inheco

User and Installation Manual

Thermoshake

Part No.:
710014X

Doc ID: 900113-003 December 2021

INHECO Industrial Heating and Cooling GmbH reserves the right to modify their products for quality improvement. Please note that such modifications may not be documented in this manual.

This manual and the information herein have been assembled with due diligence. **INHECO GmbH** does not assume liability for any misprints or cases of damage resulting from misprints in this manual. If there are any uncertainties, please feel free to contact sales@inheco.com. → How to contact INHECO, page 6.

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1 IMPORTANT NOTES

1.1. General Information

Read the user instructions completely. The manual explains how to operate and handle the Thermoshake devices: Thermoshake and Thermoshake RM. In case these manual instructions are not followed, injury or product damage cannot be excluded.

Missing or insufficient knowledge of the manual leads to loss of liability against INHECO GmbH.

This manual is part of the Thermoshake devices and must be retained until the device is disposed of and must be passed on with the Thermoshake when the device is taken over by a new user.

The Thermoshake devices meet the acknowledged rules of technology and comply with today‘s standards.

Manual instructions must be followed in order to ensure safe handling of the device.

Security-related warnings in this manual are classified into three hazard levels:

- The signal word WARNING indicates hazards which – without precautionary measures – can result in serious injury or even death.
- The signal word CAUTION indicates hazards which – without precautionary measures – can result in minor to moderate injuries
- The signal word NOTE stands for the general precautionary measures that have to be taken to avoid damaging the device when using it.
- The signal word NOTICE stands for the general measures that help using the device.

Contact INHECO in case there are any uncertainties of how to operate or how to handle the Thermoshake device.

Your opinion about this manual provides us with valuable insights on how we can improve this document. Please do not hesitate to direct your comments to sales@inheco.com, → How to contact INHECO, page 6.

1.2. Explanation of Symbols

Symbol	Explanation
	Potential danger of serious injury or death → signal word WARNINg or CAUTION indicate the severity.
	Caution: Potential danger of hot surface.
·	Bullet points indicate steps of instructions.
-	Hyphens refer to enumerations.
→	Arrows indicate: “refer to” and are mostly an active link

1.3. Abbreviations and Glossary

The following acronyms and items are used in this document	
°C	Degree Celsius
°F	Degree Fahrenheit
mm	Millimeter
in	Inch
Hz	Hertz [1/s]
K	Kelvin
kg	Kilogram
lbs	Pounds
dB(A)	Decibel
RH	relative humidity
TEC	Thermo- Electric- Cooler (Thermoelectric Module)
Vdc	Voltage direct current
Adc	Ampere direct current
W	Watt
rpm	revolutions per minute
IVD	In Vitro Diagnostic
FDA	Food and Drug Administration
MTC	Multi TEC Control controls up to 6 INHECO devices individually
STC	Single TEC Control controls 1 INHECO device
Offset	The difference between the set temperature and actual value once the temperature is stable
PT100	PT100 is a Resistive-Temperature-Detector (RTD). This sensor increases its resistance with increasing temperature.
Calibration	Calibration is the validation of specific measurement techniques and equipment. At the simplest level, calibration is a comparison between measurements - one of known magnitude or correctness - made or set with one device and another measurement made in as similar a way as possible with a second device.

1.4. Warranty

The warranty period starts on the date of shipment. Any damage caused by operating the Thermoshakes outside the specifications and guidelines leads to the loss of warranty. Broken seals on INHECO devices lead to the loss of warranty as well.

INHECO will only accept parts / devices for return that do not pose a threat to the health of our staff. In particular, the devices may not have been used in Biosafety Level 3 and 4 environments, or have been exposed to radioactive or radiation materials. → Cleaning and Decontamination, page 25.

Devices exposed to Biosafety Level 3 and 4 Environments are not accepted by INHECO for return.

1.5. How to contact INHECO

INHECO GmbH	
Address	Fraunhoferstr. 11 82152 Martinsried Germany
Telephone - Sales	+49 89 899593 120
Telephone - Techhotline	+49 89 899593 121
Fax	+49 89 899593 149
E-Mail - Sales	sales@inheco.com
E-Mail - Technical -Hotline	techhotline@inheco.com
Website	www.inheco.com

Technical Support & Trouble Shooting Instructions:

http://www.inheco.com/service/technical-support.html

2 PRODUCT DESCRIPTION

2.1. Intended Use

The Thermoshake is one of the most compact heated and cooled shaking positions for a wide range of standard ANSI/SLAS (formerly SBS) plates and tubes. The Thermoshake can be placed on the deck of liquid handling systems with the lowest possible usage of space. It combines excellent control of temperature and fluid mixing. The cooling function offers the unique possibility to stop reactions quickly by reducing the temperature of the liquid samples. Shaking curves are linear and orbital.

The Thermoshake devices can be operated with two types of precise temperature/rpm controllers with integrated power supply (MTC or STC). The units are heating/cooling devices with CE and UL certification. They are mainly used on robotic platforms and systems in LabAutomation.

The Thermoshake is designed specifically for use in Life Science. The Thermoshake is prepared for easy integration into IVD applications, but the final IVD validation has to be performed by the first marketer (IVD application).

When using the Thermoshake devices in a Biosafety Laboratory Environment, the user is responsible for labeling the devices according to the WHO Laboratory Biosafety Manual (ISBN 92 4154650 6) and for operating the devices according to this Biosafety Manual.

The Thermoshake must be used exclusively by laboratory professionals trained in laboratory techniques with labautomation systems and having studied the instructions for use of this instrument as well as the instructions of the workstation the device is used in.

2.2. Scope of Supply

Before initial operation, make sure that the shipment of your unit and its scope of supply is complete and no parts are damaged.

In case of parcel or product damages, make photos of the damaged boxes and products and email them to **techhotline@inheco.com** immediately. Transportation damages must be reported to INHECO within 7 days of delivery. The following components should be included in each shipment:

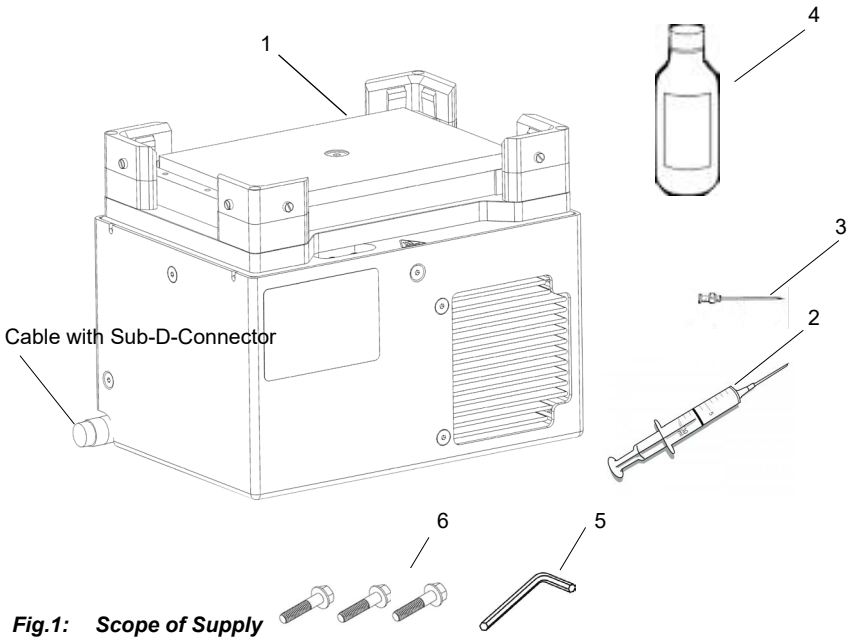


Fig.1: Scope of Supply

(1) Thermoshake incl. Sub-D-Connector Cable *

(2) Syringe to refill the cooling liquid

(3) Syringe needle to refill the cooling fluid

(4) Cooling fluid

(5) Socket wrench for filling nozzle of the cooling liquid reservoir

(6) 3 allen screws to fix thermal adapters

* image may vary depending on what Thermoshake is ordered.

The Sub-D-Connector Cable is already connected with the Thermoshake and it also needs to be conntected to the Black Slot Module installed inside the TEC Control Unit (MTC or STC). → Initial Operation, page 12.

2.3. Labels

The identification label with part number and serial number also contains important technical indications. The electrical specification on the label must meet your local situation. The label is placed on the side of the device. The identification label must not be removed. If it has become illegible or falls off, it has to be replaced by a new identification label. New labels can be ordered at INHECO. In case the label is missing and you do not know the part number and serial number, they can also be read out with the software (MTC/STC Demo Tool) which can be downloaded from INHECO´ login section on **www.inheco.com**. → Trouble Shooting & Support, page 18f.

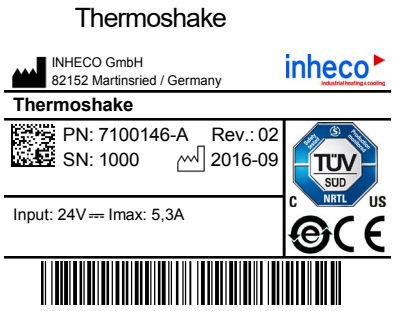


Fig.2: Product labels on the device

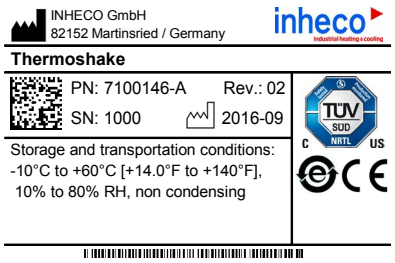


Fig.3: Shipment labels on the package

In case of an empty reservoir
refill with **32ml**
INHECO Cooling Liquid only!

CAUTION!
Overfilling may cause
malfunction of the liquid circuit!

Caution Hot

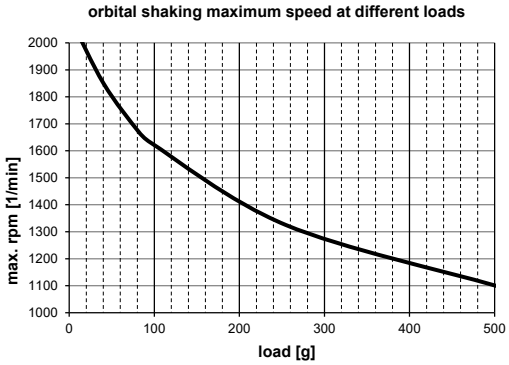
Fig.4: Other lables on the product

2.4. Technical Data

Technical Data incl. Dimensions		
Thermoshake type	**Thermoshake**	**Thermoshake RM**
Outer dimensions **height**	p/n 7100146 118 mm [4.685 in]	p/n 7100144 116 mm [4.567 in]
Length x width	147 mm x 104 mm [5.787 in x 4.095 in]	
Input voltage / max. current	24Vdc / 5.3Adc	
Temperature range	+4°C to +70°C [+39.2°F to +158°F]	
Maximum ΔT ($=T_{ambient} - T_{target}$)	25°C (cooling mode only) [77°F]	
Noise	Max. 42dB(A)	
Maximum load	1.0 kg (→ also performance curve)	
Shaker frequency **weight reduce the max. speed**	100 to 2000 rpm (→ also performance curve)	
Shaking amplitude	2 mm [0.07874 in]	
Shaking pattern	Orbital, linear (diagonal, lengthways, sideways)	
Protection Category	IP 22	
Weight including cables	3.5 kg [7.7 lbs]	

Enviromental Conditions		
Tolarable relative humidity	Operation	10-80% RH (non condensing) at +20°C up to +30°C [+68°F to + 86°F]
	Transportation and storage	10-80% RH (non condensing) at +20°C up to +30°C [+68°F to + 86°F]
Temperature	Operation	+15°C to +32°C [+59°F to 90°F]
	Transportation and storage	-10°C to + 60°C [+14°F to 140°F], non condensing

* Condensate can prevent the Thermoshake from operating properly and can damage the Thermoshake. Condensate should be eliminated on a daily basis or more often, for example by heating cycles in between cooling cycles.



Movement shape	Max. shaking frequency with microplate 96 (or load of 82g)
n,w,s,e (orbital)	1700 rpm
n,e,s,w (orbital)	1700 rpm
nw, se (diagonal)	700 rpm
ne, sw (diagonal)	700 rpm
n, s (sideways)	650 rpm
e, w (lengthways)	400 rpm

Fig.5: Performance curve

3 SAFETY INSTRUCTIONS

3.1. Product-specific Risks

WARNING
Follow the safety instructions given below in order to avoid danger for user and device.

General

- The Thermoshake device (“the device”) needs maintenance on a regular basis regarding cooling liquid, → Maintenance (Refilling of Cooling Liquid Reservoir), page 20ff and regarding the pump →
- The device has to be placed in an upright position. On non-observance, it will eventually overheat, causing the temperature fuse to blow.
- The main power switch of the TEC Control Unit must always be accessible.
- Free air supply must be ensured to prevent damage to the device. Do not cover the ventilation openings at the front and rear panel at any time. Ensure a minimum of at least 30 mm (1.2 inch) of free space between the ventilation openings at the front and at the back and adjacent devices or walls.
- Ensure that there is no other device installed next to the device increasing the inletair temperature for the device above the specified temperatures. In case of doubt, please contact INHECO for further analysis.
- Do not insert any parts into the ventilation inlet or outlet.
- Do not exceed minimum or maximum ambient temperature and humidity conditions during operation or storage of the device → Technical Data, page 9.
- The device must not be used in environments with risk of explosion.
- The device is for indoor use only.

Burning Hazard:

- Devices can burn your skin. Even after switching off the TEC Control Unit, the connected devices can still be hot and could seriously burn your skin as the material‘s temperature can reach up to +70°C [+158°F]! It takes a while to cool down after the device has been used.

Electrical Shock:

- The device must not be used if the device itself or the power cable shows visible signs of damage.
- You can suffer an electric shock and injuries, if the Thermoshake is not connected properly or if you do not disconnect the device from the TEC Control Unit outlet before opening the housing.
- Never connect or remove the power plug of the TEC Control Unit with wet hands.
- Original power cable for the TEC Control Unit provided by INHECO has to be used to guarantee safe and proper operation.
- The wall power outlet must have a ground earth connection (Safety Class 1).
- Where an ungrounded receptacle is encountered, a qualified electrician must replace it with a properly (PE) grounded receptacle in accordance with the local electrical code.
- Make sure that the electrical specification on the identification label at the side panel meets your local situation. → Labels, page 8.

Biosafety Laboratory Environment

- When using the devices in a Biosafety Laboratory Environment, the user is responsible for labeling the devices according to the WHO Laboratory Biosafety Manual (ISBN 92 4154650 6) and for operating the devices in accordance to this WHO Laboratory Biosafety Manual.

3.2. Technical Alterations

- Do not alter the product. Any modification or change which is not approved by INHECO leads to the loss of warranty. Broken seals on INHECO devices lead to the loss of warranty as well.
- Use only original parts provided by INHECO. Parts provided by other suppliers can impair the functionality of the unit.
- Damages due to the use of non-original parts are excluded from INHECO's liability.

3.3. Malfunctions

- In case of a malfunction, switch off and disconnect the device immediately. Make sure to inform the authorized person in charge.
- Make sure that the malfunctioning unit is not accidentally re-installed and used before the malfunction is effectively eliminated. → Trouble Shooting and Support, page 18.

4 HARDWARE INSTALLATION

4.1. Scope of Supply

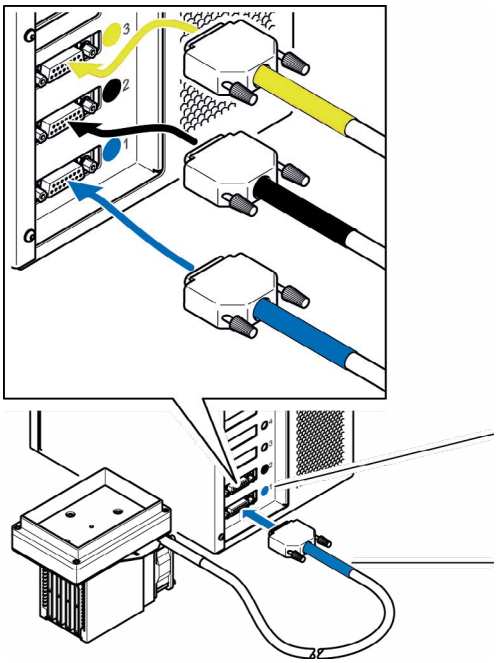
Before initial operation, make sure that the shipment of your unit is complete and neither packaging nor parts are damaged → Scope of Supply, chapter 2.2.

4.2. Initial Operation

4.2.1. How to connect device to the MTC / STC

In order to connect an INHECO heating/cooling/shaking device, the TEC Control Unit has to be equipped with the corresponding Slot Module. There are blue, black, and red Slot Modules available. The following table shows the appropriate Slot Module for each heating/cooling/shaking device.

Product	Color	Article No.	Heating/cooling/shaking Unit
Blue Slot Module	blue	2400128	CPAC
Black Slot Module	black	2400125	CPAC HT 2-Tec, HeatPAC, Heated Lid, Teleshake 95, Thermoshake,
Yellow Slot Module	yellow	2400211	Thermoshake AC, Thermoshake AC 180, Teleshake AC, Teleshake 95 AC



For clear identification, all Slot Modules and connectors are marked in blue, black or red.

When connecting a new device, the color code has to be strictly respected.

In case of wrong connection, interaction will not be possible and an error message will be issued

The color coding of the Slot Modules is visible from the outside through small round windows.

At the connectors, the sleeve must be marked in the same color as the Slot Module.

Fig.6: Connecting a heating/cooling/shaking device (image shows CPAC)

- Disconnect the power cord of the TEC Control Unit.
- Connect the heating/cooling/shaking device to the appropriate Slot Module and lock the connector. The Heated Lid must be connected to a Black Slot Module.
- Connect the power cord of the TEC Control Unit.
- Switch the TEC Control Unit on: The touch-screen display of the TEC Control Unit shows the name (or abbreviation) of the currently connected device. When multiple devices are installed, you can switch between the devices by touching the arrow left or arrow right button of the touch screen.

NOTE
Never plug in our plug out a device while the Controller is running. Always turn off the Controller before disconnecting or connecting a device.

4.3. Programming the Movement Pattern

The default movement pattern is orbital.

- For programming the shaking shape use the command “SSSFigure” (please refer to the Firmware Command Set of the MTC or STC in login section of webpage **www.inheco.com).** The maximum frequency of linear shaking is lower than the maximum speed of orbital shaking → performance curve, page 9.

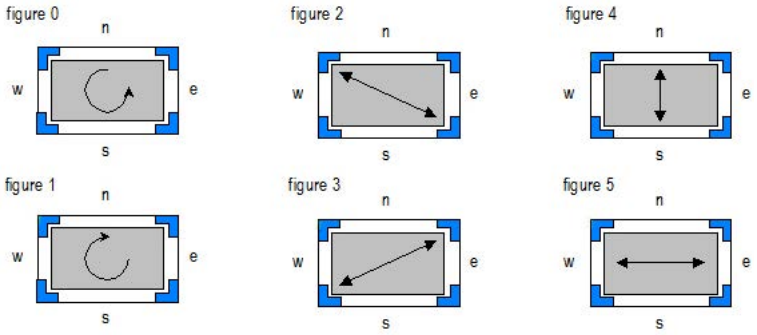


Fig.7: Programmable shaking patterns

NOTICE
Shaker pattern below 200 rpm is not a fine circle but looks more like vibration.

4.4. Fixation of Disposables (Tubes, Reservoirs, Plates)

A proper positioning of the disposable is absolutely essential to avoid uncontrolled motions of the plate, and to achieve the desired shaker frequency.

Tubes, reservoirs, and plates without flat bottom require a thermal adapter (insert, nest), -> Installation of Adapters, page 15. A flat bottom plate can be placed directly onto the contact surface and is positioned by the corner brackets.

A custom-fit thermal adapter plate (insert, nest) for the temperature transfer into the tube or plate also ensures a proper positioning of the plate. The positioning brackets of the four corners can be taken off in case a such a custom-fit adapter plate holds the labware in place. -> chapter 4.5. Visit **www.inheco.com** to find the custom-fit adapter for your disposable.

NOTICE
Optimized temperature settings require a temperature off-set value adjusted to the thermal characteristics of the disposable. → Manual MTC/STC for further details.

4.4.1. Fixation of Flat Bottom Plates

- Adjust the grub screws of the corner brackets for firm positioning of flat bottom plates.

NOTICE
- Grub screws of the corner brackets may need adjusting for perfect fit.
- Disposable fixation via positioning brackets may not be necessary, if a thermal adapter for temperature transfer is used → Removal of positioning brackets, chapter 4.5 below)

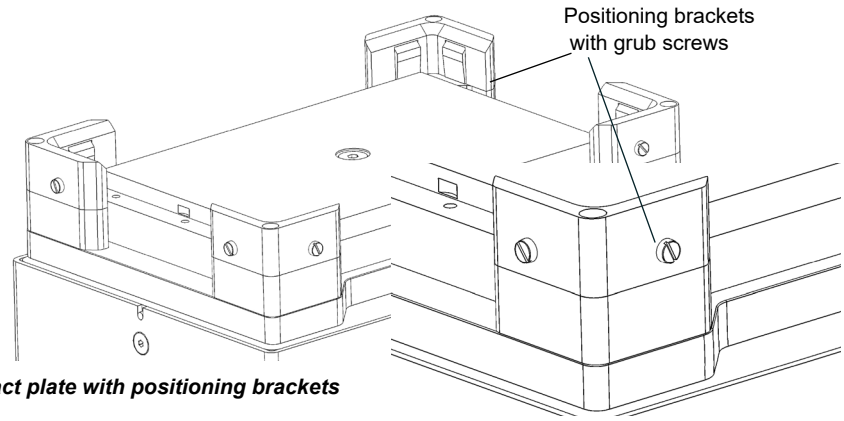


Fig.8: Contact plate with positioning brackets

NOTE
For ANSI/SLAS (formerly SBS) listed plates the maximum allowed torque is 0.3 Nm.

4.5. Removal of Positioning Brackets

(only for Thermoshake 7100146 and **not** for Thermoshake RM 7100144)

The positioning brackets of the Thermoshake 7100146 (grey brackets can be removed in case it facilitates the positioning of the plates, given that a thermal adapter (insert, nest) is installed on the Thermoshake.

- Unscrew the four vertical screws of the positioning brackets with a 1.5 mm socket wrench (not within scope of delivery).

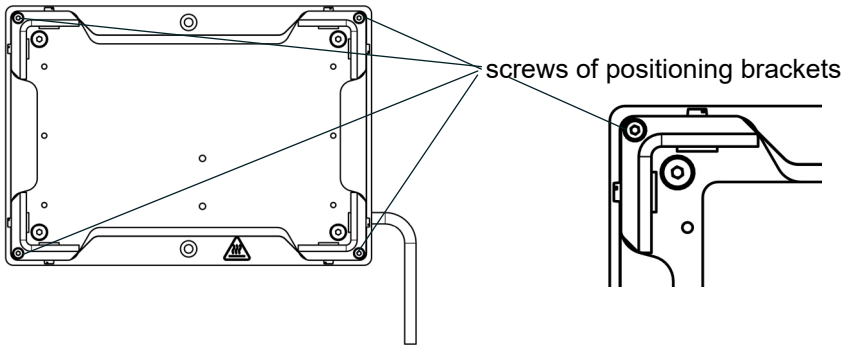


Fig.9: Removal of positioning brackets

4.6. Installation of Adapter Plates (Inserts, Nests)

A thermal adapter is not needed for microplates with flat bottoms. Such plates can be placed directly onto the temperature contact surface of the Thermoshake.

Custom-fit adapters are required for all tubes, reservoirs and plates without flat bottoms, to ensure temperature transfer into the disposable/assay. The adapter may facilitate accurate porsitioning for easy robotic handling plate.

Visit **www.inheco.com** to find the adapter which fits your tube, reservoir or plate. In case you do not find your disposable on the list of adapters, ask **sales@inheco.com** for a custom design.

There are two orientations possible for the installation of the adapter plates.

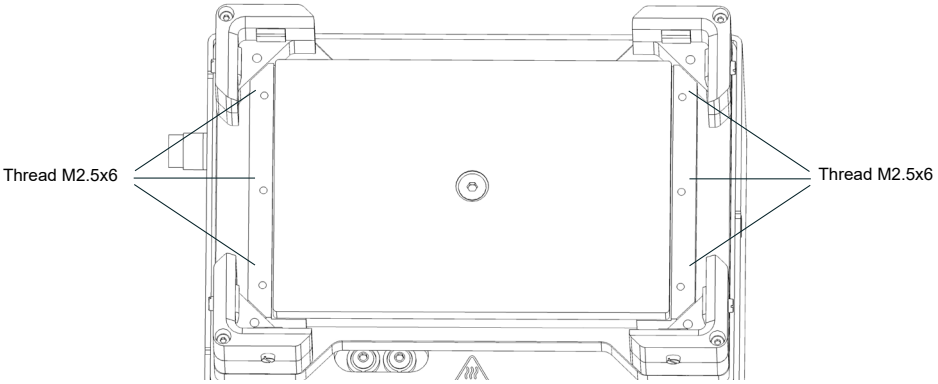


Fig.10: Threaded holes to fix or unfix the adapter plates

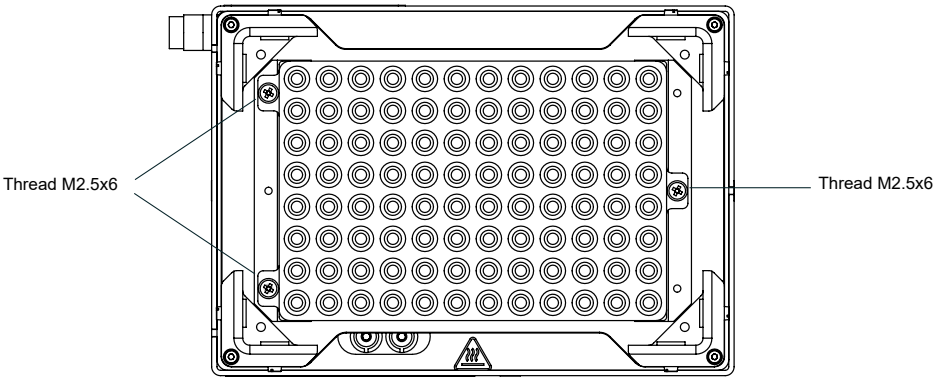


Fig.11: Themoshake with installed PCR adapter plate

4.7. Mechanical Integration

The Thermoshake devices are usually integrated into liquid handling workstations. The way of fixation depends on the hardware provided by the automation platform manufacturer. When the Thermoshake devices are placed on a bench top, they must be fixed to the ground with two M4 screws via the thread holes of the units. The ground must be firm and even.

Drilling schematic for secure mounting of the Thermoshake unit on a working table is shown in the following figure.

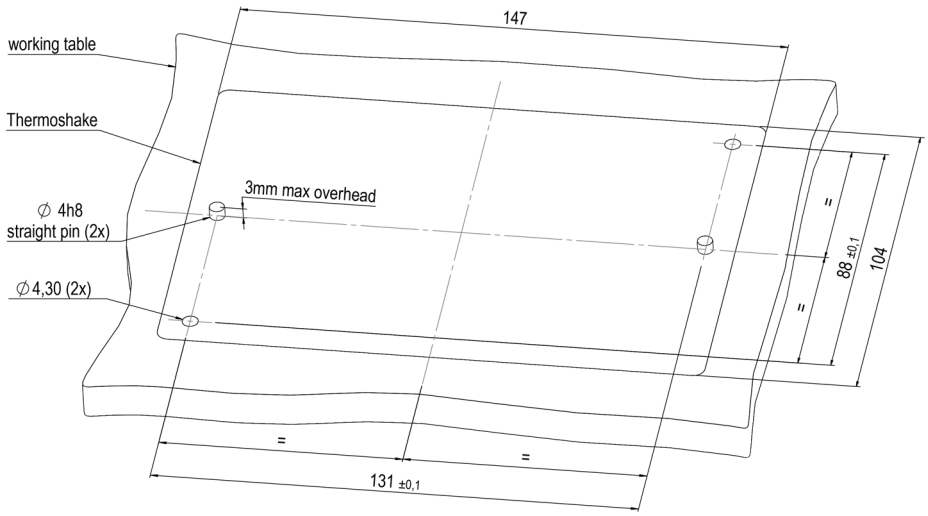


Fig.12: Drilling Scheme

NOTE
Thermoshake always needs to be fixed to the ground for proper shaking performance.

5 SOFTWARE INSTALLATION

INHECO offers a software called Demo Tool to provide limited functional control (also possible via touchscreen of the MTC/STC) and the opportunity to send manually entered firmware commands to the devices.

We recommend to contact your workstation provider for integration (including software integration) of the MTC/STC with devices into your workstation.

6 DAILY USAGE

The devices can be operated by touch-screen at the front panel of the MTC/STC, by the Demo Tool software delivered by INHECO or by the software of your liquid handling workstation. The INHECO Demo Tool software and the touch-screen allow programming basic temperature and shaking sequences. More complex control sequences can be performed with the software of your robotic platform provider or if you write your own software based on our Firmware Command Set and DLL.

For more information consult the following documents:

- for touch-screen operation: MTC/STC Manual
- for software operation: Demo Tool Manual
- for firmware commands: MTC/STC Firmware Command Set

These documents can be downloaded from INHECO´ login section on **www.inheco.com**.

6.1. Safety Instructions for Operation

Free air supply of the ventilation inlet and outlet must be ensured to avoid damage to the unit.

NOTE
Do not operate the Thermoshake devices in an ambient temperature of more than 32°C (90°F). Otherwise the devices may not work properly or may even get damaged.

Ensure that there is a minimum of at least 30 mm / 1.2 inches free of space between the ventilation openings and adjacent devices or walls.

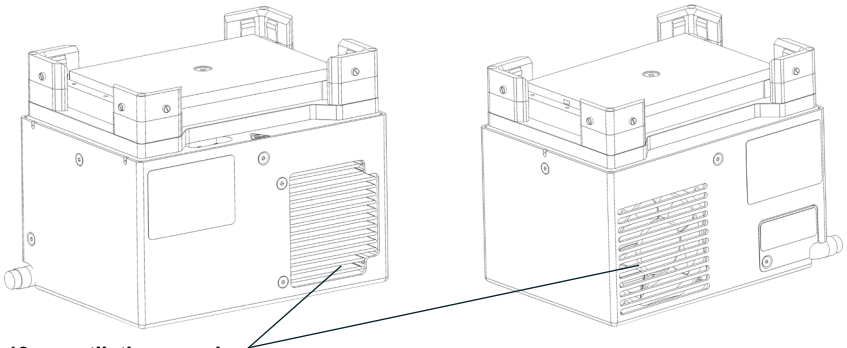


Fig.13: ventilation openings

WARNING
Devices can burn your skin. Even after switching off the TEC Control Unit, the connected devices can still be hot and could seriously burn your skin as the material‘s temperature can reach up to +70°C [+158°F]! It takes a while to cool down after the device has been used.

7 MAINTENANCE

7.1. Software Updates

For updates of the Demo Tool Software, contact: **sales@inheco.com** → How to contact INHECO, page 6.

7.2. Trouble-Shooting & Support

In case of an operation failure follow the trouble-shooting instructions of this chapter. INHECO needs the below mentioned information to help you troubleshooting the operation failure.

Provide the following when contacting INHECO for support:

- INHECO product number of the device (shown on device label)
- INHECO product name of the device (shown on device label)
- INHECO serial number of the device (shown on device label or via software)
- Detailed error description
- Error code report (generated with software “MTC/STC Demo Tool”)
- Information about setup of devices:
    - integrated in workstation
    - controlled by MTC or STC (incl. part number and serial number)
    - controlled by workstation software or INHECO software

Serial numbers are shown on the device labels of the TEC Control Unit and connected devices, but you can also read them out by using INHECO’s software “MTC/STC Demo Tool” (Demo Tool). The Demo Tool must also be used to generate the above mentioned report of error codes for the TEC Control Unit and all connected devices → Demo Tool Manual.

Based on the above information, INHECO’s Techhotline decides about the requirement of a return. → Return for Repair only with RMA Number, page 26.

7.2.1. Installation of the Software “MTC/STC Demo Tool”

The Demo Tool can be downloaded from INHECO´ login section on **www.inheco.com**. In this section you will also find the Demo Tool Manual with detailed instructions of the software.re.

Download the MTC/STC Demo Tool and the DLL file into the same folder. Both files must be saved **into the same folder, otherwise it is impossible to run the Demo Tool.**

7.2.2. Serial Numbers via Demo Tool

Start the Demo Tool and click on the button “find MTC” (or “find STC”). The software scans all Com-Ports and subsequently displays the connected MTC/STC as well as connected devices.

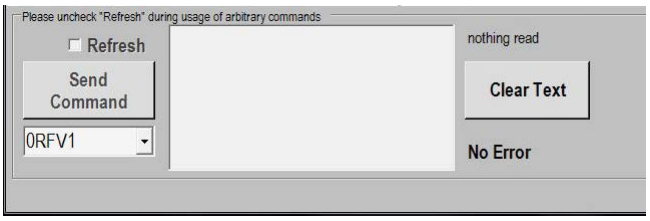


Fig.14: Command section of the User Interface

- Make sure the Refresh Box is unchecked (as in Fig. 14).
- Enter your command into the command field. (overwrite the last command shown in this field e.g. last command was 0RFV1).
- Select button “Send Command”.
- Enter following Commands:
    - for MTC/STC Mainboard serial number: 0RFV2
    - for Slot Module serial number: xRFV2 (x=slotID: 1-6)
    - for external connected device: RSNx (x=slotID: 1-6)

7.2.3. Error Code Report generated with “MTC/STC Demo Tool”

- Start the Demo Tool.
- Click on the button “find MTC” (or “find STC”).
  The software scans all Com-Ports and subsequently displays the connected MTC/STC as well as connected devices.
- Click on the button “report error codes”.
  An additional window appears in which all error codes are displayed. Email a screenshot of this window along with all other required information to **techhotline@inheco.com**

7.3. Maintenance (Refilling of Cooling Liquid Reservoir and Pump)

The Thermoshake needs a well defined minimum level of cooling liquid to work properly and to avoid damages to the system. To ensure that the Thermoshake does not run dry INHECO implemented a sensor to check the liquid level of the cooling liquid. The sensor can be addressed with a command to report the cooling liquid level. This command can be integrated into your daily routine with different ways:

- integrated in workstation software (→ contact your workstation provider to receive information)
- integrated in start up routine of MTC/STC (error displayed on touch-screen → chapter 7.3.3)
- integrated in the error code report of INHECOs Demo Tool software (→ chapter 7.3.4)
- manually send via INHECOs Demo Tool software (→ RRS Command, chapter 7.3.4)

NOTE
In any case we recommend to refill the Thermoshake at least every 3 months.

7.3.1. Refill Tools delivered with Thermoshake

- 100ml cooling liquid (23% ethanol, 77% distilled water)
- syringe to fill the reservoir
- socket wrench (2mm) to open filling nozzle

7.3.2. Refill Procedure

- Switch off the power of the MTC/STC.
- Unplug the Thermoshake from the MTC/STC.
- Loose the screw plugs of the cooling fluid reservoir (→ fig. 15).
- Fill the reservoir with the injection syringe delivered with the Thermoshake until the liquid is visible in the filling nozzle.

NOTE
Use the original INHECO cooling fluid or a mixture of 23% ethanol and 77% distilled water to avoid damage to the unit.

- Insert the needle of the empty syringe as deeply as possible into the filling nozzle and extract as much of the fluid as possible.

NOTE
This method ensures that the reservoir contains cooling fluid at the maximum filling level.

- Close the reservoir with the screw plugs of the cooling fluid reservoir.

NOTE
Never leave the reservoir open.

- Connect the Thermoshake with the MTC/STC.
- The Thermoshake is now ready again for use.

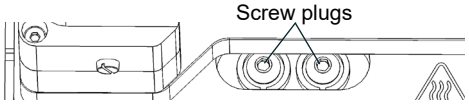


Fig.15: Screw plugs of the cooling fluid reservoir

7.3.3. Refill Check with MTC/STC Touch Screen Display

Error 7 displayed on the MTC/STC touch screen indicates the refill requirement. The touch screen of the MTC/STC controller box displays Error 7 only under the following conditions:

- The power of the control unit MTC/STC was switched on less than 10 minutes ago (Error 7 is only displayed for 10 minutes).
- No other errors occurred during the first 10 minutes of power supply (error messages overwrite previous error messages).
- MTC: Thermoshake and slot number are selected via the select buttons. Example: Thermo 6 is displayed in the upper left corner if Thermoshake of slot 6 is selected.
- Activate heating/cooling by touching the button Temp which then appears black.

NOTICE
Upper left corner indicates Thermo 6 when the Thermoshake of slot 6 is selected.
Use < or > to control select devices.

Fig.16: Activate heating/cooling by touching the button Temp which then appears black

Procedure to check cooling liquid with display of MTC

- Switch MTC power off.
- Switch MTC power on.
- Select Thermoshake and Slot via Select button. (Fig. 16 display: e.g .Thermo 6)
- Touch button Temp. (Temp. button must appear black)

Procedure to check cooling liquid with display of STC

- Switch STC power off.
- Switch STC power on.
- Touch button Temp. (Temp. button must appear black)

In case the touch screen displays Error 7, the liquid reservoir of the selected Thermoshake is below minimum filling level and requires a refill of cooling fluid. In case the touch screen does not display Error 7 after selection of the Thermoshake and Slot, the filling level may not be at maximum level, but the level is sufficient.

7.3.4. Refill Check with MTC/STC Demo Tool

The **MTC/STC Demo Tool** and the **Demo Tool Manual** can be downloaded from INHECO´ website **www.inheco.com.** Login/password can be requested from **sales@inheco.com.**

The Demo Tool offers two options to check the refill requirement:

- check via Error Code Report (→ below)

- check with RRS command (→ page 23)

Check refill requirement via Error Code Report:

- Select button Report Error Codes.
- Search in the displayed report for Details of Error: 07: **occurrences: 00X** → Fig. 17
- Make a note of the number of occurrences in case Error: 07 is listed in report.
- Filling level is fine in case Error: 07 is not shown (scroll down report).
- Restart MTC/STC in case Error: 07 is shown.
- Enter value of target temperature between 40 and 700 (+4°C and +70°C).
- Activate temperature by a mouse click on the Set button of the target temperature.
- Select button Report Error Codes again.
- Search again for the number of occurrences in the Details of Error: 07: **occurrences: 00X.**
- Compare number of occurrences of 2nd report with number of occurrences of 1st report.

In case number of occurrences has increased from one report to the next, a refill is required.

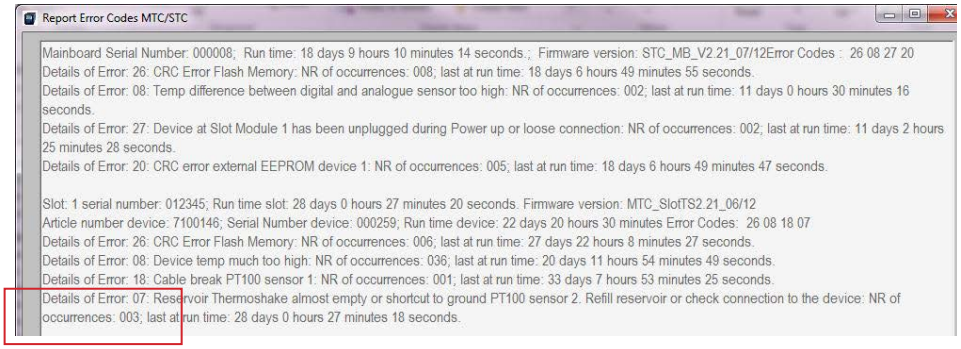


Fig.17: Example: Details of Error 07: no. of occurrences: 003, in case of an increase in 2nd report to 004 → refill is required

NOTICE
Maximum number of occurrences is 255. If this number is reached the error memory of the slot module has to be erased.

- Make a screenshot of error code report.
- Send screenshot to techhotline@inheco.com along with request for command to set back the error codes.

Check refill requirement via RRS command:

- Enter value of target temperature between 40 and 700 (+4°C and +70°C).
- Activate temperature by a mouse click on the Set button of the target temperature.
- Uncheck the REFRESH checkbox.
- Enter in the command field the command xRRS (x = SlotID → table below).

Command for STC	Description
1RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to a Single TEC Control unit.

Commands for MTC	Description
1RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to slot module 1
2RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to slot module 2
3RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to slot module 3
4RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to slot module 4
5RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to slot module 5
6RRS	send this command to check the filling level of cooling liquid of a Thermoshake connected to slot module 6

NOTICE
The command field shows either the default command 0RFV1 or the last command you have entered. Overwrite this last command.

- Select button Send command.

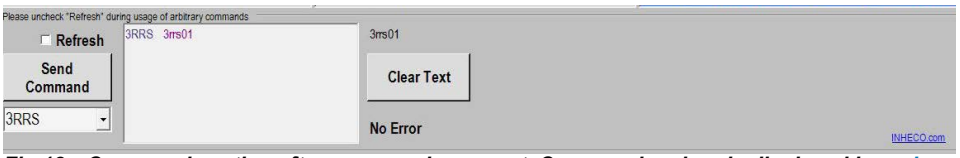


Fig.18: Command section after command was sent. Command and reply displayed in reply message field.

- The command and answer are displayed in the reply message field (→ possible replies in table on page 24).

NOTE
The last number of the answer is relevant: 0 means empty and 1 means full.

Possible Answer (x = slotID)	Description of Reply Messages
xrrsY0 or xrrsY1	the fifth digit (here Y) is the reply message byte from the error code table and the sixth digit is 0 (zero) when the reservoir is empty or 1 (one) when the reservoir is full.
xrrs00	empty system
xrrs01	full system
xrrs60	empty system (6 indicates reset detected)
xrrs61	full system (6 indicates reset detected)
xrrsR0	empty system (R indicates cable break or shortcut PT100 detected)
xrrsR1	full system (R indicates cable break or shortcut PT100 detected)
xrrsA..._..._...	This is a reply without information on level status thus command has to be repeated: • Select button Refresh (in the upper left corner of user interface) • Uncheck refresh check box • Resend command.

7.4. Service for Pump

It is recommended to perform a regular service for the Thermoshake pump after about 6000 hours runtime of the pump. The pump itself only runs during cooling. Thus, in case you use the Thermoshake mainly for cooling purpose the runtime of the device is the same as the runtime of the pump.

In case you use the Thermoshake for heating and cooling, you will need to find the proportion between heating and cooling. And use this with the runitme of the device, e.g. 10000 hours runtime => 1/3 heating and 2/3 cooling => runitme of pump is 6666 hours Thus, service would be recommended.

The service comprises exchange of pump valve plate and membrane, exchange of tubings and qualtiy check → Trouble Shooting & Support, page 18

7.5. Cleaning

CAUTION
Before **cleaning** the Thermoshake devices, disconnect the power and make sure that the temperature at the heating plate is below +50°C.

The contact surface should be cleaned regularly to ensure optimum heat transfer into the disposable and assay. Always clean the contact surface after a spillage. Use a cloth with a 50:50 water / isopropanol solution and make sure that no deposits are left on the surface. Liquids must not enter into the unit.

Do not use aggressive cleaning fluids such as acetone, or abrasive cleaners.

Contact INHECO in case you prefer other cleaning liquids or methods as they might be be harmful for the material of the devices.

7.6. Decontamination

Decontamination is required before return of a device to INHECO in case it has been exposed to human or animal blood/fluid/tissue or has been exposed to biological, chemical, or radioactive materials.

The surface decontamination should include a wipe-down of the housing surface with a decontaminating solution. A solution of 70% alcohol, bleach (5%-12%) or Microside SQ can be used where effective for the respective target material (organism). Otherwise the appropriate decontamination method and solution to eliminate any risk must be applied. Fumigation (e.g. with toxic formaldehyd or ethylene oxide gas) might be required if decontamination of unaccesable areas is needed but ensure to take precautions when using toxic gases or fluids for decontamination.

NOTICE
Contact INHECO if you are not sure whether the used decontamination method or solution could damage the device or its surface material.

NOTE
In case of **decontamination with gas,** make sure that no liquid enters inside the device. Usually the device is in operation and connected to the power outlet, as ventilation is needed for an efffective decontamination with gas.

7.7. Calibration / Verification

For proper performance of the Thermoshake devices, it is recommended to verify the thermal and shaking performance at least once a year. Depending on the application, shorter verification intervals may be required. INHECO recommends to use the INHECO Measurement Plate (IMP) to perform the verification.

Contact **techhotline@inheco.com** in case of performance deviations from set values.

NOTICE
Please note that the set Heater Offset has an impact on the temperature verification of the device. Make sure that the Heater Offset is considered when performing the temperature verification.

7.8. Return for Repair only with RMA Number

INHECO devices must be repaired by INHECO only. Parts must not be exchanged by the user. Exchange of parts or broken seals can lead to the loss of warranty. Spare Parts must be ordered from INHECO.

INHECO only accepts decontaminated devices for repair, firmware update, maintenance etc., in case the devices were exposed to blood, to other body fluids or tissues, to biological, chemical or radioactive materials.
→ Decontamination and Cleaning, page 25.

Devices which were exposed to biosafety level 3 and 4 environments are not accepted by INHECO for return.

Ask **techhotline@inheco.com** or visit **www.inheco.com/service/returns-rma.html** for the return procedure before you return a device to INHECO. Do not return any devices without INHECO's RMA number. INHECO's RMA number must be shown on the outside of the return package. Returns without RMA number are not being processed by INHECO.

Devices should ideally be returned in the original packaging. If not possible, make sure that devices are sufficiently protected and cannot move within the package to avoid transportation damage.

7.9. Transportation and Storage

It is recommended to keep the original packaging. INHECO devices should be shipped and stored in their original packaging. Adhere to required environmental conditions for transportation and storage → Technical Data, page 9.

7.10. Shut Down and Disposal

The device has to be disposed of in accordance with environmental and biosafety directives. You have to arrange for correct electric waste disposal following current safety regulations of your country.

All INHECO devices are RoHS and WEEE compliant.

8 ACCESSORIES

8.1. Multi TEC Control (MTC) / Single TEC Control (STC)

Product Name	Description	Part Number
Mutli TEC Control	controls up to 6 INHECO devices individually	8900030
Single TEC Control	controls 1 INHECO device	8900031

8.2. Black Slot Module

Product Name	Description	Part Number
Black Slot Module	connects CPAC HT 2-TEC, HeatPAC, Teleshake 95, Thermoshake, Heated Lid with MTC/STC	2400125

8.3. Thermal Adapter for Temperature Transfer

A list of adapters (inserts, nests) can be downloaded from INHECO´ webpage **www.inheco.com** or requested from **sales@inheco.com**.

8.4. Miscellaneous

Product Name	Description	Part Number
INHECO Measurement Plate (IMP)	verification of temperature and shaking performance	7901000
Heated Lid	heating up to +135°C	8900033
Cooling Liquid Thermoshake	100 ml for 3 refills (23% ethanol + 77% distilled water)	3800053

9 APPENDIX

EC - Declaration of Conformity

in accordance with Directive 93/68/EEC (CE), 2014/30/EU (EMC), 2014/35/EU (LVD) and 2011/65/EU (RoHS II)

Product:	Single TEC Control (STC), Single TEC Control Compact (STCC), Multi TEC Control (MTC), Multi TEC Control Compact (MTCC) (with Slots 2400125+2400128+2400211+2400205) connected with corresponding devices: CPAC Microplate, CPAC Ultraflat, Thermoshake or Teleshake, HeatPAC, Heated Lid
Part No:	8900029, 8900030, 8900031, 8900036, 8900033 7000163, 7000168, 7000179, 7000190, 7000166, 7100136, 7100146, 7100144, 7100160, 7100161, 7900046, 7100150, 7100151
Standards (Safety):	EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 EN 61010-2-010:2014 EN 61010-2-101:2017
Standards (EMC):	EN 55011:2016 EN 61326-1:2013 EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-4-2:2009 EN 61000-4-3:2006 A1:2009 A2: 2010 EN 61000-4-4.2004 A1.2010 EN 61000-4-5: 2006 EN 61000-4-6:2009 EN 61000-4-8:2010 EN 61000-4-11:2004

This product complies with the essential requirements of the Low Voltage Directive (LVD) and Electromagnetic Compatibility (EMC) directive, when used for its intended use.

International Standards	For international standards please see UL certificate U8 046515 0033 Rev.00, U8 046515 0034 Rev.00 and U8 046515 0037 Rev. 01 Download UL certificat: http://www.inheco.com/service/certificates.html
Manufacturer address:	INHECO Industrial Heating and Cooling GmbH Fraunhoferstr. 11 82152 Martinsried Germany

Martinsried, May 2020