AirLife®

AirLife DuoTherm®
Humidification System

Basic Service Manual

AirLife DuoTherm® Humidification System

Basic Service Manual

AirLife
2710 Northridge Dr. NW,
Suite A
Grand Rapids, MI 49544

℞ ONLY

Technical and Clinical Support
productquality@myAirLife.com

Customer Service
Hours: 6:00 a.m. - 6:00 p.m. MST
1-800-433-2797 from within the United States
info@myAirLife.com

Notice to the user that any serious incident that has occurred in relation to the device should be reported to the manufacturer at, productquality@myAirLife.com, and the competent authority of the Member State in which the user patient is established.

Contents

Chapter 1: Preparation

WARNING Annual inspection according to the procedure provided in Chapter 3 and documented in the form provided in the appendix is required to maintain patient and user safety and product performance.

WARNING The information provided in this manual is intended for the technical staff that shall perform the routine safety inspections and basic repairs that do not require formal training or access to the interior of the device. Do not attempt to repair or service the AirLife DuoTherm® Humidification system in ways that are not outlined within this service manual. For service and repair outside of the scope of this basic manual, contact AirLife and arrange for service and/or repair at an authorized service depot.

1.1 Cleaning and Disinfecting

Refer to User Manual for cleaning and disinfecting procedures.

1.2 Incoming Goods Inspection

Check delivery for completeness and compliance with the delivery note. The scope of delivery must be documented in the maintenance and/or repair log for the humidification system. If the contents are damaged or if the delivery is incomplete, please notify AirLife and arrange for service or repair to be conducted at an authorized service depot.

1.3 Electrostatic Discharge (ESD) Protection

Take precautions when servicing the device. Use an ESD workstation and an ESD wristband; otherwise, electrical components of the humidification system may be damaged.

1.4 Equipping the Maintenance/Repair Workstation

The maintenance/repair workstation must be equipped with the items listed below.

- ESD workstation and ESD wristband
- Suitable safety tester; for example, SECUTEST SIII + (or equivalent)
- Pin for activating the thermostatic switch Ø max. 4 mm min. length 100 mm
- Digital reference thermometer
- Water tank
- USB cable (377SV101594)
- PC with USB interface and Progflash service program
- AirLife DuoTherm® humidification chamber (377CBRE)
- AirLife DuoTherm® heated breathing circuit (37723CE, 37747CE, 37748CE, or equivalent)
- Flow source for generating an air flow in the tubing system between 5-50 LPM

1.5 Instructions-for-Use and Technical Description

The instructions for use and supplements to the technical description must be observed together with this service manual.

1.6 Maintenance and Repair Log

A maintenance and/or repair log must be kept for every humidification system throughout its service life. Every device is tested and released per the certificate of final inspection included with the original packaging. Retain that certificate as part of the maintenance log and supplement the log annually with the testing prescribed in Chapter 3 and the log in the appendix. The annual testing begins from the date the device is placed in service.

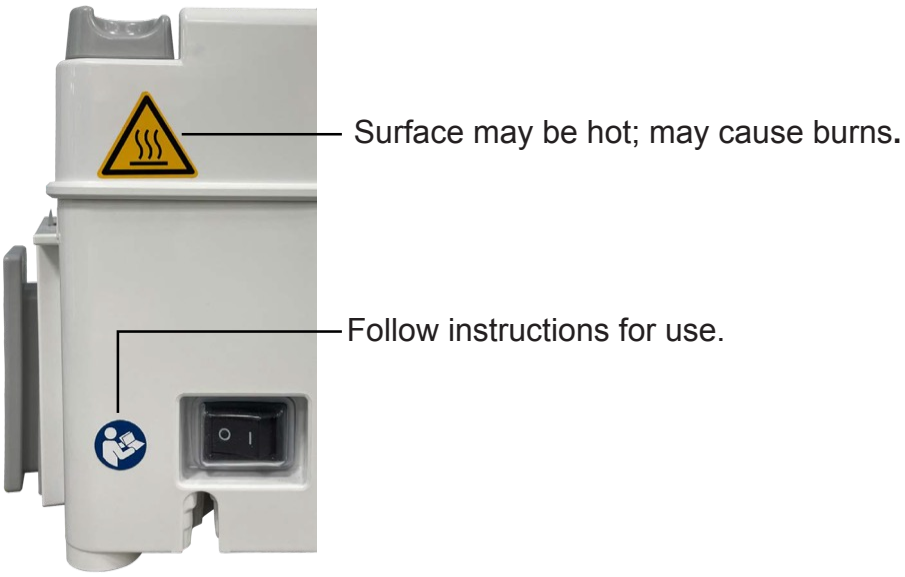
NOTE: The expected service life of the device is eight years if operated according to the Operator's Manual and maintained at least annually per this service manual.

2
Chapter 2: Maintenance and Repair

2.1 Inspecting the Humidification System for Damage

Check the items listed below when inspecting the humidification system. The device must be checked for damage upon receipt and annually. For any damage requiring internal service or repair that is not described in this Basic Service Manual, return the unit to AirLife or an authorized repair depot.

- Replace the housing part whenever you detect cracks or fissures.
- If the viewing window is dirty, clean it.
- If the air vents are dirty, clean them.
- If the control buttons are damaged, the circuit board must be replaced.
- If the power switch cover is missing or torn, it must be replaced.
- If the power switch cannot be operated without problems, it must be replaced.
- If the sockets for the heating wire adapter / temperature probe are damaged or blocked, they must be replaced.
- If the front-panel overlay is partially or fully detached, it must be replaced.
- If the heating plate is scratched, it can be carefully smoothed and cleaned using a fine wire wool scourer or fine sand paper. If the heating plate has significant, deep scratches that prevent the humidification chamber from making uniform contact, it must be replaced.
- If the feet are missing, they must be replaced.
- If the lever for retaining the water chamber cannot be operated, or if it is loose or cracked, it must be replaced.
- If the power cord cannot be plugged in, the power cable must be replaced.
- If the power cord is damaged, it must be replaced.
- If the USB socket is damaged, the circuit power board must be replaced.
- If the safety information/safety labels are illegible or missing, they must be reattached as shown below.



Position of the safety stickers

2.2 Diagnostic tools

2.2.1 Event List

The AirLife DuoTherm® stores a list of about 200 events categorized as alarms, warnings, and other events (see the tables below), and a listing of these events can be shown on the humidifier display. To see the Event List,

press the  and  buttons simultaneously for three seconds. The Event List items appear in color according to the function of the entry:

Table: Event list colors

Color	Function
Gray	Information
Red	Error
Blue	Warning

Use the  or  buttons to scroll through the Event List and press the  button to exit.
Use the Progflash maintenance tool to read, save, and delete the event list. In addition to the alarms, the respective patient, chamber, and heating plate temperatures are also transmitted. Alarm conditions are listed in the user manual.

The following tables describe the Event List entries.

Table: Alarms

Entry in the event list	Description
* ID > 01 Temp. Patient too high	Point-of-care respiratory gas temperature too high
* ID > 02 Temp. Patient high	Point-of-care respiratory gas temperature high
* ID > 03 Temp. Patient low	Point-of-care respiratory gas temperature low
* ID > 04 Temp. Chamber high	Chamber temperature high
* ID > 05 Temp. Chamber low	Chamber temperature low
* ID > 08 Pat. Temp. sensor defect	Point-of-care temperature sensor faulty
* ID > 09 Chamb. Temp. sensor defect	Chamber temperature sensor faulty
* ID > 10 HP. Temp. sensor defect	Heating plate temperature sensor faulty
* ID > 11 Insp. heater defective	Inspiratory heating wire faulty
* ID > 12 Exp. heater defective	Expiratory heating wire faulty
* ID > 13 Chamber not detected	Chamber not detected
* ID > 14 Water level high	Water level too high
* ID > 15 Water level low	Water level too low
* ID > 18 VT signal low	Hardware alarm
* ID > 19 HP temp. too high	Hotplate temperature too high
* ID > 20 Pat. Sensor not attached	Point-of-care temperature sensor not attached
* ID > 21 Cham. Sensor not attached	Chamber temperature sensor not attached
* ID > 26 Sensors short circuit	Temperature probe cable faulty

Table: Warnings

Entry in the event list	Description
* ID > 04 Chamber temperature high	Chamber temperature high
* ID > 08 Patient temperature over 42°C	Point-of-care respiratory gas temperature high
* ID > 09 Battery discharge	Discharge battery

Table: Other events

Entry in the event list	Description
* Device Powered ON	Device was switched on
* water detection: OFF	Water level detection setting has been changed
* exp. Heating Power: 1 to 4	Power level of exp. heating wire has been changed
* Respiratory Mode: NIV to FREE	Mode has been changed
* Humidity: low -> high	Humidification setting has been changed
* Chamber-Temp: 30.0ºC to 29.0ºC	Set point of the chamber temperature has been changed
* Patient-Temp: 33.0ºC to 31.0ºC	Set point of the patient temperature has been changed
* old time: 25/10/16 11:24	Date/time has been changed
* Factory reset	Factory settings have been loaded
* Off state	Device has switched to Off state
* Brown Out Reset occurred!	Reset after a drop of the voltage (for example, because of mains' voltage fluctuations)
* Software reset triggered!	Reset after a software update of factory reset

Table: Temperature entries

Entry in the event list	Description
Tp= xx °C	Patient-end gas temperature, in degrees Celsius
Tk= xx °C	Chamber outlet temperature, in degrees Celsius
Thp= xx °C	Heater plate temperature, in degrees Celsuis

2.2.2 Parameter 1 List

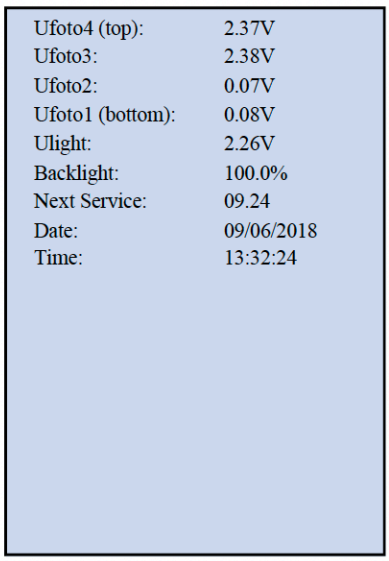
Open the Parameter 1 List by simultaneously pressing the  and  buttons for three seconds.

Parameter 1 List	
patient temperature:	39.8°C
chamber temperature:	29.0°C
heater temperature:	21.5°C
Rinsp:	14.8 Ohm
Rexpi:	24.6 Ohm
Pinsp:	23.0%
Pexpi:	47.8%
Php:	9.2%
Usec:	23.4V
Isense:	1.18A
MAX_INSP:	76%
MAX_EXPI:	76%
tp_init:	39.9°C
tk_init:	29.0°C
thp_init:	21.5°C
warmup:	29 min

Parameter	Description
patient temperature	Patient end respiratory gas temperature
chamber temperature	Chamber outlet gas temperature
heater temperature	heater temperature
Rinsp	Resistance of the inspiratory heating wire
Rexpi	Resistance of the expiratory heating wire
Pinsp	Current duty cycle of the inspiratory heating wire (%)
Pexpi	Current duty cycle of the expiratory heating wire (%)
Php	Current duty cycle of the heating plate (%)
Usec	Secondary voltage (rated 22V)
Isense	Heating wire current
MAX_INSP	Maximum power of the inspiratory heating wire (depending on the mains voltage)
MAX_EXPI	Maximum power of expiratory heating wire (depending on the mains voltage)
tp_init	Gas temperature at the patient end sensor at the switch-on time
tk_init	Chamber Outlet temperature at the switch-on time
thp_init	Temperature of the heating plate at the switch-on time
warmup	Remaining warm-up time in minutes

2.2.3 Parameter 2 List

Open the Parameter 2 List by simultaneously pressing the  and  buttons for three seconds.

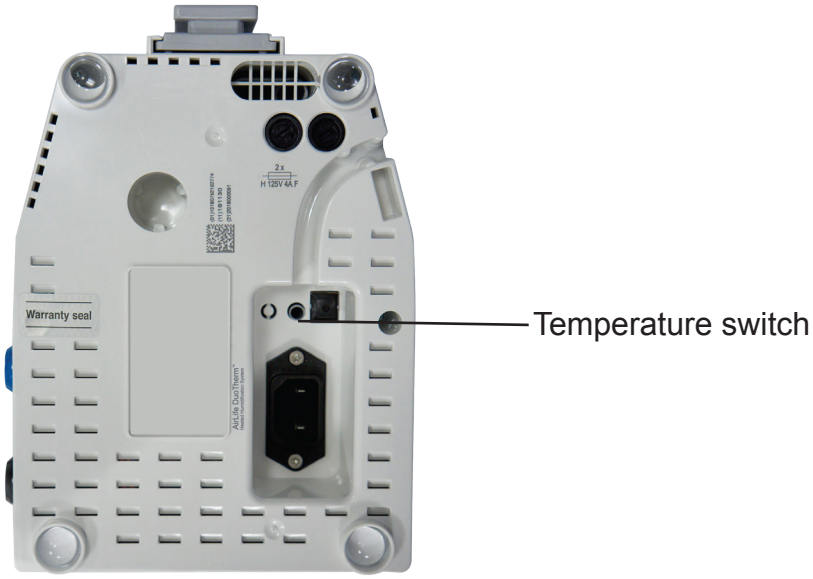


Parameter	Description
Ufoto4 (top)	Voltage at the top IR receiver transistor of the water level detection
Ufoto3	Voltage at the upper central IR receiver transistor
Ufoto2	Voltage at the lower, central IR receiver transistor
Ufoto1 (bottom)	Voltage at the lowest IR receiver transistor
Ulight	Measured voltage at the ambient light sensor
Backlight	Current brightness of the LCD backlight in percent
Next Service	Date, on which the next service appointment must take place (for information purposes)
Date	Date (Date unit was manufactured or as-set by customer)
Time	Time stamp (Time unit was manufactured or as-set by customer)

2.3 Resetting the Temperature Switch

If the heating plate does not heat up, first check whether the temperature switch needs to be reset. To do this, make sure the heater plate is cooled down, and then use a thin tool, approximately 8 centimeters long, (for example, wooden skewer, screwdriver, or similar tool) to carefully depress the temperature switch (shown below). An audible click confirms that the temperature switch has been reset. After the switch has been reset, the humidification system can be put into operation as usual. If the temperature switch trips again, return the unit to an authorized repair depot for service/repair.

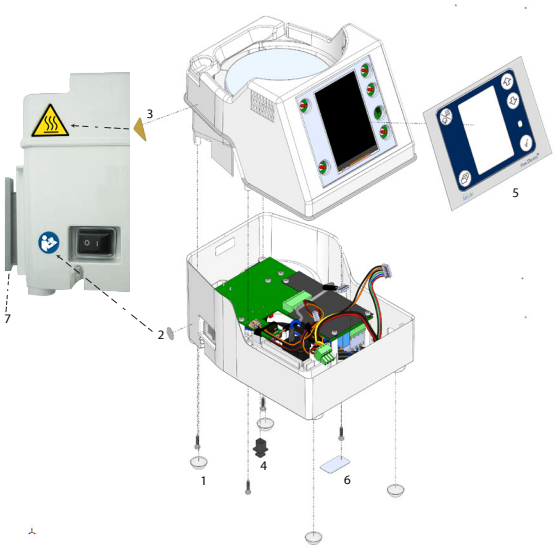
The tripping of the temperature switch during regular operation of the respiratory gas humidifier is unlikely, because safety mechanisms prevent the critical shut-off point from being reached; however, the temperature switch may trip during operation if the humidifier chamber is suddenly removed when the heating plate temperature is high (>120°C).



Resetting the temperature switch

NOTE Any repairs during the warranty period will be carried out by AirLife or an authorized service provider. Breaking the security seal during the warranty period results in loss of warranty. After the warranty period, a separate warranty seal can be applied see next page: Mechanical configuration.

2.4 Mechanical configuration



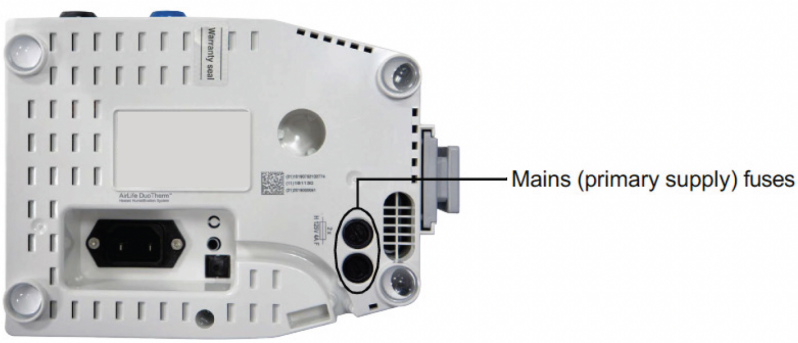
Item	Part No.	Description	Qty.
1	377SV100994	Feet, Self-Adhesive Housing	4
2	377SV100946	Sticker, Follow Instructions for Use	1
3	377SV100948	Sticker, Hot Surface Warning	1
4	377SV101005	Cap, USB Connector Cover	1
5	377SV101093	Film, Front	1
6	1000001488	Sticker, Warranty Seal	1
7	377SV101519	Spare part, Bracket, Housing Mounting	1

2.5 Replacing the Fuses

2.5.1 Mains (Primary Supply) Fuses

⚠ **WARNING** Before replacing a fuse, ensure that the power cord is disconnected.

If the humidity system does not run on, check the device fuses and replace them if necessary. Make sure to use the correct replacement fuses as specified in the spare parts listed in chapter 5: Spare Parts.
With a #2 flat blade screwdriver, push in and rotate the fuse cap counter-clockwise. To replace the fuse cap push in and rotate the cap to lock it into position.



Mains (Primary Supply) fuses

2.6 Setting the Date and Time

To set the date and time:

1. Open the Parameter 2 List by pressing the and buttons simultaneously for three seconds.
2. Press the button for three seconds.
3. Use the and buttons to choose a setting, and then press to confirm your choice. The chosen setting appears in gray.
2. Press the button to exit the menu.

Time settings

NOTE The date and time can also be read and set using Progflash

Chapter 3

3.1 Annual Inspection and Inspection after Repairs

Perform the following safety inspection in accordance with IEC 62353 / EN 62353 every 12 months of clinical operation and after any repair work. Note that the Humidifier is tested for electrical safety in accordance with IEC 62353/ EN 62353 at the manufacturing facility and the results are documented in the Certificate that accompanies the device in the original packaging. Retain the original certificate as part of your maintenance log for the device along with the results of the annual inspections detailed below. Record the results of the annual inspections using the Service and Post-Repair Log included in the Appendix.

The initial factory electrical safety test is valid for up to 12 months from the date it is placed in service as long as the device arrives undamaged.

3.2 Inspecting the Humidification System for Damage

Inspect all exterior surfaces and components of the Humidifier, including the power cord and accessories. Note any significant evidence of damage on the form. Note the reason for the inspection; annual or post repair and, if the latter, note the nature of the repair.

3.3 Electrical Safety Inspection

The measurements are carried out in accordance with IEC 62353 / EN 62353 (latest valid version). The breathing tube (including heating wires and temperature probe) is a type BF application part, whereby the tube end, the heating wire and the metallic part of the temperature probe can be considered as patient connections in regard to electrical aspects.
The factory utilizes a SECUTEST SIII+, but equivalent test equipment is acceptable if it is calibrated and intended for the specific electrical safety testing described below.

3.4 Device Function Performance Test

NOTE: For the tests with the humidification system switched on, it is essential to introduce a gas flow between 5-50 LPM to the chamber inlet. Various alerts may appear if the humidification system is put into operation without gas flow. If alerts appear, turn off the base unit briefly, ensure gas is flowing, and run the test again. The device is not intended for use without gas flow.

3.4.1 Set the humidifier up with a compatible dual heated Duotherm breathing circuit, e.g. 37747CE according to the operator's manual and circuit IFU. Make sure the inspiratory and expiratory heating wires are connected and the temperature probes are fully inserted.

3.4.2 Apply a continuous flow of gas into the chamber between 5-50 LPM.

3.4.3 Turn on the humidifier and confirm an audible beep and the LEDs under the button must flash briefly.

3.4.4 Note and record the displayed firmware version and hour meter value that appears on the splash screen during start-up.

3.4.5 After the base unit has started, check that the display is correctly shown and that the heating plate and the tube heaters are warming up. Confirm warm-up by observing temperatures in the Parameter 1 list or by viewing the actual temperatures by pressing and holding the up or down arrow button.

Note: If the airway temperature has not risen by 2°C within 4 minutes after the humidification system is switched on, an alarm message appears. Check for adequate flow through the system.

3.4.6 The warm-up phase takes 30 minutes after the unit is turned on and the remaining time may be observed on the Parameter 1 list.

3.4.7 After the warm-up phase, confirm the symbol clears from the display.

3.4.8 Wait a few minutes after the completion of the warm-up phase, and check whether any alarm messages occur.

3.4.9 Press the button for three seconds to check whether the therapy pause operates properly. The appears on the right, top, for 2 minutes and then automatically clears.

3.5 Keyboard Functions

With the Humidifier normally operating after the warm-up period, check the function of the listed buttons:

	Trigger an alarm by disconnecting the temperature probe or heater wire adapter from the base unit. Press the alarm mute/ therapy pause button and confirm the audible alarm is muted for 2 minutes after you press this button. The visual alarm should remain on the display for the 2 minute muted period. Re-connect the adapter/probe and confirm the audible and visual alarms clear.
	Confirm the configuration menu opens when this button is pressed
	Confirm the patient and chamber temperature displays actual temperature while the button is pressed and held. Confirm the display returns to the set values when the button is released.
	Confirm the patient and chamber temperature displays actual temperature while the button is pressed and held. Confirm the display returns to the set values when the button is released.
	Confirm the Change Menu opens when this button is pressed for three seconds

3.6 Temperature Measurement Accuracy

For testing the entire measuring chain (including temperature probe), a calibrated reference thermometer is required. To check the temperature accuracy of the system:

3.6.1 Prepare a container with lukewarm water (approximately 37°C) that is at least 6“ deep and large enough to fit the temperature probes and reference probe within close proximity of each other.

3.6.2 Connect the humidification chamber, temperature probe, and heating wire adapter.

3.6.3 Connect inspiratory heating wire with heating wire adapter.

3.6.4 Put the AirLife DuoTherm base unit into operation.

3.6.5 Dip both temperature probes together with the reference thermometer into the lukewarm water to the same depth, suspending the probes away from surfaces in close proximity.

3.6.6 Compare all temperatures after approximately one minute. The temperatures measured by AirLife DuoTherm® Humidification System are viewed by pressing and holding the up or down button or by using the Parameter 1 page (recommended). The measured temperatures must not deviate from the reference thermometer display by more than ± 2°C.

3.6.7 Alternatively, the accuracy of the system can be checked by using a temperature probe replacement made from fixed resistors (1151.5 ohms corresponding to 39 °C for patient-end probes and 1143.8 ohms corresponding to 37°C for the chamber probe). The following maximum deviations apply to this measurement:

- Patient-end temperature: +/-0.5°C
- Chamber temperature: +/-0.7°C

3.7 Detection of The Humidification Chamber

3.7.1 With the system set up and operating normally, release the humidification chamber by operating the chamber retention lever, being careful not to touch hot surfaces.

3.7.2 Within ten seconds, the Humidification Chamber Missing alarm must be displayed.

3.7.3 Re-set the chamber to its normal location and confirm the alarm clears.

3.8 Humidification Chamber Water Level Detection

3.8.1 Insert an empty humidification chamber into its normal location.

3.8.2 Start up the base unit as described in the instructions for use, ensuring the Water Level Detection is activated.

3.8.3 After no more than 60 seconds, the "Water Level Too Low" alarm appears visually and audibly.

3.8.4 Add water to the chamber manually through one of the 22 mm ports to a level approximately ½ to ¾ of the Max Fill Line.

3.8.5 The "Water Level Too Low" alarm must clear.

3.8.6 Manually add additional water to the chamber to a level approximately ½“ above the Max Fill Line.

3.8.7 After no more than 60 seconds, the "Water Level Too High" alarm appears visually and audibly.

3.8.8 Remove the over-filled chamber from the device, being careful to not touch potentially hot surfaces, and replace with a humidification chamber filled to its normal level (either manually filled to ½ to ¾ of the Max Fill Line, or attached to a spiked water bottle and hung above the chamber.

3.8.9 The "Water Level Too Low" alarm clears audibly and visually.

3.9 Recognizing Heating Wires and disconnect alarms

3.9.1 With the Humidifier operating normally, remove the heating wire adapter from the base unit.

3.9.2 Confirm that a Heater Wire Alarm activates visually and audibly within 30 seconds.

3.9.3 Replace the heater wire adapter and confirm the visual and audible alarm clears.

3.9.4 Remove the Inspiratory Heating Wire Adapter from the Inspiratory manifold of the breathing circuit.

3.9.5 Confirm that a Heater Wire Alarm activates visually and audibly within 30 seconds.

3.9.6 Replace the heater wire adapter and confirm the visual and audible alarm clears.

3.9.7 Remove the Expiratory Heating Wire Adapter from the expiratory manifold of the breathing circuit.

3.9.8 Confirm that a Heater Wire Alarm activates visually and audibly within 30 seconds.

3.9.9 Replace the heater wire adapter and confirm the visual and audible alarm clear.

3.10 Recognizing the Temperature Probe and disconnect alarm

3.10.1 With the base unit switched on and operating normally, remove the temperature probe from the humidifier to check whether the Temperature Probe Missing or Faulty alarm appears visually and audibly.

3.10.2 Replace the temperature probe and confirm that the audible and visual alarms clear.

3.11 Checking the Parameter 1 List

3.11.1 Open the Parameter 1 List by simultaneously pressing the  and  for approximately three seconds.

3.11.2 With an Adult Duotherm circuit, ref 37747CE connected and operating normally after the warm-up period, confirm the secondary voltage (Usec) value is between 17.5V and 25.8V.

3.11.3 Measure the mains voltage using a calibrated instrument.

3.11.4 Check the accuracy of the secondary voltage by using the following tables. For the secondary voltage (Usec) reading, the measured mains voltage must lie in the interval specified in each case.

3.12 Checking the Parameter 2 List

3.12.1 Open the Parameter 2 List by simultaneously pressing the  and  for approximately three seconds.
3.12.2 Check that Ufoto4 (top) is > 2V.
3.12.3 Check that Ufoto3 is > 2V.
3.12.4 Check that Ufoto 2 is < 0.15V.
3.12.5 Check that Ufoto 1 (bottom) is < 0.15V.

3.13 Overall Results, Interpretation, and Disposition

3.13.1 Review and conclude the overall test results:
- If all tests pass, place the device in service and assign a next-calibration-date in 12 months.
- If any test fails, remove the device from service and arrange for service or repair.
- Optional: Set the next service appointment (month and year) using the Progflash.

3.14 Completion of the Functional Test

3.14.1 Use ProgFlash to read, save, or delete the Event List.

3.14.2 Reset the Humidifier to factory settings by pressing the  and  buttons simultaneously for three (3) seconds. The system will restart and default to INV mode, 3 drops.

3.14.3 Remove the USB cable and reattach the cap of the USB port.

Chapter 4 Using the Progflash Maintenance Tool

The Progflash maintenance tool is an application for transferring humidification system settings and firmware updates. In addition, it can provide information from the humidification system for troubleshooting or documentation purposes.

4.1 Installing the Progflash Maintenance Tool

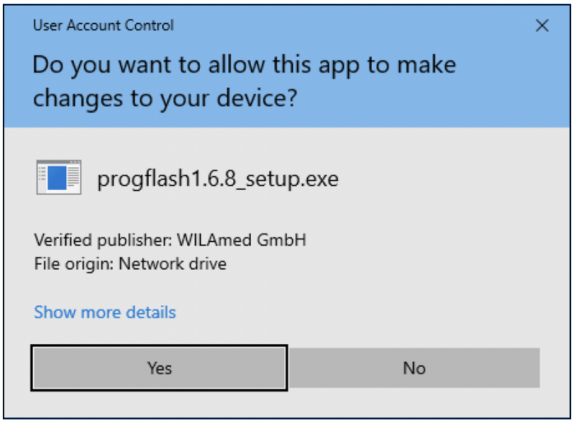
Run the Setup application according to the following instructions.

NOTE Do not connect the AirLife DuoTherm® Humidification System to the computer yet.

CAUTION: Commands must not be sent to the system without the required USB drivers installed. Doing so may cause the device to enter an unstable state, such as a continuous boot loop.

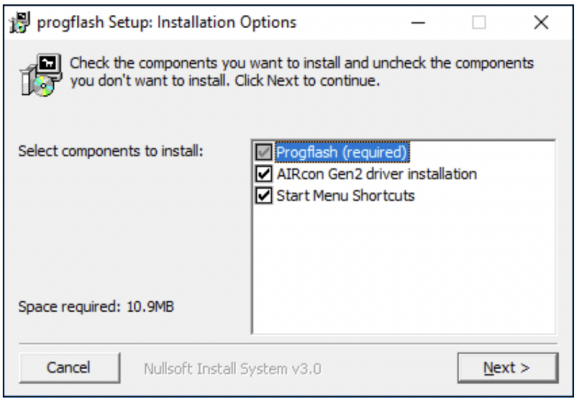
CAUTION: The USB port is intended for service-use only. A cable must not be connected to the system during therapy.

1. Click **Yes** to allow the application to make changes.



Allow changes

2. Select the options to be installed.



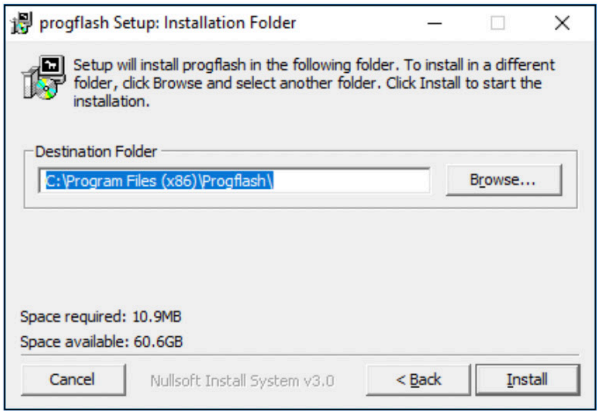
Progflash options

Figure 4-2. Progflash options

The shortcuts in the **Start** menu are optional, and the AIRcon Gen 2 driver only needs to be installed once.

3. Click **Next**.

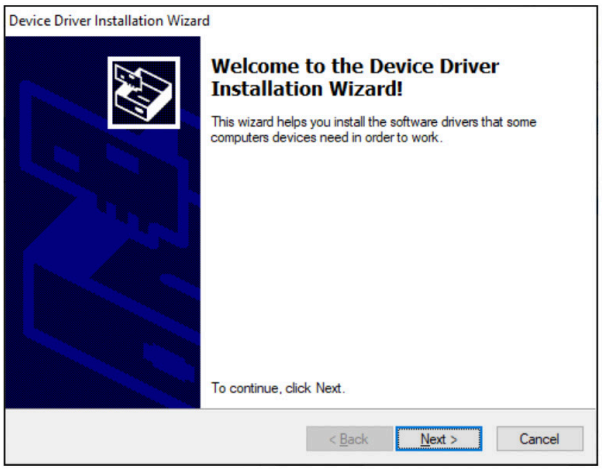
4. Click the **Browse** button to select the destination folder, and then click **Install**.



Destination folder

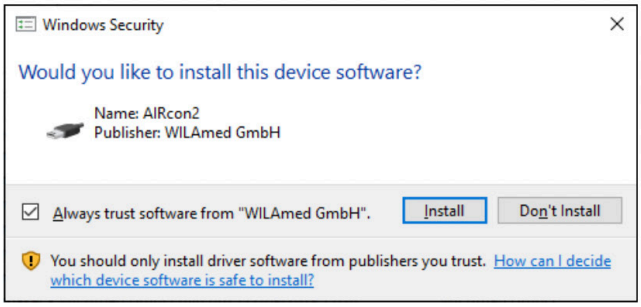
If you have selected the AirLife DuoTherm® driver installation component, the device driver installation wizard starts.

5. Click **Next**.



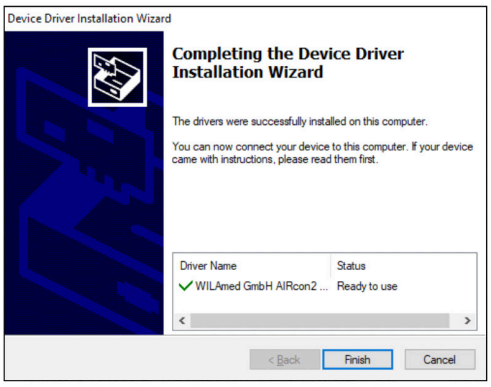
Device driver installation wizard

6. If the Windows Security message appears, click **Install**.



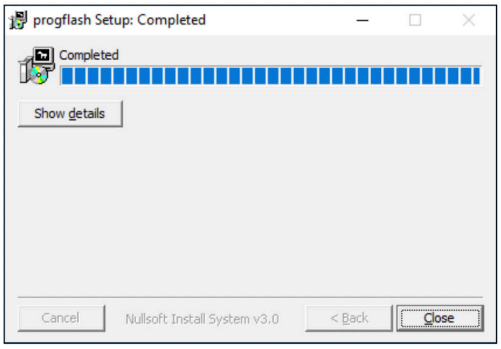
Windows Security window

7. Click **Finish**



Successful driver installation

8. After the installation process is complete, click **Close**.



Completing the installation

The AirLife DuoTherm® Humidification System can now be connected to the computer.

9. Remove the cap from the USB socket and connect the USB cable (377SV101594).

NOTE: Do not discard the cap. It must be replaced at the end of the functional test.

10. If it is not running, turn on AirLife DuoTherm® Humidification System.

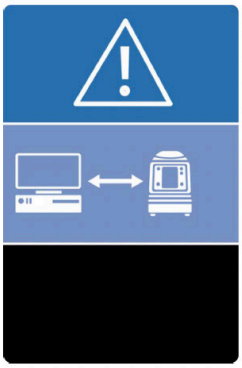
The first time the humidification system is connected to the computer, the driver installation is completed automatically.

4.2 Setting the Protocol Mode

The following procedure provides the steps to set up the communication protocol between the AirLife DuoTherm® Humidification System and the PC.

To activate the protocol mode:

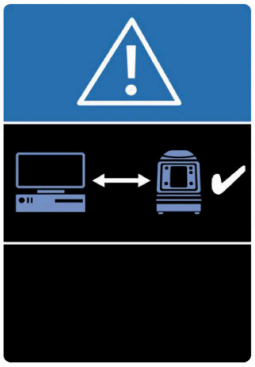
1. Connect the AirLife DuoTherm® Humidification System to the computer.
2. Turn on the humidification system and open the **Settings** menu by pressing the button for three seconds.
3. Press the button for three seconds.
4. The humidification system screen appears as shown below.



Protocol mode

5. Press the button to confirm your choice.

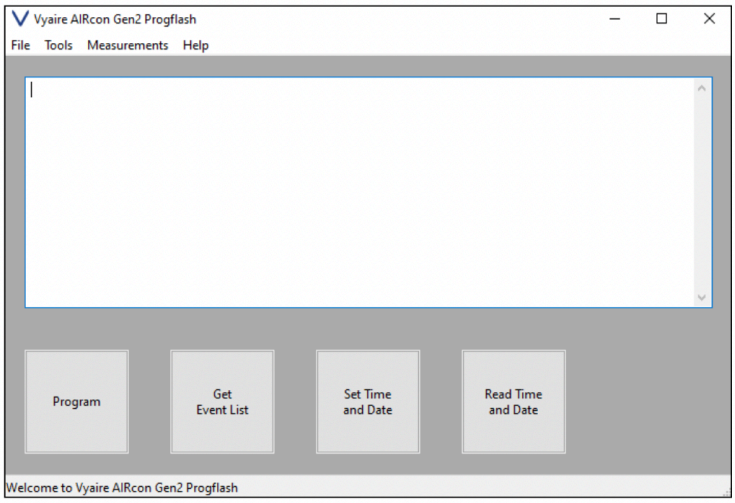
   The screen appears as shown below.Data exchange can only take place in this condition.



4.3 Using the ProgFlash Functions

The first time you start the humidification system, the Main window opens as shown in the figure below. This window contains a menu bar for selecting commands, a text box for viewing output, and buttons for frequently used functions.

NOTE To delete the text box content, click **File > Clear Output Window …**



Main screen

The sections that follow describe the four function buttons.

i. Reading or Deleting the Event List

To retrieve data from the humidification system and display it in the text box, click the **Get Event List** button.

⚠ **CAUTION** Save the Event List before clearing it from the memory of the humidification system. To save the list, click **File > Save Output Window ...**

To clear the event memory from the humidification system, click **Tools** > **Clear Event List**..

ii. Checking or Adjusting the Time Settings

You can view the date and time by clicking the **Read Time and Date** button.

To set the time, on the **Tools** menu, select the time zone by clicking **Change Time Zone**.

NOTE: You can select the local time (local) or Greenwich time ("GMT") options. The date and time are based on the operating system settings.

To automatically transfer the time settings to the AirLife DuoTherm® Humidification System, click the **Set Time and Date** button.

iii. Setting the Service Date

To transfer a service date to the humidification system, click **Tools > Set next service date** and then select or enter the date (month and year) as needed. When the appointment date expires, a 🔧 appears on the humidification system display.

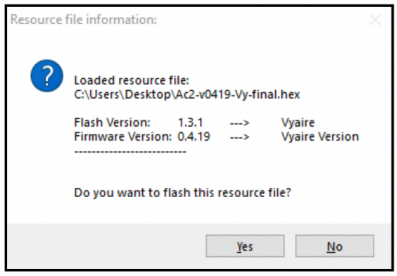
iv. Firmware update

NOTE Firmware updates may only be carried out if authorization has been granted. Only released versions may be transferred.

NOTE A complete functional check must be completed after a firmware update.

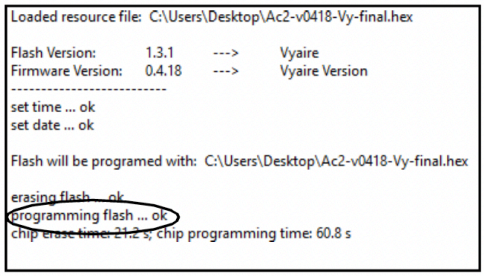
To select a resource file to be transferred directly to the AirLife DuoTherm® Humidification System,click **Tools** > **Program a resource file**.

In the **Resource File Information** message box, click **Yes** to confirm that you want the update process to start.



Confirming updates

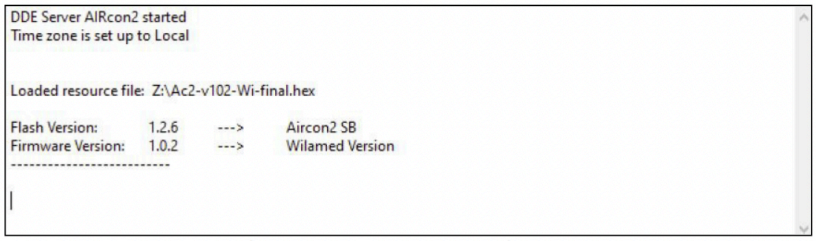
After the update has been transmitted successfully, the message **programming flash ... ok** appears in the text window.



Programming flash confirmed

The humidification system automatically checks the integrity of the data. If the check is successful, the message CRC OK appears on the screen and the humidification system restarts. The update process is not completed until the correct firmware version number appears on the Start screen of the humidification system. You can optionally set the path of a resource file by clicking **File > Open Resource File ...**.

When you start the Progflash maintenance tool, the resource file is automatically loaded and a message about the resource file appears in the text box. The date, time, and the firmware update are transferred in one step to the humidification system by clicking the **Program** button.

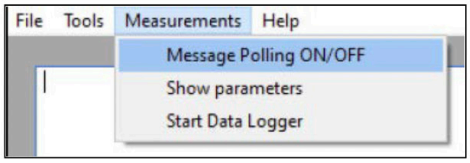


Display of the path to a resource file

v. Measuring and Storing

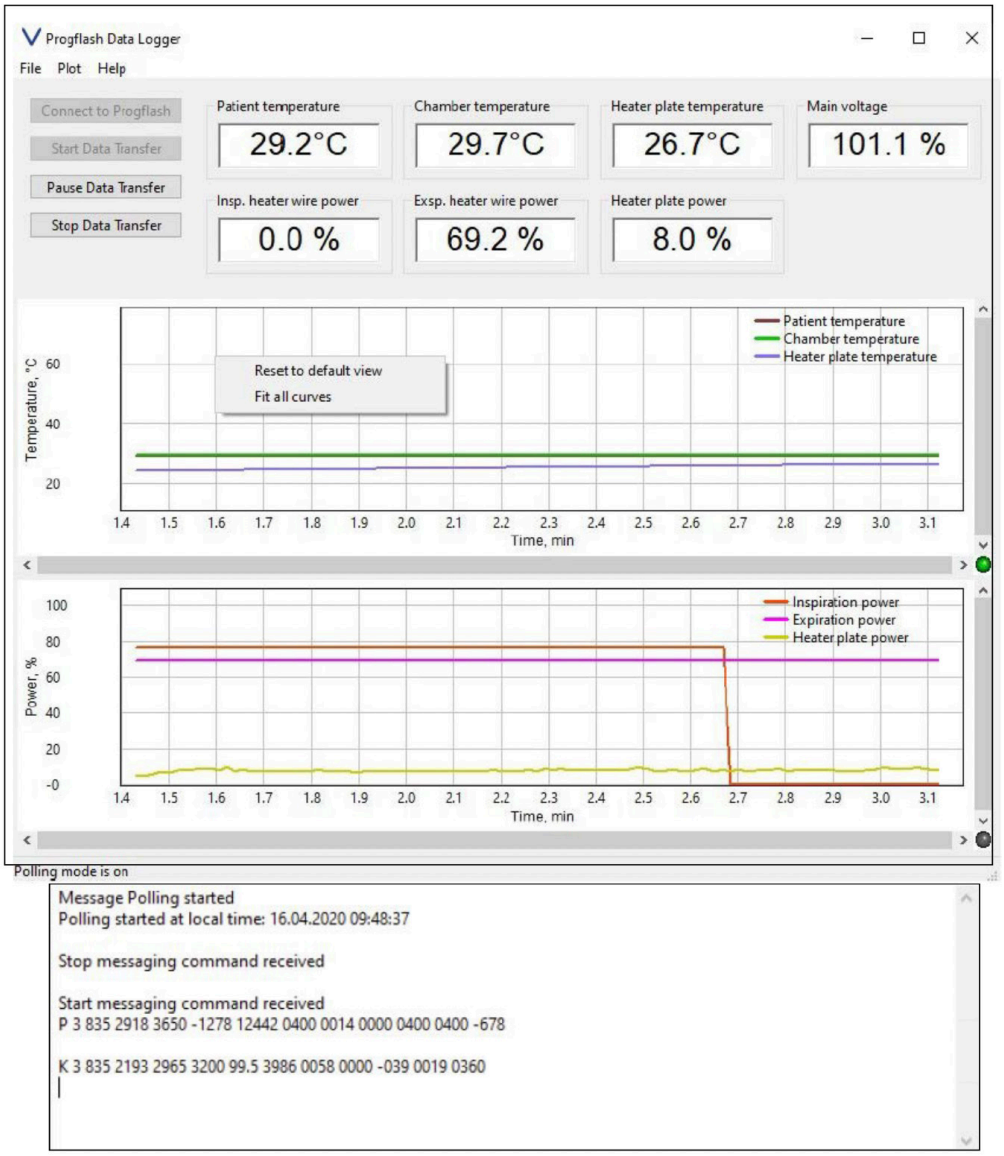
To view target and actual values, click **Measurements** on the menu bar.

Start the transmission of set points and actual values by clicking **Measurements** > **Message Polling ON / OFF**.



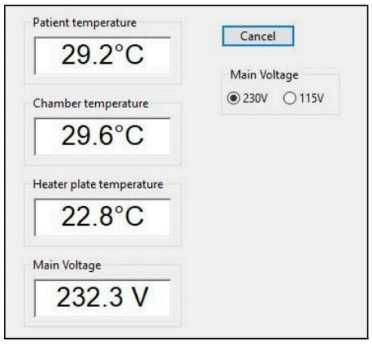
Starting the measurement

The values appear in the text box.



Receiving data

To view the patient end temperature, chamber temperature, heating plate temperature, and the mains voltage, click **Measurements** > **Show parameters**.



View of current patient-end temperature, chamber temperature, heating plate temperature, and mains voltage

To view the curves, click **Measurement > Start Data Logger**.

Graphical display of the recordings:

- To adjust the size of the recording, right-click in the curves.
- To show or hide curves, select the corresponding option on the “Plot” menu.
- To stop the recording, click Stop Data Transfer.

Message	Possible causes	Remedies
• AirLife DuoTherm isn't in PROTOCOL MODE !!!	• The device has not been set into protocol mode.	• Activate the protocol mode (see "4.2 Setting the Protocol Mode").
• Could not set configuration • Could not claim interface • Couldn't find the USB device • Could not open USB device • Cannot access USB • USB transmission failure • Flash verify at page • {Number} failed! • Flash read at page {Number} failed! • Flash page write {Number} failed!	• The connection to the device has been interrupted. • The device is not switched on or connected. • The user does not have sufficient rights. • Another application requires the driver or accesses the device. • Hardware fault or other unknown errors.	• Check the USB cable. • Check that the device is switched on and in protocol mode. • Close other applications. • Reinstall driver. • Run Progflash with administrator rights. • The unit must be returned to an authorized repair depot to replace the display module.
• Unknown flash series • Unknown manufacturer	• Hardware fault or other unknown errors.	• The unit must be returned to an authorized repair depot to replace the display module.
• Flash size of external memory too small	• Invalid resource file. • Hardware fault or other unknown errors.	• Select a valid resource file. • The unit must be returned to an authorized repair depot to replace the display module
• Resource file doesn't exist!	• The resource file path is invalid, or the file has been deleted.	• Select a valid resource file.
• Can't open resource file!	• Another application accesses the resource file. • The user does not have sufficient rights	• Select a valid resource file. • Close other applications. • Run Progflash with administrator rights.
• Resource Data not found • Invalid file size: {Size} • Wrong data • Wrong file format • Resource file name error	• The resource file is invalid.	• Select a valid resource file.
• Set time & date went wrong! • Set of service date went wrong!	• The connection to the device has been interrupted. • Unknown error.	• Check the USB cable. • Check that the device is switched on and in the protocol mode.
• The procedure has been aborted!	• A setting transfer wasn't successful. • A firmware update was aborted by the user.	• Check the USB cable. • Check that the device is switched on and is in the protocol mode.
• Cannot create program directory	• A directory could not be created.	• Check the permissions or run the setup with administrator privileges.
• Another program instance is already running, aborting	• Another instance of Progflash is in progress.	• No remedy is required.

Chapter 5: Spare Parts

Table 5.1: Basic Spare Parts

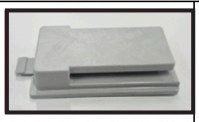
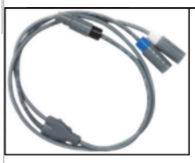
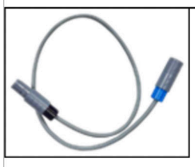
Item	Item no.	Description
	377SV101519	Device Holder; Bracket adapter
	377SV100824	1 x 4 A, 125 V, Fast Blow, 10 kA Breaking Capacity, UL listed fuse (for AirLife DuoTherm® 377HTR)
	377SV101594	USB cable
	377SV100994	Device feet, Self-adhesive, 4 pcs
	377SV100946	Sticker, Follow Instructions for Use
	377SV101005	Cap, USB Connector Cover
	377SV100948	Sticker, Hot Surface Warning

Table 5.2: Device Accessories

Item	Item no.	Description
	377PR5 / 377PR5E	Temperature measuring probe for heated breathing tube 160cm
	377PR6 / 377PR6E	Temperature measuring probe for heated breathing tube 180cm
	377ADL	Heating wire adapter, Dual limb inspiratory / expiratory
	377ASL	Inspiratory heating wire adapter
	377PWR	AirLife DuoTherm® Power Cord for United States

AirLife®

Appendix:
AirLife DuoTherm® Humidification System Safety Testing and Maintenance Log

1. Device Under Test Identification

Serial number (SN)		**Reference number**	377HTR

Person Performing the tests	
Date:	
Test Type (Annual or Post-Repair)	

2. Visual inspection

No damage and anomalies detected (including power cord and markings) (reference EN62353 § 5.2)	**PASS ☐**	**FAIL ☐**
Notable as-recieved Observations (N/A if none)		

3. Electrical Safety Testing according to EN/IEC 62353:2014 version

Measurement device		Calibration Due Date:	
EN 62353 Version			
Nominal voltage in V		Nominal frequency in Hz	
Nominal power in VA		Protection class	

Test *Check*	***Set value***	***Actual value***	***Rating***	
Insulation resistance, **in Mohm (reference EN62353 § 5.3.3 & Table 2)**	> 7		**PASS ☐**	**FAIL ☐**
Device leakage current, **In µA (reference EN62353 § 5.3.4.2.2 & Table 3)**	< 500		**PASS ☐**	**FAIL ☐**
Applied parts leakage current, **In µA (reference EN62353 § 5.3.4.3.2 & Table 3)**	< 5000		**PASS ☐**	**FAIL ☐**
**Test voltage of the leakage current measurement*	99 < V < 132		**PASS ☐**	**FAIL ☐**

4. Functional Performance tests

Firmware version	
Hour Meter Reading	

Start-Up Test	*Rating*		*Comment*
Start screen, startup Audible Beep and two LED flashes under Mute/Pause button	**PASS** ☐	**FAIL** ☐	
Confirmation of warm-up; Chamber and patient temperatures rise to set point and the warm-up symbol functions	**PASS** ☐	**FAIL** ☐	
Confirmation that Therapy Pause functions properly	**PASS** ☐	**FAIL** ☐	
Confirm Chamber heating	**PASS** ☐	**FAIL** ☐	
Confirm Circuits heating	**PASS** ☐	**FAIL** ☐	

5. Keyboard Function

Confirmation of Alarm Mute function,	**PASS** ☐	**FAIL** ☐	
Confirmation of Menu Button function,	**PASS** ☐	**FAIL** ☐	
Confirmation of Actual Temperature display via Up and Down Arrows	**PASS** ☐	**FAIL** ☐	
Confirmation of Change Menu access via Check button	**PASS** ☐	**FAIL** ☐	

6. Temperature Accuracy Test

Accuracy of Temperature Probes within ± 2 ºC of reference probe	**PASS** ☐	**FAIL** ☐	
Display of patient temperature with fixed resistor (optional): 38.5°C ≤ T ≤ 39.5 °C	**PASS** ☐	**FAIL** ☐	
Display of chamber temperature with fixed resistor (optional): 34.3°C ≤ T ≤ 35.7 °C	**PASS** ☐	**FAIL** ☐	

7. Detection of Humidification Chamber

Confirm Humidification Chamber detection operates properly	**PASS** ☐	**FAIL** ☐	

8. Humidification Chamber Water Level Detection

Confirm High Water Level alarms operate properly	**PASS** ☐	**FAIL** ☐	
Confirm Low Water Level alarm operates properly	**PASS** ☐	**FAIL** ☐	

9. Heater Wire Detection

Confirm Heater Wire detection alarms operate (Base, Inspiratory, and Expiratory)	**PASS** ☐	**FAIL** ☐	

10. Temperature Probe Detection

Confirm Temperature Probe disconnect alarm operates properly	**PASS** ☐	**FAIL** ☐	

11. Check the values of parameter list 1

Test ***Check***	***Rating***		***Comment***
Heater plate temperature **30°C ≤ T ≤ 60°C**	**PASS** ☐	**FAIL** ☐	
Inspiratory resistance (Rinsp) **12.5Ω ≤ R ≤ 18Ω**	**PASS** ☐	**FAIL** ☐	
Expiratory resistance (Rexp) **12.5Ω ≤ R ≤ 18Ω**	**PASS** ☐	**FAIL** ☐	
Secondary voltage Usec **17.5V ≤ U ≤ 25,8V**	**PASS** ☐	**FAIL** ☐	**Actual Usec voltage:** **Actual Mains voltage:**

12. Check the values of parameter list 2

Test ***Check***	**Rating**		***Comment***
IR beam Ufoto4 (top) **> 2.00V**	**PASS** ☐	**FAIL** ☐	
IR beam Ufoto3 **> 2.00V**	**PASS** ☐	**FAIL** ☐	
IR beam Ufoto2 **< 0.15V**	**PASS** ☐	**FAIL** ☐	
IR beam Ufoto1 (bottom) **< 0.15V**	**PASS** ☐	**FAIL** ☐	

13. Overall Results/ Interpretation

Result	**PASS** ☐	**FAIL** ☐	*Comment*	Pass-Place in service Fail- Place out of service, repair
Next service date				
Check performed by, on (Date,Signature)				