promobot

Promobot ThermoControl Plus

Autonomous Screening Station
for Temperature Measurement

promo-bot.ai

Contents

1. General information

1.1. Description and primary functions

ThermoControl Plus (**ThermoControl** or **device**) is a screening station for automatic contactless face temperature measurement with facial recognition functionality.

The device performs a facial skin temperature measurement at a distance of up to 25 cm without interaction with another person or with the device's surface. It can be set up to automatically save the person's photo and the results in a database. It will notify the operator if the user's face temperature is above average. It can store the results with the person's full name and be integrated with access control systems. The station adjusts its sensor according to the user's height to ensure the proper temperature measurement.

1.2. How ThermoControl Plus measures temperature

A human body temperature is not constant. It differs not only from person to person, but from one part of the body to another. For the most accurate results, specialists recommend measuring temperature in the armpit or rectally. In a high throughput area, these options are not viable. One of the best solutions is a contactless temperature measurement taken from a person's face.

ThermoControl is a screening station made for automatic contactless face temperature measurements.

Human faces don't have a consistent temperature throughout the surface (Fig. 1). The manufacturer considered that when developing the screening logic. The device measures the temperature in 10 points of a person's face. A temperature sensor moves from the top to the bottom of the face, starting at the forehead and ending on the lips, determining the most precise temperature rate. The most accurate measurement is provided when the forehead is uncovered (Fig. 2).

ThermoControl does not measure temperature orally, in the armpit or rectally.

Human's face may become colder or hotter depending on weather conditions. It is not recommended to measure temperature immediately upon entering the building; user must wait until face temperature evens out.
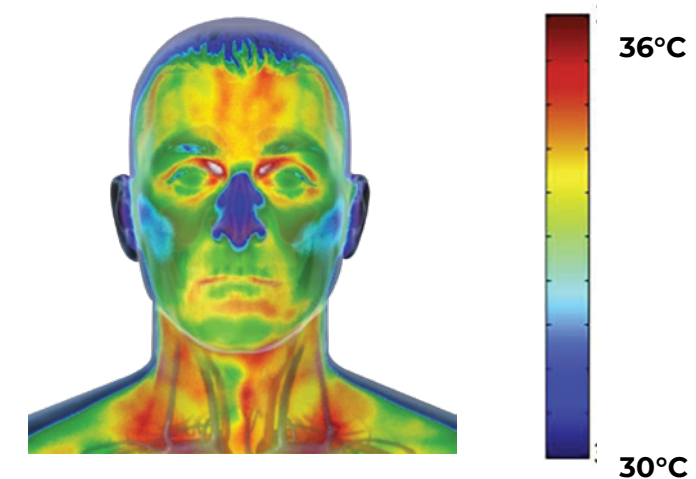

Fig. 1 **Face heatmap**

Make sure you provide the most accurate measurement.

1. Remove your headwear

2. Remove your glasses and mask

3. Make sure your forehead is dry
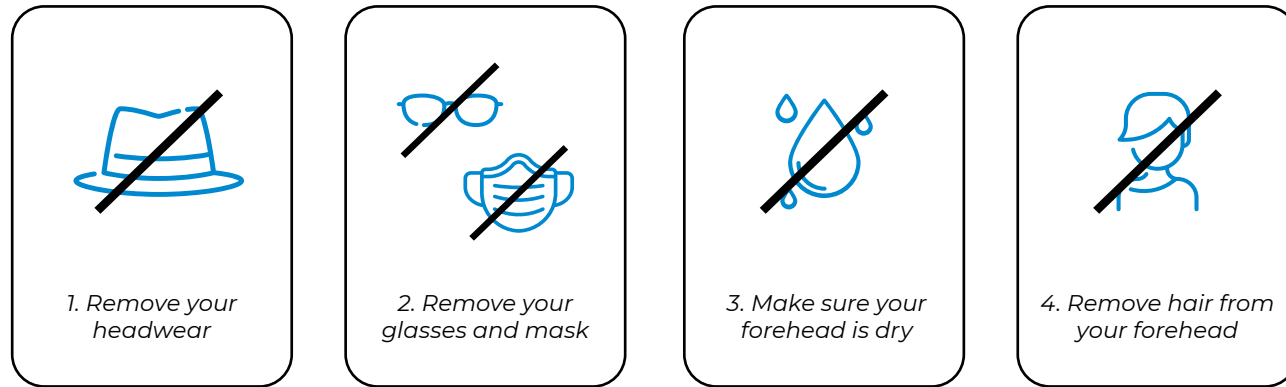
4. Remove hair from your forehead

Fig. 2 *Measurement guidelines*

The following factors affect a healthy person's body temperature:

- individual metabolism;
- age (small children generally have a higher body temperature);
- clothes;
- outside temperature;
- a time of day (body temperature is lower in the morning and higher at the end of the day);
- physical labor;
- menstrual cycle;
- makeup.

1.3. Technical characteristics*

Table 1. **Technical characteristics**

Name	Value
Min dimensions, LWH, cm	1260 x 625 x 550
Max dimensions, LWH, cm	1840 x 625 x 550
Weight, kg	55
Display size, inches, no less than	21.5
Temperature measurement range, °C	+36 – +42
Measurement accuracy, °C	±0.2
Measurement speed, seconds	1 – 5
Measurement distance, cm, up to	25
Operating temperature range, °C	+18 – +40
Network interface	Wi-Fi 802.11ac / Ethernet
Power grid voltage, Volts	220 / 110
Power grid frequency, Hz	50 – 60
Power consumption, W	350
Server storage at the client's facility	Available
Integration with access system	Available
Online video calls	Available

⚠ ** The manufacturer reserves the right to change the location of the product's built-in computing module, both inside and outside of the device's casing.*

1.4. Design

The station consists of the following elements, as illustrated in Fig. 3.

Proximity/distance sensor

Camera

Temperature sensor

Microphone

Display

Guide block

Speaker

Main section
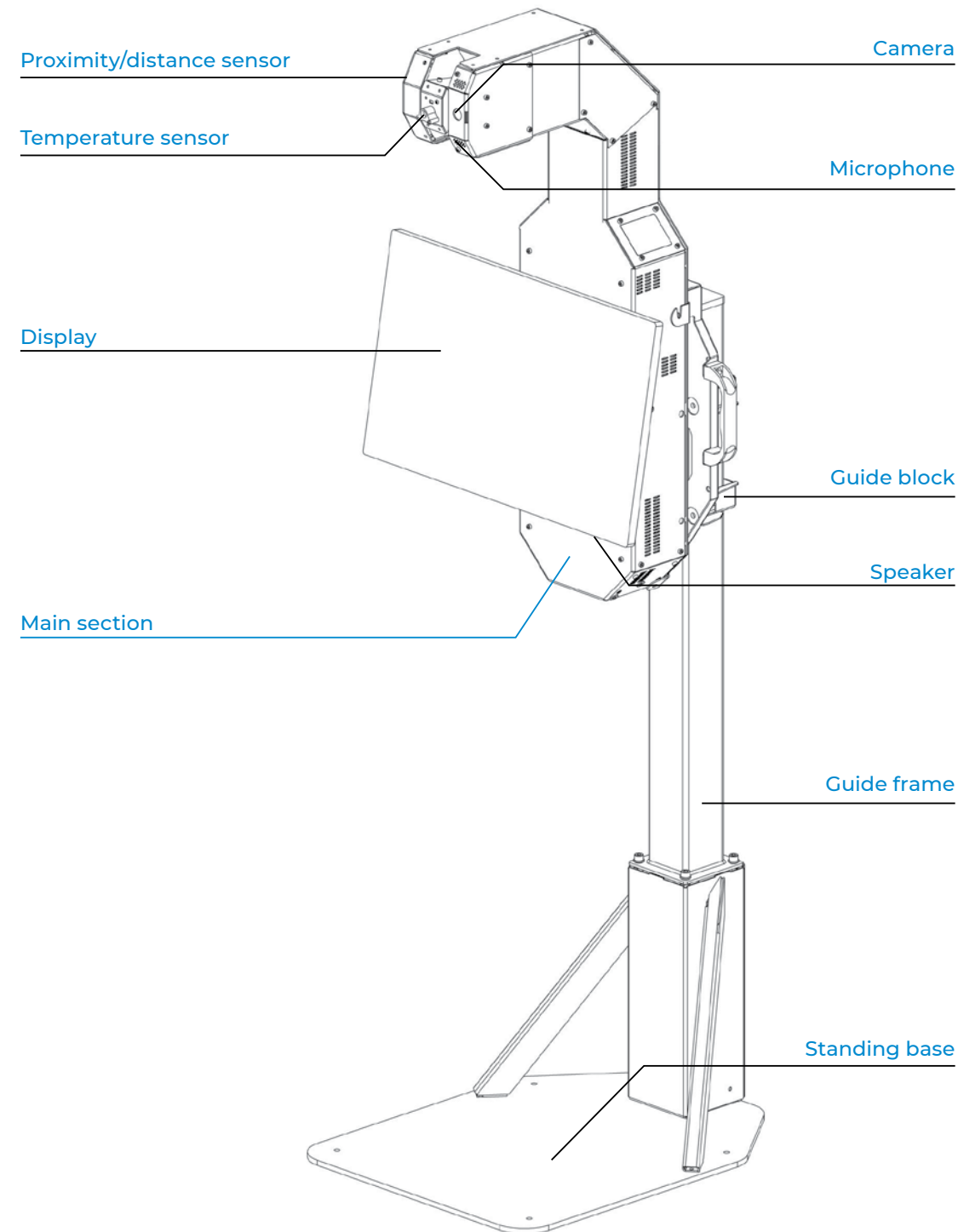
Guide frame

Standing base

Fig. 3 Promobot ThermoControl Plus screening station

1.5. Design and functionality

The ThermoControl Plus screening station functions as a complex stationary electrodiagnostic device connected to the Internet via Ethernet or Wi-Fi supporting the 802.11 AC standard.

In normal operation mode, the screening device:

- detects and recognizes the user's face;
- automatically adjusts a built-in temperature sensor;
- performs a contactless face skin temperature measurement using the temperature sensor (with accuracy of 0,2°C within +36 – +38°C temperature range and 0,3°C accuracy within other temperature ranges measuring human skin or any compatible materials);
- displays instructions during the measurement process;
- displays measurement results;
- color-codes the results (green color if the temperature is normal, red if it is above normal);
- logs a person's photo and the measurement result and saves them in the database on a server;
- is remotely monitored via web service;
- notifies the station operator in case of high/low temperature via the web service;
- provides video chat functionality between the operator and the user after the measurement.

The station can operate offline without connection to the Internet. In this case, remote monitoring and notifications to the operator may function via a local network.

2. Intended use

2.1. Usage limits

Usage limits are imposed in accordance with the main technical characteristics of the device (Table 1).

2.2. Assembly, setup and launch

2.2.1. Preliminary safety measures

The station is a complex electronic device that is constantly connected to the power grid. The device must be installed on a flat, hard surface and grounded. Installation, disassembly, transportation, preparation for operation, and maintenance of the device are carried out only when the power cable is disconnected from the socket.

Visual inspection of the main device nodes is mandatory before using the station. **DO NOT** operate the station with a malfunctioning power unit and damaged power cord.

The power supply parameters must correspond to the main technical characteristics of the device. **DO NOT** operate the station with unstable power grid voltage.

2.2.2. Assembly

Before the device is assembled, all of its main elements must be removed from the soft packaging and checked for completeness. Package contents (Table 2) include:

Table 2. Package contents

Name	Quantity
Standing base (a & b)	1 pc.
ThermoControl Plus main section	1 pc.
Display	1 pc.
Rails	2 pcs.
Guide frame	1 pc.
Guide block	1 pc.
Pipe plug	1 pc.
Mounting bolt M4*8	4 pcs.
Mounting bolt M6*8	1 pc.
Mounting bolt M6*12	2 pcs.
Mounting bolt M6*16	8 pcs.
Mounting bolt M6*14	4 pcs.
Mounting bolt M4*12	6 pcs.
Mounting bolt M6*20	2 pcs.
Mounting bolt M8*20	4 pcs.
Washer M8	4 pcs.
Washer M6	4 pcs.
Plastic washer	2 pcs.
Anchor	4 pcs.
Sticky pad	4 pcs.
Toolkit	1 pc.
User manual	1 pc.
Power cord	1 pc.

a – 1x

b – 1x

c – 1x

f – 1x

d – 1x

e – 1x

h – 1x

m – 1x

k – 1x

* refer to pic. 10; 13 if a rear panel is angled

k – 1x

* refer to pic. 10.1; 13.1 if a rear panel is rounded
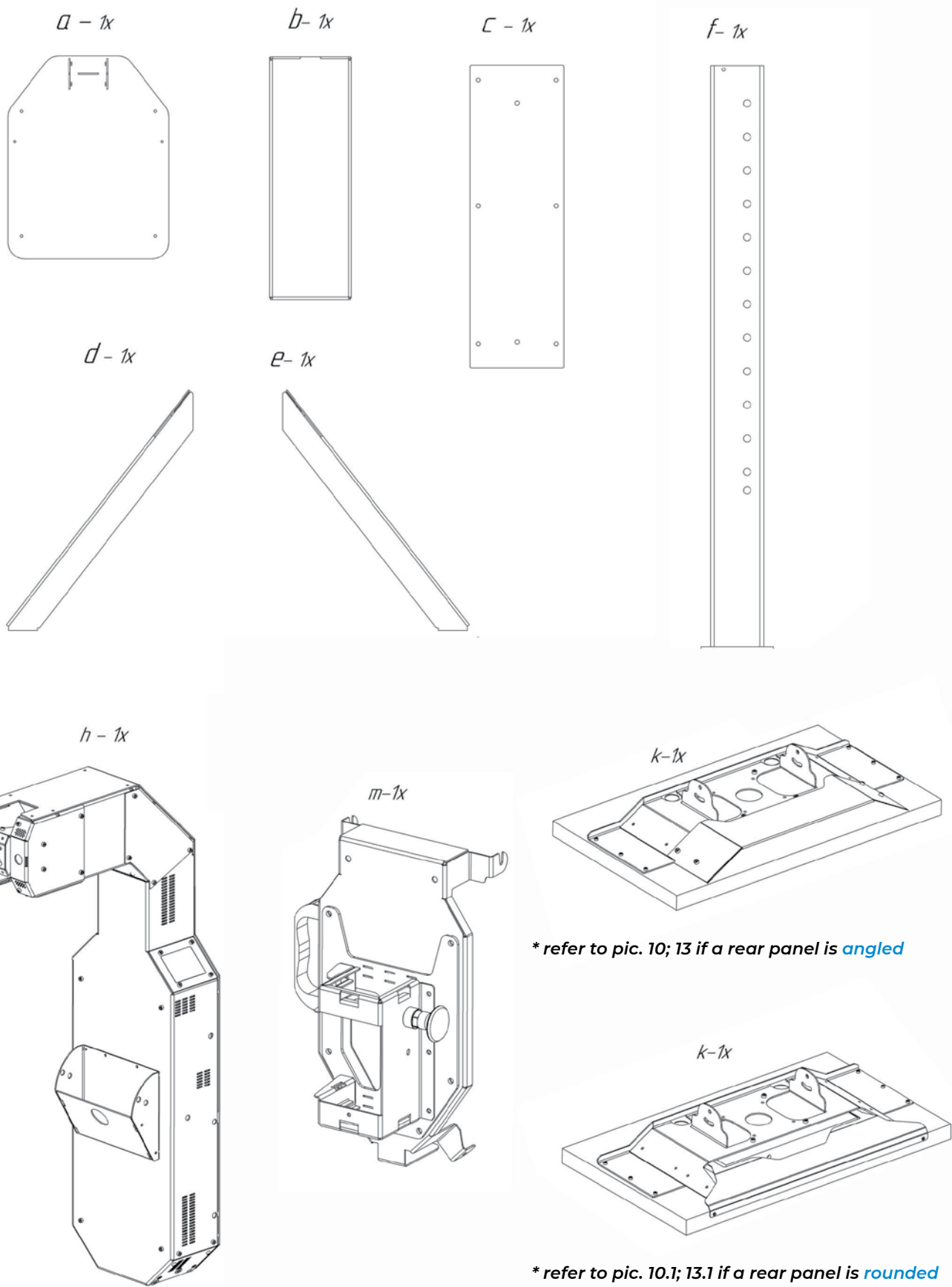
Fig. 4.1 *Package contents, pt. 1*

FS-573	4x	FS-621	6x	FS-2313	1x	FS-588	2x	FS-595	4x
M4×8		M4×12		M6×8		M6×12		M6×14	
FS-599	8x	FS-609	4x	FS-598	2x	FS-706	4x	MH-2195	2x
M6×16		M8×20		M6×20		φ8		φ6×17×3	
FS-587	4x	FS-2154	4x	PK-2158	4x	MH-2323	1x		
φ6		φ8×65		40×40		80×80			

H2	H3	H4	H5	H6

Fig. 4.2 *Package contents, pt. 2*

The following steps are needed in order to assemble the device. Numbers next to the images indicate the assembly steps. These steps must be performed in the order presented.

> **!** **The assembly process involves lifting heavy objects and circuit wiring. Please keep that in mind before getting started.**

1

2

3

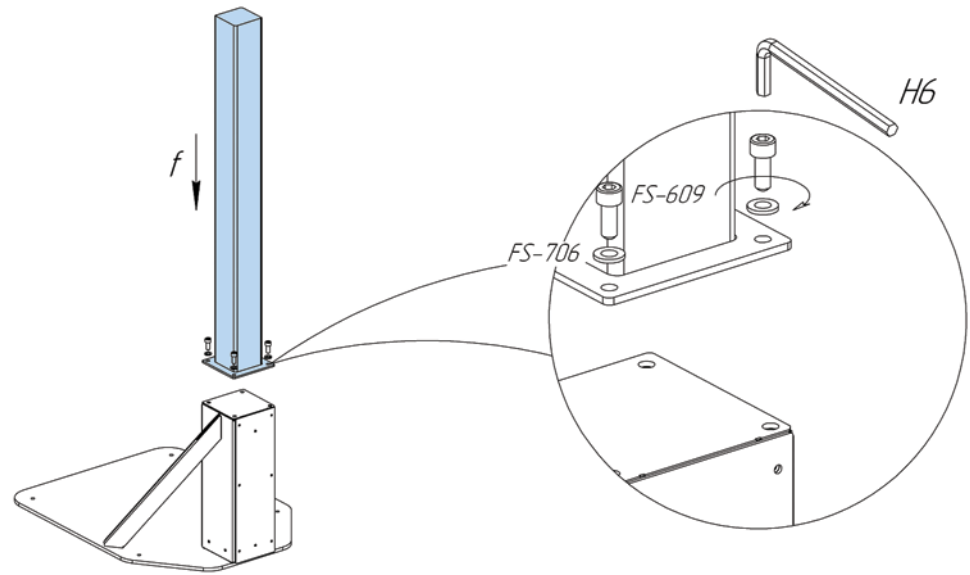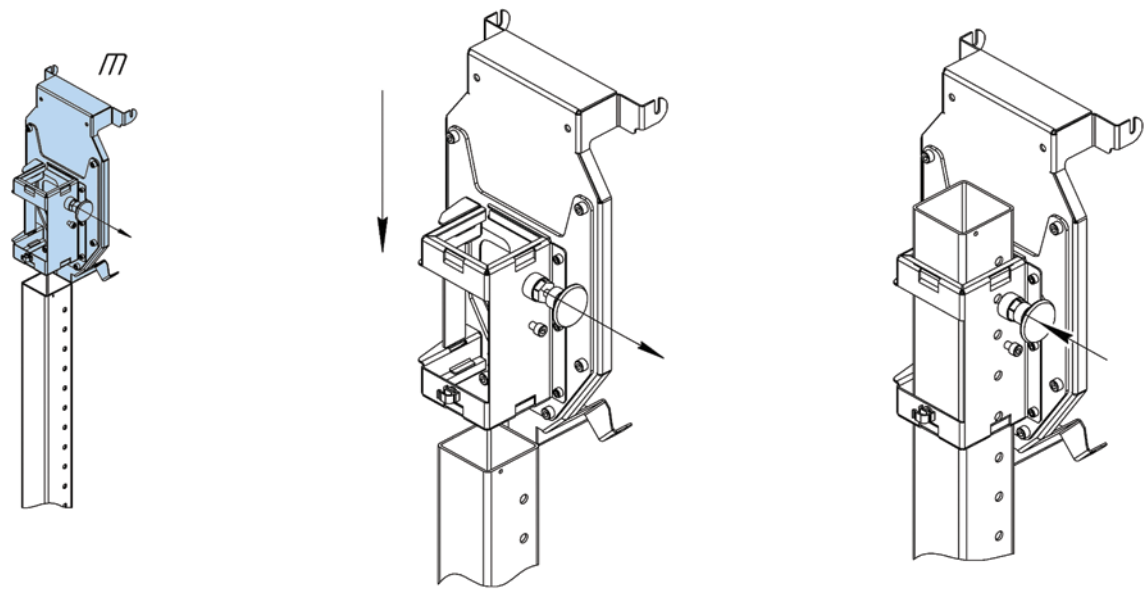**4**

5

f

H6

FS-609

FS-706

7

MH–2323

H5

FS-2313

6

m
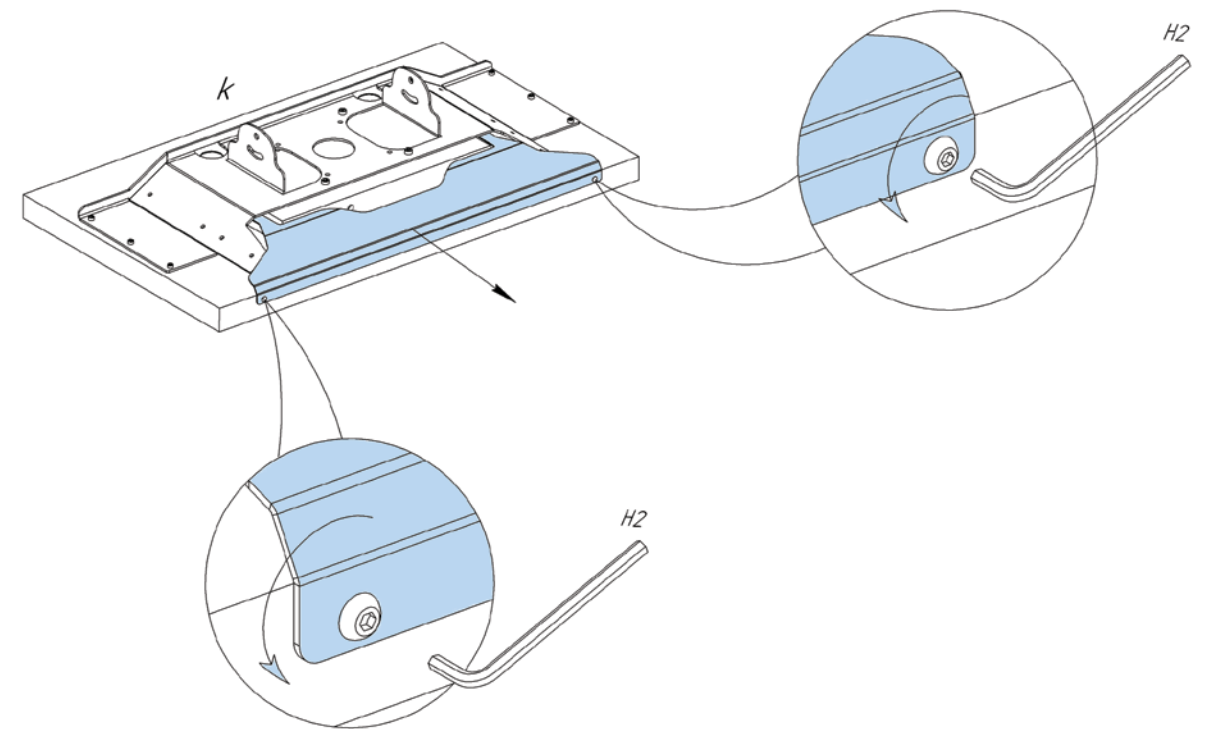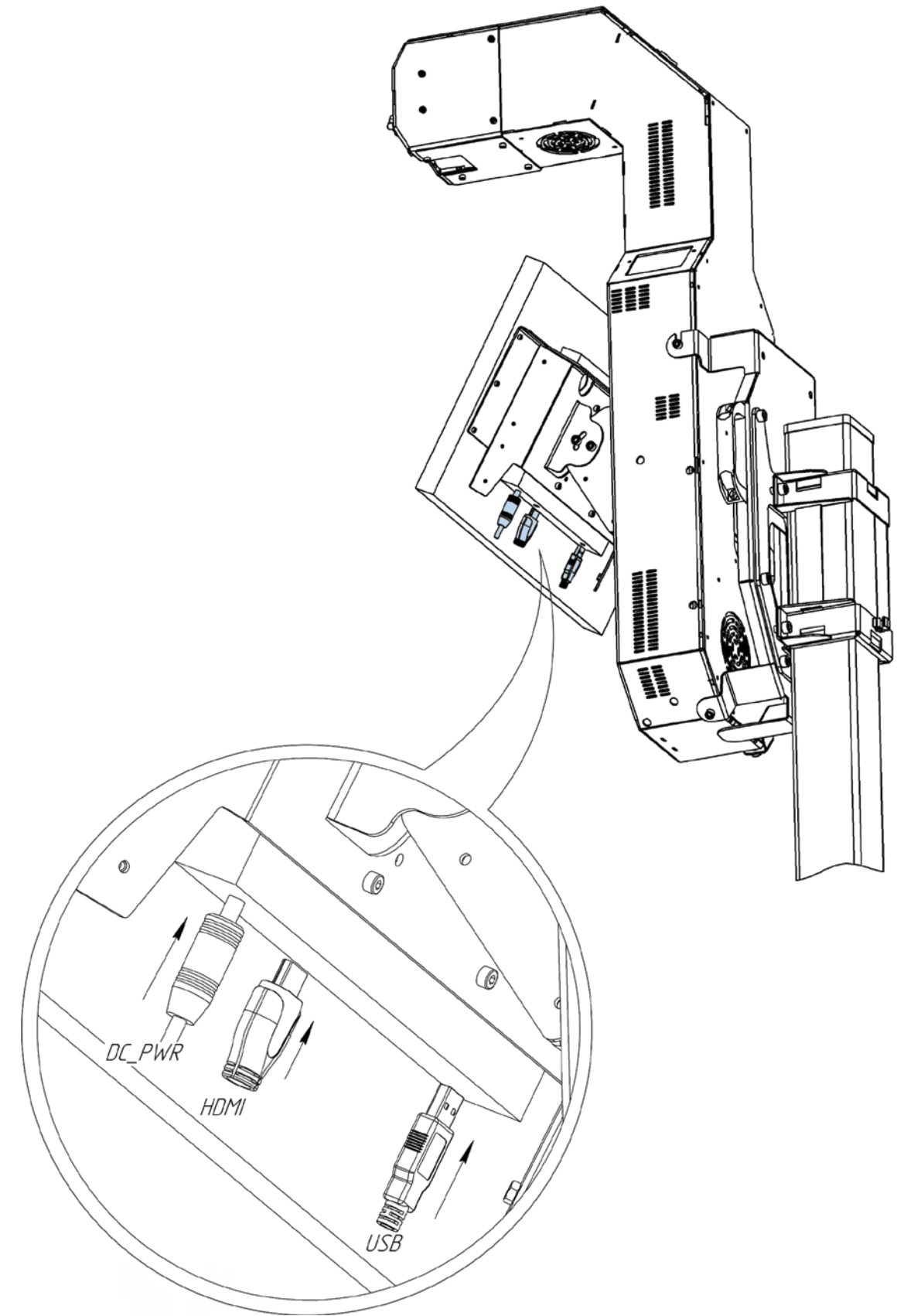
8

H5

FS-599

4 MM/0,16 "

h

FS-599

4 MM/0,16 "

9
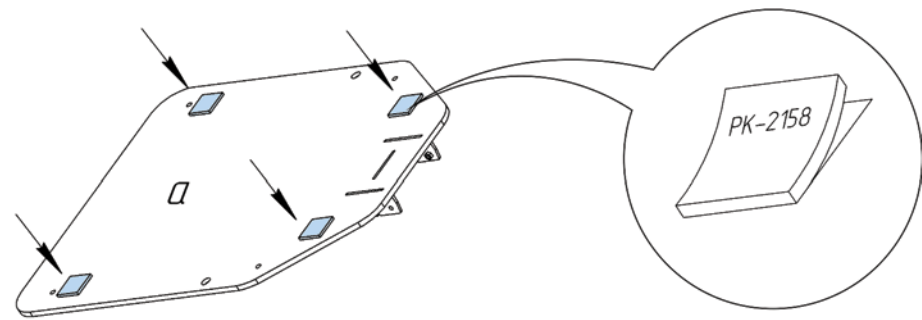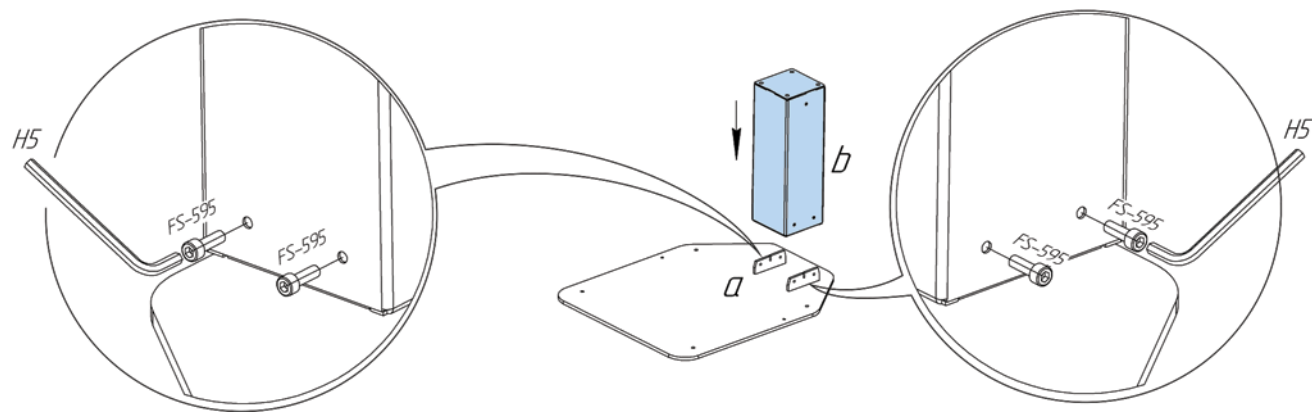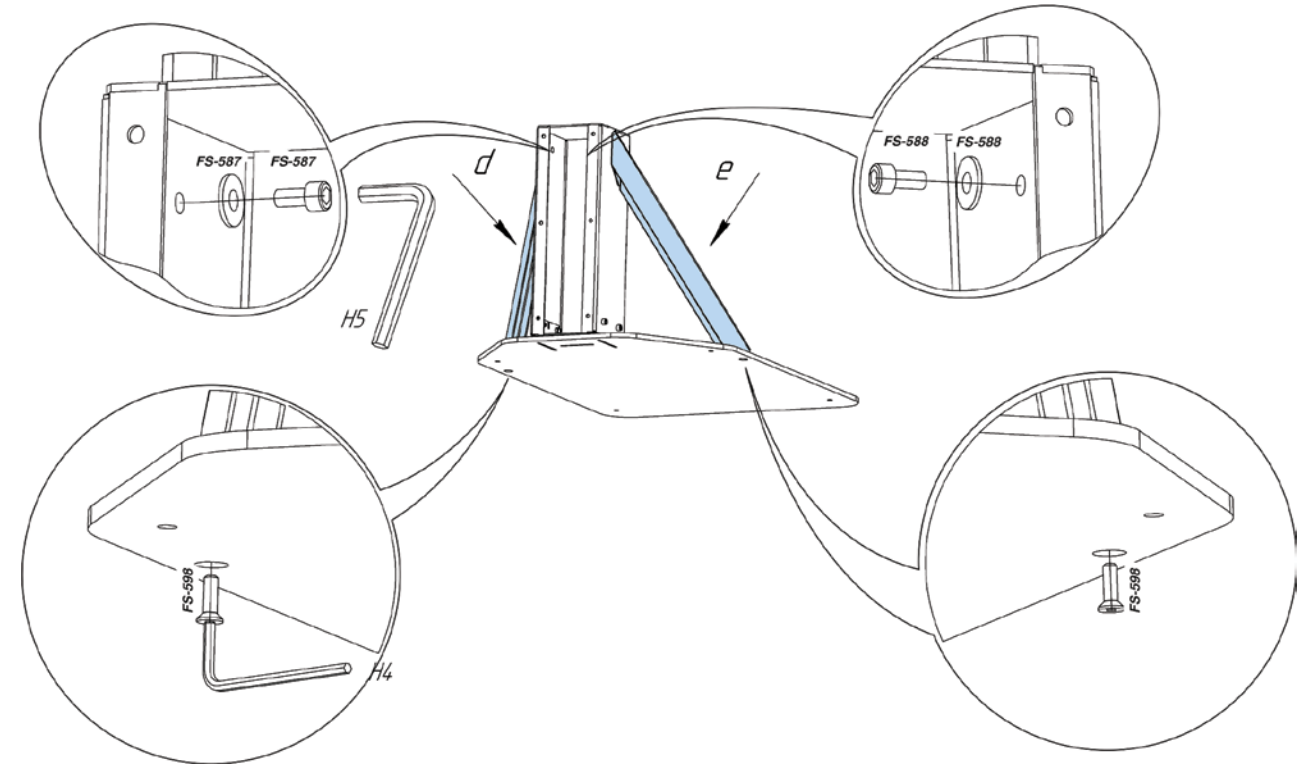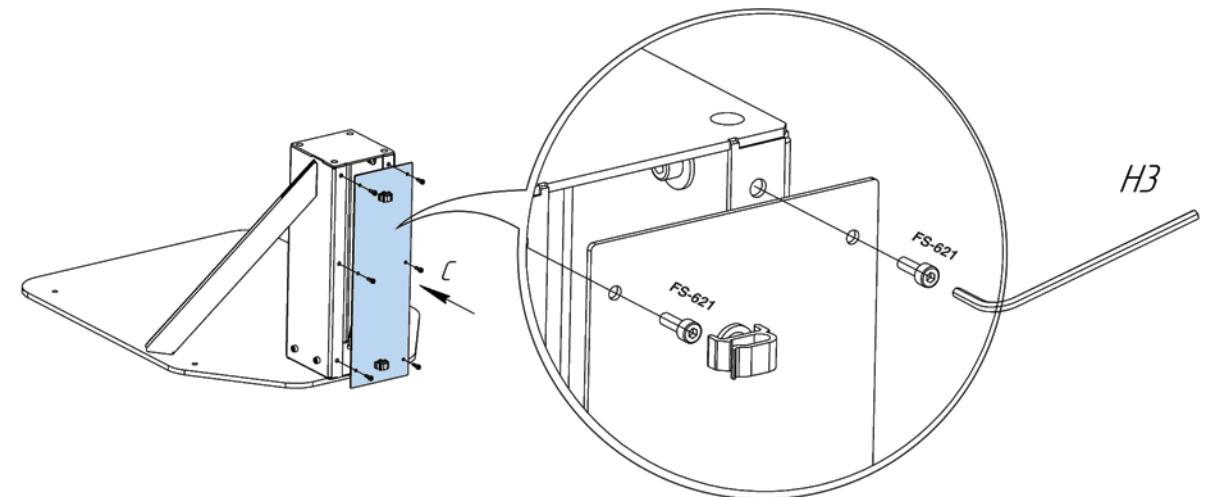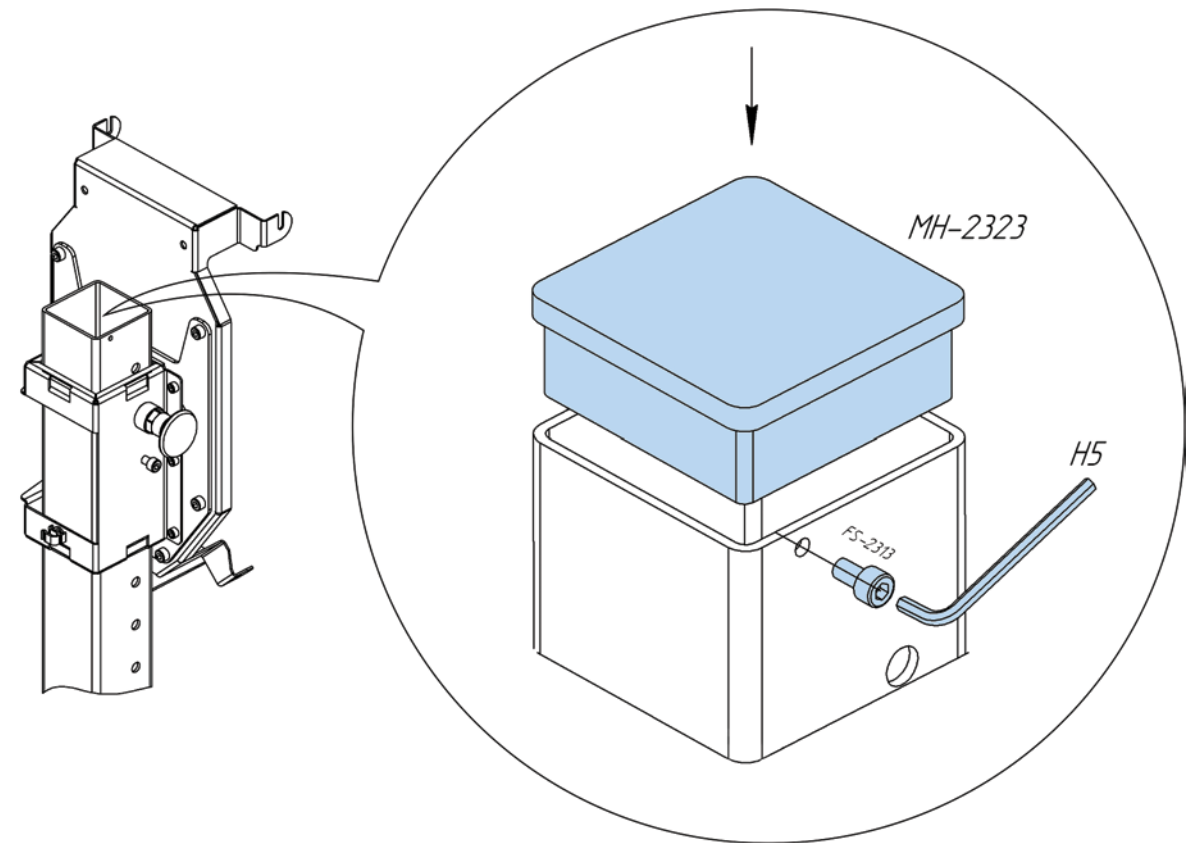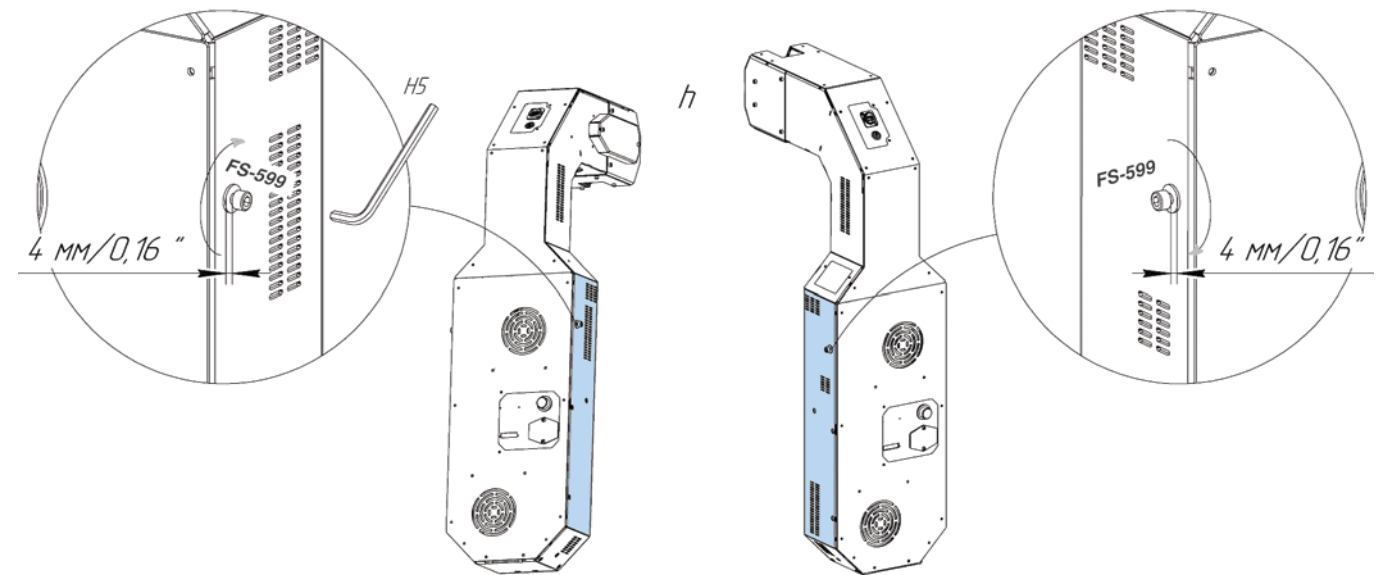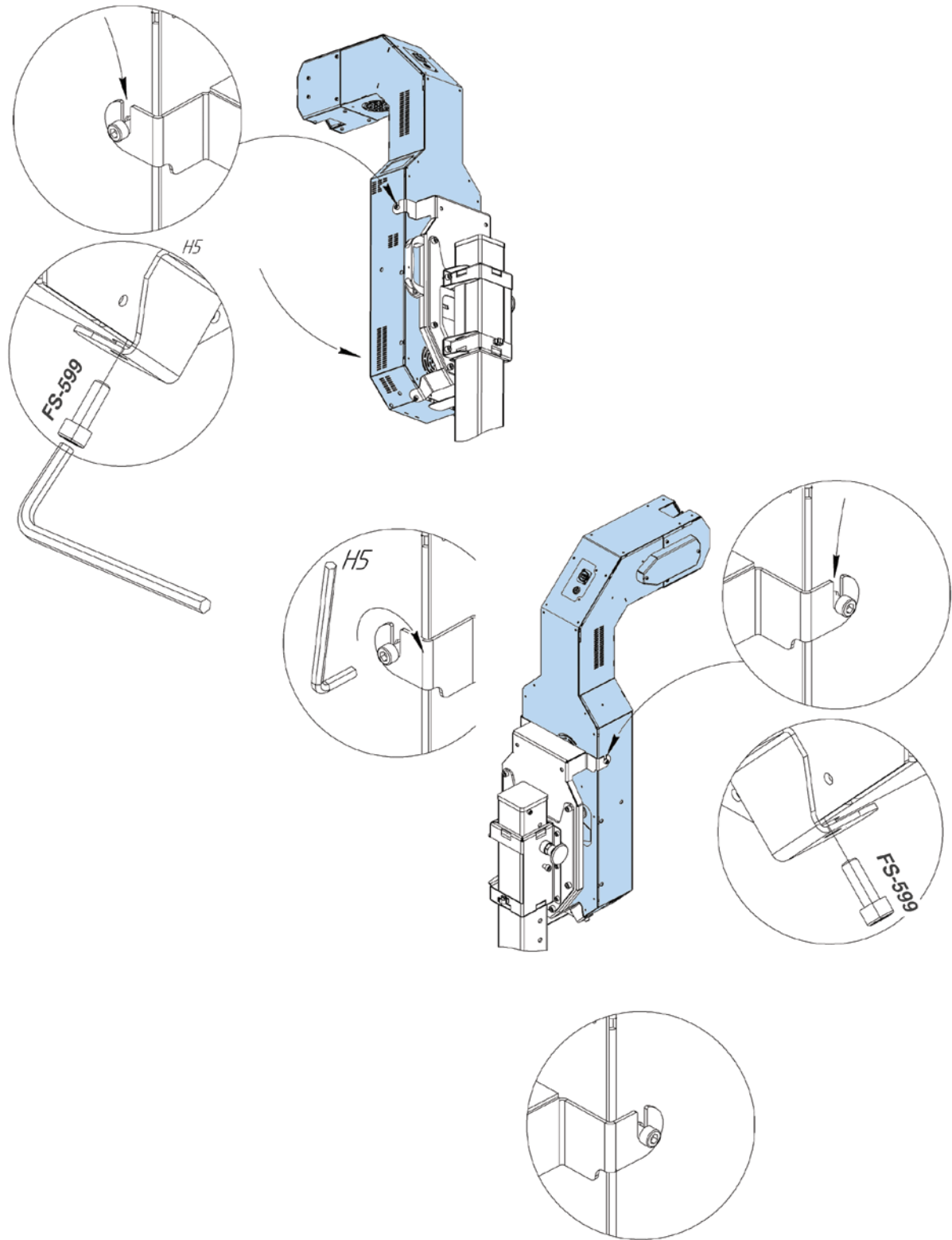
10 *installing angled panel*
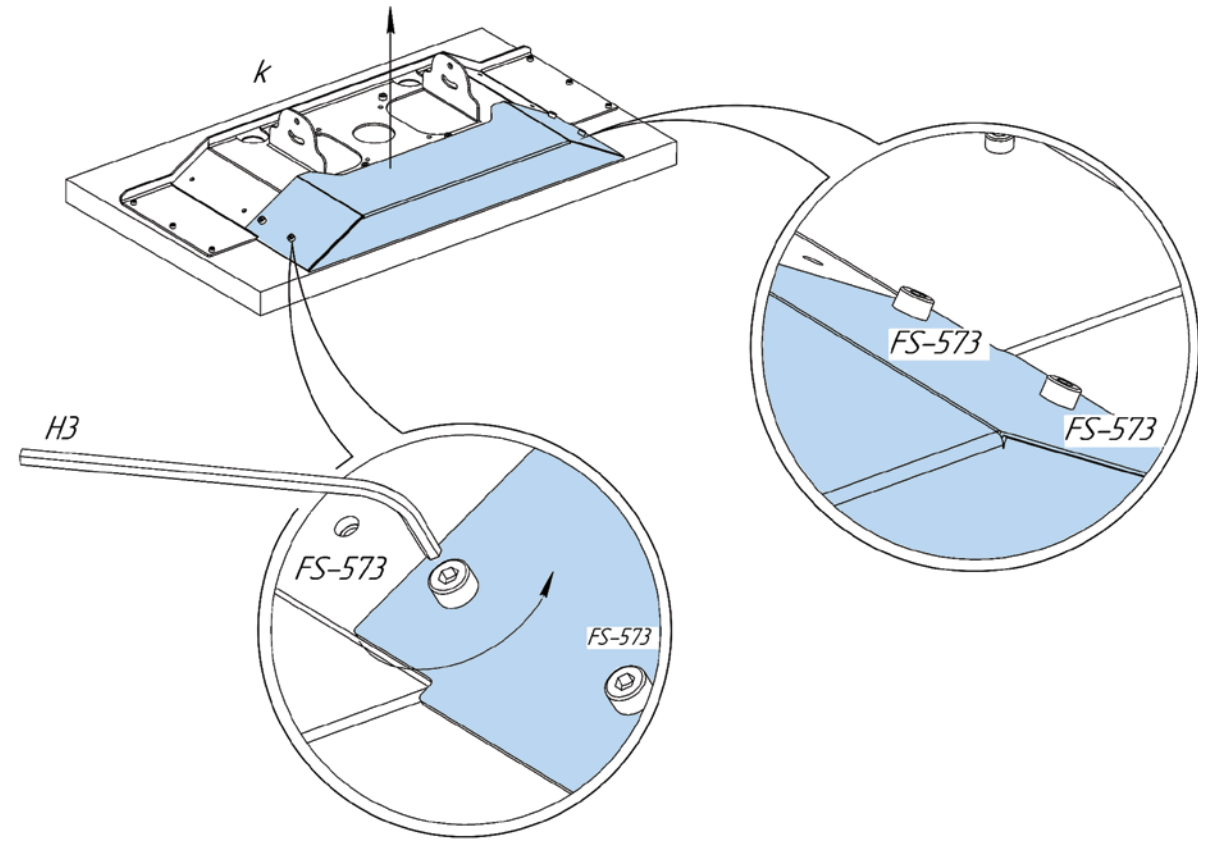
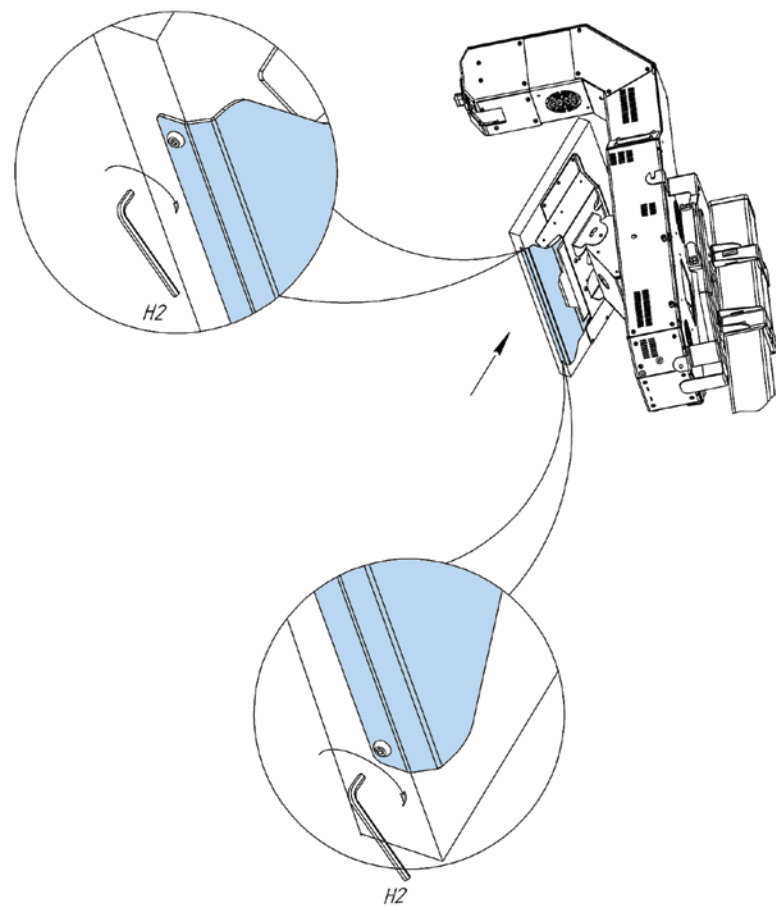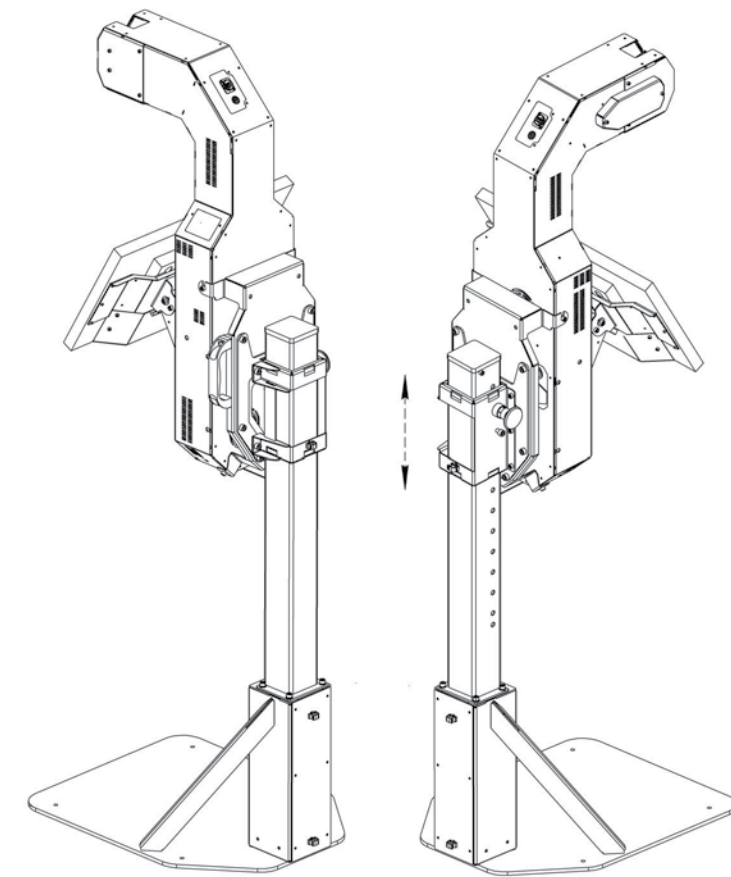**10.1** *installing rounded panel*

11

12
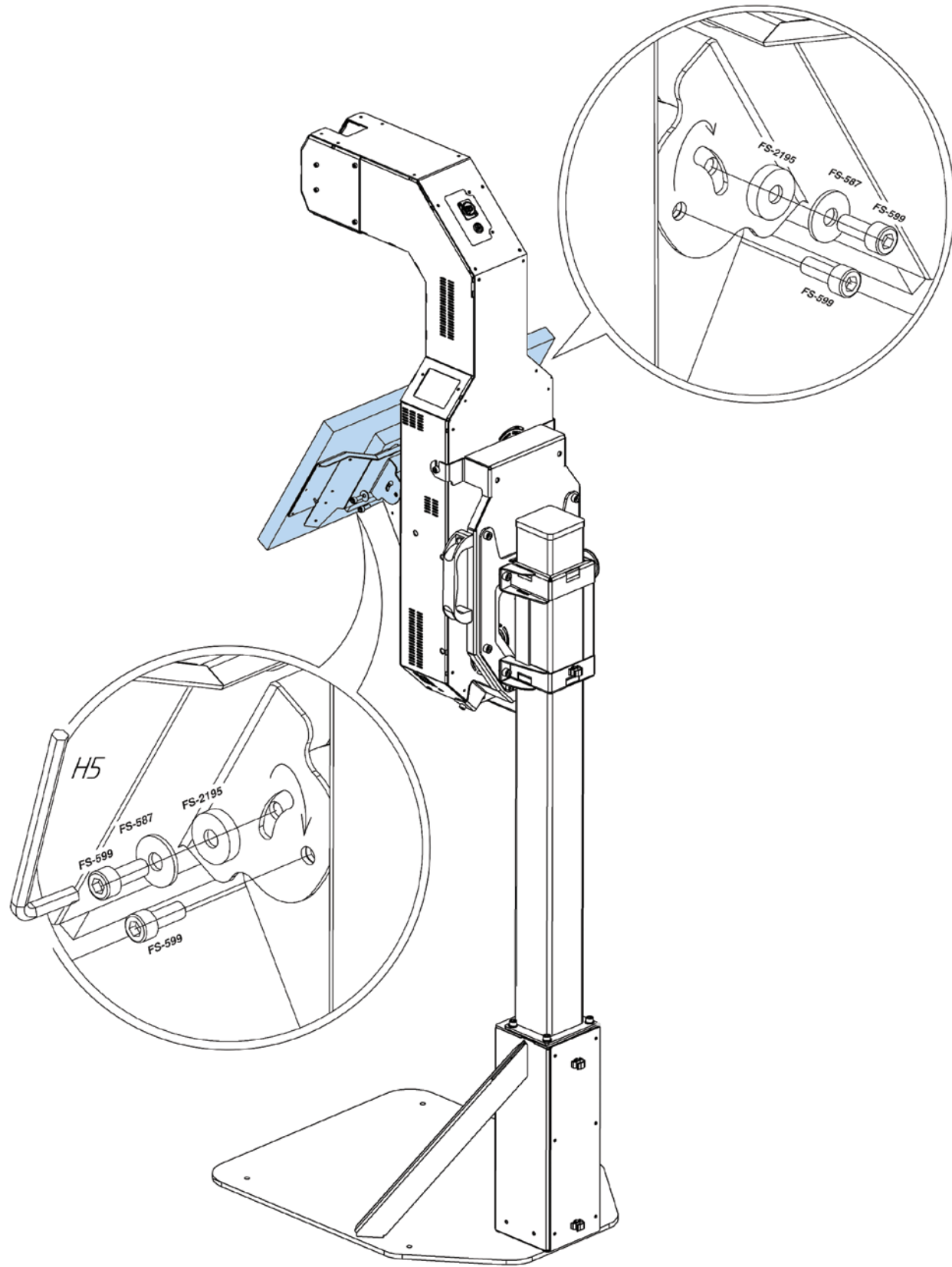
13 *installing angled panel*
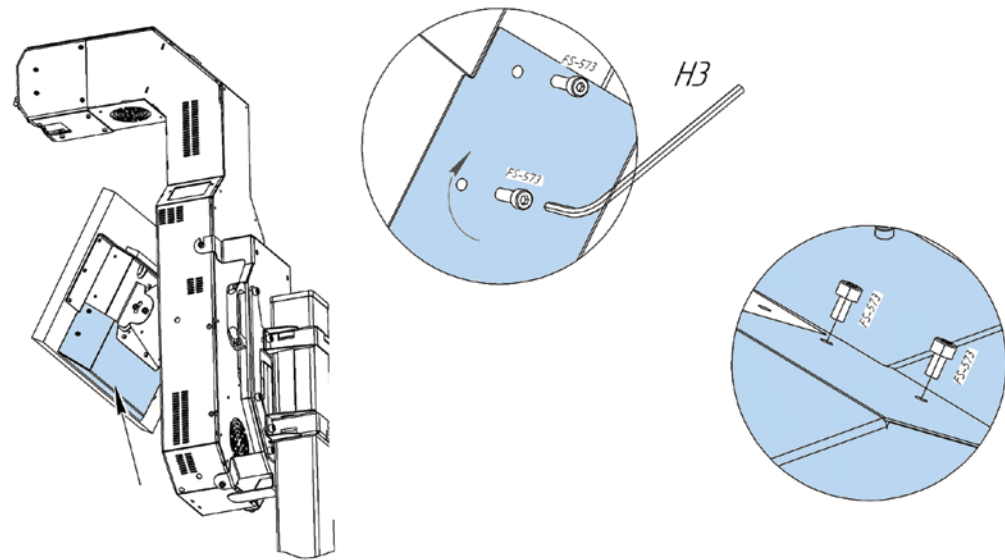
13.1 *installing rounded panel*

14

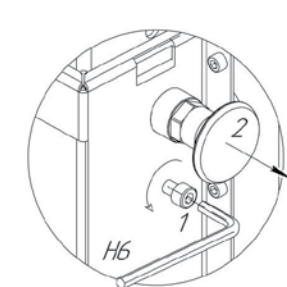
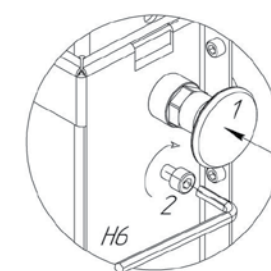**14.1** **14.2** **14.3**

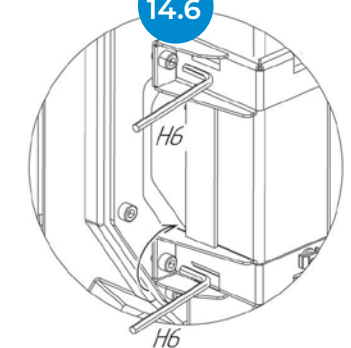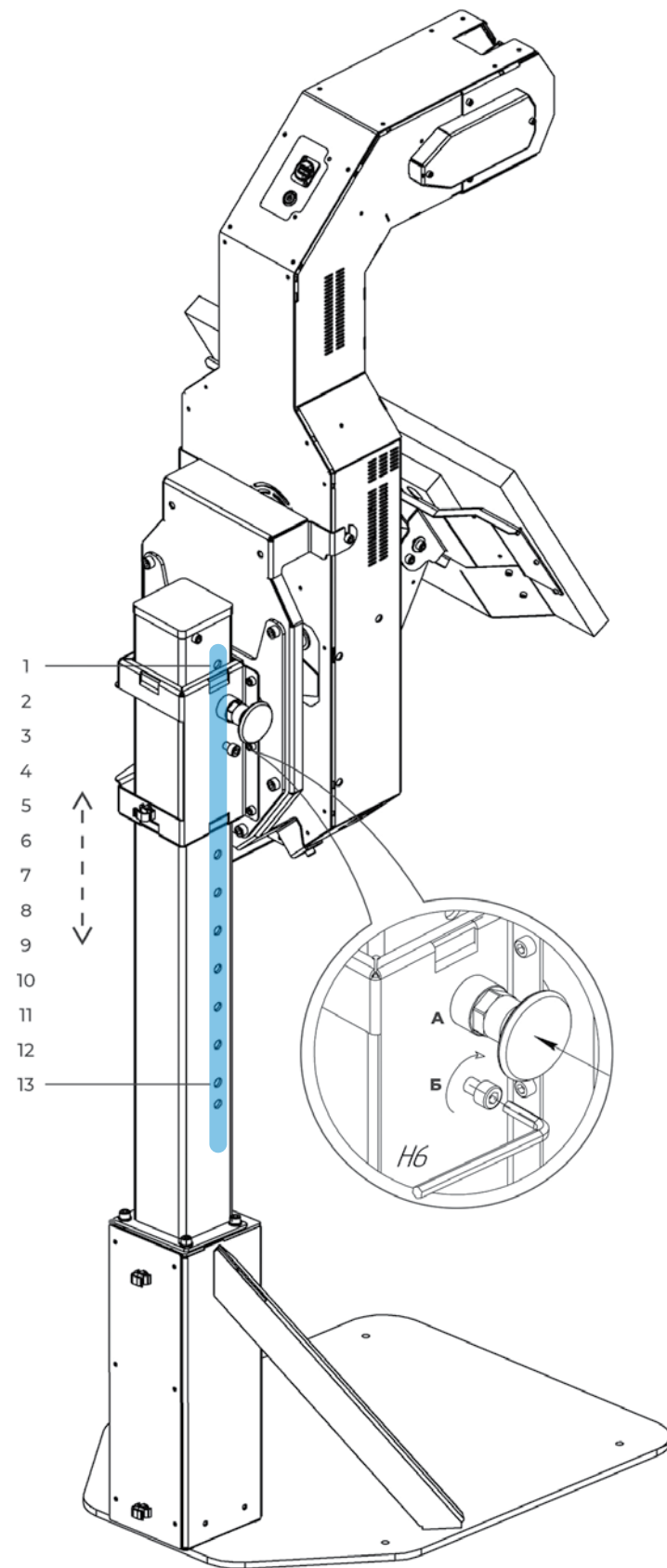Leave loose
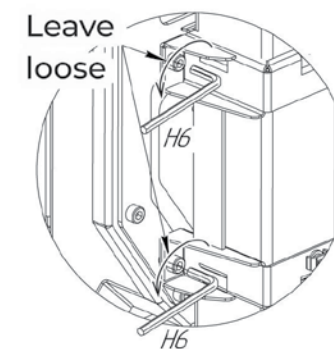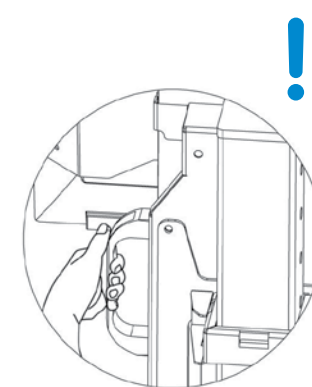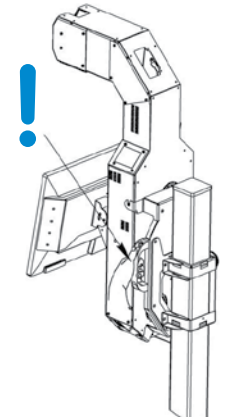
14.4 **14.5** **14.6**

Fig. 5 *Height adjustment*

2.2.3. Height adjustment

The station's height can be adjusted to improve facial recognition and measurement accuracy.

It is recommended to keep the station adjusted so the sensor is located on the user's eyes level. Move the guide block along the guide frame to adjust the height. Set the guide block to one of 13 positions.

Table 3 shows what heights are detected depending on the guide block's position. Upper and lower thresholds mean maximum and minimum height, respectively. The thermal sensor will scan the temperature within these thresholds. Average column shows the recommended height of the user for each position. Numbers are shown from high to low (1 is the guide frame's top pin position and 13 is the bottom pin position).

Table 3. Available heights based on the position of the device's sensor*

Device position	Upper threshold, cm	Average, cm	Lower threshold, cm
1	200	177	154
2	195	172	149
3	190	167	144
4	185	162	139
5	180	157	134
6	175	152	129
7	170	147	124
8	165	142	119
9	160	137	114
10	155	132	109
11	150	127	104
12	145	122	99
13	142	119	96

⚠ ** Refer to pic. 14 for a visual instruction of the height adjustment*

2.2.4. Operational requirements

Ensure all of the operational requirements are met before using the device.

ThermoControl must operate in a dry, heated room that maintains the temperature ratio referenced in technical characteristics (Table 1). No drafts are allowed in the room where the station is operating. General requirements include:

- noise level in the room must not exceed 75 dB;
- illumination level in the room must be in the range of 150 – 5000 lux;
- Wi-Fi RSSI signal strength must be within the range of 0 – -70 dBm to ensure a stable connection to the station.

If the outdoor temperature is less than +17°C, a person must remain in the room for several minutes to stabilize their temperature. After that, they shall proceed with the measurement. It will ensure measurement accuracy as per the technical characteristics. The best solution for that process is to form a line of people with a certain distance between each other. Make sure each person is indoors for at least one minute before they take the measurement.

Another method of correcting the temperature after entering the building is to have a separate room with an air temperature of +20–23°C. A person must remain in that room for one minute or more upon entering the testing area.

During the operation, a personnel member uses the web service to control the station. This service is accessed through the Internet. Make sure the operator's PC has a stable Internet connection, OS and Google Chrome version 56 for proper measurement control.

2.2.5. Power up

Turn on the station after assembly and installation. Plug the power cord (included in the package) into the connector located on the back panel (#1, Fig. 6). Connect the station to the power outlet.

To turn on the station:
1. Toggle the power switch into the ON position (#2, Fig. 6);
2. Press the power button (#3, Fig. 6);
3. Wait for the station to start.

To turn off the station:
1. Press the power button (#3, Fig. 6);
2. Wait for the station to shut down;
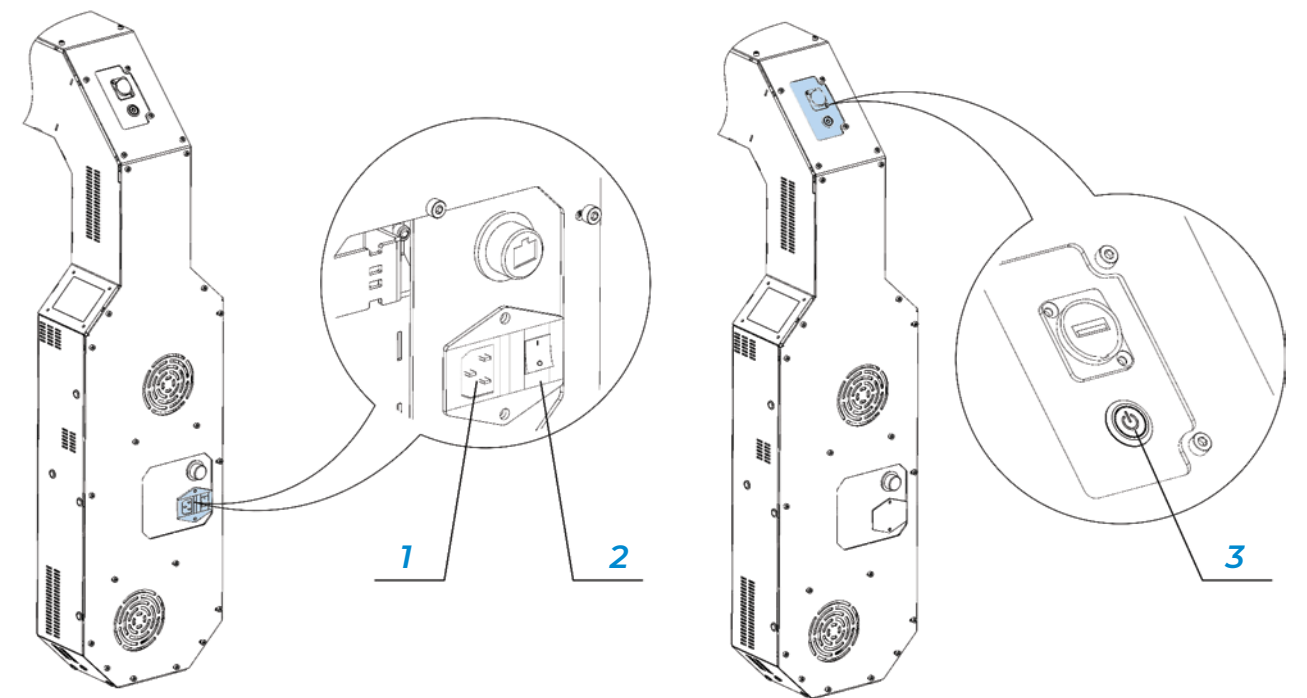3. Toggle the power switch into the OFF position (#2, Fig. 6).

Fig. 6 Device power up

2.2.6. Initial setup

When the station is powered and started, sequentially tap the upper left corner of the display 5 times to access the service menu.

A password window will appear after the 6 taps (Fig. 7). Once the correct password is entered, the service menu will be available for the initial setup procedure.
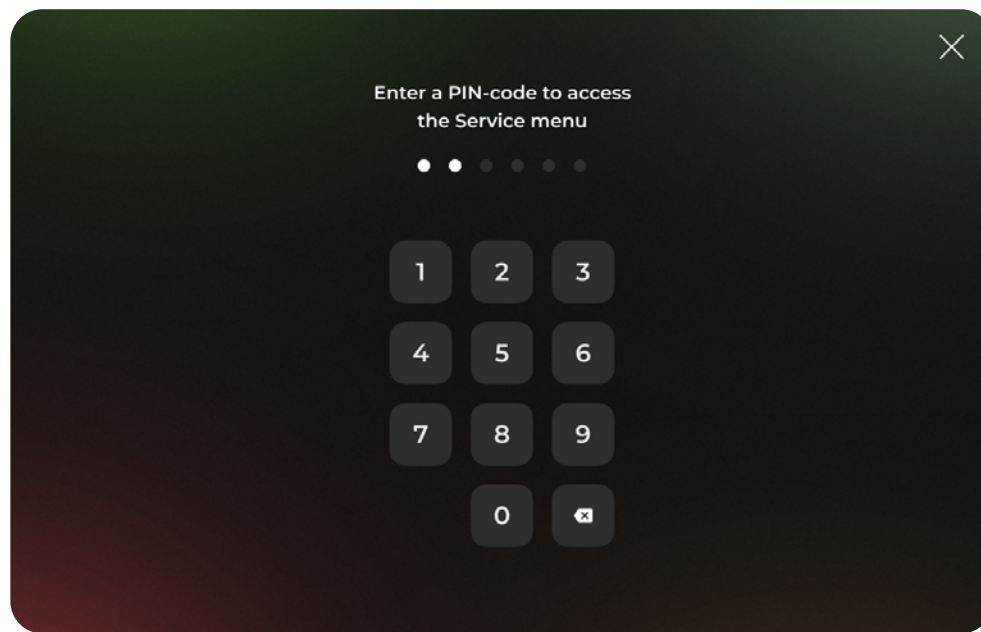

Fig. 7 Password window

> ⚠ The service menu will be unavailable for two minutes upon three incorrect password-entry attempts.

Service menu includes seven tabs with settings:

- Network
- Account
- Language
- Sound
- Temperature
- Interface Settings
- Advanced Settings

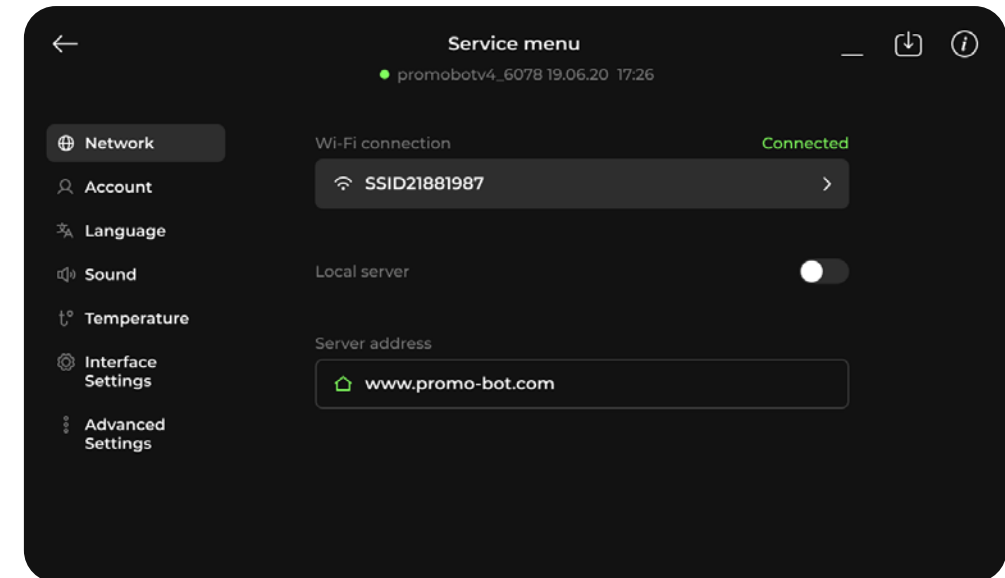Web service opens Network as the default tab (Fig. 8).

Fig. 8 Service menu of the device, Network tab

The station has to be connected to the Internet to fully function. It can be connected to a wireless network or via Ethernet cable.

Connecting device via Wi-Fi

1. For wireless connection, specify the name (SSID) of a wireless network. Tap the Search button and select one of the available networks from the list. Afterward, enter your network password in the Enter password field (Fig. 9).
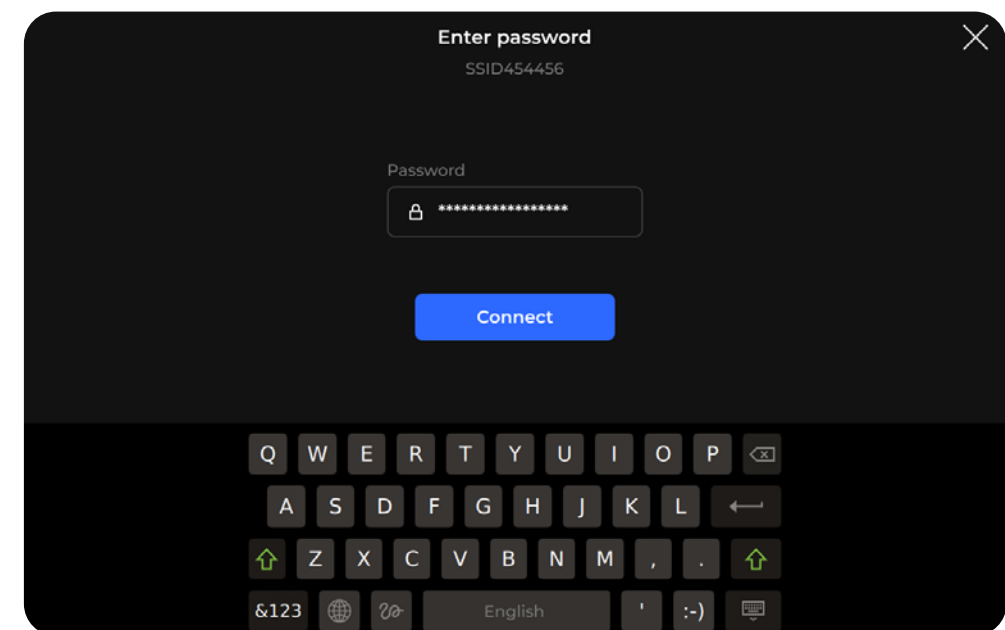

Fig. 9 Wireless network password field

2. After connecting to the Internet, set the web server address where the measurement information should be sent. The supplier server address is set by default.

3. It can be changed by entering the address in the address input field. Tap the Local server button for a local server connection.

Temperature settings

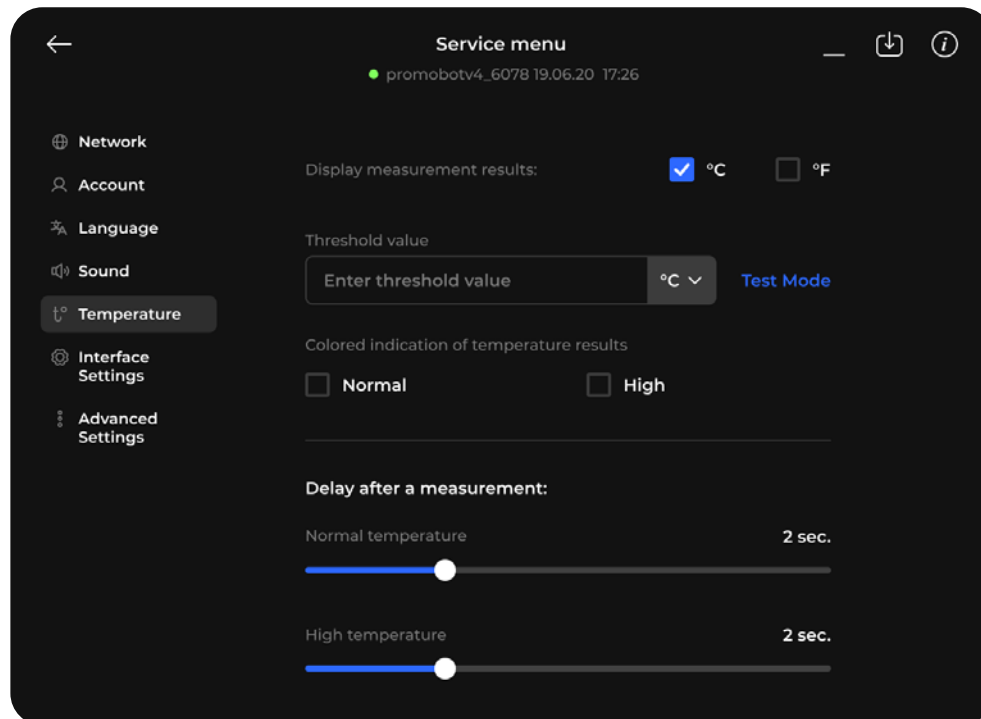Go to Temperature (Fig. 10).

Fig. 10 Temperature settings

1. Select the measurement units; Celsius, Fahrenheit or both units simultaneously. Uncheck °C and °F if displaying measurement values is not necessary.

2. Set the normal temperature threshold value in selected units. Change the threshold units, if necessary. Exceeding this threshold during the measurement identifies those scanned who have increased body temperature. The default threshold value is 37.1 °C.

3. Select the color indication values for measurement result display. Color indications are set up separately for normal and increased temperatures.

If the person's temperature is normal, an active «Color indication for normal temperature» toggle will present the measurement result with a green color.

If the person's temperature is above threshold value, an active «Color indication for high temperature» toggle will present the measurement result with a red color. Both toggles can be disabled for neutral color for all measurements. By default, both toggles are activated, and measurement results are displayed with the assigned colors.

4. Select the measurement display time. Both normal and increased temperature display times in seconds can be set up using a «Delay after the normal measurement» or «Delay after the high measurement». By default, both results will be displayed on screen for 5 seconds.

Save photos to the database

This setting enables saving photos to the database of measurement results. Switch to the Advanced Settings section to access the setting (Fig. 11). The setting is enabled by default.
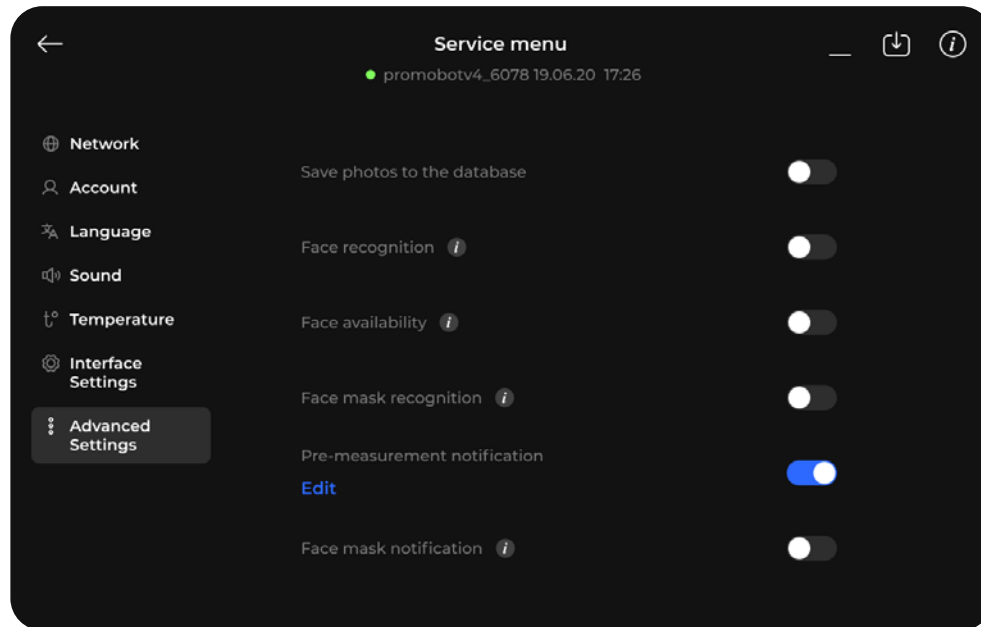

Fig. 11 *Save photos to the database in the Advanced Settings section*

Language settings

Select the Primary language for user interface, voice prompts and Service menu. If necessary, set up to two additional languages for text hints.
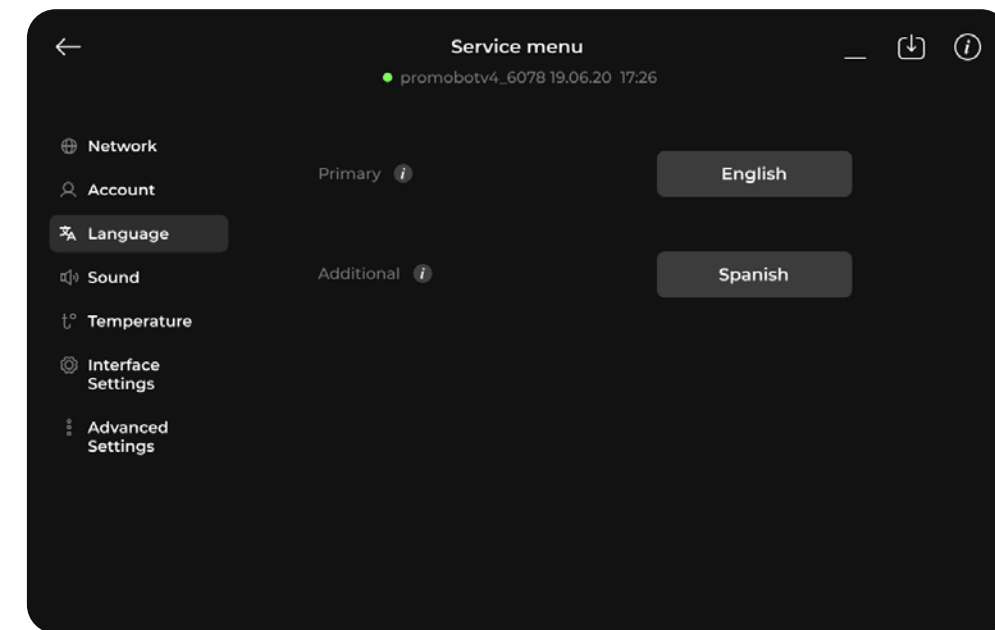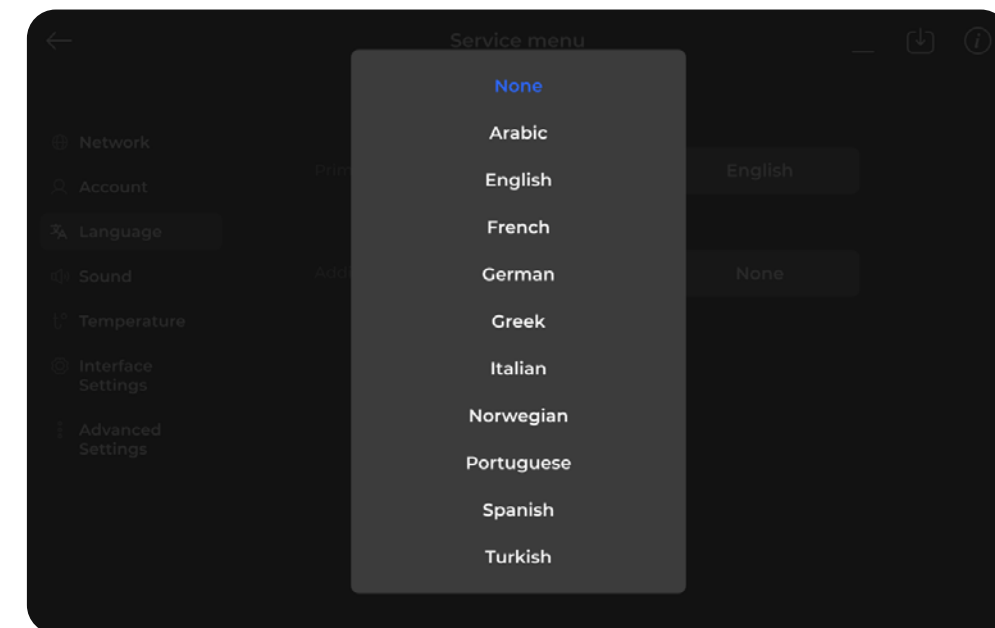

Fig. 12 *Language settings*

Fig. 13 *Select a language*
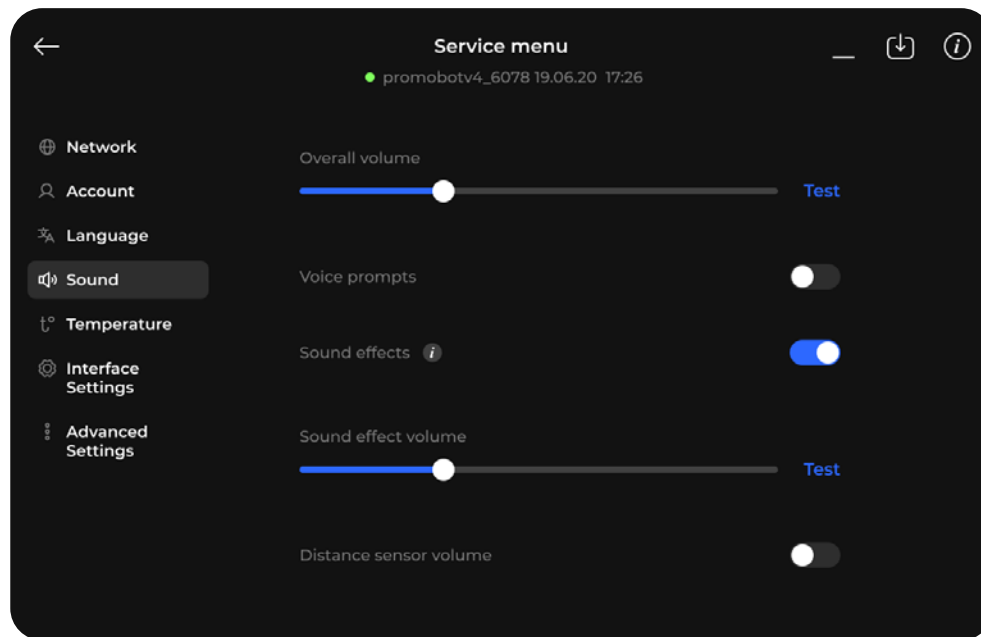
Sound settings

Go to Sound (Fig. 14).

Fig. 14 ***Sound settings***

1. The Voice prompts setting enables voice prompts. By default, the Voice prompts setting is disabled.

2. The Sound effects setting enables sounds for measurements results. By default, the sound is disabled. When enabled, set an appropriate Sound effects volume. Check the volume levels by tapping the Test buttons.

Welcome Screen configuration

The Welcome Screen is displayed when the station is not in use. Tap the toggle to use the Welcome Screen (Fig. 15). To upload the Welcome Screen, save the video or static image file to a flash drive. The supported file types are png, jpeg, webm, mp4 and avi. Name the file "welcome.*", where "*" is one of the supported file types for the Welcome Screen. Insert the flash drive into the ThermoControl USB port and press "Update" button in the Welcome Screen section. Wait for the file to be uploaded to the station.
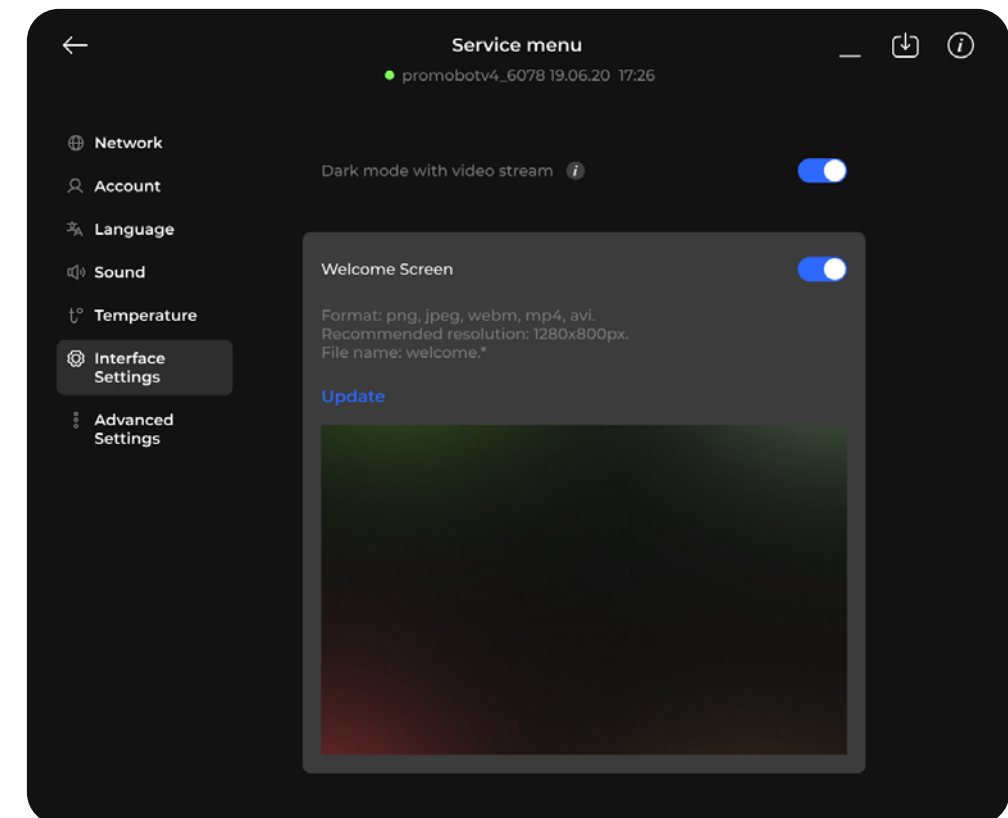

Fig. 15 ***Welcome Screen in the Interface Settings section***

2.2.7. Additional settings

Device registration

During the initial station setup, operators must register the device in the web monitoring service. The process is identical for both local and remote servers' setup. Go to Account (Fig. 16) and tap Add new device button.
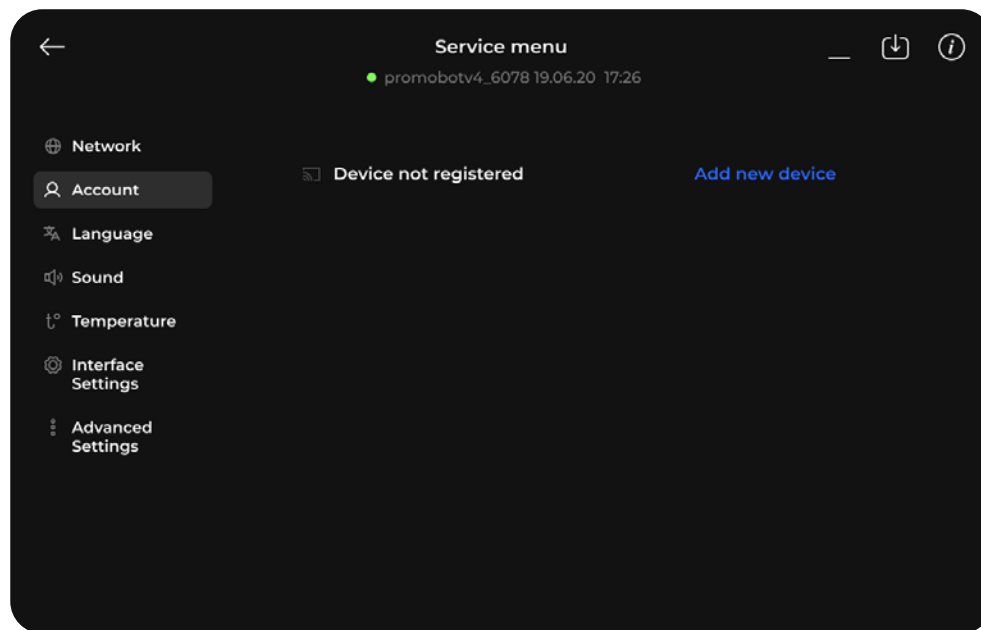

*Fig. 16 **Add new device in the Account section***

After tapping the Add new device button, two registration options will appear: sign up with a new account or sign in using an existing account (Fig. 17).
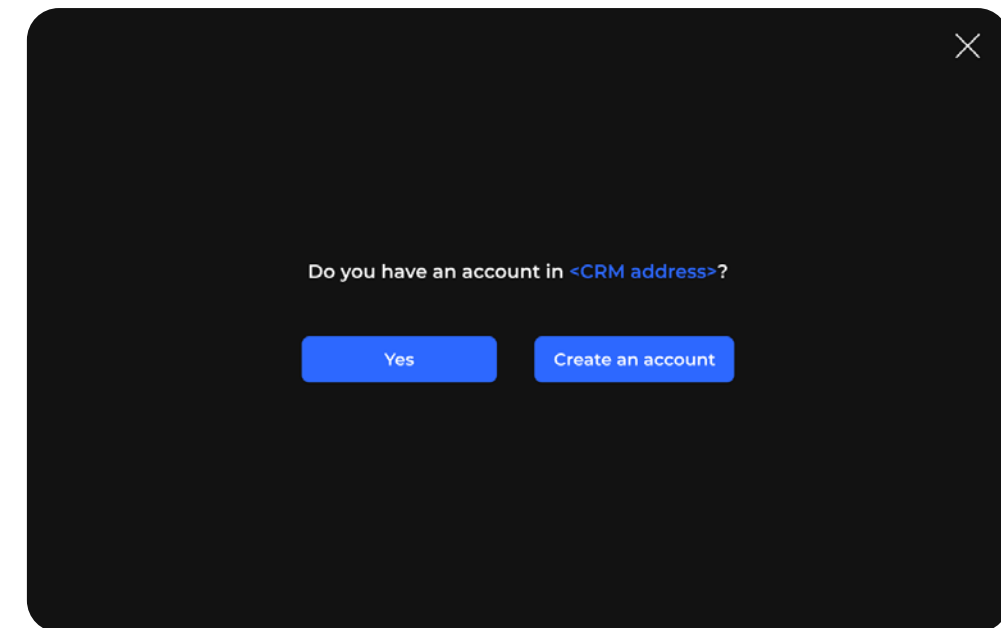

*Fig. 17 **Registration options***

Tap Yes to register the device using an existing account. A login window will appear. Use account credentials to log into the monitoring service (Fig. 18).
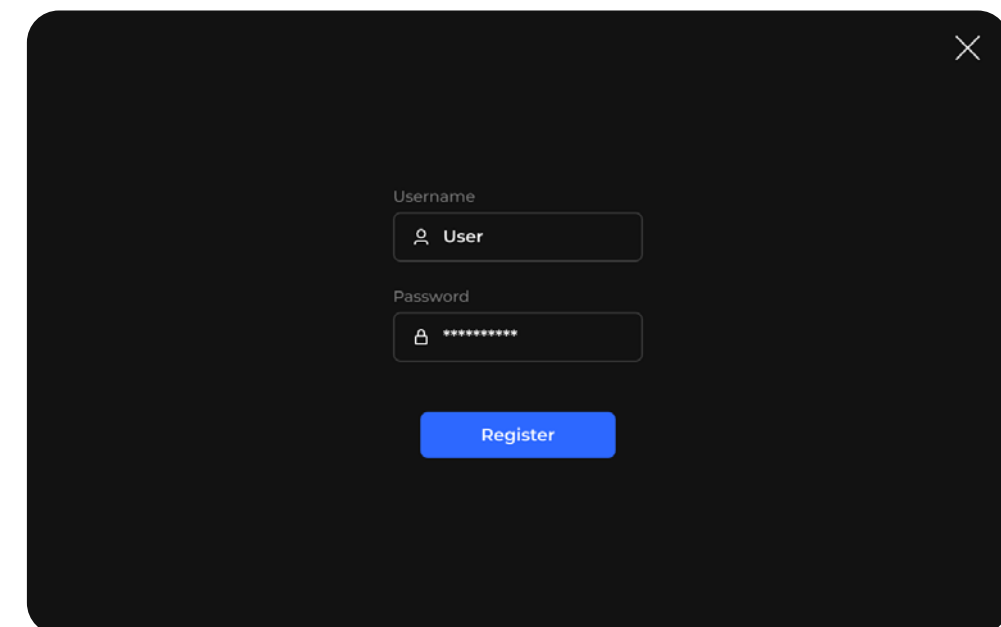

*Fig. 18 **Login window***

Enter the credentials of a Manager role account of the web service. Then, tap the Register button. If the registration is successful, and the account has the proper roles set, the device will be added to the web service and assigned to the operator company.

Registering a new device in the web service will automatically create a new account. The device will be assigned to that account.

To create a new account, tap Create an account. A screen with the new user information will appear (Fig. 19). By default, the username and password for the new accounts are matching.
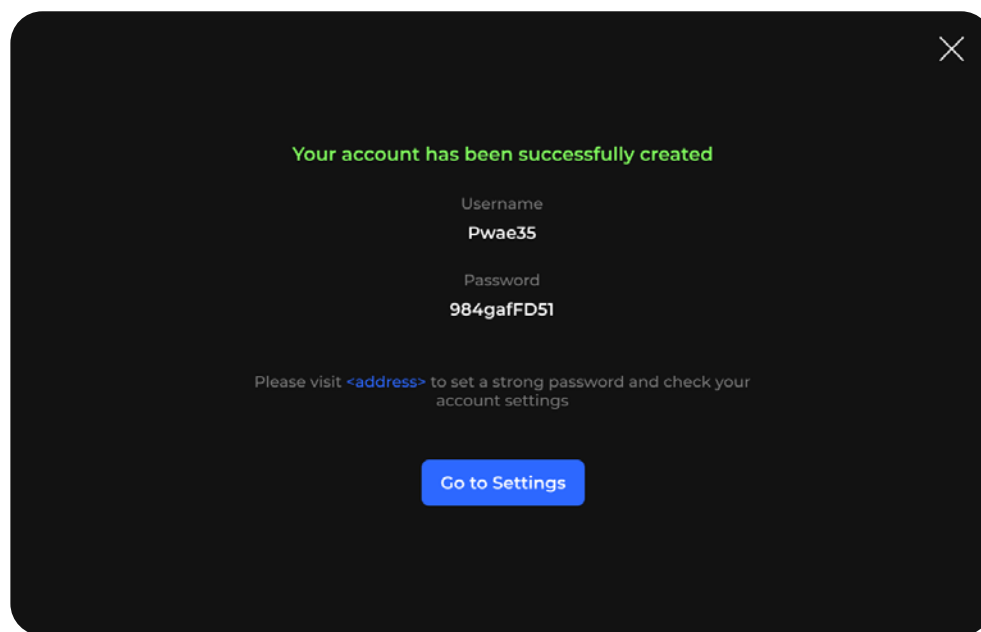

Fig. 19 ***New user information window***

Removing device from the server

⚠️ *If the device is removed from the server, it will not be able to send the measurement results to the monitoring service until it is registered again.*

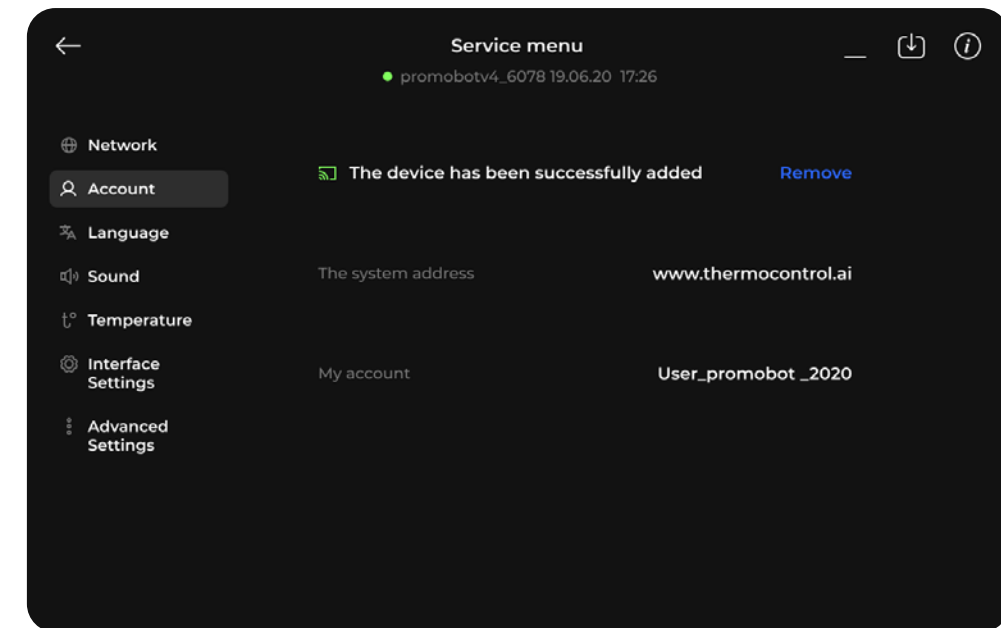To remove the device, tap the Account button, then tap Remove (Fig. 20).

Fig. 20 ***Remove device in the Account section***

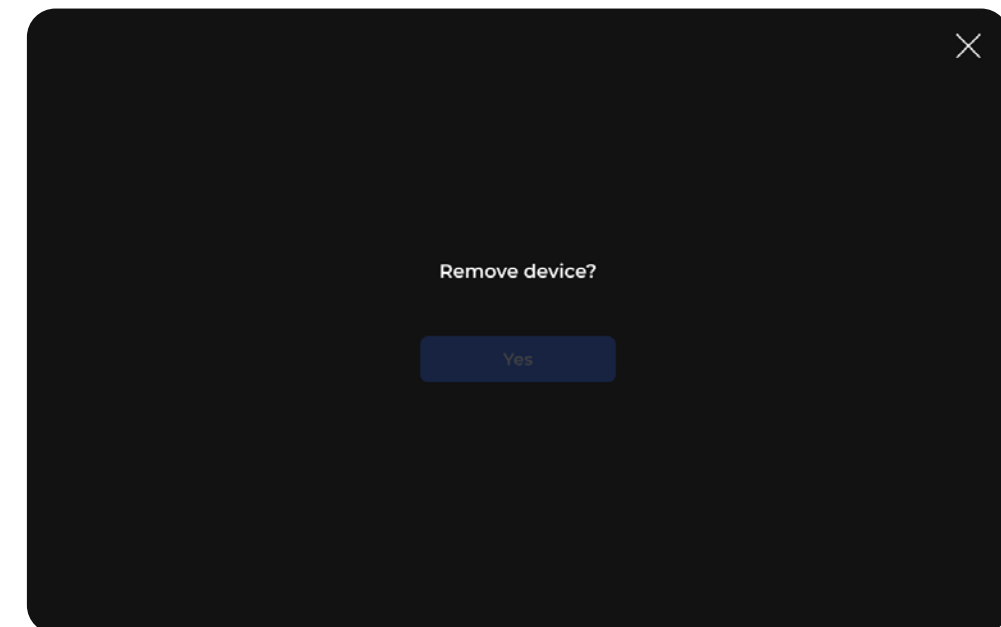A confirmation window will appear (Fig. 21).

Fig. 21 ***Remove the device confirmation window***

The Yes button becomes available in 4 seconds (Fig. 22). Tap Yes to remove the device.
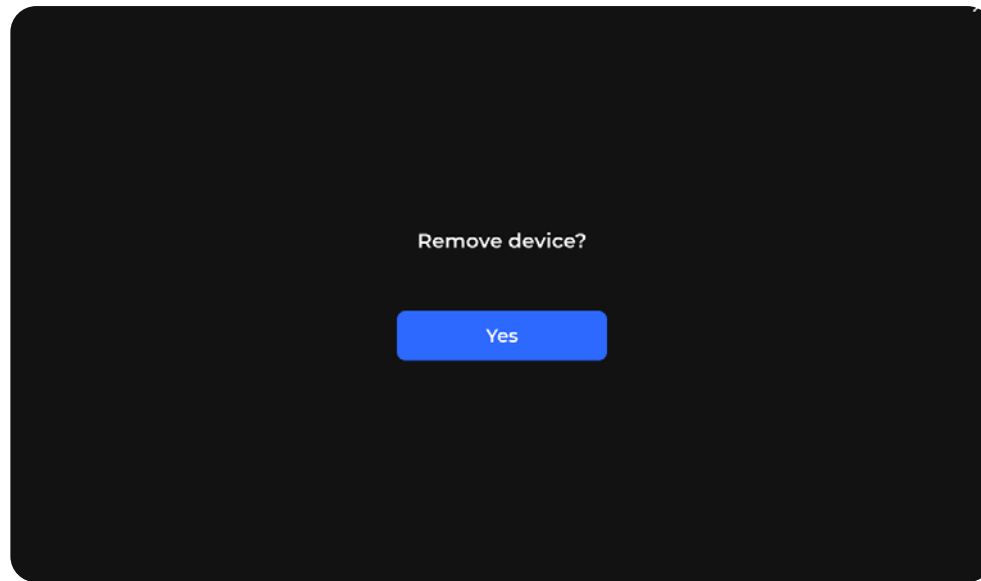
Fig. 22 *Active Remove the device button*

After the device has been removed, the Add new device button appears again in the service menu. The station also will disappear from the user's company device list.

Device information overview

To see more information about the device, tap the Information button at the top right section of the service menu and select Connection from the drop-down menu (Fig. 23).
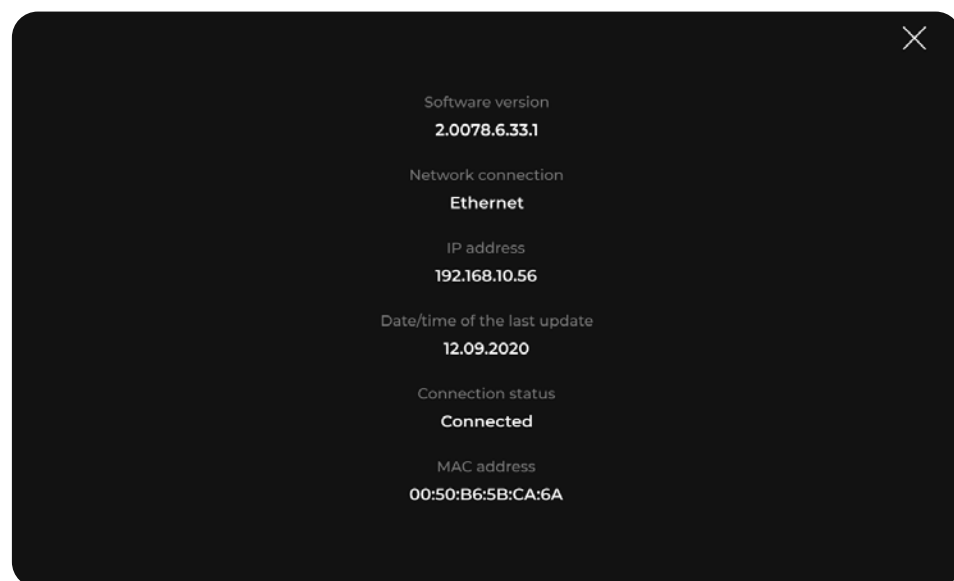

Fig. 23 *Device information window*

The following information is available:

- Software version
- Most recent software update date and time
- Internet connection type (Wi-Fi or Ethernet)
- Internet connection status (Connected or Disconnected)
- Device's IP address
- Device's MAC address

Tap the Close icon in the upper left corner to close the information window.

Once the station initial setup is completed, and the device is assigned to the web service account, test the measurement send process. Close the service menu by tapping the icon in the upper left corner. Follow the instructions on the screen. Measurement sending status is displayed in the upper left corner of the screen, on the interface status panel (Fig. 24).
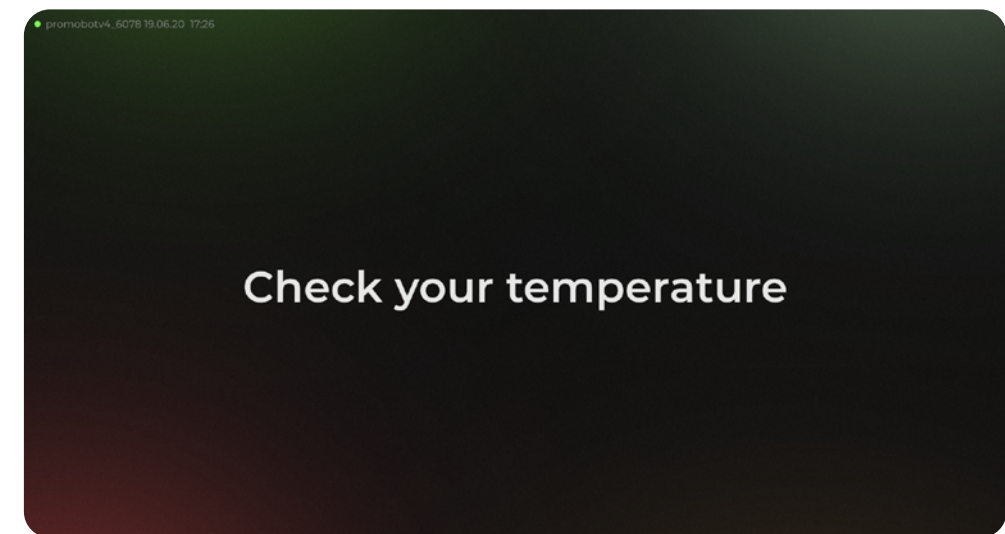

Fig. 24 *Main screen with the status display in the upper left corner*

If the icon is gray, the device has not sent any measurement results since its activation.

Updates installation

Software updates can be installed from the service menu. Tap the Update button in the upper right corner of the service menu to bring up the current version window (Fig. 25). A notification will appear if updates are available.
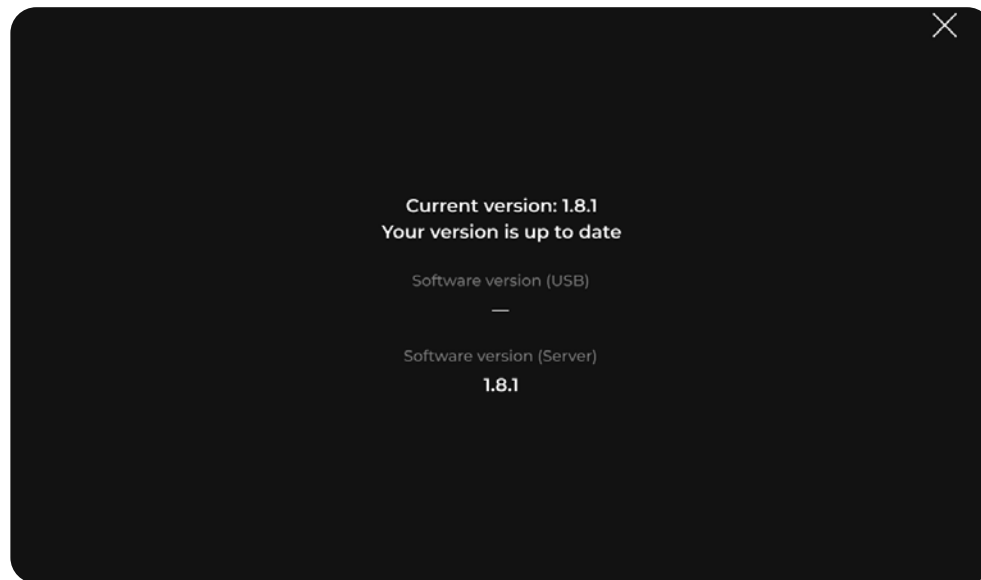

Fig. 25 Current version window

Updates can be installed over the Internet or from the USB flash drive (Fig. 26).
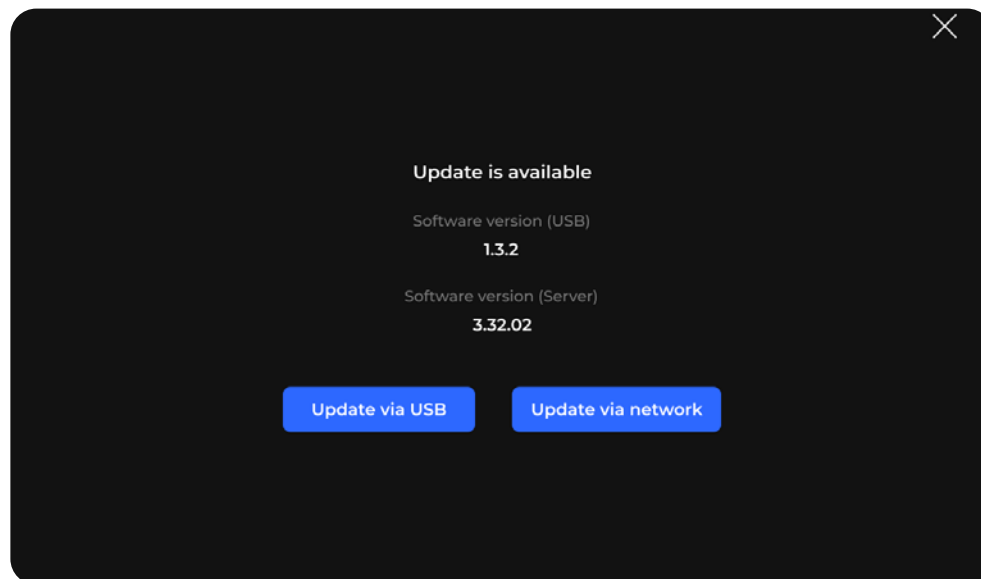

Fig. 26 Update window

Additional languages

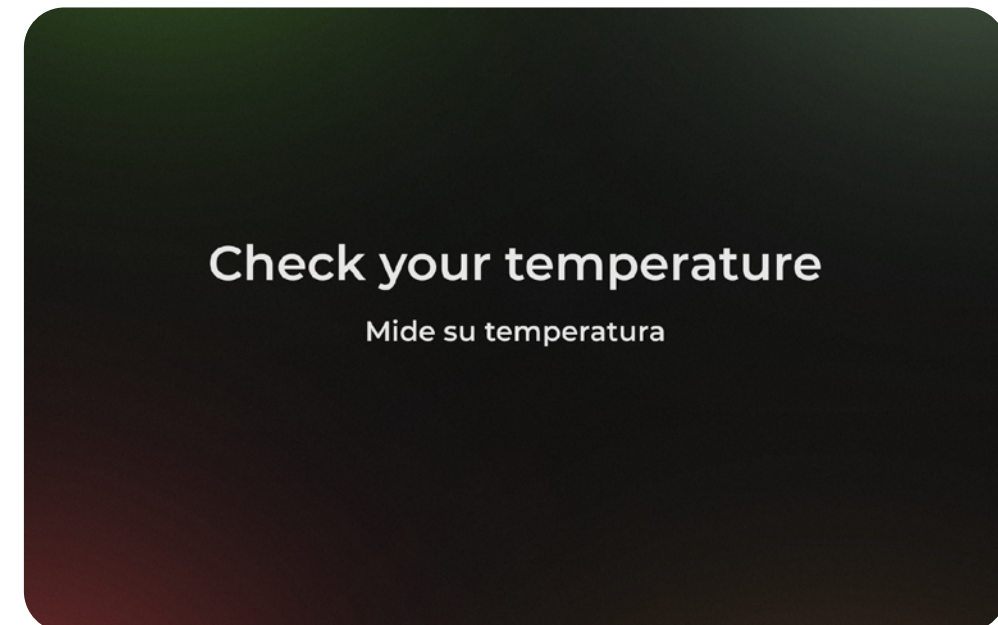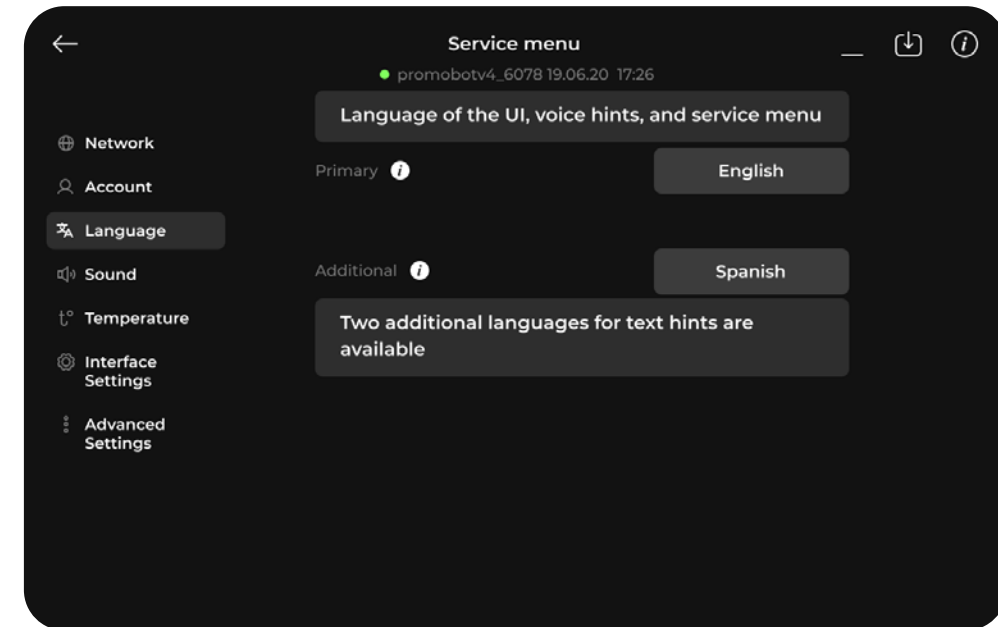Text notifications can be displayed in two additional languages (Fig. 27).

Fig. 27 Main screen with an additional language

Single spot measurement

By default, ThermoControl measures the temperature by moving its sensor up and down, collecting temperature data from 10 points of the user's face. The final temperature measurement is calculated using an algorithm. Results might differ from a pyrometer, which measures temperature in a single spot on the face.

To compare a single-spot measurement of the device with the pyrometer, select Test Mode in the Temperature section (Fig. 28, 29).

No instructions will be shown during the Test Mode. Measure temperature as if using the pyrometer. Bring forehead to the sensor at the same distance as for the pyrometer. A measurement spot must remain the same.

Fig. 29 **Single spot measurement results**
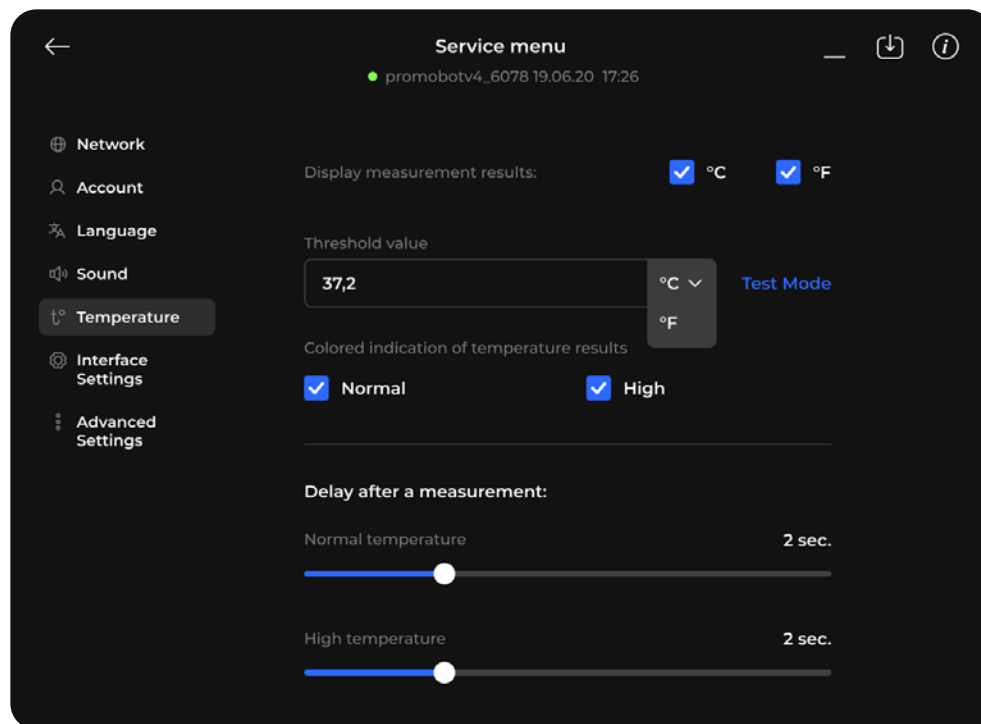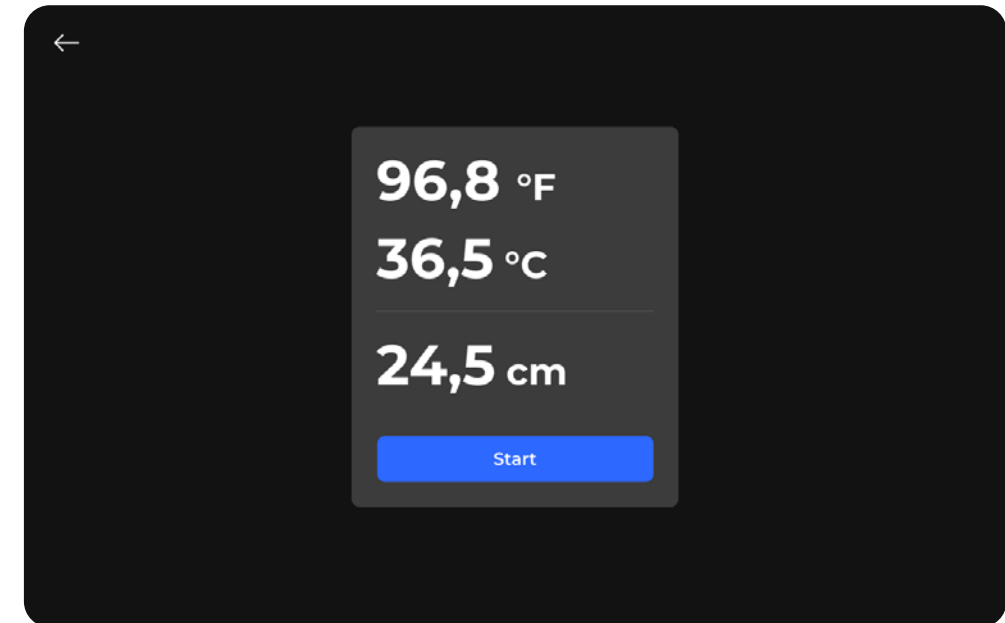

Fig. 28. **Test Mode in the Temperature section**

Light mode

Go to Interface Settings to switch between two interface appearances: light or dark (Fig. 30).
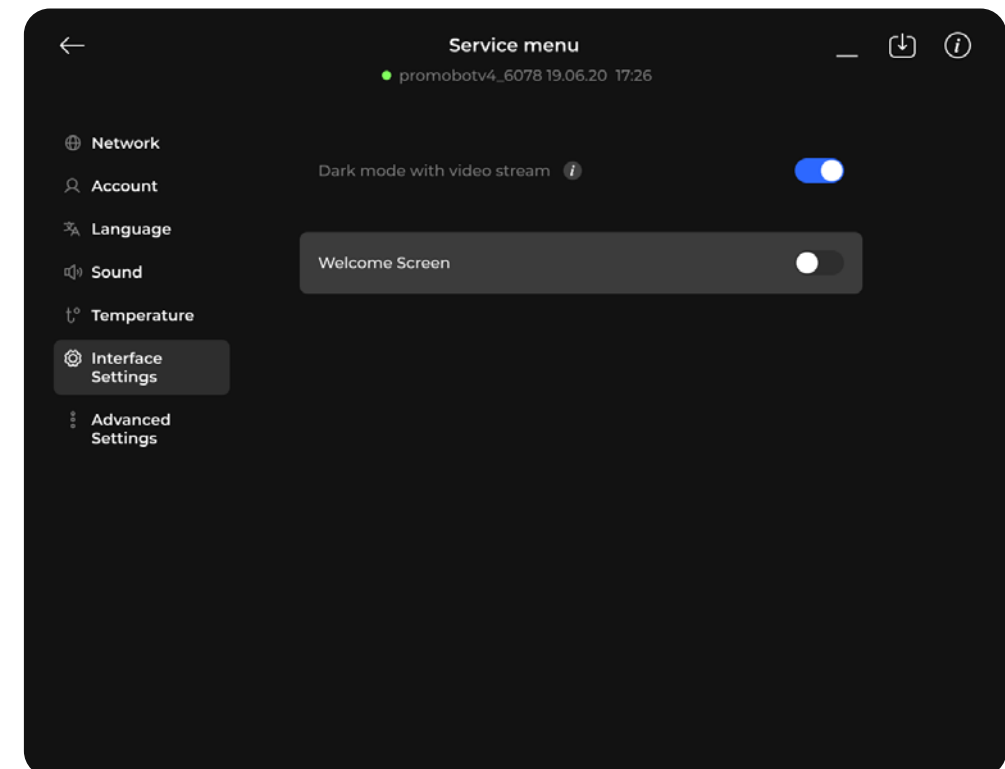

Fig. 30 **Dark mode button in the Interface Settings section**

Light mode disables the video stream; in dark mode, the users see themselves from the camera's video stream. In light mode, helping screens are shown instead of the video stream (Fig. 31).
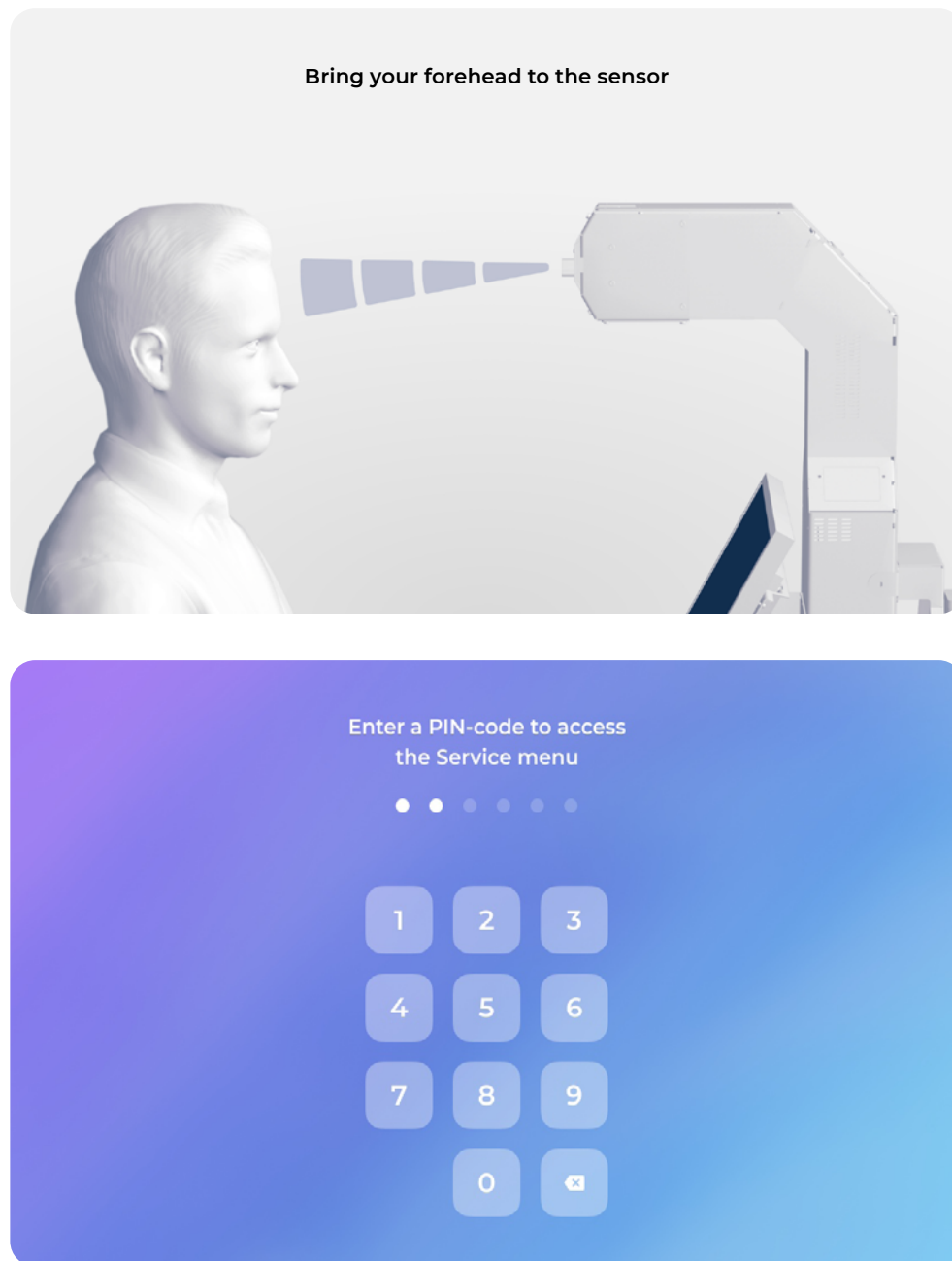

Fig. 31 *Light mode interface*

Advanced Settings

Go to Advanced Settings (Fig. 32) to set up the following:

- Facial recognition — stores each recognized face for later name assignment;
- Liveness detection — recognizes the person in front of the camera and detects inanimate objects. The station will not measure the temperature of a hand, a mug or other object;
- Pre-measurement notification — shows a notification window with a custom message. To continue measuring, the user must tap the Proceed button;
- Face mask notification — a notification reminds the user to wear a mask.
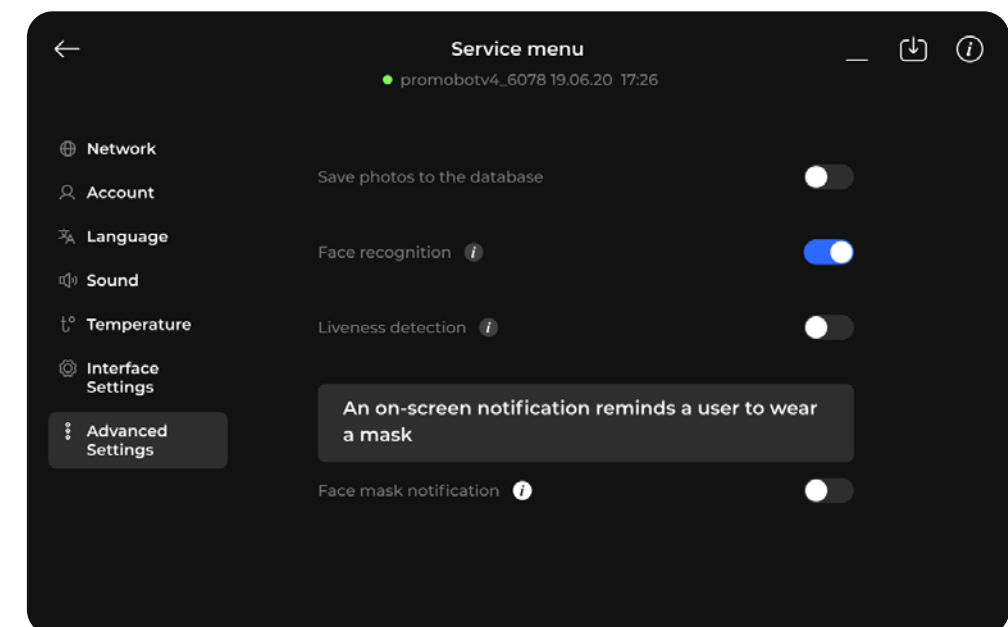
Fig. 32 *Advanced Settings*

Toggles differ depending on the selection. If the Face recognition toggle is disabled, then the next setting will be shown as Face detection instead of Liveness detection.

Facial detection — protects from measuring printed faces.

If Facial recognition is enabled and Facial detection is disabled, then the Face mask notification setting will be shown as Face mask detection.

Face mask detection — the device will not measure the temperature if the user does not wear a mask.

2.3. Guidelines

2.3.1. Operator guidelines

Operator grants access to the Thermo CRM web service. The Thermo CRM collects statistics and stores measurement results. See the Thermo CRM user guide for more information on the service.

2.3.2. User guidelines

The instructions are displayed on the main screen of the device. (Fig. 33). In order to use the station, a user steps on the standing base facing the main section of the device.
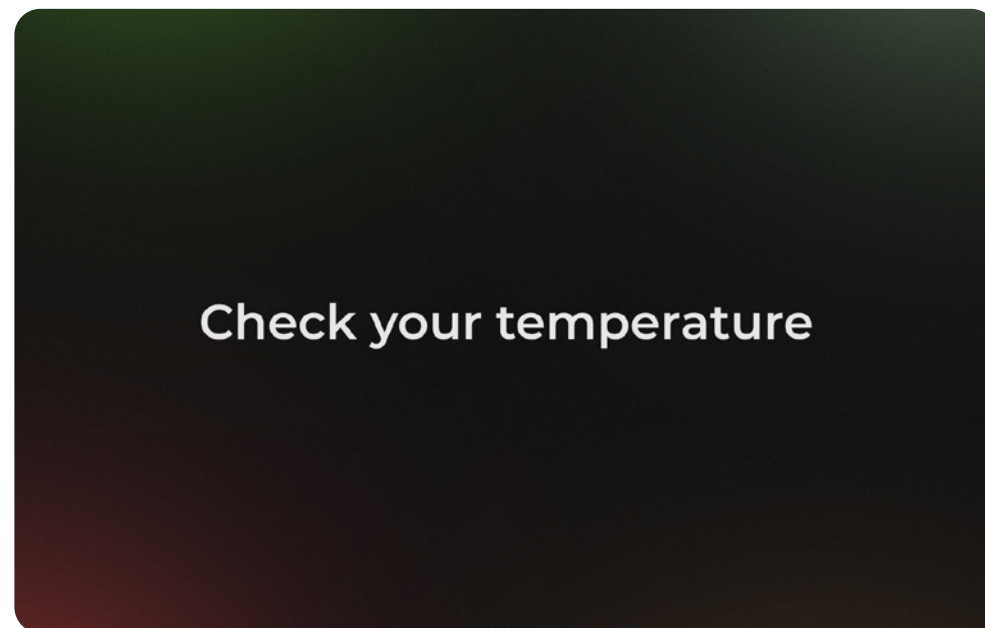

Fig. 33 **Station main screen**

If a person's forehead is placed incorrectly in relation to the range sensor, the station will inform the person and display a screen with advice on a proper measurement position (Fig. 34, 35).
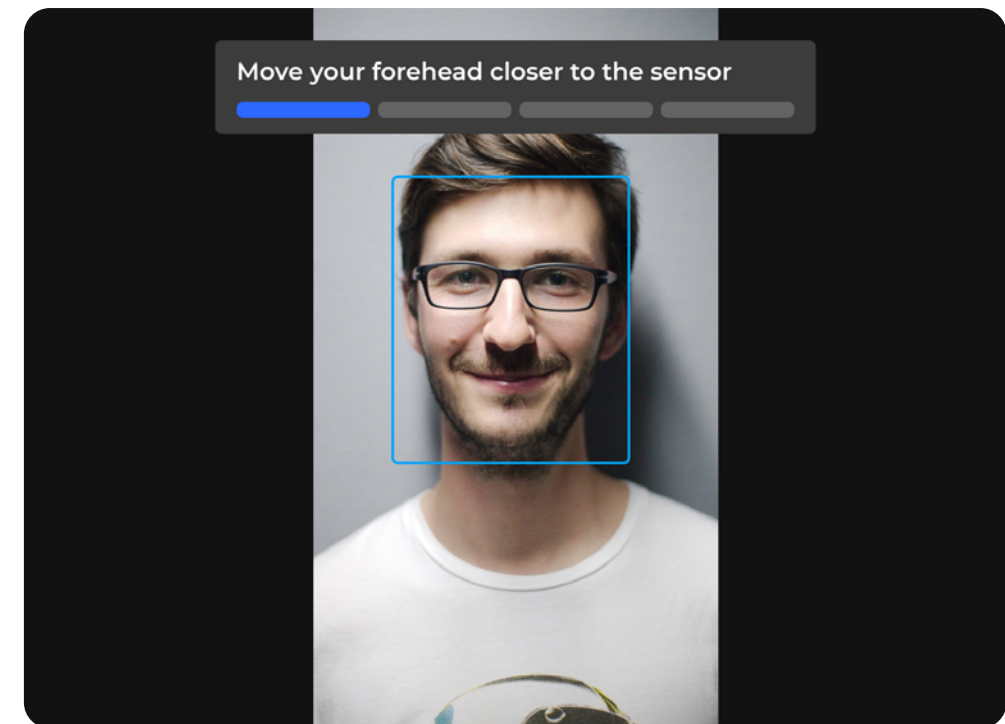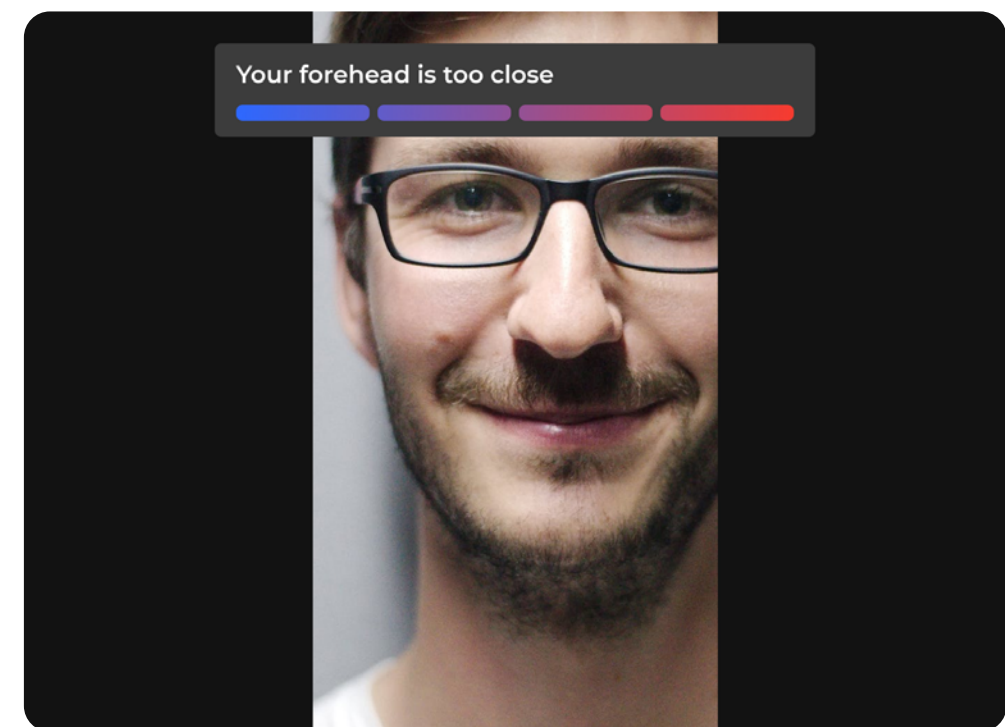

Fig. 34 **Position adjustment screen**

Fig. 35 **Measurement distance alert**

After the user properly positions in front of the station, the station recognizes the user's face and determines the person's height. Height detection ensures the correct sensor position is used for the measurement, depending on the distance. A rotary mechanism is used for the adjustment. A recommendation screen accompanies the process (Fig. 36):

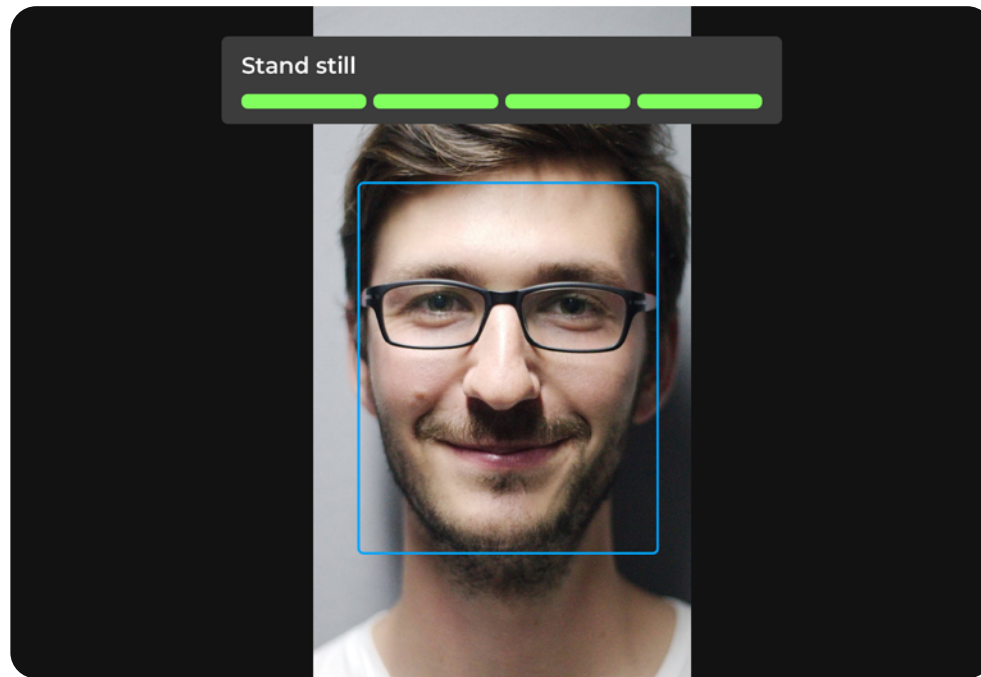*Fig. 36 A recommendation screen informs user to stand still during the process*

Once a measurement has been taken, the results are displayed. Color-coding is used for better result identification. Green indicates normal body temperature (Fig. 37). Red indicates increased body temperature (Fig. 38).
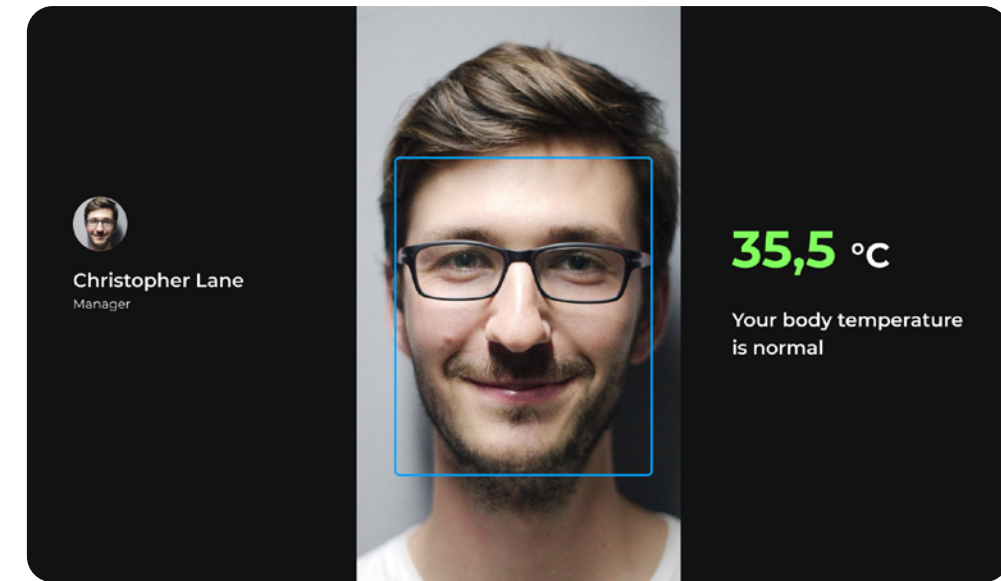

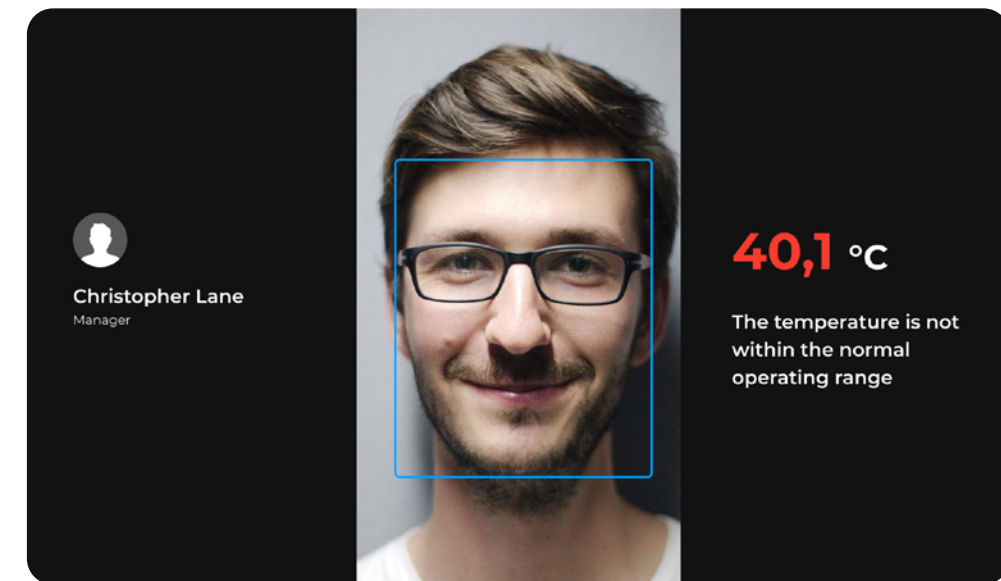*Fig. 37 Measurement results – body temperature is normal*

Fig. 38 Measurement results – body temperature is above normal

User photo and measurement results are stored in the database on a server. If the measurement result is above normal, a notification is sent to the operator's workplace.

After the measurement has been completed, the user steps away from the device. Depending on the results, the operator acts according to the instructions adopted at the operational facility of the station. If the face mask notification toggle is active, the device will remind the user to wear a face mask (Fig. 39).
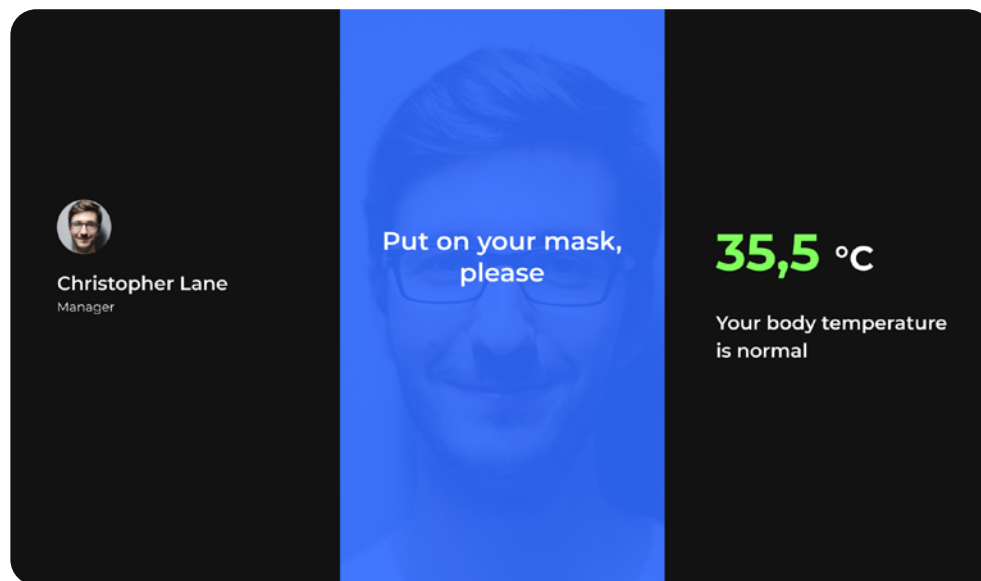
Fig. 39 Face mask notification

2.4. Safety guidelines

2.4.1. In the event of device failure

Failure of ThermoControl Plus is not considered a critical matter, as it is unable to lead to any emergency situations that could cause damage to individual property, any state and public property, the environment or the life and health of individuals. This manual does not include nor imply any specific guidelines for operators on that matter.

2.4.2. In case of emergency operation

In case of emergency operation, i.e., if the operating conditions of ThermoControl Plus station provided in this manual exceed the resistance to the external factors as listed in technical characteristics to the device (Table 1), operators must disconnect the device entirely and take measures to eliminate emergency conditions according to the guidelines adopted by the operational facility of the station.

3. Maintenance

Scheduled preventive maintenance is performed during the station operation. Scheduled maintenance is carried out cyclically, with the following frequency as per Table 4:

Table 4. **Maintenance schedule**

Description	Frequency
Software update	As released
Syslog analysis	Once a month
General inspection of the station	Once a month
Voltage monitoring and electricity consumption in compliance with the Technical Passport data	Once a month

Unscheduled maintenance is carried out depending on the technical condition and specific performance results of the device.

The station surface must be cleaned of dirt, dust and other substances which could interfere with its operation. Unplug the station before cleaning. A damp cloth can be used to clean the station. Do not use abrasive materials, solvents or any other aggressive chemicals (including acids) in the cleaning process. Do not immerse the station in liquid. Do not rinse it with tap water or allow electronic components of the device to come into contact with liquids.

However, the device can be disinfected with liquids containing alcohol according to the instructions adopted at operational facilities.

4. Warranty

1. Contact authorized service centers of ThermoControl Plus if you have problems using the device.

2. Before using the device, carefully read the user manual.

3. The legal basis of these warranty terms is the current legislation.

4. ThermoControl Plus warranty period is 12 months starting from the delivery date. In case of any product defects in that period, the warranty shall be extended for the period during which the device was not in operation.

5. The service life of the product directly depends on the operating conditions.

6. Warranty terms do not apply to product malfunctions resulting from:
   - Non-compliance with operational guidelines;
   - Mechanical damage caused by external impact or any other type of impact;
   - Use of product for non-intended purposes;
   - Natural disaster;
   - Adverse atmospheric and other external influences on the product, including rain, snow, humidity, heat and aggressive environments;
   - Infiltration of foreign objects, insects, animals, materials or substances into the device
   - Outside modification, repair, or violation of the station's integrity;
   - Failure of spare parts and accessories due to normal wear and tear.

7. The manufacturer will eliminate all of the encountered defects that arise during the warranty period free of charge, as well as replace the station entirely if the defects did not arise as a result of violating the usage or storage guidelines by the client. Warranty repairs are carried out by the manufacturer's service center.

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