Apollo / Apollo-I Microplate Absorbance Reader

LB 917

Operating Manual

73664BA2

Rev. No.: 00, 05/2022

Not for use in in-vitro diagnostic (IVD) procedures.

The information in this guide is subject to change without notice.

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This instrument is not designed or intended for use with installations or equipment in hazardous environments. Servicing of the instrument must only be performed by Berthold Technologies Field Service Engineers or service staff authorized by Berthold Technologies.

Please contact our Service Center at service@berthold.com if you have any operational issues.

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Table of Contents

1 Prefatory Comments 7
1.1 Contact Information 7
1.2 The Operating Manual 7
1.3 Typographical Conventions 8
1.3.1 Symbols on the instrument 8
1.3.2 Warnings, Notes and Symbols used in this Manual 8
1.4 Connections at the instrument 9

2 Important Information 10
2.1 Intended Use 10
2.2 Safety Instructions and Precautions 10
2.3 Consignes de Sécurité 12
2.4 Sicherheitshinweise 14
2.5 Further Instructions 16

3 General description 17
3.1 Features and Benefits 17
3.2 Product Overview 17

4 Getting Started 19
4.1 Unpacking 19
4.2 Setup and Installation 19

5 General Operation 20
5.1 Instrument self-check 20
5.2 Protocol interface 20
5.2.1 File Management 21
5.2.2 Function Keys 23
5.3 Perform a measurement 23

6 Setup a protocol 25
6.1 Define measurement parameters 25
6.2 Define the Layout 27
6.2.1 Plate Layout 27
6.2.2 Define standard concentrations 28
6.3 Define shake settings 30
6.4 Calculations 31
6.4.1 Kinetic 31
6.4.2 Preprocess calculation 34
6.4.3 Curve fitting 34
6.5 Interpret 35
6.6 Quality Control 36
6.7 Incubator settings (Apollo-I only) 37

7 Results 38
7.1 Results interface 38
7.1.1 Raw Data 38
7.1.2 Interpret results 39
7.1.3 Analysis 40
7.1.4 Curve 40
7.1.5 QC results 41
7.2 Kinetic Results interface 41
7.2.1 Kinetic Raw Data 41
7.2.2 Kinetic Analysis 42

7.2.3 Kinetic Curve 42

8 Settings 43
8.1 Language 43
8.2 Filter 43
8.3 Maintenance of microplate drawer 45
8.4 Print 45
8.5 Date&Time 46

9 Help 47

10 Maintenance of the instrument 48
10.1 Light source replacement 48
10.2 Adding optical filters (optional) 49
10.3 Cleaning and Decontamination of the instrument 50

11 Trouble Shooting 51

12 Technical Data 52

13 Preparing for Transport 54

14 Warranty and Technical Issues 55
14.1 Special spare parts 55
14.2 Warranty statement 55
14.3 Customer service 55
14.4 Return Shipment to Berthold Technologies 56

15 Index 57

1 Prefatory Comments

1.1 Contact Information

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1.2 The Operating Manual

This operation manual is valid for both, LB 917 Apollo and LB 917 Apollo-I (with heating) from the delivery of the Berthold product to the user until its disposal. Version and release date of this operating manual can be found in the bottom of each page.

Read all instructions thoroughly and completely before working with the product. Keep the operating manual for future reference.

The information in this guide is subject to change without notice. However, should questions arise which are not answered in this manual please contact bio@berthold.com.

Revision history of the Operating Manual 73664BA2

Revision, Date	Changes
Rev 00, 05/2022	Initial version

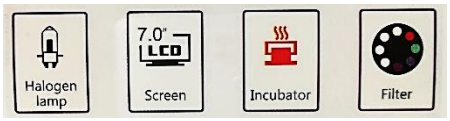
1.3 Typographical Conventions

1.3.1 Symbols on the instrument

Symbols	Description
	Warning – Biological hazard
	Warning – general warning, risk of danger
CE	This product bears the CE mark, based on conformity to current EC legislation and stated on the declaration of conformity.
	No domestic waste. The electronic product must not be disposed of in domestic waste.

Depending on the instrument configuration (with/without incubator) additional informative labels are located below the front door.

Example for LB 917 Apollo-I:



1.3.2 Warnings, Notes and Symbols used in this Manual

CAUTION

Refers to a potentially dangerous situation, which can result in medium or minor physical injuries or damages to property, if it is not avoided.

NOTICE

If this information is not observed, deterioration in the operation and/or property damage may occur.

IMPORTANT

Sections marked with this symbol point out important information on the product or on handling the product.

Symbols	Description
●	Enumerations
1)	Actions
< >	Icon buttons
[ ]	Tab Pages, Menu items, dialog boxes and select lists

1.4 Connections at the instrument

LB 917 is equipped with a USB port, a COM port and a LAN port, as well as a Print port at the right side of the cover.

The power socket is located at the rear side.

See chapter 3.2, Fig 2, for details.

2 Important Information

2.1 Intended Use

The Apollo/Apollo-I microplate reader is used for absorbance measurements in colorimetric Enzyme-Linked Immunosorbent Assays (ELISA). Depending on the selected test, sample concentrations can be calculated out of the absorbance values (quantitative analysis), or samples can be classified according to Cut-Off thresholds as positive or negative (qualitative analysis). In addition, the kinetic course of the reaction can be determined.

The device is for use in scientific research, food and environmental research or agriculture.

CAUTION

LB 917 Apollo /Apollo-I must not be used for in vitro diagnostics.

LB 917 Apollo/Apollo-I must not be used for any other purpose than those described in this manual.

2.2 Safety Instructions and Precautions

CAUTION

Please adhere to the following safety instructions and precautions before and during operation of the system or taking the instrument into service.

- The instruments have been calibrated and tested and are supplied in a condition that allows safe and reliable operation of the equipment, both electrically and mechanically, if the user follows the instructions set forth in this manual.
- The person, responsible for bringing the instrument to market, must assure, that the safety instructions and precautions of this manual are communicated to the user.
- Only qualified trained personnel may operate and maintain the instrument.
- It is strongly recommended that all users read this manual prior to use. This Operating Manual includes information and warnings to be observed by the user to ensure safe operation of the instruments. Improper operation of the instrument may cause injury or electric shock.
- The operation, maintenance and repair of the Instrument should comply with the basic guidelines and the warnings in this manual. Incorrect operation and maintenance will have effect on the lifetime, performance and safety features of the Instrument.
- If legal regulations exist for the installation and/or use of sample measuring instruments in the country of installation, the installer and the operator are responsible for observing these regulations.
- The user must ensure that the instruments are set up and installed in such a way that their function is not impaired. Please refer to the instrument's installation description in chapter 4.2.
- Use only the accessories, particularly the power cords, supplied with the instrument or by Berthold Technologies for working with this instrument, for operation.
- Never connect the power cord near liquids to avoid electric shock or fire. The power cord must not get wet!

- The power cord may only be connected to a socket outlet that complies with the local regulations of the country where the unit is installed and supplies voltage and current as specified in the system specification. See chapter12.
- Berthold Technologies assumes no liability for any damages, including those to third parties, caused by improper installation, use or handling of the device. The instruments are live and improper handling may cause damage.
- The instrument should be installed in a location with less dust and away from wet areas, direct sunlight or strong light sources. The installation location should be well ventilated and be away from electromagnetic interferences and heat sources.
- Use the instrument only for the intended applications. Please read the information on the Intended Use and the restrictions.
- The instruments are for indoor use only. They must be operated in a laboratory environment by trained and experienced personnel only.
- The instrument is equipped with a ventilator designed for proper cooling of the internal components. Do not cover the ventilator or place the instrument in a location where the ventilator can be blocked.
- The user must assure that assays are validated with the system prior to use.
- Some assays, assay components or specimen may potentially present a biohazard, infection risk or other type of hazard to the user. Always follow the safety precautions as specified in the test system enclosure, e.g., for performance and temperature range. Wear appropriate protective equipment like laboratory coats or chemically resistant rubber gloves and work responsibly to avoid injuries such as chemical burns or contamination.
- Explosive and flammable substances must not be used with the instrument.
- Avoid moisture to prevent corrosion.
- Avoid splashing liquids on the outer surfaces. Wipe away all splashes immediately and decontaminate the surfaces.
- Avoid injury. Keep your body and hands away from the motorized sample drawer and other moving parts during operation.
- Power off the instrument when you finish your work.
- When handling cleaning and decontamination agents, the safety instructions of the reagent supplier must be followed. Wear appropriate protective equipment. Also read chapter 10.3 of this manual.
- The user may only carry out the maintenance work described in the Maintenance chapter. The user must not open the housing of the instruments.
- The operator should not open or repair the Instrument by himself. Don’t drive off any screws or parts. This may damage the instrument and will void the warranty. If service is required, contact the Berthold Technologies service or your local distributor.
- Switch off the instrument before disconnecting the plug. Hold the socket when you pull out the plug and don’t pull the power cord only.
- If the instrument is not in use for a longer period of time, disconnect it from mains and cover it to protect it against dust.
- Disconnect the power supply from mains at once in the following cases:
  - Liquid has entered the instrument
  - Abnormal sound or smell appears
  - Instrument dropped or outer housing is damaged
  - Malfunction detected
  - Overheating detected
  - Defective insulation sheath of cables

  Do not operate the instrument anymore and call the service. Please read Chapter 14.3.
- Prior to repair or maintenance, the instrument must be cleaned and decontaminated to prevent service personnel from contact with potentially hazardous materials.

- All service and maintenance work beyond the scope of this manual may only be carried out by service technicians trained and authorized by Berthold Technologies. Before further use, the instrument must be reassembled and inspected in accordance with the instructions in the service manual.
- Only parts specified by Berthold Technologies may be used for maintenance and service.
- Always disconnect the plug before opening the device for service or modifications.

2.3 Consignes de Sécurité

CAUTION

Veuillez respecter les consignes de sécurité et les précautions suivantes avant et pendant l'utilisation du système ou la mise en service de l'appareil.

- Les instruments ont été calibrés et testés et sont fournis dans un état qui permet un fonctionnement sûr et fiable de l'équipement, tant sur le plan électrique que mécanique, si l'utilisateur suit les instructions énoncées dans ce manuel.
- La personne responsable de la mise sur le marché de l'instrument doit s'assurer que les instructions et les précautions de sécurité de ce manuel sont communiquées à l'utilisateur.
- Seul un personnel qualifié et formé peut utiliser et entretenir l'instrument.
- Il est fortement recommandé à tous les utilisateurs de lire ce manuel avant de l'utiliser. Ce manuel d'utilisation comprend des informations et des avertissements que l'utilisateur doit respecter pour assurer un fonctionnement sûr des instruments. Une utilisation incorrecte de l'instrument peut entraîner des blessures ou un choc électrique.
- Le fonctionnement, la maintenance et la réparation de l'instrument doivent être conformes aux directives de base et aux avertissements de ce manuel. Un fonctionnement et un entretien incorrects auront un effet sur la durée de vie, les performances et les caractéristiques de sécurité de l'instrument.
- Si des réglementations légales existent pour l'installation et/ou l'utilisation d'instruments de mesure d'échantillons dans le pays d'installation, l'installateur et l'opérateur sont responsables du respect de ces réglementations.
- L'utilisateur doit s'assurer que les instruments sont configurés et installés de manière à ce que leur fonction ne soit pas altérée. Veuillez vous reporter à la description de l'installation de l'instrument au chapitre 4.2.
- Pour le fonctionnement, n'utilisez que les accessoires, en particulier les cordons d'alimentation, fournis avec l'instrument ou par Berthold Technologies pour travailler avec cet instrument.
- Ne branchez jamais le cordon d'alimentation à proximité de liquides afin d'éviter tout choc électrique ou incendie. Le cordon d'alimentation ne doit pas être mouillé !
- Le cordon d'alimentation ne doit être connecté qu'à une prise de courant conforme aux réglementations locales du pays où l'appareil est installé et fournissant la tension et le courant spécifiés dans les spécifications du système. Voir le chapitre 12.
- Berthold Technologies n'assume aucune responsabilité pour les dommages, y compris ceux causés à des tiers, causés par une installation, une utilisation ou une manipulation incorrectes de l'appareil. Les instruments sont sous tension et une manipulation incorrecte peut provoquer des dommages.

- L'instrument doit être installé dans un endroit moins poussiéreux et éloigné des zones humides, de la lumière directe du soleil ou de sources lumineuses fortes. Le lieu d'installation doit être bien ventilé et éloigné des interférences électromagnétiques et des sources de chaleur.
- N'utilisez l'instrument que pour les applications prévues. Veuillez lire les informations relatives à l'utilisation prévue et aux restrictions.
- Les instruments sont destinés à une utilisation en intérieur uniquement. Ils doivent être utilisés dans un environnement de laboratoire par un personnel formé et expérimenté uniquement.
- L'instrument est équipé d'un ventilateur conçu pour refroidir correctement les composants internes. Ne pas couvrir le ventilateur ou placer l'instrument dans un endroit où le ventilateur peut être bloqué.
- L'utilisateur doit s'assurer que les tests sont validés avec le système avant de les utiliser.
- Certains tests, composants de tests ou échantillons peuvent potentiellement présenter un risque biologique, un risque d'infection ou un autre type de danger pour l'utilisateur. Respectez toujours les précautions de sécurité spécifiées dans le boîtier du système de test, par exemple, pour les performances et la plage de température. Portez des équipements de protection appropriés, tels que des blouses de laboratoire ou des gants en caoutchouc résistant aux produits chimiques, et travaillez de manière responsable pour éviter les blessures telles que les brûlures chimiques ou la contamination.
- Les substances explosives et inflammables ne doivent pas être utilisées avec l'instrument.
- Évitez l'humidité pour prévenir la corrosion.
- Évitez les projections de liquides sur les surfaces extérieures. Essuyez immédiatement toute éclaboussure et décontaminez les surfaces.
- Évitez les blessures. Maintenez votre corps et vos mains à l'écart du tiroir à échantillons motorisé et des autres pièces mobiles pendant le fonctionnement.
- Mettez l'instrument hors tension lorsque vous avez terminé votre travail.
- Lors de la manipulation de produits de nettoyage et de décontamination, il convient de respecter les consignes de sécurité du fournisseur de réactifs. Portez un équipement de protection approprié. Lisez également le chapitre 10.1.3 de ce manuel.
- L'utilisateur ne peut effectuer que les travaux d'entretien décrits dans le chapitre Entretien. L'utilisateur ne doit pas ouvrir le boîtier des instruments.
- L'utilisateur ne doit pas ouvrir ou réparer l'instrument par lui-même. N'arrachez aucune vis ou pièce. Cela pourrait endommager l'instrument et annulerait la garantie. Si une réparation est nécessaire, contactez le service après-vente de Berthold Technologies ou votre distributeur local.
- Éteignez l'instrument avant de débrancher la fiche. Tenez la prise lorsque vous retirez la fiche et ne tirez pas uniquement sur le cordon d'alimentation.
- Si l'instrument n'est pas utilisé pendant une période prolongée, débranchez-le du secteur et couvrez-le pour le protéger de la poussière.
- Débranchez immédiatement l'alimentation du réseau dans les cas suivants :
  - Du liquide a pénétré dans l'instrument
  - Un son ou une odeur anormale apparaît
  - L'instrument est tombé ou le boîtier extérieur est endommagé
  - Détection d'un dysfonctionnement
  - Surchauffe détectée
  - Gaine isolante des câbles défectueuse

  N'utilisez plus l'instrument et appelez le service après-vente. Veuillez lire le chapitre 14.3

- Avant toute réparation ou maintenance, l'instrument doit être nettoyé et décontaminé pour éviter que le personnel de service n'entre en contact avec des matériaux potentiellement dangereux.
- Tous les travaux d'entretien et de maintenance dépassant le cadre de ce manuel ne doivent être effectués que par des techniciens de service formés et autorisés par Berthold Technologies. Avant toute nouvelle utilisation, l'instrument doit être remonté et inspecté conformément aux instructions du manuel d'entretien.
- Seules les pièces spécifiées par Berthold Technologies peuvent être utilisées pour l'entretien et le service.
- Débranchez toujours la fiche avant d'ouvrir l'appareil pour l'entretien ou les modifications.

2.4 Sicherheitshinweise

CAUTION

Bitte beachten Sie die folgenden Sicherheitshinweise und Vorsichtsmaßnahmen vor und während des Betriebs des Systems oder der Inbetriebnahme des Geräts.

- Die Geräte wurden kalibriert und geprüft und werden in einem Zustand ausgeliefert, der einen sicheren und zuverlässigen Betrieb des Geräts sowohl in elektrischer als auch in mechanischer Hinsicht ermöglicht, wenn der Benutzer die in diesem Handbuch aufgeführten Anweisungen befolgt.
- Die Person, die für das Inverkehrbringen des Geräts verantwortlich ist, muss sicherstellen, dass die Sicherheitsanweisungen und -vorkehrungen dieses Handbuchs an den Benutzer weitergegeben werden.
- Nur qualifiziertes Fachpersonal darf das Gerät bedienen und warten.
- Es wird dringend empfohlen, dass alle Benutzer dieses Handbuch vor dem Gebrauch lesen. Diese Bedienungsanleitung enthält Informationen und Warnhinweise, die vom Benutzer zu beachten sind, um einen sicheren Betrieb des Geräts zu gewährleisten. Eine unsachgemäße Bedienung des Geräts kann zu Verletzungen oder Stromschlägen führen.
- Der Betrieb, die Wartung und die Reparatur des Geräts sollten in Übereinstimmung mit den grundlegenden Richtlinien und den Warnhinweisen in diesem Handbuch erfolgen. Eine unsachgemäße Bedienung und Wartung hat Auswirkungen auf die Lebensdauer, die Leistung und die Sicherheitsmerkmale des Geräts.
- Bestehen im Aufstellungsland gesetzliche Vorschriften für die Installation und/oder Verwendung von Probenmessgeräten, so sind der Installateur und der Betreiber für die Einhaltung dieser Vorschriften verantwortlich.
- Der Anwender muss sicherstellen, dass die Geräte so aufgestellt und installiert werden, dass ihre Funktion nicht beeinträchtigt wird. Bitte beachten Sie die Installationsbeschreibung des Gerätes in Kapitel 4.2.
- Verwenden Sie für den Betrieb nur das Zubehör, insbesondere die Netzkabel, das mit dem Gerät oder von Berthold Technologies für die Arbeit mit diesem Gerät geliefert wurde.
- Schließen Sie das Netzkabel niemals in der Nähe von Flüssigkeiten an, um einen elektrischen Schlag oder Brand zu vermeiden. Das Netzkabel darf nicht nass werden!
- Das Netzkabel darf nur an eine Steckdose angeschlossen werden, die den örtlichen Vorschriften des Landes entspricht, in dem das Gerät installiert wird, und die die in der Systemspezifikation angegebene Spannung und Stromstärke liefert. Siehe Kapitel 12.

- Berthold Technologies übernimmt keine Haftung für Schäden, auch nicht gegenüber Dritten, die durch unsachgemäße Installation, Verwendung oder Handhabung des Geräts entstehen. Die Geräte stehen unter Spannung und eine unsachgemäße Handhabung kann zu Schäden führen.
- Das Gerät sollte an einem staubarmen Ort und fern von Nässe, direktem Sonnenlicht oder starken Lichtquellen installiert werden. Der Installationsort sollte gut belüftet und von elektromagnetischen Störungen und Wärmequellen entfernt sein.
- Verwenden Sie das Gerät nur für die vorgesehenen Anwendungen. Bitte lesen Sie die Informationen über den Verwendungszweck und die Einschränkungen.
- Die Geräte sind nur für den Gebrauch in Innenräumen bestimmt. Sie dürfen nur von geschultem und erfahrenem Personal in einer Laborumgebung betrieben werden.
- Das Gerät ist mit einem Ventilator ausgestattet, der für die richtige Kühlung der inneren Komponenten sorgt. Decken Sie den Ventilator nicht ab und stellen Sie das Gerät nicht an einem Ort auf, an dem der Ventilator blockiert werden kann.
- Der Benutzer muss sicherstellen, dass chemische Tests vor ihrer Verwendung mit dem System validiert werden.
- Einige Testsysteme, Test-Komponenten oder Proben können eine biologische Gefahr, ein Infektionsrisiko oder eine andere Art von Gefahr für den Benutzer darstellen. Befolgen Sie stets die Sicherheitsvorkehrungen, die in der Packungsbeilage des Testsystems angegeben sind, z. B. für Leistung und Temperaturbereich. Tragen Sie geeignete Schutzausrüstung wie Laborkittel oder chemikalienbeständige Gummihandschuhe und arbeiten Sie verantwortungsbewusst, um Verletzungen wie Verätzungen oder Kontaminationen zu vermeiden.
- Explosive und entflammbare Stoffe dürfen nicht mit dem Gerät verwendet werden.
- Vermeiden Sie Feuchtigkeit, um Korrosion zu verhindern.
- Vermeiden Sie Flüssigkeitsspritzer auf den Außenflächen. Wischen Sie alle Spritzer sofort weg und dekontaminieren Sie die Oberflächen.
- Vermeiden Sie Verletzungen. Halten Sie Ihren Körper und Ihre Hände während des Betriebs von der motorisierten Probenschublade und anderen beweglichen Teilen fern.
- Schalten Sie das Gerät aus, wenn Sie Ihre Arbeit beendet haben.
- Beim Umgang mit Reinigungs- und Dekontaminationsmitteln sind die Sicherheitshinweise des Reagenzienlieferanten zu beachten. Tragen Sie eine geeignete Schutzausrüstung. Lesen Sie auch Kapitel 10.1.3 dieses Handbuchs.
- Der Benutzer darf nur die im Kapitel Maintenance beschriebenen Wartungsarbeiten durchführen. Der Benutzer darf das Gehäuse der Geräte nicht öffnen.
- Der Benutzer darf das Instrument nicht selbst öffnen oder reparieren. Es dürfen keine Schrauben oder Teile herausgedreht werden. Dies kann das Instrument beschädigen und führt zum Erlöschen der Garantie. Wenden Sie sich im Servicefall an den Service von Berthold Technologies oder an Ihren örtlichen Händler.
- Schalten Sie das Gerät aus, bevor Sie den Stecker abziehen. Halten Sie die Steckdose fest, wenn Sie den Stecker herausziehen und ziehen Sie nicht nur am Netzkabel.
- Wenn das Gerät längere Zeit nicht benutzt wird, trennen Sie es vom Stromnetz und decken Sie es ab, um es vor Staub zu schützen.
- Trennen Sie das Gerät in folgenden Fällen sofort vom Stromnetz:
  - Flüssigkeit ist in das Gerät eingedrungen
  - Ungewöhnliche Geräusche oder Gerüche treten auf
  - Das Gerät ist heruntergefallen oder das äußere Gehäuse ist beschädigt.
  - Fehlfunktion festgestellt
  - Überhitzung festgestellt
  - Defekter Isoliermantel von Kabeln

  Nehmen Sie das Gerät nicht mehr in Betrieb und rufen Sie den Service an. Bitte lesen Sie Kapitel 14.3.

- Vor der Reparatur oder Wartung muss das Gerät gereinigt und dekontaminiert werden, um den Kontakt des Servicepersonals mit potenziell gefährlichen Stoffen zu vermeiden.
- Alle Service- und Wartungsarbeiten, die über den Umfang dieses Handbuchs hinausgehen, dürfen nur von Servicetechnikern durchgeführt werden, die von Berthold Technologies geschult und autorisiert wurden. Vor der weiteren Verwendung muss das Gerät gemäß den Anweisungen in der Serviceanleitung wieder zusammengebaut und überprüft werden.
- Für Wartung und Service dürfen nur von Berthold Technologies spezifizierte Teile verwendet werden.
- Ziehen Sie immer den Netzstecker, bevor Sie das Gerät für Servicearbeiten oder Änderungen öffnen.

2.5 Further Instructions

Storage conditions:

Before delivery or if the instrument is not used for a longer period, store it in the original cardboard box in a dry and dust-free environment, well-ventilated and free of any corrosive gasses. Protect the instrument from direct sunlight, significant temperature fluctuations and strong electromagnetic interference sources!

Storage temperature: -10°C – +45°C, relative humidity less than 80%, not-condensing,

Transport conditions:

-10°C – + 45°C, in original cardboard box and free of liquids. Avoid heavy shock, vibration, and humidity during transportation.

Quality control

It is considered good laboratory practice to run laboratory samples according to instructions and specific recommendations included in the package insert of the reagent kit or the standard laboratory protocol for the test to be conducted. Control measurements of commercially available test kits should be performed according to the kit insert instructions after installation and regularly furthermore during lifetime of the instrument. If a test kit is not available, it is recommended to measure a Blank and a known laboratory sample in exchange. A failure in the performance of Quality Control checks could result in erroneous test data.

Disposal

Decontaminate the instrument before disposal! This absorbance reader contains electronic parts. To prevent environmental pollution please dispose the instrument and the corresponding accessories according to local legislation. Within the EC dispose the instrument and accessories according to the WEEE directive. If questions appear, e.g., in terms of recycling, contact Berthold Technologies or its local representative for further information.

Disposal of chemical waste

Please dispose chemical or potentially hazardous waste always carefully and according to local legislation. It is recommended to treat potential biohazard waste by autoclave

3 General description

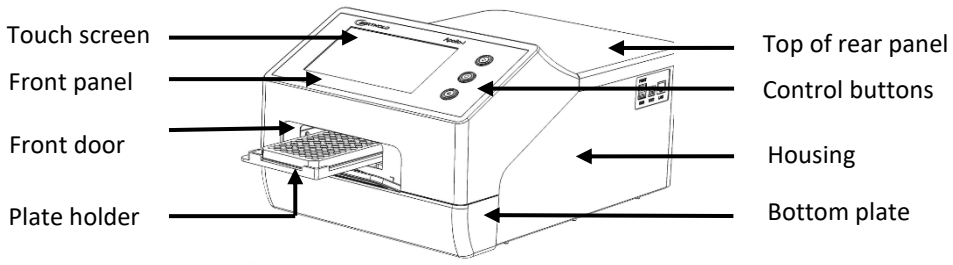
The Apollo/Apollo-I microplate reader measures absorbance in colorimetric Immuno Assays. The measurements are performed in 96 well microplates. Measurements can be performed using onboard software on the device.

3.1 Features and Benefits

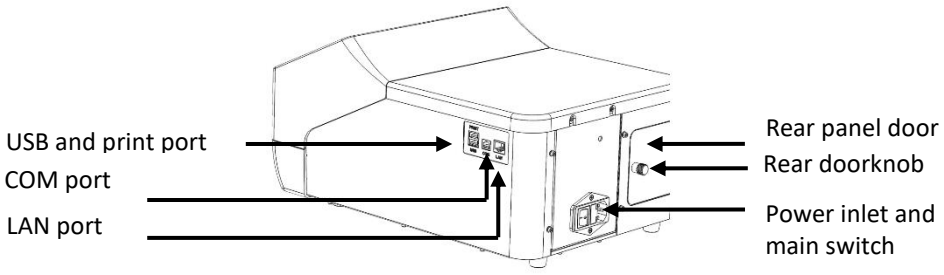
- Easy to use: 7 ‘’ color touch screen and 3 external keys.
- Operating system allows collection, editing and saving of data.
- Instrument can be used as standalone device or connected to PC using the PC software. If used in stand-alone mode data can be transferred to PC by USB drive.
- 8 position optical filter wheel, equipped with 4 standard optical filters (405nm, 450nm, 492nm, 630nm); additional optional filters are available for installation by the user.
- 8 channel vertical optical path, zero dispersion single mode fiber measurement system, automatic plate well center position function.
- 96-well visual layout allows setting of blank, sample, positive/negative control, quality control and multi-value control.
- Multi-choice tests on single plate.
- Single or double wavelength measurement.
- Self-checking optical path, mechanical motion, top reading.
- Plate shaking function, time and speed are adjustable.
- Energy saving light source (Quartz halogen lamp)
- Multiple data export ports.
- Measurement results can be exported as .CSV file to MS Excel.
- Apollo-I only: The device is equipped with a built-in incubator.

3.2 Product Overview

Before first use of the instrument, please view the figures and read this chapter carefully.



Scheme: Front view



Scheme: Side and rear view

	Function
Control button	Start, Stop and Plate in/out
Plate holder	Carries a 96 well microplate
Print port	For connection of an external printer
USB port	For connection of USB stick or mouse
COM port	For connection to external PC
LAN port	Ethernet port
Rear panel door	For service. For access to optical filter wheel or replacement of light source.
Door knob	To open back door.

Table: Description of buttons and connections

4 Getting Started

4.1 Unpacking

Each Apollo/Apollo-I is thoroughly tested before shipping. Please check the package again when you receive the instrument and contact your local distributor or manufacturer if:

- The outer package is damaged
- The outer package shows traces of moisture
- The outer package has marks of impact
- The outer package has signs of being opened

After opening, please check the instrument and the accessories content.

- Confirm that the accessories have been included according to the packing list.
- Check the instrument's appearance for any damage.

4.2 Setup and Installation

Perform the following steps:

1. Locate the instrument on a flat dry and clean worktable with a stable and level surface, keeping the front side with enough space for the plate holder to move in and out. Also keep 15 cm space for back, left and right side for ventilation and for connecting the cables.

CAUTION

Keep the instrument away from corrosive gasses and liquids.

2. Operating conditions:
   The environment should be free of corrosive steam or smoke.
   Ambient temperature: +5°C to +45°C.
   Relative humidity: 10% - 80%, non-condensing
3. Connect the instrument to an appropriate power outlet using one of the provided country-specific power cords.

CAUTION

Don't connect the instrument to a power socket without ground wire.

4. Switch on the main power using the switch on the rear of the Instrument. The front panel will cycle through a start-up and self-test screen

5 General Operation

IMPORTANT

This software description is valid for both, LB 917 Apollo and LB 917 Apollo-I (with heating function). The Apollo-I screenshots show a heating symbol in the lower right corner, but are otherwise identical to those of the Apollo without heating.

5.1 Instrument self-check

This chapter describes the default protocol operation, beginning with the self-check after power on.

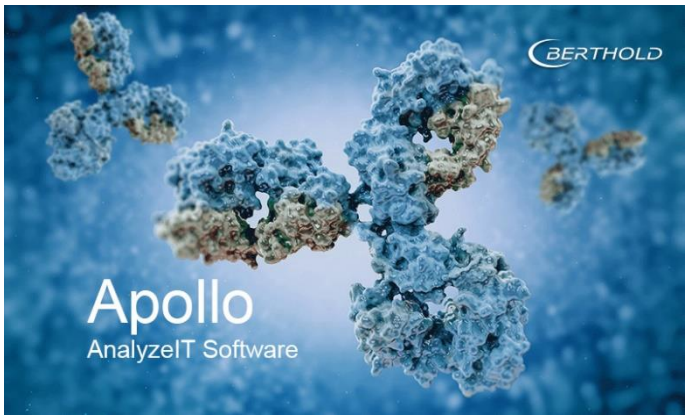


Fig 1: Startup screen for Apollo

5.2 Protocol interface

After the self-check, the Main Menu is opened.

You can choose between 4 tabs, **[Protocol], [Results], [Settings] and [Help]**, using the touch screen, or using a connected mouse.

Create, save, measure and set parameters. Refer to Fig 2.

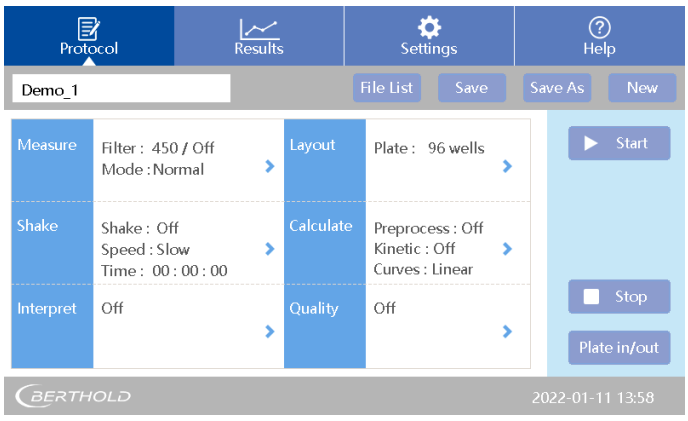


Fig 2: Main screen

5.2.1 File Management

The upper left box shows the current **[protocol name]**. As shown in Fig. 2 the current default protocol is Demo_1.

- Click **<New>** to create a new protocol. Input the new protocol name, click **<Enter>** (Fig 3).

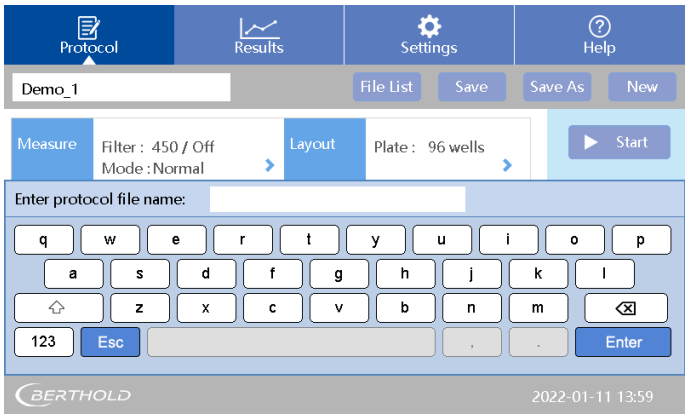


Fig 3: Set up a new protocol

- Click **<Save>**, for saving a new name and the protocol settings to memory.

  Note: If a new protocol is used to read a plate, and the data are saved, the main parameters will be grayed out and cannot be changed. As long as a new protocol is not used, the parameters can be changed.
- Click **<Save as>** after opening and modifying a current protocol and save it as a new named protocol.
- Click **<File List>** to view the list (Fig 4) of all existing files. Protocol and Data files are in the same list. Data files are marked with an icon . Choose a file and **<Open>** to view the specific information of this protocol.

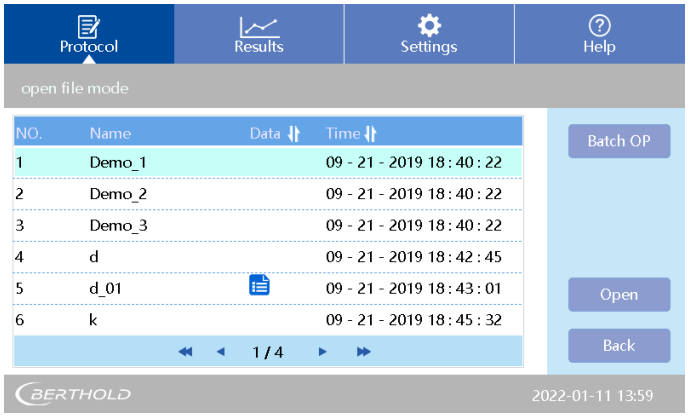


Fig 4: File List

- Use the buttons  to sort the files.

- Click the **<arrow>** buttons to toggle through pages.
- Click **<Batch OP>** (Fig 5) to enter the interface for batch deleting, importing and exporting protocol files.

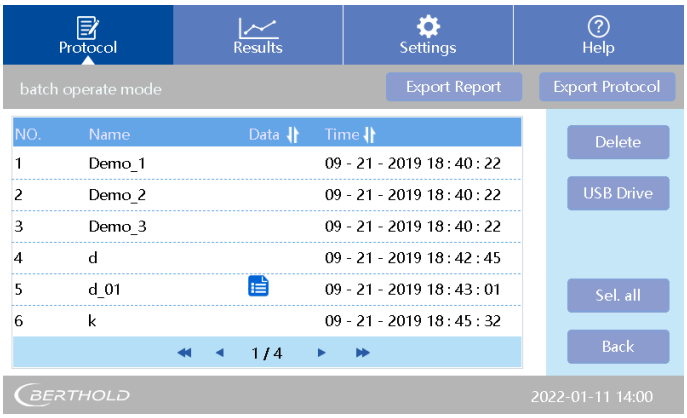


Fig 5: Submenu Batch OP

- Click **<Delete>** to delete the chosen protocol file (Fig 7) in the internal memory. A warning message will appear. Protocol files on a USB stick cannot be deleted using the instrument.
- Click **<USB drive>** to exchange protocol files between the internal memory and the external USB drive (see Fig 6-8)
- Click **<Export report>** to export result files individually or in batches from the internal disk to the external USB drive.
- Click **<Export Protocol>** to export protocol files individually or in batches from the internal disk to the external USB drive.
- Click **<Import>** to import files from the external USB drive to the internal memory.
- Click **<Sel. all>** to select all protocol files on the internal memory or the USB drive. The button will chance to **<Desel. all>,** then.
- Click **<Back>** to return to the Main menu.

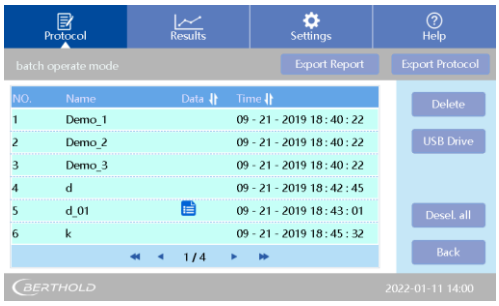


Fig 6: Select all protocols

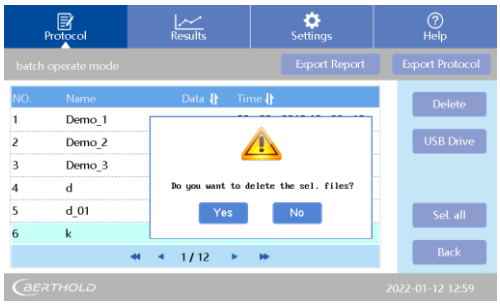


Fig 7: Warning message when deleting protocol

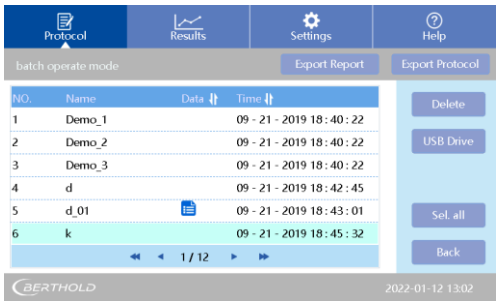


Fig 8: Select one protocol

5.2.2 Function Keys

Actions can be started by use of the function keys on the **[Protocol]** main screen (Fig 2).

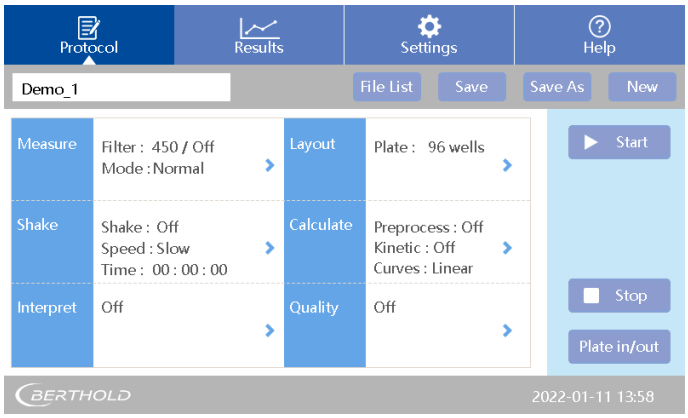


Fig 2: Protocol main screen

- Click the **<Start>** button to start a protocol.
- Click the **<Stop>** button to stop a running protocol.
- Click the **<Plate in/out>** button to open/close the plate carrier.

5.3 Perform a measurement

1. Start at the **[Protocol]/<File List>** and choose a Demo protocol. Set parameters as needed, or press **<Open>**to choose another existing protocol, or press **<New>** to set up a new protocol (see below for creating a new protocol).
2. Click **<Plate in/out>** to open the plate carrier and place the microplate onto the holder. Make sure that A1 on the microplate aligns with A1 on plate holder. (See Fig 9.)

   Diagonally to position A1, there is a spring-loaded plate which serves to position the plate correctly. Make sure that the plate is seated firmly and straight in the frame so that it does not jam when it is inserted into the instrument.

Fig 9: A1 position

IMPORTANT

Do not turn off power to instrument in the middle of a reading or when the drawer is opening or closing.

3. Click **<Start>** to begin the reading. A box will appear to **[Enter the results file name]**. Enter the file name.

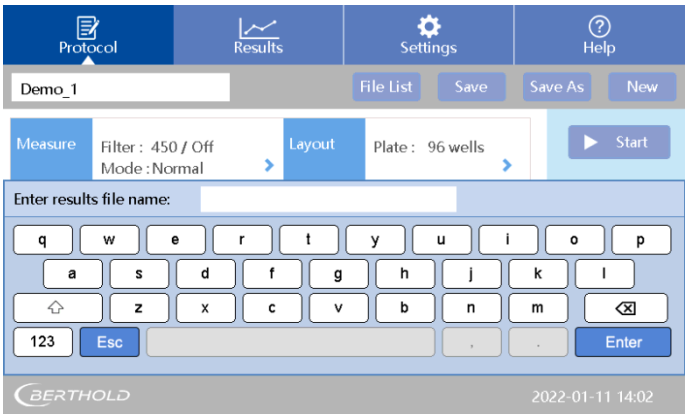


Fig 10: Enter the results file name

During a reading, a dialog box will indicate **[measuring now],** and all buttons are disabled, except for **<Stop>** which can be used to interrupt the measurement.

4. The measurement will take approximately 15 seconds, and upon completion the display will switch to the **[Report]** interface to display measurement results (see Fig 11)

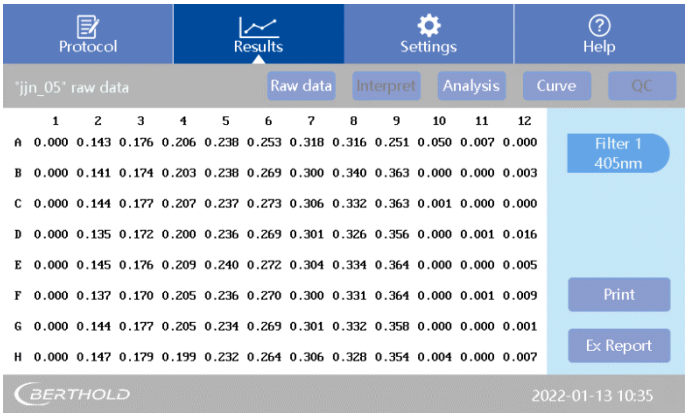


Fig 11: Report interface with results

The results may vary depending on parameter settings. See chapter 7 for additional information on the **[Results]** Interface.

6 Setup a protocol

Create a new protocol as described above by setting the parameters (wavelength, shaking settings, layout, data calculations, etc.) and saving the protocol afterwards.

Alternatively, one can choose one of the demo protocols or another existing protocol from the file list and change the settings.

Start at the **[Protocol]** main screen. See Fig 2 in chapter 5.2.

6.1 Define measurement parameters

1. Select a protocol. Click **[Protocol]/<Measure>** and set the parameters for filters (wavelength) and mode (reading speed). See Fig 12.

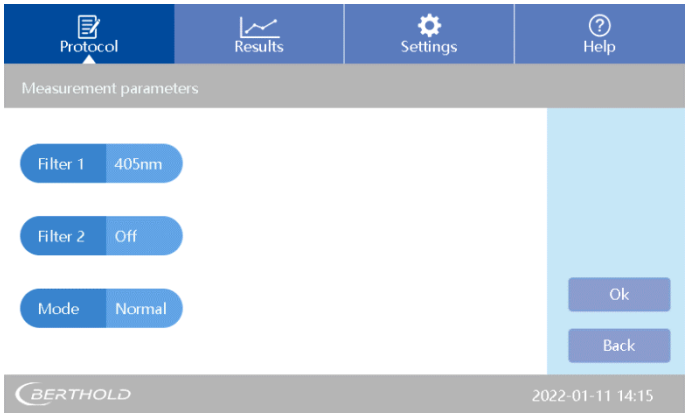


Fig 12: Measurement parameter settings

2. Define the Filter 1 settings. Click on the right side of **<Filter 1>**. All installed filters are shown. There are 4 standard filter included: 405nm, 450nm, 492nm, 630nm. Select a filter for the Filter 1 wavelength. Select the filter wavelength needed. See Fig 13.

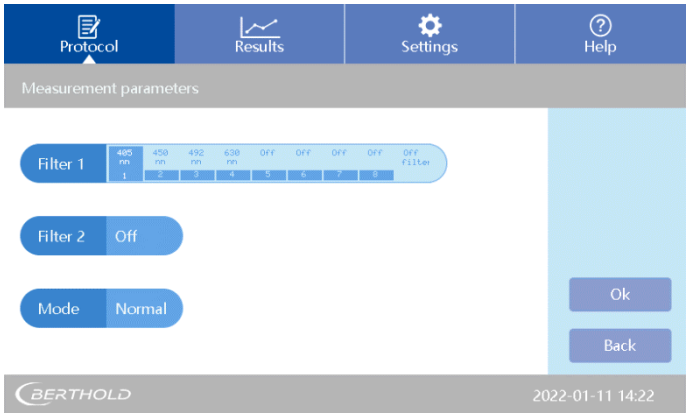


Fig 13: Filter 1 settings

3. LB 917 can measure at a single wavelength or at two wavelengths.

   Set **<Filter 2>** to **<Off>** in case of a single wavelength measurement.

If a second wavelength measurement is desired, define Filter 2 settings. Click on the right side of **<Filter2>** and select a second wavelength, different from that of Filter 1. See Fig 14.

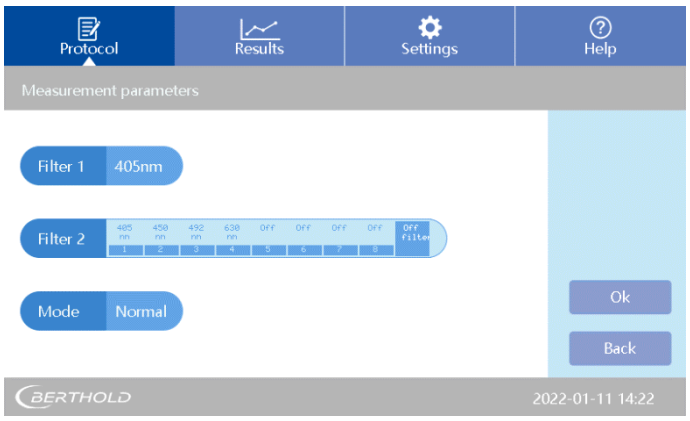


Fig 14: Filter 2 settings

4. To define the measurement speed, click on the right side of **<Mode>** and select between **<Normal>** and **<Fast>.** See Fig 15.

   Usually, **<Normal>** is recommended.

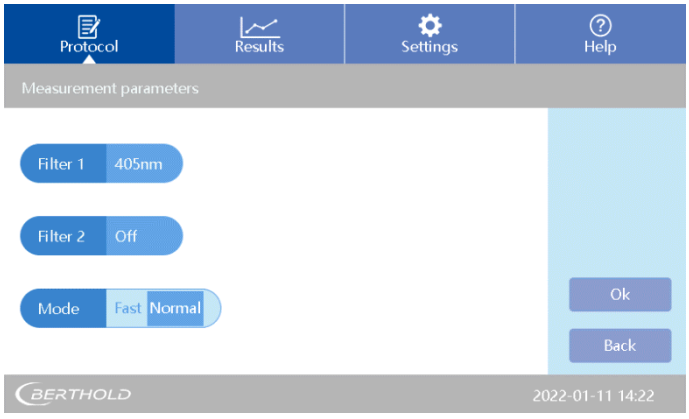


Fig 15: Measurement speed settings

5. Press **<OK>** to finish the settings and return back to the **[Protocol]** main screen.

6.2 Define the Layout

6.2.1 Plate Layout

1. Press **<Layout>** to set the layout of the sample plate. You will find an area for plate layout definition, available **<Sample types>** and the buttons **<Concentration>, <Delete all>, <OK>** and **<Back>.**

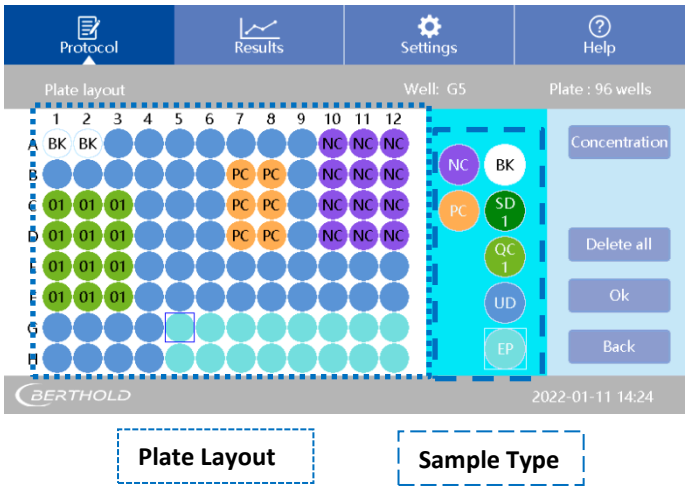


Fig 16: Plate layout

2. First select the sample type. Tap on the desired sample type. The type selected will have a white frame (on Fig 16 EP). Then select the well position on the plate layout. The selected positions on the layout will match the colour of the selected type.

   The following options for the sample type are available:

Sample Type	Description
BK	Blank; several well can be set as Blanks
SD 1	Standard sample: up to 12 standards available; set several wells with the same standard number
QC 1	Quality control: up to 9 samples available set several wells with the same number
UD	Unknown sample position: set several position as unknown samples.
EP	Empty position: for the corresponding positions on the microplate without a sample. The measurement will show EP rather
NC	Negative control position
PC	Positive control position

For standards and quality control samples: See Fig 17 and Fig 18.
Type on the key to get a menu of the number of standards. Up to 12 standards are available. Select the number you need. The number bar will disappear. Select the well position on the layout, then.

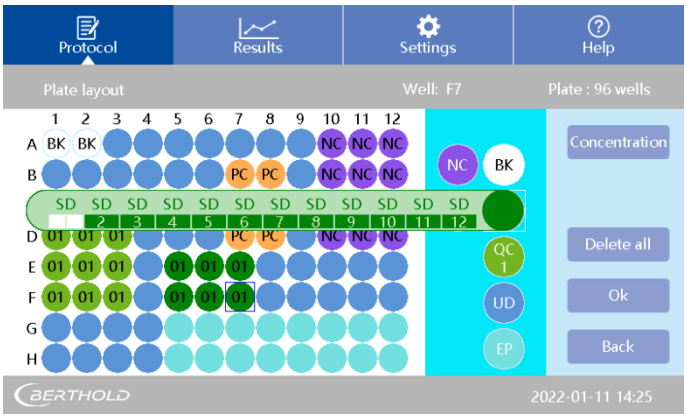


Fig 17: Menu of the number of standards

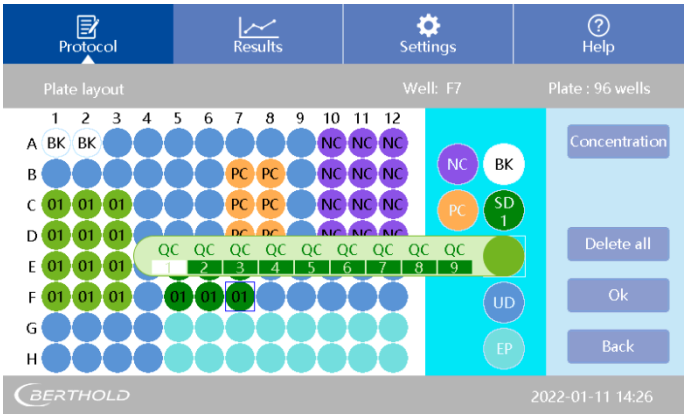


Fig 18: Menu of the number of Quality control samples

3. In case of standard samples, it is necessary to input the standard sample concentrations before starting a measurement. Go on with chapter 6.2.2.

4. After setting of all position types, press **<OK>** to return to the **[Protocol]** screen.

6.2.2 Define standard concentrations

If standard concentrations have to be defined, press **<Concentration>** at the top right of the plate layout interface. The **[set standard concentration]** interface will open. 12 standard default values will be shown. See Fig 19.

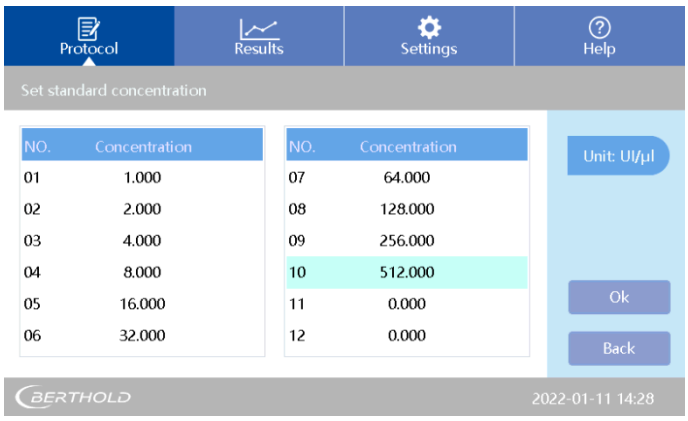


Fig 19: Set standard concentration interface

1. Set the concentration for the standard positions that have been defined in the layout. The ones which have not been set in the layout will not be considered.

2. Click the concentration number twice to input the concentration value. Confirm your input with **<Enter>.** See Fig 20.

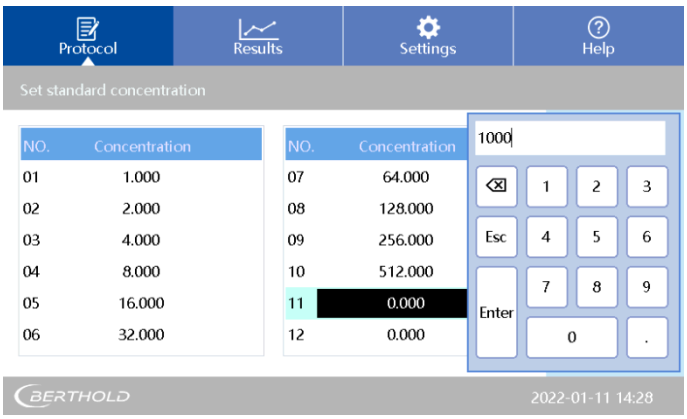


Fig 20: Set standard concentrations

Make sure that the number of each of the standards is corresponding correctly to the position of the standards as set up in the layout. Any mistake will affect the curve fitting and measurement result.

3. Select your Concentration units by pressing the **<Unit>** button at the top right side of the screen. See Fig 21.

4. Press **<OK>** to confirm and return back to the **[Plate layout],** and then **<OK>** again to return to the main **[Protocol]** interface.

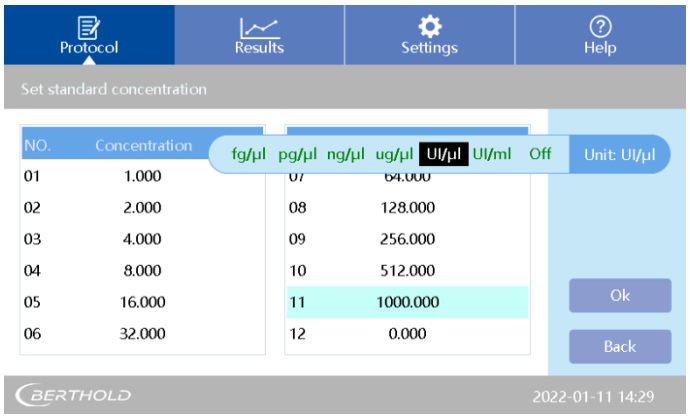


Fig 21: Selection of Units

6.3 Define shake settings

Shaking of the sample plate mixes the samples and helps the settlement of liquid samples on the bottom of the wells.

1. Click **<Shake>** on the **[Protocol]** main screen to enter the **[Shaking parameters]** interface. (Fig 22)

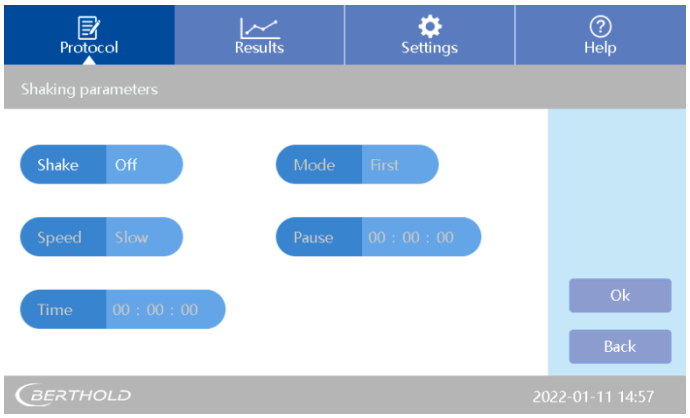


Fig 22: Shaking parameter interface

2. Click **<Shake>** and **<On>** or **<Off>** then.

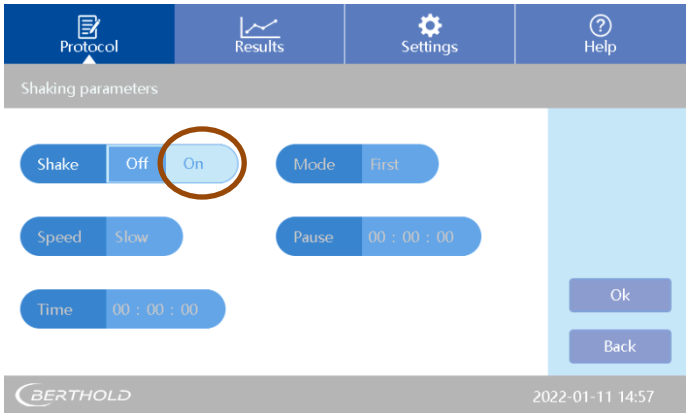


Fig 23: Set Shake on

3. Click on **<Speed>** and select between **<Slow>, <Normal>** and **<Fast>.**

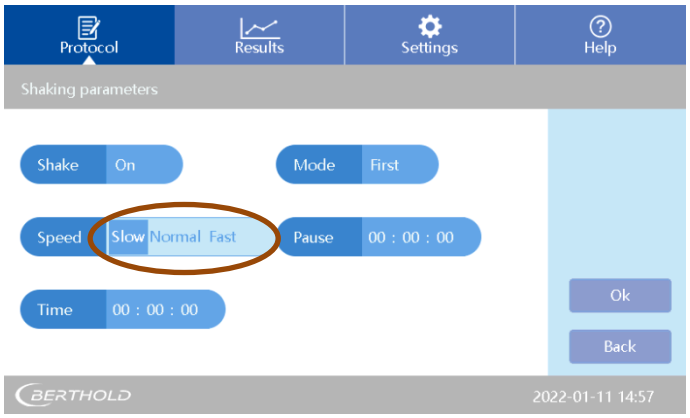


Fig 24: Speed Settings

4. Click **<Time>** to define the shaking time. The number must be set as hh/mm/ss.

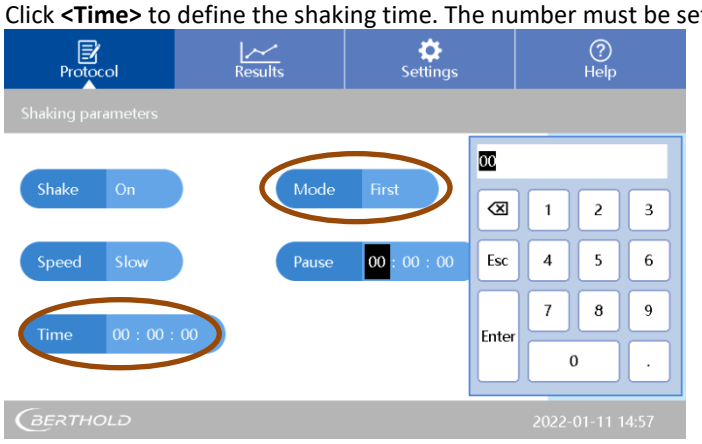


Fig 25: Shaking time setting

5. Set the shaking **<Mode>**. There are two setting: **<First>** and **<Each>**.
   Choose **<First>** to shake only before the first reading in a multiple reading.
   Choose **<Each>** to shake each time before a reading, e.g., in a kinetic assay.
6. Click the **<Pause>** button to set a pause time between shaking and reading the absorbance.
7. Press **<OK>** to complete the settings, and return to the <Protocol> interface

6.4 Calculations

This menu is for definition of the sample processing methods for

i. Kinetic
ii. Preprocess (calculation of double wavelength measurements)
iii. Curve fitting of standard curves

1. See Fig 2: **[Protocol]** main interface.
2. Click **<Calculate>** on the **[Protocol]** interface to enter **[Calculation parameters].**

6.4.1 Kinetic

Perform the following steps to set up a Kinetic protocol.

1. Click **<Kinetic>** is **<on>.**
2. Click **<Readings>**, and input the number of desired measurement readings.

   If one filter is used: the maximum number of kinetic readings is 219.

   If two filters are used: the maximum number of kinetic readings is 99.

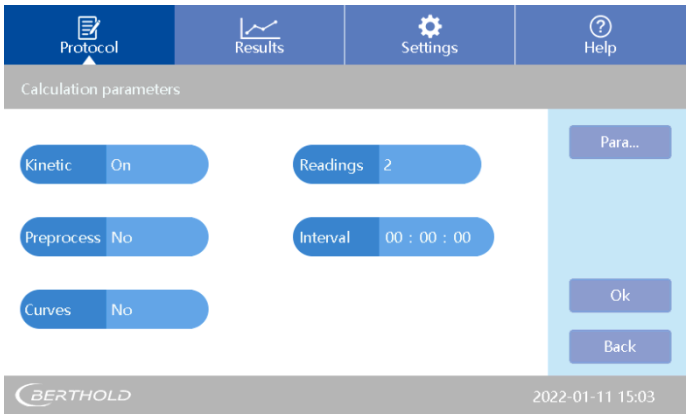


Fig 26: Calculation parameters

3. Click the **<interval>** button to set the interval between the readings. The format is hh:mm:ss.
4. Click the **<Para>** button on the right side of the screen and open the kinetic parameter submenu. See Fig 27.

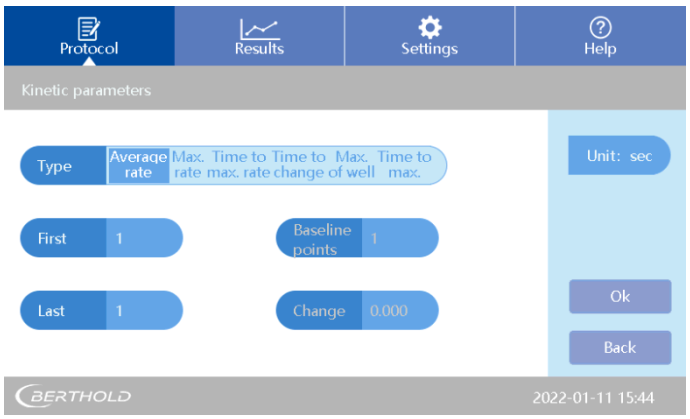


Fig 27: Submenu Kinetic Parameter

5. Select the **<Type>**. There are different options available:

Type	Description
<Average rate>	If **average rate** is selected, the result shows the average rate of absorbance changing in each well. The average kinetic rate calculates the slope of the signal vs time. The rate is calculated by linear regression using every two readings within the selected data and time range. Then all the slope is averaging. **First/Last**: define the first and last reading point for calculation.
<Max rate>	The software searches the data for the maximum rate (slope of signal vs time) that is found in each well. To obtain the maximum rate, the rate is calculated by linear regression using every two readings within the selected data and time range
<Time to max rate>	Time required to reach the maximum rate.

Type	Description
<Time to change>	Calculates the time required to reach a defined change in the signal (in each well). The three parameters at right are active. See Fig 28. **Baseline Select:** The baseline parameter is the number of initial readings that are used for the baseline calculation. Select the value from which the change in the signal is calculated. There are 2 options: **Begin/End:** The number of initial readings is calculated from the beginning/end of the measurement. **Baseline Points:** The number of readings used for baseline calculation. The software calculates the average value of the readings selected from the baseline. The average equals the baseline value. If you select **End,** the change is extrapolated starting from the end of the measurement. **Change:** The change from the baseline as an absolute change. The change in signal is specified in the **Change** parameter and is compared to the baseline. The signal change from the baseline value is calculated as an absolute value. Set the value. This change is added to the baseline value to create a required change value. The result is the exact interpolated time at which the given change occurs. If the absorbance change is less than the setting, it will not be recorded.
<max absorbance of well>	Use the calculation to search for the maximum measurement value in each well.
<time to max absorbance>	The time required to reach the max absorbance.

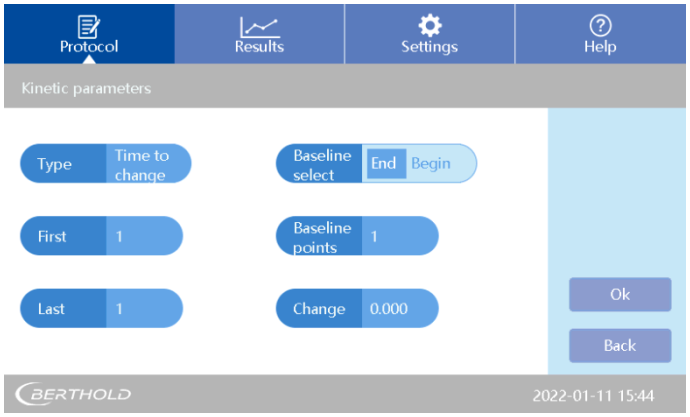


Fig 28: Time to change settings

Set parameters according to experimental requirements.

6.4.2 Preprocess calculation

IMPORTANT

This submenu is for double wavelength measurement only. The two wavelength measurements M1 and M2 can be charged differently. See Fig 29.

1. Click on the right side of the **<Preprocess>** button in the **[Calculate parameters]** inter-face. A menu as shown in Fig 29 will appear.

Fig 29: Preprocess calculation options

2. The following calculations are available:

   <M1-M2>, <M1/M2>, <M1+M2>, <M1*M2>, <M2-M1>, <M2/M1>

3. Select the desired calculation.

6.4.3 Curve fitting

1. See Fig 26.
2. Click the **<Curves>** button in the **[Calculate parameters]** inter-face.
   A menu as shown in Fig 30 will appear.
3. The following options are available:

   <NO> (=off), <Linear>, <Logistic>, <Cubic Spline>, <Point to Point> and <Factor>.

   Press the selected option according to your assay information.
4. After measurement, the software will produce a curve fitting using the standard absorb-ance and concentration values.

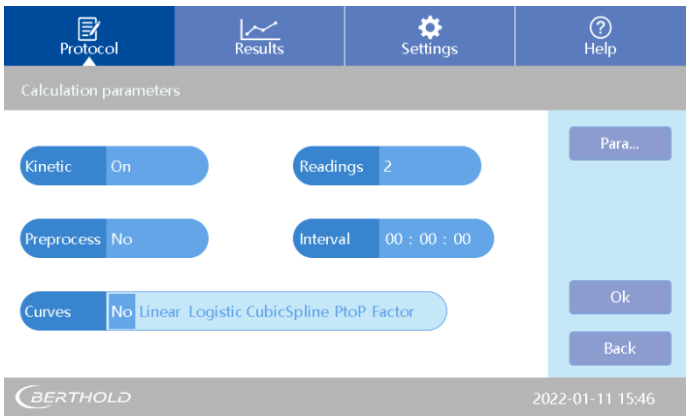


Fig 30: Curve fitting options

6.5 Interpret

IMPORTANT

This menu is for definition of assays using positive and negative controls for calculation of Cut-off thresholds (qualitative analysis).

1. See Fig 2: **[Protocol]** main interface.
2. Click **<Interpret>** on the **[Protocol]** interface to enter the submenu **[Interpretation]** for qualitative analysis. See Fig 31.

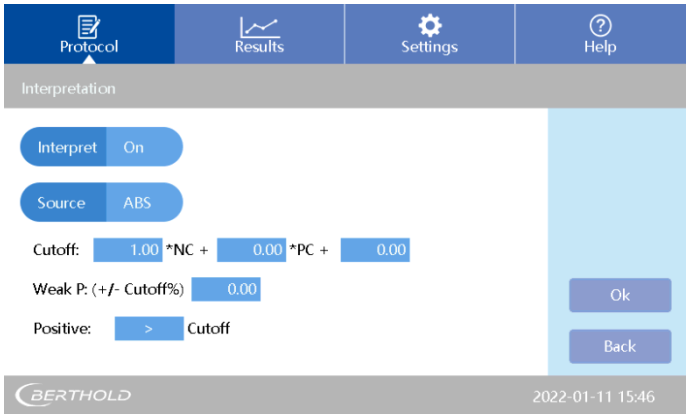


Fig 31: Qualitative analysis

3. Click **<Interpret>** and select **<On>.**
4. Click **<Source>.** Select between**<ABS>** (absorbance) or **<Conc.>** (concentration) as desired.
5. Define the formula for Cutoff. Formula for the threshold value Cutoff is:

   a x NC + b x PC + c

   a,b,c: reagent control coefficients, which can be set as needed
   NC: negative control average value
   PC: positive control average value.

   Click coefficient **<a>** to type the coefficient value needed to multiply by NC, and confirm by pressing **<OK>.** Set **<b>** and **<c>** in the same way.

   If the Cutoff does not require a coefficient calculation with PC or NC, the coefficients **<b>** and **<c>** can be left as zero.
6. Weak P: (+/- Cutoff%): Input a **<value>** which means the measurement result within this Cutoff % will be judged as weak positive. Calculate and set the value according to the description in the reagents user manual.
7. Click the symbol **>,** to toggle between **>** and **<**, comparing the positive interpretation to the Cutoff value. Set it according to the reagent user manual.
8. Click **<OK>** to complete and return to main interface.

6.6 Quality Control

1. See Fig 2: **[Protocol]** main interface and click <**Quality>** to enter the submenu for quality control. See Fig 32.

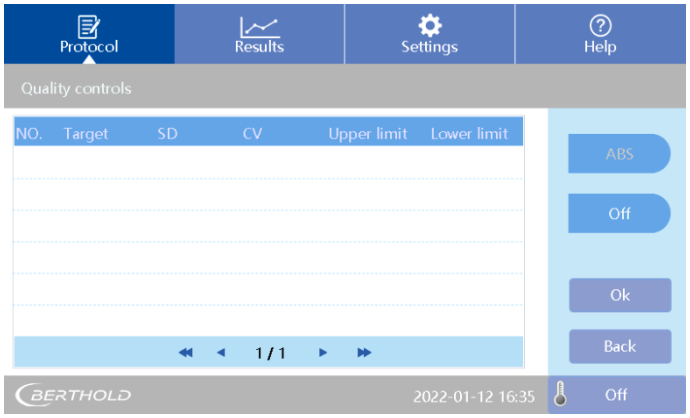


Fig 32: Quality control

2. Click **<Abs>** or **<Conc.>** as quality control variable.
3. Click **<On>** or **<Off>** to turn on or off the quality control.

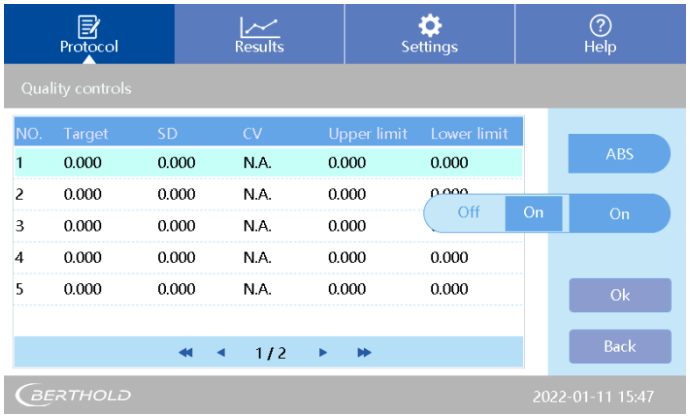


Fig 33: Switch Quality control on/off

4. If quality control is switched on, click the values in the **[Target]** column and set the quality controls concentration or absorbance values, depending on what has been selected above. Set the values in the **[SD]** column accordingly. The respective quality control values can be found in the reagent kit user manual.
5. When using Quality controls, set the QC samples in the **[Layout]** interface, refer to the section 6.2.1.

6.7 Incubator settings (Apollo-I only)

1. Click into the lower right corner of the protocol interface, showing the incubator status (usually set to **<Off>**), to enter the incubator setting interface. See Fig 34
2. Set incubation **<On>.**

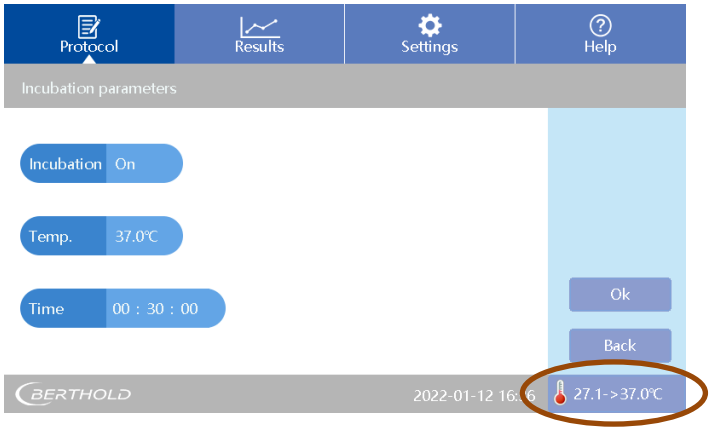


Fig 34: Incubator settings

3. Click **<Temp>** to set the incubator temperature as needed.

   Temperature range: room temperature + 4°C to 50°C
4. Click **<Time>** and set the required incubation time. The incubation time is completed when the countdown is over. Teasurement starts afterwards.
5. Click **<OK>** to return to the main interface.

Incubator specification:

- Temperature range: room temperature + 4°C to 50°C
- Liquid warm-up time from 25℃ to 37℃ ≤50min（96-well plate，200ul water/well）
- Temp. Uniformity ±0.5℃ @37℃
- Temp. Accuracy ±0.5℃ @37℃

7 Results

This interface shows the measurement results. Measurements are performed in the **[Protocol]** interface. After measurement, the display will switch to the **[Results]** interface automatically, showing the current measurement results.

Alternatively you can view results by clicking the **[Results]** tab at the top of the screen.

If **<Interpret>, <Analysis>, <Curve>** and **<QC>** values are set to **<On>** in the **[Protocol]** interface, the different calculated values can be viewed additionally to the Raw data. If they have been set to **<Off>**, the buttons will be greyed out and there will be no results.

7.1 Results interface

7.1.1 Raw Data

1. Click <**Raw Data>** to display the absorbance raw data values.
2. If the measurement was set to use and calculate with 2 wavelengths, click the **<Filter x>** button on the right side to select the filter whose absorbance values are to be viewed.

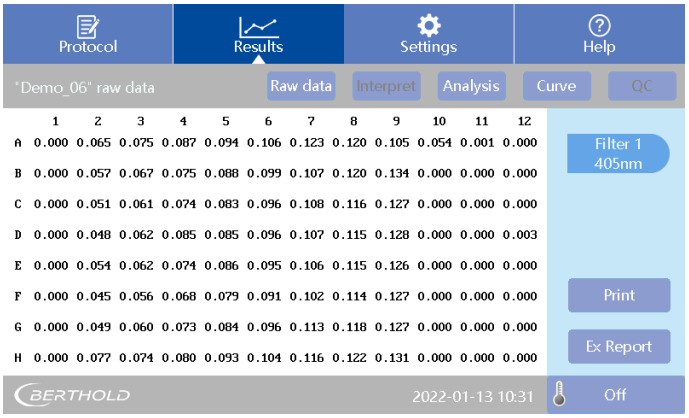


Fig 35: Raw data results

3. Click **<ExReport>** to enter into the export report interface. See Fig 36.

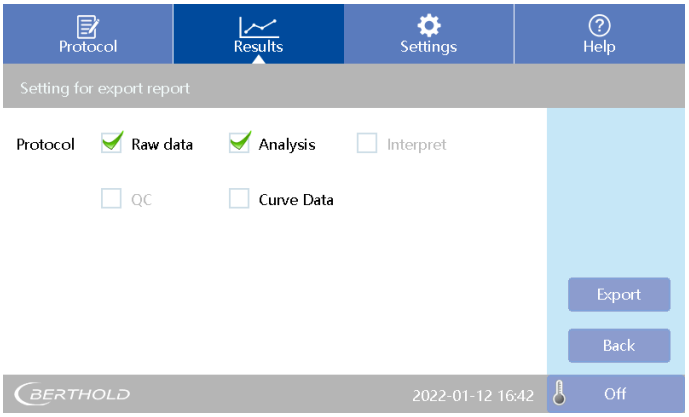


Fig 36: Export report settings for Kinetics (example)

4. Click **<Export>.** Kinetic reading data are exported in .csv-file format with individual rows including the full set of data of all wells. This allows the user to select rows of data and create graphs.

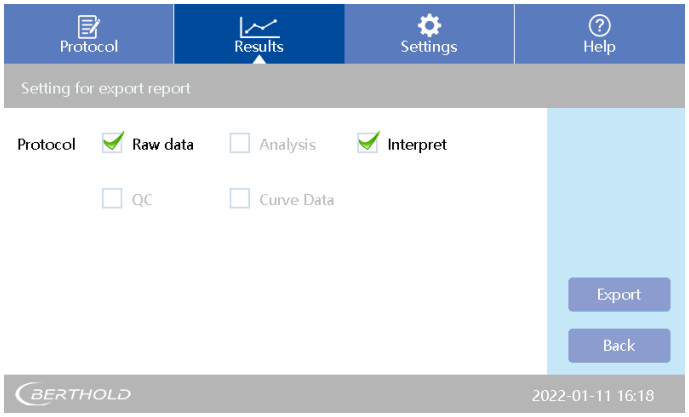


Fig 37: Export settings for qualitative analysis (example)

5. If a thermal printer is connected (optional), click **<Print>** to print data.

7.1.2 Interpret results

1. Click **<Interpret>** to show the current interpreted measurement results.

Fig 38: Interpret results

On the right side the threshold value **Cutoff** is displayed. Refer to chapter 6.5 for details. Absorbance values above the Cutoff are marked with + or ++ and additionally with colours.

Flags	Description
++ in red	positive
+ in blue	week positive

IMPORTANT

If the results are printed: P indicates positive and + indicates weak positive.

This is different from the display on the screen.

7.1.3 Analysis

This submenu is for quantitative analysis. It is used for calculation of concentrations using the correlation of absorbance to concentration as it has been established by the standard settings and the curve fit.

1. Click **<Analysis>** to display the results of your quantitative assay run in microplate format. See Fig 39

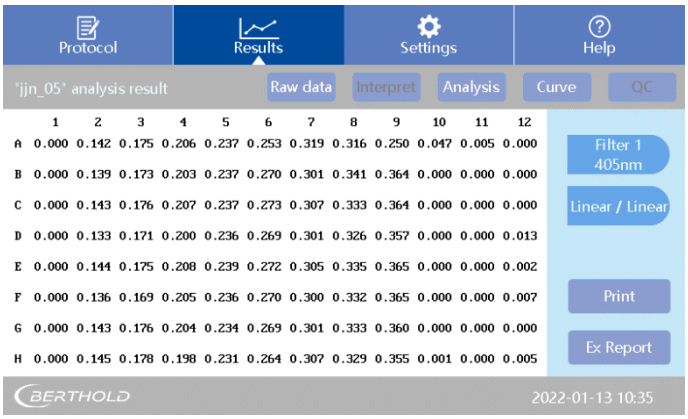


Fig 39: Measurement results for quantitative analysis

2. **<Linear/Linear>** shows the method of curve fitting. See next section for description.

7.1.4 Curve

1. Click **<Curve>** to view the curve of the concentration value vs. absorbance reading value. Fig 40 shows a curve fitting with linear scale for absorbance on the y-axis and linear scale for concentration on the x-axis (Linear/Linear).
2. You may select between **<Linear/Linear>, <Linear/Log>, <Log/Linear>** or **<Log/Log>** for curve fitting.
3. It is possible to adjust the curve fitting settings if the fit of the curve is not optimal.

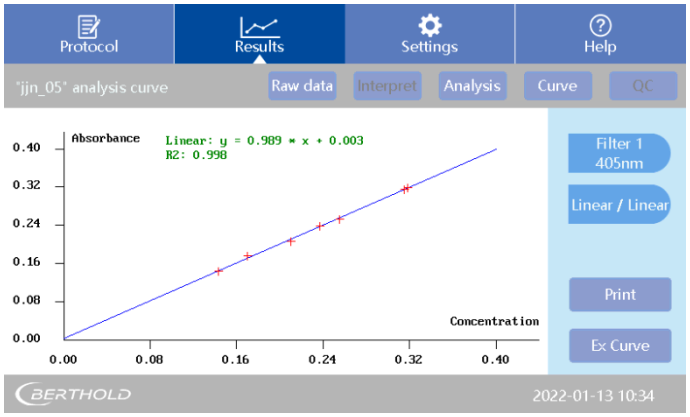


Fig 40: Curve fitting

7.1.5 QC results

If a protocol has been set up with QC samples, they will be assessed as passed or failed.

1. Click **<QC>.** See Fig 41. If a QC sample has failed, it is marked in red colour.

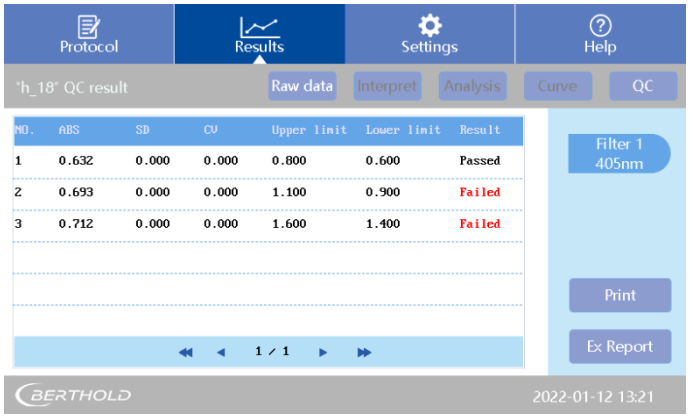


Fig 41: QC results

7.2 Kinetic Results interface

7.2.1 Kinetic Raw Data

Fig 42 shows Cycle 1 of a kinetic absorbance measurement.

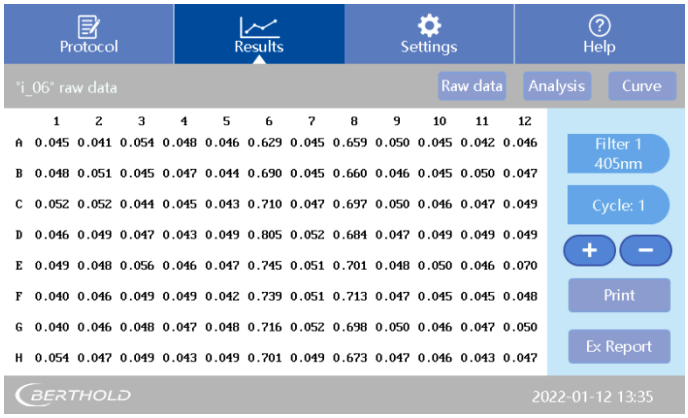


Fig 42: Kinetic Raw Data

1. Use **<+>** or **<->** to scroll through the measurement cycles.
2. **<Cycle 1>** indicates the sample number. Click this button and input the specific cycle number you want to jump to.
3. If absorbance values are shown in red colour, this indicates that the absorbance is outside of the instruments range.

7.2.2 Kinetic Analysis

1. Click **<Analysis>.** See Fig 43.
2. The data processing method, e.g., Average rate, is indicated. See chapter 6.4.1, Fig 27 for details.

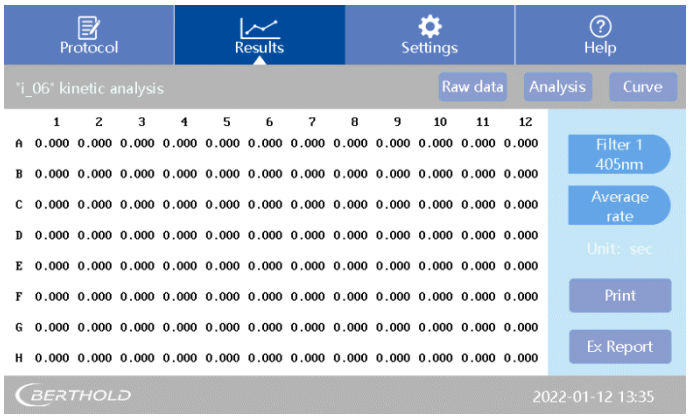


Fig 43: Kinetic Analysis

7.2.3 Kinetic Curve

A kinetic curve showing the absorbance value vs. the cycle number can be displayed for each sample position. See Fig 44.

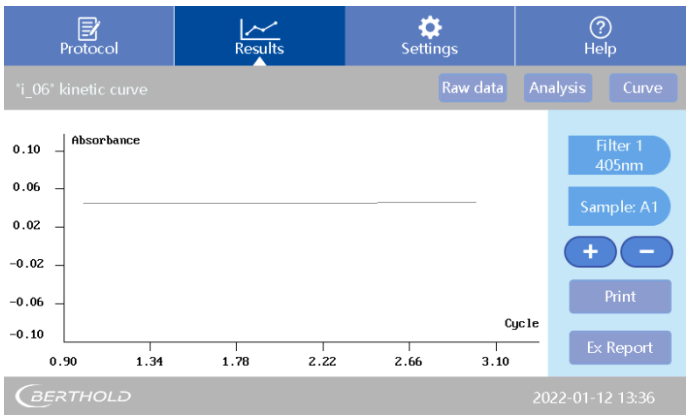


Fig 44: Kinetic curve of sample A1

1. Click the **<+>** or **<->** button to shift the sample position to A2, A3, etc.
2. To view all sample curves press **<->** at sample position A1. See Fig 45.

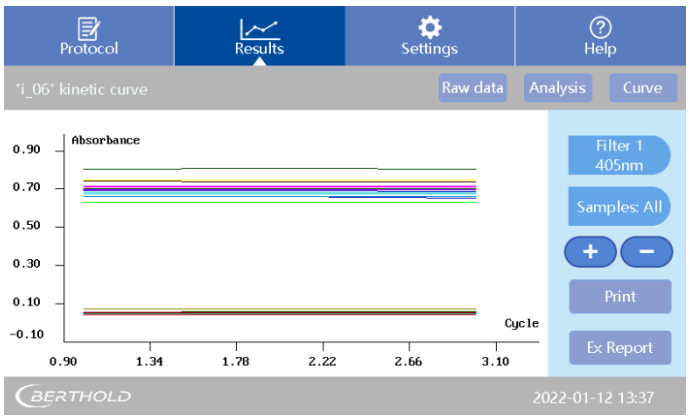


Fig 45: Kinetic curve of all samples

8 Settings

This part contains the settings of language, filter, maintenance, printer and the Date&Time menu. Tap on **[Settings]** and select the submenu according to your needs.

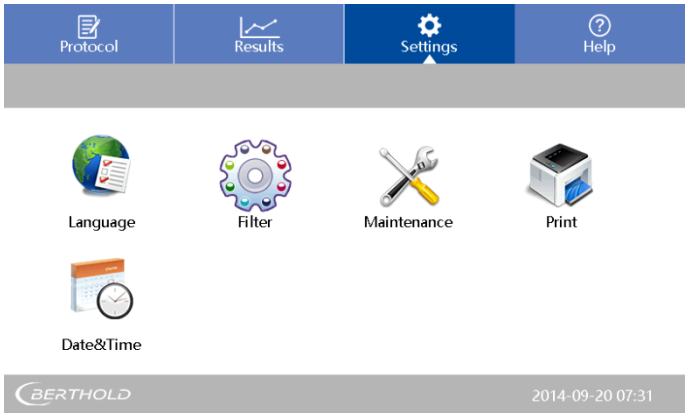


Fig 46: Settings menu

8.1 Language

1. Press **<Language>** in the **[Settings]** tab page. See Fig 47.

Fig 47: Set Language

2. Click on the right side of **<Language>** and select the language needed. Currently only English and Chinese are available.
3. Confirm your settings with **<OK>** or leave the menu with **<Back>.**

8.2 Filter

This instrument is equipped with four standard filters which have positions on the filter wheel from 1-4. For filter positions see Fig 48 and Fig 49 below.

If extra filters are bought together with instrument, the filters can be installed by the user.

The customer will need to update the filter wheel settings in the software afterwards.

IMPORTANT

Please install new filters into the instrument prior to adjusting the filter wheel settings in the software!

Please refer to Chapter 10.2 for details.

1. Click the Filter icon in the **[Settings]** interface. See Fig. 48

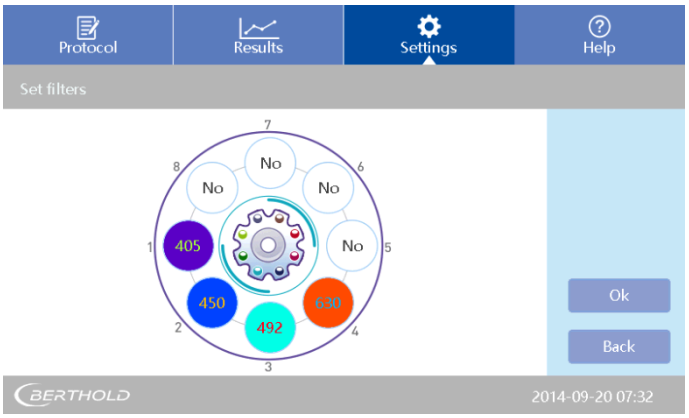


Fig 48: Filter settings

2. Click a blank position **<No>**, input the wavelength using the pop up window. See Fig 49.

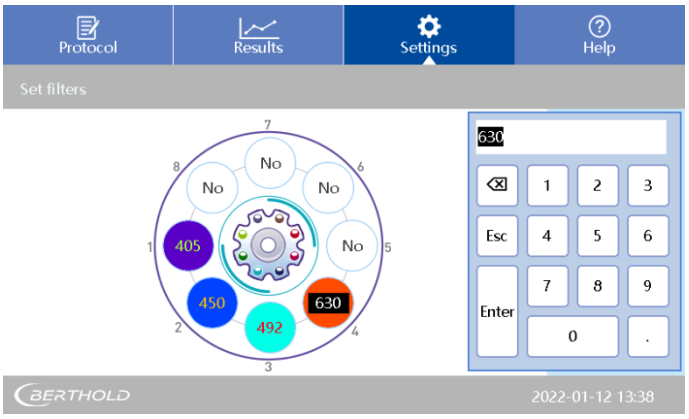


Fig 49: Set new filter

In case of a wrong input, double click to input again.

IMPORTANT

The position number of a filter in the software and the filter wheel must be identical. Otherwise the readings will be incorrect.

3. Click **<OK>** to complete after setting.

8.3 Maintenance of microplate drawer

1. Press **<Maintenance>** in the **[Settings]** tab page. See Fig 50.

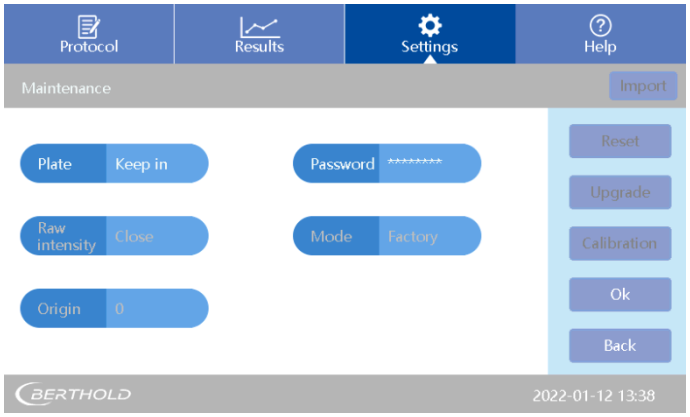


Fig 50: Maintenance menu

2. Only the microplate drawer option **<Plate>** can be adjusted by the user. This setting is used to adjust how the microplate drawer is controlled.

   Two options are available:
   <Keep in> means the microplate drawer will stay closed after a measurement.
   <Keep out> means the microplate drawer will open after a measurement.

3. Confirm your settings with **<OK>** or leave the menu with **<Back>.**

All other maintenance settings can only be adjusted at the factory (password protected) or by trained service personnel

8.4 Print

1. Press **<Print>** in the **[Settings]** tab page. See Fig 51.

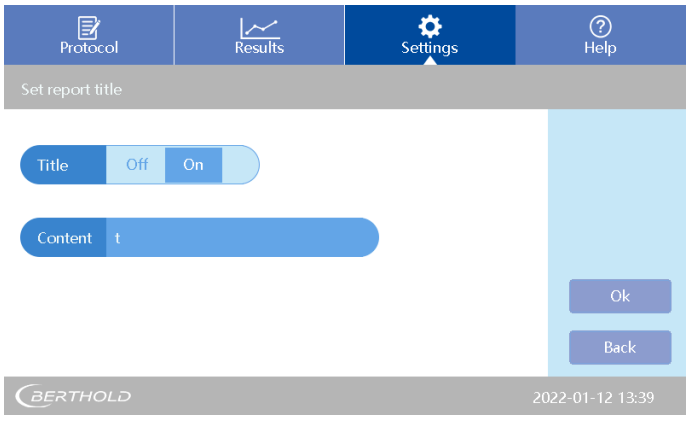


Fig 51: Set report title

2. The report title will be printed if **<Title>** is set **<On>.**
3. Click on the right side of **<Content>** and insert your report title.
4. Confirm your settings with **<OK>** or leave the menu with **<Back>.**

8.5 Date&Time

1. Click **<Date&Time>** in the **[Settings]** tab page. Click on the right side of **<Date>** or **<Time>** on the area to set. See Fig 52.

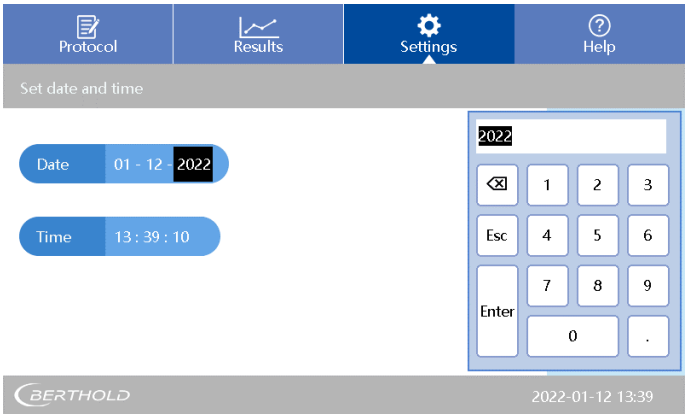


Fig 52 Set Date&Time

Format of Date: **Month – Day - Year**
Format of Time: **Hour : Minute : Second**

2. Confirm every single entry with **<Enter>**.
3. Click **<OK>** to complete the setting or leave the menu with **<Back>.**

9 Help

This menu provides a short introduction on the functions of the tab pages.
See Fig.53.

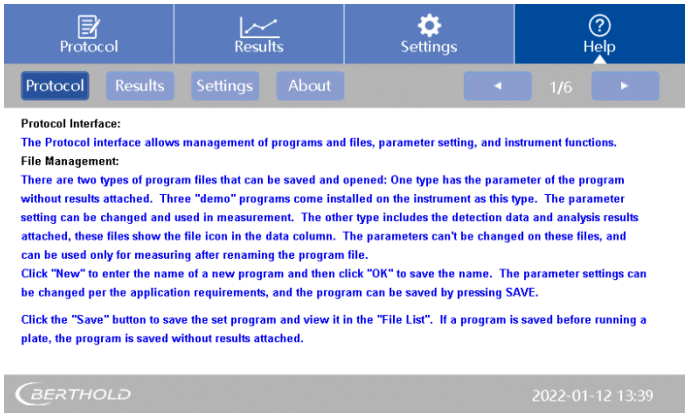


Fig 53: Help menu

1. Click [**Protocol], [Results]** or **[Settings]** to review a summary of each function.
2. Click **<About>** to for information on the current firmware version.

10 Maintenance of the instrument

Please observe the following:

- The Instrument are calibrated before leaving the factory. The user is not allowed to disassemble the instrument and make adjustments. If anything is defective, please contact Berthold Technologies. Refer to chapter 2, too.
- Continuous emergency turning on/off is not allowed.
- Make sure apply the device with correct input voltage scope.
- **Parts replacement:** All of the components of this instrument have been designed, manufactured and tested to ensure quality and long life. If used properly, according to this instruction manual, the main electronic and mechanical parts will not need regular maintenance.

10.1 Light source replacement

Contact Berthold Technologies or its distributors for information on ordering a new halogen lamp if replacement is necessary.

Operate as follows:

1. Make sure cut-off the power supply before replacement of any part.
2. Open the back door of the instrument. Locate the light source (see Fig 56).Loosen the screws on the light source connector with a small screw driver and remove this connector by gently pulling it upwards.

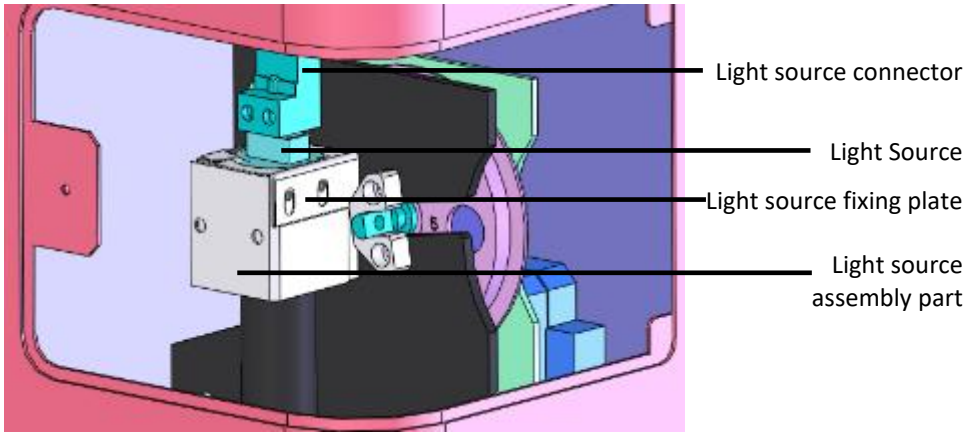


Fig 54: Position of light source

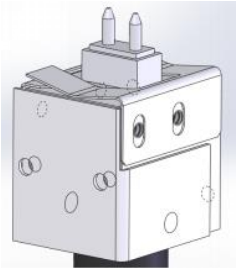


Fig 55 Details of Fig 54

3. Loosen the light source fixing plate and remove it, remove the light source by pulling upward and remove it from the instrument.

CAUTION

If the light source has been used recently, it still may be hot.

NOTICE

Do not touch the glass surface of the lamp, always hold it at the base. Do not use excessive force to prevent damage.

4. Replace a new light source by reversing the above steps, pay attention to the position of the light on the light source part, loaded flat and stable then fix the fixing plate (Fig54).

10.2 Adding optical filters (optional)

The LB 917 Apollo/Apollo-I Reader is equipped with 4 standard filters inside. Additional filter need to be purchased separately and can be installed by the user if other wavelength are needed.

NOTICE

Do not touch the filters to avoid fingerprints or smudging which can lead to inaccurate readings.

Do not touch any other mechanical or electrical part inside the instrument when installing the filter wheel.

For installation of filters, take the following considerations into account:

1. Turn off the instrument.
2. Wear laboratory gloves to prevent touching the optical filter glass.
3. Loosen the knob at the rear side to open the back door and remove the optical filter wheel using the included Allen key. See Fig 57 below.
4. Identify the empty position you want the filter to put in. Position numbers are marked on the back side of the filter wheel.
5. Remove the fixing plate by removing the screws (Fig. 58) and insert the new filter in the desired empty position. Make sure that the filters do not fall out since the fixing plate has been unscrewed! The arrow direction on the filter should be the same as the light incident direction. See Fig 57 below.
6. Replace the fixing plate and the screws.
7. Load the wheel back into the slot with the number marks facing the rear of the instrument and re-fasten it with the Allen key.
8. Close the back door.
9. Adjust the filter wheel settings in the software afterwards. See chapter 8.2 for instructions.

IMPORTANT

Please install new filters into the instrument prior to adjusting the filter wheel settings in the software!

The position number of a filter in the software and the filter wheel must be identical. Otherwise the readings will be incorrect.

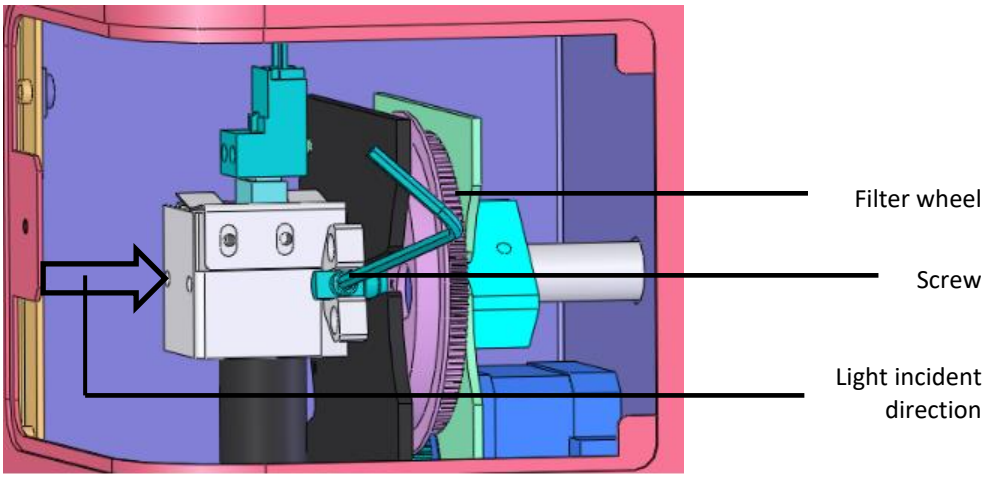


Fig 57 Remove the filter wheel

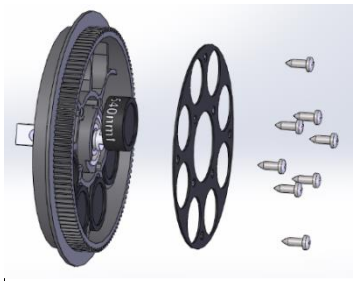


Fig 58 Unscrew the fixing plate

10.3 Cleaning and Decontamination of the instrument

The microplate holder should be cleaned using a cloth damp with water. If necessary, use a mild detergent. In case of decontamination or heavy pollution use a damp cloth with a small amount of 70% alcohol. Always wipe with a damp cloth with water afterwards and dry the microplate holder carefully.

Other parts and the outer housing of the instrument can be cleaned as needed with a cloth damp with water. If necessary, use a mild detergent.

NOTICE

If liquid has entered the instrument, disconnect the power cord and contact the service!

11 Trouble Shooting

Problem	Possible Cause	Solution
Instrument will not start	No power	Check power supply, cable plugs, fuses and voltage of outlet
Lamp will not turn on	Power to lamp failure Lamp defective	Check power before replacement of lamp; Replace the lamp
Weak light	Lamp defective	Replace the lamp
No reset signal of microplate	Photoelectric switch defective	Replace photoelectric switch. Contact the service!
Measurement result with big deviation or no result. Filter wheel does not work or turns too much before stopping.	Filter wheel photoelectric switch defective	Replace Filter wheel photoelectric switch Contact the service!
Microplate does not move forward or not backward.	Movement obstruction	Check microplate holder
Measurement results not precise	Microplate is not placed correctly in the drawer	Check if microplate is placed correctly in the holder
Start of measurement is interrupted	Communication interrupt.	Press <stop>, restart to measure
Strong light	New filter added in the software, but without filter on wheel.	Delete the filter setting which is not needed. New filters must be in the correct slot numbers
Self-check alarm E016 - E025 (Apollo-I only)	Abnormal incubation function	Check whether the incubation line is connected

12 Technical Data

Parameter	Specification
Light Source	Quartz-Halogen Lamp, spectral range: 340 – 750nm
Detection Unit	Photo diode, 8 channels + 1 reference channel
Dynamic range	Up to 4 OD
Resolution	0.001 Abs
Linearity	$R^2 \geq 0.995$ (0-3 OD)
Wavelength Accuracy	≤ ± 2 nm
Absorbance Stability	≤ 0.005 OD (0-2 OD) ≤ 0.3% (2-3 OD) ≤ 2.0% (3-4 OD)
Absorbance Accuracy	± 1 % or ± 0.005 OD (0-3 OD) whichever is greater (@405 nm) ± 2 % (3-4 OD) (@405 nm)
Absorbance Precision	≤ 0.2 % CV (@0-3 OD) (@405 nm) ≤ 1 % CV (@3-4 OD) (@405 nm)
Sensitivity	≥ 0.01 OD
Channel deviation	< 0.01 OD
Microplate Format	96 wells
Reading Speed	Single wavelength < 15 s / 96 well, Double wavelength < 28 s / 96 well (Normal mode)
Shaking	3 shaking modes: slow, medium, fast
Optical filter	Four standard filter 405/450/492/630nm, max load eight filters.
Display	7 inch touch screen (800 x 480 dots)
Data output	3 USB ports, for PC, USB disk and optional printer
Regulations	CE
Power Supply	100 – 240 VAC ± 10%, 50/60 Hz
Working Temperature and Humidity	Ambient temperature: +5°C to +45°C 10-80% humidity, non-condensing Maximum relative humidity of 80% for temperatures up to 31°C; decreasing linearity to 50% relative humidity up to 40°C
Altitude	Max. 2000m above sea level
Dimension	295 × 440 × 225 mm (W×D×H)
Weight	Apollo: 10 kg Apollo-I: 11 kg
Software	Built-in software for powerful and validated data analysis

Incubator Parameter (Apollo-I only)	Specification
Incubator temp range	Ambient +4°C – 50°C
Liquid warm-up time	Liquid warm-up time ≤ 50 min from 25℃ to 37℃ (96-well plate, 200ul water/well）
Temp. Uniformity	± 0.5°C @37°C
Temp. Accuracy	± 0.5°C @37°C

Modifications due to technical advancement reserved.

13 Preparing for Transport

NOTICE

The following safety provisions must be taken to transport or ship the instrument.

1. Turn the instrument off and disconnect power supply.
2. Clean the instrument according to the instructions for cleaning and decontamination in this manual.
3. For safe shipment put the instrument and the accessories into the original cardboard box and seal it.
4. If the original box is not available, please contact service@berthold.com
5. Before returning, please refer to the information on return shipment and decontamination in chapter 14.4.

14 Warranty and Technical Issues

14.1 Special spare parts

CAUTION

If a power cord has to be replaced, use only the spare parts supplied by Berthold Technologies or its local representative.

14.2 Warranty statement

The instrument is sold in accordance with the general conditions of sale of Berthold Technologies GmbH & Co KG and its affiliates and representatives.

Berthold Technologies warrants this product to be free of defects in material and workmanship for a period of 24 months from the date of delivery, ex works Bad Wildbad.

Berthold Technologies or its authorized representative will repair or replace, at its option and free of charge, any product that under proper and normal use proves to be defective during the warranty period.

Berthold Technologies shall in no event be liable or responsible for any incidental or consequential damage, either direct or indirect.

The above warranty shall not apply if:

1. the product has not been operated in accordance with the operating manual
2. the product has not been regularly and correctly maintained
3. the product has not been repaired or modified by a Berthold Technologies authorized representative or user
4. parts other than original Berthold Technologies parts are used
5. the product and parts thereof have been altered without written authorization from Berthold Technologies GmbH & Co KG
6. the product has not been returned properly packed in the original Berthold Technologies packaging

This warranty does not apply to any third-party product involved in the application.

14.3 Customer service

Customer service will be provided in the first instance by the network of Berthold Technologies representatives. In the event of any problem experienced with your instrument, the first recourse should be your local Berthold Technologies representative. For further problems requiring hardware or software expertise, contact the Technical Support group at Berthold Technologies GmbH & Co KG. Here are the contact data:

Berthold Technologies GmbH & Co KG

Technical Support
Calmbacher Str. 22
75323 Bad Wildbad / Germany
Phone: +49 (0)7081 177 114
Fax: +49 7081 177 301
Email: service@berthold.com

Please have the following relevant information available:

1. serial numbers, part number, revision: see production label on instrument
2. software and firmware versions

14.4 Return Shipment to Berthold Technologies

In case of an instrument return shipment please refer to our website and follow the instructions:

http://berthold.com/rma

An RMA number is required to ship an instrument for repair and identify your instrument when it arrives.

Confirmation on Decontamination

If you return an instrument to Berthold Technologies for servicing purposes which is not properly decontaminated, there will be a health risk for Berthold Technologies employees.

We therefore need your confirmation that the instrument was decontaminated and cleaned properly before shipping. Follow the instructions on cleaning, decontamination and preparations for transport and confirm the decontamination in the online form.

15 Index

Adding optical filters 49
Calculations 31
Cleaning / Decontamination 50
Confirmation on Decontamination 56
Connections 9
Consignes de Sécurité 12
Contact information 7
Curve fitting 34
Customer service 55
Date&Time settings 46
Disposal 16
Double wavelength meas. 34
Features and benefits 17
File Management 21
Filter installation 43
Function keys 23
Help menu 47
Incubator 37
Intended use 10
Kinetic 31
Language settings 43
Light Source 48
Maintenance 48
Measurement parameters 25
Microplate drawer 45
Perform measurement 23
Plate Layout 27
Print settings 45
Product overview 17
Protocol interface 20
Qualitative analysis 35
Quality control 36
Results 38
Return shipment 56
Revision history 7
RMA number 56
Safety instructions 10
Self-check 20
Setup a protocol 25
Setup and installation 19
Shaking 30
Sicherheitshinweise 14
Spare Parts 55
Standards 28
Storage conditions 16
Technical Data 52
Transport 54
Transport conditions 16
Troubleshooting 51
Typographical conventions 8
Unpacking 19
Warranty Statement 55