swiss airtainer

User Manual

RKN Temperature Controlled Container

www.swissairtainer.com

RKN Temperature Controlled Container
P/N 0120C90d-00-A
Doc. Number 0120-OT-C90d-001
Revision C

1 Revision record

Revision A	Initial release.
Revision B	Minor changes to text and layout.
Revision C	Modification of the wireless transmission instruction before and after flight §5.4.9, §5.4.10, and §5.4.11, following the in-flight detection qualification.

2 Abbreviations and acronyms

HMI	Human-Machine Interface
MSU	Multi Sensors Unit
ODLN	Operational Damage Limits Notice
TCC	Temperature Controlled Container

3 Table of contents

4 Introduction

4.1 Scope

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

4.2 Safety instructions

Safe design:

- No sharp edge in structural components.
- Materials used do not constitute any health risk.

Safe handling:


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


Do not charge the container when inside an airplane.


Do not charge the container outdoors, or in a damp, moist environment.

4.3 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.

4.4 Container overview

The temperature-controlled air cargo container is used to transport temperature-sensitive goods in a temperature controlled environment.

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. An **equipment bay** containing the temperature control system;
5. **Photovoltaic panels** on the roof;
6. **Battery** inside the base.

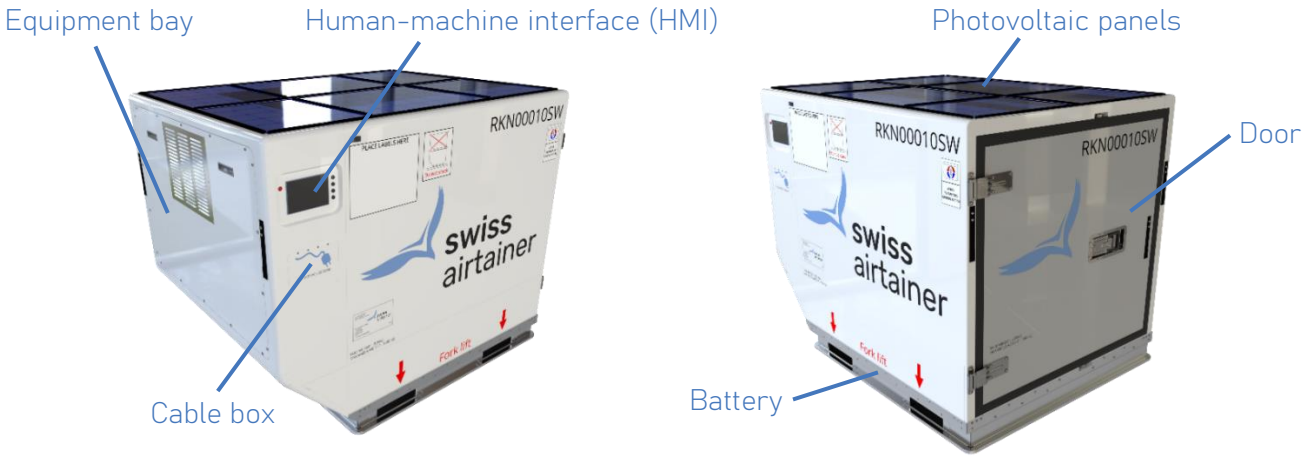


Figure 1 – TCC RKN container

- The container is a forkliftable LD3 for air cargo.
- It can transport either one US pallet 1220 x 1016 mm (48 x 40 in.) or one EU pallet 1200 x 800 mm (47.3 x 31.5 in.). (See §5.5 for loading).

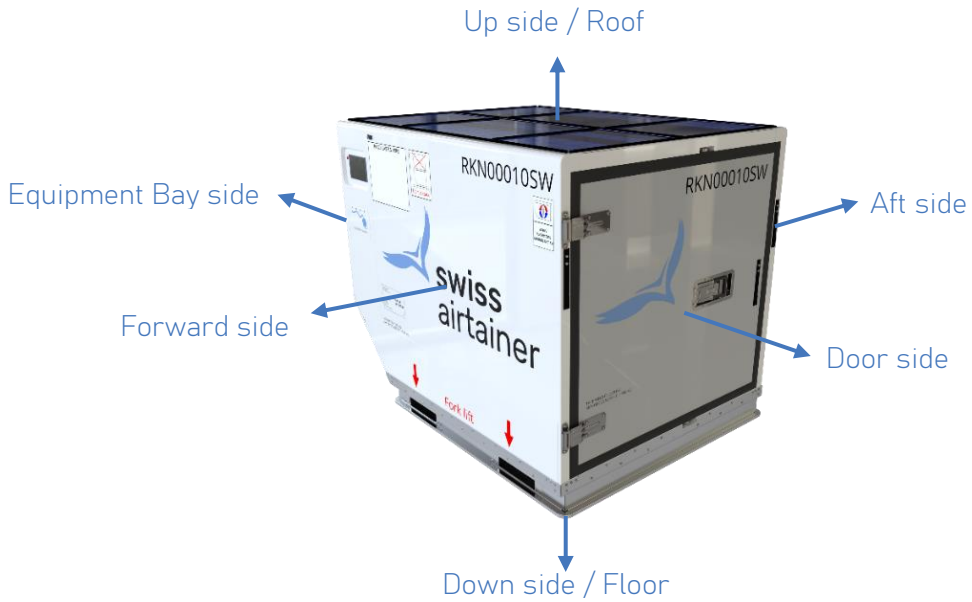


Figure 2 – TCC RKN main orientations.

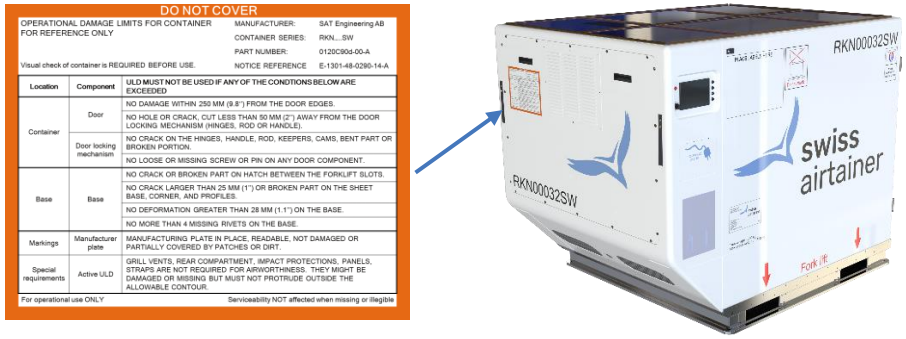
5 Quick guide for operators

OVERVIEW

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

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

5.1 Operational Damage Limits Notice (ODLN) marking


DO NOT COVER

OPERATIONAL DAMAGE LIMITS FOR CONTAINER
FOR REFERENCE ONLY

MANUFACTURER: SAT Engineering AB
CONTAINER SERIES: RKN...SW
PART NUMBER: 0120C90d-00-A
NOTICE REFERENCE E-1301-48-0290-14-A

Visual check of container is REQUIRED BEFORE USE.

Location	Component	ULD MUST NOT BE USED IF ANY OF THE CONDITIONS BELOW ARE EXCEEDED
Container	Door	NO DAMAGE WITHIN 250 MM (9.8") FROM THE DOOR EDGES.
		NO HOLE OR CRACK, CUT LESS THAN 50 MM (2") AWAY FROM THE DOOR LOCKING MECHANISM (HINGES, ROD OR HANDLE).
	Door locking mechanism	NO CRACK ON THE HINGES, HANDLE, ROD, KEEPERS, CAMS, BENT PART OR BROKEN PORTION.
		NO LOOSE OR MISSING SCREW OR PIN ON ANY DOOR COMPONENT.
Base	Base	NO CRACK OR BROKEN PART ON HATCH BETWEEN THE FORKLIFT SLOTS.
		NO CRACK LARGER THAN 25 MM (1") OR BROKEN PART ON THE SHEET BASE, CORNER, AND PROFILES.
		NO DEFORMATION GREATER THAN 28 MM (1.1") ON THE BASE.
		NO MORE THAN 4 MISSING RIVETS ON THE BASE.
Markings	Manufacturer plate	MANUFACTURING PLATE IN PLACE, READABLE, NOT DAMAGED OR PARTIALLY COVERED BY PATCHES OR DIRT.
Special requirements	Active ULD	GRILL VENTS, REAR COMPARTMENT, IMPACT PROTECTIONS, PANELS, STRAPS ARE NOT REQUIRED FOR AIRWORTHINESS. THEY MIGHT BE DAMAGED OR MISSING BUT MUST NOT PROTRUDE OUTSIDE THE ALLOWABLE CONTOUR.

For operational use ONLY — Serviceability NOT affected when missing or illegible

Figure 3 - ODLN marking location.

All containers are labeled 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.

5.2 Charging

WARNING!

- Charging must never take place inside an airplane.
- Charging must not take place in a damp, moist environment.
- Check the cable for damages/abnormalities before connecting it to an electric outlet.
- Check that the cable is not connected to an electrical outlet before moving the container and place it back in the cable box with the adapters.

CAUTION!

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

NOTE

- Max. charging time is 4 hours, with or without container operating. Duration depends on battery level and ambient temp.
- For optimal charging, make sure the ambient temperature is ranging between 0 °C and 25 °C (32 °F and 77 °F).
- The container must be charged within ambient temperature ranging between -30 °C and 55 °C (-22 °F and 131 °F).
- Connect only one container per single-phase electrical outlet to avoid overloading the fuse. Charging a container requires a max of 1600 W when operating and 1000 W when not operating.
- A 240 VAC electrical outlet requires at least 8 A circuit capability.
- A 120 VAC electrical outlet requires at least 16 A circuit capability.

5.2.1 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 in the cable box:

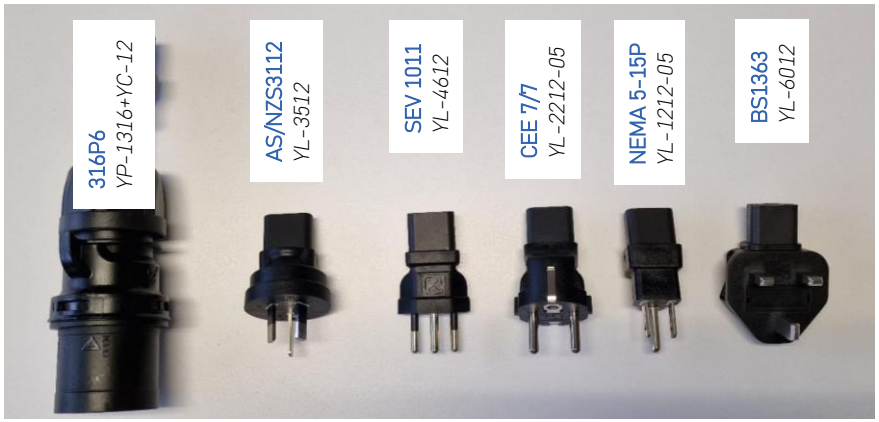


Figure 4 - Available cable adapters in the cable box.

2. Connect the applicable adapter to the cable and then to the electrical outlet;
3. To verify the charging is in progress, turn on the HMI (§5.4.1) and look for the charging icon;

- State of charge can be monitored on the HMI (§5.4.1).
- The battery is considered fully charged above 95 %.

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

5.2.2 Charging with photovoltaic panels

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

This feature is automatic and does not require any intervention:

1. Place the container outside (§5.3.1) during the day and ensure maximum direct sunlight exposure (Figure 5);
2. Avoid shadow in the vicinity of high buildings or structures;
3. The solar charge can be verified from the HMI (§5.4.1).

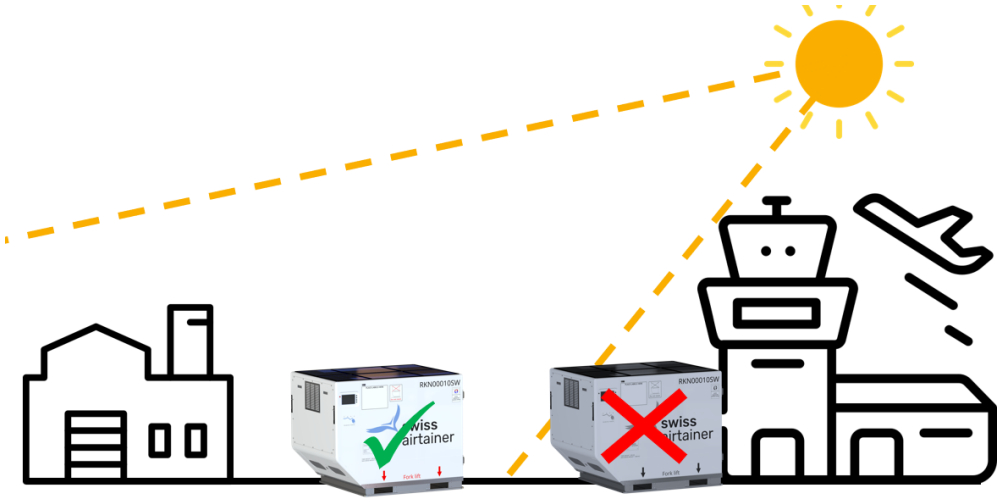


Figure 5 - Positioning of the container for proper sunlight exposure.

5.3 Handling guidelines

5.3.1 Moving the container with a forklift

Move the container with a forklift (Figure 6).

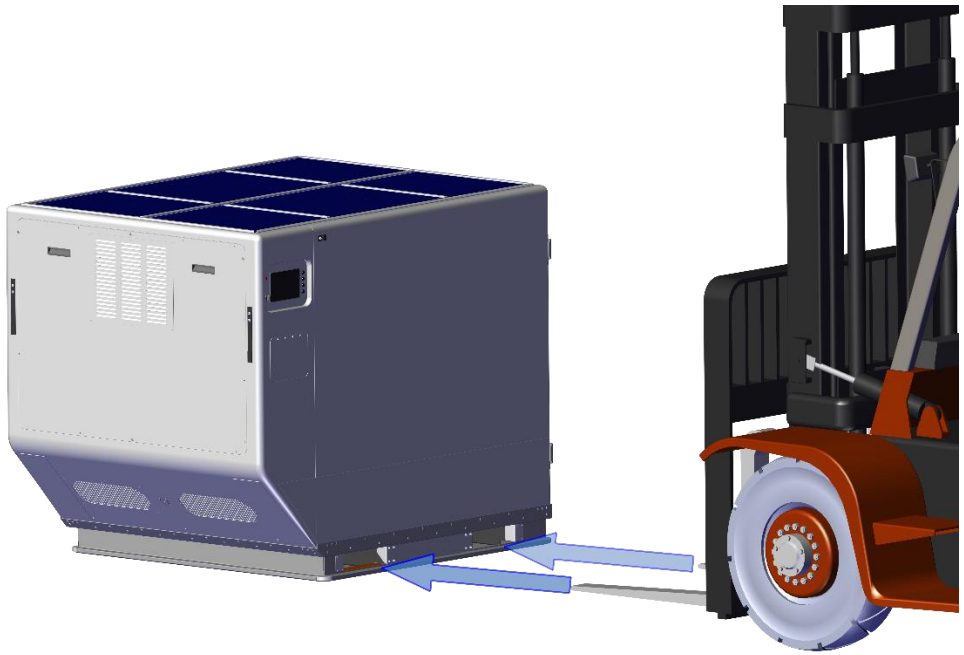


Figure 6 - Forklift pockets located on the forward/aft sides of the container.

CAUTION!

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

5.3.2 Moving the container on a roller bed

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

Figure 7 - Location of the handle straps.

5.3.3 Container storage

- Always store the container on a flat ground at temperatures ranging between -25 °C and 50 °C (-13 °F and 122 °F).
- If stored outside, ensure direct illumination from sunlight to power the photovoltaic panels and enable solar charging.

DO NOT STACK A CONTAINER OR LOAD HEAVIER THAN 400 KG.

WARNING!

- Lightweight containers could fall with strong wind.

CAUTION!

- Sensitive photovoltaic panels on top. A solar charge is impossible in case of stacking.

CAUTION!

- If stacking with a lightweight object, always place a wooden plate, or similar, large enough to rest on both rails (at least 1534 mm) on the container roof to protect the photovoltaic panels (Figure 8).

Figure 8 – Positioning of protective wooden plate on the container roof before stacking.

5.3.4 Charging duration

If the state of charge is lower than 30 % it is recommended to charge the container.

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

Charging time	Average battery state of charge increase
½ hour	~ 12.5 %
1 hour	~25 %
2 hours	~50 %
4 hours	~100 %

Table 1 - Average charging time on an electrical outlet.

5.3.5 Wrapping

Do not wrap the container. It will block the air inlet and outlet and the container will stop operating.

5.4 Control and preconditioning

5.4.1 Control unit: human-machine interface (HMI)

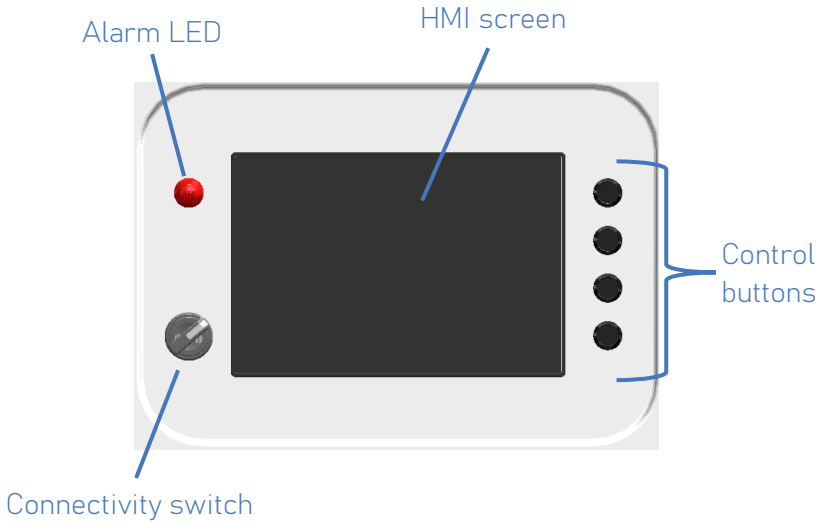


Figure 9 - Control unit – Human/Machine Interface (HMI)

Figure 9 is a touch screen that allows 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 control buttons on the right side to navigate the screen.

To start the HMI:

1. Press any control button (Figure 9);
2. Wait a few seconds for the screen to turn on;
3. The main page will light up (Figure 10).

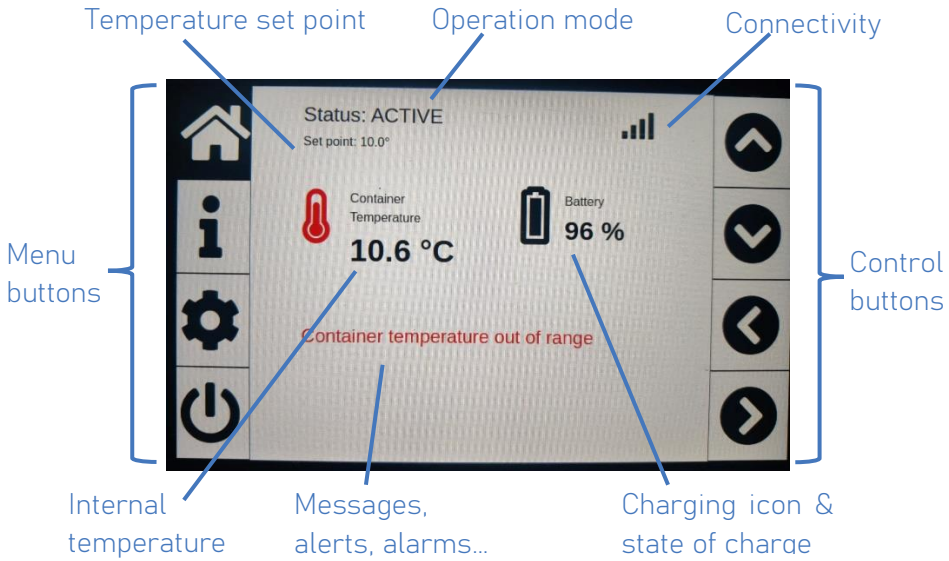


Figure 10 - HMI main page.

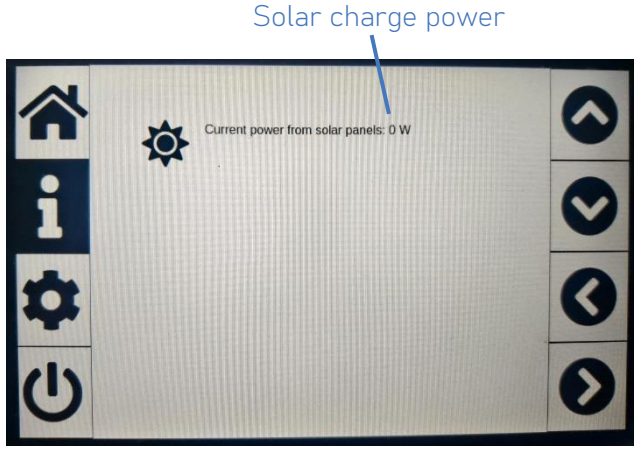


Figure 11 - HMI information page.

5.4.2 Security Code

Certain pages such as temperature setting (§5.4.3) and turning on/off the container (§5.4.5) require a security code.

Contact info@swissairtainer.com for instructions.

5.4.3 Temperature setting

On the touch screen (Figure 12):

1. Click on the settings icon ⚙;
2. Click on the temperature set point;
3. Enter the security code (§5.4.2);
4. Follow screen indications: enter the temperature set point;
5. Validate by pressing ✓.

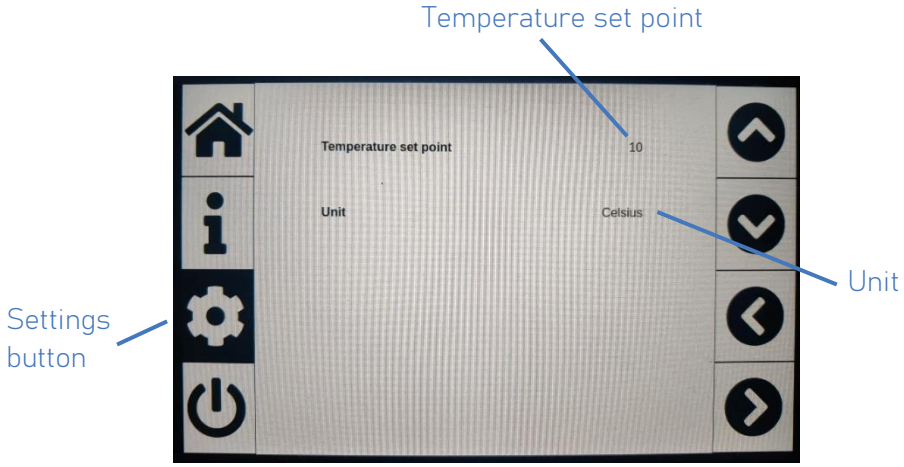


Figure 12 - HMI settings page

5.4.4 Switch between degree Celsius and Fahrenheit

On the touch screen (Figure 12):

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

5.4.5 Turn on/off the container

On the touch screen (§5.4.1):

1. Click on the power button ⏻;
2. A status message will show the current operational mode;
3. Confirm the command by pressing ✓;
4. Enter the security code (§5.4.2).

Figure 13 - HMI activation page

5.4.6 Functional test

- Disconnect the container from the electrical outlet (grid).
- Set the temperature at 5 °C (41 °F) (§5.4.3).
- Start the container (§5.4.5).
- Open the door (§5.5.1).
- Check for airflow coming out of the air ducts located on the upper left and right sides, inside the container (Figure 14).

Figure 14 - Location of the air ducts inside the container.

5.4.7 Preconditioning the container

Precondition the container at the temperature set point before loading:

In a non-temperature controlled environment:

- Recommendation: connect the container to an electrical outlet (§5.2.1).
- Ensure the door is fully closed (§5.5.3).

In a temperature-controlled environment:

- Ensure the door is open and secured (§5.5.1).

In all environments:

- Turn on the HMI (§5.4.1).
- Adjust the temperature set point as required (§5.4.3).
- Make sure you hear the internal fans start, if not already running.
- Make sure there is no alarm or warning reported on the HMI (§7).
- Wait for approximately 20 min.
- Verify that the temperature reached the set point (§ 5.4.1).

5.4.8 Preconditioning the load

The temperature control system can precondition the load itself if required:

- If not already done, precondition the container (§5.4.7).
- Recommendation: connect the container to tan electrical outlet (§5.2.1).
- Place the load in the container (§5.5.2).
- Close the door (§5.5.3).
- Make sure there is no alarm or warning reported on the HMI (§7).
- Verify that the temperature reached the set point (§5.4.1).

5.4.9 Wireless transmission connectivity

Figure 9 has three positions:

- AUTO: The container will automatically detect the flight to disable the wireless transmission before takeoff and enable it after landing.
- ON: The wireless transmission is always enabled.
- OFF: The wireless transmission is always disabled.

5.4.10 Before loading into the aircraft

- Ensure the connectivity switch (Figure 9) is set to the AUTO position (Figure 15).

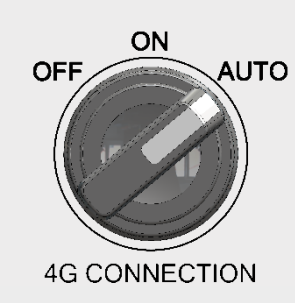


Figure 15 - Connectivity switch set to AUTO position.

5.5 Loading

5.5.1 Door opening

1. Press the lock on the handle to release it (Figure 16);
2. Pull the handle (Figure 16);

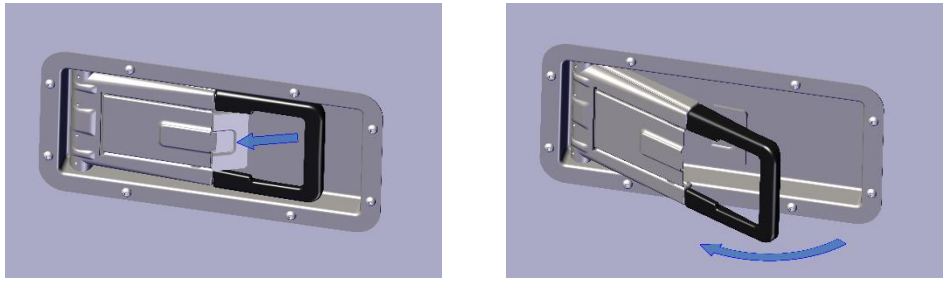


Figure 16 - Door handle opening.

CAUTION!

Always use the hook to secure the door.

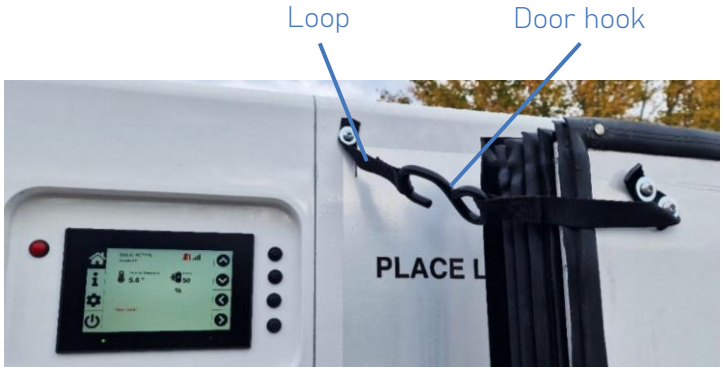


Figure 17 - Door hooked in the open position.

5.5.2 Loading

CAUTION!

1. Place the load on a pallet and secure it with shrink-wrap or similar:
   - Ensure proper weight distribution.
   - Do not wrap the pallet itself to allow air to flow under it.
2. Precondition the load and the container before loading (§5.4.7, §5.4.8);
3. Place the load in the container:
   - Ensure the load is centered inside the container (Figure 18).
   - 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 19);
5. Close the container's door (§5.5.3).

Max. load dimensions (WxLxH) 1219 x 1200 x 1270 mm (48"x 47"x50") including the pallet.

Figure 18 - Pallet loaded in the container.

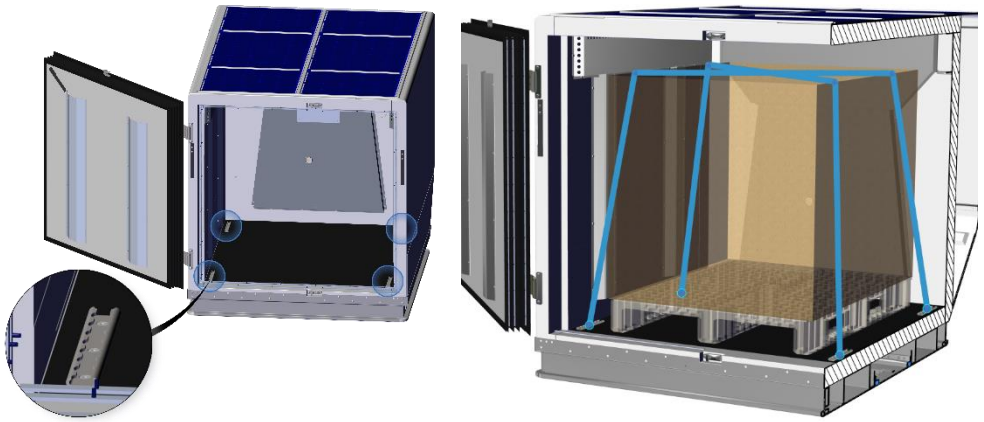


Figure 19 - Straps attachment on the tie-down tracks.

5.5.3 Door closing

1. Press on the door with the handle open;

⚠ WARNING!

2. **When the door seal touches the structure, make sure the two cams hooks the keeper** (Figure 20);
3. At the end, press on the handle until hearing a "click" from the handle lock.

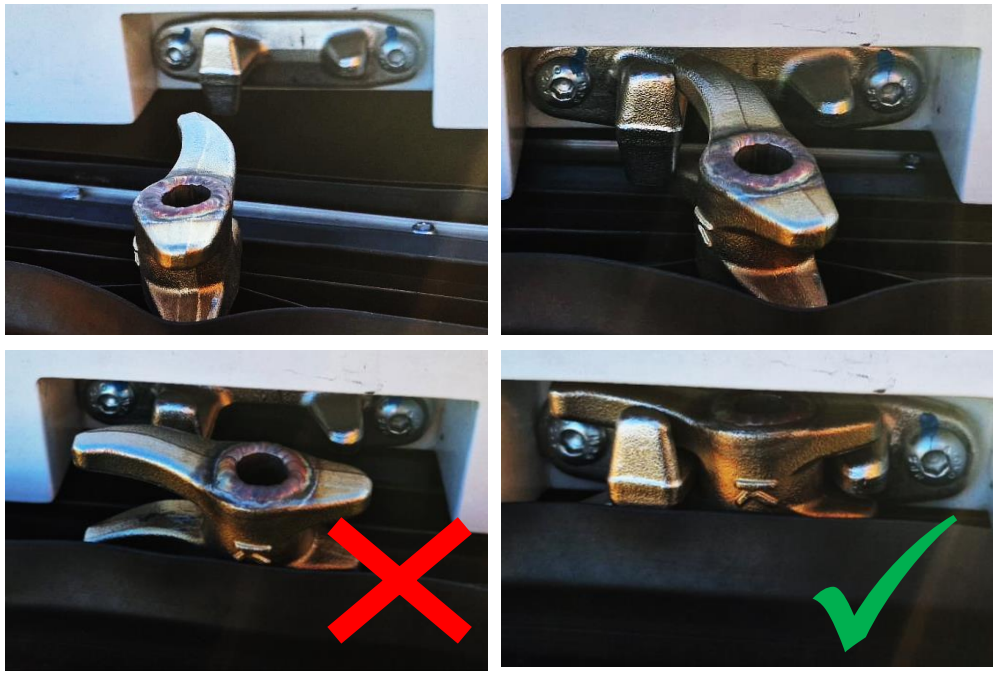


Figure 20 – Correct position of the two door cams.

5.5.4 After loading

1. Check that the battery level is at 90 % or above;
2. Check that internal temperature equals the temperature set point;
3. Check that there is no alert or warning (§7);
4. Check that the alarm LED is off;
5. Check that the door is properly closed (§5.5.3).

5.5.5 Unloading

1. Before unloading, check the container for any damage;
2. Open the door (§5.5.1);
3. Unload the pallet (§5.3.1);
4. Turn off the container.

6 Battery autonomy and ambient temperature limitations

6.1 Autonomy

The container's autonomy corresponds to the maximal duration it can maintain the temperature of the load. It is a function of:

- The battery state of charge.
- The difference between set temperature and ambient temperature.

Power consumption depends on the temperature difference between the interior of the container and the outside environment. To optimize the container's autonomy when running solely on the 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.

Cooling mode: T set point 5 °C / 41 °F and ambient 50 °C / 122 °F	> 20 hours
Cooling mode: T set point 5 °C / 41 °F and ambient 30 °C / 86 °F	> 55 hours
Cooling mode: T set point 5 °C / 41 °F and ambient 20 °C / 68 °F	> 80 hours
Heating mode: T set point 5 °C / 41 °F and ambient 0 °C / 32 °F	> 165 hours
Heating mode: T set point 5 °C / 41 °F and ambient -10 °C / 14 °F	> 50 hours
Heating mode: T set point 5 °C / 41 °F and ambient -30 °C / -22 °F	> 30 hours

Table 2 - Battery autonomy without solar power

The ambient temperature limitations for operating and storage of the container are defined in Table 3.

Operational temperature range	-30 °C to 55 °C / -22 °F to 131 °F
Storage temperature range	-25 °C to 50 °C / -13 °F to 122 °F

Table 3 - Ambient limitations

7 Operation modes, information, alerts, and alarms

7.1 Information

7.1.1 Operation modes - Active/Inactive

The container has two modes: "Active" (on) and "Inactive" (off).

Once the container is active (§5.4.5), it will automatically regulate the internal temperature to the set point.

7.1.2 Charging state – electrical outlet and solar charge

When the container is charging, the power source is indicated as follows:

- Icon  is displayed on the HMI (§5.4.1) while charging from an electrical outlet.
- Icon  is displayed on HMI (§5.4.1) when the solar charge is active.

7.1.3 Preconditioning in progress

Reason:

- A new temperature set point is set (§5.4.3) and the temperature control system is activated (§5.4.5).
- The container is in a preconditioning state until the internal temperature reaches the set point.

7.1.4 Temperature control system 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.

7.1.5 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.

7.2 Alerts

7.2.1 Battery state of charge below 30 %

Reason:

- Prolonged interruption of power supply or insufficient solar energy input.

Action:

- Connect the container to the electrical outlet (§5.2.1).

7.2.2 Battery temperature high

Reason:

- The container battery temperature is too high, above 65 °C / 149 °F.

Action:

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

7.2.3 Door open

Reason:

- The door is not closed.

Action:

- If not loading or preconditioning the container, close the door (§5.5.3).

7.2.4 Ambient temperature out of range

Reason:

- The ambient temperature is out of the range limits: -30 °C to 55 °C (-22 °F to 131 °F).

Action:

- Refer to troubleshooting §8.5

7.3 Alarms

7.3.1 Internal temperature too high

Reason:

- The internal temperature is at least 3 °C (5.4 °F) above the temperature set point.

Action:

- Refer to troubleshooting §8.3.

7.3.2 Internal temperature too low

Reason:

- The internal temperature is at least 3 °C (5.4 °F) below the temperature set point.

Action:

- Refer to troubleshooting §8.3.

7.3.3 Battery discharged, temperature control inactive

Reason:

- The battery is discharged and cannot provide power to the temperature control system.
- HMI is powered by the backup battery.

Action:

- Refer to troubleshooting §8.4.

7.3.4 Temperature control system sensor calibration expired

Reason:

- The validity period of the temperature control system sensor calibration has expired (limit :12 months).
- The recalibration was not performed as scheduled.

Action:

- Replace the container (a recalibration is required and will be performed by Swiss Airtainer).

7.3.5 MSUs calibration required

Reason:

- The validity of the internal temperature sensors calibration has expired (12 months).
- The recalibration was not performed as scheduled.

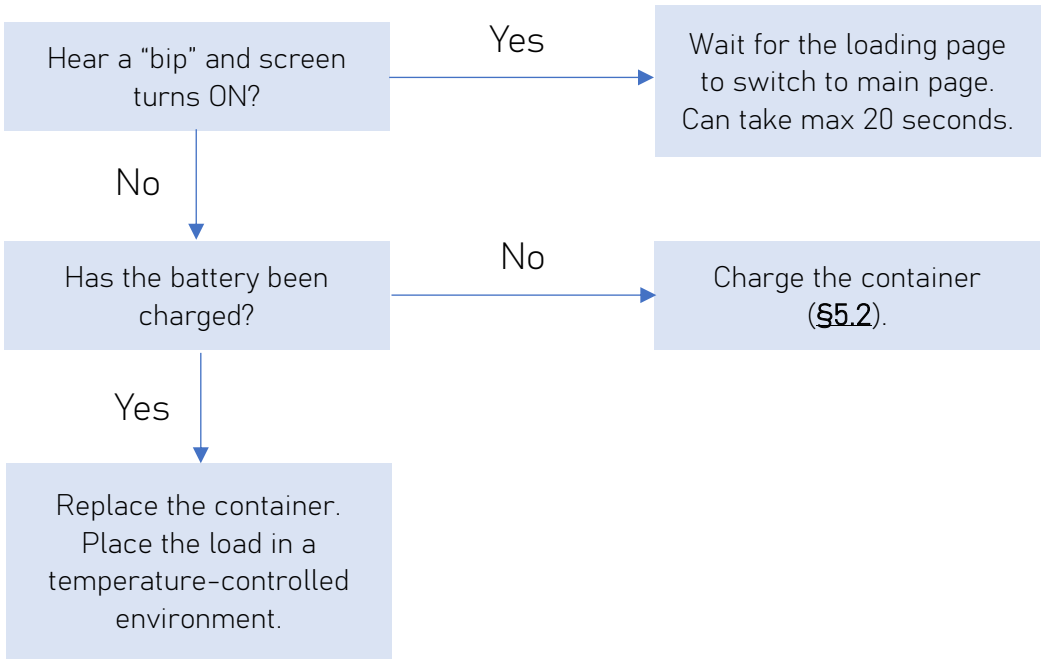
Action:

- Replace the container (a recalibration is required and will be performed by Swiss Airtainer).

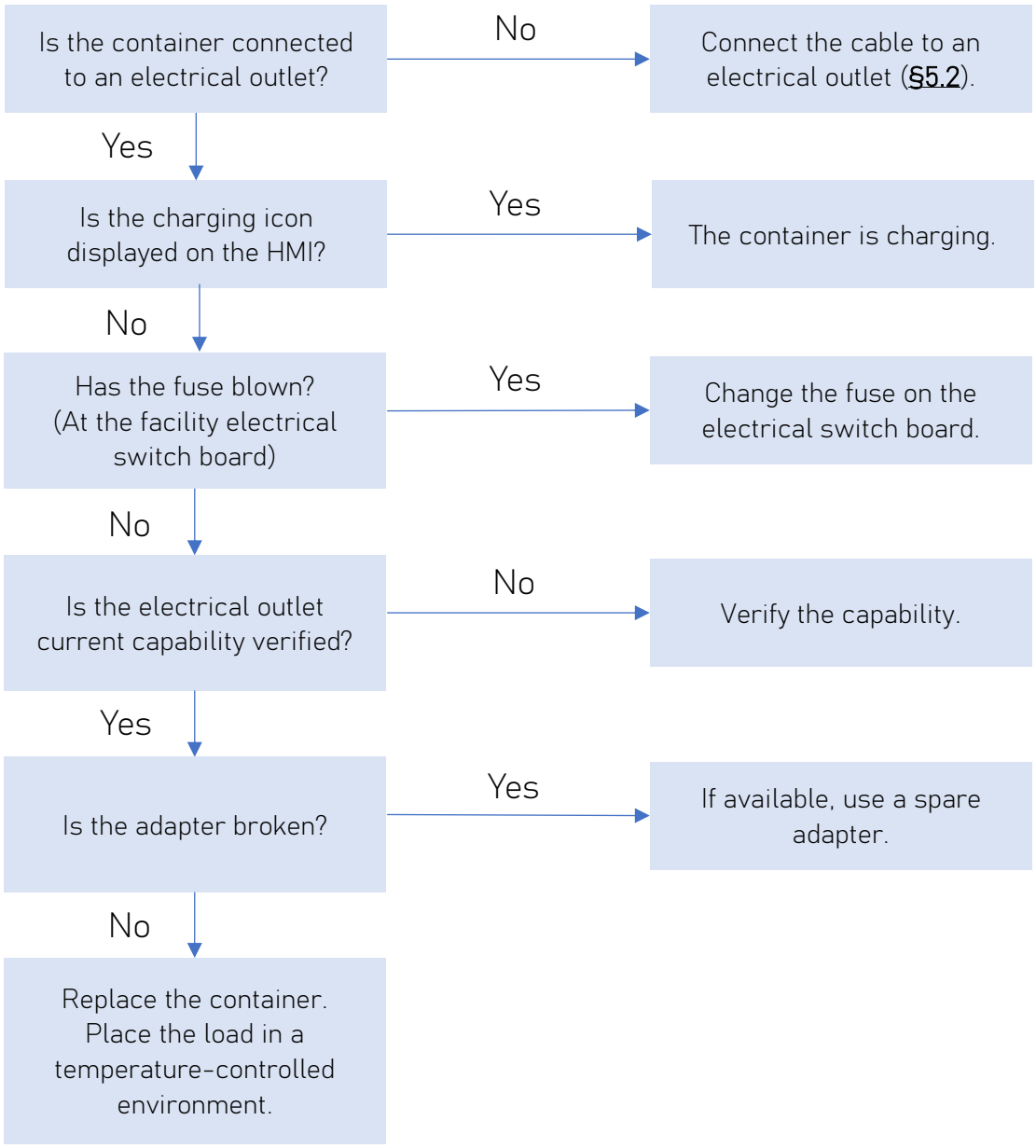
8 Troubleshooting

8.1 HMI does not turn on

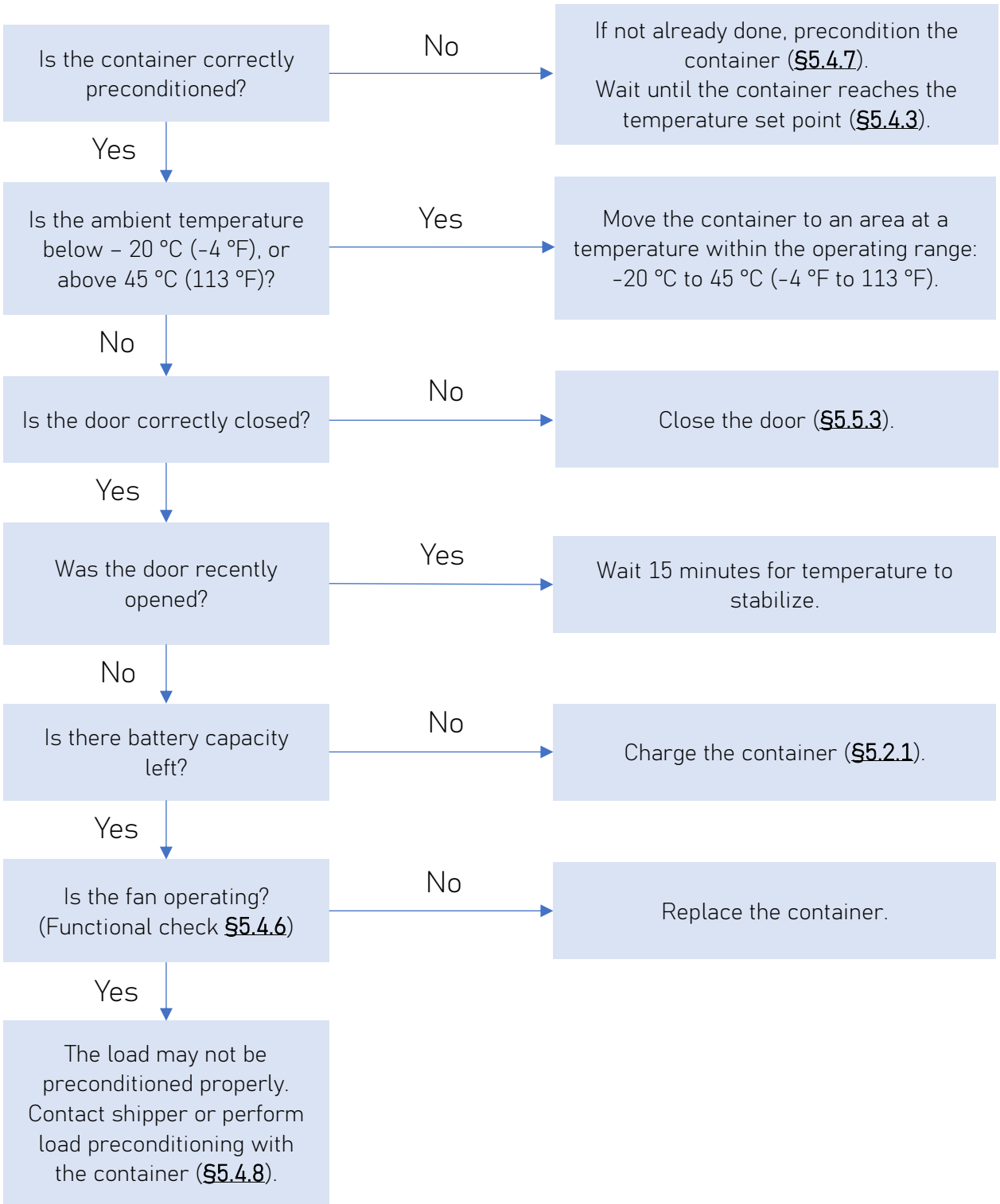
Touch any button next to the HMI and wait for a few seconds.



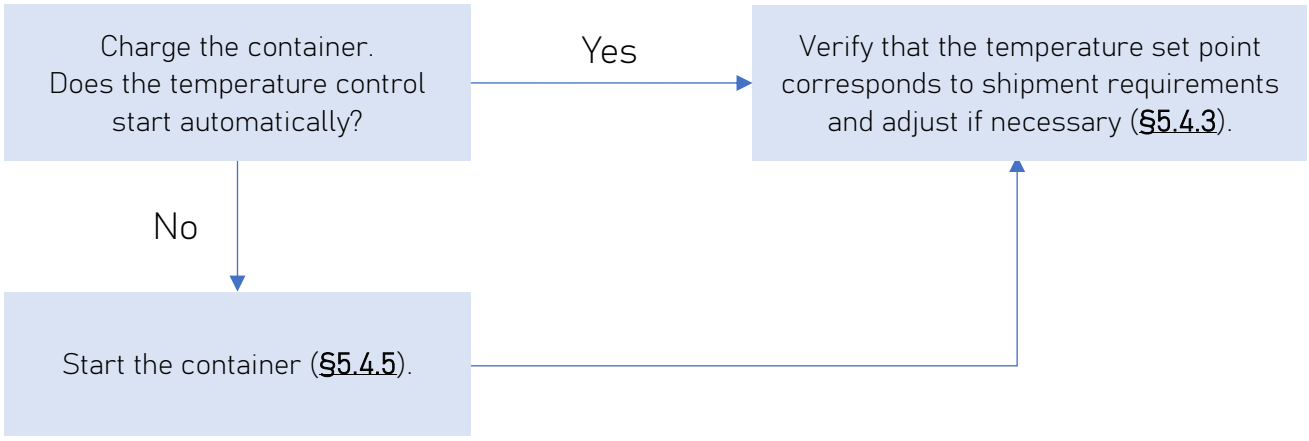
8.2 Battery does not charge



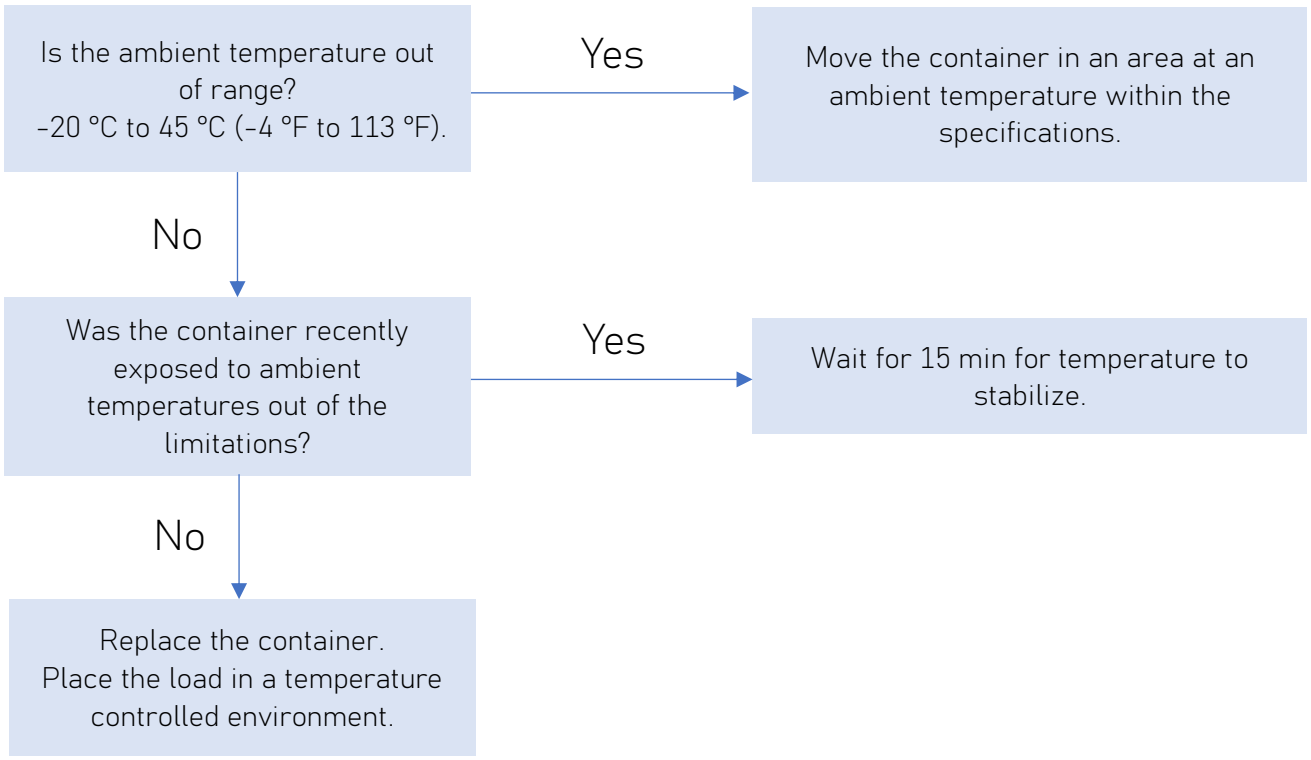
8.3 Internal temperature out of range



8.4 Battery empty, temperature control system stopped



8.5 Ambient temperature out of range



9 Technical specifications

Temperature control system

Recharging electrical outlet	Grid: 100-240 VAC, 50-60 Hz Photovoltaic panels: 480 W
Maximum power consumption while charging	1600 W
Maximum charging time	4 hours
Temperature set point range	4 °C to 25 °C (39 °F to 77 °F)

Dimensions

External dimensions (LxWxH) - SAE AS36100 K4	1985 x 1534 x 1621.5 mm
Internal dimensions (LxWxH)	1377.5 x 1309.5 x 1328 mm
Internal volume	2.4 m^3
Minimum load dimensions (LxWxH) pallet included)*	1200 x 800 x 625 mm
Maximum load dimensions (LxWxH), pallet included)	1220 x 1200 x 1300 mm

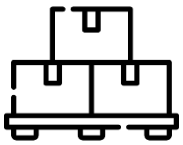
Weight

Tare weight**	390 kg
Maximum load weight**	1198 kg
Maximum gross weight	1588 kg

** Size of the minimum tested load guaranteeing the performance mentioned in the specifications.*

*** Tare weight and max. load weight might change after repair. Check the manufacturer plate for actual weight.*

10 Checklist

	**Starting** • Press any button on the control unit (HMI) to start the temperature control system (§5.4.1). • Press the ⏻ button on the HMI and follow the instructions (§5.4.5).
	**Charging** Inside: • Connect the container to an electrical outlet (§5.2.1). • Verify that the HMI starts and ensure the charging icon is displayed. Outside: • During the day, place the container under direct sunlight exposure (§5.2.2). • Start the HMI and verify the solar charge from the main page (§5.2.2).
	**Preconditioning** • The container must be preconditioned before loading (§5.4.7). • The container can precondition the load if required (§5.4.8). • Set the temperature in the settings page on the HMI (§5.4.3). • Switch units from °C to °F on the settings page on the HMI (§5.4.4).
	**Loading** • Place the load on a pallet and secure it with shrink wrap or similar. • Ensure airflow between load and floor, do not shrink-wrap the pallet. • Open the door and secure it with its hook (§5.5.1). • Place the load and secure it with the tie-down tracks (§5.5.2). • Close the door and ensure the correct position of the cams (§5.5.3). • Check that there is no alarm/alert on the HMI (§5.4.1). • Ensure a sufficient battery level before unplugging the cable (§5.2.1). • Ensure the cable and all six adapters are placed in the cable box (§5.2.1).
	**Handling** • Move the container with a forklift from forward / aft sides (§5.3.1). • Aim for the fork pockets and do not push the container with a forklift. • The container base must not touch the ground when moving (§5.3.1). • Comply with ambient limitations (§6).
	**Storage** • Do not stack any objects heavier than 400 kg on top of the container. • When stacking, always use a wooden panel on the roof to protect the photovoltaic panels (§5.3.3). • Follow storage instructions (§5.3.3). • Comply with the ambient limitations (§6).