motor input and output shaft for drum, reduction ratio 1/41;

drum (3), grooved, pitch diameter 271 mm, flange diameter 300 mm, length 390 mm.

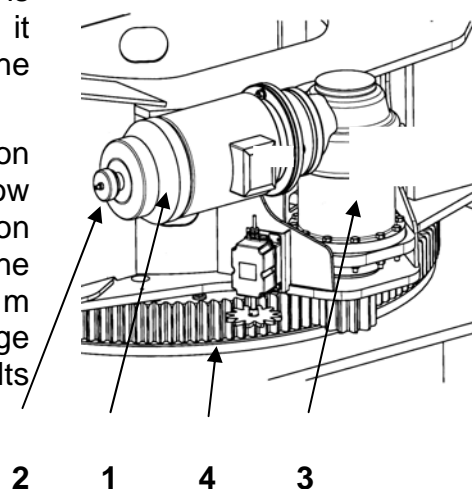


1.4.5.3 Slewing

The slewing unit is flanged onto the revolving slewing platform and comprises:

motor (1) three-phase, asynchronous, self-braking, 4 poles, 6 daNm, with disc brake with two braking surfaces; the brake is equipped with a release device, for taking it out of service that is operated by turning the knob (2) clockwise;

reduction gear (3), epicyclic in cast-iron casing, reduction ratio 1/151, with hollow shaft and flange at motor input; output pinion m 10 z 11 that engages directly with the **slewing ring (4)** with **two** turns of the balls m 10 z 136, bolted to the fixed undercarriage and to the slewing platform with 36+36 bolts M 22.



1.4.5.4 Erection

Erection of the crane is hydraulic; a power pack operates **3** cylinders that permit aligning (and folding) the towers and jib.

The **hydraulic power pack** is located on the revolving slewing platform and comprises:

motor , three-phase, asynchronous, 4 poles, 2.2 kW
2 gear pumps , delivery 2 and 4 l/min
reservoir 90 l with level indicator
3 control valves with 3 positions with solenoid valves
pressure relief valve set to approximately 300 bar
pressure gauge
hydraulic pipes , 5/16" type SAE 100 R7

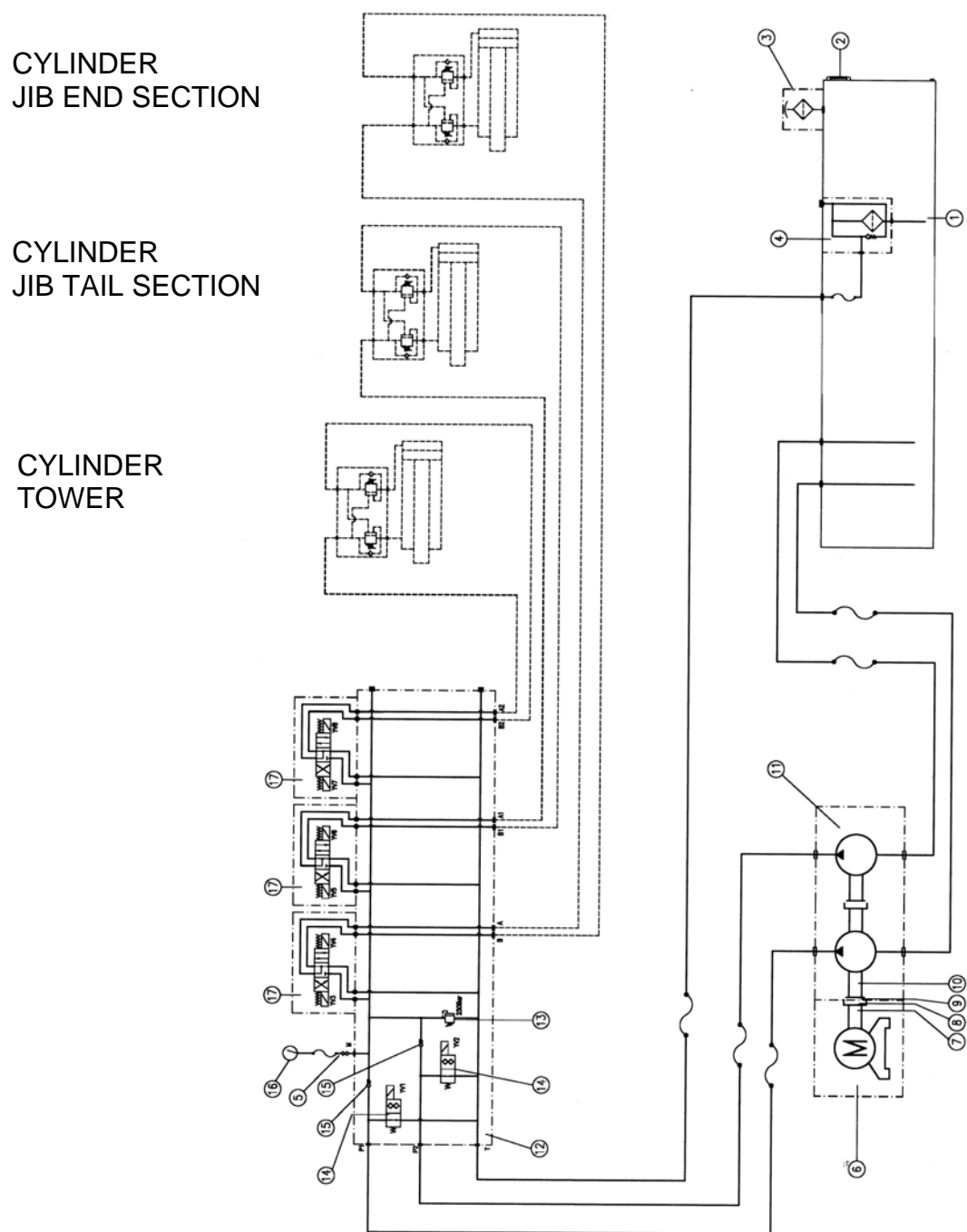
The tower cylinder, located on the lower tower section, is equipped with a flanged overcentre valve and has the following specifications:

stem diameter	130 mm
bore	220 mm
travel	2305 mm

The jib cylinders, governed by 2 control valves with 3 positions, are equipped with a flanged overcentre valve and have the following specifications:

	tail	end section
stem diameter	60 mm	45 mm
bore	130 mm	90 mm
travel	1407 mm	762 mm

1.4.6.1. HYDRAULIC DIAGRAM



1.4.7 PRECAUTIONS WHEN USING THE HYDRAULIC SYSTEM

Before setting the hydraulic system in operation it is necessary to check the fluid level with the level indicator plug on the power pack reservoir and, if necessary, top it up.

CAUTION: *An insufficient amount of oil in the reservoir can cause erection to stop and damage the pump of the hydraulic power pack.*

NOTICE: *If topping up is required, follow the instructions of point 4.1.6.*

The level varies according to the crane set-up.

In particular, the hydraulic fluid level is greatest when the crane is dismantled. In this condition the level must be visible through the level indicator plug on the reservoir.

Before doing any erection or dismantling, it is essential to fill all the system components (cylinders, valves, pipes) so that operation will be safe and proper

CAUTION: *Failure to observe this operation can produce sudden movements when folding the towers and damage the structures of the crane.*

To fill the system it is necessary to operate the opposite control (ERECTION before DISMANTLING, or vice versa) until the pressure shown on the pressure gauge reaches approximately 150 bar and then stop the operation.

It is now possible to perform the required operation of DISMANTLING or ERECTION.

1.4.8 CONTROL ELEMENTS

1.4.8.1 Main switch

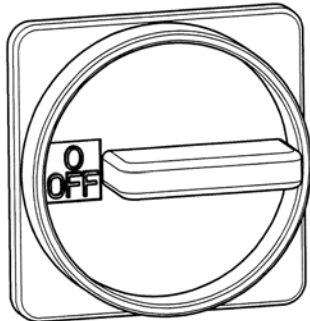
The main switch is inside the electric box and can be operated from the outside with a knob on the door.

It permits cutting off power to the equipment and to all the devices connected to it.

The switch has two positions, off-on, marked by the symbols “O” and “I”. It is possible to block the knob in the “off” position with a padlock.

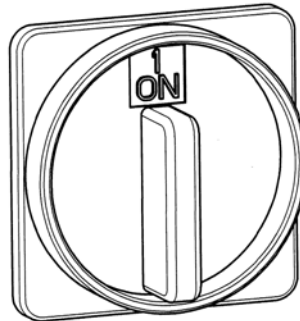
Opening and closing the door of the electrical equipment is only possible with the disconnecting switch on position “O”, therefore with the box switched off.

WARNING: *To cut off the electric power supply to the crane completely, you need to extract the plug from the socket on the fixed undercarriage or cut off the power supply to the site's distribution board.*



OFF

panel off



ON

panel on

1.4.8.2 Pushbutton panel

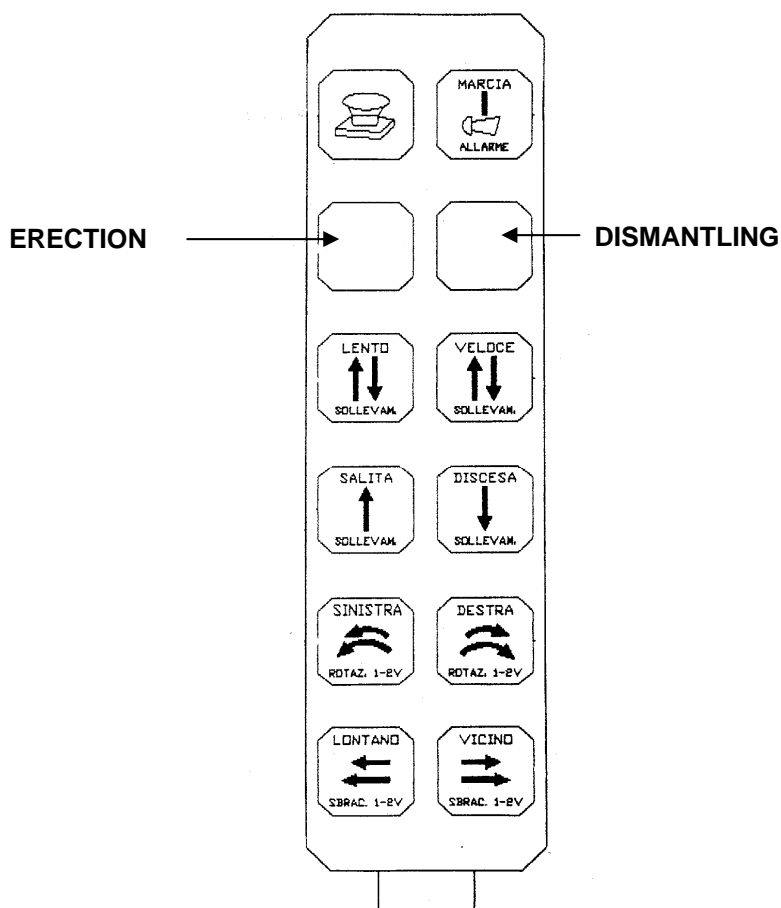
The pushbutton panel is equipped with a cable and plug and it can be connected either to the socket under the electric box or to the one on the fixed undercarriage.

The red mushroom-head STOP button must be turned clockwise to be released.

Simply pressing the green START / ALARM button enables all the movement controls and operates the audible warning.

Simply pressing the SLOW and RAPID buttons enables speeds II and III both UP and DOWN.

All the other buttons operate the corresponding movements and cause them to stop when they are released.



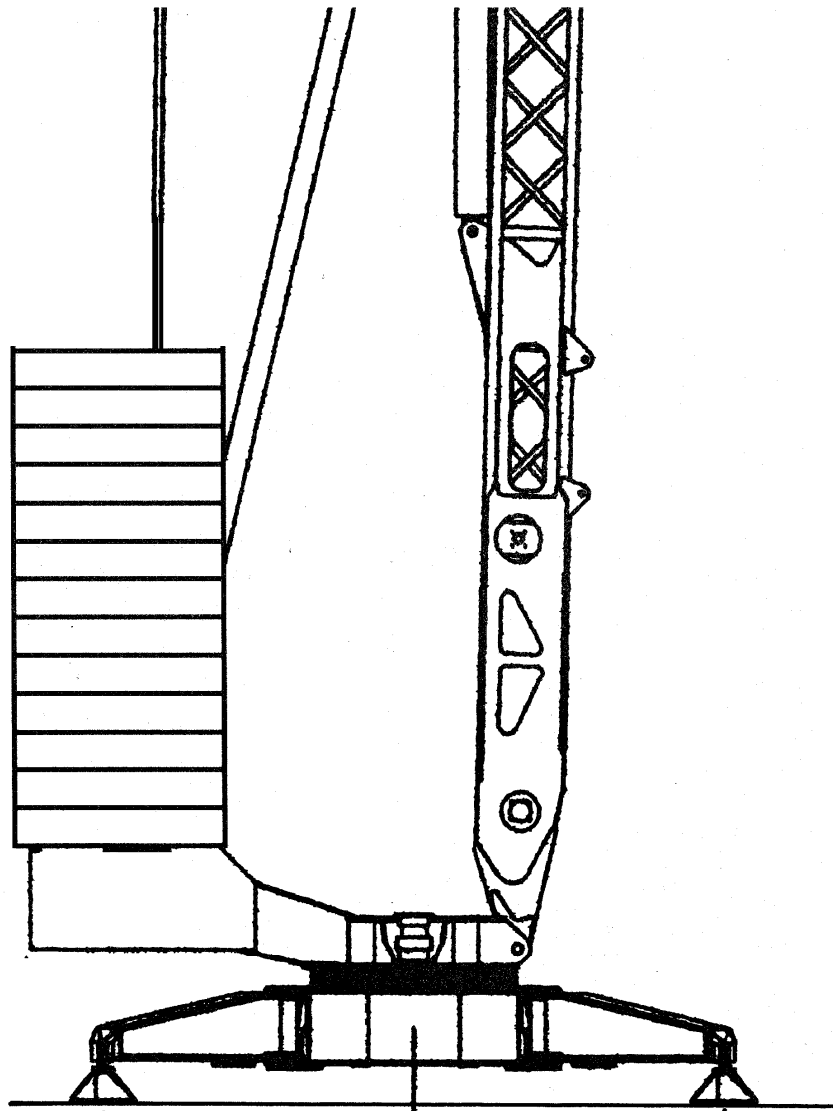
NOTICE: For easy reference, the crane's wiring diagram is included at the end of this manual; a copy of the diagram is located inside the electric box too.

1.4.9 COUNTERWEIGHT BALLAST

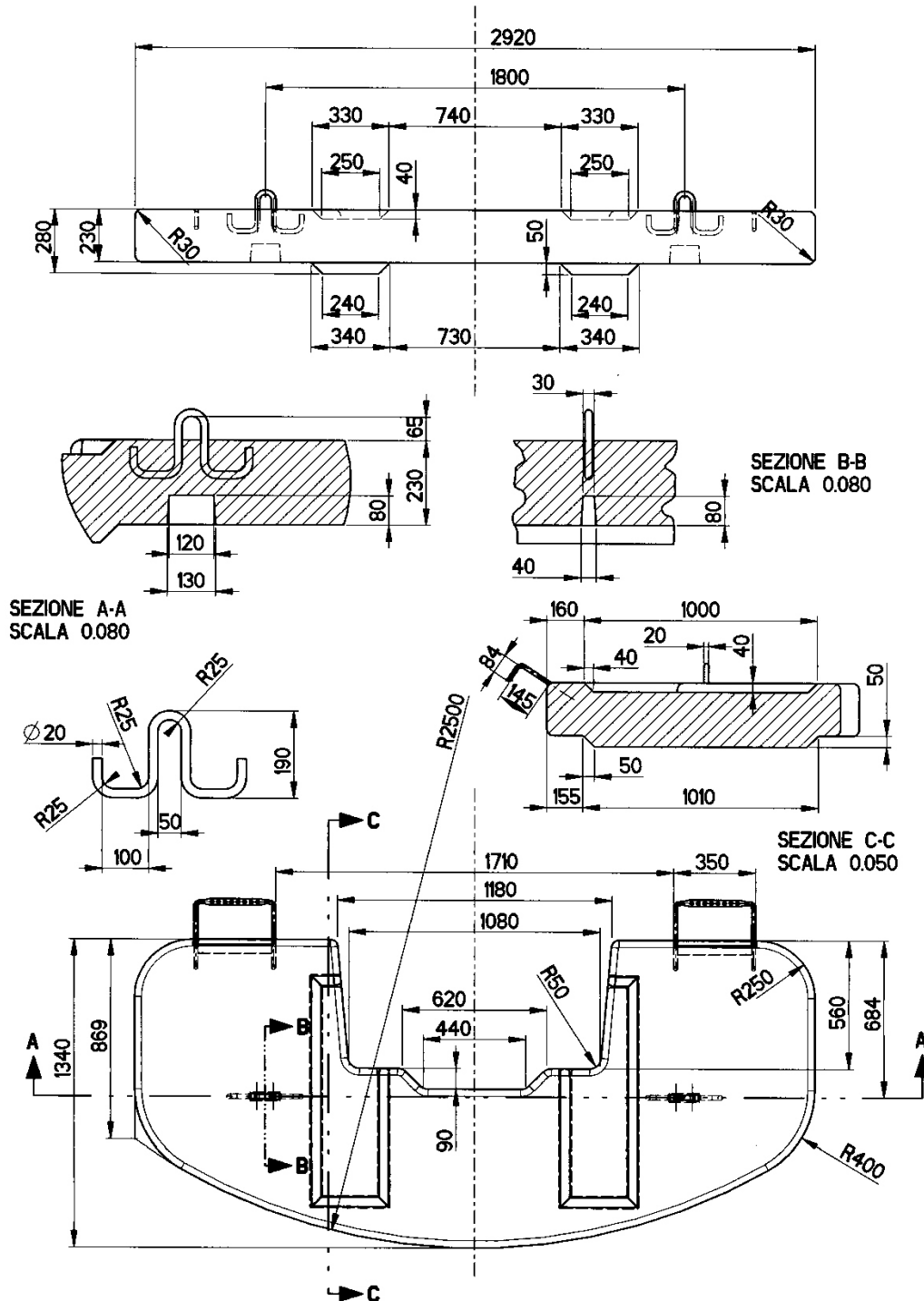
The counterweight ballast is composed of two erection blocks and **13** completion blocks.

The erection blocks are an integral part of the crane and remain in position during transport too.

The completion blocks are supplied and transported separately. They are composed of slabs of reinforced concrete weighing **1,550** kg each and they should be positioned after straightening the towers.



1.4.9.1 COMPLETION BLOCKS



Weight of block kg 1550 ± 30
Density 2450 kg/m³



TEREX | COMEDIL

Self-Erecting

Tower Crane

CBR 40H-4

REV.000-1

2

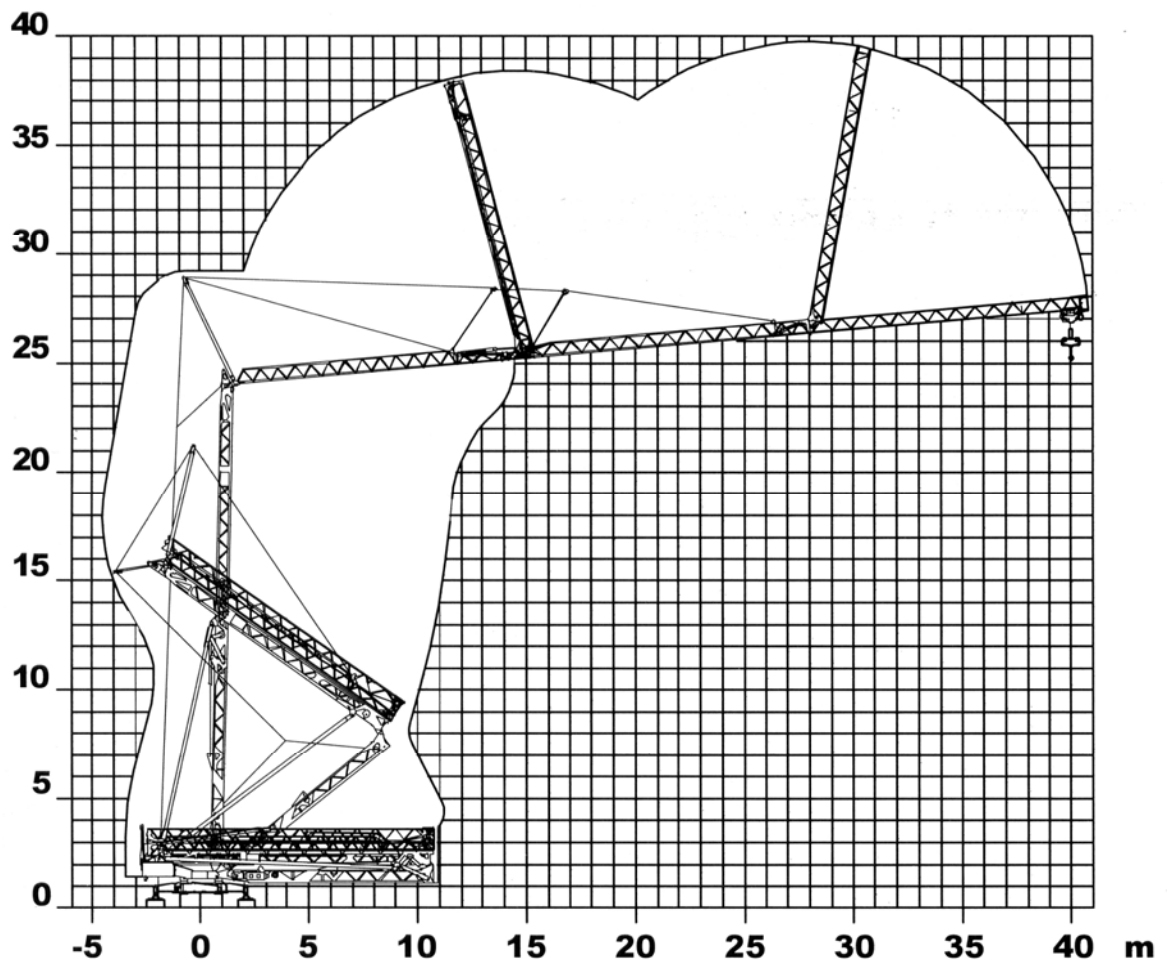
**- SITE PREPARATION
- TRANSPORTATION**

2.1 SITE PREPARATION

Site preparation is to be done and paid for by the user and it must be accomplished before the arrival of the crane.

2.1.1 ERECTION CLEARANCES

It is first of all necessary to make sure that the minimum clearance needed to erect and dismantle the crane is free from all obstructions.



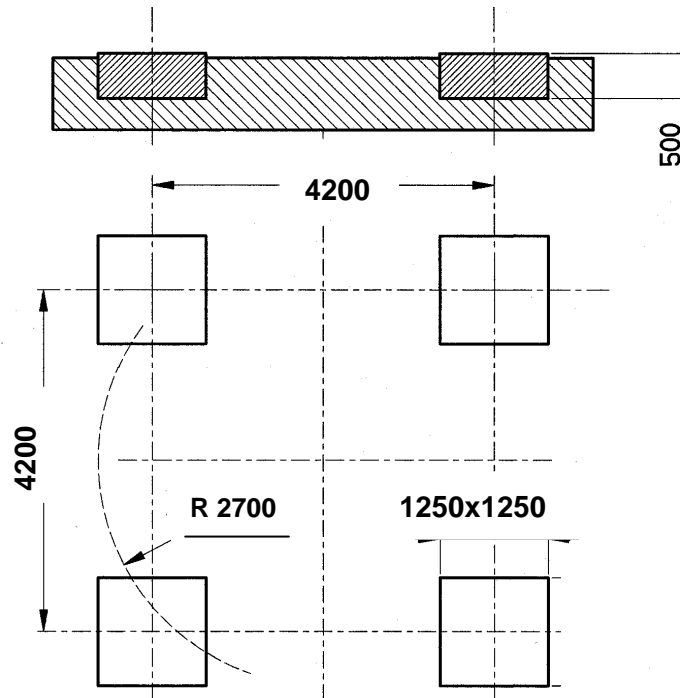
2.1.2 SUPPORTING BASE

Before the crane reaches the site it is necessary to prepare four supports on a base square as shown in the figure.

The supports must be composed of suitably reinforced plinths and of such dimensions as to be able to discharge the load transmitted by the stabilizers without yielding. It is recommended to place 4 boards of hardwood between the crane stabilizers and the plinths; approximate dimensions in cm: 50x50x15.

The maximum load on each support is **29,500 daN** (approximately 30,000 kg). The plinths must be positioned at such a distance from the excavations as to ensure that the load on the supports causes no subsidence of the ground even in the event of long periods of rain.

The dimensions given on the drawing are by way of example and produce a unit load on the ground of approximately 2 kg/cm². If the ground is not so strong it will be necessary to increase the dimensions appropriately.



2.1.3 ELECTRICAL CONNECTION

The electrical connection must be made by accredited personnel and must be in conformity with current standards.

Ahead of the supply cable there must be a residual current device of class A gauge 32 A with miniature circuit breakers with a C-type tripping curve.

voltage	400 V \pm 6% three-phase 50 Hz
required power	20 kVA
short-circuit current	\leq 10 kA
socket	32 A
supply cable:	minimum degree of insulation 07 minimum cross-section 6 mm ² (e.g.: H07 VVF - 4G6)

NOTICE: The cross-section of the cable must be such as to ensure that the voltage to the crane's box never, not even for a moment and even in the harshest conditions of service, falls under 360 V. If this is not so, it will be necessary to increase the cable cross-section appropriately.

2.1.4 PROTECTION FROM ATMOSPHERIC DISCHARGE

The sizing, construction, testing and servicing of the systems protecting against atmospheric discharge must meet the prescriptions of the CEI 64-8 and CEI 81-1 standards.

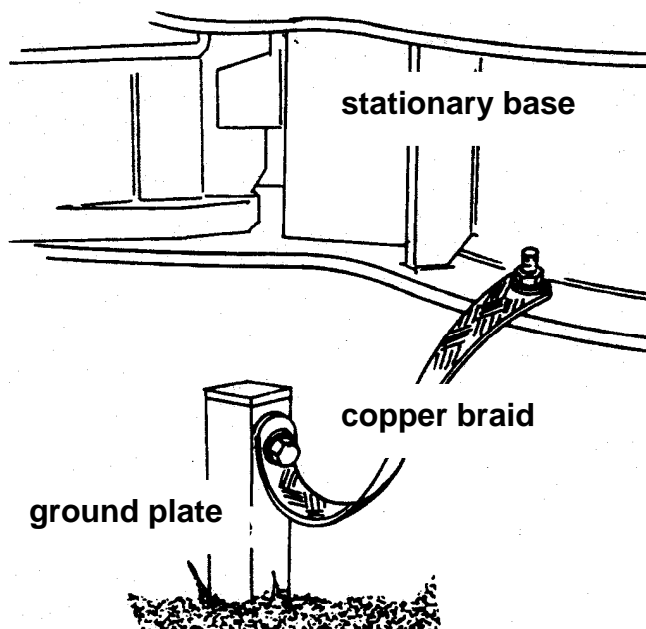
It is recommended to utilize qualified firms that can guarantee compliance of the system with the above or other standards or laws in force in the country where the crane is used.

2.1.5 GROUNDING SYSTEM

Installation of the crane on site must obligatorily include the system for grounding and protecting against atmospheric discharge in observance of the standards and laws in force in the country.

The structure of the crane must be grounded with copper braid of cross-section no less than 25 mm² connecting the prearranged point on the fixed undercarriage and equipped with a terminal with at least 2 ground plates (see figure).

The ground where the plate is fitted must not be made ground and must always be kept damp.



Crane grounding shall be in perfect working order also during crane erection and dismantling.

2.1.6 COUNTERWEIGHT BALLAST

The counterweight ballast, on the rotating undercarriage, is generally supplied with the crane; if you have any special requirements, you must contact **Comedil** directly.

When the crane arrives on site, make sure you have suitable equipment for lifting **1550 kg** (weight of each block).

2.1.7 TOWING VEHICLES

The user must have a self-propelled vehicle on site suitable for towing in order to move the crane into position. The weight of the vehicle must be at least equal to that of the crane. The hook must be suited to receive the eye of the crane's drawbar and made so as to prevent the pin from accidentally slipping out.

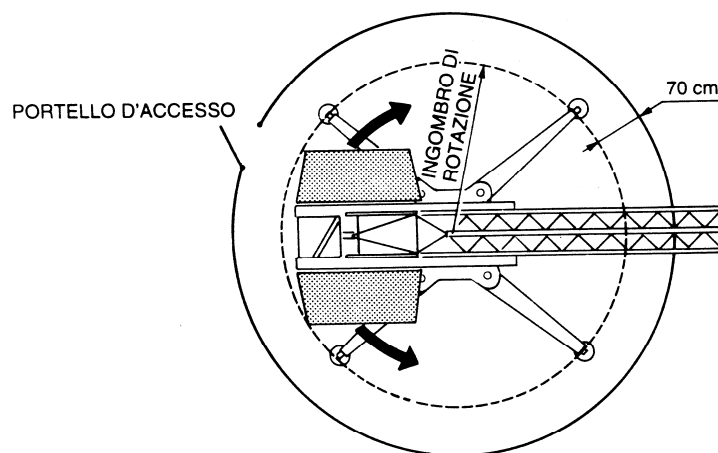
2.1.8 TEST LOADS

To check the setting and operation of the safety devices, the user must have the following loads on site, weighed beforehand together with any accessories (basket, fork, etc.):

- 1000 kg + 100 kg (40 m jib and raised jib)
- 1850 kg + 100 kg (27.5 m folded jib)
- 2000 kg + 100 kg (for 2-part line maximum load)
- 4000 kg + 200 kg (for 4-part line maximum load)

2.1.9 SLEWING AREA FENCING FOR THE CRANE

The entire area covered by the slewing of the crane's counterweight must be suitably separated by fencing equipped with a lock and key. This fencing must be at least 1 m high and at least 70 cm from the range of action of the most protruding portion of the counterweight as shown in the figure by way of example.



2.1.10 SAFETY SIGNS

The specific signs for the crane must be displayed on the site.
For example, these are some of the main signs to display:

- beware of hanging loads
- no entry (to be put up at the crane fencing entrance)
- no transiting or standing in the range of action of the crane
- no manoeuvring when the machine is being serviced
- no crane operation by unauthorized persons
- safety belts must be worn
- safety gloves must be worn
- hard hats must be worn
- safety footwear must be worn



2.2 INSTRUCTIONS FOR TOWING AND TRANSPORT

2.2.1 TOWING CONDITIONS

WARNING: *Towing the crane is only permissible on site with a self-propelled vehicle that is type-approved for towing a trailer of weight equal to or greater than that of the crane. Towing on roads is only permissible if the crane is equipped with type-approved braking system and lights.*

The axles have been sized to permit moving the crane with the erection ballast block only.

This travelling must take place on solid, firm ground at a maximum speed of **10 km/h** and with tyres inflated as directed in point 2.2.5.

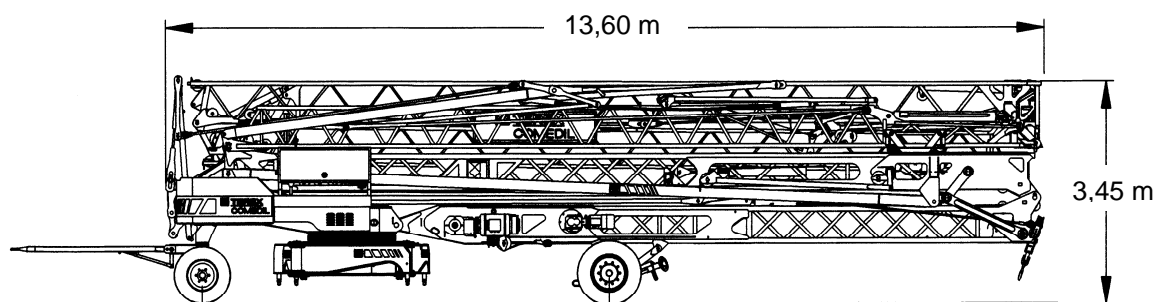
The maximum permissible gradients are 10% in the direction of travel and 5% sideways.

WARNING: *Travelling on broken ground or on higher gradients than as contemplated can cause the crane to tip over with severe consequences for the exposed persons and for the crane itself.*

The drawbar must be hooked onto the tractor so as to prevent the pin from accidentally slipping out.

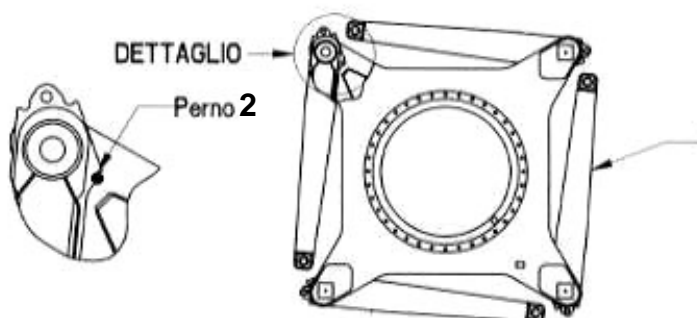
2.2.2 TOWING SET-UP

The figure shows the crane in its towing set-up with the relative clearances.



Before commencing towing, make sure that:

- the tyre pressure corresponds to the indications of the chart in point 2.2.5;
- the hoisting block assembly is suitably fastened;
- all parts that could move are secured in a safe and stable manner;
- the arms of the undercarriage (1) are folded and secured with the connecting pins 2 as shown in the detail of the figure.



2.2.3 DETACHED PARTS

The crane has no detached parts except for the ballast completion blocks (see point 1.4.9) and the axles whose mass is:

front axle	300 kg
rear axle	500 kg

2.2.4 PERMISSIBLE LOADS ON THE AXLES AND DRAWBAR

steering front axle	8,000 kg
rear axle	14,000 kg
max permissible draught on the drawbar	8,000 kg

2.2.5 TYRES

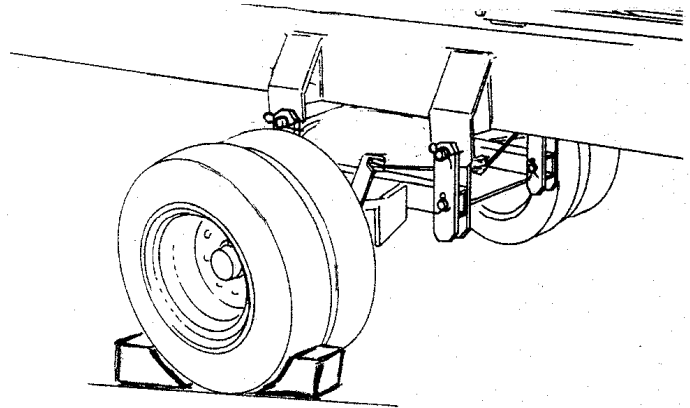
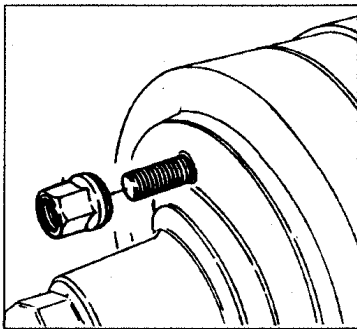
	STEERING AXLE	REAR AXLE
tyres	8.25 -15	8.25 -15
pressure	8 bar	8 bar
stud bolts	no. 6 M18x1.5	no. 6 M18x1.5
torque wrench setting	26 daN m	26 daN m

2.2.6 SPECIAL INSTRUCTIONS

The wheel fastening is shown in the figure and must always be done by placing the washer with the ball support in between towards the rim.

Before travelling each time it is advisable to check the tightness of the nuts and the pressure of the tyres. In addition, make sure that the pins are locked with split pins.

When the crane is parked it must be blocked with 4 wedges under the rear wheels. The wedges must be suitable for a wheel of diameter approximately 84 cm.



2.2.7 TOWING OPERATIONS NOT PERMITTED

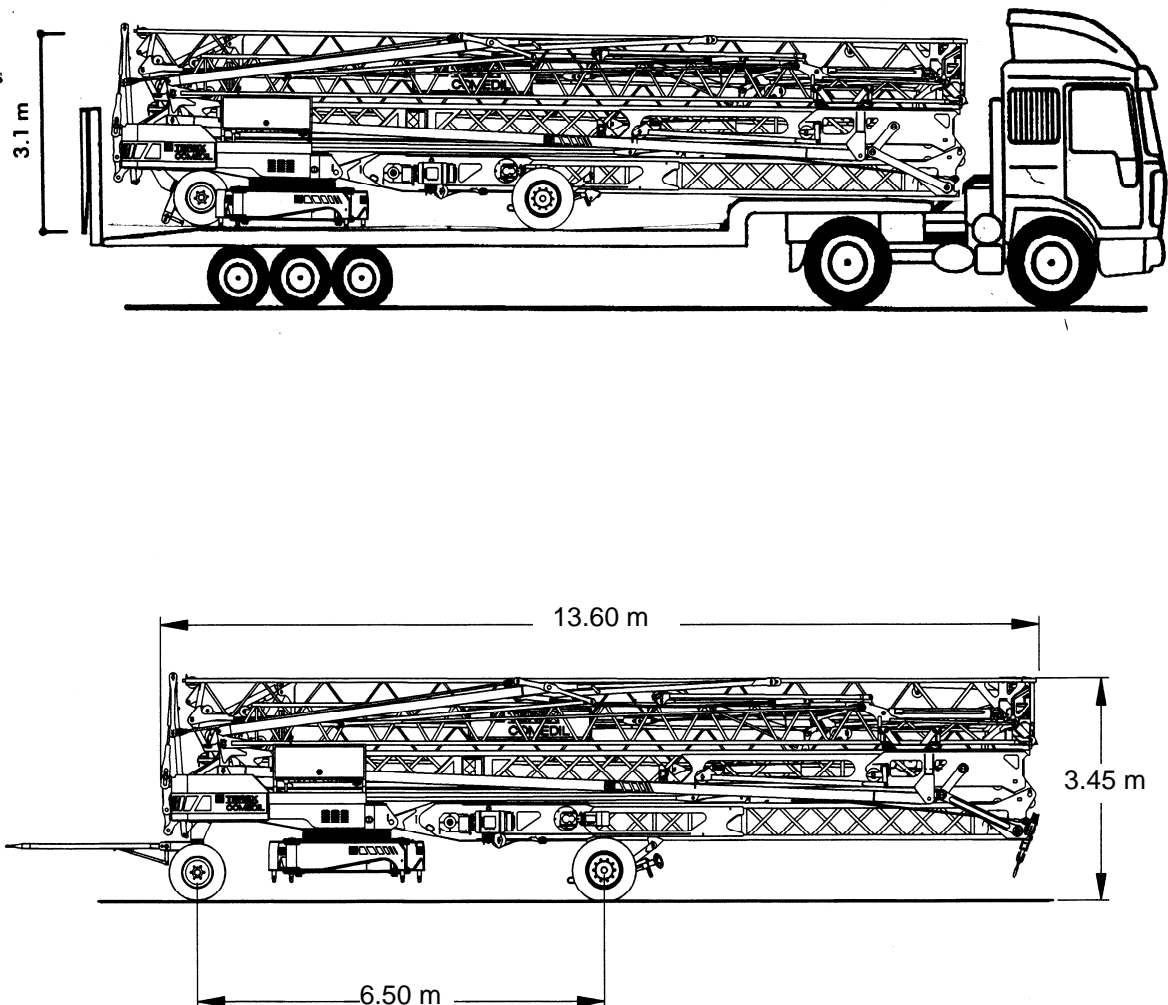
The following towing operations are definitely not permissible:

- towing with the wheels sunk in the ground
- towing the crane from points other than the drawbar
- towing with low tyre pressures
- towing the crane sideways
- towing by exerting a greater force than the permissible load on the drawbar
- towing with parts not securely fastened or potentially free to unhook
- towing with persons on the crane
- accompanying the crane by walking in hazardous zones
- towing the crane when it is not completely folded back into the towing position

2.2.8 TRANSPORT

The crane can be transported, dismantled, on a vehicle with a deck of suitable dimensions. The overall dimensions of the crane are given in the figure.

Loading and unloading the crane on and off the vehicle must be done by using the specific hooks on the crane with slings suited to withstand a balanced load of 22,000 kg or by using the vehicle's runways. In this case, with the aid of two hydraulic jacks, it is necessary to bring the axles back into the towing position by acting first underneath the rear axle and then under the front one in order to be able to fit the two pins back in their seats; the overall dimensions of the crane become as shown in the figure at the bottom.



2.3 STRUCTURES AND METHODS OF ACCESS

The crane is automatic and self-erecting, as a result all servicing operations are to be performed on the ground with the crane dismantled.

Climbing on the crane is not permitted.

In the event of special maintenance work on parts that are not accessible from the ground it is obligatory to use a suitable platform or extending scaffolding.

Access to the lower parts of the structure is never permitted with the crane in operation.

WARNING: *Standing in the area covered by the slewing of the ballast can be a serious danger for people due to the risk of getting crushed between the fixed undercarriage and the revolving part above.*

The revolving part must be separated as indicated in point 2.1.9.

Access is permitted for maintenance work in accordance with the indications of point 4.1.



TEREX | COMEDIL

Self-Erecting Tower Crane CBR 40H-4

REV.000-1

3

- ERECTION**
- OPERATION**
- DISMANTLING**

3.1 INSTRUCTIONS FOR POSITIONING AND ERECTION

The erection operations must be performed by specially trained personnel belonging to the **Comedil** After-Sales organization as prescribed in point 1.2.1.

Personnel assigned to erection must be equipped with at least the following personal protective equipment:

- hard hat
- safety gloves with five fingers
- safety footwear with non-slip soles made of insulating material
- clothes with no risk of entanglement

CAUTION: *Meticulously follow the instructions in the sequence specified in this manual.*

3.1.1 ELECTRICAL CONNECTION

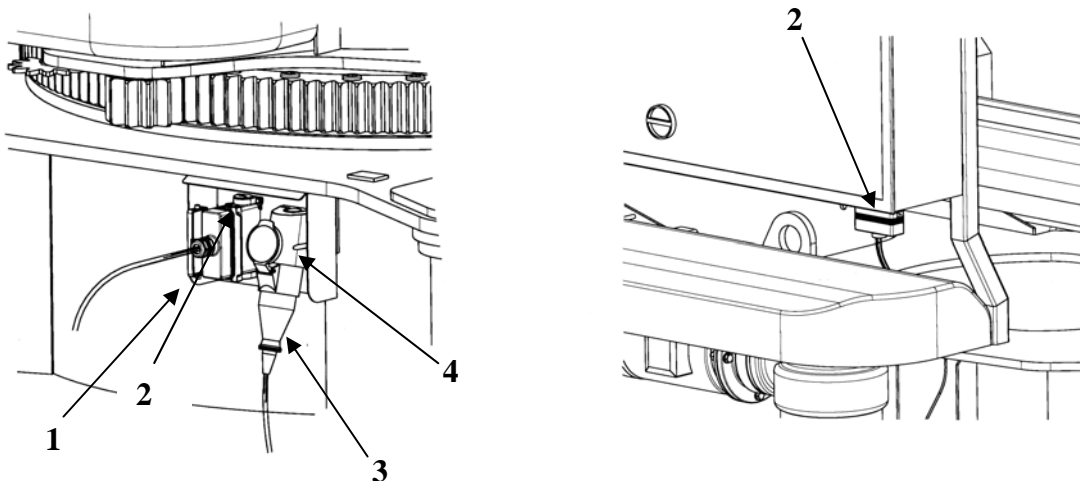
Make sure that the prescriptions of point 2.1. have been observed and there is the necessary clearance to erect the crane correctly (see 2.1.1).

Tow the crane on its wheels into the required position.

Make the ground connection as directed in point 2.1.5.

Make the electrical connection observing the instructions of point 2.1.3 and, using the trailing socket (3) supplied with the crane, connect to the plug (4) on the fixed undercarriage.

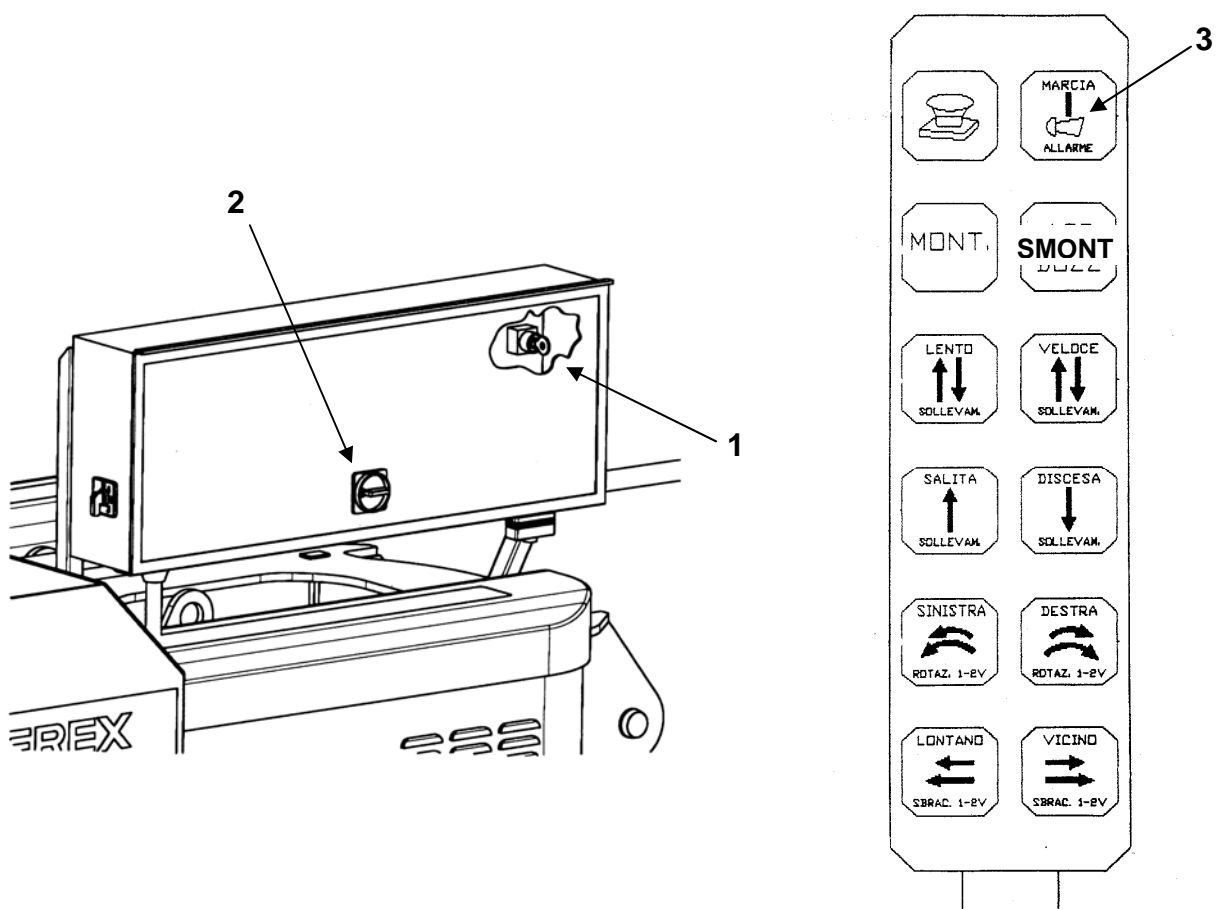
Connect the connector (1) of the pushbutton panel with the socket (2) on the fixed undercarriage or under the electric box.



Open the door of the electric box and turn the switch (1) onto the ERECTION position.

Close the door of the electric box and turn the main switch (2) onto "I".

Press the green START / ALARM button of the pushbutton panel (3): the sound of the horn warns of the activation of the electrical equipment and all the devices connected to it.



Press ERECTION and check that the hydraulic power pack motor fan (1) turns in the direction shown by the arrow.

If it is necessary to invert the phases, cut off power to the site's distribution board.

WARNING: Before operating on the supply circuit, cut off power with the residual current main switch of the site's distribution board.

Invert two phases in the socket of the crane's supply cable.

CAUTION: Operate solely on the supply cable without acting either on the electrical equipment connection or on the motor sockets.

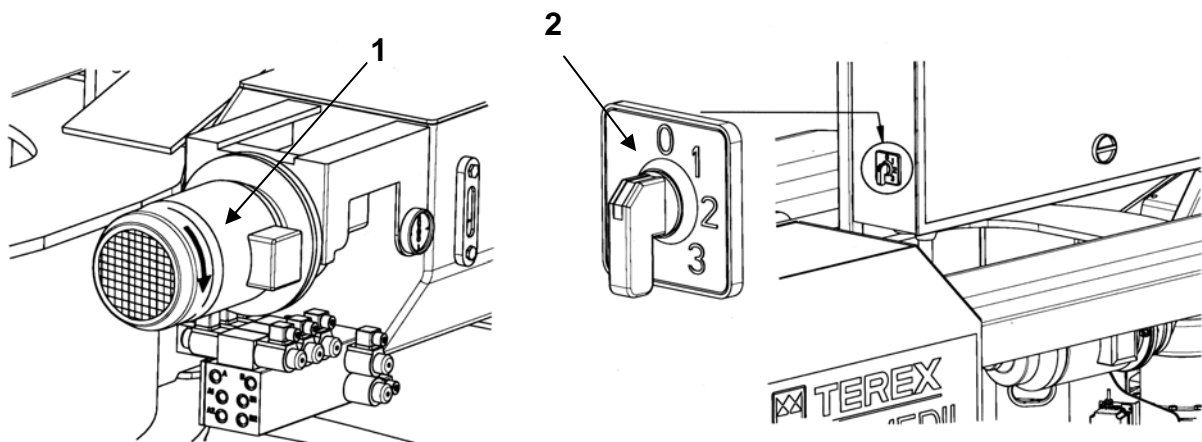
The erection movements are governed by hydraulic cylinders, one for the tower and two for the jib, supplied by the hydraulic power pack through control valves governed by solenoid valves.

The cylinders are operated one at a time; the enabling signal is given by the 4-position cylinder selector (2) on the right-hand side of the electric box.

In particular:	pos. 0	discharge oil
	pos. 1	tower cylinder
	pos. 2	jib intermediate section cylinder
	pos. 3	jib end section cylinder

The movements are controlled from the pushbutton panel (ERECTION and DISMANTLING button).

Before setting the hydraulic system in operation, check the fluid level with the gauge and, if necessary, top it up (see 1.4.7).



3.1.2 POSITIONING THE CRANE

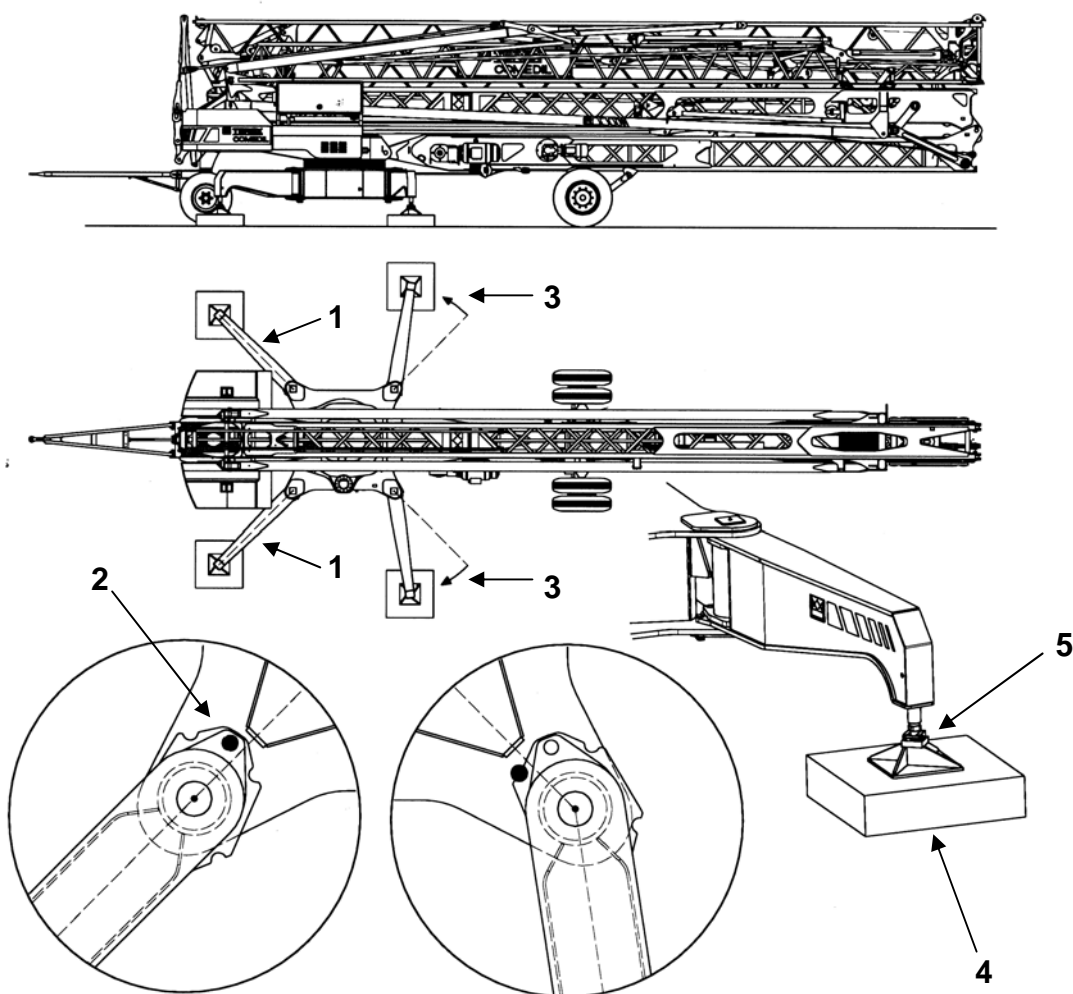
Open the two rear undercarriage arms (1), ballast side, and secure them in the working position with the pins (2).

Open the two front undercarriage arms (3), tower side, arranging them as shown in the figure.

NOTICE: To aid the operation of opening the supporting arms, operate *RIGHT* and *LEFT* slewing.

Position four hardwood boards (4) (see point 2.1.2) and hang the stabilizer supports (5) on the relevant screws.

Adjust the screws so that the supports are slightly raised off the boards.



Turn the cylinder selector knob onto position **1**.

Operate the **ERECTION** control until the front stabilizers are firmly resting on the wooden boards.

Level the undercarriage (check with a spirit level) crossways by adjusting the screw jacks.

Continue the movement until the wheels are discharged.

Remove the split pins from the axle pins (1) and remove the pins joining it to the slewing platform.

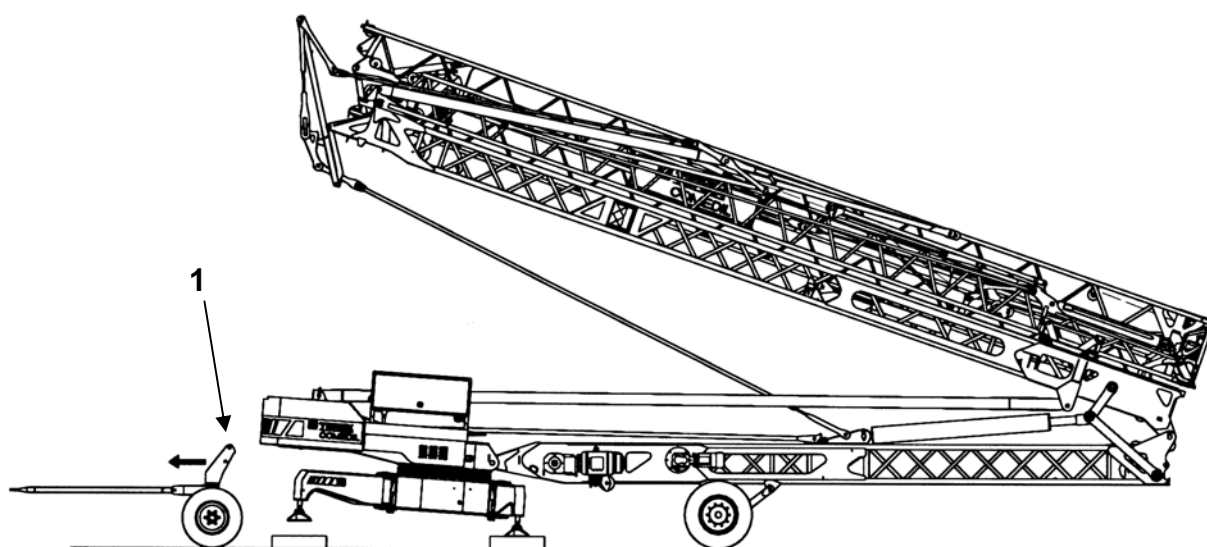
Fit the split pins back on the pins and take the axle out of the range of action of the crane; to aid this operation and prevent the axle tipping over, support it with the drawbar made integral with the axle by means of a specific pin.

Operate the **DISMANTLING** control until the undercarriage reaches the horizontal position.

Adjust the stabilizers to load the rear supports.

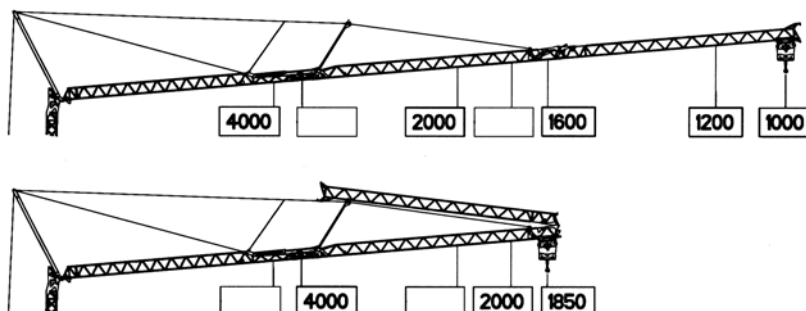
Discharge and turn the two front supports into the working position securing them with the pin.

Operate the **ERECTION** to make the front stabilizers rest on the wooden boards, checking the level lengthways and correcting it, if necessary, with the screw jacks.



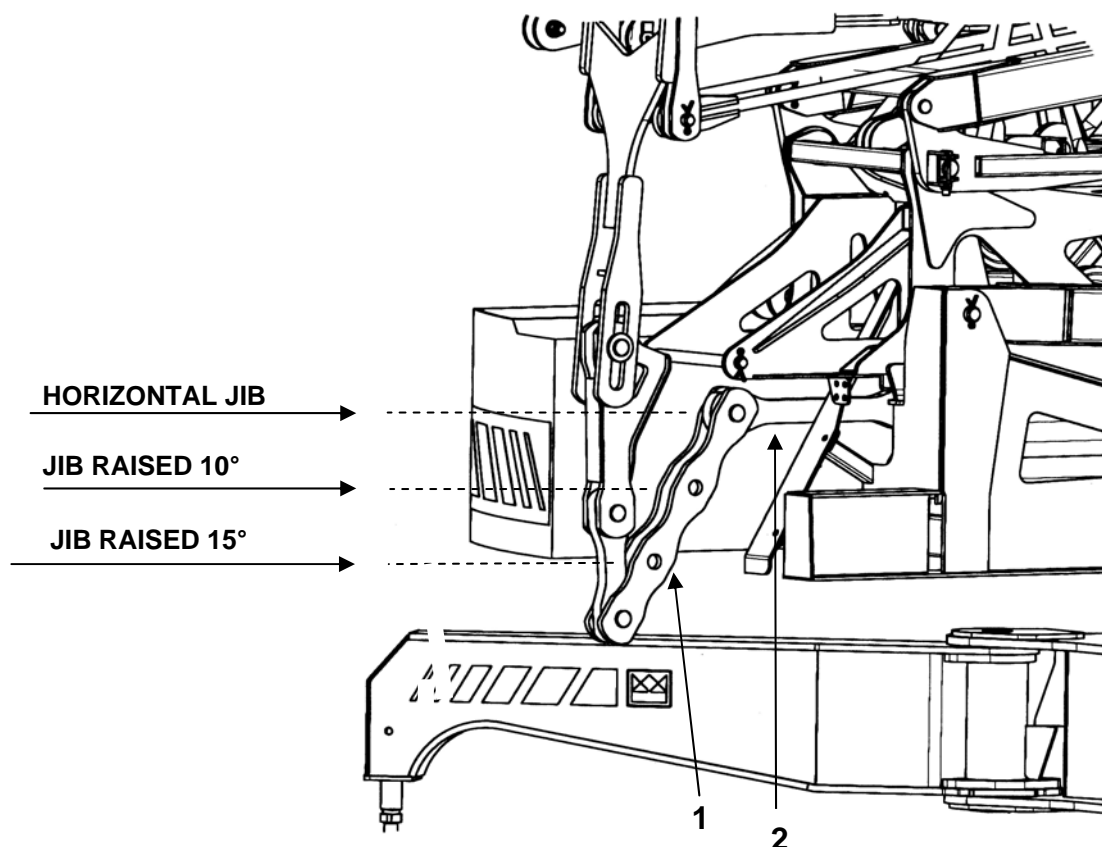
3.1.3 PREPARING THE JIB

Before proceeding with erection, make sure that the rear tie-rod and the capacity signs are ready for the required set-up.



The crane can also work with the jib raised by 10° or 15° and/or folded back as indicated in point 1.3.3 "Range of Set-Ups."

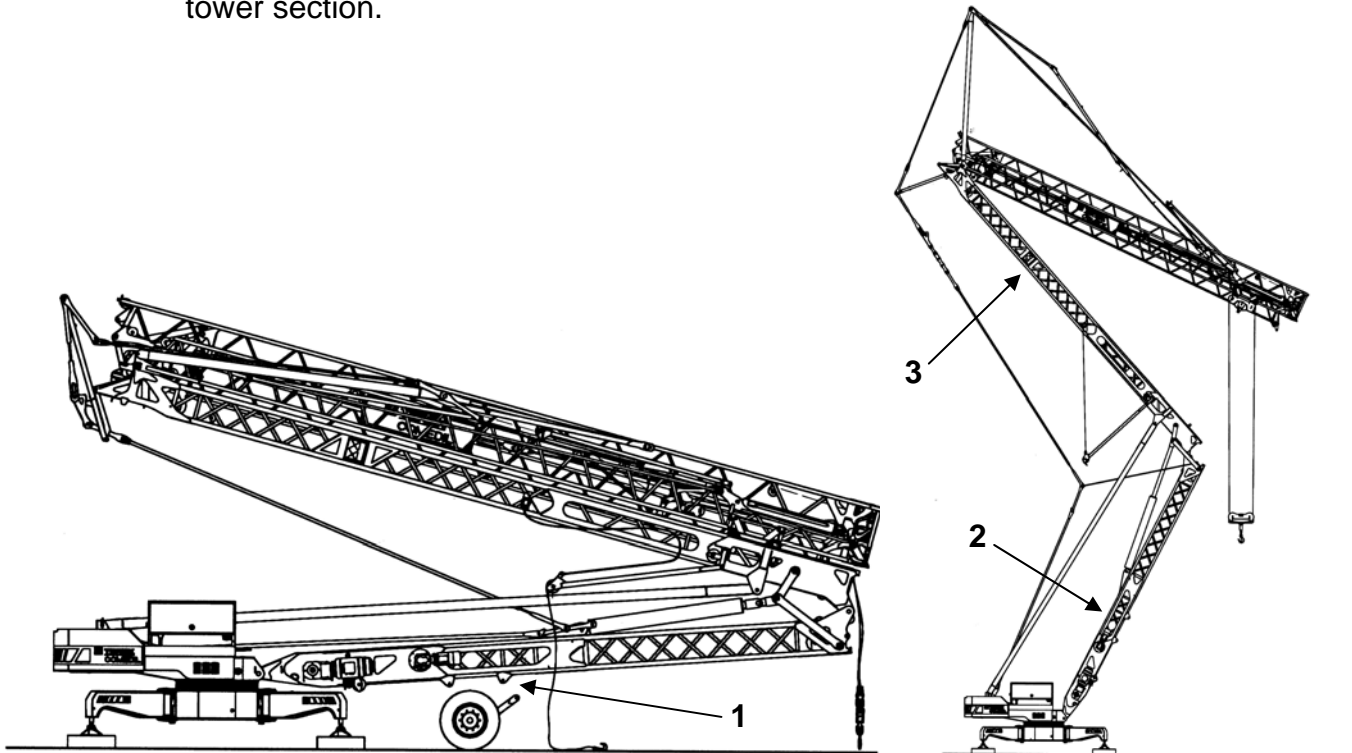
The various set-ups are obtained by changing the pivot point between the vertical tie-rod with three holes (1) and tie-rod (2)



3.1.4 TOWER ERECTION

Continue with ERECTION checking that the pressure on the gauge does not exceed 270 bar.

When the rear axle loses its load, remove the pins (1) securing it to the lower tower section.



Continue operation until the lower tower section (2) and the upper tower section (3) are aligned with each other and vertical.

During this phase of erection, make sure that the hoisting rope and the block assembly do not get entangled with anything.

Stop the operation when the pressure has risen to 120 bar.

WARNING: Do not erect the towers if the wind speed is greater than 30 km/h.

NOTICE: The movement of the trolley, first forwards and then backwards during erection is entirely natural and must not be changed by pressing NEAR or DISTANT.

WARNING: In this condition, with the erection ballast only, the crane cannot be used to hoist loads nor be left out of service because of the risk of tipping over. If it is not planned to complete ballasting within the work shift, the towers must be folded back into the transport position

3.1.5 BALLASTING

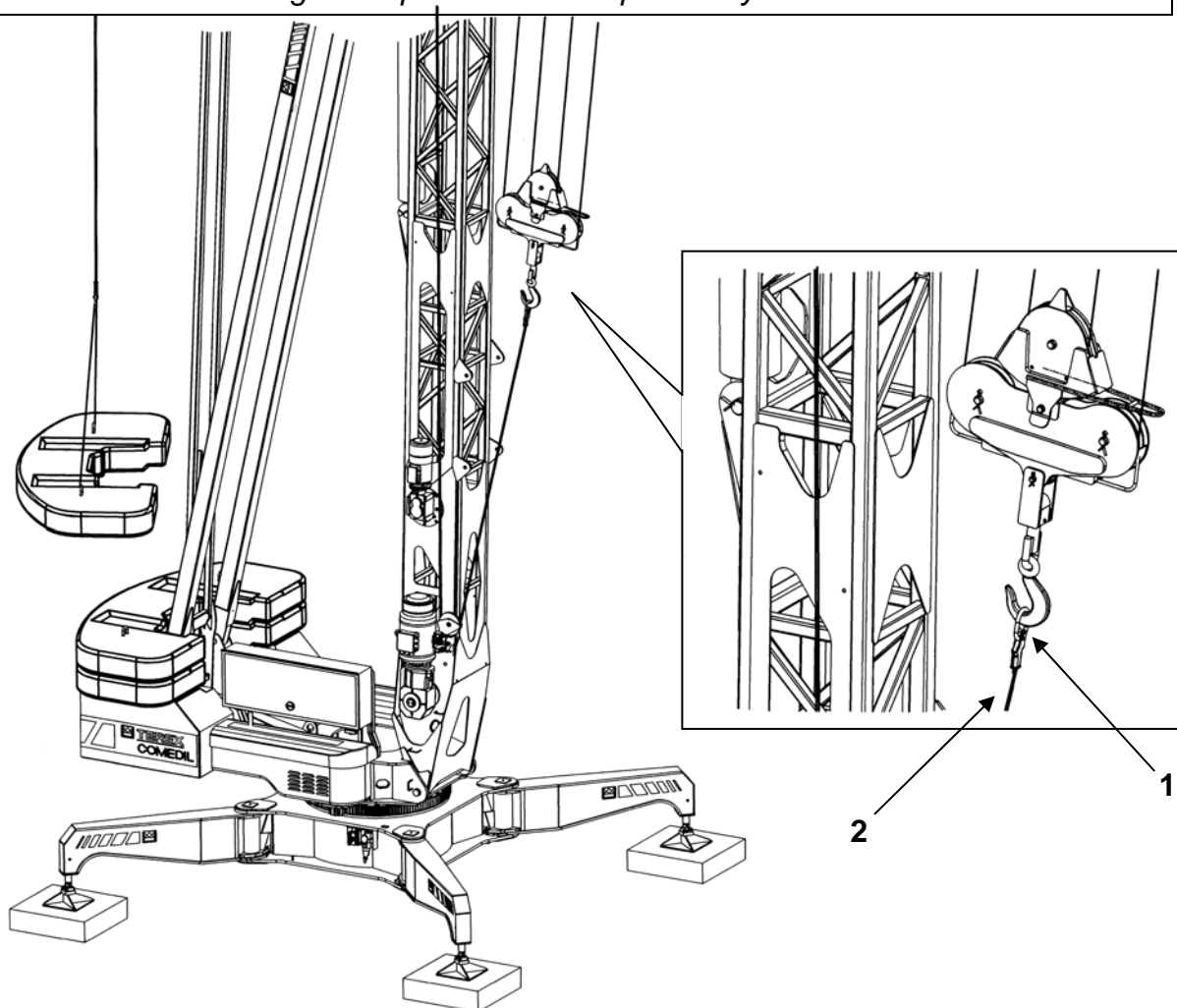
Before carrying out any other operations, it is necessary to complete the crane ballasting. Here we describe the operation of using the self-ballasting device (**DAZ**) supplied as an option with the crane.

If there is no **DAZ** it is necessary to use lifting equipment (crane truck, fork-lift truck, etc.) with a capacity greater than the weight of each block.

Take the trolley to approximately 3-4 m from the tower and lower the block assembly until it can be connected with the ring (1) at the end of the load rope (2).

By operating the UP and DOWN movements, load all the required blocks, taking care that they get properly positioned and no sand or stones get in between the blocks.

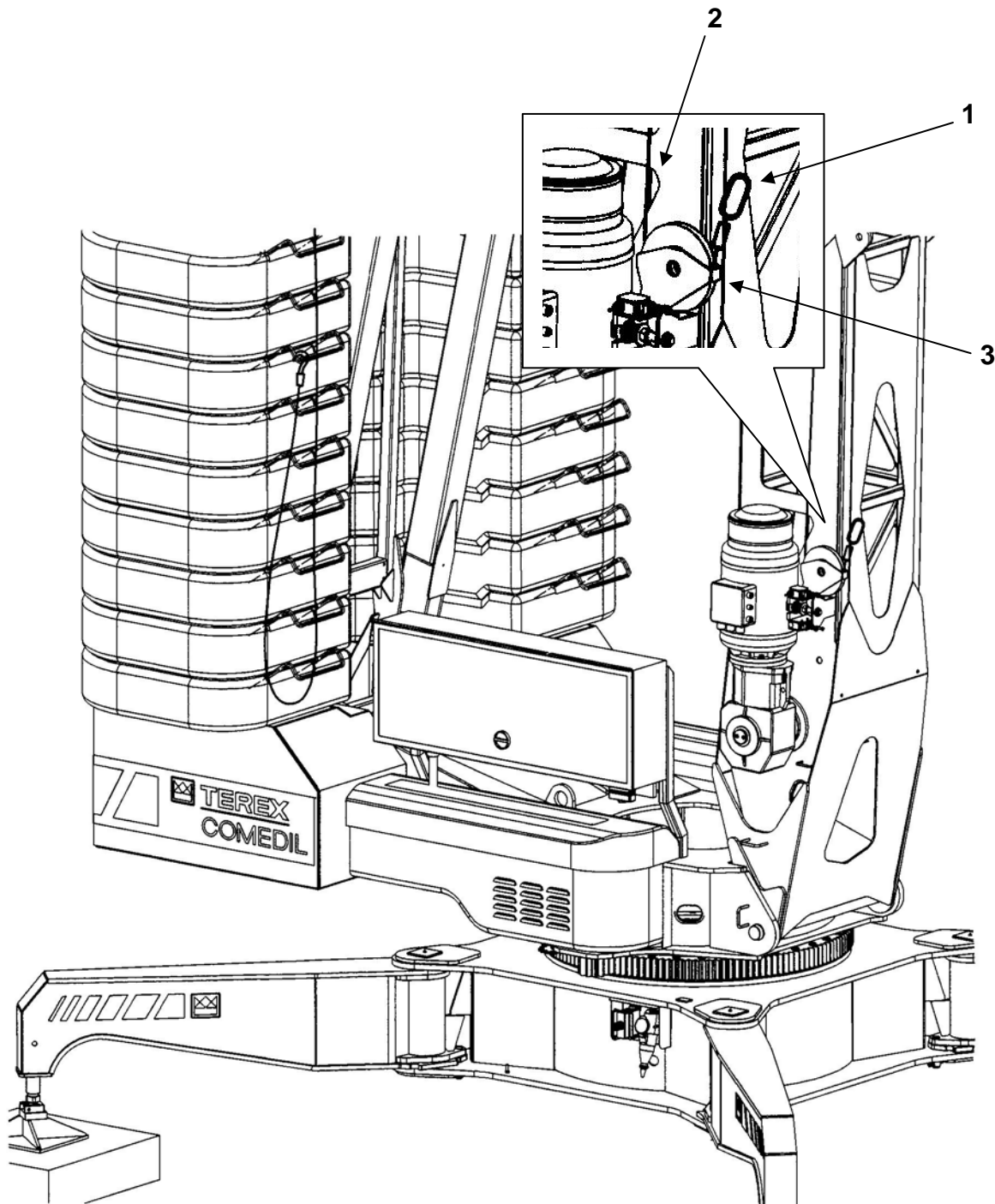
NOTICE: The operation of completing the ballasting should be carried out by keeping the switch on **ERECTION**. Hoisting takes place at micro speed only.



On completing the operation of positioning all the blocks, unhook the ring (1) of the self-ballasting rope (2) from the work hook.

Pull the other end of the rope until the ring rests on the idle pulley (3).

Insert the rope through the pegs of the blocks hooking the end hook to one peg, as shown in the figure, so that the rope stays slightly taut.



3.1.6 JIB ALIGNMENT

WARNING: Make sure that all the required ballast has been loaded; opening the jib without ballast causes the crane to tip over.

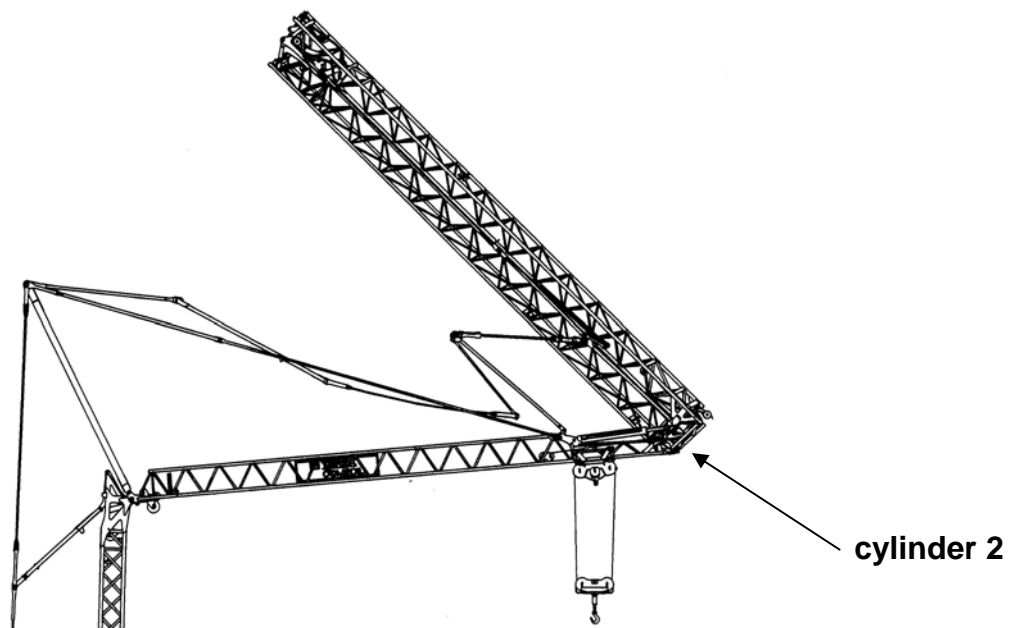
WARNING: Make sure that above the jib there are no obstacles such as electricity cables or jibs of other cranes. The highest point the jib reaches is approximately 40 m off the ground.

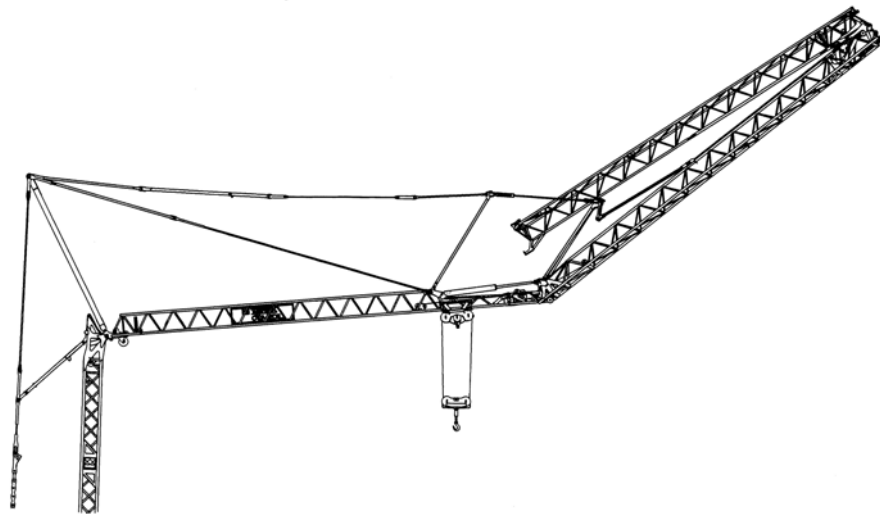
WARNING: The operation of aligning (and folding) the jib cannot be performed if the wind exceeds 30 km/h. When carrying out this operation, SLEWING is absolutely prohibited.

Switch the cylinder selector onto position **2 (cylinder 2)**.

Operate the ERECTION control and start opening the jib, checking that the pressure on the gauge does not exceed 250 bar.

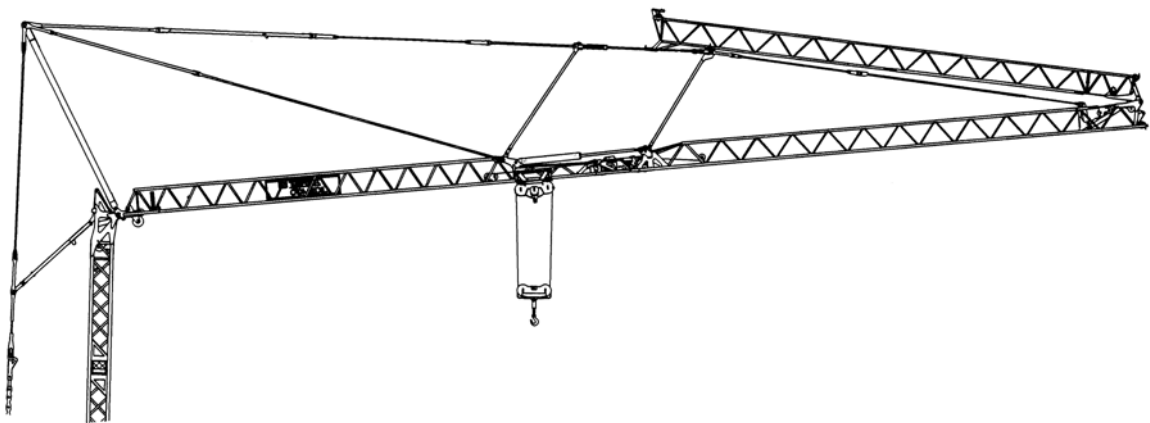
During the operation, check that the movement of opening out the tie-rods takes place evenly and continuously.





Continue the movement until cylinder 2 is fully extended.

After completing the operation, stop when the pressure has risen to approximately 200 bar; this ensures the cylinder has reached its limit stop.

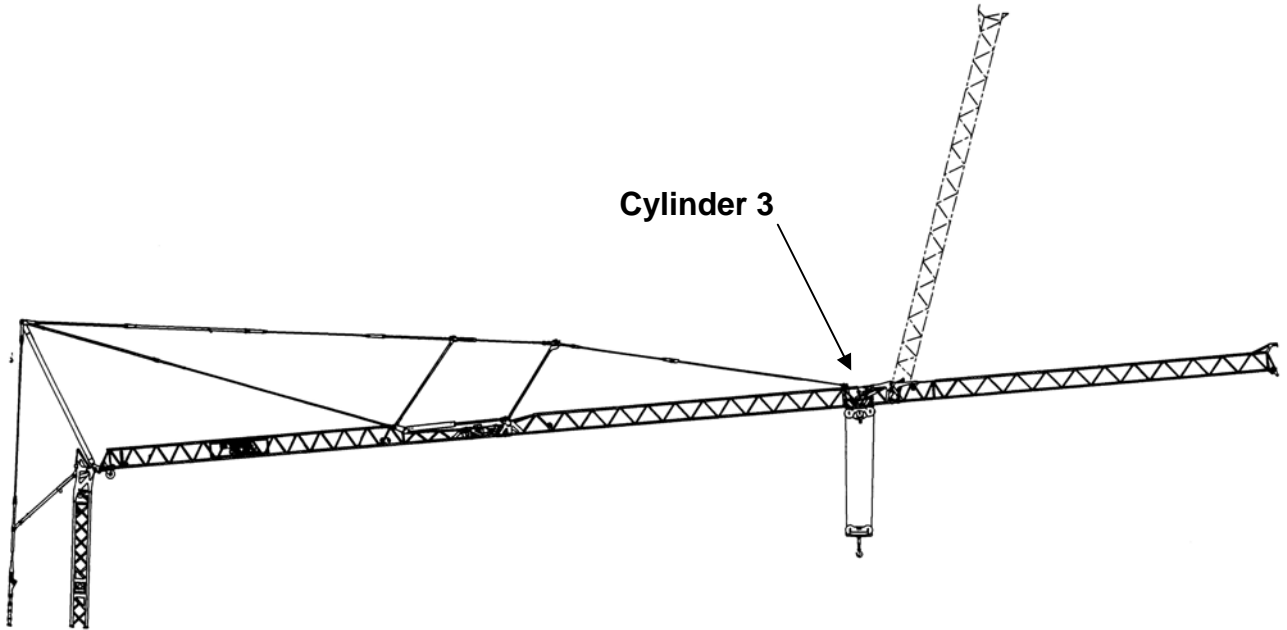


NOTICE: The crane can work with the jib end section folded back (see 1.3.3); in this case, set the safety devices as indicated in point 3.2.

To complete jib alignment, it is necessary to switch the cylinder selector onto position **3 (cylinder 3)** and operate ERECTION.

Continue the movement until cylinder 3 is fully extended.

After completing the operation, stop when the pressure has risen to 200 bar; this makes sure the cylinder has reached its limit stop.



After completing the operation of erection, open the electric box and switch over onto the WORK position.

Before putting the crane into service, it is necessary to set the safety devices as described in the following paragraphs.

3.2 SAFETY DEVICES - FUNCTION AND SETTING

Whenever erecting the crane, before putting it into service, it is always necessary to set the safety devices as described in the following paragraphs.

The setting of the safety devices must be checked and corrected also in the event of changing the arrangement of the jib with the crane erected such as passing from an aligned jib to a folded jib or vice versa.

The limiters and limit switches must be set by an expert from our After-Sales Service Organization.

WARNING: *Using the crane with any one of the safety devices partially or totally inefficient can be a serious danger for people.*

Each device is marked with an abbreviation permitting it to be easily identified. The position, designation and abbreviation of the safety devices are schematically shown in the figure in point 3.2.1.

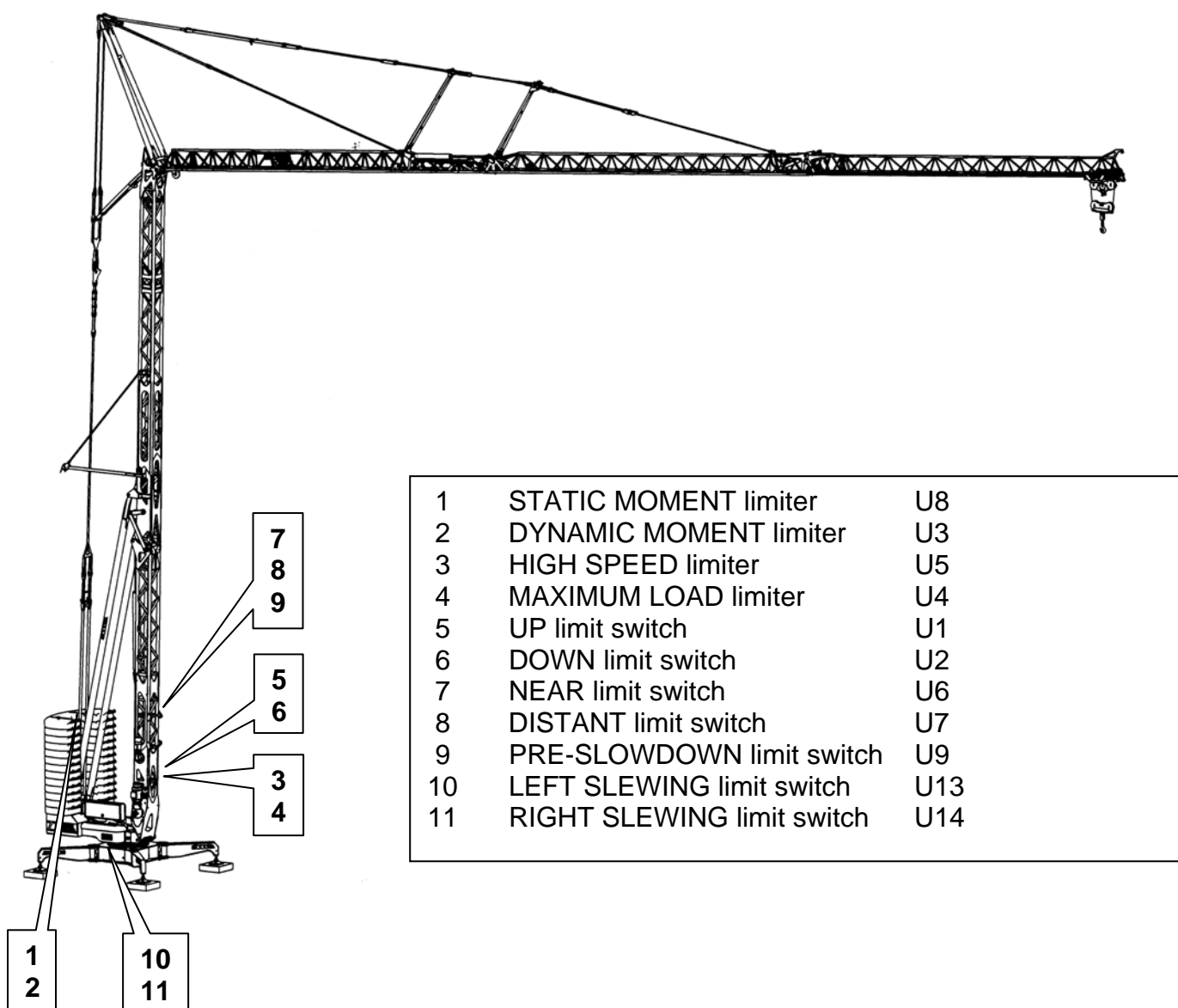
When using the **crane with folded jib**, the same settings made for the aligned jib apply except for the DISTANT limit switch of the trolley.

NOTICE: *The limiters and limit switches are safety devices and must not be used as devices to stop the movements during normal use of the crane.*

NOTICE: *Check the capacity signs are arranged correctly.*

NOTICE: *The limiters and limit switches must be replaced and the electric circuits checked by an expert from our After-Sales Service Organization.*

3.2.1 POSITION OF THE SAFETY DEVICES ON THE CRANE



3.2.2 STATIC MOMENT LIMITER U 8

Function

The limiter U8 is positioned on the vertical tie-rod; it blocks the DISTANT movement if the load permitted by the load diagram is exceeded (see point 1.3.3).

To restore the movement it is necessary to reduce the load or reduce the radius by operating NEAR.

Checking and Setting

The setting of the limiter U8 must be checked by using the contemplated TEST LOADS (see point 2.1.8) and proceeding as follows:

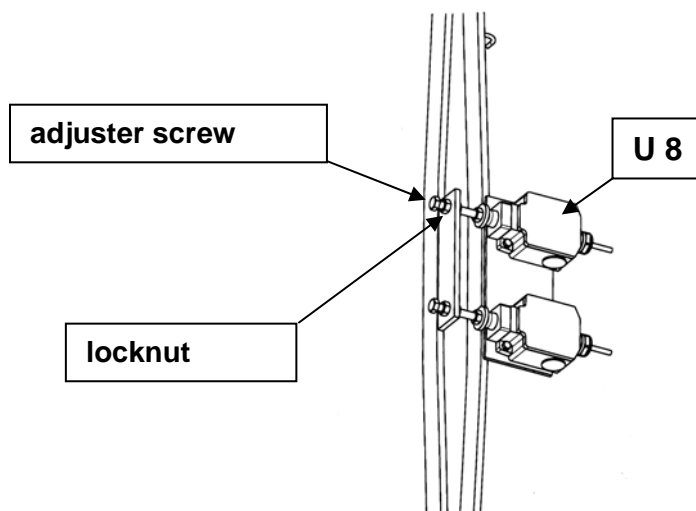
- take the trolley to approximately 3 metres from the tower
- hook on a load of 2100 kg suitably slung and hoist it by approximately 20 cm off the ground
- take the trolley up to the 2000 kg sign

On reaching this position the DISTANT movement must stop.

If it does not, it is necessary to do the setting by carrying out the following operations:

- release the locknut of the adjuster screw
- take the adjuster screw into contact with the microswitch so that the DISTANT movement is prevented
- lock the locknut of the adjuster screw

Using the TEST LOAD (2000 kg) recheck that the U8 limiter works properly.



3.2.3 DYNAMIC MOMENT LIMITER U 3

Function

The limiter U3 is positioned on the vertical tie-rod; it blocks the UP and DISTANT movement if the load permitted by the load diagram is exceeded (see point 1.3.3). The limiter U3 tripping moreover causes the audible warning to cut in.

To restore the movements it is necessary to reduce the load or reduce the radius by operating NEAR.

Checking and Setting

The setting of the limiter U3 must be checked by using the contemplated TEST LOADS (see point 2.1.8) and proceeding as follows:

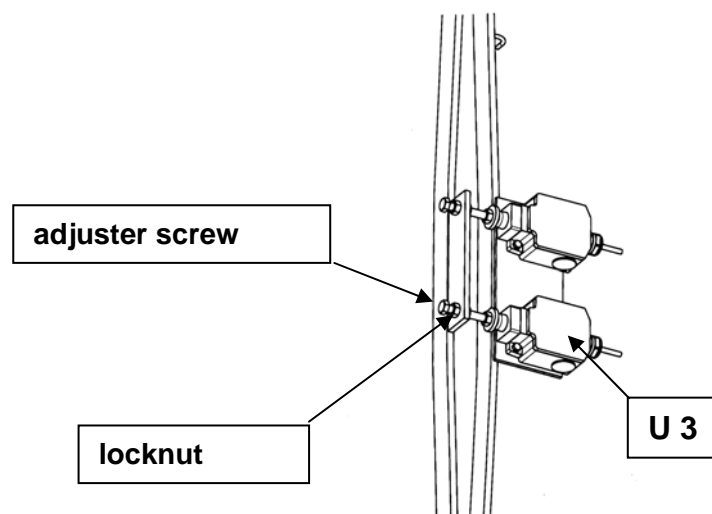
- take the trolley to the end section of the jib
- hook on a load of 1100 kg suitably slung
- operate UP

In this condition the UP and DISTANT movements must be blocked.

If it does not, it is necessary to do the setting by carrying out the following operations:

- release the locknut of the adjuster screw;
- take the adjuster screw into contact with the microswitch so that the audible warning trips and the UP and DISTANT movements are prevented.
- lock the locknut of the adjuster screw

Using the NOMINAL LOAD (1000 kg) recheck that the U3 limiter works properly.



3.2.4 HIGH SPEED LIMITER (GV) U 5

Function

The limiter U5 is positioned on the hoisting motor; it blocks the HIGH SPEED UP movement if the load permitted with this operation is exceeded (see point 1.3.3).

To restore the movement it is necessary to reduce the load.

Checking and Setting

The setting of the limiter U5 must be checked by using the contemplated TEST LOADS (see point 2.1.8) and proceeding as follows:

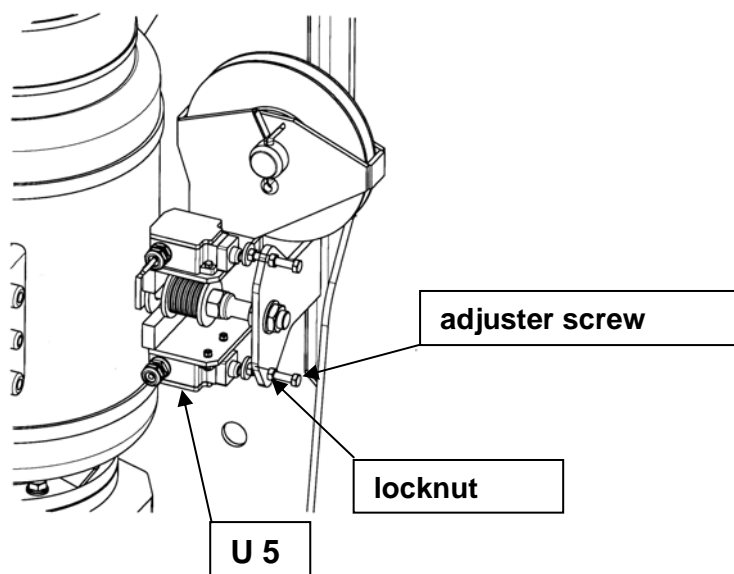
- take the trolley to approximately 3 metres from the tower
- hook on a load of 1100 kg suitably slung
- operate UP at MICRO SPEED, LOW SPEED and HIGH SPEED.

In this condition the HIGH SPEED movement must be blocked and the MICRO SPEED and LOW SPEED movements must take place without the limiter U 5 tripping.

If it does not, it is necessary to do the setting by carrying out the following operations:

- release the locknut of the adjuster screw;
- take the adjuster screw into contact with the microswitch so that the HIGH SPEED UP movement is prevented.
- lock the locknut of the adjuster screw

Using the LOAD of 1000 kg, recheck that the U 5 limiter works properly.



3.2.5 MAXIMUM LOAD LIMITER U 4

Function

The limiter U 4 is positioned on the hoisting motor; it blocks the UP movement if the load permitted with this operation is exceeded (see point 1.3.3).

To restore the movement it is necessary to reduce the load.

Checking and Setting

The setting of the limiter U 4 must be checked by using the contemplated TEST LOADS (see point 2.1.8) and proceeding as follows:

- take the trolley to approximately 3 metres from the tower
- hook on a load of 2100 kg (4200 kg with 4-part line) suitably slung
- operate UP at MICRO SPEED.

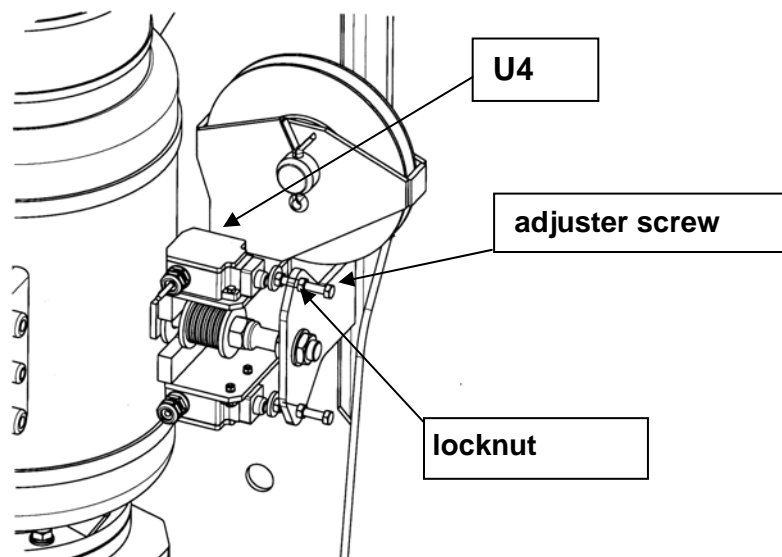
In this condition the MICRO SPEED UP movement must be blocked

If it does not, it is necessary to do the setting by carrying out the following operations:

- release the locknut of the adjuster screw;
- take the adjuster screw into contact with the microswitch so that the MICRO SPEED UP movement is prevented.
- lock the locknut of the adjuster screw

Using the MAXIMUM LOAD (2000 or 4000 kg) recheck that the U 4 limiter works properly.

When using a **crane with raised jib** the MAXIMUM LOAD is 1000 kg; it is therefore necessary to set the limiter U4 using a load of 1100 kg.



3.2.6 UP LIMIT SWITCH U1

Function

The limit switch U1 is positioned on the drum of the hoisting winch; it blocks the UP movement when the block assembly reaches the position for the setting.

Checking and Setting

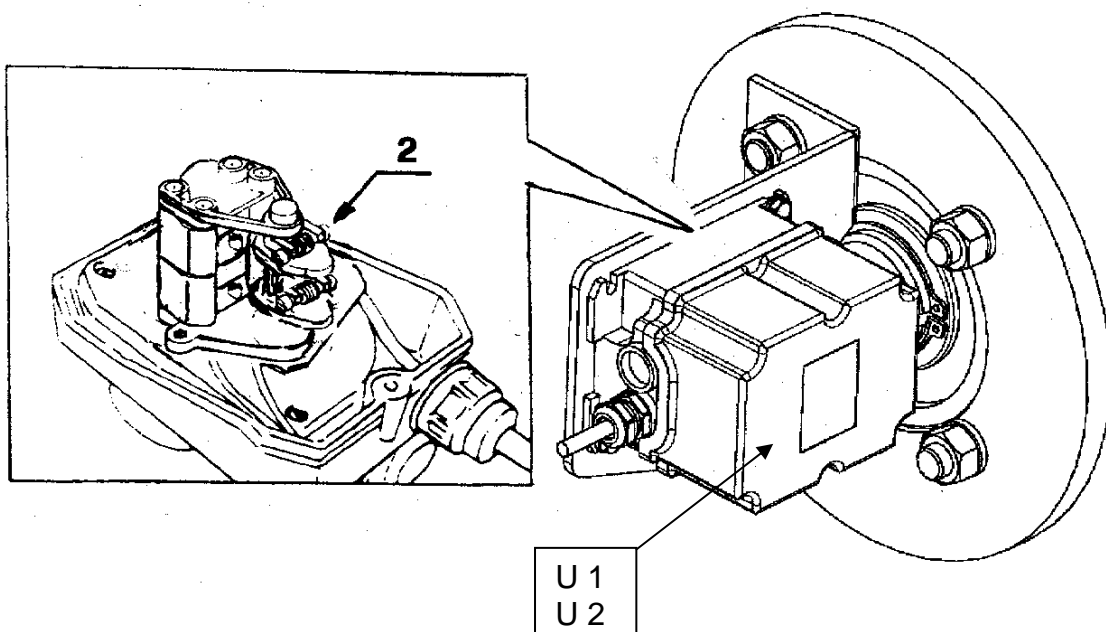
The setting of the limit switch U1 must be checked by hoisting the block assembly near to the trolley and proceeding as follows:

- operate the UP control and, keeping speed I (MICRO), hoist the block assembly until the movement is stopped by the limit switch U1 tripping. It must stop before contact is made between the block assembly and trolley.
- check that the position reached is the one required and that anyhow the minimum distance between the block assembly and trolley is no less than 1 metre.

If it does not, it is necessary to do the setting by carrying out the following operations:

- operate the UP control and hoist the block assembly as far as the contemplated stop point
- remove the cover of the limit switch U 1
- using the screw (2) turn the cam to bring it into contact with the microswitch that stops the UP movement
- tighten the safety screw and fit the cover back on.

Using the UP and DOWN operations, recheck that the U1 limit switch works properly.



3.2.7 DOWN LIMIT SWITCH U2**Function**

The limit switch U2 is positioned on the drum of the hoisting winch (together with U1); it blocks the DOWN movement when the block assembly reaches the position for the setting.

Checking and Setting

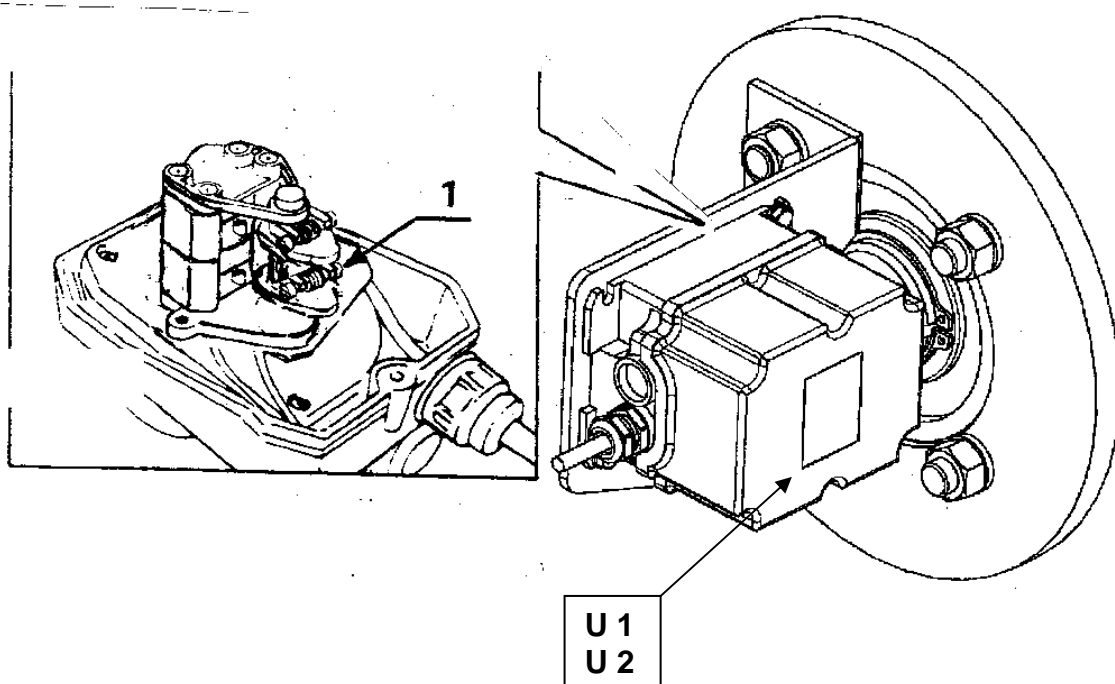
The setting of the limit switch U2 must be checked by lowering the block assembly near to the ground and proceeding as follows:

- * operate the DOWN control and lower the block assembly until the movement is stopped by the limit switch U2 tripping
- * check that the position reached is the one required and that anyhow the block assembly does not rest on the ground even with the trolley near the tower
- * check that at least 3 turns of rope always remain wound on the drum.

If it does not, it is necessary to do the setting by carrying out the following operations:

- * operate the DOWN control and lower the block assembly as far as the contemplated stop point
- * remove the cover of the limit switch U2
- * using the screw (1) turn the cam to bring it into contact with the microswitch that stops the DOWN movement
- * tighten the safety screw and fit the cover back on.

Using the UP and DOWN operations, recheck that the U2 limit switch works properly.



3.2.8 TROLLEY LIMIT SWITCH (U6, U7, U9)

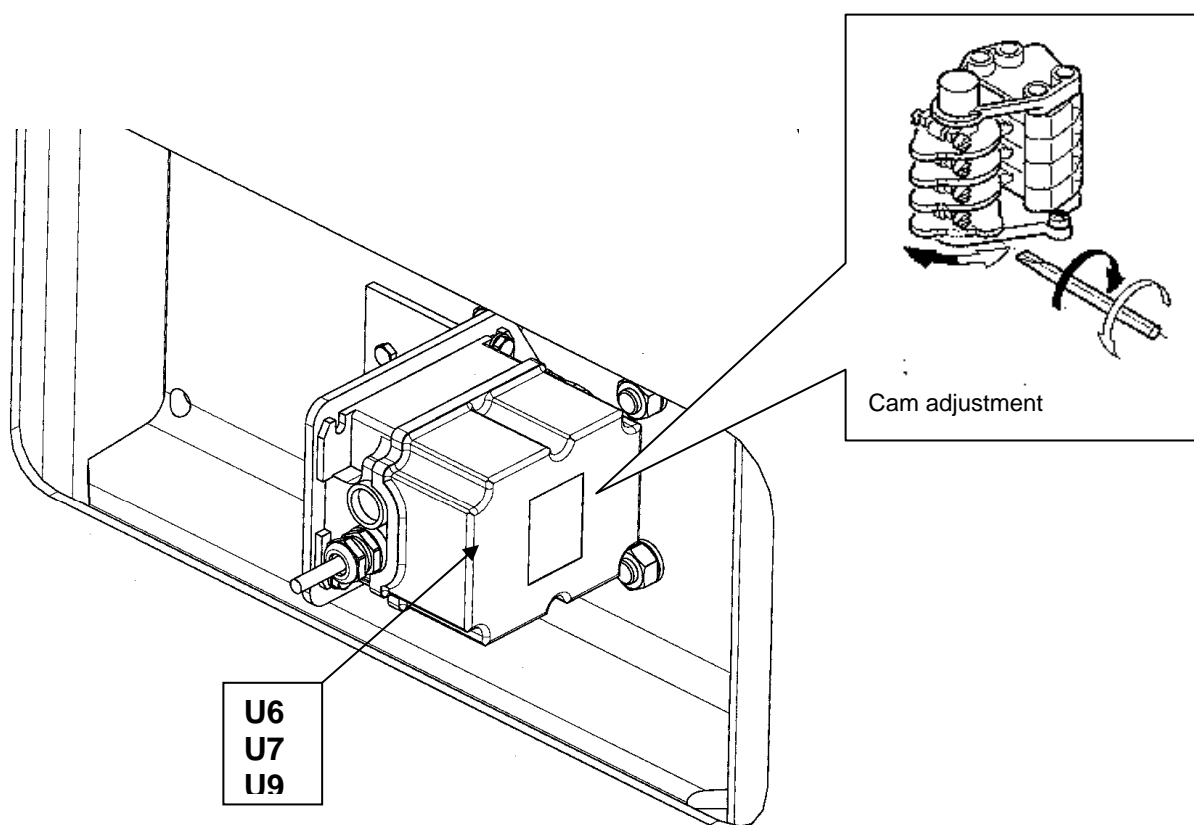
Function

The trolley limit switch, (**U6** NEAR – **U7** DISTANT – **U9** PRE-SLOWDOWN), of the worm screw type, is located on the tower coaxial with the shaft of the trolley drum; it stops the NEAR and DISTANT movements before the trolley strikes the buffers. The function of the pre-slowdown contact is to shift down to first speed before stopping.

The crane is supplied with the limit switch already set.

Checking

LIMIT SWITCH operation is checked by operating the NEAR control to take the trolley into the minimum radius position, or the DISTANT control to maximum radius; the movement must slow down and then stop before the trolley strikes the rubber buffers.



3.2.9 SLEWING LIMIT SWITCH U13 - U14

Function

The limit switch U13-U14 is positioned on the slewing platform by the slewing ring; it blocks the LEFT or RIGHT movement when approximately 2 consecutive turns have been made in the same direction.

Checking and Setting

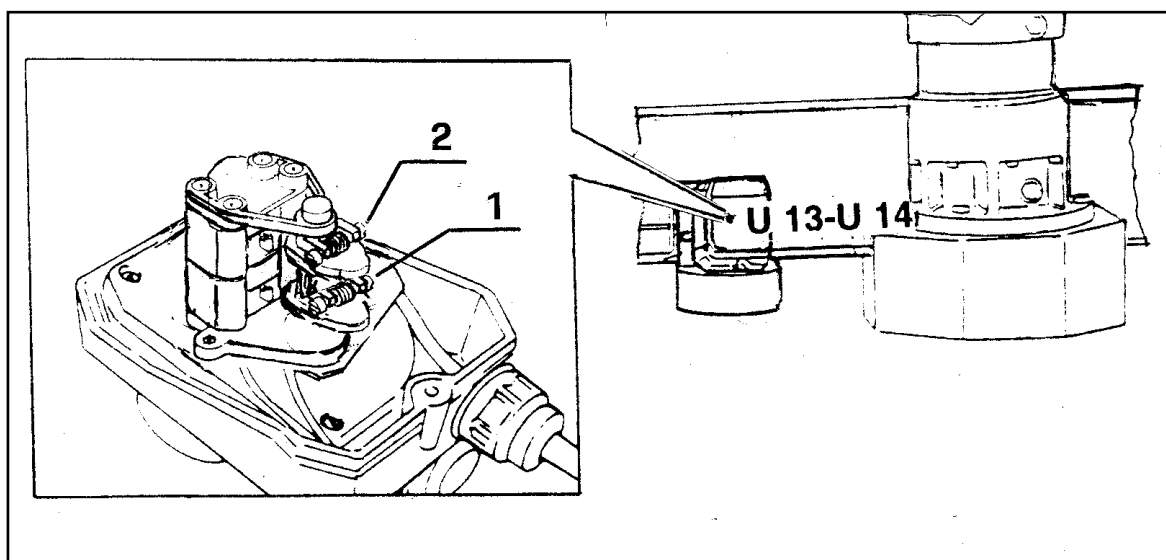
Limit switch U13 is checked by operating the LEFT control to make two consecutive turns in the same direction; the movement must be stopped after making the second turn.

If it does not, it is necessary to do the setting by carrying out the following operations:

- turn the crane so that the cables are not twisted
- operate the LEFT control and turn through 2 complete turns
- remove the cover of the limit switch U13-U14
- using the screw **2** turn the cam to bring it into contact with the microswitch that stops the LEFT movement
- fit the cover back on

To check and set the limit switch U14 (RIGHT) the same procedure applies as described for the LEFT, using screw **1**.

Using the RIGHT and LEFT operations, recheck that the U13 - U14 limit switch works properly.



3.3 BRAKES - CHECKING AND SETTING

The electric motors, for hoisting, trolley traversing and slewing, are equipped with disc brakes. Before putting the crane into operation it is necessary to check that the brakes are efficient, correcting the braking torque and the air gap if necessary.

To modify the braking torque you need to proceed as follows:

- lower the hook down to the ground in the case of the hoisting motor;
- remove the protective cap of the brake (1);
- tighten the self-locking nuts (5) to increase the braking torque (or untighten them to decrease it) to obtain optimal braking;

CAUTION: *The self-locking nuts must be tightened with the same angular movement so that the springs are all equally preloaded.*

- make sure that the energized electromagnet (3) is able to effectively retrieve the mobile keeper (4); if the spring preloading (7) is too high, the electromagnet is not able to fully attract the keeper, causing buzzing and current absorption that can damage the winding of the electromagnet;
- fit the protective cap back on (1).

The distance between the electromagnet (3) and the mobile keeper (4) tends to increase due to the normal consumption of the brake linings of the brake discs (6).

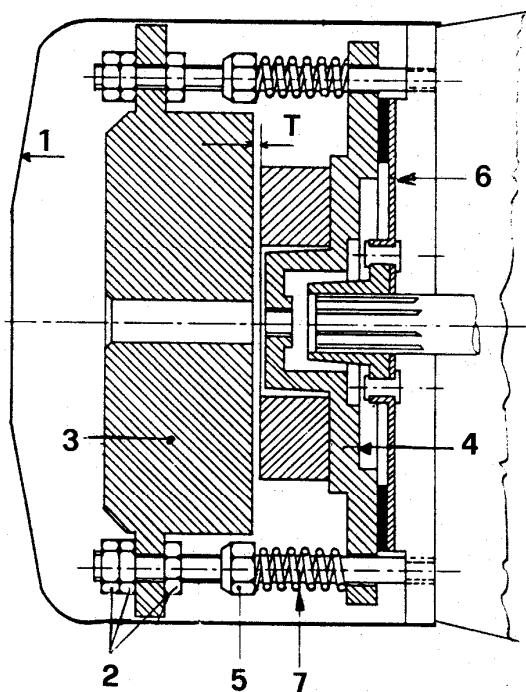
This distance (T), called AIR GAP, must be kept within the limits shown in the following chart to ensure the brake works correctly.

AIR GAP VALUES	adjustment value	max wear limit
brake with 1 disc	0.5 - 0.7 mm	1.1 mm
brake with 2 discs	0.8 - 1.0 mm	1.5 mm

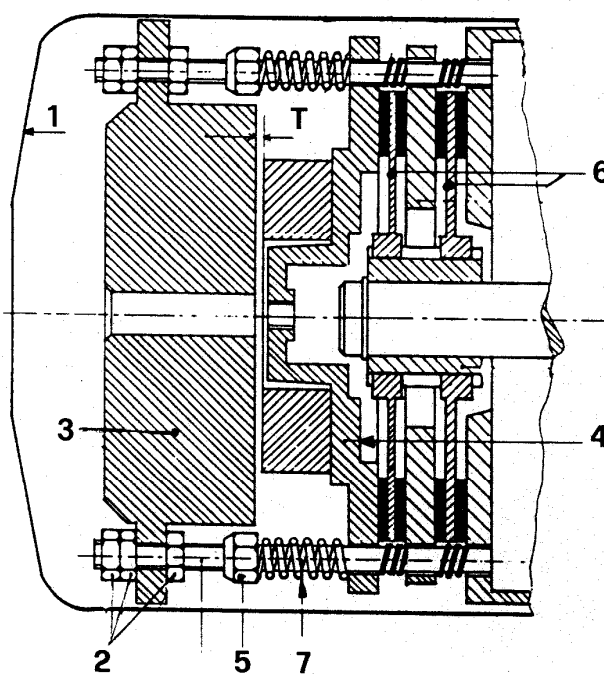
To adjust the air gap, proceed as follows:

- remove the cap (1);
- loosen the fixing nuts (2) and turn them to move the electromagnet (3) nearer or further away to reach the correct adjustment;
- use a feeler gauge to check that the required value is constant all along the perimeter of the electromagnet;
- carefully tighten the nuts and locknuts (2) and make sure that on energizing the electromagnet the brake discs (6) turn freely without rubbing;
- fit the cap back on.

BRAKE WITH 1 DISC



BRAKE WITH 2 DISCS



3.4 GENERAL OPERATING INSTRUCTIONS

3.4.1 BEFORE PUTTING INTO SERVICE

The crane can be put INTO OPERATION only when it is in a perfect state of efficiency; if this is not so, it must be prevented from being used until optimum conditions are restored.

Therefore, before each work shift, it is necessary to make the following checks:

- check the conditions of the crane's supports on the ground, making sure that no yielding has made the undercarriage unlevel;
- inspect the state of the structure and check that the geometry of the crane has not changed;
- restore the block of the slewing brake (see point 3.4.3);
- check the integrity and efficiency of the grounding;
- check the state of the supply cables and pushbutton panel (or manipulator);
- check the efficiency of the residual current device;
- check that all the limiters and limit switches work properly;
- check that the movements correspond to the indications of the control elements (see point 1.4.8);
- check the brakes are efficient by braking a few times with no load so as to eliminate any trace of moisture;
- check the turn of the ropes and especially the winding on the drums;
- check the state of the hoisting rope;
- check the efficiency of the anti-unhooking device of the hoisting hook.

3.4.2 INSTRUCTIONS FOR A RATIONAL USE OF THE CONTROLS

Crane operation requires perfect knowledge of its movements and a rational use of the relative controls.

Hoisting controls

Starting, changing speed and stopping the UP and DOWN movements take place progressively and are controlled electronically by a frequency convertor (inverter). When depositing the load it is necessary to consider the braking distance to permit scaling down to the lower speeds before the load reaches the ground.

Do not operate the UP or DOWN controls by jogging.

Slewing controls

Starting, changing speed and stopping the RIGHT and LEFT movements take place progressively and are controlled electronically by a frequency convertor (inverter).

When stopping the manoeuvre it is necessary to consider the braking distance needed to stop the load in the required position.

Trolley traversing controls

Starting, changing speed and stopping the NEAR and DISTANT movements take place progressively and are controlled electronically by a frequency convertor (inverter).

When stopping the manoeuvre it is necessary to consider the braking distance needed to stop the load in the required position.

NOTICE: *The electronic slewing and trolley control devices are supplied already programmed and preset.
Any adjustments must be made solely by personnel of the **Comedil** After-Sales Organization.*

3.4.3 TAKING OUT OF SERVICE

At the end of each work shift or when the wind exceeds 72 km/h it is mandatory to carry out the following operations:

- release the slewing brake by turning the knob on the cap of the slewing motor clockwise (see 1.4.5.3); this allows the crane to turn freely with the wind;

WARNING: *Leaving the slewing brake locked when there is a stormy wind puts the crane in danger of tipping over.*

- take the hoisting block assembly up to approximately 2 m from the jib without any load hanging from it and take the trolley halfway along the jib just before its folding pivot;
- cut off the electricity supply to the crane by turning off the disconnecting switch on the electric box.
- it is moreover recommended to disconnect and put the pushbutton panel or manipulator away in a safe place.

3.5 SWITCHING OVER 2/4-PART LINES

The crane can be equipped with a trolley and block assembly fitted for both 2 and 4 part ropes (2/4-PART LINE).

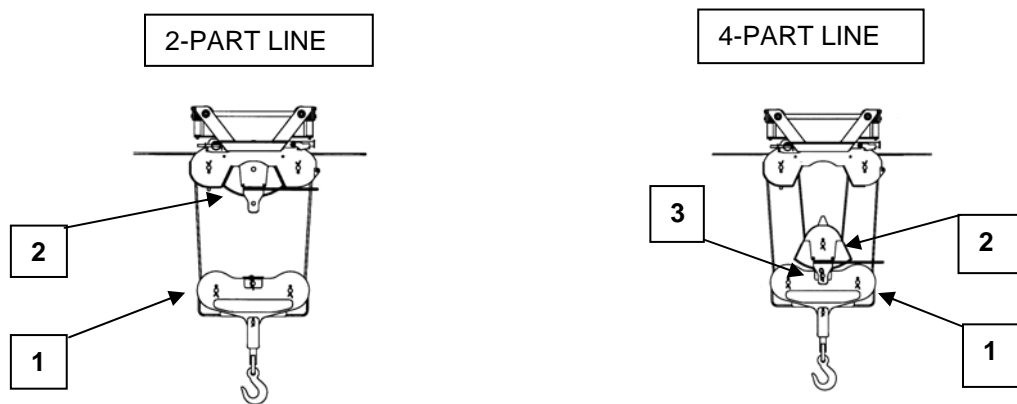
Switching over from a 2-part line to a 4-part line

- Operate the DOWN control and lower the block assembly (1) onto the ground.
- On continuing with the DOWN control, the small block assembly (2) will start moving down.

WARNING: As the block assembly (2) moves down, keep the block assembly (1) resting on the ground in an upright position so as to help the rope run on the relative pulleys.

- Take the block assembly (2) down to the ground and hook it onto the block assembly (1) with the pin (3).
- Set the up and down limit switches (U1 and U2) as indicated in points 3.2.6 and 3.2.7

CAUTION: Working with a 4-part line is prohibited when the jib is raised.



Switching over from a 4-part line to a 2-part line

- Operate the DOWN control and lower the set of the two block assemblies (1) (2) onto the ground.
- Free the two block assemblies by taking out the pin (3)
- Operate the UP control and bring the block assembly (2) into contact with the trolley.
- Set the up and down limit switches (U1 and U2) as indicated in points 3.2.6 and 3.2.7

3.6 DISMANTLING INSTRUCTIONS

The dismantling operations must be performed by specially trained personnel belonging to the **Comedil** After-Sales organization as prescribed in point 1.2.1.

Personnel assigned to dismantling must be equipped with at least the following personal protective equipment:

- hard hat
- safety gloves with five fingers
- safety footwear with non-slip soles made of insulating material
- clothes with no risk of entanglement

CAUTION: *Meticulously follow the instructions in the sequence specified in this manual.*

Open the door of the electric box and turn the switch onto the ERECTION position.

Position the trolley in the middle portion of the jib (intermediate jib section) and hoist the block assembly to 4-5 m from the jib.

Switch the cylinder selector, located on the door of the electric box, onto position **3 (cylinder 3)**.

Operate the DISMANTLING control and start closing the jib end section, checking that the pressure on the gauge does not exceed 250 bar.

WARNING: *Make sure that above the jib there are no obstacles such as electricity cables or jibs of other cranes; the highest point the jib can reach is approximately 40 m off the ground.*

WARNING: *The operation of folding the jib must be performed with a max wind speed of 30 km/h. When carrying out this operation, SLEWING is absolutely prohibited.*

Stop the operation when the jib end section rests on the tie-rod.

Operate NEAR to position the trolley in the red painted zone (jib tail section) making sure the trolley runs smoothly.

Switch the cylinder selector onto position **2 (cylinder 2)** and operate the DISMANTLING control checking that the pressure does not exceed 250 bar.

WARNING: *At the start of the folding phase, check the arrangement of the hoisting ropes and trolley, making sure the hoisting rope does not enter the races of the pulleys engaged by the trolley rope.*

NOTICE: *During this operation there will be a bang, which is entirely normal, due to the sudden movement of the pulley support of the trolley rope under tension.*

Throughout this operation, see that the tie-rods fold back properly without jamming.

WARNING: *In the event of breakdown or special circumstances in which it is not possible to fold the jib, you must contact the **Comedil** After-Sales Service.*

Stop the operation when the pressure has risen to 200 bar.

Switch the cylinder selector onto position **1**.

Remove all the additional ballast with the aid of a fork-lift truck or a crane truck that can lift 1550 kg; if the crane is equipped with a self-ballasting device (DAZ), follow the instructions of point 3.1.5.

WARNING: *The erection blocks must always remain on the crane; without this ballast the crane will tip over.*

Operate DISTANT to position the trolley in the red painted zone; this position permits positioning the trolley precisely in the tower when dismantling towers.

Take the block assembly to a distance from the trolley of approximately 8 m.

CAUTION: *The block assembly must be in the **2-part line** condition (see 3.5).*

NOTICE: *The towers can be dismantled in the four directions parallel to the supporting square.*

Briefly operate ERECTION until the pressure has risen to 150 bar.

Operate the DISMANTLING control to close the towers.

Check that no obstructions are encountered as the jib and towers come down and that the block assembly stays outside the towers.

CAUTION: *Throughout the dismantling phase, never operate the DISTANT or NEAR control; if the initial position of the trolley is exact, the trolley, while moving backwards and forwards during the transitory phase, will enter its seat precisely without any interference.*

CAUTION: *During the phase of folding back the towers, check the arrangement of the hoisting rope and that the ballast arm folds back correctly above the tower strut.*

When it is necessary to prepare the crane for towing, insert the rear axle under the tower, before completely folding back the towers.

Then fit the front steering axle utilizing the opening of the towers as described in point 3.1.2.

Before towing or transporting the crane by truck, meticulously follow the instructions of paragraph 2.2.



TEREX | COMEDIL

**Self-Erecting
Tower Crane
CBR 40H-4**

REV.000-1

4

- MAINTENANCE

4.1 MAINTENANCE INSTRUCTIONS

4.1.1 GENERAL

Operational reliability, safety and durability of the machine largely depend on thorough maintenance.

Maintenance performed regularly at the required intervals contributes to considerably increase the durability and value of the crane.

Besides the normal checks required by current regulations, it is necessary for the user to schedule periodical servicing to be performed by his own personnel in charge of maintenance.

Before doing any maintenance work, cut off the electricity supply to the crane.

The maintenance work must be indicated with appropriate signs.

During maintenance work it is necessary to respect the safety standards and the current standards for accident prevention; in accordance with the working conditions it is necessary to wear protective clothing, eyewear, gloves, hard hat and any other suitable protective equipment.

Welding work can only be performed if expressly authorized in writing by **Gru Comedil**.

In these cases it is necessary to work with a face mask and fume extractor since the galvanized or painted metalwork release harmful fumes during welding.

Make sure you use metal shields to protect the electric cables, hydraulic pipes, ropes and all parts that could get damaged.

4.1.2 MAINTENANCE SCHEDULE

The maintenance schedule and intervals described below are given only by way of example, they are not binding and they refer to normal working conditions. In cases of heavy duty use of the crane, or in particularly dusty or corrosive environments, the maintenance work must be more frequent.

WARNING: *If during maintenance work any serious trouble is noted such as buckling of structural elements, pivot pins coming out, etc., contact **Gru Comedil immediately**. The data plates on the crane must be decipherable; if they are not, they must **obligatorily** be replaced.*

MAINTENANCE INTERVALS		A	B	C	D	E	F	G	H	I
maintenance operations assembly										
COMPLETE CRANE inspection of all constructional parts		●								
SLEWING										
	grease		●							
Slewing ring	check tightness				●					
	Check clearance between the two rings							●		
Crown wheel	spray with grease spray		●							
Reduction gear	check level			●						
	change oil							●		
Brake	check gap			●						
HOISTING										
Reduction gear	check level			●						
	change oil							●		
Brake	check gap			●						
TROLLEY										
Reduction gear	check level			●						
	change oil							●		
Brake	check gap			●						
ELECTRICAL SYSTEM										
Limit switch	check functions and adjustments	●								
	spray contacts with anti-moisture spray									●
Wires and cable clamps	check integrity	●								
Electric box	check terminals			●						
	clean oxidized contacts		●							

A = every day
B = every week
C = every month

D = every 3 months
E = every 6 months
F = every year

G = every 2 years
H = every erection
I = every dismantling

MAINTENANCE INTERVALS		A	B	C	D	E	F	G	H	I
maintenance operations assembly										
ROPES										
check there are no knots, yielding or breakage		•								
check the fastenings, winding on pulleys and drum		•								
have specialized personnel check					•					
clean and grease				•						
check the trolley rope tension			•							
MECHANICAL PARTS										
Pins check positioning in seat and split pins			•							
Screws check integrity of fastenings			•							
Pivot pins remove and grease							•			
Pulleys and bearings remove and grease					•					
Feet check stability and levelling of crane		•								
Bolts clean and grease									•	
HYDRAULIC SYSTEM										
Tank check level									•	
change filter / change oil								•		
Cylinder / overcenter check damage and leakage										
Pipes/unions check damage and leakage									•	•
Control valve / pressure gauge check damage and leakage										
AXLES										
Check the tightness of the nuts on the stud bolts									•	•
Check the pressure of the tyres									•	•
Check the integrity of the pins and split pins									•	•
Check the state of the tyres									•	•

A = every day
B = every week
C = every month

D = every 3 months
E = every 6 months
F = every year

G = every 2 years
H = every erection
I = every dismantling

4.1.3 SLEWING RING

The slewing ring is fastened to the structure by **M 22** high-strength bolts, tightened with a torque wrench to a setting of **50 daN.m**.

This tightness must be checked within the first month of work and every 3 months thereafter by specialized personnel authorized by **Comedil**.

WARNING: *If, when making the check or during operation, you notice any slackening or breakage of even just one bolt of the ring you must put the crane out of service and contact Comedil*

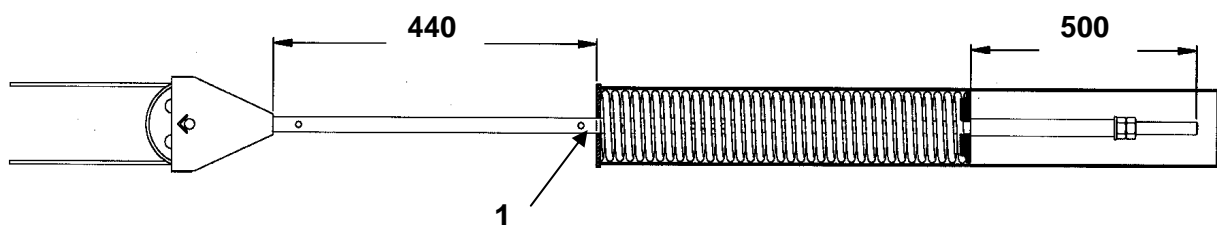
At least once every **two** years, or when there is unusual play between the two portions of the slewing ring, you must measure the clearance that must be no greater than **3 mm** measured axially between the outer ring and the inner ring.

4.1.4 TROLLEY ROPE TENSIONER

The tensioning and compensation of the trolley rope are governed by the tensioner in the upper tower section.

In the event of maintenance or replacement, the correct tension of the trolley rope is obtained by arranging the tensioner and spring as shown in the following diagram, meticulously observing the measurements. To make this easier, extract the rope tensioner beyond the final measurement, stopping it temporarily with a bar through the holes **1** on the rod.

These guidelines apply when the crane is in the transport position, **crane dismantled**; during the various phases of erection and at work it is entirely normal for the tensioner to change its position several times.



4.1.5 CHECKING THE ROPES

To ensure the greatest working safety for site personnel it is essential for all the ropes installed on the crane to be in a good state of repair and show no sign of wear, corrosion or strands breaking.

It is necessary to inspect the ropes every day, checking the general conditions of deterioration and deformation, replacing them immediately if they no longer meet the safety requirements; special attention must be paid to the points of connection of the ropes with the crane.

The crane must in any case be submitted to testing when an accident has occurred that might have caused damage to the rope or before returning it to service after a protracted period of inactivity.

The ropes must be lubricated regularly and kept clean of sand and cement.

Ropes must always be replaced if any of the following situations arise:

1) The number of broken strands visible on a control length equal to 6 or 30 times the diameter of the rope exceeds the limit shown in the chart

ROPE	6 diameters	30 diameters
Hoisting	5 strands	10 strands
Trolley traversing	8 strands	16 strands

2) The total diameter of the rope is reduced by 7% compared to the original diameter, even if at a single point

3) A strand is entirely broken or has been damaged reducing its cross-section by over 40% at some points.

4) The rope is permanently dented, twisted or bent because of external causes, such as rubbing on sharp edges for example.

5) The core of the rope sticks out of the rope (even at a single point) or one or more strands, when the rope is taut, appears slack and protrudes from the rope.

WARNING: Breaks are often difficult to identify because the end of the broken strand stays in its original position and does not protrude from the rope. To check the condition of the rope, clean the grease off its surface and rub a piece of soft wood along the length of rope to check, then bending the rope by hand so that the ends of the broken strands, if there are any, stick up from the rope.

The ropes must only be replaced by specialized personnel authorized by **Comedil**.

4.1.6 LUBRICATION

The lubrication of the various parts of the crane must be done at regular intervals as directed in the maintenance schedule.

The chart indicates the types of lubricant to use for each component of the crane; using lubricants other than the ones indicated here can impair the good operation of the machine.

COMPONENT	TYPE OF LUBRICANT
Hydraulic system	hydraulic oil OSO46 (AGIP)
Slewing reduction gears, Trolley traversing reduction gear Hoisting reduction gear.	oil BLASIA 220 (AGIP)
Inside slewing ring, lubricators, axles	grease GREASE MU-EP2 (AGIP)
Pins and pivots	grease GREASE MU-EP2(AGIP)
Uncovered gears	grease spray URANUS (NILS)

WARNING: After changing, the oils and greases must be recovered and disposed of in observance of current regulations. It is absolutely prohibited to disperse lubricants in the environment as they are harmful for the environment and for people.

4.1.7 STORING THE CRANE

In periods when the crane is out of service, garage it sheltered from the weather.

If this is not possible, you must protect the motors, limit switches, plugs/sockets and tyres that should be kept raised off the ground.

In addition, it is recommended to thoroughly lubricate the ropes, the bearings of the pulleys and trolley wheels and all the pivot points.

4.2 INSTRUCTIONS FOR ROUTINE REPAIRS

There follows a list of the simplest and most common faults that can be resolved directly on site without requesting assistance from the Service Centre.

4.2.1 GENERAL TROUBLE OF AN ELECTRICAL NATURE

One of the crane movements does not work, there is not the noise of the electric disc brake opening, but the related electric contactors work correctly:

The associated fuse or miniature circuit breaker might have tripped, due to a fault with the corresponding motor or its supply line: identify the fault and after repairing change the fuse or reset the MCB.

One of the crane movements does not work, but the related electric contactors work correctly and there is the noise of the electric disc brake opening:

The motor's disc brake might be jammed: do not persist with the control, but try releasing the disc by levering between the disc and the adjacent fixed parts of the brake.

An electromechanical brake does not work:

The electromagnet has burnt.

The gap is too wide between the keeper and the electromagnet of the brake, such as to allow the magnet to attract the keeper: adjust the gap.

There is no gap between the keeper and electromagnet of the brake, such as to allow the keeper to move to free the brake disc: adjust the gap.

The brake springs are tightened in a pack and do not allow the keeper to move to free the brake disc: adjust the spring adjustment.

The control element (pushbutton panel, manipulator, etc.) is inactive:

With the motor not powered: the start button has not been pressed so the line contactor is not cocked.

The stop button has not been unblocked: unblock it with a slight rotation.

The plug of the control element may be badly inserted in the socket, or a pin of the plug may be broken.

The "start" button may be defective or oxidized.

The cable of the control element might have a broken conductor.

The controls are uncertain:

The contacts of the buttons of the control element might be oxidized:
polish them.

The cable of the control element might have a broken conductor.

Operating a control immediately, or very quickly, causes the residual current device of the site panel to trip:

There is dispersion of electric current to ground: find the fault on the supply line or on the motor of the movement causing the RCD to trip.

Operating the main disconnecting switch immediately causes the residual current device of the site panel to trip:

There is dispersion of electric current to ground in the control transformer or in the line of the electric panel immediately downstream from the main switch of the panel.

The residual current device of the site panel systematically trips, even with the crane's main disconnecting switch in position "0":

There is dispersion of electric current to ground on the crane supply line.

4.2.2 ELECTRICAL TROUBLE WITH HOISTING

The "RAPID" hoisting speed does not work:

You are trying to hoist a greater load than is permissible at "RAPID" speed.
The hoisting speed limiter is off its setting or there is a fault on the relative electric circuit.

The "UP" movement does not work:

One of the following devices is off its setting or the circuit is broken: up limit switch, maximum load limiter, moment limiter with tripping on the up movement.

The "DOWN" movement does not work:

The limit switch is off its setting or there is a fault on the relative electric circuit.

4.2.3 ELECTRICAL TROUBLE WITH TROLLEY TRAVERSING

The "DISTANT" movement does not work:

One of the following devices or the relative electric circuit is broken: distant limit switch, moment limiter with tripping on the distant movement.

The "NEAR" movement does not work:

The limit switch or its electric circuit is broken.

4.2.4 ELECTRICAL TROUBLE WITH CRANE SLEWING

The "RIGHT" movement does not work:

The crane might have reached its right limit switch position: turn to the left.

The limit switch (right movement) is off its setting or there is a fault on its electric circuit.

The "LEFT" movement does not work:

The crane might have reached its left limit switch position: turn to the right.

The limit switch (left movement) is off its setting or there is a fault on its electric circuit.

4.2.5 OPERATIONAL TROUBLE WITH ERECTION

During erection the motor of the power pack works properly but the crane stops at a certain position:

There may be a mechanical obstruction preventing the movement from continuing.

The pressure limiter valve might be off its setting: try and increase the setting without exceeding the value indicated in point 1.4.5.4

Lack of oil in the tank of the power pack.

4.2.6 MISCELLANEOUS OPERATIONAL TROUBLE

The block assembly moves irregularly, especially down with no load:

there might be difficulty with the rotation of a pulley due to rubbing on the support or a bearing jamming: remove the cause of the difficulty with rotation.

The trolley moves irregularly:

there might be difficulty with the rotation of a pulley due to rubbing on the support or a bearing jamming: remove the cause of the difficulty with rotation.

The rope might have some obstruction to its free movement: check that the two branches of rope leaving the drum have the right tension and, if necessary, check the complete turn of the trolley rope and the tensioner-compensator on the jib.

When contacting the Service Centre always state the following data that are given on the crane's data plate:

MODEL

SERIAL No.

YEAR OF MANUFACTURE

as well as the exact address of the Site

4.3 INSTRUCTIONS FOR REMAINING HAZARDS

The user must be aware that using hoisting equipment, which is intended solely for professional use, exposes him to remaining hazards of the equipment; these hazards cannot be eliminated or sufficiently reduced with the design and against which the protection and guards are either not effective or not completely effective.

4.3.1 NATURE OF REMAINING HAZARDS: SAFETY MEASURES

The crane's presence on the site can involve some remaining hazards, which cannot be completely reduced with the design and techniques of protection.

It is necessary to take account of the potential presence of these risks both to set down rules of conduct and to prepare personal protective equipment.

We provide a list of remaining hazards, drawn up according to our acquired experience, offering the necessary precautions:

- a) Hazards deriving from imperfect control over the trajectory of the load, by the operator:**
 - use solely expert and trained operators
 - choose trajectories free from obstacles and far from areas occupied by persons.
 - the signals for hooking, hoisting, manoeuvring, depositing and unhooking the load must be exchanged using an established code that is well known to all the workers.
 - observe the prescriptions of this manual
- b) Hazards deriving from hanging loads: they affect the area where the equipment operates.**
 - before starting to erect the crane, check that there are no items, tools or miscellaneous materials left on the structure that can afterwards fall onto the ground
 - take care over slinging the loads; for bulk loads, use suitable containers; do not fill the containers above their capacity limits
 - do not pass the load over people
 - use the audible warning before starting manoeuvres that require attention by the persons in the work area
 - when moving the load, pay attention not to strike the scaffolding, materials, structure of the building, etc.
 - display the "BEWARE OF HANGING LOADS" sign where it is clearly visible

- c) **Hazards deriving from protruding parts of the machine:** concerns the area nearby the crane, especially during maintenance work and installation.
- during the normal work cycles, prevent access to the area covered by the slewing of the crane.
 - during installation and maintenance work, pay the necessary attention, wear a hard hat and suitable clothing.
- d) **Hazards deriving from moving parts:** concerns the area covered by the slewing of the crane and some parts of the equipment during installation and maintenance work
- during the normal work cycles, prevent access to the area covered by the slewing of the crane
 - during the phases of installation, wear a hard hat and do not stand in the area covered by the movements of the crane
 - do not carry out any maintenance work when there are parts in motion;
 - during maintenance work, cut off the electricity supply to the crane and padlock the switch of the electric box on position "0"
 - during maintenance, make sure that the lever of the parking brake for slewing is in the "WORK" position.
 - do not carry out any maintenance work on the crane when the wind is strong enough to slew the crane on its own
- e) **Hazards deriving from the presence of power supply cables:**
- if the electric power connection is not made through a buried shaft, use cables with a strong wearproof covering
 - signal the presence of the power cable
 - do not cross any zones with the power cables on the ground where vehicles and persons might transit
 - do not install the ground plates with one end standing out from the ground without suitable protection
- f) **Hazards of falling from the low parts of the structure:**
- during inspection and maintenance work on the accessible parts of the structure, pay attention to the danger of falling
 - access to the high parts of the structure is not permitted

g) Hazards deriving from static electricity: involve cranes installed near transmitters; in this case there may be an accumulation of static electricity on the crane that is not discharged through the machine's grounding system, with the result that there can be potential on the crane's hook that is not the same as the ground potential with the risk of electric shock when the operator touches the hook or the load connected to it. When the crane works in these conditions, the following standards must be observed:

- the personnel must be informed about this hazard
- load handling must be done with insulating means, such as nylon slings or bands, etc.
- the operators must wear insulating gloves and footwear
- the hook and any hanging loads with non-insulating means must be grounded by the operator before being touched.

Bear in mind that static electricity that may have been discharged will quickly accumulate again in a short time.

4.4 TRAINING PERSONNEL

Generally, no particular information is provided for training for erection and maintenance work since these operations are reserved for specialized personnel. Operator training must take place in conformity with the UNI-ISO 9926/1 and 9926/3 standards that must be known.

When choosing the operator, who must be at least 18 years old, it is necessary to consider:

a) physical aspect:

- sight and hearing
- no vertigo when working at heights
- no disorders due to drugs or alcohol

b) psychological aspect:

- behaviour under stress
- mental balance
- sense of responsibility

Training must moreover provide complete knowledge of the rules applicable to hoisting equipment, knowledge of the hand signals, radio communications, equipment and techniques for moving loads. It is necessary to acquire technical knowledge of the equipment, its characteristics, the capacity diagrams and safety devices.

Training must essentially be directed toward the practical aspect of driving (at least 75% of the training time), and the theoretical knowledge must be checked with operational aptitude.

4.5 DEMOLISHING THE EQUIPMENT

If the crane is registered with public offices it is mandatory to report its demolition in accordance with current regulations, attaching the official documents and the identification plate

It should be considered that the crane is composed of:

- iron structures and mechanisms
- lubricating oils and greases
- electrical parts and electric cables
- electric motors
- plastic materials
- tyres

If demolition is assigned to third parties it is necessary to use firms authorized for disposal of the above-mentioned materials.

If you do the demolishing, it is necessary to separate the materials by type and afterwards appoint authorized firms for their disposal.

You must observe all the regulations in force in the country in which you are operating.

WARNING: *A crane or a scrap of a crane left in an area where free access is not prohibited is a serious danger for people, especially for children and animals.
All responsibility lies with the owner of the crane.*

CAUTION: *A crane can be identified, even without its data plate, by the many serial numbers stamped on the metalwork.*