LB 942

Tristar 3 Multimode Microplate Reader

Tristar 5 Multimode Microplate Reader

Operating Manual

69173BA2

Rev. Nr.: 00, 02/2020

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

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

DISCLAIMER
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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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1 Preface

1.1 Contact Information

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1.2 The Operating Manual

1.2.1 Validity of the Operation Manual

This operating manual is valid for all configurations of

LB 942 Tristar 3 (ID 69173) and LB 942 Tristar 5 (ID 69185)

from the delivery of the 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 these instructions thoroughly and completely before working with the product. We have tried to compile all information for safe and proper operation for you. Keep the operating manual for future reference.

The manufacturer reserves the right to make changes to this operating manual at any time without stating reasons.

However, should questions arise which are not answered in this manual please contact BERTHOLD, bio@berthold.com.

Revision history of the manual

Date	Changes
02/2020	Initial document

1.2.2 Copyright

1.2.3 Structure of the Operating Manual

This Operating Manual is structured as follows:

The manual covers all manipulations in a work flow order starting from installation via regular operation to maintenance.

Headings, important notes and names of software buttons and dialog boxes are highlighted.

In each section you are guided through the respective procedures step by step. The steps are consecutively numbered in each section.

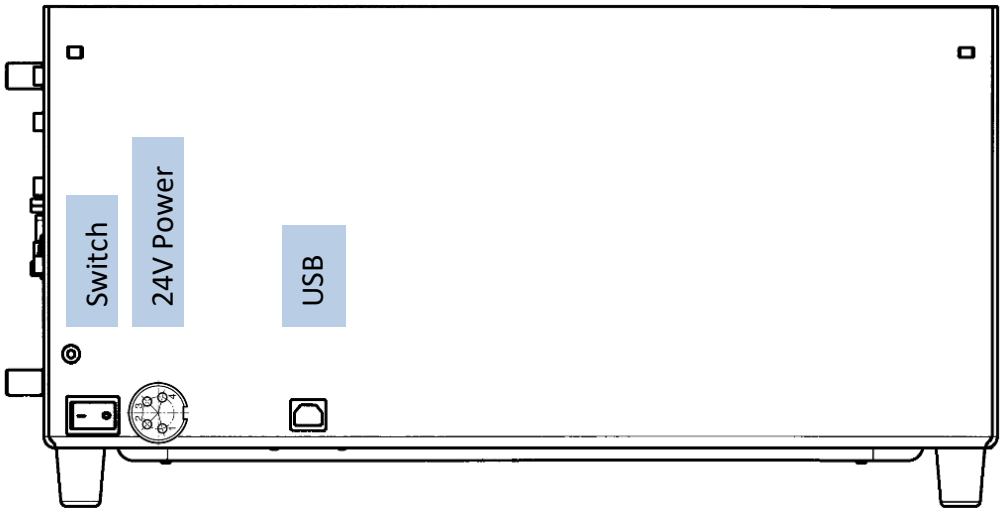
For your convenience, illustrations are placed directly next to the respective text.

For warnings, notes and symbols used in this manual see chapter 1.5.2.

1.3 Explanation of LEDs and Beeps

LED	Instrument status
lights up **green**	Instrument OK and connection to PC OK
lights up **yellow**	Instrument OK, no connection to PC
flashes **yellow** + 1 short beep	New CAN is installed after power on of instrument
lights up **yellow** + 1 long beep	CAN correctly installed
lights up **red**	Shortly after power on of the instrument (during initialization)
flashes **red** + 2 short beeps	Error after power on of instrument / CAN module not correctly installed

1.4 Connections and Switches



	Description
switch	Power switch
24V Power	Power supply unit (24V DC, only use original power supply)
USB	USB B connection to PC

1.5 Typographical Conventions

1.5.1 Symbols on the Instrument

Symbols	Description
	Warning – general warning, risk of danger
	This instrument 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.
	Manufacturer symbol
	Warning - Hot surface
	Warning – Biohazard material

1.5.2 Warnings, Notes and Symbols used in this Manual

⚠ DANGER

Indicates an imminent, major hazard, which will certainly result in serious injuries or even death if the hazard is not avoided.

⚠ 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 are symbolized by numbers
< >	Buttons are printed inside angular brackets in bold type
[ ]	Menu titles and items, dialog boxes and select lists are printed inside square brackets in bold type
/	Menu items and submenu item are separated by an angular line.

2 Important information

2.1 Safety Instructions

This operating manual includes information and warnings that have to be observed by the user in order to ensure safe operation of the instruments**.**

IMPORTANT

General notes of the manufacturer:

- The instruments have been manufactured in accordance with the safety requirements for electrical measuring systems.
- The instruments are tested by the manufacturer and supplied in a condition that allows safe and reliable operation.
- Only accessories, in particular desktop power supply, power supply cable and data connection cable if any, supplied with the instrument or by Berthold Technologies for working with this instrument may be used for operation.
- The instrument was tested by an independent accredited testing laboratory. It meets the requirements of DIN EN 61326-1: Class A and is compliant to the limits and methods of DIN EN 55011 Class A. If necessary, take measures to mitigate the radio interferences, which could possibly occur in the domestic environment.

Safety instructions:

Please do always act according to the following safety instructions, before as well as during operation of the system!

⚠ DANGER

Dangerous voltage:

- The user is responsible for connecting the instrument in accordance with the valid regulations for electrical instruments.
- The mains supply voltage range of 100 – 240 VAC ± 10%, 50/60 Hz, must not exceed.
- Disconnect the power supply before opening the instrument.
- To disconnect the unit from the power supply, the plug of the AC adaptor must be disconnected from the unit.
- The electronic unit of the detector generates high voltage. Do not touch it during operation!

- Protect yourself from electrostatic charge, as discharge could damage sensitive instrument parts, especially sensitive parts of the computer and electronics boards. This is especially true when working on device openings, e.g. filter openings.
- The mains adapter is provided with a 3-pole grounded plug. If your wall outlet does not allow connection of a 3-pole plug, have a suitable wall outlet installed by qualified personnel or use an adapter for safe grounding. Please observe the safety specifications of the grounded plug. Set the instrument up to ensure easy access to the mains switch.
- All supplied devices and additional devices must be connected to the mains with grounded connection: Use a grounded plug!

⚠ CAUTION

Damage to persons or property by improper start of operation:

- Before set up and operation of the instrument it is necessary to read the instructions below as neither safe operation of the instrument nor safety of the user are guaranteed otherwise. Failure to follow the instructions may invalidate the warranty.
- If the law lays down regulations on the installation and/or operation of sample measuring systems, then it is the operator's responsibility to adhere to them.

- The manufacturer has done everything possible to guarantee that the equipment functions safely, both electrically and mechanically. The user has to make sure that the instrument will be set up and installed properly to guarantee safe operation.
- This equipment must be installed and used in accordance with the manufacturer´s recommendations. Installation must be performed by properly trained and authorized personnel.
- Set up the device in such a way that the mains plug is easily accessible.
- The ventilation slits must not be covered. A distance of at least 10 cm to neighboring units or walls must be maintained.
- Remove the transportation lock before switching on the instrument.

⚠ CAUTION

Damage to persons or property by improper use of the instrument:

- The instrument may only be operated by personnel who have been trained on the use of the system. It is strongly recommended that all users read this manual prior to use.
- BERTHOLD TECHNOLOGIES assumes no liability for any damages, including those to third parties, caused by improper use or handling of the instrument.
- The units are not for use in in-vitro diagnostic (IVD) procedures. Use the instrument only for the designated application. Please refer to the intended use statement.

- The instrument is designed for indoor use only.
- Hot surface: Care while touching the cover or the lamp, it can be hot. Never touch the heating foil inside the device.
- Never put parts of your body or other devices into the instrument while the unit is in operation.
- If you can see that the instrument has become unsafe to use, switch it off and disconnect it from power supply.
- If liquid gets inside the instruments, pull the power cord. Clean the unit or have it cleaned by an authorized service center.

⚠ CAUTION

Damage to persons or property by chemical or biological substances:

- Observe all legal requirements for the handling of biological or chemical assay reagents, samples and waste.
- Prior any measurement/operation with reagent liquids an individual risk assessment has to be done by the user.
- Some assays, assay components or specimen may pose a biohazard, a risk of infection or other kinds of danger for the user. Always adhere to the safety precautions and recommendations for assay performance and temperature range, written in the assay's package insert. Wear appropriate protective equipment such as laboratory coats or chemical rubber cloves and act carefully to avoid chemical burn, contamination and potential infection.
- The operator is responsible for the use of reagents. Follow strongly safety advices of the reagent supplier and the test manufacturer.
- If there is any doubt about the compatibility of decontamination and cleaning agents with parts of the device or with substances contained therein, please contact the device manufacturer or his local representative.

- Use only reagents recommended by the kit manufacturer and in accordance with the kit manufacturer's instructions for the designated assay, for priming the injector lines or washing and cleaning.
- Explosive substances must not be used with the instrument.
- Avoid spilling liquids on the outer surface, the plate carrier or other parts of the instrument.Wipe up all spills immediately and decontaminate the surfaces in cases of biohazard spilled liquids.
- Waste (when priming/washing the tubing) always has to be disposed properly: If a waste pump is installed, a bottle has to be connected. If no waste pump is present, a suitable prime plate has to be placed below the injectors during priming/washing.
- Liquid from priming/washing may be corrosive (see chapter “Cleaning Tubing”)
- Injector solutions may be pumped back only if the appropriate reagent bottle is connected.
- Dispose chemical and biohazard waste carefully and according to local legislation. It is recommended to treat potential biohazard waste by autoclaving.

⚠ CAUTION

Damage to persons or property by improper service or repair:

- The operator may only perform the maintenance work described in this user guide.
- Use only parts described in this manual for servicing.
- The tests and service work recommended by the manufacturer has to be performed to make sure that the operator remains safe and that the instrument continues to work correctly. Any service and maintenance work not described in this user guide has to be performed by authorized service personnel.
- Reliable instrument function can be guaranteed only when original spare parts are used.

- Service and repair work may be carried out by qualified personnel only.
- Do not open any instrument doors as long as the instrument is in operation.
- Disconnect power supply before opening the instrument.
- Upon removal of the front and top parts of the housing no safety measures are in effect. Be aware of any moving parts. The interior of the instrument may reach temperatures that can cause burns. Some parts of the instrument may remain hot without visual indication for some time after the power has been turned off.
- Protect yourself from electrostatic charge, as discharge could damage sensitive instrument parts, especially sensitive parts of the computer and electronics boards.
- There are no exchangeable electrical components in the instrument. In case of malfunction call authorized service personnel.

⚠ CAUTION

Damage to property by incomplete transport package

The instrument should be shipped in its own case. For transport all transportation locks (e.g. for the plate carrier) have to be installed.

NOTICE

Cleaning:

For instrument cleaning, please refer to the respective sections in this manual.

2.2 Consignes de Sécurité

Ce mode d'emploi contient des informations et avertissements qui doi-vent être suivis par l'utilisateur afin de garantir un fonctionnement en toute sécurité des instruments.

IMPORTANT

Informations générales du fabricant :

- L´appareil a été fabriqué conformément aux directives de sécurité en vigueur pour les appareils de mesure électroniques.
- Les appareils sont contrôlés à l'usine et livrés dans un état assurant la sécurité de fonctionnement.
- Seuls les accessoires, en particulier le bloc d'alimentation, le câble d'alimentation et, le cas échéant, le câble de connexion de données, fournis avec l'instrument ou fournis par Berthold Technologies pour travailler avec cet instrument peuvent être utilisés pour le fonctionnement.
- L'instrument a été testé par un laboratoire d'essai indépendant et accrédité. Il répond aux exigences de la norme DIN EN 61326-1 : Classe A et est conforme aux limites et méthodes de la norme DIN EN 55011 Classe A. Si nécessaire, prenez des mesures pour atténuer les interférences radio qui pourraient éventuellement se produire dans l'environnement domestique.

Consignes de Sécurité:

Il est impératif de respecter les consignes de sécurité suivantes, non seulement avant la mise en service mais aussi pendant le fonctionnement de l'appareil!

⚠ DANGER

Tension électrique dangereuse :

- Il est de la responsabilité de l'utilisateur d'installer l'équipement conformément à la réglementation électrique.
- La plage de tension d'alimentation du secteur ne doit pas dépasser 100 - 240 VAC ± 10%, 50 / 60 Hz.
- Débrancher l'alimentation avant d'ouvrir l'appareil.
- Pour déconnecter l'appareil de l'alimentation électrique, la fiche de l'alimentation doit être retirée de l'appareil.
- L'unité électronique du détecteur génère une tension élevée. Ne pas la toucher pendant le fonctionnement!

- Protégez vous des charges électrostatiques afin d'éviter de provoquer des décharges qui pourraient endommager des parties sensibles de l'appareil telles que les cartes électroniques ou PC. Ceci concerne en particulier lors d'ouvertures de l'appareils, notamment lors de la manutention des barrettes de filtres
- L'instrument est fourni avec une fiche à 3 broches dont une prise de terre. C'est une règle de sécurité. Il est nécessaire que cette fiche puisse être branchée sur une prise reliée à la terre. Dans le cas contraire, veillez à faire appel à un électricien afin d'installer une telle prise. Il ne faut pas négliger cette consigne de sécurité.
- Tous les appareils fournis et les appareils supplémentaires doivent être raccordés au réseau avec mise à la terre : Utilisez une prise de courant avec mise à la terre !

⚠ ATTENTION

Dommages corporels ou matériels en cas de mauvaise mise en service:

- Avant l'installation et la mise en service de l'instrument, tous les utilisateurs des appareils sont tenus de lire ces instructions d'utilisation. Le cas échéant, le fonctionnement correct de l'appareil et la sécurité de l'utilisateur ne peuvent être garantis. Ne pas suivre ces instructions d'utilisation entraine une annulation de la garantie.
- Si des réglementations légales existent pour le montage et/ou l'utilisation d'instruments de mesure, il est de la responsabilité de l'installateur et de l'exploitant de les respecter.
- Le constructeur a fait le nécessaire pour assurer le fonctionnement sûr des appareils (du point de vue électrique, électronique et mécanique). L'utilisateur est tenu de veiller à ce que les appareils soient installés correctement afin de garantir leur utilisation en toute sécurité.
- Les appareils ne doivent être utilisés que par des personnes autorisées et leur utilisation est réservée au personnel compétent. Tous les utilisateurs des appareils sont tenus de lire d'abord ces instructions d'utilisation.
- Installez l'appareil de manière à ce que la fiche secteur soit facilement accessible.
- Les fentes d'aération ne doivent pas être couvertes. Une distance de 10 cm au minimum doit être maintenue entre l'appareil et d'autres appareils ou parois.
- La fixation de transport doit être démontée avant la mise sous tension de l'appareil.

⚠ ATTENTION

Dommages corporels ou matériels dus à une mauvaise utilization:

- Les appareils ne doivent être utilisés que par des personnes autorisées et leur utilisation est réservée au personnel compétent. Tous les utilisateurs des appareils sont tenus de lire d'abord ces instructions d'utilisation.
- BERTHOLD TECHNOLOGIES décline toute responsabilité de dommages résultant d'une utilisation non conforme à l'emploi prévu, y compris des dommages causés à un tiers.
- L'appareil n'est pas prevu pour l'utilisation diagnostique in vitro et ne peut être utilisé que pour son usage initiallement prévu.
- L'appareil est destiné uniquement pour une utilisation intérieur.
- Surface chaude: Attention en touchant le couvercle ou la lampe – danger de brûlures! Ne jamais toucher la feuille chauffante à l'intérieur de l'appareil.
- Ne mettez jamais une partie de votre corps ou des objets dans l'appareil lorsque celui-ci est en fonctionnement
- Si vous vous apercevez que le fonctionnement de l'appareil n'est plus sûr, il faut alors l'arrêter et le débrancher de la prise secteur.
- Si du liquide a pénétré dans l'appareil il faut immédiatement le débrancher. Il faut ensuite, le nettoyer ou bien le faire nettoyer par une agence de service après-vente autorisée.

⚠ CAUTION

Dommages aux personnes ou matériel causés par des substances chimiques ou biologiques:

- Respecter la réglémentation en vigueur concernant la manipulation des déchets biologiques, des réactifs et des prélèvements/échantillons.
- Avant la première mesure ou manipulation avec les réactifs, l'utilisateur doit effectuer une évaluation des risques
- Certains systèmes de tests, composants de tests ou échantillons peuvent potentiellement présenter un risque biologique, un risque d'infection ou un autre type de danger. Respectez toujours les consignes de sécurité et les recommandations relatives à la performance et à la température recommandée du test, inscrites sur la notice. Porter un équipement de protection approprié, comme des blouses de laboratoire et / ou des gants de protection contre les produits chimiques, et faire preuve de prudence pour éviter les brûlures chimiques, la contamination et les infections potentielles.
- L'utilisateur assume la responsabilité exclusive de l'utilisation des réactifs. Respecter scrupuleusement les consignes de sécurité du fournisseur de réactifs et du fabricant du test.
- En cas de doute sur la compatibilité des produits de décontamination et de nettoyage avec les pièces de l'appareil ou avec les substances qu'il contient, veuillez contacter le fabricant de l'appareil ou son représentant local.

- Utilisez uniquement les réactifs recommandés par le fabricant du kit et conformément aux instructions du fabricant du kit pour le test choisi, pour l'amorçage des lignes d'injection ou le lavage et le nettoyage.
- Les substances explosives ne doivent pas être utilisées avec l'appareil.
- Évitez les éclaboussures de liquides sur la surface extérieure, le porte-plaque ou d'autres parties de l'instrument. Essuyez immédiatement toutes les éclaboussures et décontaminez les surfaces en cas de d'éclaboussures de liquides présentant un danger biologique.
- Les déchets (lors de l'amorçage / lavage de la tubulure) doivent toujours être éliminés correctement: si une pompe à déchets est installée, une bouteille doit être connectée. Si aucune pompe à déchets n'est présente, une plaque vide et appropriée doit être placée au-dessous des injecteurs pendant l'amorçage / lavage
- Le liquide provenant du tuyau d'évacuation peut être corrosif (voir chapitre "Cleaning Tubing / lavage des tubulures")
- Les solutions à injecter peuvent être pompéessi le flacon de réactif approprié est connecté
- Éliminer les déchets chimiques et biologiques avec soin et conformément à la législation en vigueur. Il est recommandé de traiter les déchets potentiellement dangereux à l'autoclave.

⚠ ATTENTION

Dommages corporels ou matériels dus à un entretien ou à une réparation inadéquats

- Seuls les travaux d'entretien décrits dans le manuel peuvent être effectués par l'utilisateur.
- Seules les pièces spécifiées peuvent être utilisées.
- Afin d'assurer la sécurité de l'utilisateur et le bon fonctionnement des appareils, effectuer les travaux d'inspection et d'entretien recommandés par le fabricant. Toutes les mesures d'entretien et de réparation allant au-delà de celles spécifiées dans ce manuel sont réservées aux techniciens autorisés.
- Le fonctionnement correcte est garanti si et seulement si les pièces de rechange utilisées soient appropriées.

- Les travaux d'entretien et de réparation devront être confiés exclusivement à des spécialistes dûment formés.
- N'ouvrez aucune porte de l'appareil tant qu'il est en fonctionnement.
- Débrancher l'alimentation avant d'ouvrir l'appareil.
- Si vous ouvrez l'appareil, votre sécurité et celle de l'appareil ne sont plus garanties (capôt et parois de l'appareil). Faites attention aux parties mobiles. L'intérieur de l'appareil et certaines pièces peuvent atteindre des températures pouvant provoquer des brûlures s'il y a contact. Même lorsque l'appareil est éteint, des parties peuvent rester chaudes alors qu'il n'y a pas d'indication visible de température élevée.
- Protégez vous des charges électrostatiques afin d'éviter de provoquer des décharges qui pourraient endommager des parties sensibles de l'appareil telles que les cartes électroniques ou PC.
- Il n'y a pas de composants électriques interchangeables dans l'appareil. En cas de dysfonctionnement, appelez un technicien agréé.

⚠ ATTENTION

Dommages corporels ou matériels dus à un emballage de transport incorrect

Transporter l'appareil uniquement dans son emballage d'origine. Lors du transport, bloquer le support de plaques à l'aide de la vis d'arrêt.

INDICATION

Nettoyage:

Pour le nettoyage de l'instrument veuillez vous référer au paragraphe correspondant dans ce mode d'emploi.

2.3 Sicherheitshinweise

Die vorliegende Bedienungsanweisung enthält Informationen und Warnungen, die vom Benutzer befolgt werden müssen, um einen sicheren Betrieb der Geräte zu ermöglichen.

WICHTIG

Allgemeine Hinweise des Herstellers:

- Die Geräte wurden in Übereinstimmung mit den Sicherheitsanforderungen für elektronische Messgeräte hergestellt.
- Die Geräte sind werkgeprüft und wurden in betriebssicherem Zustand ausgeliefert.
- Zum Betrieb darf nur Zubehör, insbesondere Tischnetzteil, ggf. Netzversorgungskabel und Datenverbindungskabel, verwendet werden, das mit dem Instrument oder von Berthold Technologies für die Arbeit mit diesem Instrument geliefert wurde.
- Das Instrument wurde von einem unabhängigen, akkreditierten Prüflabor getestet. Es erfüllt die Anforderungen der DIN EN 61326-1: Klasse A und entspricht den Grenzwerten und Methoden der DIN EN 55011 Klasse A. Falls erforderlich, sind Maßnahmen zur Minderung der Funkstörungen zu ergreifen, die möglicherweise in häuslicher Umgebung auftreten können.

Sicherheitshinweise:

Handeln Sie immer gemäß der vorliegenden Sicherheitshinweise, sowohl vor als auch während des Gerätebetriebs.

⚠ GEFAHR

Gefährliche elektrische Spannung:

- Es liegt im Verantwortungsbereich des Anwenders, dass die Geräte nach den lokalen elektrischen Vorschriften installiert werden.
- Die Netz-Stromversorgung darf den Spannungsbereich von 100 - 240 VAC ± 10%, 50 / 60 Hz, nicht überschreiten.
- Vor dem Öffnen des Gerätes ist die Stromzufuhr zu unterbrechen.
- Um das Gerät von der Stromversorgung zu trennen, muss der Stecker des Netzteils am Gerät abgezogen werden.
- Die Elektronik des Detektors erzeugt Hochspannung. Sie darf während des Betriebs nicht berührt werden.

- Elektrostatische Aufladungen (z.B. durch Teppichböden) müssen beim Öffnen des Gerätes verhindert werden, da Entladungen am Gerät zur Beschädigung empfindlicher elektronischer Teile, besonders am Computer oder den Elektronik-Boards, führen können. Dies gilt besonders bei Arbeiten an geräteöffnungen, z.B. Filteröffnungen.
- Die Netzadapter sind mit einem 3-poligen Netzkabel ausgestattet. Dies ist eine Sicherheitsausstattung. Wenn die Steckdose keinen 3-poligen Anschluss unterstützt, muss ein Fachelektriker eine passende 3-polige Steckdose installieren oder einen passenden Adapter zur Erdung des Anschlusses bereitstellen. Zerstören Sie niemals die Sicherheitsvorkehrungen des geerdeten Anschlusses.
- Alle gelieferten Geräte und Zusatzgeräte sind geerdet ans Netz anzuschließen: **Schutzkontaktstecker** verwenden!.

⚠ VORSICHT

Personen- oder Sachschäden durch unsachgemäße Inbetriebnahme:

- Vor Inbetriebnahme des Gerätes ist es zwingend erforderlich, die Bedienungsanleitung zu lesen, da ansonsten die Sicherheit des Gerätes und des Benutzers nicht gewährleistet wird. Wenn Sie den Angaben in der Bedienungsanleitung nicht folgen, kann die Garantie erlöschen.
- Bestehen für die Errichtung und/oder den Betrieb von Probenmessgeräten gesetzlich vorgeschriebene Regelungen, so ist es die Aufgabe des Errichters und Betreibers, diese einzuhalten.
- Der Hersteller hat alles unternommen, um ein sicheres Arbeiten der Geräte (bezüglich Elektrik, Elektronik und Mechanik) zu gewährleisten. Der Benutzer muss dafür sorgen, dass die Geräte so aufgestellt und installiert werden, dass ihr sicherer Gebrauch nicht beeinträchtigt wird.

- Die Geräte dürfen nur in Übereinstimmung mit Herstellerempfehlungen installiert und benutzt werden. Die Inbetriebnahme darf nur von ordnungsgemäß trainierten und autorisierten Personen durchgeführt werden.
- Stellen Sie das Gerät so auf, dass der Netzstecker leicht zugänglich ist.
- Die Öffnungen des Ventilators dürfen nicht abgedeckt werden. Der Abstand zum Nachbargerät oder zur Wand muss mindestens 10 cm betragen.
- Die Transportsicherung muss entfernt werden bevor das Gerät eingeschaltet wird.

⚠ VORSICHT

Personen- oder Sachschäden durch unsachgemäßen Gebrauch:

- Die Geräte dürfen nur von dafür geschultem Personal betrieben werden. Es wird allen Anwendern dringend empfohlen, diese Bedienungsanleitung vor Benutzung zu lesen.
- BERTHOLD TECHNOLOGIES übernimmt keinerlei Gewährleistung für Schäden, auch gegenüber Dritten, die durch unsachgemäße Handhabung der Geräte hervorgerufen werden.
- Die Geräte sind nicht für den Einsatz in der In Vitro Diagnostik bestimmt und dürfen nur für den vorgesehenen Zweck eingesetzt werden. Lesen Sie hierzu die Angaben zum bestimmungsgemäßen Gebrauch.

- Die Geräte dürfen nur innerhalb von geschlossenen Räumen betrieben werden.
- Stellen Sie das Gerät so auf, dass Sie es leicht ein- und ausschalten können.
- Heiße Oberfläche: Vorsicht beim Berühren der Abdeckung bzw. der Lampe, sie können heiß sein. Berühren Sie niemals die Heizfolie im Gerät.
- Währund des Gerätebetriebs dürfen niemals Körperteile oder andere Geräte in das Instrument eingebracht werden.
- Bei Beeinträchtigung der Betriebssicherheit sind die Geräte abzuschalten und vom Netz zu trennen.
- Ist Flüssigkeit in das Innere des Gerätes gelangt, Netzstecker ziehen. Das Gerät durch eine autorisierte Servicestelle reinigen lassen.

⚠ VORSICHT

Personen- oder Sachschäden durch chemische oder biologische Substanzen:

- Beachten Sie alle gesetzlichen Vorschriften für den Umgang mit biologischem Abfall, mit Reagenzien und Proben
- Vor der Messung/Benutzung von Reagenzien muss der Anwender eine individuelle Risikoanalyse durchführen.
- Einige Testsysteme, Testkomponenten oder Proben können potentiell eine biologische Gefährdung, ein Infektionsrisiko oder eine andere Art von Gefahr darstellen. Halten Sie immer die Sicherheitsmaßnahmen und die Empfehlungen für die Testdurchführung und den Temperaturbereich ein, wie sie in der Beilage des Testsystems angegeben sind. Tragen Sie angemessene Schutzausrüstung, wie Laborkittel oder Chemikalien-Schutzhandschuhe und arbeiten Sie vorsichtig, um chemische Verätzung, Kontamination und potentielle Infektion zu vermeiden.
- Die Anwendung der Reagenzien liegt im alleinigen Verantwortungsbereich des Benutzers. Befolgen Sie alle Sicherheitsanweisungen des Reagenzienlieferanten und des Testherstellers.
- Bestehen Zweifel an der Verträglichkeit von Dekontaminations- und Reinigungsmitteln mit Teilen des Gerätes oder mit darin enthaltenen Stoffen, wenden Sie sich bitte an den Gerätehersteller oder seinen lokalen Vertreter.

- Es dürfen nur vom Testhersteller empfohlene Reagenzien in Übereinstimmung mit seinen Angaben für den ausgewählten Test, das Füllen der Injektorschläuche oder Waschen und Reinigen, verwendet werden.
- Explosive Substanzen dürfen nicht mit dem Gerät verwendet werden.
- Vermeiden Sie das Spritzen von Flüssigkeiten auf die äußeren Oberflächen, den Plattenträger oder andere Teile des Instruments. Wischen Sie alle Spritzer sofort weg und dekontaminieren Sie die Oberflächen im Fall von verspritzten biogefährdenden Flüssigkeiten.
- Flüssigabfall vom Füllen oder Reinigen der Schläuche muss immer ordentlich entsorgt werden. Wenn eine Abfallpumpe installiert ist, muss eine Flasche angeschlossen werden. Falls keine Abfallpumpe vorhanden ist, muss ein passendes Auffanggefäß (prime plate) während des Füllens und Reinigens unter den Injektoren plaziert werden.
- Flüssigkeiten, die aus dem Abfallschlauch kommen, können ätzend sein (siehe Abschnitt Cleaning tubing)
- Flüssigkeiten aus den Injektoren dürfen nur zurückgepumpt werden, wenn die entsprechende Reagenzienflasche angeschlossen ist.
- Entsorgen Sie chemischen und biogefährdenden Abfall vorsichtig und entsprechend der lokalen Gestzgebung. Es wird empfohlen, potentiell biogefährdenden Abfall zu autoklavieren.

⚠ VORSICHT

Personen- oder Sachschäden durch unsachgemäße Wartung oder Reparatur:

- Es dürfen nur die im Handbuch beschriebenen Wartungsarbeiten vom Anwender ausgeführt werden.
- Bei Wartungsarbeiten dürfen nur die angegebenen Teile verwendet werden.
- Für die Sicherheit des Benutzers und die Funktionsfähigkeit der Geräte sind die vom Hersteller empfohlenen Überprüfungen und Wartungsmaßnahmen durchzuführen. Alle über die Betriebsanleitung hinausgehenden Wartungs-und Instandhaltungsmaßnahmen dürfen nur von autorisierten Technikern ausgeführt werden.
- Ordnungsgemäße Funktionalität kann nur bei Verwendung der Original-Ersatzteile garantiert werden.

- Service- und Reparaturarbeiten dürfen nur von Fachleuten ausgeführt werden.
- Öffnen Sie das Gerät nicht solange es in Betrieb ist.
- Vor dem Öffnen des Gerätes ist die Stromzufuhr zu unterbrechen.
- Wenn das Gerät geöffnet ist sind Sicherheitsmaßnahmen nicht mehr in Betrieb. Auf bewegliche Komponenten achten! Das Innere der Geräte kann Temperaturen erreichen, die Verbrennungen verursachen können. Einige Teile können heiß bleiben ohne sichtbare Zeichen, auch nachdem das Gerät abgeschaltet worden ist.
- Elektrostatische Aufladungen (z.B. durch Teppichböden) müssen beim Öffnen des Gerätes verhindert werden, da Entladungen am Gerät zur Beschädigung empfindlicher elektronischer Teile, besonders am Computer oder den Elektronik-Boards, führen können.
- Es gibt im Gerät keine austauschbaren elektrischen Komponenten. Rufen Sie im Fehlerfall autorisiertes Servicepersonal.

⚠ VORSICHT

Sachschaden durch fehlerhafte Transportverpackung:

Das Gerät sollte nur in der eigenen Verpackung transportiert werden. Beim Transport ist darauf zu achten, dass alle Transportsicherungen (z.B. für den Plattenträger) eingesetzt werden.

HINWEIS

Reinigung:

Zum Reinigen des Gerätes bitte den entsprechenden Teil dieser Bedienungsanleitung beachten.

2.4 Further Instructions

Storage conditions

Before delivery or if the instrument is not used for a longer period of time, store it in the original storage case in a dust-free environment and protected from direct sunlight and significant temperature fluctuations.

Storage temperature : 0-40°C
Humidity: 10 - 85% humidity, no condensation

Return shipment

If the instrument has to be returned to BERTHOLD TECHNOLOGIES for re-calibration, servicing or inspection, we recommend to use the original storage case. Please contact the service for further instructions. Refer to chapter 3.3 for details.

Disposal

Decontaminate the instrument before disposal! This instruments 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 or contact your local representative.

3 Warranty and Technical Issues

3.1 Special Spare Parts

The following spare parts are safety parts: Use only the specified original part. For support contact Berthold Technologies or your direct agent only.

	Specification	ID-No.
External Power supply unit GST220A24-R7B	**Input** 100-240 VAC ± 10%; 50 / 60 Hz; Class I **Output** 24 VDC, 9.2 A, max 221 W	59048

3.2 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 12 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:

- the product has not been operated in accordance with the operating manual
- the product has not been regularly and correctly maintained
- the product has not been repaired or modified by a Berthold Technologies authorized representative or user
- parts other than original Berthold Technologies parts are used
- the product and parts thereof have been altered without written authorization from Berthold Technologies GmbH & Co KG
- 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.

Berthold Technologies reserves the right to refuse to accept the return of any product that has been used with radioactive or (micro)biological substances, or any other material that may be deemed hazardous to employees of Berthold Technologies. Such products have to be properly decontaminated and marked.

Before returning products to Berthold Technologies ensure the devices are properly decontaminated and the form "**Confirmation on decontamination**" is properly filled in and will be accompanying the product. (See appendix for a blank form)
Before returning products to Berthold Technologies, a returns/repair number must be obtained and clearly identified on the packing and documents. Call Berthold Technologies to get this number. Retain the original packaging for use if the instrument needs to be returned to Berthold Technologies.

3.3 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, the Technical Support group at Berthold Technologies GmbH & Co KG will be available by phone, fax or email to deal with your queries. Here is their address, phone, fax and e-mail:

Berthold Technologies GmbH & Co KG
Technical Support
Calmbacher Str. 22
75323 Bad Wildbad
Germany
Phone: +49 7081 177 114
Fax: +49 7081 177 301
Email: service@berthold.com

At the end of this manual you will find a Customer Reply Form (Appendix section). If a problem arises with the instrument which you are not able to resolve, please fill in this form. This form should then be transmitted to your Berthold Technologies representative or to Technical Support at Berthold Technologies, where it will receive early attention.

Please also make sure that you have the relevant information available before contacting Berthold Technologies. Helpful information would include:

- serial numbers, part number, revision: see production label on instrument

- software and firmware versions
- monitor and log files (refer to the respective service manuals)

4 Introduction

4.1 Intended Use

The Tristar 3/Tristar 5 is a modular multi-technology microplate reader for different types of fluorescent, luminescent and absorbance research applications.

The units are not for use in in-vitro diagnostic (IVD) procedures.

These units are not designed for use in hazardous areas.

4.2 Description

The availability of measurement technologies in an individual instrument is dependent on your order. All Tristar 3 and Tristar 5 instruments are equipped with filter optics. In Tristar 5 models one or two monochromators are available for measurement additionally.

The Tristar 3/5 microplate reader is distinguished by its exceptionally high sensitivity allowing detection limits in scientifically relevant magnitudes with low reagent consumption.

Detector sensitivity and stability are the result of Berthold Technologies´ experience with thousands of photon counters. The patent pending dual mode photodetector combines the advantages of true photon counting for high sensitive luminescence measurements with quasi background-free operation of the triggered analogue mode for best fluorescence results.

True photon counting has the benefit that no user parameters need to be set, ensuring the same conditions are used for every measurement during the instrument´s entire life time. The fast photon counting circuitry provides a dynamic range in excess of six orders of magnitude, which complements the range of the latest assays. For fluorescence meas-urements a pulse triggered analogue circuitry is implemented in the detector electronics, offering quasi temperature independent and noise-free operation.

A proprietary design of the optical system achieves absolute minimization of cross-talk down to 10^{-6} (depending on the type of microplate). A double grating monochromator in 3D design (option) can be used instead of filters for wavelength selection with variable settings for the slit widths for adjustable spectral bandwidths.

The instrument can read solid plates as well as strip plates from 6 to 384 well formats with a height not exceeding 21 mm (respective adapter frames need to be applied).

4.3 Recommendations for proper handling

IMPORTANT

Recommendations for good and consistant results:

- Do not expose instrument to direct sunlight.
- Set up instrument in dry rooms.
- Open lid for loading filter/microplates or cleaning only to keep light and dust out.
- Keep the plate carrier free from dirt.
- Remove spilled reagents immediately with a damp cloth or optical grade tissue.
- Very bright samples may cause saturation of the PMT (indicated by an “Overload” message); let the PMT recover for a few seconds.

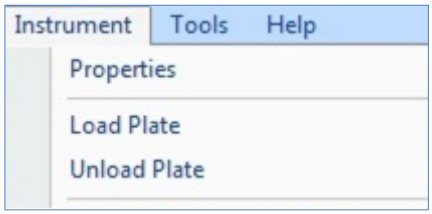
NOTICE

Rules to avoid damages to mechanical, electrical and optical components:

- Load microplates correctly.
- Do not use microplates or strip plates with heights exceeding 21 mm.
- Do not fill the microplates above their specified maximum volume.
- Do not shake completely filled microplates in the instrument.
- Do not overfill the reagent trough as liquid spills in the injector compartment may cause severe damage to the electrical system; take special care when ice in the trough starts to melt.

4.3.1 Plate Tray

The instrument front panel includes the plate tray. It can be opened and closed under control of the ICE or MikroWin software.



4.3.2 Filter Slides

Behind the big front flap the filter sliders are accessible. To replace or clean the filter you have to manually open the flap and eject the slides via software.

Proceed as follows

- Open the flap by hand; make sure the plate carrier is inside the instrument
- In the [**Excitation Filter Slide]** dialog box, click on the button **<Eject Slide>**
- Clean or replace filter.
- Push in filter holder all the way into the slide.
- Click **<OK>** in the **[Excitation Filter Slide]** dialog box. The slide moves all the way into the instrument.
- Do this with the emission filters in an analogous way.

Cleaning filters

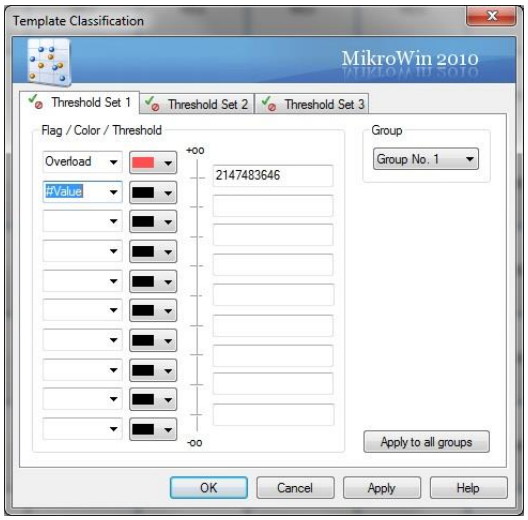
- Filters should be cleaned using a lint-free cloth or, better, a micro fibre cloth, as used for cleaning eye glasses.

4.3.3 Overload Detection

The detector has an overload detection function to prevent the PMT from damage by high levels of light.

MikroWin supports this by displaying the expression **Overload** instead of a value. Instead of the expressions **MEA** or **LB** in the calculation matrices, one has to use the threshold function: **TRH (MEA) or TRH(LB1), TRH(LB2)**, … respectively.

The threshold level itself and the expression to be displayed are set in the **[Options] / [Threshold]** dialogue (Type exactly: **2147483646** to guarantee maximal dynamic range without the risk of damage to the detector).



4.3.4 Injectors

The tubing from the solution bottles are connected to the injector ports using screw-type caps. The reagent trough and the reagent mounts provide means to position reagent vials safely.

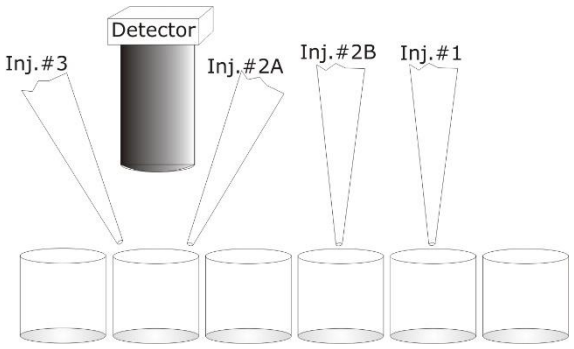
Injector parameters

The parameters for control of the injector are entered in the software:

- For measurement in the **[Measurement Page]** of the **Protocol Wizard (ICE)** or in **[Settings] (MikroWin)**
- For washing and priming in the [**Instrument]** menu.

Injector Tip Location

The outlet-tips of the injectors are located right above to top level of the microplate The tips may be installed in different locations in horizontal orientation with respect to the measurement position:



4.3.5 Alpha Screen™ Option

For AlphaScreen™ measurements the instrument may be equipped (optional) with a laser diode (5 mW) for excitation of the donor beads.

To ensure optimum yield of the laser excitation the laser is located right at well surface. The access port is the former channel for the tip of injector #2, which cannot be used when the AlphaScreen™ option is installed.

4.3.6 Shaking Function

Shaking is controlled by software. The following shaking modes are available with variable amplitudes and speed:

- linear
- orbital
- double-orbital

Shake Modus	Amplitude [mm]	Slow [RPM]	Normal [RPM]	Fast [RPM]
Linear	max 1	300	540	1020
	max 2	300	540	840
	max 3	300	540	660
	max 4	300	540	540
	max 5	300	420	420
Orbital	max 1	300	540	1020
	max 2	300	540	840
	max 3	300	540	660
	max 4	300	540	540
	max 5	300	420	420
Double Orbital	max 1	300	540	540
	max 2	300	420	420
	max 3	240	240	240
	max 4	240	240	240
	max 5	240	240	240

4.3.7 Aperture, Excitation Optics and Beam Size

The settings for the aperture, the excitation optics and the beam size of the monochromator are made in the software. The settings for excitation optics and beam size are only available for Tristar 5. Tristar 3 has a fixed excitation optics setting which cannot be changed by the user.

IMPORTANT

Berthold Technologies recommends to use the **Default** settings.

Refer to the following tables for the available settings:

Aperture

Options	Description	Use for
Default	Depending on the selected microplate format, one of the following options will be preset automatically.	
0-Rd. 6.7	Round aperture Ø 6.7 mm	Luminescence, 6-96 well format
1-Square 3.7	Square aperture 3.7 mm	Luminescence, 384 well format
2-Rd 11	Round aperture Ø 11 mm	Fluorescence and Absorbance, all plate formats; Priming
3-Rd-2	Round aperture Ø 2 mm	HTRF 384 well

Excitations optics (Tristar 5 only)

Options	Description	Use with
Default	Depending on instrument configuration and available technologies, one of the following options will be preset automatically.	
0-Open	No limitation of the excitation beam Ø 6-7 mm	Filter; HTRF only
1-Laser		currently unused
2-Small filter 0.25 mm	Excitation beam reduced	Filter (top)
3-Wide filter 0.45 mm	Excitation beam only slightly reduced ≙ Default when using filters	Filter (top)
4-Mono	Monochromator position setting	Mono
5-Mono Order Sorting Filter 1	Additional sorting filter; depending on selected wavelength the order sorting filter is selected by software automatically	Mono
6-Mono Order Sorting Filter 2	Additional sorting filter; depending on selected wavelength the order sorting filter is selected by software automatically	Mono
7-Bottom Filter	For bottom reading	Filter (bottom)

IMPORTANT

The submenu Excitation Optics contains summerizing information about possible settings for filters and monochromator.

If excitation filters are used, it is possible to select between the options for filters (Default, or 0-, 2-, 3-, 7-).

If a monochromator is used (see chapter 7.3.2 for details), this submenu is invisible, as the 4-Mono setting is fix and the settings 5/6-Mono Order Sorting Filter are automatically selected by software.

Beam size Mono (Tristar 5 only)

Options	Description	Use for
Default	Default ≙ Wide no automatic preset depending on plate format! In cases of 384 well microplates select Narrow actively.	
Narrow	2.5 mm	384 well format
Wide	3.5 mm	96 well format

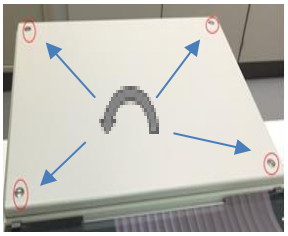
5 Installation

Read this part completely prior to starting the first steps and make sure that all prerequisites are met as described below.

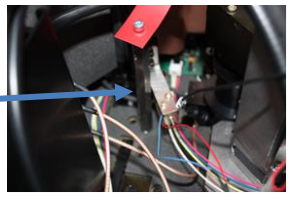
5.1 Unpacking and Setup

1. Unpack your Tristar 3 or Tristar 5 model and its accessories.
2. The instrument is heavy and awkward to lift. It must be carried by 2 persons. Grab the device only from below (the device pedestals are raised therefor) and never at the lamp housing, and put it onto an appropriate laboratory desk.
3. Open the big front flap and remove the transportation safety device.

4. Open the top lid of the instrument by removing the four screws.



5. Remove the transportation lock indicated by the red tap. Make sure to unscrew the complete hexagonal rod attached to the horizontal support.



6. Remove external power supply from its box and connect to power cord. Connect the power cord to the respective socket of the instrument

Mains socket

7. Verify the mains switch is in **OFF** position
8. Check if your mains supply is within the permissible range of the external power supply operating voltage **(100 – 240 VAC ± 10%; 50 / 60 Hz).**

   Connect instrument only if it is matching!
9. Put the jack of the external power supply into the wall outlet
10. For the consecutive software installation the in-strument should remain **turned off**.

5.2 Software Installation

The instrument can be run with either ICE or MikroWin software. Dependent on your software configuration follow either the instructions for ICE software or MikroWin software installation respectively.

The device names displayed by the software vary depending on model and are therefor referred to in this manual as **[Tristar x].**

IMPORTANT

Mikro Win software description:

The installation description of Mikro Win software and driver is part of this this manual. All additional information will be found in the MikroWin software manual, coming in electronic form with the software.

See chapter 5.2.2 for information about the destination location.

IMPORTANT

Precondition for both software packages:

Windows compatible PC with Windows 7, 8, 8.1 or 10.

5.2.1 Installation of ICE Operating Software

The ICE operating software and the instrument driver software are delivered on a USB stick.

IMPORTANT

ICE software must always be installed before the respective driver !

For installation local administrator level is necessary.

Proceed as follows:

1. Close all Windows applications before you start installing the software.
2. Insert the USB stick into a USB slot and browse to the USB root directory. The software installation does not start automatically.
3. The USB stick contain a folder with ICE software files and a folder with the instrument driver software. Double-click the "**ICE software folder"** at first. Double-click **"Setup.exe"**, then.

   Depending on Windows security settings Security Warnings dialogues may appear during the installation steps. Always confirm the messages to continue the installation.
4. A wizard guides you through the installation. Select / insert your entries. Confirm your entries with **<OK>** or **<Next>.**

Additional resources:
As the software requires some additional resources for proper operation the set up wizard will check for the presence of these resources (.NET Framework 2.0 and Crystal Reports for .NET Framework) on the computer. If the resources are found, the installation of Instrument Control and Evaluation (ICE) software is started.

In case these resources are not available on the computer the set up wizard will start with the installation of these resources.

5. The wizard informs you when the ICE software is successfully installed. Close the dialog with **<Finish>.**
6. After a successful installation the ICE icon will be visible on your desktop.

5.2.2 Installation of MikroWin 2010 Operating Software

IMPORTANT

Local Administrator Level

For the installation of MikroWin and driver software as well as for any updates and upgrades of the respective software the user has to have local Administrator rights for the computer.

Proceed as follows:

1. Close all Windows applications before you start installing the software.
2. The **MikroWin Advanced version** is delivered with a USB hard lock for copy protection. The hard lock is matched with the installation CD. The installation has to be performed without the hard lock plugged in. Do not attach the USB hard lock to PC during installation of software!
3. Insert software CD into a CD or DVD drive. The set up routine starts automatically.

   In case the installation does not start automatically, browse to the CD´s root directory and double click "**Setup.exe"**
4. A wizard guides you through the installation. Select / insert your entries. Confirm your entries with **<OK>** or **<Next>.**

   It is recommended to keep/select the following (default) settings:

   [Destination location]: C:\Program Files\Mikrotek\V50\MikroWin2010
   [Setup Type]: Typical
   [Select features]: all available Curvefit and Export features
   [Select Program Folder]: add a Mikrowin 2010 program icon to the program folder list.
5. Activate your MikroWin 2010 dependend on the version.

IMPORTANT

Activation of MikroWin Software

For **MikroWin Advanced**: Put in the hard lock into the PC right after installation of software. The hardlock needs to be attached during all operations with MikroWin.

For **MikroWin Lite version** run the activation procedure as described below.

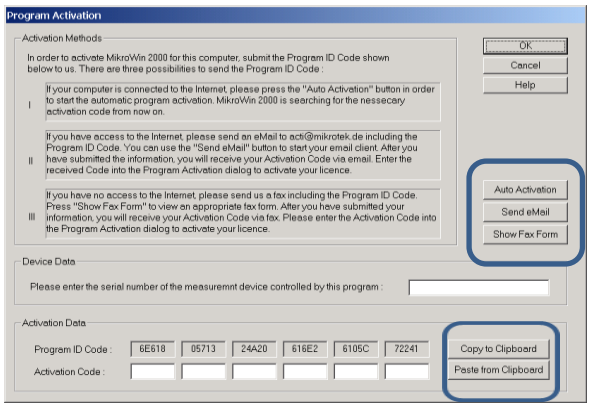
5.2.3 Activation of MikroWin Lite Software

The Activation prodedure needs to be executed only when a new installation of Mikrowin 2010 has been performed.

It is recommended to switch off and disconnect the instrument during software activation.

1. Follow the startup info displayed when starting a not yet activated MikroWin 2010 Lite software without the instrument switched to on.
2. Go to **[Help] / [Program Activation]**

   There are 3 ways to acquire the activation code:
   I) online via internet (proceed with step **3**)
   II) via email (proceed with step **7**)
   III) via fax (proceed with step **14**)



Activation via internet:

3. Enter **[serial number]** of instrument in the dialog box **[device data]** and click **<Auto Activation>.**
4. Click **<OK>** on the next screen to confirm the activation process.
5. Code will be transferred online and will be automatically entered into the respective boxes. The activation code will be returned within German office hours only.
6. Once code is entered in respective fields click **<OK>**

Activation via email:

7. Click **<Copy to Clipboard>**
8. Click **<Send eMail>** and select suitable a email profile
9. Use "**MikroWin Program Activation**" as subject and provide these details of your system: Program ID Code, Device Serial Number and Program Licence Code
10. Email with respective activation code will be returned within 24 h
11. Copy code to clipboard.
12. Re-access the **[Program activation]** menu and click **<Paste from Clipboard>**
13. Click **<OK>**

Activation via fax

14. Click **<Copy to Clipboard>.**
15. Click **<Show Fax Form>.**
16. Paste Program ID Code into respective fields and enter additional required information.

5.2.4 Installation of Driver Software

For communication between the software and the instrument via USB port the driver software needs to be installed and set up.

IMPORTANT

Install the instrument driver software for ICE and MikroWin from USB stick.

For installation local administrator level is necessary.

The instrument needs to be **switched off** during this process.

1. Close all Windows applications before you start installing the software.
2. Make sure the instrument´s power switch is in **OFF** position.
3. Insert the USB stick into a USB slot and browse to the USB root directory. The software installation does not start automatically.
4. The USB stick contain a folder with the instrument driver software. Double-click the setup.exe file in the respective folder.
5. A wizard guides you through the installation. Select your respective operating software.

6. It is recommended to install all features. Individual changes are not recommended. Confirm your entries with **<Next>**.
7. Complete the installation with **<Finish>**.
8. Connect the USB cable to a USB port of the computer.
9. A message will be shown in the task bar during the USB driver installation.

10. After a few minutes a message confirming the successful installation will be displayed in the task bar.
11. Turn instrument on by putting the mains switch into ON position.
12. Open **ICE software**  or **Mikrowin software**  dependent on the kind of installation you have done prior.

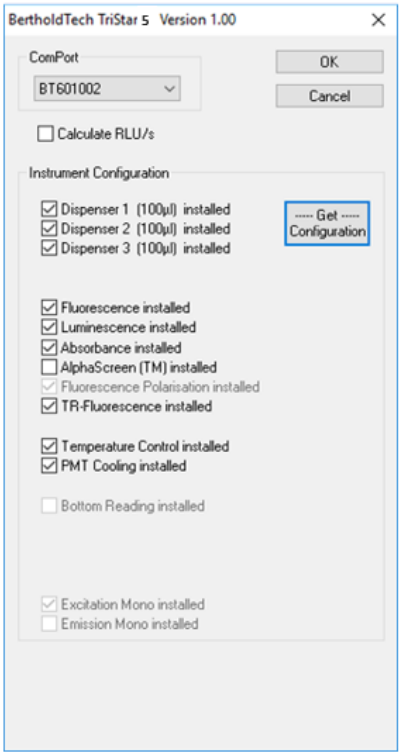
13. **For ICE:**
    Select **[Tristar x]** in the **[View]** menu. Go to the **[Instrument]** menu then and select **[Properties].**

    For Mikro Win:
    Select the menu item **[Installation]/[Driver]** to open the installation driver dialog box with a separate tab for each driver type. Double-click **[Berthold Tech TriStar x].**

    Select the entry starting with BT60…. in the **[ComPort**]section.

    The raw data are usually displayed as RLU representing the total amount of counts acquired during the reading time per well.

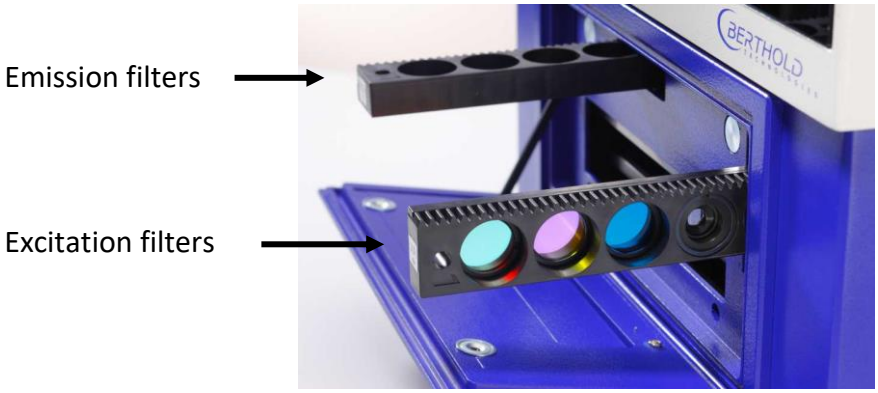
    By checking **[Calculate RLU/s]** the total amount of counts will be divided by the respective reading time



14. Click **<Get Configuration>**
    the available injectors (with their volume) of the instrument will be automatically checked as well as Temperature Control and PMT Cooling when installed. Also, the measurement modules available in your instrument will be checked.
15. Click **<OK>**
16. **Mikrowin only:**
    Click **<OK>** to close the [Installation]/ [Driver] dialogue.
17. The instrument is now ready to use.

5.3 Installing Filters

The instrument comes with an excitation and an emission filter slide, each capable of holding up to 5 filters.



Depending on your order the instrument is equipped with different measurement technologies and the following filters are included.

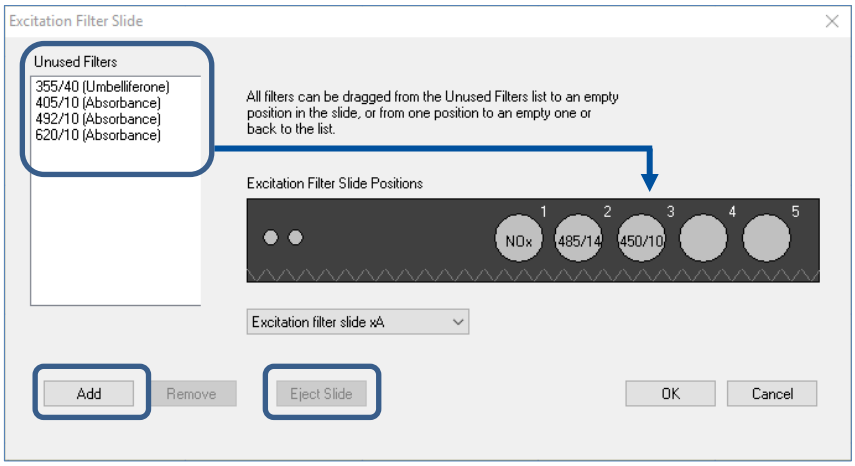
Measurement technology	Included filters
Absorbance reading	450nm absorbance filter
Fluorescence reading	Ex 485/14 nm Em 535/25 nm
TRF	Ex 350/40 nm Em 615/8 nm
TR-FRET/HTRF	Ex 320/40 nm Em 620/10 nm and 665/7 nm

Additional filters may be ordered individually and can be installed easily, both physically and in the software.

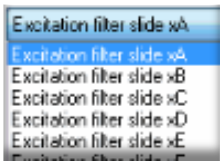
5.3.1 Installing Excitation Filters

Proceed as follows to define a new (additional) filter:

1. Select **[Instrument]/[Excitation Filter Slide]** in the software.
2. Click **<Add>**
3. Define a descriptive **[Name]** for the new filter and check the **[Usage]** in the **[Add Filter]** dialog box. Click **<OK>.**
4. Highlight the new filter in the list of **[Unused Filters]** and drag it into an empty **[Excitation Filter Slide Position]**.



5. Some filter slides are preconfigured for certain measurement technologies:



xD = time resolved fluorescence (TRF) and TR-FRET
xE, xF, xG = fluorescence polarization (FP).

6. Open the big flap at the front of the instrument.
7. Click **<Eject Slide>** in the **[Excitation Filter Slide]** dialog box.
8. Remove the excitation filter slide from the instrument.
9. Mount the filter(s) into the position(s) defined in the software. For excitation and absorbance, filters of 25 mm, 15mm and 12.7mm can be used. Filters of 15 mm and 12.7 mm diameter can only be mounted by using an adapter and a clamp ring.

Filters with diameter	to be mounted with
12.7 mm (1/2 inch)	adapter **ID 57194-005** and clamp ring **ID 57195-005**
15 mm	adapter **ID 64666-005** and clamp ring **ID 34767-005**
25 mm (1 inch)	-----

25 mm 15 mm 12.7 mm

Excitation filter mounted

10. Insert the slide again until the front of the slide is aligned with the front of the instrument
11. Click **<OK>** and close the front flap.

5.3.2 Installing Emission Filters

Emission filters are installed in almost the same manner as excitation filters.

1. Select **[Instrument]/[Emission Filter Slide]** in the software.

2.-8. Act according to the description in section 5.3.1 Installing Excitation Filtersfor the emission filter slide, too.

9. Mount the filter(s) into the position(s) defined in the software.

   25mm filters are recommended for emission as they ideally matching the emission light path. Filters with **12.7mm (1/2 inch) and 15 mm** diameter may be used, but not recommended, as sensitivity will be compromised. If these filters shall be used, they need to be mounted with the clamp rings and adapters stated in the table of item 9. in section 5.3.1

Emission filters mounted

Position 5 is reserved for Luminescence readings

10. **NOTE:** Emission filter mH for bottom measurement position (see instructions in the description of the distinct measurement technologies for details) use special filter slides with apertures and integrated 45° degree mirrors to redirect the bottom emission to the detector. Filters may be mounted above these mirrors as described above.

5.4 Bottom Reading Position

Some instrument models can measure microplates from the bottom reading position, exciting the sample and collecting the emission light from underneath the microplate. This measurement mode is available for selected readout technologies (see description of the respective technologies for details).

NOTE: To use the bottom reading position, make sure, an mH emission filter slider is installed and the red microplate frame is used.

6 Instrument Control and Evaluation Software

6.1 ICE Directories and Files

The directories for data and parameter files are defaulted as described below. Any accessible directory on the computer and the local network can be selected though when saving data and parameter files using the "**Save … File As…**" command.

Default directories

- Data files My Documents\ICE\DataTriStar x
- Protocol files My Documents\ICE\ParaTriStar x
- Priming files My Documents\ICE\ParaTriStar x

In consequence each Windows user has own directories containing his data and protocol files. Hence, when users log on, individually shared files may need to be copied to each user´s ParaTriStar x directory, esp. the Default Customized Priming sequence **100default_01.wge**.

File Names

There is no limitation in naming data and protocol files other than the Microsoft Windows conventions.

Data file names are to be defined prior to measurement start. Renaming is possible using the **[Save Data File As…]**" command producing a copy of the data file with a new name.

Protocol file names are to be defined at the end of creating a protocol. Renaming is possible using the **[Save Protocol File As…]**" command producing a copy of the protocol file with a new name.

File Types

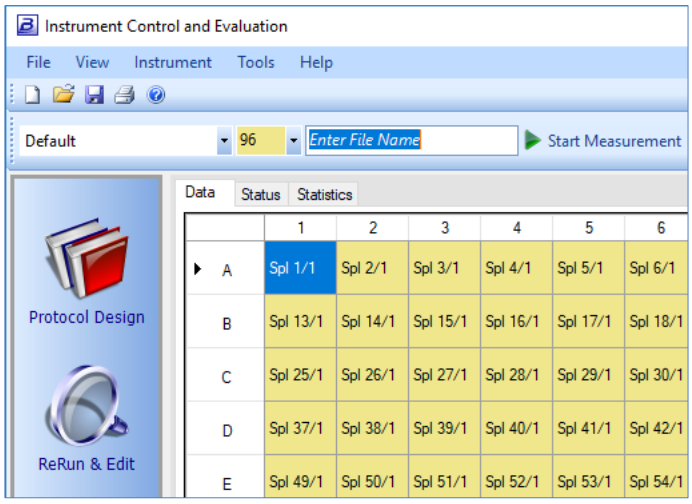
ICE works with 5 file types indicated by the respective file name extensions.

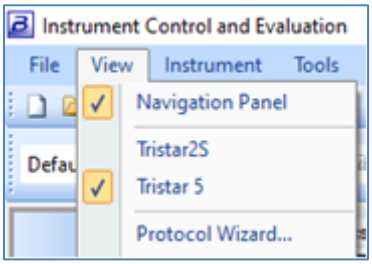
- Protocol files have the extension **.wgp**
- Data files have the extension **.wgd**
- Standard curve files have the extension **.wgs** (to be used as reference curves)
- Multiple Analyte profiles have the extension **.wgm**
- Customized prime sequences have the extension **.wge**

6.2 ICE User Interface

6.2.1 ICE Default Setup

Default main screen of ICE:

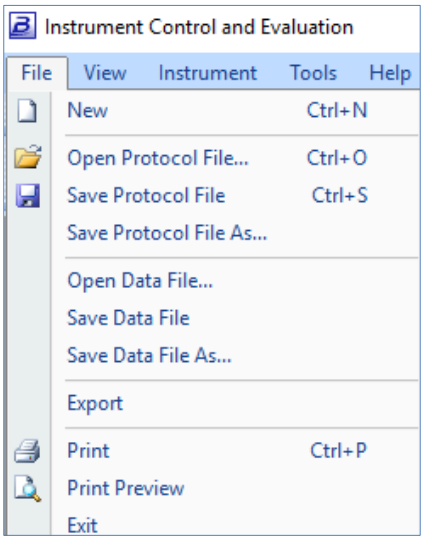




To return to the default layout after any changes you may have to check **[View]/[Navigation panel]** and **[Tristar x]**.

6.2.2 File Menu

The **[File]** menu contains commands to open and save data and protocol files



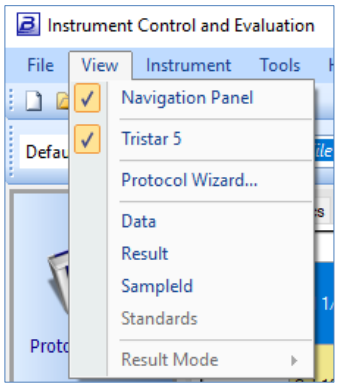
[New] clears data display to start a new measurement

[Open Protocol File…] opens an existing protocol

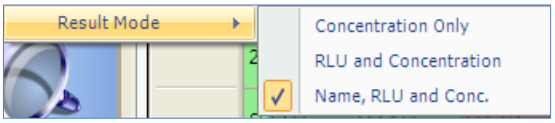
[Save Protocol File] saves loaded protocol file
[Save Protocol File As...] saves loaded parameter settings with a new name
[Open Data File] opens an existing measurement
[Save Data File] saves displayed data
[Save Data File As…] saves displayed data with a new name
[Export] exports the data set as EXCEL file according to the settings made in the protocol
[Print] prints the selected data set shown on the screen
[Print Preview] displays a preview of the print-out
[Exit] closes ICE software

6.2.3 View Menu

The View menu defines how the user interface and data are displayed.

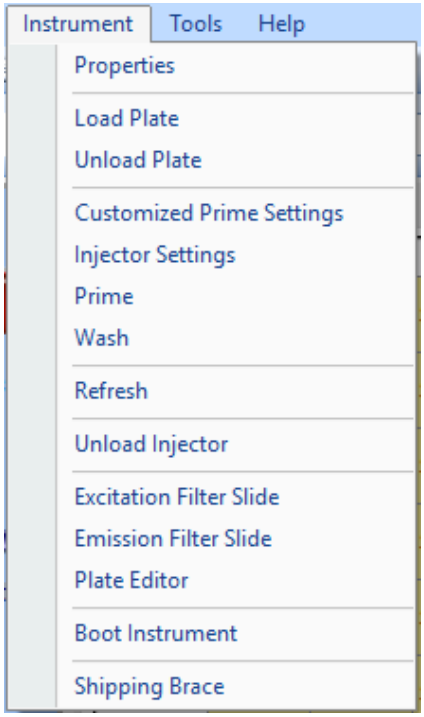


[Navigation Panel] shows/hides navigation panel on the left
[Tristar x] adjusts user interface for Tristar x
[Protocol Wizard] starts wizard for protocol creation
[Data] displays raw data (RLU or RLU/s)
[Result] displays calculated data
[Sample ID] displays sample IDs
[Standards] displays standard concentrations
[Result Mode] to select the content of the result display



6.2.4 Instrument Menu

In the Instrument menu basic instrument settings and communication may be accessed.



[Properties] includes instrument driver settings and instrument configuration

[Load Plate] moves plate into the instrument

[Unload Plate] moves plate out of the instrument

[Custom. Prime Settings] dialogue for editing prime sequences

For the setting and options please read chapter "Priming Tubings"

[Injector Settings] general settings for wash and prime sequences

[Prime] starts the priming sequence (filling the lines)

[Wash] starts the washing sequence (cleaning the lines)

[**Refresh**] injects once to fill the tip (e.g. after longer periods of idleness)

[Unload Injector] starts the unloading sequence (recovering reagents back into the reservoir)

[Excitation Filter Slide] dialogue for definition and positioning of excitation filters

[Emission Filter Slide] dialogue for definition and positioning of emission filters

[Plate Editor] dialogue for definition of microplate dimensions. See section 7.1 for details.

[Boot Instrument] establishes communication and boots instrument

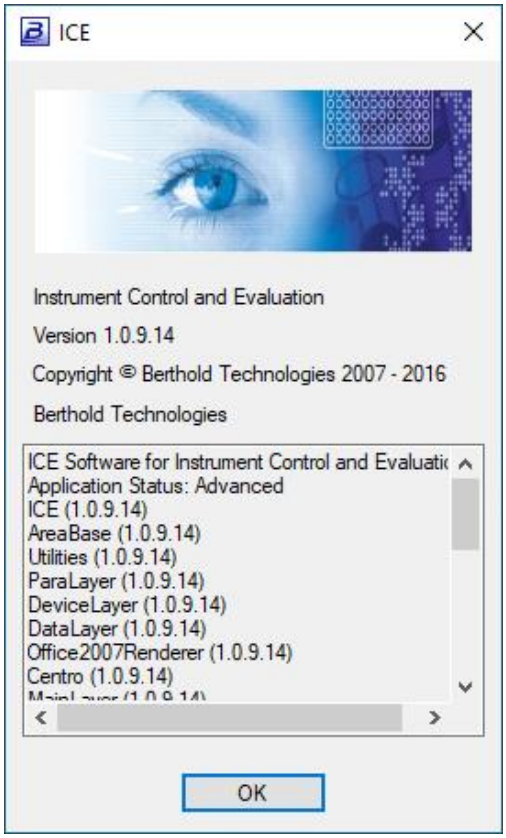
[Shipping Brace] moves XY table to a position enabling the insertion of the trans-portation lock

6.2.5 Tools Menu

In the **[Tools] / [Options]** menu you can define the default root directory for the protocol (**ParaTriStar x)** and data (**DataTriStar x)** folders.

6.2.6 Help Menu

The **[Help]** menu allows you to view basic software information.



7 Operation with ICE

Defining protocols and running measurements on the Tristar 3 and Tristar 5 is straight forward. The procedure is the same for all types of assay types, e.g. Raw Data, Dual Label, Kinetic, Repeated, Scanning and Spectral Scanning. A measurement can be carried out immediately after a stored protocol is selected. At the end of each measurement the results are stored and may be printed or exported.

Result file names can be given without limitation. The extension for result files as well as measurement files is fixed, though.

7.1 Adding and Editing Microplate Dimensions

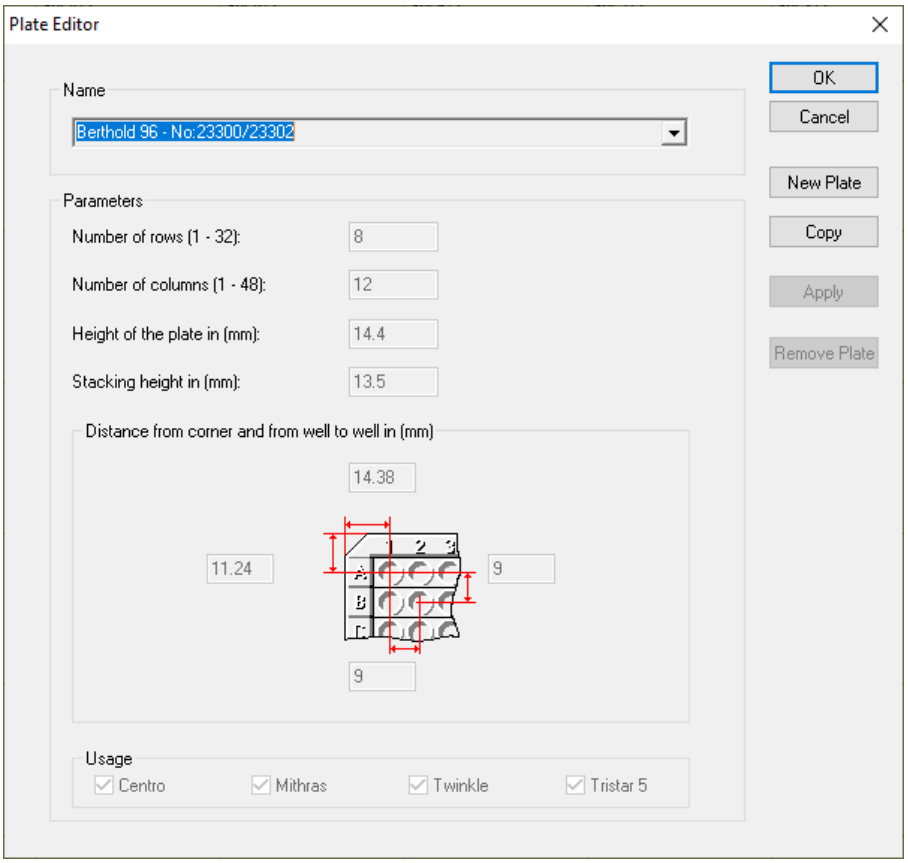
Microplates must be defined in the plate editor prior to defining a measurement protocol. Some microplate models are predefined.

Microplates can differ in their dimensions dependent on brand and type. Please refer to the manufacturer´s most recent information for exact dimensions of the microplates.

NOTICE

Only 6 to 384 well plates with a plate height up to 21 mm are supported in the Tristar 3 and Tristar 5. Petry dishes, Terasaki plates and filter membranes can be used, but have to be specified individually.

1. Click **[Instrument]/[Plate Editor].**



2. Click **<New Plate>** or select a plate with matching well format and click **<Copy>.** Insert all necessary information, then.

[Name]	insert a descriptive name
[Number of rows]	e.g. 8 for a 96 well plate
[Number of columns]	e.g. 12 for a 96 well plate
[Height of the plate]	insert the plate height in mm. Most 96 and 384 well plates are between 14 and 15.5 mm.
[Stacking height]	the stacking height of the microplate is the resulting height (the visible part) when plates are put on top of each other (e.g. in a plate stacker). In case this information is not available from the plate manufacturer the stacking height can be derived by stacking 2 plates and measuring the total height; by subtracting the regular height of one of the plates the resulting value will be the stacking height

[Distance from corner and from well to well]:
Insert the distance between the left outer edge of the plate and the center of well A1.

Insert the distance between to upper outer edge of the plate and the center of well A1.

Insert the distance between the well centers of consecutive rows (vertical well distance).

Insert the distance between the well centers of consecutive columns (horizontal well distance).

[Usage] check the **[TriStar x]** checkbox
you may check additional instruments in case you have multiple instruments in operation

3. Click **<Apply>** to take over the information.
4. Click **<OK>.** The plate can now be used in the protocol files

7.2 Define a Protocol – Common Steps for all Protocols

IMPORTANT

The protocol setup is guided through a wizard. Most of the steps passed through the protocol setup are similar in all kinds of protocols, both Raw Data and Curve Fit, and independent from the used measurement technology.

To set up a protocol proceed as follows:

1. Starting on the main screen click **[Protocol Design]** in the left-hand Navigation bar. The **[Protocol design]** icon will change its color and the Navigation bar will change the icons.

   If you want to use an already existing protocol for measurement, you may proceed with chapterXXXXXX

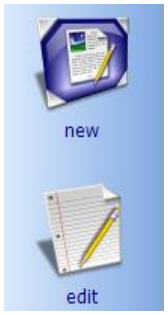
   Click **[ReRun&Edit]** to operate existing files.

2. Click **[new]** to define a new protocol or **[edit]** to edit an existing protocol.

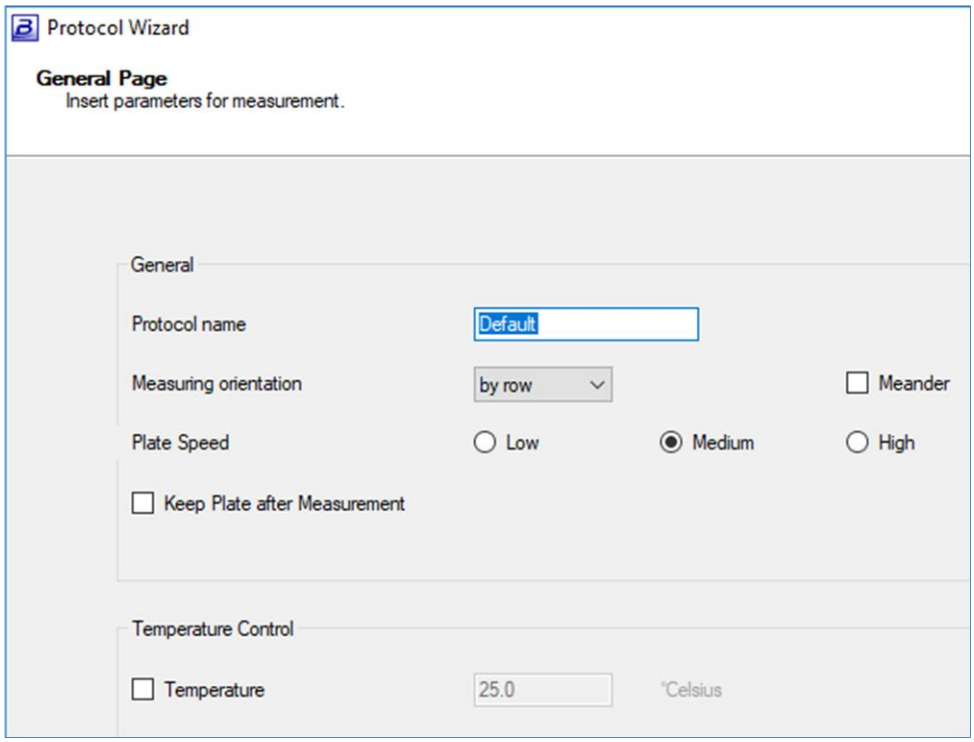
   Use the Backbutton  to go back to the previous menu, if desired.

3. To set up a new protocol, click **[Raw Data]** or **[Curvefit]**. A protocol wizard will guide you through the protocol setup.

   Click **<Next>.**



4. The **[General Page]** appears. Insert the parameters for measurement.



[Protocol name] enter a descriptive name for the protocol

[Measuring orientation] select by column or by row

[Meander] Check Meander to have the instrument read one row from the left to right and the consecutive one from right to left or one row from top to bottom and the consecutive from bottom to top.

[Keep plate after Measurement]

Check the checkbox in case you want the micro-plate being kept inside the instrument after the reading being finished.

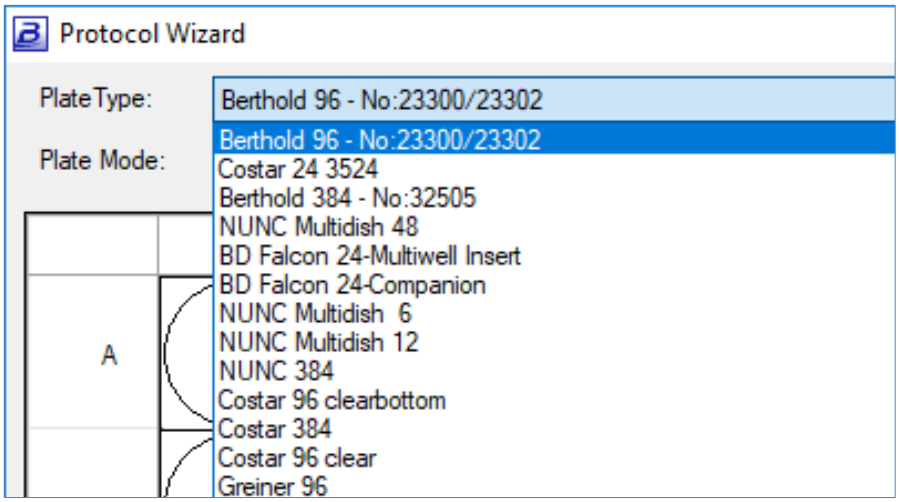
[Temperature] Check Temperature to activate the temperature control for this protocol.

Robot, Barcode and Multi Plate Data File Mode are currently not active.

Click **<Next>.**

5. Select the [Plate Type] and the [Plate Mode]

[Plate Type]



Some microplates are predefined in the software.

Additional microplates have to be defined in the **[Plate Editor]** prior to defining a protocol. See section 7.1 for details.

[Plate Mode]

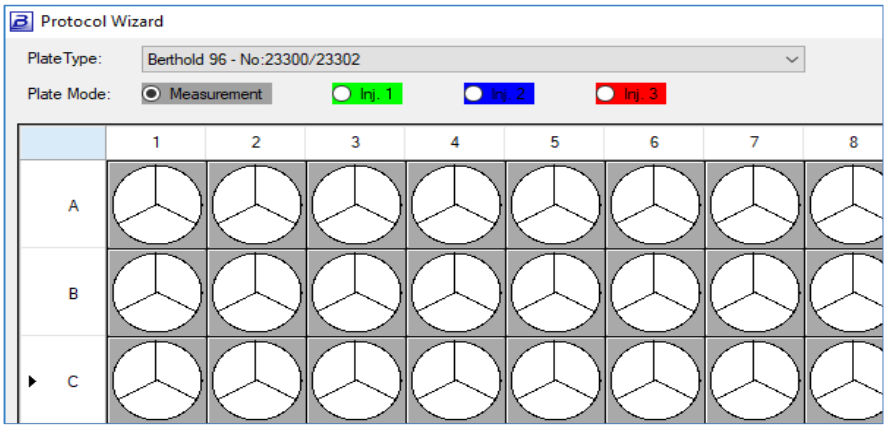
Select the wells for measurement and injection.

Click the respective plate mode <radio button> and assign the area:

- for the whole plate, click the top left corner
- for a row, click the respective character
- for a column, click the respective number
- for an area, click and drag the mouse
- for an individual well, click into it

Measurement radio button:

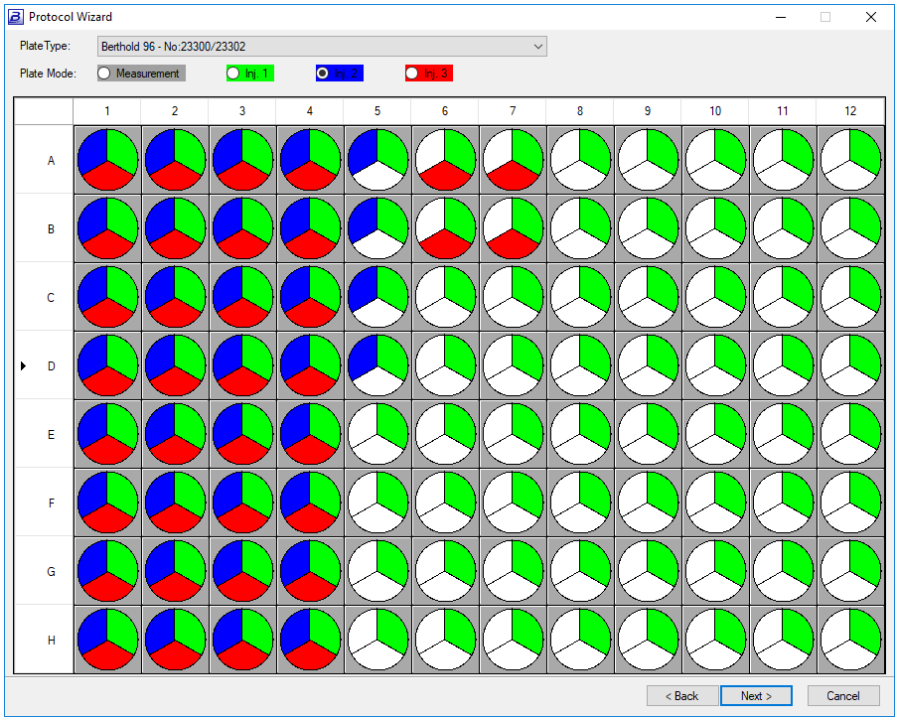
Select the wells to be measured always at first by clicking the **<Measurement radio button>**.



Wells with a gray outside area are selected for measurement.

Inj 1, Inj 2 or Inj 3 radio buttons:

Select the respective injector and the wells to be injected into subsequently by clicking the **<Inj 1>, <Inj 2> or <Inj 3>** radio button.



Note: You can only inject into wells selected for measurement!

Wells coloured in the respective colour are injected into.

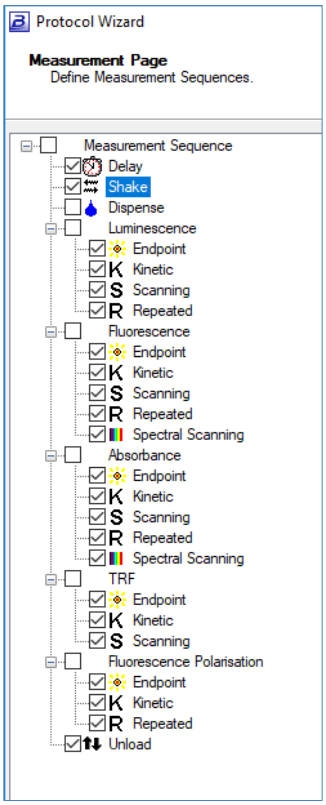
Click **<Next>.**

6. Define measurement operations on the **[Measurement page]**.

NOTICE

The availability of measurement technologies and measurement types may vary dependend on your order. Only measurement technologies available for this individual instrument will be shown on the measurement page for setup of a measurement sequence.

- Available operations are shown on the left-hand area of the page.
- Allowed operations are indicated by a check mark.
- Double-clicking an operation opens the specific properties dialogue.



Example of a measurement page

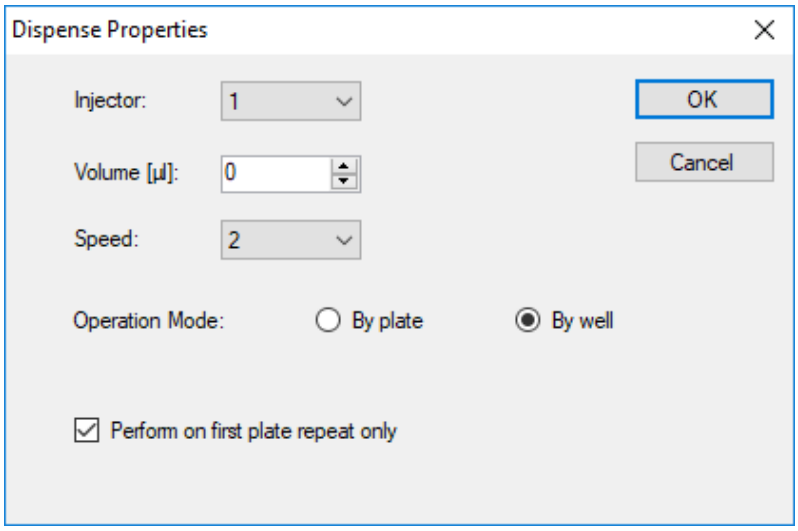
7. Double-click **[Delay]** if a delay/incubation time is required. Insert your settings.

   [Duration] (0.1-3600s)

   [Operation Mode] by plate or by well

   Click **<OK>** to confirm and for returning to the measurement page.

8. Double-click **[Dispense]** in case a reagent addition is required prior to the measurement. Insert the required settings.

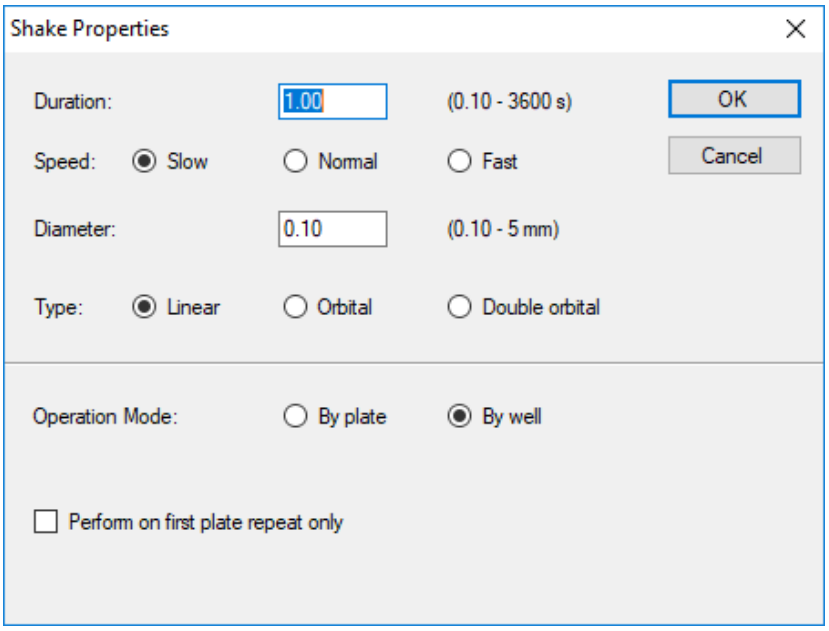


[Injector] select 1, 2 or 3
[Volume] 10 to 100 µL
[Speed] select 1 to 5
[Operation Mode] by plate or by well
[Perform on first plate repeat only] check if desired

Click **<OK>** to confirm and for returning to the measurement page.

In case additional reagent additions are required repeat this procedure for the other injector(s).

9. Double –click **[Shake]** if shaking is required.



[Duration] 0.1 to 3600s
[Speed] slow, medium or fast
[Diameter] 0.1 to 5 mm
[Operation mode] by plate or by well
[Plate repeat checkbox]

Click **<OK>** to confirm and for returning to the measurement page.

10. Define the reading step for your technology and protocol type.

NOTICE

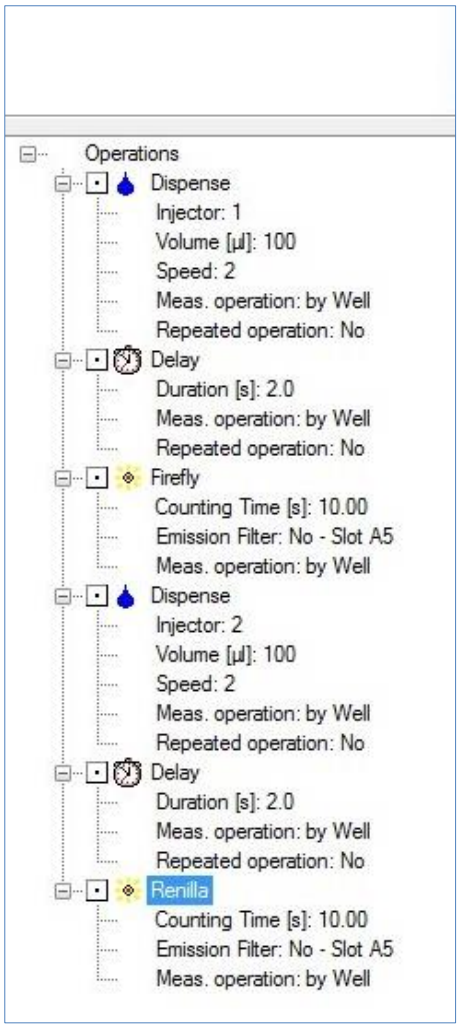
The different technologies (Luminescence, Fluorescence, Absorbance,….) and protocol types (Endpoint, Kinetic, Repeated,…) require different layouts of software screens for definition of the measurement step.

Step 10 is therefor outsourced to chapter 7.3. Refer to this chapter and act as described for your measurement technology and protocol type. Proceed with step 11, then.

11. The sequence of selected **[Operations]** will be displayed on the right-hand side of the measurement page.

    Operations can be moved up or down by clicking on the operation and dragging them to the respective position

    Operations can be deleted by highlighting and hitting the DEL key or by dragging to the left.

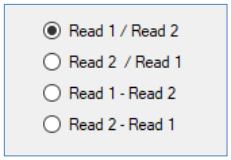


Example for a Dual Luciferase Reportergene Assay

    Click **<Next>.**

12. The **[Multilabel Calculation Page]** will appear only in cases of 2 readings. Select the
    [Type of calculation]

    Click **<Next>** to continue.



13. Define **[Export]** settings.
    Type your [Header] specific for this protocol.

    Select the data set by dragging from left to right.

    [Sample ID] sample information
    [Measurement Data] readings

[Result calculated]	data
[Error]	any error codes
[Overlay]	well information
[Statistics]	measurement settings

Type your **[Footer]** specific for this protocol.

Define **[Directory]** for the export file.

Check if **[Automatic Export]** is required.

Click **<Next>.**

14. Define **[Print]** settings.
    Select the data set by dragging from left to right.

[Page Header]	file names
[Measurement Data]	readings
[Statistics]	measurement settings
[Results]	calculated data
[Overlay]	well information
[All Curves]	kinetics curves
[Zoomed Curves]	zoomed view of curves

    Define **[page orientation]** and **[margins].**

    Check if **[Automatic Print-out]** is required.

    Click **<Next>.**

15. Click **<Finish>** to save the protocol.
16. Define the protocol **[File name]** and click **<Save>.**

7.3 Define a Raw Data Measurement

A raw data measurement generates pure values for each measured well, e.g. in RLU or RLU/s for luminescent measurements.

7.3.1 General Remarks

Chapter 7.3 describes the outsourced step 10 of chapter 7.2 for Raw Data measurements.

IMPORTANT

The measurement settings for

- 7.3.2 Endpoint/Dual Endpoint

are described in detail for several measurement technologies.

The following chapters

- 7.3.3 Kinetic Reading
- 7.3.4 Scanning
- 7.3.5 Repeated mode (long-term kinetic)
- 7.3.6 Spectral Scanning (Tristar 5 only)

describe the special measurement settings, different from Endpoint measurement, for this protocol types.

Depending on your order an individual instrument may not be equipped with all described technologies, or additional technologies, not described in this manual, are available (e.g.Alphascreen).

For all technologies and protocol types:

[Reading Position] is only available if the instrument is equipped with bottom reading technology.
Choose reading from above (Top) or below (Bottom) the plate.

Usually: Top

Note: If reading position Bottom is selected, the red plate frame and the “mH” Emission filter slide must be used.

[Second Measurement] It is recommended to use a second measurement for very fast switching between first and second readings of e.g. fast BRET kinetics or for ratiometric readings monitoring fast reaction kinetics. It may not be used for single Endoint readings

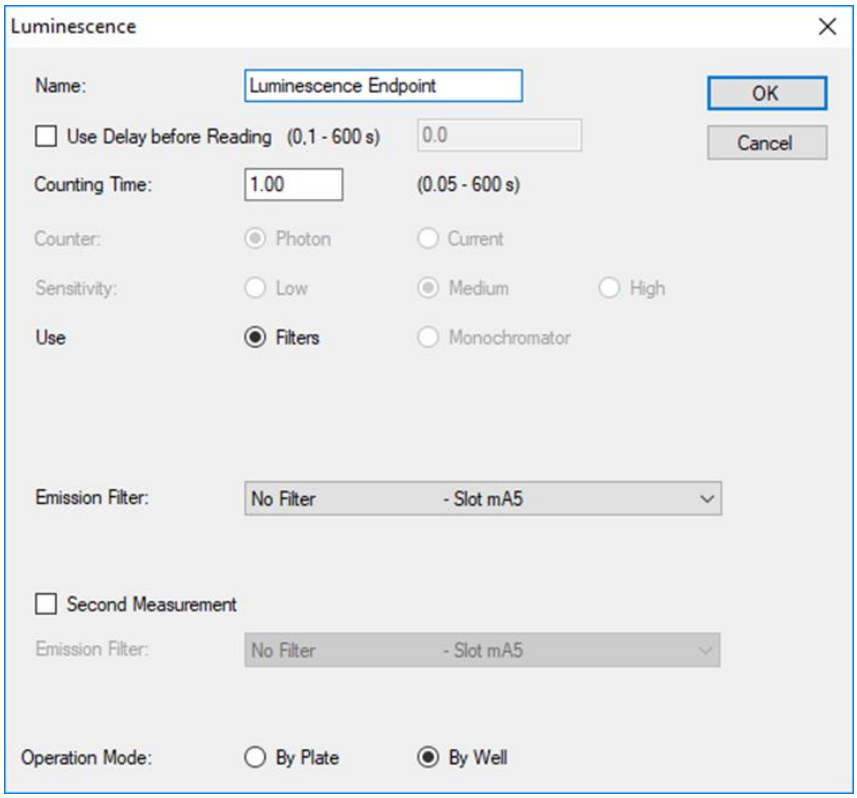
7.3.2 Define an Endpoint Reading

Double –click **[Endpoint]** of your desired measurement technology and define the reading settings. The different technologies require different layouts of software screens for definition of the reading.

Please view the following screens for your desired measurement technology.

1. **Luminescence Endpoint reading**
   A luminescent measurement generates pure values for each measured well, in RLU or RLU/s. This measurement type is e.g. useful in luminescent research assays to determine ATP content, single reporter gene expression, activities of caspases, kinases and many other enzymes.

   Note: If filters are used (e.g. BRET), they must be defined prior in the Instrument menu and the respective filter slide/position must be selected in the menu **[Emission Filter]**.
   Refer to chapter 5.3.2 *Installing Emission Filters* for details.



[Name]	give a (descriptive) name
[Use delay….]	check if desired and set value
[Counting Time]	0.05 to 600 s
[Emission Filter]	usually: No Filter (em. filter slide A, position 5 is empty)
[Operation Mode]	by plate or by well

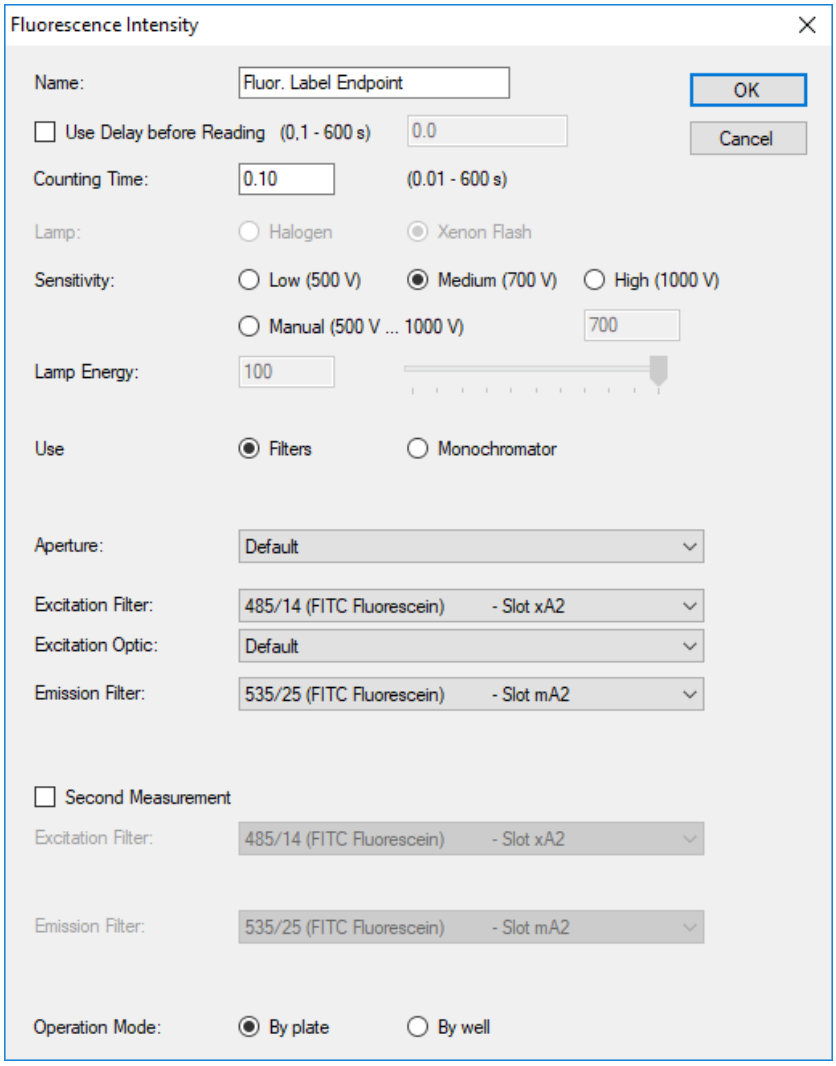
Click **<OK>** and continue with step 11 in chapter 7.2.

2. **Fluorescence Endpoint Reading :**

Depending on the configuration of your individual instrument and the availability of monochromators the screens may vary.

Note: filters must be defined prior in the Instrument menu. Refer to chapter 5.3 *Installing Filters* for details.

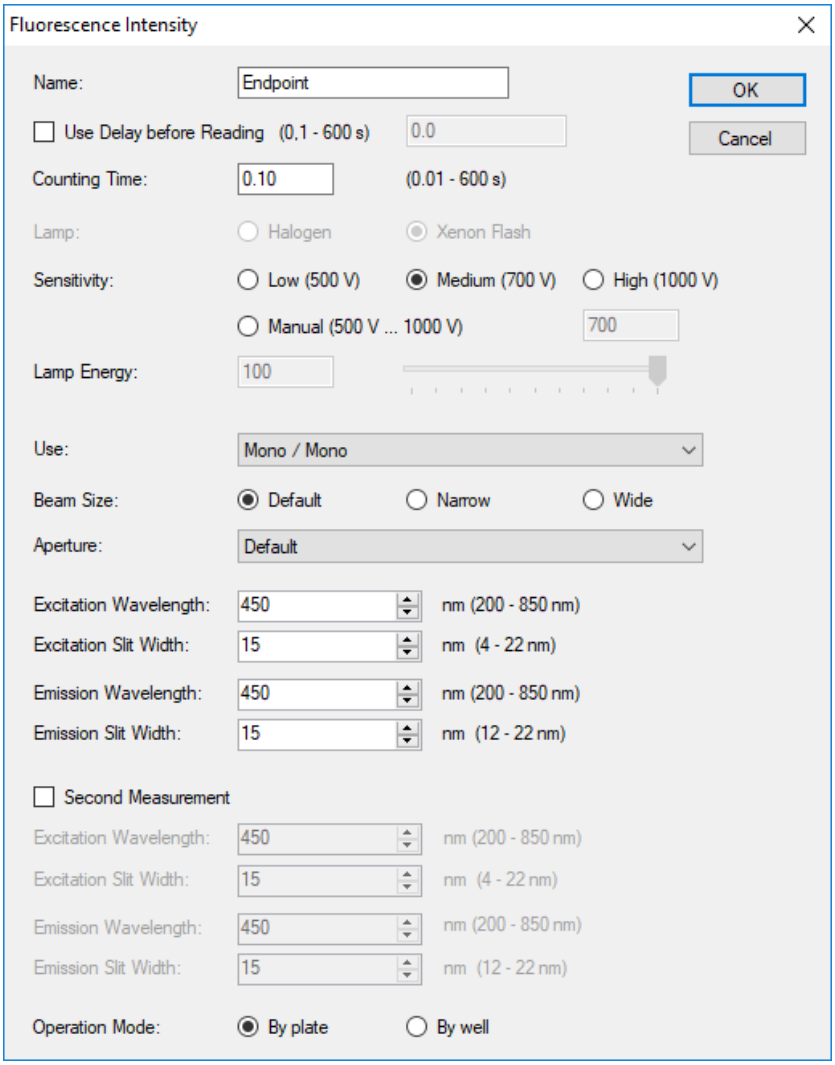
Example for reading with filters:



[Name]	give a (descriptive) name
[Use delay….]	check if desired and set value
[Counting Time]	0.01 to 600 s
[Sensitivity]	select/set value
[Use]	Filters
[Aperture]	usually default
[Excitation Filter]	select from list
[Exc. Optics]	usually default
[Emission Filter]	select from list
[Operation Mode]	by plate or by well

Click **<OK>** and continue with step 11 in chapter 7.2.

Example for reading with 2 monochromators:



[Name]	give a (descriptive) name
[Use delay….]	check if desired and set value
[Counting Time]	0.01 to 600 s
[Sensitivity]	select/set value
[Use]	Mono/Mono
[Beam Size]	select Default/Narrow/Wide; see chapter 4.3.7, too.
[Aperture]	usually default
[Exc. Wavelength]	set value in a range of 200-850 nm
[Exc. Slit Width]	set value in a range of 4-22 nm
[Em. Wavelength]	set value in a range of 200-850 nm
[Em. Slit Width]	set value in a range of 12-22 nm
[Second Measurement]	check if desired and set values
[Operation Mode]	by plate or by well

IMPORTANT

The software allows settings for **[Exc. Wavelength]** and **[Em. Wavelength]** in accordance to the spectral range of the excitation source. Please note, that the usually built-in photomultiplier tube for measurement has a spectral range of 280-600/650 nm. Select your wavelengths settings respectively for good results.

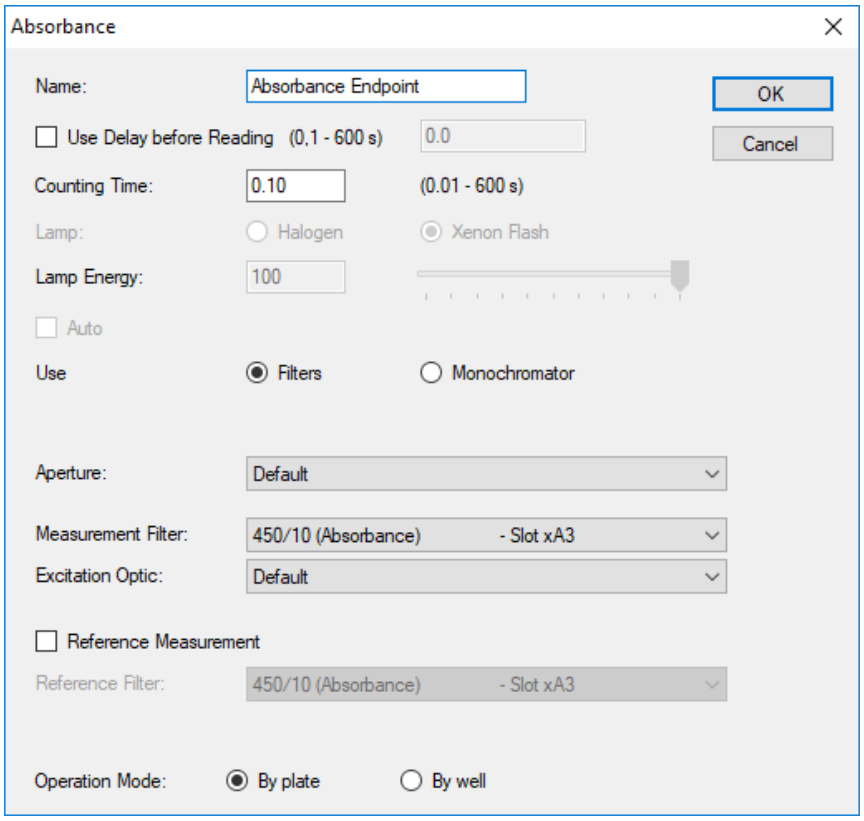
Click **<OK>** and continue with step 11 in chapter 7.2.

3. **Absorbance Endpoint Reading**

Depending on the configuration of your individual instrument and the availability of monochromators the screens may vary.

Note: Filters must be defined prior in the Instrument menu. Refer to chapter 5.3.1 *Installing Excitation Filters* for details.

Example for reading with filters:



[Name]	give a (descriptive) name
[Counting Time]	0.01 to 600 s, usually 0.1 s
[Use]	Filters
[Aperture]	usually default
[Measurem. Filter]	select from the list
[Excitation Optics]	usually default **2-Small filter** is especially recommended for UV-applications.

[Reference Measurement] in case a reference measurement is desired, please check the checkbox.

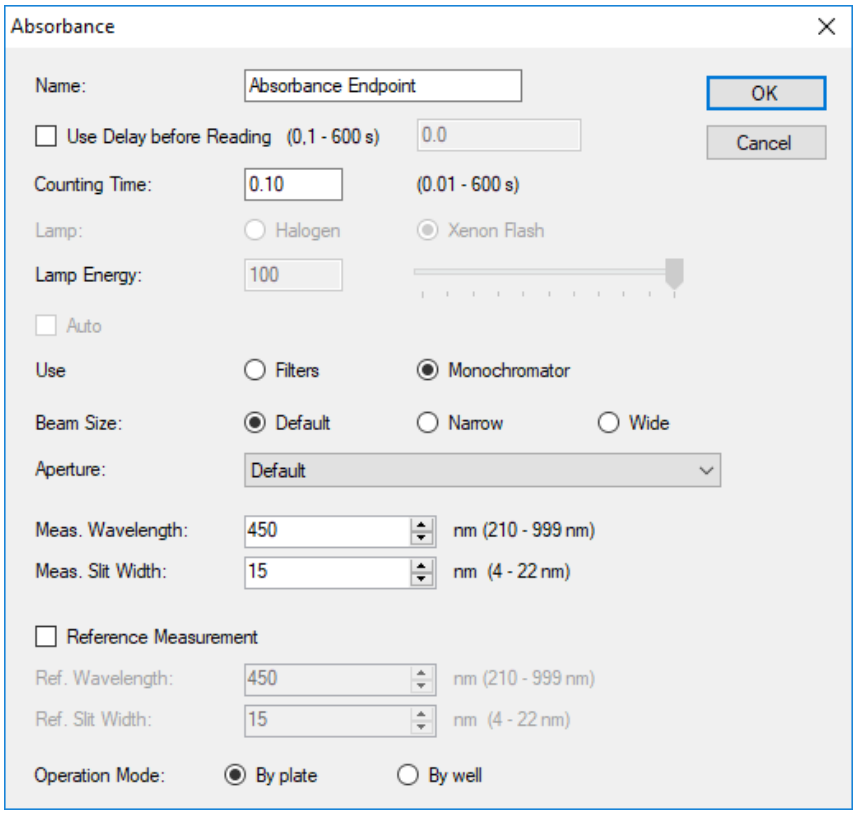
[Reference Filter] select from the list

Note: the values derived with this filter (reference values) will be automatically subtracted from the measurement value per well.

Operation Mode by plate or by well

Click **<OK>** and continue with step 11 in chapter 7.2.

Example for reading with monochromator:



[Name] give a (descriptive) name

[Use delay….] check if desired and set value

[Counting Time] 0.01 to 600 s; usually 0.1 s

[Use] select Monochromator

[Beam Size] usually Default; see chapter 4.3.7, too.

[Aperture] usually Default

[Meas. Wavelength] set value in a range of 210-999 nm

[Meas. Slit Width] set value in a range of 4-22 nm

[Second Measurement] check if desired and set values

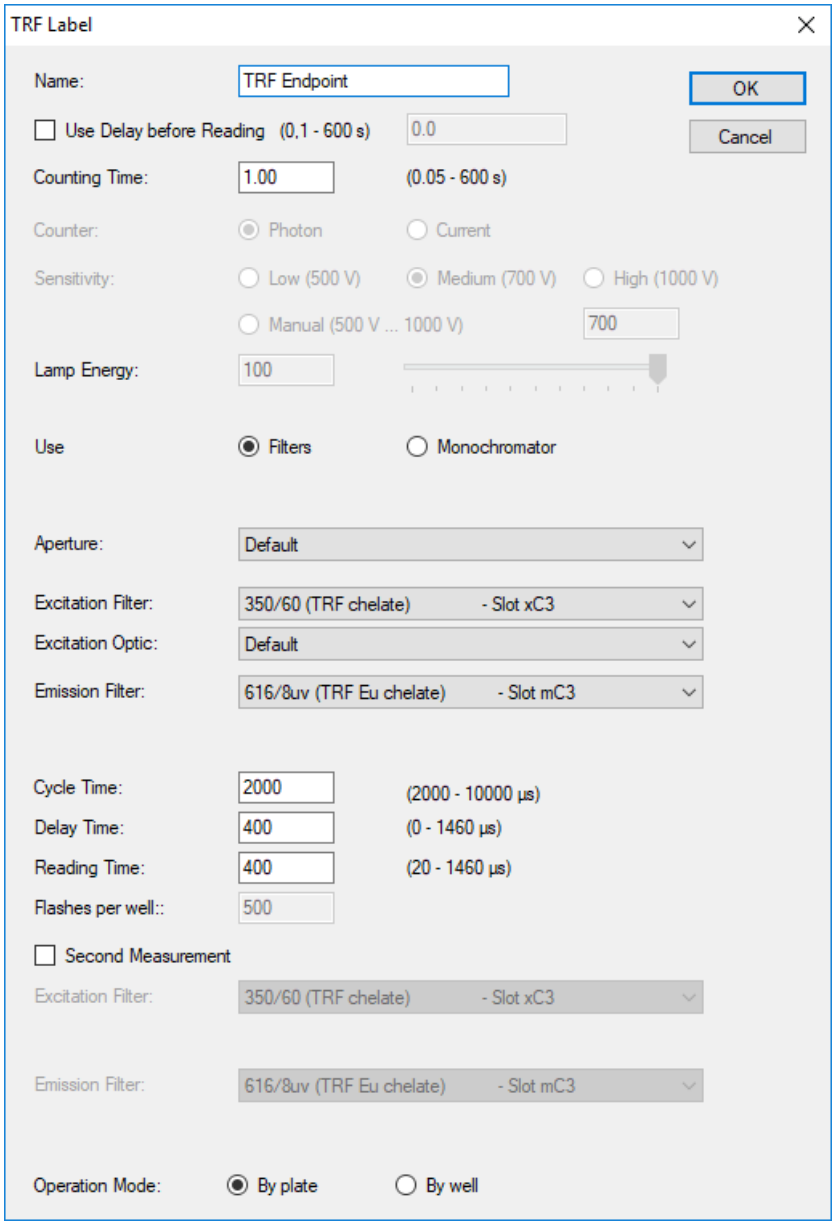
[Operation Mode] by plate or by well

Click **<OK>** and continue with step 11 in chapter 7.2

4. **Time Resolved Fluorescence (TRF) Endpoint Reading**
   For a better sensitivity filters are recommended for measurement.

   Note: Filters must be defined prior in the instrument menu. Refer to chapter 5.3 *Installing Filters* for details.

   Example for reading with filters:



[Name]	give a (descriptive) name
[Counting Time]	0.05 to 600 s, usually 0.1 s
[Use]	Filters
[Aperture]	usually default
[Excitation Filter]	select from list
[Excitation Optics]	set to default, small or wide.
[Emission Filters]	select from list
[Cycle Time]	set to 2000 µs

repr. max. frequ. 500 Hz

[Delay Time] time for which the detector is gated out, i.e. does not collect any signals (waiting for the unspecific prompt fluorescence to die off). Set a value in the range of 0-1460 µs.

Typical settings are:

DELFIA® Europium	400 µs
DELFIA® Samarium	100 µs
DELFIA® Terbium	500 µs
HTRF®	100 µs (Filter)

[Reading Time] time of the window within the PMT collects the time-resolved signal. Set a value in the range of 20-1460 µs.

Typical settings are:

DELFIA® Europium	400 µs
DELFIA® Samarium	100 µs
DELFIA® Terbium	1400 µs
HTRF®	300 µs

[Flashes per well] calculated

[Second Measurement] check if desired and set values

[Reference Filter] select from the list

Note: the values derived with this filter (reference values) will be automatically subtracted from the measurement value per well.

[Operation Mode] by plate or by well

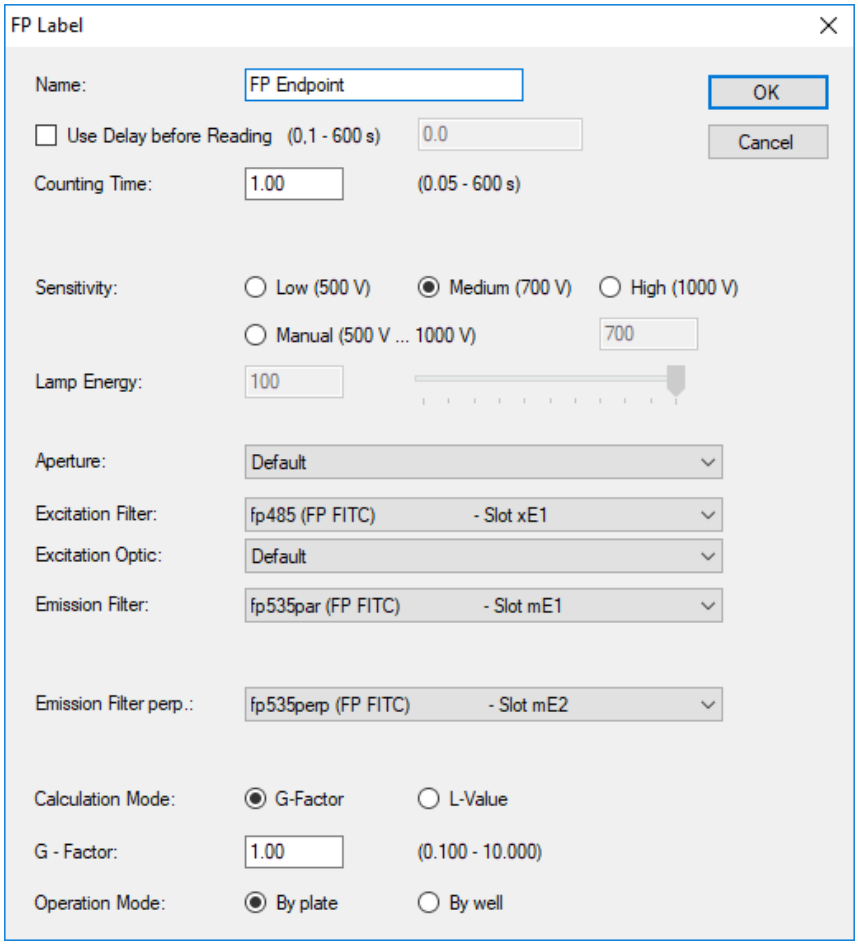
Click **<OK>** and continue with step 11 in chapter 7.2.

5. **Fluorescence Polarisation**

Fluorescence Polarisation (FP) Assays require only one fluorescent label to determine a molecular binding.

Note: FP filters use precisely aligned polarisation filters. For ideal results only use special FP filter slides. Filters must be defined prior in the instrument menu. Refer to chapter 5.3 *Installing Filters* for details.

Example for use with filters:



[Name]	give a (descriptive) name
[Counting Time]	0.05 to 600 s
[Sensitivity]	Select Low / Medium / High or set manually
[Aperture]	usually default
[Excitation Filter]	choose the appropriate excitation filter
[Excitation Optics]	usually default
[Emission Filters]	choose the appropriate emission filter for vertically oriented fluorescence
[Emission Filter perp.]	choose the appropriate emission filter for perpendicularly oriented fluorescence
[G-Factor]	Enter the correct G factor for your assay and this instrument, derived from a G factor determination measurement.

[L-Value]	Enter the correct L value for your assay and this instrument, derived from a L value determination measurement.
[Operation Mode]	by plate or by well

Click **<OK>** and continue with step 11 in chapter 7.2.

6. **Dual Label Assay protocol**

   In a Dual Label Assay two consecutive Endpoint measurement series are defined. Refer to the respective section for setup details. Each series may start with an injection. A mathematical ratio may be calculated between both measurement series afterwards (step 12 in chapter 7.2). This measurement type is useful in luminescent research assays to determine dual reporter gene expression. A typical protocol is shown in step 11, chapter 7.2 .

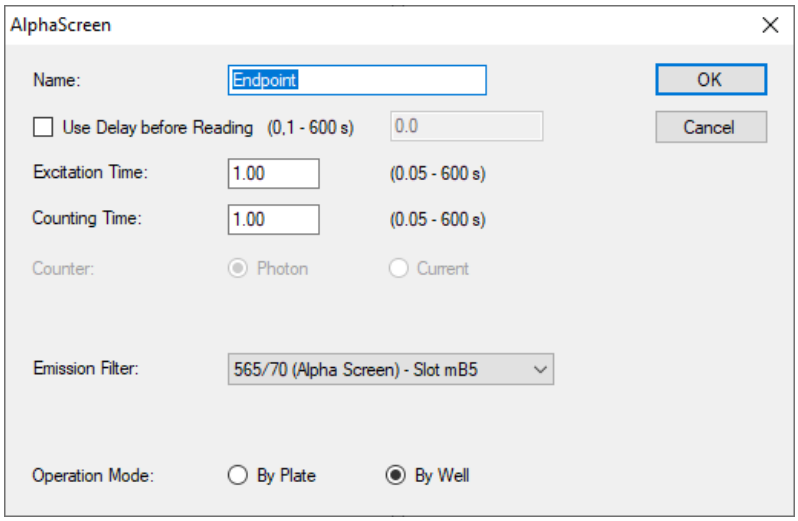
   Click **<OK>** and continue with step 11 in chapter 7.2.

7. **AlphaScreen**

   For the AlphaScreen™ Assay the instrument must be equipped with a laser diode for excitation of the donor beads. The access port is the former channel for the tip of injector #2, which cannot be used when the Alphs Screen option is installed.

   Alpha ScreenTM Assays are to be performed at very low ambient light levels. Preferred light quality is green light.

   Note: Make sure that the AlphaScreen™ emission filter is installed and the microplate used for AlphsaScreen is defined in the software and its dimensions are set according to the manufacturer's data.



[Name]	give a (descriptive) name
[Excitation Time]	Enter the time in seconds, within the laser is switched on to excite the donor beads.
[Counting Time]	Enter the time in seconds over which the signal from the acceptor beads is to be collected.
[Emission Filter]	Select the emission filter to be used. The pre-defined filter with name and position in the filter wheel is displayed. Currently the F565 (AlphaScreen) ,ID no. 40991 filter is the recommended one for best coverage of the acceptor beads´ emitted light.
[Operation Mode]	by plate or by well. It is recommended to use the by plate mode for fast throughput of a plate as the lamp is stabilized only once.

Click **<OK>** and continue with step 11 in chapter 7.2.

7.3.3 Define a Kinetic Reading

The kinetic measurement mode is appropriate for fast kinetics assays lasting over several seconds up to minutes, e.g. enzyme kinetics and Calcium influx.

IMPORTANT

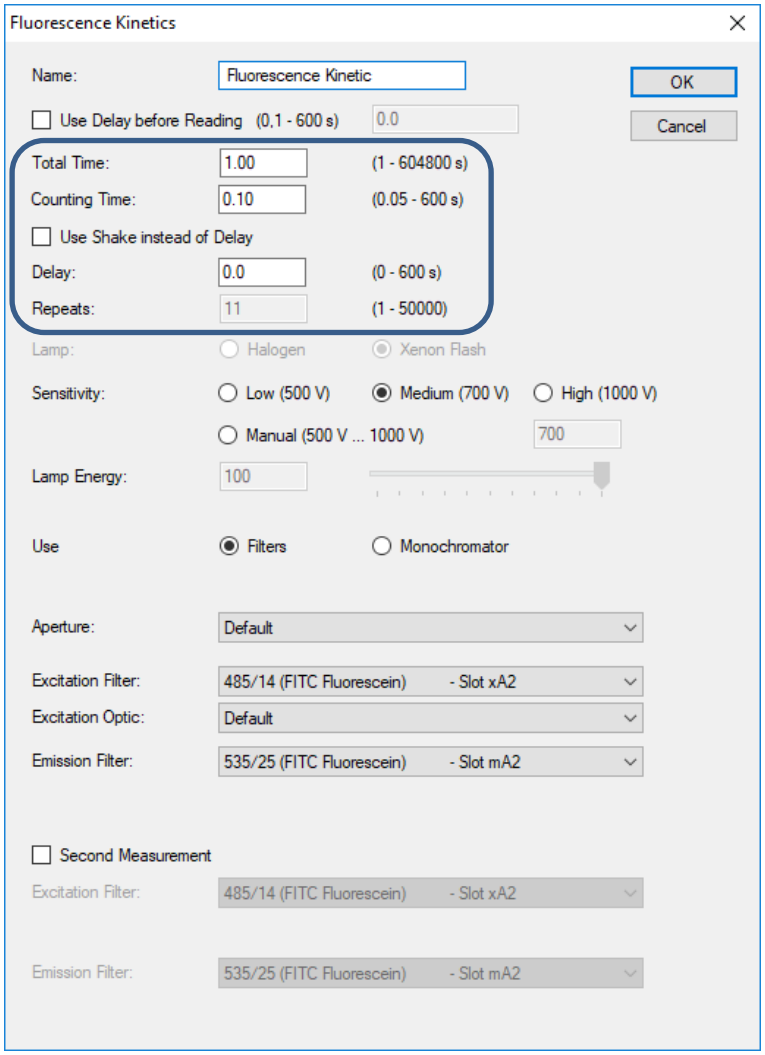
The ICE protocol setup is guided by a wizard and most steps are identical for all kinds of protocols. Refer to chapter 7.2 *Define a protocol – general steps* and chapter 7.3 *Define a raw data measurement* for general hints.

Refer additionally to chapter 7.3.2 *Define an Endpoint protocol* for the measurement technology to be used. The Kinetic reading screens are only slightly different to the Endpoint measurement screens.

Double –click **[Kinetic]** of your desired measurement technology and define the reading settings.

Some additional settings have to be inserted for Kinetic reading. They are independent from and therefor identical for all measurement technologies.

Example of a fluorescent kinetic reading with filters:



Special settings for Kinetic reading are marked with a frame.

[Total Time]	the entire kinetic time in s (max.7 days)
[Counting Time]	0.05 to 600 s; possible settings may vary dependent on the selected **[Total Time]**.
[Use shake instead of delay]	check if used
[Delay]	0 to 600s
[Repeats]	are calculated automatically

For description of other settings refer to chapter 7.3.2

Click **<OK>** and continue with step 11 in chapter 7.2.

A 2nd or 3rd kinetic operation may be added, e.g.after a dispensing operation and set up in the same way.

7.3.4 Define Scanning

A scanning measurement mode is appropriate for assays with heterogeneous distribution of signal, e.g. cellular assays.

IMPORTANT

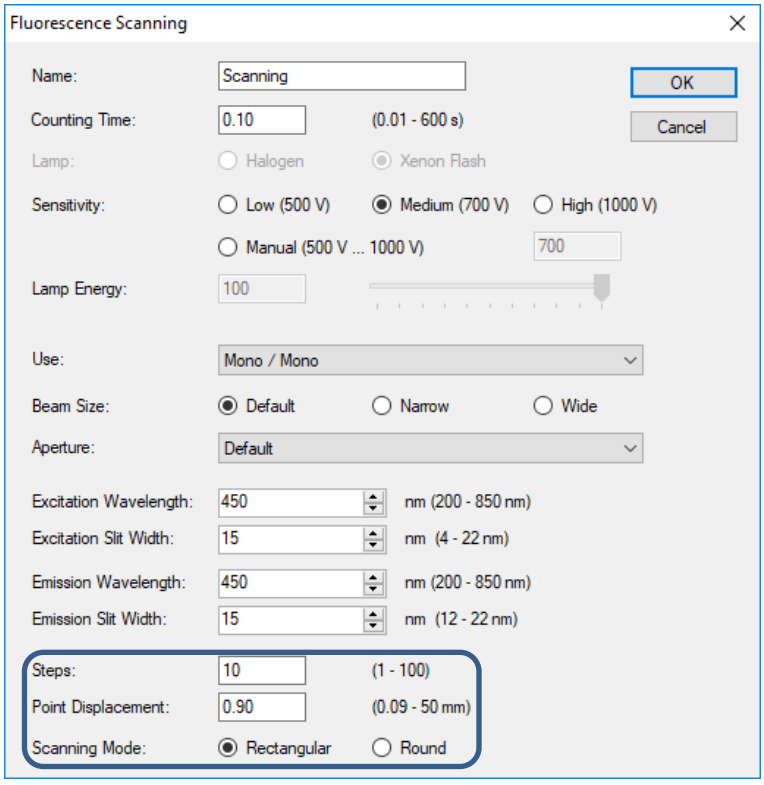
The ICE setup is guided by a wizard and most steps are identical for all kinds of protocols. Refer to chapter 7.2 “Define a protocol – general steps” and chapter 7.3.1 “General remarks”.

Refer additionally to chapter 7.3.2 “Define an Endpoint protocol” for the measurement technology to be used. The Scanning screens are only slightly different to the Endpoint measurement screens.

Double –click **[Scanning]** of your desired measurement technology and define the reading settings.

Some special settings have to be inserted for Scanning. They are independent from and therefor identical for all measurement technologies.

Example of a fluorescent scanning screen



Special settings for Scanning are marked with a frame:

[Steps]	1 to 100 scanning points in x and y direction.
[Point displacement]	distance between points
[Scanning mode]	select rectangular or round matrix

For description of other settings refer to chapter 7.3.2

Click **<OK>** and continue with step 11 in chapter 7.2.

7.3.5 Define a Repeated Measurement

A repeated measurement mode is appropriate for long-term kinetic assays lasting over multiple minutes up to several days, e.g. cellular luminescence, slow enzyme kinetics, long-term gene expression or growth monitoring

IMPORTANT

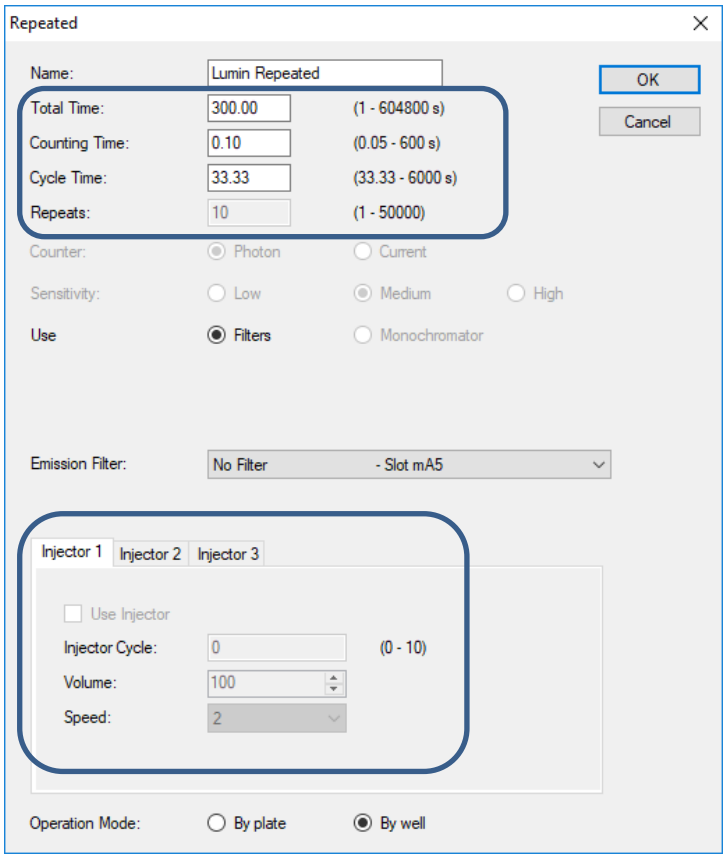
The ICE setup is guided by a wizard and most steps are identical for all kinds of protocols. Refer to chapter 7.2 *Define a protocol – general steps* and chapter 7.3 *Define a Raw Data measurement* for general hints.

Refer additionally to chapter 7.3.2 *Define an Endpoint protocol* for the measurement technology to be used. The Repeated measurement screens are only slightly different to the Endpoint measurement screens.

Double –click **[Repeated]** of your desired measurement technology and define the reading settings.

Some special settings have to be inserted for Repeated measurement. They are independent from and therefor identical for all measurement technologies.

Example of a luminescent repeated measurement screen



Special settings for Repeated reading are marked with a frame.

[Total Time]	the entire kinetic time in s (max.7 days)
[Counting Time]	0.05 to 600 s; possible settings may vary dependent on the selected **[Total Time]**.

[Cycle Time]	the time a specific well is read again in the consecutive cycle. Possible settings may vary dependent on the selected **[Total Time]** and **[Counting Time].**
[Repeats]	are calculated automatically
[Use Injector]	Check this box for an injection within the repeated cycle
[Injector cycle]	0 means prior to a measurement; up to 10
[Volume]	10 to 100µl
[Speed]	1 to 5

For description of other settings refer to chapter 7.3.2

Click **<OK>** and continue with step 11 in chapter 7.2.

7.3.6 Define Spectral Scanning (Tristar 5 only)

A wavelength scanning measurement mode is appropriate when the peak wavelengths of the fluorophores or dyes are unkown or when changes of the said are expected to change due to assay conditions, e.g. pH, polarity, enzymatic activities.

The TriStar^5 is equipped with a monochromator in the excitation optics and/or emission optics, thus absorbance scans or fluorescence scans can be performed.

IMPORTANT

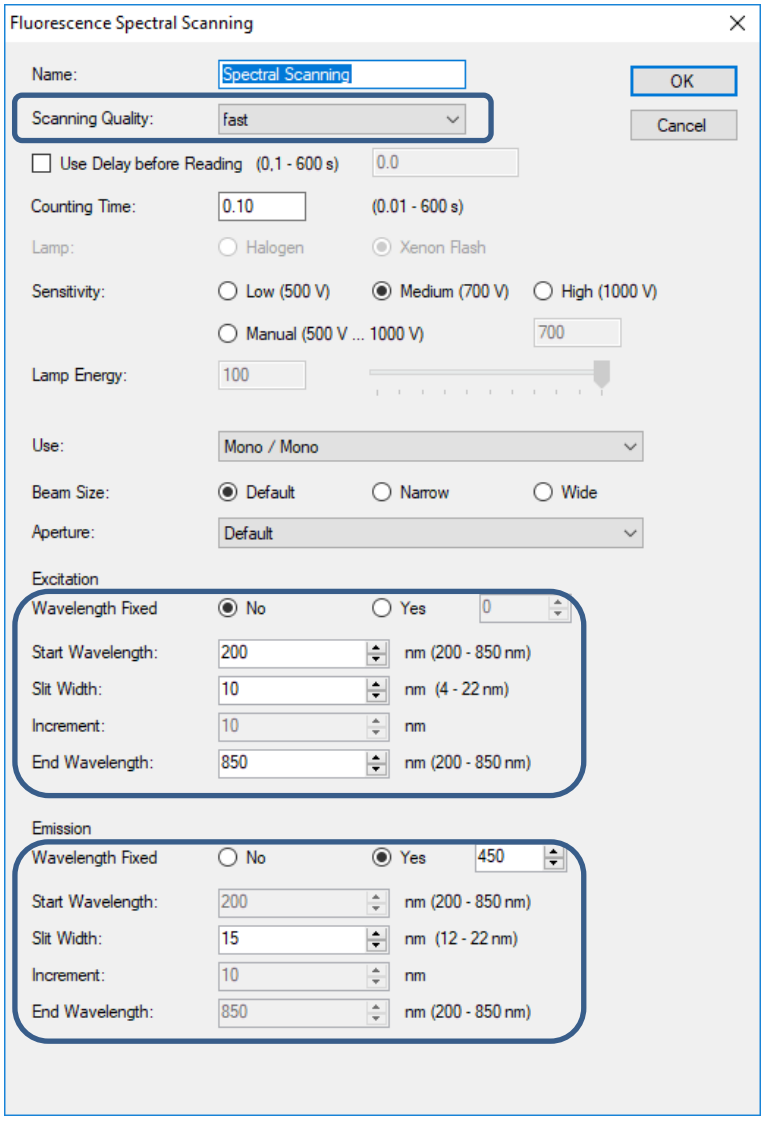
The ICE setup is guided by a wizard and most steps are identical for all kinds of protocols. Refer to chapter 7.2 *Define a protocol – general steps* and chapter 7.3 *Define a Raw Data measurement* for general hints.

Refer additionally to chapter 7.3.2 *Define an Endpoint protocol* for the measurement technology to be used. The Spectral scanning screens are only slightly different to the Endpoint measurement screens.

Double –click **[Spectral Scanning]** of your desired measurement technology and define the reading settings.

Some special settings have to be inserted for Spectral Scanning. They are independent from and therefor identical for all measurement technologies.

Example for Fluorescence Spectral Scanning (Tristar[5] with 2 Monochromators)



Special settings for Spectral Scanning are marked with a frame:

[Scanning quality]	fast (increment fixed: 10nm) high (increment fixed: 1nm) customized
[Wavelength Fixed]	No/ Yes + respective wavelength. Either excitation wavelength or emission wavelength must be fixed.
[Start Wavelength]	200-850 nm selectable
[Slit Width]	4-22 nm (Excitation) / 12-22nm (Emission)
[Increment]	1 to 50 nm, depending on settings for [Scanning quality]
[End Wavelength]	200-850 nm selectable

Depending on the measurement technology the ranges for **[Start Wavelength]** and **[End wavelength]** may vary.

For Luminescence: 300-850 nm
For Absorbance: 210-999 nm

For Absorbance Spectral Scanning the **[Scanning Quality] Quick** is additionally available. If selected, the menu items for **[Slid Width]** are reduced.

7.4 Start a Raw Data Measurement

The protocol that has been created at last will be pre-selected. In case you want to perform another measurement you may simply select another protocol from the list.

IMPORTANT

The general measurement steps are described in detail in chapter:

- 7.4.1 Endpoint Reading

The following chapters

- Kinetic Reading
- Scanning
- Repeated mode (long-term kinetic)
- Spectral Scanning (Tristar 5 only)

describe the special features of this protocol types, different from the End-point Reading.

NOTICE

Use of injectors:

If injectors are to be used, they must be primed prior to protocol start. Refer to chapter 8.1 for details.

Plate frame:

Make sure the appropriate plate frame is inserted.

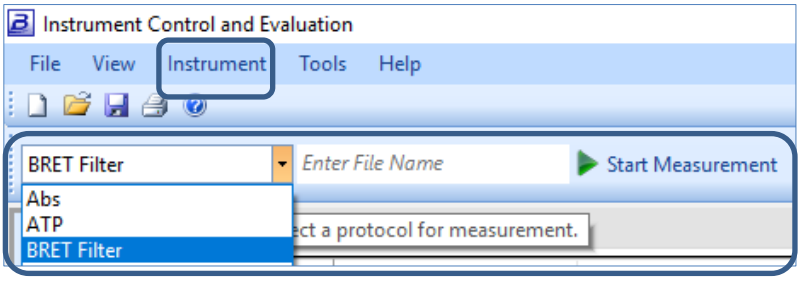
⚠ CAUTION

Reagent trough:

Do not overfill the reagent trough as liquid spills in the injector compartment may cause severe damage to the electrical system. Take special care when ice in the trough starts to melt.

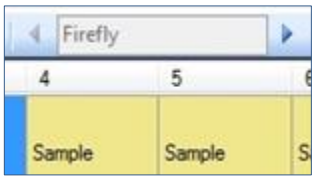
7.4.1 Start an Endpoint Reading

To start a measurement act as follows on the **[Main screen]**:



1. Select the **[Protocol]** to be used.
2. Enter a **[file name]** under which the measurement is to be stored.
3. Click **<Start Measurement>.** The plate tray will be unloaded automatically. A **[Load plate to continue]** screen will be displayed.
4. If the microplate frame has not been inserted before: Select a **microplate frame** suitable for the microplate to be used and insert it into the plate tray.
   Use the
   - **black frame** for microplates with plate heights of 15 mm (±1 mm), e.g. 96 and 384 well plates.
   - **red frame** for microplates with plate heights of 20 mm (±1 mm), e.g. 6, 12, 24 well plates.
   - **green frame** for lidded microplates with plate heights of 15 mm (±1 mm), e.g. 96 and 384 well plates.
5. Insert the microplate with your samples: well A1 facing to the rear and left side.
6. Click **<OK>** on the **[Load plate to continue]** screen to start the measurement.
7. The selected wells of the microplate will be measured and the numerical value of the signal will be displayed.

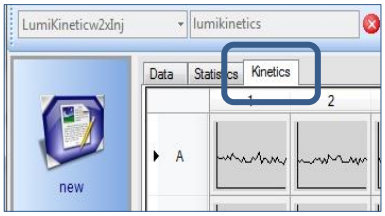
   In cases of two readings (e.g. Dual Luciferase Assay):
   you may switch between the two readings by clicking on the arrows.



8. Click on the tab **[Statistics]** to view information about your protocol and instrument.
9. When the measurement has finished, select **[Instrument] / [Unload Plate]** to retrieve the microplate (still in measurement position) and remove it from the instrument.

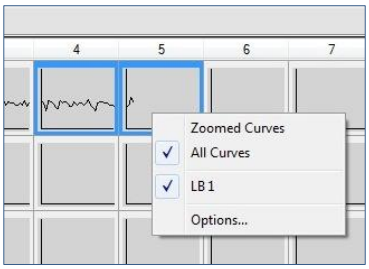
7.4.2 Kinetic Reading

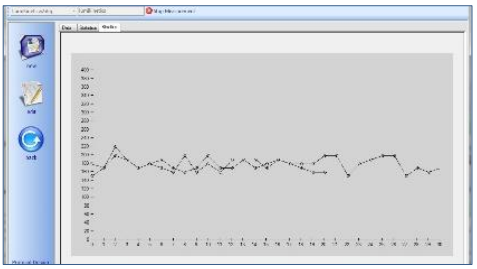
- In cases of Kinetic reading you may also choose to view the curves by clicking the **[Kinetic tab]**



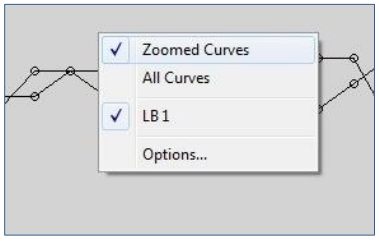
The scale of the axes can be changed by right-clicking into the curves and selecting **[Options]**…

- To get a zoomed view click into the respective wells to highlight them, then right-click and select **[Zoomed Curves]**





- To un-zoom right-click into the zoomed view and select **[All Curves].**

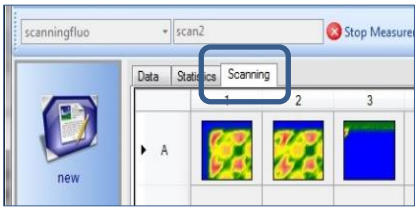


7.4.3 Scanning

- In cases of Scanning the selected wells of the microplate will be measured and the numerical value of the signal will be displayed.

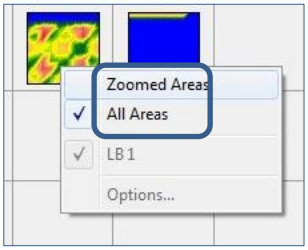
  You may switch between the individual readings by clicking on the arrows.

- You also choose to view a graphical display by clicking the Scanning tab.



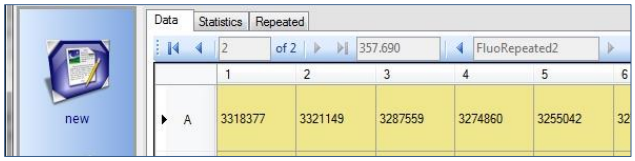
- To get a zoomed view click into the respective wells to highlight them, then right-click and select **[Zoomed Areas].**

- To un-zoom right-click into the zoomed view and select **[All Areas].**



7.4.4 Repeated Measurement

- In case of Repeated reading you may switch between individual readings by clicking on the arrows.

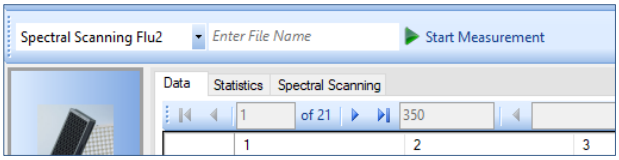


- You also choose to view the curves by clicking the **[Repeated tab].**

  The scale of the curves axes can be changed by right-clicking into the curves and selecting **[Options]…**
- To get a zoomed view click into the respective wells to highlight them, then right-click and select **[Zoomed Curves].**
- To un-zoom right-click into the zoomed view and select **[All Curves].**

7.4.5 Spectral Scanning (Tristar 5 only)

- In case of Spectral Scanning you may switch between individual readings at their specific wavelength by clicking on the arrows.



- You also choose to view the curves by clicking the [**Spectral Scanning tab].** The scale of the curves axes can be changed by right-clicking into the curves and selecting **[Options]…**
- To get a zoomed view click into the respective wells to highlight them, then right-click and select **[Zoomed Curves].**
- To un-zoom right-click into the zoomed view and select **[All Curves].**

7.5 Curvefit Measurement

A curvefit measurement contains standards with known concentrations which are used to determine unknown concentrations of the samples.

7.5.1 General Remarks

Refer to chapter 7.2 *Define a Protocol – Common Steps for all Protocols*.

Chapter 7.5 describes the outsourced step 10 of chapter 7.2 for Curvefit measurements.

Depending on your order an individual instrument may not be equipped with all described technologies, or additional technologies, not described in this manual, are available (e.g. Alphascreen).

For all technologies and protocol types:

[Reading Position] is only available if the instrument is equipped with bottom reading technology.
Choose reading from above (Top) or below (Bottom) the plate.

Usually: Top

Note: If reading position Bottom is selected, the red plate frame and the “mH” Emission filter slide must be used.

[Second Measurement] It is recommended to use a second measurement for very fast switching between first and second readings of e.g. fast BRET kinetics or for ratiometric readings monitoring fast reaction kinetics. It may not be used for single Endoint readings

7.5.2 Curve Properties Page

The curve properties page allows to insert different kinds of standardizations and to define the properties of the curve. Depending on the type of standardization selected, specific submenus and check boxes will be available or greyed out. The user may choose between

Full standardization: Measure the whole standard curve before measuring samples.

Reference Standard curve: Use a still measured curve and recalibrate it with the help of 2 calibrators.

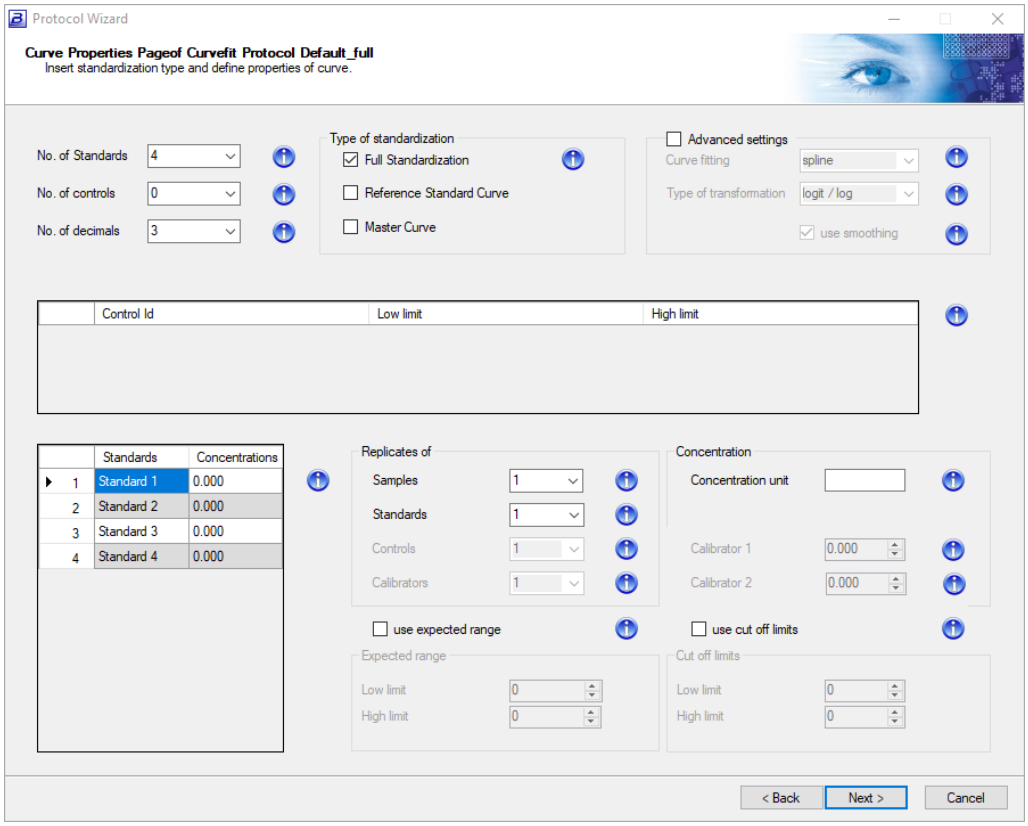
Master curve: Use a verified curve for your assay and recalibrate it with the help of 2 calibrators.

The  button informs you about the respective setting on the page.

7.5.3 Define and start an Immunoassay with Full Standardization

A complete set of standards is measured with the samples on a microplate. This method is best suited to eliminate day-to-day variations in assay preparation as well as lot variations of the chemistry.

Click **[Full Standardization]** and setup the following default page according to your needs.



[No.of standards] The minimum of standards depends on the selected curve fitting method in the section [**Advanved settings]**

For **[spline]** calculation: minimum of 4 standards

For **[point to point]** calculation: 2 standards

Maximum of standards is 10.

[No. of controls] Controls may be used to verify your results against known concentrations. Set 0-10 controls.

[No. of decimals] Number of decimals to be shown in the report

Set 0-3 decimals.

[No. of blanks] This item is only available if **[linear regression]** is used for curve fitting. Blanks have to be measured before standards. The mean value of the blanks will be subtracted from your results. Insert a number of 0-96 blanks.Value 0 means that blanks are not used.

[Advanced settings]	Check the checkbox and choose the type of [curve fitting].
[Curve fitting]	**[spline]:** calculation of standard curve using spline mathematics **[point to point]**: simple connection of the points of the standard curve. **[linear regression]:** calculation of the standard curve using linear regression.
[Type of transformation]	availability of transformation types is dependent on the selected type of curve fitting. **For spline:** logit/log, log/log, log/lin Choose whether to perform a logit-log or log-log transformation prior to the spline fit. Use logit-log for standard curves where saturation is expected in the upper RLU range (usually preferable). You can also select log/log instead. All standard RLU mean values Bi and entered concentration values are now transformed in the logit-log range with usual normalization of Bi/Bmax. **[use smoothing]** only available for Spline. **For point to point:** lin/lin only, no smoothing **For linear regression:** lin/lin, logit/log, log/log; no smoothing.
[Control]	This section is only available if the [No. of controls] is ≥ 1. Insert the identities and the low and high limit for your controls to be shown in the report.
[Standards]	Insert the concentration of standards you want to use for measurement. The concentrations must increase, otherwise you will get an error message.
[Replicates]	Insert the number of [Samples], [Standards] and [Controls, if available. Set a number of 1-10.
[use expected range]	If desired, check the check box andiInsert a low and a high limit to define your expected range for measurement. Below the low limit and above the high limit concentrations will not be calculated.
[concentration unit]	Insert the concentration unit to be shown in the report.
[use cut off limits]	If desired check the checkbox and insert a low and a high limit to define cut off thresholds. There will be shown remarks in the report, if a concentration is below, between or above the thresholds.

After complete definition of the assay protocol, start the measurement according to the description in chapter 7.4.

8 Maintenance

8.1 Priming the Tubing

8.1.1 Priming before Measurement

Some assays require the injection of reagent prior or during measurement. For good operation the injection lines have to be primed previously.

NOTICE

Priming injectors:

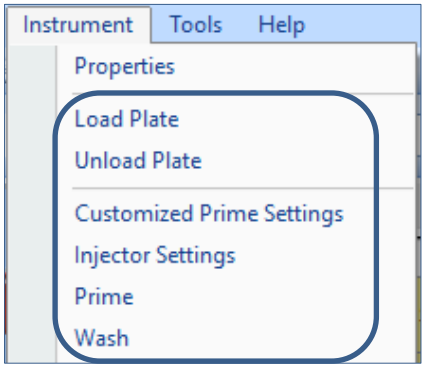
It is strongly recommended to perform the priming with deionized water first and leaving the lines filled with deionized water before priming with reagents.

This procedure avoids reagents aerosol splashes at the injector tips and thus contamination of the instrument.

⚠ CAUTION

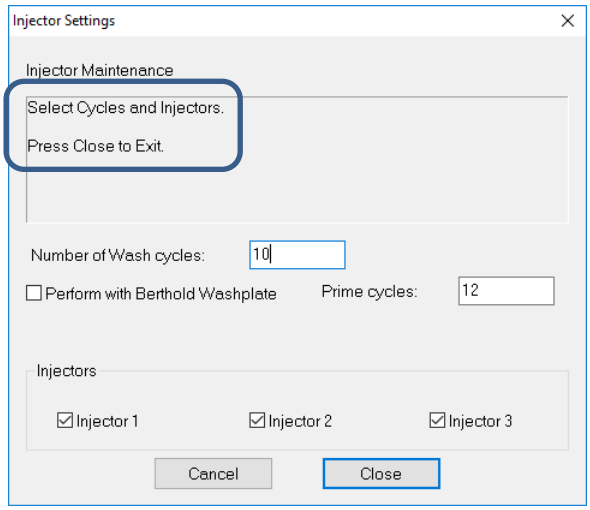
Reagent trough:

Do not overfill the reagent trough as liquid spills in the injector compartment may cause severe damage to the electrical system. Take special care when ice in the trough starts to melt.



To prime the injection lines act as follows:

1. Click **[Instrument]/[Load Plate]** and insert the Wash plate (or another 96 well plate).
2. Click **[Instrument]/[Injector Settings]** and set the information as requested on the screen.



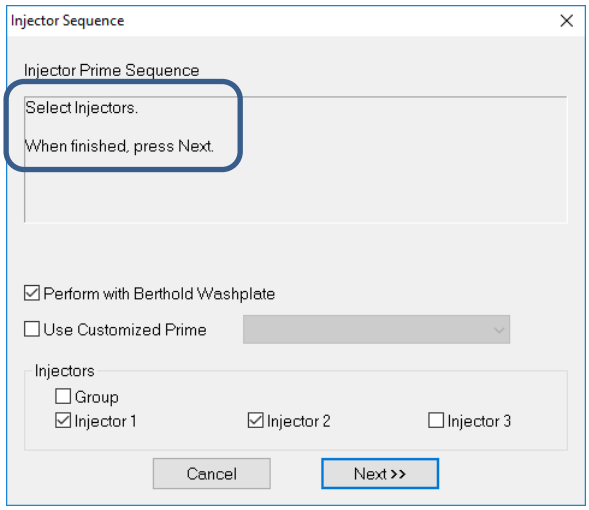
[Perform with Berthold Washplate] Check if available.

[Prime cycles] to be used for default priming.
Recommandation: 12 cycles

[Injectors] Check and the repective Injectors to be primed.

Click **<Close>.**

3. Click **[Instrument]/[Prime]** to open the Injector Sequence, set the requested information and follow the signs on the current and the following screens.



[Perform with Berthold Washplate] Check if available.

[Use customized Prime] select a user defined protocol (see next chapter).
Uncheck the Use Customized Prime to use the plain prime mode (12 injection cycles).

[Injectors] Check the repective Injectors to be primed or prime as a group.

Wait for the Priming procedure to be finished for the respective injectors and **<Close>** the dialog.

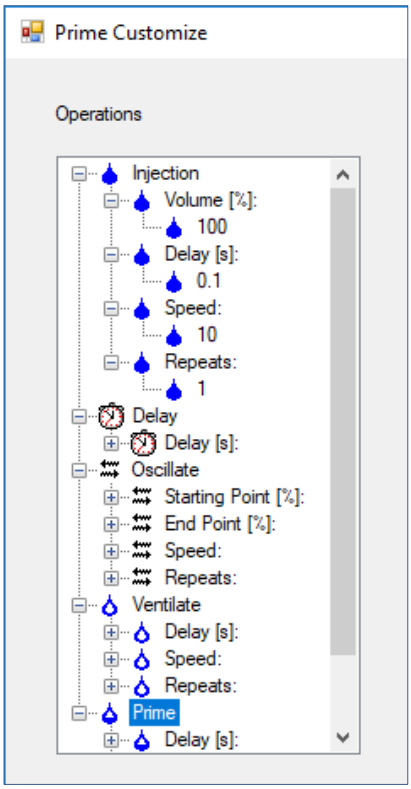
4. Remove the prime / wash plate by clicking **[Unload Plate]** in the **[Instrument]** menu. The instrument is now ready for use.

8.1.2 Customizing the Priming Sequence

Some reagents (e.g. with high viscosity) or solutions (e.g. cells) require special priming procedures which can be defined individually.

1. Click **[Instrument]/[Customized Prime Settings]** to open the Prime Customize dialog.

   Clicking on + in the Operations window will expand the respective folders and display the settings.



The following operations and settings are available:

- Injection

  The injector is filled with the max. injection volume from the reagent reservoir and injects the set volume.

[Volume]	[%] of the max. injection volume
[Delay]	delay before operation [s]
[Speed]	1 … 10
[Repeats]	number of repeats

- Delay

  The delay time that elapses between operations, e.g. to mimic the injection timing of the assay (this can be important with a cell suspension)

[Delay]	elapsing time [s]

- Oscillate

  The injector is (partly) filled and oscillates between the set positions (back into the reagent reservoir).

[Start. Point]	% of the max. injection volume
[End Point]	% of the max. injection volume
[Speed]	1 … 10
[Repeats]	number of repeats

- Ventilate

  The injector is completely filled (beyond the max. injection volume) from the reagent reservoir and injects the total volume of the bellow.

[Delay]	delay before operation [s]
[Speed]	1 … 10
[Repeats]	number of repeats

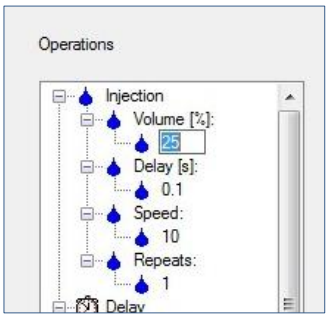
- Prime

  The injector is filled with the max. injection volume from the reagent reservoir and injects the full volume.

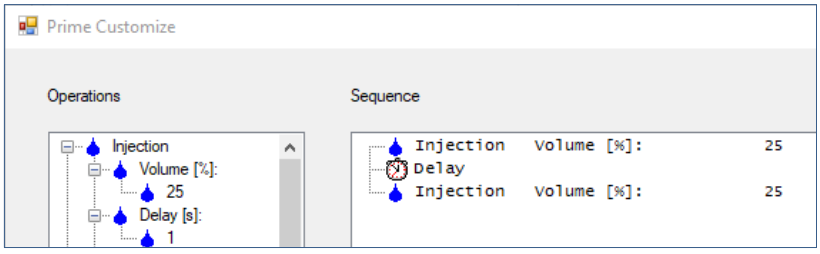
[Delay]	delay before operation [s]
[Speed]	1 … 10
[Repeats]	number of repeats

2. To change the settings, act as follows:

   - expand the operation
   - expand the setting
   - click onto the number
   - click onto the number a 2nd time
   - type the appropriate number
   - confirm with the ENTER key



3. To select a respective operation for the prime sequence drag it from the Operations column to the Sequence column.



4. To change the sequence the arrow buttons on the right side can be used 

   To remove an operation the button  can be used.

5. After the sequence is completed enter a name for this priming sequence and click **<Save>**. The respective directory will be displayed.

   The file will get the extension .wpe.

   Close the dialog with  .

8.2 Cleaning the Instrument

NOTICE

If there is any doubt about the compatibility of cleaning agents with parts of the device or with substances contained therein, please contact the device manufacturer or his local representative.

8.2.1 Cleaning the Surfaces

The surface of the instrument is protected by a washable finish.

- Dirty or dusty surfaces should be cleaned using a damp cloth or optical grade tissue.
- If necessary, use a mild detergent or diluted Ethanol (70%).
  Do not use a scouring agent!
- For bio-hazardous spills use an appropriate disinfectant, e.g. 5 % bleach. Use a damp cloth or an optical grade tissue.

8.2.2 Cleaning the Inside of the Instrument

The inside does not need to be cleaned regularly. Only in case of liquid spillage it may be necessary to clean the inside. Call a Berthold Technologies technical support person.

NOTICE

Do not open the instrument by yourself!

Call a Berthold Technologies technical support person.

Service Technicians only: Before opening the instrument, turn it off and disconnect it from power supply! Open the screws on the instrument cover to clean the instrument inside. Then detach the cover by moving or lifting it carefully.

Always keep the sample holders and the entire inside of the instrument clean. Wipe off any dirt using a damp cloth or optical grade tissue. Use cotton buds for corners. Remove dirt quickly so it does not get fry and may not have any adverse effect on moving parts.

8.3 Cleaning the Tubing

Injector tubing has to be washed

- before starting work
- before changing reagents
- at the end of each work session before turning off the instrument
- after longer periods of inactivity

IMPORTANT

CLEANIT DAILY:

The injector cleaning solution CLEANIT DAILY, to be ordered at Berthold Technologies, product code 45218, is an efficient and proven cleaning solution for most of the common reagents in use. It is recommended to use this solution at least once a weak to ensure a long lifetime of the injectors!

CAUTION

Solutions recommended by the kit manufacturer

may be used for daily cleaning. Some of these reagents may be hazardous. Please refer to the respective safety instructions (e.g. H and P codes) of the supplier.

Potential recommended cleaning reagents may be

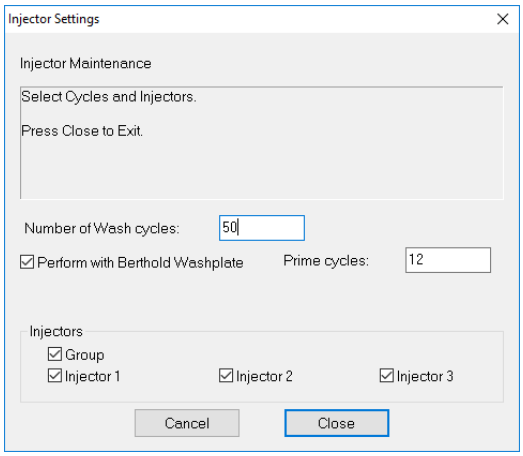
- deionised water
- diluted alcohol: 70 % Ethanol or Isopropanol
- 2 - 5 % hypochlorite solution (“bleach”)
- 0.5 – 1 M Chloric acid (HCl)
- 0.5 – 1 M Sodium hydroxide (NaOH)
- 0.1 % SDS
- Non-foaming detergent (up to 10 %)

IMPORTANT

Wash with deionised water

After use of any reagent for cleaning and decontamination, wash with deionised water then to replace the reagent.

1. Click **[Instrument]/ [Load Plate]** and insert the wash plate or another 96 well plate.
2. Click **[Instrument]/[Injector Settings]** to open the **[Injector Maintenance Menu]** and set the information as requested on the screen. Define the default **[number of wash cycles]**.



[Number of Wash cycles] usually ≥ 20, depending on assay reagents and microplates (see warning in section 3. below)

[Perform with Berthold Washplate] Check if available. Without the wash plate a maximum of only 24 cycles is possible.

[Injectors] Check the repective Injectors to be primed or prime as a group

3. Click **[Instrument]/[Wash]** and set the information requested on the screen(s) to perform the washing.

⚠ CAUTION

Make sure the total Wash volume does not exceed the volume of the plate being used!

4. Wait until the wash cycles are completed and click **<Close>.**
5. Click **[Unload plate]** to remove the wash plate.

After cleaning, the tubing have to be re-primed with the respective assay reagent prior to use.

IMPORTANT

Recommendations for of idle periods:

- For periods of hours up to a few days leave deionised water in the injection lines.
- For longer periods of multiple days up to weeks wash the lines with a reagent of choice and with distilled water then. Empty the lines by starting the Wash procedure without water, then.

IMPORTANT

Check the tubing connections regularly for leaks. Faulty tubing connections must be replaced.

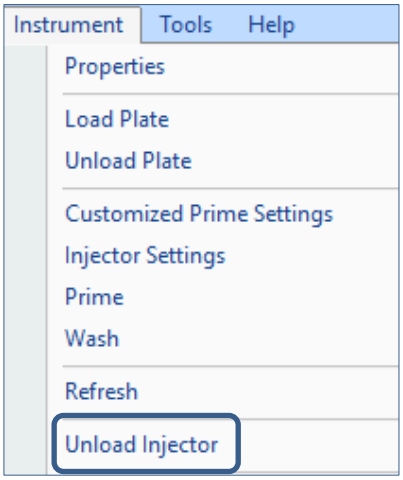
8.4 Emptying the Tubing

IMPORTANT

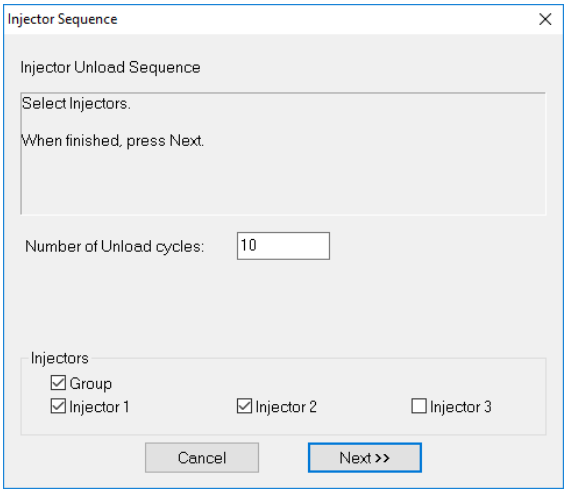
This operation can be used to empty the injection lines after the measurement and re-collect valuable reagents in the reagent reservoirs.

Make sure the reagent reservoirs are connected to the injection tubing !

1. Click **[Instrument]/ [Unload Injector]**.



2. Define the **[Injector Unload Sequence**]. Set the information as requested on the screen.



[Number of Unload cycles] A cycle is equivalent to the max. injection volume of the injector installed. Recommendation: 10 cycles in minimum

[Injectors] Check the respective check box or any combination of check boxes.

Click **<Next>.**

3. Wait for the unload operation to be finished and click **<Close>.**

8.5 Decontamination

In cases of biohazard spillage, other kinds of pollution or before service and reshipment, all accessible parts of ther instrument must be decontaminated.

NOTICE

If there is any doubt about the compatibility of decontamination agents with parts of the device or with substances contained therein, please contact the device manufacturer or his local representative.

Follow the instructions of the reagent suppliers, too.

1. All outer surfaces, including the microplate holder, must be decontaminated, e.g. by wiping with 70% isopropanol or ethanol. Wipe with distilled water afterwards to remove reagent residues and dry the surfaces.
2. Decontaminate the injector system by following the instructions for cleaning, but leave the reagent, e.g. 70% isopropanol or ethanol, in the tubing for approx. 10 minutes. Wipe the outside of the tubing multiple times, too.
3. Replace the reagent for decontamination with distilled water now to remove reagent residues.
4. Empty and dry the tubings.
5. See the decontamination form in chapter 11, too.

8.6 Preparations for Transport

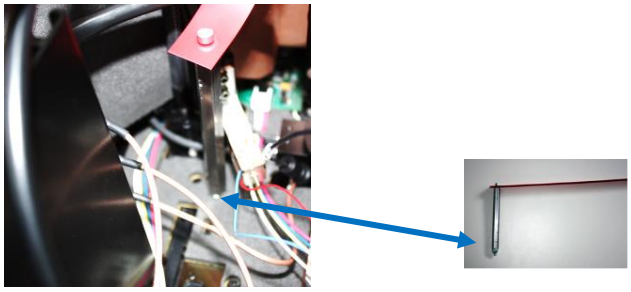
IMPORTANT

The following safety provisions have to be taken to transport or ship the instrument:

- Remove the microplate from the instrument.
- Turn instrument off and disconnect it from mains.
- Make sure the instrument is decontaminated properly before removing it from the laboratory and fill in the decontamination form.
- Click **[Instrument]/[Shipping Brace]** in the Instrument menu.
- Turn the instrument off and disconnect it from mains.

- Insert the two transport safety devices.

Open the big front flap and insert the transportation safety device



Open the top lid of the instrument by removing the four screws.
Screw the transportation lock (hexagonal rod) indicated by the red tap.
Refer to chapter 5.1 for additional information.

- For shipping you must use the original transportation case.
- Encase the instrument with the styrofoam parts.
- Tape shipping carton tightly.
- Have a filled in Declaration on Decontamination accompany the instrument when shipping back to Berthold Technologies or one of its representatives.

9 Trouble Shooting

Symptom	Possible cause	solution
LED flashes red accompanied by 2 beeps	CAN module not correctly installed	1) switch instrument off and on again 2) call service
LED stays orange	Cable between instrument and computer is not connected Wrong COM assigned	1) attach cable properly 2) use service software and run “Scan COM ports” command
Instrument does not respond to software commands (status “Timeout Error”)	Cable between instrument and computer is not connected Wrong COM assigned	1) attach cable properly 2) use service software and run “Scan COM ports” command
LED stays dark	Instrument not switched on Mains not plugged in mains supply deactivated mains plug defective	1) switch instrument on 2) plug in mains 3) check with local house electrician 4) call service
Lower signal than expected	Pipetting/preparation error substrate consumed	1) verify by checking replicate and other samples / controls / standards and prepare faulty sample again 2) prepare new plate and read immediately after adding substrate
Signal not above background readings	No sample No reagents added	1) check sample preparation 2) add reagents

No signal at all	Faulty PMT	Call service
Plate is not moved to measurement position	Plate not correctly inserted Wrong frame Plate too high	1) insert plate correctly 2) change frame 3) use another plate with a total max. height of 16 or 21 mm respectively
Error message no plate	No plate Wrong frame	1) insert plate 2) insert black frame for 15 mm plates
High background signal	Reagents not prepared properly Reagents contaminated Plate contaminated	1) prepare reagents properly 2) prepare fresh reagents 3) use another clean plate 4) call service
Standard curve cannot be calculated	Standards pipetted in wrong order	1) prepare new plate with correct layout of standards 2) use the edit function in the standard curve tab
Excel Files cannot be opened	Excel is not installed	Install Excel
Adobe PDF files cannot be opened	Adobe Acrobat Reader is not installed	Install Adobe Acrobat

10 Technical Data

10.1 Instrument

Operating voltage	24 VDC ± 5%
Max. power consumption	140 VA
Certifications	CE, NRTL (USA/CAN)
Protection class	III
Temperature range	storage: 0° - 40°C operation: 15° - 35°C
Humidity	10 – 80%, not condensing maximum relative humidity of 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity up to 40 °C
Altitude	Max. 2000 m (above sea level)
Pollution degree	2
Dimensions	(W x D x H) depending on variant 391 x 470 x 344 mm (Tristar 3) 391 x 470 x 395 mm (Tristar 5)
Weight	Approx. 20 kg (Tristar 3) Approx. 32 kg (Tristar 5)
Plate formats	6 to 384 well, solid and strip, Dimensions 128 x 86 mm (L x W), height 14.0 – 21.0 mm (adapters necessary) Petri dishes 35 and 60 mm Eppendorf µPlate G 0.5 Standard cuvettes (with cap)
Measurement technology	Luminescence BRET, BRET^2 Fluorescence (top) FRET Absorbance VIS & UV Time-Resolved Fluorescence TR-FRET/ HTRF

	FP AlphaScreen™
Operation modes	Integral measurement 0.05 – 600 seconds (single and multiple endpoint) Kinetics measurement (total length up to 7 days) Repeated measurement (total length up to 7 days) Plate repeats (up to 50,000) Scanning (up to 10,000 single data points) Spectral Scanning (Tristar 5 only) Dispensing with 3 independent variable injectors Shaking Delay (up to 600 second) Unload
Excitation source	Xenon flash lamp, 10 W, 200 to 1000 nm Laser diode, 5mW, 670 nm (with AlphaScreen™ option only)
Detector	Photomultiplier operated in single or dual mode, spectral range 280-650 nm Photodiode, spectral range 200 to 1000 nm
Monochromator	f number: 2.7 (high light transmission) variable bandwidth: 4-22nm increment: 1 nm stray light rejection: 10^{-6}
Excitation filters	High quality filters Ø 15 mm or 12.7 mm with adapter; 25 mm; 25.4 mm
Emission filters	High quality filters up to Ø 25.4 mm
Sensitivity	Luminescence: ATP: <6 amol/well (96) Fluorescence: FITC: <7 amol/well (384sv) Absorbance: Accuracy better 2 % (96) precision better 0.6 % (96) Time-Resolved Fluorescence: Eu: <5 amol/well (96) in Tristar 5 <35 amol/well (96) in Tristar 3
Dynamic Range	6 orders of magnitude (photon counter) 0-3.5 OD (photodiode)

Crosstalk	10^{-6} (black plates)
Injector	up to 3 injectors, JET injection technology variable volumes: 10 – 100 µL speed 200 – 440 µL/sec accuracy better 2% precision better 2% injections into microplates with up to 384 wells (384 wells: in preposition only)
Temperature control	Optional: +5°C above room temperature to 45°C
Shaking	3 modes (linear, orbital, double-orbital) variable amplitude and speed
Interface(s)	USB
Operating system	Win 7 (32/64 bit), Win 10 (32/64bit)
PC requirements	Pentium like CPU (2 GHz or better/intel Core iX recommended), 1 free USB 2.0 port
ICE Software	wizard support for parameter entries input of plate format selection of wells raw data assays (reporter genes, caspases, etc) dual raw data assays (e.g. dual reporter genes) kinetic repeated scanning spectral scanning ratio calculation or subtraction data export: EXCEL Microsoft. Net Framework 2.0 required

10.2 External Power Supply

Type	Desktop power supply
Input	100-240 VAC ± 10%, 50/60 Hz
Output	24 VDC / 9.2 A
Protection class	Class I
Energy efficiency	Level VI

11 Customer Reply Forms

11.1 Repair/Maintenance Order Form and Decontamination Form

Send the Forms to:

Berthold Technologies GmbH & Co KG
Technical Support
Calmbacher Str. 22
75323 Bad Wildbad
Germany
Phone: +49 7081 177 114
Fax: +49 7081 177 301
Email: service@berthold.com

or **your local representative.**

Blank Form can be found overleaf.

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Prozess Control, Bioanalytic, Radiation Protection

Repair Order / Maintenance Order

Delivery note

Berthold Technologies GmbH & Co KG
Service Department
Calmbacher Strasse 22
75323 Bad Wildbad

Central Customer Service:
Phone: +49 (0)7081 177-111
Fax: +49 (0)7081 177-339
E-Mail: service@Berthold.com
www.Berthold.com

1 Your Details:

Company/Department:	
First name - Last name:	
Address:	
Postal Code - City	
Phone:	
Fax:	
Email:	
Date, signature:	
Instrument or component:	
Serial no.:	
Description of failure or note: Please describe the malfunction as accurately as possible	
Your order number:	

Estimates desired: ☐ Repair Release up to the amount of: EUR

cont. on page 2

Importen Notes:

1. Fill out the delivery note completely (this page). If you have your own order, it must be placed in the package.
2. Please fill out overleaf decontamination certificate completely.
3. Pack equipment / assembly group securely for transport and attach this sheet in a document pouch on the outside of the package.

A contractual relationship is only entered with your signature, after receipt of the order and subsequent order confirmation. The "General Terms of Delivery for Products and Services of the Electrical Industry" apply (berthold.com/AGB).

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Prozess Control, Bioanalytic, Radiation Protection

Confirmation of Decontamination

In compliance with legal regulations and to protect our employees and operating equipment we need the completed and signed decontamination certificate before your order can be processed.

2

Instrument or component has come into contact with:	 radioactive substances	 chemical reagents	 contagious biological material
Please mark with a cross:	☐	☐	☐
Medium			
Concentrate			
Harmless	☐	☐	☐

Means of decontamination applied:

I hereby confirm that the instrument or component specified above was decontaminated / cleaned using the appropriate method. ☐

I hereby confirm that the instrument or component specified above has not come into contact with any hazardous or contagious samples or reagents. ☐

I hereby confirm that the instrument or component specified above has not been activated by radiation. ☐

3 Instrument or component for safe transport and this sheet in a document pouch attached outside of the package.

Attention!
Should the declaration not be received within one week, we have to return the instruments unrepaired freight forward (for safety reasons). We appreciate your understanding for this measure, which is necessary to protect our employees.

With best regards

Your Berthold Technologies Service-Team

DC00002DV2 Rev.07

BERTHOLD TECHNOLOGIES GmbH & Co. KG, Calmbacher Straße 22, 75323 Bad Wildbad, Germany
Central Customer Service: Phone +49 (0)7081 177-111, Fax +49 (0)7081 177-339,
Email: service@Berthold.com, www.Berthold.com

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Modifications due to technical advancement reserved.