

User Manual

RKN Temperature Controlled Container



swissairtainer.com

1 Revision record

Revision A	Initial Release
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3 Introduction

3.1 Scope of the manual

This manual provides the instructions for operating the Swiss Airtainer container RKN. This user manual is published by Swiss Airtainer SA without warranty. In case of questions regarding this document please contact Swiss Airtainer: info@swissairtainer.com

3.2 Safety instructions

Safe design:

- No sharp edges in structural components.
- Material used does not constitute risk to health.

Safe handling:

- Pay caution of the manuals warnings when precaution is necessary.



Always follow IATA Dangerous Good Regulation when loading container with dangerous goods.



Do not charge the container when inside an airplane.



Do not charge the container outdoor, or in damp, moist environment to avoid any risk of electric shocks.

3.3 Symbols used in this manual



Warning!

Danger that **can** lead to death or injury if necessary measures are not taken.



Caution!

Hazard that **can** lead to injury or material damage if necessary measures are not taken.



Note

Practical information or tips.

3.4 The container

The temperature-controlled air cargo container is used to transport temperature sensitive load at refrigerated and controlled room temperature range;

The container consists of:

1. A **container structure** where the load is placed;
2. A **Temperature Control System**;
3. A control unit, the **Human/Machine Interface (HMI)** that controls the container ([§4.4](#)), the temperature set point and provides information and warnings ([§6](#));
4. An **Equipment Bay** containing the temperature control system;
5. **Photovoltaic panels** on top and **Battery** in the base.

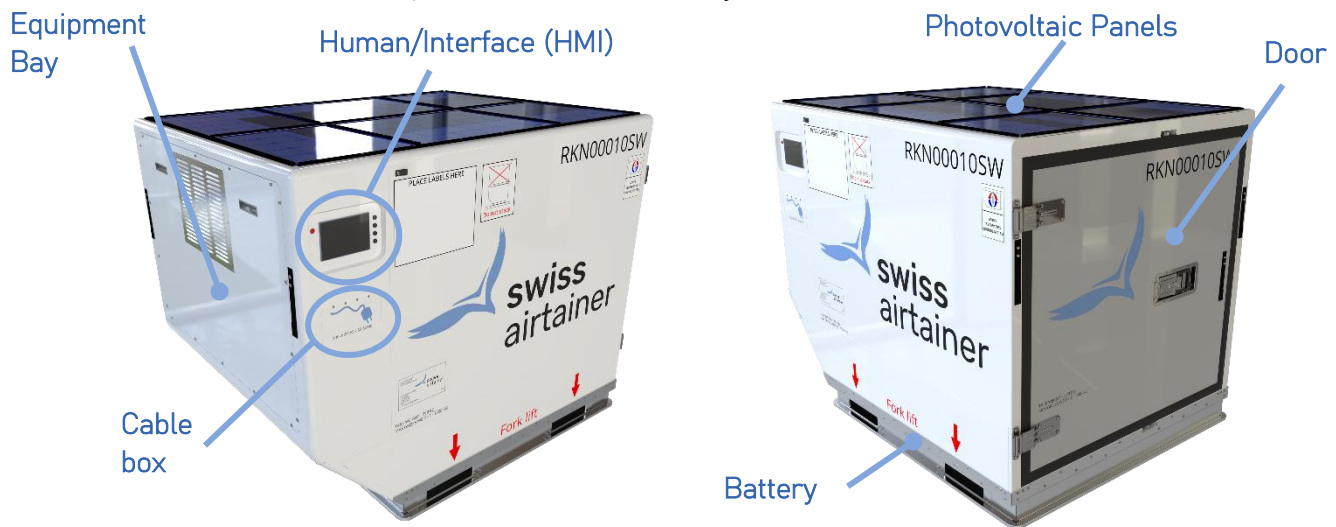


Figure 1 – RKN TCC container

- The container is a forkliftable LD3 for air cargo;
- It can transport one (1) US pallet 1'220 x 1'016 mm (48 x 40 in.) or one (1) EU pallet 1'200 x 800 mm (47.3 x 31.5 in.) of load (see [§4.5](#) for loading).

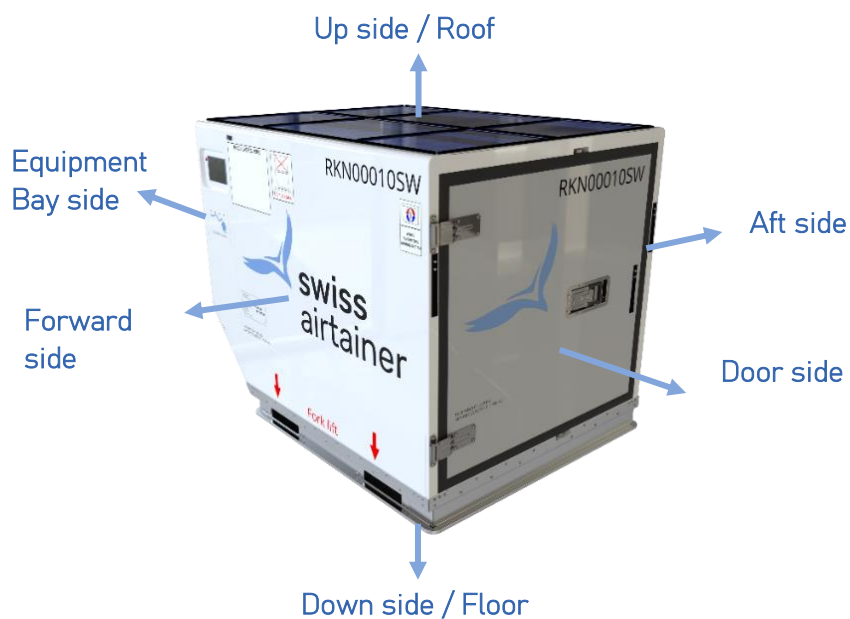


Figure 2 – RKN TCC main orientations.

4 Quick guide for operators

OVERVIEW

This quick guide covers the main instructions for operating the container: charging, handling, controlling, pre-conditioning and loading.

Additional information is described in Part II Operational Manual: info, warning and alarm interpretation, troubleshooting, technical information, and checklist.

4.1 Operational Damage Limits Notice (ODLN) Sticker

OPERATIONAL DAMAGE LIMITS FOR CONTAINER FOR REFERENCE ONLY		DO NOT COVER	MANUFACTURER: CONTAINER SERIES PART NUMBER	Swiss container SA SERIES RELEASED ON A
Subsystem	Component	DO NOT COVER ANY OF THE CONDITIONS BELOW ARE DETECTED		
Container	Door	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
	Door locking mechanism	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
	Door handle	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
Base	Base frame	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
	Base plate	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
	Base cover	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
Markings	Manufacturing date	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		
Special requirements	Active USD	NO CUTS OR THE EDGE LAMINATE OR LESS THAN 200 MM AWAY		



Figure 3 – ODLN sticker example and location

All containers are labelled with an Operational Damage Limits Notice (ODLN). It describes the acceptable damage limits for airworthiness.

Refer to the list to determine the acceptable damage limit before loading the container onboard the aircraft.

4.2 Charging



WARNING!

- Charging must **never** take place inside an airplane.
- Charging must not take place in a damp, moist environment due to risk of electric shocks.
- Before using the cable and before connecting it to an electric outlet, check the cable for damages/abnormalities.
- Before moving the container, check that the cable is not connected to the electrical outlet and placed back in the cable box.



CAUTION!

- When charging, always pull out the entire cable (5 m) to avoid overheating.
- Ensure the cable is straight and does not have loop or knots.



NOTE

- Charging time depends on the battery level and ambient temperature.
- Maximum charging time is 4 hours with or without the container operating.
- For optimal charging, make sure the ambient temperature is within the range 0 °C to 25 °C (32 °F and 77 °F).
- The container must be charged within ambient temperature range of -20 °C (-4 °F) to 50 °C (122 °F).
- To avoid overloading of the electrical outlet fuse, connect only one container per single-phase electrical outlet. Charging a container requires max 1'600 W when operating and 1'000 W when not operating.
- A 240 VAC electrical outlet requires at least 8 A circuit capability.
- A 120 VAC electrical outlet requires at least 15 A circuit capability.

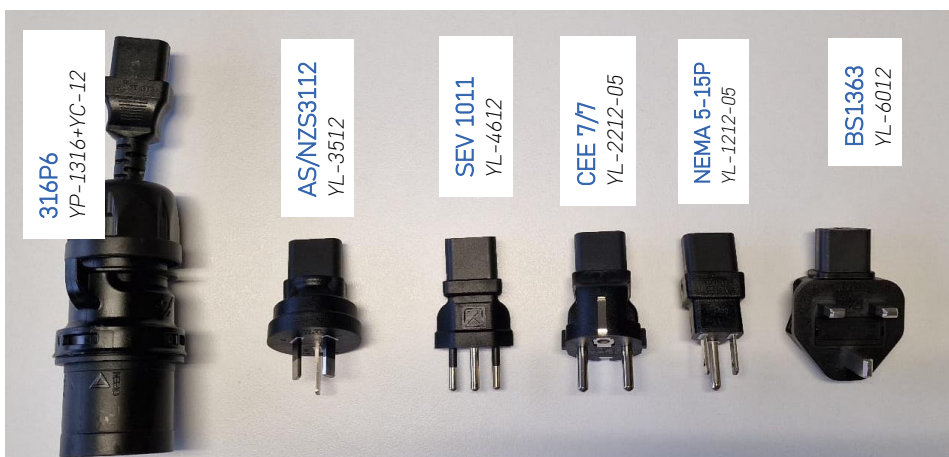
4.2.1 Charging with electrical outlet


1. Open the hatch of the cable box and pull out the cable.

! CAUTION!

- Pull out the cable to its **full** length.

Six adapters are available:



2. Connect the applicable adapter to the cable;
3. Connect the adapter to the cable and then to the electrical outlet;
4. To verify the charging is in progress, turn on the HMI (§ 4.4.1) and look for the charging icon 

- State of charge can be monitored on the HMI (§ 4.4.1);
- The battery is considered fully charged above 95 %;

5. When charging is complete, remove the cable from the electrical outlet and disconnect the adapter from the cable;
6. Place the cable and all adapters in the cable box;
7. Make sure all six (6) adapters and the cable are properly stored in the cable box.

4.2.2 Charging with photovoltaic panels

When stored outside during the day, the container can recharge itself with the photovoltaic panels on the roof.

This feature is automatic and does not require any intervention:

1. Place the container outside (§4.3.1) during the day and ensure direct illumination from sun as much as possible (Figure 4);
2. As much as possible, avoid shadow on the vicinity of high buildings of structures;
3. The solar charge can be verified from the control unit (§4.4.1 on information screen).

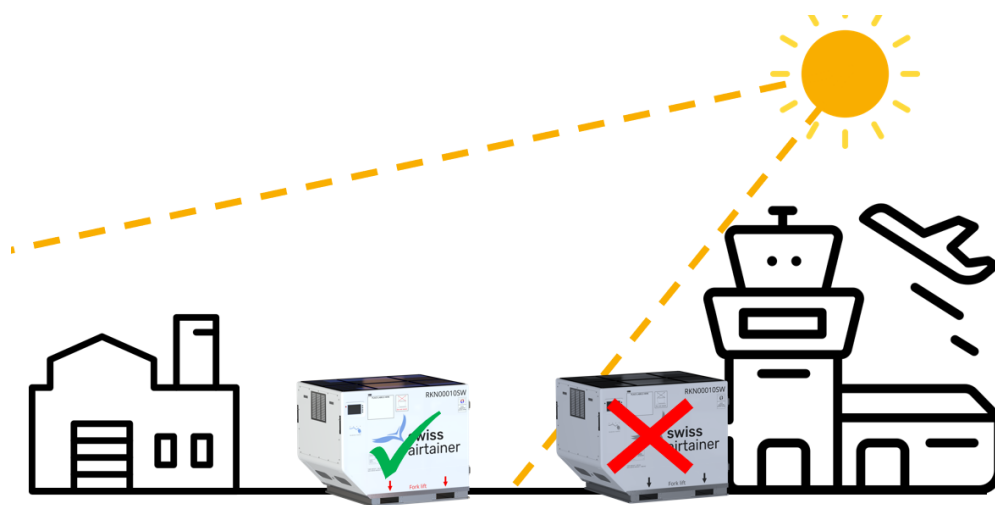


Figure 4 – Positioning of RKN for proper sunlight illumination

4.3 Handling guidelines

4.3.1 Move the container with forklift

- Use a forklift to lift the container (Figure 5).

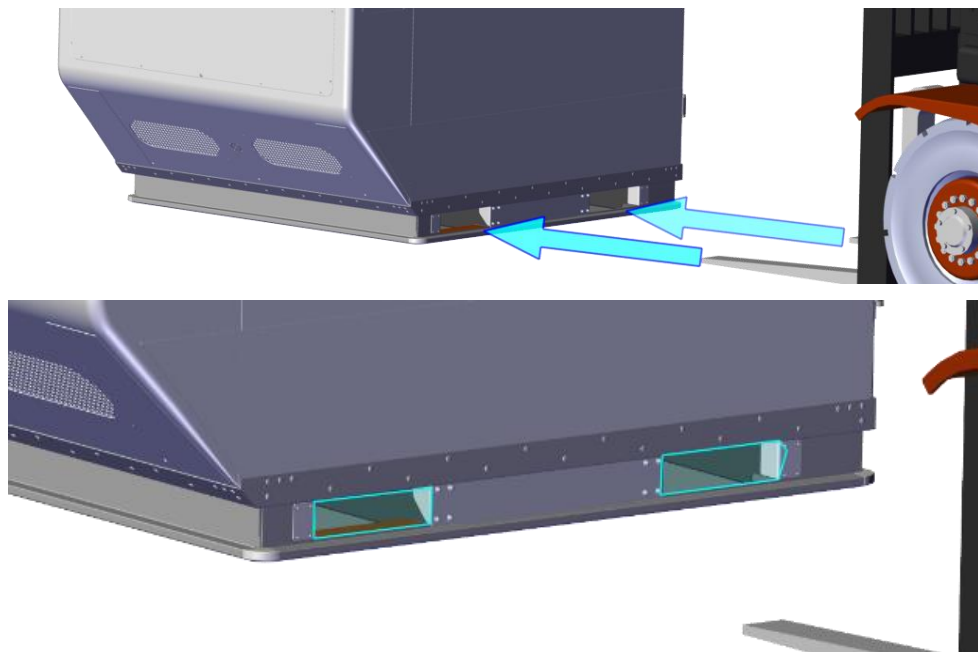


Figure 5 – Forklift pocket located on the forward/aft side of the container



CAUTION!

- Only lift the container from the **forward and aft sides**.
- The container **must not touch the ground** when moved with a forklift.
- Make sure to **aim for** the forklift **pocket**.
- DO NOT PUSH THE CONTAINER FROM ANY OTHER SURFACE AREA, AS IT WILL RESULT IN DAMAGES.**

4.3.2 Move the container on roller bed

- Handle straps are available to move the container on roller bed.



Figure 6 – Location of straps on **door** and **EQB side** of the container

4.3.3 Storage

- Store the container on flat ground at temperatures between -25°C to $+50^{\circ}\text{C}$ (-13°F to $+122^{\circ}\text{F}$);
- If stored outside, ensure direct illumination from sunlight to power the photovoltaic panels and enable self-sufficient charging.

DO NOT STACK with container or load heavier than 400 kg.



WARNING!

- Light weight container, if stacked could fall with wind.



CAUTION!

- Sensitive photovoltaic panels on top. Solar charge impossible in case of stacking.



CAUTION!

- If stacking with lightweight object, always place wooden plate, or similar, **large enough to rest on both rails (at least 1'534 mm)** of the container roof to protect the photovoltaic panels (Figure 7).

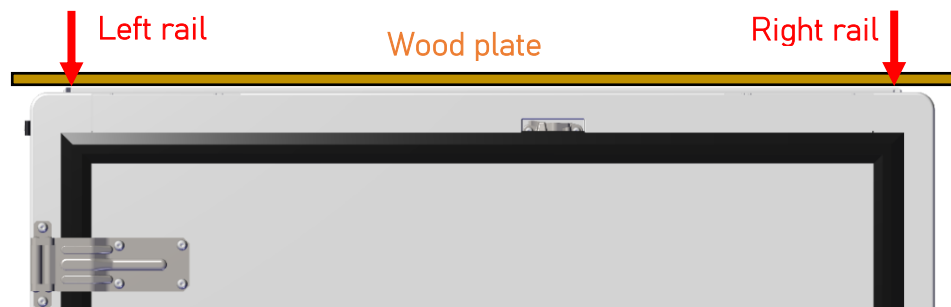


Figure 7 – Positioning of protective wooden plate on the container roof before stacking

4.3.4 Shipment duration

If the state of charge is lower than 30 % it is recommended to charge the container either by connecting it to the electrical outlet ([§4.2.1](#)) or by solar charge ([§4.2.2](#)).

When preparing next shipment, follow charging time displayed in Table 1:

Table 1 – Average charging time on electrical outlet

Charging time	Average battery state of charge increase
30 minutes	~ 12.5 %
1 hour	~25 %
2 hours	~50 %
4 hours	~100 %

4.3.5 Wrapping

Do not wrap the container. If the container was to be wrapped, the air inlet and exhaust would be blocked and the container would not operate properly.

4.4 Control and preconditioning

4.4.1 Control unit: Human/Machine Interface (HMI)

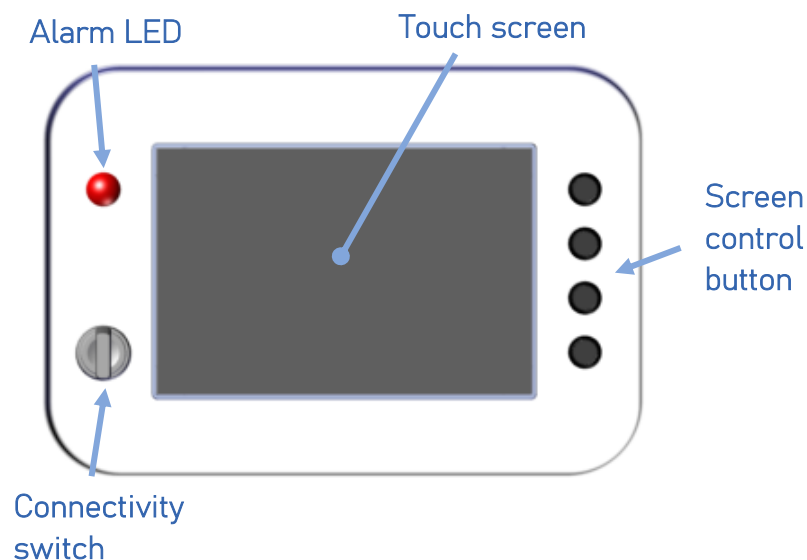


Figure 8 - Control unit - Human/Machine Interface (HMI)

The HMI (**Figure 8**) is a touch screen that allow the user to:

- Turn ON/OFF the Temperature Control System;
- Adjust the temperature set-point;
- Display information: internal temperature, battery level, charging state, connectivity, alerts, alarms, etc.

It is located on the forward side of the container (**Figure 1**).

It has four (4) control buttons on the right side to navigate on the screen.

To start the HMI:

1. Press any control button (**Figure 8**);
2. Wait five (5) seconds for the screen to turn on.
3. The Main page will light up, ref fig 9.

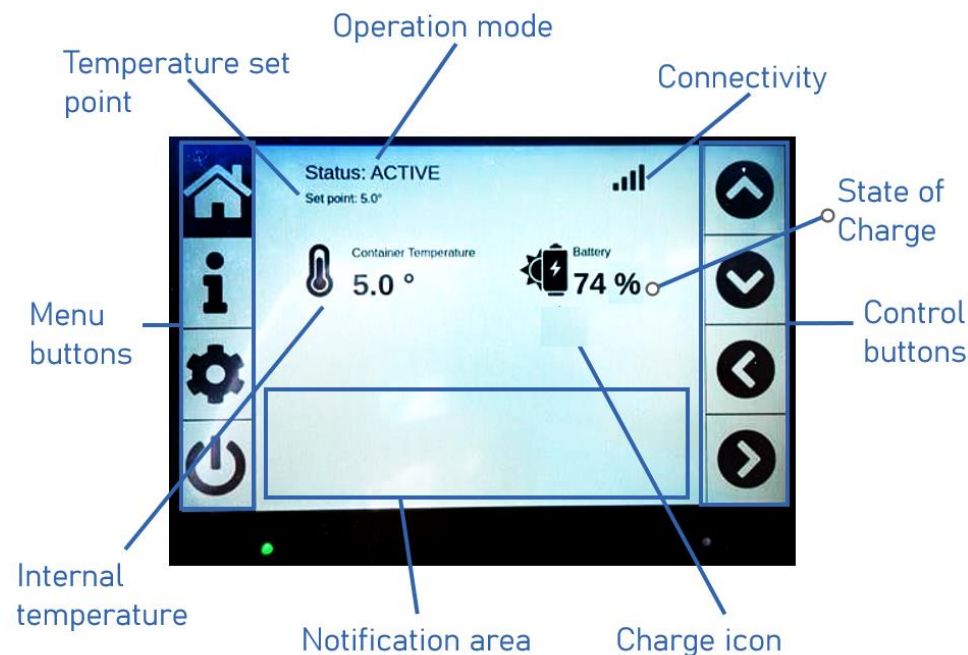


Figure 9 - HMI main page.

Information page:

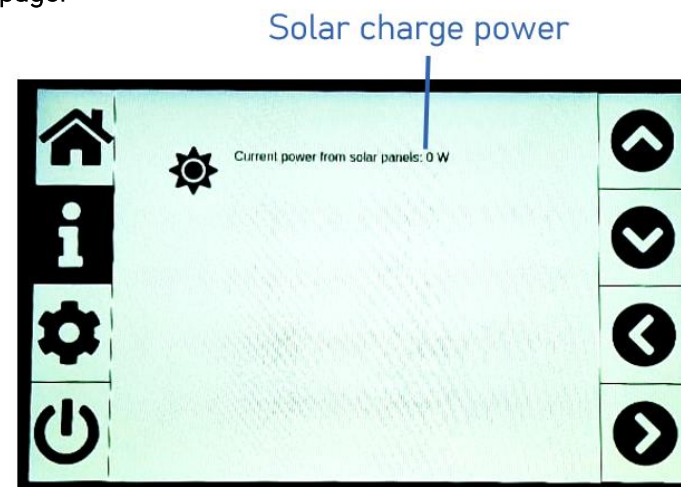


Figure 10- HMI information page.


4.4.2 Security Code

Certain pages such as set temperature (§4.4.3) and turning ON/OFF the container (§4.4.5) requires a security code.

Contact info@swissairtainer.com for instructions.

4.4.3 Set the temperature

On the touch screen (Figure 11):

1. Click on settings button 
2. Click on temperature set point;
3. Follow screen indications: enter the temperature set point;
4. Enter security code (§4.4.2);
5. Validate by clicking on OK.

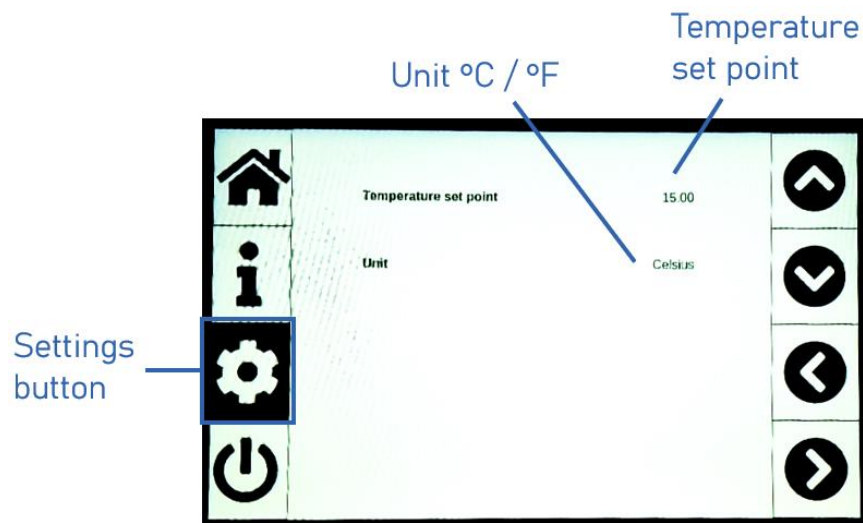


Figure 11 - HMI settings page


4.4.4 Switch between degree Celsius and Fahrenheit

On the touch screen (Figure 11):

1. Click on settings button 
2. Click on unit;
3. Follow screen indications: select Celsius (°C) or Fahrenheit (°F).

4.4.5 Turn ON/OFF the container

On the touch screen (§4.4.1):

1. Click on power button 
2. A status message will show the current operational mode;
3. Confirm the command by pressing on ✓ confirmation button;
4. (If needed, press ✕ to cancel;)
5. Enter the code (§4.4.2).

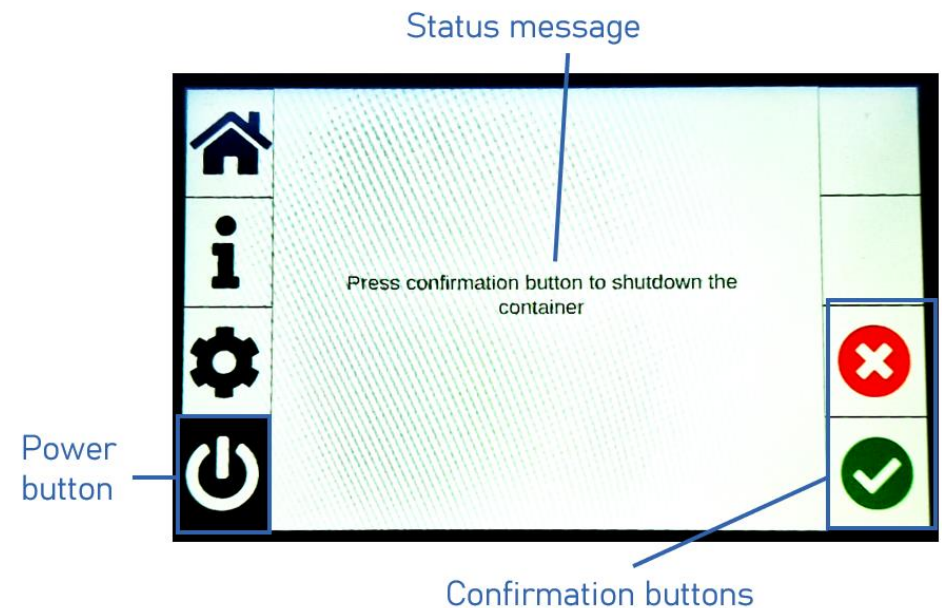


Figure 12 - HMI activation page

4.4.6 Functional test

- If required, disconnect the container from the electrical outlet (grid);
- Set the temperature at +5 °C (+41 °F) (§4.4.3);
- Start the container (§4.4.5);
- Open the door (§4.5.1);
- Check for airflow coming out of the air ducts located on the upper left and right sides, inside the container (Figure 13).

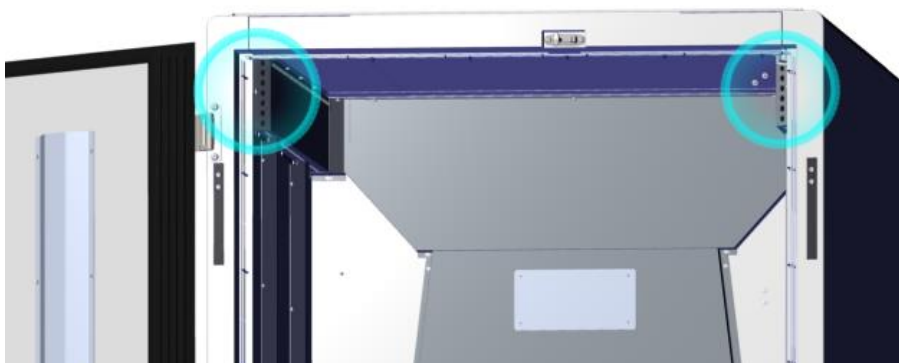


Figure 13 – Location of the air ducts inside the container.

4.4.7 Preconditioning of the container

Precondition the container at the temperature set point, prior to loading →

→ 1.a. In a non-temperature-controlled environment:

- Recommendation: connect the container to an electrical outlet (§4.2.1);
- Ensure the door is fully closed (§ 4.5.1).

→ 1.b. In a temperature-controlled environment:

- Ensure the door is open and held by its hook (§ 4.5.1).

2. In all environments:

- Turn on the HMI (§ 4.4.1);
- Adjust the temperature set point as required (§ 4.4.3);
- Make sure you hear the fans start, if not already running;
- Make sure there is no alarm or warning on the HMI (§6);
- Wait for 20 min;
- Verify that the temperature reached the set point (§ 4.4.1).

4.4.8 Pre-conditioning of the load

The Temperature Control System of the container can pre-condition the load if required:

- If not already done, pre-condition the container (§4.4.7);
- Recommendation: connect the container to the electrical outlet (§4.2.1);
- Place the load in the container (§4.5.2);
- Close the door (§ 4.5.1);
- Make sure there is no alarms or warnings on the HMI (§6);
- Verify that the temperature is at the set point (§ 4.4.1).

4.4.9 Wireless transmission connectivity



CAUTION!

The wireless transmission **must be disabled** before the container is loaded onto the airplane.

The connectivity switch (Figure 8) has 3 positions:

- AUTO: Do not use the auto mode.
- ON: The wireless transmission is enabled.
- OFF: The wireless transmission is disabled.

4.4.10 Disable wireless transmission before loading into the aircraft

- Set the connectivity switch (Figure 8) to OFF position.

4.4.11 Enable transmission after off-loading from the aircraft

- Set the connectivity switch (Figure 8) to ON position.

4.5 Loading

4.5.1 Open the door

1. Press the button on the door (**Figure 14** marked yellow in left figure);
2. Pull the handle (**Figure 14** marked in black on both figures);

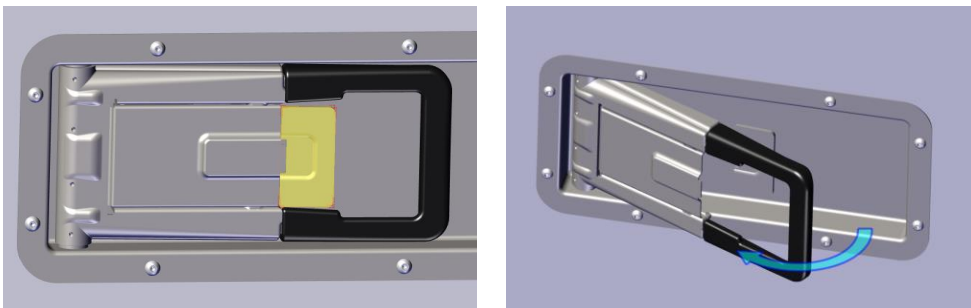


Figure 14 - Door handle opening.

To hold the door in open position, use the door hook (**Figure 15**).

CAUTION! When loading, always use the hook to keep the door from accidentally closing.

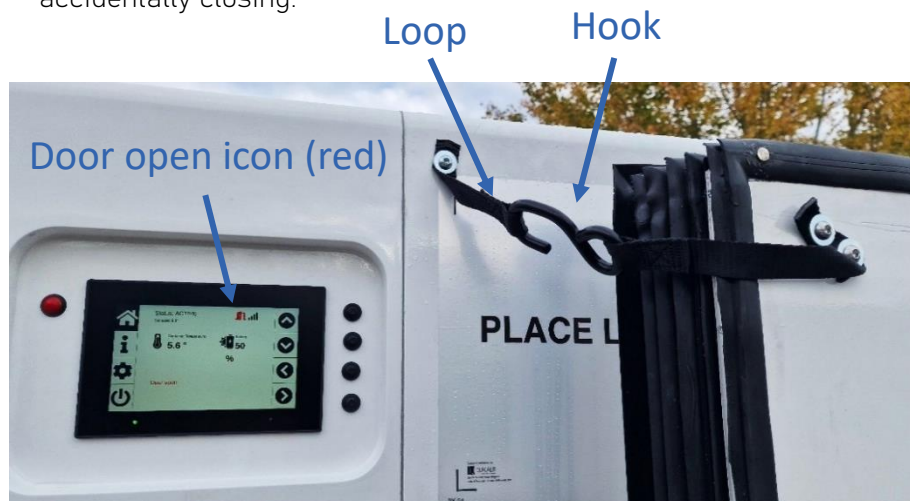


Figure 15 - Door hooked in open position

4.5.2 Loading

CAUTION!

1. Place the load on a pallet and secure it with shrink-wrap or similar:
 - Ensure proper weight distribution;
 - If shrink-wrap is used, do not wrap the pallet to let air flow onto the floor.
2. Pre-condition the load and the container before loading (**§4.4.7** and **§4.4.8**);
3. Place the load in the container (**Figure 16**):
 - Ensure the load is centered inside the container (**Figure 17**);
 - Do not place any load between the container walls spacers;
 - Ensure the load does not block the return air on the rear wall.
4. Secure the load to the tie down tracks with straps (**Figure 18** and **Figure 19**);
5. Close the container's door (**§ 4.5.1**).

Max. load dimensions (L*W*H) 1220 x 1200 x 1300 mm (48 x 47 x 50") including the pallet.

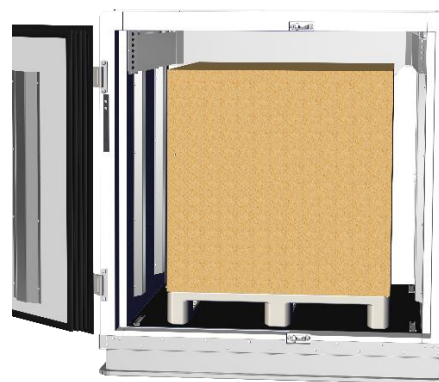


Figure 16 - US pallet size load placed inside the container - front view

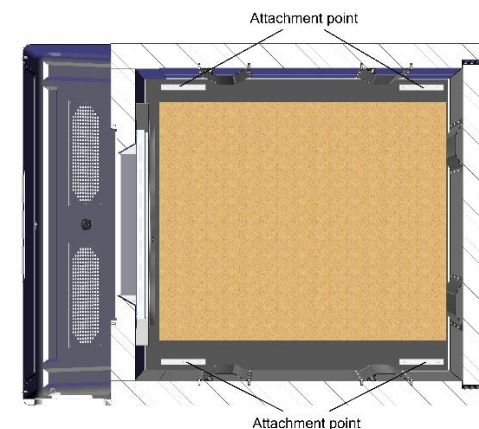


Figure 17 - US pallet centered inside the container - top view

Part I – Quick guide

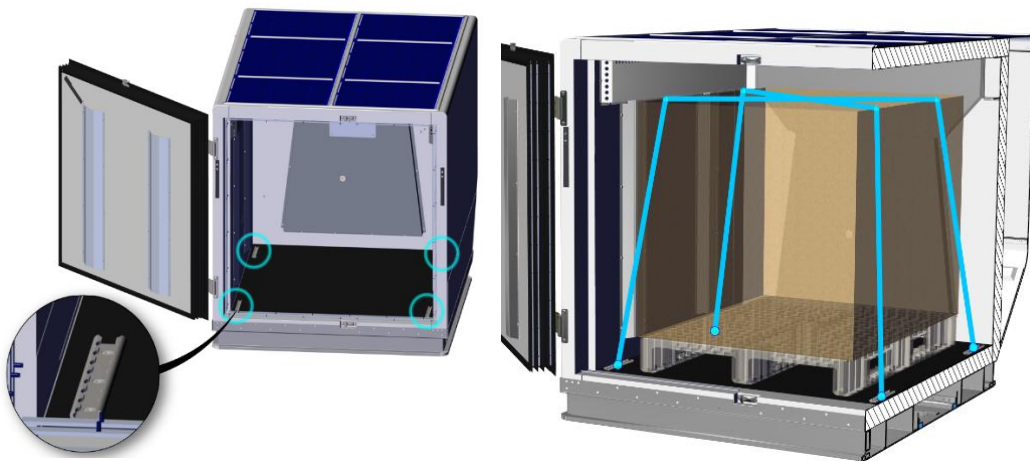


Figure 18 – location of the tie-down tracks (blue).

Figure 19 – Straps position (blue).

4.5.3 Close the door

1. Press on the door with the handle open;

WARNING!

2. When the door seal touch the structure, make sure the cam hooks the keeper (and [Figure 21](#));
3. At the end, press on handle until you hear a “click”.

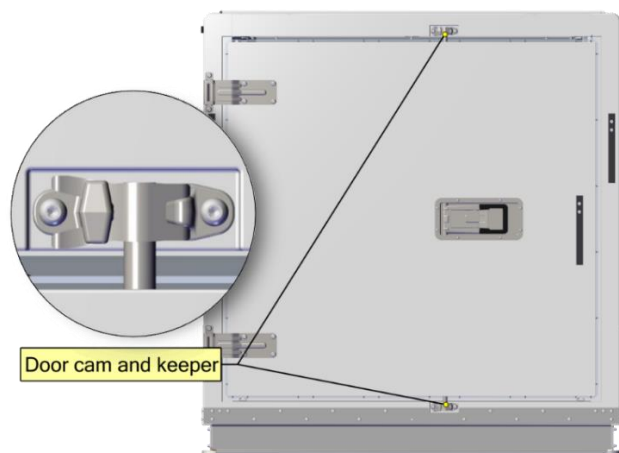


Figure 20 – Door cam and keeper system.

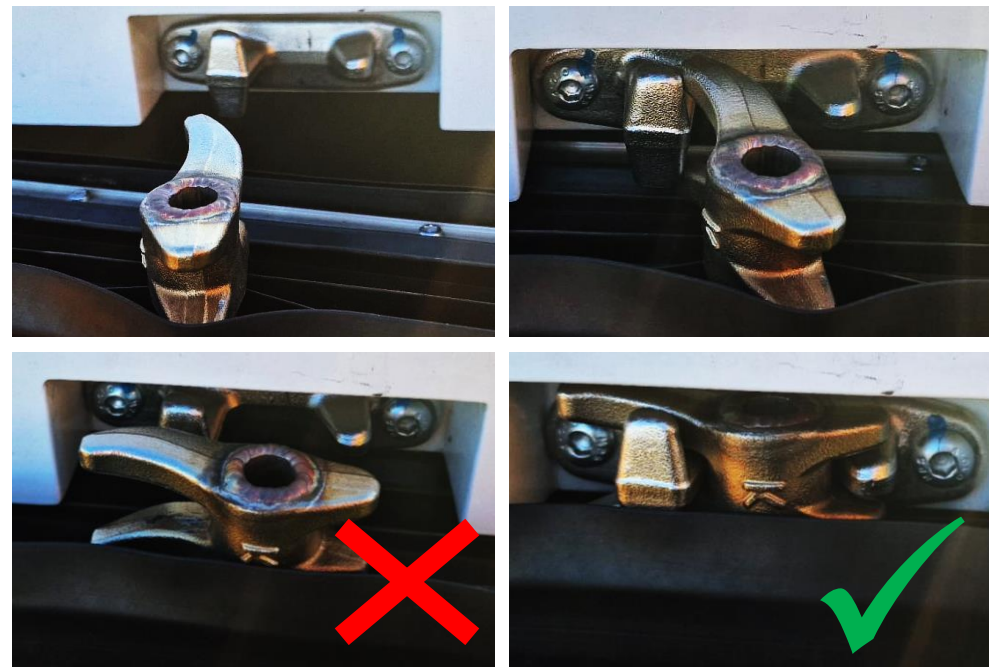


Figure 21 – Procedure to secure the door and the keeper.

4.5.4 After loading

1. Check battery level is 95 % or above;
2. Check internal temperature equals the temperature set point;
3. Check there is no alerts or warnings ([S6](#));
4. Check the alarm led is not ON;
5. Check the door is properly closed ([S4.5.3](#)).

4.5.5 Unloading the container

4. Before unloading, check visually the container for damages;
5. Open the door ([S4.5.1](#));
6. Unload the pallet ([S4.3.1](#));
7. Turn off the container.

5 Battery autonomy and ambient temperature limitations

5.1 Autonomy

The container autonomy is the maximum time the container can maintain the temperature of the load. It is defined by:

- The battery State of Charge (SoC);
- The power consumption of the Temperature Control System;
- The difference between set temperature and the ambient temperature;
- The mass of the load.

The power consumption depends on temperature difference between inside and outside of the container. To optimize the container autonomy when running on battery, always precondition both the load and the container before loading. **Table 2** shows the minimum battery autonomy time in different set temperature and ambient conditions

Table 2 - Battery autonomy without solar power

Cooling mode: T set point 5° and ambient + 20 °C	~70 hrs
Heating mode: T set point 5° and ambient -10 °C	~50 hrs
Cooling mode: T set point 5° and ambient + 40 °C	~20 hrs
Heating mode: T set point 5° and ambient -20 °C	~30 hrs

The ambient temperature limits for operating and storage of the container is defined **Table 3**.

Table 3 - Ambient limitations

Operational temperature range	-30 to +50 °C (-22 to 122 °F)
Storage temperature range	-25 to +50 °C (-13 to +122 °F)

6 Operation mode, information, alert, and alarm

6.1 Information



6.1.1 Operation mode: Active/Inactive

The container has two modes: "Active" (ON) and "Inactive" (OFF).

Once the container is active (§4.4.5), it will automatically regulate the internal temperature to the set point.

6.1.2 Charging state – electrical outlet and solar charge

When the container is charging, it can be verified with the following:

- Icon  can be seen on the main screen (§4.4.1) when charging from electrical outlet is ongoing;
- Icon  can be seen on the main screen (§4.4.1) when solar charging is ongoing.

6.1.3 Preconditioning to X °C in progress

Reason:

- A new temperature set point is set (§4.4.3) and the temperature control is activated (§4.4.5);
- The container is in preconditioning state until the internal temperature reach the set point.

6.1.4 Temperature control sensor calibration due at DD/MM/YY

Reason:

- The Temperature Control System sensor calibration runs out of time;
- Calibration must be planned before the date displayed on the HMI screen.

6.1.5 MSUs calibration due at DD/MM/YY

Reason:

- The internal temperature sensors calibration runs out of time;
- Calibration must be planned before the date displayed on the HMI screen.

6.2 Alert

6.2.1 Battery state of charge below 30 %

Reason:

- Container battery state of charge below 30 %.

Action:

- Connect the container to the electrical outlet (S4.2.1).

6.2.2 Battery temperature high

Reason:

- Container battery temperature is too high, above 65 °C.

Action:

- Move the container to a cooler area:
 - Optimal charging temperature range: 0 to +25 °C (+32 to +77 °F).

6.2.3 Door open

Reason:

- The door is not closed.

Action:

- When ready, close the door by following the process S4.5.3.

6.2.4 Ambient temperature out of range

Reason:

- The ambient temperature is out of the range limitations: -30 °C to + 50 °C (-22 °F to 122 °F).

Action:

- Refer to troubleshooting S7.5

6.3 Alarms

6.3.1 Internal temperature too high

Reason:

- The internal temperature is too high: +3 °C (+5.4 °F) above the temperature set point.

Action:

- Refer to troubleshooting [§7.3](#).

6.3.2 Internal temperature too low

Reason:

- The internal temperature is too low: 3 °C (5.4 °F) below the temperature set point.

Action:

- Refer to troubleshooting [§7.3](#).

6.3.3 Battery discharged, temperature control inactive

Reason:

- The battery is discharged and cannot provide power to the temperature control system.
- HMI screen runs on backup battery.

Action:

- Refer to troubleshooting [§7.4](#).

6.3.4 Temperature control sensor calibration expired

Reason:

- The temperature control sensor calibration ran out of time (12 months old).
- The recalibration was not performed as scheduled.

Action:

- Replace the container.
- A recalibration is required before using the container.

6.3.5 MSU calibration required

Reason:

- The Multi Sensor Unit calibration ran out of time (12 months old).
- The recalibration were not performed as scheduled.

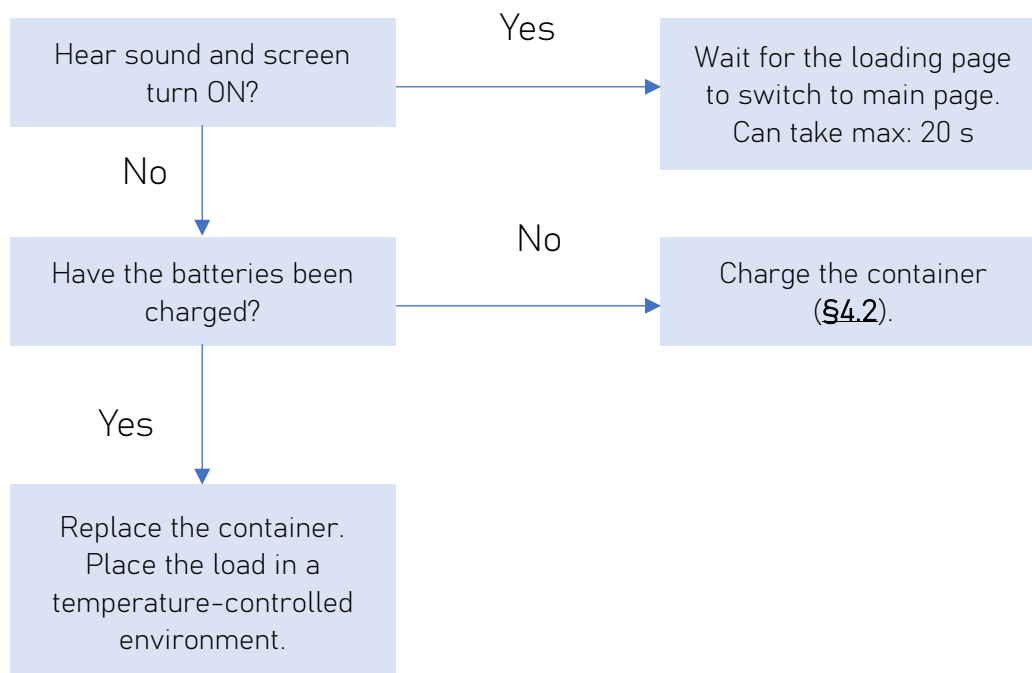
Action:

- Replace the container.
- A recalibration is required before using the container.

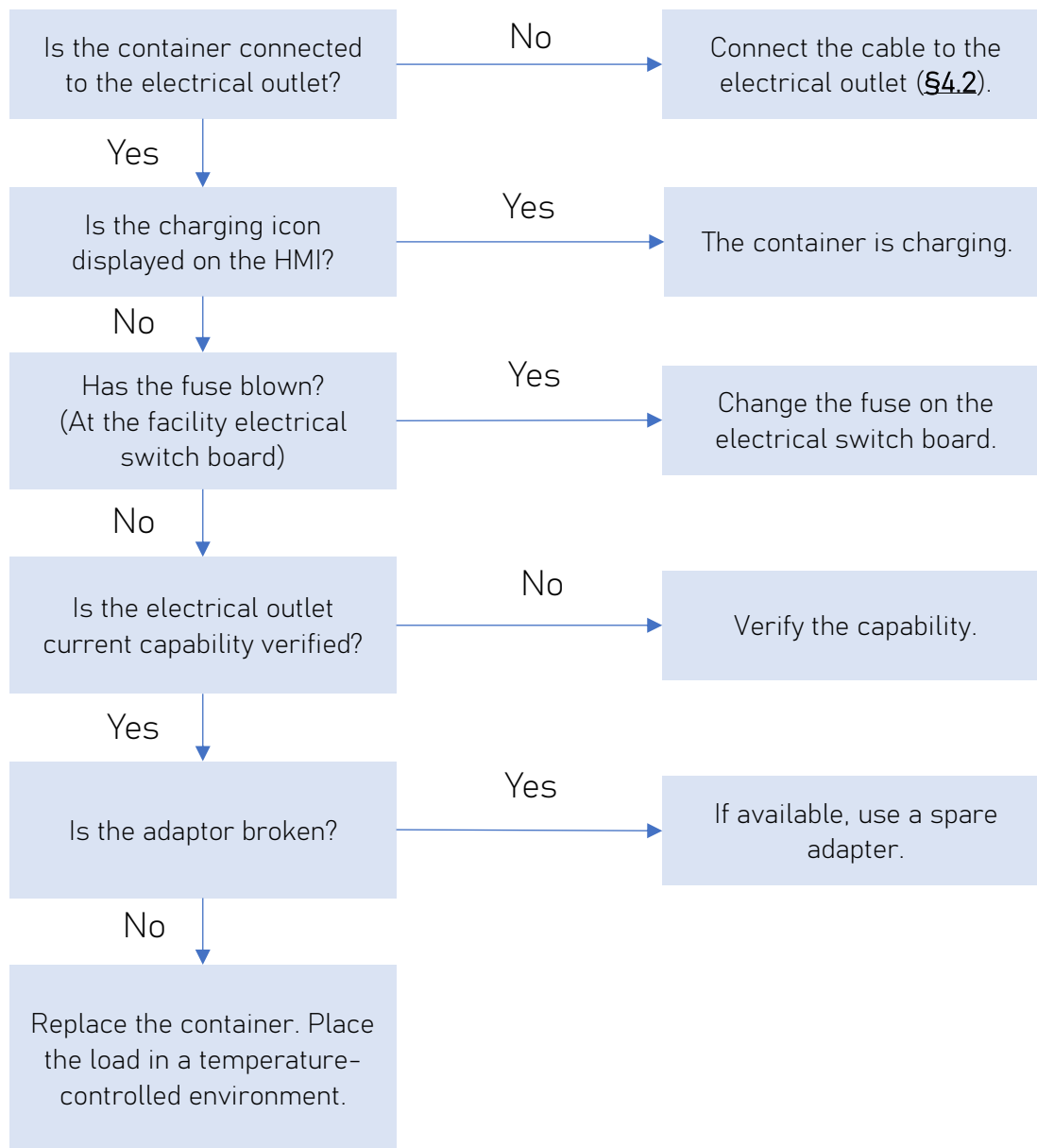
7 Troubleshooting

7.1 HMI screen does not turn ON

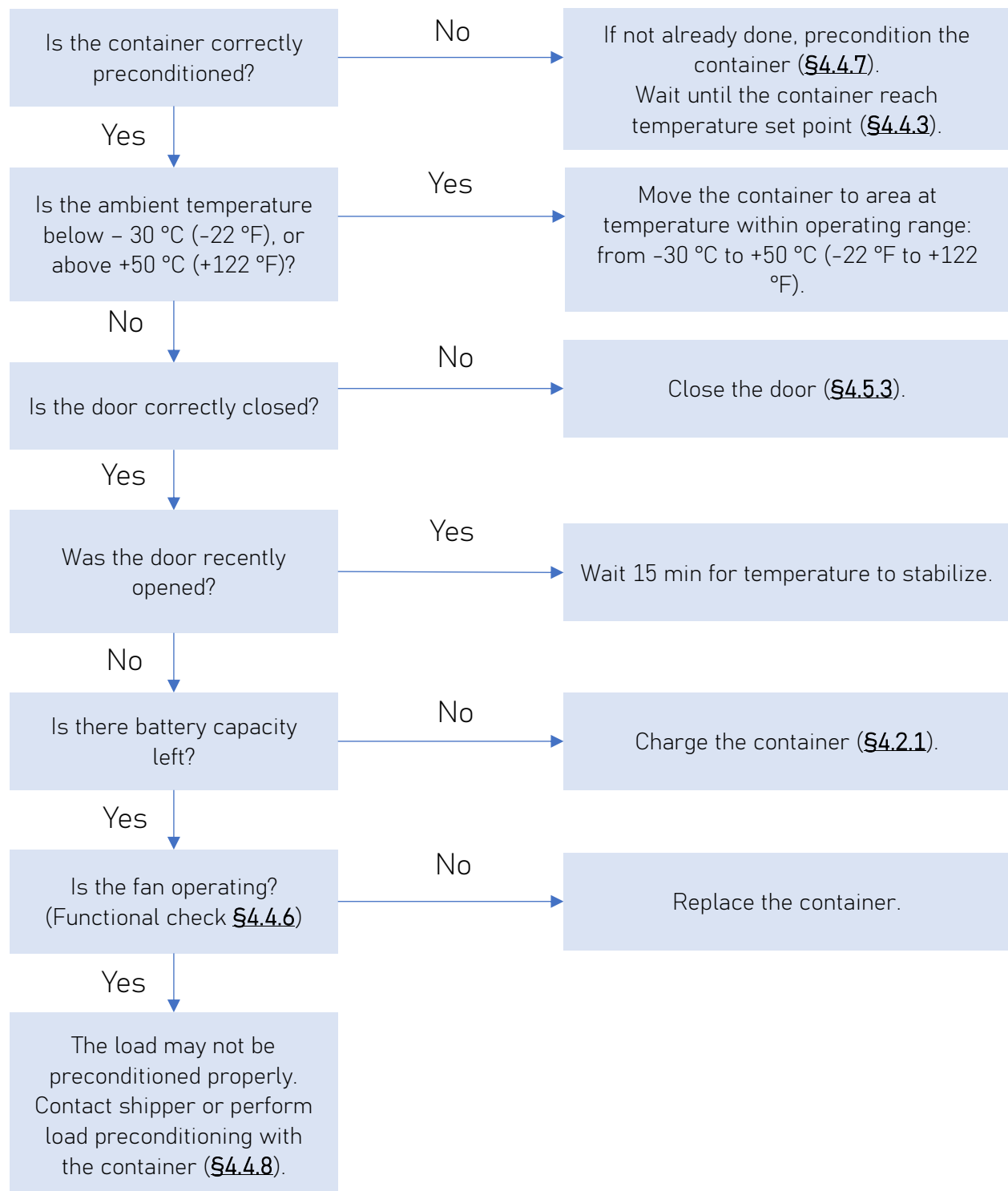
Touch any button of the HMI and wait for 5 sec.



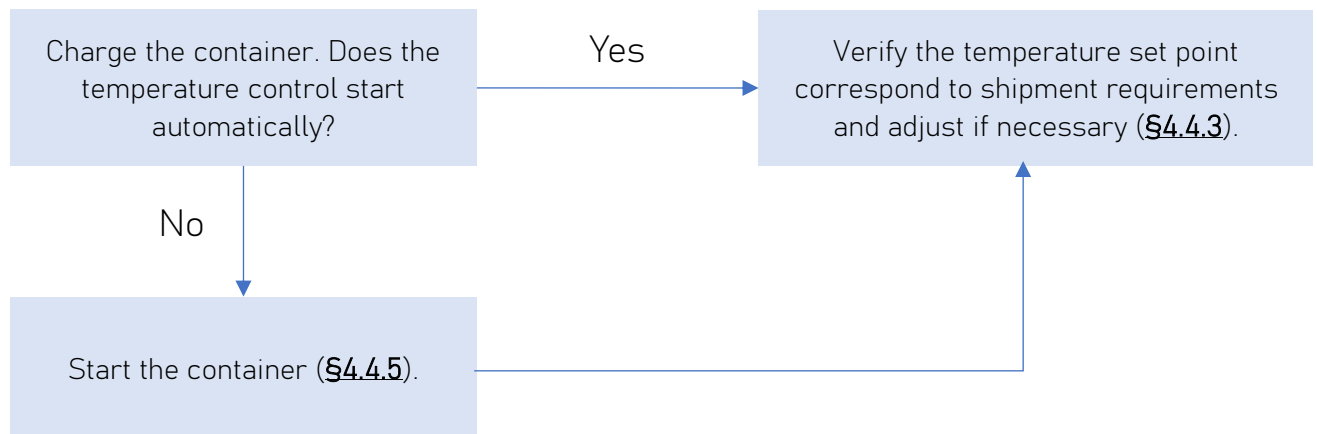
7.2 Batteries do not charge



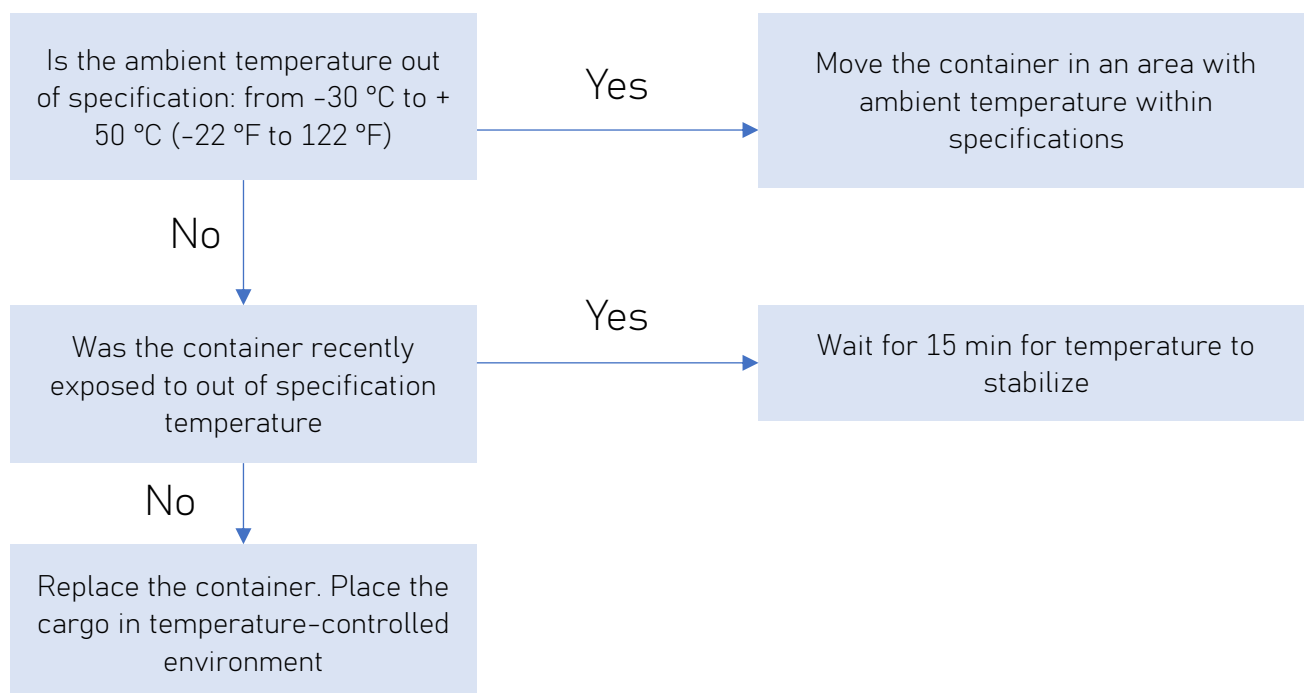
7.3 Internal temperature out of specifications



7.4 Battery empty, temperature control system stopped



7.5 Ambient temperature out of the specification



8 Technical specification

Temperature Control System

System regulating the temperature of the load with redundant compressors and electrical heating.

Powered by rechargeable batteries.

Recharging electrical outlet	Grid: 100-240 VAC, 50-60 Hz Solar Panel: 480 W
Maximum power consumption while charging	1'600 W
Maximum charging time	4 hrs
Temperature set point range	+4 to +25 °C (39.2 to 77 °F)

Dimensions







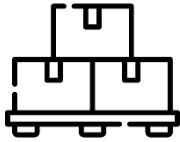


External dimensions (LxWxH) – SAE AS36100 K4	1'985 x 1'534 x 1'621.5 mm
Internal dimensions (LxWxH)	1'379.5 x 1'309.5 x 1'324 mm
Loading volume	2.4 m ³
Minimum load dimensions (LxWxH, pallet included)	1'200 x 800 x 344 mm
Maximum load dimensions (LxWxH, pallet included)	1'220 x 1'200 x 1'300 mm

Weight

Tare weight*	390 kg
Maximum load weight*	1'198 kg
Maximum gross weight	1'588 kg

** Tare weight (and, thus, max load weight) might change after repair, check the manufacturer plate for actual weight.*

9 SAT RKN TCC Check list

	<p>Starting:</p> <ul style="list-style-type: none"> To start temperature control system, press any button on the control unit (HMI) (§4.4.1); On HMI, press  button and follow instructions (§4.4.5).
	<p>Charging:</p> <p><u>Inside:</u></p> <ul style="list-style-type: none"> Connect container to electrical outlet (§4.2.1); Verify the control unit HMI starts and ensure the charging icon is displayed. <p><u>Outside:</u></p> <ul style="list-style-type: none"> During the day, place the container under direct illumination from the sun (§4.2.2); Start the HMI and verify the solar charge from the main page (§4.2.2).
	<p>Pre-conditioning:</p> <ul style="list-style-type: none"> Prior to loading, container must be preconditioned (§4.4.7); If required, container can precondition load (§4.4.8); Set temperature in settings page  on the HMI (§4.4.3); Switch from °C to °F on the settings page  on the HMI (§4.4.4).
	<p>Loading:</p> <ul style="list-style-type: none"> Place load on pallet and secure it with shrink wrap or similar; Ensure airflow between load and floor, do not shrink wrap the pallet; Open door and hold it open with hook (§4.5.1); Place load in container (§4.5.2) and secure it with tie down track; Close door and ensure keeper locked the cam (§4.5.3); Check there are no alarms / alerts on the HMI (§4.4.1); Ensure sufficient battery level before unplugging cable (§4.2.1); Ensure cable and all 6 adapters are placed in cable box (§4.2.1).
	<p>Handling:</p> <ul style="list-style-type: none"> Move container with forklift from forward / aft side (§4.3.1); Aim for the forklift pocket and do not push container with forklift; The Container base must not touch the ground when moved (§4.3.1); Comply with ambient limits (§5).
	<p>Storage:</p> <ul style="list-style-type: none"> Do not stack with objects heavier than 390 kg; When stacking, always use wooden panel on roof to protect photovoltaic panels (§4.3.3); Follow storage instructions (§4.3.3), comply with ambient limits (§5).