

MAINTENANCE INSTRUCTIONS

DINO XT II
160 • 180 • 210

Manufacturer:

Dinolift Oy
Raikkolantie 145 | FI-32210 LOIMAA
Tel. + 358 20 1772 400 | info@dinolift.com | www.dinolift.com

TRANSLATION OF THE ORIGINAL INSTRUCTIONS

Valid from serial numbers:

160XT II	17854->
180XT II	30529, 30531->
210XT II	3885, 3889->

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1. TO THE MAINTENANCE PERSONNEL

This maintenance instruction manual is intended to give the qualified service person, who is familiar with the basic structure of the lift, the required instructions for maintenance, adjustments and repairs of the lift.

These maintenance instructions are an addition to the operating instructions. It is essential, that the person, responsible for the maintenance, has familiarised himself with the operating and safety instructions of the lift before starting the service operations.



DANGER

Perform all the service and repair operations in accordance with the local regulations for occupational safety.

Exercise particular caution while performing service- and maintenance operations. A faulty machine may cause severe, unforeseen risks.

If you are not sure which parts, tools or measures are necessary, consult your dealer or the manufacturer's service organisation.

Dinolift Oy is constantly developing its products. For this reason, the contents of this manual might not always be in full compliance with the most recent version of the product. Dinolift Oy reserves the right to modify the product without prior notice. Dinolift Oy assumes no liability for any problems caused by changed or missing data or mistakes in this manual.

Please consult your dealer or the manufacturer for more information and detailed instructions.

NOTICE

The operator must receive instructions and consent from the manufacturer for all such specific work methods or conditions, as well as for service, repair or modification operations, that the manufacturer has not explicitly defined in the unit's operation and maintenance instructions.

1.1. GENERAL WARRANTY TERMS

Dinolift Oy warrants newly delivered DINO aerial work platforms to be free from defects in materials, constructional parts, components and workmanship, with terms and limitations set out in the warranty terms. Full warranty terms are provided by the distributor.

The warranty period starts from the date of delivery from factory. Warranty cases related to engines and generators or other accessories manufactured by external suppliers are to be handled by and with the local authorized distributor of each respective manufacturer.

The warranty covers only the cost of constructional parts and components used in the equipment. The warranty does not cover:

- damage or loss caused by transportation.
- damage or loss caused by misconduct, misapplication or accident damage, failure or loss caused by negligence of instructions, manufacturer specified service program, maintenance or storage.
- normal wear of the equipment and damage resulting therefrom, nor wearing parts and materials, such as rubber tyres, seals, hoses, fittings, batteries, filters, etc.
- damage, failure or loss caused by maintenance or repair work performed by unauthorised service personnel.
- damage, failure or loss caused by the purchaser's acts or omissions causing alterations or modifications to the structure, configuration or quality of the product.
- any indirect damage or loss such as loss of profit and downtime costs, etc.
- any claims by a third party.
- any damage caused to other property.

Warranty claims and damaged parts shall be processed according to Dinolift instructions of warranty procedure. Contact the distributor for further instructions. No claim will be accepted if Dinolift notification and warranty procedures are not followed or non-original parts or parts not approved by the Supplier have been used.

For more information on warranty procedures, contact the distributor or

Dinolift Oy
After Sales Services
Raikkolantie 145
FI-32210 Loimaa
Finland
warranty@dinolift.com

1.2. SAFETY AND THE ENVIRONMENT

1.2.1. General safety instructions for maintenance

Exercise particular caution always when carrying out service- and maintenance operations. A faulty lift, or a lift from which covers, safety devices or other parts have been removed, may operate in an unexpected way.

If you must disable any of the safety devices for maintenance, make sure to resume its operation after the maintenance, and check that it works correctly.

Beware of sudden and unexpected movements.

Support the platform, the boom system, the articulated arms and the support outriggers in a position where the load does not rest on the structure under repair or cause any other danger (e.g. in transport position or use of supporting structures)

When removing hydraulic cylinders, also note that

- the cylinders may be oily and slippery
- the cylinders are heavy. Use a lift and suitable lifting gear for lifting

Do not spill oil on the ground.

Dispose of used oils and oily waste appropriately. Observe the local regulations and the regional or site-specific recycling instructions.

Remember when handling batteries:

Electrolytic liquid is highly corrosive – always wear protective clothing and eye guards.

The batteries generate hydrogen gas during charging – naked flame prohibited, danger of explosion

Use genuine spare parts for maintenance. This way, you will ensure correct operation and structural safety of the lift even after the maintenance.

1.2.2. Filling quantities of chemical substances

	Liquid type	Volume
Hydraulic oil	Kendall Megaflow AW HVI 22	30-35 l
	Fuchs Hydraway Bio SE 22	
	Fuchs Hydraway Bio SE 32-68	
	Mobil EAL 32	
Hydraulic oil (winter option)	Neste Hydraul 28 Arctic	30-35 l
Lubricant	Mobilux EP2 NLGI 2	
	Mobil Grease XHP 222	
Chain lubricant	Würth HHS Grease	
Engine oil (lifts with power pack)	SAE 10W-30	0,6 l (Honda)
		1,1 l (Hatz)

Consult the separate engine manual for more information and specific recommendations for engine oil.

The hydraulic oil type, used in the lift, is marked on the label, affixed to the side of the reservoir.

1.2.3. Materials and recyclability

Tyres

Type	Radial M+S	Size
		225/70R15C
		225/75R16C*
The tyres meet the requirements of the REACH regulation.		
The tyres can be recycled. A recycling fee has been paid for the tyres, so the used tyres may be left for recycling if they are replaced.		
Note the national and local regulations and policies.		

*Option

Other materials

Metals	Steel, aluminium, cast iron	
	Hydraulic pipes and components	Recyclable
	Power pack, axles	
Plastics	Covers, mud flaps (ABS, PE)	Recyclable
	Tyres	Plastic parts are marked with material ID.
Battery	Lead battery	Recyclable
Electric components	Wires, components	Partly recyclable
Hydraulic hoses		Not recyclable Hazardous waste.
Oils and lubricants	Used oils, oily filters etc.	Not recyclable Hazardous waste.

1.3. SAFETY-RELATED NOTIFICATIONS

The following safety alert symbols and safety signal words are used in this manual.

Observe all the safety instructions that follow these symbols, in order to avoid dangerous situations and personal injuries.



This is a general safety alert symbol and it is used to alert you about a potential hazard. Observe the additional instructions given in form of text or symbols that follow this symbol.



DANGER

Red DANGER-message warns for an imminent or potential hazardous situation which, if not avoided, may result in death or serious injury.



WARNING

Orange WARNING -message is used in connection with potential risk factors, which if not avoided, under certain conditions, may result in death or serious injury.



CAUTION

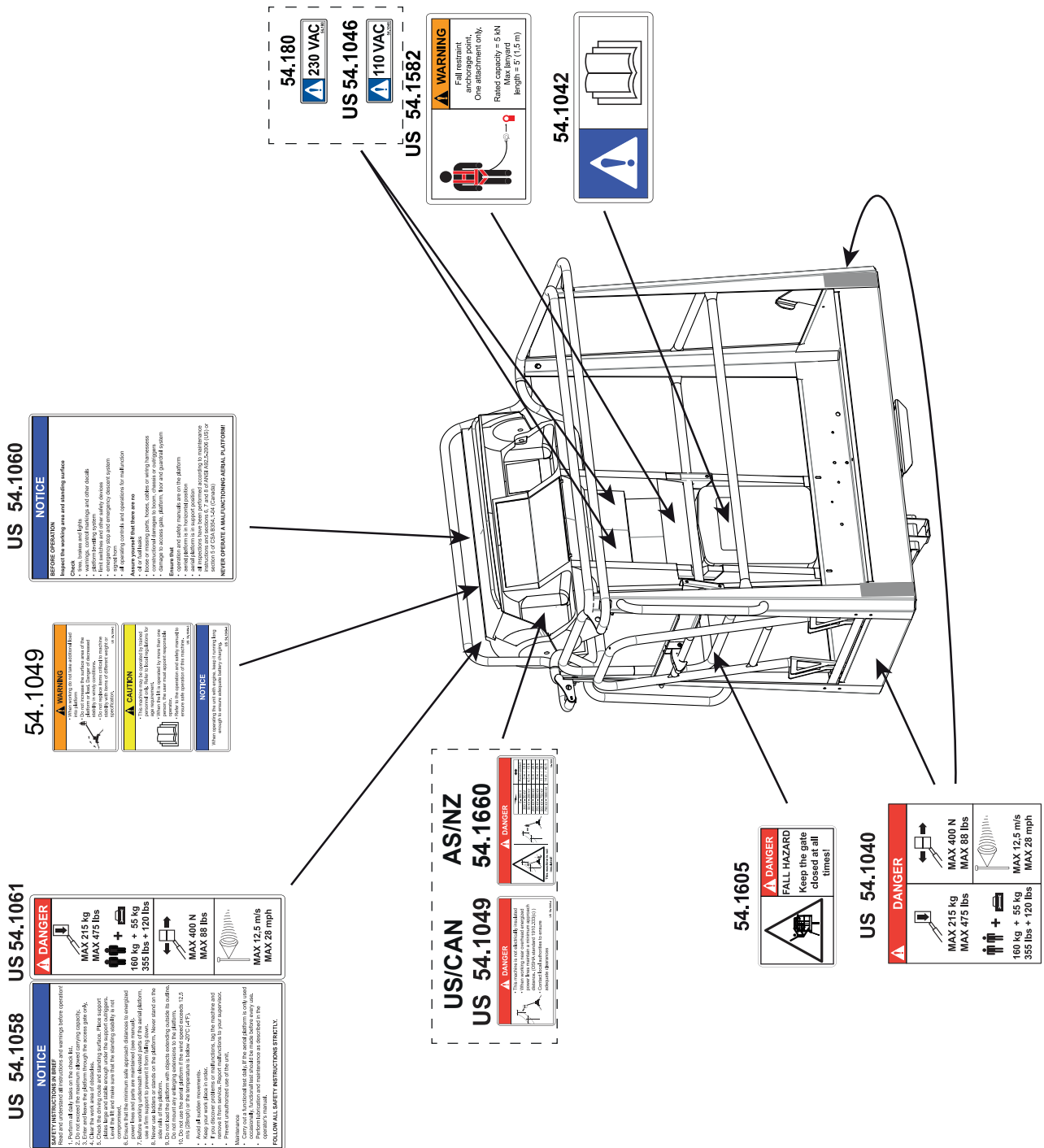
Yellow CAUTION -message is used to warn about a hazardous situation which, if not avoided, could result in minor or moderate injury.

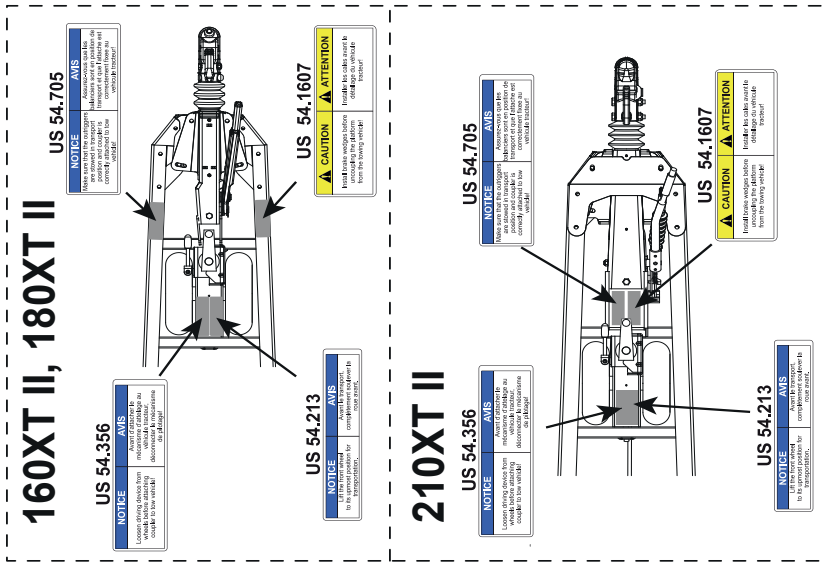
NOTICE

Blue notice-message is used to draw your attention to special notifications or instructions that are related to the operation or maintenance. Such messages include, for example, instructions that are related to reliability of the machine or aim to avoid material losses.

1.4. SAFETY LABELS

(ANSI/CSA/AS/NZS) The following safety labels must be intact, clean and legible. Replace the labels if necessary. CE Safety labels and all instructional labels are listed in the spare parts list.





US 54.1578

⚠ DANGER
Falling objects may cause injury or death. Keep away from work area while work is in progress.

⚠ CAUTION
Exhaust fumes may be hazardous to your health. Do not breathe in exhaust fumes in an enclosed or poorly ventilated area.

US 54.1034

⚠ CAUTION
CRUSHING HAZARD
Release pressure of moving parts carefully.

54.794

⚠ **⚠** **⚠**

250 kPa
2.5 bar
35.9 psi

54.612

⚠ **⚠**

54.520

450 kPa
4.5 bar
65.3 psi

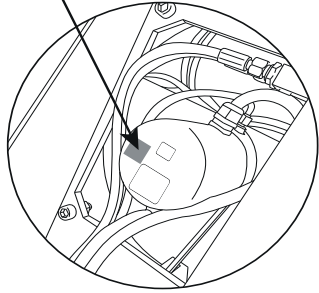
⚠ **⚠**

160-180XTB II: 54.1610
210XTB II: 54.1603

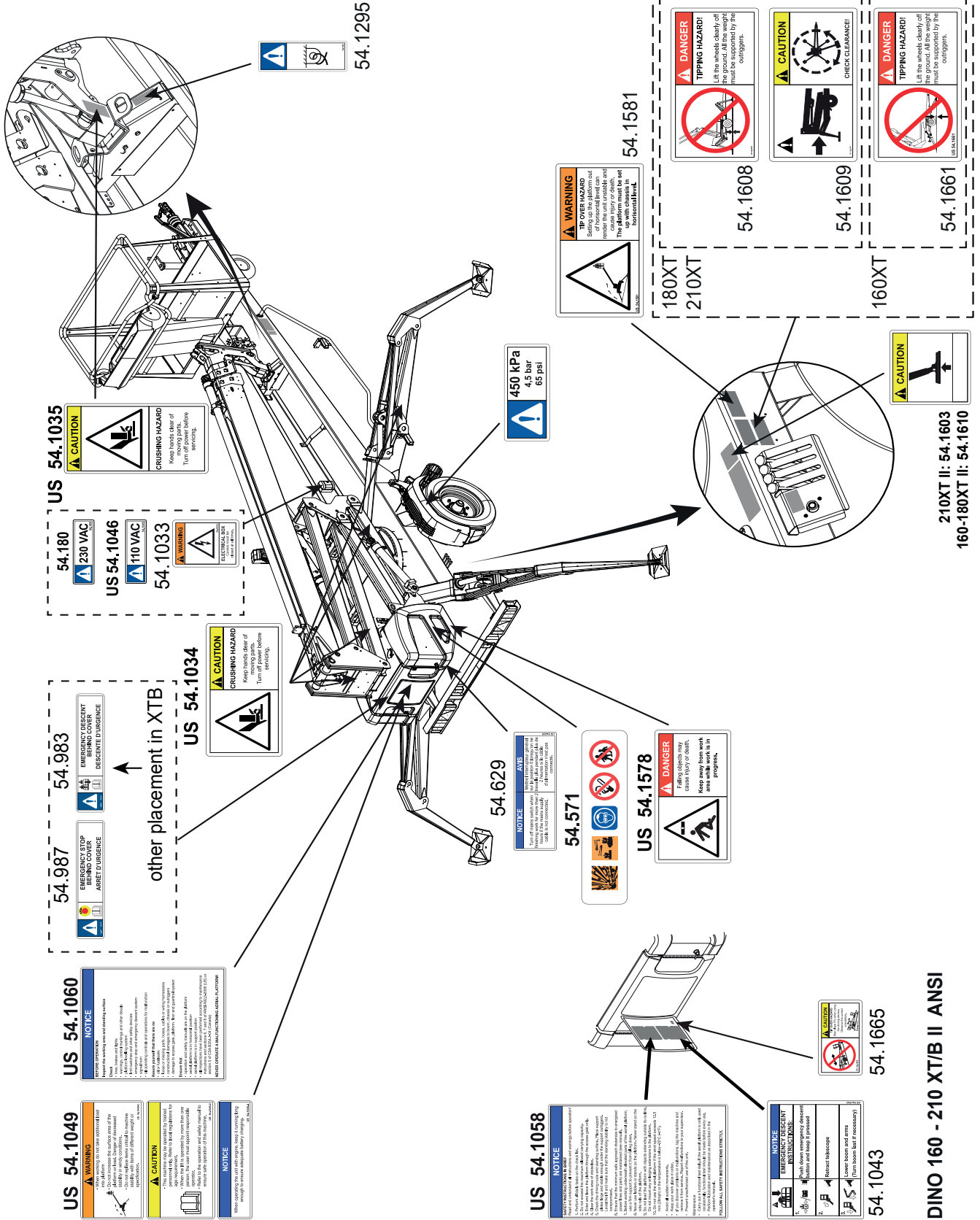
May not cover other stickers

⚠ WARNING
Do not touch the battery terminals.

54.1033



DINO 160 - 210 XT/B II ANSI



US 54.1049

WARNING

Do not address the scissor arms of the lift to the back, top or front of the body. Do not touch the scissor arms or the platform while the lift is in motion.

CAUTION

The machine may be operated by hand or by remote control. Do not touch the scissor arms or the platform while the lift is in motion. Do not touch the scissor arms or the platform while the lift is in motion.

NOTICE

When working on the lift, use the correct lifting technique to avoid injury. Do not touch the scissor arms or the platform while the lift is in motion.

US 54.1060

NOTICE

Keep the scissor arms and the platform clear of the scissor arms and the platform. Do not touch the scissor arms or the platform while the lift is in motion. Do not touch the scissor arms or the platform while the lift is in motion.

54.987 **EMERGENCY STOP**
54.983 **EMERGENCY DESCENT**
54.1035 **CRUSHING HAZARD**
54.1046 **230 VAC**
54.1033 **110 VAC**
54.1034 **CRUSHING HAZARD**
54.1043 **ELECTRICAL BOX**

other placement in XTB

54.1295

US 54.1058

NOTICE

When working on the lift, use the correct lifting technique to avoid injury. Do not touch the scissor arms or the platform while the lift is in motion. Do not touch the scissor arms or the platform while the lift is in motion.

54.629

NOTICE

When working on the lift, use the correct lifting technique to avoid injury. Do not touch the scissor arms or the platform while the lift is in motion. Do not touch the scissor arms or the platform while the lift is in motion.

450 kPa
6.5 Bar
95 PSI

WARNING

TIP OVER HAZARD

Steering up the platform out of the scissor arms may cause the lift to tip over. The lift must be supported by the horizontal beam.

180XT **210XT** **160XT**

54.1581

54.1608 **DANGER TIPPING HAZARD!**
 Lift the wheels clearly off the ground. All the weight must be supported by the outriggers.

54.1609 **CAUTION**
 CHECK CLEARANCE

54.1661 **DANGER TIPPING HAZARD!**
 Lift the wheels clearly off the ground. All the weight must be supported by the outriggers.

NOTICE

When working on the lift, use the correct lifting technique to avoid injury. Do not touch the scissor arms or the platform while the lift is in motion. Do not touch the scissor arms or the platform while the lift is in motion.

54.1043

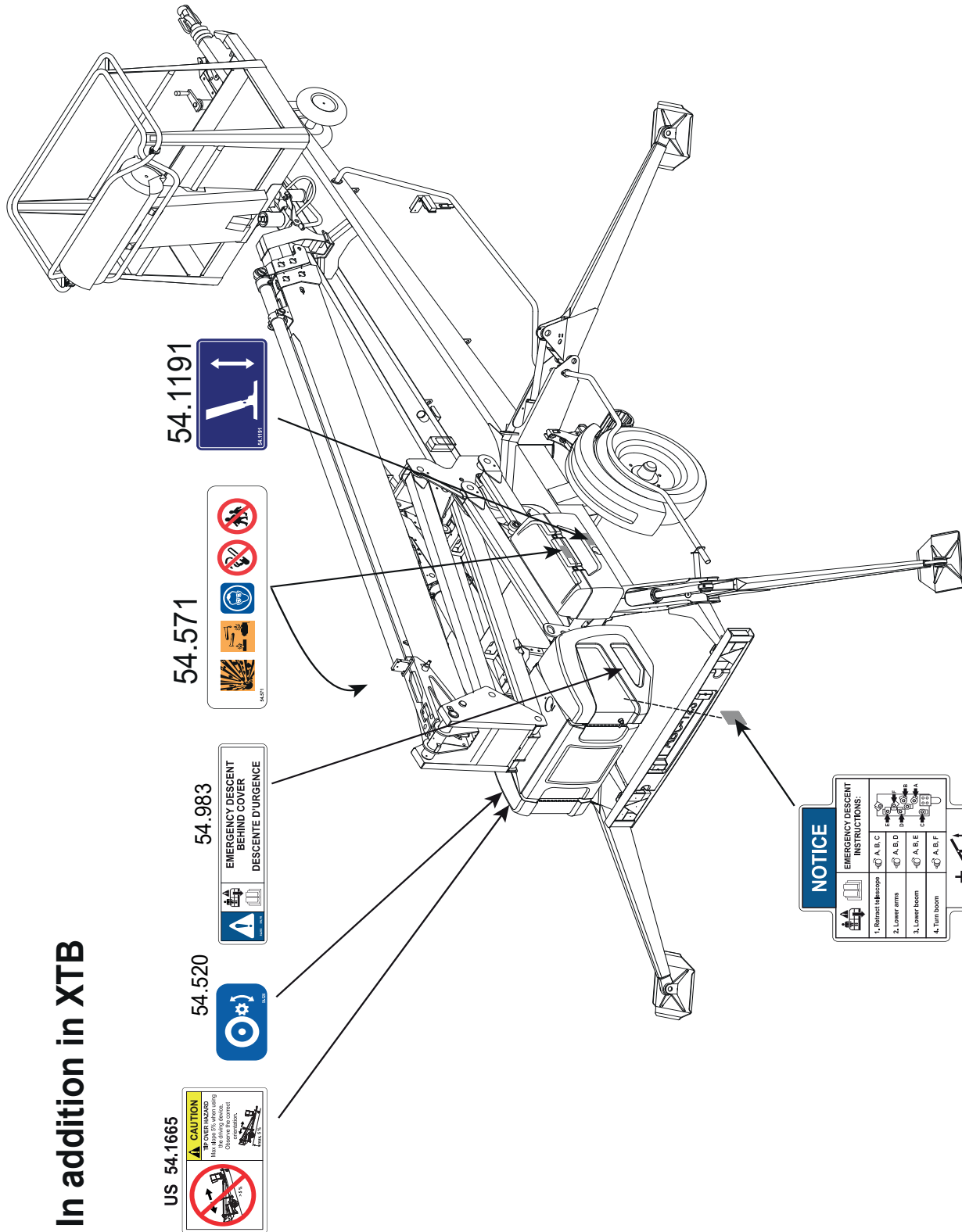
CAUTION

When working on the lift, use the correct lifting technique to avoid injury. Do not touch the scissor arms or the platform while the lift is in motion. Do not touch the scissor arms or the platform while the lift is in motion.

54.1665

DINO 160 - 210 XT/B II ANSI

In addition in XTB



NOTICE

EMERGENCY / DESCENT INSTRUCTIONS:

1. Retract telescopic	A, B, C
2. Lower arms	A, B, D
3. Lower boom	A, B, E
4. Turn boom	A, B, F

+

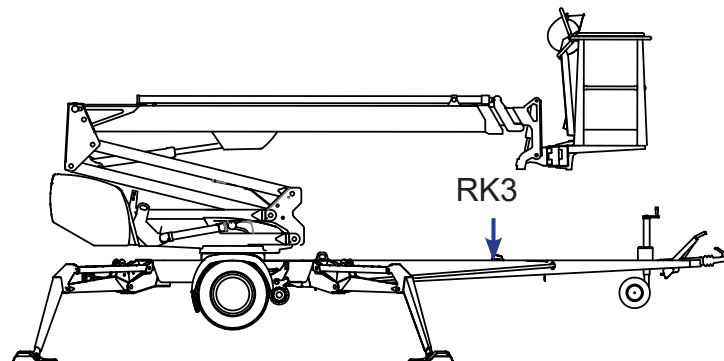
54.1845

DINO 160 - 210 XT/B II ANSI

1.5. SAFETY DEVICES

1. Supervision of transport position of the boom

The safety limit switch RK3 prevents the operation of the outriggers and the driving device when the boom is not resting on the transport support. The switch is located on the tow-bar at the transport support.

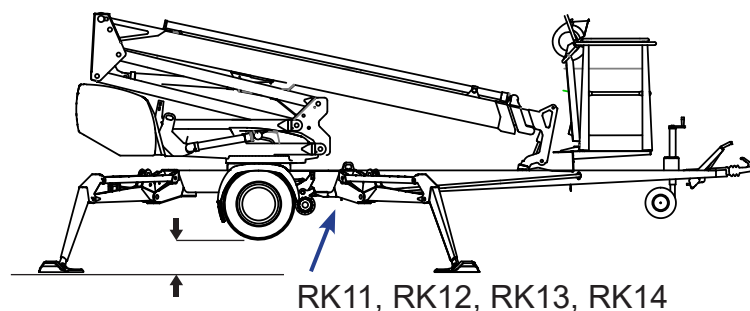


If the supervision of transport position is not functioning properly, the engine will stop. The defect must be repaired before the operation can be resumed.

2. Supervision of supporting

The lift's all support outriggers must be in the support position before the boom is lifted. Make sure that the wheels are off the ground.

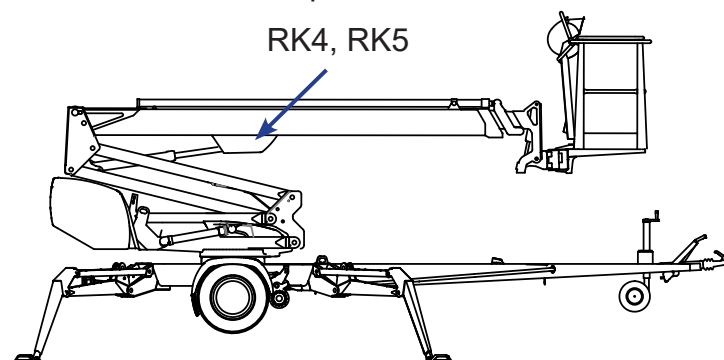
The safety limit switches RK11, RK12, RK13 and RK14 are located on the support outriggers.



3. Overload control of the boom

The outreach limit switch RK4 and overload limit switch RK5 prevent the lift from being overloaded by limiting the outreach of the lift to the side.

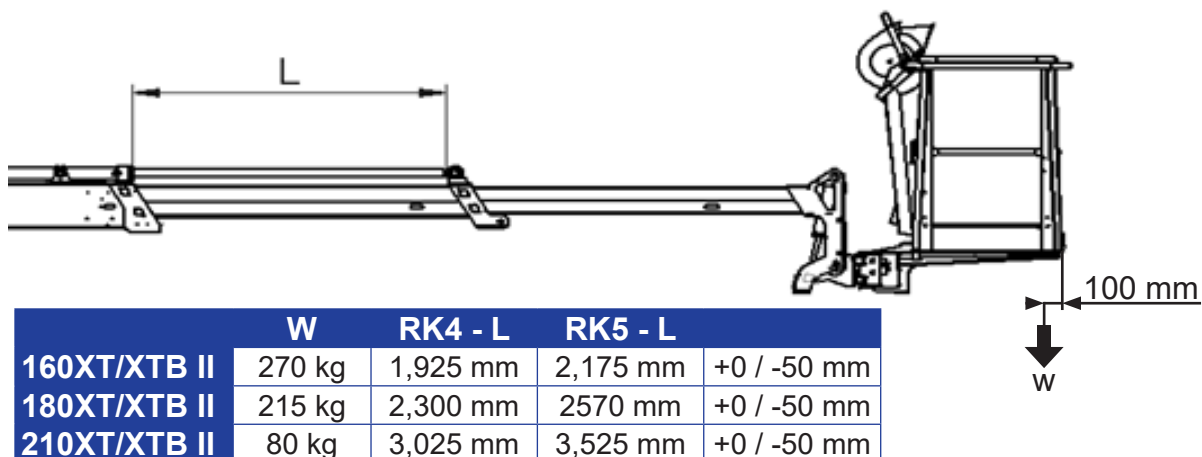
The limit switches are located under the cover at the top end of the lifting cylinder. During operation, the cover must be intact and in place.



The green light in the control centre on the platform is lit, when the platform is within the allowed operating range.

The reach limit switch **RK4** will stop the movements, which impair the stability of the lift (extending the telescope and lowering the boom), at a predetermined position.

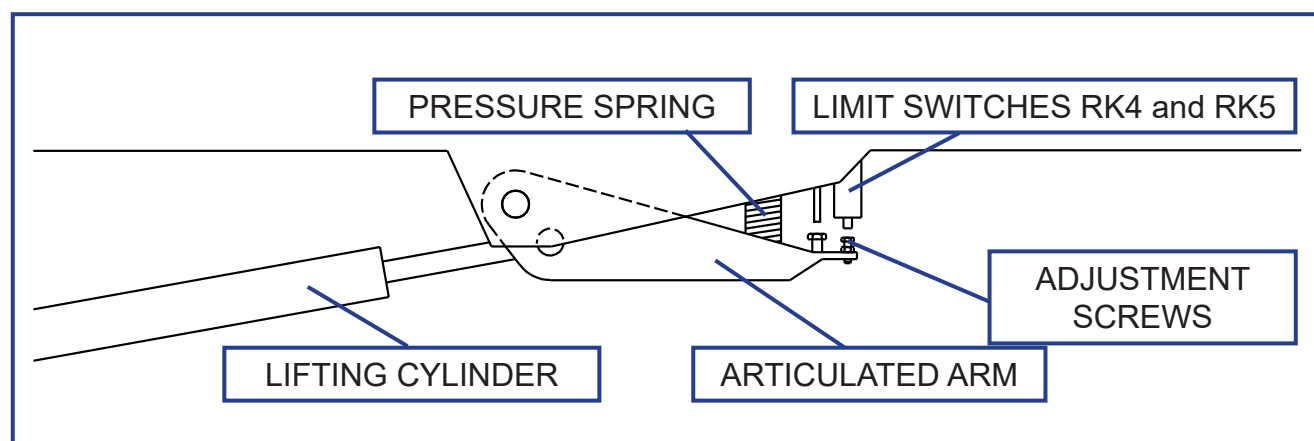
Adjusted values of the limits:



The red warning light for overloading will illuminate as soon as the **RK4** has stopped the movement. While at the outreach limit, the red warning light and the green signal light will flash in turns. In this situation, the lift can be operated in the direction, in which it remains inside the permitted outreach area.

The overload limit switch **RK5** backs up, if the **RK4**, for some reason, does not work. Once the **RK5** is activated, the red warning light for overloading in both control centres will be continually illuminated, and a warning buzzer will sound on the platform.

The operation of the overload limit switches is based on monitoring of the boom's lifting torque.

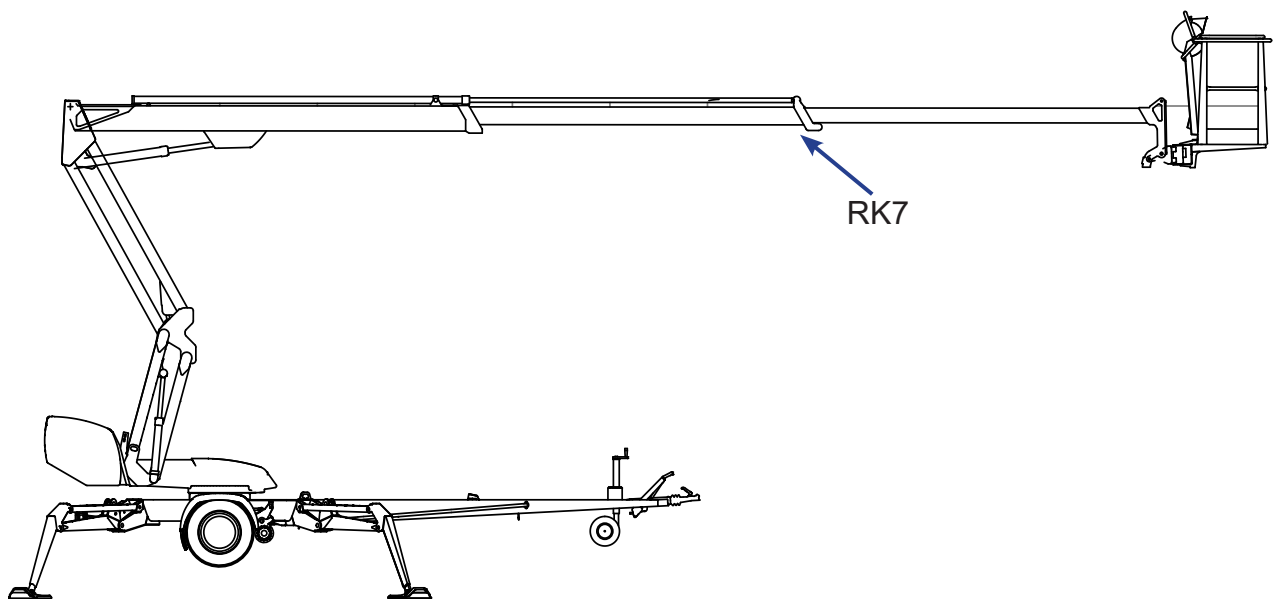
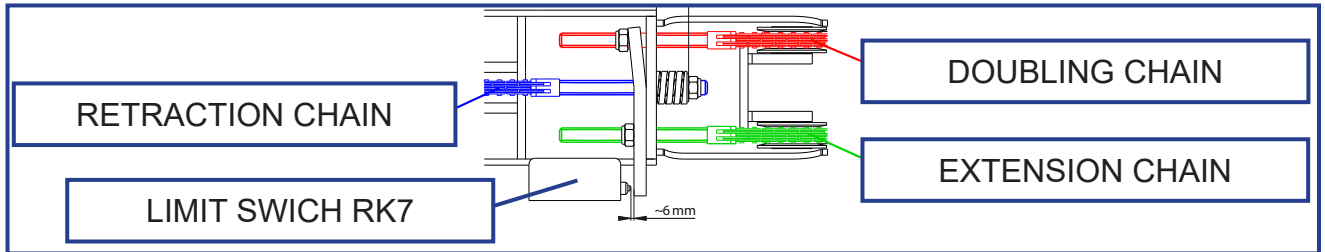


DANGER

The limit switches must never be readjusted, nor the operation of the mechanism be impeded. **Risk of turning over the lift!**

5. Supervision of the telescope chain

The extension chains for the telescope are doubled. If the load-bearing chain slackens or breaks, the doubling chain prevents the movements of the telescope, and the safety switch RK7/RK15 breaks the emergency stop circuit.

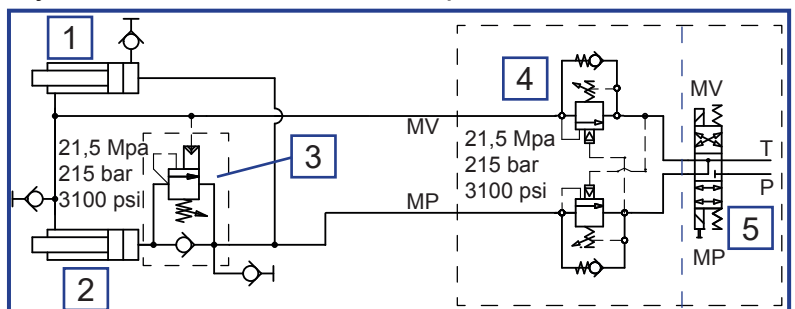


6. Preventing the inclination of the platform

The platform is levelled hydraulically by means of a so-called slave cylinder system, where the master cylinder controls the slave cylinder that inclines the work platform.

The levelling system comprises the following parts:

1. Master cylinder
2. Slave cylinder
3. Load regulation valve
4. Double load regulation valve
5. Electric directional valve



7. Safety devices for hose rupture

All the load-bearing cylinders are equipped with valves for rupture or leak in the hydraulic system, which prevent the load from falling.

Outrigger cylinders	Lock valves	Prevent the inching of the outriggers in either direction.
Lifting cylinder of the boom	Load regulation valve	Prevents the load from falling
Lifting cylinder of the articulated arms	Load regulation valve	Prevents the load from falling
Telescope cylinder	Load regulation valve	Prevents the inching of the telescope in either direction.
Levelling system	Load regulation valves	Prevents the inclination of the platform

8. Emergency stop buttons

Depressing the emergency stop button, stops all the movements immediately and turns off the power unit. The button can be found at each control station. Once the button has been depressed, only the emergency descent functions remain operational.

The emergency stop button locks in the lower position, and it must be released before starting the power unit.


NOTICE

If the unit does not start, make sure that the emergency descent button is not in the lower position at any of the control stations.

The emergency stop button in the platform control centre is fitted with a signal light, which remains illuminated while the lift is in the normal operating mode. The light will go out, if the emergency stop function is activated by any of the emergency stop switches or by the safety device.

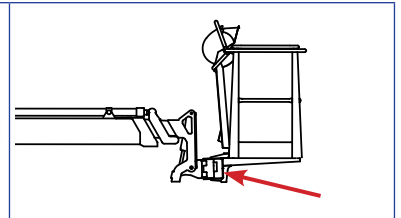
1.6. OPTIONAL SAFETY DEVICES

The following types of safety devices intended for different applications and operating environments are available for the machine.

 <b style="font-size: 1.2em; margin-left: 10px;">WARNING
<p>The optional equipment listed in this chapter may be mandatory safety devices depending on the equipment of the machine and the country of operation. It is strictly prohibited to remove or disable any safety devices installed on the machine.</p>

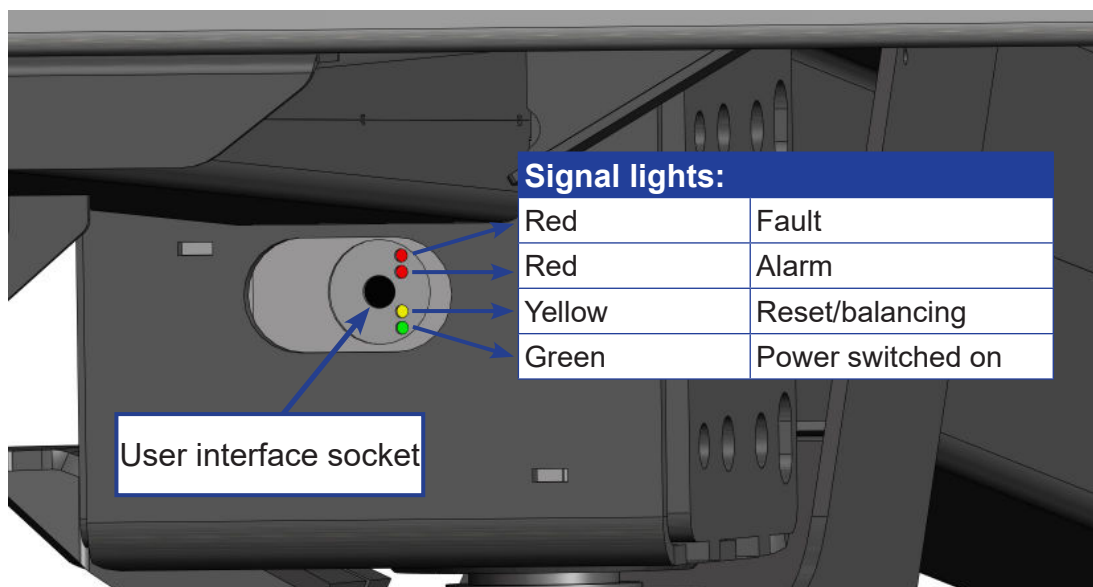
1.6.1. Platform load control (OPTION)

The machine may be equipped with a separate platform load control system that prevents the operation, if the platform load is too heavy. It is located under the platform, in the location marked in the picture.



The monitoring device for platform load switches the power unit off, and prevents all the movements when overloading occurs. As signs of overloading, the buzzer will sound and the red warning light for overloading will flash in the platform control centre.

The use of the lift may be resumed as soon as the load has been reduced.

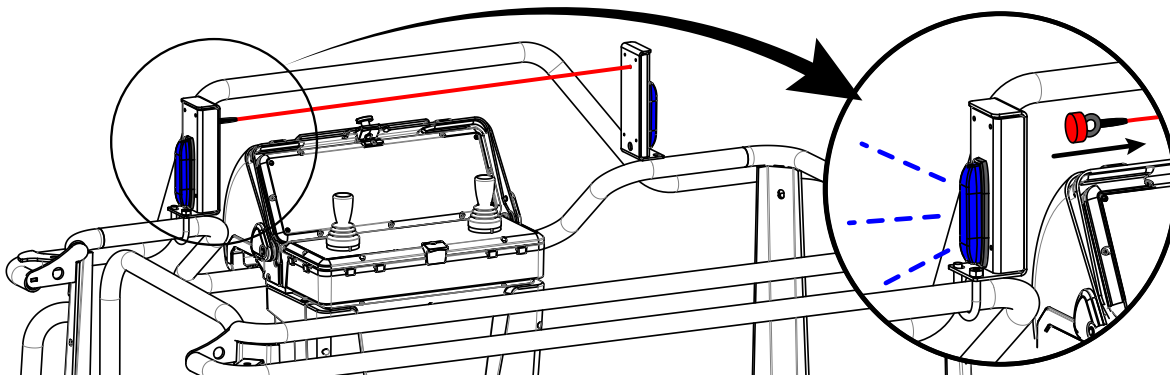


Load	Signal light	Sound signal	Boom control
100 %	No light	No alarm	Normal
> 100 % (-0 + 10%)	Continuous light	Alarm	Blocked

1.6.2. DINO SAFE-GUARD (OPTION)

The platform control centre may be equipped with a SafeGuard squeeze protection unit. The unit is intended for protecting the operator against trapping or crushing when the machine must be used in confined spaces with a risk of getting squeezed between the platform and the surrounding structures.

The SafeGuard system stops the machine if the safety rope above the control centre is pushed so that the magnet at the end of the rope comes off its counterpart.



When the magnet is detached from its counterpart, the SafeGuard unit stops all the movements and prevents the use of motion controls in the upper control centre. Only the "telescope in" movement (emergency lowering) and the emergency stop button will remain operational in the platform control centre. These movements can be operated normally from the lower control centre.

The SafeGuard system also triggers an audible alarm and turns on warning lights on both sides of the control centre.

The normal operation of the machine may be resumed as soon as the magnet is returned back in place.

1.6.3. Frost guard (OPTION)

The lowest permissible operating temperature of the lift is -20 °C

The lift may be equipped with a switch that measures the temperature. The switch is located in the LCB control centre, where its display indicates the operating temperature in the Celsius temperature scale.

The switch prevents the use of the lift if the temperature is below the permitted value.

1.6.4. Wind speed meter (OPTION)

If the wind speed exceeds 12.5 m/s, the lift must not be used.

The platform can be equipped with a wind speed meter. The meter triggers an alarm signal if the wind speed exceeds 12.5 m/s. This option is in particular intended for aerial access platforms with a working height over 22 m.

1.6.5. Alarm signal for lowering of the boom (OPTION)

Warns with a sound signal during lowering of the boom or the articulated arms.

The sound signal that is audible at the ground level warns the passers-by moving in the area

1.6.6. Sound warning of the chassis movements (OPTION)

Gives an audible warning signal during transferring and when the outriggers are being operated.

The sound signal that is audible at the ground level warns the passers-by moving in the area

2. MAINTENANCE SCHEDULE

Maint.	Schedule	Person responsible	Reference
A	Daily	Operator	Operating instructions
B	1 month / 100 hours*	Competent person who is familiar with the lift	Maintenance instructions
C	6 months / 400 hours*	Competent person who is familiar with the lift	Maintenance instructions
D	Annually / 800 hours*	Skilled technician who is well familiar with the structure and operation of the lift	Maintenance instructions
E	As needed	Skilled technician who is well familiar with the structure and operation of the lift	Maintenance instructions

* Service must be performed every indicated month or operating hour interval, whichever comes first.

NOTICE

In addition to the daily maintenance routines according to the maintenance schedule, every operator is obliged to perform a site-specific worksite inspection.

T = Check (general/visual checking of condition).

P = Thorough Inspection. To be performed following the procedure, described in the separate maintenance instructions.

V = Lubricate

S = Carry out replacements and repairs in accordance with this point

Always lubricate the lift and apply a protective grease film immediately after the washing.

The lift must be subjected to an extraordinary inspection always after an exceptional event. An event is exceptional, for example, if the lift has been damaged so severely, that its strength or operational safety may have been endangered. Consult the maintenance manual for more detailed instructions.

NOTICE

If the lift is equipped with a petrol-driven or a diesel power pack, then in addition to the normal maintenance routines must also be carried out the service measures in accordance with the power pack's manual.

NOTICE

Under demanding conditions where moist, corrosive substances or corrosive climate may speed up the deterioration of the structures and induce malfunctions, the maintenance intervals must be shortened, or the influence of corrosion and malfunctions must be reduced by using appropriate protective agents.

Maintenance item		A	B	C	D	E
1	Condition of chassis structures, boom and work platform	T	T	T	P	
2	Bearings of the overload protection device joint		V	T/V	T/V	
3	Bearings of outriggers and outrigger cylinders		V	T/V	P/V	
4	Bearings of outrigger footplates and moving parts of outrigger limit switch system		V	T/V	P/V	
5	Bearings of boom and articulated arms		V	T/V	T/V	
6	Bearings of the platform		V	T/V	T/V	
7	Bearings of the levelling cylinders		V	T/V	T/V	
8	Bearings of the lifting cylinder		V	T/V	T/V	
9	Sliding surfaces / rolls of the telescope		T/V	T/V	T/V	
10	Bearings of the telescope cylinder			T/V	T/V	
11	Condition of cylinders				P	
12	Flyer-chain			V	P/V	
13	Slide pads and sliding pad clearances		T	T	T	
14	Turning device			V	P/V	
15	Electro-hydraulic rotating adaptor				T	
16	Tyres and tyre pressures	T	T	P	P	
17	Coupling / overrun device		T	V	P/V	
18	Jockey wheel slide and threads				P/V	
19	Brakes			T	T	
20	Axles and suspension				P	
21	Driving device		T	V	P	
22	Lights	T	T	T	P	
23	Hydraulic oil	T	T	T	S	
24	Hydraulic hoses, pipes and fittings	T	T	T	P	
25	Condition and attachment of battery, electrical devices and wiring		T	T	P	
26	Hydraulic pressure				P	
27	Condition of safety limit switches				T	
28	Operation of safety limit switches	T	T	T	P	
29	Operation of overload protection device			T	P	S
30	Load holding and load regulation valves			T	T	
31	Platform levelling system		T	T	T	
32	Platform control devices	T			P	
33	Emergency descend, emergency stop and sound signal	T	T	T	T	
34	Labels, machine plates and instructions	T	T	T	T	
35	Test loading				P	
36	Corrosion protection				T	S
37	Movement speed adjustment					S
38	Special inspection					S

2.1. SCHEDULE FOR INSPECTIONS REQUIRED BY THE AUTHORITIES

Inspections must be performed in accordance with local, state or federal regulations, legislation, directives, standards. The manufacturer recommends following inspections, as required by local authorities in platforms country of origin.

A pre-use inspection must be done before taking the platform to use for the first time and before first start-up after major repairs and alterations.

A thorough inspection and a test loading of the lift must be carried out at least once every twelve (12) months.

The platform should undergo a major inspection within ten (10) years after having been originally put into service. A major inspection includes non-destructive testing and inspection while dis-assembled.

A special inspection should be done if the platform has been exposed to exceptional circumstances which may have affected the structural integrity of critical components.

The inspections should be carried out on regular basis throughout the service life of the lift.

If the lift is used under extreme conditions, intervals between the inspections shall be reduced.

The overall operating condition of the lift as well as the condition of the safety-related control devices shall be established in the regular inspections. Particular attention shall be paid to changes which affect the operational safety.

During inspections the notifications given in previous inspections, practical experience from use and information on performed repairs should be taken into account and can be implemented for better safety.

Major and special inspections shall be carried out by a competent person or competent body, who is familiar with the operation and structure of the lift. The competent person should periodically update their knowledge and be able to demonstrate their competency if so required.

A report should be made of the inspections and the reports should be kept with the unit stored in the space reserved for it.

The report should include

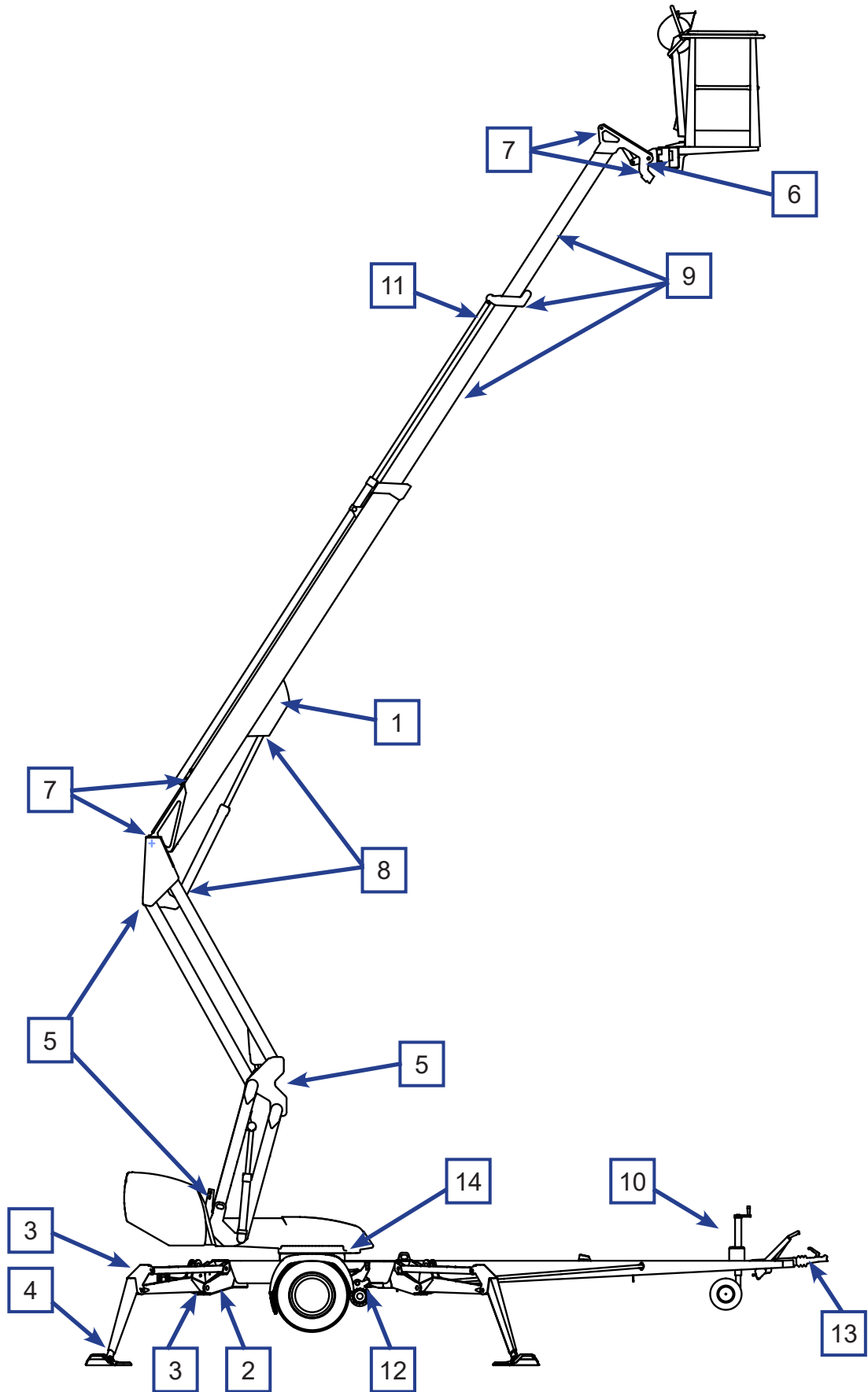
- information about the inspection
- data of repair welds (date, what was repaired and repaired by whom)

When the lift is ready for operation after annual inspection, the date of inspection shall be marked on the inspection plate affixed to the lift.

NOTICE

Check the regulations for the inspections and the competence of the inspector with the local authorities.

2.2. LUBRICATION PLAN



3. ROUTINE MAINTENANCE DURING OPERATION

The maintenance operations, that are the responsibility of the operator, are described in this chapter.

The more demanding maintenance operations that require special skills, special tools or specific measurements and adjustment values are instructed in the separate Maintenance Instructions. In such maintenance and repair cases, the operator shall contact an authorized service provider, the distributor or the manufacturer.

Make sure that all the service and maintenance procedures of the lift are performed in time and according to the given instructions.



WARNING

Any such faults, observed during operation or periodic service, which affect the operational safety of the unit, must be repaired before the lift is used next time.

Keep the lift clean. Clean the lift especially carefully before services and inspections. Impurities may cause serious problems, for example, in the hydraulic system.

Use original spare parts and consumables. Consult the spare parts list for more detailed information about the parts.

The first service after 20 hours of operation

- change the pressure filter element
- adjust the brakes according to the instructions (see point “Wheel brakes and bearings”)
- check the wheel bolts for tightness after about 100 km of driving

If the lift is operated under demanding conditions (in exceptionally humid or dusty environment, corrosive climate, etc.) the intervals between the oil changes and the other inspections shall be shortened to meet the prevailing conditions in order to maintain the operational safety and reliability of the lift.

The timely performance of the periodic servicing and the inspections is absolutely mandatory, because neglecting them may impair the operational safety of the lift.

The guarantee will not remain valid, if the servicing and the periodic inspections are not performed.

3.1. INSTRUCTIONS FOR DAILY MAINTENANCE AND INSPECTIONS

3.1.1. Check the condition of chassis, the boom and the work platform

Check visually the condition of the access routes, the work platform, the platform gate and the handrails.

Check visually the condition of the boom and the frame structures.

3.1.2. Check the tyres and tyre pressure

Check visually that the tyres are duly inflated, and do not show any damage.

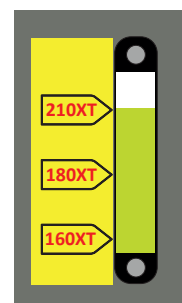
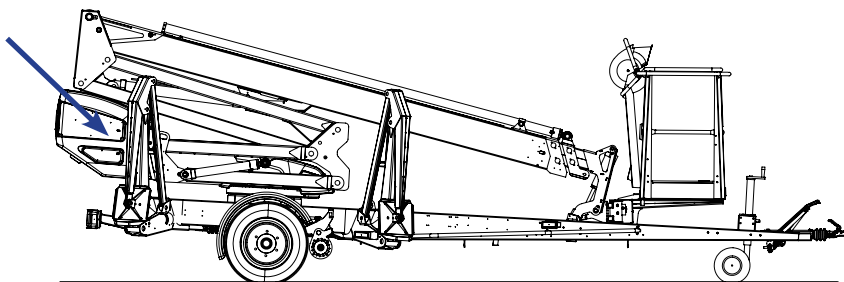
3.1.3. Check the lights

Check the condition of all the warning and signal lights as well as the road traffic lights of the trailer.

3.1.4. Check the hydraulic oil level

Check the hydraulic oil level with the platform in the transport position.
If necessary, top up hydraulic oil in accordance with the scale on the tank.

The hydraulic oil tank is located under a cover on the right-hand side of the lift.



At the same time, check in the level eye of the oil tank that the oil is looking clean and normal (no excess foam etc.).

3.1.5. Check the hydraulic hoses, pipes and connectors

Check visually the hydraulic hoses, pipes and connections.
Make sure that there are no visible oil leaks.

Replace any externally damaged hoses and clashed pipes or fittings.

3.1.6. Check the operation of the safety limit switches

Test the operation of the safety limit switches that prevent the movements of the boom and the outriggers as follows:

1. The lift is in the transport position with the outriggers in the upper position, and the driving device connected.
2. Lift the boom via the controls in the chassis control centre.
The boom must not operate in any position of the selector switch.
3. Lower the outriggers to the operating position of the lift
4. Using the controls in the chassis control centre, lift the boom so much that it raises from the support
5. Drive the outriggers.

The outriggers must not operate in any position of the selector switch.

3.1.7. Check the operation of the emergency descent, the emergency stop and the sound signal

Test the operation of the emergency stop, the emergency descent system and the sound signal from both the chassis control centre and the platform control centre.

- lift the boom about 1-2 metres (using lever 8) and extend the telescope 1-2 metres (using lever 9) keeping the emergency stop button depressed – the movement shall now stop
- using the emergency descent, retract first completely the telescope, then lower the boom
- pull up the emergency stop button
- test the operation of the sound signal

3.1.8. Decals, stickers and signs

Check that all the signs, warning decals and pictorials in the control centres are in place, intact and clean.

3.1.9. Instruction manuals

Check that the user manuals accompanying the lift are legible.

3.1.10. Check the operation of the safety limit switches

Test the correct operation of the safety limit switches that prevent the movements of the boom and outriggers in the following manner:

1. The lift must be in the transport position, with the outriggers raised and the driving device engaged.
2. Operate the boom from the controls in the chassis control centre.
The boom must not operate in any position of the selector switch.
3. Lower the outriggers to the operating position of the lift

4. Using the controls in the chassis control centre, lift the boom so much that it raises from the support
5. Drive the outriggers.
The outriggers must not operate in any position of the selector switch.

If the machine is equipped with platform load control (OPTION)

Check from the signal lights that the platform load control is in operation.

When the basket is empty, the signal lights for the sensor must be as indicated in the table.

LED		System status
RED LED	not illuminated	System not malfunctioning
RED LED	not illuminated	System not overloaded
ORANGE LED	steady illuminated	The empty weight of the basket is correctly adjusted (± 15 kg)
GREEN LED	flashes	The sensor is operational

3.1.11. Check the operating controls

Check the operating controls of the platform control centre and the chassis control centre:

- check the overall condition of the operating controls
- test all the movements. Ensure that all the movements stop when the control lever is released.

3.1.12. Check the operation of the emergency descent, the emergency stop and the sound signal

Test the operation of the emergency stop, the emergency descent system and the sound signal from both the chassis control centre and the platform control centre.

- lift the boom about 1-2 metres (using lever 8) and extend the telescope 1-2 metres (using lever 9) keeping the emergency stop button depressed – the movement shall now stop
- using the emergency descent, retract first completely the telescope, then lower the boom
- pull up the emergency stop button
- test the operation of the sound signal

3.1.13. Decals, stickers and signs

Check that all the signs, warning decals and pictorials on the control centres are in place, intact and clean.

3.1.14. Instruction manuals

Check that the instruction manuals accompanying the lift are legible.

4. PERIODIC SERVICE

The measures, included in the maintenance schedule, which are the responsibility of a skilled service person, who is thoroughly familiar with the operation and structure of the lift, are described in this chapter.

4.1. INSTRUCTIONS FOR MONTHLY SERVICE AND INSPECTION

In addition to the measures given in this chapter, you should also carry out the daily inspections according to the maintenance schedule. If you observe any flaws, defects or damage in the lift, take the necessary corrective actions.

4.1.1. Lubricate the greasing points

See points 2–9 in the maintenance schedule. The nipples are marked in the lubrication plan. In the machine, their positions are marked with decals.

Apply grease until the grease, that comes out of the joint, is clean. Wipe off excessive grease, if necessary.

Lubricant: Esso Beacon EP2 or equivalent.

Lubrication point	Number in the lubrication plan
Bearings of the overload protection device	1
Joints of the outriggers and the outrigger cylinders	2 and 3
Joints of the outriggers' foot plates, and the moving parts of the outrigger limits	4
Bearings of the boom and the articulated arms	5
Bearings of the levelling system of the platform	6
Articulation bearings of the levelling cylinders	7
Articulation bearings of the lifting cylinders	8
Sliding surfaces and rollers of the telescope	9

Lubricate the sliding surfaces of the telescope with silicone.

4.1.2. Check and adjust the play between the slide pads and the slide surface

Check the play between the slide pads and the slide surface.

If necessary, eliminate the play of the slide pads to make the boom extensions run in the centre without chafing the edges. The slide pads **must, however, not** press the boom.

NOTICE

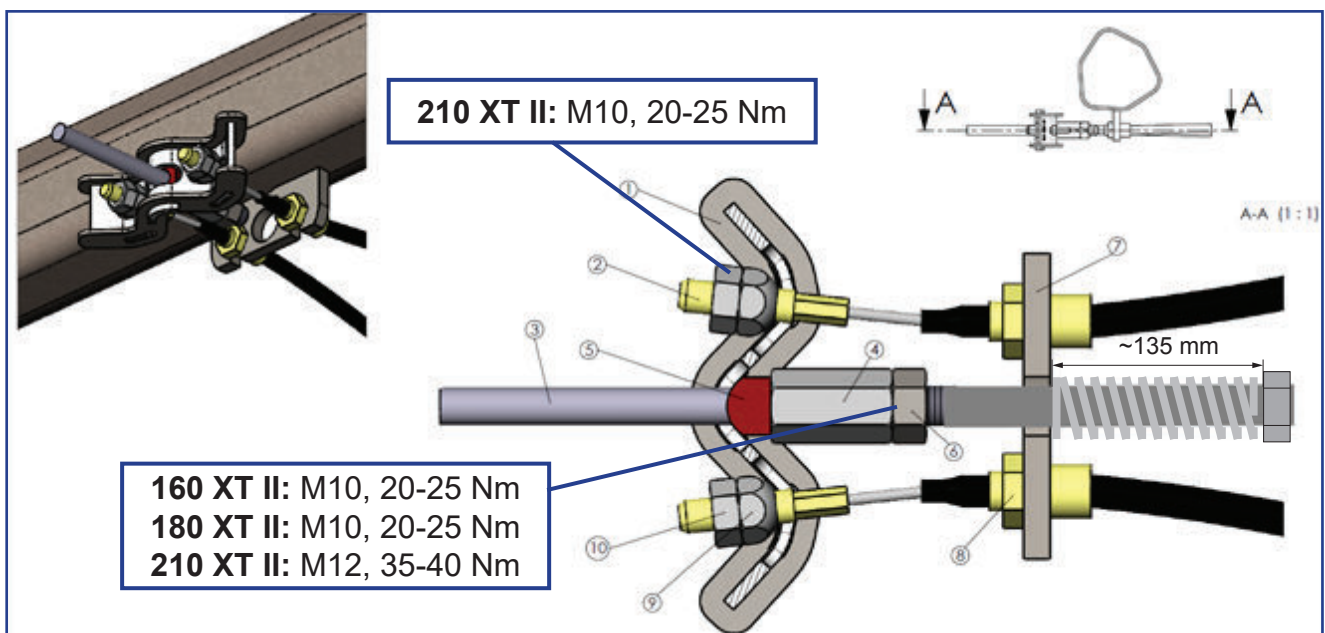
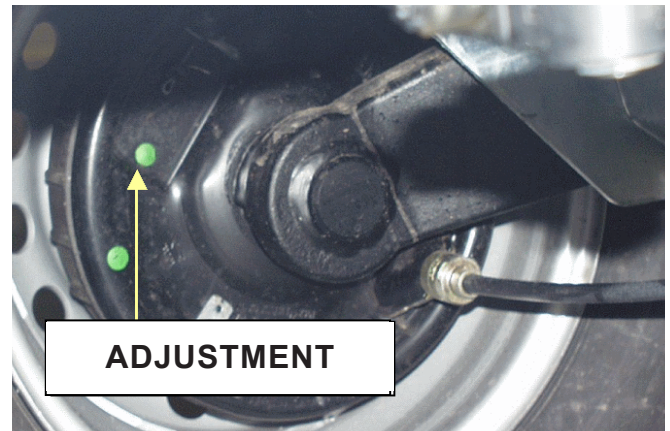
The slide pads must always be secured after the adjustment using threadlocker.

4.1.3. Check the adjustment of the tow hitch and the overrun brake

Check the condition of the tow hitch and the tow ball coupling. Check the brake adjustment.

Adjusting the brakes

1. Bring the lift to the support position so that its wheels rise off the ground.
2. Make sure that the wheels can rotate freely.
3. Check the attachment of the brake rods.
4. Turn the adjustment wheel, behind the hole, shown by the arrow, until the wheel no longer can be turned by hand.
5. Turn the bolt counter-clockwise until the wheel may be turned freely.
6. Once the hand brake has been released, and the operating brakes adjusted, the springs on the brake rod extension must be pre-tightened as shown in the picture.



Tightening the brake system too much causes overheating of the brakes during transportation, and added force requirement on the driving device.

We recommend performing a test run after the adjustment in order to ensure flawless operation of the brakes by braking 2-3 times.

NOTICE

The brakes must be adjusted after every 5000 km. Depending on the total towing distance of the trailer, the adjustment may not be necessary at every monthly service.

4.1.4. Check the driving device

Check that the driving device is operating correctly.

When the lift is transferred by means of the driving device, it must travel straight.

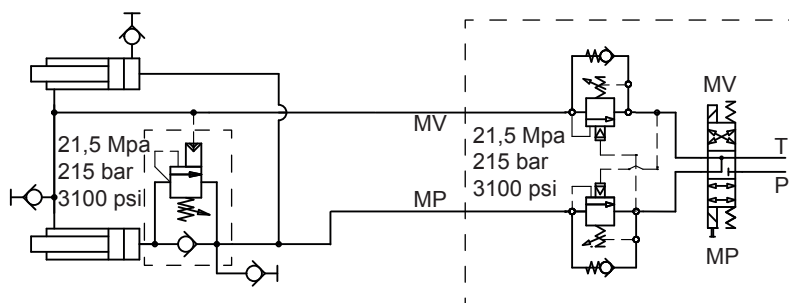
Check the load holding valves of the driving device for tightness.

4.1.5. Check the condition and attachment of the battery and the wiring.

Check visually the condition and attachment of the battery and the visible wiring.

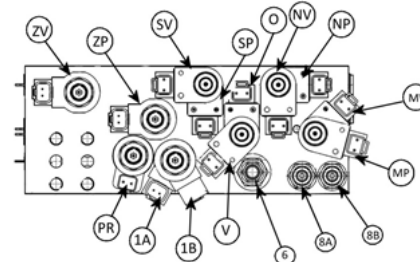
4.1.6. Check the operation and condition of the platform's levelling system

The platform is levelled by means of a so-called slave cylinder system, where the master cylinder under the platform controls the slave cylinder. The platform keeps its level position only if the valves in the system are tight.



The levelling system comprises the following parts:

1. Master cylinder
2. Slave cylinder
3. Load regulation valve
4. Double load regulation valve (8A and 8B)
5. Electric directional valve



If the platform, viewed by the operator, drifts forwards, the reason can be:

- a leak in the slave cylinder's double load regulation valve (on the piston rod side) towards the electric directional valve (which is by design not tight)
- an internal leakage in the cylinder

If the platform, viewed by the operator, drifts backwards, the reason can be:

- a leak in the load regulation valve (4) on the piston (bottom) side of the slave cylinder in the direction of the electric directional valve (5), which is not tight
- an internal leakage in the cylinder

The leak will cause drifting of the platform until the load regulation valve (3) under the platform closes. The closing is caused by dropping of the pressure on the piston rod side to the opening ratio, which is 5:1. If the valves are not tight, refer to the service instructions for checking the load regulation valves.

Settings of the load regulation valves in the levelling system:

- the opening pressure of the double load regulation valves (4) is 21.5 MPa (215 bar)
- the opening pressure of the load regulation valve (3) under the platform is 21.5 MPa (215 bar)

Do not change the pre-set values of the valves.

4.2. INSTRUCTIONS FOR INSPECTIONS EVERY 6 MONTHS

These service measures must always be carried out between the annual services at every 6 months or 400 hours, whichever comes first.

In addition to these service measures, also carry out the measures included in the daily and monthly services.

4.2.1. Check and lubricate the turning device bearings and the gear ring

Check visually the turning device and its welded seams. In particular, check the attachment points of the joints and the turning bearing.

Lubricate the turning bearing and the gear ring. Reference number of the point in the lubrication plan: 14.

1. Remove the crescent-shaped cover plates from the underside of the lift.
2. Lubricate the turning bearing nipples (4 pieces).
3. Put the cover plates back in place.

NOTICE

Excess grease pressure may press out the turning bearing seal.

4.2.2. Lubricate the telescope cylinder bearings

Apply grease until the grease, that comes out of the joint, is clean. Wipe off excessive grease, if necessary.

Lubricant: Esso Beacon EP2 or equivalent.

Reference number of the point in the lubrication plan: 11

4.2.3. Lubricate the Flyer-chain

Lubricate the visible parts of the Flyer-chains of the boom twice a year. Use Master chain lubricant 1-4014 or equivalent.

4.2.4. Check the attachment of the wheels and the tyre pressures

Check the wheel bolts for tightness and the tyre pressures.

Tightness of the wheel bolts:

160XT II = 90 Nm

180XT II, 210XT II = 325 Nm

Check the tyre pressures: The correct pressure ratings are marked both on the tyres and on the jockey wheel bracket.



The maximum loading capacity of the tyre is achieved at the maximum inflation pressure marked on the tyre. If the tyres have been replaced, check that the pressure matches with the marking on the tyre.

4.2.5. Lubricate the tow hitch and the overrun

Reference number of the point in the lubrication plan: 13.

If necessary, apply a thin grease film on moving parts of the ball coupling.

4.2.6. Check the condition of the brakes

The following service measures must be carried out every six months or after driving 13,000–15,000 km:

- check the brake linings for wear
- check the operation of the overrun brake (by means of a test run – execute a few braking tests)
- lubricate the sliding part of the overrun brake

The **wheel bearings** are lubricated for life and do not require any servicing.

(The bearings do not need any additional lubrication and they cannot be adjusted.)

Turn the wheels at least once every 3 months to keep the lubricating film intact.

NOTICE

The double row angular contact compact bearings have a long service-life and they are maintenance-free. Therefore, the bearings very rarely break under normal operating conditions. If a bearing fails due to exceptional operating conditions, replace the entire brake drum assembly with the pressed-in bearings and locking nut.

Assign a specialised workshop for the work.

4.2.7. Lubricate the driving device

Apply grease into the nipples, until the grease, that comes out of the joint, is clean. Wipe off excessive grease, if necessary.

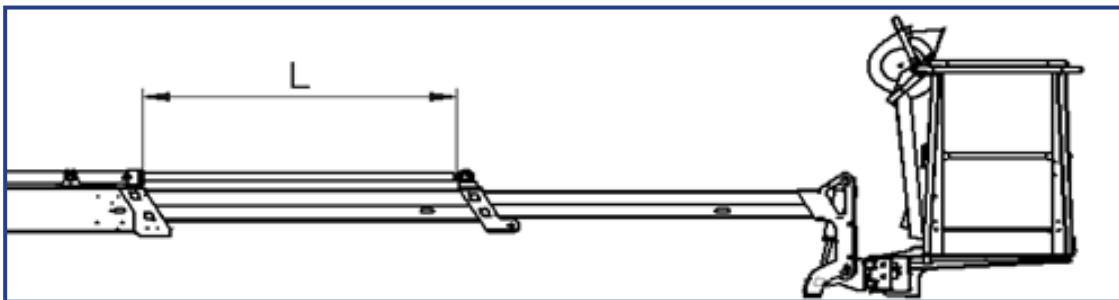
Lubricant: Esso Beacon EP2 or equivalent.

Reference number of the point in the lubrication plan: 12

4.2.8. Checking the adjustment of the overload protection device

Check the adjustments of the overload protection device as follows:

1. Check the test loads and the adjusted values in the table of the chapter "Safety devices".
2. Put a test load onto the platform
3. Drive the boom to a horizontal position.
4. After this, extend the telescope until the red signal light lights up and the movement stops.
5. Measure the stroke and compare it with the adjusted value for RK4 in the table.

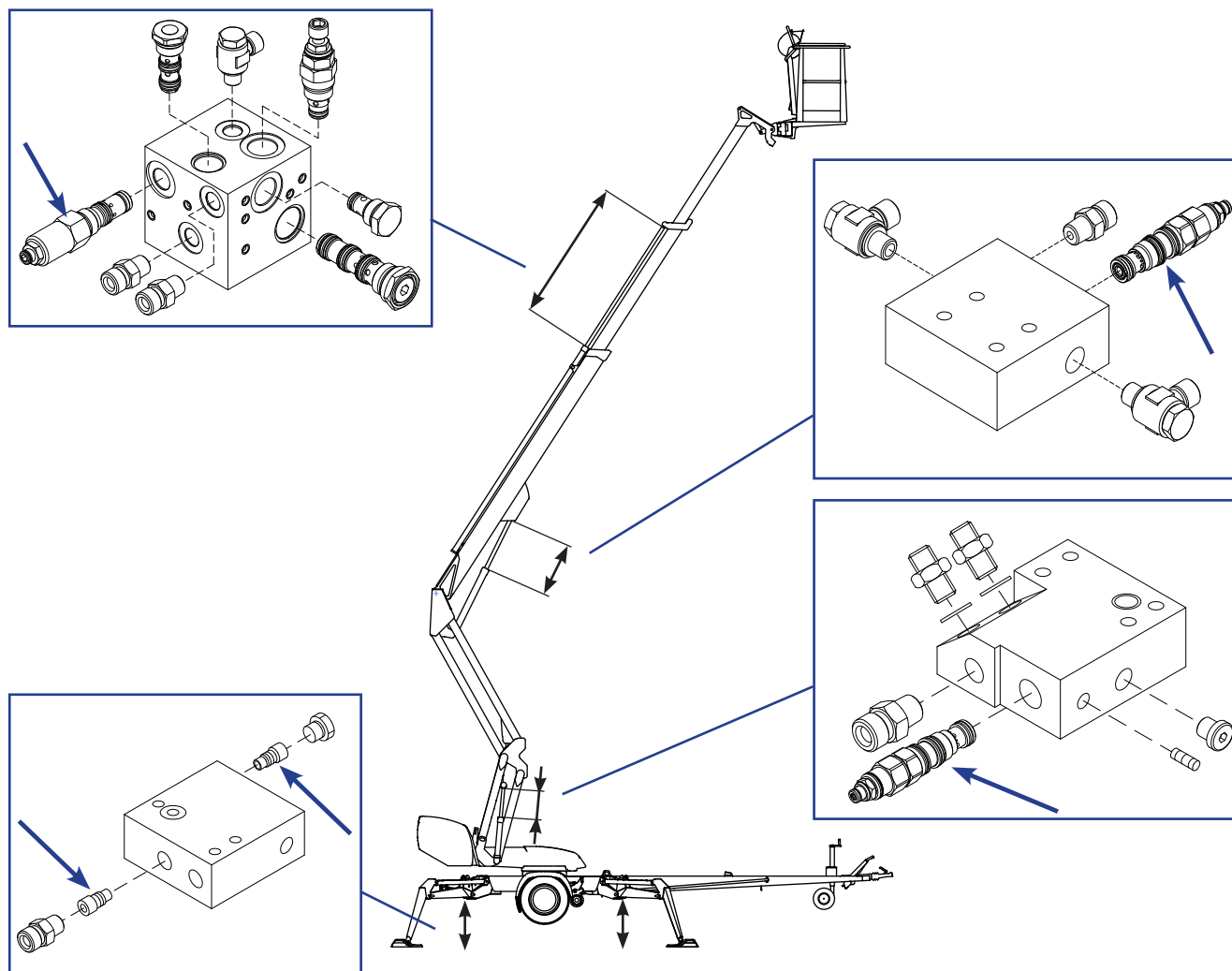


6. If the stroke is longer, readjust according to the instructions.

4.2.9. Check the operation of the load regulation valves

Check the operation of the valves in accordance with the instructions below. If the valve has leaked, carry out the measures according to the service instructions after the inspection instructions.

1. Load holding valves of the outriggers
 - using the outriggers, raise the lift off the ground on a level surface
 - measure the distance from the chassis to the floor separately at each outrigger
 - leave the lift in this position for a few minutes.
 - measure the distances again. The distances should be the same as at the beginning.
2. Load regulation valves of the boom cylinder and the cylinders of the articulated arms
 - drive the boom to a location where you can reliably measure its position
 - keep an eye on the boom for a few minutes
 - repeat the measurement. The position of the boom should be the same as at the beginning
3. Load regulation valve of the telescope cylinder
 - drive the telescope to a determined position
 - measure the length of the telescope cylinder's stroke
 - drive the boom to an almost vertical position, and leave it there for a few minutes
 - lower the boom and repeat the measurement. The length of the stroke should not have changed
4. Load regulation valve of the work platform's levelling system
 - put a load of 100–200 kg on the platform
 - measure the height of the platform's rear edge from the floor
 - leave the lift in this position for a few minutes
 - repeat the measurement. The height position of the platform's edge should be the same as at the beginning.



NOTICE

The valve can only be opened 2–3 times after which it has to be replaced. After this, the valve may start to leak, and it must be replaced by a new one.

Service instructions for the valves

- Remove and clean the valve.
- Check the O-rings and, if necessary, replace them.
- Put the valves carefully in place.
- Do not change the pre-set values of the valves.
- If necessary, replace the valve.



WARNING

Support the platform, the boom system and the outriggers in a position, where the load does not rest on the structure to be repaired. Ensure that the cylinders are not under pressure.

4.3. INSTRUCTIONS FOR ANNUAL MAINTENANCE OF THE LIFT

The annual maintenance must be carried out every 12 months or 800 hours of operation, whichever comes first. The measures of the smaller services need not be carried out separately in connection with the annual maintenance as they, to the extent necessary, are included in the instructions for the annual maintenance.

Under demanding conditions where moist, corrosive substances or corrosive climate may speed up the deterioration of the structure and induce malfunctions, the inspection must be performed more often and the influence of corrosion and malfunctions must be reduced by using appropriate protective means.

Only technical specialists who are familiar with the structure and the operation of the lift are allowed to maintain the lift.

NOTICE

The annual maintenance of the lift with relevant inspections does not replace the annual inspection, executed by an expert or an expert body with documented evidence of competence.

Clean the lift thoroughly before the service

The hydraulic and electric appliances must not be dismantled if they are not clean. Any contaminants in the system may cause malfunctions later on. Wash the lift externally.

- use pressure air to dry the electric devices, hydraulic connectors etc. before opening them
- apply appropriate moisture repellent to the electric appliances after the drying
- always protect the piston rods with e.g. CRC3-36 anti-corrosive agent after washing with a solvent



CAUTION

Be careful not to direct the high pressure water jet straight to the electric appliances, such as the control centres on the chassis and on the platform, relays, solenoid valves and limit switches.

4.3.1. Inspect thoroughly the support outriggers and the outrigger cylinder joints

check the mechanical structure of the outriggers and the welded seams

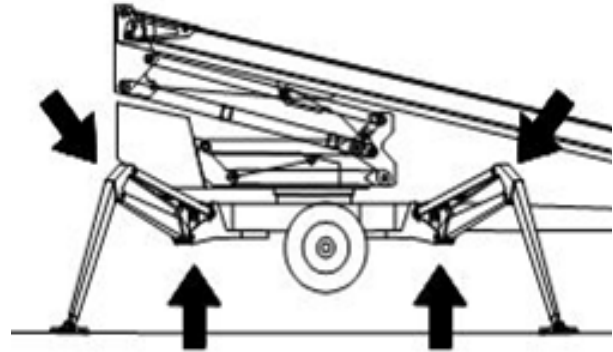
The structures must not show signs of deformations or cracks No fractures or cracks are allowed in the welded seams.

Check the footplates for deformations, cracks or breaches

Also check that the footplate can turn freely on its joint.

Check the condition of the outrigger joints:

1. lower the outriggers slightly
2. swing the outriggers back and forth in the horizontal plane and check the joints for play
3. check the operation and condition of the limit switch mechanisms on the outriggers
4. replace any worn out parts
5. lubricate the outrigger joints (see point “Lubrication plan”)



Lower the outriggers to the support position.

4.3.2. Check the frame structures, the boom system, the work platform and the platform carrier

check the condition of the chassis

- general condition
- check the attachment of the tow-bar to the chassis
- check the condition of the overrun and its attachment to the chassis.
- check the rims, the tightness of the wheel bolts, the tyres and the tyre pressures The correct pressure ratings are marked both on the tyres and on the jockey wheel bracket.
- check the condition of the transport support of the boom

inspect the boom

- extend the telescope and check that there are no permanent deformations, dents or traces of substantial wear in the boom
- check the welded seams for wear, cracks or breaches
- check the boom attachment for cracks or breaches
- inspect the boom joints, the sliding pads and their play – readjust if necessary. Lubricate the sliding surfaces
- check the condition of the cable chain, its clamp brackets as well as the tightness of the screw connections
- check the condition of the platform brackets
- check the locking of the platform pin

Inspect the work platform

- general condition
- check that the platform does not show signs of deformations, substantial wear or buckles
- check that the handrails, the steps, the gate and the attachment of the gate are in order
- check that the lock of the gate and the gas spring are in order
- check the condition of the platform floor plate
- check the platform carrier for notable buckles or deformations

4.3.3. Check thoroughly the tow hitch and the overrun

Check:

- attachment of the tow hitch
- clearances
- condition of the tow-ball coupling
- condition of the locking device
- check that the overrun brake mechanism moves freely
 - apply the parking brake
 - push the tow-ball-coupling inward
 - the tow-ball-coupling must be able to automatically return to its initial position resulting from the action of the gas spring

4.3.4. Inspect thoroughly the hydraulic hoses, pipes and connections

- check the hoses for any leaks or chafing
- check that the pipes do not show any dents, leaks, trace of corrosion or chafing at the clamps
- check that all the pipes are properly fastened
- check the hose and pipe connections for leaks, and that the connections are properly tightened

Replace any externally damages hoses or buckled pipes.

4.3.5. Inspect the axle and the suspension

- check the attachment of the axle
- check the condition of the rubber absorbers and the torsion arms

4.3.6. Check thoroughly the condition of the brakes

1. remove the wheels
2. clean the brake system and check the settings
3. check that the brake shoes can move, and that their springs properly return them
4. replace any worn out linings
5. put the wheels in place and tighten the wheel bolts
6. Remember to re-check the tightness of the wheel bolts after a drive of about 100 km.
7. check the tyre pressure
8. check the free movement of the overrun brake and the parking brake
9. check the safety wires

4.3.7. Check electro-hydraulic rotary adaptor

Lift the articulated arms up so that you can remove the covers of the turning device.

Check the electro-hydraulic rotary adaptor for oil leaks. Check that the lever arm does not seize.

Put the covers back in place after the inspection.

4.3.8. Inspect thoroughly the turning device

Check visually the turning device and its welded seams. In particular, check the attachment points of the joints and the turning bearing.

Check the turning device:

- general condition
- play and attachment of the angular gear
- condition of the gear ring
- play of the turning bearing Max. allowed axial play is about 1 mm.
- check the attachment of the turning motor
- check the attachment bolts of the turning device for tightness:

M16, 280 Nm M12, 115 Nm

NOTICE

If you have to turn open or tighten the attachment bolts, secure them with threadlocker. Always tighten the bolts crosswise.

Lubricate the turning bearing and the gear ring. Reference number of the point in the lubrication plan: 14.

1. Remove the crescent-shaped cover plates from the underside of the lift.
2. Lubricate the turning bearing nipples (4 pieces).
3. Put the cover plates back in place.

NOTICE

Excess grease pressure may press out the turning bearing seal.

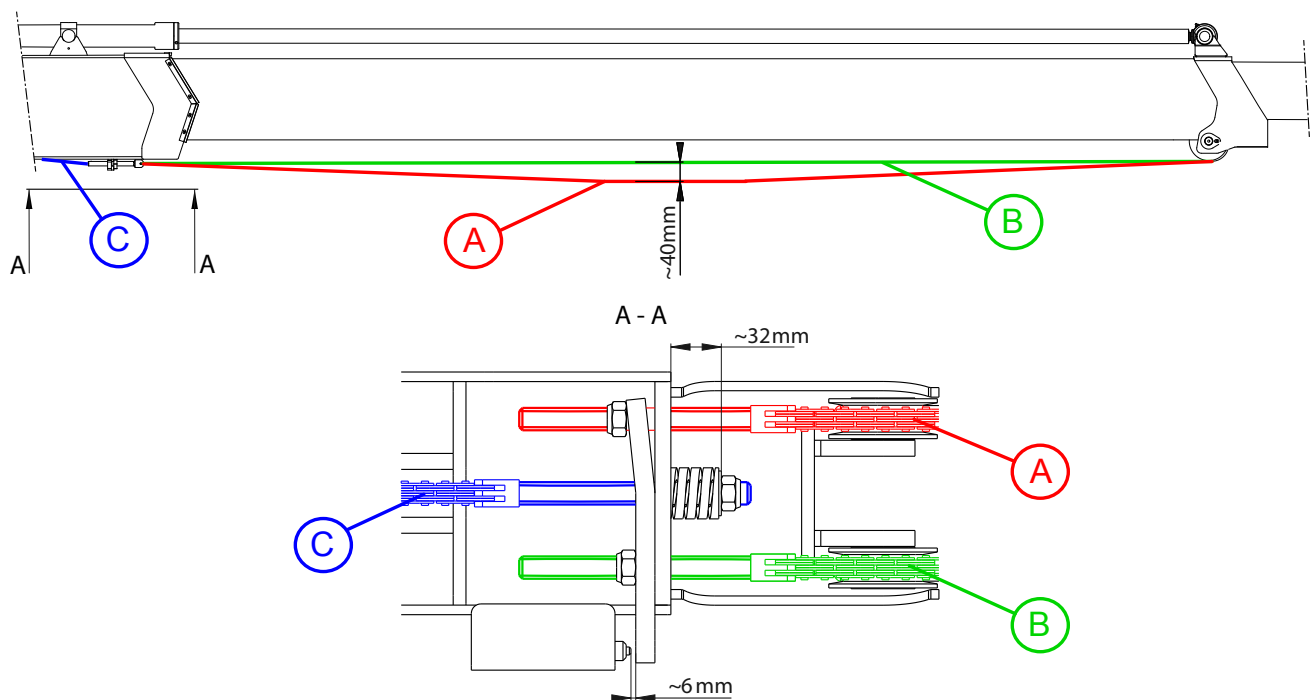
4.3.9. Inspect thoroughly the Flyer-chains

Inspect the condition and attachment of the Flyer-chains, the locking of the pins and the tightness of the spring.

1. Drive the boom to a horizontal position.
2. Drive the boom extensions completely out and retract them by about 30 mm.
3. Check that the extension chain (B), closer to the limit switch, does not sag significantly. Adjust as necessary. **Note! Tightening this chain also affects the length**

of the spring. (see the Point 5).

4. Check that the extension chain (A), farther away from the limit switch, sags in the middle by about 40 mm. Adjust as necessary.
5. Check the length of the spring of the retraction chain (C) by extending the boom completely. The length of the spring should be about 32 mm.
6. Finally, check that the distance between the limit switch and its counter plate is about 6 mm.



7. Extend and retract the boom several times after the readjustment. Return the boom to the measuring position, and repeat the measurement.
8. Check the attachment of the extension chain (A), farther away from the limit switch, by pulling it with your hand.

4.3.10. Inspect the cylinders, and lubricate the joint bearings

1. Lifting cylinder:
 - drive the lift cylinder to its upper position from the chassis control panel
 - inspect the condition of the piston rod and tightness of the connections
 - drive the lift cylinder to its lower position from the chassis control panel
2. Telescope cylinder:
 - retract the telescope cylinder from the chassis control panel
 - extend the telescope cylinder from the chassis control panel
 - check the condition of the cylinder, the piston rod and tightness of the connections
3. lubricate the joints of the lifting cylinder, the telescope cylinder and the levelling cylinders
4. check the condition of the slave cylinder guard
5. Lifting cylinder of the articulated arms:
 - extend the articulated arm cylinders from the chassis control panel
 - check the condition of the cylinders, the piston rods, the wiper rings and tightness of the connections
6. Outrigger cylinders:
 - lower the outriggers to the support position
 - check the condition of the cylinder, the piston rods and tightness of the connections
 - lubricate the joints
 - check the condition of the cylinder guards

4.3.11. Check the battery, the electrical appliances and the wiring

Check thoroughly the electric system

- check that the control centre boxes are dry, clean and tight.
- check the condition of the cable connections and their protection against moisture
- check the condition and attachment of the limit switches
- check the limit switch lead-throughs for tightness
- check the connections of the electric valves
- check the connections of the solenoid valves
- perform visual inspection of all electric wiring
- check the condition of the mains cable plug
- check the condition of the electric motor.

Battery for the emergency descent system

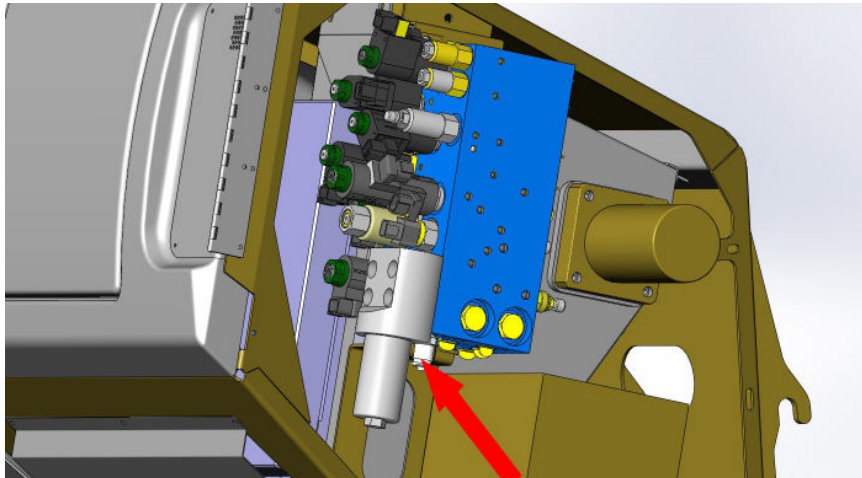
The system incorporates an automatic battery recharger with short circuit and overheat protection.

- output 125 W
- charging voltage 13.7–14.7 V
- rated current 10 A

as necessary, top up battery fluid above the elements

4.3.12. Measure hydraulic pressures

1. Connect the pressure gauge to the measuring point (inlet MP).



2. Make the oil flow through the relief valve by driving one of the movements against the end stop.
3. Read the pressure in the gauge
max. pressure at the operating temperature (40-60 °C) is:
 - 20–21.5 MPa (205–215 bar)
 - the turning pressure is 5.5-7,0 MPa (55-70 bar)

If you have to readjust the pressure, secure the new setting with a seal.

4.3.13. Inspecting the condition and functionality of the operating controls

Check the operating controls of the platform control centre and the chassis control centre:

- check the overall condition of the electric appliances inside the box and spray with moisture repellent, if necessary
- check the cables and the tightness of the cable clamps
- test the sound signal, the emergency stop and the emergency descent
- test all the movements. Ensure that all the movements stop when the control lever is released.

4.3.14. Decals, stickers and signs

Check that all the signs, warning decals and pictorials in the control centres are in place, intact and clean.

If the labels have started to come off or tear apart, or if the symbols or texts are illegible, then the decals must be replaced.

Product numbers of the decals are visible on the decals or the product numbers of new decal sets can be found in the spare part list.

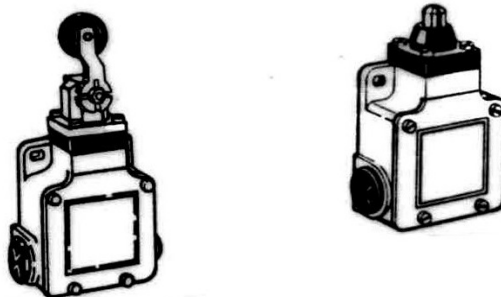
4.3.15. Instruction manuals

Check that the user manuals accompanying the lift are legible.

4.3.16. Check the attachment and condition of the safety devices

Check the attachment and the condition of the limit switches externally.

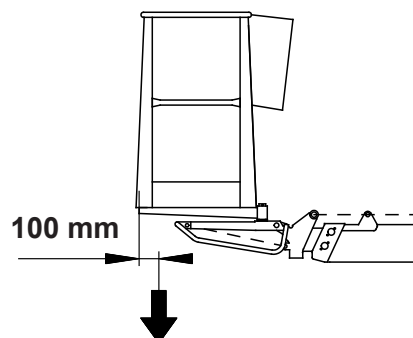
- from the tow-bar (transport position of the platform, RK3)
- on the safety device (RK4 and RK5)
- on the support outriggers (RK11, RK12, RK13 and RK14)
- boom (RK7 and RK8)



4.3.17. Checking the operation of the safety limit switches

Check the operation of the limit switches for the outriggers and the boom from the chassis control panel LCB:

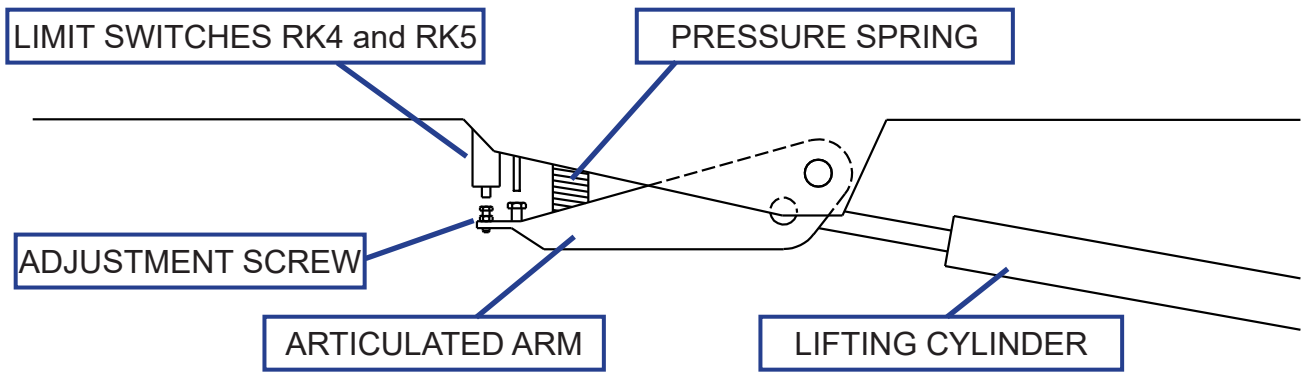
1. lift the platform from the transport position
 - the outriggers must not operate in any position of the selector switch
2. drive the boom to the transport position and lift the outriggers
 - the boom must not operate in any position of the selector switch
3. lower the outriggers (level the lift)
4. put a load on the platform as shown in the picture:
 - 160XT II: $w = 270 \text{ kg}$
 - 180XT II: $w = 215 \text{ kg}$
 - 210XT II: $w = 80 \text{ kg}$
5. lift the boom and extend the telescope:
 - The movement stops as soon as the red outreach limit signal light lights up (at max. outreach). Now:



the lifting of the boom should be operational – the lowering of the boom must NOT be operational

the retraction of the telescope should be operational – the extension of the telescope must NOT be operational

4.3.18. Checking the operation of the overload limit switches RK4 and RK5

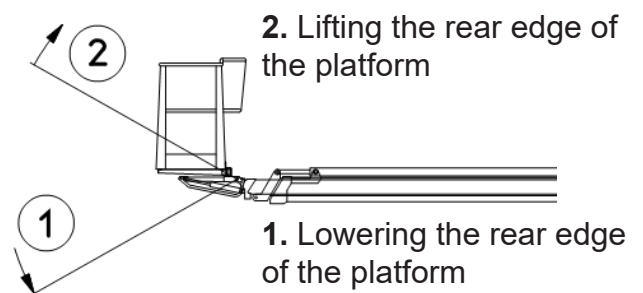


Check the operation of the overload limit switches from the chassis control panel LCB.

For the test, keep the same carefully weighed test load, placed at the distance of 100 m from the rear edge of the platform, as in the previous test.

Checking the adjustment of RK4

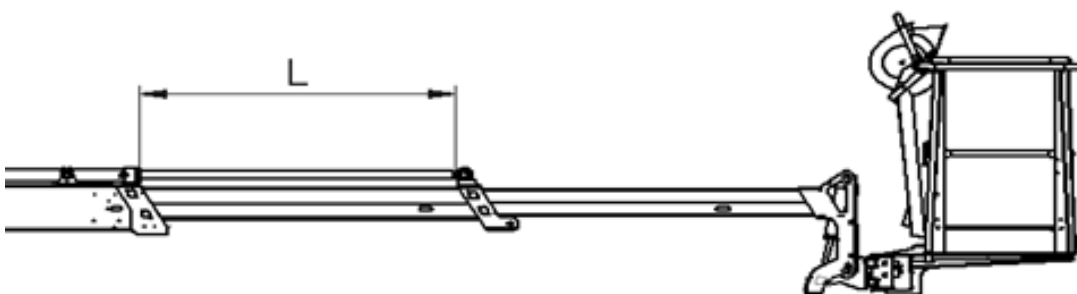
1. Drive the boom to a horizontal position from the chassis control centre.
2. Lift, lower and lift again the rear edge of the work platform, using its levelling function.



NOTICE

Before checking or adjusting the reach limits, always drive the platform to a horizontal position using the levelling function, ending the procedure by lifting the rear edge.

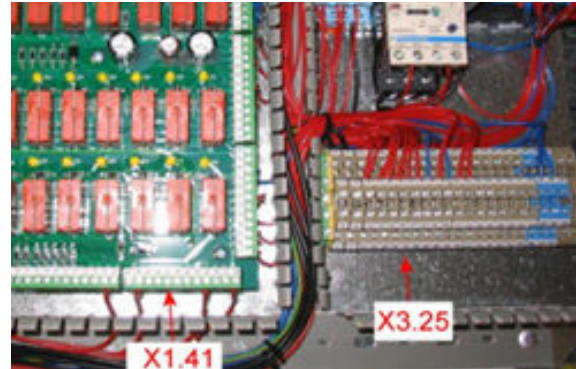
3. Extend the telescope until it stops. Do not correct the position of the platform.
4. Make sure that a red signal light on the platform is illuminated.
5. Measure the telescope cylinder's projecting part (L) and compare the measure with the value for RK4 in the table in the chapter "Safety devices".



6. If the stroke is too long, adjust the limit switch and secure it with a seal wire.

In case the outreach limit switch (RK4) fails, overloading of the boom is prevented by a second safety limit switch (RK5). Checking the adjustment of RK5

7. Disable the RK4 for testing by disconnecting the conductor from the terminal X1:43 and connecting the terminals X3:25 and X1:41 inside the chassis control centre with a jumper lead for measuring.
8. Connect another jumper lead between the points X1 and X2 of the relay SR3.
9. Retract the telescope and then extend it again.
10. Measure the telescope cylinder's projecting part (L) and compare the measure with the value for RK5 in the table in the chapter "Safety devices".
11. If the projecting part is too long, readjust the RK5 and secure it again with a seal.
12. Remove the jumper leads from the terminal blocks and restore the operation of the RK4 by connecting the conductor to the terminal block X1:43.
13. Put the cover for the limit switches back in place.



WARNING

Always check the operation of both limit switches in connection with the service.
Remember to resume the operation of both limit switches after the adjustment.

4.3.19. Check the lights

Check the condition of the lights and the reflectors. Replace any burned-out bulbs or lights, and damaged reflectors.

4.3.20. Inspect thoroughly the driving device

Check that the valves of the driving device operate properly and no movement occurs when the spool is in the neutral position.

4.3.21. Lubricate the slide and threads of the jockey wheel

Lubricating the slide and threads of the jockey wheel
Reference number of the point in the lubrication plan: 10.

4.3.22. Change the hydraulic oil and the filter

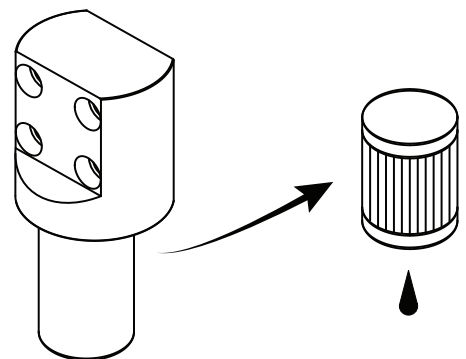


CAUTION

Protect your skin against exposure to hydraulic oil. Used oil can be harmful to the skin.

Changing the hydraulic oil and the filter:

1. remove the plug and drain the oil tank with the lift's all cylinders fully retracted
2. clean and rinse the oil tank with suitable agent
3. replace the pressure filter
4. install the drain plug
5. refill the tank with fresh oil, the volume required for change is about 20 litres
 - check the information about the oil filled at the factory in the scale decal on the oil reservoir.
 - The viscosity class of the hydraulic oil must be ISO VG22-32, and the oil must meet the requirements according to DIN 51524- HLP.
6. if necessary, top up hydraulic oil to the level with the upper edge of the level eye, while the lift is in the transport position.



NOTICE

Do not mix different oils types.

4.3.23. Inspect the anti-corrosion treatment

Repeat the anti-corrosion treatment using e.g. Tectyl 210R anti-corrosion agent

4.3.24. Test loading



WARNING

The operation of the limit switches RK4 and RK5 must always be checked before the test loading!

As required, refer to the point “Checking the operation of the overload limit switches RK4 and RK5” for instructions.

1. Place the lift on an even surface with good carrying capacity. Drive the outriggers to their lowest position.
2. Turn the boom to the side from the tow-bar and lower it on the ground.
3. Put a weighed load of 215 kg (I) onto the platform.
4. Lift the boom and the articulated arms into their upper position and extend the telescope (maximum lifting height).
5. Lower the boom until the safety device stops the movement.
6. Turn the boom round over 360°.
7. Retract the telescope and lower the boom to a horizontal position.
8. Extend the telescope until the safety limit switch RK4 stops the movement.
9. Establish the standing stability in this situation by turning the lift round over 360°.

Check the structures after the test-run.

After the above mentioned test loading and the subsequent inspection have been completed without finding any defects in the structure or stability of the lift, the lift may be used provided that the reach and platform load restrictions, presented in the reach/platform load chart of this manual, are observed.

The max. allowed load on the platform is 215 kg.

In conjunction with the first, i.e. start-up inspection, the lift shall be subjected to an overload test with an excess load of 50 % and after that the supporting structures shall be thoroughly inspected.

4.4. ADJUSTING THE MOVEMENT SPEEDS

Measuring devices required for the adjustment:

- multimeter with possibility to measure direct current (A)
- screwdriver with narrow tip for adjusting the trimmer

1. Disconnect the conductor 523 from the connector K25B.22 on the cover of the LCB centre. Connect the multimeter between the connector K25B.22 of the relay, and the conductor 523 as shown in pic01.

2. Connect the measuring leads to the direct current inlets of the multimeter, and turn the selector switch of the meter to the position "dc-current measurement" (max. current $I_{max} = 2A$).

Lift the machine off the ground with the outriggers for operating the boom.

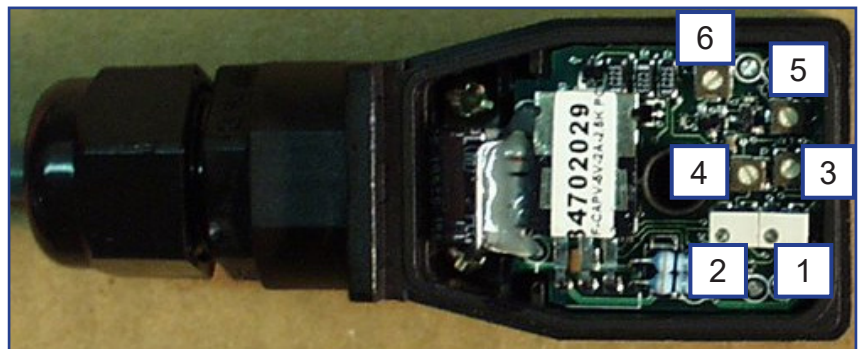
3. Turn the key switch to position 3.
The power unit must not be running.

4. Check that the adjustable resistors TR9, TR10, TR11 and TR12 on the circuit card of the main centre have been turned counter-clockwise to their extreme positions.



CONTROL CARD SCREWS

1. Maximum current I_{max}
2. Minimum current I_{min}
3. Adjusting the frequency
4. Intensity of frequency
5. Ascending ramp
6. Descending ramp



5. Adjusting the frequency (lift in the UCB-mode, power unit is not running)

First turn the adjustment screw 3 on the control card to its minimum position (extreme position counter-clockwise). After that, turn it 1/4 round clockwise.

6. Adjusting the intensity of frequency (lift in the UCB-mode, power unit is not running)

First turn the adjustment screw 4 on the control card to its minimum position (extreme position counter-clockwise). After that, turn it 1/4 round clockwise.

7. Adjusting the ascending ramp (lift in the UCB-mode, power unit is not running)

First turn the adjustment screw 5 on the control card to its minimum position (extreme position counter-clockwise). After that, turn it 1/5 round clockwise.

8. Adjusting the descending ramp (lift in the UCB-mode, power unit is not running)

Turn the adjustment screw 6 on the control card to its minimum position (extreme position counter-clockwise).

The descending ramp is not used.

9. Adjusting the min. current for the control card (lift in the UCB-mode, power unit is not running)

Adjust the minimum current via adjustment screw 2 on the control card to $I_{\min} = 300 \text{ mA}$.

The current intensity increases as the screw is turned clockwise.

10. Adjusting the max. current of the control card (lift in the LCB-mode, power unit is not running)

10.1. Operating from the chassis control centre, lift the boom at high movement speed.

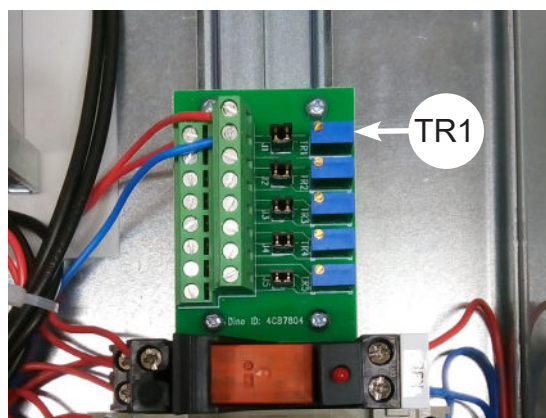
Simultaneously, adjust the maximum current via screw 1 on the control card to 1,350 mA, the current intensity increases as the screw is turned clockwise.

10.2. Start the power unit, and extend the telescope at high movement speed for 10 seconds. Measure the cylinder stroke. The target is about 50 cm. If this cannot be achieved, you can try to increase the maximum current. The current intensity must not be too high, as this would decrease the adjustment range of the joystick.

The movement speeds are adjusted via the adjustable resistors on the circuit card in the main control centre. The speed of the following movements can be adjusted:



- TR9 = levelling of the platform
- TR10 = high movement speed from the chassis control centre (rabbit)
- TR11 = lowering of the boom
- TR12 = lowering of the articulated arms



Trimmercard on the cover of the LCB-centre:

- TR1 = low movement speed of the boom (tortoise)

11. Calibration of the chassis control centre (lift in the LCB-mode, power unit is not running)

Operating from the chassis control centre, lift the boom at high movement speed.

Simultaneously, adjust the current intensity via the adjustable resistor TR10 to 1350 mA (or to the same value as in point 10).

12. Adjusting the low movement speed from the chassis control centre (lift in the LCB-mode)

Operating from the chassis control centre, extend the telescope at low movement speed. Simultaneously, adjust the current intensity via the adjustable resistor TR1 to 675 mA (or to a half of the value in point 10).

13. Adjusting the lowering speed of the boom (lift in the LCB-mode)

- 13.1 Operating from the chassis control centre, lower the boom at high movement speed. Simultaneously, adjust the current intensity via the adjustable resistor TR11 to 1150 mA (to a value about 200 mA lower than in point 10).
- 13.2 Check the lowering speed of the boom -> start the power unit, and fully retract the telescope. Lift the platform floor to the height of 2.8 metres by lifting the boom.
- 13.3 Lower the boom to its lowest position at high movement speed (a distance of 2 m). The lowering should take about 13 seconds. As necessary, set the time via trimmer TR11.

14. Lowering the articulated arms (lift in the LCB-mode)

Operating from the chassis control centre, lower the articulated arms at high movement speed. Simultaneously, adjust the current intensity via adjustable resistor TR12 to 1250 mA (a value about 100 mA lower than in point 10). Lift the articulated arms all the way up. Lower the articulated arms all the way down at high movement speed, and measure the time it takes. The time should be 20–22 seconds. If necessary, set the time via trimmer TR12.

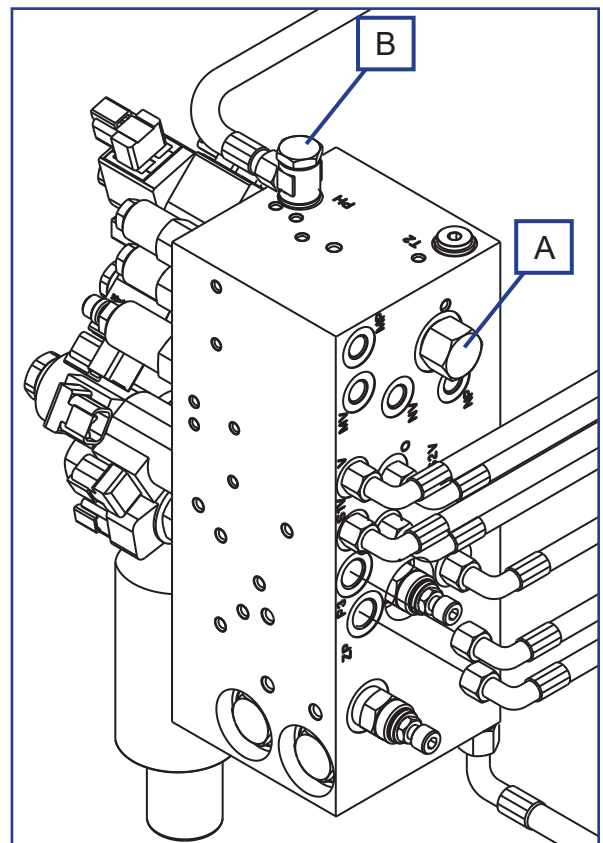
15. Adjusting the levelling speed of the platform (lift in the LCB-mode, power unit is not running)

Operating from the chassis control centre, level the platform at high movement speed, and simultaneously, carry out the basic adjustment by setting the current to 700 mA via adjustable resistor TR9. Operating from the chassis control centre, tilt the platform outward at high movement speed, and measure the total time it takes. The time should be 35-40 seconds. If necessary, adjust via screw A on the valve block.

16. Adjusting the rotation of the platform (lift in the UCB-mode)

Adjust the current value for rotation of the platform to 800 mA via adjustable resistor TR13 on the additional circuit card. To do the basic setting, first screw the throttle screw B on top of the valve block in clockwise, and after that, loosen it half a turn.

Operating from the platform, execute the rotation movement of the platform clockwise, and measure the time it takes. The time should be 14–16 seconds.



17. Calibration of the platform control centre (lift in the UCB-mode)

Instruct your assistant to retract the telescopic movement at full speed using the joystick. Simultaneously, adjust the maximum current via screw 1 on the control card to 1,350 mA (or to the same value as in point 10.5).

18. Checking the movement speeds from the platform.

Operate all the movements from the platform control centre, and check that they are functioning properly. Check that the lowering speed of the boom and the articulated arms is approximately the same as was adjusted in points 13 and 14.

19. Disconnect the multimeter Reconnect the conductor 523.

4.5. ADJUSTING THE OVERLOAD LIMIT SWITCHES

For adjusting the overload limit switches shall be used the same test load as for checking the operation of the overload limit switches. Check the test loads and the adjusted values in the table of the chapter “Safety devices”.

The adjustment of the limit switches shall be carried out so that the last movement of the platform's rear edge will be lifting.

Adjusting the RK5:

1. Remove the limit switch cover
2. Disable the RK4
 - undo the RK4 as much as necessary to ensure that the RK5 certainly trips first
 - disable the limit switch electrically in accordance with the instructions in point “Checking the operation of the overload limit switches RK4 and RK5”
3. extend the boom and measure the length of the telescope cylinder's projecting part (L) Compare the measure with the value for the RK5 in the table. Adjust as necessary.
4. tighten the locking screw of the RK5 and check once more the settings. Check that the red light is on.

Adjusting the RK4:

1. set the RK4 to trip before the RK5
2. extend the boom and measure the length of the telescope cylinder's projecting part (L) Turn the adjustment screw to such a position, that the measure will match with the adjusted value for the RK5 in the table
3. tighten the locking of the adjustment screw and check once more the settings
4. apply a safety wire to the adjustment screws in such a manner that it will not be possible to unscrew the screws away from the limit switches
5. apply a seal on the wire
6. put the cover back in place

4.6. CHECKING AND CALIBRATION OF THE PLATFORM LOAD CONTROL (OPTION)

CHECKING THE PLATFORM LOAD CONTROL

If the lift is equipped with a safety device for monitoring the platform load, its settings must be checked every six months as follows:

1. Drive the boom to a position, where you can place a test load on it. The added load must not make the bottom of the basket yield so that it will come into contact with any external structure.
2. Check the signal lights for the platform load control sensor, while the basket is empty:

LED	System status	
RED LED	not illuminated	System not malfunctioning
RED LED	not illuminated	System not overloaded
ORANGE LED	steady illuminated	The empty weight of the basket is correctly adjusted (± 15 kg)
GREEN LED	flashes	The sensor is operational

3. Put the maximum load allowed for the lift onto the platform for the test
 - The red signal light for overloading in the lift's control centre must not be illuminated.
 - The movements of the lift are operating normally
4. Add an extra weight of 10% onto the platform to increase the total load to 110%
 - The red signal light for overloading will start flashing at the sensor and in the control centres.
 - The engine will be turned off, and the movements of the lift will no longer operate.

If the platform load control system does not stop the lift, it must be calibrated!

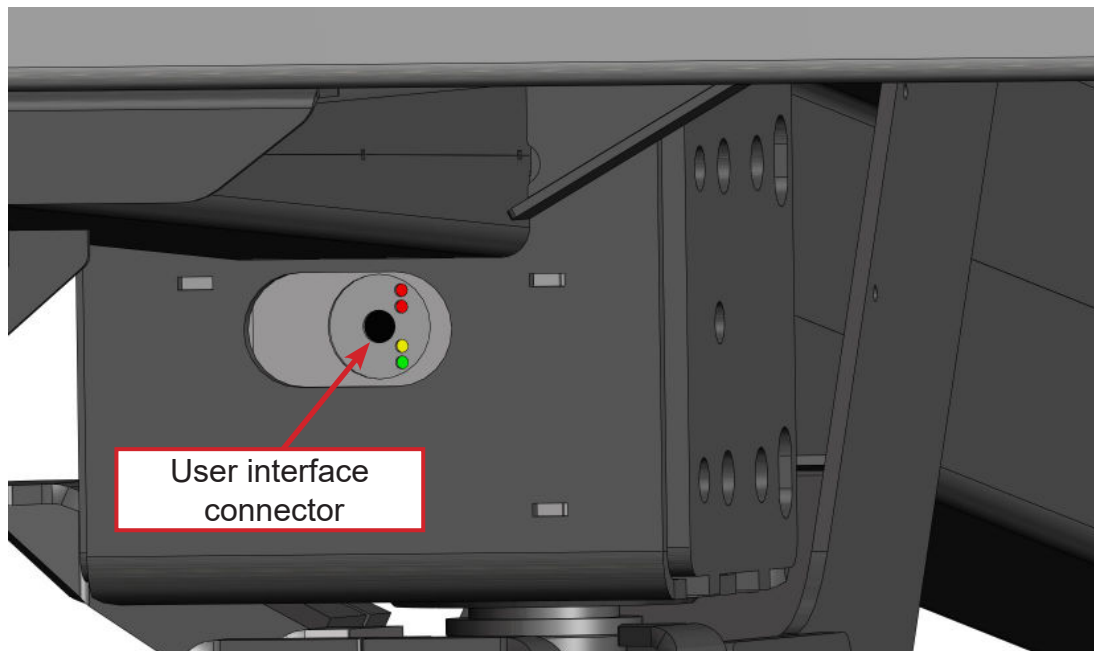
5. Remove the weights from the platform. The normal operation of the lift must resume. The same signal lights must be illuminated at the platform load control sensor as in the beginning of the test.

CALIBRATION OF THE PLATFORM LOAD CONTROL

Required tools:

- TEACH IN calibration tool, Dino id:48.19044
 - a weighed load that is 1.1 times the maximum permissible load for the lift
1. Empty the basket. No excess load allowed in the basket. Make sure that the bottom of the basket is not supported by any other structures.
 2. Switch on the power to the lift. The green "power on" LED will light up on the sensor. It has first steady light, and, after having activated, it starts flashing.

3. Remove the protective cover of the plug for the platform load sensor at the location of the user interface connector, shown in the picture.



4. Connect the conductor of the TEACH IN tool to the socket. The letter "T" starts to flash in the adjusting device.
5. Keep the button marked "4" depressed for about 4 seconds – until the letter "T" will be illuminated continuously.
6. Release the pushbutton.
7. Put the weight of 275 kg (overload of 10%) in the centre of the basket. The letter "T" will be flashing slowly. Make sure that the bottom of the basket is not supported by any other structures.
8. Keep the button marked "4" depressed for about 4 seconds – until the letter "T" will be illuminated continuously. When you release the button, the letter "T" will be illuminated continuously.
9. Disconnect the adjusting device from the sensor. The alarm should now be active. If the alarm function has not yet been activated, pull the platform lightly downward with your hand to activate it.
10. Lift the weight up from the basket for at least 4 seconds (the sensor has some delay), then put the weight back.
11. Ensure that the alarm will be turned on. If the alarm function has not yet been activated, pull the platform lightly downward with your hand to activate it. If the alarm cannot be activated just by pulling lightly downward, readjust the system. Ensure that the basket has not been subjected by any excess loads or supporting forces during the adjustment.



12. Remove the weight from the platform.

13. Put the protective cover for the plug back in its place in the platform load sensor.

The adjustment of the platform load control is now completed. If the platform load exceeds the maximum allowed load for the lift 10 %, then the platform load sensor switches off the power unit and blocks all the movements. In this situation, the red signal light for overloading will be flashing.

The emergency descent functions of the lift will continue to operate normally, although the platform load control has interrupted the operation.

4.7. SPECIAL INSPECTION

(INSPECTION AFTER AN EXCEPTIONAL SITUATION)

The inspection is required if the lift has been damaged in a manner which may affect its strength or safe operation.

- that the lift has been subjected to all inspections included in the annual periodic service
- the lift must be subjected to a test loading and an operational inspection with a load of 110%.
- a protocol shall be drawn up of the inspection
-

4.8. INSPECTION DISASSEMBLED

Inspections must be performed in accordance with local, state or federal regulations, legislation, directives, standards. The manufacturer recommends following inspections.

Inspection disassembled should be carried out after 10 years. If the condition of the lift is found to be inferior during the annual inspection, the inspection disassembled should be performed. After the first 10 years, the inspection is recommended to be repeated every 5 years.

NOTICE

Check the regulations for the inspections and the competence of the inspector with the local authorities.

When the lift is subjected to an inspection disassembled, a separate report with the following information shall be attached to the protocol:

- which structures were disassembled,
- which non-destructive inspection methods were applied
- which repair measures were used

The inspection protocol shall be kept until the end of the lifts service life. A copy of the inspection protocol shall be kept with the lift at all times.

Before the inspection:

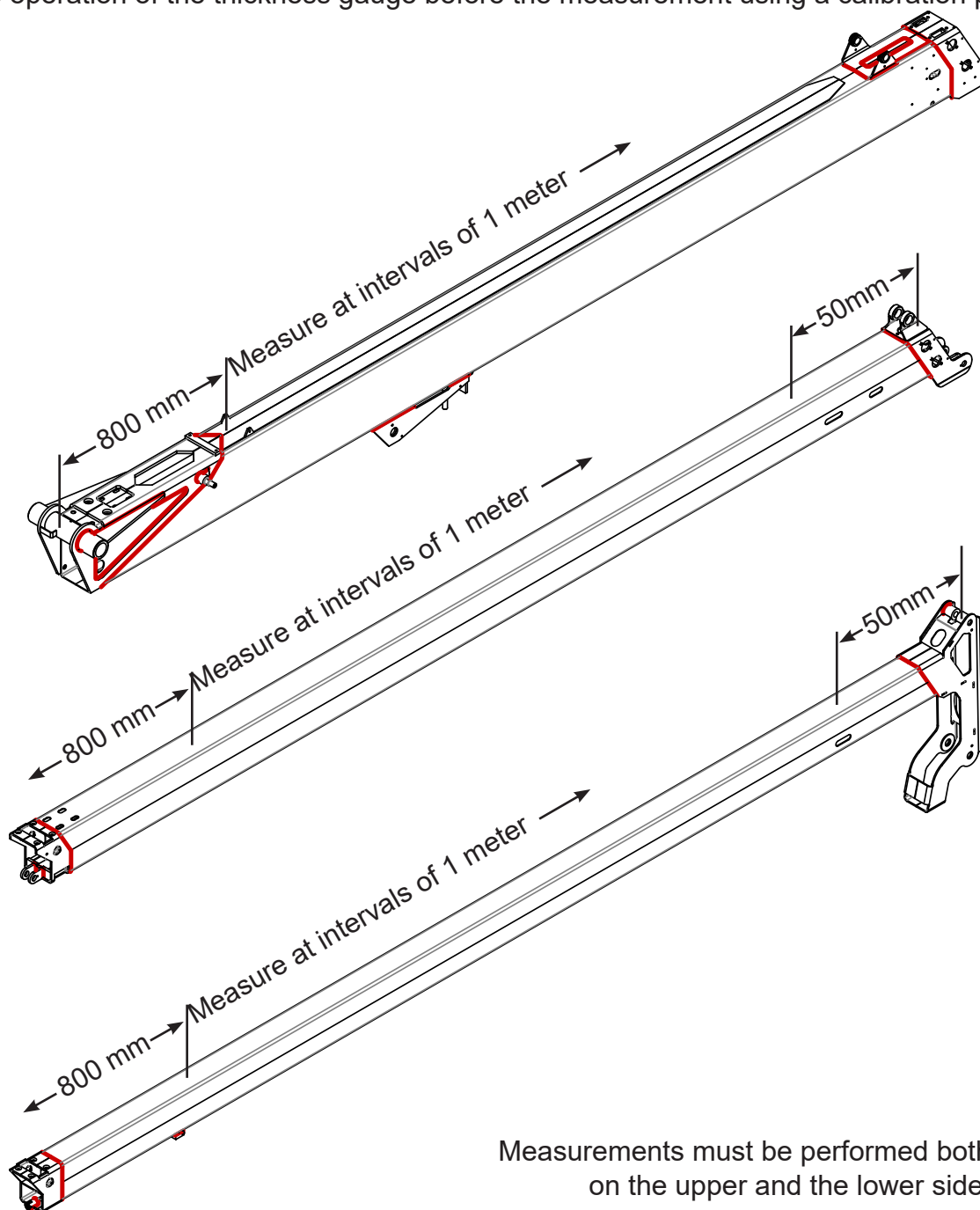
1. Clean the lift thoroughly
2. Perform the regular annual inspection according to the instructions

NOTICE

The measured thickness of the plates must be at minimum 0.9 x nominal thickness. The measurement points must be cleaned of paint and rust. Ultrasonic testing can be used for checking the condition of the pins and thickness of the steel plates. No permanent deformations are allowed in the load-bearing structures.

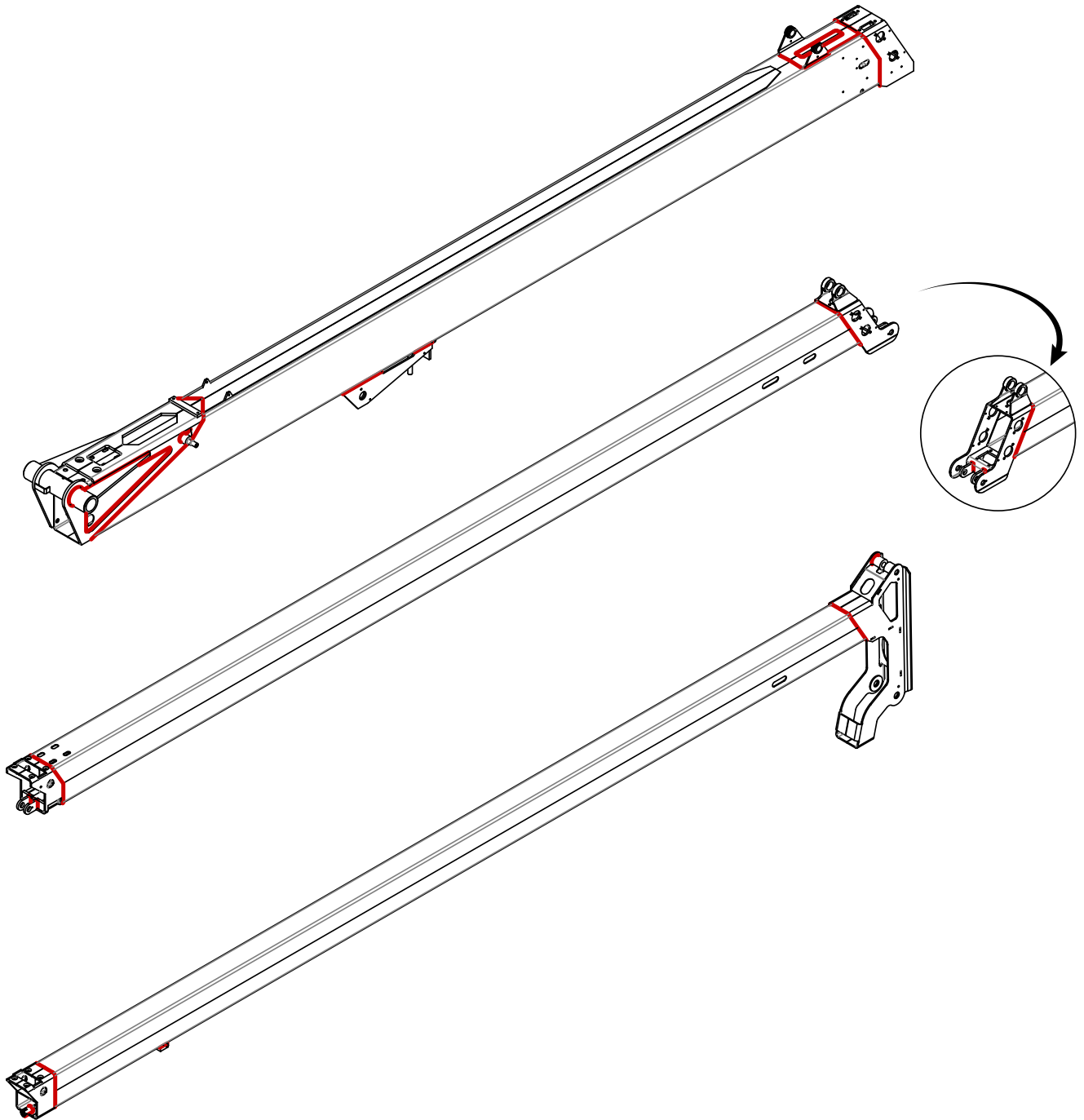
Boom system

1. Remove the covers
2. Disassemble the telescopic boom and wash the parts
3. Check the boom for straightness, twists, deformations, dents, buckles or signs of wear (visual inspection)
4. Measure the wall thickness of the boom profile (3.0 mm) using a thickness gauge. (Check the operation of the thickness gauge before the measurement using a calibration piece.)



5. Inspect the boom internally for any signs of corrosion or wear using an endoscopic camera.

6. Inspect the welded seams highlighted in the picture by applying the magnaflux method.



7. Inspect all other welded seams visually.

Check:

8. the condition and attachment of the Flyer chain brackets
9. the condition, wear-out grade, corrosion and play of the Flyer chains (wash if required).
The axial play of the Flyer chains must not exceed 1 mm/10 links
10. the rollers, pins and play of the Flyer chain
11. the attachment and condition of the energy chain
12. the attachment and condition of the cables and hoses
13. the brackets of the lift cylinder, and the telescopic, master and slave cylinders and the platform. (Magnaflux method.)
14. the bushings and play of the boom joint
15. the bearings and play of the overload protection safety device (disassemble and wash).
Replace any worn out parts
16. the slide pads and attachment (outside of boom)

Replace parts:

- Attachment pins of the Flyer chains (mandatory)
- Chain rollers, bearings and pins (inside the boom)
- Slide pads and bolts (inside the boom)
- Tightening spring of the Flyer chain

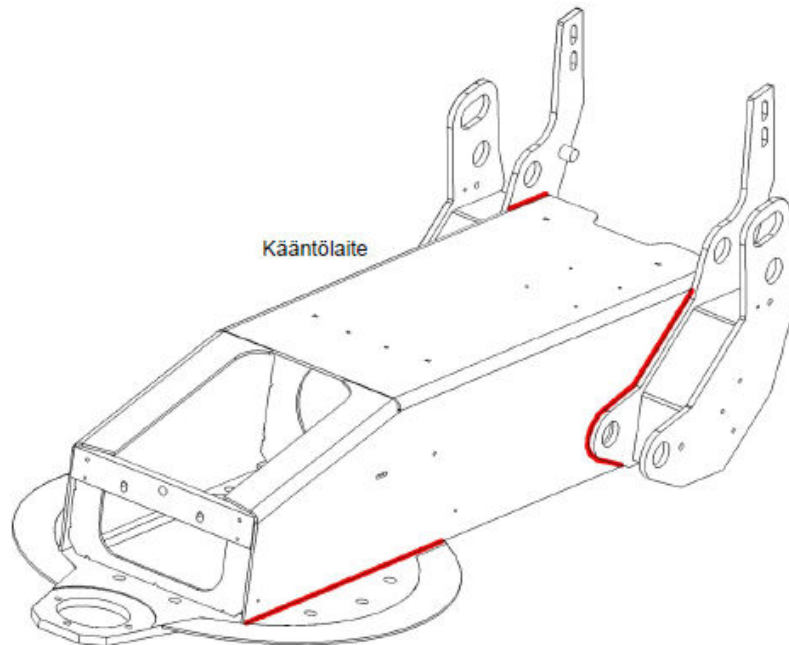
- Hydraulic hoses and electric cables inside the booms should be replaced if on uusittava, they show cracks or signs of wear.

Turning device

1. Remove the covers
2. Clean the gear rings of the turning bearing and the swing gear

Inspect:

3. the retainer ring for the gearwheel of the swing gear
4. the welded seams highlighted in the picture by applying the magnaflux method.



5. Inspect all other welded seams visually.

Check:

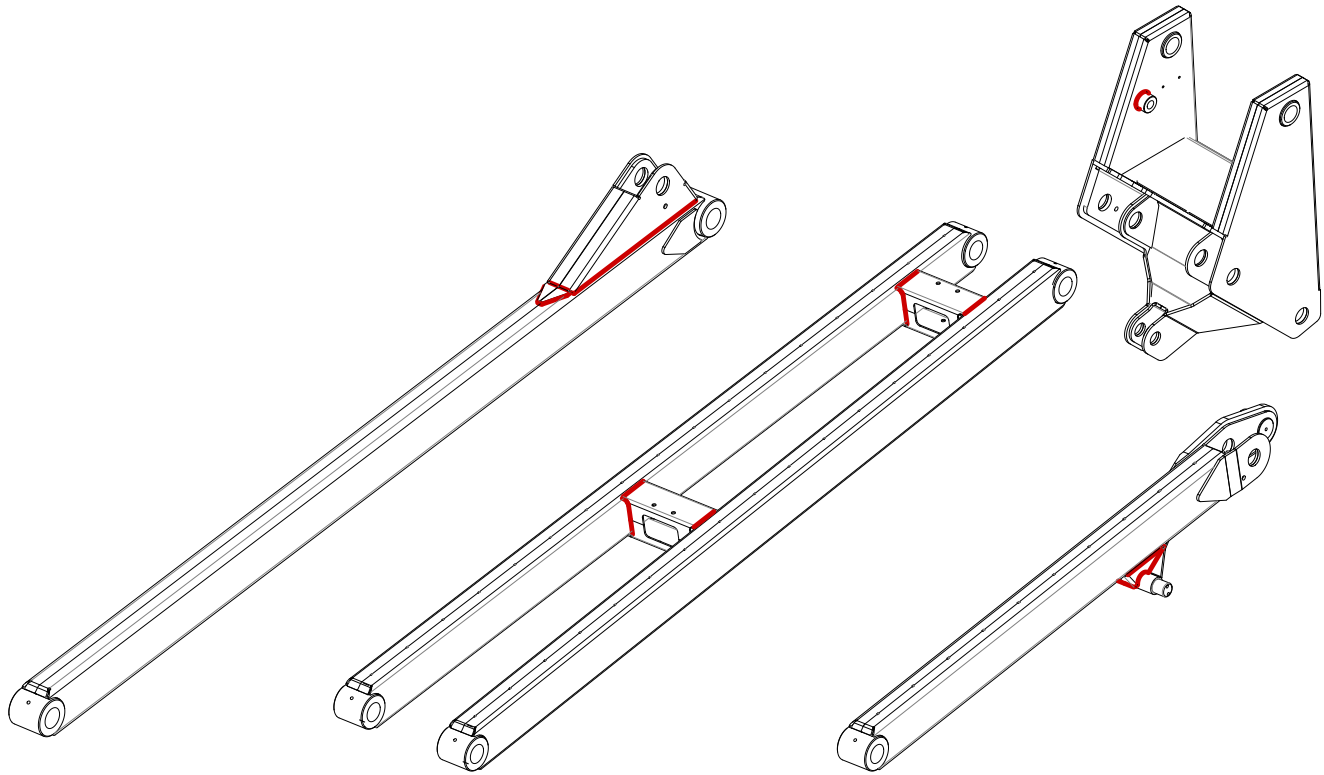
6. the turning device frame for straightness, dents, buckles, twists, cracks or signs of corrosion. If you observe signs of corrosion, measure the thickness of the plate, if required
7. the play and gasket of the turning bearing
8. the condition/wear-out grade of the gear ring
9. the play of the swing gear, box construction, oil level, condition and tightness of the gaskets and seals
10. the attachment and shaft key of the hydraulic motor on the angular gear. Fill the attachment box with grease
11. the attachment of the gear wheel and shaft on the swing gear's secondary shaft. Apply protective grease externally on the top

Replace parts:

- the bolts by which the turning gear is attached to the turning device and to the chassis (Mandatory)

Articulated arms

1. Inspect the welded seams of the bushing housings and brackets of the articulated arms highlighted in the picture by applying the magnaflux method.



2. Inspect all other welded seams visually.

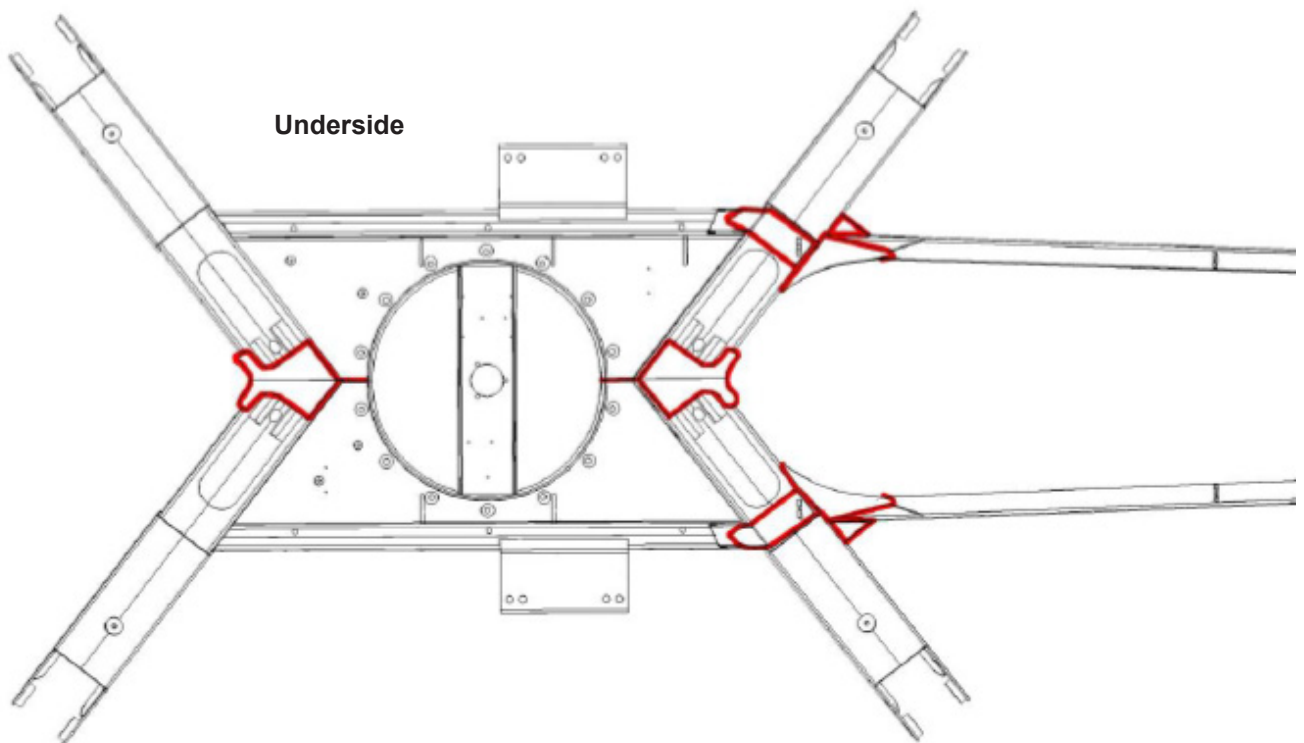
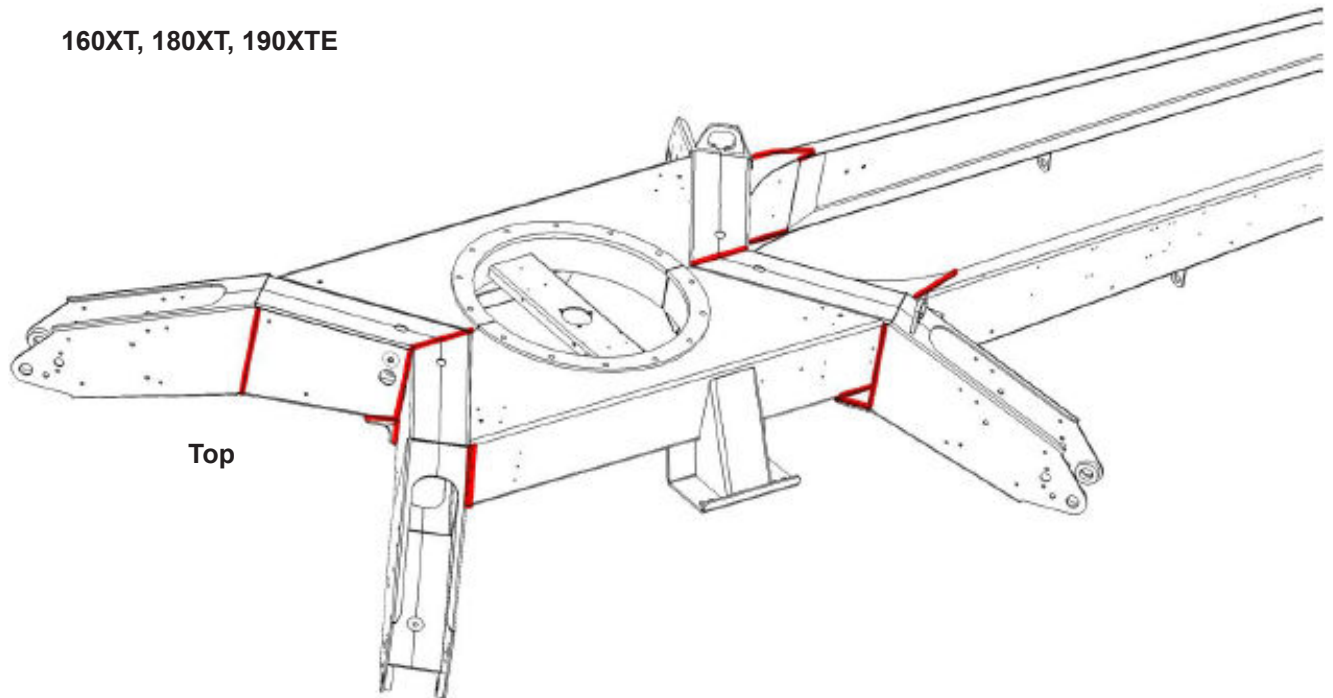
Check:

3. the arms for straightness, deformations, dents, buckles, frost damage or signs of corrosion. If you observe signs of corrosion, measure the thickness of the plate
4. the bushings and play of the pins
5. the attachment bolts of the pin caps
6. the welded seams and plates of the intermediate frame and the attachment frame of the boom. (Magnaflux method.)
7. the play of the attachment pins of the articulated arms to the intermediate frame and the attachment frame of the boom.
8. the lift arm between the lower and the upper arm systems (“dog bone”) and its attachment to the arm system
9. the attachment and condition of the cables and hoses

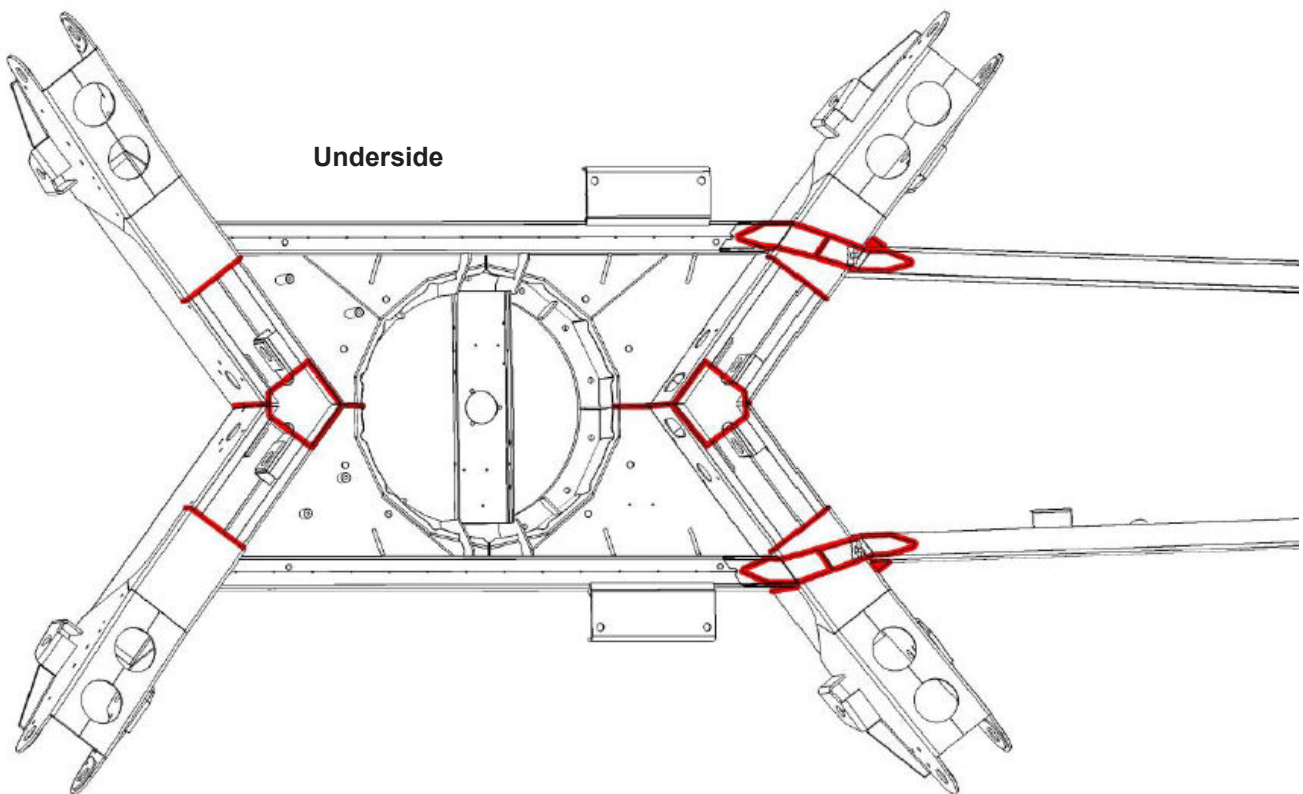
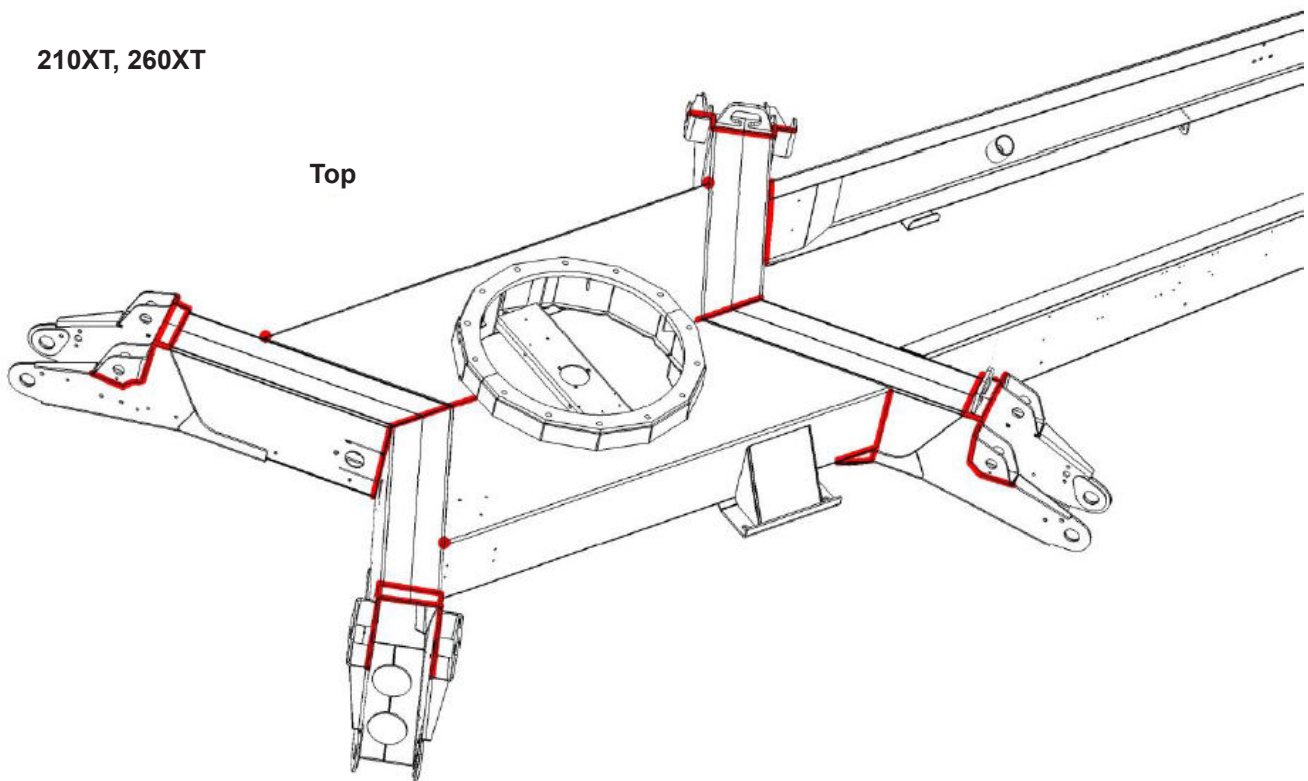
Chassis

1. remove the protective plates from the turning centre
2. Inspect the welded seams highlighted in the picture by applying the magnaflux method. (also on the underside)

160XT, 180XT, 190XTE



210XT, 260XT



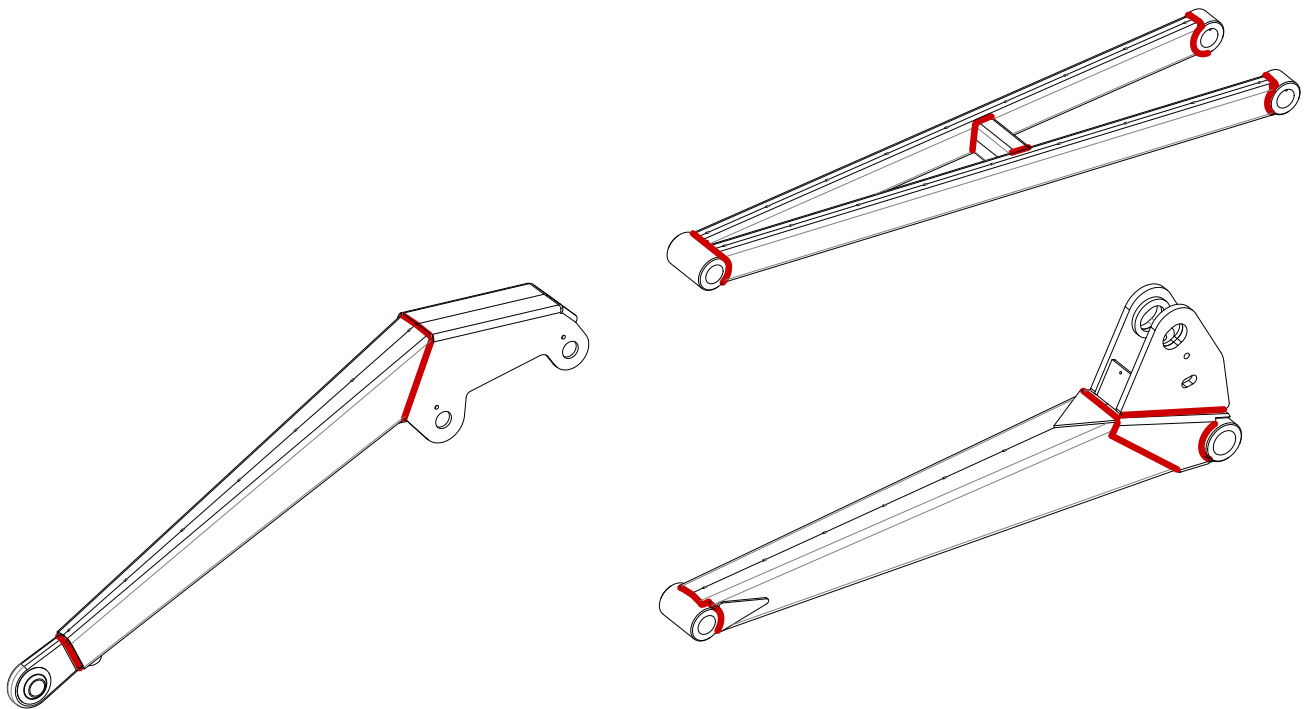
3. Inspect all other welded seams visually.

Check

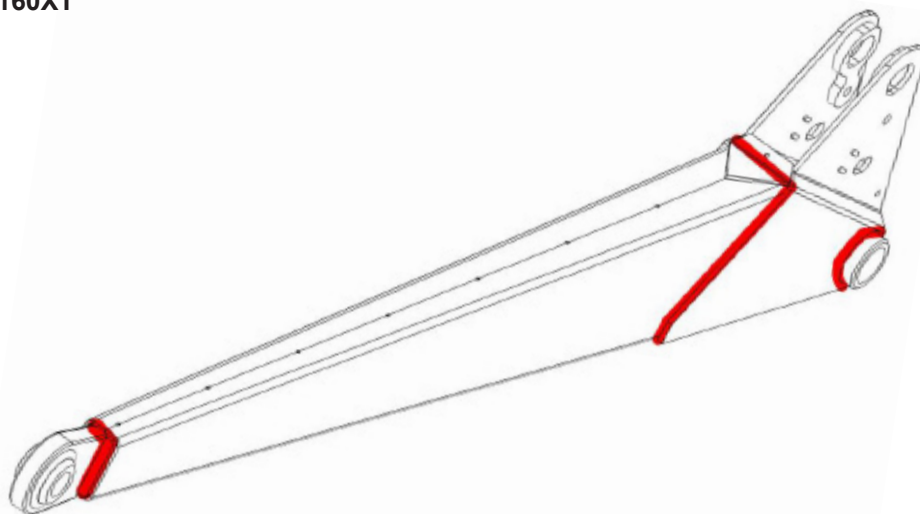
4. that there are no cracks, deformations, dents, buckles or signs of corrosion in the frame plates. If you observe signs of corrosion, measure the thickness of the plate.
5. the support outrigger housings and outriggers for straightness and that there are no

twists, dents, deformations or signs of corrosion. If you observe signs of corrosion, measure the thickness of the plate.

6. Inspect the welded seams highlighted in the picture by applying the magnaflux method



160XT



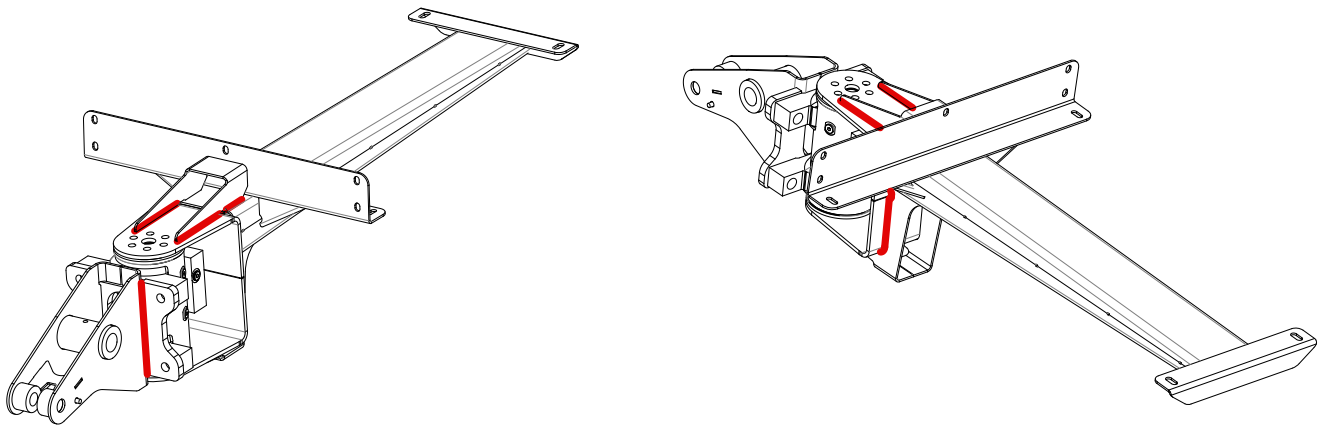
7. Inspect the outrigger cylinder brackets on the central frame side by applying the magnaflux method

Check:

8. the bearings and play of the outrigger joints
9. the attachment and bearings of the foot plates
10. clean the limit switch mechanisms of the outriggers and check the bushings. Check the operation.

Platform and the platform carrier

1. Inspect the welded seams highlighted in the picture by applying the magnaflux method



Check

2. that there are no deformations, dents, buckles, twists or signs of corrosion in the platform carrier
3. the welded seams of the platform, and that there are no signs of deformations, bends, corrosion or any excess material that increases the weight
4. the attachment and condition of the rotary actuator
5. the condition and operation of the gate (must close automatically with the power of the spring)
6. the play of the bearings and bushings

Replace parts:

- attachment bolts of the platform to the carrier (Mandatory)

Cylinders

1. Remove the covers of the support outrigger cylinder rod and outreach limit mechanism of the boom

Check (on all cylinders)

2. the welded seams of the cylinder tube bracket and the bottom flange (with the support outrigger cylinders removed). (Magnaflux method.)
3. the welded seam of the piston rod eye. (Magnaflux method.)
4. the attachment of the valve housings on cylinders and renew the attachment bolts
5. the attachment and condition of the spherical bearings
6. that neither the cylinder tube nor the piston rod shows signs of corrosion (in particular the outrigger cylinders and the cylinder under the platform)
7. the piston rod for straightness

Replace parts:

- attachment bolts of the valve housings on the outrigger cylinders (Mandatory)

Pins

All pins must be checked and replaced if necessary. The pins that cannot be inspected in the machine, shall be removed for the inspection.

1. inspect all the pins for cracks (ultrasonic test).

Check:

2. welded seams of the pin caps
3. welded seams of the pin caps
4. locking of the pin caps
5. signs of wear and play of the bearings and bushings

PARTS THAT MUST BE REPLACED:

- attachment pins of the Flyer chains (Mandatory)
- attachment bolts of the slewing bearing between the turning device and the chassis (Mandatory)
- o-rings of the valve plate and the load-holding valve of the outrigger cylinder (Mandatory)
- attachment bolts of the valve plate on the outrigger (Mandatory)
- attachment bolts of the platform to the bearer (Mandatory)

Tightening torques:

Attachment bolts of the turning bearing	M1622.0068	280Nm
Attachment bolts of the turning bearing	M1218.0078	150Nm
Attachment bolts of the valve plate on the outrigger cylinders	M0620.0007	15Nm
Attachment bolts of the platform	M8	25Nm
Check valves of the outriggers	47.377	55Nm
Locking of the load-holding valves of the outriggers	46.127	35Nm
Plug/connector of the load-holding valves of the outrigger cylinders	45.0594 / 46.427	120Nm
Load holding valves	47.2722	60Nm
Attachment bolts of the turning gear	M1018 / M1022	45Nm

5. INSTRUCTIONS FOR FAULT-FINDING

5.1. PROBLEMS RELATED TO POWER SUPPLY AND START-UP

FAULT	REMEDY
-------	--------

1. Electric motor cannot be started by depressing the start button, although the selector switch 1 is in position LCB or UCB

The emergency stop button has jammed in the lower position.	Pull up the button and re-start the motor from the start button.
Fuse F1 has blown.	Replace the fuse (10A).
No mains supply (230 VAC) to the selector switch.	Check the extension cords, possible distribution boards and fuses.
Fault current safety switch has tripped.	Reset the fault current safety switch.
Voltage is supplied to the selector switch, but is not transmitted further.	Check the operation of the selector switch and replace it, if necessary.
Voltage is supplied to the selector switch, and is also transmitted further.	Check the operation of the motor's control contactor and thermo-relay as well as the operation of the relays that control the operation of the contactor.
Limit switch RK7 for the telescope chain has disconnected the contactor circuit.	Check the operation of the RK7 and readjust according to the instructions.
No direct-current supply (12VDC).	Main switch has been turned off, turn on the switch.
If the machine is equipped with platform load control (option): Overload on the platform. (The red signal light is flashing).	Reduce the platform load. If the overloading is caused by a clash, move the work platform away, using the emergency descent system. The overloading will cease, and the lift will again operate normally.

2. No power supply to the lift, although the main switch is on and the selector switch is in position LCB or UCB

Power supply has not been activated.	Press the start button to activate the power supply.
One of the fuses F1, F11 or F12 has blown.	Change the fuse and press the start button.
Battery is flat.	Recharge the battery.


Check, whether the fault is in the electric system or in the hydraulic system.

FAULT	REMEDY
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3. Power unit does not start

Battery is flat.	Recharge the battery.
The mains cable is plugged.	Disconnect the plug from the mains.
No supply of direct-current (12VDC), because the main switch is disengaged.	Switch on the main switch.


4. Power unit cranks but does not start

Fuel tank is empty.	Fill the fuel tank.
Choke is off.	Press the choke button (cold engine). 
Throttle lever is in idling position.	Increase the engine revolutions.

5.2. OPERATIONAL PROBLEMS RELATED TO THE MOVEMENTS

FAULT	REMEDY
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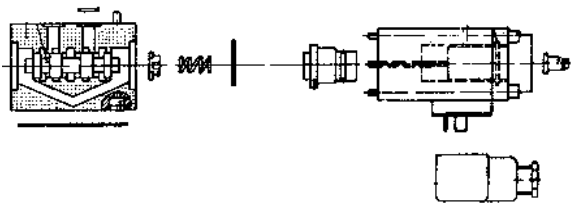
6. None of the platform movements is operational, although the electric motor is running and the selector switch is in the correct position (operation from the chassis control centre or the platform control centre)

Green signal light for the outriggers is not illuminated. Limit switches for the outriggers have not closed.	Make sure that all the outriggers are steady supported on the ground. Check the operation of the outrigger limit switches RK11, RK12, RK13 and RK14.
The green signal light for the outrigger limit switches is illuminated, but the boom movements do not operate.	Check the operation of the safety relay SR2 for the outrigger circuit.
The lift has been overloaded.	Reduce the platform load or Retract the telescope until the platform returns inside its operating range (the green light in the platform control centre lights up).
	
The Safeguard (option) prevents the operation from the platform control centre.	Return the magnet of the Safeguard to its counter-piece.

7. Outriggers do not move

Boom is not resting on the transport support.	Drive the boom onto the transport support.
The selector switch (1) is in the wrong position.	Turn the selector switch to the correct position.
The limit switch on the boom support has not closed.	Drive the boom onto the transport support and check the operation of the limit switch RK3.
Electric valve for movement of boom/outriggers does not operate (jams in the centre position).	For remedy, refer to item 8.

8. Malfunctions of platform movements – only one of the movements can be operated

Irregular and indefinite malfunctions. 	Make sure that the hydraulic oil and the filter have been changed. Thoroughly clean the solenoid valve spools and housings (requires utmost cleanliness – particles, that cause malfunctions, cannot possibly be spotted with the naked eye). Also temporary contact failures in the joysticks may cause malfunctions. Spray with moisture repellent.
Lifting and lowering of the boom and the extension of the telescope are not operational, the red light is illuminated on the platform and in the chassis control centre, and the buzzer is audible.	The boom has been overloaded; retract the telescope and retry the operation (automatic reset).

FAULT**REMEDY****9. Some of the boom movements is not operational**

	Refer to item 8. Electric valve is open. Remedy as instructed above in conjunction with the seizure of the electric valve spool.
Activation of, for example, lifting of the boom, activates some other movement.	Some of the solenoid valves for the boom movements is jammed in the open-position. Wash carefully the spool and the housing.

10. Telescopic movement does not operate

	Refer to item 8. Ensure that the solenoid valve for the telescope is not stuck in the centre (open) position.
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12. Too fast or slow movements

The boom movements are either too fast or too slow	Check the setting of the movement speeds according to the instructions.
----------------------------------------------------	-------------------------------------------------------------------------

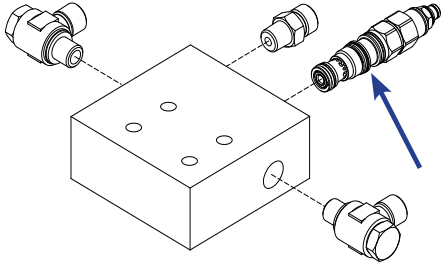
5.3. DRIFTING OF THE BOOM OR OUTRIGGERS

FAULT

REMEDY

13. Boom drifts slowly downward

Load regulation valve is leaking.



Remove and clean the valve.

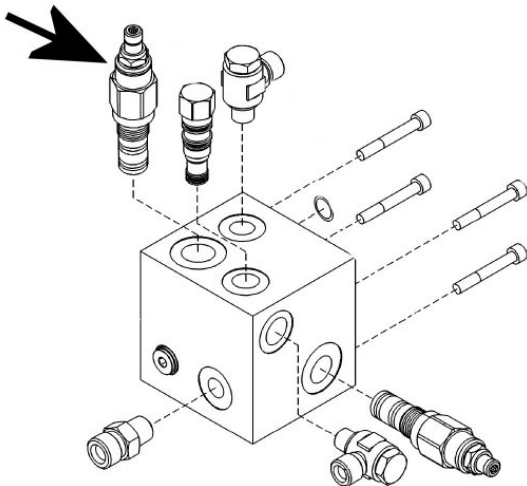
Check the condition of the o-rings.

Install the valve carefully – the correct tightening torque is 60 Nm.

If necessary, replace the valve.

14. Telescopic movement drifts slowly inward

Load regulation valve is leaking.



For remedy, refer to item 13.

FAULT	REMEDY
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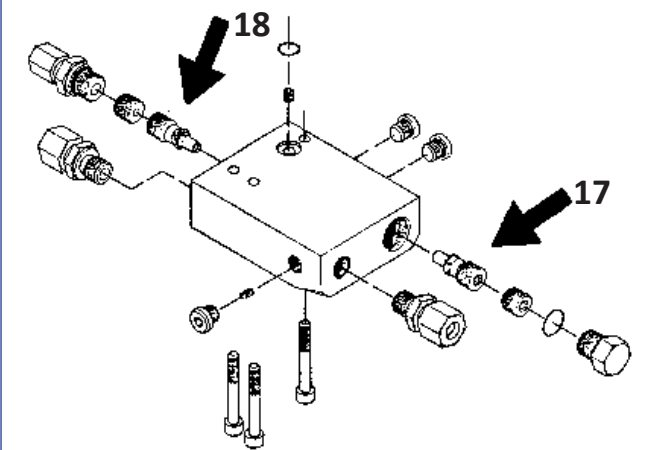
15. Platform drifts backward

Double load regulation valve on the bottom side is leaking.	For remedy, refer to item 13.
Load regulation valve under the platform is leaking.	For remedy, refer to item 13.

16. Platform drifts forward

Double load regulation valve on the rod-side is leaking.	For remedy, refer to item 13.
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17. Outrigger does not stay in the support position

Load regulation valve on the bottom-side is leaking.	

18. Outrigger does not stay in the transport position

Load regulation valve on the rod-side is leaking.	Measures as above.
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19. Driving device is not operational, although the selector switch is in the correct position

Boom is not resting on the transport support.	Drive the boom onto the support.
If the machine is equipped with remote control of the driving device: the emergency stop button on the remote control is depressed.	Release the emergency stop button.
Electric valve for movement of boom/outriggers does not operate (jams in the centre position).	For remedy, refer to item 7.

5.4. PROBLEMS RELATED TO TOWING

FAULT	REMEDY
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19. Braking force is too low

Too much play in the brake system.	Adjust the brake system.
Brake linings not yet run-in.	Pull the parking brake lever slightly and drive 2-3 kilometres.
Brake-shoes "glazed", dirty or oil on the friction surfaces.	Replace the brake-shoe sets. Clean the friction surfaces of the brake drum.
Overrun brake jams.	Lubricate the overrun.
Brake rod jammed or bent.	Repair.
Brake wires rusty or cracked.	Replace the wires.

20. Uneven and jerky braking

Too much play in the brake system.	Adjust the brake system.
Shock absorber of the overrun device faulty.	Replace the shock absorber.
Reverse automatics – brake-shoe jams in the carrier.	Replace the brake-shoe in the carrier.

21. The brakes drag (only one of the wheels brakes)

Brake units wrongly adjusted.	Readjust the brake units according to the instructions. Also refer to point 20 for possible cause.
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22. The lift brakes when throttling down

Shock absorber of the overrun device faulty.	Replace the shock absorber.
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23. Reversing forced or impossible

Brakes have been adjusted too tight.	Adjust the brake system.
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FAULT	REMEDY
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24. Wheel brakes overheat

Brake system wrongly adjusted.	Adjust the brake system.
Wheel brake dirty.	Clean the wheel brake.
Overrun brake – the transmission rod of the overrun jams.	Remove, clean and lubricate the transmission rod.
Parking brake not completely released.	Release the parking brake completely.

25. Ball-coupling is not locked

Inner parts of the ball-coupling dirty.	Clean and lubricate the inner parts of the ball-coupling.
Tow-ball of the towing vehicle too large.	Measure the tow-ball. According to DIN74058, the diameter of the ball must be max. 50 mm and min. 49.5 mm. If the measure is different or the ball is not perfectly spherical, replace the ball.

Always, when changing brake-shoes, replace all the shoes on the axle.

Always, when assembling the brakes, make sure to install the springs, the brake-shoes and the expander in the right way.

When adjusting the brakes, turn the wheels forward (in the driving direction)!

There are many possible reasons for malfunctions, but the following are the most common:

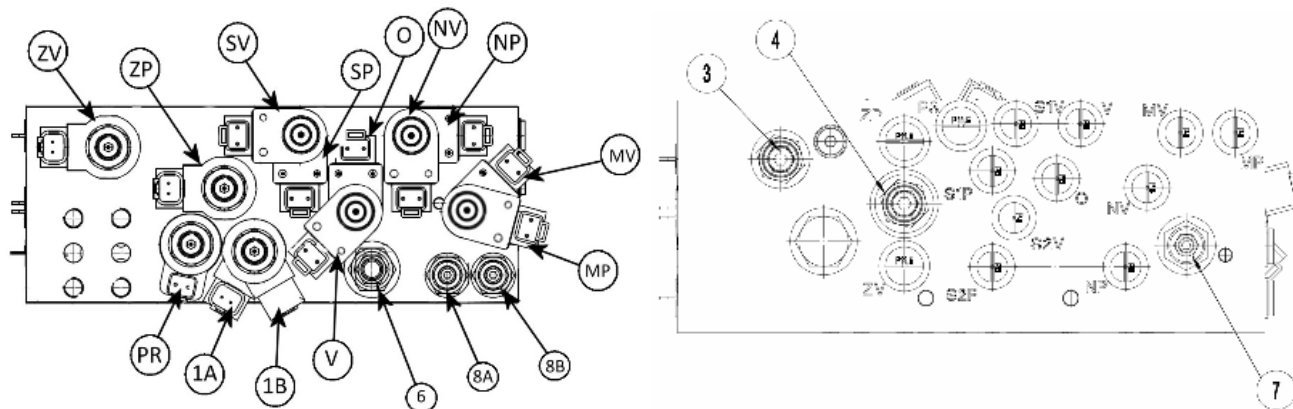
- low supply voltage (long and thin supply cable)
- the battery is flat (low voltage)
- contaminants in the hydraulic system
- loose electric connection or a contact failure caused by moisture

Keep the lift clean and protect it against moisture.

6. HYDRAULIC SYSTEM

6.1. GENERAL INFORMATION OF HYDRAULICS

Activation of any of the movements requires that three electric valves be in operation simultaneously. The retraction of the telescope is an exception, as it requires simultaneous operation of two valves only. The valves are: the flow regulation valve (PR), the selection valve boom/chassis (1B) and the control valve for the movement in question. Using the selection valve boom/chassis is not required for retraction of the telescope.



Valves:			
3.	Main pressure limit	4.	Pressure limit for extension of the telescope
6.	Pressure limit for turning	7.	Adjustment of the platform's levelling speed
8A/B	Load regulation for levelling of the platform		
1A/1B	Selection "boom/chassis"	PR	Flow regulation valve (Propo)
SV/SP	Articulated arms	NV/NP	Lifting of the boom
MV/MP	Levelling of the platform	O/V	Turning of the boom
ZV	Retraction of the telescope	ZP	Extension of the telescope

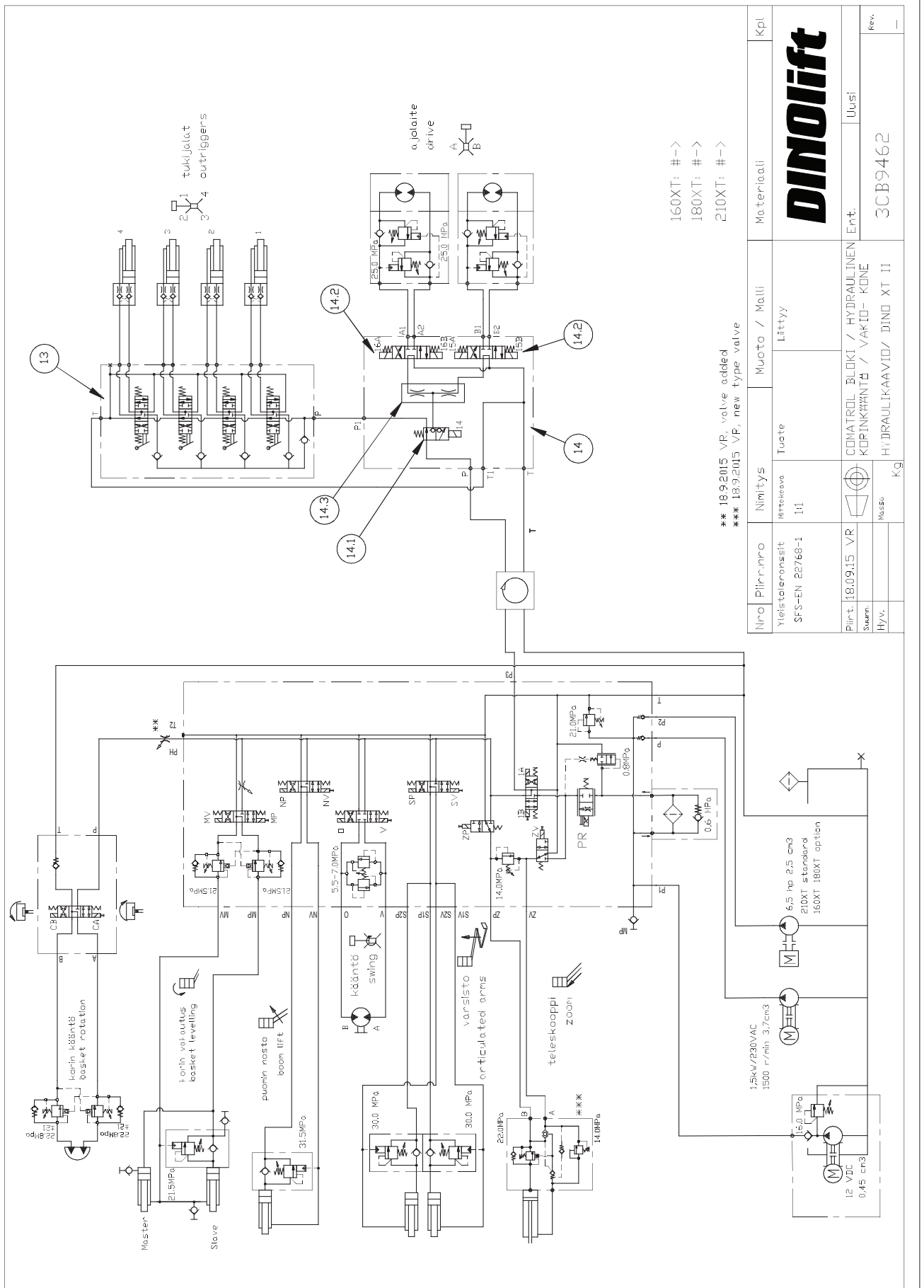
To control the valves manually in the case of malfunction, press the pins at the end of the electric valves. Take into account, when you operate valves manually, that you can only activate those movements that bring the work platform lower.

If the movements operate when controlled manually, the fault is in the electric system of the operating controls or the valve spools are dirty, which causes jamming (refer to the fault finding scheme, point 6).

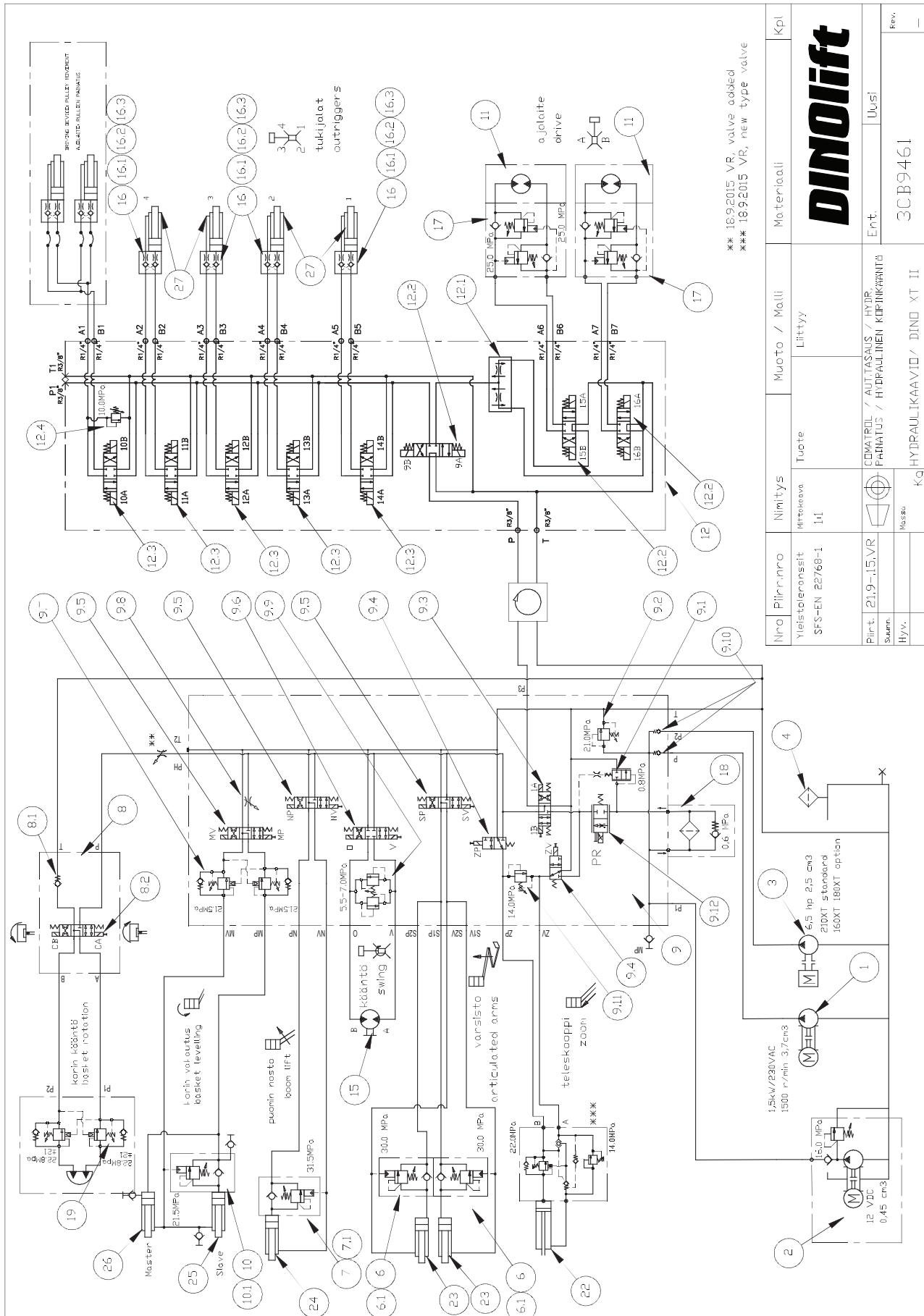
If none of the movements operate, the fault is in the hydraulic system.

6.2. HYDRAULIC DIAGRAM

Vakiokone / Standard machine / Standardmaschine / Standardmaskin / Standard maskine / Machine standard



**Automaattitasauksella / Automatic levelling / Automatische Nivellierung /
Automatik nivellering / Automatisk avbalansering / Automatisk nivellering /
Stabilisation automatique**



** 18.9.2015 VR, valve added
*** 18.9.2015 VR, new type valve

Nro	Piirrokko	Nimitys	Muoto / Malli	Materiaali	Kpl
Yleistilanselit	SFS-EN 22768-1	Ilmesteleava	Liftitty		
Plint.	21.9-15.VR			CEMATROL / AUTTASAUUS / HYDR. PAINATUS / HYDRAULIEN KONTROLL	Ent.
Suunn.					Dusi
Hyv.					3CB9461
					Rev.
					-



7. ELECTRIC SYSTEM

7.1. ELECTRIC COMPONENTS

Device ID's used in the electric diagram and component functions are described in this chapter. Spare part numbers of main components are included in a separate spare part list.

CHASSIS CONTROL CENTRE (LCB), RELAYS	
K1:	START CONTACTOR FOR THE ENGINE (M1) Control circuit fuse F2 10A.
K2:	AUXILIARY RELAY FOR THE EMERGENCY STOP BUTTON Switches off the mains supply (230VAC). Control circuit fuse F2 10A.
K3:	TURNING THE BOOM CLOCKWISE Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K4:	TURNING THE BOOM COUNTER-CLOCKWISE Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K5:	AUXILIARY RELAY FOR THE "BOOM DOWN" MOVEMENT Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K6:	RETARDATION OF THE "BOOM DOWN" MOVEMENT Decreases the maximum lowering speed of the boom by connecting a resistor to the control circuit of the control card. Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K7:	AUXILIARY RELAY FOR "BOOM UP" MOVEMENT Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K9:	AUXILIARY RELAY FOR THE "TELESCOPE IN" MOVEMENT Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K10:	AUXILIARY RELAY FOR THE "TELESCOPE OUT" MOVEMENT Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K11:	LOWERING THE ARTICULATED ARMS Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K12:	RETARDATION OF THE "ARTICULATED ARMS DOWN" MOVEMENT Decreases the maximum lowering speed of the articulated arms by connecting a resistor to the control circuit of the control card. Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).

K13:	RAISING THE ARTICULATED ARMS
	Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K15:	LEVELLING THE PLATFORM
	Levelling the platform backward. Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K16:	LEVELLING THE PLATFORM
	Levelling the platform forward. Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K17:	CENTRE POSITION ACTIVATION OF THE JOYSTICK
	Switches off the voltage from micro-switches of the joystick, if the dead-man-switch DMK has not been pressed while the joystick is in the centre position.
K18:	CONTROL RELAY FOR THE ADDITIONAL RESISTORS CONTROLLING THE MOVEMENT SPEED
	The relay switches over the control voltage from the propo-card to the adjustable resistor for the boom/levelling of platform.
	When the relay is active, the control voltage is routed via the resistor TR10 (movement speed of the boom from the chassis control centre)
	As the relay is not active the control voltage is routed via the resistor TR9 (levelling of platform).
	Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K19:	CHANGE-OVER RELAY FOR THE CONTROL VOLTAGE OF THE PROPO-CARD.
	As the relay is active the control voltage to the Propo-card is supplied via additional resistors. As the relay is not active the control voltage is supplied to the joystick by means of which the control voltage is adjusted to desired value with the help of adjustable resistors inside the joystick.
	Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K20:	FUNCTION RELAY FOR OUTREACH LIMIT SWITCH RK4
	Switches off the “telescope out” movement as the RK4 operates. Delay about 1,2 sec. Control circuit fuse F2 10A.
K21:	AUXILIARY RELAY FOR SWITCHING OFF THE “BOOM DOWN” MOVEMENT.
	Safety limit switch RK4 controls the relay that breaks the control circuit from the spool of the relay K5. Control circuit fuse F2 10A.
K22:	AUXILIARY RELAY FOR SWITCHING OFF THE “TELESCOPE OUT” MOVEMENT
	Closing point of the safety limit switch RK4 controls the relay, which switches off control voltage from the spool of the relay K10, delay 2.5 sec. Control circuit fuse F2 10A.
K23:	CHANGE-OVER RELAY ON THE CHASSIS
	Controls the solenoid valve for selecting on the chassis. Fuse F2 10A.

K24:	CENTRE POSITION ACTIVATION OF THE JOYSTICK Depressing the dead-man-switch DMK switches off the control voltage from the spool of the relay K17, which would otherwise disconnect the control voltage of the micro-switches on the joystick.
K24B:	CONTROL RELAY FOR THE BOOM Switches off the control voltage supply to the selector valve spool once the dead-man-switch DMK is depressed.
K25:	CONTROL RELAY FOR THE 1B VALVE Switches the voltage of 12VDC to the selector valve of the boom.
K25B:	CONTROL RELAY FOR THE PR-VALVE When driving the chassis, switches the voltage of 12VDC directly to the PR-valve. When driving the boom, the points direct the adjusted current from the control card to the PR-valve.
K26:	RPM - RELAY Controls the combustion engine revolutions. Increases the revolutions when the control movement is active. Control circuit fuse F9 1.6A (Platform control centre) and F4 10A (Chassis control centre).
K27:	AUXILIARY RELAY FOR CURRENT SUPPLY TO THE DRIVING DEVICE The relay is controlled by the limit switch RK3. Fuse F3 10A.
K28:	CONTROL RELAY FOR THE SOLENOID OF THE EMERGENCY DESCENT UNIT Switches on the voltage supply to the emergency descent unit solenoid SR1 Fuse F7 10A.
K29:	PREVENTION OF DUAL CONTROL The relay is controlled by the emergency descent buttons S11 and S13 Control circuit fuse F7 10A.
K31:	SWITCH-OFF-RELAY FOR THE COMBUSTION ENGINE Fuse F2 10A.
K32:	SWITCH-OFF-RELAY FOR THE COMBUSTION ENGINE Fuse F2 10A.
K33:	AUXILIARY STARTING RELAY FOR THE DIESEL ENGINE
K34:	RELAY FOR PREVENTING THE ELECTRIC MOTOR FROM RESTARTING Prevents the electric motor from starting after the failure in AC power supply by switching off the control voltage from the control contactor of the motor.
K35:	RELAY FOR PREVENTING THE ELECTRIC MOTOR FROM RESTARTING Connects the voltage supply to the relay K34, if the voltage in the control circuit of the contactor is switched off.

K36:	SELECTOR RELAY FOR SLOW MOVEMENT SPEED Feeds the lower control voltage to the propo-card via the trimmer TR1.
K390:	CHANGE-OVER RELAY FOR OPTIONAL FUNCTIONS When the relay is active, the lifting-lowering movements of the articulated arms are switched over to the joystick movements in the X-direction. When the relay is not active, the joystick movements in the X-direction control turning of the boom to the left and right.
K391:	CHANGE-OVER RELAY FOR OPTIONAL FUNCTIONS When the relay is active the in-out movements of the telescope are switched over to the joystick movements in the Y-direction. When the relay is not active lifting-lowering movements of the boom are switched over to the joystick movements in the Y-direction
K40:	CONTROL OF THE COMBUSTION ENGINE CHOKE Switches on the combustion engine choke. Fuse F2 10A.
K41:	SENSOR RELAY FOR THE AC SUPPLY When the lift is connected to an AC supply, the relay switches off the start circuit and switches on the stop circuit of the combustion engine. The relay spool is controlled by the AC-voltage.
K42:	START RELAY FOR THE COMBUSTION ENGINE Fuse F2 10A.
K60:	SWITCH-OFF-RELAY FOR THE FUNCTIONS CONTROLLED FROM THE CHASSIS CONTROL CENTRE Switches off the voltage supply to all the other boom movements during levelling of the platform.
K91:	MONITORING RELAY FOR THE LIMIT SWITCH RK3 Monitors the tips 13–14 of the limit switch.
K92:	MONITORING RELAY FOR THE LIMIT SWITCH RK3 Monitors the tips 21–14 of the limit switch.
SR2:	Safety relay monitoring the operation of the outriggers The safety relay resets as soon as all the outrigger safety limit switches (RK11, RK12, RK13 and RK14) have closed. After that it is possible to operate the boom.
SR3:	SAFETY RELAY FOR MONITORING OVERLOADING OF THE BOOM Safety limit-switch RK5 controls the operation of the safety relay. Overloading of the boom: SR3 is disconnected. The safety relay is automatically reset upon return to the normal outreach range. The delay adjusted with the capacitors affects the tripping moment of the SR3. If the RK5 fails: SR3 is disconnected. The safety relay is not automatically reset, and the due operation of the electric equipment must be checked. The delay adjusted with the capacitors affects the tripping moment of the SR3.

SR4:	SAFETY RELAY FOR THE EMERGENCY STOP CIRCUIT
	SR4 switches off control voltage from the engine control contactors.
	The safety relay operates provided that the emergency stop buttons on the upper and lower control centres are in their upper positions and the chain limit switch RK7 is not active. In addition the contactors K1 and K2 must be inactive.
	The safety relay will trip if one of the emergency stop buttons either on the upper or on the lower control centre is depressed or the chain limit switch is activated.
CHASSIS CONTROL CENTRE (LCB), SWITCHES	
S1:	LOCKING EMERGENCY STOP SWITCH
	Stops all other functions except the emergency descent and the sound signal, which remain operational.
S8:	SELECTOR SWITCH FOR MOVEMENT SPEED
	Selects either the high or the low movement speed for the boom. In addition, serves as the Start&Stop switch in the chassis control panel.
S13:	START SWITCH OF THE EMERGENCY DESCENT SYSTEM
	Controls the solenoid for the emergency descent unit which starts the unit and supplies the control voltage to the control levers while the the emergency descent system is in operation.
S14:	I/O START SWITCH
	Starts the electric motor provided that the machine is connected to mains electricity. If the machine is equipped with a combustion engine and is not connected to mains electricity, this switch is used for starting the combustion engine. Passes by the Start&Stop functionality.
S16:	TURNING OF THE BOOM TO THE RIGHT - LEFT
	Non-locking lever switch (chassis control centre).
S17:	BOOM UP-DOWN
	Non-locking lever switch (chassis control centre).
S18:	TELESCOPE IN-OUT
	Non-locking lever switch (chassis control centre).
S19:	ARTICULATED ARMS DOWN-UP
	Non-locking lever switch (chassis control centre).
S20:	LEVELLING THE PLATFORM FORWARD-BACKWARD
	Non-locking lever switch (chassis control centre).
S24:	TURNING TO THE LEFT
	Prevents the left drive motor from rotating.
S25:	TURNING TO THE RIGHT
	Prevents the right drive motor from rotating.

S26:	DRIVE TO THE FRONT Makes the machine move forward.
S27:	DRIVE TO THE REAR Makes the machine move backward.
S32:	TELESCOPE IN Non-locking button switch. After the SR3 has tripped, the telescope can be retracted by depressing the button.
S40:	COMBUSTION ENGINE CHOKE Non-locking button switch. Depressing the button keeps the choke of the combustion engine active.
CHASSIS CONTROL CENTRE (LCB), OTHER ITEMS	
F1:	1.6A FUSE FOR ACTIVATION CIRCUIT OF THE TIMER CARD
F2:	10A CONTROL FUSE FOR START CIRCUIT AND MONITORING CIRCUIT OF THE OUTREACH
F3:	10A CONTROL FUSE FOR THE DRIVING DEVICE
F4:	5A FUSE FOR CONTROL LEVERS AND JOYSTICK IN THE CHASSIS AND PLATFORM CONTROL CENTRES
F5:	5A FUSE FOR THE PROPO-CARD
F6:	10A CONTROL FUSE FOR THE SOLENOID VALVES
F7:	10 A CONTROL FUSE FOR THE EMERGENCY DESCENT CIRCUIT
F8:	10A CONTROL FUSE FOR THE COMBUSTION ENGINE
F12:	TIMER CARD FUSE 16A
H3:	GREEN LED SIGNAL LIGHT Indicates the operation of the outrigger limit switches RK11-RK14.
H4:	RED LED SIGNAL LIGHT Indicates the tripping of the SR3.
HM1:	HOUR METER Measures the running hours of the machine.
Q1:	TURN SWITCH WITH KEY Selector switch for choosing the operating location. 1 = chassis + chassis control centre 2 = platform control centre

TC:	TIMER CARD
	Control card for supply voltage.
	Disconnects the supply voltage from the lift after a preset delay (normally 1 hour)
	Start buttons S2 and S6 are used for re-activation of the control voltage.
TR1:	ADJUSTABLE RESISTOR
	Adjustable resistor for the slow movement speed. Located on the trimmer circuit card on the cover.
TR9:	ADJUSTABLE RESISTOR
	Adjustable resistor for the levelling speed of the platform.
TR10:	ADJUSTABLE RESISTOR
	Adjustable resistor for lowering speed of the boom.
TR11:	ADJUSTABLE RESISTOR
	Adjustable resistor for the movement speed when operating from the chassis centre.
TR12:	ADJUSTABLE RESISTOR
	Adjustment of the articulated arms' lowering speed.
U1:	VOLTMETER
	When the mains electricity is connected, the voltmeter indicates the mains voltage.
PLATFORM CONTROL CENTRE (UCB), RELAYS	
K41b:	SENSOR RELAY FOR THE AC SUPPLY
	When the AC-supply is connected, the start/stop automation is operational.
K50:	CONTROL RELAY FOR SIGNAL LIGHTS INDICATING THE STATE OF LOADING OF THE PLATFORM
	The relay is controlled by the opening point of the limit switch RK4.
K54:	TIME RELAY FOR STARTING THE ELECTRIC MOTOR
	Start/stop automation with a delay of 3 seconds.
K61:	TURNING OF THE PLATFORM
	Time relay for start of turning movement.
K68:	AUXILIARY RELAY FOR THE EMERGENCY STOP FUNCTION
	Prevents the operation from the platform control centre if the emergency stop button has been depressed.
K69:	AUXILIARY RELAY FOR THE START&STOP FUNCTION
	Enables the Start&Stop function to be operated from the LCB centre when the machine is stopped via the I/O switch.
K531:	BYPASS RELAY OF THE START&STOP FUNCTION
	Passes by the Start&Stop functionality when the I/O button is depressed.

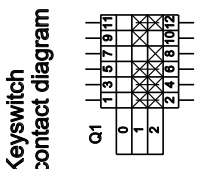
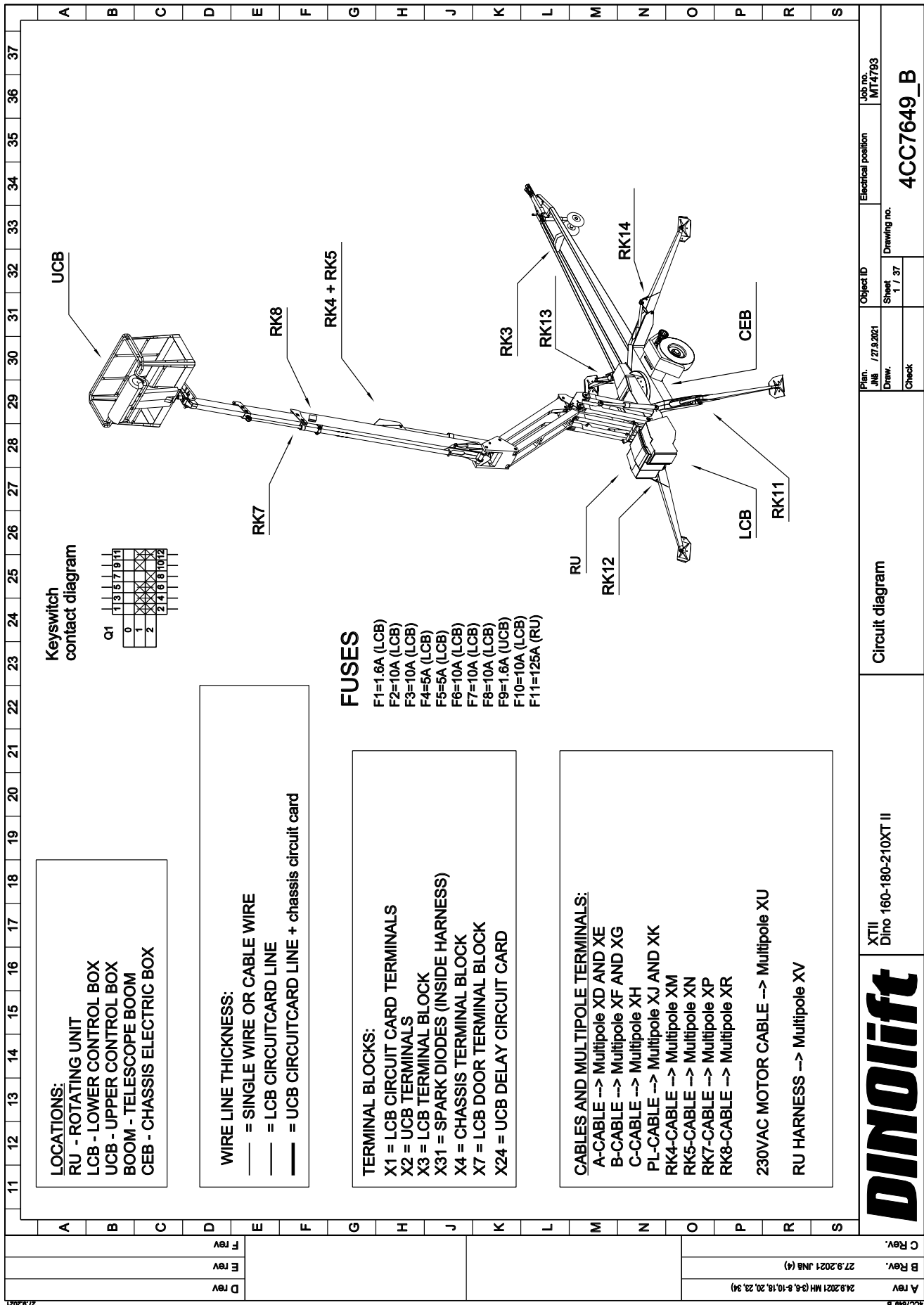
K541:	AUXILIARY RELAY FOR THE START&STOP FUNCTION Auxiliary relay for the Start&Stop function.
T13:	ADJUSTABLE RESISTOR Turning speed of the platform.
PLATFORM CONTROL CENTRE (UCB), SWITCHES	
DMK:	DEAD-MAN-SWITCH
JST:	JOYSTICK As the right side of the rocker switch is depressed, the movements are: boom up - down and turn right – left) When the left side of the rocker switch is depressed, the movements are: telescope in–out and articulated arms up–down.
S4:	LOCKING EMERGENCY STOP SWITCH Stops all other functions except the emergency descent and the sound signal, which remain operational.
S5:	STOP SWITCH Disconnects the control voltage from the control contactor of the electric motor and the stop relay of the combustion engine.
S6:	START SWITCH Controls the contactor of the electric motor and start solenoid of the combustion engine if the combustion engine is used.
S10:	SOUND SIGNAL SWITCH
S11:	EMERGENCY DESCENT SWITCH Controls the solenoid for the emergency descent unit which starts the unit and supplies the control voltage to the control levers while the the emergency descent system is in operation.
S12:	LEVELLING THE PLATFORM FORWARD-BACKWARD Control switch, non-locking lever switch. The levelling is operated by pressing the button S29 and turning the lever switch S12.
S29:	SELECTOR SWITCH FOR LEVELLING OF THE PLATFORM Non-locking button switch. Switches on the control voltage to button switch S12 as the switch is depressed.
S31:	TELESCOPE IN Non-locking pushbutton for retracting the telescope.
S36:	TURNING THE PLATFORM TO THE LEFT-RIGHT Non-locking lever switch. The turning is operated by pressing the button S29 and turning the lever switch S36.

S41:	COMBUSTION ENGINE CHOKE Non-locking button switch. Depressing the button keeps the choke of the combustion engine active.
PLATFORM CONTROL CENTRE (UCB), OTHER ITEMS	
H1:	GREEN LED SIGNAL LIGHT The platform inside the operating range.
H2:	RED LED SIGNAL LIGHT The platform at the border of the operating range.
F9:	JOYSTICK FUSE 1.6A
PR:	SOCKET OUTLET ON THE PLATFORM 230VAC 16A.
ÄM2:	BUZZER Indicates the operation of the safety limit switch RK5 and the emergency stop switches S1 and S4.
REMOTE CONTROL FOR DRIVING DEVICE (OPTION)	
K100:	FUNCTION RELAY FOR EMERGENCY STOP OF REMOTE CONTROL FOR DRIVING DEVICE Prevents the driving if the emergency stop button has been depressed.
K101:	FUNCTION RELAY FOR EMERGENCY STOP OF REMOTE CONTROL FOR DRIVING DEVICE Prevents the driving if the emergency stop button has been depressed.
K102:	FUNCTION RELAY FOR EMERGENCY STOP OF REMOTE CONTROL FOR DRIVING DEVICE Prevents the driving if the emergency stop button is released and the dead-man-switch is depressed.
S24:	ACTIVATION BUTTON FOR DRIVING Driving is enabled if the button is depressed.
S28:	TURN SWITCH, TURNING TO THE RIGHT/LEFT Turns the machine to the left/right during driving forward or backward.
S27.1:	DRIVE TO THE REAR Makes the machine move backward.
S26.1:	DRIVE TO THE FRONT Makes the machine move forward.
EM-STOP:	EMERGENCY STOP BUTTON OF REMOTE CONTROL FOR DRIVING DEVICE Prevents the driving by disconnecting the control voltage supply to the driving valve.

LIMIT SWITCHES	
RK3:	LIMIT SWITCH ON THE BOOM SUPPORT Prevents the operation of the outriggers and the driving device if the boom is not resting on the support in the transport position. Controls the relay K30.
RK4:	SAFETY LIMIT SWITCH FOR THE ADJUSTED OPERATING RANGE The operation of the limit switch stops the “boom down” movement and the “telescope out” movement.
RK5:	BACKUP LIMIT SWITCH FOR THE SAFETY LIMIT SWITCH RK4. Trips after the preset delay (2,4 seconds) the safety relay SR3 which controls the sound signal AM2 and switches off the control voltage to the limit switch RK4.
RK7:	SAFETY LIMIT SWITCH FOR THE TELESCOPE CHAIN. Operation of the safety limit switch stops the electric motor. The limit switch switches off the control voltage to the contactor K1 after which only the emergency descent unit will operate.
RK8:	SAFETY LIMIT SWITCH “TELESCOPE FULLY RETRACTED” The limits switch closes when the telescope is completely retracted. If the RK4 or RK5 has failed, the boom cannot be lowered until the telescope has been completely retracted and the points of the limit switch RK8 have closed.
RK11- RK14:	LIMIT SWITCHES ON THE OUTRIGGERS The limit switch closes as soon as sufficient force is exerted on the outrigger. Prevents the operation of the boom unless the outriggers are not firmly supported on the ground and all limit switches are not closed.
OTHER MARKINGS	
B1:	BATTERY 12VDC 44AH
E1:	THERMORELAY FOR THE ELECTRIC MOTOR
F11:	MAIN BATTERY FUSE 125A
J1:	PLUG
M1:	ELECTRIC MOTOR 230VAC 1.5kW
M2:	EMERGENCY DESCENT MOTOR 12VDC Max. operating time 10 min.
PL:	ROTARY ADAPTOR The electric circuits between the chassis and the turning device go through the electric rotary adaptor.

SR1:	SOLENOID OF THE EMERGENCY DESCENT UNIT
	When energized, starts the emergency descent unit M2.
SPV:	MAIN SWITCH
	Disconnects the plus terminal of the battery.
T1:	BATTERY CHARGER
	Charging voltage 13,8VDC 10A
	Charges the battery if the mains supply is connected.
VVK:	FAULT CURRENT SWITCH 25A 30 ms.
ÄM1:	SOUND SIGNAL

7.2. ELECTRIC DIAGRAM



FUSES
 F1=1.6A (LCB)
 F2=10A (LCB)
 F3=10A (LCB)
 F4=5A (LCB)
 F5=5A (LCB)
 F6=10A (LCB)
 F7=10A (LCB)
 F8=10A (LCB)
 F9=1.6A (UCB)
 F10=10A (LCB)
 F11=125A (RU)

LOCATIONS:
 RU - ROTATING UNIT
 LCB - LOWER CONTROL BOX
 UCB - UPPER CONTROL BOX
 BOOM - TELESCOPE BOOM
 CEB - CHASSIS ELECTRIC BOX

WIRE LINE THICKNESS:
 — = SINGLE WIRE OR CABLE WIRE
 — = LCB CIRCUITCARD LINE
 — = UCB CIRCUITCARD LINE + chassis circuit card

TERMINAL BLOCKS:
 X1 = LCB CIRCUIT CARD TERMINALS
 X2 = UCB TERMINALS
 X3 = LCB TERMINAL BLOCK
 X31 = SPARK DIODES (INSIDE HARNESS)
 X4 = CHASSIS TERMINAL BLOCK
 X7 = LCB DOOR TERMINAL BLOCK
 X24 = UCB DELAY CIRCUIT CARD

CABLES AND MULTIPOLE TERMINALS:
 A-CABLE --> Multipole XD AND XE
 B-CABLE --> Multipole XF AND XG
 C-CABLE --> Multipole XH
 PL-CABLE --> Multipole XJ AND XK
 RK4-CABLE --> Multipole XM
 RK5-CABLE --> Multipole XN
 RK7-CABLE --> Multipole XP
 RK8-CABLE --> Multipole XR
 230VAC MOTOR CABLE --> Multipole XV
 RU HARNESS --> Multipole XV

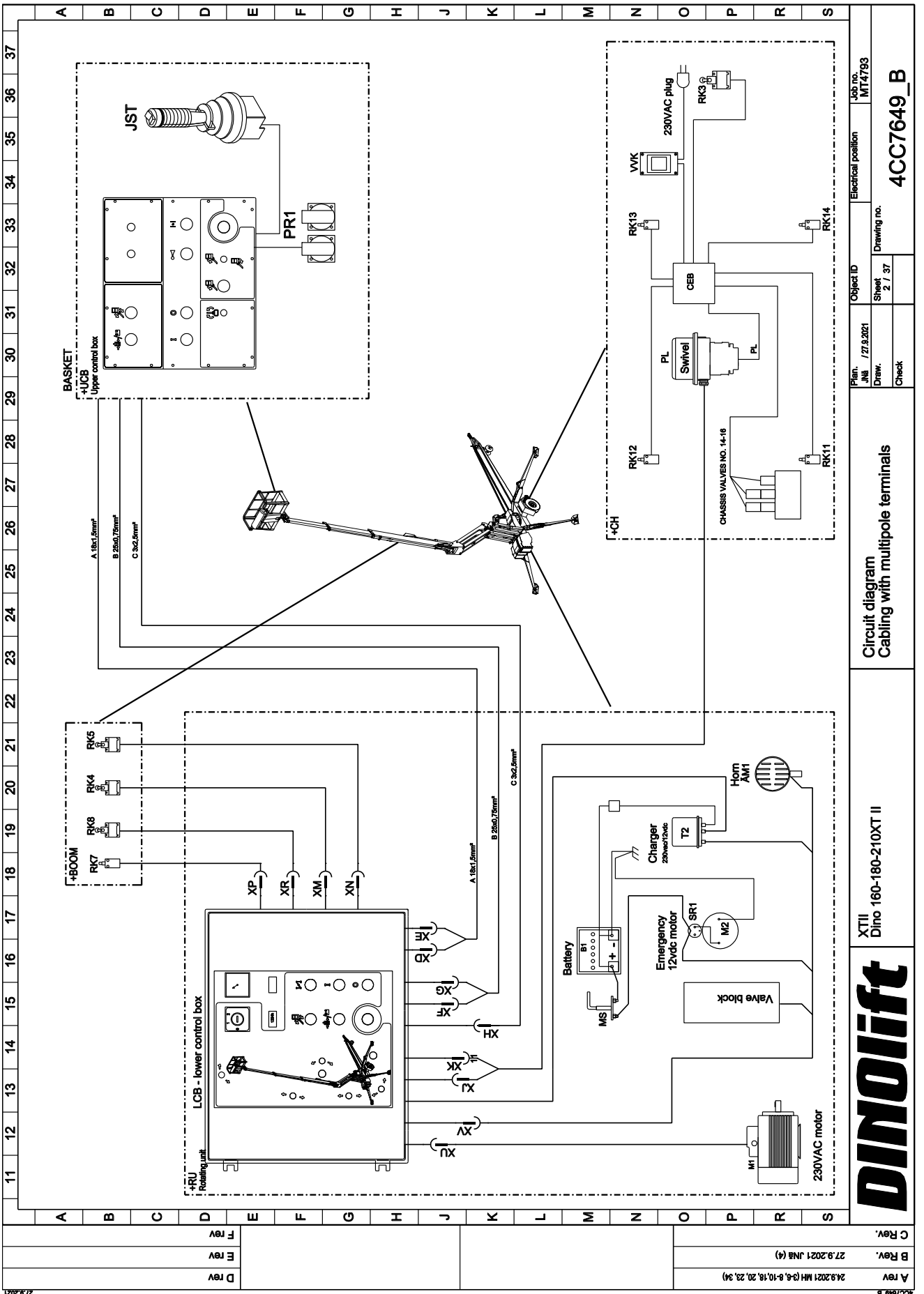


XTII
 DINO 160-180-210XT II

Circuit diagram

Plan: JNB / ZT.9.2021
 Draw: 1 / 37
 Check:
 Object ID:
 Electrical position:
 Job no. MT4793
 Drawing no. 4CC7649_B

A Rev.	24.9.2021 MH (3-5, 8-10, 18, 20, 23, 34)
B Rev.	27.9.2021 JNB (4)
C Rev.	



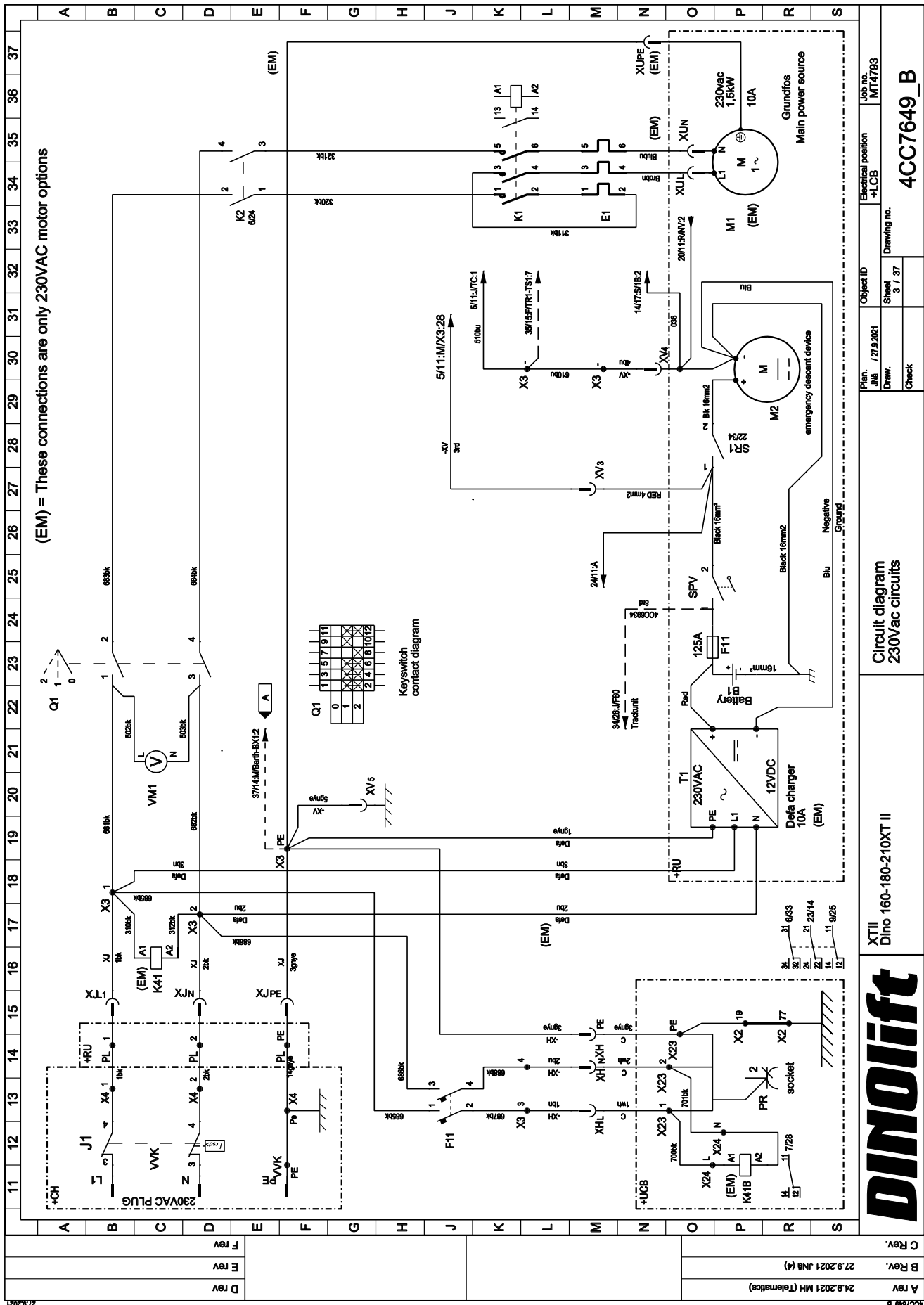
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B Rev.	27.9.2021 JNB (4)
C Rev.	

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XT11
Dino 160-180-210XT II

Circuit diagram
Cabling with multipole terminals

Plan.	JNB	Object ID	Job no.
Draw.	27.9.2021	Electrical position	MT4783
Sheet	2 / 37	Drawing no.	4CC7649_B
Check			

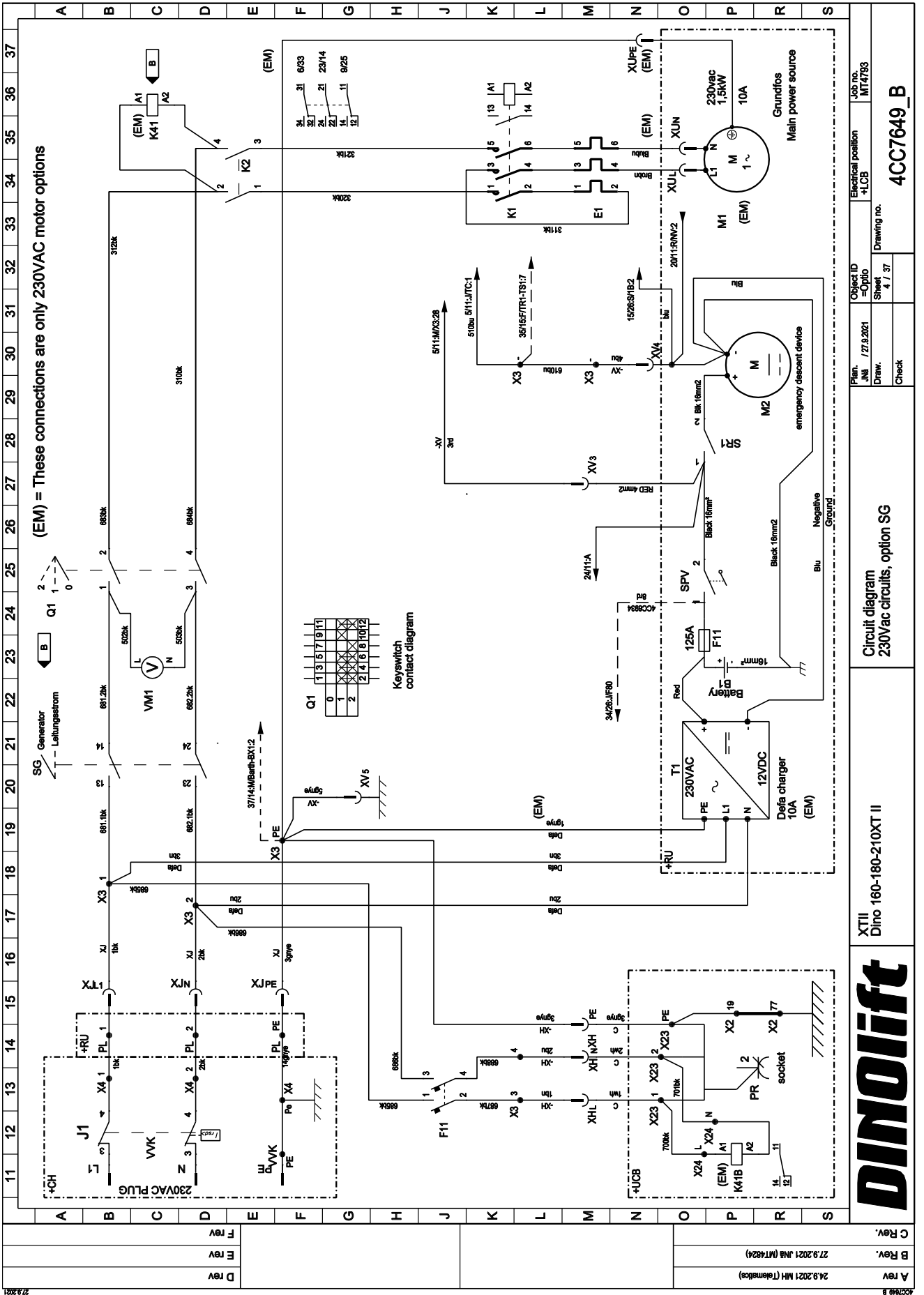


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B Rev.	27.9.2021 JNB (4)	Electrical position	+LCB	Draw.	3 / 37	Drawing no.	4CC7649_B
C Rev.				Check			

DINOLIFT

XTII
Dino 160-180-210XT II

Circuit diagram
230Vac circuits



407948 B	24.9.2021 MH (Telenbos)	A Rev.
	27.9.2021 JNB (MT4824)	B Rev.
		C Rev.

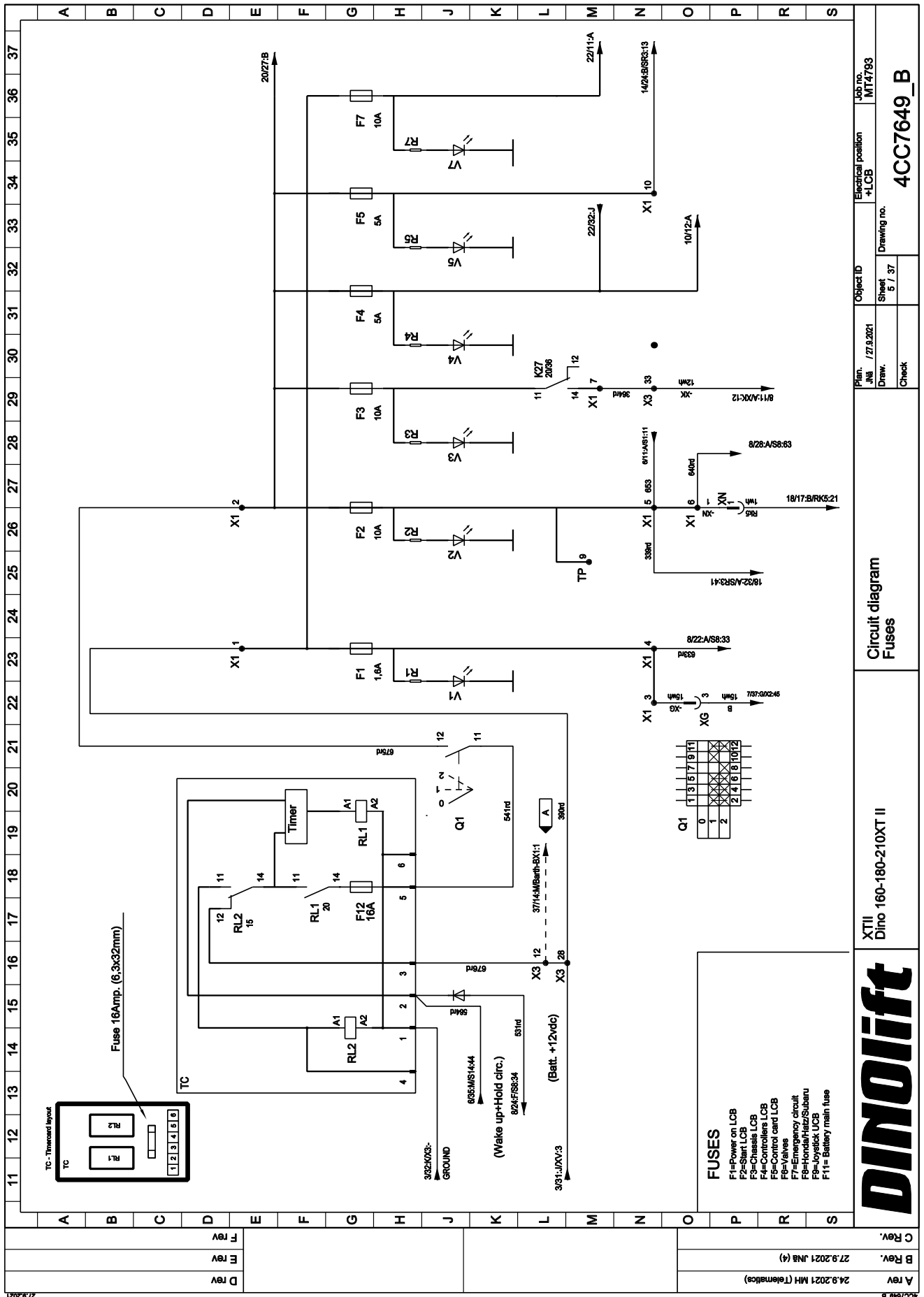
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XT11
Dino 160-180-210XT II

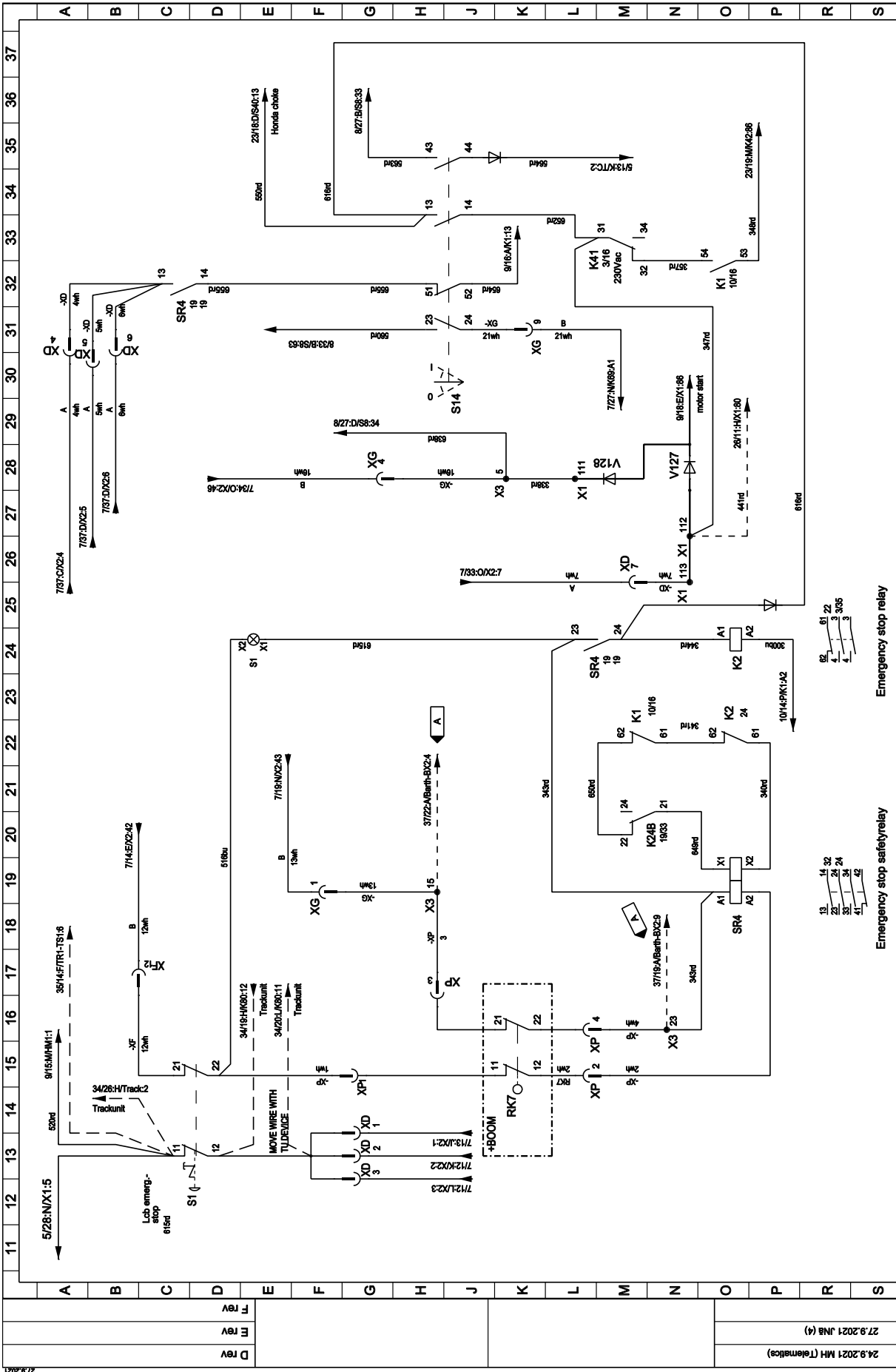
Circuit diagram
230Vac circuits, option SG

Plan. JNB / 27.9.2021	Object ID =Optio	Electrical position +LCB	Job no. MT4793
Draw. 4 / 37	Sheet	Drawing no.	
Check			

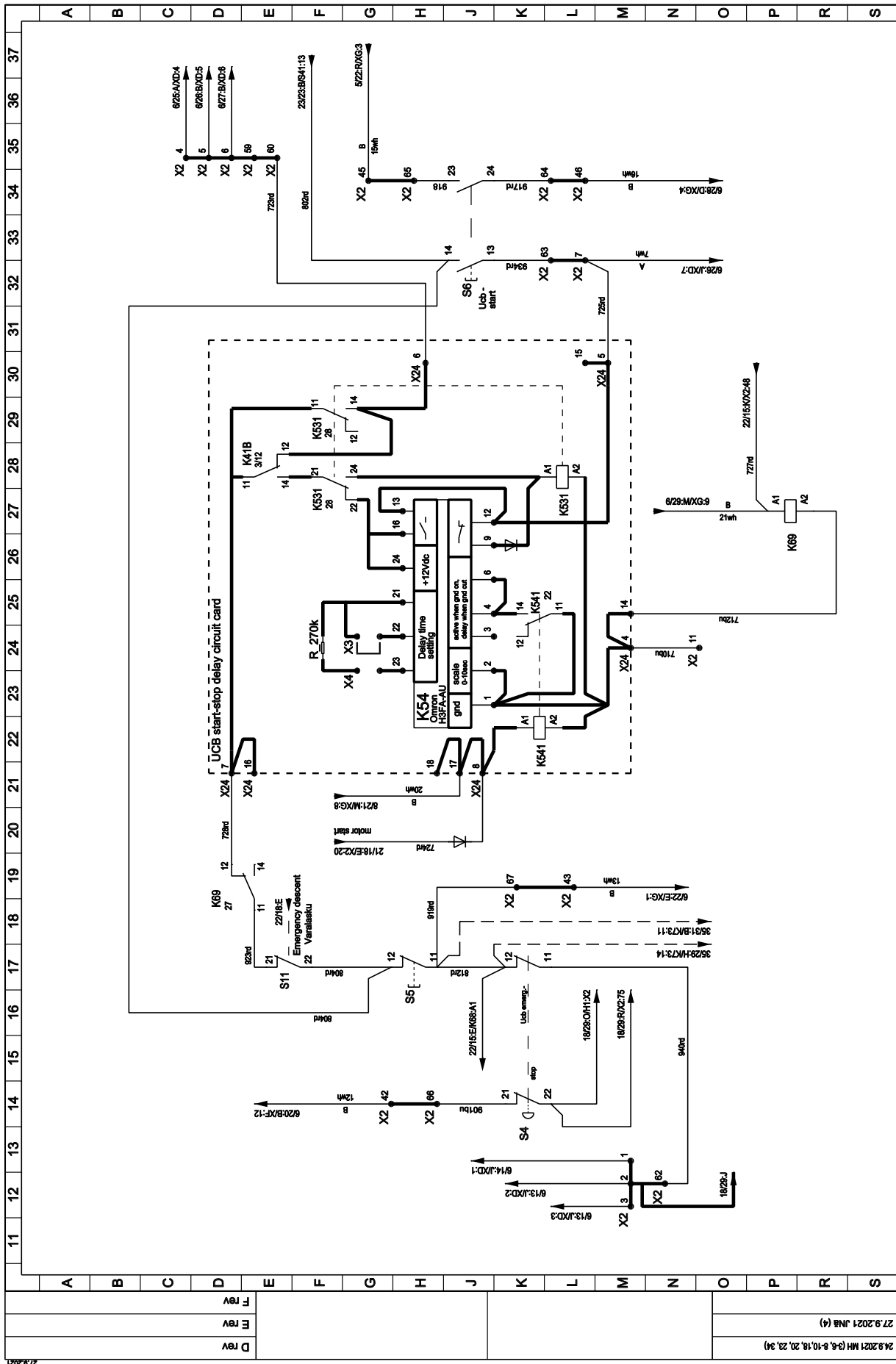
4CC7649_B



A Rev. 24.9.2021 MH (Thematics)		B Rev. 27.9.2021 JNB (4)		C Rev.	
D Rev.		E Rev.		F Rev.	
DINOlift		XTII Dino 160-180-210XT II		Circuit diagram Fuses	
Object ID		Electrical position		Job no.	
JNB / 27.9.2021		+LCB		MT4793	
Sheet		Drawing no.		4CC7649_B	
5 / 37					
Draw.		Check			

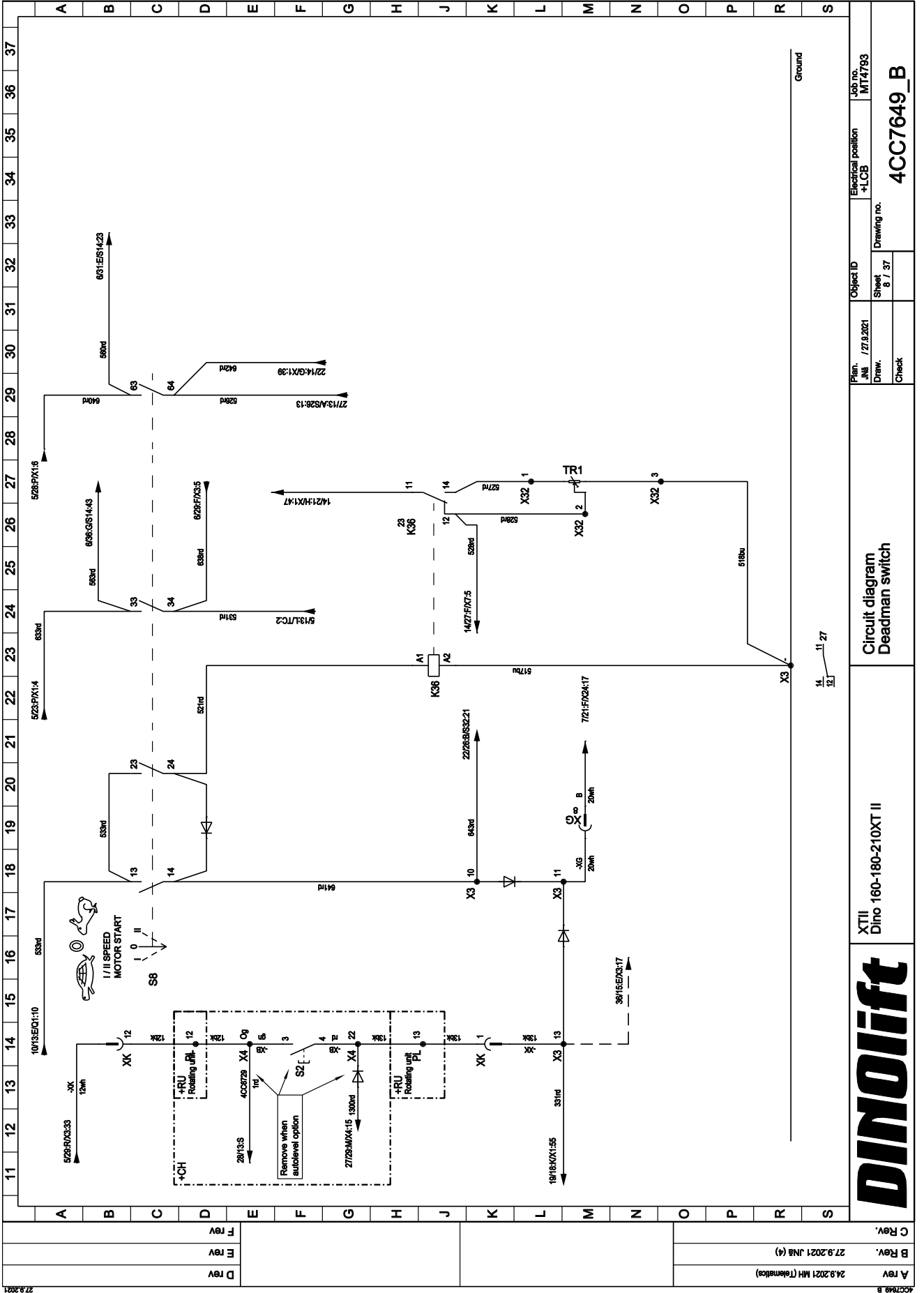


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B Rev.		27.9.2021 JNB (4)	Electrical position		MT4783
C Rev.			+LCB		
			Drawing no.		4CC7649_B
			Sheet		6 / 37
			Check		
			Draw.		
			Plan.		
			JNB / 27.9.2021		
			Emergency stop relay		
			Emergency stop safetyrelay		
			Circuit diagram		
			Emergency stop		
			XTIII		
			Dino 160-180-210XT II		
			DINOLIFT		



A Rev. 24.9.2021 MH (3-5, 8-10, 16, 20, 23, 34)		B Rev. 27.9.2021 JNB (4)		C Rev.	
D Rev.		E Rev.		F Rev.	
XTII		Dino 160-180-210XT II		Circuit diagram Start&Stop Emergency stop	
Object ID		Electrical position		Job no.	
Sheet 7 / 37		Drawing no.		MT4783	
Plan: JNB / 27.9.2021		Drawing no.		4CC7649_B	
Draw.		Check			





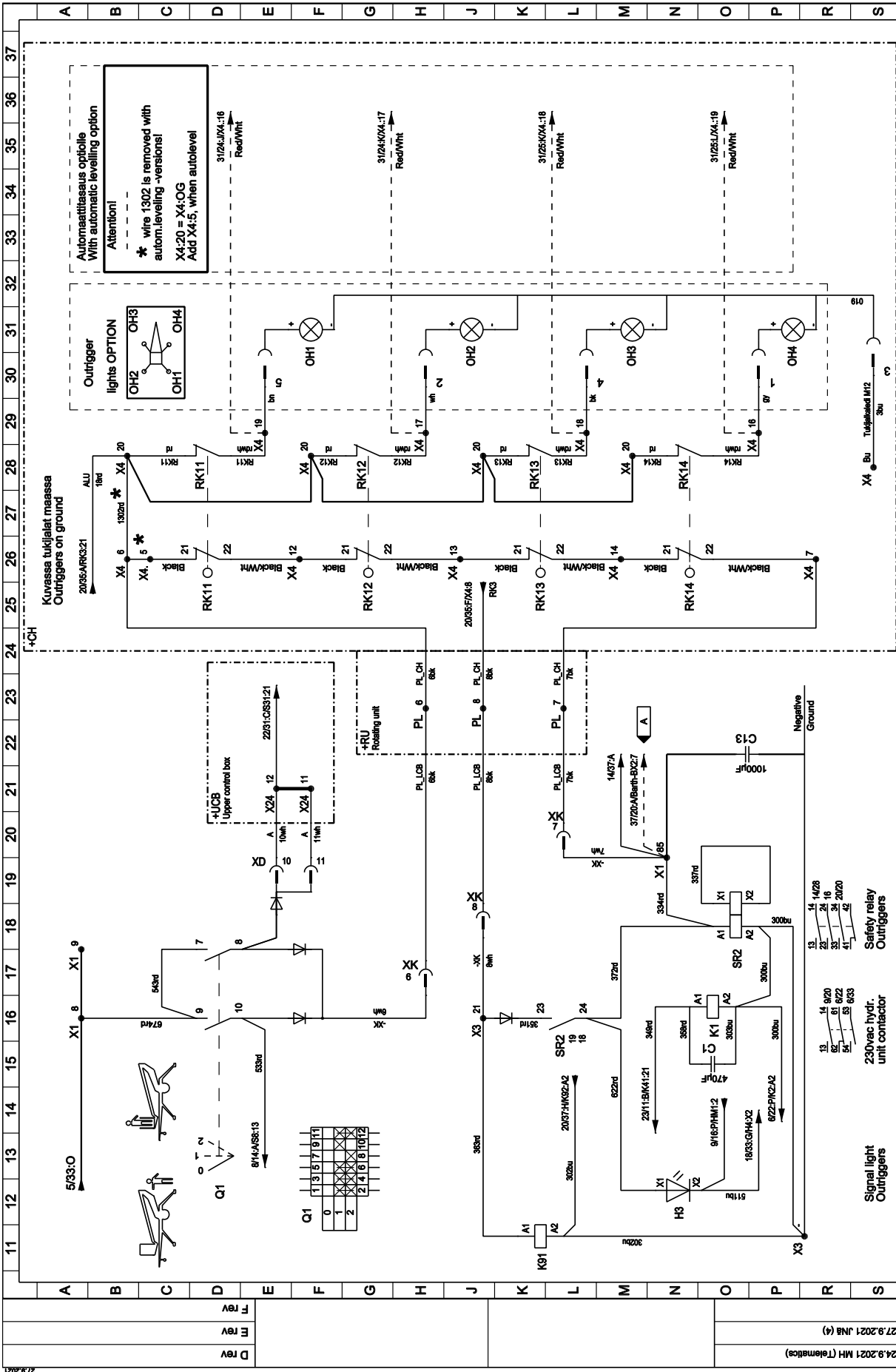
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	E Rev	27.9.2021 JMS (4)	B Rev	
	F Rev		C Rev	

Object ID: 4CC7649_B
 Job no.: MT4789
 Electrical position: +LCB
 Drawing no.: 8 / 37
 Sheet: 8 / 37
 Check: _____

Circuit diagram
 Deadman switch

XTH
 Dino 160-180-210XT II

DINOLIFT



Automaattiasetus optiolle
With automatic levelling option
Attention!
* wire 1302 is removed with
autom.levelling -versions!
X4:20 = X4:OG
Add X4:5, when autolevel

Outrigger
lights OPTION
OH2
OH3
OH1
OH4

Kuvassa tulkijat maassa
Outriggers on ground
20355ARK321

Upper control box
+LJCB
X24 12
2281COSB121
A X24 11
10mm
11mm

Rotating unit
+HRU
PL 6 PLCH 60k
PL 8 PLCH 60k
PL 7 PLCH 70k
PL 10B 70k

Signal light
Outriggers
230VAC hydr.
unit contactor

Safety relay
Outriggers

3126/XX:17 Red/Wht
3125/XX:18 Red/Wht
3125/XX:19 Red/Wht

X4 Bu Tulpainnut M12 30 0

Object ID
Job no. MT4783
Electrical position +LCB

Plan. J.M. / 27.9.2021
Draw. Sheet 10 / 37
Check

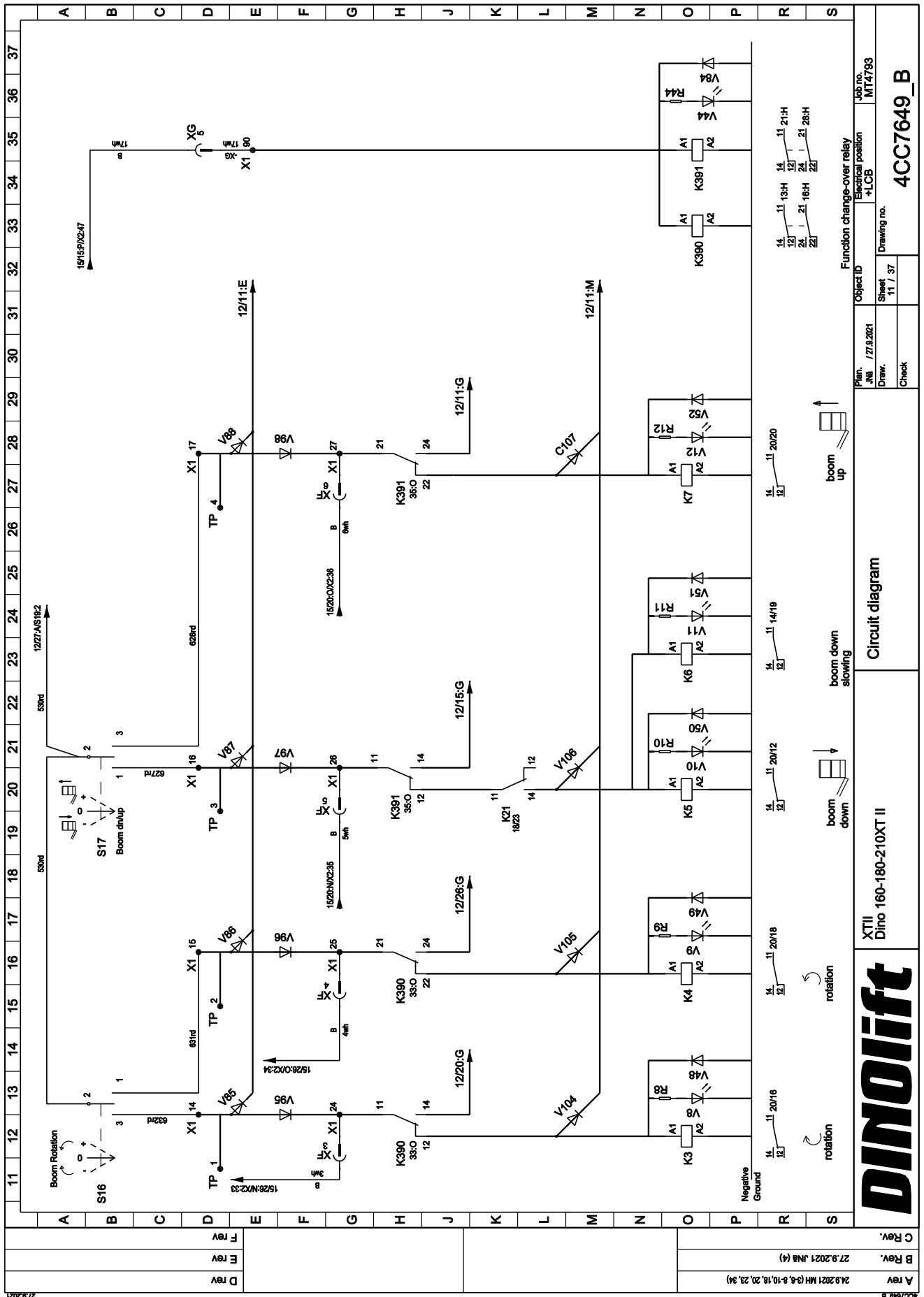
Circuit diagram
Outrigger switches

XTH
Dino 160-180-210XT II

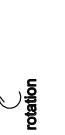
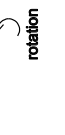
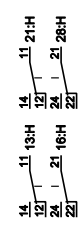
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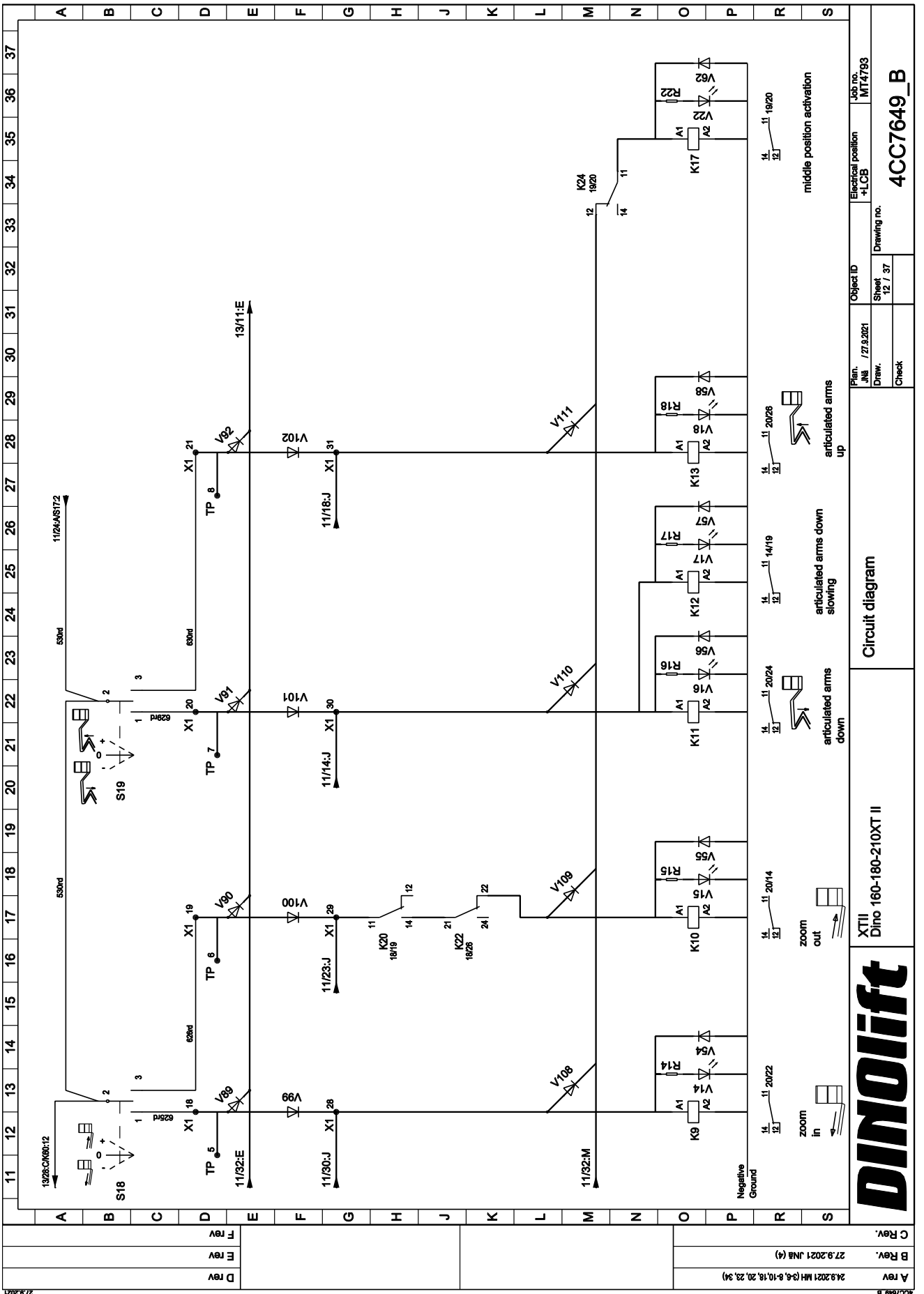
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27.9.2021 JMS (4)
C Rev.

27.9.2021

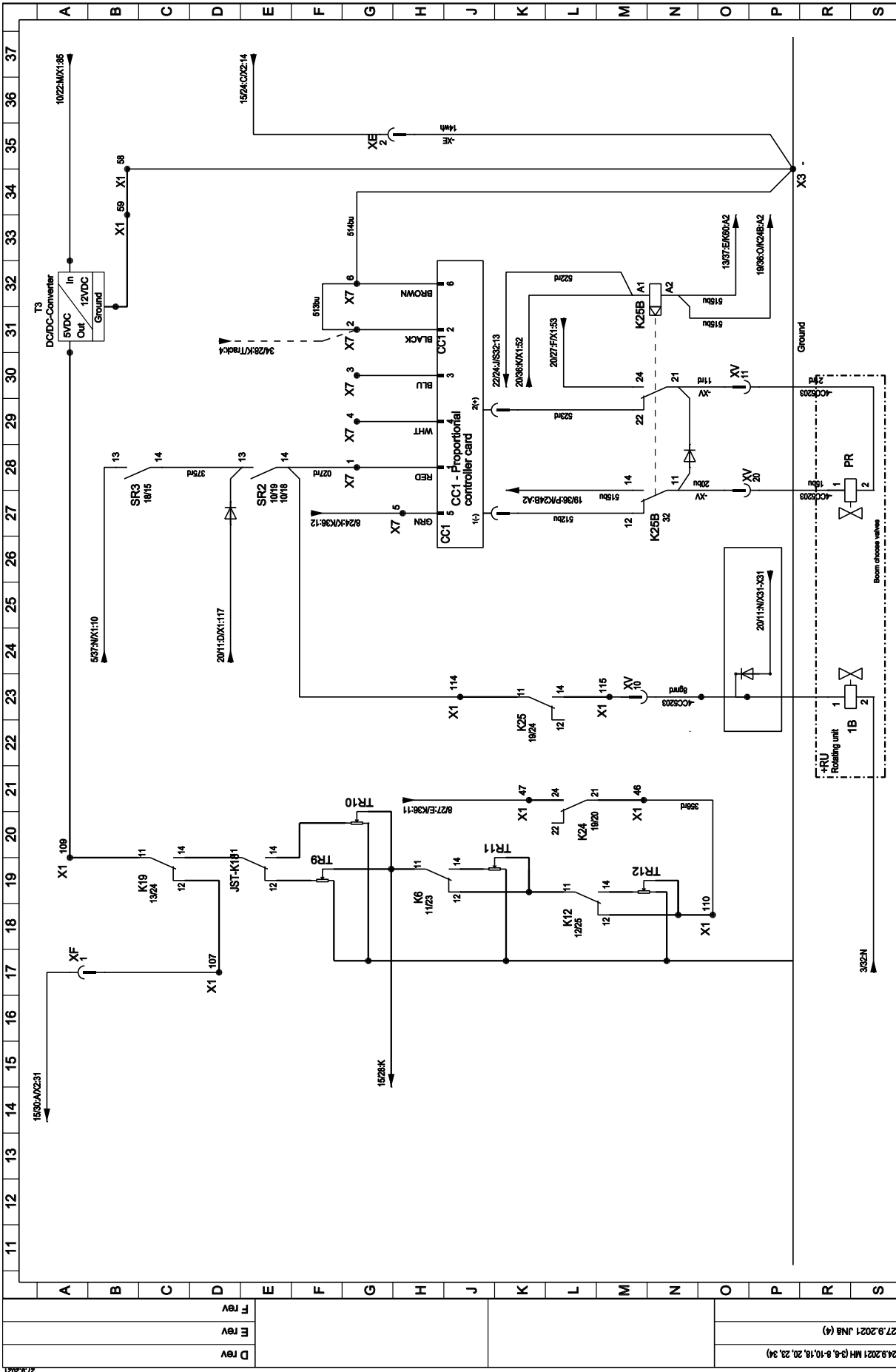


A Rev. 24.9.2021 MH (3-5, 8-10, 16, 20, 23, 34)		B Rev. 27.9.2021 JNB (4)		C Rev.	
D Rev.		E Rev.		F Rev.	
Plan: JNB / 27.9.2021		Object ID		Job no. MT4793	
Draw: 11 / 37		Electrical position		+LCB	
Check:		Drawing no.		4CC7649_B	
Function change-over relay		Circuit diagram			
DINOlift		XTII DINO 160-180-210XT II			

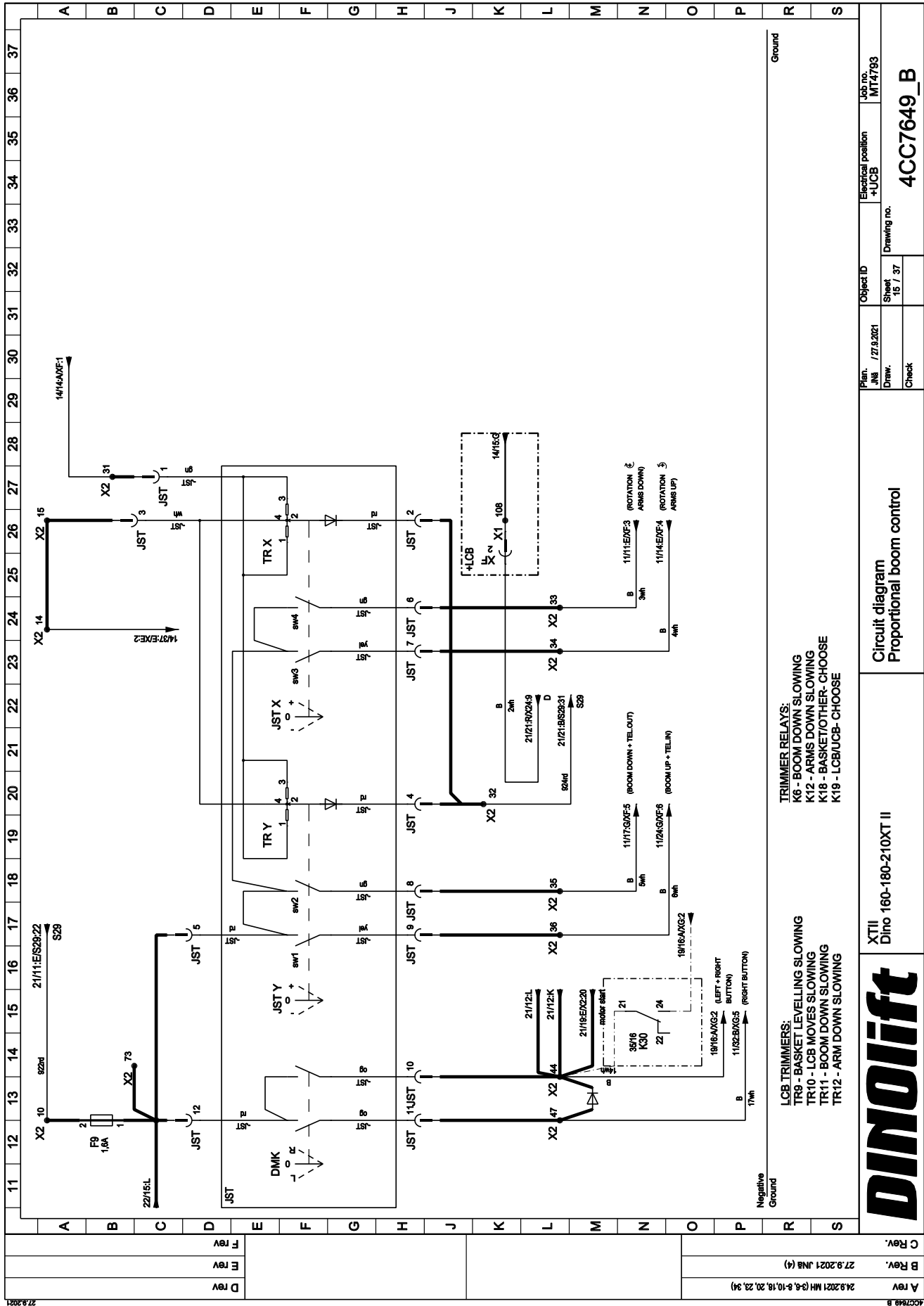




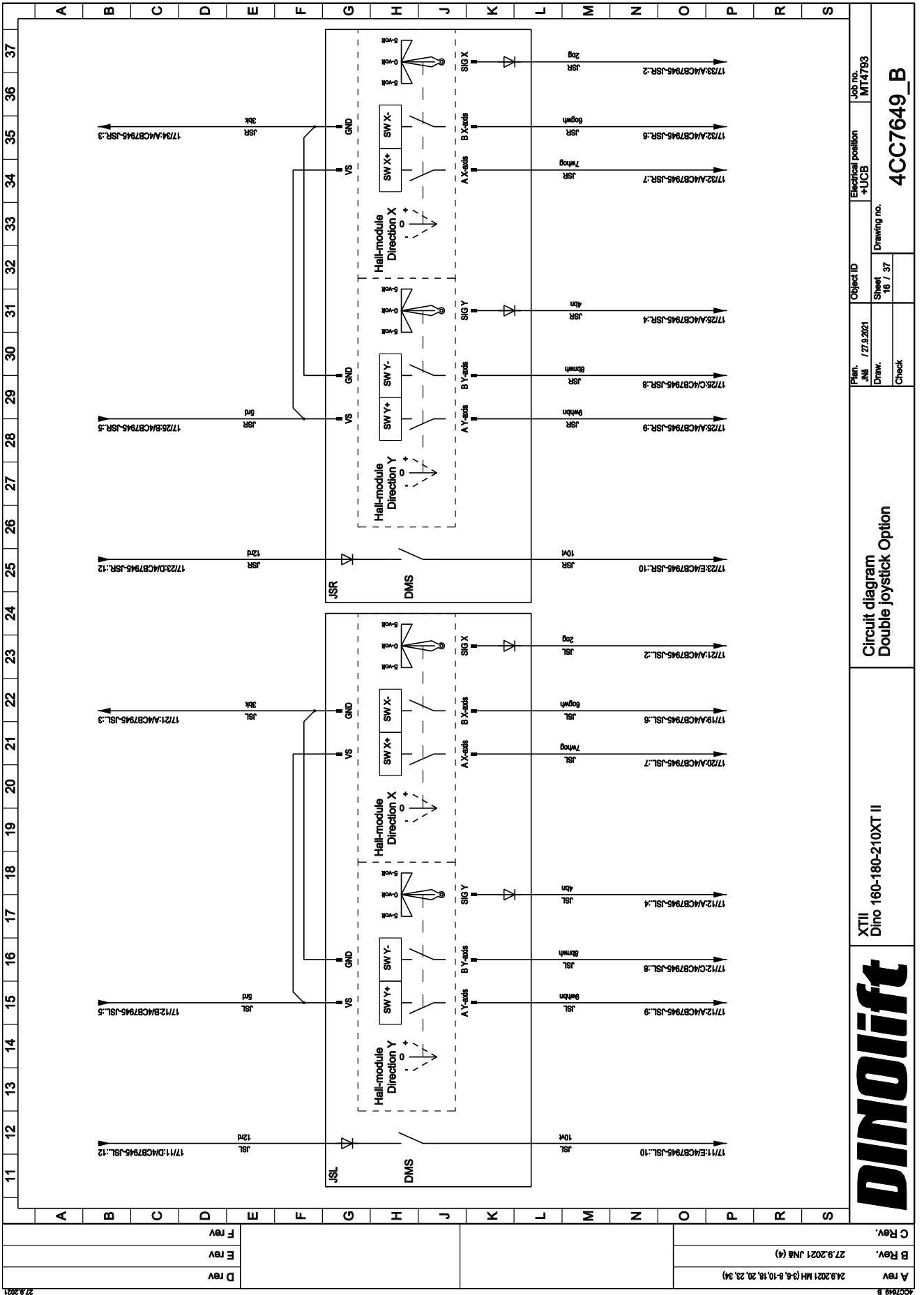
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E Rev							B Rev 27.9.2021 JMB (4)	C Rev
T Rev							Plan. JMB / 27.9.2021	Object ID Electrical position +LCB
							Sheet 12 / 37	Job no. MT4783
							Check	Drawing no. 4CC7649_B
							Draw.	Object ID
							Check	Electrical position +LCB
							Circuit diagram	Job no. MT4783
							XT11	Drawing no. 4CC7649_B
							Dino 160-180-210XT II	Job no. MT4783
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							Dino 160-180-210XT II	Job no. MT4783
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							Dino 160-180-210XT II	Job no. MT4783
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							XT11	Drawing no. 4CC7649_B
							Dino 160-180-210XT II	Job no. MT4783
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							Dino 160-180-210XT II	Job no. MT4783
							XT11	Drawing no. 4CC7649_B



A Rev. 24.9.2021 MH (3-9-9-10-18, 20, 23, 34)		B Rev. 27.9.2021 JMB (4)		C Rev.	
D Rev.		E Rev.		F Rev.	
Plan. JMB / 27.9.2021		Object ID		Electrical position	
Draw. 14 / 37		+LCB		Job no. MT4783	
Check		Drawing no.		4CC7649_B	
Circuit diagram		Proportional boom control		XIII	
Dino 160-180-210XT II		DINOLIFT		27.9.2021	



Plan: JMS / 27.9.2021	Object ID	Electrical position	Job no.
Draw: 15 / 37		+UCB	MT4793
Check:			
Circuit diagram		4CC7649_B	
XTII		Dino 160-180-210XT II	
DINOLIFT			
A Rev.	24.9.2021 MH (3-8, 9-10, 16, 20, 34)		
B Rev.	27.9.2021 JMS (4)		
C Rev.			



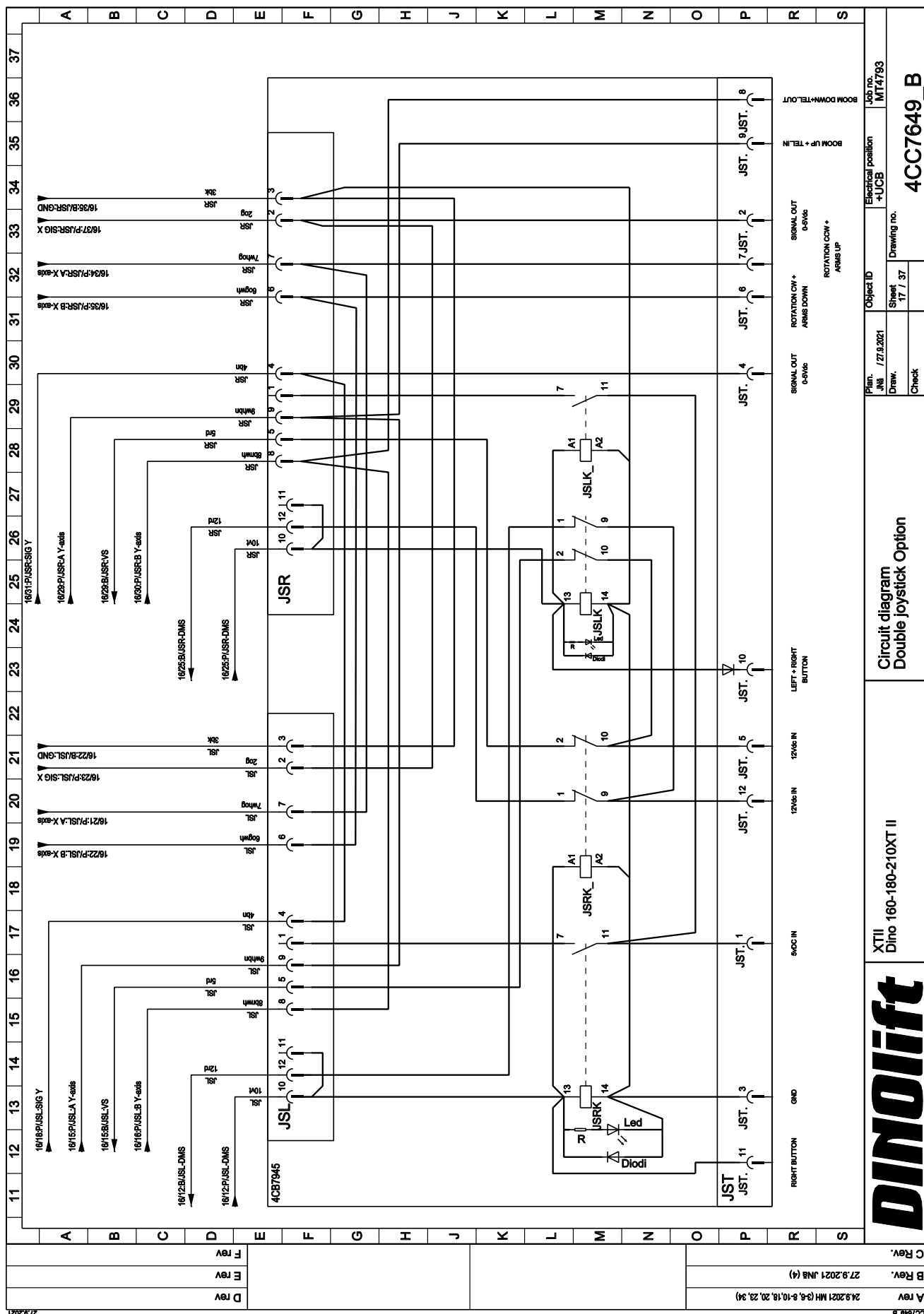
DINOLIFT

XT11
Dino 160-180-210XT II

Circuit diagram
Double joystick Option

Plan. JMB / 27.9.2021
Object ID
Electrical position +UCB
Job no. MT4783
Drawing no. 4CC7649_B
Sheet 16 / 37
Check

A Rev.	24.9.2021 JMB (3-8-9-10-18-20-23-34)
B Rev.	27.9.2021 JMB (4)
C Rev.	



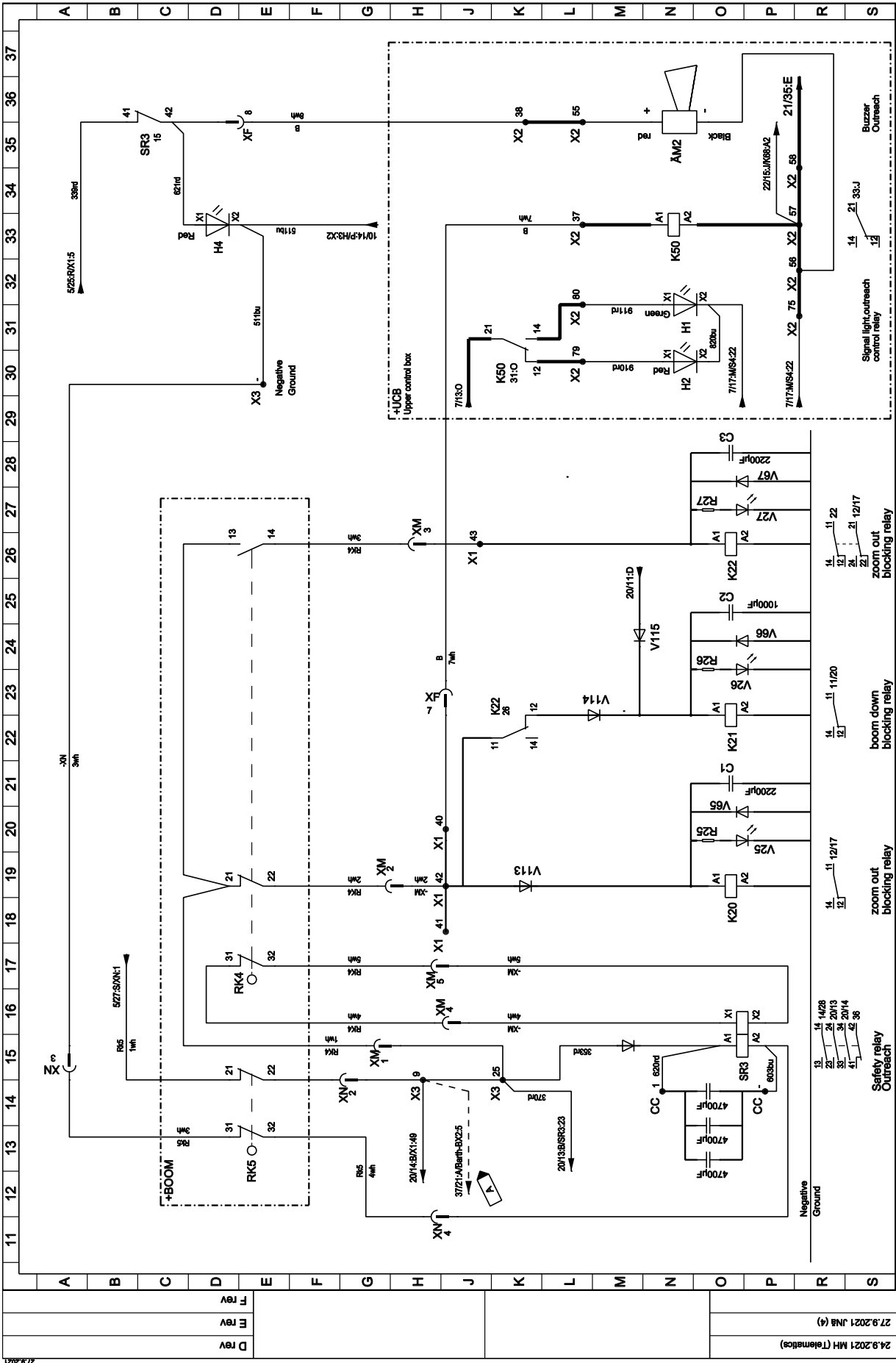
DINOLIFT

XTII
Dino 160-180-210XT II

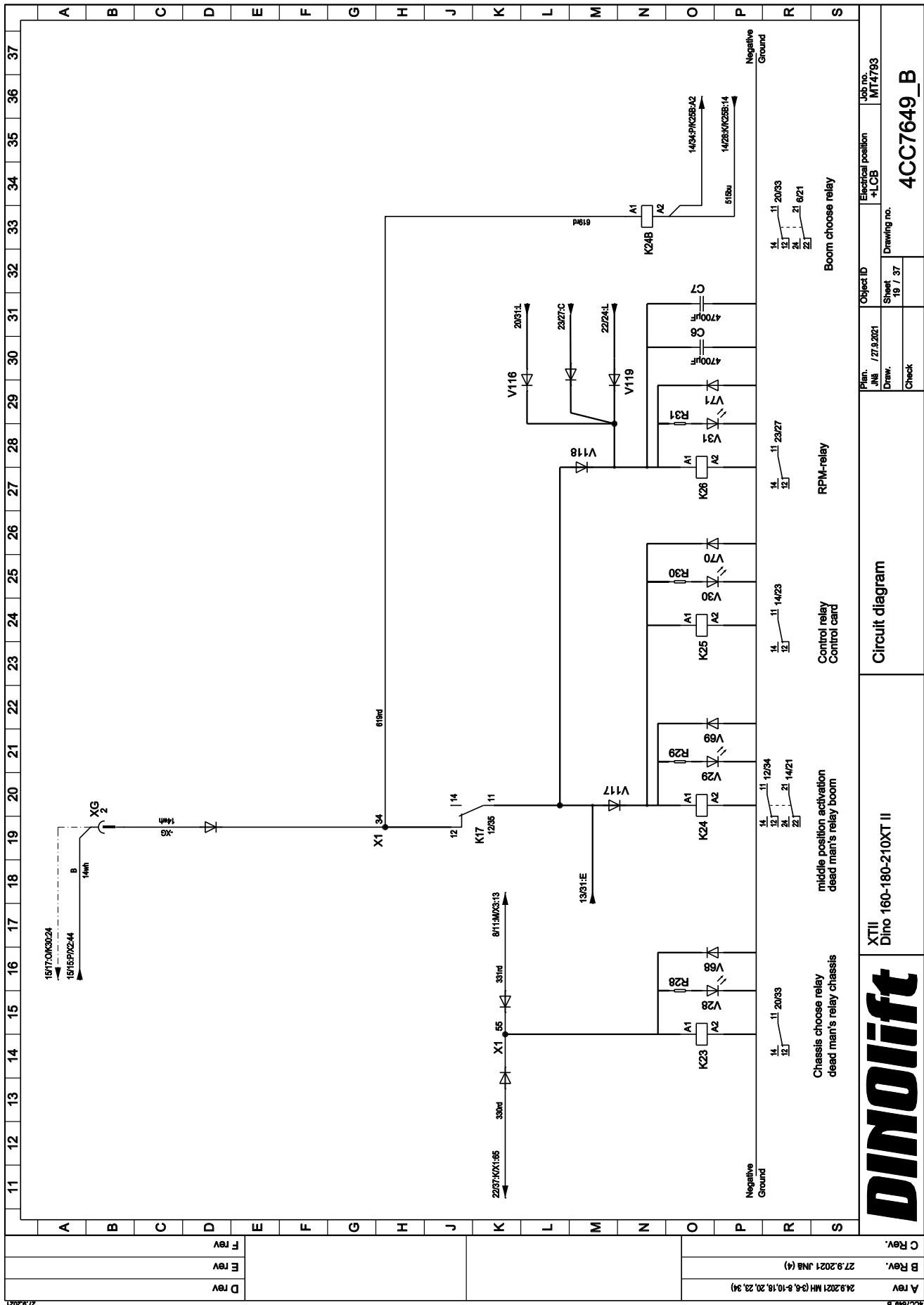
Circuit diagram
Double joystick Option

Object ID
Electrical position
+UCB
4CC7649_B

A Rev.	24.9.2021 MH (3-5, 8-10, 18, 20, 23, 34)
B Rev.	27.9.2021 JNB (4)
C Rev.	



A Rev. 24.9.2021 MH (Terminales)		B Rev. 27.9.2021 JMS (4)		C Rev.	
D Rev.		E Rev.		F Rev.	
T Rev.		U Rev.		V Rev.	
27.9.2021		27.9.2021		27.9.2021	
4CC7649_B		4CC7649_B		4CC7649_B	
Job no. MT4783		Job no. MT4783		Job no. MT4783	
Drawing no. 18 / 37		Drawing no. 18 / 37		Drawing no. 18 / 37	
Sheet 18 / 37		Sheet 18 / 37		Sheet 18 / 37	
Object ID		Object ID		Object ID	
Electrical position +LCB		Electrical position +LCB		Electrical position +LCB	
Plan. JMS / 27.9.2021		Plan. JMS / 27.9.2021		Plan. JMS / 27.9.2021	
Check		Check		Check	
Circuit diagram Outreach control		Circuit diagram Outreach control		Circuit diagram Outreach control	
XTIII Dino 160-180-210XT II		XTIII Dino 160-180-210XT II		XTIII Dino 160-180-210XT II	
DINOLIFT		DINOLIFT		DINOLIFT	



A Rev.	24.9.2021 MH (3-5, 8-10, 18, 20, 23, 34)
B Rev.	27.9.2021 JNB (4)
C Rev.	

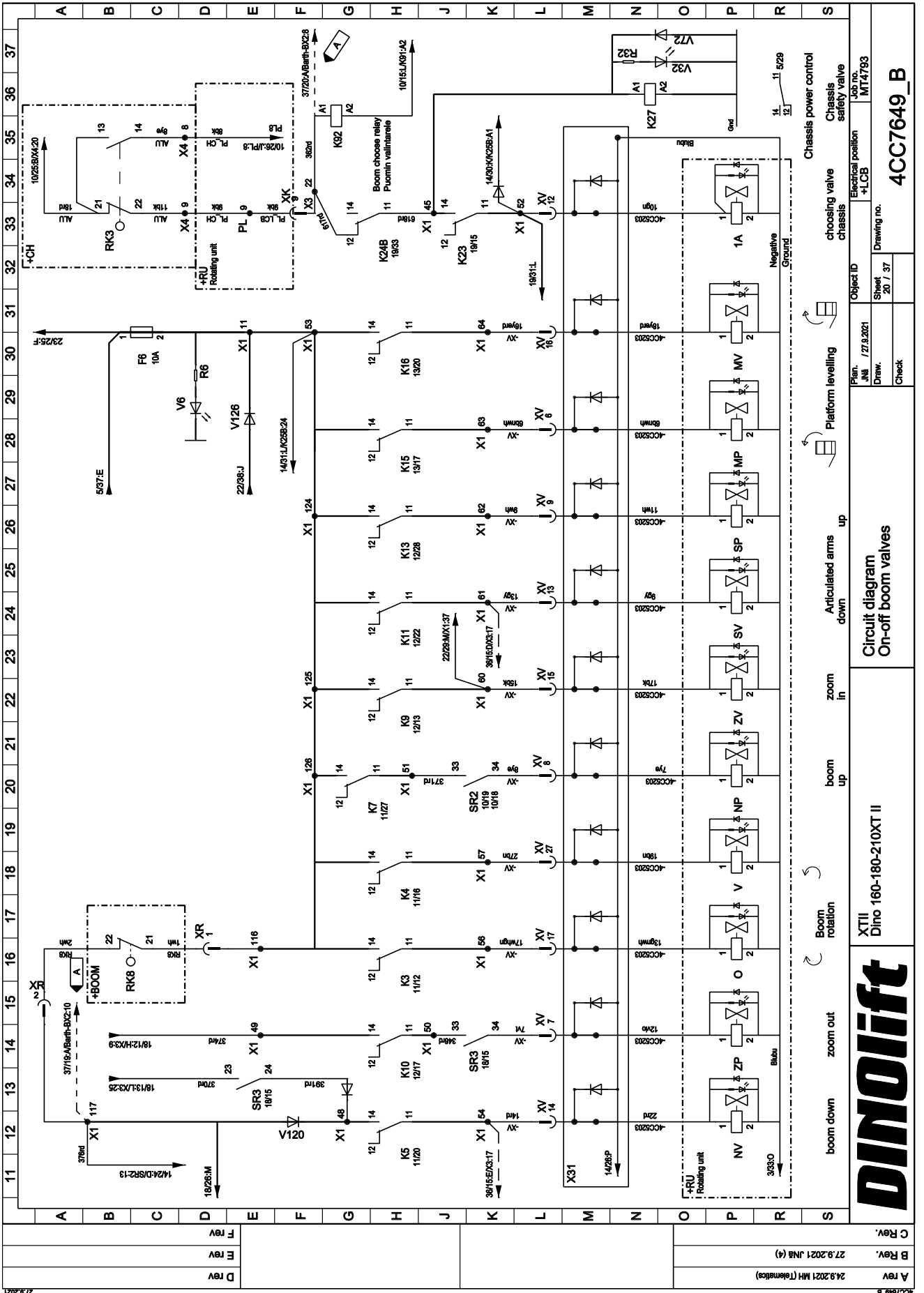


XTII
Dino 160-180-210XT II

Circuit diagram

Plan:	JNB / 27.9.2021
Draw:	
Check:	

Object ID	Job no.
Electrical position	MT4793
Sheet	19 / 37
Drawing no.	4CC7649_B



DINOLIFT

XT11
Dino 160-180-210XT II

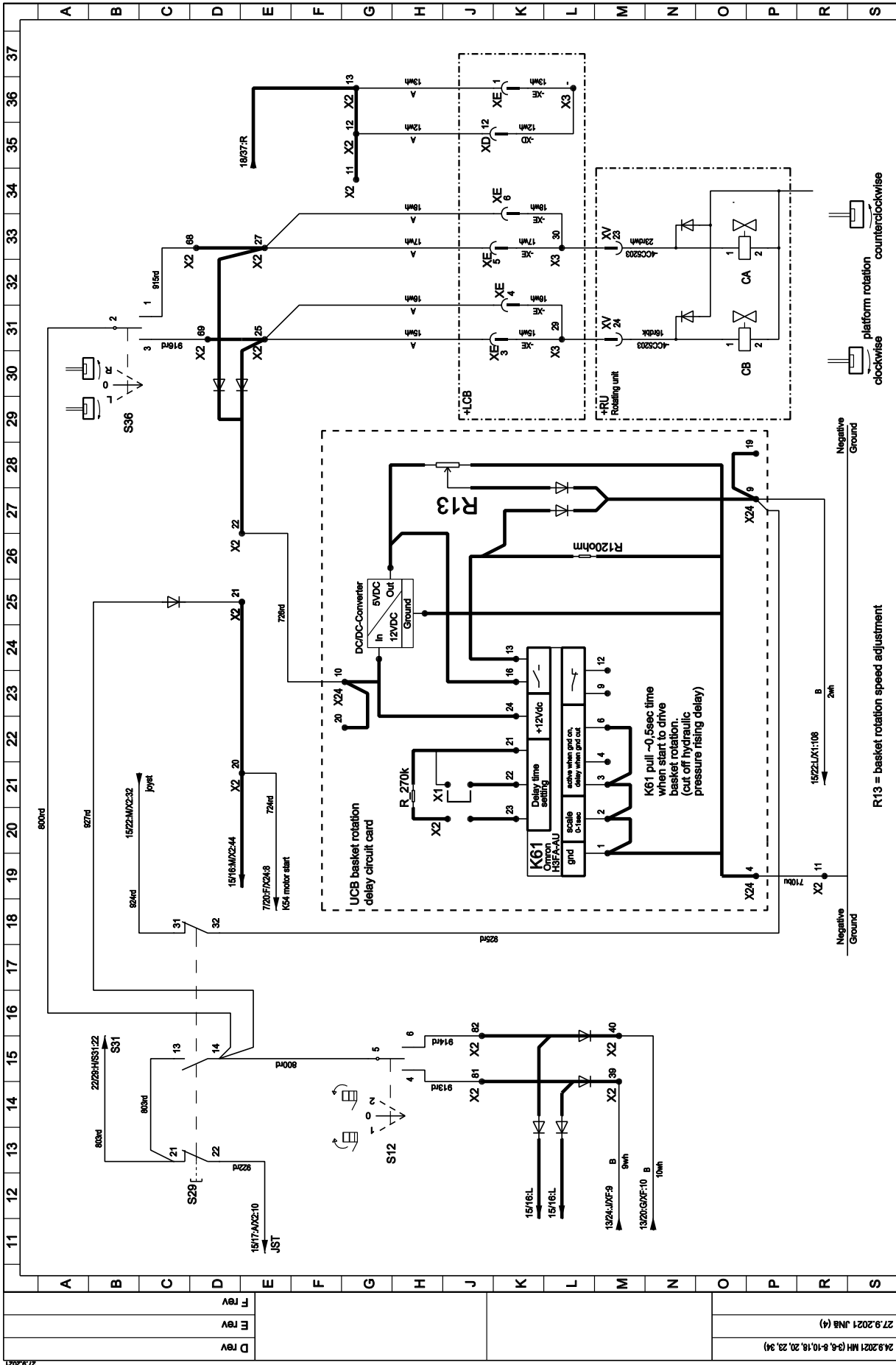
Circuit diagram
On-off boom valves

Plan. J.M. / 27.9.2021
Draw. /
Check

Object ID
Electrical position
+LCB

Job no.
MT4783

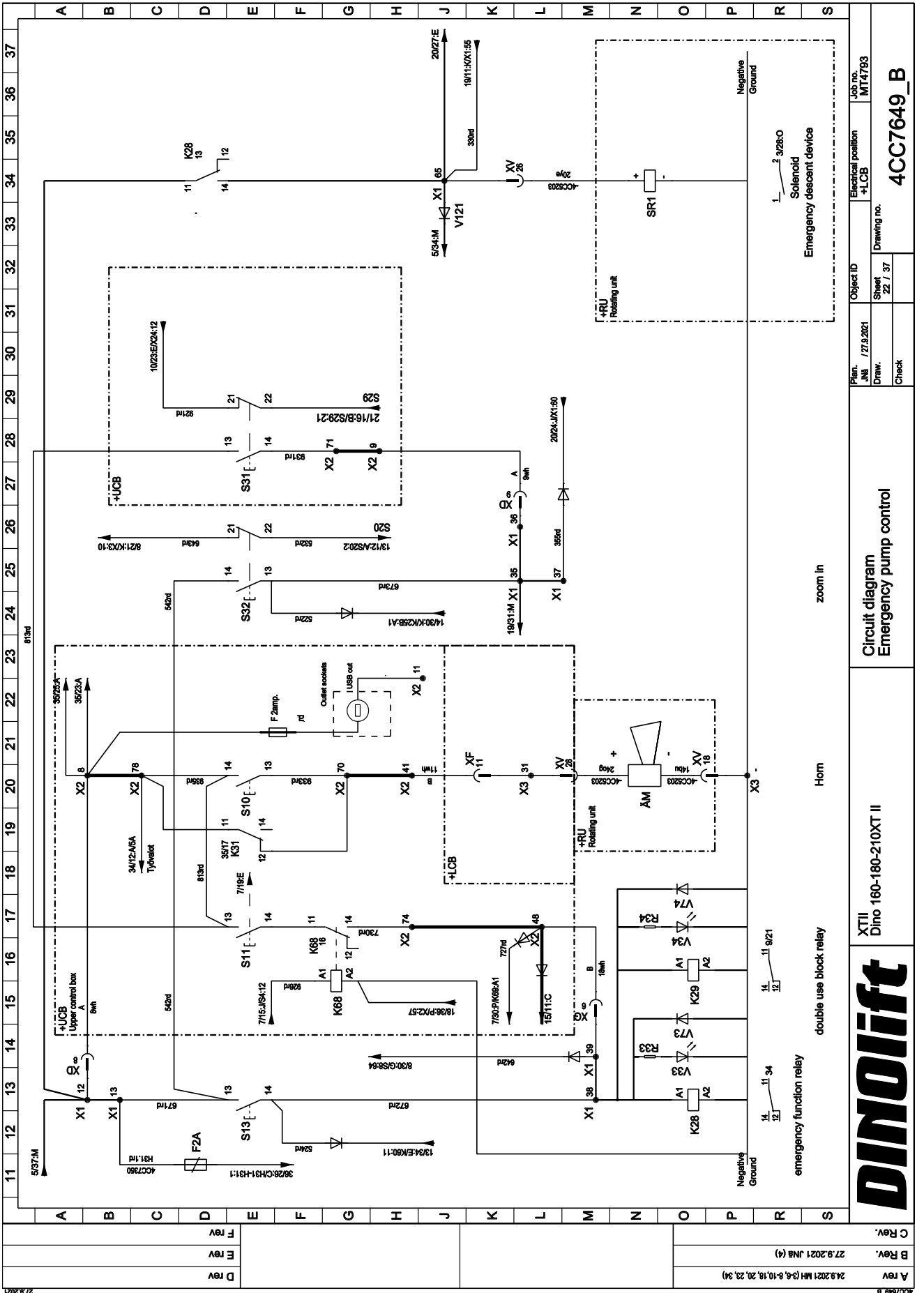
A Rev.	24.9.2021 MH (Trematics)
B Rev.	27.9.2021 JMS (4)
C Rev.	



DINOLIFT		XTII D160-180-210XT II		Circuit diagram Basket level & turn		Object ID JNB / ZT.9.2021		Job no. MT4793	
A Rev. 24.9.2021 MH (3-5, 8-10, 20, 23, 34)		B Rev. 27.9.2021 JNB (4)		C Rev.		Drawing no. 21 / 37		Electrical position +UCB	
D Rev.		E Rev.		F Rev.		Check		Drawing no. 4CC7649_B	

R13 = basket rotation speed adjustment

platform rotation
clockwise
counterclockwise



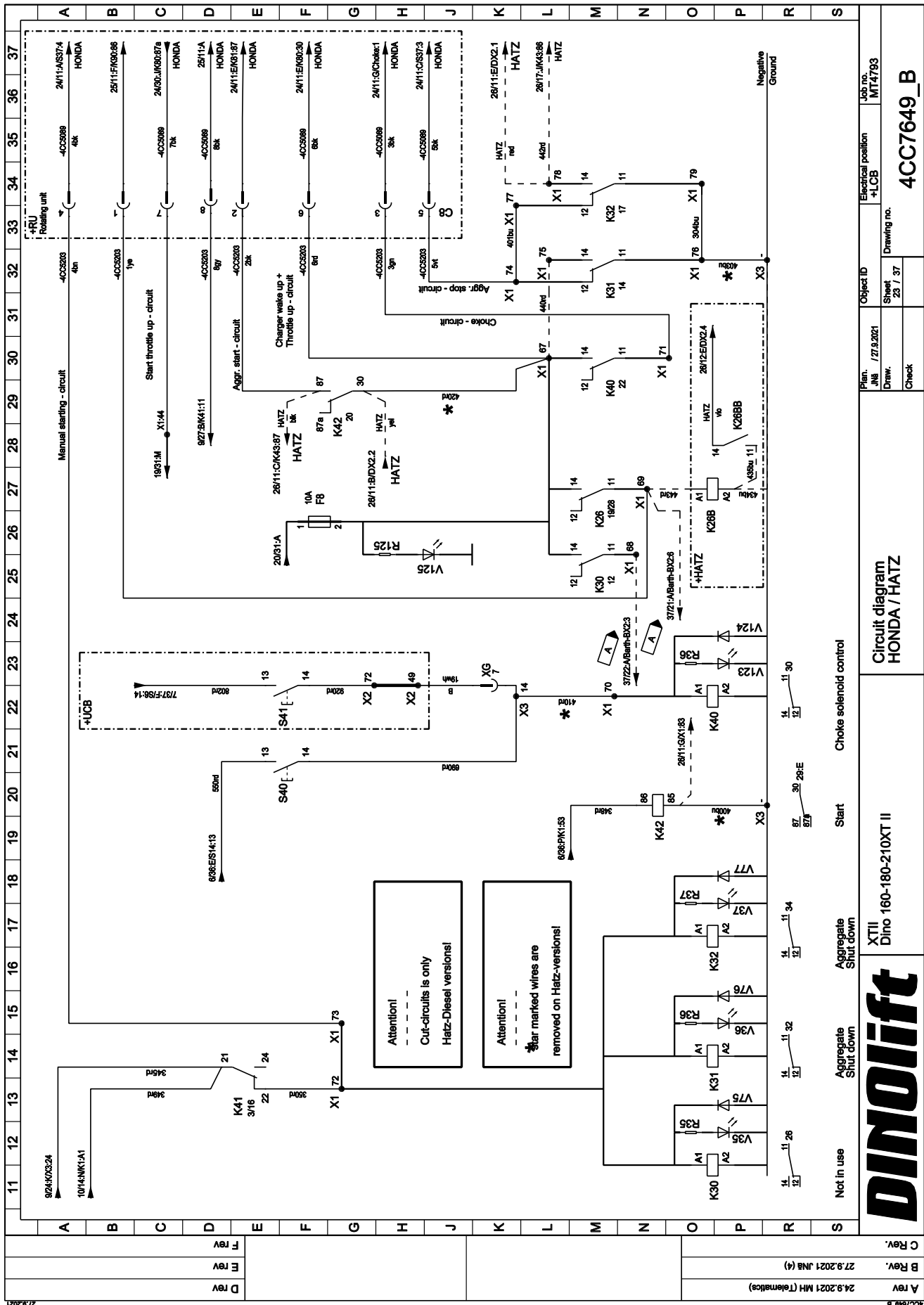
24.9.2021 MH (9-9-10-19, 20, 23, 34)	A Rev.	Object ID	4CC7649_B
27.9.2021 JMB (4)	B Rev.	Electrical position	+LCB
	C Rev.	Job no.	MT4783

DINOLIFT

XT11
Dino 160-180-210XT II

Circuit diagram
Emergency pump control

Sheet 22 / 37
Drawing no. 4CC7649_B



A Rev.	24.9.2021 MH (Thematics)
B Rev.	27.9.2021 JNB (4)
C Rev.	

Plan:	JNB / 27.9.2021
Draw:	
Check:	

Object ID	Electrical position	Job no.
	+LCB	MT4793

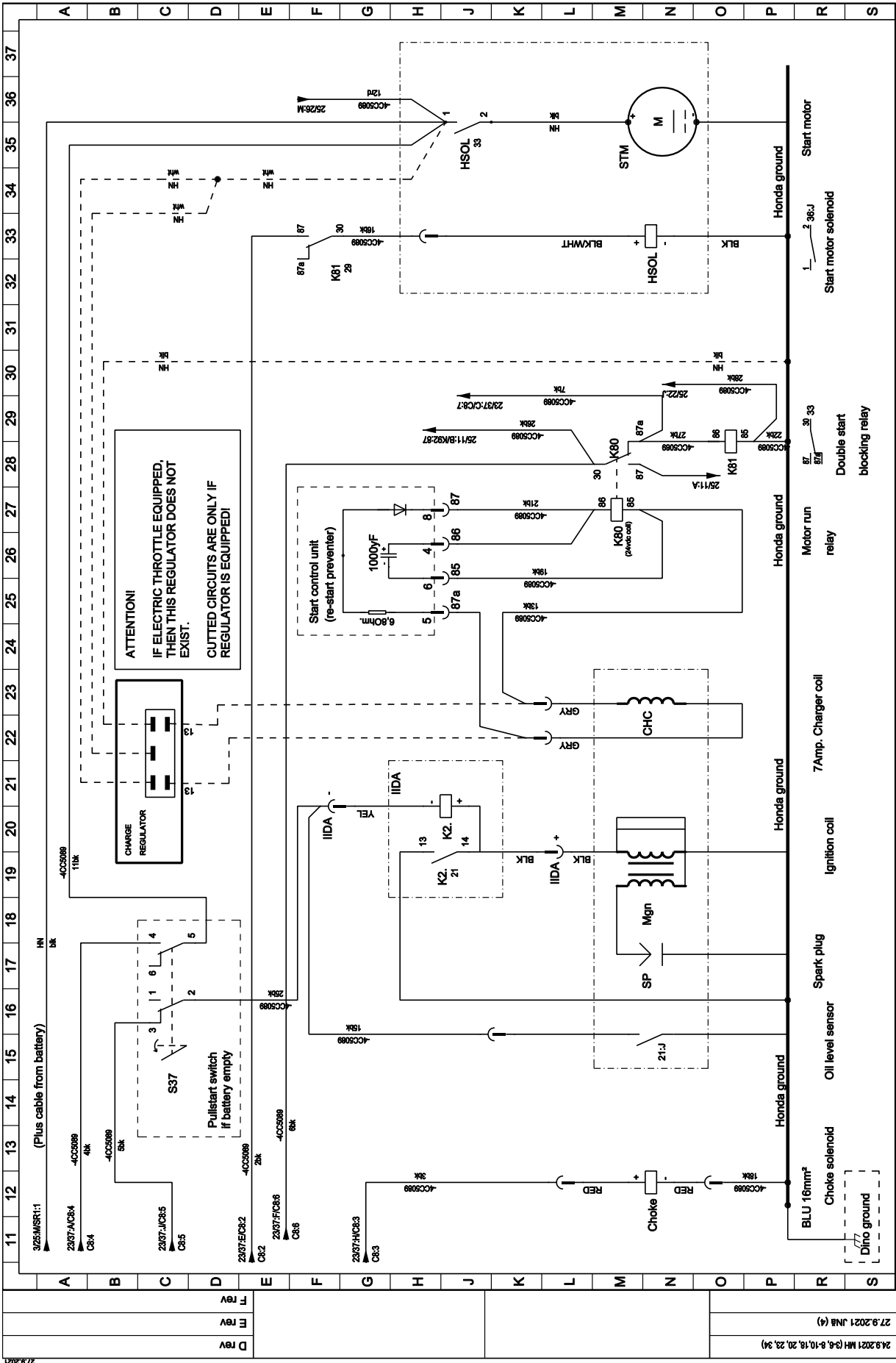
Sheet	23 / 37	Drawing no.	4CC7649_B
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DINOLIFT

XTII
Dino 160-180-210XT II

Circuit diagram
HONDA / HATZ

Not in use Aggregate Shut down Start Choke solenoid control



A Rev.	24.9.2021 MH (3-8-10-18, 20, 23, 34)
B Rev.	27.9.2021 JMB (4)
C Rev.	

DINOLIFT

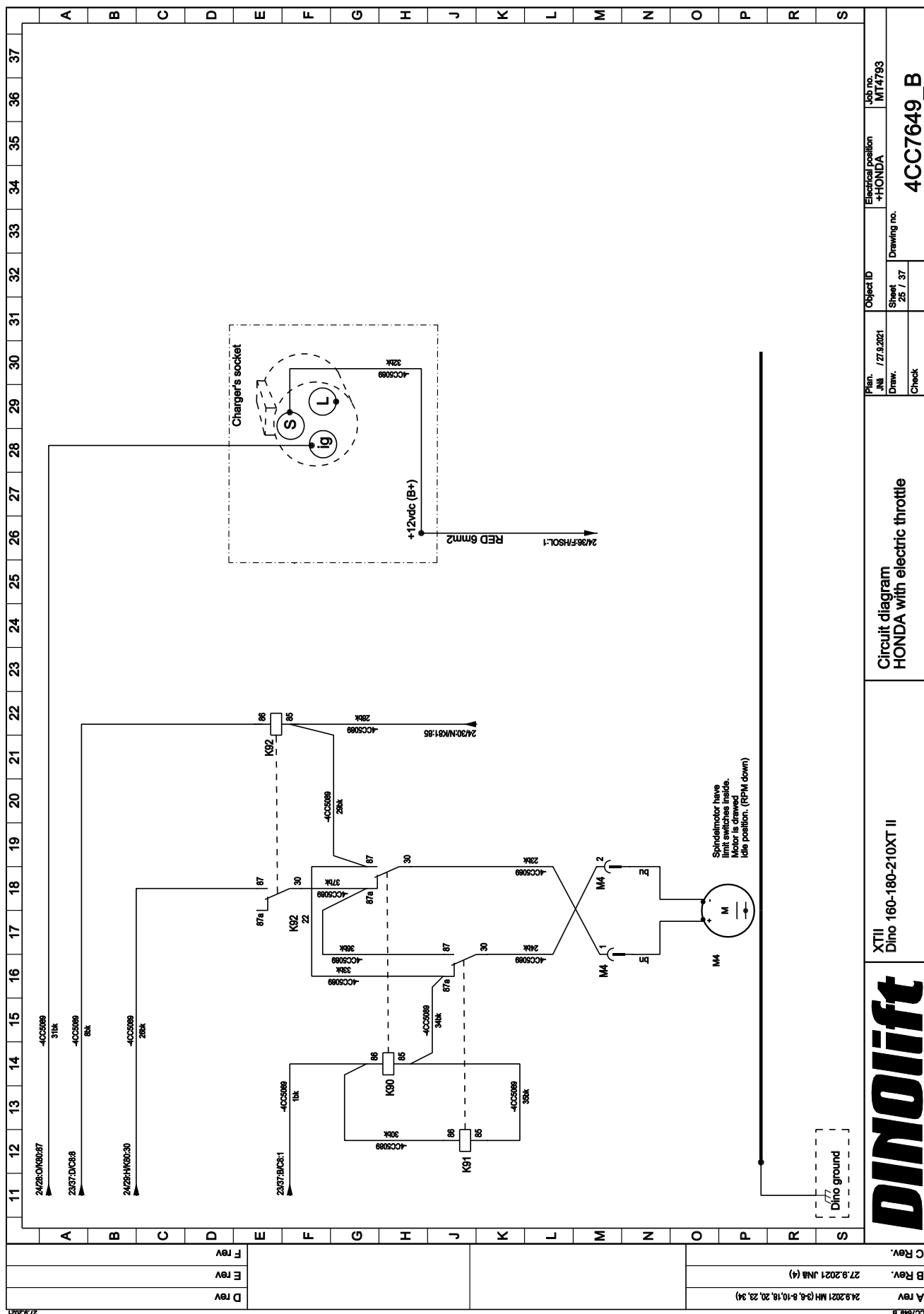
XTIII
Dino 160-180-210XT II

Circuit diagram
HONDA option

Object ID
Electrical position
Job no.

Plan. JMB / 27.9.2021
Draw. Drawing no.
Sheet 24 / 37
Check

4CC7649_B



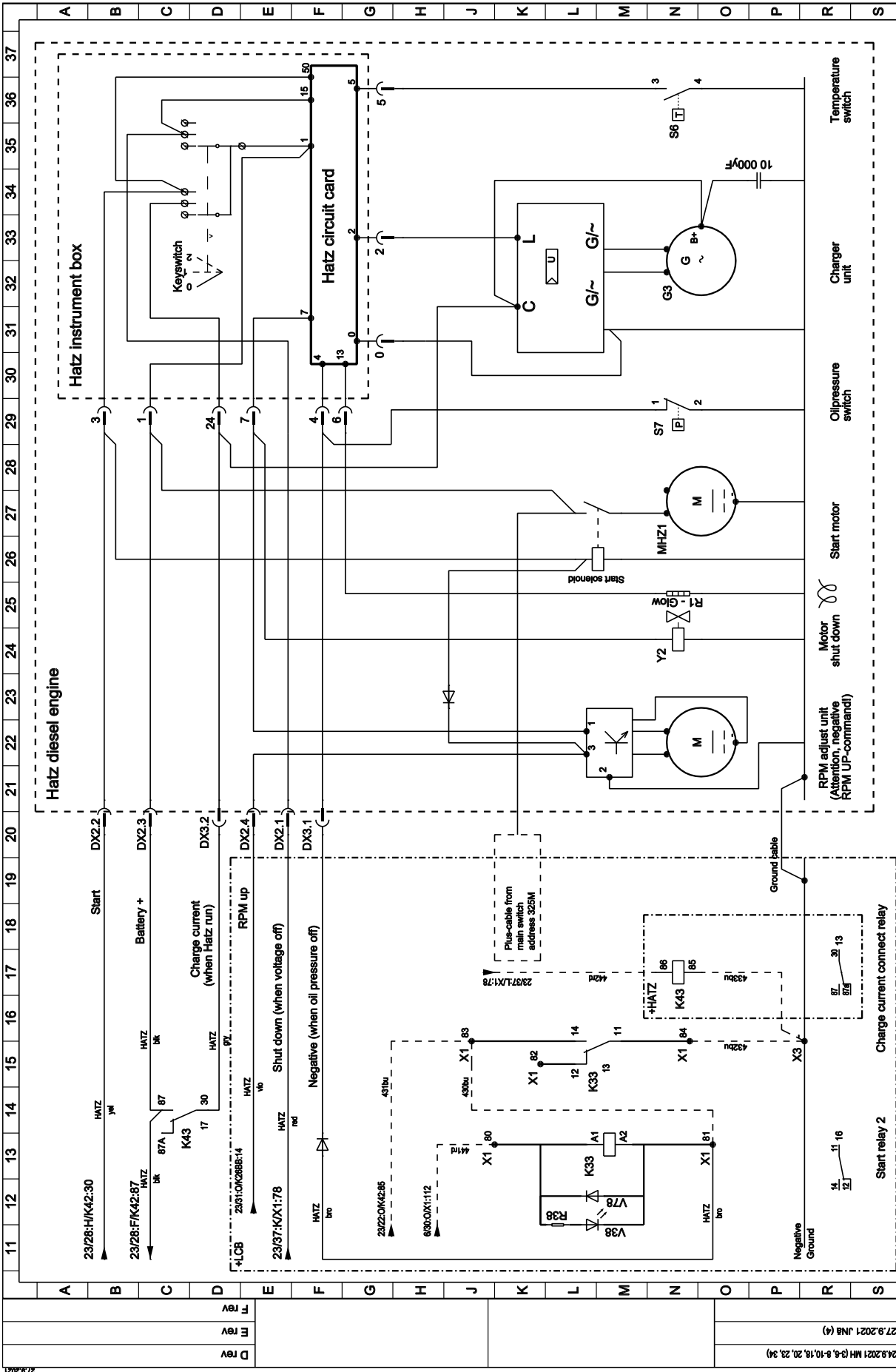
Plan: JNB / Z7.9.2021	Object ID	Electrical position	Job no.
Draw: 25 / 37		+HONDA	MT4793
Check:			4CC7649_B

Circuit diagram
HONDA with electric throttle

XTII
Dino 160-180-210XT II



D Rev.	24.9.2021 MH (3-8, 9-10, 18, 20, 23, 34)	C Rev.
E Rev.	27.9.2021 JNB (4)	
F Rev.		



DINOLIFT

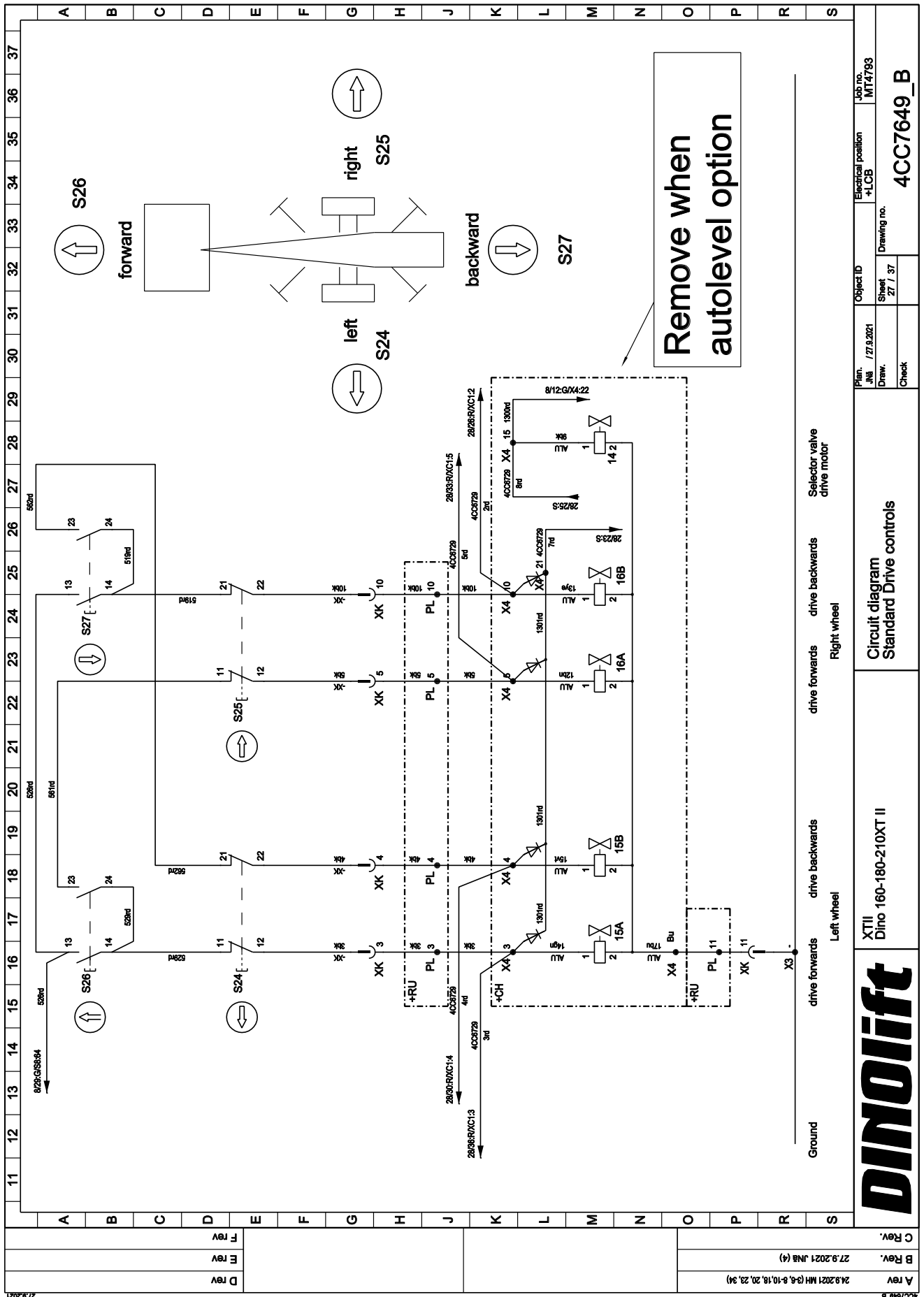
XTII
Dino 160-180-210XT II

Circuit diagram
HATZ option

Plan. JMB / 27.9.2021	Object ID	Electrical position	Job no.
Draw. 28 / 37		+HATZ	MT4783
Check			

4CC7649_B

A Rev.	24.9.2021 MH (3-9-10-18-20-23-34)
B Rev.	27.9.2021 JMB (4)
C Rev.	



Remove when autolevel option

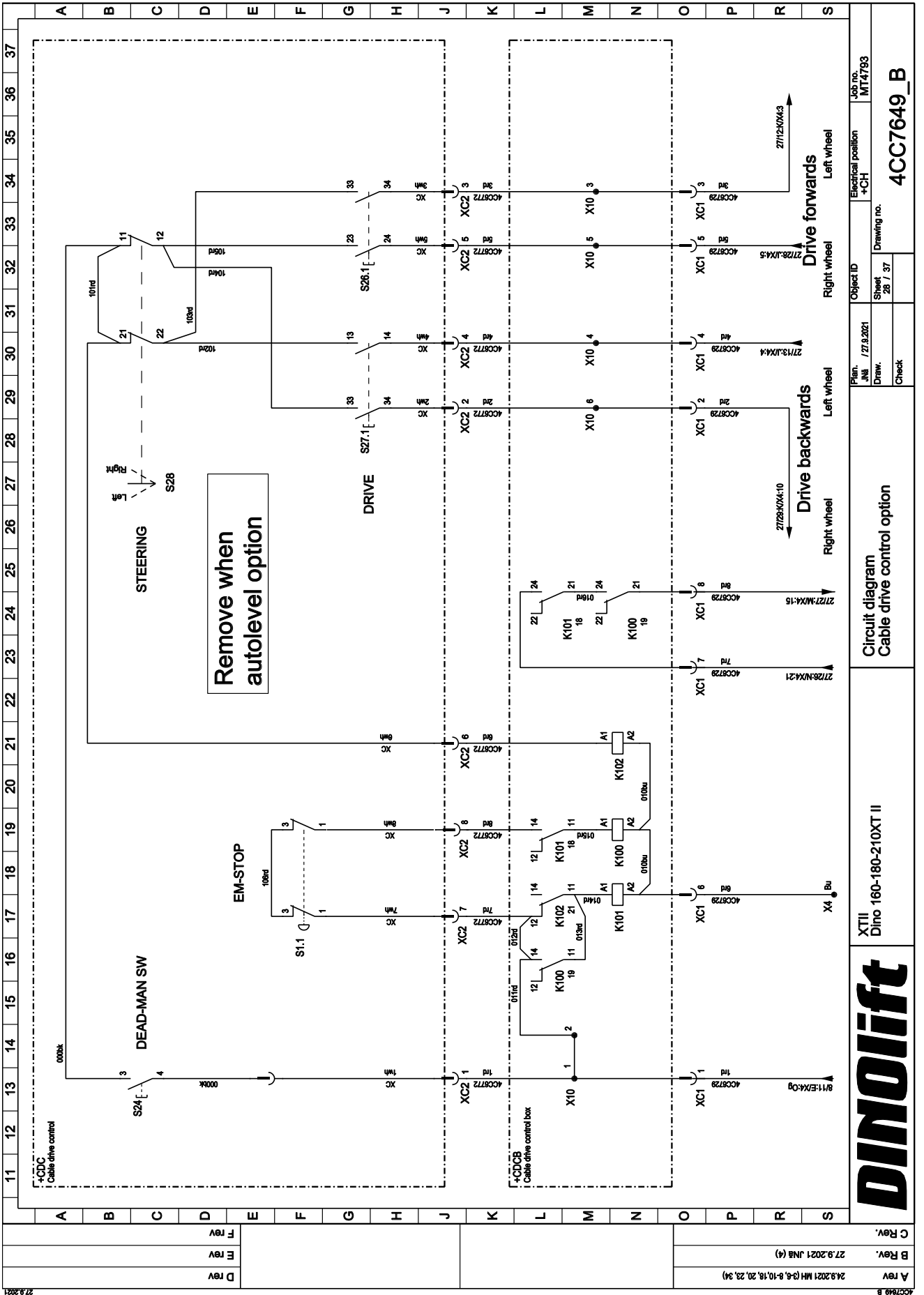
A Rev.	24.9.2021 MH (3-5, 8-10, 16, 20, 23, 34)
B Rev.	27.9.2021 JNB (4)
C Rev.	

DINOLIFT

XTII
Dino 160-180-210XT II

Circuit diagram
Standard Drive controls

Plan:	JNB	/ 27.9.2021	Object ID	Electrical position	Job no.
Draw:				+LCB	MT4793
Check:					
					4CC7649_B



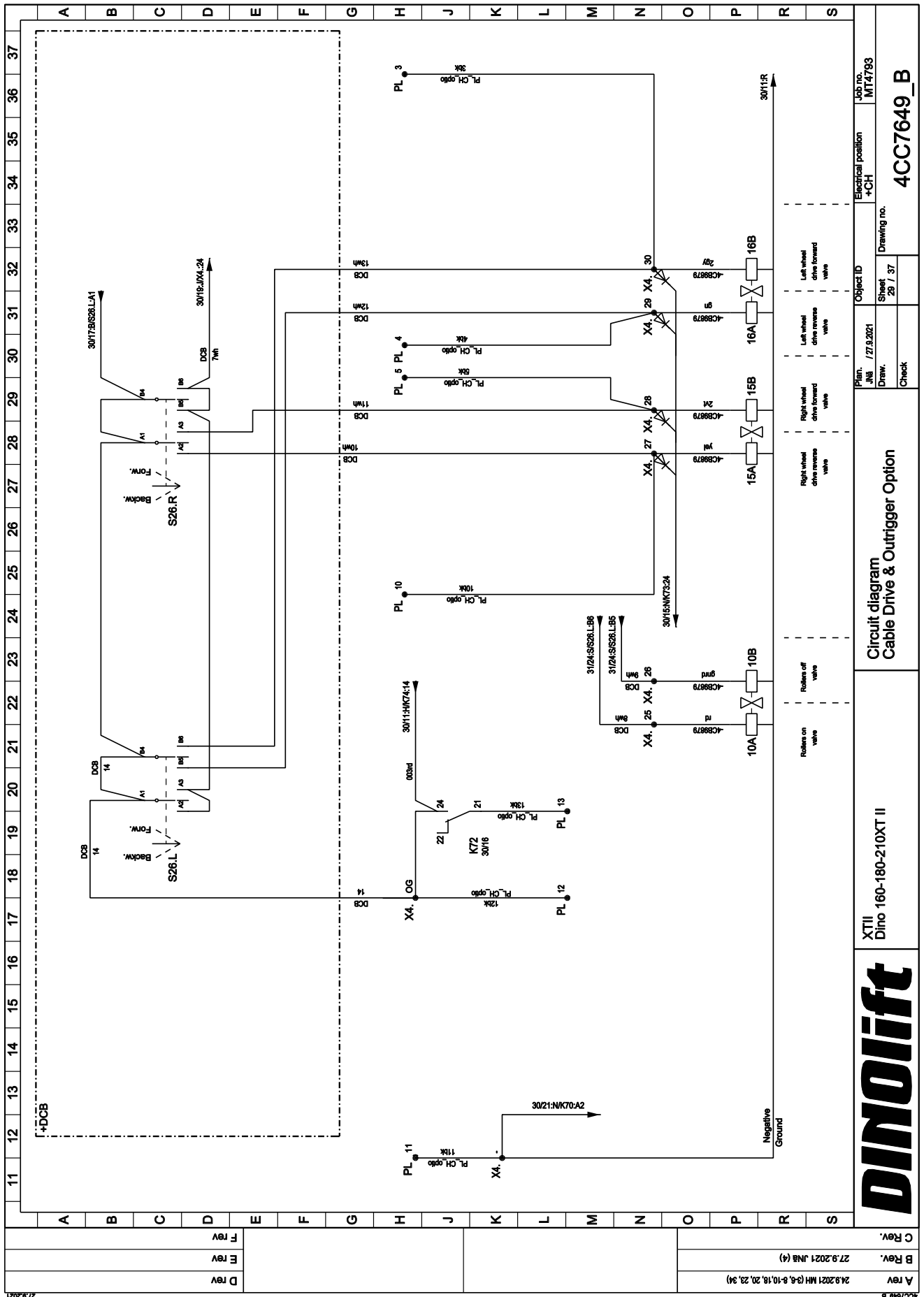
27.9.2021	A Rev	24.9.2021 MH (3-9-10-18, 20, 23, 34)	Object ID	Job no.
	B Rev	27.9.2021 JMB (4)	Electrical position	MT4783
	C Rev		Sheet	4CC7649_B
			28 / 37	
			Check	
			Draw.	
			Plan.	
			JMB / 27.9.2021	
			Object ID	
			Electrical position	
			Job no.	

DINOLIFT

XT11
Dino 160-180-210XT II

Circuit diagram
Cable drive control option

4CC7649_B

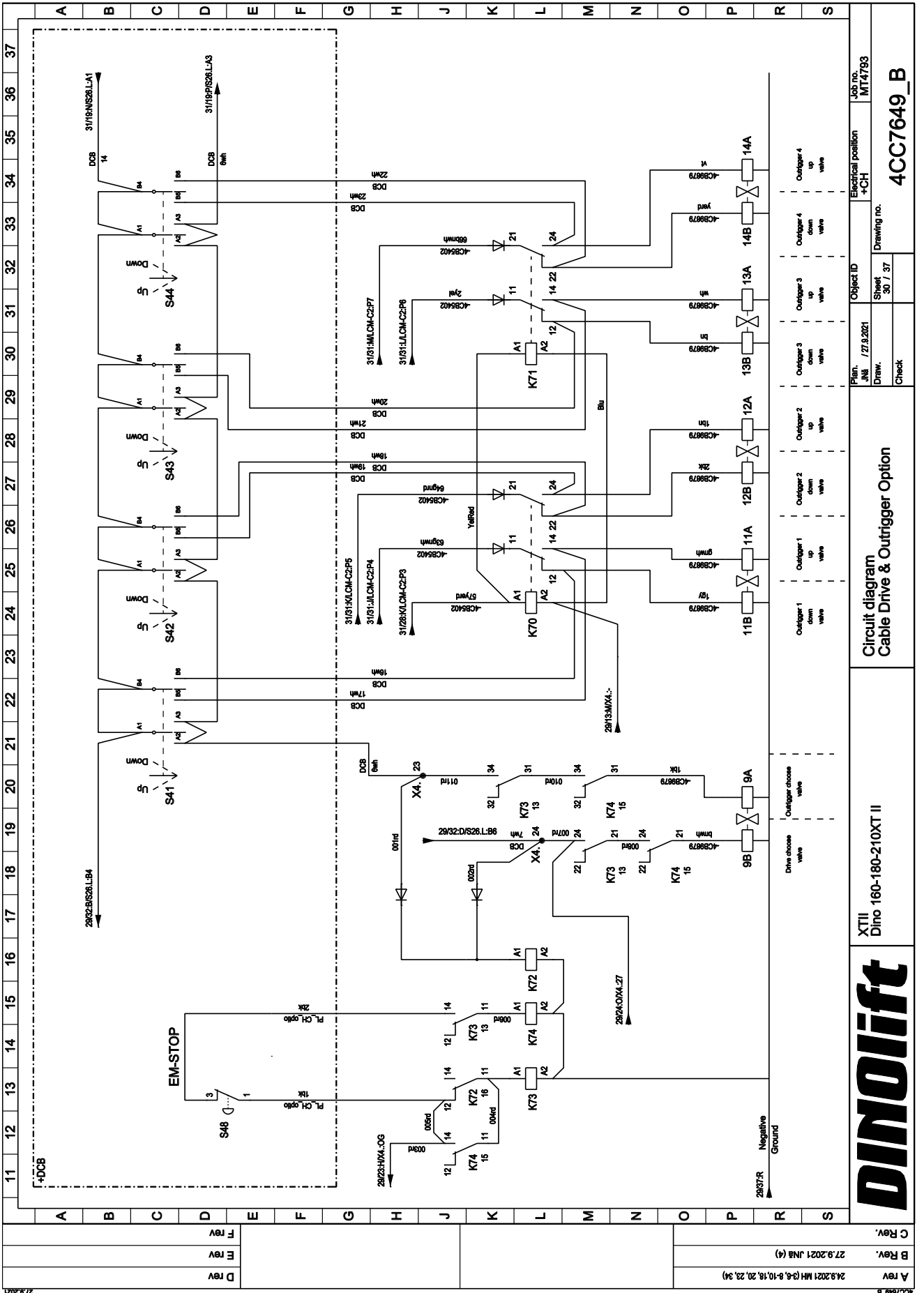


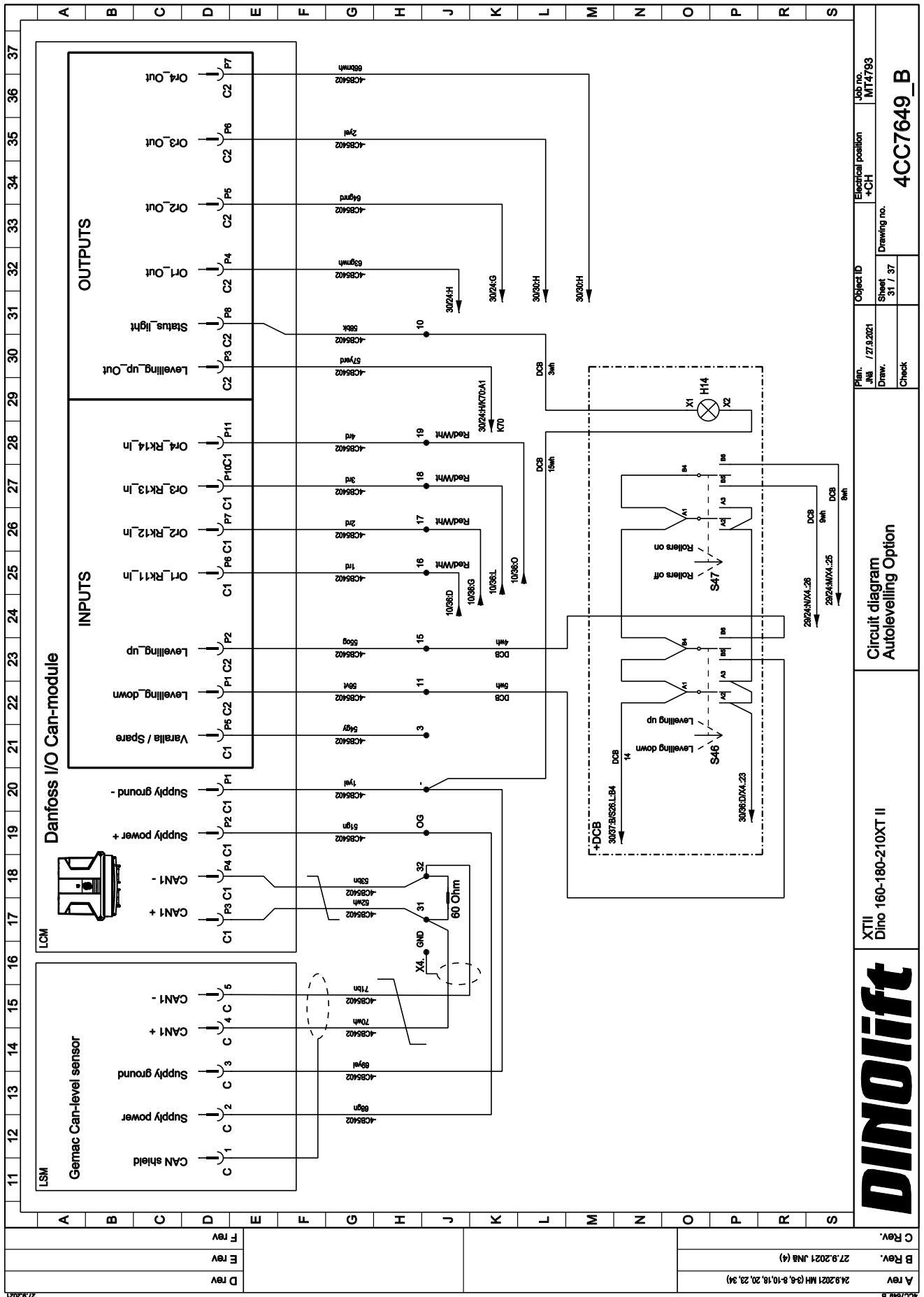
27.9.2021	A Rev	24.9.2021 MH (3-5, 8-10, 18, 20, 23, 34)	Job no. MT4793
	B Rev	27.9.2021 JNB (4)	Electrical position +CH
	F Rev		Object ID
	D Rev		Plan: JNB / ZI 9.2021
			Draw. no. 4CC7649_B
			Sheet 28 / 37
			Check



XTII
Dino 160-180-210XT II

Circuit diagram
Cable Drive & Outtrigger Option





Job no. MT4793
Electrical position +CH
Drawing no. 4CC7649_B
Sheet 31 / 37

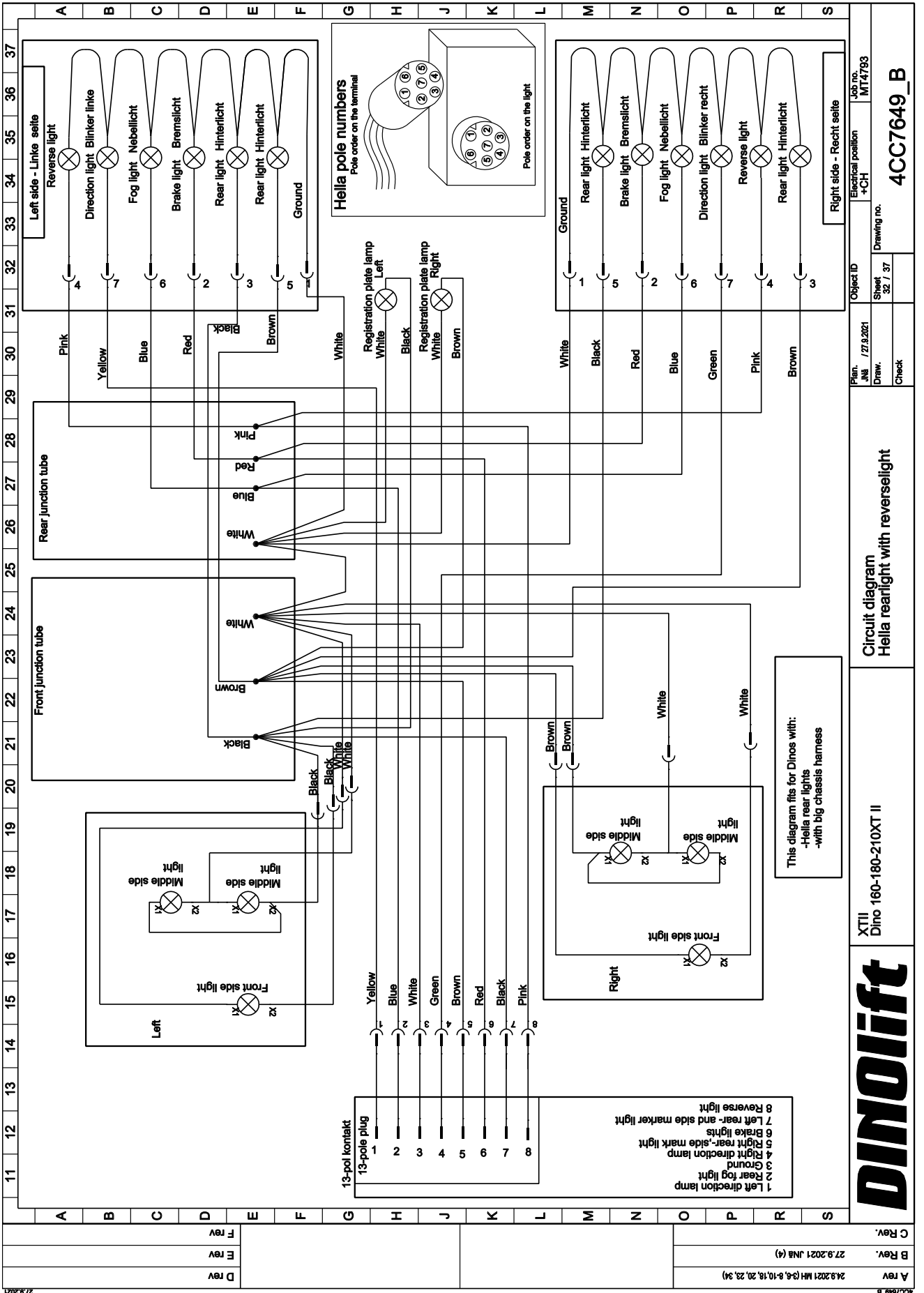
Plan. JNB / ZT.9.2021
Draw. JNB
Check

XTII
Dino 160-180-210XT II

DINOLIFT

Circuit diagram
Autolevelling Option

A Rev.	24.9.2021 MH (3-8, 9-10, 20, 23, 34)
B Rev.	27.9.2021 JNB (4)
C Rev.	



Object ID: 4CC7649_B
 Electrical position: +CH
 Job no.: MT47893

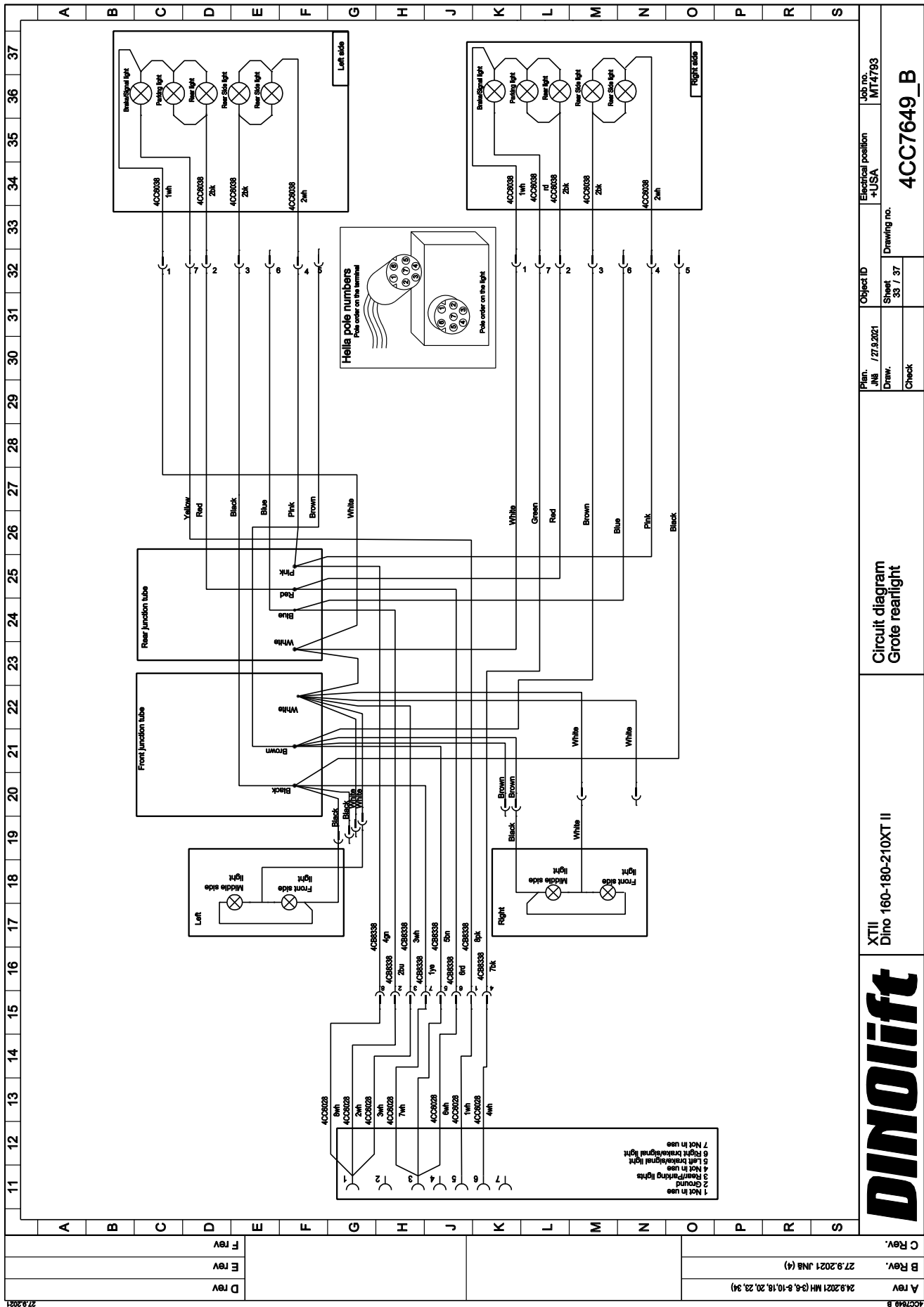
Plan: JMB / 27.9.2021
 Draw: 32 / 37
 Check:

Circuit diagram
 Hella rearlight with reverselicht

XT11
 Dino 160-180-210XT II

DINOLIFT

A Rev. 24.9.2021 MH (3-8-9-10-18, 20, 23, 34)
 B Rev. 27.9.2021 JMB (4)
 C Rev.



DINOLIFT

XTII
Dino 160-180-210XT II

Circuit diagram
Grote rearlight

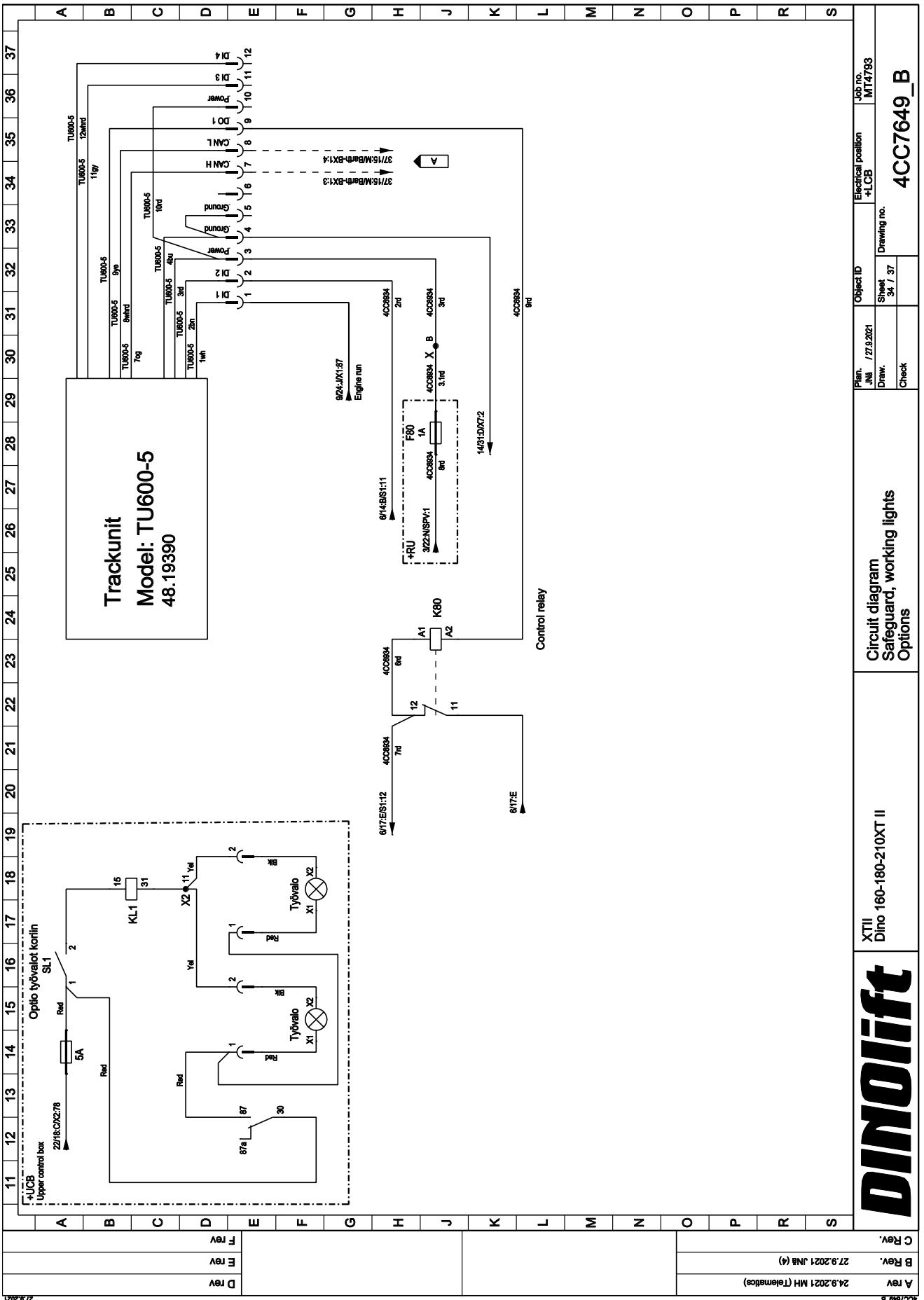
Plan: JNB / 27.9.2021
Draw. 33 / 37
Check

Object ID
Electrical position
+USA

Job no.
MT4793

Drawing no.
4CC7649_B

A Rev.	24.9.2021 JNB (3-5, 8-10, 16, 20, 23, 34)
B Rev.	27.9.2021 JNB (4)
C Rev.	



A Rev.	24.9.2021 MH (Törmäkoski)	B Rev.	27.9.2021 JMS (4)	C Rev.	
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DINOLIFT

XTHI
Dino 160-180-210XT II

Circuit diagram
Safeguard, working lights
Options

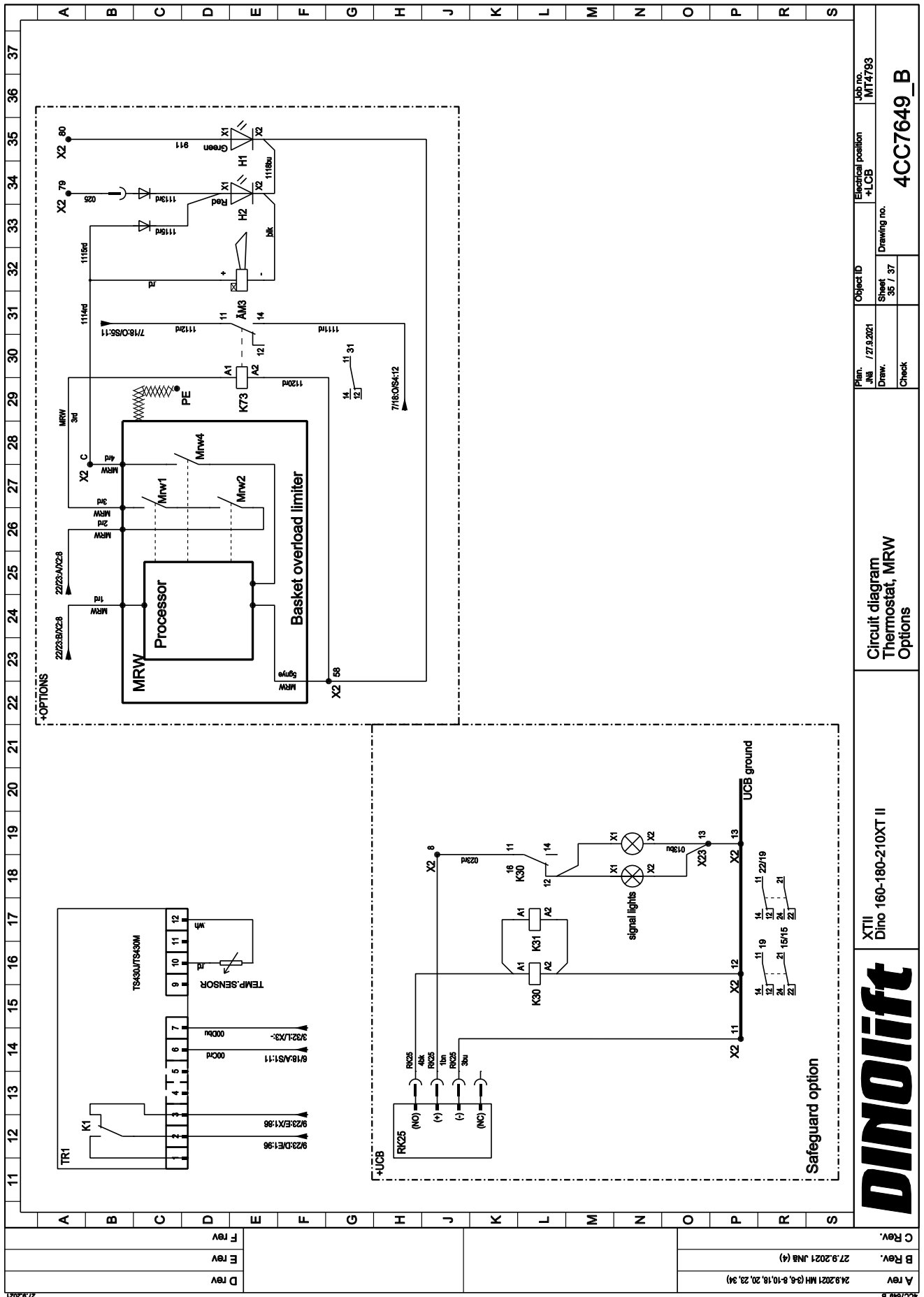
Plan. JMS / 27.9.2021
Object ID
Electrical position
+LCB

Job no.
MT4783

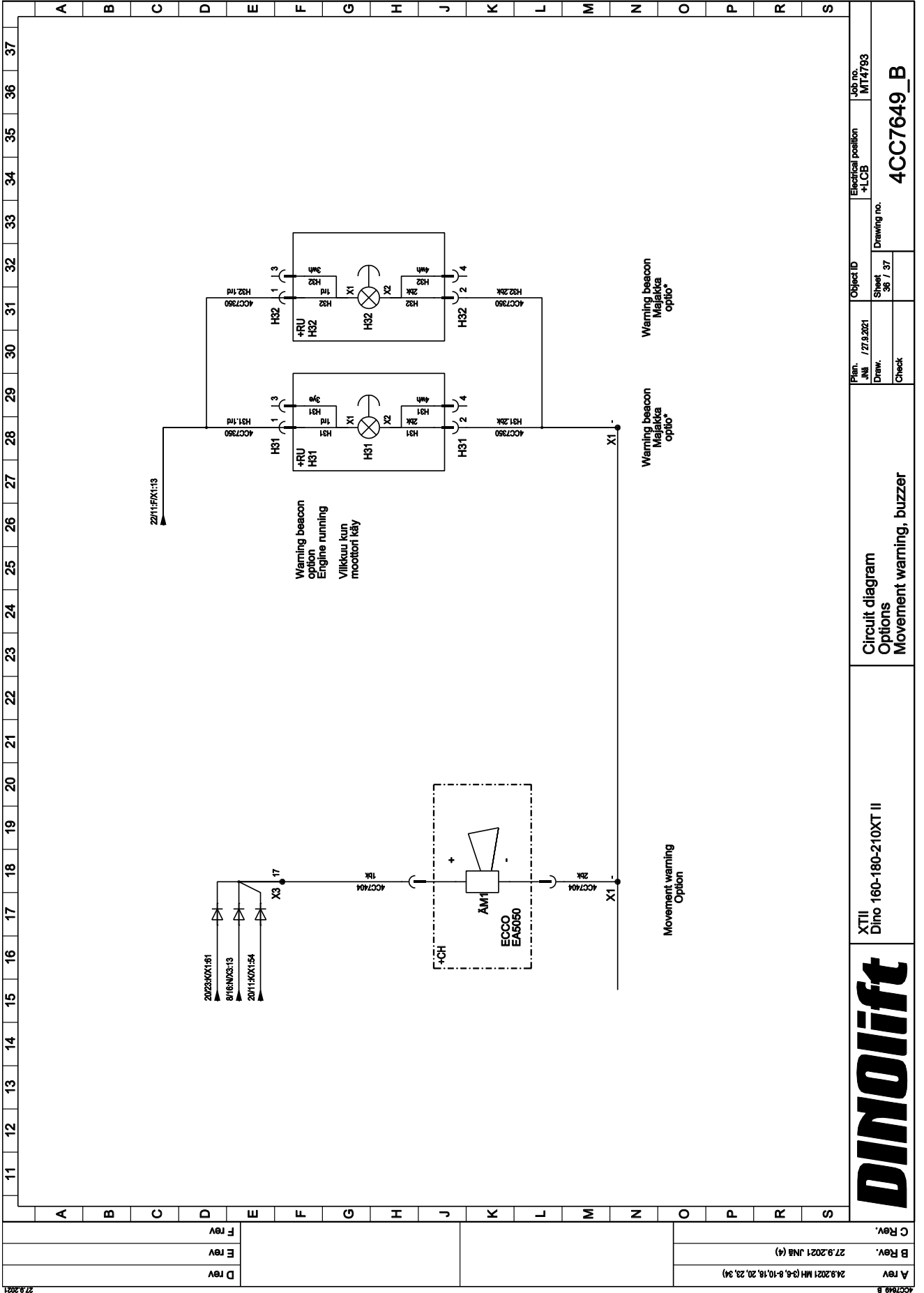
Drawing no.
4CC7649_B

Sheet
34 / 37

Check



<p>27.9.2021</p> <p>D Rev.</p> <p>E Rev.</p> <p>F Rev.</p>	<p>A Rev. 24.9.2021 MH (3-5, 8-10, 18, 20, 23, 34)</p> <p>B Rev. 27.9.2021 JNB (4)</p> <p>C Rev.</p>	<p>Object ID</p> <p>Electrical position +LCB</p> <p>Job no. MT4793</p> <p>Drawing no. 4CC7649_B</p> <p>Sheet 35 / 37</p> <p>Plan: JNB / ZT.9.2021</p> <p>Draw. Check</p> <p>Object ID</p> <p>Circuit diagram Thermostat, MRW Options</p> <p>XTII Dino 160-180-210XT II</p> <p>DINOlift</p>
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27.9.2021	D Rev.	24.9.2021 MH (3.9-9-10-18, 20, 23, 34)	A Rev.
	E Rev.	27.9.2021 JNB (4)	B Rev.
	F Rev.		C Rev.

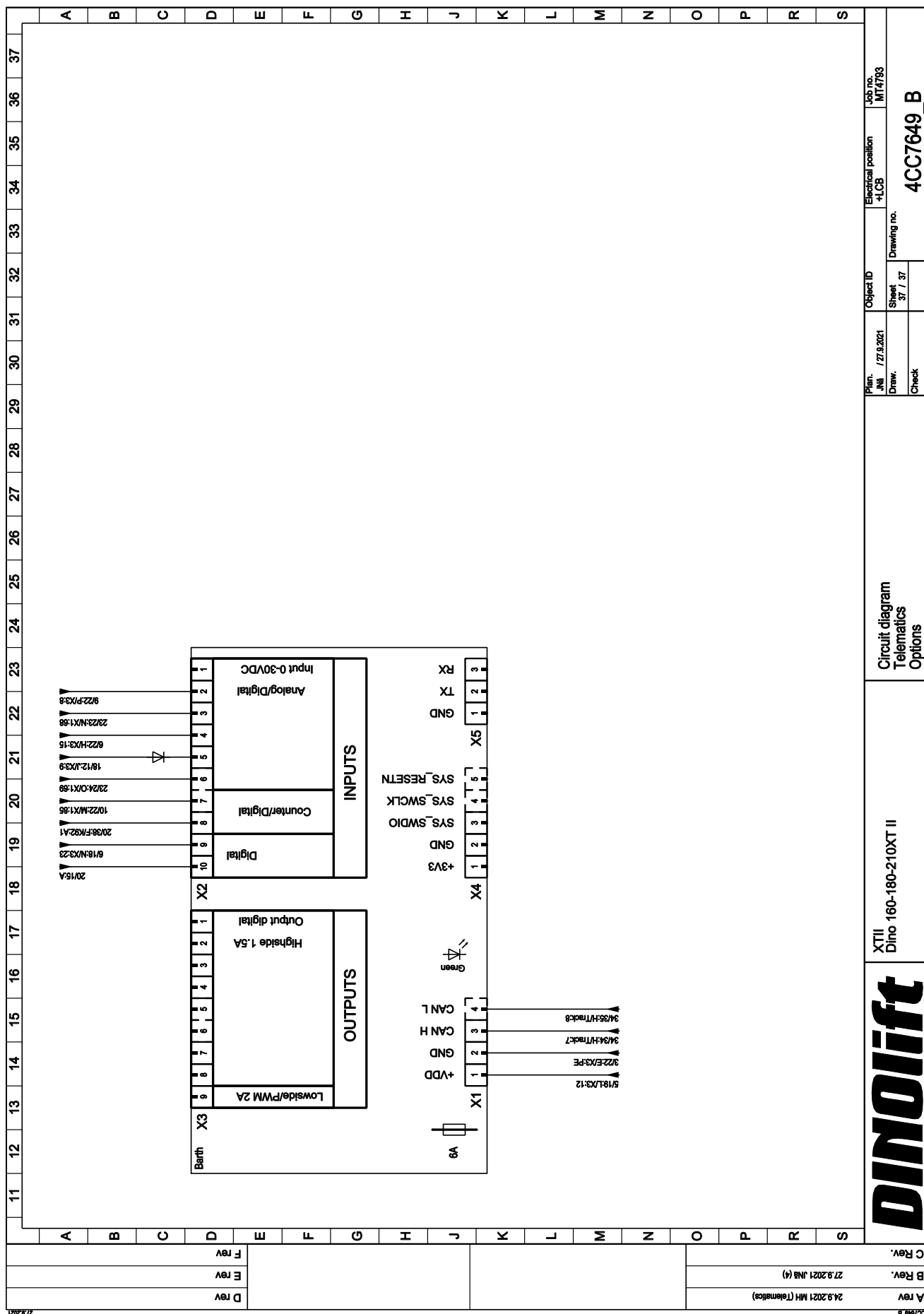
DINOLIFT

XTH
Dino 160-180-210XT II

Circuit diagram
Options
Movement warning, buzzer

Plan: JNB / 27.9.2021
Draw:
Check:

Object ID
Electrical position
+LCB
Job no.
MT4793
Drawing no.
4CC7649_B
Sheet
96 / 37



DINOLIFT

XTII
Dino 160-180-210XT II

Circuit diagram
Telematics
Options

Plan: JN8 / ZT 9.2021
Draw: /
Check: /

Object ID: /
Sheet: 37 / 37

Electrical position: +LCB
Job no.: MT4793

4CC7649_B

A rev	24.9.2021 MH (Telematics)
B rev	27.9.2021 JN8 (4)
C rev	
D rev	
E rev	
F rev	