

# Bardware User's Manual Bardware User's Manual

PyroTec<sup>™</sup> PRO Hardw are User's Manual, V1.2

# 0 Preface

For YourBefore performing any work on or with PyroTec™ PRO, first read this User's Manual care-Safetyfully, in particular chapter 2 "Safety."

## 0.1 Manufacturer

Address of Manufacturer



Lonza Walkersville 8830 Biggs Ford Road Walkersville, MD 29414 USA

# 0.2 Use of the Product

#### 0.2.1 Intended Use

Intended Use PyroTec<sup>™</sup> PRO is an open automation platform product for general laboratory use. It is intended for routine laboratory tasks, such as general-purpose pipetting, general-purpose liquid handling, and robotic processes.

#### 0.2.2 Improper Use

**Improper Use** PyroTec<sup>™</sup> PRO must not be used with options or components that are not approved by Lonza.



#### WARNING

The use of non-approved options may impair the safety concept of the PyroTec<sup>™</sup> PRO. This means that the safety and compliance to national and international standards, as required for UL/CSA certification, by EC directives, etc. cannot be ensured any more.

# 0.3 CE Conformity

Declaration of<br/>ConformityPyroTec™ PRO is designed and built in compliance with the basic safety and health re-<br/>quirements of applicable EC Directives. With the declaration of conformity, the manufac-<br/>turer declares conformity with the provisions of the Directives.

**CE Label** 



# 0.4 CSA Certification

PyroTec<sup>™</sup> PRO is tested and certified by the Canadian Standards Association (CSA).

**CSA Marking** The CSA marking is affixed to the PyroTec<sup>™</sup> PRO.

Radio Interference	According to the ICES-001 notice the following statement applies to the PyroTec <sup>™</sup> PRO:
English	<b>Canadian Radio Interference Regulations</b> ICES-001 Notice for Industrial, Scientific and Medical Radio Frequency Generators: This ISM apparatus meets all requirements of the Canadian interference-causing equip- ment regulations. Please note that this requirement is only for generators that operate at over 10,000 Hz.
Français	<b>Réglementation canadienne en matière de perturbations radioélectriques</b> Avis de l'ICES-001, générateurs de radiofréquences dans le domaine industriel, scientifique et médical: Cet appareil ISM (industriel, scientifique et médical) satisfait à toutes les exi- gences définies par la réglementation canadienne en matière d'équipements générant des perturbations radioélectriques. Veuillez noter qu'il s'agit d'une exigence concernant uni- quement les générateurs fonctionnant au-delà de 10 000 Hz.

## 0.5 FCC Rules

RadioAccording to the rules of the US government agency "Federal Communications Commis-Interferencesion (FCC)" the following statement applies to the PyroTec™ PRO:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 18 (ISM equipment) of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Operating Manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



#### ATTENTION

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

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# 1 About this Manual

Purpose ofThis chapter describes the purpose of the manual, specifies the product the manual dealsThis Chapterwith and whom the manual is intended. It explains the symbols, conventions and abbreviations used and offers other general information.

Purpose ofThis manual describes the PyroTec™ PRO and provides all information required for theThis Manualsafe operation and maintenance of the instrument.

- Product Pic-<br/>turesThe delivered instrument may not exactly match the product pictures shown in this oper-<br/>ating manual.
- Target GroupThis manual is intended for everyone who wants to learn about the safe operation and<br/>maintenance of the PyroTec™ PRO. Laboratory personnel and operators are specifically<br/>addressed.

Laboratory personnel operating PyroTec<sup>™</sup> PRO instruments require thorough knowledge of applications, instrument functions and software programs as well as all applicable safety rules and regulations.

**Scope** This manual is applicable for:

# 4 x PyroTec Pro<sup>™</sup> System Configurations



1 Plate Instrument with Loading ID 1x Sunrise reader 1x Heat Plate 1x Loading ID 5x Loading ID Carriers 2 Plate Instrument without Loading ID 2x Sunrise readers 2x Heat Plates



2 Plate Instrument with Loading ID 2x Sunrise readers 2x Heat Plates 1x Loading ID 5x Loading ID Carriers



- 1. PyroTec<sup>™</sup> PRO Part No. 25-A10; 1 Plate instrument without loading ID
- 2. PyroTec<sup>™</sup> PRO Part No. 25-A20; 2 Plate instrument without loading ID
- 3. PyroTec<sup>™</sup> PRO Part No. 25-A11; 1 Plate instrument with loading ID
- 4. PyroTec<sup>™</sup> PRO Part No. 25-A21; 2 Plate instrument with loading ID

### **1.1 Reference Documents**

Additional reference documents are listed below but are not enclosed or linked.

What Does the Doc. ID Tell You?	The Doc. IDs listed below are root numbers. Therefore, they do not contain information about the language, document version or the medium (data storage medium, hardcopy, downloadable file, etc.) of the document. Check the scope of the corresponding document to make sure that you are in possession of the correct version.
Manuals supplied with PyroTec™ PRO Instruments	The following manuals are included in the shipment and considered part of a PyroTec <sup>™</sup> PRO instrument: • PyroTec <sup>™</sup> PRO User Manual
Application Software Man- uals	According to your order configuration and the applications you plan to run, the following documents are supplied:
	WinKQCL™ Endotoxin Detection and Analysis Software User Guide Manual PyroTec™ PRO Software User Guide

## **1.2 Trademarks**

The following product names and any registered and unregistered trademarks mentioned in this manual are used for identification purposes only and remain the exclusive property of their respective owners (for simplicity reasons, the symbols for trademarks, such as  $\degree$  and  $\square$  are not repeated later in the manual):

- WinKQCL<sup>™</sup> and PyroTec<sup>™</sup> PRO are trademark of Lonza Walkersville in major countries
- Tecan<sup>®</sup> Freedom EVOware<sup>®</sup> and Freedom EVO<sup>®</sup> are registered trademarks and Sunrise<sup>™</sup> is a trademark of Tecan Group Ltd. in major countries

# 1.3 Abbreviations

Air LiHa	Air displacement pipetting arm
cLLD	Capacitive liquid level detection
сv	Coefficient of variance or variation
DiTi	Disposable tip
DMSO	Dimethyl sulfoxide
EN	European Norm
ETFE	Ethylene/Tetrafluoroethylene-copolymer
FEP	Tetrafluoroethylene/Perfluoropropylene-copolymer
FFPM	Perfluoroelastomer
FSE	Field service engineer
СН	Liquid handling
LiHa	Liquid handling arm
МСА	Multichannel arm
MCA96	Multichannel arm with 96 channel pipetting head
мю	Monitored incubator option
МР	Microplate
МРО	Monitored pump option
PCTFE	Polychlorotrifluoroethylene
PE	Polyethylene
pLLD	Pressure based liquid level detection
РМР	Pressure monitored pipetting
PnP	Pick and place arm
РОМ	Polyoxymethylene
РР	Polypropylene

PS	Polystyrene
vPTFE	Polytetrafluoroethylene
PVC	Polyvinylchloride
PVDF	Polyvinylidenefluoride
RoMa	Robotic manipulator arm
RF	Radio frequency
USB	Universal serial bus
UPS	Uninterruptable power supply
wно	World Health Organization

# 2 Safety

Purpose of<br/>this ChapterThis chapter describes the safety concept of PyroTec™ PRO, provides general rules<br/>of correct behavior, and warnings concerning hazards associated with the use of<br/>the PyroTec™ PRO.

Significance of<br/>These Safety<br/>InstructionsThe safety of users and personnel can only be ensured if these safety instructions<br/>and the safety-related warnings in the individual chapters are strictly observed and<br/>followed.

# 2.1 Warning Notices Used in This Manual

Warning notices appear as follows:

The symbols used for safety-related notices have the following significance:

Warning Symbols



WARNING Generally, the triangular warning symbol indicates the possibility of personal injury or even loss of life if the instructions are not followed.

Whenever possible, the symbol indicates the hazard a person is exposed to more specifically. The symbols used in this Operating Manual have the following significance



WARNING Toxic substances



WARNING Biological hazard



WARNING Radioactive radiation



WARNING Fire hazard

WARNING Electrical danger



WARNING Crushing hazard



WARNING Laser hazard



WARNING Explosive material

ATTENTION Symbols ATTENTION notes appear as follows ATTENTION

With the general "Read This!" symbol, ATTENTION indicates the possibility of equipment damage, malfunctions, or incorrect process results, if instructions are not followed.

Other symbols indicate significance of the ATTENTION more specifically:



ATTENTION Wear protective gloves

ATTENTION Disturbance by electromagnetic RF waves. Do not use a cellular phone.

# 2.2 Product Safety

Principle

PyroTec<sup>™</sup> PRO is designed and built in accordance with the present state-of-the-art technology and the recognized technical safety regulations. Nevertheless, risks to users, property and the environment can arise if the PyroTec<sup>™</sup> PRO is used without due care and attention.

The safety of all users and personnel depends on the strict observation of these safety instructions and awareness of the safety-related warnings provided in this manual.

#### 2.2.1 Instrument-Related Hazards and Safety Measures

Please pay great attention to the following general safety information.



#### WARNING

- This manual must always be available to all persons performing the tasks described herein.
- Legal regulations, such as local, state, and federal laws concerning the use or application, as well as the handling, of dangerous materials in connection with the PyroTec<sup>™</sup> PRO must be strictly followed.
- The operating company is responsible for defining instructions in accordance with company procedures and local legal requirements. The instructions provided by the operating company must be strictly observed.
- Observe the correct environmental conditions for storage and operation.
- Structural changes to the safety devices are forbidden.
- Damaged safety devices must be replaced immediately as described in this manual.
- The PyroTec<sup>™</sup> PRO must not be modified in any way without prior consultation and written approval from Lonza.
  - Authorized modifications to the system may only be performed by an FSE certified for the repair and upgrading of the PyroTec<sup>™</sup> PRO.
  - o Lonza will reject any claim resulting from unauthorized modifications.
- Fire hazard can be caused by the improper use of the PyroTec<sup>™</sup> PRO.
- The PyroTec<sup>™</sup> PRO should not be installed in locations where there is a hazard of explosion.
- Any contamination must be dealt with immediately as described in this manual.
- The user is responsible for ensuring that the PyroTec<sup>™</sup> PRO is always operated under proper conditions
  - Maintenance, service, and repair tasks should be performed with care, on schedule, and only by authorized personnel.
- Risk of incorrect measuring results
  - After system care or maintenance has been performed, operation must only be resumed after the correct system operating conditions have been verified.
- Always use recommended consumables and original spare parts for maintenance and repair to assure good system performance and reliability.
- Lifting or moving the instrument can cause serious injuries.
  - Injuries to the back due to overload can occur.
  - Lifting or moving the instrument must be correctly prepared and may only occur under the direction of a qualified Lonza person.
  - o Lifting or moving the instrument can cause damage due to unsecured parts.
- There is potentially lethal voltage inside the instrument.

- Equipment should be connected to a grounded power source using an approved power cord with grounding conductor.
- o Do not remove covers and other parts protecting from electricity.
- Always keep the areas of electric parts, such as power supply plug, mains switch, etc., dry.
- Though the safety concept assumes that the safety panel is always closed during normal operation, it is necessary to have access to the elements in the working area behind the safety panel for setup, maintenance and troubleshooting purposes.
- Always be aware of the mechanical hazards.
- Wear laboratory apparel, rubber gloves, safety goggles, etc. as appropriate.
- If the system is leaking, unsafe operating conditions and incorrect measuring may result
  - If liquid is dripping from the tips or other parts of the liquid system, the PyroTec<sup>™</sup> PRO must not be operated any more.
  - Operation may only be resumed if the necessary maintenance or repair work has been performed and the proper condition of the system has been verified.
- Electromagnetic RF waves from a cellular phone may affect the function of the liquid detection.
  - Faulty detection of the liquid surface may be the consequence, which causes the system to produce incorrect results.
  - Keep a distance of at least 2 m from the instrument when using a cellular phone
- Parts of the pipetting head are moved with great force.
  - Injuries (piercing and crushing) are possible when you reach into the working area of the pipetting head.
  - Make sure that all safety covers are in place before starting the instrument.
  - o Do not reach into the working area of the instrument
- Regarding all hazards (referring to the listed hazards earlier in this section) pay attention to the following:
  - Prior to using hazardous materials, perform a risk assessment.
  - Consider specific workplace conditions, such as temperature, air ventilation, and electrostatic discharge.
  - Make sure that the risk is acceptable prior to use of the instrument.
  - o Do not place devices emitting electromagnetic fields close to the instrument.
  - Do not connect devices that may interfere with the supply grid to the same power line as the instrument.



• Chemical, biological, and radioactive hazards can be associated with the substances used or the samples and reagents processed with the PyroTec<sup>™</sup> PRO (e.g., during load-ing and unloading). The same applies to waste disposal.

PyroTec<sup>™</sup> PRO Hardw are User's Manual, V1.2



- $\circ$   $\;$  Always be aware of possible hazards associated with these substances.
- o Use appropriate protective clothing, safety goggles and gloves.
- The handling of substances and the disposal of waste may be subject to local, state, or federal law, or to regulations with regard to health, environment, or safety. Strictly observe the corresponding provisions.
- Caustic substances can cause burns and eye injury.
  - o Avoid exposure to caustic substances.
  - Use appropriate protective clothing, safety goggles, mouth/nose protection and gloves.
- The instrument is not explosion protected. Not for use in Ex zones. When using flammable material take the risk of fire into consideration:
  - o Avoid the formation and accumulation of flammable vapors.
  - Avoid the spillage of flammable material.

# **3** Operating Company

The operating company must ensure that the PyroTec<sup>™</sup> PRO and the safety features function properly and that all the personnel in contact with the instrument are adequately trained.

#### Responsibilities

- Method and process validation.
- Defining the processes in compliance with the Standard Operating Procedures.
- Ensuring that installation and operational qualifications (IQ OQs) have been completed.
- Ensuring that all personnel in contact with the PyroTec<sup>™</sup> PRO are adequately trained.
- Ensuring the availability of appropriate protective clothing and equipment.
- Ensuring the maintenance and safe operation of the PyroTec<sup>™</sup> PRO.
- Requiring adherence to laboratory safety regulations and directives.

#### 3.1 User Qualification

The laboratory personnel must be fully qualified and trained to operate the PyroTec<sup>™</sup> PRO. The work described in this User's Manual must only be performed by authorized personnel with the qualifications prescribed below.

#### Laboratory personnel must:

- Have suitable technical training,
- Be familiar with the laboratory safety regulations and directives,
- Be familiar with the instructions for the safety elements of the instrument,
- Use protective clothing and equipment,
- Be familiar with and adhere to good laboratory practices,
- Have read and understood the instructions in the User's Manual.

Lonza recommends that the operator attend an operator-training course including routine use and end-user maintenance training. Please ensure training requirements are stated clearly on a completed pre-installation checklist.

#### 3.1.1 Operator

The operator (lab technician) works for the operating company. **Required Skills** 

- Command of local languages
- Command of English is preferable

The operator has application software access rights allowing him/her to run methods and perform system care.

# 3.2 Safety Elements

#### 3.2.1 Safety Panels

The space around the worktable is protected with safety panels. Whereas the front safety panel can be opened, the other safety panels are permanently installed on the PyroTec<sup>™</sup> PRO.

#### WARNING



Injuries caused by moving parts A not completely opened front safety panel might close automatically. Open the front safety panel completely (more than 180°).

#### 3.2.2 Door Locks

During operation, the front safety panel is locked by means of two door locks. The safety concept of the PyroTec<sup>™</sup> PRO assumes that the front safety panel is always closed when the instrument is running.

#### 3.2.3 Modifications on the Safety Panels

Some options for the PyroTec<sup>™</sup> PRO require modifications on the safety panels. These modifications must be performed by a Lonza approved FAS (field application specialist) when the option is installed.

**WARNING** If the options, which require modifications on the PyroTec<sup>™</sup> PRO, are installed improperly, the safety concept may be impaired.

Always make sure that the options are installed in compliance with the instructions given by the manufacturer.

**WARNING** If any safety element fails to operate as expected, e.g. if the door locks fail to lock or open at the expected time, immediately notify the Lonza field service engineer.



#### 3.2.4 Which are Safety Elements?

The following figures show the elements of the PyroTec<sup>™</sup> PRO, which have a protective function or have in any other way to do with safety.





Safety elements / standard (open) front safety panel

- A Standard front safety panel
- B Door lockC Side safety panel

- **D** Top safety panel
- E Loading interface (optional)
- X Cutout for continuous loading

PyroTec<sup>™</sup> PRO with Closed Front Safety Panel (Option)



#### Safety elements / closed front safety panel (option)

- A Closed front safety panelB Door lock
- C Side safety panelD Top safety panel

PyroTec<sup>™</sup> PRO with Front Safety Panel with Adjustable Access Window (Option)



Safety elements / front safety panel with adjustable access window (option)

- A Front safety panel
- B Adjustable access window
- C Door lock

- D Side safety panel
- E Top safety panel

3.3 General

Removal ofThe protective and safety devices installed on the PyroTec™ PRO must not be removed orSafety Ele-disabled during operation.ments

In the event such elements were removed, e.g. for maintenance work, operation may only be resumed when all protective and safety devices have been completely installed and checked.

#### 3.3.1 Product Safety Signs

Where are PyroTec<sup>™</sup> PRO Instrument

Safety Notices

Attached?

The figure shows the safety notices attached to the PyroTec™ PRO instrument. It also shows their locations:



Fig. 2-6 Safety notices attached to the product

The following table explains the significance of the notices

Symbol	Significance
$\underline{\mathbb{V}}$	Warning of hazards if you reach beyond the yellow line (see short arrows)
	Warning of hazards if you reach into the cabinet if, for instance, a reader or centrifuge is installed.
	Do not use a cellular phone

Tab. 2-1 Significance of the safety notices

Damaged, lost, or illegible symbols (notices or stickers) must be replaced immediately.

#### 3.3.2 Laser Radiation

The optional barcode scanner emits laser radiation—namely, a low-power collimated beam in the visible spectrum with the following properties:

- Wavelength: 655 nm
- Pulse duration: 150 μs
- Maximum power of energy output: 1.0 mW

CAUTION



The Loading-ID is a class 1 laser product pursuant to IEC/EN 60825-1:2014 that emits laser radiation.

Dazzle, flash-blindness, and after images may be caused by the laser beam. Skin or iris injury can be caused near to or in contact with the source.

- Do not stare into the laser beam or into its reflections.
- Do not reach into the laser beam near to the source.
- Do not touch the source during operation.

#### 3.4 Decontamination Declaration

When to De-<br/>contaminateApart from regular decontamination, the user must thoroughly decontaminate the instru-<br/>ment according to standard laboratory regulations in the following cases:

- Before any maintenance or service work is performed on the instrument.
- In case of accidents (e.g. crash, spilled substances, etc.).
- Before a Lonza approved FAS (field application specialist) performs any on-site work on the instrument.
- Before the instrument or parts of it are returned to Lonza (e.g. for repair).
- Prior to storage of the instrument.
- Prior to disposal of the instrument or parts of it.
- Generally, before the instrument or parts of it leave the user's site.

Decontamination Method to the respective application and the substances associated with it. The user takes the full responsibility for the appropriate decontamination of the entire equipment.

	WARNING
	Biological or chemical hazard and/or radioactive radiation.
	Contamination hazard due to parts of the instrument, which are not completely decontaminated.
	Not only must the parts having direct contact with chemicals or biological material be treated, but also the tubing system as well as the whole upstream equipment.
Certificate of Decontamina- tion	Before a Lonza approved FAS (field application specialist) carries out any work on the in- strument, or before the instrument is returned, the owner of the instrument must confirm in writing that the decontamination has been performed properly and in accordance with good laboratory practice guidelines. For this, the owner must enclose a declaration (e.g. Certificate of Decontamination).
	Lonza can provide the corresponding forms (Certificate of Decontamination or Repair Or- der) in case the owner of the instrument has no template for such a declaration at hand. Contact the Lonza Scientific Support for further information.
	Note: Lonza reserves the right to refuse any instrument or a part of it, or will charge an

# 3.5 General Safety Rules

Legal Regula-	All local, state, and federal laws, which prescribe the use or application as well as the han-
tions	dling of dangerous materials in connection with the instrument, must be strictly followed.
Duty of Maintenance and Care	The user is responsible for ensuring that the instrument is operated in proper condition only, and that maintenance, service, and repair tasks are performed with care, on schedule, and by authorized personnel only.
Spare Parts to	Use only genuine consumables and genuine spare parts for maintenance and repair to as-
Be Used	sure good system performance and reliability.
Modifications	Modifications to the instrument are only permitted after prior consultation and written approval of the manufacturer. Only FSEs certified in repairing and upgrading the system are authorized to make modifications.

extra fee, if the decontamination is not declared sufficiently.

Lonza will reject any claim resulting from unauthorized modifications.

# 4 Technical Data

Purpose ofThis chapter introduces the reader to the PyroTec™ PRO and its main components. It con-<br/>tains technical data, requirements, and performance data.

#### 4.1 Introduction

What isThe PyroTec™ PRO is a precision instrument designed for automating routine laboratory<br/>tasks in the domains of life science and bio pharma. The PyroTec™ PRO is an open and<br/>flexible platform.PRO?PRO:

**Delivery** The PyroTec<sup>™</sup> PRO is delivered only to Lonza authorized field service engineers, who take responsibility for assessing and investigating each installation at an end-user site to comply with local requirements.

#### 4.1.1 PyroTec<sup>™</sup> PRO Overview



Illustration 1: PyroTec<sup>™</sup> PRO instrument overview

#### 4.1.2 Product Identification and Labelling

Type plate

Model	PyroTec™	PRO	)
REF	30151962	00	
m	2099-12-31		30151962 009912123456
SN	9912123456		
U,f	100-120VAC/	220-2	240VAC,50/60HZ
P	1200VA		
Fuse	T2AH 250 VAC	:	T2AH 250 VAC
made in	T10AH 250 V/ Switzerland	AC	T10AH 250 VAC
	Lonza W 8830 Big Walkersv MD 2179 USA	alkersv gs Foro /ille 3	ille I Road

Details for product identification can be read from the type plate, which is located on the back of the instrument near the power inlet.

On the type plate (A) you find the following information:

- Identification data
  - o Model
  - o REF: Ordering information (material number)/revision level
  - o Production date
  - o SN: Serial number
- Technical data
  - Supply voltage (Volts), frequency (Hertz)
  - P: Power consumption (VA)
  - Fuse: Required fuse protection (A)
- Manufacturer's name and address
- Conformity marking

More details of product identification, such as specific data of the instrument according to the order configuration, can be taken from the **Tecan Maintenance and Service Logbook**.

# Serial NumberThe identification data is also printed on the serial number label (B). This label can beLabelviewed from the front side of the instrument and is attached below the diluters.

Instrument Heights

Instrument equipped with:	Instrument height:	
Air displacement pipetting arm, Air LiHa	1070 mm	42.1 in.
Robotic manipulator arm, RoMa	920 mm	36.2 in.

Safety Panel Dimensions

г

Opening

Dimensions of the opening in the front safety panel: PyroTec<sup>™</sup> PRO: 1130 x 170 mm (44.5 x 6.7 in.)

**Supply Ratings** 

	PyroTec™ PRO
Line voltage (single phase)	100 - 120,220 - 240 V AC (-15% / +10%)
Frequency	50/60 Hz
Power	1200 VA
Fuses	<ul> <li>2 x T10A (instrument power)</li> <li>x T2A (main powered options)</li> </ul>

**Note:** Considering possible under voltage on the mains supply, the combined power consumption in the lower input voltage band (100 - 120 VAC) must not exceed 1000 VA in order to keep the input current below the fused values.

#### **Electrical** Classification with regard to electrical safety according to EN/IEC standards:

#### Safety

Overvoltage category	II	IEC 60664-1
Pollution degree	2	(EN) IEC 61010-1

#### **Power Switch**

The power switch is placed at the level of the front access panel. The power switch does not switch the mains voltage directly, but gives a control signal to the power supply.

Specification	Description
Circuitbreak	By unplugging the instrument.
Power on delay	0.2 - 0.5 sec.
Power off delay	1 - 2 sec.

At installation or later movement of the instrument, ensure that it is always possible to unplug the mains cable at the instrument.

Uninterrupti-<br/>ble PowerFor an optimal operation of instruments and smooth running of the relevant application,<br/>Lonza recommends connecting an online UPS, so that the power supply runs via the UPS<br/>with a filter effect.

UPS recommendations:

UPS Type	Short-circuit-proof
UPS Power Output	1.5 times the average consumption of the equipment.
Recommended minimum UPS size	2500 WATTS

Note: A switched UPS type that switches over to batteries only after network breakdown is not recommended.

For further assistance, contact your site manager or your nearest Lonza representative.

A switched UPS type that switches over to batteries only after network breakdown is not recommended.

Status LampThe status lamp is located above the diluters in the center of the instrument front surface.<br/>It displays the instrument operational states with red and green light that is either contin-<br/>uous or flashing. When the status lamp light is red, an acoustic alarm sounds.

The illuminated area is 540 x 18 mm (21.26 x 0.7 in.).

EnvironmentalAll instruments are intended for indoor operation and storage only. The tables below giveConditionsan overview.

ATTENTION Barcodes cannot be read due to the influence of sunlight or other light sources on the barcode scanner.

- Do not expose the instrument to direct sunlight.
- Do not install strong light sources that may impair the function of the barcode scanner near the instrument.

Operating Conditions	Operating temperature	15°C to 32°C (59°F to 90°F)
	Operating humidity	30% to 80% relative (non-condensing) at 30°C (86°F) or be- low
	Operating altitude	Max. 2000 m above sea level

Pipetting Conditions	Pipetting temperature	20°C to 27°C (68°F to 80.6°F)	
	Pipetting humidity	30% to 60% relative (non-condensing) at 25°C (77°F) or be- low	
Storage Conditions	Storage temperature	1°C to 60°C (34°F to 140°F)	
conditions	Storage humidity	5% to 80% relative (non-condensing) at 30°C (86°F) or below	
Transport Conditions	Transport temperature	-20°C to 60°C (-4°F to 140°F) for maximum 24 hours	
Contractions	Transport humidity	20% to 80% relative (non-condensing) for maximum 24 hours	
Emissions	Noise emission (EN61010-1)	< 85 dBA [61.3 dBA (sound pressure), measured at a dis- tance of 1 m from the instrument]	

# 4.2 Configuration Data

**Upgradeability** An existing PyroTec<sup>™</sup> PRO instrument can be upgraded with a Front-Loading ID (barcode scanner) that can be installed later after the initial installation.

Field upgrades can be performed by a Lonza approved FAS (field application specialist) only.

DeliveryThe PyroTec™ PRO is delivered only to a Lonza approved FAS (field application specialist),<br/>who take responsibility for assessing and investigating each installation at an end-user site<br/>to comply with local requirements.

#### 4.2.1 Air LiHa Configuration

The Air LiHa can be used on:

• PyroTec<sup>™</sup> PRO: The Air LiHa is always equipped with a lower DiTi eject device and features the Air LiHa MultiSense functions.

#### 4.2.2 Tecan<sup>®</sup> Sunrise<sup>™</sup> Reader and Loading ID

The pictures below show the possible Tecan<sup>®</sup> Sunrise<sup>™</sup> readers and Loading ID configurations:

This manual is applicable for:

# 4 x PyroTec Pro<sup>™</sup> System Configurations

1 Plate Instrument without Loading ID 1x Sunrise reader 1x Heat Plate

![](_page_28_Picture_6.jpeg)

1 Plate Instrument with Loading ID 1x Sunrise reader 1x Heat Plate 1x Loading ID 5x Loading ID Carriers

![](_page_28_Picture_8.jpeg)

![](_page_28_Picture_9.jpeg)

2 Plate Instrument with Loading ID 2x Sunrise readers 2x Heat Plates 1x Loading ID 5x Loading ID Carriers

![](_page_28_Picture_11.jpeg)

![](_page_28_Picture_12.jpeg)

- 1. PyroTec<sup>™</sup> PRO Part No. 25-A10; 1 Plate instrument without loading ID
- 2. PyroTec<sup>™</sup> PRO Part No. 25-A20; 2 Plate instrument without loading ID
- 3. PyroTec<sup>™</sup> PRO Part No. 25-A11; 1 Plate instrument with loading ID
- 4. PyroTec<sup>™</sup> PRO Part No. 25-A21; 2 Plate instrument with loading ID

#### 4.3 Requirements

#### 4.3.1 Computer Requirements

Refer to the PyroTec<sup>™</sup> PRO Software Manual for details on minimum computer requirements.

#### 4.3.2 Software Requirements

WinkQCL <sup>m</sup> Endoloxin Delection and Analysis Soliware 1 vo.0 of higher	WinKQCL™ Endotoxin Detection and Analysis S	oftware V	6.0 or higher
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## 4.4 System Modules

The system modules are briefly introduced in the following sections. According to your order configuration, some of these options might be installed.

#### 4.4.1 Air Displacement Pipetting Arm (Air LiHa)

The PyroTec<sup>™</sup> PRO is equipped with an Air LiHa which is a robotic arm having multiple pipette tip for general pipetting tasks. The Air LiHa working principle is based on air displacement technology where a Plunger Drive, directly mounted on top of a pipetting channel, varies the volume of an air chamber for aspiration and dispensing. The Air LiHa is designed for use with disposable tips only.

ral Data	Usable tips	Disposable tips <ul> <li>Conductive</li> <li>With filter</li> </ul>	1000 µl
	Number of channels	8	
	Tip spreading	Distance from tip to tip	9 to 38 mm (0.31 to 1.5 in.)
	Volume range	0.5 µl to 1000 µl (1 ml)	
	Theoretical resolution	0.1 µl	
	Dispense speed	1000 µl	less than 2 seconds
	Dispense modes	0.5 µl to max. volume	Free (non-contact) dispense for single pipetting or contact dis- pense
		5 μl to max. volume	Free (non-contact) dispense for multi pipetting
	DiTi pickup force	23 N +/- 4 N	
	Pipetting Precision	Refer to the tables in Air Lil	Ha Pipetting Precision below.
	Special functions	Liquid level detection pLLD and PMP Lower DiTi eject	See corresponding sections with the same names.

Gene

Air LiHa Operating	Axis	LiHa type	PyroTec™ PRO
Ranges	X-axis	All	Refer to section on Worktable Access Range
	Y-axis	8-tip LiHa	373 mm (14.7 in.)
	Z-axis	All	210 mm (8.27 in.)

# **Clearance** The tip clearance is the maximum space between the worktable surface and the mounted tip (initial position).

Tip type	Tip clearance
DiTi adapter (A)	260 mm (10.24 in.)
Reference tip (B)	210 mm (8.27 in.)
DiTi 1000 µl (C)	178 (7.01 in.)

#### Air LiHa The positioning accuracy of the Air LiHa allows for the following applications:

Accuracy/ Precision

• Air LiHa can be used in combination with 96-well microplates.

Axis	Repeatability					
x	±0.15 mm (0.006 in.)					
Y	±0.15 mm (0.006 in.)					
Z	±0.3 mm (0.012 in.)					

Equidistant Tip The equidistant movement of sampling tips in Y direction is:

**Movement** • from 9 mm ± 0.4 mm

• to 38 mm ± 1 mm

DisposableUse only Lonza disposable tips. Conductive disposable tips are available with filter, in fol-TipsIowing volumes:

• 1000 μl

**DITI Carrier** A DiTi Carrier holds up to three trays of 96 disposable tips.

#### Air LiHa Tip Adapter

The Air LiHa is equipped with a special type of tip adapters, which contain a pressure sensor, the electronics for the Air LiHa MultiSense functions and a user replaceable Inline filter.

#### **Tip Adapter** Dimensions

The dimensions of the Air LiHa tip adapter and the MultiSense tip adapter are the same.

Dimension	Standard tip adapter	Air LiHa tip adapter	Difference
Х	26.9 mm	37.1 mm	10.2 mm
Y	20.0 mm	21.6 mm	1.6 mm
Z	10.0 mm	9.1 mm	- 0.9 mm

#### Limitations on the Workspace

The dimensions of the Air LiHa tip adapter affect the workspace as follows:

The Z-offset (not range) is smaller by 7 steps (0.7 mm) for instruments equipped with • the Air LiHa.

#### Labware

• With the Air LiHa tip adapter the maximum permissible height of labware placed on the adjacent grid position (on the left of the accessed grid position) is 3 mm smaller compared to a standard tip adapter. This limitation applies when pipetting is done at minimum Z-height.

![](_page_31_Picture_10.jpeg)

#### ATTENTION

A magnetic field too close to the Air LiHa tip adapter may interfere with the reed switch in the tip adapter and lead to unexpected switching with the result e.g. of a "DiTi not fetched" error.

#### **Pipetting Precision**

**Prerequisites** Based on Lonza quality control requirements, the values in the tables below are only valid if maintenance instructions and schedule have been followed strictly.

Definition Precision is calculated as coefficient of variance (CV %). Typical pipetting precision is defined as the median value of the CV (calculated over all channels) of all tested instruments.

Only Tecan<sup>®</sup> disposable tips guarantee attainment of the performance specified for the **Pipetting Tips** Lonza pipetting instruments.

#### **Best Values** Air LiHa

Precision

Pipetting

The pipetting precision values listed below are based on the following criteria:

- OPTIMIZED liquid handling precision data (proven on 3 independent Air LiHa systems)
- For small volumes a single channel calibration is necessary • (see footnotes in table) For details on single channel calibration refer to the EVOware Software Manual
- Custom liquid class in EVOware

- Pipetting conditions Temp. 20°C to 27°C/68°F to 80.6°F, relative humidity 30% to 60% (non-condensing).
- Tap water with a conductivity of 0.3 mS/cm to 1 mS/cm
- Free dispense; single pipetting mode, complete range from  $0.5\,\mu$ l to 1000  $\mu$ l
- 8 channels, 12 replicates, CV and accuracy calculated over each channel and complete 96 well plate

DiTi Type	Volume	Precision (CV)	Accuracy		
DiTi1000	100 µl	≤ 0.5%	± 1.0%		
	1000 µl	$\leq 0.5\%$	± 1.0%		

#### **Typical Values**

The pipetting precision values listed in the table below are typical values that can be achieved in EVOware with default liquid classes without further optimization.

- The data below is based on the poorest CV or accuracy value of at least three tested instruments in production.
- The values were calculated the following way:
  - Single pipetting mode, tap water with a conductivity of 0.3 mS/cm to 1 mS/cm, 8 channels, 12 replicates, CV and accuracy calculated over each channel and complete 96 well plate unless otherwise stated.

Air LiHa Pipetting Precision; typical values								
Тір	Volume Precision (CV) Accuracy							
DiTi1000	10 µl	1.5%	± 13.0%					
	100 µl 0.5% ± 1							
	500 μl 0.5% ± 1.0%							
	1000 μl 0.5% ± 1.0%							
Water Free Dispense: Multi Dispense								
Тір	Volume	Precision (CV)	Accuracy					
DiTi1000	12 x 50 µl	2.5%	± 2.0%					
	6 x 100 μl	2.5%	± 2.0%					

	Factory and Field Verification Values						
Test	General test conditions, carried out with the Setup & Service Software:						
Conditions	<ul> <li>All liquid handling values have been verified under controlled laboratory environ- ment at temperatures between 20°C and 27°C and a humidity between 30 % and 60 % at 25°C.</li> </ul>						
	Liquid: water						
	Pipetting mode: single pipetting, free dispense						
	New DiTi for each sample						
	The pipetting precision values listed in the table above are based on the following criteria:						
	<ul> <li>Liquid handling precision data tested for each produced PyroTec<sup>™</sup> PRO</li> </ul>						
	Values are for pipetting water with disposable tips						
	Default liquid class in EVOware						
	No single channel calibration required						
Wetted Materials	In normal operation, the disposable tips are the only wetted parts. Other parts are not ex- posed to the pipetted liquids except in case of a malfunction (too much liquid aspirated). However, other parts may be exposed to aerosols from the liquid.						
	• The parts that come into contact with sample liquid:						
	<ul> <li>Disposable tips: PP</li> </ul>						

- The parts that may be moistened with aerosols:
  - Tip cone (gold-plated brass)
  - o Inline filter

#### 4.4.2 Robotic Manipulator Arm (RoMa)

The PyroTec<sup>™</sup> PRO instrument is equipped with a robotic manipulator arm. The robotic manipulator arm is used to transport microplates from one position to another position on the worktable.

Force in Z-direction	60 N
Z-range	Total range: 259 mm (10.2 in.) Work range: 257 mm (10.12 in.)
Transportable mass	Max. 0.4 kg (0.88 lbs.)
Gripper force	10 N
Gripper space range	58 to 140 mm (2.28 to 5.51 in.)
Rotation angle	270° (left or right oriented)

![](_page_34_Picture_1.jpeg)

#### ATTENTION

Improper transport of labware (microplates, etc.). Use only labware that is rigid enough not to be deformed by the gripper force.

# 4.5 Chemical Resistance

**Chemical** In the following table the chemical resistance of the used (standard) materials is specified:

#### Resistance

Chemical resistance table										
Material	FEP	PVC	Silicone	POM	PVDF	PP	PTFE	FFPM	PCTFE	ETFE
Acetone	ο	/	0	x	/	0	0	0	о	0
Acetonitrile (C <sub>2</sub> H <sub>3</sub> N)	0	/	/	/	х	0	nd	nd	nd	0
Formic acid 100 %	ο	x	x	/	х	0	0	x	о	0
Ammonium hy- droxide 25 %	0	x	0	/	0	0	0	nd	0	0
Chloroform	0	/	/	x	о	х	0	x	x	/
Dimethyl- formamide	0	/	/	/	/	0	0	0	0	/
DMSO	0	/	x	ο	/	0	nd	nd	nd	0
Acetic acid 96 %	0	/	x	/	о	x	0	0	о	x
Acetic acid ethylester	0	/	/	x	/	х	nd	nd	nd	x
Ethanol 96 %	0	x	x	0	о	0	0	0	о	0
Formaldehyde 40 %	0	x	x	х	0	0	0	х	0	0
Sulfuric acid 40 %	0	x	/	/	о	0	0	о	о	0
Sulfuric acid 96 %	0	/	/	/	/	x	0	о	о	0
Isopropanol	0	/	x	о	о	ο	0	о	о	0
Diluted bleach, NaOCl	0	х	х	/	0	х	0	0	ο	ο
Methanol	0	x	0	x	0	0	0	0	0	0
Methylene chloride	0	/	/	x	/	/	ο	0	0	/

Sodium hydroxide 10M	0	х	0	/	х	0	nd	nd	nd	ο
Perchloric acid 60 %	0	/	/	x	0	х	0	х	х	/
Petroleum ether 30/50	0	x	/	x	0	/	nd	nd	nd	х
Hydrochloric acid 32 %	0	х	/	/	0	0	0	0	0	0
Trichloroacetic acid 40 %	0	/	/	0	0	/	0	0	0	х

Legend:

- o Resistant
- x partly resistant, use is possible with frequent replacements
- / not resistant, unsuitable for use
- nd not determined

#### 4.5.1 Resistance of Special Materials

#### 4.5.1.1 Air LiHa Tip Cone

The Air LiHa tip cone and the inline filter may be moistened with aerosols from the sample liquid.

The chemical resistance of the gold-plated brass tip cone depends on temperature and exposure time. The inline filter is made of polyethylene, its chemical resistance is comparable with the one of polypropylene (PP).

When pipetting aggressive liquids or strong solvents, check the Air LiHa tip cone for corrosion and replace the inline filter if it is not clean any more.
### **5** Description of Function

Purpose ofThis chapter explains the basic principle of the PyroTec™ PRO, shows how it is structuredThis Chapterand gives a functional description of the assemblies.

# 5.1 Introduction

Components	The instrument consists of a platform that includes worktable, frame, housing, main elec- tronic boards, and power supply.			
	The platform is available in one size.			
	<ul> <li>Instrument size (approximate instrument length: 150 cm (59.06 in.)).</li> <li>The platform can be placed onto a cabinet.</li> </ul>			
Robotic Arms	The instrument is equipped with one Air displacement pipetting arm (Air LiHa), which is used for liquid handling (pipetting, diluting, etc.), and one robotic manipulator arm (RoMa) that is used to transport microplates			
Sample/ Carrier Identification	A front LoadingID is available to identify carriers and containers on the worktable by means of a barcode scanner.			
Standard	Standard components with PyroTec <sup>™</sup> PRO, e.g.			
	Multichannel pipetting option			
	MultiSense option			
	Incubator			
	Front Loading ID (optional)			
Control	The operator controls the system via a personal computer, on which the instrument soft ware as well as the relevant application software are installed.			

### 5.2 Structure

### 5.2.1 The PyroTec<sup>™</sup> PRO Worktable

Positioning Pins	On the PyroTec <sup>™</sup> PRO worktable, evenly spaced positioning pins ensure proper positioning of all carriers according to the grid represented within the software. One grid position de- fines the minimal width of carriers, e.g. wash stations and strip racks for tubes. The posi- tioning pins also enable the sliding of carriers/racks in Y-direction.		
Sliding	Sliding carriers and racks are needed for:		
Carriers and Racks	<ul> <li>Replacement (loading/unloading) of carriers or racks during operation,</li> </ul>		
	• The identification of tubes, microplates, troughs etc. on carriers by the front-loading ID arm.		

### 5.3 Function

### 5.3.1 Air Displacement Pipetting Arm (Air LiHa)

Purpose of AirThe Air LiHa is a pipetting arm for general pipetting tasks. Aspiration and dispense of liquids are based on air displacement.

**Tip** Servo motors move the tips in X, Y or Z-direction.

Movements

The pipetting tips can be moved independently in Z-direction. In Y-direction, equidistant tip spreading is possible. This enables the arm to pipette e.g. from vessels with a small cavity spacing (such as a microplate) to vessels with a larger cavity spacing (such as a tube rack) with all tips simultaneously.



- A Air chamber in Z-rod
- B Disposable tip
- **C** Lower DiTi eject device
- **D** Plunger drive

- X Axis from left to right of worktable
- Y Axis from front to back of worktable
- Z Vertical axis above worktable
- **Tip Types** The Air LiHa is intended for disposable tips only. Different DiTi sizes are available. The maximum volume of the air chamber (1250 µl) matches the largest DiTi type (1000 µl).

#### **The Pipetting** Each pipetting channel of the Air LiHa is equipped with an individual plunger drive to vary System the volume of the air chamber in the Z-rod.



The figure shows two Z-rods in spread position to show how they are arranged.

The plunger drives are alternately mounted on the right or left side for odd an even-numbered channels.

This arrangement allows for moving the Z-rods completely together (to minimum spreading distance "x"), while the drives overlap each other.

- Encoder
- Motor
- Z-rod
- Tip adapter
- DiTi cone

Z-Brake Since each Z-rod of the Air LiHa has its own plunger drive, the Z-rod's weight may cause the channel to move down when the instrument is switched off. For that reason, the Air LiHa is equipped with a Z-brake that inhibits the Z-rod from moving down by its own weight.

> If the Z-rods are blocked in their uppermost Z-position by the Z-brake, the axes cannot initialize anymore. In that case, the Z-brake needs to be released so that the Z-rods can be moved down manually.

For moving the Z-rod manually, the Z-brake needs to be released.

### Function

The figure shows the main parts and the work principle of the Air LiHa systems air chamber and plunger drive.



Principle of the Air LiHa plunger drive

- A Encoder
- **B** Motor
- **C** Gears
- **D** Nut
- E Threaded spindle
- F Seal

- **G** Plunger
- H Pressure sensor
- I Tip adapter
- J Air chamber
- K Inline filter
- L Disposable tip

# **Plunger Drive** A motor drives a threaded spindle via a gear pair. To aspirate liquid, the spindle rotates and the thread moves the nut and the attached plunger upwards. The vacuum in the chamber sucks the liquid into the disposable tip.

During dispense, the spindle rotates in reverse direction, the plunger moves down and presses the liquid out of the tip.

Air Chamber In the lowest position, the plunger end is close to the disposable tip to keep the dead volume in the air chamber low.

The sealing between the plunger and the air chamber seals the chamber gas-tight against ambient air.

The controlled variation of the volume in the air chamber enables precise aspirate and dispense actions. A sophisticated electronic motor control moves the plunger accordingly.

Tip AdapterThe pressure sensor and electronics in the tip adapter are used for the Air LiHa MultiSense<br/>functions.

To prevent inner contamination by sample liquid, a replaceable inline filter is enclosed in the tip adapter. In case of an erroneous aspiration action, e.g. if a wrong disposable tip is mounted and, as a result, too much liquid is aspirated, the liquid reaches the filter. This effects a pressure change in the air chamber and the pressure sensor causes the plunger movement to stop.

If the inline filter got contact with sample liquid, it needs to be replaced.

DiTi EjectThe lower DiTi eject device allows to eject disposable tips at a low position. Together withDevicethe optional DiTi waste cover and the DiTi waste slide, it prevents from spilling sample liquid onto the worktable, minimizes spreading of aerosols and thus minimizes contamination risks.

### 5.3.2 Air LiHa MultiSense Functions

Purpose of the<br/>MultiSenseThe Air LiHa MultiSense functions are used for pipetting tasks with Air LiHa and disposable<br/>tips (DiTis). They include:FunctionsCompositive liquid level detection)

- cLLD (capacitive liquid level detection)
- pLLD (pressure based liquid level detection)
- PMP (pressure monitored pipetting)

CapacitiveThe cLLD function measures the capacitance between the tip and the carrier containingLiquid Levelthe labware with the sample. As soon as the tip touches the liquid surface, the change in<br/>capacitance triggers a detection signal. cLLD records the height of the tip at the time of the<br/>trigger signal. This only works with conductive liquids and conductive DiTis.

This function is not limited to the Air LiHa MultiSense functions. It is the same with the standard tip adapters.

Pressure- Based Liquid Level Detection	The pLLD function measures the pressure changes in the tip as the tip moves down. As soon as the tip touches the liquid surface, the pressure change triggers a detection signal. pLLD records the height of the tip at the time of the trigger signal.
	pLLD can be used as an alternative to the capacitive liquid level detection (cLLD), e.g. for detecting non-conductive liquids, or it can be used in combination with cLLD for conduc-tive liquids.
Pressure-Mon- itored Pipet- ting	The PMP function monitors the pressure changes in the air gap between the sample and the system liquid during aspiration and dispense. PMP is able to detect errors, such as clots and air aspiration, by comparing recorded and modeled (real-time simulated) pres-

### 5.3.3 Robotic Manipulator Arm Standard (RoMa Standard)

sure signals.

The robotic manipulator arm is used to transport microplates, reagent blocks, deep well plates, etc. to different positions on the worktable or for storage in the microplate shelf.

The RoMa standard coordinate system consists of five axes; the X-axis, the Y-axis and the Z-axis defining linear movements and the R-Axis defining rotational movements. The grippers can move in horizontal direction (G-axis).



Robotic manipulator arm RoMa

- **G** Axis for gripper movements
- **R** Rotational axis
- **X** Axis from left to right of worktable
- Y Axis from front to back of worktable
- Z Vertical axis above worktable

### 5.3.4 Safety Elements

Front Safety Panel	The front safety panel is secured in closed position with the door locks. Two gas springs fa- cilitate the opening of the panel.		
Functions of	The standard front safety panel has the following function:		
Safety Panel	<ul> <li>Restrict access to moving parts (moving parts, mechanical hazards)</li> </ul>		
	Protection from spilling sample or reagent		
Functions of Safety Panel	Front Safety Panel With Adjustable Access Window (Option) The front safety panel with adjustable access window has the following functions:		
	<ul> <li>Prevent direct access to moving parts (moving parts, mechanical hazards)</li> </ul>		
	Protection from spilling sample or reagent		
How do the	Door Locks		
Door Locks Work?	The door locks actively lock the front safety panel during operation of the PyroTec $^{\mathrm{TM}}$ PRO.		
	This is achieved with a software command from the application software.		
Application	The application software is programmed in such a way that		
Software	<ul> <li>If the safety panel is open, the process cannot be started.</li> </ul>		
	• The door locks can only be unlocked when the process is stopped or in pause mode.		

The figure shows the door locks in connection with the standard and closed safety panel:





Door locks

The door locks consist of a locking device (A) with an electromagnetic actuator on each side of the worktable and a catch (B), which is mounted to the safety panel. A switch in the locking device monitors if the safety panel is open or closed.

### 5.4 Reader

Variables

The following microplate reader type is supported and always mounted on the instrument worktable:

• Tecan<sup>®</sup> Sunrise<sup>™</sup>

The microplate is loaded and unloaded by means of a RoMa arm. For more information about the microplate reader, refer to the reader's documentation.

#### 5.4.1 Capacitive Liquid Level Detection

How Does itThe integrated capacitive liquid level detection (cLLD) measures the capacitance betweenWork?the tip and the instrument worktable; i.e. the corresponding carrier. As soon as the tip<br/>touches the liquid surface, the change in capacitance serves to trigger a detection signal.<br/>The conductivity of the liquid and the labware type have influence on the detectability.



- 1) The tip moves downwards to detect liquid.
- 2) The tip is at detection level.
- 3) The tip has contact to the liquid surface after detection.
- Tip
- B Liquid level
- **C** Sample
- **D** Tube

The liquid level detection evaluates both the liquid detection signal (when the tip moves into the sample liquid) and the exit signal (when the tip retracts).

Α

Each channel has an individual liquid detection.

**Influencing** The application software offers the following adjustments of influencing variables:

• The sensitivity of the liquid level detection can be adjusted.

- In order to improve the detection, "Double Detection" is used; i.e. the detection is performed once, then the tip retracts by a short distance and a second detection is performed. The results are only considered valid if the measured detection levels are within a specified limit. This is useful, e.g. if there are bubbles on the liquid surface.
  - The first detection run detects the surface of the bubble.
  - o The bubble bursts at the latest when the tip retracts.
  - o A second detection run will measure a different detection level.
  - o The first value is rejected and the detection is repeated

**Advantages** Advantages due to the liquid detection feature:

- Minimum submerge depth of the tip
- Reduced tip contamination and accordingly less washing effort for tip

- Appropriate message if no liquid or not enough liquid available for sampling
- Software controlled, constant submerge depth during aspiration and dispensing
- Enabling clot detection

### 5.4.2 Clot Detection

How Does it Work? The clot detection is based on the liquid level detection. The application software monitors the exit signal while the tip is retracted after aspiration of a liquid and compares the level at which the exit signal appears with the liquid level detection value.

In the following the function of the clot detection and its limits are scrutinized.



Sample aspiration

- 1) The tip detects the liquid level.
- 2) The tip moves down into the liquid to the specified submerge depth (S).
- The tip aspirates a sample while continuously maintaining the submerge depth (called "tracking").

The application software calculates the theoretical level of the liquid surface after aspiration.

- A Tip
- B Liquid level
- **C** Sample
- **D** Tube
- E Original liquid level
- **F** Liquid level after aspiration
- **S** Submerge depth

### If There Are No Clots



No clot detected

#### After aspiration:

1) The tip retracts from the sample.

Normally, i.e. if there is no clot, the exit signal is detected shortly after passing the level of the calculated liquid surface.

This delay is caused by adhesion forces that make the liquid stick to the tip.

- The clot detection checks if the exit signal is within a predefined limit (L).
- 3) The tip is still within the limit after detection of the exit signal.

No error message will be generated.

If There Is aThe clot detection generates an error message during retraction of the tip in two situa-Clot Detectedtions. In both situations, a clot sticking to the tip or clogging the tip is the most possible<br/>cause for the non-appearance of the exit signal within the limit.

# Clot Sticking to Situation 1: the Tip

A clot sticking to the tip may be the cause for the delayed exit signal.



- 1) The tip is beyond the limit (L) and there is still no exit signal.
- When the exit signal appears, the tip is out of the limit.
   An error message will be generated.

Clot Detected

Expected Volume not Aspirated

### Situation 2:

Alternatively, a clogged tip or other problems may be the cause for the fact that no or too little liquid is aspirated.



No liquid aspirated

 There is an attempt to aspirate liquid, but the liquid level remains the same (e.g. because the tip is clogged).

The liquid surface is expected to be at level (A) after aspiration.

2) The tip retracts and there is no exit signal within the limit (L).

An error message will be generated.

A Theoretical liquid level after aspiration

This error situation is only given when larger volumes in relation to the geometry of the vessel are to be aspirated. At very low volumes the expected difference of the liquid surface level before and after aspiration is not sufficient for the detection.

#### Limits of the The following critical situation may occur if the sample has not been centrifuged properly. **Clot Detection**



Sample not completely aspirated A - Theoretical liquid level after

aspiration.

- 1) There are floating particles in the sample. The tip aspirates liquid.
- 2) During aspiration (in the worst case shortly before the end of the aspiration process), a particle clogs the tip (see arrow).

The liquid surface is expected to be at level (A) after aspiration.

3) The tip retracts and the exit signal appears within the limit (L).

No error message will be generated though the tip is clogged.

Though a certain amount of liquid has been aspirated, the expected difference of the liquid surface level before and after aspiration is too small for proper functioning of the clot detection.



Racks?

### IMPORTANT

For that reason it is very important that the samples are properly centrifuged and handled carefully to avoid floating particles.

### 5.4.3 Lower DiTi Eject Option

The lower DiTi eject option enables disposable tip ejection at a lower position. With the optional cover DiTi waste and the DiTi waste slide, it reduces risk of projection from elevated positions and thus minimizes contamination risks.

The rocker spreads over the corresponding number of tips.

### 5.4.4 Carriers and Racks

What Are Carriers are supports that hold racks - which contain tubes or other containers and are **Carriers and** placed at precisely definable positions on the worktable.



Example of typical carrier/rack/container assembly

- Carrier (can slide on worktable) С Container (here: Tube) Α
- Rack (here: Tube rack) R

Carrier	PyroTec <sup>™</sup> PRO utilizes a fixed deck layout. The carriers should be used in the same position
Positioning	where they are left during installation.

BarcodeBarcodes on the carriers and on most of the individual containers can be identified.Identification

### 6 Installation

Purpose of	This chapter describes:	
This Chapter	• How to prepare the site for installation of the PyroTec <sup>™</sup> PRO instrument	

### 6.1 Site and System Preparation

Site Requirements	•	Verify the installation site against the general site requirements Describe any modifications needed.
Date of Delivery		Determine the date of delivery.

### 6.1.1 Site Requirements

**Delivery Route** Take the following points into consideration with regard to transport of the instrument within a site:

Loading platform	Is there a loading platform or similar de-	
	vice?	
	Is it suitable for unloading the instrument	
	from a truck?	
Load capacity of elevator	At least 400 kg / 882 lbs.	
Minimum size of elevator	According to instrument size	
Doors and entryway openings	Widerthan 940 mm / 37 in.	
Passageway corners	Are the passage ways wide enough to	
	transport the instrument around corners?	

### Space

Check the size of the room where the instrument will be installed:

Is there enough space for all of the components

- Enough space to place instrument, cabinet, and extensions?
- Enough space to open doors of instrument and cabinet?
- Enough walking space around the instrument?
- Space for placing system liquid/waste containers?
- Space for the control computer?

Minimum space between instrument and wall:

• 10 cm/ 4 in.

**Note**: though the instrument works perfectly at this minimum distance to the wall, be aware of the fact that it is an advantage if the rear of the instrument is accessible, e.g. for maintenance and service work.

#### Weights

Load capacities

Check the minimal load capacities of:

Floor	365 kg / 804.7 lbs.
Table or cabinet	300 kg / 661.4 lbs.

Which components take wall outlets

#### Supply

Check the availability of wall outlets

- Instrument
- Computer
- Readers



### Workbench

#### ATTENTION

PyroTec<sup>™</sup> PRO placed on a weak and unstable workbench can lead to LLD and pipetting failures caused by vibrations of the instrument or other devices on the workbench.

- Place the instrument on a rigid vibration-free workbench that is able to carry the weight of the instrument.
- Make sure that the surface of the workbench does not get out of shape due to the load. All feet of the instrument must rest firmly on the surface for levelling the instrument properly.

#### **Environmental Conditions**

Make sure that the environmental conditions, such as humidity, operating temperature, etc. are fulfilled.

If the instrument is equipped with a LoadingID, make sure that the intensity of external light does not exceed 8000 lux.

#### ATTENTION

Barcodes cannot be read in the presence of sunlight or other strong light sources.

- Do not install the instrument where it is exposed to direct sunlight.
- Strong light sources may impair the function of the barcode scanner.

### 6.2 Unpacking

**Check before** Note: Unless otherwise specified a contracted field specialist will perform this procedure. unpacking

Check the following, before unpacking the instrument:

- Is the packaging damaged in any way? •
- Is the instrument damaged in any way?
- Is the delivered material complete according to the "Order Configuration/Packing List" for the instrument?

#### Unpacking and If the cabinet needs to be screwed down to the floor (if a centrifuge is used, this is al-Positioning ways the case): Use the drilling template and set the required screw anchors.

- If applicable: Place the cabinet in its proper position. •
- If applicable: Screw the cabinet down to the floor. •
- Unpack the instrument (Leave the transport locks and moorings in place). •
- Place the instrument onto the workbench or cabinet using the special transport han-• dles.



Remove the side pillars (A)

Level the instrument as required.

Packaging The instrument packaging has been designed to prevent damage to instrument and parts materials during normal transport conditions. Keep the packaging materials for future use.

### 6.3 Installing and Connecting

Note: Unless otherwise specified a contracted field specialist will perform this procedure.

### 6.3.1 PyroTec<sup>™</sup> PRO Instrument

#### Checks

MovementTo check the mechanics, manually move the axes of all modules and options slowly toChecktheir end positions. All axes must move smoothly without any jerking.

Note: The LiHa and RoMa arms are equipped with Z-brakes. Therefore, these axes cannot be checked when the instrument is off.

Check the screw terminals of the power supply as follows:

• Open the left access door.



• Tighten the four screw terminals on the Option DCU.

### 6.4 Checking the CAN Bus Resistance

CAN Bus Strings To control the different modules and options of the PyroTec™ PRO there are CAN bus strings on two different levels:

- High CAN (or Option CAN [communication with modules and optional])
- Low CAN (or Local CAN [communication within modules and options, e.g. liquid handling system, Front Loading ID, etc.])

CAN BusThe CAN bus termination must be adapted to the individual configuration of the instru-<br/>ment. For this reason, most PCBs have either jumpers or switches to connect the termina-<br/>tion resistors, where appropriate.

In every case two participants of a CAN bus string must be terminated.

The example below shows how the implementation of an additional module (e.g. Module 3) may affect the CAN bus termination. Which modules exactly must be terminated depends on the position of the module.



To check the termination, use the special cable to measure the resistance of the CAN bus string.



Measuring cable (A) with RJ45 connector (B) to PCB and plugs (C) to connect a multimeter Adapter cable (D) with distributor (Tpiece, E), used if all RJ45 connectors on the PDB are occupied.

In this case, unplug one option. Connect the adapter cable between the PCB and the measuring cable and connect the option to the T-piece.

#### **Check the Settings**

Check the jumper or switch settings for the CAN bus termination as follows:

How to Check the Termination

Open the left access door.

**Note**: Make sure that the instrument is switched off while measuring the CAN bus resistance.

•



- Connect the multimeter to the RJ45 connector of the corresponding PCB (in most cases the Optibo DCU).
- Measure the CAN bus resistance.
- A Low CAN (or Local CAN) B – High CAN (or Option CAN)

 Set the jumpers or switches on the corresponding PCB according to the following table:

CAN Bus	Checkpoints	Resistance	Means
Option CAN	RJ45 on Optibo DCU	.50-65 w	Correct number of jumpers
	SMIO/SAFY	~ 40 w	1 jumper redundant
	board	~ 120 w	1 jumper missing
Local CAN	RJ45 on Optibo DCU	50-65 W	Correct number of jumpers
	corresponding test	~ 40 W	1 jumper redundant
	points on PCBs	~ 120 W	1 jumper missing

### 6.5 Installing Options

How to installFor information on how to install the option, refer to the Service Manual of the respectivethe Optionoption.

### 6.5.1 Modifications on Safety Panels

ModificationsSome options for the PyroTec™ PRO require modifications on the safety panels. Theseon the Safetymodifications must be performed by an authorized Lonza FSE (field service engineer) whenPanelsthe option is installed.



### WARNING

If the options require modifications on the PyroTec<sup>™</sup> PRO are installed improperly, the safety concept may be impaired.

Always make sure that the options are installed in compliance with the instructions given by the manufacturer.

### 6.5.2 Mains Outlets for Options

The instrument is equipped with switched mains outlets, which are located behind the cover panel as shown below. The outlets are intended for options with low power consumption, such as readers. These are only powered when the instrument is powered on. The max current of all outlets together must not exceed 2 amps.



#### ATTENTION

The mains outlets are internally fused with 2 A fuses. Do not connect options with high power consumption.

To make the mains outlets accessible for connecting options, proceed as follows.

Connecting Options to Mains Outlet





- Remove the four screws (A)
- Remove the right cover (B)





- Connect the options to the mains outlets (A)
   Note: The space behind the cover is restricted. Therefore, angle type mains plugs must be used; otherwise, cover cannot be installed.
- Open the right access door (A)
- Guide the mains cables to the right (see dashed lines in the figure)
- Route the cables behind the carrier plate (B) down to the options
- Remount the cover
- Close covers and doors

### 6.5.3 Reader

Reader Types The following readers can be used with the PyroTec<sup>™</sup> PRO system:
 Tecan<sup>®</sup> Sunrise<sup>™</sup>

InstallationThe installation procedure depends on whether the Sunrise™ reader is delivered togetherDetailswith a new Lonza PyroTec™ PRO instrument or whether it is added later. If it is added<br/>later, the instrument must be upgraded before the Sunrise™ reader can be installed.

### 6.6 Site Acceptance

**Completion** A Lonza approved FAS (field application specialist) should complete all IQOQPQ forms and documentation

The Customer should sign all IQOQPQ documents as acceptance of the installation completion

### 7 Transport, Storage and Packaging

Purpose of<br/>this chapter instructs how to shut down the PyroTec<sup>™</sup> PRO and how to pack it for storage<br/>or transport.

Note: Unless otherwise specified this procedure will be performed by a contracted field specialist."

### 7.1 Transport

#### WARNING

Lifting or moving the instrument can cause serious injuries.

- Injuries to the back due to overload can occur
- Injuries can be caused due to a falling instrument
- Always use the lifting handles when lifting the instrument
- Four trained relocation staff are needed to lift the instrument
- Depending on the type, the instrument weights up to 300 kg, check the weight before lifting
- The center of gravity is located near the rear of the instrument. Be aware of the fact that the load at the rear is heavier than the load at the front
- Do not lift the instrument at any other part than the lifting handles



### WARNING

Lifting or moving the instrument can cause damage due to unsecured parts

- Always prepare the instrument for transport, before lifting or moving it
- Always use the lifting handle when lifting the instrument
- Do not lift the instrument at any other part than the lifting handles



#### WARNING

- Damage of the instrument feet by shifting the instrument
- Always lift the instrument into position

### How to Lift Lifting the Instrument

To lift the instrument, the transport handles must be applied to the base structure of the instrument. Consider the safety instructions above.





To apply the transport device, proceed as follows:

- Attach all four transport handles
- Shift bars through the handles
- Secure the bars with the pins

### 7.2 Storage

the

Instrument

Protect the instrument against dust and debris with a cover. For long-term storage, pack the instrument in its original packing.

### 7.3 Packaging

Packaging

Packing the PyroTec<sup>™</sup> PRO

**dimensions** The figure shows the packaging of the PyroTec<sup>™</sup> PRO:



Instrument	Length	Width	Height	Gross Weight
PyroTec <sup>™</sup> PRO	156 cm	92 cm	121 cm	Approx. 250kg
	Approx. 61.4 in	Approx. 36.2 in	Approx. 49 in	Approx. 551 lbs.

The packaging consists of

- A wooden pallet with specially shaped foam parts
- The cardboard box for accessories
- A packaging strap, edge protection, buckle and brackets to fix the cardboard box to the X-bay
- The outside wooden box with a lid, packaging straps
- Transport lock devices
- Cardboard strips to block the axes
- Cardboard strips to protect the worktable
- Foam blocks as shown in the figure:



A – Foam block for RoMa arm (example shows block for RoMa long)
B – Foam block for LiHa arm
C – Foam block for PnP arm
D – Foam block for MCA

E – Foam block with adhesive tape to be placed instead of arm

- F Diluter support block
- G Foam block for Front Loading Id
- ${\rm H-Support\,below\,Front\,Loading\,Id}$
- I Box corner protection

How to PackTo pack the PyroTec™ PRO, proceed as follows:the PyroTec™• Put the PyroTec™ PRO on the pallet as shown in the figure:PRO



### Transport Locks



- Mount the transport locks (B) on either side of the PyroTec<sup>™</sup> PRO.
  - Lower part: Fix the transport lock with the screw (C).
  - Upper part (A): Engage the nut for T-slots in the arm guide and tighten the screw of the transport lock.









- Protect the arms with the corresponding foam block.
- Move the RoMa, the PnP gripper head and the CGM rotator downwards in such a way that they fit into the recess of the appropriate foam block.

With the PnP arm and the CGM the Zbrake must be loosened to move the PnP head and the CGM rotator into their position.

 Arrange all arms with foam blocks as shown in the figure.
 Note: The arms must be placed on the left side.

- Insert the short cardboard strips (A) between the arms.
- Insert the cardboard strips (B) on the right and the left side of the arms to prevent them from moving in X-direction.

The long cardboard strip matches an instrument with a single arm. Cut it to the corresponding length for instruments with several arms.

 Place the diluter support block (A) below the diluters as shown in the figure.



Fixing the Accessory Box





• Place the two cardboard strips (A) onto the worktable to prevent it from being scratched by the accessory box.

- Prepare the packaging strap as follows:
  - Cut two pieces of packaging strap to a length of approx. 1m (40 in.).
  - Insert one side of the straps in the brackets as shown in the figure.
  - Engage the brackets (A) at the X-bay as shown in the figure.
     Place the bracket in the correct position, since the paint of the instruments surface may be scratched when the bracket slides along the X-bay.



• Place the accessory box (A) into the gap as shown in the figure.

Fasten the accessory box as follows:
 Attach the straps to the buckle
 (A) as shown in the figure.

- At the corner of the accessory box, apply edge protection (A) between the strap and the box as shown in the figure.
- o Tension the strap
- Cut the excess strap (B) Make sure that there is no gap between the cardboard box and the left foam block (arm support)



• Place the outer wooden box (B) on the pallet

- Put corner protection blocks (A) into place.
- Place the lid (A) on top of the packaging.



- Apply 3 packing straps.
- Stick the dispatch label to the front side of the packaging (see arrow).

**Unpacking** To unpack the PyroTec<sup>™</sup> PRO, follow the instructions for packing in reverse order. **Note:** Lonza recommends keeping the original packaging for future transport or storage of the PyroTec<sup>™</sup> PRO.

The packaging has been carefully designed to prevent damage to the instrument or its parts.

### 8 Operation

Purpose ofThis chapter explains the operating elements and possible operating modes. It gives in-<br/>structions on how to operate the PyroTec<sup>™</sup> PRO properly and safely.

### 8.1 Operating and Display Elements

### 8.1.1 Operating Elements

Apart from the power ON/OFF switch and the pause button there are no specific operating elements on the PyroTec<sup>™</sup> PRO instrument.

The power ON/OFF switch is located at the instrument's lower right corner. A status light in the switch indicates if the instrument is switched on.



Power ON/OFF switch and pause button

- A Pause/resume buttonB Power ON/OFF switch
- C Front access panel, closed

Note: The control for switching on or off is delayed to accept only definite commands.

- For switching on: Keep the power ON/OFF switch pressed for at least 0.5 seconds.
- For switching off: Keep the power ON/OFF switch pressed for at least 2 seconds.

Pause/ResumeThe pause/resume button allows the user to pause and later resume a test run for accessButtonon request.Note: During operationkeen the front access panel closed to have access to the switches

Note: During operation, keep the front access panel closed to have access to the switches.



### ATTENTION

Unintended pausing or switching off the instrument.

To avoid unintended actuation, pay attention to the following:

When opening or closing the front access panel, make sure that the **pause** button and

the power **ON/OFF** switch are not pressed unintentionally.

- Before pressing the **pause** button or the power **ON/OFF** switch, make sure that you will press the intended button.
- Before pressing the **pause** button in order to pause a process, make sure that the instrument is running.
- Before pressing the **pause** button in order to resume a process, make sure that the instrument is pausing and that the safety panel is closed.



#### WARNING

Injuries caused by moving parts

A not completely opened front safety panel might close automatically.

• Open the front safety panel completely (more than 180°).

Internal Communication Communication within the PyroTec<sup>™</sup> PRO and the communication between the instrument and its modules is achieved by means of cable connections between the respective control electronics.

**User Interface** Display functions and controls are available in the software packages and user interfaces on the PC. Depending on your application, refer to the relevant separate documentation.

### 8.1.2 Display Elements

Status LampThe status lamp displays the instrument status and is combined with an acoustic alarm<br/>(sound). It is installed in the top cover of the instrument.<br/>The sound level (loudness) and mode (continuous or intermittent) can be selected during<br/>installation.



Status lamp The status lamp can indicate the following states:

Instrument status lamp signals			
Status lamp color:	Instrument status:		
Lampoff	The instrument is in idle mode or switched off		
Green continuous light	A process is running		
Green flashing	The process has been paused; or user prompt; or door locks open		
Red flashing, alarm sound is on	Process is in error state; software displays error message		
Red continuouslylit	Fatal error, system stops operation		

### 8.2 Operating Modes

PossibleBefore performing any work on or with PyroTec™ PRO, first read this User's Manual care-Operatingfully.Modes

The PyroTec<sup>™</sup> PRO can be run in three different operating modes:

- Routine operation mode (operator)
  - This is the normal operating mode, in which the application is run.
  - In this mode, the runtime controller of the corresponding application software controls the PyroTec<sup>™</sup> PRO.
- Process definition and service mode (application specialist, maintenance personnel)
  - Special tasks are performed in this operating mode, such as adjustments to establish the process.
    - Tests to ensure the operating readiness.
  - For these tasks, different software tools are used.
    - Refer to the "WinKQCL<sup>™</sup> Software Manual".
    - For service mode, refer to the "Instrument Software Manual".
- Setup and service mode (a Lonza approved FAS (field application specialist))
  - o Serves to set up the instrument, to make adjustments and to run tests.

### 8.3 Operating in Routine Operation Mode

### 8.3.1 Safety Instructions



### WARNING

Automatically moving parts.

Injuries (crushing, piercing) possible if the safety panels are not in place or if the standard front safety panel is installed. The standard front safety panel is partially open, allowing access to the worktable and continuous load

- Before starting the PyroTec<sup>™</sup> PRO, make sure that the safety panel is closed.
- Never operate the instrument with the safety panels open.
- Do not reach into the instrument (specifically through the aperture beneath the yellow line on the instrument front side).

### WARNING

Contamination risks through contamination of the worktable or frame. Hazardous liquids or samples can be spilled onto the worktable, due to the failure of the liquid system or a handling module, such as the RoMa.

- Visually inspect all hardware components, e.g. the worktable, the RoMa, etc., for possible spillage of hazardous liquids.
- Make sure that the containers are accurately positioned on the worktable.

### Safe Worktable Layout

### ATTENTION

Unsafe layout of the worktable can cause e.g.:

- Loss or dropping of DiTi
- Loss or dropping of microplates
- Spillage of hazardous liquids because of collisions or too high filling level (more than 80%) of cavities
- Spillage due to imprecise pipetting in 96-well microplates placed on the Te-Link
- Cross-contamination because critical elements are placed near the wash station or DiTi waste (splashes).

Before and during instrument use, check the worktable for the safety of its layout.



#### ATTENTION

To ensure a proper liquid flow, make sure that the tubing is not twisted or inhibited from free flow.



#### ATTENTION

Instruments are intended for indoor operation with controlled temperatures. DiTis may leak due to pipetting liquids with high vapor pressure. It is important to maintain constant temperature plus air gaps.

### ATTENTION

Possible malfunction due to tip clogging.

Using liquids with undissolved particles could lead to clogged tips and thus result in liquid not being dispensed.

Clogging can also result if the tips have not been thoroughly washed.

With Te-PS and Low volume tips, do not use liquids with undissolved particles.

### Air Displacement Pipetting Arm (Air LiHa)

#### ATTENTION

Pipetting errors due to insufficient maintenance.

Leakage or malfunction of the Air LiHa might remain undetected if the maintenance has not been performed properly.

Make sure to perform the necessary maintenance and tests according to the maintenance schedule.

### Applications

For all applications of the PyroTec<sup>™</sup> PRO the user must ensure that the requirements of each protocol are carefully observed. Attention must be given to:

- Sample/reagent volumes and concentrations
- Test plate layout
- Sequence of steps
- Temperature restrictions
- Time limits

The PyroTec<sup>™</sup> PRO should process controls, standards, or reference materials in the same manner as test samples. Prior to any first-time application, test runs should be made with the assay to allow optimization of all liquid handling parameters.

The PyroTec<sup>™</sup> PRO requires accurate positioning of all reagents, samples, racks, and plates on the instrument's worktable. The operator should verify these positions accordingly before executing any program.

In the event of power failure or an otherwise aborted run, all partially processed samples should be discarded. Do not attempt to restart an interrupted program unless the computer screen displays explicit instructions for resuming operation.

#### Chemical, Biological and Radioactive Hazards

#### WARNING

All samples and test kit components must be considered potentially hazardous agents.

- A potential risk can arise from the liquids being handled by the instrument, such as infectious biological samples, toxic or corrosive chemicals, or radioactive substances.
- Strictly apply appropriate safety precautions according to local, state, and federal regulations.
- Handling and disposing of waste must be in accordance with all local, state, and federal environmental, health, and safety laws and regulations.
- Use appropriate protective clothing, safety goggles and gloves.

### 8.3.2 Enclosed Work Area



#### WARNING

Unexpected, fast movements of arms and tips.

Interfering with the arm and tip movements can lead to serious injuries or equipment damaging.

Never operate the instrument while safety panels, covers or access doors are open or removed.

The software will prompt the operator when the worktable setup requires new racks or carriers. Any further interference in the work area is strictly prohibited.

The operator might need to open or remove the safety panels for instrument setup, cleaning, and maintenance purposes.

#### 8.3.3 Switching the Instrument On

Before switching the instrument on, checking the following:

#### WARNING

If the pipetting head is initialized with the tip block or DiTis mounted to it, the remaining liquid in the tips may be drawn into the head and thus contaminate the head (e.g. after a power failure or crash).

In this case, manually remove the tip block or the DiTis before switching on.



### WARNING

Automatically moving parts.

If the safety panels are not in place, injuries (crushing, piercing) are possible. Before starting the PyroTec<sup>™</sup> PRO, make sure that the safety panel is closed.

Never operate the instrument with the panel open.

To switch the PyroTec<sup>™</sup> PRO on, proceed as follows:

- Press the power ON/OFF switch for the 0.5 seconds to switch the instrument on.
- Wait until the status light in the power ON/OFF switch is lit



## Lit power ON/OFF switch ATTENTION

Before starting an application, thoroughly flush the whole liquid system. Make sure that daily maintenance procedures have been performed. Make sure that there are no air bubbles in the tubing and no liquid droplets on DiTi adapters or tips.

• Start up the runtime controller of the application software.

The instrument is now ready to receive commands from one of the available application software packages.

• Perform the necessary checks before starting a run.

### 8.3.3.1 After a Power Failure

**Objects Held**If you want to resume operation after a power failure, it is important that objects still held**by RoMa**by the grippers of the RoMa be removed manually before switching the instrument on.

Otherwise, the objects will be dropped during instrument initialization, which may lead to a crash or spillage.



### ATTENTION

In the event of power failure or an otherwise aborted run, all partially processed samples should be discarded. Do not attempt to restart an interrupted program unless the computer screen displays explicit instructions for resuming operation.

### 8.3.4 Instrument Preparation and Checks

GeneralThis section contains instructions for routine use. It is intended as a guide to build yourInformationSOP (Standard Operating Procedure).

Any modifications of the implemented tests in your Application Software must be carried out by application specialists or expert operators.

Before starting a run, pay attention to the following:



### ATTENTION

In the event of power failure or an otherwise aborted run, all partially processed samples should be discarded. Do not attempt to restart an interrupted program unless the computer screen displays explicit instructions for resuming operation.

### **Consumables** • Check the disposable tip rack and add tips if necessary.

- Make sure that all carriers and labware are properly positioned in accordance with the Lonza PyroTec<sup>™</sup> PRO deck layout.
- Ensure that the daily maintenance has been carried out according to the maintenance chapter.
- Make sure that the splash protection of the DiTi waste unit is mounted.



### ATTENTION

Unsatisfactory pipetting result

### ATTENTION

Risk of contamination by liquid splashing on the worktable during DiTi ejection. The cover for the DiTi waste slide must always be installed. This prevents liquid from splashing onto the worktable and thus minimizes contamination risks.



### WARNING

Check for tip clearance when using the 1000  $\mu I$  DiTis

Worktable

Regarding the worktable, pay attention to the following:



### ATTENTION

Improper positioning of objects on the worktable may lead to disturbances or errors in the process, e.g. misinterpretation of barcodes. Do not use free space on the worktable to deposit any objects



### ATTENTION

Improper initialization of robotic arms.

The robotic arms cannot initialize property if there is an object, such as a lost sample tube or a tool, etc., between the arm and the initial stop position.

- Make sure that there are no unwanted objects present in the instrument.
- Check the arm position after the initialization command.

**RoMa Gripper** If the instrument is to be started up anew after a power failure, it is important that any objects still held by the grippers of the RoMa Gripper be removed before the start. Otherwise they will be dropped during the startup.

### WARNING

Contamination risks through contamination of the worktable or frame. Hazardous system liquids or samples can be spilled onto the worktable, if tubes or microplates held by the grippers of RoMa are dropped after a restart.

• Visually inspect the arm devices whether they still hold any objects between their grippers.

Remove such objects before starting up the instrument.

### 8.3.4.1 Carriers

Carrier Positioning	Slide carriers over the positioning pins until they abut on the lock pins.
	Make sure that the barcode on the carrier corresponds to the settings in the Application Software.
Carrier Fixation and Replacement	The positioning pins hold the carriers in defined positions, but still allow carriers to be ex- changed during an application. A rail in the carrier base fixes the carrier in X-direction; the stop pins in the third row on the worktable fix the carrier in Y-direction. When prompted to do so by the software, the operator can replace a carrier during an application.
	Make sure that the stop pins limit the carrier movement correctly, otherwise crashes or incorrect pipetting may occur.
Positioning Pins	If a positioning pin is damaged, replace it immediately.
	Place the carriers only on the provided positions as the instrument is adjusted to these po- sitions. Carriers placed e.g. on the left of positioning pin 1 can cause mechanical problems (collision) of errors in the identification of barcoded samples.
Placing Carriers	All carriers must be in close contact with the worktable, so that the capacitive liquid level detection is guaranteed. For this purpose, clean the carriers and the worktable in regular intervals.

Make sure that the correct rack is used for the carrier.

If a carrier is damaged, replace it immediately.

**Carrier ID** Each carrier ID must be unique.

### WARNING

Wrong identification of a carrier

If carriers are not placed correctly on the worktable and if there are unfavorable circumstances (barcode labels not within specified limit, distance incorrectly placed carrier to the barcode reader still enables reading), the barcode reader might read the wrong carrier.

- When loading carriers, always slide them all the way to the stop at the lock pin.
- When carriers need to be removed, always remove them completely from the worktable.

### 8.3.4.2 Racks and Containers



### WARNING

If a rack is damaged, replace it immediately. Make sure that the correct barcode is used for the rack.



### ATTENTION

### Microplates

Microplates must be positioned correctly on the carrier, seating well in their holder. Make sure that the microplate does not rest on the holder rim in a slanting position.



### ATTENTION

### **Racks for Disposable Tips**

Before positioning the new racks in the DiTi Carrier on the worktable, carefully check the DiTis for transport or storage damage (refer to the instructions enclosed in the outer package):

- The DiTis must not be damaged
- The DiTis must not be bent

Ensure that the DiTis to be loaded onto the carriers correspond to the ones indicated in the application software (size, with filter/without filter).



### ATTENTION

Crash or erroneous pipetting results when the wrong tips are loaded on the worktable.

If tips are longer than expected:

Crash of the tips with the labware.
Wrong pipetting results because the tips are pressed against the bottom of the container, which constricts the liquid flow through the tip orifice.

If tips are shorter than expected:

Aspiration of air instead of liquid, which may result in erroneous results.

• Make sure that the tip lengths of the DiTis present on the worktable correspond with the ones defined in the application software.



#### ATTENTION

DiTi crash/erroneous pipetting results due to incorrect DiTi types.

- The PyroTec<sup>™</sup> PRO is designed to use 1mL conductive filter DiTis (Lonza P/N 00229884).
- Do not confuse the different DiTi types.
- Pay attention to the labels on the DiTi boxes/packaging.

#### ATTENTION

DiTis are not dropped properly

- The environmental conditions have a major effect on the electrostatic charge. Increased relative humidity usually results in less charge (surroundings of the instrument, DiTi storage conditions).
- Alternatively, the DiTis can be treated with an ionizer that neutralizes the electrostatic charge. In many cases this solution provides the desired effect. However, the ionizer has not proved to be effective in critical cases.
- Disposable tips must not be reused as this bears the risk of problems during the "drop DiTi" procedure. Reusing DiTis results in increased electrostatic charge.

#### Containers (Troughs, Vials, Tubes, etc.)



#### ATTENTION

Risk of mixing up containers during loading. When loading sample tubes and reagent vials pay attention to the following:

- Strictly follow the loading instructions provided by the software.
- Double-check all containers for correct placement on the carrier.

## If the system configuration has LoadingID capabilities the sample tubes can be identified by the bar code scanner automatically

#### **Use of Tubes**

For sample and reagent tubes, use the following carrier (strip rack)

Strip rack	Tube diameter, outside
Standard	13 mm

In each rack, use tubes of one size only. Tube height and diameter must be identical for all tubes.



#### ATTENTION

Ensure all tubes are positioned correctly in the carrier touching the rack bottom; otherwise liquid level and clot detection functions might not work properly.

Minimum inner diameter for primary sample tubes		
Tip type Tube diameter, inside		
<b>DiTi 1000</b> μl	8 mm	

#### 8.3.4.3 Preparation of Samples

#### ATTENTION

Visually inspect the samples before pipetting They must be free of:

- Clots
- Form
- Droplets on the tube wall



• The sample tubes must not contain any additional (non-conductive) inserts or have covers.

**Note**: For further information on sample preparation, please refer also to the recommendations given by your manufacturer and by the WHO.

#### 8.3.5 Runtime Controller



#### ATTENTION

The runtime controller of the application software controls The PyroTec<sup>™</sup> PRO. With the runtime controller, the following tasks are performed during installation and maintenance where appropriate. Runtime controller should only be accessed by Lonza approved engineers:

- Login for lab operator, application specialist or administrator:
  - The software only allows authorized users with a valid login to perform any action on the instrument.
- Starting a process run.
- Performing maintenance.
- User management:
  - Allows the administrator to set up users with the corresponding access rights.

Refer to the WinKQCL<sup>™</sup> Software User Guide and the PyroTec<sup>™</sup> PRO Software User Guide.

#### 8.3.6 Checks and Terminating Tasks

Performing Checks and Tasks	•	Check if the run has been terminated without any error (check for error messages).
	•	Empty and clean the reagent troughs.

Empty and clean the waste container and rinse it with ethanol.

#### WARNING

Contamination of the pipetting head.

If the pipetting head is initialized with the fixed tip block or DiTis mounted to it, the remaining liquid in the tips may be drawn into the head and thus contaminate the head.

• Always drop the DiTis before initializing the pipetting head, i.e. before switching the instrument off (each time the instrument is switched on, the head will be initialized again).

#### 8.3.7 Switching the Instrument Off

Before switching the instrument off, some maintenance tasks might need to be performed, e.g. tip cleaning.

Except in an emergency, switch the instrument off only after an application is completed. To switch the instrument off:

Press the power ON/OFF switch and keep it pressed for at least 2 seconds.



#### ATTENTION

Wait until the status light in the power switch is off (for approximately 10 seconds) before switching the instrument on again.

#### 8.3.8 When a Crash Occurred

When a crash occurred, consult chapter 8 "Troubleshooting", for possible corrective measures. Check the log files generated by the application software.



#### ATTENTION

After a harsh crash some components of the instrument may be out of alignment or even defective.

If a harsh crash occurred, contact your local service organization to have the instrument checked.

**RoMa Crash** After a crash with the RoMa, check the gripper and the RoMa alignment. Refer to 10.2.2 "RoMa / Gripper Alignment".

## 8.4 Operating in Process Definition Mode

#### 8.4.1 Process Validation

The device must be validated by qualified technical personnel (e.g. Lonza approved engineer or technician) before putting into service and after changes. Use of kits or kit components on PyroTec<sup>™</sup> PRO is only allowed after validation by Lonza, the kit manufacturer or operator of the system.

For all applications of PyroTec<sup>™</sup> PRO, the user must ensure that the requirements of each protocol are carefully observed.

A systematic approach of risk analysis, validation of critical parameters and system validation should be followed to ensure that the system or combination with kit provides reliable and reproducible performance.

Make sure that the validation process is executed according to national laws and standards.



#### ATTENTION

Crash or erroneous process results The PyroTec<sup>™</sup> PRO requires accurate positioning of all reagents, samples, racks, and plates on the worktable.

• Verify these positions accordingly before executing any program.

#### 8.4.2 Liquid Handling

#### 8.4.2.1 General Instructions

**System Liquid** Make sure that the requirements for the system liquid are met.

#### **Use of Test Tubes**

In the application software, the following rack parameters for test tubes are predefined:

Striprack	Test tube diameter, outside
Standard rack	13 mm

**Note**: In the case of deviating parameters, these values must be adjusted in the application software.

When using test tubes, pay attention to the following:

- In each rack, use test tubes of one size only. Tube height and diameter must be identical for all test tubes.
- Make sure that all test tubes are positioned correctly in the rack and touch the rack bottom.

#### Setting of Z-heights

#### Z-travel

A carrier's Z-travel is the Z-height above any obstacles that go with this carrier.

#### Z-dispense

Z-dispense is the Z-height from which liquid is dispensed from the air. It should be adjusted to a height from which no droplets can fall into adjacent cavities.

#### Z-start

Z-start is the Z-height at which liquid detection is activated. Z-start must be situated at least 1 mm below the cavity rim and above the liquid level. The microplate, for which Z-start is defined 1 mm above the cavity rim, is an exception to this rule.

#### Z-max

Z-max is the Z-height which lies as close as possible to the lowest cavity point without touching the cavity bottom.



**Note**: The use of deviating parameter values must be discussed with the responsible application specialist.

Cylindrical or cuboid-shaped cavities allow for optimal tracking. When using differently shaped cavities, their inner dimensions and their immersion depth must be optimized. The inner diameter of the cavities (or of test tubes) must be calibrated carefully and typed in the corresponding data fields.

#### **Fill Level of Cavities**

To ensure safe handling (e.g transport by means of RoMa, PnP, etc.) of the containers, make sure that the fill level of the cavities does not exceed the following limits:

- Fill the test tubes to a maximum of 80%.
- Fill microplates to a maximum of 80% of the cavity volume
- Fill reagent troughs at maximum to the specified volume (e.g. 100 ml trough: 100 ml equals approximately 90% of the total trough volume.

#### 8.4.2.2 Liquid Handling with LiHa

#### **Liquid Conductivity**

When configuring samples that will be tested on PyroTec<sup>™</sup> PRO, it may be necessary to adjust conductivity settings such that the system is able to correctly detect liquid levels. For more information surrounding the usage of different liquid classes, please contact Lonza's Scientific Support.

Liquid conductivity			
Conductivity	Liquid	Sensitivity	
Very good	Serum, DNA solution, buffer	medium	
Good	Tap water	high	
Bad	DMSO, ethanol, distilled water	very high	



#### ATTENTION

Full system functionality can only be guaranteed when Lonza certified disposable tips are used



#### ATTENTION

Contamination of the 3/2-way valve.

Make sure not to aspirate sample, or other liquid that may contaminate the valve, into the 3/2-way valve.

#### 8.4.2.3 LiHa Arm

High DensityVibrations, caused by the movement of other arms may result in positioning difficulties in<br/>high-density applications.

If you encounter such difficulties, please contact your local service organization. In such applications, where the mechanical precision is very critical, speed and acceleration of the arm movements may be adapted accordingly.

#### 8.4.3 Maintenance

Make sure that your instrument and devices are in a faultless state. Regular maintenance guarantees the high accuracy and precision you require and at the same time minimizes downtime of instrument and devices. For detailed descriptions of the maintenance tasks, refer to "Preventative Maintenance and Repairs" in this User Manual.

## 9 Preventive Maintenance and Repairs

Purpose of<br/>This chapterThis chapter gives instructions on all maintenance work to be performed in order to keep<br/>the PyroTec™ PRO in good working condition. In addition to this, adjustment, and repair<br/>jobs the operator can carry out by himself/herself are explained.

PrincipleOnly operate the PyroTec™ PRO when it is in good working condition. Strictly observe the<br/>maintenance instructions as set out in this manual. To achieve specified performance and<br/>reliability of the instrument, regularly carry out the maintenance and cleaning tasks.<br/>Contact the local service organization with any problems or inquires.

## 9.1 Tools and Consumables

#### 9.1.1 Cleaning Agents

#### WARNING

Working with cleaning agents may be hazardous.

• Always observe the safety measures given by the manufacturer.



#### WARNING

Fire hazard

- Do not use flammable liquids without supervision by the operator.
- Take measures to prevent electrostatic discharge.

#### ATTENTION

Strong detergents can dissolve carrier and worktable surface coatings.

• For cleaning the instrument, use alcohol or water as cleaning agents.

Commercially Available	Commercially available cleaning agents				
Cleaning Agents	Agent	Description	Manufacturer	Part No.	
	Contrad 70	Surface active cleaning agent	Decon Labs Inc., USA www.deconlabs.com	Please contact the manufacturer	
	Contrad 90 Contrad 2000	Surface active cleaning agent	Decon Laboratories Lim- ited, UK www.decon.co.uk	Please contact the manufacturer	
	Decon 90	Surface active cleaning agent	Decon Laboratories Lim- ited, UK www.decon.co.uk	Please contact the manufacturer	

	Bacillol Plus	Alcoholic, disinfection agent, free of formaldehyde, for sur- face cleaning		Bode Chemie, Hamburg www.bode-chemie.de	Please contact the manufacturer
	DNAzap	Cleaning agent for surfaces contaminated with nucleic ac- ids		Ambion www.ambion.com	Please contact the manufacturer
	Kohrsolin	Surfa	ce disinfectant	Bode www.bode-chemie.de	Please contact the manufacturer
	Peraclean	Disir	ifectant	Evonik Degussa www.evonik.com	Please contact the manufacturer
	SporGon	Disinfectant		Decon Laboratories www.deconlabs.com	Please contact the manufacturer
	Liqui-Nox	Weak detergent		Alconox www.alconox.com	Please contact the manufacturer
Cleaning Agent	Cleaning agents' specifications				
Specifications	Agent		Specification		
	Water		Distilled or deionized water		
	Alcohol		70% ethanol or 100% isopropanol (2-Propanol)		
	Decon / Contrad		Liquid concentrate, for dilution with water (normally2%, 5% in case of severe contamination)		
	Weak detergent		E.g. Liqui-Nox		
	Disinfectant		E.g. Bacillol plus, Peraclean, SporGon		
	Surface disinfectant		All disinfectants except: Lysetol FF, Peraclean, SporGon		
	Base		E.g. 0.025 - 0.25 mol/l NaOH		
	Bleach		0.5% to 3% sodium hypochlorite		

For concentrations and applications, see the description of the manufacturer.

Instrument Parts and	Clean	ing agent's application	
Cleaning Agents	Instrument part	Cleaning agent	
	DiTi waste slide	Water, alcohol, weak detergent, disinfectant, base, bleach	
	Worktable	Water, alcohol, weak detergent, disinfectant, base, bleach	
	Housing	Water, alcohol, surface disinfectant	
	Metal parts	Water, alcohol, disinfectant	
	Carriers	Water, alcohol, weak detergent, disinfectant	

	<b>Use</b> : Decon / Contrad for surface cleaning only <b>Do not use</b> : Decon / Contrad, Bleach, Peraclean, SporGon as clean- ing bath for carriers (damage to aluminum)
Racks	Water, alcohol, weak detergent, disinfectant
Gripper	Water, alcohol, weak detergent, disinfectant
Safety panels	Water, alcohol, disinfectant, suitable for acrylic glass
Disposable tip cones	Alcohol
Arm guide, arm guide roller of arms	Do not use any agent
Z-rod	Do not use any agent

**Note**: After use of weak detergents, base or bleach, thoroughly clean with water and wipe dry to totally remove the cleaning agent and obtain normal operating conditions.

#### Cleaning Cleaning

**Tissue** Use a lint-free tissue together with the appropriate cleaning agent.

#### 9.1.2 For Air LiHa Maintenance

ommended.

Material Needed for	To perform the maintenance on the Air LiHa, the following tools and consumables must be available:			
Maintenance	Special tools and consumables			
	<ul> <li>Inline Filter kit Air LiHa (incl. filter removal tool)</li> </ul>			
	o DiTi cone wrench			
	<ul> <li>Air LiHa tip adapter adjustment gauge (optional)</li> </ul>			
9.2 Mainter	nance Schedule			
	<b>Note</b> : To ensure a good working condition of the PyroTec instrument, a yearly (depending on configuration) maintenance carried out by an authorized field service engineer is rec-			

MaintenanceNote: In order to be able to track all maintenance performed on the PyroTec™ PRO overRecordthe whole lifetime, the periodic maintenance must be recorded as follows:

- Fill in the necessary data in the form "Daily/Weekly Maintenance Checklist".
- File the form in the "Maintenance and Service Logbook".

MaintenanceThe maintenance tables are divided according to the frequency the corresponding mainte-<br/>nance task must be periodically performed. For example, there are tables for:

- Daily maintenance
- Weekly maintenance
- Half-yearly maintenance

#### **Example and** Explanation

Example for a maintenance table, followed by explanations:

Example (e.g. daily maintenance)			
Instrument/ Component	Maintenance Task	Reference	
Part A	Clean thoroughly	Water with weak detergent	
Part B	Check adjustment of compo- nent C	Refer to section X.X.X, 2 Y-Z	

#### Instrument/Component

Specifies the instrument or one of its individual components on which a maintenance task must be performed.

#### Maintenance Task

States briefly what maintenance must be performed on the instrument/component mentioned before.

#### Reference

- Gives additional information, e.g. on means, tools, etc. that are necessary to perform • the maintenance task mentioned before.
- Contains references to the sections in this manual or to other documents where the • corresponding instructions can be found.

General Note: The daily and weekly maintenance schedule described here is a general guideline. Guideline The schedule and the cleaning agents may have to be adapted to your special laboratory conditions and depending on your application.

> Note: It is necessary to tighten the DiTi cone for Air LiHa (this is only necessary for the LiHa (with system liquid). The adapter hardware is quite fixed on the Air LiHa and there is no room to tighten it further. The seals and or the DiTi adapters are replaced in the preventative maintenance or if they become defective.

#### 9.2.1 Maintenance: Immediate Maintenance

If the instrument is leaking, switch it off immediately and eliminate the source of leakage. Referalso to section "Checking for Leaks".

At Beginning of Day	Instrument/Component	Maintenance Task
,	DiTi cones (LiHa)	Clean
		Check for deposits
		Tighten
		Adjustment check
	Air displacement pipetting arm (Air LiHa)	Clean and inspect DiTi cones
	RoMa	Visually check grippers for deformities and damage
During Day	Instrument/Component	Maintenance Task
	DiTi waste bag	Check and change when it is full
At End of Day	Instrument/Component	Maintenance Task
	Air displacement pipetting arm (Air LiHa)	Clean and inspect DiTi cones
	Carriers and racks	Clean using a detergent or antiseptic solution
	Worktable	Clean
	Safety panel	Clean
	DiTi waste bag	Change
	DiTi waste slide and waste station unit	Clean
	Lower DiTi eject option	Clean rocker
	RoMa standard	Clean gripper fingers using alcohol or acetone

## 9.2.2 Maintenance Table: Daily Maintenance

## 9.2.3 Maintenance Table: Weekly Maintenance

Daily Maintenance	Daily maintenance		
	Instrument/Component	Maintenance Task	Reference
	Air displacement pipetting arm (Air LiHa)	Perform the following tests: • Instrument Warm-up	See PyroTec™ PRO Software User Guide

Weekly Maintenance	Instrument/Component	Maintenance Task	Reference
	Liquid handling arm, Robotic manipulator arm,	Clean front arm guide	See section "Arm Guide"
	Air displacement pipetting arm (Air LiHa)	Perform the following tests:	See PyroTec™ PRO Software User Guide

The weekly maintenance should be performed on the last working day of each week.

### 9.2.4 Maintenance Table: Yearly Maintenance

Annual maintenance will be performed by a Lonza approved FAS (field application specialist) and be offered through a service contract. Reference material for the maintenance tasks can be available upon request.

Every Twelve Months	Instrument/Component	Maintenance Task
	Air displacementpipetting arm (Air LiHa)	Perform liquid handling performance verification test (Colorimetric QC Kit test or Gravimetric test)
	Complete PyroTec™ PRO	Clean system
	Frontal arm guide	Clean
	Worktable	Visually inspect worktable grids for wear and replace if necessary.
	LiHa	Visually inspect moving parts, especially Y-belt and lower DiTi eject option, for wear and replace faulty parts. Check parts for abrasion; wipe wear debris off, if necessary.
	LiHa; support tubing	Check condition of mesh (must not be broken). Check if support-tubing ends lock firmlyin their seats. Replace defective support tubing.
	DiTi cone and tubing ex- tension	Replace
	Air LiHa; DiTi cone tip adapter	Replace option DiTi cone Air LiHa
	RoMa	Visually inspect moving parts, especially Y-belt, for wear and replace faulty parts. Check parts for abrasion; wipe wear debris off, if necessary.
	RoMa; Z-rod	Clean
	Complete PyroTec <sup>™</sup> PRO	Perform tests according to form "Preventive Maintenance"

Depending on your system configuration there may be other parts not described in this chapter, which have to be exchanged during regular service maintenance procedures. Please contact your local service organization, for further information on maintenance tasks and schedule of your system.

#### 9.2.5 Maintenance Table: Two-Yearly Maintenance

While under a service contract, additional activities will occur at the two-year time interval. Reference material for the maintenance tasks can be available upon request.

Every Two Years

Instrument/Component	Maintenance Task
Air LiHa Tip Adapter	Replace Tip Adapter Air LiHa.
Air LiHa Cylinder Assembly	Replace Cylinder Assembly

## 9.3 MaintenanceTasks



#### WARNING

Automatically moving parts:

- Injuring (crushing, piercing) possible if the safety panels are not in place.
  - Always switch off the instrument for maintenance tasks or to clean the instrument surfaces, e.g. worktable, instrument panels etc.
  - Never clean the instrument while it is switched on.

## 9.3.1 Disposable Tip (DiTi) of Air LiHa



#### ATTENTION

Possible contamination of samples, or leaking of DiTis. Prior to loading disposable tip trays into the rack and onto worktable, make sure that the DiTis are faultless and clean.

- Ensure that only regular and straight Lonza disposable tips are being used.
- Inspect the DiTi box for traces of microbial contamination.

#### WARNING

Pipetting tips can cause injuries.

• Avoid contact with the pipetting tips and contact with aerosols when accessing the worktable, by wearing adequate protective clothing.



#### WARNING

Possible contamination. Tips can be contaminated.

- Assure appropriate safety measures (e.g. wear rubber gloves).
- Dispose of used DiTis properly and safely according to your local regulations.

#### 9.3.1.1 Disposable Tip Cone (DiTi cone) LiHa



#### WARNING

Possible contamination.

The space between the disposable tip cones and the tubing extension can become moistened with sample liquid and thus create a contamination risk.

- Decontaminate the entire equipment thoroughly before maintenance work.
- Decontaminate also the space between disposable tip cones and the tubing extension before manipulating the DiTi pickup mechanism.



inspection

#### ATTENTION

Possible malfunction due to deposits in or on the disposable tip cone.

If the DiTi cones are moistened with sample liquid containing certain substances, a hard coating can build up.

- Eventually the DiTis do not fit any more and pick up problems or leakages are the result.
- Deposits can clog the tubing extension after a period.
- Replace DiTi cones that cannot be cleaned.

**Cleaning and** Perform the following maintenance on the DiTi cone:

- Clean the DiTi cones with a lint free tissue and isopropanol.
- Visually check the disposable tip cones and the protruding tip during maintenance. Make sure that the tubing extensions are clean and free of deposits.
- If deposits are visible, remove DiTi cone and
  - o Disassemble and thoroughly clean the DiTi adapter.
  - 0



Check if the DiTi cones are not loose. If necessary, use the cone wrench to ighten the DiTi cones.

- A Tighten (counterclockwise)
- B Loosen (clockwise)

Cone wrench

Replacing DiTi Adapter	This section describes the replacement of the DiTi adapters.		
Preparation	To prepare for replacement, proceed as follows:		
	• Switch the instrument off.		
	Open the front safety panel.		
	• Manually move all Z-rods up to their topmost position.		
	• Move all Z-rods together towards the front of the instrument.		
	• Spread the Z-rods all the way.		
Removal	To remove the DiTi adapter, proceed as follows:		
	• Hold the tip ejector tube while unscrewing the DiTi cone, using the supplied cone wrench.		
	Remove the tip ejector tube.		

- Unscrew the adapter cylinder
- Pull the tubing extension and the pipetting tube approximately 25 mm (1 in) out of the tip adapter.
- Separate the tubing extension from the pipetting tubing.
- Remove the tubing extension together with the adapter cylinder.

#### Installation To install the DiTi pickup mechanism, proceed as follows:



DiTi pick up mechanism installation

Α Z-rod

D

Ε

- B Tip adapter
- С Thread

Pipetting tubing

Adapter cylinder

- F Tubing extension
- G O-ring
- Н Separator ring (white)
- 1 DiTi cone
- Tip ejector tube (outer rim pointing .1 upwards)
- Carefully pull the pipetting tubing approximately 25 mm (1 in) out of the tip adapter.
- Put the adapter cylinder on the tubing extension (knurled part pointing upwards).
- Seize the two parts and push the conical (blank) part of the tubing extension 6 to 8 • mm (0.24 to 0.32 in) into the tubing.
- Screw the adapter cylinder onto the tip adapter and tighten slightly. •
- Slide the separator ring and then the O-ring onto the lower part of the tubing exten-• sion.
- Shift the tubing into the adapter cylinder. •
- Slide the tip ejector tube (outer rim pointing upwards) on the adapter cylinder, hold it • with one hand and screw the DiTi cone into the adapter cylinder.
- Tighten the DiTi cone carefully, using the supplied cone wrench. ٠

#### 9.3.1.2 Disposable Tip Cone (DiTi cone) Air LiHa



#### ATTENTION

Possible malfunction

- If the disposable tip cones are moistened with sample liquid containing certain substances, a hard coating can build up. This may render the DiTi cone incompatible with disposable tips, resulting in pick up problems.
- Deposits can clog the tip cone after a period.



#### ATTENTION

Initialization error possible, if Z-rod is blocked in the uppermost Z-position.

- Do not (manually) move the Air LiHa Z-rods to the uppermost Z-position.
  - If an initialization error occurs, release the Z-brake, and manually move the Z-0 rods down by approximately 2.5 cm (1 in).

**Cleaning and** 

Perform the following maintenance on the Air LiHa DiTi cone.

inspection

- Clean the DiTi cones with a lint free tissue and isopropanol. •
- Visually check the disposable tip cones during maintenance. Make sure that the tip • cones are clean and free of deposits.
- If deposits are visible: •
  - Remove the Air LiHa DiTi cone. 0
  - Clean the parts thoroughly.

• Replace the inline filter.

Test and • To ensure operating readiness, perform the following test: Settings

o Instrument Warm-up

Refer to the PyroTec<sup>™</sup> PRO Software User Guide.

**Replacement** Please contact your local Lonza representative to schedule a service visit.

#### 9.3.1.3 Air LiHa Inline Filter

9.3.1.4

Note: Irrespective of the regular maintenance schedule, the filter needs replaced if moistened because of an erroneous aspiration (too much liquid aspirated).



#### WARNING

DiTi cone can be contaminated.

- Decontaminate the DiTi cone and assure appropriate safety measures.
- •

## WARNING

The filter removal tool can cause injuries.

- Avoid piercing your finger or hand.
- Wear protective rubber gloves during filter removal.

To replace the inline filter in the DiTi cone of the Air LiHa, proceed as follows:

• Remove the inline filter from the DiTi cone as shown in the figure below.



Filter removal tool



- Carefully pierce the old filter sideways, using the filter removal tool (A).
- Swivel the tool downwards to pry out the filter.
- Remove the filter from the DiTi cone.
- Clean the DiTi Cone with alcohol and allow to dry.
- Make sure that the DiTi cone is dry before inserting the inline filter.



- Place the new inline filter on a clean and even surface.
- Move the DiTi cone downwards onto the filter.

Press the filter into the DiTi cone in such a way that it does not stick out from the DiTi cone any more.

Test and Settings

• To ensure operating readiness, the operator should run the PyroTec<sup>™</sup> PRO Software module "Instrument Warm-Up". The PyroTec<sup>™</sup> PRO software module also contains an embedded "Inline filter test" in test runs to ensure system functionality.

## 9.3.2 DiTi Waste Bag

#### WARNING

**Potentially infectious** 

Instrument parts and solid waste may be contaminated with potentially infectious materials.

- Follow basic biohazard precautions.
- Wear appropriate personal protective equipment, such as gloves, lab coats and protective eye wear



#### WARNING

Risk of fire or explosion

If inflammable reagents were used in the process, remains of these substances on the waste DiTis may accumulate and form combustible vapors.

- If inflammable reagents are in use, change the DiTi waste bag frequently.
- Perform a risk assessment to define further measures.

The filling height of the DiTi waste bag must be checked regularly. Make sure that there is no DiTi jam within the DiTi waste slide and change the DiTi waste bag at least once at the end of the day.

#### **Removal** Follow the procedure below to change the DiTi waste bag.



- Lift the fastener to remove the bag housing. Note: Be sure to dispose of waste according to your laboratory guidelines.
- Remove the DiTi waste bag and dispose of it appropriately.

Installation

• Install a new DiTi waste bag into the empty bag housing.

**Note**: The waste bag must be suitable of disposable tips, and in case you are operating with biohazardous material suitable for that material as well, it must e.g. have an adequate thickness and be labeled with a corresponding biohazard label.

## Waste BagTypical dimensions for the waste bag (W x L) 300 mm x 600 mmSpecificationThickness: 0.05 mm

Material: Polypropylene, polyethylene, or co-polymer (auto-clavable) Imprint: Biohazard

Note: The waste bags used must meet your local safety guidelines.

#### 9.3.3 DiTi Waste Station Unit



#### WARNING

Potentially infectious Instrument parts may be contaminated with potentially infectious materials.

- Follow basic biohazard precautions
- Wear appropriate personal protective equipment, such as gloves, lab coats and protective eyewear.

#### 9.3.3.1 Cleaning the DiTi Waste Slide

The discarded DiTis contain residues of sample and reagents, which contaminate the DiTi waste slide.

**Note**: Heavy contamination of the slide might cause the DiTis to be stuck in the DiTi waste slide.

Quick Cleaning To clean the DiTi waste slide, proceed as follows:

• Open the front safety panel.



Removing DiTi waste slide inset

- Remove the cover (A) from the DiTi waste slide.
- Remove the DiTi waste slide inset (B) from its hold.

**Note**: Hold a tissue under the DiTi waste slide inset when carrying it away to prevent contaminated substances and DiTis from dropping to the floor.



Spray some disinfectant on the inner surface of the DiTi waste slide as hown in the figure.

uitable agents:

Theck if there are residues of contamilation on the inner surface of the DiTi vaste slide.

f yes, schedule a thorough cleaning of he parts as described below.

DiTi waste slide

- Reinstall the DiTi waste slide inset.
- Make sure that the positioning pin of the DiTi waste slide is properly positioned in the slot (D).
- Reinstall the cover

#### **Thorough Cleaning**

To thoroughly clean the DiTi waste slide, perform the following procedure.

- Remove the cover from the DiTi waste slide as described above.
- Remove the DiTi waste slide inset from its holder as described above.
- Put the DiTi waste slide inset and the cover into a basin filled with cleaning agent and allow soaking for 30 minutes to 4 hours (depending on agent).
- Allow the parts to dry.
- Reinstall the DiTi waste slide inset as described above.
- Reinstall the cover as described above.

#### 9.3.3.2 Cleaning the Complete DiTi Waste Station Unit

The DiTi waste station unit may be contaminated with residues from reagents and samples, which must be removed.

Apart from the normal position (work position) the DiTi waste station unit can take the following positions:

- If pulled to the mechanical stop: The front access panel can be opened, but the unit cannot be removed.
- If pulled to the middle position: The unit can be removed, but the front access panel cannot be opened.

To remove and clean the DiTi waste station unit, proceed as follows:

- Removal
- Remove the DiTi waste bag housing
- Remove the DiTi waste slide inset.



Removing the DiTi waste station unit from the work table

- Pull and hold the quick release lever (B).
- Pull the DiTi waste station unit (A) towards yourself.
- Open the front access panel to be able to release the waste tubing.
- Remove the waste tubing.
- Close the front access panel.
- Shift the unit back to the middle position and remove (lift) it.

Cleaning

- To clean the unit, it is not necessary to disconnect the waste tubing.
  - Wipe the surface of the DiTi waste station unit with a suitable cleaning agent (e.g. water, alcohol, disinfectant) to remove any spilled reagent.
- You can now clean the DiTi waste station and the worktable.

Installation

- Reapply the waste tubing under the front access panel and close the panel.
- Reinstall the DiTi waste station unit on the worktable by pushing the button of the quick release fastener again and sliding the option to its original position until it engages on the positioning pins of the worktable.

#### 9.3.4 Worktable



#### WARNING

Possible worktable damage

- Only clean the worktable with small amounts of cleaning agent, e.g. with a damped cloth.
- Do not spill cleaning agent on the worktable.

# Cleaning the<br/>WorktablePerform the following procedure to clean the pipetting instrument's worktable.• Remove all racks and carriers from the worktable.

PyroTec<sup>™</sup> PRO Hardw are User's Manual, V1.2

- Wipe the surface of the worktable with a suitable cleaning (e.g. alcohol, disinfectant) to remove any spilled reagent.
- If necessary, clean with additional water.

#### 9.3.5 Safety Panels

Cleaning thePerform the following procedure to clean the safety panels.Safety Panels

- Wipe the inner and outer surface of the safety panels with a suitable cleaning agent, e.g. water, alcohol, or disinfectant, to remove any spilled reagent or sample.
- If necessary, further clean the surface with water or alcohol.

#### 9.3.6 Lower DiTi Eject Option

**Cleaning the** Perform the following procedure to clean the rocker of the lower DiTi eject option:

- Wipe the surface of the rocker (A) with a suitable cleaning agent (e.g. alcohol, disinfectant)
- If necessary, further clean with water.

#### 9.3.7 Arm Guide

Rocker

The following description is applicable to:

- Liquid handling arm (LiHa)
- Robotic manipulator arm (RoMa standard and long)

Cleaning theIn order to avoid uneven movements of the arm, use a cotton tab or a lint free tissue on aArm Guidescrewdriver to clean the arm guide roller and a lint free tissue to clean the arm rails.

**Note**: Do not use alcohol or solvents to clean the arm guide. Do not use grease on the arm rails.



## 9.4 Precision and Function Tests

## 9.4.1 Liquid Handling Performance Verification Testing

QC Kit	Lonza recommends the use of the QC kit for liquid handling performance verification test- ing at least once per year during Preventative Maintenance by a Lonza approved Field Ap- plication Specialist; a higher frequency may apply, based on the Quality & Regulatory re- quirements of the laboratory using the PyroTec <sup>™</sup> PRO platform.
	The QC Kit is based on Artel's patented Ratiometric™ Photometric technology, and is being made available for Lonza's customers. Customer benefits include:
	Traceability of test results to the international standards.
	Robustness of the method in a daily lab environment
	Ease-of-use
Alternative Methods	Alternative methods are : Gravimetric test; contact Scientific Support for more information on this method.
Software Used for Various Tests	The "Setup & Service" and application software offer a variety of tests to check individual functions of the modules.
	Refer to the "Instrument Software Manual"
	Refer to the "PyroTec™ PRO Software User Guide"

## 9.5 Decontamination

AgentsNote: The selection of the appropriate decontamination agent depends on the contamina-<br/>tion degree and the kind of contaminant.<br/>Decontamination can be performed with the following agents:

- Bleach 0.5% to 3%
- 70% ethanol + 30% H<sub>2</sub>O

CommerciallyFor commercially available agents that can be used for decontamination or disinfection.AvailableAgentsHints Concerning Decontamination

In order to remove protein residues in the tubing and tips, flush the liquid system periodically with weak acid, followed by base. Alternatively, use the above-mentioned commercially available agents. Certain agents can be used as system liquids additives. They will not affect most immunological assays.

Elimination of<br/>Nucleic AcidNucleic acid residues in standard tips and pipetting tubing can usually be eliminated by<br/>means of wash or decontamination cycles with 3% bleach solution. Appropriate commer-<br/>cially available agents (e.g. DNAzip) are used to keep the pipetting area (worktable, carri-<br/>ers, etc.) free of interfering nucleic acids.

## 9.6 Adjustments and Replacements

#### 9.6.1 Positioning Pins

**Replacing Po-** To Replace a positioning pin on the worktable, proceed as follows: **sitioning Pins** 



Extracting a positioning pin

Slide the front most part of a carrier onto the positioning pin to be replaced.

Carefully lift the carrier (see arrow) to oull out the positioning pin. No not use force to extract the pin. If it loes not come loose, retry with the arrier in a slightly changed position.

Carefully press the new pin into the

'ou can use a small rubber mallet if he pin cannot be inserted manually.

hole on the worktable.



Inserting a positioning pin

**Note**: When replacing positioning pins, take note to the following:

- Make sure to only replace a pin by one of exactly the same type and pay attention to the orientation.
- Do not leave uncovered grid holes on the worktable as liquids might flow into the area below the worktable.



#### ATTENTION

Loose positioning pins can result in bad positioning of carriers and labware.

• It is recommended that you replace removed positioning pins with new ones.

## **10 Troubleshooting**

Purpose ofThis chapter helps to resume operation after a minor problem has occurred with theThis ChapterPyroTec™ PRO. It lists possible occurrences, their probable cause and suggests how to<br/>remedy the problem.

Which ErrorsThe troubleshooting table below lists possible malfunctions and errors of the PyroTec™can the Opera-<br/>tor CorrectPRO. The operator is able to correct some of those problems or errors by him/herself. For<br/>this, appropriate corrective measures are listed in the column "Corrective measures".<br/>The Lonza FSE according to separate instructions usually performs the elimination of more<br/>complicated malfunctions or errors. In this case, reference to the FSE is made.

## 10.1 Troubleshooting Table

Trouble-<br/>shooting byThe following table lists problems and errors and gives instructions on how to eliminate<br/>them. For additional guidance on what operation to perform in your current circumstance,<br/>contact Lonza Scientific Support.:

	Troubleshooting table		
Problem, error	Possible cause	Corrective measures	
Problem, error on instrumen	t level	-	
Communication error	Power not ON Power/communication in- terrupted No communication	Switch on instrument Check cable and plug Switch off instrument and PC, wait until the status lamp is dark, switch on instrument and PC	
	X, Y or Z-drive	Check for obstacles	
Initialization error	Arms cannot initialize	Make sure that the arms can move freely, i.e. that their movement range is not obstructed by other ob- jects.	
	Hardware defective	Contact Lonza Scientific Support	
Front safety panel does not unlock properly	Mechanical failure of the door locks	Contact Lonza Scientific Support	
Front safety panel does not lock properly	Mechanical failure of the door locks	Switch off the instrument. Contact Lonza Scientific Support	
Problem, error on liquid handling arm (LiHa) and tips			
Positioning error	X, Y or Z-drive blocked Crash Hardware defective	Check for obstacles Check container, rack, and carrier positions Contact Lonza Scientific Support See "Carrier Positioning"	

No Tip available	Disposable tip tray empty Wrong disposable tip tray elected	Place disposable tip tray on speci- fied position Use adjust DiTi position function in PyroTec™ PRO software module See Application Software Manual
Tip not picked up	Wrong tip position coordi- nates	Define tip position See Application software manual
Tip not removed	Wet or unclean cone DiTi adapter mounted in- correctly	Clean DiTi cone Check correct installation of DiTi adapter See "Disposable Tip Cone (DiTi Cone) LiHa"
No liquid detected	Not enough liquid Bad ground connection of carrier	Check/add liquid Place rack correctly on carrier Clean carrier, to ensure good con- nection As sure container-rack-carrier-work- table contact
	Wrong detection parame- ters	Check parameter in the application software
	Dirty DiTi cone	Clean DiTi cone See "Instrument Parts and Cleaning Agents"
	MultiSense option: Pres- sure measurement bad	Contact Lonza Scientific Support
Not enough liquid detected	Not enough liquid Incorrect container/rack definition	Check/add liquid Check container, rack definition See Application Software Manual
Clot detected	Clot aspirated (cLLD) Wrong container diameter	Replace DiTi and retry Check container data See "Application Software Manual" Contact Lonza Scientific Support
Level sense failure	Use of mobile phone or high level of static electric- ity in the area	Do not use mobile phones, not even in standby-mode closer than 2 m to the instrument.
	Low humidityin the room	Increase ambient humidity (humidi- fier)
	Incorrect sample position- ing Bent tips Use of incorrect carrier Incorrect LiHa, X-, Y- and Z-setup Incorrect tip configuration	Rectify sample positioning Replace bent tips Use/configure the correct carrier. Contact Lonza Scientific Support Rectify tip configuration

	Wrong settings for liquid conductivity Wrong liquid class settings Foam or bubbles in the liq- uid containers	Rectify the settings for liquid con- ductivity Rectify the settings for liquid classes or remove foam/bubbles
	Loose or leaking connec- tions causing drops at tips to appear Insufficient system liquid	Perform daily maintenance Perform daily maintenance
	Electrostatic charged cloth- ing or furniture	Discharge electricallythrough con- tact with an earthed object
	Highly conductive system liquid	Use system liquid with a conductiv- ity below 500 µS/cm
Problem, error on air displace	ement pipetting arm (Air LiH	a) and tips
Precision (Gravimetric) Test failed	Wrong liquid class used Dirty DiTi cone	Check / correct the liquid classes Clean DiTi cones
	Plungerseal defective	Contact Lonza Scientific Support
Pipetting channel does not meet specified performance	Inline filter moistened (too much liquid aspirated)	Replace inline filter See "Air LiHa Inline Filter"
Initialization error in Z-axis	Z-rods are blocked in the uppermost Z-position	Manually reposition the Z-rods by releasing the Z-brake and moving the Z-rod down by approx. 2.5 cm (1 in.) See "Releasing the Z-brake of the Air LiHa"
Air LiHa tip adapter crash	Tip adapters not aligned correctly	Contact Lonza Scientific Support for re-aligning the tip adapters
Problem, error on multichanr	nel arm	
Tips/DiTis are not aligned properly to the carriers	The carrier offsets are not taught correctly The carriers are not ad- justed correctly The mechanics are defec- tive	Contact Lonza Scientific Support
During the pipetting process the pipetting head stops and generates an error	Aspirate / dispense accel- eration and or deceleration is too fast compared to speed: plunger plate is blocked	Contact Lonza Scientific Support.
Several or all pipetting chan- nels are leaking	Wrong DiTis,, tip cone seals or gaskets used The DiTis are not picked up properly	Only use DiTis, tip cone seals or gaskets provided by Lonza Check the carrier positions Contact Lonza Scientific Support

	Old, defective tip cone seals or gaskets.	Perform leakage test Contact Lonza Scientific Support	
	Pipetting head defective	Contact Lonza Scientific Support.	
A single channel is leaking	The tip cone seal, gaskets or other seals in the pipet- ting head are defective	Contact Lonza Scientific Support.	
A single DiTi is not picked up correctly	The individual DiTi is de- fective	Replace the DiTis If the problem cannot be solved, contact Lonza Scientific Support.	
A single DiTi is not dropped	The individual DiTi is de- fective	Replace the DiTis If the problem cannot be solved, contact Lonza Scientific Support.	
	The tip cone seal on this DiTi position is defective.	Contact Lonza Scientific Support.	
Several/all DiTis are not dropped	Wrong DiTis are used	Use DiTis provided by Lonza only If the problem cannot be solved, contact Lonza Scientific Support.	
The DiTi box is lifted up with the DiTis after picking up Di- Tis	The carrier is not adjusted correctly X and/or Y offsets are specified incorrectly The DiTi Box does not meet the specifications	Exactly adjust all carriers If the problem cannot be solved, contact Lonza Scientific Support. Use only Lonza DiTi boxes	
Inaccurate pipetting results	The DiTis are not picked up properly	Check the carrier positions Contact Lonza Scientific Support	
	The tip cone seals are de- fective.	Contact Lonza Scientific Support	
	The liquid handling param- eters are incorrect	Contact Lonza Scientific Support.	
	The carriers are not ad- justed correctly.	Contact Lonza Scientific Support	
	The pipetting head is de- fective.	Contact Lonza Scientific Support	
Problem, error on robotic manipulator arm, RoMa Standard			
Microplate not picked up	No microplate on carrier Cannot pick up microplate	Contact Lonza Scientific Support	
Unusual noise during arm movement	Worn or damaged parts	Contact Lonza Scientific Support	

## 10.2 Troubleshooting Instructions

#### 10.2.1 Releasing the Z-brake of the Air LiHa

The Air LiHa is equipped with a Z-break (electrical actuation of release) to prevent the Z-rods from moving down by their weight when the power is off.

Manual Acti- The Z-brake of the Air LiHa can be released manually, when the instrument is switched off.

vation

- The Z-brake releases or brakes all Z-rods simultaneously.
- When the instrument is switched on the Z-brake is actuated electrically.
- •

To release the Z-brake of the Air LiHa manually, proceed as follows:



#### WARNING

Moving parts of the Air LiHa.

Injury of fingers possible when releasing the Z-brake manually or if instrument starts unexpectedly.

- Switch the instrument off before actuating the Z-brake manually.
- Do not reach into the moving area of the Air LiHa and the Z-rods when the instrument is in an undefined state.
- Stop all programs that may cause the Air LiHa to move.



Air LiHa Z-brake release button

- Switch the instrument off.
- Hold the Z-rods in position before actuating the brake release armature.

Best practice is to hold a finger underneath all isolation blocks of the tip adapters (A).

• Press the brake release armature (B) of the Air LiHa (C) upwards (arrow) to release the Z-brake.

The brake release armature is accessible with all covers mounted.

• Move the Z-rods manually up or down.

In principle, the Z-rods tend to move downwards.

Make sure that the tip adapters and tips do not collide with any objects below.

• Release the armature when the tip adapters and tips are in the desired position.

#### 10.2.2 RoMa / Gripper Alignment

**Checking the** To check the adjustment of the gripper fingers, proceed as follows: **Gripper Fin-**

gers



Adjustment of gripper fingers

- Switch the instrument off.
- Move the RoMa down until the gripper fingers almost touch the worktable surface (A).
- Check if the gripper fingers are at the same height and if they are parallel.
- If necessary (difference in height, [a]), adjust the height of the gripper fingers by slackening the screws (B) and moving the gripper fingers in the correct position.
- Make sure that the gripper fingers are parallel.
- Tighten the screws.

Checking the RoMa Alignment



To check the alignment of the RoMa Z-axis, proceed as follows.

Checking RoMa alignment

- Switch the instrument off.
- Move the RoMa down until the gripperfingers almost touch the top surface of the positioning pins.
- Check the gap to the worktable surface (or to the positioning pins).
- Swivel the gripper module head and compare the gap in all positions as indicated in the figure (A, B, C, and D).
- If the difference of the gap exceeds 0.5 mm (0.02 in.), the RoMa is misaligned.

In this case, contact your local service organization.

## 11 Shutdown, Transport and Storage

Purpose ofThis chapter instructs how to shut down the PyroTec<sup>™</sup> PRO, how to pack it for storage orThis Chaptertransport, and specifies the storage and shipping conditions.

## 11.1 Shutdown

#### 11.1.1 Instrument

Since the material processed by the PyroTec<sup>™</sup> PRO is unknown to Lonza, detailed information on how to dispose of it cannot be given here.

#### WARNING

Chemical, biological, and radioactive hazards can be associated with the waste material from the process run on the PyroTec<sup>™</sup> PRO.

Treat these substances and disposables, such as DiTis, etc. in accordance with good laboratory practice guidelines.

Inquire about appropriate collecting points and approved methods of disposal in your country, state, or region.

When disposing of operating material of the PyroTec<sup>™</sup> PRO the relevant national and regional laws, directives and recommendations must be followed.

- To shut down the instrument for a long period:
- Save data and exit application software and instrument software.

• Press the power **ON/OFF switch** for 2 seconds to switch the instrument off. The status lamp turns off.



B Power ON/OFF switch

Note: Wait until the status lamp is off before switching the instrument on again.



• Unplug the power cord from the power supply at the rear of the instrument.



RS232 interface on Optibo PCB

- ARS232 interface connectorBUSB connector
- Disconnect the instrument from the PC.
- If desired, unplug the interface cable from the USB port on the Te-CU board behind the left access door.
  - Alternatively, Disconnect the RS-232 interface cable from the Te-CU board.
- Clean and, if necessary, decontaminate the entire instrument.

#### 11.1.2 Reporting

- Fill out a copy of the decontamination form and place it with the instrument.
- Record the shut down in your "Maintenance and Service Logbook"

## 11.2Transport



#### WARNING

Lifting or moving the instrument can cause serious injuries.

- Injuries to the back due to overload can occur
- Injuries can be caused due to a failing instrument
#### ATTENTION

•

Lifting or moving the instrument can cause damage to due to unsecured parts

• Lifting or moving the instrument must be correctly prepared and may only occur under the direction of a qualified Lonza person only

Lifting or moving the instrument must be correctly prepared and may only occur under

**Transport** The transport of the instrument may be done under direction of a qualified Lonza person only. Due to the heavy weight, trained relocation staff is needed to lift the instrument.

### 11.2.1 Unpacking

The unpacking of the instrument may be done by a qualified Lonza service person only.

PackaingThe instrument packaging has been designed to prevent damage to instrument and partsmaterialsduring normal transport conditions.

Keep the packaging materials for future use.

the direction of a qualified Lonza person.



#### ATTENTION

Do not remove the transport moorings before the instrument is in its final operating position.

#### 11.2.2 Packaging

The packaging of the instrument may be done by a Lonza approved FAS (field application specialist) only.

PackaingUse original packing material that has been designed to prevent damage to instrumentmaterialsand parts under normal transport conditions.

**Guarantee** All Lonza guarantees are void if the instrument is not correctly prepared by qualified Lonza service personnel for transport.

## 11.3 Storage

Protect the instrument against dust and debris with a cover. For long-term storage, pack the instrument in its original packing.

## **12 Disposal**

Purpose ofThis chapter includes regulatory information about recycling that needs to be followed.This Chapter

# StatutoryWith the information given in this chapter, the situation in the European Union and theBasisEC-Directives pertaining to waste disposal are taken into consideration. Outside the European Union, comparable statutory regulations are binding.

## 12.1 Disposal of Packing Material

According to Direction 94/62/EC on packaging and packaging waste, the manufacturer is responsible for the disposal of packing material. However, since the unit packaging for PyroTec<sup>™</sup> PRO is specially designed, replacement is costly. It is recommended that the packaging is kept on site for easy retrieval should it be needed.

## 12.2 Disposal of Operating Material

Since the material processed by the PyroTec<sup>™</sup> PRO is unknown to Lonza detailed information on how to dispose of it cannot be given here. WARNING

Chemical, biological, and radioactive hazards can be associated with the waste material from the process run on the PyroTec<sup>™</sup> PRO.

Treat these substances and disposables, such as microplates, system liquid, etc. in accordance with good laboratory practice guidelines.

Inquire about appropriate collecting points and approved methods of disposal in your country, state, or region.

When disposing of operating material of the PyroTec<sup>™</sup> PRO the relevant national and regional laws, directives and recommendations must be followed.

## 12.3 Disposal of the PyroTec<sup>™</sup> PRO

#### **12.3.1 General Instructions**

#### WARNING

Depending on the application, parts of the PyroTec PRO may have been in contact with biohazardous, poisonous or even radioactive material.

- Make sure to treat this material according to the applicable safety standards and regulations.
- Always decontaminate the parts before disposal.

For the disposal of the PyroTec<sup>™</sup> PRO, please contact your local service organization.

## 12.3.2 Local Requirements European Union

EC DirectiveThe European Commission has released the Directive on Waste Electrical and ElectronicWEEEEquipment (WEEE, 2012/19/EU).Since August 2005, producers have been responsible for taking back and recycling electrical and electronic equipment.



#### ATTENTION

Negative environmental impacts associated with the treatment of waste.

- Do not treat electrical and electronic equipment as unsorted municipal waste.
- Collect waste electrical and electronic equipment separately.

## 12.3.3 Local Requirements People's Republic of China

#### Marking for Control of Pollution

RequiredThe People's Republic of China Electronic Industry Standard SJ/T11364-2014Product Infor-<br/>mation"Marking for the Restriction of the Use of Hazardous Substances in Electronic and Electri-<br/>cal Products" requires the marking for the restriction of the use of hazardous substances<br/>in electronic and electrical products.

ProductIn accordance with the requirements specified in SJ/T11364-2014, all electronic and elec-Markingtrical Lonza products sold in the People's Republic of China are labeled with a marking for<br/>the restriction of the use of hazardous substances.

Marking for the restriction of the use of hazardous substances			
Marking	Explanation		
	This marking indicates that this electronic product contains certain hazard- ous substances and can be safely used during the environment-friendly use period, but it shall enter the recycling system after the environment- friendly use period.		

# **13 Spare Parts and Accessories**

Purpose of This Chapter	This chapter lists disposables that are used in connection with the PyroTec™ PRO, spare parts, accessories, and options including their ordering information.
How to Find Spare Parts	Look up the ordering information on the tables.
How to Order Spare Parts	Order the parts from Lonza. Always state the designation and the part number when or- dering spare parts. Note: This chapter only contains spare parts that can be replaced by the operator him/her- self. To order spare parts other than listed here, please contact Lonza Scientific Support.
Ordering Address	Order the parts from Lonza.

## 13.1 Software

Plain Text Designation	P/N	Label Designation
EVOware Standard	n/a included with 25-611/E	SOFTWARE EVOWARE STANDARD v2.8 SP1
WinKQCL™ Endotoxin Detection and Analy- sis Software Version 6	25-611/E	WinKQCL <sup>™</sup> Version 6

## **13.2Documentation**

Plain Text Designation	P/N	Label Designation
PyroTec™ PRO User Manual	n/a	Not for sale

# 13.3PyroTec<sup>™</sup> PRO Basic Accessories Kit

Description	Spare Part Number/ De- scription	Picture
FILTER AIR LIHA ASSY REPLACEMENT	30066883 INLINE FIL- TER AIR LIHA	
PLATE REFERENCE TOMA-3 BCD ASSY	30033849 PLATE REF- ERENCE ROMA-3 BCD EVOLYZER-2	

	30017613	
INSERT CALIBRATION ASSY ROMA-3	TOOL REF- ERENCE ROMA-3	000
	30013574	
TIP REFERENCE PMP	TIP REFER- ENCE PMP	51
	30013576	
TOOL MOUNTING X-RING 0.74/1.02	TOOL MOUNTING X-RING 0.4/1.2	
	30041341	
TOOL MOUNTING O-RING PMP	tool Mounting O-Ring PMP	
BLOCK TEST LEAKAGE PMP	30013578 BLOCK TEST LEAKAGE PMP	
KIT PINS LOCK/GUIDE	10619001 PIN SET GENESIS	

	30157222 DONGLE EVOWARE USB PYRO- TEC™ PRO	L'E
KIT ACCESSORY LONZA PYROTEC <sup>™</sup> PRO: includes - 30157222 DONGLE EVOWARE USB PYROTEC <sup>™</sup> PRO, 10700830 WRENCH FORK, 30006384 CAP SCREW, 10900333 SCREW FIL.HEX.M4*8 A2 BN1593 (no pic.)	10619517 WRENCH CONE DITI OPTION 5 PCE.	
	10619103 COVER SCREW 20 PCE.WORK- TABLE GEN- ESIS	

# 13.4Tools, Gauges

Plain Text Designation	P/N	Label Designation
Transporthandles, 1 set	10612003	HANDLE TRANSPORT SET GENESIS
Cone wrench for DiTi option	10619517	WRENCH CONE DITI OPTION 5 PCE.
Tool set PMP	30013579	SET TOOL PMP

## 13.5 Optional System Modules and Accessories

## 13.5.1 Air Displacement Pipetting Arm (Air LiHa)

No.	Plain Text Designation	P/N	Label Designation
2	Inline filter kit for Air LiHa DiTi cone, package of 30 pc. incl. filter removal tool	30066883	INLINE FILTER AIR LIHA

## 13.5.2 Robotic Manipulator Arm (RoMa)

No/	Plain Text Designation	P/N	Label Designation
1	Eccentric RoMa fingers	30017037	GRIPPER ECCENTRIC ROMA-3

## 13.6Carriers, Racks, Troughs

## 13.6.1 Carriers for Reagents and Troughs

Plain Text Designation	P/N	Label Designation	Width
Carrier for 3 reagent troughs In use with 100 mI (10613049) or 3 trough holders (10619626)	10613020	CARRIER ADDITIVE TROUGH 3 PCE. MAX.100ML	1/25 mm/ (0.98 in.)
Lonza Reagent troughs	00229888	Trough, Disposable, 100uL	

## 13.6.2 Carrier for Disposable Tips

Plain Text Designation	P/N	Label Designation	Width
DiTi waste slide and bag holder In use with DiTi Carrier (10613012)	30097476	SLIDE WASTE+BAG HOLDER DITI RACK SILVER	6/150/ (5.91 in.)
DiTi Carrier for 3 trays of 96 disposables tips	10613022	CARRIER RACK 3 DITI WIDTH 6 CARRIER UNIT	6/150/ (5.91 in.)



- A Container for DiTi waste bag
- **B** Trough holder
- **C** Wash station
- D Slot of lower DiTi waste
- E DiTi waste slide

DiTi waste station unit



Carrier for DiTi racks (3 DiTi racks 1000 µl)

## 13.6.3 Carriers for Tubes

Plain Text Designation	P/N	Label Designation	Width
Carrier for tubes, 13 mm, 6 x 16 pos. Set of 6 carriers	10613002	RACK STRIP 16 POS. TUBE 13MM 6 PCE.	1/25 mm/ (0.98 in.)
Carrier for tubes, 13 mm, 6 x 16 pos.	10613004	CARRIER 6*16 POS. TUBE 13MM	6/150/ (5.91 in.)



Carrier for tubes (example for 16 tubes)

# 13.7Tips

Plain Text Designation	Lonza P/N
Liquid Handling Filtered Tips, 1000uL	00229884

# 14 Support

Purpose of This Chapter	This chapter informs you how to contact us in case help is needed. It lists addresses and telephone numbers of the manufacturer's representatives.
How To Get Help	Lonza and its representatives maintain a fully trained staff of technical specialists around the world. For any technical question, contact the nearest Lonza representative.
Feedback on This Manual	If you have any comments on this Operative Manual or suggestions for improvement, please send them by email to <u>scientific.support@lonza.com</u> or <u>scientific.support.eu@lonza.com</u> .

In your e-mail, please specify the manual name, the document ID, and the manual version. This information is shown at the bottom of each printed page and on the first page of the help file (context sensitive help of software products).

## 14.1 Contacts

Product Sup-<br/>port & Tech-<br/>nical ServiceIf your Lonza product fails to function properly, if you have questions about how to use or<br/>maintain our products, or if you need to send an instrument to Lonza for repair or other<br/>service, please contact our Scientific Support.

North America

- Customer Service: 800 638 8174 (toll free)
- Scientific Support: 800 851 0390 (toll free)
- <u>Scientific.support@lonza.com</u>
- Online ordering: <u>http://bioscience.lonza.com</u>

#### Europe

- Customer Service: +32 87 321 611
- Scientific Support: +32 87 321 611
- <u>Scientific.support.eu@lonza.com</u>
- Online ordering: <u>http://bioscience.lonza.com</u>

International For technical support for countries outside of the USA or Europe, please contact your local Lonza sales office or regional distributor. See Contact Information below:

- Australia + 61 3 9550 0883
- Austria 0800 201 538 (toll free)
- Brazil + 55 11 2069 8800
- China + 86 6430 3488
- France 0800 91 19 81 (toll free)
- Germany 0800 182 52 87 (toll free)
- India+91 22 4342 4000
- Japan + 81 3 6264 0660
- Luxemburg + 32 87 321 611
- Singapore + 65 6521 4379
- The Netherlands 0800 022 4525 (toll free)
- United Kingdom 0808 234 97 88 (toll free)