



Fig. 3: Transport suspension points

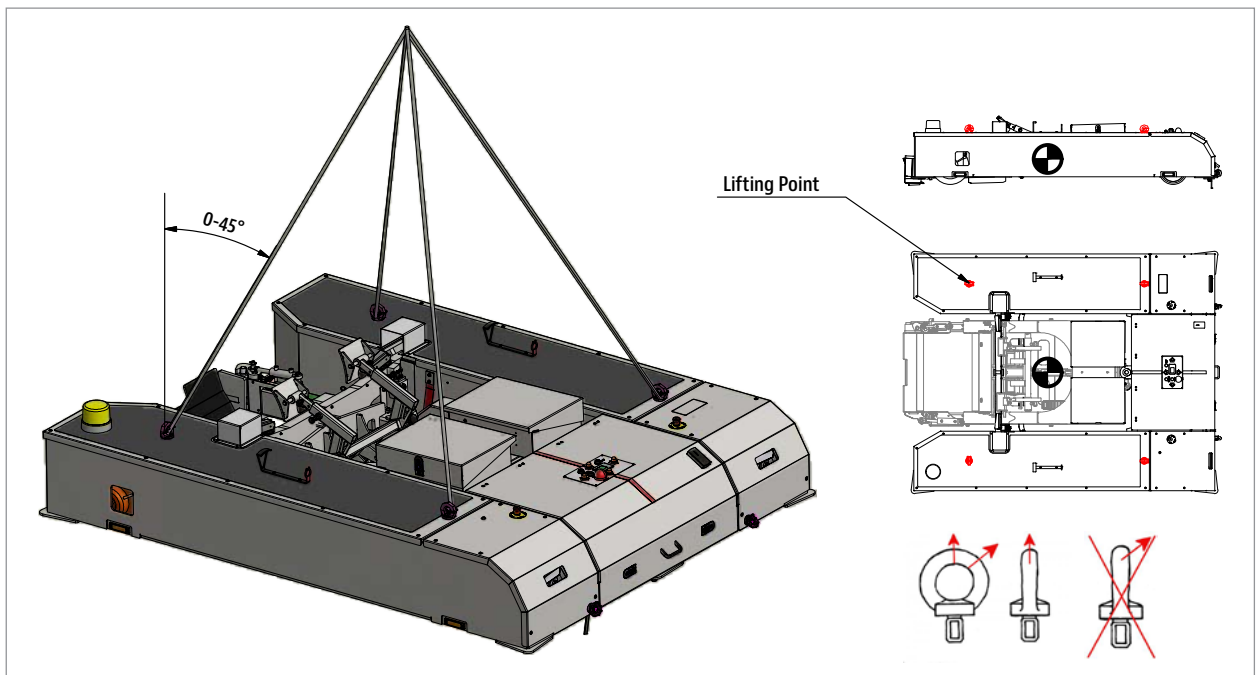



Fig. 4: Transport lugs rigging plan



4. TECHNICAL DATA

4.1. VEHICLE DATA

TWIN		3900 NG	6500 NG	6500 NG FLAT	7500 NG	7500 NG FLAT
Use for		single & double nosewheel, wheeled helicopter 				
Maximum towing capacity ¹⁾		39 t 85980 lbs	50 t 110231 lbs	50 t 110231 lbs	75 t 165347 lbs	75 t 165347 lbs
Maximum nosewheel weight capacity		4,5 t 9921 lbs	6 t 13228 lbs	6 t 13228 lbs	7,5 t 16535 lbs	7,5 t 16535 lbs
Dimensions (without antenna, grips on the surface)	width	2136 mm 84,09 inch	2136 mm 84,09 inch	2136 mm 84,09 inch	2136 mm 84,09 inch	2136 mm 84,09 inch
	length	2596 mm 102,2 inch	2596 mm 102,2 inch	2596 mm 102,2 inch	2596 mm 102,2 inch	2596 mm 102,2 inch
	height	350 mm 13,78 inch	350 mm 13,78 inch	324 mm 12,76 inch	350 mm 13,78 inch	324 mm 12,76 inch
Ground clearance		110 mm 4,33 inch	110 mm 4,33 inch	85 mm 3,35 inch	110 mm 4,33 inch	85 mm 3,35 inch
Max width of the Nosewheel		665 mm 26,18 inch	665 mm 26,18 inch	665 mm 26,18 inch	665 mm 26,18 inch	665 mm 26,18 inch
Nosewheel diameter	min.	180 mm 7,09 inch	180 mm 7,09 inch	180 mm 7,09 inch	180 mm 7,09 inch	180 mm 7,09 inch
	max.	670 mm 26,38 inch	670 mm 26,38 inch	670 mm 26,38 inch	670 mm 26,38 inch	670 mm 26,38 inch
Unladen weight		1700 kg 3748 lbs	1700 kg 3748 lbs	1700 kg 3748 lbs	2100 kg 4630 lbs	2100 kg 4630 lbs
Time to load/fix aircraft (approx.)		10 sec	10 sec	10 sec	10 sec	10 sec
Speed		1,5 m/s 5,4 km/h 3,36 mph	1,5 m/s 5,4 km/h 3,36 mph	1,45 m/s 5,22 km/h 3,25 mph	1,05 m/s 3,78 km/h 2,35 mph	1,05 m/s 3,78 km/h 2,35 mph
Batteries (maintenance-free, deep cycle gel batteries)		4 x 220 Ah	4 x 220 Ah	4 x 220 Ah	4 x 220 Ah	4 x 220 Ah
Voltage		48 V	48 V	48 V	48 V	48 V
AC Microprocessor controlled electric motors		✓	✓	✓	✓	✓
Range (depending on the workload)		3-4 Days	3-4 Days	3-4 Days	3-4 Days	3-4 Days
Possible terrain		Concrete, stone				
Tyres		Puncture-proof tyres			Puncture proof tyres with quartz sand particles	

Advanced radio remote control with safety features, waterproof, certification of conformity, worldwide safety approval including airports, TÜV certified



Mistakes and technical alterations reserved

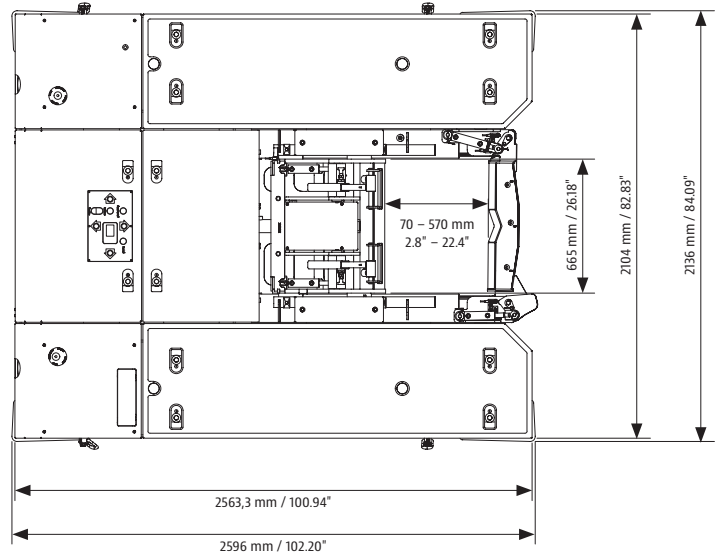
Date 01.2022

1) The stated towing capacity is valid for towing on normal ground conditions without any incline.

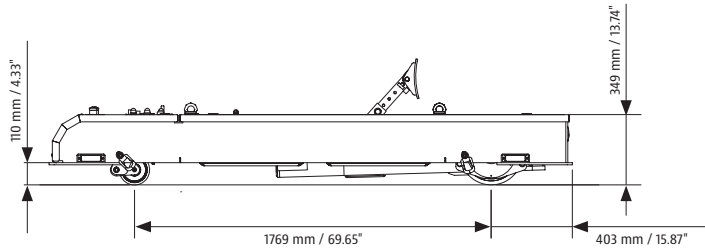
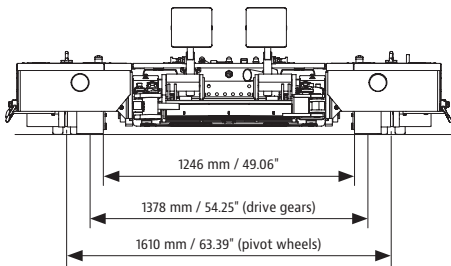
4.2. DIMENSIONS

Vertical stroke: 150 mm / 5.91"
 Sliding Table stroke: 300 mm / 11.81"
 Hydraulic Door stroke: 200 mm / 7.87"

Dimensions without hand grips, antenna, etc.
 Subject to change without prior notice



Standard Models



Flat Models

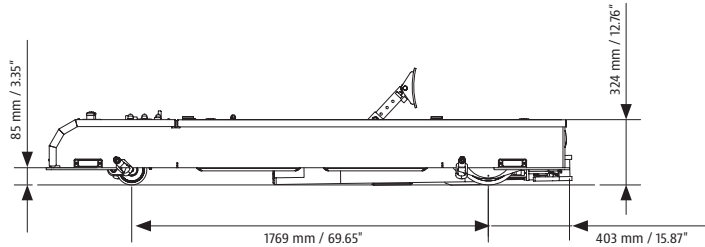
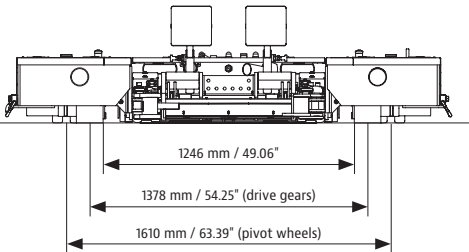


Fig. 5: Vehicle dimensions

4.3. TYPE PLATE



Fig. 6: Type plate (Example)

4.4. NOISE EMISSION

In accordance with Machine Directive 2006/42/EU Clause 1.7.4.2. u), noise must obligatorily be declared for technical equipment and devices.

The emission level has been determined at a distance of 1 m from the machine surface and 1.60 m above the ground.

Sound pressure level

The workplace-related emission level L_{pA} of the machine is less than 70 dB(A). Declaration of measurement information is required only if:

- the A-weighted emission sound pressure level at the workplaces exceeds 70 dB(A); if this level is lower than or equal to 70 dB(A), this must be declared;
- the maximum value of the current C-weighted emission sound pressure level at the workplaces if it exceeds 63 Pa (130 dB related to 20 μ Pa);
- the A-weighted sound power level of the machine, if the A-weighted emission sound pressure level at the workplaces exceeds 80 dB(A).

Workplace-related emission level L_{pA}	Required declarations
< 70 dB(A) → Towing vehicle	$L_{pA} < 70$ dB(A)
71 – 80 dB(A) → not applicable	$L_{pA} = \dots$ dB(A)
> 80 dB(A) → not applicable	$L_{pA} < 70$ dB(A) / $L_{WA} = \dots$ dB(A) ¹⁾

In the workplace-related emission levels L_{pA} extraneous noise and ambient compensation (proportion of reflected sound) are not included in the calculation but possible additions due to included measurement inaccuracy.

1) L_{WA} : sound pressure level

4.5. MOTOR

Type of Motor	2 x 2500 W AC	2 x 5500 W AC
Power		40 Nm
S2 60Min		14.9 Nm
Voltage	3 x 33 V	3 x 31 V
Protection IP	44	66
Gearbox design		Planetary
Gear ratio	1/27	1/31.1
Parking brake	12 Nm	10 Nm

4.6. BRAKING SYSTEM

Mototok has two braking systems:

- Regenerative braking system
- Electromagnetic disc-brake System

The regenerative braking system is the main braking system. When decelerating, the drive motor is used as generator. The current produced is stored back into the batteries (additional load).

At the moment when the electromotor comes to a stop, the electromagnetic disc brake is put into operation to block the drive. The switch-on delay is adjustable in the controllers by tenths of seconds.

The brake values are adjusted by a programming device which is plugged into the controller. This insertion may be done only by authorised persons..

Example of possible brake unit settings:

9 Dbrake	250 A	13 DBrkEnd	0.1 Sec
10 Nbrake	250 A	14 NBrkRamp	0.2 Sec
11 Fbrake	250 A	15 NBrkEnd	0.5 Sec
12 DBrkRamp	0.5 Sec		

4.7. BATTERIES

- VRLA – Valve regulated lead acid batteries
- Grid plate
- Nominal capacity 220 Ah
- Bloc battery
- Design life: 7 years
- Maintenance free
- Proof against deep charge acc. to DIN 43539 T5
- Recyclable

Nominal Voltage	12 V
Nominal Capacity C_{20} 1,75V/C 20°C	220 Ah
Discharge current I_{20}	10,000 A
Max. load with suitable matching contacts	approx. 770 A
Length	518 mm
Width	274 mm
Height up to top cover	216 mm
Height over Terminals	242 mm
Weight	approx. 70 kg
Internal resistance acc. to IEC 896-2	3.5 Ohm
Short circuit current acc. to IEC 896-2	3606 A
Terminal	A-Terminal

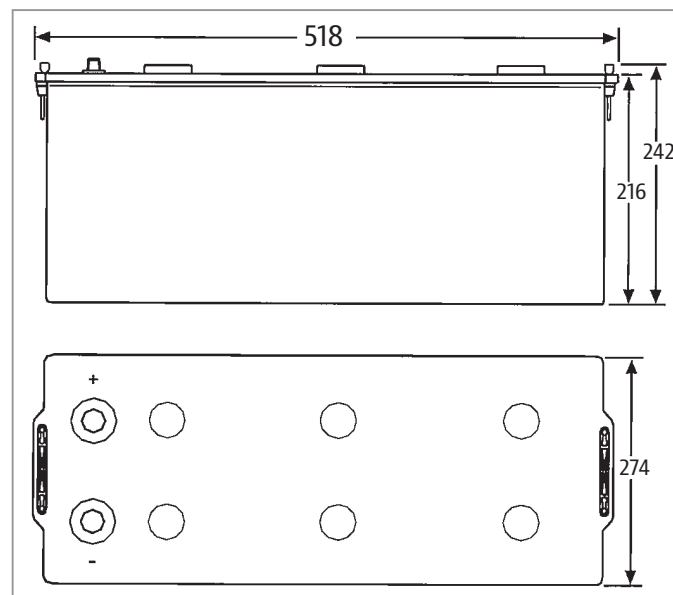


Fig. 7: Dimensions of the Batteries

7.2. CONTROLS

7.2.1. DISPLAY AND INSTRUMENT PANEL



Fig. 13: Display and instrument panel

1. The main switch switches on the radio remote control and starts the DC/DC converter. After this, the device can be started using the remote control.
2. Button for closing the sliding table 2
3. Display to indicate battery voltage, operating time and fault analysis. In the lower left corner the two driving control computers are indicated. The "OK" is replaced by an error code if there is a fault. The battery symbol indicates the battery's charging capacity.
4. The direction lights aid the driver in recognising in what direction the tug will go. Activating the joystick then triggers a release and the electric brakes are released. The direction light comes on and only now does the vehicle drive in the desired direction.
5. Switch for changing between fully automatic and manual loading of the nose wheel.
6. Emergency rotary switch for release the nose gear in case of a malfunction

7.2.2. DISPLAY

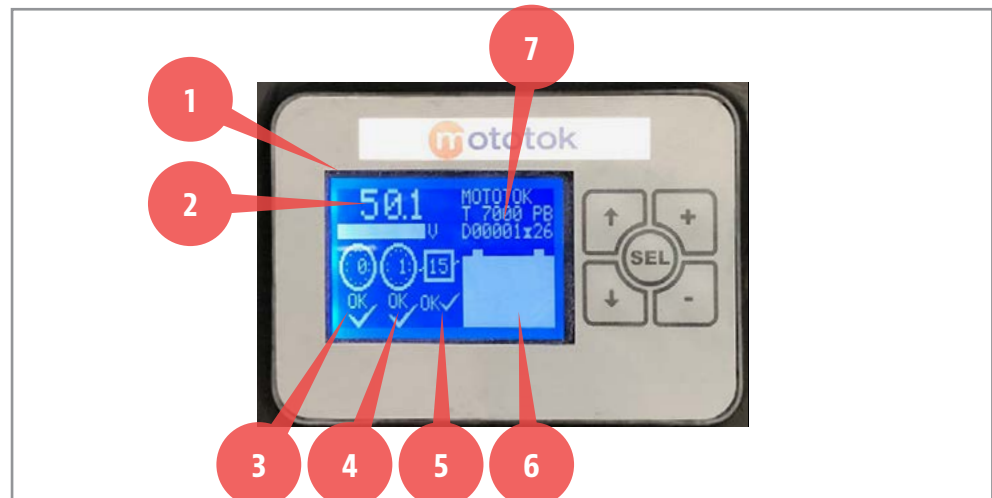


Fig. 14: Display

1. Display
2. Battery voltage
3. Indicates left drive / Indicates error code for the left drive
4. Indicates right drive / Indicates error code for the right drive
5. Control board error code
6. Battery charge capacity
7. Indicates hours of operation

7.2.3. RADIO REMOTE CONTROL

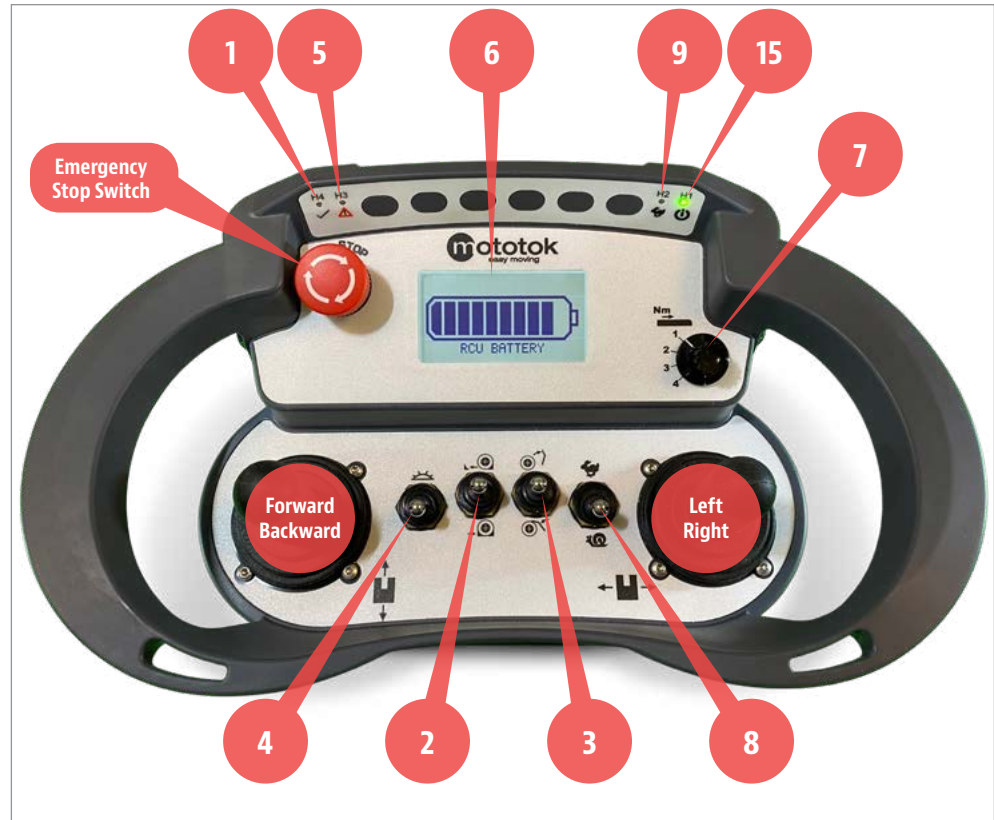


Fig. 15: Radio remote control – top view



Fig. 16: Radio remote control with optional coiled cable for signal transmission

1. Green LED, confirms connection between RCU and Mototok
2. Sliding table
 - upwards = the sliding table moves backwards
 - downwards = the sliding table moves forwards

The switch springs back independently into the central position. By activating the switch, the sliding table is moved up to the nose wheel tyre until the hydraulic pressure switch switches off.

Attention: The tug cannot move if the end position is reached and the lifting platform has not been raised.
3. Safety paddles
 - upwards = safety paddles move upwards
 - downwards = safety paddles move down onto the nose wheel

The switch springs back independently into the central position. The safety catch holds the nose wheel in position and prevents the nose wheel from sliding out.
4. Switch for headlight and work light.
5. Error light:
 - fast flashing: no connection to the Mototok vehicle
 - slow flashing: CAN BUS fault
6. State of charge of the remote-control battery. Not related to the tug batteries. Replacing the battery is recommended if three bars are indicated or sooner.
7. For vehicles with automatic track guidance (AGV –optional equipment):
 - Position 1: Normal speed pre-selected as with switch 8,
 - Position 2: Vehicle drives rapidly with platform lowered/slowly with platform raised
 - Position 3: Lane guidance is turned off, vehicle drives at the same speed as with lane guidance
 - Position 4: Lane guidance system is turned on

For vehicles with oversteering protection system (optional equipment):

 - Position 1: 2300 Nm
 - Position 2: 2500 Nm
 - Position 3: 2800 Nm
 - Position 4: 3000 Nm
8. Switch for setting the speed "Slow" and "Fast" (hare/snail). If an aircraft is loaded, the speed is automatically set at "slow".
9. Yellow LED control light indicates that the fastest speed has been selected.
15. Green LED – main power supply



Fig. 17: Radio remote control – left and right view

10. Only military version: switch from white to red light (combat lighting)
11. Automatic mode:
starts the loading or unloading automatic sequence
Manual mode:
Opens and closes the gate hook and the gate
12. If the button is pressed for 3s the remote control unit turns on or off. If a free channel has been found by the remote control an acoustic signal sounds. Afterwards, press the green button (13) to pair the remote control with the tug and put the tug into operating mode.
13. Always press the green button after switching on the remote control. If a run command is present (pressed joystick), the main contactor and thus the Mototok are switched off. Possible indication of dirty joystick.
14. Only in manual mode: Button for raising and lowering the lifting platform. To raise the lifting platform, click twice within 0.5 seconds (as on a computer mouse button). If the platform is up it is lowered again by clicking once. If it is in the lower position, the sliding table moves back automatically and releases the tyres of the nose wheel. In automatic mode the button has no function.

7.10. OVERSTEERING PROTECTION (OPTIONAL)

Some models are equipped with an Oversteering Protection System. Three weighing cells (2 for double nose wheel operation and 1 for single nose wheel operation) measure the action of forces onto the nose wheel whilst turning. If a threshold of these forces is exceeded, an alarm will sound (see [section "7.11. Generic alarm output", page 80](#)). If the user ignores the alarm, the Mototok will stop for about twenty seconds. Manoeuvring can proceed only after this time has passed.

This threshold can be adjusted via the radio remote control using the turn-switch „7“:

Position 1:	2300 Nm
Position 2:	2500 Nm
Position 3:	2800 Nm
Position 4:	3000 Nm

If necessary, increase the torque threshold using the turn-switch „7“ on the remote control.

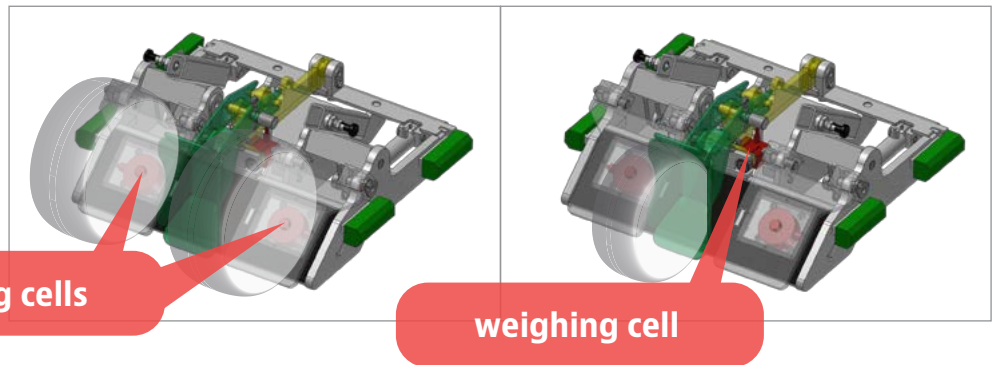


Fig. 35: Weighing Cells

8. EMERGENCY MEASURES

8.1. OVERRIDE PROCEDURE – SENSOR FAULT CORRECTION

If the door gets stuck in one position or has been forcibly stopped and the remote control accepts no commands to open or close the door, the processing logic has become interrupted. Depending on the position of the sliding table, it is not possible to give drive commands either. For this reason the automatic door and sliding table must be brought back to their original position. From this position all the sequential logical steps start new.

You have two options:

1. If the **Mototok is equipped with a computer** (option), no matter in which position the platform is blocked, turn once the blue reset switch and an emergency opening sequence starts (equivalent to the autodoor sequence)
2. If the **Mototok is not equipped with a computer** (standard machines), you can also use the blue reset switch (the Emergency switch on the panel has to be turned during the entire process) but combined with the remote control, the following steps only work if the platform is in the down position:

Step 1: Position the platform in the lower position using the pump manually. If the platform is already in the lowered position, skip step 1

Step 2: Turn and hold turn the Emergency switch on the panel and push the **switch 2** (sliding table) of the remote control **downwards** the door lock will be opened.

Step 3: Turn and hold turn the Emergency switch on the panel and push the **switch 2** on the remote control **upwards**. The door opens. Continue pressing **switch 2 upwards** until the door is completely open and the yellow LED of the sensor lights up.

Step 4: If you want to move the sliding table backwards, turn and hold turn the Emergency switch on the panel and at the same time push the **switch 3 upwards**. This is the 0-setting or start position.



Fig. 40: Override procedure operation



Fig. 41: Reset Button

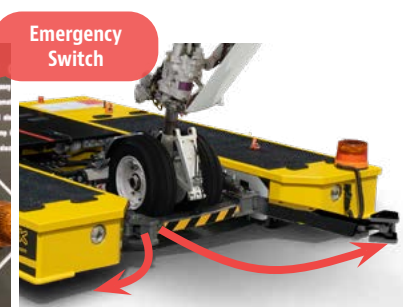


Fig. 42: Override procedure opens the door

8.2. HYDRAULIC EMERGENCY DROP AND EMERGENCY RELEASE

In the hydraulic compartment you will find lever valves for opening the hydraulic conducts. Please notice the instruction label inside the hydraulic compartment for the functionality of every valve. To open the valve, install the adapter cap to the valve push button then push the adapter cap. In case of malfunction of the hydraulic pump or an electric control valve, please follow these instructions:

1. Open the appropriate valve **Y2** using the adapter provided. The platform lowers.
2. Next extend the sliding table manually using the installed manual pump. Before beginning to pump out the sliding table, the valve **Y3** must be opened using the adapter. Continue pumping until the sliding table has been fully extended.
3. Then open the valve for the safety catch **Y10** and continue pumping.
4. Next open the valve of the door **Y6** using the adapter and continue pumping until the nose wheel is exposed.

Valve	Designation
Y1	Platform up
Y2	Platform down
Y3	Slidingtable open
Y4	Slidingtable close
Y5	Door close
Y6	Door open

Valve	Designation
Y7	Securing Paddles down
Y8	Securing Paddles up
Y9	Doorlock close
Y10	Doorlock open
Y11	Tire size smaller
Y12	Tire size larger

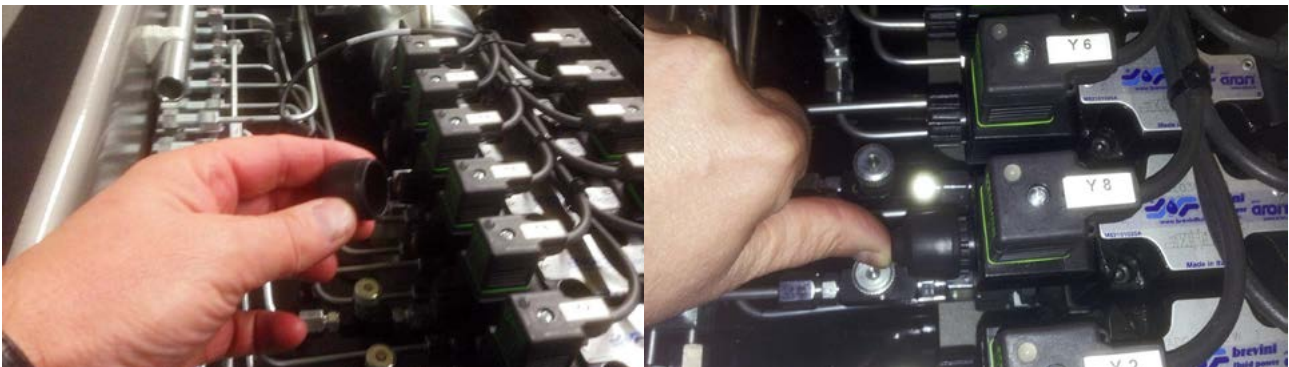












Fig. 43: Hydraulic valves

9.2.4. INDICATION OF OPERATING STATUS BY EXTERNAL LED-INDICATOR

OPERATING STATUS	LED-Indicator					
	 < 80%	 > 80%	 100%	 Air		
Main charging	X					U < 1.9 VpC blinking
Backup charging		X				
Battery full / Maintenance charge			X			
Electrolyte circulation by AIR				X		
Pause Mode	X		X			alternate blinking
OPERATING STATUS DURING MALFUNCTION	 < 80%	 > 80%	 100%	 Air		Malfunktion No.
Battery malfunction					X	1 ... 2
Time malfunction	X				X	3 ... 4
Control malfunction		X			X	9 ... 14
Temperature Malfunktion			X		X	6 ... 8
Low AIR pressure				blinking		

9.2.5. SAFETY FUNCTION OF THE ELECTRONIC CHARGING SWITCH DEVICE AT MALFUNCTION NUMBER

1. battery missing, reverse con. or voltage is < 0.5VpC
2. during switch on the battery voltage is > 2.40VpC, under 2.30V/Z the charger switch on automatic
3. battery voltage long er as 30min < 1.5VpC
4. const. current phase to long
6. temperature in the charger is to high
7. temperature at headsink or transformer to high
8. battery temperature out of range
9. main supply error *
- 11.-13. control malfunction
14. module defect *

* Only 2- or 3-phase charger

Nr	Description	operator checks (5 min)	weekly (5 min)	quarterly (2 std)	yearly	5-yearly
General						
1	Visual inspection for damage to the control panel, the two drive wheels, the castors, the hydraulics, the door, the sliding table and the remote control.	X	X	X	X	X
Handheld remote control and receiver						
2	Check the rechargeable batteries for secure hold in the fixture	X		X	X	X
3	Check contacts of the fixture for corrosion and damages.			X	X	X
4	Check rubber cover of joysticks for cracks, brittleness and tightness.		X	X	X	X
5	Test the emergency stop function. Check the locking mechanism of the emergency stop switch.		X	X	X	X
6	Clean joystick contact with contact cleaner.					X
7	Change the radio remote control batterie with one on charge.	X	X	X	X	X
8	Check if all labelling and symbols are visible. Check button functionality with maintenance software on computer (only with onboard PC).			X	X	X
9	Visually check for damages at the receiver antenna.				X	X
10	Check the clamp overthrow nut for a mechanical secure hold. Check the rubber anti-vibration fixtures for fissures or partitions.					
Display and dashboard						
11	Check the functionality of the four directional lights.			X	X	X
12	Check the display for function and defects.	X	X	X	X	X
13	Check the switches for function, locking and control.			X	X	X
Hydraulic compartment						
14	Check hydraulic ducts for fixed fit and leakage.			X	X	X
15	Check emergency valves, manual pump and emergency pump circuit switch for functionality.			X	X	X
16	Check the cable connections of the valves for fixed fit.				X	X
17	Check the cable of the pump motors and of the contactor for proper fit and fixedness.			X	X	X
18	Check the compartment for traces of oil.		X	X	X	X
19	Refill the hydraulic oil as required.			X	X	X
20	Replace hydraulic oil.					X
21	Check the platform hydraulic cylinder on the right and left side of the platform for tightness and correct position.				X	X
22	Check hydraulic pressure of 190 bar with pressure gauge.					X
23	Check the contact pressure setting of the sliding table and match with factory setting if required.				X	X

Nr	Description	operator checks (5 min)	weekly (5 min)	quarterly (2 std)	yearly	5-yearly
Electrical equipment						
24	Open the cover and check the floor of the compartment for traces of oil.			X	X	X
25	Check the control board for loose plug connections.			X	X	X
26	Check the control board for traces of water (calcium deposits and traces of corrosion).			X	X	X
27	Check the sealing on the sides of the compartment for damages and defects.			X	X	X
28	Check the cables for traces of chaffing.			X	X	X
29	Check the lights in the front and back, if necessary, adjust them to be glare-free.					X
Driving motors						
30	Check the tightness for the cable of the driving motors.				X	X
31	Check the tightness of all screws of the driving motors with torque wrench.				X	X
32	Check the height of the rim screws. All screws should protrude the same height.				X	X
33	Check for unusual running noise of the driving motors.			X	X	X
34	Check gearbox for oil leakage.				X	X
35	Tires: Visual check tires for wear and tear.		X	X	X	X
Batteries						
36	Check battery clamps for secure hold.				X	X
37	Check cables and insulation for damages.				X	X
38	Check batteries for tightness.				X	X
39	Perform a visual inspection for corrosion caused by acid (acid vapour).				X	X
40	If no AGM-batteries: refill distilled water. Caution: only refill after charging!					
Caster wheels						
41	Clean castor wheels if necessary.				X	X
42	Check wheels for damage or flaws.		X	X	X	X
43	Check if the caster wheels turn smooth and quietly and change them if necessary.				X	X
44	Check the movement and full scope of the rotary disc bearing and change if necessary.				X	X
45	Lubricate the rotary disc bearing at the grease nob.			X	X	X
46	If active casters, check the condition of drive chain and apply grease.			X	X	X
Sliding table:						
47	Clean the sliding surface of the sliding table.			X	X	X
48	Check the polymer sliders for wear.				X	X
49	Check the hydraulic cylinder for tightness and proper hold.				X	X

Nr	Description	operator checks (5 min)	weekly (5 min)	quarterly (2 std)	yearly	5-yearly
Securing paddles						
50	Check if the safety clamps are functioning securely.			X	X	X
51	Check the stick pads of the paddles for roughness and apply new silicon coating if necessary.				X	X
52	Check the length adjustment and apply lubrication if necessary.			X	X	X
53	Check the hydraulic cylinder for tightness and proper hold.				X	X
Automatic door						
54	Check the door hinge for backlash.				X	X
55	Check door limit stop, readjust or replace if necessary				X	X
56	Check the stick pads of the door for roughness and apply new silicon coating if necessary.					X
57	Check the hydraulic cylinder of the door for tightness and proper hold.				X	X
58	Check the actuator of the door lock for proper fit and tightness. Apply grease.			X	X	X
Sensors						
59	Check every induction sensor for hold and the function with a metal plate.			X	X	X
60	Check the hold of the metal counterpart in combination with the sensor LED, the LED light should not flicker or fade out.			X	X	X
61	Check the two limit switches for the upper and lower position of the platform.			X	X	X
62	If rotation limiter are installed: Check the reflectors on each aircraft which is handled.	X				
63	If rotation limiter are installed: Check switching of the sensors with a reflector and clean the sensor.		X	X	X	X
64	If differential oversteering protection system is installed: Check the functioning of oversteering protection system.		X	X	X	X
65	If differential oversteering protection system is installed: Calibrate sensors with calibration tool and torque wrench.				X	X
Emergency stop switch						
66	Check every induction sensor for hold and the function with a metal plate.			X	X	X

Nr	Description	operator checks (5 min)	weekly (5 min)	quarterly (2 std)	yearly	5-yearly
Maintenance						
67	Lubrication: Lubricate all lubrication points that are marked in the lubrication plan and are not listed in the maintenance schedule due to a shorter lubrication cycle.				X	X
68	Replace hydraulic pressure switch					X
69	Replace hydraulic hoses					X
70	Replace emergency stop buttons.					X
71	Replace safety relay K30.					X
72	Replace start-up relay K2					X
73	Replace main contactor K1					X
74	Review the condition of drive motors (5kW AC) (equivalent hours 5000 hours)					X
75	Replace joystick					X
76	Replace antenna					X
77	Replace remote battery				(2 years)	X
78	Replace active castors or drive chain if necessary					

13.4. LIFETIME OF PARTS

Name			Run-time	Obligatory	Recommended
Hydraulic pressure switch		Replace	5 years	X	
Hydraulic hoses		Replace	6 years		X
Emergency stop button		Replace	5 years		X
Safety relay K30		Replace	5 years	X	
Start-up relay K2		Replace	5 years	X	
Main contactor K4		Replace	5 years	X	
Turning wheels	depending on wear	Visual inspection		X	
Drive wheels	depending on wear	Visual inspection		X	

Drive motors	2500 W	Replace	1000 h	X	
Drive motors	5000 W	Replace	1000 h	X	
Electric vehicle battery	as required		maximum 6 years		X

Radio remote control					
Antenna	as required	Visual inspection	5 years		X
Batteries	as required	Renew	2 years	X	
Joystick		Clean contact with alcohol	1 year		X
Joystick		Replace	5 years	X	

13.5. SCREWS TIGHTENING TORQUES

Check all screw connections regularly for tightness and retighten if necessary.

Information on the maximum tightening torque in Nm for strength class 8.8 according to ISO 898 / 1.

Screw size	Maximum tightening torque
M 4	3.0 Nm
M 5	5.9 Nm
M 6	10 Nm
M 8	25 Nm
M 10	49 Nm

Screw size	Maximum tightening torque
M 12	85 Nm
M 14	135 Nm
M 16	210 Nm
M 18	300 Nm
M 20	425 Nm