

User and Installation Manual



Single Plate Incubators

Incubator MP | Incubator DWP | Incubator Shaker MP | Incubator Shaker DWP
Part No.: 7300003 | 7300006 | 7300013 | 7300009

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.

The brand and product names within this manual are registered trademarks and belong to the respective titleholders.

Table of Contents

Important Notes 03
 General Information 03
 Explanation of symbols 04
 Abbreviations and Glossary 04
 Warranty 05
 How to contact INHECO 05
Product Description 06
 Intended Use 06
 Scope of Supply 07
 Functional Elements 08
 Labels 09
 Technical Data 10
 Shaker functionality Incubator Shaker MP / DWP 12
 Thermal functionality Shaker MP / Shaker DWP 13
Safety instructions 14
 Product-specific Risks 14
 Technical Alterations 15
 Malfunctions 15
Hardware installation 16
 Scope of Supply 16
 Initial Operation 16
 Electrical Details General 18
 Address Switch 19
 Connecting devices 19
 Mechanical Integration 21
 Labware Use and Detection 22
Communication with the Incubator 23
 Integration in workstation 23
 COM port identification 23
 Example configuration of several Incubators to the USB Host PC 25
Operation 26
 Typical Process Example for integration in robotic systems 26
Maintenance 28
 Cleaning 28
 Decontamination 28
 Servicing 28
 Software updates 28
 Calibration and Adjustment 29
 Trouble-Shooting & Support 29
 Return to INHECO only with RMA Number 30
 Transportation and Storage 30
 Shut Down and Disposal 30
 Assembling the transportation lock 31
Quality 32
 Final QS Tests 32
 Calibration and Adjustment 32
 Automatically self test AQS 32
Failures 33
 Drawer failure 33
Accessories 35
Appendix 36

1 IMPORTANT NOTES

1.1. General Information

Read the user instructions completely. The manual explains how to handle the Incubator DWP, Incubator MP, Incubator Shaker DWP and Incubator Shaker MP (Incubator devices). For the operation of the Incubator devices a third party workstation software is strongly recommended. → Communication with Incubator devices®, chapter 5

The manual explains how to handle the INHECO stackable devices.



In case the instructions contained in this manual 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 Incubator devices and must be retained until the unit is disposed of and must be passed on with the Incubator device when the unit is taken over by a new user.

The Incubator devices meet the acknowledged rules of technology and comply with today's standards.

Manual instructions must be followed in order to limit the safety risk during operation of the unit.

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** is given to indicate hazards which – without precautionary measures – can result in minor to moderate injuries or could disturb the proper functioning of the unit.
- The signal word **NOTE** stands for the general precautionary measures that have to be taken to avoid damaging the device.
- 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 Incubator devices.

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
	A possible danger, leading to serious bodily harm is being pointed out to you.
	Caution: hot surface
	Excenter within the device
	Indication for electrostatic discharge (ESD)
•	Bullet points indicates an instruction.
-	Hyphens refer to enumeration.
→	indicates refer to and are mostly an active link
Blue writing	indicates a software button

1.3. Abbreviations and Glossary

The document uses the following terms	
CC	Communication controller
Controller	Microprocessor with on chip peripheral
CRC	Cyclic Redundary Check
FCS	Firmware Command Set
Heater	Same as Temperature Controller
IVD (D)	In vitro diagnostic (directive)
MP	Micro Plate
PCR	Polymerase Chain Reaction
PWM	Pulse-Width Modulation
Shaker	Controller for shaker regulation
TBC	To Be Continued
Temperature Controller	Controller for heat regulatioin
USB	Universal Serial Bus
CE	Conformity Mark
NRTL	Nationally Recognized Testing Laboratory
DLL	Dynamic Link Library
PC	Personal Computer
EU	European Union
SBS	Society for Biomolecular Screening
DWP	Deepwell Plate
IVD	In vitro diagnostics
FDA	Food and Drug Administration
DIP	Dual In line package
N.A.	Not Applicable
RT	Room Temperature
wo	without
w	with

1.4. Warranty

The warranty period starts on the date of shipment. Any damage caused by operating the Incubator device 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 37.

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 499
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

INHECO's Incubators (Incubator MP, Incubator DWP, Incubator Shaker MP and Incubator Shaker DWP) are automated and compact single incubating positions for the use in fundamental research, drug discovery, clinical research and diagnostic applications in automated liquid handling stations.

The incubators can be used as stand-alone devices or stacked to form a tower. The flexible design of the incubator devices allow even stacking of different devices in one tower. The unique vibration reduced shaking principle offers free programmable shaking curves (orbital, linear, eight, elliptic, etc) and amplitudes. The precise automated drawer system guarantees a direct and easy access by robotic grippers and pipetting heads.

The Incubator devices have a built-in precise temperature and shaker control (only shaker devices), plate loading sensors, several test routines and an USB interface for controlling the devices, enabling the use of the Incubator products in FDA, IVD compliant environments and applications. Software and verification tools are available to form a complete thermal solution for all kinds of incubation applications.

The Incubator devices are designed specifically for use in Life Science and In Vitro Diagnostics. The Incubator devices are 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 devices of the Incubator family in a Biosafety Laboratory Environment, the user of the device is responsible for labeling the device according to the WHO Laboratory Biosafety Manual (ISBN 92 4154650 6). The user is furthermore responsible for operating the devices of the Incubator family depending on the biosafety level regulations according to the WHO Laboratory Biosafety Manual.

A technical skilled integrator has to install and integrate the Incubator. The Incubator should be used exclusively by laboratory professionals trained in laboratory techniques with labautomation systems and having studied the instructions for use of this instrument.

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:

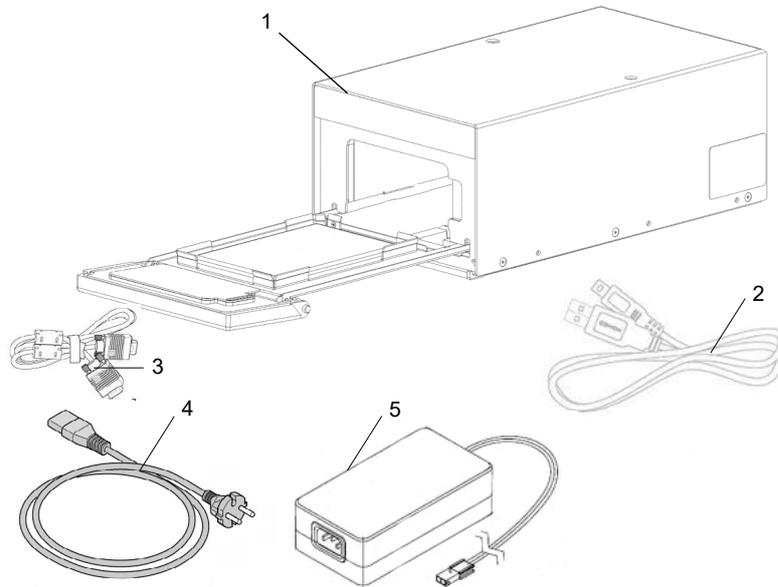


Fig.1: Components

- | | |
|---|--|
| (1) Incubator ¹⁾ | (3) 15 - Pole Sub-D-Connector |
| (2) USB cable | (4) Power cord Europe, UK or US (not scope of supply unless ordered) |
| (5) Power supply (not scope of supply unless ordered) | |

1) Image differs depending on which system has been ordered

2.3. Functional Elements

Figure 2 introduces the terminology of the Incubator's functional elements.

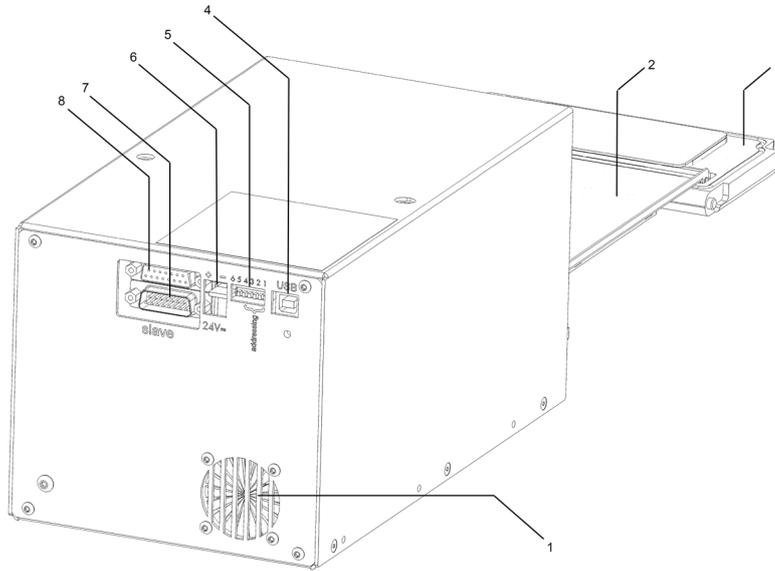


Fig.2: Functional elements

- | | | |
|----------------------|-----------------------|---------------------------------------|
| (1) Fan | (4) USB Connector | (7) 15 pole Sub-D-Connector male. |
| (2) Loading drawer | (5) Address Switch | (8) 15 pole Sub-D-Connector female. |
| (3) Front door | (6) Power Connector | |

2.4. 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 back panel of the Incubator 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 (IVDD Incubator software) which can be downloaded from the log in section of www.inheco.com. → Manual INHECO Incubator Shaker control.



Fig.3: Examples of identification labels

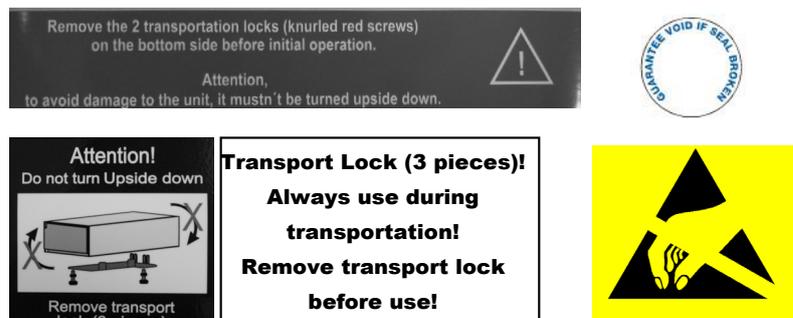


Fig.4: Labels outside device or package

Devices are ESD sensible



Caution Hot



Excenter label in shaker

Fig.5: Labels within the device

2.5. Technical Data

Technical Data incl. Dimensions				
Incubator type	MP	DWP	Shaker MP	Shaker DWP
Input voltage	24Vdc			
Input power	30W max	45W max	50W max	60W max
Maximum numbers of devices per power supply (2400121)	6	4	3	3
Temperature range	Room temperature + 5K up to +80°C (+175°F)		RT+ 5K, RT + 10K (for shaking longer than for 1 hour) up to +80°C (+175°F)	
Tolerable reative humidity ambient	10-80% relative (non condensing) at +20°C (+68°F) up to +30°C (+86°F)			
Maximum load of the shaker platform	N.A.		250 g	
Shaker frequency range	N.A.		6.6 Hz to 30 HZ → 400 rpm to 1800 rpm	
Maximum shaking amplitude (difference between the maxima)	N.A.		3 mm	
Shaking direction	N.A.		Arbitrary programmable: e.g. orgital / linear	
Dimension in Y_{Module} w connector cable	295.5 mm			
Dimension in Y_{Module} wo connector cable	268.5 mm			
Dimension in X_{Module}	149 mm			
Dimension in Z_{Module} wo pin	58 mm	104 mm	88,5 mm	139 mm
Open drawer incl. door Y_{Drawer}	193.5 mm	223.5 mm	209 mm	239 mm
Dimension of the thermal chamber in $Z_{Chamber}$	18 mm	50 mm	18 mm	53 mm
Weigth	2.5 kg	3.4 kg	4.5 kg	5.4 kg
Maximum Number of devices in one stack due to interaction during shaking and power limitation of power supply	5	4	3	2

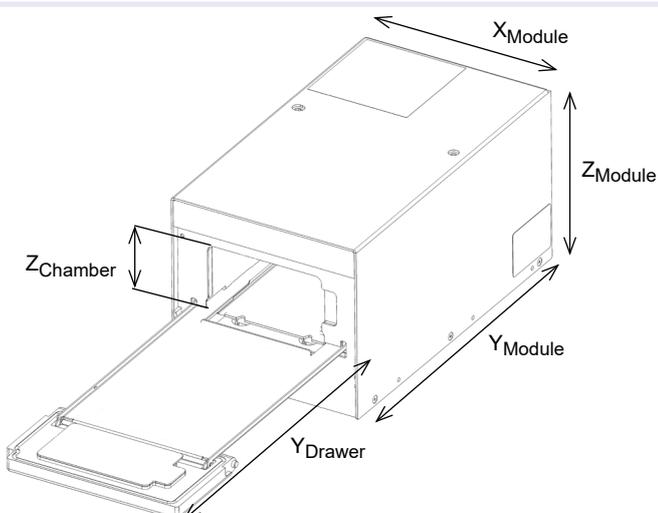
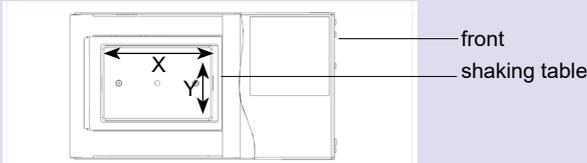


Fig.6: Dimensions

Drawer Specifications		
Accuracy of the end position of the drawer in x, y and z (drawer open); single unit, all parts at specified ambient temperature		±0,30 mm
Maximum Drawer load		0,25 kg
Open drawer resistance for a force in Z-axis without plastic deformation		10 N

Environmental Conditions		
Maximum operation height		
Tolarable relative humidity	Operation	10-80% relative (non condensing) at +20°C (+68°F) up to +30°C (+86°F)
	Transportation and storage	-10°C to +60°C (+14°F to +140°F), non condensing
Temperature	Operation	+20°C to + 30°C (+68°F to +86°F)
	Transportation and storage	-10°C to + 60°C (+14°F to 140°F), non condensing

2.6. Shaker functionality Incubator Shaker MP / DWP

Parameter	Value		
Amplitude range	0.0 – 3.0 mm*		
Speed range	6.6 – 30.0 Hz*		
Speed precision	±2 Hz		
Load	40 – 250g* (weight of plate and liquid and adapter)		
Supervision	speed and amplitude (closed loop controller)		
Shaker movement	North – South (linear) East – West (linear) Round (orbital) “Eight” (this is possible but not recommended because it might damage the shaker)		
	Amplitude accuracy**	±20% (of the target amplitude)	
	Phase shift accuracy**	±11°	
	** validated for the Heating Plate movement / average value over 10 cycles		
	Single Axis (North – South and East – West)	Shaker Load: 100g	
	Shaker	Shaker amplitude [mm]	
	Speed [Hz]	Single device	Maximum stack
	10	X = 1.0 to 2.2 or Y = 1.0 to 2.2	X = 1,0 to 1.9 or Y = 1.0 to 1.9
	15	X = 1.0 to 2.7 or Y = 1.0 to 2.7	X = 1.0 to 2.4 or Y = 1,0 to 2.4
	20	X = 1,0 to 1.2 or Y = 1.0 to 1.2	X = 1.0 to 1.2 or Y = 1.0 to 1.2
Shaker Movement			
		Round (Phase shift = 90°)	Shaker Load: 100g
	Shaker	Shaker amplitude [mm]	
	Speed [Hz]	Single device	Maximum Stack
	10	X = 1.0 to 2.2 Y = 1.0 to 2.2	X = 1,0 to 1.9 Y = 1.0 to 1.9
	15	X = 1.0 to 2.7 Y = 1.0 to 2.7	X = 1.0 to 2.4 Y = 1.0 to 2.4
	20	X = 1.0 to 1.2 Y = 1.0 to 1.2	X = 1.0 to 1.2 Y = 1.0 to 1.2
		„Eight“ (Phase shift = 0°)	Shaker Load: 100g
	Shaker	Shaker amplitude [Hz]	
	Speed [Hz]	Single device	Triple Stack
	X = 12 / Y = 24	X = 1.0 to 2.4 Y = 1.0 to 2.4	X = 1.0 to 2.2 Y = 1.0 to 2.2
	X = 15 / Y = 30	X = 1.0 Y = 1.0	X = 1.0 Y = 1.0
			

* For detailed shaker performance, see chapter below.

2.7. Thermal functionality for all Incubators

Parameter	Value			
Temperature range	Room Temperature plus 5K to +80°C [+176°F]			
Accuracy absolute (@ ambient temperature stability ±1K)	The accuracy is defined as the difference between the target temperature of the heating plate and the average of the measured temperature on the heating plate. The heating plate temperature is measured at 5 positions on the heating plate according to the INHECO measurement head PM-0105. The 5 measurement positions are according to the Plate positions A1, H1, E6, A12 and H12.			
	Target Temp. Validation Tool		Accuracy [°C] for all incubator	
	+37°C [+98,6°F]		± 1.0	
	+60°C [+140°F]		± 1.5	
	+80°C [+176°F]		± 2.0	
	(temperatures higher than +60°C reduces the uniformity over the labware)			
Uniformity measured in well	Uniformity is defined by the maximum difference between lowest and highest temperature according to a Greiner 96 Flat Bottom Plate (Positions A1, A12, E7, H12)			
	Target Temp. Validation Tool		Uniformity [°C] for non shaking devices	Uniformity [°C] for shaking devices
	+37°C [+98,6°F]		≤ 0.8	≤ 0.8
Evaporation in unsealed Micro Plates (can be reduced by using lid or cover)	Incubator non shaker temperature +37°C [+98,6°F], max. 25% loss of liquid in 4 h , deionized water, room temperature 24-26°C [75,2-78,8°F], rel. humidity 40-50%, altitude at 410 m over Sea level		Incubator shaker temperature +37°C [+98,6°F], max. 32% loss of liquid in 4 h , deionized water, room temperature 24-26°C [75,2-78,8°F], rel. humidity 40-50%, altitude at 410 m over Sea level	
Heatup time at start temperature +20°C [+68°F] with target temperature +37°C [+98°F]	max.30 min; Volume 280µl per well. *	max.100 min; Volume 1.5 ml per well. **	max.30 min; Volume 280µl per well. *	max.120 min; Volume 1.5 ml per well. **

* The target temperature is reached when all sensors are in the tolerance band of 37°C ±1°C [98,6°F ±3,6°F]
Measured with: 1) **Greiner 96 Flat Bottom Plate**

** The target temperature is reached when all sensors are in the tolerance band of 37°C ±1°C [98,6°F ±3,6°F]
Measured with: 1) **NUNC 96 Deep Well Plate**

3 SAFETY INSTRUCTIONS

3.1. Product-specific Risks



WARNING

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

NOTICE

Turning a shaker unit upside down might require a renewal of the shaker drive. Keep the screws for later transportation purposes.

General

- The Incubator devices ("the unit") hardly require any maintenance, for minor maintenance interventions refer to → Servicing, page 37 and Quality, page 41.
- The main power connector of the unit must always be accessible to shut down the system in case of emergency.
- The unit has to be placed in an upright position.
- Standing ground must be solid, even and stable to bear the devices weight.
- Free air supply must be ensured to prevent damage to the . Do not cover the ventilation openings at the front and rear panel at any time.
- Ensure a minimum of at least 250mm or 10 inches of free space between the ventilation openings and adjacent devices or walls.
- Do not exceed minimum or maximum ambient temperature and humidity conditions during operation or storage of the unit → Technical Data, page 11.
- The unit must not be used in environments with risk of explosion
- The unit is for indoor use only.
- The unit must not be used if the Incubator, the power adapter housing or the power cable show visible signs of damage.
- Make sure that the electrical specifications on the label at the rear panel of the battery charger meet your local situation.

Crushing Hazard:



- The excenter can possibly pinch your skin when changing its position.

Burning Hazard:



- The Incubator can burn your skin, even after switching off the Incubator it can still be hot and could seriously burn your skin.



Electrical Shock:

- The unit must not be used if the unit itself or the power cable shows visible signs of damage.
- You can suffer an electric shock and injuries, if the Incubator is not connected properly or if you do not disconnect the unit from the wall power outlet before opening the housing.
- Never connect or remove the power plug with wet hands.
- Make sure that the Incubator does not get in contact with liquids while the unit is connected to the power outlet.
- Original power cable 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 and Serial Numbers, page 10.

Biosafety Laboratory Environment

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



ESD Electrostatic discharge

- The Incubator devices are ESD (electrostatic discharge) sensitive devices. Electrostatic charges as high as 4000V accumulate on the human body can discharge without detection.
- Although the Incubator devices feature proprietary ESD protection circuitry, permanent damages may occur to devices subjected to high energy electrostatic discharge.

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 Incubator 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 38.

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 → Components, chapter 2.2, page 7. Keep original packaging for future shipments.

The Power Supply and Power Cable are not part of the scope of supply, as for stacked devices only the master device needs a Power Supply and Cable . They have to be ordered separately → Chapter 9.

4.2. Initial Operation

A technical skilled integrator has to install and integrate the Incubator.

4.2.1. Disassembling the transportation screws

(only for Shaker devices)

After unpacking the Incubator Shaker device, the two red screws (transportation lock) at the bottom side have to be unscrewed without tilting or turning the device upside down. Keep the screws and plate for later transportation purposes. Do not dispose the original package, as it might be needed for further transportation.

NOTE

Turning the unit upside down might require a renewal of the shaker drive calibration. Keep the screws for later transportation purposes.

A transportation label on the top of the Shaker device is indicating where the transportation lock is applied and also that you should not turn the device upside down.

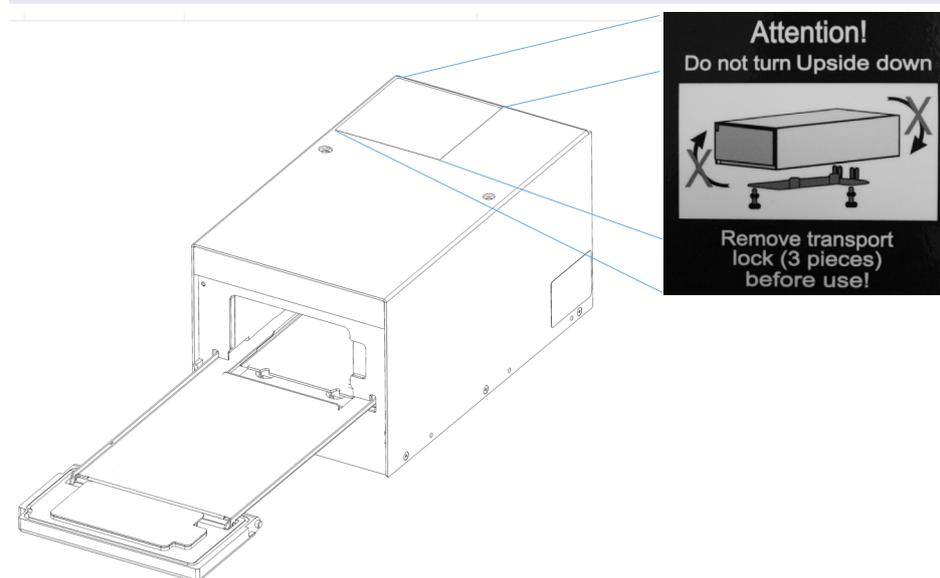


Fig.7: Transportation label at the upper side

The transportation lock is a metal plate held with 2 screws at the bottom of the device

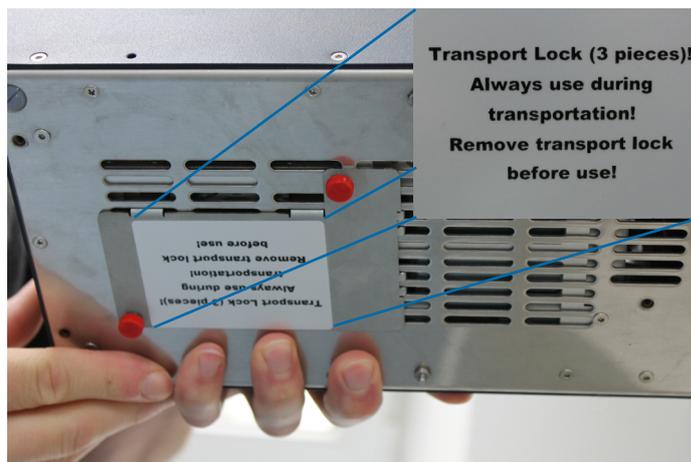


Fig.8: Transportation lock at the bottom of the device

- Turn the Incubator Shaker slowly to the left

NOTE!

Cover side in direction of assembler, like in figure 10!

- unscrew the screw just by hand.

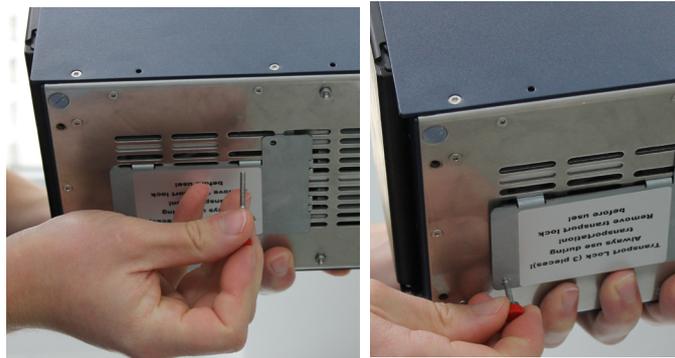


Fig.9: Screws screwable without screwdriver

- After the screws are removed the metal plate will have to be actively taken out of the grid while you still keep the contact at one side.



Fig.10: Loosened metal plate

4.3. Electrical Details General

NOTE

Do not connect the Incubator Devices to the computer before software installation routine asks you to do so → chapter 5, page 25

- Plug in the power supply and USB cable

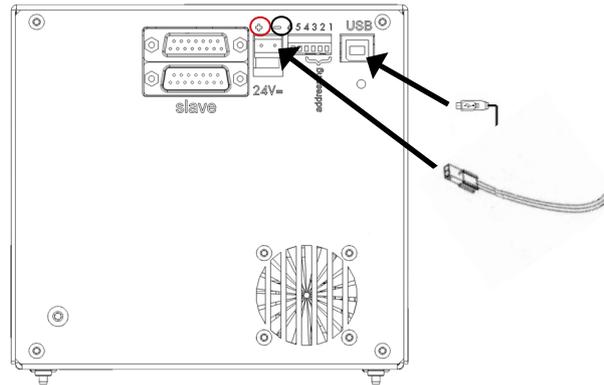


Fig.11: Standard connection for one device

The device needs an electrical power supply that provides a stable 24Vdc voltage. The power consumption for one device is max. 65 Watt. If more devices are stacked, the power supply must be able to deliver the resulting power consumption. The polarisation at the power connector at the back side is shown in the following picture. The red circle shows the “plus-pole” and the black the “minus-pole”. Please contact INHECO → techhotline@inheco.com if you are not sure how many devices can be used with one power supply.

NOTE

Since the USB interface is not optimized for a secure real time data transfer, all communication is secured by a cyclic checksum (CRC). In case the communication between the computer and the Incubator Unit often fails due to timeouts, it is likely that it is due to the computer. Consider the following with regards to communication stability:

- In case you encounter communication instability, verify the communication stability with different computers or different configurations.
- Disconnect other devices from the computer which may interfere with the communication stability.
- De-activate the automated Windows update. For integration purpose, use INHECO's DLL and Firmware Command Set → login section www.inheco.com

- check LED Status (optional)

LED status	Description
green slow flashing	Power is connected
green fast flashing	USB connection to PC
green	Device has been once initialized*

* If the software is closed and the device still connected with USB and to power the LED remains green. If the software is restarted the devices have to be initialized again.

4.4. Address Switch

A six-pole DIP-Switch can be found at the back side.

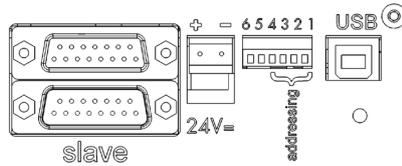


Fig.12: Rear side of Incubator showing the Address-Switch

Only the switches 1 to 4 are used for setting the address. These switches are for identification, if more than one single-device or stack is connected to the PC with USB. The default address is “2”. The recognition of the device/stack depends on the switches position as shown in figure 13.

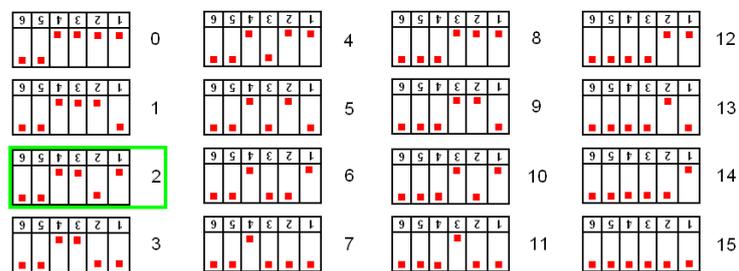


Fig.13: Address-Switch

4.5. Connecting devices

4.5.1. Stackable devices and multiple towers

INHECO's compact single position Incubators are high performance plug & play devices for the use on automated robotic platforms or as standalone units. They can either be used as single devices or stacked in a tower. In addition multiple towers or single devices can be controlled parallel from one host PC via USB. The combination of different devices of the Incubator family in one tower is possible.

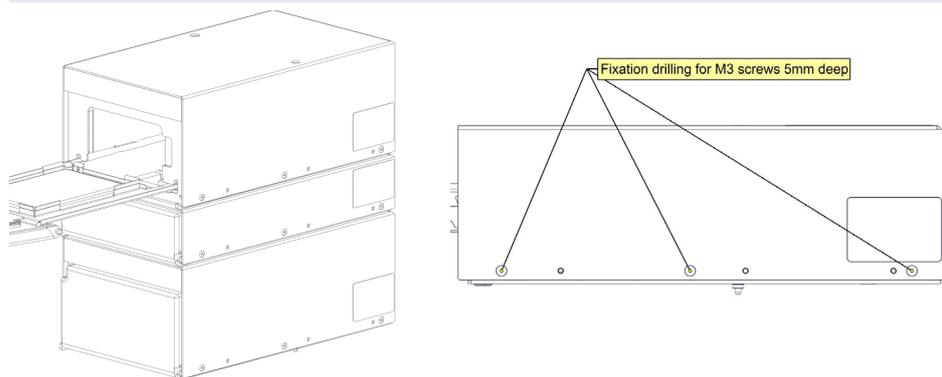


Fig.14: Example of stacked devices

Two devices are operated with one power supply and controlled via one USB interface, the 15-pole SUB-D-Connectors on the back side are used for connecting the devices. The following chapter shows, how the devices have to be connected. → Technical Data for maximum allowed numbers of instruments, page 11.

4.5.2. How to connect two devices (Master to slave)

- plug in the 15-pole SUB-D-Connectors
The slave will be connected to the lower male Connector and the master in the upper female connector.

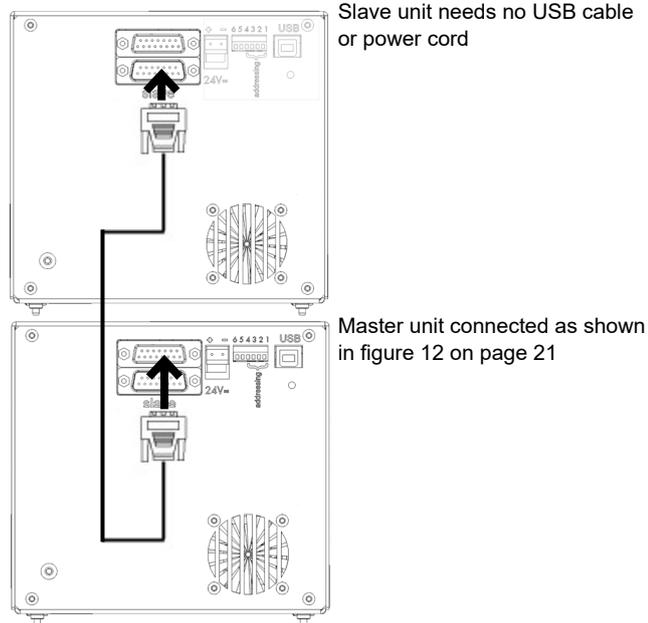


Fig.15: Two connected devices

4.5.3. How to connect two devices (slave to slave)

- plug in the 15-pole SUB-D-Connectors
The 15-pole SUB-D-Connector of the slave connected with master will be connected to the upper male Connector and of the second slave in the lower female connector.

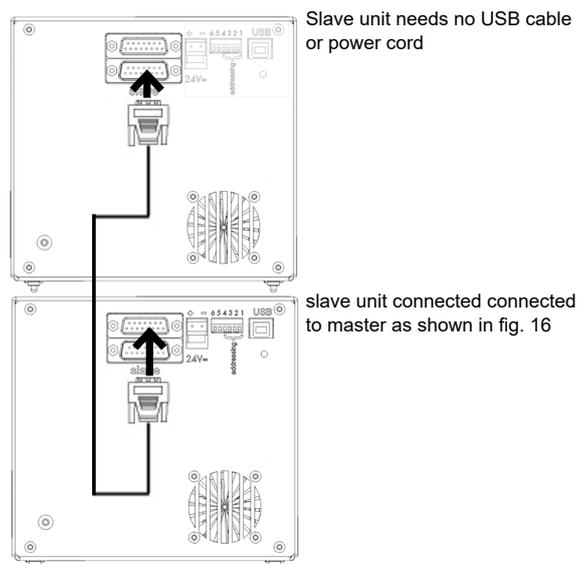


Fig.16: Two connected devices

NOTE

It is possible to connect several devices on top of the master device. The maximum number of devices is shown in the Technical Data. Each device can be stacked on top of one incubator and connected corresponding to figure 16 → Technical Data, page 11.

If you want to connect more devices than recommended for one stack this is possible but has to be in a second tower. Connections again corresponding to this example

4.6. Mechanical Integration

The devices can be integrated into a workstation to guarantee a firm stand. Therefore all devices have position pins.

- Place the device on an appropriate plate for a firm and even stand (please contact your workstation provider to find out if they offer an appropriate adapter plate).
- Use the position pins on the bottom side for exact positioning of the device/stack.

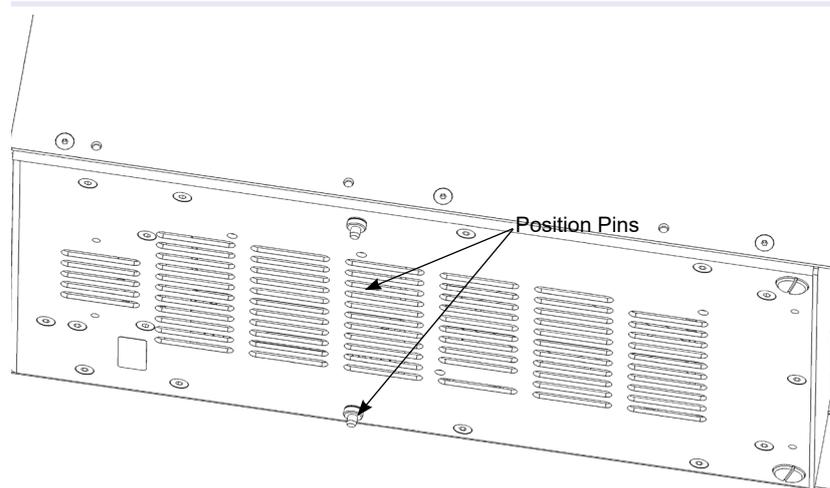


Fig.17: Position pins

NOTE

It is not advisable to stack more than the recommended devices (refer to chapter 2.6) on top of each other without additional mechanical fixation. There are mechanical limitations of how many devices can be stacked. Please contact INHECO if you are not sure if your set up is recommended.

The device has to be in balance for proper shaker performance.

NOTE

If not integrated into a workstation a ground plates with pin holes is also necessary. Never use the Incubator (especially a shaker) if only placed on pins. This leads to an unsteady shaking and problems with opening the drawer.

4.7. Labware Use and Detection

The heat transfer is optimized for microplates with flat bottom to ensure uniform heat exchange. If you observe a non uniform heating of other plate types (e.g. round bottom) a special adapter might be needed. INHECO offers to design and manufacture customized adapter.

The devices can measure the temperature at the top of the heat plate only. The temperature of the liquid in the microplate differs from this. Therefore a heater offset must be defined and set before the temperatures in the liquid samples are correct (see also command SHO in the firmware command set).

The heat plate has three integrated sensors for measuring the temperature. The temperature of the sensors is averaged.

Only for Incubator with shaking function:

When a labware is placed on the drawer and the door is being closed, the labware will be clamped on the drawer. When the drawer reaches its end position inside the Incubator Shaker, the labware will sink on the heat plate for best thermal contact. You can hear a short shaking noise to ensure, that the labware is sinking on the heat plate but only when the labware is detected correctly from the device.

4.7.1. Incubator MP and Incubator Shaker MP

The Incubator MP and Incubator Shaker MP are built for the use with microtiterplates. The Labware detection is optimized for Greiner Plates. If different microtiterplates are used, the user has to assure, that the Labware detection works well with these plates too.

4.7.2. Incubator DWP and Incubator Shaker DWP

The Incubator DWP and Incubator Shaker DWP are built for the use with deep well plates. The Labware detection is optimized for Nunc Plates. If different deep well plates are used, the user has to assure, that the Labware detection works well with these plates too.

4.7.3. Criteria for labware determination

- Light master plates are better than dark ones
- Master plates with matt surface are better than shiny ones
- Attaching an adapted tape on the left side of the master plate improves the success rate of the Labware detection. If you want to write your own software control or integrate it in an existing workstation control you should keep in mind the following fact. With the command ASE1 the incubator shaker is unable to shake without detected Labware. The command ASEND has been added to enable shaking without detected Labware. We do not recommend using it! The command ASE1 is preferred. It ensures that the Labware is correctly placed on the shaker and performs within the specifications.

5 COMMUNICATION WITH THE INCUBATOR

A technical skilled integrator has to install and integrate the Incubator. For questions regarding the local computer settings contact your system administrator. The Incubator should be used exclusively by laboratory professionals trained in laboratory techniques with labautomation systems and having studied the instructions for use of this instrument incl. documents from workstation provider (e.g. software manual).

5.1. Integration in workstation

Please follow the instructions of your workstation provider regarding the control of the incubator.

Before initialising the program, it might be necessary (depening on your workstation software) to know the COM port of the connected incubator.

NOTE

Since the USB interface is not optimized for a secure real time data transfer, all communication is secured by a cyclic checksum (CRC). In case the communication between the computer and the Incubator Unit often fails due to timeouts, it is likely that it is due to the computer. Consider the following with regards to communication stability:

- In case you encounter communication instability, verify the communication stability with different computers of different configurations.
- Disconnect other devices from the computer which may interfere with the communication stability.
- De-activate the automated Windows update. For integration purpose, use INHECO's DLL and Firmware Command Set → login section www.inheco.com

5.2. COM port identification

- Connect the Incubator via USB cable to the PC.
- [Click on Start](#) in the taskbar and start the control Panel
- [Open Hardware and Sound](#)



Fig.18: Image control panel in Windows7

The following window will open

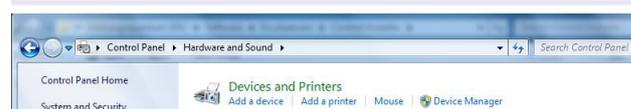


Fig.19: Select device manager

- [Select the devicemanager](#) and the following window is displayed.

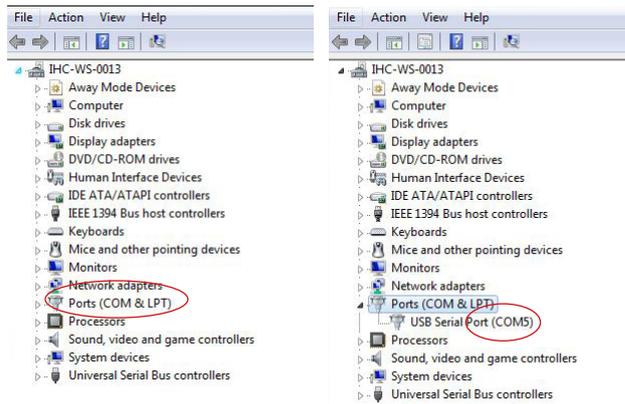


Fig.20: Device Manager

- Select the subitem Ports (COM & LPT):

The Incubator Device should be found in the list of assigned ports.

The COM port is shown behind the the USB Serial Port in brackets.

Please continue with → start the workstation software.

Additional dialogues could appear, depending on Windows configuration, user rights and firewall. For questions about these, please contact your administrator.

6 OPERATION

This chapter describes how the Incubator devices need to be set up, to be operated by a computer through the USB interface.

The setting of parameters and the operation of the incubator devices is only possible through the USB interface.

Consult the document „Firmware Command Set“ which can be downloaded from the login section on INHECO' website www.inheco.com for more information about the software integration of the incubator devices or contact your workstation provider.

The Incubator should be used exclusively by laboratory professionals trained in laboratory techniques with labautomation systems and having studied the instructions for use of this instrument incl. documents from workstation provider.

6.1. Typical Process Example for integration in robotic systems

All Incubator devices should be used integrated in to a robotic systems. Please contact the supplier of your robotic system to discuss the integration routine.

A typical cycle for a process could contain the following steps:

- Scan COM Ports (mandatory)
- Find device and floor ID of connected devices (mandatory)
- Check the number of drawer cycles and the firmware versions of all devices
- Initialize all devices (mandatory)
- Open doors simultaneous or sequential
- Insert the Labware
- Set target temperature for each Incubator
- Set heater offset according to the used type of micro plate
- Set frequencies, amplitudes and phase shift for all devices (only for shaker)
- Close the doors
- Start shaking (only for shaker)
- Start heating
- Check cyclic temperatures, frequencies, amplitudes and the error flags (only for shaker)
- Optional change target temperature
- Optional restart heating
- Optional change frequencies etc. (only for shaker)
- Optional restart shaking (only for shaker)
- Stop shaking (only for shaker)
- Stop heating
- Open all doors

All commands for the integration of the Incubator devices are described in the document “Incubator FCS /Document NR: 900334-XXX”.

6.2. LED status

The LED indicates the status of the module:

- Power on and device is initialised >> LED blinking slow
- Firmware download >> LED is blinking (ca. 3-5 Hz)
- USB-Communication not present >> LED is blinking (ca. 1 Hz)

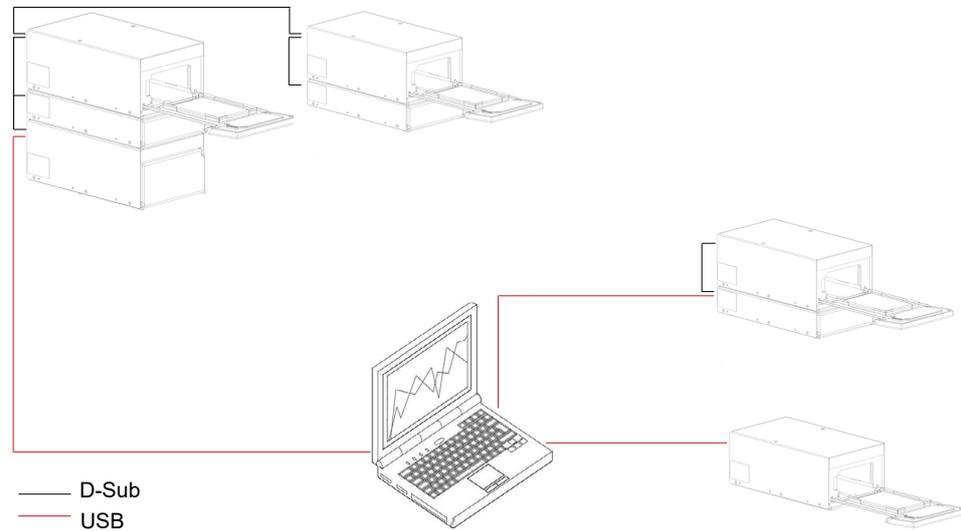


Fig.21: Interconnection

NOTE!

For the implementation it is important to consider different setup conditions. Some devices may be already connected to the USB (green LED is on) some may not (green LED is blinking at 1 Hz). The blinking of the LED stops only after the first message with the correct device ID is sent to the Incubator device. Therefore you need to send at least two messages to bring all devices into the same state. The reason for that is that slave devices have to register themselves to the master device within a certain time frame. This happens after the first correct USB message to the master was sent

6.3. Set Disposable Off-set command

Aim of setting temperature offsets: the sample reaches and maintains the set temperature.

Unless an offset value is determined and set, the temperature of the sample is likely to differ from the set temperature due to heat loss between the device contact surface and the sample inside the disposable. To compensate this effect, an offset value can be set at a chosen temperature, e.g. at one of the target temperatures. After setting the offset value for one target temperature and setting the room temperature value, a relative offset value is added to all temperatures above room temperature, resulting in a temperature offset line with a specific gradient.

How to set the heater Off-set with your workstation software → Manual Workstation Software.

NOTE!

Only for Incubator MP device:

The default Heat up Off-set for 37°C is 4°C for a Greiner 96 Flat Bottom Plate.

If your workstation software does not provide an option to set the heater Offset you can use the INHECO incubator shaker control software which can be downloaded from the login section on INHECO' website www.inheco.com → Manual INHECO Incubator Shaker Control Software.

The incubator shaker control software offers only limited features to control the incubator devices and cannot be used for integration into automated systems. It is developed to send single commands and test the functionality of the devices.

- **Command for the heater Offset:**

SHOxxx (= Set Heater Off-Set and xxx = desired off set)

Example: You want to use an Off-Set of 2°C use Command SHO20

NOTE!

The used Heat-Up Off-Set has an influence on the temperature verification with the IMP → Calibration / Verification, chapter 7.5.

7 MAINTENANCE

7.1. Cleaning



CAUTION

During **cleaning**, the Incubator device has to be disconnected from power. Make sure that no liquid enters the inside of the device.

Before cleaning the Incubator units, 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 to the disposable. Always clean the contact surface if there has been a spillage. Use the cloth dipped in 50:50 water / isopropanol solution and make sure that no deposits are left on the surface. Care should be exercised to prevent water from running inside the unit.

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

Please check with INHECO any cleaning method that is not mentioned in it his paragraph to prevent damage to the Incubator devices.

7.2. Decontamination

The most common decontamination method is by fumigation with formaldehyde or ethylene oxide gas.

The surface decontamination can include a wipe-down of the housing with a moistened cloth. Ethanol (70%) can be used, where effective, against target organisms.

The use of Bleach (5%-12%) or Microside SQ is also possible.

7.3. Servicing

Run the Command AQS every 100h. Either by implementing the AQS command into the workstation software or by using the incubator software to enter the command manually. Please note the AQS command was developed for the Incubator Shaker MP mainly, → Quality, chapter 8 page 32.

Temperature and shaking should be verified regularly. INHECO recommends to use the IMP to perform the verification.

If Flap is not opening or closing correctly, please check:

- that the excenter is in the correct position when drawer is open to make sure that it is not displaced.
- whether the golden contact pins are dirty (oxidized). If they are dirty try to clean the contacts of the flap with oxid solving contact spray.
- that seal ring is in good condition and within its guidance.

Please contact INHECO if you are not sure how to perform the above mentioned servicing actions.

7.4. Software updates

For updates of the Incubator Control Software, contact: sales@inheco.com → How to contact INHECO, page 6.

7.5. Calibration and Adjustment

The adjustment of the shaker and/or the calibration of the temperature are done at INHECO. Settings are stored into the devices EEPROMS and redundant in an INHECO Database. A redundant check of all data is done. The INHECO Measurement Plate (IMP) can be used for verification of shaking amplitude and temperature up to 60°C.

NOTE!

The used Heat-Up Off-Set has an influence on the temperature verification with the IMP. As the Incubator is delivered with a default Heat-up Off-Set of 4°C at 37°C the IMP will verify 41°C at 37°C. Thus always check your Off-Set for IMP data verification.

7.6. Trouble-Shooting & Support

In case of an operation failure follow the trouble-shooting instructions of this chapter. INHECO needs the below mentioned information including the serial numbers of your devices and the error code report. With this information INHECO can help you to trouble- shoot the reason for 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 "IVDD Incubator Shaker Software")
- Information about setup of devices:
 - o integrated in workstation
 - o controlled by workstation software or INHECO Software

Serial numbers are shown on the device labels of the Incubator unit but you can also read them out by using INHECO's software "IVDD Incubator Shaker Software". → Manual INHECO Incubator Shaker Control .

The software can also be used to generate to read out the error code flags for the Incubator unit. Based on the above information, INHECO's Techhotline decides about the requirement of a return. → Return for Repair only with RMA Number, page 39.

7.6.1. Serial Numbers via "IVDD Incubator Shaker Software"

Start the IVDD Incubator Shaker Software and click on the button "open com" and initialize. The software scans all com ports and subsequently displays the connected Incubator.

- Enter your command RFV2 into the command field. (overwrite the last command written in this field e.g. RFV)



Fig.22: Command section

- Send command

7.6.2. Error Code flags generated with "IVDD Incubator Shaker Software"

- open INHECO Incubator Shaker Control Software
- click on [open com](#)
- send command AID
- click on [report error flags](#)

The error codes will appear next to the button [report error flags](#). Please send a screenshot of the section.



Fig.23: Error flag section

NOTE

All error codes will be deleted after a power down of the incubator.

7.7. Return to INHECO 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. → Decontamination and Cleaning, page 37.

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.

7.8. Transportation and Storage

It is recommended to keep the original packaging. INHECO devices should be shipped and stored in their original packaging with all accessories. Adhere to required environmental conditions for transportation and storage → Technical Data, page 11.

Do not return Incubator Shaker devices without assembled transportation lock. → Assembling of transportation lock, page 40.

7.9. Shut Down and Disposal

INHECO devices must be disposed of in accordance with environmental and biosafety directives. You have to arrange for correct electric waste disposal following actual safety regulations for your country.

INHECO devices are RoHS and WEEE compliant.

7.10. Assembling the transportation lock

The transportation lock is needed for Incubator Shaker transports to avoid damage to the shaker mount.

NOTE

- Turning the unit upside down might require a renewal of the shaker drive.
 - Do Not turn the two screws too hard, just finger tight.
 - Do Not use a screwdriver the red covers help to tighten them by hand! If the screws are tightened to hard it could damage mechanical parts inside the device!
 - Secure the transportation lock with a simple tape (not to adhesive)
- Insert the Metal Plate (received with delivered instrument) into the grid, which might take some tries.



Fig.24: Metal Plate insertion

NOTE

- 1) Turn the unit about 45° to the back to position the lock correctly. With this movement the front-rear-shaker is moved to the back and only then the lock can be placed correctly.
- 2) Turn the unit about 45° - 60° to the left to position the lock correctly. With this movement the sideways-shaker is moved to the left and only then the lock can be placed correctly. → <http://www.inheco.com/service/returns-rma.html> for short instruction video

- Screw the 2 screws with red head by hand (only hand-tight)



Fig.25: Placing screws

NOTE

Check whether the screws are screwed in the threat hole by trying to pull them out gently. You can also use an additional tape to secure the lock in case the screws are not correctly within the threat hole.

- After the transportation lock is installed correctly. The device can be shipped without a risk of transport damage if the original packaging is also used.



Fig.26: correct installed transportation lock and **incorrect** installed transportation lock

8 QUALITY

8.1. Final QS Tests

All units, which leave INHECO, have to pass through three semi-automatic test procedures.

8.1.1. Drawer Test

The device must pass at least 100 drawer cycles with correct Labware detection without error.

8.1.2. Performance Test

Finally all important functions are tested and the self test AQS (see chapter 8.3) must run without error.

8.2. Calibration and Adjustment

The adjustment of the shaker and/or the calibration of the temperature are done at INHECO. Settings are stored into the devices EEPROMS and redundant in an INHECO Database. A redundant check of all data is done. The INHECO Measurement Plate (IMP) can be used for verification of shaking amplitude and temperature.

8.3. Automatically self test AQS

The automatically self test AQS (which is optimized for Incubator shaker MP) is performing several tests to ensure proper functionality of the device. After the tests are finished, the device generates an error code (see Firmware Command Set). These tests are:

- Drawer Test: Checks opening and closing of the drawer.
- Shaker Test: Tests timing, amplitudes and frequencies of different settings
- Temperature Test: Tests timing and homogeneity of the heating procedure including boost.
- Duration: 3 min. 30 sec.

With the Incubator shaker DWP an false error could be shown to verify this error we recommend to use the IMP to see whether it is a false or a true error.

9 FAILURES

In case you observe any failures or receive any failure message by your workstation software without clear remedy instruction please contact the support of your workstation provider.

9.1. Drawer failure

9.1.1. error 10

- check whether the labware matches the labware criteria specified in chapter xxx
- check whether the opening for the electric eye of drawer detection is open

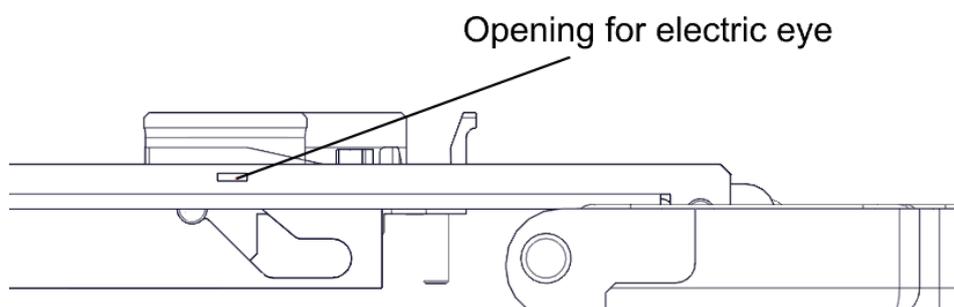


Fig.27: opening for electric eye

- check whether the electric eye of drawer detection is clean

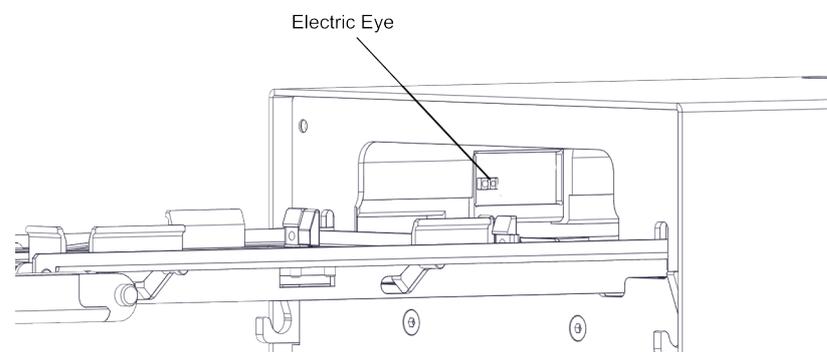


Fig.28: opening for electric eye

- reboot the incubator

9.1.2. error 13

- check whether the golden contact pins and contact area of drawer are clean
- check whether the seal ring of drawer is in correct position

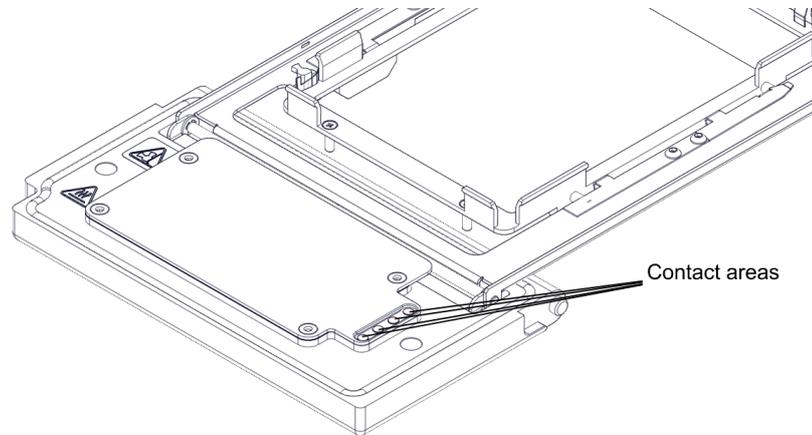


Fig.29: contact area on drawer lid and correct seal ring position

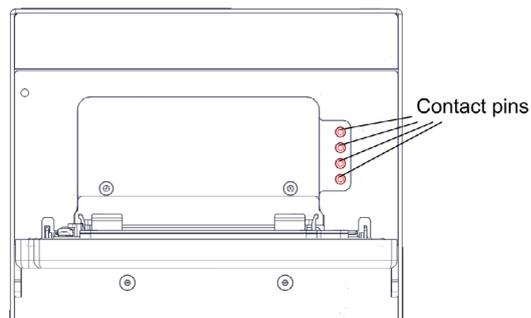


Fig.30: contact pins

- reboot the incubator

9.1.3. drawer is not closing correctly

- check whether something is blocking the door
- check the excenter position

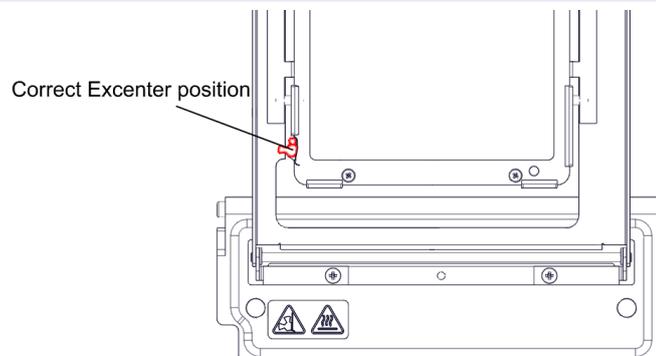


Fig.31: correct excenter position

10 ACCESSORIES

10.1. Power Supply

The Power Supplies are not delivered together with each system. They must be ordered separately at INHECO as for stacked incubators a Power Supply is not necessary. Only the master devices need a Power Supply.

10.1.1. Order Details

	INHECO Part Number
Power Supply built for 1 and more incubators (AC Input: 100-240 V / 2,5A / 50-60 Hz and DC Output: 24 V / 7,5 A (180W))	2400121

10.2. Power Supply Cord

10.2.1. Order Details

	INHECO Part Number
U.K. Power Supply Cord set	1004214
European Power Supply Cord set	1004184
North-American Power Supply Cord set	1004185

10.3. Miscellaneous

10.3.1. Order Details

	INHECO Part Number
INHECO Measurement Plate (IMP)	7901000
Transportation Lock for Incubator Shaker MP and Incubator Shaker DWP	3201339

Declaration of Conformity

in accordance with Directive 2014/35/EU, 2012/19/EU and 2011/65/EU

Product: Incubator MP
Incubator DWP
Incubator Shaker MP
Incubator Shaker DWP

Part No: 7300003; 7300006; 7300013; 7300009

Standards (Safety): EN 61010-1:2011-07
EN 61010-2-010:2015-05
EN 61010-2-101:2017-10

Standards (EMC): 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: 2008 + A2:2010
EN 61000-4-4:2012
EN 61000-4-5:2006
EN 61000-4-6:2014
EN 61000-4-11:2004

This product complies with the essential requirements of the Low Voltage Directive 2014/35/EU and EMC directive 2014/30/EU, when used for its intended use.

International Standards For international standards please see UL certificate U8 17 09 46515 028
Download UL certificat: <http://www.inheco.com/service/certificates.html>

Manufacturer address INHECO Industrial Heating and Cooling GmbH
Fraunhoferstr. 11
82152 Martinsried
Germany

Martinsried, March 2018



Place and date of issue

Günter Tenzler, Managing Director