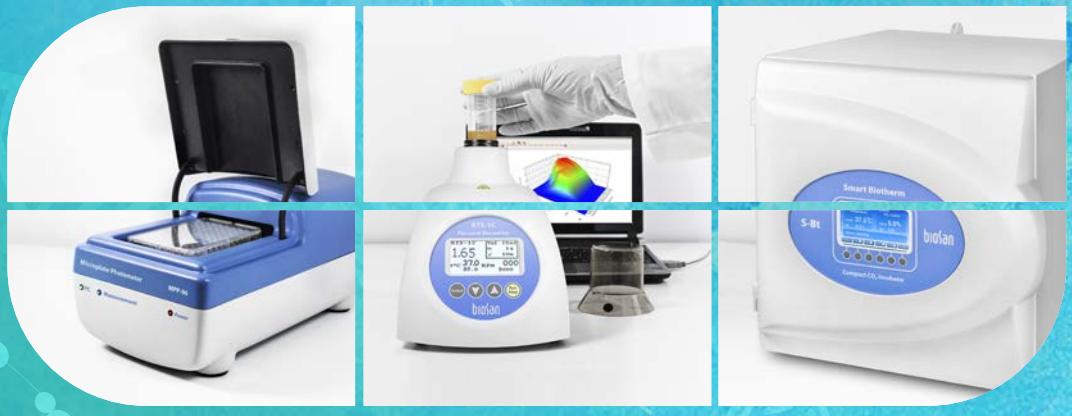
biosan

Medical–Biological
Research & Technologies

world of biotech-innovatica

Catalogue 2017–2018 v3



WELCOME TO THE BIOSAN PRODUCT CATALOGUE 2017–2018

For 26 years, the mission of BIOSAN has remained unchanged - reducing the risks of sample preparation by offering lines of laboratory equipment based on the most advanced scientific and industrial technologies.

The catalog of 2017–2018 traditionally represents a wide range of laboratory equipment for carrying out both the simplest stages of sample preparation, such as mixing, shaking, centrifuging, incubation, and for implementing more complex and advanced stages — cell cultivation, nucleic acid isolation, as well as instruments for final result analysis.

In addition, we offer auxiliary and supportive equipment and instruments - water purification systems, automatic pipettes / dispensers, DNA/RNA UV-Cleaner Boxes, UV Cleaners–Recirculators and much more. We are proud of complex solutions for small and medium medical diagnostic laboratories - especially we want to emphasize the 3D-IW8 washers and the MPP-96 photometer for Enzyme linked Immunoassay analysis (ELISA) as well as the automatic nucleic acid extraction station BIOMAGPURE 12.

Instrument models are constantly being improved in accordance with the wishes and comments of our customers. We pay special attention to reliability, ergonomics and ease of use.

SAMPLE PREPARATION SOLUTIONS

We are focused on solving the problems of reproducibility of experimental data, the cause of which is usually the sample preparation of a biomaterial. The absence of strict rules for sample preparation leads to the greatest number of errors in the implementation of the methodology.

Errors accumulate in connection with: 1) a significant decrease in the volumes of reactants (from milliliters to microliters); 2) the lack of intermediate temperature logistics of the technological process (temperature shelf); 3) the characteristics of mixing micro-quantities of reagents; 4) the lack of laboratory air decontamination systems in the process; 5) inappropriate storage of cellular material not regulated by the method.

We offer solutions for sample preparation only after we make sure that they are ideal for eliminating the above-mentioned errors.

WORLD OF BIOTECH-INNOVATICA

We continue to develop the planetary model of the World of Biotech-Innovatica and are ready to offer you not only already known devices, but also completely new and unique equipment.

Recently, to the state-of-art personal bioreactors Reverse – Spinner RTS-1, RTS-1C (see page 106) already placed on the Cellomica orbit, providing not only the necessary conditions for reproducible bioprocess, but also non-invasive registration of the specific growth rate for cell cultures in real time, the S-Bt Smart Biotherm CO_2 incubator (see page 104) was added, designed to work with cell cultures, where it is necessary to maintain a given concentration of carbon dioxide, temperature and relative humidity, and we also expect the next generation of bioreactor Reverse – Spinner RTS-8 (see page 4), eight channel growth detector of microbiological cultures.

We have replenished the Immunologica orbital with a new product - a microplate photometer HiPo MPP – 96 (see page 124). The reliability of the measurements and the computer program for data processing was confirmed by the corresponding external laboratory tests. Thus, the ELISA product line became complete.

CUSTOMER SUPPORT

We are attentive to all customer requests. Specialists of the company promptly provide warranty and post warranty service, as well as solving problems that may arise from users both at the stage of ordering equipment and during operation and maintenance. We are always happy to assist you in the development of skills in the operation and maintenance of our products.

Additional information about the products can be found on the website www.biosan.lv, including video of the products demonstrating the functional characteristics. Electronic brochures, catalog and user manuals are also available for download.

VISION

We plan to continue our continuous improvement in order to remain your partner and expert in both Life Science research and medical diagnostics. This will allow us to develop new promising products, while remaining in the same row with the world's leading bioengineering companies.

We will be sincerely happy if you are interested in BIOSAN products. Thank you for your cooperation!

Vasily Bankovsky
Ph.D., Biology
President of BIOSAN

NEW PRODUCTS AND ANNOUNCEMENTS

GENERAL LAB EQUIPMENT

* — New features and updated specifications

RTS-8 ANNOUNCEMENT

Multi-channel Bioreactor with non-invasive real time biomass, pH and pO_2 measurement

RTS-8 is a personal bioreactor that utilizes patented Reverse-Spin® technology that applies non-invasive, mechanically driven, low energy consumption, innovative type of agitation where cell suspension is mixed by the single-use falcon bioreactor tube rotation around its axis with a change of direction of rotation motion resulting in highly efficient mixing and oxygenation for aerobic cultivation. Combined with a near-infrared optical system it is possible to register cell growth kinetics non-invasively in real time.

Features:

- Parallel cultivation of 8 tube bioreactors enables to save time and resources for bioprocess optimization
- Individually controlled bioreactor accelerates optimization process
- Possibility to cultivate microaerophilic and obligate anaerobic microorganisms (not strict anaerobic conditions)
- Reverse–Spin® mixing principle enables non-invasive biomass measurement in real time
- Near-infrared optical system makes it possible to register cell growth kinetics
- Free of charge software for storage, demonstration and analysis of data in real time
- Compact design with low profile and small footprint for personal application
- Temperature control for bioprocess applications
- Active cooling for rapid temperature control, e.g. for temperature fluctuation experiments
- Task profiling for process automatization
- Cloud data storage to remotely monitor the process of cultivation while at home or using a mobile phone

Software features:

- Real–Time cell growth logging
- 3D graphical representation of OD or growth rate over time over unit
- Pause option
- Save/Load option
- Report option: PDF and Excel
- Remote monitoring option (requires internet connection)
- Cycling/Profiling options
- User manual calibration possibility for most cells

TS-100C ANNOUNCEMENT

Bluetooth option

New Smart model of TS-100C with added possibility of control up to 7 units from PC via Bluetooth® technology.

In modified versions specially designed software enables control of the following parameters:

1. Rotation speed
2. Temperature
3. Time
4. Sound signal
5. Creating Profiling programs using controlled parameters
6. Visualization of temperature vs time and speed vs time graphs
7. Data export to Excel and CSV formats
8. Error messages/Fault diagnostics

ES-20/80 NEW

see page 110

Shaker-incubator

ES-20/80 shaker-incubator for biotechnological and pharmaceutical laboratories is a professional category equipment. The typical applications include - microbial and cell culture cultivation, protein expression, solubility studies, general mixing, as well as other various applications in the fields of biology and chemistry. The unit is equipped with a newly developed triple eccentric mechanism for platform motion that provides supreme balancing characteristics, superior reliability and quiet operation. The achieved stability of the unit during vigorous mixing allows for stacking installation of up to 3 units which enables to save space. The new display and easy to use user interface provide a clear and intuitive control of parameters and also allow data logging, storage and display over time. Additional features like out of balance sensor and automatic thermostat failure detection make this shaker-incubator an advanced and safe product. Bluetooth connectivity to PC allows for data management, data logging, parameter control and profiling in a dedicated software that can be requested separately.

A built-in heat-resistant brushless fan provides precise temperature distribution inside the chamber (from 10 °C above ambient up to +80 °C). Additionally, excellent sample temperature uniformity of ±0.3 °C at 37 °C is achieved. The inner chamber is made of stainless steel. State-of-the-art motor, thermal insulation materials and parameter PID-control decrease the energy consumption and make the shaker-incubator highly energy efficient despite its relatively large size.

S-Bt Smart BioTherm NEW

Compact CO_2 Incubator

see page 104

S-Bt Smart Biotherm is designed for work in the areas of cell biology (operations with animal cell cultures and tissues), molecular biology (DNA/RNA reaction analysis, hybridization reactions), biotechnology (synthesis of target proteins and other molecules), immunology (synthesis of antibodies and other proteins of immune system). Unit provides a six-sided heating: the heating elements are located on the walls and on the door, thus providing excellent uniform temperature distribution, regardless of external factors, such as ambient temperature and positioning of the device.

Built-in infrared CO_2–sensor allows precise control of the CO_2 level. The sensor makes measurement non-sensitive to changes in temperature and humidity inside the incubator.

The chamber is made of stainless steel with smoothed seams to minimize contamination and to facilitate cleaning.

S-Bt is equipped with a UV air recirculation system — 1 UV lamp and a fan are mounted behind the rear wall, providing decontamination of the working volume.

A convenient access port is built in the wall of the incubator for easy output of wire sensors or devices' installed inside. The access port is heated independently to prevent formation of condensate.

Unit is equipped with error tracing and alarm systems, which significantly lower potential risks during operation.

Unit is equipped with a "black box" system that records temperature, humidity and CO_2 levels to the inner memory. Bluetooth connection to PC is available.

HiPo MPP-96 NEW

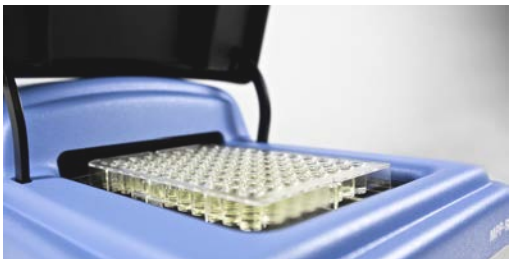
see page 124

Microplate Photometer

Microplate Photometer HiPo is a compact tabletop device for measuring the results of ELISA and microbiological studies in 96-well microplates. Photometer is controlled and outputs data via computer. An extensive range of additional interference filters is available (with average increment of 10 nm).

The device is supplied with specialized software **QuantAssay**. Features of **QuantAssay** software:

- ELISA assays of any complexity can be carried out via robust assay editor with help of Assay Wizard
- Quantitative assay includes up to 20 standards
- Avidity/Affinity assays
- Multiplex assays with up to 7 assays on one plate
- Qualitative assay includes up to 11 controls
- BestFit function for selecting the best calibration curve
- User friendly interface: get your results in 3 clicks
- Save, load and export results
- Creates visual reports
- Save, load and export results
- Creates visual reports



BioMagPure 12 NEW

see page 117

Compact Bench-Top Robotic Workstations For Automated Nucleic Acid Purification

The **BioMagPure 12** consists of compact bench-top robotic workstations for automated nucleic acid purification. Usage of pre-filled reagent cartridges and disposable consumables enable a true walk-away automation and high quality nucleic acid extraction solution. Proven magnetic separation technology makes purification efficient, easy to use, reliable, safe and cost effective.

BioMagPure 12 has an ingeniously designed polygonal reaction chamber with patented parts that ensure high efficiencies of lysis and elution through large contact area of magnet and heating element allowing to maximize magnetic bead recovery, minimize the residues of magnetic beads and alcohols in the final elute product. Specific formation of reaction chamber ensures unrivaled mixing ability and exclude conventional mixing by tip or pipetting thus eliminates cross-contamination possibility.

Reagent kits contains everything for extraction procedure performance including all necessary plastics, pre-filled reagent cartridges, incubation buffers and solutions for sample pre-treatment (if needed).

With the flexibility of processing 1-12 samples per run, the **BioMagPure 12** is tailor-made to fit small clinics and early stage laboratories. By occupying minimal counter space and greatly reducing technician man-hours, this series allows organizations to operate facilities in a much more cost effective fashion.

Assist NEW

see page 99

Automatic pipettes

The **Assist** series pipettes are single or 8, 12 channel variable volume pipettes designed to measure and transfer volumes.

Single channel pipettes are produced in ten ranges of volumes from 0.1 µl to 10,000 µl depending on the model.

Multichannel pipettes are produced in four ranges of volumes: 0.5-10 µl, 5-50 µl, 20-200 µl, 50-300 µl.

The pipettes are equipped with an analog counter which shows the pipetting volume. The volume setting is done by turning the pipetting pushbutton knob or the black adjustment knob in the right direction. The volume range is shown on the pipetting pushbutton.

Assistboy NEW

see page 101

Pipette controller

Assistboy pipette controller is a device intended for pipetting liquids with the use of measuring pipettes. It can work with all types of glass or plastic serological pipettes in the volume range from 0.5 ml to 100 ml.

Controller is equipped with exchangeable filter membrane which protects shaft mechanism from aggressive liquid fumes.

Two dispense modes permit selection of dispensing intensity depending on the user's needs. The selected setting of the pipette controller mode is shown on the display.

R-24/10 NEW

24 place rotor for LMC-4200R

Rotor for round bottom plastic tubes and vacutainers, capacity of 24 pcs. Volume of tubes 10-15 ml or vacutainers 2-9 ml.

see page 46

M-8/50 NEW

Roller platform for Multi Bio RS-24

Roller platform for eight 50 ml tubes. Application: hybridization reactions.

see page 23

MagSorb-16 NEW

see page 118

Magnetic rack for manual nucleic acid extraction

MagSorb-16 magnetic rack for manual nucleic acid extraction, easily accomodates up to 16 single use tubes (1.5–2 ml). The rack consists of following parts: tube mounting racks and magnetic stand.

Different manufacturers offer wide range of magnetic NA extraction kits, but all of them are based on magnetic particles and utilize the same principles of extraction. Every step of extraction on magnetic particles is crucial, so it is important to choose the right equipment for effective NA purification.

Labaqua series NEW

see page 88

Ultrapure water systems

Labaqua ultrapure systems are multi-purpose water purification systems. The Labaqua systems produce ultrapure and pure water directly from tap water.

Labaqua ultrapure water can be used for the most demanding applications including, but not limited to: Inorganic trace analysis, Liquid chromatography, Cell culture, Molecular biology.

Purified water is collected in a storage tank. An integrated recirculation system ensures consistent quality of water.

All cartridges and filters are easily accessible and no tools are required to replace them. The Labaqua system can be installed on a laboratory bench or mounted on a wall.

PDS-250 NEW

see page 87

DNA/RNA Decontamination Solution, Spray, 250 ml

PDS-250 is ready-to-use solution for eliminating DNA and RNA from surface prior PCR reaction preparation. DNA/RNA is removed within seconds after use. The solution contains a surfactant and a non-alkaline and non-carcinogenic agent. **PDS-250** is intended for use at PCR cabinets and laminars (e.g. UVT-S-AR), lab devices - BioMagPure 12, TS-100, pipettors - Assist series pipettes, etc.

TR-21/50 and TR-44/15 NEW

see page 17

Test tube racks

We are delighted to announce new test tube racks for our orbital shaker PSU-20i; orbital shaker-incubators ES-20/60 and the new ES-20/80.

Racks are made of stainless steel with adjustable angle for your convenience **TR-21/50** and **TR-44/15** will fit on our universal platform UP-168 .

Both racks are with high capacity - **TR-21/50** can hold up to 21 x 50 ml tubes, while **TR-44/15** is made for 44 x 15 ml tubes and two of the racks can be fit simultaneously on UP-168.

CATALOGUE 2017-2018

MIXING DEVICES: ROCKERS, SHAKERS, ROTATORS, VORTEXES

MR-1, Mini Rocker–Shaker

DESCRIPTION

Mini Rocker–Shaker **MR-1** provides regulated gentle rocking motion of the platform and is ideal for mini gel destaining after electrophoresis, conducting Northern, Southern and Western blot analysis.

Shaker is a compact, noiseless device designed for personal use. The use of direct drive and brushless motor allows continuous mixing up to 7 days and ensures reliable, trouble-free operation for more than 2 years.

Non–slip, temperature resistant, silicone mat located on the rocker's platform provides stable position for vessels during shaking. Optional dimpled PDM mat fixes tubes of different sizes.

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

Basic Plus
Product Class

MR-1

Rocking uni-rotation

ACCESSORIES FOR THE STANDARD PLATFORM:

Optional dimpled mat **PDM** prevents different size tubes from rolling around the platform

Product video is available on the website

MR-12, Rocker–Shaker

DESCRIPTION

MR-12 Rocker–Shaker provides both soft and intensive mixing of solutions or nutrient media in vessels or plastic bags placed on the platform. Adjustable speed and platform tilt angle allows setting parameters for optimal solution transfer and mixing.

The device is ideal for gel destaining after electrophoresis and homogenisation of bioextraction media. It is optimal for biomolecule hybridization on strips and for staining/destaining procedures. When installed inside a bioincubator it is ideal for growing cells and cell cultures in disposable plastic reactor-bags (working volumes up to 10 liters, media volumes up to 5 liters).

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

Premium
Product Class

MR-12

Rocking uni-rotation
with adjustable tilt

MR-1 and MR-12, Rocker-Shakers

SPECIFICATIONS

	MR-1	MR-12
Mixing frequency range	5–30 oscill/min	1–99 oscill/min (increment 1 oscill/min)
Fixed tilt angle	7° (fixed)	0°–10° (increment 1°) (for 1–50 oscill/min.) 10° (for 51-99 oscil/min.)
Max. continuous operation time	168 hrs	
Digital time setting	1 min–24 hrs / non–stop	1 min–99 hrs 59 min (increment 1 min) / non–stop
Non-slip silicone mat is supplied as standard	215 × 215 mm	480 × 380 mm
Maximum load	1 kg	5 kg
Display	LED	LCD, 16 × 2 signs
Platform working area	215 × 215 mm	480 × 380 mm
Overall dimensions (W × D × H)	220 × 205 × 120 mm	430 × 480 × 210 mm
Weight	2.1 kg	11.9 kg
Input current/power consumption	12 V, 320 mA/3.8 W	12 V, 1.1 A/13 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V	

PDM, dimpled mat

MR-1 with PDM dimpled mat

MR-12

ORDERING INFORMATION: Cat. number

MR-1 with standard platform **Bio PP-4S**	BS-010152-AAG
MR-12 with standard platform **PP-480**	BS-010130-AAI

Optional accessories: for MR-1:

PDM, dimpled mat	PDM

3D, Sunflower Mini-Shaker

DESCRIPTION

"Sunflower" **3D** Mini–Shaker provides adjustable three-dimensional smooth rotation of the platform and is designed for mixing blood samples, for minigel staining and destaining, sample washing, blot hybridization reactions.

Mini–Shaker is a compact device with low energy consumption. The use of direct drive and brushless motor allows continuous mixing up to 7 days and ensures reliable, trouble-free operation for many years.

Non–slip, temperature resistant, silicone mat located on the shaker's platform provides stable position for vessels during shaking. The platform is suitable for placing a versatile dimpled PDM mat for different size tubes.

Mini–Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

Basic Plus
Product Class

3D — uni–rotation

Product video is available on the website

Multi Bio 3D, Programmable mini-shaker («Sunflower» type)

DESCRIPTION

Programmable mini-shaker **Multi Bio 3D** is designed for a variety of applications: hybridization reactions, cell growing, gel washing, soft extraction and homogenisation of biological components in solutions.

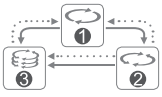
Multi Bio 3D provides realization of several types of motion in one module. This option of Biosan instruments essentially extends possibilities and enhances efficiency of preparation of test samples as well as allows selecting the mixing type according to individual requirements.

Microprocessor control allows performing not only ❶ **Orbital 3D rotation** of the platform, but also ❷ **Reciprocal 3D motion** (of ping–pong type) as well as ❸ **Soft vibrating rocking.** These three motion types can be performed separately, pairwise and in cycles, periodically repeating the sequence of three motion types. The shaker is designed for laboratories with increased demands for quality of mixing, extraction and cell growing processes.

Non–slip, temperature resistant, silicone mat located on the shaker platform provides stable position for vessels during shaking. Optional dimpled PDM mat fixes tubes of different sizes.

Programmable shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C.

Premium
Product Class



Multi–rotation

Orbit

Product video is available on the website

3D Mini-Shaker and Multi Bio 3D, Programmable 3D shaker («Sunflower» type)

	3D	Multi Bio 3D
❶ Speed control range (orbital and reciprocal motion)	5-60 rpm	1-100 rpm
❷ Turning angle (reciprocal motion)	—	0-360° (increment 30°)
❸ Rocking angle (Vibro motion)	—	0-5° (increment 1°)
Fixed tilt angle	7°	
Orbit	—	22 mm
Platform working area	215 × 215 mm	
Non-slip silicone mat is supplied as standard		
Maximum continuous operation time	168 hours.	24 hours.
Time setting range for ❶ ❷	—	0-250 sec.
Time setting range for ❸	—	0-5 sec.
Number of cycles	—	0-125 times
Maximum load	1 kg	
Overall dimensions (W × D × H)	235 × 235 × 140 kg	
Weight	1.2 kg	1.8 kg
Input current/power consumption	12 V, 260 mA/3.1 W	12 V, 380 mA/4.6 W
External power supply	Input AC 100-240 V, 50/60 Hz; Output DC 12 V	

ACCESSORIES FOR THE STANDARD PLATFORM:

Optional dimpled mat **PDM** prevents different size tubes from rolling around the platform

PDM, dimpled mat

Multi Bio 3D with PDM mat

ORDERING INFORMATION:

	Cat. number
3D with stand. platform **Bio PP-4S**	BS-010151-AAG
Multi Bio 3D with stand. platform **Bio PP-4S**	BS-010125-AAG

Optional accessories:

PDM dimpled mat	PDM

PSU-10i, Orbital Shaker

Premium
Product Class

DESCRIPTION

Shaker **PSU-10i** provides regulated orbital motion of the platform and is designed for use both in small specialized biotechnological laboratories and in large multidisciplinary laboratories: a choice of five (5) interchangeable platforms provides the possibility of performing various procedures and techniques.

Shaker **PSU-10i** incorporates a direct drive system, a brushless motor with a guaranteed service life up to 35,000 hours and an automatic loading balancing system. These innovations allow for continuous mixing up to 7 days, ensure reliable, trouble-free operation for more than 2 years and significantly expand the range of the device performance in both high and low limits.

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

Orbit

Product video is available on the website

PSU-20i, Orbital Shaker

Premium
Product Class

DESCRIPTION

Shaker **PSU-20i** provides three motion types: ❶ **orbital,** ❷ **reciprocal** and ❸ **vibrating,** which can be performed separately, pairwise and sequentially in repeated cycles.

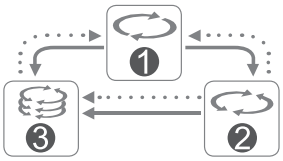
Shaker is designed for applications both in small specialized laboratories and in large multidisciplinary laboratories. **PSU-20i** is an ideal instrument for laboratories conducting research in biopharmaceutics and biomedicine.

Shaker **PSU-20i** is noiseless and reliable in operation, incorporates a direct drive system and brushless motor with a guaranteed service life up to 35,000 working hours. The use of direct drive and brushless motor allows for continuous mixing up to 7 days and ensures reliable operation for more than 2 years.

A choice of nine (9) different interchangeable platforms provides possibility of performing various procedures and techniques. Special attention should be paid to a multilevel platform, which allows accommodation of a large number of various microplates, Petri dishes, cultural bags and other low containers.

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

Orbit



Multi–motion

Description and pictures of all platforms can be found on page 16 - 17

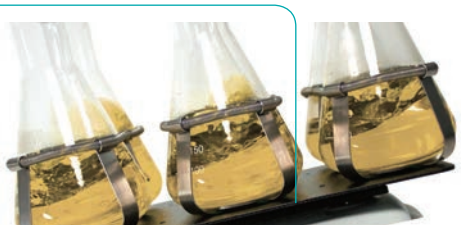
PSU-10i and PSU-20i, Orbital Shakers

SPECIFICATIONS

	PSU-10i	PSU-20i
Multi-motion	—	+
Speed control range*	50-450* rpm (increment 10 rpm)	20-250* rpm (increment 5 rpm)
Digital speed control	+	
Max. continuous operation time	168 hrs.	
Orbit	10 mm	20 mm
Digital time setting	1 min. –96 hrs./non–stop	
Maximum load	3 kg	8 kg
Overall dimensions (W×D×H)	220×205×90 mm	410×410×130 mm
Weight	3.4 kg	11.7 kg
Input current/power consumption	12 V, 800 mA/9.6 W	12 V, 3.2 A/40 W
External power supply	Input AC 100-240 V, 50/60 Hz; Output DC 12 V	

* — max. speed depends on the load and vessels' shape

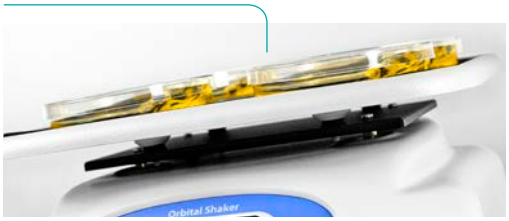
Platform P-6/250 for PSU-10i



Platform Bio PP-4 for PSU-10i

Platform for PSU-20i PP-20/4

Platform Bio PP-4 for PSU-10i



ORDERING INFORMATION: Cat. number

PSU-10i, shaker without platform	BS-010144-AAN
PSU-20i, shaker without platform	BS-010145-ACI

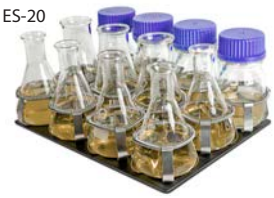
Cat. numbers of all platforms can be found on page 16 - 17

PSU-20i motion types	Description	Speed range	Turning angle	Motion timer*	Digital time setting
❶ Orbital	Orbital motion with an option of shifting direction	20-250 rpm	—	0-250 sec	1 min.-96 hrs (increment 1 min.) or non–stop
❷ Reciprocal	Orbital motion with shifting direction of rotation	20-250 rpm	0-360° (30° increment)	0-250 sec	
❸ Vibrating	High speed, low amplitude motion	—	0-5° (1° increment)	0-5 sec	

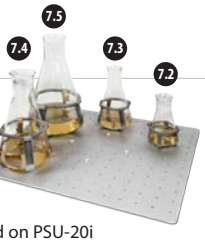
* — for switching to the next motion in the cycle

Description and pictures of all platforms can be found on page 16 - 17

Platforms for PSU-10i and ES-20

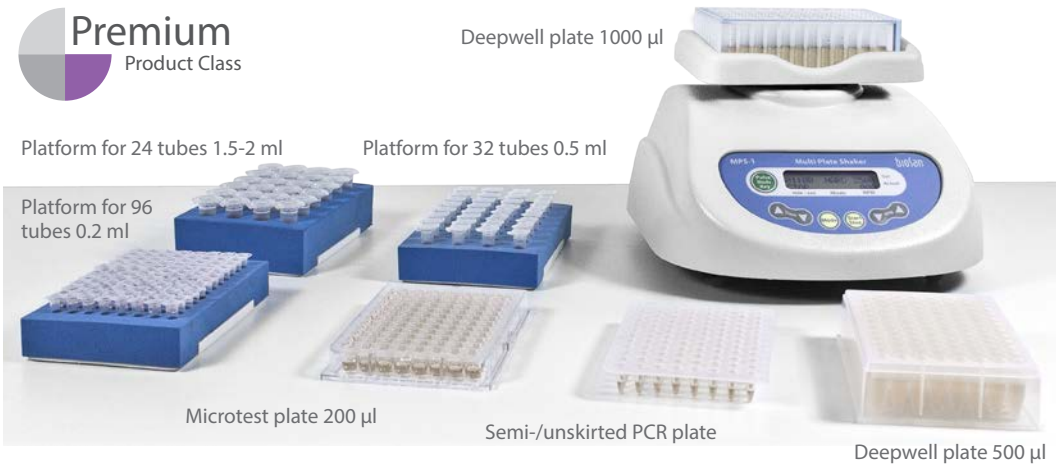
Platform	Description	Dimensions	Working Area	Cat. number
❶ **UP-12** Used on PSU-10i, ES-20 	Universal platform with adjustable bars for different types of flasks, bottles and beakers with silicone mat	285 × 220 × 40 mm	270 × 195 × 40 mm	BS-010108-AK
❷ **Bio PP-4** Used on PSU-10i 	Flat platform with silicone mat for Petri dishes, culture flasks, agglutination cards	255 × 255 mm	230 × 230 mm	BS-010116-AK
❸ **PP-4** Used on ES-20 	Metallic flat platform with silicone mat for Petri dishes, culture flasks, agglutination cards	220 × 220 mm	215 × 215 mm	BS-010108-BK
❹ **P-12/100** Used on PSU-10i, ES-20 	Platform with clamps for flasks, 100–150 ml (12 places)	250 × 190 mm	250 × 190 mm	BS-010108-EK
❺ **P-6/250** Used on PSU-10i, ES-20 	Platform with clamps for flasks, 250–300 ml (6 places)	250 × 190 mm	250 × 190 mm	BS-010108-DK
❻ **P-16/88** Used on PSU-10i, ES-20 	Platform with spring holders for up to 88 tubes up to 30 mm diameter (e. g. 10 ml, 15 ml, 50 ml tubes)	275 × 205 × 75 mm	275 × 205 × 75 mm	BS-010116-BK

Platforms for PSU-20i and ES-20/60

Platform	Description	Dimensions	Working Area	Cat. number
1 **UP-330** Used on PSU-20i 	Universal platform with adjustable bars for different types of flasks, beakers	345 × 430 × 105 mm	300 × 400 × 80 mm	BS-010145-AK
2 **P-30/100** Used on PSU-20i, ES-20/60 	Platform with 30 clamps for 100-150 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-BK
3 **P-16/250** Used on PSU-20i, ES-20/60 	Platform with 16 clamps for 250-300 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-CK
4 **P-9/500** Used on PSU-20i, ES-20/60 	Platform with 9 clamps for 500 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-AK
5 **P-6/1000** Used on PSU-20i, ES-20/60 	Platform with 6 clamps for 1000 ml flasks	360 × 400 mm	360 × 400 mm	BS-010135-DK
6 **PP-400** Used on ES-20/60, ES-20/80 	Flat platform with non–slip silicone mat	360 × 400 mm	360 × 400 mm	BS-010135-FK
7 **UP-168** Used on PSU-20i, ES-20/60, ES-20/80 	Universal platform for different flasks (Clamps ordered separately)	360 × 400 mm	360 × 400 mm	BS-010135-JK
7.1 **FC-50** 7.2 **FC-100** 7.3 **FC-250** 7.4 **FC-500** 7.5 **FC-1000** 7.6 **FC-2000** Used on PSU-20i	Clamp for 50, 100, 250, 500, 1000, 2000 ml flask (for UP-168)	Ø 50 mm Ø 65 mm Ø 85 mm Ø105 mm Ø130 mm Ø165 mm		BS-010126-MK BS-010126-HK BS-010126-JK BS-010126-LK BS-010126-IK BS-010126-NK
7.7 **TR-21/50** 	Test tube rack for 50 ml with 21 drillings	340 × 124 mm	2 per platform	BS-010135-KK
7.8 **TR-44/15** 	Test tube rack for 15 ml with 44 drillings	340 × 124 mm	2 per platform	BS-010135-LK
8.4 **PP-20/4** Used on PSU-20i 	Four-level flat platform with non–slip rubber mat	380 × 480 × 510 mm	365 × 465 × 510 mm	BS-010126-EK
8.3 **PP-20/3** Used on PSU-20i	Three-level flat platform with non–slip rubber mat	380 × 480 × 340 mm	365 × 465 × 340 mm	BS-010126-DK
8.2 **PP-20/2** Used on PSU-20i	Two-level flat platform with non–slip rubber mat	380 × 480 × 170 mm	365 × 465 × 170 mm	BS-010126-CK
8.1 **PP-20** Used on PSU-20i 	One-level flat platform with non–slip rubber mat	380 × 480 mm	365 × 465 mm	BS-010126-BK

MPS-1, High–Speed Multi Plate Shaker

Premium
Product Class



DESCRIPTION

High–Speed Multi Plate Shaker **MPS-1** can be used in virtually any application by providing adjustable mixing of reagents in microtest plates, PCR plates, deepwell plates and test tubes (shaking tubes 0.2 to 2 ml and vortexing any volume up to 50 ml).

The shaker is compact and user–friendly. The shaker is ideal for personal use.

MPS-1 features a head for vortexing a single tube.

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

MPS-1 features **Pulse Mode** mixing function that works on the principle of giving a periodic impulse: the tube is accelerated to the set speed, holds it for 3 seconds and then drops the speed to zero. This motion is repeated until the timer runs out. This method provides a constant state of resuspension of the particles inside a tube, as the acceleration is always changing. The advantage of this method is the high throughput of mixed samples compared to vortexing a single tube.

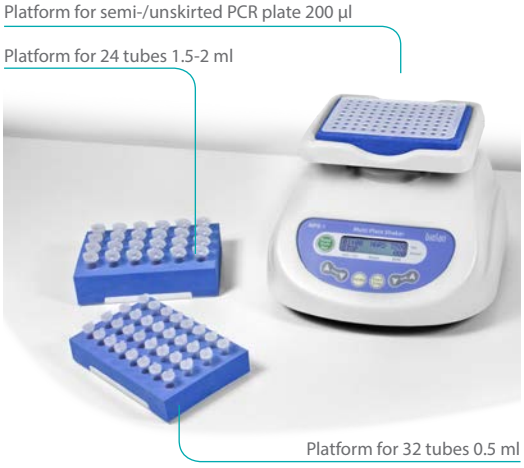
FEATURES

- Speed control range 300–3,200 rpm
- Stable mixing with 3 mm orbit
- Five mixing presets
- **Pulse Mode** mixing function
- Quiet operation — low noise at maximum speed
- Universal platform holder for Deepwell plates and Microtest plates
- Additional 4 platforms for semiskirted and unskirted PCR plates 200 µl as well as for tubes from 0.2 to 2 ml

Orbit


Vortex


Product video is available on the website



MPS-1, High–Speed Multi Plate Shaker

Vortexing a 50 ml tube

Vortexing a 15 ml tube

Mixing Speed control range	300–3,200 rpm
Platform options:	
– For semi-\unskirted PCR plate or 96 microtest tubes 0.2 ml	**P-02/96**
– For 24 microtest tubes 1.5-2 ml	**P-2/24**
– For 32 microtest tubes 0.5 ml	**P-05/32**
– For 24 microtest tubes 0.5 ml and 48 microtest tubes 0.2 ml	**P-02/05**
– Universal platform for deepwell plates, 96-well microtest plates (U, V or flat bottomed), 384-well microtest plates	
Types of mixing presets:	
VORTEX	3,200 rpm
HARD	2,600 rpm
MEDIUM	1,800 rpm
SOFT	1,000 rpm
CUSTOM	adjustable rpm
Features a **Pulse Mode** mixing function	
Features a Vortex function	
Maximum load	0.3 kg
Mixing Orbit	3 mm
Acceleration time to maximum speed	5 sec
Digital time setting	0–60 min (15 sec increment)/ non–stop
Maximum continuous operation time	8 hrs
Noise level, not more	65 dB
Weight	5.1 kg
Overall dimensions (W × D × H)	225 × 215 × 150 mm
Input current/power consumption	12 V, 800 mA / 10 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

SPECIFICATIONS

APPLICATIONS OF UNIVERSAL BUILT-IN PLATFORM

Deepwell plate 96/1000 µl

Microtest plate 200 µl

Deepwell plate 96/500 µl

ORDERING INFORMATION:

	Cat. number
MPS-1, Multi Plate Shaker with built-in universal platform	BS-010216-A03
MPS-1, Multi Plate Shaker with built-in universal platform and set of 4 platforms (P-02/96, P-2/24, P-05/32, P-02/05)	BS-010216-A11

Optional platforms:		Cat. number
❶ **P-02/96**	For semi-/unskirted PCR plate or 96 microtest tubes 0.2 ml	BS-010216-CK
❷ **P-2/24**	For 24 microtest tubes 1.5-2 ml	BS-010216-AK
❸ **P-05/32**	For 32 microtest tubes 0.5 ml	BS-010216-BK
❹ **P-02/05**	For 24 microtest tubes 0.5 ml and 48 microtest tubes 0.2 ml	BS-010216-DK

❶ Platform **P-02/96**

❷ Platform **P-2/24**

❸ Platform **P-05/32**

❹ Platform **P-02/05**

PSU-2T, Mini–Shaker

DESCRIPTION

Mini–Shaker **PSU-2T** is designed for immunoassays and provides adjustable mixing of reagents in microplates. The device ensures smooth movement of the platform even at low speeds.

Shaker is a compact and user-friendly device. It takes up little space on a desk and is ideal for personal use. The use of direct drive and brushless motor allows continuous mixing up to 7 days and ensures reliable, trouble-free operation for more than 2 years. Display of the device switches between time and speed readings.

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

Basic Plus
Product Class

Ø 2 mm
Orbit

Product video is available on the website

SPECIFICATIONS

Speed control range	150–1,200 rpm
Digital time setting	1 min–24 hrs / non–stop
Digital setting and control of time and speed	
Max. continuous operation time	168 hrs.
Direct drive mechanism	
Orbit	2 mm
Overall dimensions (W×D×H)	220 × 205 × 90 mm
Weight	2 kg
Input current/ power consumption	12 V, 280 mA/3.4 W
External power supply	Input AC 100-240 V, 50/60 Hz; Output DC 12 V

Ⓐ Platform IPP-2

Ⓑ Platform IPP-4

ORDERING INFORMATION:

	Cat. number
PSU-2T with standard platform **IPP-2**	BS-010155-AAG

Optional platforms

IPP-4	BS-010102-AK

Platforms for microtest plates:

Ⓐ **IPP-2** (standard platform) for 2 microtest plates	184 × 132 mm
Ⓑ **IPP-4** (optional platform) for 4 microtest plates	266 × 170 mm

Multi Bio RS-24 and Multi RS-60, rotators

Premium
Product Class

Multi Bio RS-24

Product video is available on the website

Premium
Product Class

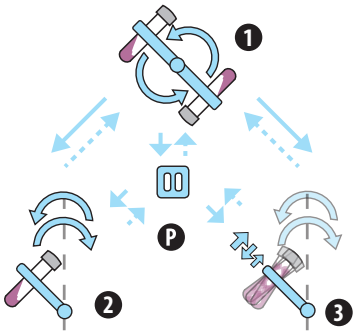
Multi RS-60

Product video is available on the website

Programmable Rotators performs several motion types in one module. Microprocessor control allows performing not only ❶ **Vertical overhead rotation** of the platform, but also ❷ **Reciprocal rotation (rocking motion)** as well as ❸ **Vibration.** These three motion types can be performed separately, pairwise and in cycles, periodically repeating the sequence of three motion types. Multi–Rotation option of Biosan instruments substantially expands possibilities and enhances efficiency of sample preparation for the examined materials and allows adjusting the mixing procedure according to the individual tasks.

Programmable Rotators can be used for variety of applications in modern life science laboratories: for hybridization reactions, cell growing, soft extraction and homogenisation of biological components in solutions, as well as for reactions of binding and washing of magnetic particles.

Multi Bio RS-24 and **Multi RS-60** are designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40 °C. Low voltage external power supply (12 V / 24V) provides electrical safety in humid environment.



NEW

It is possible to choose the position of tubes for rocking motion - horizontal or vertical. The platform does not make an additional revolution before stopping in the horizontal plane.

Programmable Rotator provides 3 rotation types and Pause:

❶ Vertical overhead rotation
❷ Reciprocal rotation (rocking motion)
❸ Vibro
Ⓟ Pause

Description and pictures of all platforms can be found on page 23

Multi Bio RS-24 and Multi RS-60, rotator

SPECIFICATIONS

	Multi Bio RS-24	Multi RS-60
❶ Vertical overhead rotation:		
Speed control range	1–100 rpm (increment 1 rpm)	
Vertical rotation movement	360°	
Time setting range	0–250 sec.	
❷ Reciprocal rotation (rocking motion):		
Speed control range	1–100 rpm (increment 1 rpm)	
Tilt angle range	1-90° (increment 1°)	
Time setting range	0–250 sec	
❸ Vibro:		
Tilt angle range	0–5° (increment 1°)	
Pause/Vibro time setting range	0–5 sec.	
GENERAL SPECIFICATIONS:		
Digital time setting	1 min–24 hrs/non–stop (increment 1 min)	
Maximum load	0.5 kg	0.8 kg
Overall dimensions (W×D×H)	365×195×155 mm	430×230×230 mm
Weight	1.7 kg	3.8 kg
Input current/power consumption	12 V, 660 mA/8 W	24 V, 750 mA/18 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V	Input AC 100–240 V, 50/60 Hz; Output DC 24 V

Multi Bio RS-24 with optional platform PRSC-22 -22

Multi RS-60 with standard platform PRS-48

ORDERING INFORMATION:	Cat. number
Multi Bio RS-24 with standard platform **PRS-26**	BS-010117-AAG
Multi RS-60 with standard platform **PRS-48**	BS-010118-AAI
Optional platforms for Multi Bio RS-24:	
PRS-5/12	BS-010117-HK
PRS-10	BS-010117-IK
PRSC-22	BS-010117-LK
PRSC-10	BS-010117-JK
PRS-1DP	BS-010149-DK
M-8/50	BS-010117-PK
Optional platforms for Multi RS-60:	
PRS-8/22	BS-010118-AK
PRS-14	BS-010118-BK

Description and pictures of all platforms can be found on page 23

Platforms for Multi Bio RS-24

Standard:	Capacity	Tube Volume	Tube Diameter	Cat. number
1 **PRS-26**	26	1.5–15 ml	10–16 mm	BS-010117-GK
Optional				
2 **PRS-5/12**	5 and 12	up to 50 and 1.5–15 ml	20–30 and 10–16 mm	BS-010117-HK
3 **PRS-10**	10	up to 50 ml	20–30 mm	BS-010117-IK
4 **PRSC-22**	22	15 ml	16 mm	BS-010117-LK
5 **PRSC-10**	10	50 ml	25–30 mm	BS-010117-JK
6 **M-8/50**	8	50 ml	25–30 mm	BS-010117-PK
7 **PRS-1DP**	Platform for microplates and racks for tall tubes 0.5 and 1 ml (e.g. Thermo 3741MTX, 3742MTX, 3744MTX)			BS-010149-DK

1 PRS-26

2 PRS-5/12

3 PRS-10

4 PRSC-22

5 PRSC-10

6 M-8/50 NEW

7 PRS-1DP

Clamps on PRSC-10

PRS series platforms are equipped with universal rubber clamps for different size tube fixation;
PRSC series platforms have metal clamps able to hold heavier solutions (e.g. soil, sand).

Platforms for Multi RS-60

Standard:	Capacity	Tube Volume	Tube Diameter	Cat. number
1 **PRS-48**	48	1.5–15 ml	10–16 mm	BS-010118-CK
Optional:				
2 **PRS-8/22**	8 and 22	up to 50 and 1.5–15 ml	20–30 and 10–16 mm	BS-010118-AK
3 **PRS-14**	14	up to 50 ml	20–30 mm	BS-010118-BK

1 PRS-48

2 PRS-8/22

3 PRS-14

Bio RS-24, Mini–Rotator

DESCRIPTION

Mini-rotator **Bio RS-24** provides vertical rotation of the platform. The rotator is an ideal instrument for preventing blood coagulation in tubes and for fulfilment of procedures of biological components extraction.

The device is simple to operate; it is designed as a low cost solution.

The unit is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

Basic Plus
Product Class

Vertical rotation 360°

Bio RS-24 in operation

SPECIFICATIONS

Speed control range	5–30 rpm
Vertical rotation movement	overhead, 360°
Digital time setting	1 min–24 hrs / non–stop (increment 1 min)
Maximum continuous operation time	8 hours
Overall dimensions (W×D×H)	325×190×155 mm
Weight	1.4 kg
Recomended load	75% of the rated volume
Input current/power consumption	12 V, 110 mA/1.3 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

PRS series platforms are equipped with universal rubber clamps for different size tube fixation;

PRSC series platforms have metal clamps able to hold heavier solutions (e.g. soil, sand).

ORDERING INFORMATION:

Cat. number

Bio RS-24
with standard platform **PRS-22** BS-010133-AAG

Optional platforms:

PRS-4/12 BS-010117-AK

PRSC-18 BS-010117-EK

Platform	Capacity	Tube Volume	Tube Diameter, Ø
❶ **PRS-22** (standard)	22	1.5–15 ml	10–16 mm
❷ **PRS-4/12** (optional)	4 and 12	up to 50 and 1.5–15 ml	20–30 mm and 10–16 mm
❸ **PRSC-18** (optional)	18	15 ml	16 mm

❶ PRS-22

❷ PRS-4/12

❸ PRSC-18

V-1 plus and V-32, Vortexes

DESCRIPTION

Basic Plus
Product Class

Vortex Orbit

V-1 plus vortex and **V-32** multi vortex are intended for intensive mixing of samples in tubes with an eccentric mechanism.

Vortex can be used for different operations:

- Mixing tissue samples;
- Suspending cell samples;
- Mixing chemical samples;
- Mixing bacterial and yeast cells when washing from the culture medium;
- Extracting metabolites and enzymes from cells and cell cultures, etc.

Vortex can be used to perform various DNA/RNA operations, such as purification of low-molecular DNA/RNA fragments in PCR-diagnostics.

Vortex is applicable in all the fields of laboratory research in biotechnology, microbiology and medicine.

Vortexes has two operation modes:

- Continuous operation;
- Impulse operation. (**V1 plus** pressure activated)

Model **V-1 plus** is a personal vortex with fluoroplastic head for single tube vortexing.

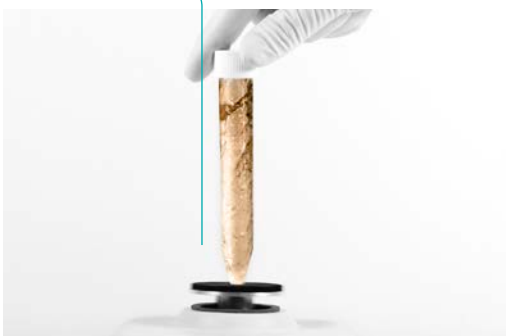
Model **V-32** is a universal vortex multipurpose device with different accessories. It is supplied with a 32-socket universal platform PV-32 for Eppendorf type tubes up to 15 ml (1.5/0.5/0.2 ml - 16/8/8 sockets) and a PL-1 head for vortexing a single tube up to 50 ml. An optional 6-socket platform PV-6/10 for 10 ml tubes (maximum tube diameter 15 mm) or a platform PV-48 for 6 strips of 8 0.2 ml microtubes can be supplied on request.

Product video is available on the website

Basic Plus
Product Class

Vortex Orbit

Platform PL-1 for V-32



V-1 plus and V-32, Vortexes

SPECIFICATIONS

	V-1 plus	V-32
Mixing principle	Vibro Eccentric	
Speed control range	500-3,000 rpm	500-3,000 rpm
Acceleration time	< 1 sec.	3 sec.
Maximum continuous operation time	24 hrs.	
Mixing module for tubes	from 0.2 to 50 ml	
Maximum mixing volume	30 ml	45 ml
Maximum load	30 g	45 g
Orbit	4 mm	2 mm
Dimensions (W×D×H)	90×150×80 mm	120×180×100 mm
Weight	0.8 kg	1.5 kg
Input current/power consumption	12 V, 320 mA/3.8 W	
External power supply	Input AC 100-240 V, 50/60 Hz; Output DC 12 V	

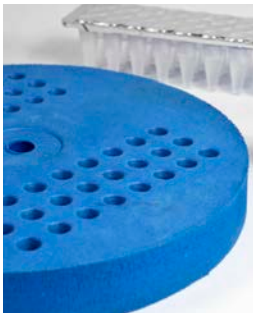
V-1 Plus

V-1 Plus

V-1 Plus

Platform PV-6/10 for V-32

Platform PV-48 for V-32



V-32 with platform PV-48

ORDERING INFORMATION:

	Cat. number
V-1 plus	BS-010203-AAG
V-32 with standard platforms **PL-1** and **PV-32**	BS-010207-AAG

Optional platforms for V-32:

PV-6/10 platform for 6 - 10 ml tubes (max. Ø 15 mm)	BS-010207-BK
PV-48, platform for 6 - 8 x 0.2ml strips or 48 tubes of 0.2 ml	BS-010207-GK

MSV-3500, Multi Speed Vortex

Basic Plus
Product Class

MSV-3500 with platform SV-8/15

Vortex

Orbit

Product video is available on the website

DESCRIPTION

Multi Speed Vortex **MSV-3500** is designed for soft or intensive mixing of reagents in different size and type plastic tubes (0.2 to 50 ml).

It is designed for operation in life science laboratories working in the fields of biochemistry, cell and molecular biology.

Unit has four types of interchangeable platforms: for Eppendorf type microtest tubes, 10/15/50 ml tubes (diameter 12/16/30 mm). Platforms can be ordered separately or as one set with **MSV-3500**.

Speed and time are under microprocessor control. LCD display indicates two lines of values: the set and actual values of speed and time.

Unit provides high maximum speed of platform rotation efficiently mixing microvolumes (less than 5 µl) of samples.

SPECIFICATIONS

Speed control range	300–3,500* rpm
Digital time setting	0–60 min / non-stop (increment 1 min)
Display	LCD, 2×16 signs
Orbit	4 mm
Maximum load	0.2 kg
Maximum continuous operation time	8 hrs
Dimensions	180×170×145 mm
Weight	2.6 kg
Input current/power consumption	12 V, 1 A / 12 W
External power supply	Input AC 100–240 V, 50/60 Hz, Output DC 12 V

* — Maximum speed depends on load

ORDERING INFORMATION:

	Cat. number
MSV-3500 with all platforms	BS-010210-TAH
MSV-3500 without platform	BS-010210-AAH

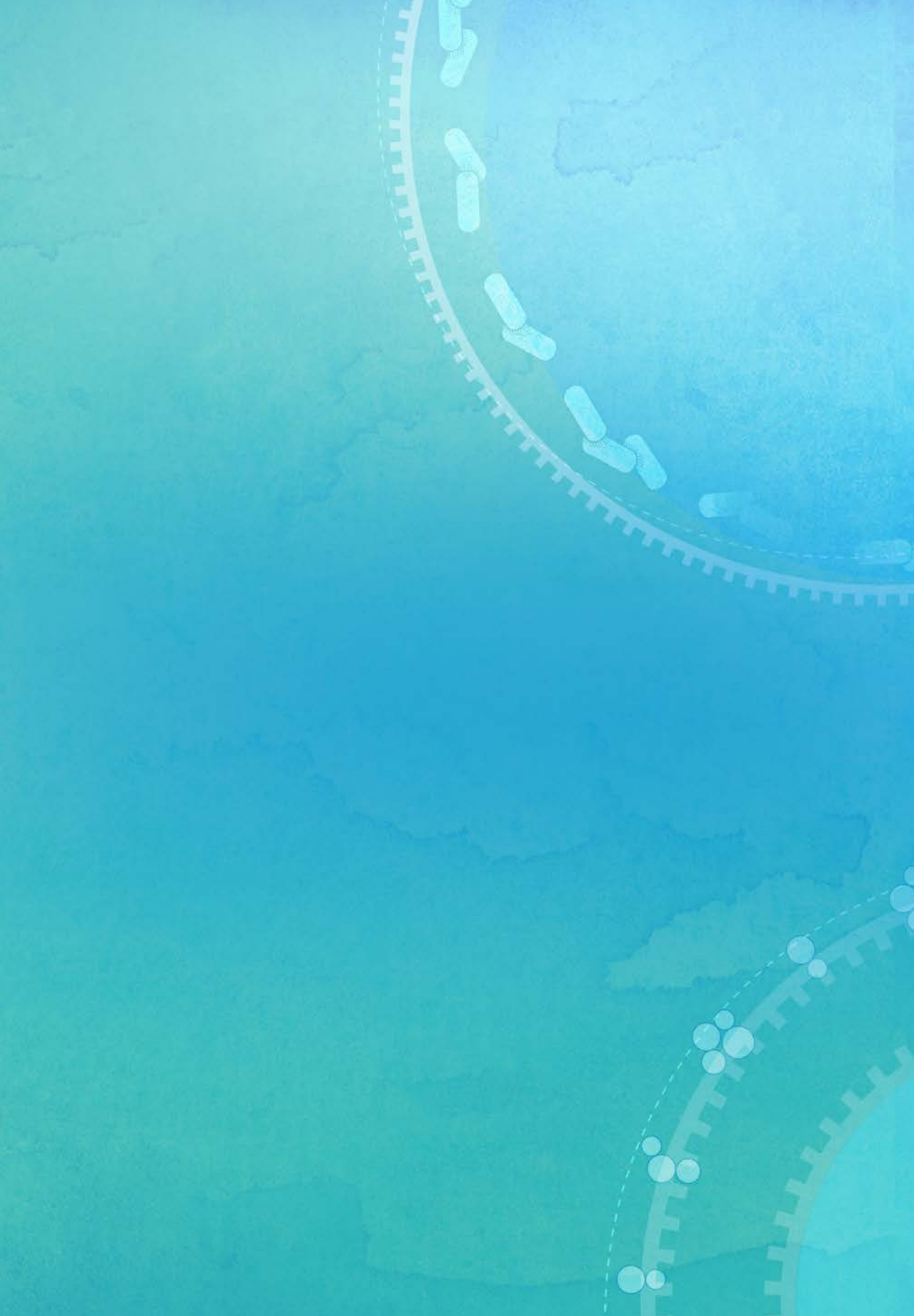
Optional platforms:		Cat. Number
❶ **SV-16/8**	Platform for 16×1.5 ml + 8×0.5 ml + 8×0.2 ml microtubes, Ø 11/8/6 mm	BS-010210-CK
❷ **SV-10/10**	Platform for 10×10 ml tubes 12 mm diameter	BS-010210-BK
❸ **SV-8/15**	Platform for 8×15 ml tubes 16 mm diameter	BS-010210-DK
❹ **SV-4/30**	Platform for 4×50 ml tubes 30 mm diameter	BS-010210-AK

❶ SV-16/8

❷ SV-10/10

❸ SV-8/15

❹ SV-4/30



CATALOGUE 2017-2018

THERMO-SHAKERS

PST-60HL, PST-60HL-4 and PST-100HL, Thermo–Shakers

DESCRIPTION

PST-60HL, PST-60HL-4 and **PST-100HL** Thermo-shakers are designed for shaking standard 96-well microtiter plates in the thermal regulation mode. Models **PST-60HL** and **PST-100HL** hold 2 plates, model **PST-60HL-4** holds 4 plates.

A multisystem principle, used in design of the Thermo–Shaker, allows operating it as 3 independent devices:

- Incubator;
- Microplate shaker;
- Thermo–Shaker.

A distinctive feature of Biosan Plate Thermo–Shakers is the patented by the company **Two-Side Microplates Heating**, which allows to achieve full correspondence of the set and actual temperature in the microplate wells.

Standard versions of Thermo-shakers provide heating up to 60°C, which is sufficient for carrying out ELISA tests.

Thermo-shaker **PST-100HL** with the ability to stabilize the temperature up to 100°C is specially designed for the hybridization reactions.

PLATE THERMO–SHAKERS PROVIDES:

- Soft or intensive sample shaking;
- Rotation speed regulation, stabilization and indication;
- Even rotation amplitude throughout the Thermo Automatic
- Setting and indication of the required temperature on the platform;
- Automatic fault diagnostics (temperature sensor, platform heating, lid heating etc.);
- With the help of the temperature calibration function, the user can calibrate the unit to compensate differences in the thermal behavior of plates from different manufacturers; **(PST-60HL, PST-60HL-4).**

APPLICATION FIELDS:

PST shakers can be used in various applications such as:

- Immunochemistry — Enzyme-Linked Immuno Sorbent Assay (ELISA). Unique bottom and top heating while shaking, ensures the most efficient linkage of target thus providing the most reliable results;
- Molecular biology — Micro and Macro array applications - incubation with shaking provides more efficient hybridization of target nucleic acid with on the surface of Micro and Macro chip printed probes **(Specific holder is required)**

Premium Product Class

Ø 2 mm Orbit

PST-60HL

Product video is available on the website

Premium Product Class

Ø 2 mm Orbit

PST-60HL-4

Premium Product Class

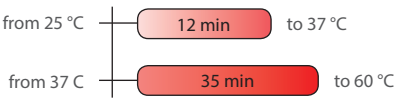
Ø 2 mm Orbit

PST-100HL

PST-60HL, PST-60HL-4 and PST-100HL, Thermo–Shakers

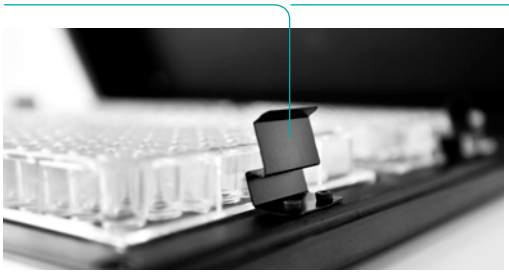
	PST-60HL	PST-60HL-4	PST-100HL
Temperature setting range	+25°C... +60°C		+25°C... +100°C
Temperature control range	+5°C above ambient... +60°C		+5°C above ambient... +100°C
Temperature setting resolution	0.1°C		
Temperature stability	±0.1°C		
Temperature uniformity @ +37°C	±0.25°C		±0.2°C
Tem perature calibration coefficient range	0.936 – 1.063 (± 0.063)		—
Heating	Two–side microplate heating (platform and lid)		Two-side microplate heating (platform and lid) + double heating contour of the platform
Orbit	2 mm		
Speed regulation range	250–1,200 rpm (increment 10 rpm)		
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)		
Display	LCD, 16×2 signs		
Max. height of microtest plate	18 mm		
Number of microtest plates	2	4	2
Weight	6.1 kg	8.8 kg	5.9 kg
Platform dimensions (W×D)	250×150 mm	290×210 mm	250×150 mm
Overall dimensions (W×D×H)	270×260×125 mm	380×390×140 mm	270×260×125 mm
Input current/power consumption	12 V DC, 3.3 A / 40 W	12 V DC, 4.15 A / 50 W	12 V, 5 A / 60 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V		

Heat up time **PST-60HL** and **PST-60HL-4:**



Heat up time **PST-100HL:**

PST-60HL-4 spring holders



ORDERING INFORMATION:

	Cat. number
PST-60HL	BS-010119-AAI
PST-60HL-4	BS-010128-AAI
PST-100HL	BS-010142-AAI

TS-100 and TS-100C, Thermo-Shakers

DESCRIPTION

TS-100 and **TS-100C** thermo-shakers are designed for intensive mixing of samples in microtest tubes or PCR plates in a temperature control environment. The **TS-100C** model of thermo-shaker differs from **TS-100** in the possibility of cooling samples down to +4°C.

FEATURES OF THERMO-SHAKERS MEET THE HIGHEST EXPECTATIONS OF USERS ACCORDING TO MANY PARAMETERS:

- Fast reaching of specified mixing speed and maintenance of equal amplitude of rotation throughout the thermo-shaker block;
- Stability of maintaining the set temperature in a wide range throughout the block surface of thermo-shakers;
- With the help of the temperature calibration function, the user can calibrate the unit approximately ±6% of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers;
- LCD display indicates pre-set and current values of temperature, speed and time of operation;
- Quiet motor operation, compact size, prolonged service life.

Functions of heating and mixing can be performed either simultaneously or independently, that allows using the unit as three independent devices:

- **Thermostat;**
- **Shaker;**
- **Thermo-shaker.**

We offer five heating and cooling blocks for each model, including a block with a plastic lid for PCR-plates. Within one model of thermo-shaker, the blocks are mutually interchangeable and can be easily installed.

THERMO-SHAKERS ARE CAPABLE TO SUPPORT VARIOUS APPLICATION SUCH AS:

- **Molecular diagnostics** — Sample lysis for further Nucleic acid automated or manual extraction;
- **Genetic** — Amplicon denaturation for NGS Library preparation;
- **Biochemistry** — Enzymatic reaction;
- **Genomics** — Protein degradation studies;
- **Cellular biology** — Extraction of metabolites from cellular material.

Premium
Product Class

Ø 2 mm
Orbit

TS-100

Heat up times for **TS-100:**

from 25°C	6 min.	to 37°C
from 37°C	15 min.	to 100°C

Product video is available on the website

Premium
Product Class

Ø 2 mm
Orbit

TS-100C

Heat up and cool down times for **TS-100C:**

from 25 °C	15 min.	to 100°C
from 100 °C	14 min.	to 25°C
from 25 °C	12 min.	to 4°C

Product video is available on the website

TS-100 and TS-100C, Thermo-Shakers

	TS-100	TS-100C
Temperature setting range	+25°C ... +100°C	+4°C ... +100°C
Temperature control range	5°C above ambient ... +100°C	15°C below ambient ... +100°C
Temperature setting resolution	0.1°C	
Temperature stability	±0.1°C	
Temperature accuracy @ +37°C	±0.5°C	
Average heating speed:	4°C/min from +25°C to +100°C	5°C/min from +25°C to +100°C
Average cooling speed:	—	from +100°C to +25°C 5°C/min from +25°C to +4°C 1.8°C/min
Temperature uniformity over the block:	@ +37°C ±0.1°C @ +60°C ±0.2°C @ +100°C ±0.2°C	@ +4°C ±0.6°C @ +37°C ±0.1°C @ +100°C ±0.3°C
Temperature calibration coefficient range	0.936 – 1.063 (±0.063)	
Speed control range	250–1400 rpm	
Acceleration time	3 sec	
Orbit	2 mm	
Display	LCD, 2×16 signs	
Microprocessor controlled temperature, mixing speed and operation time		
Digital time setting	1 min. – 96 hrs. (1 min increment)	
Maximum continuous operation time	96 hours	
Overall dimensions (W×D×H)	220×240×130 mm	
Weight	3.7 kg	
Input current/power consumption	12 V, 3.5 A/42 W	12 V, 4.9 A/60 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V	

ORDERING INFORMATION:

Cat. number

TS-100 without block	BS-010120-AAI
TS-100C without block	BS-010143-AAI

Photos and descriptions of all blocks can be found on page 34

Mixing Efficiency Video is available on the website

Product video is available on the website

TS-100C with block SC-18/02C

TS-100C with block SC-96AC

Interchangeable Blocks for TS-100

Optional Blocks:		Tube's volume	Cat. number
1 **SC-18**	20 and 12 microtubes	0.5 ml and 1.5 ml	BS-010120-AK
2 **SC-18/02**	20 and 12 microtubes	0.2 ml and 1.5 ml	BS-010120-CK
3 **SC-24**	24 microtubes	2 ml	BS-010120-EK
4 **SC-24N**	24 microtubes	1.5 ml	BS-010120-GK
5 **SC-96A**	96-well unskirted or semi-skirted microplate (0.2 ml) for PCR		BS-010120-FK

1 SC-18

2 SC-18/02

3 SC-24

4 SC-24N

5 SC-96A

Interchangeable Blocks for TS-100C

Optional Blocks:		Tube's volume	Cat. number
1 **SC-18C**	20 and 12 microtubes	0.5 ml and 1.5 ml	BS-010143-AK
2 **SC-18/02C**	20 and 12 microtubes	0.2 ml and 1.5 ml	BS-010143-CK
3 **SC-24C**	24 microtubes	2 ml	BS-010143-EK
4 **SC-24NC**	24 microtubes	1.5 ml	BS-010143-GK
5 **SC-96AC**	96-well unskirted or semi-skirted microplate (0.2 ml) for PCR		BS-010143-FK

1 SC-18C

2 SC-18/02C

3 SC-24C

4 SC-24NC

5 SC-96AC

TS-DW, Thermo–Shaker for deep well plates

Product video is available on the website

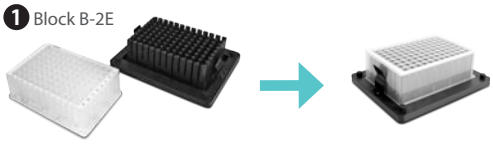
TS-DW Thermo–Shaker is designed for shaking and incubating deep well plates.

A multisystem principle, used in the design of the Thermo–Shaker, allows operating it as 3 independent devices: Incubator, Plate shaker and Thermo–Shaker.

TS-DW provides excellent temperature uniformity across the plate due to patented two-sided heating of the block and the lid, contour heating of the block and close proximity of heating elements to plate walls.

There is a number of interchangeable blocks to suit different plates such as Eppendorf® 96/1000 µl, Sarstedt® Megablock 96/2200 µl, Porvair® 96/2000 µl, Axygen® 96/2200 µl. Also we can manufacture a customized block on request.

1 Block B-2E



The block for deepwell plate is mountable, thus a custom plate module can be manufactured on request

DEEP WELL PLATE THERMO–SHAKER PROVIDES:

- Soft or intensive sample shaking;
- Rotation speed regulation, stabilization and indication;
- Even rotation amplitude throughout the Thermo-Shaker platform;
- Exceptional temperature uniformity across the plate;
- Required operation time setting and indication;
- Automatic stopping of the platform movement after expiration of the set time;
- Setting and indication of the required temperature on the platform;
- A variety of changeable blocks that can accommodate most popular deepwell plates;
- Automatic fault diagnostics (temperature sensor, platform heating, lid heating etc.).

Separate blocks to accommodate different deepwell plates will be released. For example:

- Deep Well Plates NUNC® 96/2000 µl
- Deep Well Plates Eppendorf® 96/0.5 ml

APPLICATION FIELDS:

- **Cytochemistry** — for in situ reactions;
- **Immunochemistry** — for immunofermentative reactions;
- **Biochemistry** — for enzyme and protein analysis;
- **Molecular biology** — for nucleic acid extraction.

SPECIFICATIONS

Temperature setting range	+25 °C ... +100 °C
Temperature control range	5 °C above ambient ... +100 °C
Temperature setting resolution	0.1°C
Temperature uniformity @ +37 °C	±0.1 °C*
Temperature accuracy @ +37 °C	±0.5 °C*
Temperature calibration coefficient range	0.936 – 1.063 (± 0.063)
Time of platform heating from +25 °C to +37 °C	6 min*
Speed control range	250–1,400 rpm
Orbit	2 mm
Display	LCD, 16×2 signs
Digital time setting	1 min–96 hrs (1 min increment)
Overall dimensions (W×D×H)	240×260×160 mm
Weight	5.1 kg
Input current/power consumption	12 V, 4.8 A / 58 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

* — For B-2E block

ORDERING INFORMATION:

	Cat. number
TS-DW without block	BS-010159-A02

Interchangeable Blocks:		Cat. number
1 **B-2E**	Block for one deep-well plate Eppendorf® 96/1000 µl	BS-010159-AK
2 **B-2S**	Block for one deep-well plate Sarstedt® Megablock 96/2200 µl	BS-010159-CK
3 **B-2P**	Block for one deep-well plate Porvair® 96/2000 µl	BS-010159-EK
4 **B-2A**	Block for one deep-well plate Axygen® 96/2200 µl	BS-010159-FK
5 **B-06A**	Block for one deep-well plate Axygen® 96/600 µl	BS-010159-KK

CATALOGUE 2017-2018

MINICENTRIFUGES-VORTEXES, MINI-CENTRIFUGE, CENTRIFUGES

FV-2400, Microspin and FVL-2400N, Combi–Spin

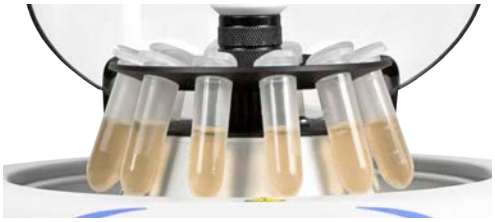
DESCRIPTION

Minicentrifuges-Vortexes Microspin **FV-2400** and Combi–Spin **FVL-2400N** is specially designed for genetic engineering research (for PCR–diagnostics experiments). Units can be used in biomedical and biotechnological laboratories.

Minicentrifuges-Vortexes provide simultaneous mixing and separation of 12 samples, using centrifuge and mixing modules, located on the common spin–module. Sequential combination of these operations allows you to collect all material at the bottom of the tube.

FV-2400 is an "open type" centrifuge (without lid), that increases the speed of centrifugation and resuspension operations.

FVL-2400N has a bioform design and equipped with a transparent protective lid accompanied by protection mechanism that stops the rotor motion when the lid is opened.



Rotor R-1.5

Basic Plus
Product Class

FV-2400

Basic Plus
Product Class

FVL-2400N

Product video is available on the website

SPECIFICATIONS

	FV-2400	FVL-2400N	FV-2400	FVL-2400N
Rotation speed (fixed)	2,800 rpm		3,500 rpm	
Max. RCF	500×*g*		700×*g*	
Continuous and impulse operation modes				
Safety		Stop at open lid		Stop at open lid
Overall dimensions (W×D×H)	120×170×120 mm	190×235×125 mm	120×170×120 mm	190×235×125 mm
Weight	1.4 kg	1.7 kg	1.4 kg	1.7 kg
Nominal operating voltage	230 V, **50 Hz**	230 V, **50 Hz**	120 V, **60 Hz**	120 V, **60 Hz**
Power consumption (120 / 230 V)	30 W (0.13 A)		30 W (0.27 A)	

Rotors for FV-2400 and FVL-2400N

ORDERING INFORMATION:	Cat. number
FV-2400 white with standard rotor **R-1.5M** and **R-0.5/0.2M**	BS-010201-AAA
FVL-2400N with standard rotors **R-1.5** and **R-0.5/0.2**	BS-010202-AAA

Optional rotors: see table below

Rotors for FV-2400:		Capacity	Type	Cat. number
1 **R-0.5/0.2M**	12×0.5 ml and 12×0.2 ml microtubes	24	Standard	BS-010201-BK
2 **R-1.5M**	12×1.5/2 ml microtubes	12	Standard	BS-010201-AK
3 **R-2/0.5**	8×1.5/2 ml and 8×0.5 ml microtubes	16	Optional	BS-010205-CK
4 **R-2/0.5/0.2**	6×1.5/2 ml. 6×0.5 ml and 6×0.2 ml microtubes	18	Optional	BS-010205-DK
5 **SR-16**	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
6 **SR-64***	Eight 8-section strips for 0.2 ml microtubes	64	Optional	BS-010201-EK

* — For any type of strips including paired

1 R-0.5/0.2M

2 R-1.5M

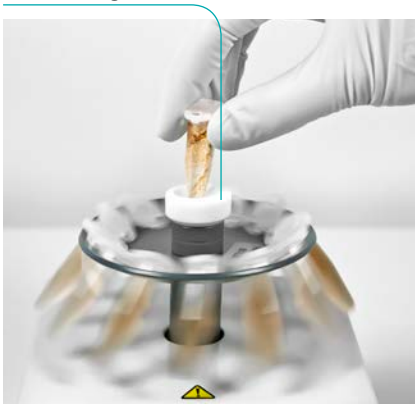
3 R-2/0.5

4 R-2/0.5/0.2

5 SR-16

6 SR-64

Tube vortexing on FV-2400

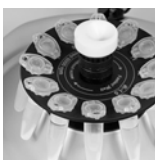


Rotators for FVL-2400N:		Capacity	Type	Cat. number
1 **R-0.5/0.2**	12×0.5 ml and 12×0.2 ml microtubes	24	Standard	BS-010205-BK
2 **R-1.5**	12×1.5/2 ml microtubes	12	Standard	BS-010205-AK
3 **R-2/0.5**	8×1.5/2 ml and 8×0.5 ml microtubes	16	Optional	BS-010205-CK
4 **R-2/0.5/0.2**	6×1.5/2 ml. 6×0.5 ml and 6×0.2 ml microtubes	18	Optional	BS-010205-DK
5 **SR-16**	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
6 **SR-32***	Four 8-section strips for 0.2 ml microtubes	32	Optional	BS-010205-FK

* — Not compatible with Combi-Spins produced before 2015

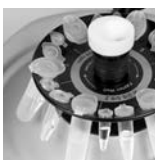
1 R-0.5/0.2

2 R-1.5



3 R-2/0.5

4 R-2/0.5/0.2



5 SR-16

6 SR-32

MSC-3000 and MSC-6000, Multi–Spins

DESCRIPTION

Centrifuge/vortex Multi–Spins **MSC-3000** and **MSC-6000** are products of many years evolution of Spin–Mix–Spin technology that is intended for collecting micro volumes of reagents on the microtube's bottom (first centrifugation spin), following mixing (mix) and collecting the reagents again from the walls and cap of the microtube (second spin). We named this repetitive algorithm of operation that is aimed at reducing the mistakes during sample preparation for PCR analysis a "sms–algorithm".

Multi–Spin is a fully automatic device for reproducing sms–algorithm for 12 tubes at one time, thus saving time considerably. A must-have instrument for PCR and DNA analyses laboratory.

Multi Spin is four devices combined in one:

1. Centrifuge — Maximum RCF:
MSC-3000: up to 800×*g*
MSC-6000: up to 2,350×*g*

2. Vortex (3 mixing modes — **soft, medium, hard**; regulated time; Vortexing regulation timer 1–20 sec)

3. Centrifuge/Vortex;

4. SMS–cycler for realization of the "sms–algorithm".

Premium
Product Class

Premium
Product Class

Both product video is available on the website

SAVING TIME WITH MULTI-SPIN

Multi–Spin allows considerable time saving compared to Combi–Spin by automatically performing cycling program of sample mixing and spinning according to the set spin–mix–spin cycle for 12 microtubes simultaneously.



	FVL-2400N	MSC-3000	MSC-6000
Speed control max.	2,800 rpm	3,500 rpm	6,000 rpm
RCF max.	500×*g*	800×*g*	2,350×*g*
Number of tubes vortexing	1 individually	12 simultaneously	
Time for completing "spin–mix–spin" cycle:			
for 2 microtubes	60 sec	25 sec	15 sec
for 12 microtubes	5–6 min	90 sec	60 sec
for 100 microtubes	60 min	15 min	10 min
Unit price ratio	1 ×	1.5 ×	1.6 ×

MSC-3000 and MSC-6000, Multi–Spins

SPECIFICATIONS

	MSC-3000	MSC-6000
Speed regulation range (increment 100 rpm)	1,000–3,500 rpm	1,000–6,000 rpm
RCF max.	800×*g*	2,350×*g*
Spin timer	1 sec–99 min	1 sec–30 min
Vortexing intensity	Soft, medium, hard	
Vortexing time	0–20 sec (increment 1 sec)	
SMS–cycle regulation	1–999 cycles	
Display	LCD, 2×16 signs	
Safety	Autostop at open lid	Lid lock
Overall dimensions (W×D×H)	190×235×125 mm	
Weight	2.1 kg	2.5 kg
Input current/power consumption	12 V, 11 W (0.9 A)	24 V, 24 W (1 A)
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V	Input AC 100–240 V 50/60 Hz; Output DC 24 V

ORDERING INFORMATION: Cat. number

MSC-3000 with standard rotors **R-1.5, R-0.5/0.2** — BS-010205-AAN

MSC-6000 with standard rotors **R-1.5, R-0.5/0.2** — BS-010211-AAL

Optional rotors: see table below

Rotor R-1.5

MSC-3000 MSC-6000

Optional rotors:		Capacity	Type	Cat. Number
1 **R-0.5/0.2**	12×0.5 ml and 12×0.2 ml microtubes	24	Standard	BS-010205-BK
2 **R-1.5**	12×1.5/2 ml microtubes	12	Standard	BS-010205-AK
3 **R-2/0.5**	8×1.5/2 ml and 8×0.5 ml microtubes	16	Optional	BS-010205-CK
4 **R-2/0.5/0.2**	6×1.5/2 ml, 6×0.5 ml and 6×0.2 ml microtubes	18	Optional	BS-010205-DK
5 **SR-16**	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
6 **SR-32***	Four 8-section strips for 0.2 ml microtubes	32	Optional	BS-010205-FK

* — Not compatible with Multi-Spins produced before 2015

1 R-0.5/0.2

2 R-1.5

3 R-2/0.5

4 R-2/0.5/0.2

5 SR-16

6 SR-32

CVP-2, Centrifuge vortex for PCR plates

DESCRIPTION

After many years of Combined Centrifuge/Vortex concept success, we are proud to introduce the long awaited Centrifuge vortex for PCR plates, **CVP-2**, to the sample preparation market.

The Spin–Mix–Spin technology is intended to spin-down micro volumes of reagents on the well's bottom (first centrifugation spin), following mixing (mix) and spin-down the reagents again from the walls and cap of the well (second spin). We named this repetitive algorithm of operation that is aimed at reducing the mistakes during sample preparation for PCR analysis a "sms–algorithm". This algorithm is registered by BioSan.

CVP-2 is a fully automatic device for reproducing sms–algorithm for 2 PCR plates at the same time, thus saving time considerably. A must-have instrument for PCR and DNA analyses laboratory.

CVP-2 IS 4 DEVICES COMBINED IN 1:

1. Centrifuge — Maximum RCF: 245 × g (1,500 rpm)
2. Vortex (300–1,200 rpm; Vortexing regulation timer 0–60 sec)
3. Centrifuge vortex
4. SMS–cycler for realization of the "sms–algorithm"

TESTED PLATE TYPES FOR USE WITH CVP-2 CENTRIFUGE:

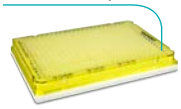
- Full-skirted 96-well standard micro-plates (without adapter)
- Half-skirted 96-well standard micro-plates (with adapter AP-96)
- Unskirted 96-wel standard l micro-plates (with adapter AP-96)
- Applied Biosystems™ MicroAmp™ Optical 96-well reaction plate (with adapter AP-96)
- Applied Biosystems™ MicroAmp™ Optical 384-well reaction plate (with adapter AP-384)
- For specific plate usage, please contact us for evaluation.

Premium
Product Class

Product video is available on the website

Adapter AP-96 for 96-well semi-skirted and unskirted PCR plates

Adapter AP-384 for 384-well PCR plates



SPECIFICATIONS

Speed regulation range	300–1,500 rpm
Min. RCF at 1,500 rpm	175 × g
Vortex regulation range	300–1,200 rpm
Setting resolution	100 rpm
Plate type:	
• Without adapter:	96-well skirted PCR plates, PCR strips in a frame;
• With adapter **AP-96:**	96-well semi-skirted and non-skirted PCR plates;
• With adapter **AP-384:**	384-well PCR plates;
Display	LCD, 2 × 16 signs
Centrifugation mode time range	0–30 min
Centrifugation mode time increment	1 s; after 1 min – 1 min
Vortex mode time range	0–60 sec
Number of programmable cycles	1–999
Chamber diameter	210 mm
Overall dimensions (W × D × H)	285 × 350 × 190 mm
Weight	6.15 kg
Input current/power consumption	12V,1.5 A/18 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

ORDERING INFORMATION

Cat. number

CVP-2 BS-010219-A02

With rotor for two PCR plates, protection lid and adapters AP-96* (a set of 2 adapters for 96-well semi-skirted and unskirted PCR plates)

Optional accessories:

AP-384* BS-010219-EK

A set of 2 adapters for 384-well PCR plates

* — Adapters are made of Ertacetal® C and are autoclavable

High-speed Mini-centrifuge Microspin 12

Basic Plus
Product Class

Protection lid

Product video is available on the website

❶ A-02 Adapters

❷ A-05 Adapters

DESCRIPTION

High-speed Mini-centrifuge **Microspin 12** is a compact desktop centrifuge designed for biomedical laboratories.

Microspin 12 is used for extraction of RNA/DNA samples, sedimentation of biological components, biochemical and chemical analysis of microsamples.

A display simultaneously shows actual and set values for:

1. Centrifugation time;

2. Set and actual speed values;

3. Relative centrifugal force.

A brushless motor provides noiseless performance at the maximal speed and long service life. An angular rotor is designed for accommodation of 12 Eppendorf microtubes and spin columns (autoclavable adapters for 0.2, 0.5 ml tubes included). The rotor is made of aluminium, it is equipped with fixing lid and included in the standard specification of the centrifuge. Constant airflow around the rotor reduces risk of samples overheating during operation.

Metal protective inserts inside the casing and lid, automatic imbalance switch-off and locking of a lid provide safe operation. Completion of centrifugation is indicated by a sound signal.

The external power supply unit allows operation of **Microspin 12** in cold rooms (at ambient temperatures from +4 °C to +40 °C).

SPECIFICATIONS

Speed control range	1000–14,500 rpm (100 rpm increment)
Relative centrifugal force control range	50–12,400 × g
Digital time setting	15 sec – 30 min
Time setting resolution	1 min –15 sec; after 1 min – 1 min
Acceleration time up to 14,500 rpm	20 sec
Slowdown time, not more	10 sec
Display	LCD, 2 line
Safety: Rotor imbalance diagnostics: automatic stop, "IMBALANCE" warning	
Overall dimensions (W × D × H)	200 × 240 × 125 mm
Weight	3.5 kg
Input current/power consumption	24 V, 2.5 A / 60 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 24 V

ORDERING INFORMATION: Cat. number

Microspin 12 BS-010213-AA1

Built-in rotor MSR-12 (12 places for microtubes 1.5/2 ml) with protection lid MSL-SC and adapters A-02, A-05 (autoclavable)

Additional/replacement parts:

MSL-SC, protection lid for rotors BS-010213-EK

❶ **A-02,** 12 pieces for microtubes 0.2 ml BS-010213-BK

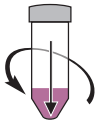
❷ **A-05,** 12 pieces for microtubes 0.5 ml BS-010213-AK

LMC-3000, Laboratory Centrifuge

DESCRIPTION

LMC-3000 is a modern low-speed bench-top centrifuge designed for operation with microtest plates and centrifuge tubes up to 50 ml, Gel Cards. This device is widely used in biomedical profile laboratories.

Basic Plus
Product Class



FEATURES:

- Soft start and run-down of the rotor;
- User-friendly setting of centrifugation parameters and simultaneous display of both set and actual values;
- Safe operation at any speed is provided by metal protection chamber and case cover, automatic stop at imbalance and a lock keeping the lid closed while the centrifuge is running;
- Low noise level;

NEW FUNCTIONS

- Rotor selection;
- Setting rotor speed in RPM or RCF (Relative Centrifugal Force);
- Multiple acceleration (Slow, Normal, Fast) and deceleration (0, Slow, Normal, Fast) modes and possibility to switch off forced braking;

- Wide choice of accessory rotors (see page 46).

Product video is available on the website

SPECIFICATIONS

Speed regulation range for centrifuge tubes	100–3,000 rpm (1,610 × *g*)
Speed regulation range for microtitre plates	100–2,000 rpm (560 × *g*)
Setting resolution	100 rpm
Rotor imbalance diagnostics (automatic stop, "IMBALANCE" warning)	
Display	LCD, 2 × 16 signs
Digital time setting	1–90 min (increment 1 min)
Chamber diameter	335 mm
Overall dimensions (W × D × H)	495 × 410 × 235 mm
Weight	11.8 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230 / 120 V)	110 W (0.5 A) / 120 W (1 A)

Rotor R-12/15

ORDERING INFORMATION:

	Cat. number
LMC-3000 without rotors	BS-010208-AAA

Rotors description, pictures and catalogue numbers can be found on page 46

LMC-4200R, Laboratory Refrigerated Centrifuge

Premium
Product Class

Product video is available on the website

DESCRIPTION

Laboratory bench-top centrifuge with refrigeration **LMC-4200R** provides temperature control of biomaterial during centrifugation. Temperature control of the so-called "cold-shelf" is a gold standard for enzymologists and cell biologists because it ensures conditions necessary for reproducibility of the sample preparation stage. Temperature control absence at this stage can cause unpredictable results.

LMC-4200R is a modern centrifuge designed for operation with microtest plates, Gel Cards and tubes from 2 to 50 ml.

SPECIFICATIONS

Temperature control range	–10°C ... +25°C
Stable temperature maintenance range	25°C below ambient ... to +25°C
Temperature setting resolution	1°C
Speed regulation range for centrifuge tubes	100–4,200 rpm (3,160 × g)
Speed regulation range for microtitre plates	100–2,000 rpm (560 × g)
Speed setting resolution	100 rpm
Rotor imbalance diagnostics (automatic stop, "IMBALANCE" warning)	
Slowdown time, not more	30 sec
Display	LCD, 2 lines
Digital time setting	1–90 min (increment 1 min)
Chamber diameter	335 mm
Dimensions (W × D × H)	635 × 580 × 335 mm
Weight	56 kg
Nominal operating voltage	230 V, 50 Hz
Power consumption (230 V)	990 W (4.3 A)

FEATURES:

- Effective way of acceleration and deceleration: Run-up time 20 sec; Run-down time, not more 30 sec;
- Efficient rate of chamber refrigeration: under 10 min;
- Maintenance of stable temperature during operation;
- User-friendly setting of centrifugation parameters (speed, temperature, time) and simultaneous display of both set and actual values;
- Safe operation is provided by a metal protection chamber and a case cover, automatic stop at imbalance (emergency shutdown, "IMBALANCE" displayed) and a lock keeping the lid closed while the centrifuge is running;
- Low noise level;
- Possibility to switch off forced braking;
- Wide choice of accessory rotors (see page 46);

NEW FUNCTIONS

- Rotor selection;
- Setting rotor speed in RPM or RCF (Relative Centrifugal Force);
- Multiple acceleration (Slow, Normal, Fast) and deceleration (0, Slow, Normal, Fast) modes and possibility to switch off forced braking;

Rotor R-24/10

ORDERING INFORMATION:

	Cat. number
LMC-4200R without rotors	BS-010212-AAA

Rotors description, pictures and catalogue numbers can be found on page 46

Interchangeable Rotors and Accessories for LMC-3000 and LMC-4200R

NEW ROTOR FOR **LMC-4200R**

Rack **RR-U**

		Rotor **R-12/10**	Rotor **R-24/10**	Rotor **R-6**	Rotor **R-6P**
Rotor type		Swing-out			
Dimensions (Ø×length)		16×105 mm		29×115 mm	
Capacity		12	24	6	
Tube's volume		10-15 ml		50 ml	
Max. speed		4,200 rpm	4,000 rpm	4,200 rpm	
Max. RCF:	**LMC-3000**	1,610×*g*	*Not applicable*	1,610×*g*	
	LMC-4200R	3,160×*g*	2,860×*g*	3,160×*g*	
Cat. number:		BS-010208-BK	BS-010212-JK	BS-010208-DK	BS-010208-XK

HOW TO CHOSE ROTOR?

PLASTIC CONICAL BOTTOM CENTRIFUGE TUBE

Manufacturers: Falcon, Greiner Bio-one, Sarstead, Corning, Nunc, TPP, etc.

15 ml → **R-12/15**

50 ml

Material: Aluminium → **R-6**

Material: POM Kocetal (Max. temperature +150 °C) → **R-6P**

PLASTIC ROUND BOTTOM CENTRIFUGE TUBE, VACUTAINERS

Manufacturers: Nunc, Greiner, Greiner Bio-one, TPP, etc.

12 pcs. → 2-10 ml + Adapters; 10-15 ml → **R-12/10**

24 pcs. → 2-10 ml + Adapters; 10-15 ml → **R-24/10**

Only for LMC-4200R

Interchangeable Rotors and Accessories for LMC-3000 and LMC-4200R

Rack **RR-U**

Rotor **R-12/15**		Rotor **R-2**	Rotor **R-24GC**
Angled Swing-out	Rotor type	Swing-out	
17×120 mm	Dimensions (w×l)	128×85.6 mm	53×74 mm
12	Capacity	2	24
15 ml	Max. height	up to 45 mm	—
4,200 rpm	Max. speed	2,000 rpm	1,500 rpm
1,610×*g*	Max. RCF: **LMC-3000**	560×*g*	280×*g*
3,160×*g*	**LMC-4200R**	560×*g*	280×*g*
BS-010208-EK	Cat. number:	BS-010208-AK	BS-010208-VK

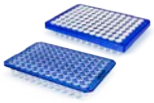
STANDARD 96-WELL MICROTITRE PLATES, SKIRTED PCR PLATES AND DEEPWELL PLATES UP TO 45 MM

Manufacturers: Nunc, Greiner, Greiner Bio-one, etc.

R-2

96-WELL SEMI-/ UNSKIRTED PCR PLATE

Manufacturers: Nunc, Greiner, Greiner Bio-one, etc.



Adapters

\+

AP-96

Material: POM Kocetal and is autoclavable

R-2

GEL CARDS

Manufacturers: Grifols®, DiaMed®, Bio-Rad® etc.

R-24GC, Rotor for Gel Cards for blood group serology testing (Forward Group, Reverse Group, RhD Type and 3 cell antibody screen). Recommended centrifugation time – 9 minutes

R-24GC

ORDERING INFORMATION: optional accesories for rotors

			Cat. number
Adapters* for R-2:			
AP-96	2 adapters for 96-well semi-skirted and non-skirted PCR plates		BS-010219-DK
Adapters** for R-12/10, R-24/10		Vacutainers dimensions (Ø×length)	
BN-13/75	for vacutainers® 2–5 ml	13×80 mm	BS-010208-PK
BN-13/100	for vacutainers® 4–8 ml	13×105 mm	BS-010208-QK
BN-16/100	for vacutainers® 8–10 ml	16×105 mm	BS-010208-RK
Rack for rotors			
RR-U			BS-010208-UK

* — Set of 2 adapters, made of POM Kocetal and is autoclavable, max. temperature +150 °C

** — Set of 12 adapters, made of POM Kocetal and is autoclavable, max. temperature +150 °C

CATALOGUE 2017-2018

THERMOSTATED EQUIPMENT: THERMOSTATS – DRY BLOCK, HEATING/COOLING SYSTEMS

Bio TDB-100 and TDB-120, Dry Block Thermostats

DESCRIPTION

Bio TDB-100 / TDB-120 – compact, easy-to-use thermostat for Eppendorf type micro tubes. It is specially designed for long incubation at different temperatures. Thermostat has undeniable advantage working with microquantities of reagents in microtubes. The thermostat possesses unprecedentedly high precision and uniformity of temperature distribution over the block.

With the help of the software-enabled temperature calibration function, the user can calibrate the unit in the range of several percent of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers.

❶ Block for Bio TDB-100

BLOCKS (BUILT IN) SPECIFICATIONS:

Bio TDB-100

❶ **Block** 24×2/1.5 ml + 15×0.5 ml + 10×0.2 microtubes

TDB-120

❷ **Block A-53** 21×0.5 ml + 32×1.5 ml microtubes

❸ **Block A-103** 21×0.5 ml + 32×1.5 ml + 50×0.2 ml microtubes

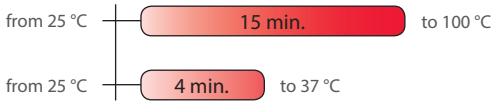
Heat up times for **TDB-120:**

Basic Plus
Product Class

Bio TDB-100

Product video is available on the website

Heat up times for **TDB-120:**



Basic Plus
Product Class

TDB-120 with block A-103

Product video is available on the website

Bio TDB-100 and TDB-120, Dry Block Thermostats

SPECIFICATIONS

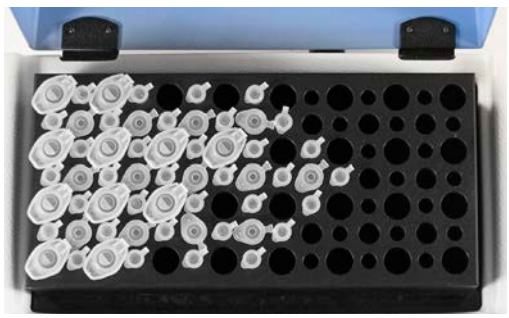
	Bio TDB-100	TDB-120
Temperature setting range	+25°C ... +100°C	+25°C ... +120°C
Temperature control range	5°C above ambient ... +100°C	5°C above ambient ... +120°C
Temperature setting resolution	0.1°C	
Temperature stability	±0.1°C	
Temperature uniformity @ +37°C	±0.1°C	
Temperature calibration coefficient range	0.936 – 1.063 (± 0.063)	0.968 – 1.031 (± 0.031)
Digital time setting	1 min. – 96 hrs /non-stop (increment 1 min)	
Display	LCD, 2×16 signs	
Block capacity	24×2/1.5 ml + 15×0.5 ml + 10×0.2 ml microtubes	**A-53** 21×0.5 ml + 32×1.5 ml microtubes **A-103** 21×0.5 ml +32×1.5 ml + 50×0.2 ml microtubes
Overall dimensions (W×D×H)	210×230×115 mm	230×210×110 mm
Weight	2.8 kg	
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz	
Power consumption	200 W (870 mA)	

ORDERING INFORMATION: Cat. number

Bio TDB-100 with built-in block	BS-010412-AAA
TDB-120 with built-in block **A-103**	BS-010401-QAA
TDB-120 with built-in block **A-53**	BS-010401-PAA

2 Block A-53

3 Block A-103



CH-100, Heating/Cooling Dry Block

DESCRIPTION

CH-100 is the result of combining two popular Biosan instruments:

1. Heating Dry block and

2. Cooling Dry block thermostat

The combined construction of aluminium block and Peltier element module cooled with the forced ventilation radiator provides fast changing of the cooling and heating modes.

CH-100 is a very effective instrument of sample preparation during enzyme reactions, hybridization reactions, DNA analysis.

Microprocessor controlled time and temperature. Simultaneous indication of set and actual temperature and time.

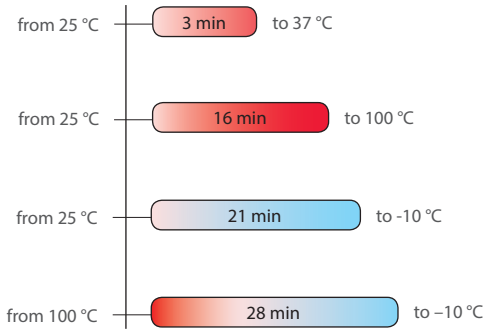
Basic Plus
Product Class

Product video is available on the website

SPECIFICATIONS

Temperature setting range	–10 °C ... +100 °C
Temperature control range	30°C below ambient ...+100°C
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature uniformity @ +37 °C	±0.1°C
Temperature calibration coefficient range	0.936 – 1.063 (± 0.063)
Digital time setting	1 min – 96 hrs / non–stop (increment 1 min)
Display	LCD, 2×16 signs
Overall dimensions (W×D×H)	240×260×165 mm
Weight	3.2 kg
Input current/power consumption	12 V, 4.4 A / 55 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

Heat up and cool down times for **CH-100:**



BLOCKS (BUILT IN) CAPACITY:

Block **CH-1**	20×0.5 ml + 12×1.5 ml microtubes
Block **CH-2**	20×1.5 ml microtubes
Block **CH-3**	20×2 ml microtubes

ORDERING INFORMATION:

	Cat. number
CH-100 with block **CH-1**	BS-010410-BAI
CH-100 with block **CH-2**	BS-010410-CAI
CH-100 with block **CH-3**	BS-010410-UAI

Ice on block CH-2

CH3-150, Combitherm-2

Premium Product Class

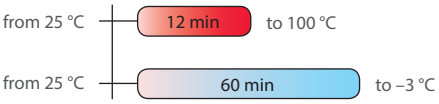
Product video is available on the website

Combitherm-2 **CH3-150** is specially designed to thermostabilise materials at temperatures from –3 °C to +150 °C according to methods of analysis. To obtain useful functionality and decrease foot-print of instruments Combitherm-2 thermoblocks combined in a common electronic circuit board as well as inside a common external body. The left part of the front keyboard is responsible for setting parameters for cooling plug-in blocks and the right part — for heating plug-in blocks. Both of them are regulated independently and can realize up to 16 programs including temperature and time in each program. Peltier technology is used for cooling below room temperature; PCB is used for heating till +150°C.

Separation of cooling and heating parts from each other increases durability of the instrument and speed of temperature changing after setting a new program.

DESCRIPTION

Heat up and cool down times for **CH3-150:**



INTERCHANGEABLE THERMOBLOCKS:

1	**B2-50**	Ø48 mm × 2 sockets, depth 58 mm
2	**B10-16**	Ø16 mm × 10 sockets, depth 56 mm
3	**B6-25**	Ø25 mm × 6 sockets, depth 40 mm
4	**B23-1.5**	23 sockets for 1.5 ml microtubes, depth 35 mm
5	**B10-13**	Ø13 mm × 10 sockets, flat bottom, depth 30 mm
6	**B5-29**	Ø29 mm × 5 sockets, flat bottom, depth 40 mm
7	**B18-12**	18 sockets for Ø12 mm round bottom tubes, depth 58 mm

Different block types can be provided on request

ORDERING INFORMATION:

	Cat. number
CH 3-150 without blocks	BS-010418-AAA
Optional blocks:	
B2-50	BS-010418-AK
B10-16	BS-010418-BK
B6-25	BS-010418-CK
B23-1.5	BS-010418-DK
B10-13	BS-010418-LK
B5-29	BS-010418-KK
B18-12	BS-010418-EK

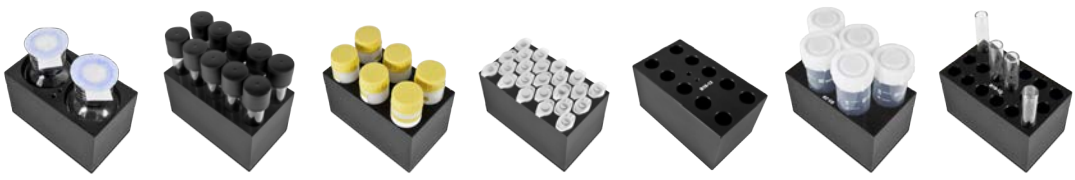
SPECIFICATIONS

Heating Block Specifications:	
Temperature setting range	+25 °C ... +150 °C
Temperature control range	5 °C above ambient ...+150 °C
Setting resolution	1 °C
Stability	±0.1 °C
Temperature calibration coefficient range	0.936...1.063 (± 0.063)

Cooling Block Specifications:	
Temperature setting range	–3 °C ... +20 °C
Temperature control range	23 °C below ambient ... 5 °C below ambient
Setting resolution	0.1 °C
Stability	±0.1 °C

General Specifications	
Digital timer with sound alarm	1 min–99 hrs 59 min (increment 1 min)
User adjustable programs (temperature and time)	16 (heating) +16 (cooling)
Display	LCD
Overall dimensions (W × D × H)	295 × 285 × 220 mm
Weight (without block)	5.6 kg
Nominal operating voltage	230 V, 50/60 Hz
Power consumption	430 W (1.8 A)

1 B2-50 2 B10-16 3 B6-25 4 B23-1.5 5 B10-13 6 B5-29 7 B18-12



QB Series, Dry Block Heating Systems with Interchangeable Blocks

Equipment presented on pages 54-55 is produced by Grant Instruments (Cambridge) Ltd. Biosan is the sole distributor of Grant Instruments products in Russia, CIS and the Baltic States (Latvia, Lithuania, Estonia) and the official distributor for a number of other regions.

DESCRIPTION

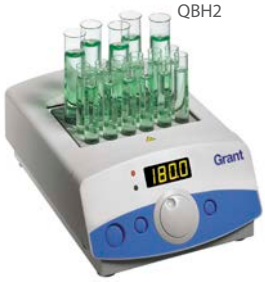
A market leading range of versatile, high quality dry block heating systems with excellent temperature control, providing a source of precision heating for many sensitive analytical procedures.

A premium product range at an affordable price:

- Accurate, reproducible and safe heating of your samples — advanced temperature control combined with high quality, precision-engineered blocks providing excellent thermal contact;
- Versatile range of interchangeable heating blocks to fit any tube or plate you are using for your samples;
- Full range of models and options to cater for basic through to more sophisticated applications;
- Wide range of accessories.

Product video is available on the website

QBD4 with a lid

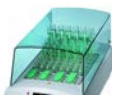


SPECIFICATIONS

Model (Cat. Num.)	QBD1 / QBD2 / QBD4	QBH2
Type	Digital	Digital
Number of blocks	1 / 2 / 4	2
Temperature range	amb. +5 °C to 130 °C	amb. +5 °C to 200 °C
Temperature setting range	+15 °C to 130 °C	+15 °C to 200 °C
Temperature stability @ 37°C	±0.1	±0.1
Temperature uniformity within the block @ 37°C	±0.1	±0.1
Display / Resolution	LED / 0.1 °C	LED / 0.1 °C
Safety: Overtemperature	Thermal fuse	
Timer with a sound alarm	1 min up to 72 hrs	
Heat up time from 25°C to 100°C	15 min	
Power consumption	150 / 300 / 600 W	300 W
Power supply	120 V or 230 V	

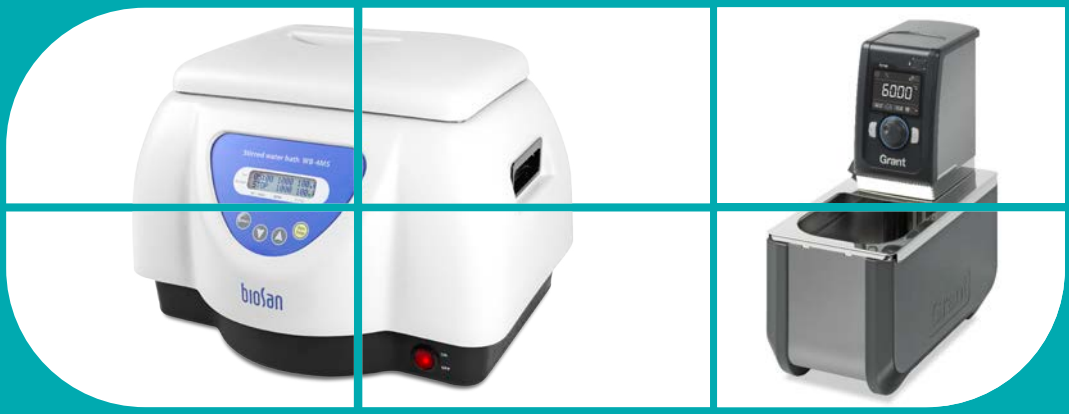
ORDERING INFORMATION: Catalogue number matches the name of the product

QB Series, Dry Block Heating Systems with Interchangeable Blocks: Accessories

Interchangeable blocks (Cat. Num.)		QBD1	QBD2	QBD4	QBH2	QBA1	QBA2
No. of blocks		1	2	4	2	1	2
QB-0 Plain block without holes		+	+	+	+	+	+
QB-10 24 × 10 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-12 24 × 12 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-13 12 × 13 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-16 12 × 16 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-17H for 10 × Falcon tubes tall 17 mm diam, 75 mm deep		+	+	+	+	+	+
QB-18 12 × 18 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
QB-24 5 × 24 mm Ø holes and universal bottles, 50 mm hole depth		+	+	+	+	+	+
QB-50 4 × 50 ml centrifuge tubes, glass universals, 50 mm hole depth		+	+	+	+	+	+
QB-H 56 × 0.2 ml microtube, 14 mm hole depth		+	+	+	+	+	+
QB-E0 24 × 0.5 ml microtube, 30 mm hole depth		+	+	+	+	+	+
QB-E1 24 × 1.5 ml microtube, 35 mm hole depth		+	+	+	+	+	+
QB-E2 24 × 2.0 ml microtube, 35 mm hole depth		+	+	+	+	+	+
QB-E5 12 x 5.0 ml microtube, 53.5 mm hole depth, 16.7 mm diameter		+	+	+	+	+	+
QB-DN Dolphin nose tube 24 × Ø 11.13 mm to Ø 6.1 mm		+	+	+	+	+	+
External Pt1000 temperature probe							
QBEP 	Standard probe. For in-sample or in-block temperature control;encased in stainless steel sheath, Ø 3 mm × 30 mm long, with 350 mm of cable	+	+	+	+	–	–
QBEP-WM 	Short-form probe. For in-sample or in-block temperature control; encased in stainless steel sheath, Ø 3 mm × 14 mm long, with 350 mm of cable	+	+	+	+	–	–
Microplate blocks of molecular biology and biotechnology applications Double-size blocks 140 × 100 × 75 mm supplied with additional extraction tool							
QDP-H 	96 holes in microplate configuration for 0.2 ml microplates, strips or individual tubes. Uniformity ± 0.3°C within tubes across the block; 6.2 mm Ø holes, 14 mm hole depth	–	+	–	+	–	+
QDP-FL 	Universal block for standard 96-well plates (u-well, v-well, flat bottom, high temperature) Uniformity ± 0.5°C between wells; supplied with hinged, double layer lid to create an insulated incubation chamber	–	+	–	+	–	+
Safety covers (not required with QDP-FL Microtiter blocks)							
	Made from tough clear acrylic for maximum visibility whilst preventing accidental touching of a hot block or contamination of samples from splashes. Clearance height 85 mm	QBL1	QBL2	QBL4	QBL2	QBL1	QBL2

ORDERING INFORMATION: Catalogue number matches the name of the product

CATALOGUE 2017-2018



THERMOSTATIC EQUIPMENT: WATER BATHS, ORBITAL/LINEAR SHAKING BATHS, UNSTIRRED WATER BATHS, HEATING/COOLING CIRCULATORS

WB-4MS, Stirred water bath

DESCRIPTION

Stirred water bath **WB-4MS** is designed for chemical, pharmaceutical, medical and biological laboratory research, for processes requiring constant temperature ranging from ambient temperature to 100 ° C.

WB-4MS provides increased temperature stabilization (up to 0.1°C) due to built-in magnetic stirrer (speed control range 250–1,000 rpm).

Easy set up, high temperature maintenance accuracy, compact size and attractive modern design make this water bath widely used.

Basic Plus
Product Class

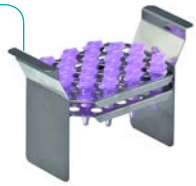
WB-4MS with base BP-1 (on the bottom)

SPECIFICATIONS

Tank capacity	4 litres
Temperature setting range	+25 °C ... +100 °C
Temperature control range	5 °C above ambient ... +100 °C
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature uniformity @ +37 °C	±0.1°C
Stirring speed control range	250–1,000 rpm
Digital time setting	1 min–96 hrs /non–stop (increment 1 min)
Display	LCD, 2 × 16 signs
Digital setting of temperature, time and mixing speed	
Plastic lid with stainless steel interior included	
Quiet operation	
Working volume	235 × 135 × 110 mm
Overall dimensions (W × D × H)	340 × 270 × 250 mm
Weight	3.4 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption	230 V, 50 Hz / 600 W (2.6 A) 120 V, 60 Hz / 670 W (5.6 A) 100 V, 50/60 Hz / 600 W (6.0 A)
Maximum continuous operation time	24 hrs

Base BP-1

6 Rack QR-LE



4 Rack QR-30

2 Rack QR-19

ORDERING INFORMATION:

	Cat. number
WB-4MS with base **BP-1** and **lid**	BS-010406-AAA

Optional racks:

QR racks	Tube size	Capacity	Cat. number
1 QR-13	Ø 10-13 mm	30	QR-13
2 QR-19	Ø 16-19 mm	16	QR-19
3 QR-24	Ø 24 mm	10	QR-24
4 QR-30	Ø 30 mm	5	QR-30
5 QR-SE	0.5 ml	44	QR-SE
6 QR-LE	1.5 ml	44	QR-LE

Combined Orbital/Linear Shaking Bath OLS26

DESCRIPTION

Patented, combined orbital and linear shaking mechanism of the **OLS26** allows optimisation of aeration and shear forces mixing, for reproducible results.

- Precision digital temperature control
- 0°C to 99°C operating range
- Stability ±0.1°C
- Easy changeover from linear to orbital shaking
- Adjustable shaking speed and stroke length
- Polycarbonate lid included as standard
- Drain tap for convenient emptying
- 3 year warranty
- TU26 icluded, other trays sold seperately

Equipment presented on pages 54-55, 59-71 is produced by Grant Instruments (Cambridge) Ltd. Biosan is the sole distributor of Grant Instruments products in Russia, CIS and the Baltic States (Latvia, Lithuania, Estonia) and the official distributor for a number of other regions.

SPECIFICATIONS

Tank size	26 litres
Minimum working depth	70 mm
Temperature control range	ambient +5 to 99°C. 0 to 99°C with accessory cooling
Temp. uniformity (DIN 12876-3) @ 70°C	±0.1°C
Temp. stability (DIN 12876-3) @ 70°C	±0.1°C
Display	2 x LED (individual displays and controls for temperature and shaking speed)
Orbital and Linear shaking speed	20 to 200 rpm (depending on load)
Orbital shaking radius	9 mm
Shaking speed display resolution	1 rpm
Linear shaking stroke length	18, 28, and 36 mm
Shaking tray area	380 x 235 mm
Timer	1 to 999 mins
Dimensions (D × W × H)	565 × 335 × 325
Heater power 120 V / 230 V	1.05 / 1.4 kW
Drain tap	yes
Safety	over temperature protection/ low liquid level cut-out
Supply voltage	110-120 V or 220-230 V

ORDERING INFORMATION:	Cat. number
OLS26 with TU26 tray	OLS26

Description and pictures of all available accessories can be found on page 61

Linear shaking bath — **LSB Aqua Pro** range

DESCRIPTION

World-renowned shaking water baths. High quality, robust design with unique magnetically coupled shaking mechanism for maximum reliability, consistency and quiet operation. Extensive range of accessories to provide the right solution for your application. Varied vessels types can be securely held using high quality, springs, clamps or racks.

FEATURES:

- Ambient +5˚C to 99˚C operation
- Stability ±0.1˚C
- Choice of two models – 12 and 18 litre
- Drain tap for convenient emptying
- 3 year warranty
- Polycarbonate lid included
- Extensive choice of accessory shaking trays. Tray sold seperately

SPECIFICATIONS

	LSB12	LSB18
	9.2 kg h: 275 mm d: 380 mm w: 360 mm 	11.2 kg h: 275 mm d: 565 mm w: 335 mm 
Tank size	12 litres	18 litres
Minimum working depth	60 mm	
Temperature range	ambient +5 to 99°C	
Uniformity (DIN 12876-3) @ 70 °C	±0.1°C	
Stability (DIN 12876-3) @ 70 °C	±0.1°C	
Display	LED	
Linear shaking speed	20 to 200 strokes/min (depending on load)	
Shaking speed display resolution	1 strokes/min	
Linear shaking stroke length	20 mm	
Shaking tray area	240 x 235 mm	420 x 235 mm
Timer	1 to 999 min	
Heater power 120 / 230V	0.8/0.8 kW	1.05/1.4 kW
Drain tap	yes	
Safety	over-temperature protection / low liquid cut-out	
Supply voltage	110-120 V or 220-230 V	

ORDERING INFORMATION:

	Cat. number
LSB12, Linear shaking bath 12 L with TU12 tray	LSB12
LSB18, Linear shaking bath 18 L with TU18 tray	LSB18

Description and pictures of all available accessories can be found on page 61

Accessories for Shaking Baths: LSB 12, LSB 18 & OLS 26

Accessories **LSB** and **OLS Aqua Pro** Product / description		**OLS26**	**LSB12**	**LSB18**
		Catalogue number		
	Universal tray - with adjustable springs. Highly versatile for a variety of vessel types.	TU26	TU12	TU18
	Flask / plate tray - with threaded holes to accept flask clamps or holder for deep well plates (≥2ml). See option below.	TF26	TF12	TF18
	Test tube tray - compatible with SR racks or can be used alone to accommodate bags and miscellaneous vessels. See rack option below.	TS26 (holds up to 5 SR racks)	TS12 (holds up to 3 SR racks)	TS18 (holds up to 5 SR racks)
	Base tray - perforated stainless steel, allows bath to be used as an unstirred bath.	SBT26	SBT12	SBT26
	Cooling coil - source of constant cooling to enable bath to be operated at or below ambient, down to 0°C. LS200 lid (with access hole for cooling coil) recommended.	CC26	—	
	Heat exchange coil - attach to a cold water supply or refrigerated circulator. Can be used down to 2°C above the temperature of the coolant. LS200 lid (with access hole for cooling coil) recommended.	CW26	—	
	Stainless steel sloping lid, gabled.	LS200	LU14	LU28
	Replacement polycarbonate lid, clear, gabled.	AQL26	AQL12	AQL26

Flask clamps and plate holder for TF tray

Cat. Number	Description	**OLS26** Capacity	**LSB12** Capacity	**LSB18** Capacity
SC-25	for 25 ml flask	28	18	33
SC-50	for 50 ml flask	24	14	26
SC-100	for 100 ml flask	15	9	17
SC-250	for 250 ml flask	8	5	14
SC-500	for 500 ml flask	6	4	6
SC-1000	for 1000 ml flask	3	2	4
SH-DWP	1 × deep well plate	4	2	4

Test tube racks / microtube racks for TS tray

Cat. Number	Tube diameter (mm)	Rack capacity
SR-10	10	48
SR-13	13	44
SR-16	16	24
SR-19	19	21
SR-25	25	12
SR-30	30	10
Cat. Number	**Microtube size (ml)**	**Rack capacity**
SR-SE	0.5	119
SR-LE	1.5	48

ORDERING INFORMATION: catalogue number matches the name of the product

Unstirred Water Bath

SUB Aqua Pro — advanced water bath range with a choice of 8 models. Supplied with base tray, lid and drain on larger bath.

JB Academy — basic range with a choice of 3 models. Supplied with base tray.

JB Nova - general purpose water bath range with a choice of 4 models. Supplied with base tray, lid and drain on larger bath.

SBB Aqua Plus boilingbath range - basic range with a choice of 3 models. Supplied with base tray.

- The reliability, quality and consistent performance of Grant products have made Grant a leading manufacturer of water baths for decades.
- A new era for Grant water baths – now all models from basic to advanced with digital controls
- Proven performance – technology to deliver temperature control you can rely on
- Set and Forget™ technology - minimal bath setup, maximum time for your work

More information about offered Grant Instruments products can be found on Biosan web-site www.biosan.lv

SUB Aqua Pro Digital Unstirred Water Bath

DESCRIPTION

Built to the highest standard and specifications and incorporating the latest technology the SUB Aqua Pro advanced water bath range supports even the most demanding applications requiring accurate temperature control. Choose from eight models with base tray and lid included as standard.

- Ambient +5°C to 99°C operation
- Set and Forget™ technology - fast heat–up, accurate temperature control
- Stability ±0.2°
- Adjustable over temperature alarm - protect samples from over heating
- Advanced dry start and run dry protection
- Three programmable temperature presets
- 3 year warranty

SPECIFICATIONS

Specifications	SUB Aqua Pro digital unstirred water bath range – summary of specifications							
	SAP2	SAP2S	SAP5	SAP12	SAP18	SAP26	SAP34	SAPD
								
	2.5 kg l: 200 mm w: 185 mm h: 200 mm	3 kg l: 215 mm w: 335 mm h: 150 mm	3 kg l: 215 mm w: 335 mm h: 200 mm	6 kg l: 380 mm w: 360 mm h: 225 mm	9.5 kg l: 590mm w: 335 mm h: 275 mm	9 kg l: 590 mm w: 335 mm h: 275 mm	14.5 kg l: 770 mm w: 335 mm h: 370 mm	9 kg l: 380 mm w: 545 mm h: 225 mm
Tank capacity	2 L	2 L (shallow)	5 L	12 L	18 L	26 L	34 L	5L & 12L
Temperature range	ambient t°C + 5 to 99							
Temp. display and setting resolution	0.1°C							
Temp stability (DIN 12876) @ 70°C	±0.2°C							
Temperature setting/energy regulation	digital							
User adjustable over temp. alarm	+							
Fixed thermal cut-out	+							
Dry start/boil dry protection	+							
Programmable temp. presets	3							
Countdown timer with audible alarm	1 to 999 min							
Working area l × w (mm)	117 × 131	139 × 289	131 × 281	281 ×306	485 × 281	481 × 278	635 × 281	131×281 & 281×306
Minimum fill level	50 mm	32 mm	50 mm	50 mm	50 mm	70 mm	70 mm	50 mm
Maximum fill level	25 mm below the top of the tank							
Drain tap included	–	–	–	+	+	+	+	+
Heater power 120V/ 230V kW	0.25/0.25	0.35/0.35	0.35/0.35	0.8/0.8	1.4/1.05	1.4/1.05	1.8/1.3	1.15/1.15
Supply voltage V	120 or 230							

ORDERING INFORMATION: catalogue number matches the name of the product

SUB Aqua Pro Digital Unstirred Water Bath

SPECIFICATIONS

OPTIONS AND ACCESSORIES							
SAP2	**SAP2S**	**SAP5**	**SAP12**	**SAP18**	**SAP26**	**SAP34**	**SAPD**
2 L	2 L (shallow)	5 L	12 L	18 L	26 L	34 L	5 L & 12 L
Replacement polycarbonate transparent lids*							
AQL2	AQL5	AQL5	AQL12	AQL26	AQL26	—	AQL5, AQL12
Directs condensation away from immersed vessels, avoids contamination, reduces evaporation and saves energy							
Stainless steel sloping lids*							
—	LU6	LU6	LU14	LU28	LU28	LU36	LU6 & LU14
Flat lids*							
—	—	LF6 (2 ring sets)	LF14 (4 ring sets)	LF28 (6 ring sets)	LF28 (6 ring sets)	LF36 (8 ring sets)	LF6 / LF14
With ring sets of variable hole diameter to accommodate tall vessels whilst reducing evaporation							
Polypropylene spheres* (packs per bath)							
1 × PS20	1 × PS20	1 × PS20	1 × PS20	2 × PS20	2 × PS20	3 × PS20	2 × PS20
Useful alternative to a lid, minimises evaporation and heat loss whilst allowing easy access to vessels in the bath; particularly useful for tall vessels							
Raised shelves – reversible, allows two shelf depths. h = shelf height above tank base (mm)							
—	—	—	RS14H (h 40 or 78) shelf covers half area of SAP12	RS18H (h 40 or 135) shelf covers half area of SAP18	RS28H (h 45 or 135) shelf covers half area of SAP26	RS36H (h 45 or 135) shelf covers half area of SAP34	RS14H (h 40 or 78) shelf covers half area of SAPD
Racks (no. per bath)							
—	—	1 × J2	2 × J2	4 × J2	4 × J2	6 × J2	1 + 2 × J2
Choice of 8 variants to accommodate different tube diameters and microtubes (see below)							
Replacement base trays							
AQBT2	AQBT5	AQBT5	AQBT12	AQBT26	AQBT26	SBT36	AQBT5 & AQBT12

Required if flat-bottomed flasks are to be placed directly on the base of the bath and to promote thermal convection in the bath

* — Lid or spheres recommended for use above 60˚C

Unstirred Bath Racks					
J2 Racks	**Tube size Ø**	**Capacity**	**J2 Racks**	**Tube size Ø**	**Capacity**
J2-10	10 mm	84	J2-25	25 mm	18
J2-13	13 mm	55	J2-30	30 mm	12
J2-16	16 mm	36	J2-SE	0.5 ml	105
J2-19	19 mm	32	J2-LE	1.5 ml	65

ORDERING INFORMATION: Catalogue number matches the name of the device

Optima™ Series, Stirred Thermostatic Baths and Heating Circulators

T100-P5

T100-P12 with lid

DESCRIPTION

A cost-effective range of multi-purpose systems combining Grant's legendary quality and reliability. Precise temperature control for a wide range of laboratory applications.

- **Accurate and safe temperature control** — for samples and users;
- **Intuitive programming and thoughtful design features** — makes working with Grant heated baths and circulators easy;
- **Robust, durable construction** — for longevity, reliability and long-term low cost of ownership;
- **A complete range** — 32 models to cover basic through to sophisticated needs, each model represents excellent value for money.

APPLICATIONS:

Grant stirred baths and circulators provide a source of precision heating and cooling for many routine and sensitive analytical procedures including sample incubation, calibration and quality control testing. All models from the **TC120** upwards are suitable for use as both open and closed loop circulators (i.e. remote vessel open or closed).

For more powerful heating requirements, i.e. above 200 °C, contact marketing@biosan.lv for advice.

Model selection (see page 67):

Any of the four **Grant Optima™** digital thermostats can be combined with any of eight Grant tanks (five stainless steel and three plastic) to provide a choice of 32 models.

Heating Circulators Specifications on page 66 and all available accessories on page 68

Optima™ Series, Heating Circulators Specifications

T100

TC120

TX150

TXF200

SPECIFICATIONS

Grant Optima™ Heating Circulators Specifications		General purpose Digital		Digital High Performance	
		T100	**TC120**	**TX150**	**TXF200**
Stability (DIN 12876) @ 70°C	°C	± 0.05	± 0.05	± 0.01	± 0.01
Uniformity (DIN 12876) @ 70°C	°C	± 0.1	± 0.1	± 0.05	± 0.05
Setting resolution	°C	0.1	0.1	0.1 (0.01 with Labwise™)	
Display		4 digit LED		full colour QVGA TFT	
Timer function		–	1 to 6000 mins	1 min to 99 hrs 59 mins	
No. preset temperatures		3	3	3	3
Re-calibration points		2	2	5	5
Offset adjustment		—	—	+	+
Socket for external probe (TXPEP, TXSEP)		—	—	+	+
Communication interface		—	—	USB & RS232	USB & RS232
Programmable		—	—	remote via PC/ laptop 1 program/ 30 segments	direct via user interface or remote via PC/laptop 10 programs / 100 segments
Relays		—	—	1	1
Safety	overtemperature	fixed	adjustable cut-out		
Safety	fluid level — float switch	+	+	+	+
Alarms (can be configured to switch a relay)		—	high, without relay	high and low	high and low
Heater power 230 V	kW	1.3	1.3	1.9	1.9
Electrical power 230 V	kW	1.4 (50–60 Hz)	1.4 (50 Hz)	2.0 (50 Hz)	2.0 (50–60 Hz)
Height above tank rim	mm	200	200	200	200
Depth below tank rim	mm	135	135	135	135
Grant Optima™ thermostat pumps (integral)					
Maximum pressure	water, mbar	—	210	310	530
Maximum flow	water, L/min	—	16	18	23 (adjusted flow rate)
Pipe bore	inlet/outlet, mm	—	6/11	6/11	6/11
Dimensions (H × D × W)	mm	315 × 145 × 115			

ORDERING INFORMATION:

	T100 EURO	**TC120 EURO**	**TX150 EURO**	**TXF200 EURO**

Optima™ Series, Water Bath Combinations and Accessories

Capacity (L) **Outer tank dimensions**	• Working area (L × W) • Min/max liquid depths • Inner tank dimensions (L × W × H) • Overall dimensions incl. controller (L × W × H)	**T100** Temperature setting range	**TC120** Temperature setting range	**TX150** Temperature setting range	**TXF200** Temperature setting range
ST5 – 5 L **stainless steel**- 3 kg h: 200 mm d: 330 mm w: 180 mm	• 150 × 150 mm • 85/140 mm • 300 × 150 × 150 mm • 330 × 180 × 395 mm	**T100–ST5** amb.+15 to 100°C	**TC120–ST5** 0 to 120°C	**TX150–ST5** 0 to 150°C	**TXF200–ST5** 0 to 200°C
ST12 – 12 L **stainless steel** – 4.5 kg h: 200 mm d: 360 mm w: 330 mm	• 205 × 300 mm • 85/140 mm • 325 × 300 × 150 mm • 360 × 330 × 395 mm	**T100–ST12** 0 to 100°C	**TC120–ST12** 0 to 120°C	**TX150–ST12** 0 to 150°C	**TXF200–ST12** 0 to 200°C
ST18 – 18 L **stainless steel** - 7 kg h: 200 mm d: 540 mm w: 330 mm	• 385 × 300 mm • 75/130 mm • 505 × 300 × 150 mm • 540 × 330 × 395 mm	**T100–ST18** 0 to 100°C	**TC120–ST18** 0 to 120°C	**TX150–ST18** 0 to 150°C	**TXF200–ST18** 0 to 200°C
ST26 – 26 L **stainless steel**- 7.5 kg h: 225 mm w: 330 mm d: 540 mm	• 385 × 300 mm • 125/180 mm • 505 × 300 × 200 mm • 540 × 330 × 405 mm	**T100–ST26** 0 to 100°C	**TC120–ST26** –15 to 120°C	**TX150–ST26** –15 to 150°C	**TXF200–ST26** –15 to 200°C
ST38 – 38 L **stainless steel** - 11 kg h: 225 mm d: 730 mm w: 330 mm	• 575 × 300 mm • 125/180 mm • 690 × 300 × 200 mm • 730 × 333 × 405 mm	**T100–S38** 0 to 100°C	**TC120–S38** –15 to 120°C	**TX150–S38** –15 to 150°C	**TXF200–S38** –15 to 200°C
P5 – 5 L plastic - 2.5 kg h: 180 mm d: 240 mm w: 330 mm	• 120 × 150 mm • 85/140 mm • 240 × 160 × 150 mm • 390 × 200 × 360 mm	**T100–P5** amb.+15 to 99°C	**TC120–P5** amb.+15 to 99°C	**TX150–P5** amb.+15 to 99°C	**TXF200–P5** amb.+15 to 99°C
P12 – 12 L plastic - 3.5 kg h: 180 mm d: 415 mm w: 350 mm	• 210 × 280 mm • 85/140 mm • 325 × 280 × 150 mm • 415 × 350 × 360 mm	**T100-P12** amb.+5 to 99°C	**TC120–P12** amb.+5 to 99°C	**TX150–P12** amb.+5 to 99°C	**TXF200–P12** amb.+5 to 99°C
P18 – 18 L plastic - 5 kg h: 180 mm d: 600 mm w: 365 mm	• 280 × 325 mm • 85/140 mm • 510 × 290 × 150 mm • 600 × 350 × 380 mm	**T100–P18** amb.+5 to 99°C	**TC120–P18** amb.+5 to 99°C	**TX150–P18** amb.+5 to 99°C	**TXF200–P18** amb.+5 to 99°C
OPTIONS AND ACCESSORIES					
Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture		–	–	+	+
External probes (optional)					
TXPEP flexible plastic probe, 3 m cable TXSEP stainless steel probe, 3 m cable		– –	– –	+ +	+ +
Remote switching device (optional)					
For switching appliances on and off (up to max. 8 Amps)		–	–	1	2
Vertical turbine pumps (optional)					
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm					
VTP 1 **VTP 2**	max. pressure 1,000 mbar max. flow 9 L/min max. pressure 1,650 mbar max. flow 12 L/min	+ +	Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow		

ORDERING INFORMATION: Catalogue number matches the name of the product

Optima™ Series, Water Bath Accessories

ACCESSORIES

	Lids to help reduce evaporation/heat loss and avoid sample contamination	**Polypropylene spheres** (no. of packs required, 300 spheres in one pack)	**Rack systems** to optimise use of available bath capacity (no. of racks accommodated)	**Raised shelves** to allow shallow vessels to be accommodated	**Accessory cooling systems** to allow systems to operate at or below room temperature by means of a cooling coil dipped into the bath; designed for minimal impact on working area		
					Refrigerated immersion coolers Consist of a cooling coil connected to a refrigeration unit by a flexible pipe. Extract heat continuously, with the bath control unit controlling temperature		**Heat exchange coil** Designed to be attached to a supply of cooling tap water or a refrigerated circulator
					C1G (0 to 40°)	C2G (–15 to 40°C)	CW5 (2°C above coolant temperature)
ST5 – 5 L stainless steel 	**STL5** flat stainless steel 	1 x PS20 	**1 × QR** 	—		—	
ST12 – 12 L stainless steel 	**STL12** gabled, hinged (removable) stainless steel 	1 x PS20 	**2 × VR** 	**RS14** 		—	
ST18 – 18 L stainless steel 	**STL26** gabled, hinged (removable) stainless steel 	2 x PS20 	**4 × VR** 	**RS22** 		—	
ST26 – 26 L stainless steel 	**STL26** gabled, hinged (removable) stainless steel 	2 x PS20 	**4 × VR** 	**RS28** 			
ST38 – 38 L stainless steel 	**STL38** gabled, hinged (removable) stainless steel 	3 x PS20 	**6 × VR** 	**RS28 or RS38** 			
P5 – 5 L plastic 	**PL5** flat, stainless steel 	1 x PS20 	**1 × QR** 	—	—	—	—
P12 – 12 L plastic	**PL12** curved plastic	1 x PS20	**2 × VR**	**RS14**	—	—	—
P18 – 18 L plastic	**PL18** curved plastic	2 x PS20	**4 × VR**	**RS22**	—		—

ORDERING INFORMATION: catalogue number matches the name of the product

NEW LT ecocool™

Energy Efficient Refrigerated / Heating Circulating Baths

DESCRIPTION

- Choice of three models, temperature range -30 °C to +200 °C (model dependent);
- Industry leading 4 year warranty with renowned service and support, no registration required;
- Active cooling through the whole temperature range;
- True energy saving of up to 80% against standard compressor units.

A new range of innovative, eco-friendly, refrigerated heating circulating baths offering significant running cost savings whilst delivering powerful cooling.

All products in the LT ecocool™ range are supplied assembled as ready to use kits, complete with accessory hosing, clips and connectors as standard.

SPECIFICATIONS

29 kg h: 640 mm d: 430 mm w: 245 mm		LT ecocool™ 100	LT ecocool™150
Temperature range	C°	-20 to 100	-25 to 150
Temperature stability	C°	±0.05	±0.02
Flow rate (max)	L/min	17	14 - 22 (adjustable)
Pump pressure (max)	mbar	250	530
Tank volume	L	5	6
Calibration points		2	5
Cooling power (typical)	@ 20°C W	240	385
	@ 0°C W	200	205
	@ -10°C W	100	105
	@ -20°C W	30	60
Programs		—	1 x 30 segments via Labwise™
Communication interface		—	USB
Temperature probe socket		—	6 pin mini DIN
Display		4 digit LED	Full colour QVGA TFT
Languages		—	5 (EN, FR, DE, IT, ES)
Weight	kg	29	
Timer		1 min to 99 hrs 59 mins	
Temperature presets		3	
Alarms		High	High and low
Electrical power (max) kW	120V/230V	2.16/2.07 (50-60 Hz)	2.28/2.76 (50-60 Hz)
Safety		Adjustable over temperature cut-out	
Ready to use kits	Assembled and supplied with standard tubing, insulation, clips and connectors		

LT ecocool™ NEW

Energy Efficient Refrigerated / Heating Circulating Baths

APPLICATIONS:

- **PHARMACEUTICAL** — Mini pilot plant reactors
- **EDUCATION** — Rotary evaporator cooling, replacement of running tap water cooling, immersing small samples, photometry, chromatography systems
- **INDUSTRIAL** — QC testing, sample preparation, general cooling, reaction chemistry, temperature control, semi-conductor manufacturing, rheometry
- **FOOD** — Refractometry
- **LIFE-SCIENCE** — Electrophoresis cooling
- **HIGH TEMPERATURE COOLING** — Active up to 200 °C

Options and accessories	LT ecocool™ 100	LT ecocool™150
Labwise™ PC software (optional)		
Allows two-way communication for status display, programming and data capture + USB cable provided	—	
External probes (optional)		
PEP plastic probe	—	+
SEP stainless steel probe	—	+
Vertical turbine pumps (optional) when pump is fitted, available working area is reduced.		
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm		Required only where application demands a higher pressure than that delivered by the internal to maintain flow. Note: The optional VTP pumps will transfer additional heat to the baths and reduce the net cooling power of the refrigeration unit. The above figures must be taken into consideration when choosing the refrigeration unit. when ordering a VTP pump, please specify which refrigeration base unit it is to be used with. Note: Other sizes of heat exchange c oil can be made to your specification, contact us for further information
VTP1-LT max. pressure 1,000 mbar; max. flow 9 L/min		
VTP2-LT max. pressure 1,650 mbar; max. flow 12 L/min		
Heat exchange coil		
CW5 Other sizes of heat exchange coil can be made to your specification, contact us for further information		Temperature range: 2 °C above the temperature of the coolant Coil Ø × l (mm): 77 × 55 Pipe bore inlet/outlet (mm): 7
Hose Kits		
HOSE100 General purpose hose kit: -40 to 100 ˚C HOSE200 High temperature hose kit: -50 to 200 ˚C		Hose kit 2 × 2m, assembled with Optima™ pump outlet plate and simple hose clips, no tools required

Optima™ R series, Refrigerated Thermostatic Baths and Circulators


TXF200-R4


TXF200-R5

Cost-effective and efficient multi-purpose systems for low temperature applications.

- Powerful precision cooling whether used in open-loop or closed-loop format
- Combining legendary quality, reliability and design for everyday usage — useful features, straightforward maintenance, compact design
- Robust, durable construction for longevity, reliability and long-term low cost of ownership
- Up to 4 years warranty

Grant low temperature circulators provide a source of precision cooling for many sensitive analytical procedures including spectrophotometry, viscometry, refractometry and electrophoresis. They are suitable for use in both open and closed loop circulation (i.e. remote vessel open or closed).

Alternatively, Grant RC series of recirculating chillers (closed circulators) can be used. These are generally needed for more powerful cooling requirements, e.g. the removal of mechanical or electrical heat produced in apparatus or machinery. Please contact marketing@biosan.lv for advice.

We recommend the following liquids for use with refrigerated thermostatic baths and circulators:

- –50 to 50 °C: Silicone oil — low viscosity (Bayer silicone M3);
- –30 to 30 °C: 50% water 50% antifreeze (inhibited ethylene glycol);
- 0 to 30 °C: 80% water 20% antifreeze (inhibited ethylene glycol);
- 5 to 99.9 °C: Water.


LTC4

The Grant Optima™ LTC4 Kit includes TX150 heating circulator and R4 tank/ refrigeration unit

Model selection:

The R4 and R5 refrigeration range consist of two refrigeration units which can be combined with four heating circulators to offer a temperature range of -47 °C to 100 °C.

Capacity (L) Outer tank dimensions	• Working area (L × W) • Min/max liquid depths • Weight	**T100** h: 315 mm d: 145 mm w: 115 mm	**TC120** h: 315 mm d: 145 mm w: 115 mm	**TX150** h: 315 mm d: 145 mm w: 115 mm	**TXF200** h: 315 mm d: 145 mm w: 115 mm
R4 – 20 L stainless steel h: 530 mm d: 490 mm w: 390 mm; *Cat.num.: R4*	• 230 × 305 mm • 80/140 mm • 40 kg	T100–R4 0°C to 100°C	TC120–R4 -25°C to 100°C	TX150–R4 -30°C to 100°C	TXF200–R4 -30°C to 100°C
R5 – 12 L stainless steel h: 585 mm d: 575 mm w: 415 mm; *Cat.num.: R5*	• 260 × 115 mm • 120/180 mm • 47 kg	T100–R5 0°C to 100°C	TC120–R5 -25°C to 100°C	TX150–R5 -47°C to 100°C	TXF200–R5 -47°C to 100°C
Options and accessories					
Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture + USB cable provided		—	—	+	+
External probes (optional)					
TXPEP flexible plastic probe, 3 m cable TXSEP stainless steel probe, 3 m cable		— —	— —	+ +	+ +
Remote switching device (optional)					
For switching mains power appliances on and off (up to max. 8 Amps)		—	—	1	1
Vertical turbine pumps (optional)					
Low noise, compact design. Supplied with pipe connections and special lid for fitting to tank, pipe bore 12.7 mm			Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow		
VTP 1 max. pressure 1,000 mbar; max. flow 9 L/min		+			
VTP 2 max. pressure 1,650 mbar; max. flow 12 L/min		+			

CATALOGUE 2017-2018

MAGNETIC STIRRERS, OVERHEAD STIRRER

MS-3000 and MMS-3000, Magnetic Stirrers

DESCRIPTION

MS-3000 and **MMS-3000** are compact magnetic stirrers with stainless steel working surface. Units provide stirring of liquids with rotation speed of magnetic element up to 3,000 rpm. Up to date it is the highest value of the maximal speed for magnetic stirrers of global producers.

Strong magnets hold the driven magnetic element firmly in the magnetic clutch. Stirring is performed without undesirable heating and noise.

Enclosures of stirrer **MS-3000** are made of strong steel and painted with powder enamel, which is chemically resistant to acids and alkali.

The stirrers are supplied with a cylinder-shape magnetic stirring bar (6×25 mm) encapsulated in PTFE for universal use.

MMS-3000 is equipped with a detachable stand for supporting various sensor elements (temperature, pH and others) inside the stirred liquid.

Magnetic stirrer is ideal laboratory instrument for PH-metering, extraction and dialysing with the small quantities of substances.

Operation temperature range +4°C to +40°C (from cold rooms to incubators) at maximal relative humidity 80%.

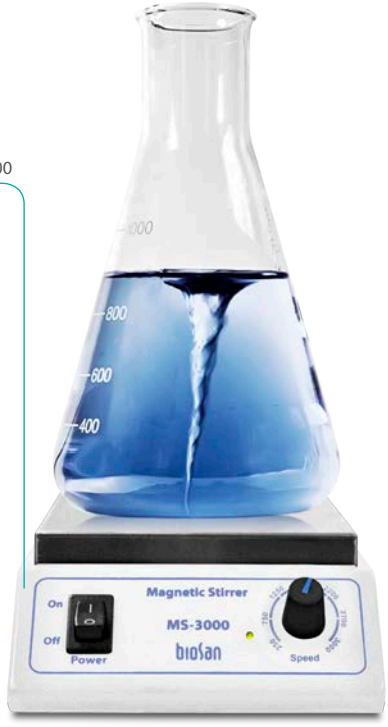
Basic Plus
Product Class

MS-3000

NEW FEATURE
SPEED DIAL

MMS-3000
with a stand

MS-3000



MS-3000 and MMS-3000, Magnetic Stirrers

SPECIFICATIONS

	MS-3000	MMS-3000
Speed control range	0–3,000 rpm	
Stirring volume up to (H_2O)	5 litres	20 litres
Working surface material	Stainless steel	
SR-1, attachable stand size	—	Ø8×320 mm
Max. length of magnetic stirring element (bar)	50 mm	70 mm
Stirring liquid viscosity	up to 1,170 mPa·s	
Maximum continuous operation time	24 hrs	
Operation in closed laboratory rooms	at ambient temperature from +4 °C to +40 °C	
Working plate size	110×110 mm	Ø 160 mm
Overall dimensions (W×D×H)	120×150×65 mm	185×230×75 mm
Weight	0.8 kg	1.5 kg
Input current/power consumption	12 V, 220 mA / 2.6 W	12 V, 250 mA / 3 W
External power supply	Input AC 100–240 V, 50/60 Hz; Output DC 12 V	

ORDERING INFORMATION: Cat. number

MS-3000	BS-010208-AAA
MS-3000 blue (on request)	BS-010301-ABF
MMS-3000	BS-010305-AA

Optional accessories for MMS-3000:

HTP-1, Holder for temperature probe (see page 77)	BS-010309-FK

MMS-3000

MMS-3000

MSH-300 and Intelli-Stirrer MSH-300i, Magnetic Stirrers with hot plate

DESCRIPTION

MSH-300 and **Intelli-Stirrer MSH-300i** are magnetic stirrers of the new generation. Enclosures of stirrers are made of metal painted with powder enamel chemically resistant to acids and alkali. The stirrers are equipped with a detachable stand for supporting various sensor elements (temperature, pH and others) inside the stirred liquid.

The stirrers are supplied with a cylinder-shape magnetic stirring bar (6×25 mm) for universal use covered with Teflon.

Units are equipped with the overheat protection providing an automatic switch-off of the device when overheating for the set temperature difference occurs.

Magnetic stirrers with heating can be used for laboratory operations such as organic synthesis, extraction, analysis of oil products, pH-measurements, dialysis, soil suspending, preparing buffer solutions, etc.

Additional protection disables the heating, if the temperature of plate exceeds the set temperature for 30°C.

Operation temperature range +4°C to +40°C (from cold rooms to incubators) at maximal relative humidity 80%.

Basic Plus
Product Class

MSH-300
with the stand

DESCRIPTION

Intelli-Stirrer MSH-300i is a digital version of magnetic stirrer with heating; it is designed for laboratories with higher requirements. It offers digital setting and control of temperature and rotation speed.

A powerful magnet allows mixing solutions with glycerine viscosity level. Maximum volume of stirred liquid (water) is 20 litres.

An external probe provides direct control of the stirred liquids temperature.

Premium
Product Class

Intelli-Stirrer MSH-300i
with the stand,
external probe and holder
for temperature probe

Product video is available
on the website

EXTERNAL TEMPERATURE PROBE:

Probe type	Thermocouple
Connection	type K
The cable is covered with Teflon, mechanically strong, elastic and chemically stable against oils, acids, aggressive reagents and liquids	
Cable length	1 m
Operation temperature range	–50 °C to +250 °C

MSH-300 and Intelli-Stirrer MSH-300i, Magnetic Stirrers with hot plate

SPECIFICATIONS

	MSH-300	Intelli-Stirrer **MSH-300i**
Speed control range	250–1,250 rpm	100–1,250 rpm (10 rpm increment)
Max. stirring volume (H_2O)	15 litres	20 litres
Plate temperature regulation range	+30 °C ... +330 °C	+30 °C ... +330 °C (1 °C increment)
Temperature control range with external probe	—	20 °C ... +150 °C
Display	—	LCD
Temperature uniformity on the plate	±3°C	
Working plate heating time till 330°C	15 min	11 min
Diameter of working plate	160 mm	
Plate material	Aluminium alloy	
SR-1, attachable stand size	Ø 8×320 mm	
Length of magnetic stirring element	10–50 mm	20–70 mm
Max. stirring liquid viscosity	up to 1,170 mPa × s	
Maximum continuous operation time	24 hrs	168 hrs
Fault indication	Outputs sound signal and turns off the heating	Outputs an error code on the display, turns off the heating
Overall dimensions (W×D×H)	190×270×100 mm	
Weight	2.9 kg	3.2 kg
Nominal operating voltage	230 V; 50/60 Hz or 120 V; 50/60 Hz	
Power consumption (Stirring)	8.5 W	
Power consumption (Heating)	550 W	

Connecting external probe to the Intelli-Stirrer MSH-300i

EXTERNAL SENSOR INSTALLATION:

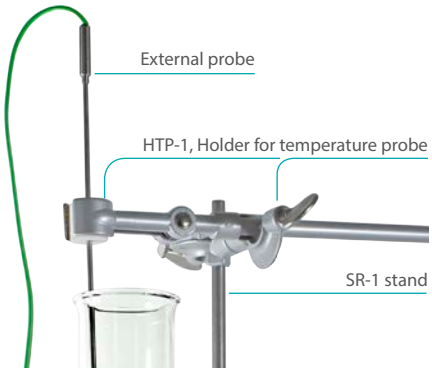


Plate heat up time for **MSH-300:**

Plate heat up time for Intelli-Stirrer **MSH-300i:**

ORDERING INFORMATION: Cat. number

MSH-300 with stand	BS-010302-OAA
Intelli-Stirrer MSH-300i with stand	BS-010309-AAA

Optional accessories:

External temperature probe	BS-010309-BK
HTP-1, holder for temperature probe	BS-010309-FK

MM-1000, Overhead Stirrer Multi Mixer

Overhead Stirrer Multi Mixer **MM-1000** is designed for stirring liquids up to 20 litres. Quiet and reliable mixer that can provide stable continuous mixing up to 7 daynights. It can realize three types of motion:

1. **Rotational**
2. **Reciprocal**
3. **Vibration**.

MM-1000 performs separate (mono–) (1; 2; 3), consecutive binary cycles *(c)* (1–2) × *c*; (1–3) × *c* and (2–3) × *c* and complex tri-cycles (1–2–3) × *c*.

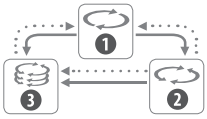
Speed, angle and time of stirrer rotation is under microprocessor control.

Multi Mixer can be used for stirring solutions up to the "medium viscosity" range (from 1,000 to 10,000 mPa·s). It is an ideal instrument for biotechnology, organic synthesis, analytical laboratories.

The innovative combination of three motion types provides high level of homogeneity due to consecutive combination of laminar and turbulent flows that cause substances to dissolve faster.

Electrically safe and energy efficient — powered by 12 V external power supply.

Basic Plus
Product Class



Multi mixing

SPECIFICATIONS OF MOVEMENT TYPES:

1 Rotation:	
Speed regulation range	40–1,000 rpm
Time	0–250 sec
2 Reciprocal motion:	
Turning angle	0°–360° (increment 30°)
Time	0–250 sec
3 Vibro motion:	
Turning angle	0°–5° (increment 1°)
Timer	0–5 sec
Stirring volume up to (H_2O)	20 L
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)
Overall dimensions (W × D × H)	140 × 135 × 250 mm
Weight	2.4 kg
Input current/power consumption	12 V, 700 mA / 8.4 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V

Accessories for MM-1000

ORDERING INFORMATION: Cat. number

MM-1000 without stirrers BS-010306-AAH

Optional accessories:	Type	Dimensions	Cat. number
A **MP-1**	Paddle stirrer	378 × (70 × 70) ×8 mm	BS-010306-AK
B **MP-2**	Propeller stirrer	2 folding blades (326 × 55 × 8 mm)	BS-010306-BK
C **MP-3**	Propeller stirrer	3 folding blades (325 × 50 × 8 mm)	BS-010306-CK
D **MA-1**	Anchor stirrer	332 × 90 × 8 mm	BS-010306-DK
E **MC-1**	Centrifugal stirrer	358 × 60 (110) × 8 mm	BS-010306-EK
F **Double clamp**	—	For device mounting	VELA00001301
G **Rod and base (page 78)**	—	For device mounting, 40 × 30 × 87cm	VELA00001300

A MP-1

B MP-2

C MP-3

D MA-1

E MC-1

F Double clamp

CATALOGUE 2017-2018

BIOSAFETY EQUIPMENT: BIOSAFETY AIR, BIOSAFETY SURFACE, WATER PURIFICATION SYSTEMS

UVR-M and UVR-Mi, UV Cleaner–Recirculators

DESCRIPTION

HOW DOES UV-AIR FLOW CLEANER-RECIRCULATOR WORK?

Operation principle is based on a constant, forced air circulation through recirculator`s chamber in close vicinity to UV lamps, thus ensuring maximal efficiency of disinfection. The inner mirror surface of recirculator chamber reflects ultraviolet rays thereby increasing the density of UV radiation and enhancing the disinfection effect.

WHAT DOES UV AIR FLOW CLEANER- RECIRCULATOR CONSIST OF?

UV Air Flow Cleaner-Recirculator consists of a germicidal UV lamp, a fan unit equipped with dust filters and a control unit, confined in a flow-through chamber.

WHAT ARE THE BENEFITS OF UVR-M AND UVR-Mi RECIRCULATORS?

- UV Air Recirculators are ideal for air disinfection in hospitals (especially in outpatient departments, operating rooms, emergency rooms, delivery rooms etc.), kindergartens, research laboratories, veterinary clinics
- Recirculators are effective against common airborne diseases by disinfecting the air and efficiently destroying disease-causing agents (viruses, microorganisms) by UV radiation
- Provide complete protection from UV radiation
- Easy to install, operate and maintain. Very low noise level
- Built-in timer allows to control the UV lamp operating time (UVR-Mi model)
- Digital control unit allows to track overall UV lamp operating time (UVR-Mi model)

RECIRCULATOR FIXATION:

- Convenient fixation on walls (standard)
- Mounting on a movable tripod (optional) Ⓐ

Basic Plus Product Class

Premium Product Class

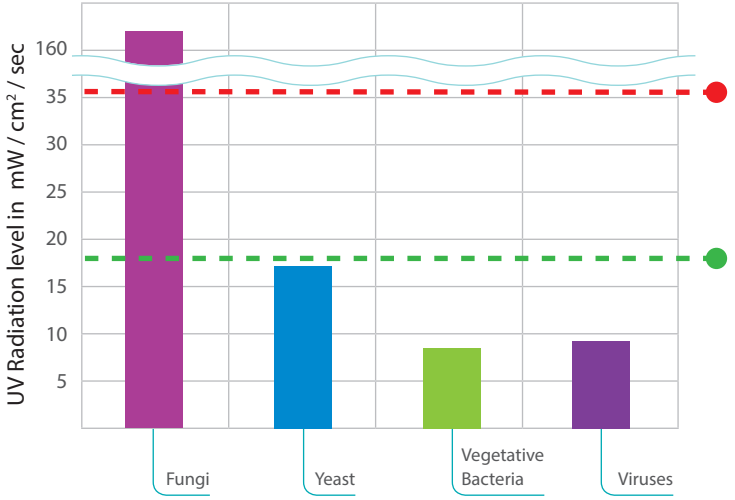
UVR-M

UVR-Mi

Both product video is available on the website

UVR-Mi
Tripod UVR-S

Sensitivity of microorganisms to UV radiation intensity in UV air recirculators UVR-M and UVR-Mi

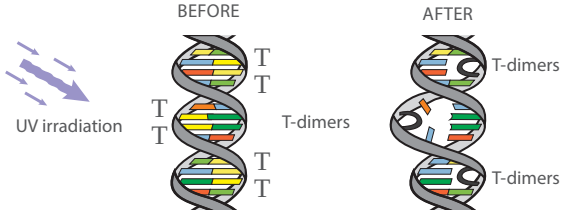


UVR-M and UVR-Mi, UV Cleaner–Recirculators

SPECIFICATIONS

Specifications:	UVR-M	UVR-Mi
UV radiation source *25W Bactericidal, TUV 25W G13 UV-C*	1 lamp	2 lamps
UV radiation level	18 mW / cm² / sec	36 mW / cm² / sec
Air-flow productivity	14 m³/hour	
Full user protection from direct UV light	Yes	
Display	—	LCD
UV lamp operation indicator	Yes	Yes
UV lamp lifetime counter	No	Yes
Timer	—	1 min–24 hrs / non–stop
Automatic switch ON/OFF	—	Yes
Lamp fault detection	—	Yes
Overall dimensions (W×D×H)	110×135×660 mm	110×135×660 mm
Weight	3.4 kg	3.4 kg
Nominal operating voltage	230 V, 50 Hz or 120 V, 60 Hz	230 V, 50 Hz
Power consumption (230 / 120 V)	125 VA (540 mA) / 160 VA (1.3 A)	110 W (0.5 A)

Operation principle



T — thymine formations

ORDERING INFORMATION: Cat. number

UVR-M	BS-040105-AAA
UVR-Mi	BS-040110-AAA

Optional adapters:

UVR-S (tripod)	BS-040105-AK

See UVR-M and UVR-Mi, UV-air flow Cleaner–Recirculators Test Report on page 149

BEFORE

AFTER

DNA/RNA UV-Cleaner Boxes

DESCRIPTION

DNA/RNA UV-cleaner boxes (**UVC/T-AR, UVC/T-M-AR, UVT-B-AR** and **UVT-S-AR**) are designed for clean operations with DNA samples. They provides protection against contamination.

All models are bench-top type, made of metal framework, glass (or plexiglas) walls and working surface painted with powder enamel or made of stainless steel (See the specifications table on the page 84).

UV-cleaner boxes are equipped with an open UV lamp installed in the upper hood. UV-radiation from the open lamps disinfects the working area inactivating DNA/RNA fragments during 15–30 min of exposure. A digital timer controls duration of the direct UV irradiation. A daylight lamp provides proper illumination of the working surface.

UV-cleaner box is equipped with a flow-type bactericidal **UV cleaner–recirculator AR**, which provides constant decontamination inside the box during operation. They are recommended for operations with DNA/RNA amplicons.

UV cleaner–recirculator AR consists of a UV lamp, a fan and dust filters organized in a special body so that a user working with a UV-cleaner box is protected against UV light. Recirculator increases the maximum density of UV light making it sufficiently effective for DNA/RNA inactivation. The UV–recirculator processes 100 UV-cleaner box volumes per hour, creating permanent aseptic conditions of operation inside the UV-cleaner box.

Specially assigned mobile table (with wheel locks) with a drawer is available on request. Two versions:

A T-4, for single size UV–Cabinets

B T-4L, for double size UV–Cabinets

Other optional furniture is featured on page 85.

ADVANTAGES OF BIOSAN UV-CLEANER BOXES:

- Ozone free high density UV decontamination
- Long living UV lamps (9,000 hours average)
- Automatic switch off of UV-lamps when the protective screen is opened
- Bactericidal flow-type recirculator providing permanent decontamination inside UV-cleaner box during operation
- Shockproof glass walls
- Low noise, low energy consumption
- Tables for installation of UV-cleaner boxes
- UV-cleaner boxes with the bactericidal **UV cleaner–recirculator AR** is the patented Biosan solution

Premium
Product Class

UVC/T-M-AR

Basic Plus
Product Class

UVC/T-AR

Basic Plus
Product Class

A UVT-B-AR on the table T-4

DNA/RNA UV-Cleaner Boxes

B UVT-S-AR on the double size table T-4L

Premium
Product Class

Product video is available on the website

Development and evaluation of DNA amplicon quantification video is available on the website

DNA/RNA UV-cleaner box UVT-S-AR with equipment for nucleic acid extraction

LF-1, laboratory chest of drawers

Table T-4L

Table T-4

T-4:	
Weight	23 kg
Maximum load	50 kg
Overall dimensions (W×D×H)	800 × 600 × 745 mm
T-4L:	
Weight	36 kg
Maximum load	75 kg
Overall dimensions (W×D×H)	1290 ×600 × 770 mm
LF-1:	
Weight	28 kg
Overall dimensions (W×D×H)	300 × 450 × 705 mm

ORDERING INFORMATION:	Cat. number
UVC/T-AR with inlet	BS-040102-AAA
UVT-B-AR with internal socket	BS-040109-AAA
UVT-B-AR with inlet	BS-040109-A05
UVC/T-M-AR with inlet	BS-040104-AAA
UVC/T-M-AR with internal socket	BS-040104-A06
UVT-S-AR with internal sockets	BS-040107-AAA
PDS-250, DNA/RNA removing solution	BS-040107-DK
Laboratory Furniture:	
T-4, table	BS-040101-BK
T-4L, table	BS-040107-BK
LF-1, laboratory chest of drawers	BS-050101-BK

See "Development and evaluation of DNA amplicon quantification" on page 141

DNA/RNA UV-Cleaner Boxes: Specifications

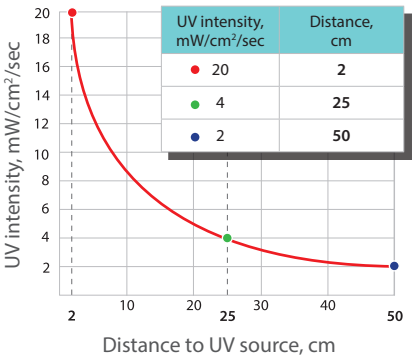
SPECIFICATION



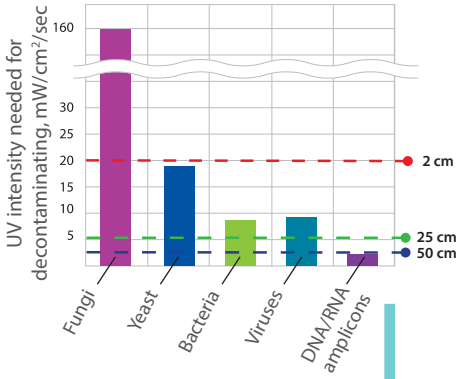

Model	**UVC/T-AR** (compact)	**UVC/T-M-AR** (compact)	**UVT-B-AR** (compact)	**UVT-S-AR** (double size)
Wall materials	Plexiglas: Polymethyl methacrylate (ALTUGLAS EX)	Rear: stainless steel Sides and front: glass (EUROGLASS, Germany)	Rear: stainless steel, Sides: steel with chemical resistant powder coating Front: glass (EUROGLASS, Germany)	Rear: stainless steel Sides and front: glass (EUROGLASS, Germany)
Working surface material	Steel with chemical resistant powder coating	Stainless steel		
Open UV-lamp	1×25W built-in bactericidal, TUV25WG13 UV-C			2×30W built-in bactericidal lamp, TUV30WG13 UV-C
Recirculator UV radiation level	15 mW/cm²/sec			
Radiation type	UV (λ = 253.7 nm), ozone-free			
Digital time setting of direct UV exposure	1 min–24 hrs/non–stop (increment 1 min)			
UV–recirculator	1×25 W (efficiency >99% per 1 hour)			1×30 W (efficiency >99% per 1 hour)
Daylight lamp (for working area illumination)	1×TLD-15W			1×TLD-30W
Thickness of side panels	4 mm	4 mm	2 mm	4 mm
Thickness of upper front panel	8 mm			
Thickness of the front protective screen	8 mm	4 mm	4 mm	5 mm
Optical transmission	92%	95%		
UV protection	>99.90% Polymethyl methacrylate ALTUGLAS EX	>96% UV-protection film, type 4 mil, clear		
Working area dimensions	650×475 mm			1,200×520 mm
Safety features	Automatic open UV-lamp switch off when screen is open			
Power outlets inside the unit (230/120 V)	Inlet for power cords	Inlet for power cords or 1 built-in socket, max. 1,000 W/600 W		3 built-in sockets max. 1,000 W/600 W, Inlet for power cords
Nominal operating voltage	100–240 V, 50/60 Hz			
Power consumption	67 W			135 W
Overall dimensions (W×D×H)	690×535×555 mm		690×585×555 mm	1,245×585×585 mm
Weight (net / gross)	23/33 kg	28.8/39 kg	31.2/42 kg	58/68.5 kg
Optional table (see lab. furniture on page 86)	**T-4** (W×D×H : 800×600×745 mm)			**T-4L** (W×D×H : 1,290×600×770 mm)

DNA/RNA UV-Cleaner Boxes

GERMICIDAL, SHORTWAVE (254 nm) ULTRAVIOLET ENERGY IS USED FOR COMPLETE DESTRUCTION OF VARIOUS BIOLOGICAL AGENTS



PER 1 SECOND



PER 15-30 MINUTES

Yeast

- Saccharomyces cerevisiae
- Brewer's yeast

Bacteria

- Clostridium tetani
- Mycobacterium tuberculosis
- Salmonella
- Dysentery bacilli
- Staphylococcus aureus
- Streptococcus hemolyticus

Viruses

- Bacteriophage *(E. coli)*
- Influenza

AVERAGE DOSAGE FOR DIFFERENT SURFACES

Surface	Dosage after 15 min	Dosage after 30 min
Working surface (40-60 cm)	1,800-2,700 mW/cm²	3,600-5,400 mW/cm²
Side walls (10-60 cm)	1,800-5,400 mW/cm²	3,600-9,000 mW/cm²
Front window (10-60 cm)	1,800-5,400 mW/cm²	3,600-9,000 mW/cm²

See the article on page 141 for full information

PDS-250, DNA/RNA Decontamination Solution, Spray, 250 ml

NEW

DESCRIPTION

Contamination is especially problematic in the highly sensitive PCR technique. Originating from aerosolized fragments, contaminant DNA can lead to cross contamination thus resulting in inaccurate data and as a result misinterpreted analysis.

PDS-250 is ready-to-use solution for eliminating DNA and RNA from surface prior PCR reaction preparation. DNA/RNA is removed within seconds after use. The solution contains a surfactant and a non-alkaline and non-carcinogenic agent. **PDS-250** is intended for use at PCR cabinets and laminars (e.g. UVT-S-AR), lab devices - BioMagPure 12, TS-100, pipettors - Assist series pipettes, etc.

Benefits - Highly effective

PDS-250 is effective against amplicon, plasmid, or genomic DNA and RNA from most surfaces with the exception of light or non-ferrous metals (e.g. aluminium, copper, lead, nickel, tin, titanium, zinc etc.).

PDS-250 is ready-to-use for eliminating DNA and RNA from suitable surfaces. Fast and easy decontamination; The use of **PDS-250** both before and after PCR analysis is fast, easy and ideal to maintain a clean work area and thereby saves time and expenses.

PDS-250 is heat resistant and stable for several years

Recommended Use: Applicable in research and industry only. Not recommended for clinical applications. Use as directed. **PDS-250** should be applied on glass, ceramic, plastic, rubber, steel and precious metal. **PDS-250** cannot be used for the cleaning of light or non-ferrous metals. To avoid damage or discoloration, it is recommended to spot test sensitive surfaces prior to use.

ORDERING INFORMATION:

	Cat. number
PDS-250, ready-to-go formulation in a spray bottle, 250ml	BS-040107-DK

Ultrapure water systems: Labaqua series NEW

DESCRIPTION

Labaqua ultrapure systems are multi-purpose water purification systems. The Labaqua systems produce ultrapure and pure water directly from tap water.

Ultrapure (Grade 1) water is dispensed through the point-of-use filter on the front panel. Pure (Grade 2) water is dispensed directly from the storage tank.

Labaqua ultrapure water can be used for the most demanding applications including, but not limited to: Inorganic trace analysis, Liquid chromatography, Cell culture, Molecular biology.

With resistivity of 18.2 Mega — Ohm × cm (0.055 µS/cm) ultrapure water produced by a Labaqua system exceeds requirements of all relevant standards (ISO 3696 Grade 1, ASTM Type I, CLSI Type I). Purified water is collected in a storage tank. An integrated recirculation system ensures consistent quality of water and reduces total organic carbon (TOC) to very low levels: <2ppb.

Pure water produced by the Labaqua systems complies with the requirements of ISO 3696 Grade 2 water and can be used for labware washing, wet chemistry methods, flame spectrophotometers, etc.

All cartridges and filters are easily accessible and no tools are required to replace them. The Labaqua system can be installed on a laboratory bench or mounted on a wall.

FEATURES:

- **Volumetric dispense** — enables the user to set accurate dispensing volume for each dispense cycle. The dispense volume can be set either from the keyboard or by using "teaching" mode.
- **Water quality** — embedded recirculation loop ensures stable premium water quality and enables practical elimination of Total Organic Carbon (TOC).
- **Low running costs** — performance of the deionization and polishing modules is constantly monitored. Monitoring algorithm enables cutting running costs, as replacement of the modules is requested only when service life is close to the end.
- **Total organic carbon (TOC) monitor** — organic contaminants may not have effect on conductivity of water, so conductivity sensors cannot be used for TOC monitoring. Therefore, a special TOC monitoring module is needed to measure TOC level.
- **Color graphic LCD display** — system component status is reflected on the display in an intuitive color pattern (Green/Yellow/Red).
- **System flowchart** — shows all component status and water quality parameters at a glance.

The Labaqua systems include:

- Boost pump
- Pre-filter set
- Reverse osmosis module
- Deionization module
- Final stage polishing module
- 30 L storage tank with an integrated Grade 2 dispensing valve
- Recirculation system

Model specific modules:

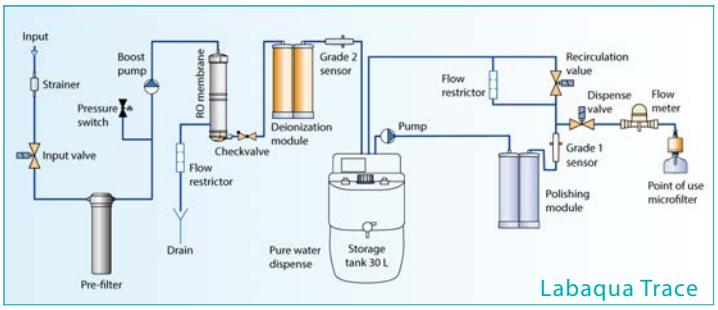
- **Labaqua Trace** — Point-of-use microfilter
- **Labaqua HPLC** — Point-of-use microfilter, TOC monitor
- **Labaqua Bio** — Point-of-use ultrafilter, UV sterilization module, TOC monitor

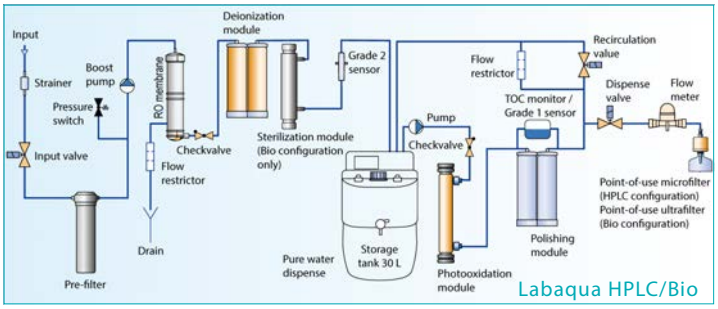
Ultrapure water systems: **Labaqua series**

Purified water specifications	Labaqua Trace	Labaqua HPLC	Labaqua Bio
Ultrapure (Grade 1) water resistivity	18.2 MΩ × cm		
Ultrapure (Grade 1) water conductivity	0.055 µS/cm		
Pure (Grade 2) water resistivity	> 10 MΩ × cm		
Pure (Grade 2) water conductivity	< 0.1 µS/cm		
TOC	< 30 ppb	< 2 ppb	
RNase	—	—	< 0.01 ng/ml
DNase	—	—	< 4 pg/ml
Bacteria	< 1 CFU/ml		< 0.1 CFU/ml
Endotoxins	< 0.15 EU/ml		< 0.001 EU/ml
Particles > 0.22 µm	< 1/ml		
Deionization module life (standard module)	1 m^3		
Dimensions (W × D × H)	320 × 560 × 620 mm		
Storage tank	30 l		
Feed water pressure	0.8 – 4 bar		
Feed water conductivity	< 1300 µS/cm		
Weight	24 kg	25 kg	26 kg
Nominal operating voltage	230 V, 50/60 Hz		
Power consumption	130 W		

	Application	Labaqua Trace	Labaqua HPLC	Labaqua Bio
General laboratory applications	Glassware rinsing	+	+	+
	Laboratory washers	+	+	+
	Autoclaves	+	+	+
	Electrochemistry	+	+	+
	Wet chemistry	+	+	+
	Spectrophotometry	+	+	+
	Buffer and media preparation	+	+	+
	Reagent preparation	+	+	+
Inorganic analysis methods	Flame atomic absorption spectrophotometry	+	+	+
	Graphite atomizer atomic absorption spectrophotometry	+	+	+
	Plasma mass-spectrometry (ICPMS)	+	+	+
	Plasma spectrophotometry (ICPOES)	+	+	+
	Ion chromatography	+	+	+
Organic analysis methodes	Liquid chromatography (HPLC/ UHPLC)		+	+
	Gas chromatography		+	+
	Total organic carbon measurements		+	+
Molecular Biology	Flow cytometry			+
	Cell and tissue culture			+
	Molecular biology			+

Ultrapure water systems: **Labaqua series**





Storage tank 30 L

ORDERING INFORMATION

	Cat. number
Labaqua Trace incl. 30l tank, power cord	BS-070105-A02
Labaqua HPLC incl. 30l tank, power cord	BS-070104-A02
Labaqua Bio incl. 30l tank, power cord	BS-070106-A02
Optional accessories:	
External pre-filter set (polyphosphate/carbon/1 µm) with manometer	BS-070104-LK
External pre-filter set (carbon/1µm) with manometer	BS-070104-KK
Storage tank "Economy" with level switch, 50 L	BS-070102-DK
Storage tank "Comfort" with level switch, 60 L	BS-070102-EK
Storage tank "Comfort", 100 L	BS-070102-FK
Storage tank "Comfort", 200 L	BS-070102-GK
Storage tank "Comfort", 300 L	BS-070102-HK
Replacement parts	
Internal prefilter set	BS-070104-AK
RO membrane (30 L/h)	BS-070102-MK
Deionization module	BS-070104-IK
Polishing module	BS-070104-BK
Microfilter - 0.22µm non sterile	BS-070104-EK
Microfilter - 0.22µm sterile	BS-070104-FK
Ultrafilter	BS-070104-GK
UV bulb 254 nm	BS-070104-CK
UV bulb 185 nm	BS-070104-DK
0.22 µm air vent filter for the storage tank	BS-070102-AK

CATALOGUE 2017-2018

DENSITOMETERS

DEN-1 and DEN-1B, McFarland Densitometers

DESCRIPTION

Densitometers are designed for measurement of cell suspension's turbidity in the range:

DEN-1: 0.3–5.0 McFarland units (100×10^6–150×10^7 cells/ml);

DEN-1B: 0.0–6.0 McFarland units (0–180×10^7 cells/ml);

Densitometers provide the opportunity to measure solution turbidity in a wider range (up to 15.0 McFarland units) however, it is necessary to remember that in this case the standard deviation values increase.

A densitometer is used for measurement of cell concentration (bacterial, yeast cells) during fermentation process, determination of microorganism sensitivity to antibiotics, microorganism identification using various test-systems, for measurement of absorption at the definite wavelength, as well as for quantitative estimation of concentration of colour solution, absorbing green light.

The operation principle is based on measurement of optical density with digital presentation of results in McFarland units. The unit is calibrated at the factory (for operation with 16 mm diameter glass tubes) and keeps calibration without power supply. However, if necessary, it is possible to calibrate the unit by 2–6 points in 0.5–5.0 (DEN-1) and 0.0-6.0 **(DEN-1B)** McFarland unit range. Both commercial standards (e.g. produced by BioMerieux, Lachema, etc.) and the cell suspensions prepared in a laboratory can be used for calibration.

Basic Plus
Product Class

DEN-1

Premium
Product Class

DEN-1B

Adapter A-16

Following polymer microparticles calibration kits and glass tubes are available on request:

- **CKG16** for glass tubes with diameter 16 mm, set of 0.5; 1.0; 2.0; 3.0; 4.0 McFarland Turbidity Standards (latex particles)
- **Glass sample tubes** without lid (diameter 16 mm, height 100 mm), which are suitable for working with **DEN-1, DEN-1B** factory calibration.

Up to date information on calibration kits can be found on the website: http://www.biosan.lv

DEN-1B rear side with calibration controls

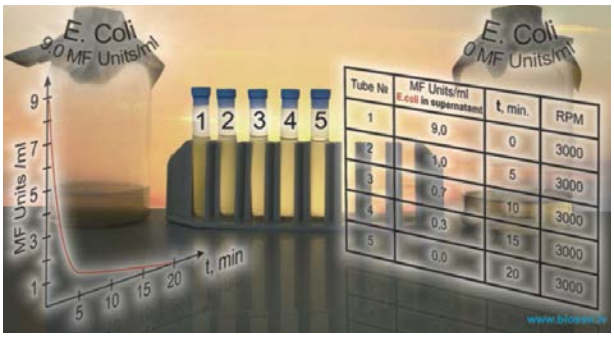
Two versions of the product are available:

1. **DEN-1** powered from external energy supply;
2. **DEN-1B** powered both from external energy supply and from batteries (AA). Besides, **DEN-1B** operates with higher precision of measurements (up to 0.01 McF).

DEN-1 and DEN-1B, McFarland Densitometers

SPECIFICATIONS

	DEN-1	DEN-1B
Light source	LED	
Wavelength	λ = 565 ±15 nm	
Measurement range	0.3–15.0 McF	0.00–15.00 McF
Display resolution	0.1 McF	0.01 McF
Accuracy	(0.3–5.0 McF) ±3%	(0.0–6.0 McF) ±3%
Measurement time	1 sec	
Sample volume	not less than 2 ml	
Tube external diameter	18 mm (without adapter) or 16 mm (using included **A-16** adapter)	
Possibility to restore factory calibration settings		
Display	LED	LCD
Overall dimensions (W×D×H)	165×115×75 mm	
Weight	0.7 kg	
Independent power supply	—	3×AA batteries
Input current/power consumption	12 V, 80 mA/1 W	12 V, 7 mA/0.1 W
External power supply	Input AC 100-240 V, 50/60 Hz; Output DC 12 V	Input AC 100-240 V, 50/60 Hz, Output DC 12 V
Standard set	External power supply	External power supply and 3×AA batteries



Application of **DEN-1** for determining concentration of microbial cells of supernatant in tubes during centrifugation. Turbidity is determined in McFarland units.

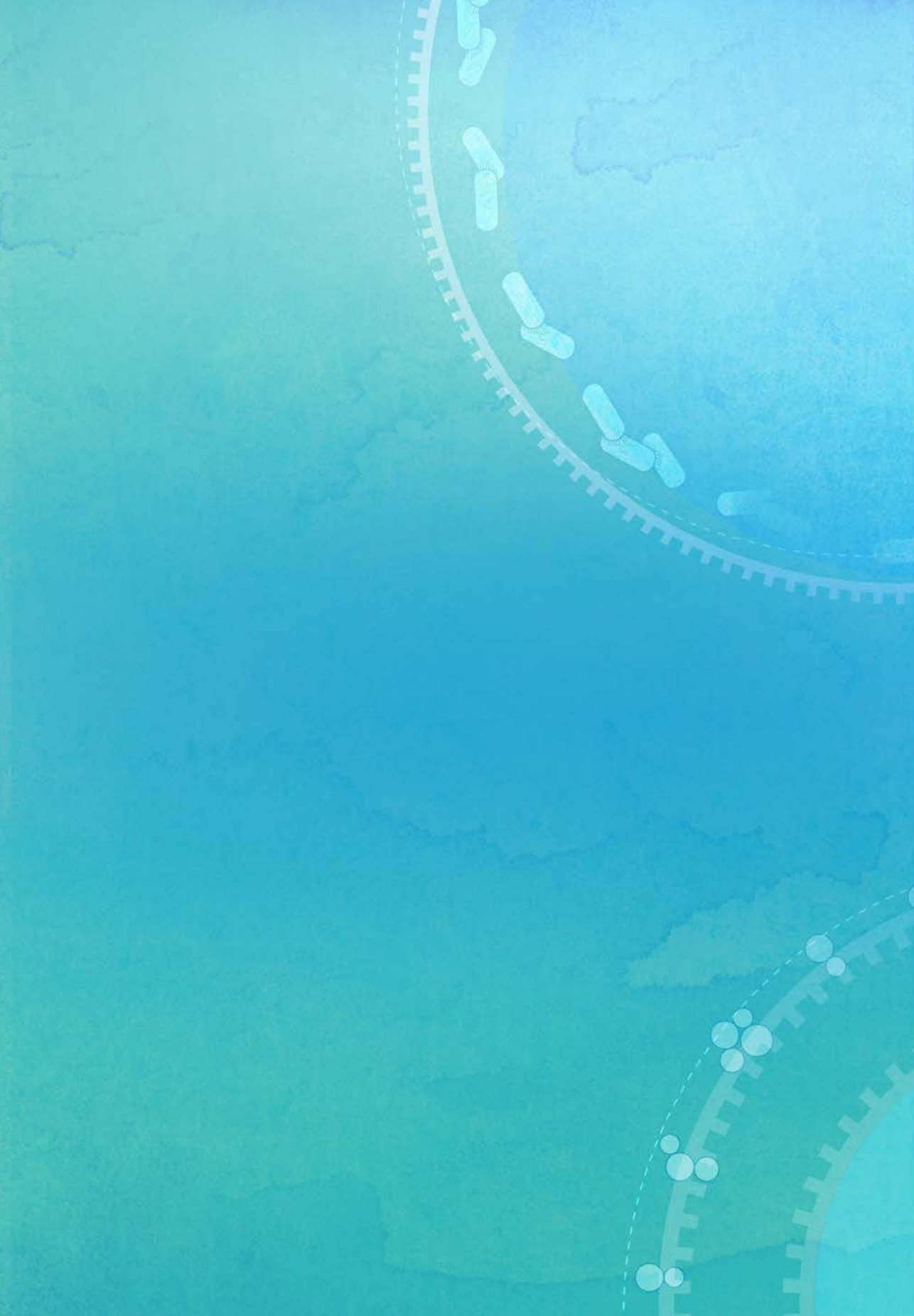
DEN-1B

ORDERING INFORMATION:

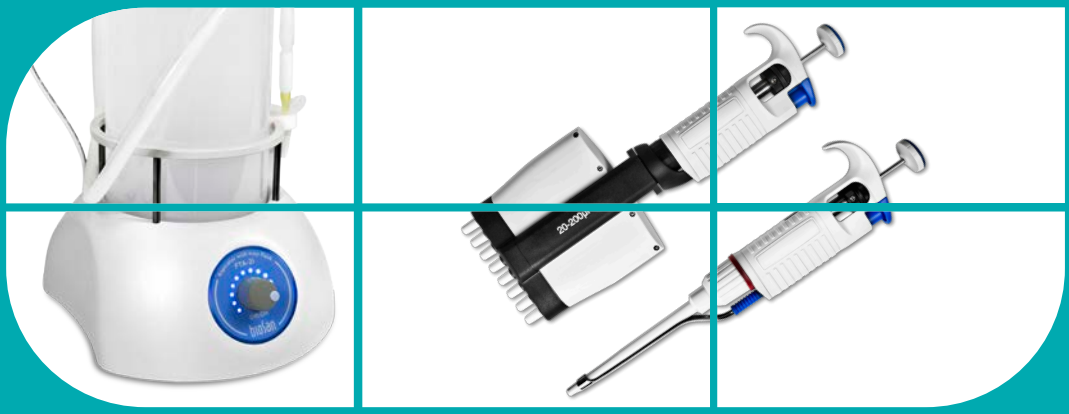
	Cat. number
DEN-1 with **A-16** adapter	BS-050102-AAF
DEN-1B with **A-16** adapter	BS-050104-AAF

Optional accessories:

CKG16 for glass tubes with diameter 16 mm (latex particles)	BS-050102-BK
Glass sample tubes without lid (16 × 100 × 0.8 mm), 78 pcs. Fits DEN-1, DEN-1B factory calibrated	BS-050102-LK



CATALOGUE 2017-2018



ASPIRATORS, PIPETTES

FTA-2i, Aspirator with Trap Flask

DESCRIPTION

Aspirator with trap flask **FTA-2i** is designed for aspiration or removal of alcohol, buffer and liquid from reaction vessels (e.g. during DNA/RNA purification or other macromolecule reprecipitation techniques).

The device can be applied for routine operations of cells washing from culture medium and resuspension in buffer. Aspirator operation principle is based on creating negative pressure in trapping flask using built-in microcompressor. The collecting tip is connected with polyethylene tube to the trapping flask. Liquid is removed from the reaction vessel when the collecting tip is in contact with the solution. A tube holder-organizer is conveniently located at **FTA-2i** right hand side; it accommodates two 1.5–2 ml tube slots (e.g. for hydrochloric acid solution and distillate) necessary for collecting tip washing and storing, so that a tip can be re-used.

FTA-2i is equipped with a level sensor that detects excess liquid with consequential prevention of the overflow by automatically switching off the pump with a sounding alarm indication.

The devices comes, as standard, with vacuum regulation control knob that allows to smoothly select a preferable aspiration speed.

Additionally, a hand operator can be purchased for a more comfortable usability of the new accessories (see list below). The autoclavable hand operator features a pressure sensitive button that can control the aspiration speed.

COMMON APPLICATIONS:

Removal and disposal of liquid from various reaction vessels

Premium Product Class

Product video is available on the website

SPECIFICATIONS

Aspiration speed	up to 10 L/min (air)
Vacuum regulation	-200 to -800 mbar (adjustable)
Trap flask	2 L, polypropylene (autoclavable)
Liquid level sensor type	Invasive
Overflow protection	Motor stops, light and sound signal
Filtration: Hydrophobic microbiologic filter 2200/02 eliminates risk of contamination from the trap flask by bacteria, viruses and infected particles	
Filter pore diameter	0.027 micron
Input current/power consumption	12 V, 1 A / 10.8 W
External power supply	Input AC 100-240V 50/60 Hz; Output DC 12 V
Dimensions (W×D×H)	185 × 290 × 390 mm
Weight*	1.85 kg

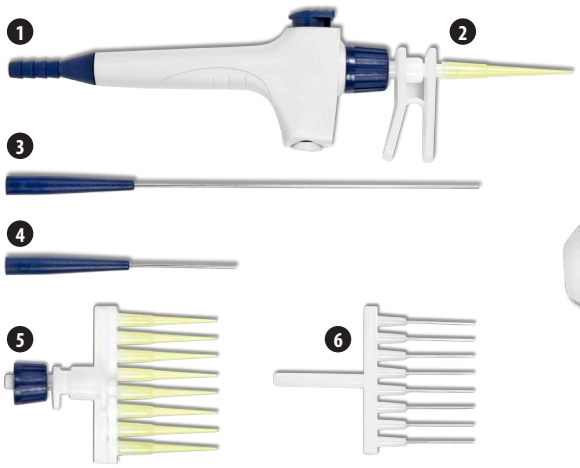
* — Accurate within ±10%.

FTA-2i, Aspirator with Trap Flask

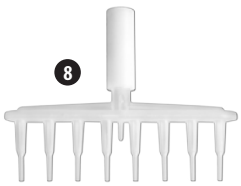
OPTIONAL ACCESSORIES:

HAS-1, hand operator set

1. Handheld vacuum controller;
2. 1-channel adapter (with ejector) for 200 µL tips;
3. 1-channel adapter with 125 mm stainless steel pin;
4. 1-channel adapter with 40 mm stainless steel pin;
5. 8-channel adapter (with ejector) for 200 µL tips;
6. 8-channel adapter with 35 mm stainless steel pin;
7. Stand SH-6.



8. MA-8, 8-channel adapter manifold



ORDERING INFORMATION:

	Cat. number
FTA-2i, with 2l trap flask, universal adapter **MA-U** (for 200/1000 µL single use tips)	BS-040120-A02
Optional accessories:	
HAS-1, hand operator set	BS-040118-PK
MA-8, 8-channel adapter manifold	BS-040108-BK
Replacement parts:	
Suction microbiologic hydrophobic filter	BS-040120-S10
MA-U, universal adapter for 200/1000 µL single use tips	BS-040118-AK

FTA-1, Aspirator with Trap Flask

DESCRIPTION

Aspirator with trap flask **FTA-1** is designed for aspiration/removal of alcohol/buffer remaining quantities from microtest tube walls during DNA, RNA purification and other macromolecule reprecipitation techniques.

The device can be used also for routine operations of cells washing from culture medium and resuspension in buffer. Aspirator operation principle is based on creating negative pressure in trapping flask using built-in microcompressor. The collecting tip is connected with polyethylene tube to the trapping flask. Liquid is removed from the microtest tube when the collecting tip touches the solution surface. A tube holder-organizer is conveniently located at **FTA-1** right hand side; it accommodates two tubes (e.g. for hydrochloric acid solution and distillate) necessary for collecting tip washing and storing, so that a tip can be reused.

1 Suction microbiological hydrophobic filter type 2200/02: Suction microbiologic filter eliminates risk of contamination with bacteria, viruses and infected particle from patient to suction pump or central vacuum distribution. Suction microbiological filter is hydrophobic with very high bacterial blocking efficiencies, up to 99.99999% particles bigger than 0.027 micron (which is smaller than Hepatitis A, B and C).

Basic Plus
Product Class

Product video is available on the website

SPECIFICATIONS

Vacuum	–500 mbar
Trap flask volume	1 litre
Dimensions with trap flask (W×D×H)	160×210×340 mm
Weight with trap flask	1.7 kg
Input current/power consumption	12 V, 300 mA / 3.6 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

Optional 8-channel adapter manifold MA-8

ORDERING INFORMATION:

	Cat. number
FTA-1 with 1L trap flask	BS-040108-AAG
Optional accessories:	
MA-8	BS-040108-BK
Replacement parts:	
Suction microbiologic hydrophobic filter	BS-040108-S25

NEW Assist, pipette series

I LOVE PIPETTE

DESCRIPTION

The Assist series pipettes are single, 8 or 12 channel variable volume pipettes designed to measure and transfer volumes.

Single channel pipettes are produced in ten ranges of volumes from 0.1 µl to10,000 µl depending on the model.

Multichannel pipettes are produced in four ranges of volumes: 0.5-10 µl, 5-50 µl, 20-200 µl, 50-300 µl.

The pipettes are equipped with an analog counter which shows the pipetting volume. The volume setting is done by turning the pipetting pushbutton knob or the black adjustment knob in the right direction. The volume range is shown on the pipetting pushbutton.

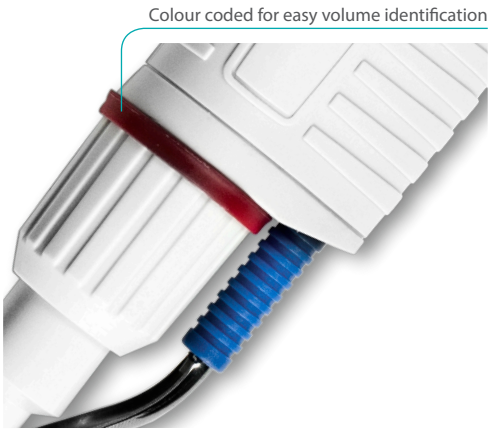
Common pipettes usage depending on the volume	
AP2, AP10, AP8-10, AP12-10	Measurement and transfer of micro-volumes, DNA sequencing and enzyme-assay applications.
AP20, AP50, AP100, AP200, AP250, AP1000, AP8-50, AP12-50, AP8-200, AP12-10, AP8-300, AP12-300	Measurement and transfer of general aqueous solution, acids and bases.
AP5000, AP10000	Measurement and transfer of large volumes.

Pipette:	Volume (µl)	Colour code	Fit to tips	Cat. number
Single channel:				
AP2	0.1 – 2.0	●	10 µl	BS-010501
AP10	0.5 – 10.0	●		BS-010502
AP20	2 – 20	●	200 µl	BS-010503
AP50	5 – 50	●		BS-010504
AP100	10 – 100	●		BS-010505
AP200	20 – 200	●		BS-010506
AP250	50 – 250	●	300 µl	BS-010507
AP1000	100 – 1,000	●	1,000 µl	BS-010508
AP5000	500 – 5,000	○	5,000 µl	BS-010509
AP10000	1,000 – 10,000	○	10,000 µl	BS-010510
Multichannel:				
AP8-10 AP12-10	0.5 – 10	—	10 µl	BS-010511 BS-010512
AP8-50 AP12-50	5 – 50	—	200 µl	BS-010513 BS-010514
AP8-200 AP12-200	20 – 200	—		BS-010515 BS-010516
AP8-300 AP12-300	50 – 300	—	300 µl	BS-010517 BS-010518
Sets:				
AP10, AP20, AP200, AP1000, 4 position stand, demo tips				BS-010519
AP10, AP100, AP1000, AP5000, 4 position stand, demo tips				BS-010520

Assist, pipette series

FEATURES:

- Contoured shape of the handle and light weight;
- Proven accuracy and precision;
- UV resistant & fully autoclavable;
- 5 & 10 ml shaft protected by filter;
- Available in 8- & 12-channel version;
- Colour coded for easy volume identification;
- The adjustable ejector height system – to accommodate virtually all brands of tips;
- Dual volume setting using the pushbutton or the thumbwheel;
- Soft spring system for smooth, effortless pipetting.



Pipette stands:	Cat. number
1 Carousel stand (rotating) for 6 pipettes	BS-010522
2 Multiple stand (fixed) for 8 pipettes	BS-010523
3 1-position stand	BS-010524
4 4-position stand	BS-010525

1 

2 

3 

4 

Pipette tips:	Cat. number
1 Pipette tips available in bulks – resealable plastic bags – keeping them safe from contamination. One bulk contains 200, 250 or 1000 pieces of tips depending on the tip volume.	On request
2 Tips racked in durable polypropylene box providing good stability on the lab bench. One rack contains 96 or 100 pieces of tips depending on the tip volume.	On request
3 Stack racks secure the tips and save valuable space. One stack rack contains 5 trays with 96 tips. Available only for 10 µl and 200 µl tips. Can be used to refill standard racks.	On request

1 

2 

3 

NEW Assistboy, pipette controller

Charging stand

Assistboy pipette controller is a device intended for pipetting liquids with the use of measuring pipettes. It can work with all types of glass or plastic serological pipettes in the volume range from 0.5 ml to 100 ml.

Controller is equipped with exchangeable filter membrane which protects shaft mechanism from aggressive liquid fumes.

Two dispense modes permit selection of dispensing intensity depending on the user's needs. The selected setting of the pipette controller mode is shown on the display.

SAFE AND EFFICIENT WORK

- Protected by a PTFE filter blocking any liquid from entering the unit
- Autoclavable filter, the pipette holder and the nosepiece
- UV resistant body for safe sterilization
- Powerful, environmentally friendly 3 Ni-MH batteries enable many hours of continuous work
- LCD display showing battery charge level

SPEED AND WORKING MODE ADJUSTMENT

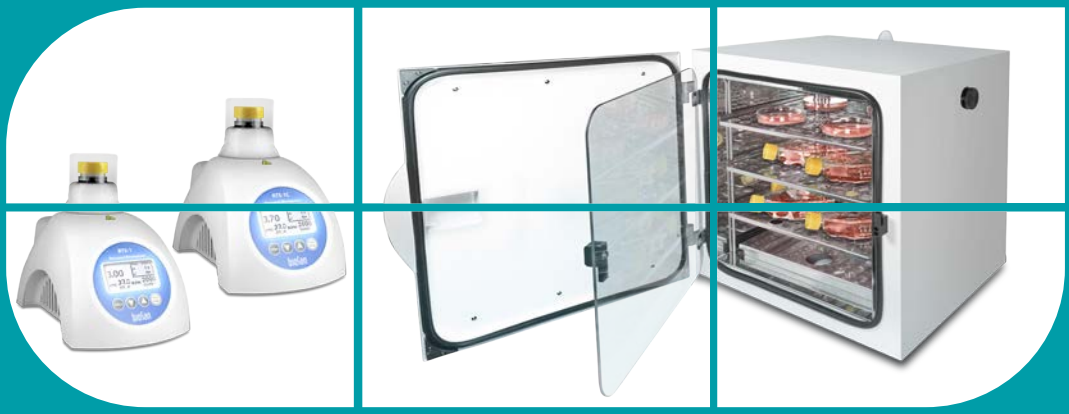
- Function buttons for SPEED and working MODE control in a reach of a thumb
- Additional speed adjustment by the pressure applied to the trigger buttons

WORKING COMFORT

- Suitable for glass & plastic volumetric pipettes 0.5-100 ml
- Ergonomically shaped handle
- Well located function buttons
- Convenient charging stand

ORDERING INFORMATION:	Cat. number
Assistboy with charging stand	BS-010521

CATALOGUE 2017-2018



BIOPROCESSING: SHAKER-INCUBATORS, CO_2 INCUBATOR PERSONAL BIOREACTORS

S-Bt Smart Biotherm, Compact CO_2 Incubator NEW

DESCRIPTION

S-Bt Smart Biotherm is designed for work in the areas of cell biology (operations with animal cell cultures and tissues), molecular biology (DNA/RNA reaction analysis, hybridization reactions), biotechnology (synthesis of target proteins and other molecules), immunology (synthesis of antibodies and other proteins of immune system). Unit provides a six-sided heating: the heating elements are located on the walls and on the door, thus providing excellent uniform temperature distribution, regardless of external factors, such as ambient temperature and positioning of the device.

Built-in infrared CO_2–sensor allows accurate control of the CO_2 level. The sensor makes measurement non-sensitive to changes in temperature and humidity inside the incubator.

The chamber is made of stainless steel with smoothed seams to minimize contamination and to facilitate cleaning.

S-Bt is equipped with a UV air recirculation system — 1 UV lamp and a fan are mounted behind the rear wall, providing decontamination of the working volume.

A convenient access port is built in the wall of the incubator for easy output of wire sensors or devices' installed inside. The access port is heated independently to prevent formation of condensate.

Unit is equipped with error tracing and alarm systems, which significantly lower potential risks during operation.

Unit is equipped with a "black box" system that records temperature, humidity and CO_2 levels, as well as statuses for door opening, UV lamp, fan and errors, to the inner memory.

Bluetooth connection to PC is available.

Smart Plus
Product Class

Bluetooth connection

Product video is available on the website

SPECIFICATIONS

Chamber Material	Stainless steel (1 mm)
Temperature setting range	+25 °C ... +60 °C
Temperature stability	±0.1 °C
Temperature uniformity @37°C	±0.3 °C
Working volume	46 litres
Number of shelves	3 (max. 6)
Inner door	Glass
Relative humidity	>90% @ 37 °C
Humidity delivery	Water bath
CO_2 control range*	0 – 20%
CO_2 sensor	Infrared sensor
Temperature and CO_2 level input	Digital
UV lamp	1 × 6 W, TUV G6T5
Data transfer	Wireless
Access port	1 (ø 26 mm)
Working voltage	230V, 50/60 Hz; 115 V, 50/60 Hz
Power consumption	600 w
Weight	37.7 kg
Dimensions (L × W × H)	400 × 410 × 580 mm
Inner chamber dimensions (L × W × H)	350 × 310 × 385 mm

* — At set temperature from ambient to 50 °C

APPLICATION AREAS:

- Cell biology: operations with animal cell cultures and tissues
- Molecular biology: DNA/RNA reaction analysis, hybridization reactions
- Biotechnology: synthesis of target proteins and other molecules
- Immunology: synthesis of antibodies and other proteins of immune system

FEATURES:

- Six-sided heating provides uniform distribution of the temperature inside the chamber
- Infrared CO_2 sensor, non-sensitive to temperature and humidity changes
- UV recirculation system for decontamination cycles
- Bluetooth data transfer to PC
- «Black box» parameter logging system
- Error tracing and alarm system
- Separately heated lockable port for chamber access for cables

S-Bt Smart Biotherm, Compact CO_2 Incubator

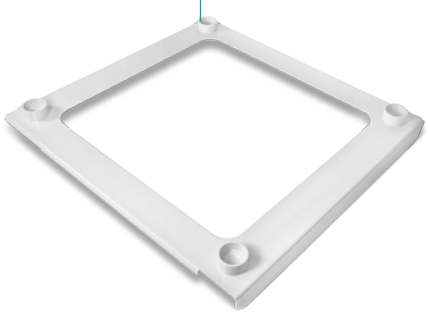
Simple CO_2 tank connection

Air UV recirculation system in the chamber

Gas purification filter

PC software

Incubator stacking device



ORDERING INFORMATION

	Cat. number
S-Bt Smart Biotherm	BS-010425-A01
Optional accessories:	
Shelf	BS-010425-AK
PC software and Bluetooth adapter	BS-010425-BK
Incubator stacking device	BS-010425-CK

RTS-1 and RTS-1C, Personal bioreactors

Smart Plus
Product Class

Product video is available on the website

USB connection

Innovative Mixing Technology: Reverse–Spin®

See the Reverse–Spin® Technology — Innovative Principle of Microbial Cultivation on page 132 of the catalog

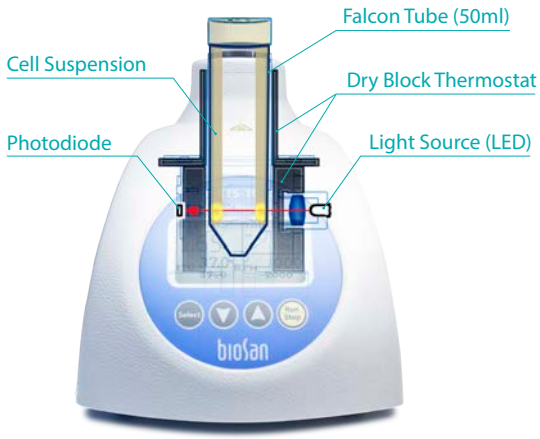
Users articles: biosan.lv/report

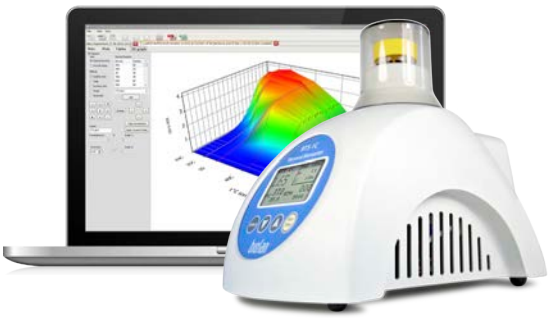
SPECIFICATIONS

	RTS-1	RTS-1C
Theoretically possible measurement range in OD_{850}, at 10 ml working volume*: Rod shaped bacteria (e.g. *E.coli*) Yeast (e.g. *P. pastoris*)	0-25 (0–45.6 OD_{600} equivalent**) 0-50 (0–75 OD_{600} equivalent)	
E.coli BL21 Factory calibration measurement range, in OD_{850}: at 10–20 ml volume at 20–30 ml volume	0 – 10 OD (0 – 19 OD_{600} equivalent) 0 – 8 OD (0 – 15.2 OD_{600} equivalent)	
Factory calibration measurement precision	±0.3 OD_{850}	
Mass transfer coefficient k_La (h^{-1})	Up to 350 ± 26 h^{-1} at 5 ml	
Measurement Wavelength (λ)	850 ± 15 nm	
Light source	LED	
Real time measurement (minutes)	1 – 60	
Temperature setting range	+25 °C ... +70 °C (increment 0.1 °C)	+4 °C ... +70 °C (increment 0.1 °C)
Bottom control range point	5 °C above ambient	15 °C below ambient
Top control range point	70 °C	
Stability	±0.1°C	
Sample temperature accuracy: 20 °C - 45 °C < 20 °C > 45 °C	± 1 ± 2 ± 3	
Sample temperature heating/cooling rate	0.7 °C/min	
Sample volume	5 – 30 ml	
Speed control range	50 – 2,000 rpm (increment 10 rpm)	
Speed control precision	±15 rpm	
Reverse Spin Time (seconds)	1- 60 (increment 1 s)	
Display	LCD	
Minimum PC requirements	Intel/AMD Processor, 1 GB RAM, Windows XP***/Vista/7/8/8.1/10, 2.0 USB port	
Optimal PC requirements	Intel/AMD Processor, 3 GB RAM, Windows 7/8/8.1/10, 2.0 USB port	
Overall dimensions (W×D×H)	130×212×200 mm	
Weight	1.7 kg	2.2 kg
Input current / power consumption	12 V DC, 3.3 A / 40 W	12 V DC, 5 A / 60 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V	

* — Highest k_La (h^{-1}) is achieved at 5 ml working volume which is optimal for aerobic cultivation
** — Conversion coefficients from OD_{850} to OD_{600} vary between strains and phases of growth
*** — Not guaranteed because OS not supported by producer

RTS-1 and RTS-1C, Personal bioreactors





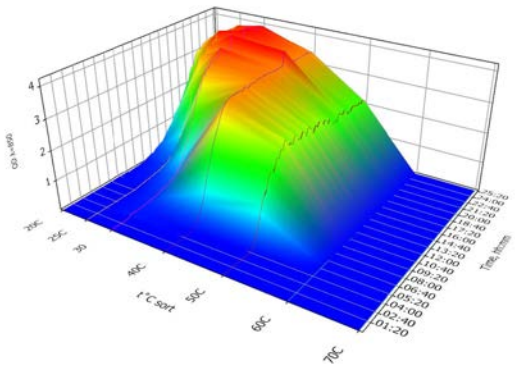


Figure 1. 3D graph of *E.coli BL21* growth kinetics showing the effect of different temperatures in 7 parallel RTS bioreactors.

DESCRIPTION

RTS-1 and **RTS-1C** are personal bioreactors that utilize patented Reverse-Spin® technology that applies non-invasive, mechanically driven, low energy consumption, innovative type of agitation where cell suspension is mixed by the single-use falcon bioreactor tube rotation around its axis with a change of direction of rotation motion resulting in highly efficient mixing and oxygenation for aerobic cultivation. Combined with a near-infrared optical system it is possible to register cell growth kinetics non-invasively in real time.

FEATURES:

- Reverse–Spin® mixing principle in 50 ml falcon tubes allows to achieve high k_La (h^{-1}) up to 450 which is essential for efficient aerobic cultivation
- Individually controlled bioreactor accelerates optimization process
- Possibility to cultivate microaerophilic and obligate anaerobic microorganisms (not strict anaerobic conditions)
- Reverse–Spin® mixing principle enables non-invasive biomass measurement in real time
- Near-infrared optical system makes it possible to register cell growth kinetics
- Free of charge software for storage, demonstration and analysis of data in real time
- Compact design with low profile and small footprint for personal application
- Temperature control for bioprocess applications
- Active cooling for rapid temperature control, e.g. for temperature fluctuation experiments
- Task profiling for process automatization
- Cloud data storage possibility to remotely monitor the process of cultivation while at home or using a mobile phone

SOFTWARE FEATURES:

- Real–Time cell growth logging
- 3D graphical representation of OD or growth rate over time over unit
- Pause option
- Save/Load option
- Report option: PDF and Excel
- Connect up to 12 units (recommended) simultaneously to 1 computer
- Remote monitoring option (requires internet connection)
- Cycling/Profiling options
- User manual calibration possibility for most cells

TYPICAL APPLICATIONS:

- Fermentation real time growth kinetics
- Clone candidate screening
- Protein expression
- Temperature stress and fluctuation experiments
- Media screening and optimization
- Growth characterization
- Inhibition and toxicity tests
- Strain quality control

ORDERING INFORMATION

	Cat. number
RTS-1C including TubeSpin® Bioreactor 50, TPP®, 20 pcs.	BS-010160-A04
RTS-1 including TubeSpin® Bioreactor 50, TPP®, 20 pcs.	BS-010158-A04
Optional accessories:	
TubeSpin® Bioreactor 50, TPP®, 20 pcs.	BS-010158-AK
TubeSpin® Bioreactor 50, TPP®, 180 pcs.	BS-010158-CK
USB 2.0 Hub 10 × ports	BS-010158-BK

RTS-1 and RTS-1C, Personal bioreactors

Recommendations for creating personal settings for cultivation of microorganisms. Points that should be considered:

CELL GROWTH DEPENDING ON ROTATION INTENSITY

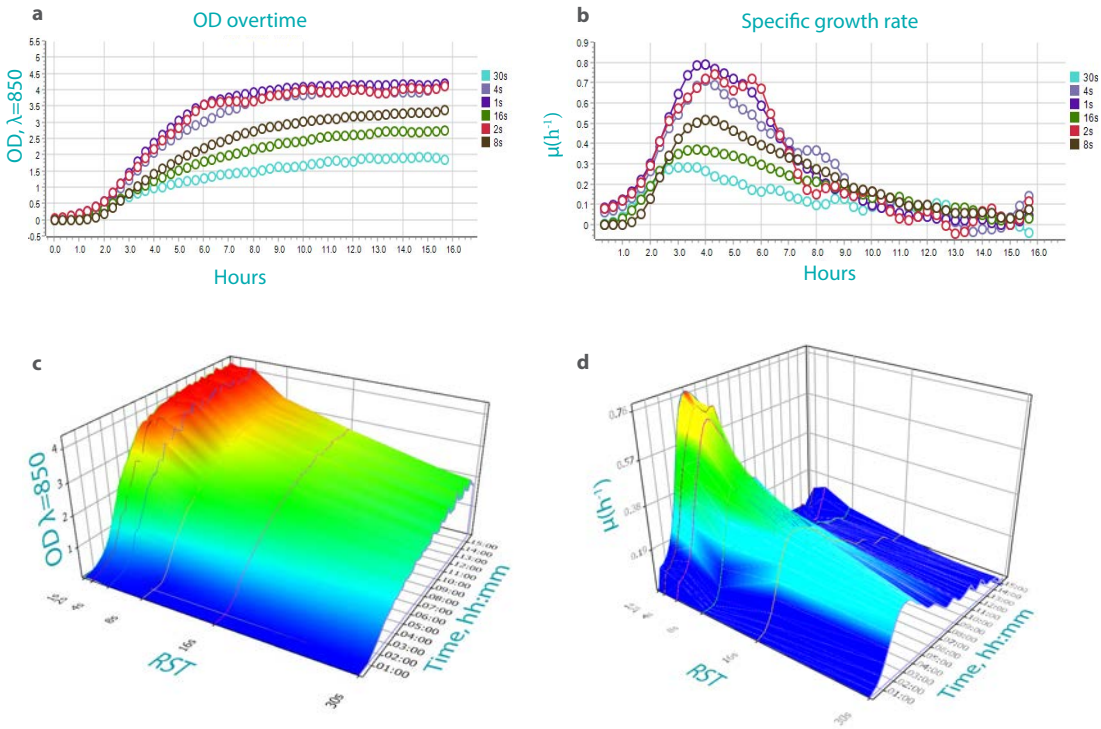
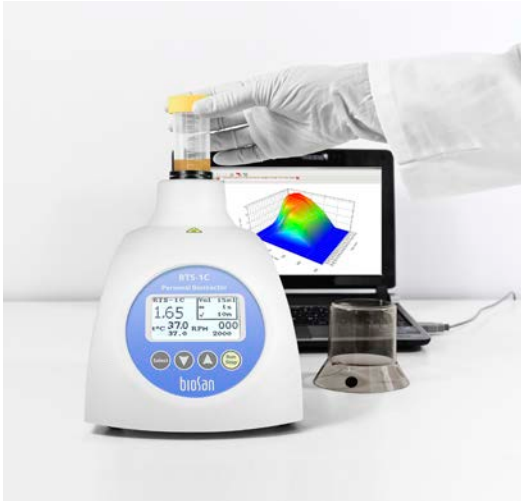


Figure 2, a-c. Influence of Reverse Spin Time (RST) on growth kinetics of *E.coli BL21* in OD_{600}. (a-c) Biomass growth; (b-d) Specific growth rate; throughout cultures were grown in 50 ml TPP Bioreactor tubes, 30% filling volume, 2000 RPM, RST 1, 2, 4, 8, 16, 30 seconds, LB medium and 37 °C temperature, to convert OD_{850} to OD_{600} simply multiply OD_{850} by 1.9.

It is known that the aerobic bacterial growth is influenced by efficient gas exchange. Figure 2 a-c, serves as an example of growth optimization and illustrates the relationship between RST and gas exchange. As RST decreased the specific growth rate and biomass yield increased, thus the highest aeration and optimal growth conditions for *E.coli BL21* were optimized at 2000 RPM 1 s RST.



RTS-1 and RTS-1C, Personal bioreactors

k_La (h^{-1}) RESULTS IN RTS-1/C

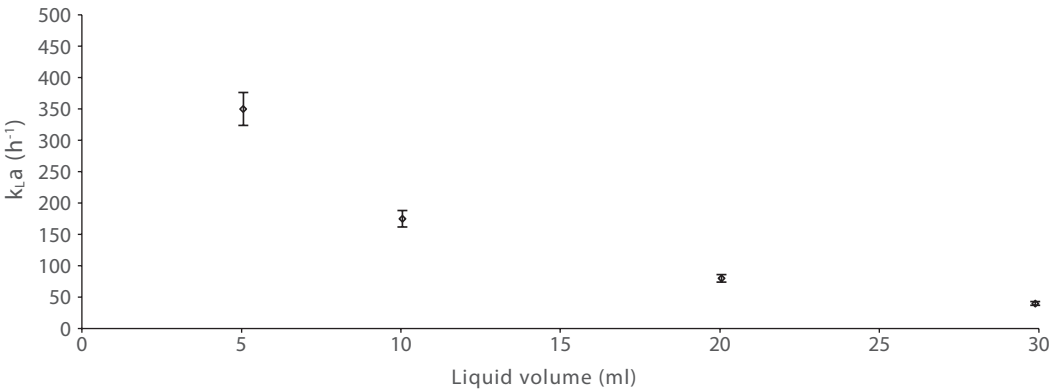


Figure 3. Determination of k_La in 50 ml TPP Bioreactor tubes. The bioreactor vessels were filled with 5, 10, 20, 30 ml deionized water, and measurements were made by non-invasive O_2 sensors and optics (PreSens, Regensburg, Germany) at 37 °C using the gassing-out method. Mean and standard deviation of at least five independent experiments are shown.

The k_La was measured in 5, 10, 20, 30 mL of deionized water in 50 ml TPP Bioreactor tubes at agitation rate of 2000 rpm and 1 s RST, this agitation rate was found optimal for Reverse–Spin® mixing principle during initial optimization studies. Over the working volume range, the k_La increased with the decrease of liquid volume (Figure 3). At smallest working volume of 5 ml, the highest k_La of 350 ± 26 h^{-1} was reached.

CELLS SUCCESSFULLY CULTIVATED

Saccharomyces cerevisiae, Pichia pastoris, Yarrowia lipolytica, Bacillus subtilis, Escherichia coli, Lactobacillus acidophilus, Bifidobacterium bifidum, Pseudomonas aeruginosa, Hybridoma, Jurkat and CHO cells.

TYPES OF RECOMMENDED TUBES

For aerobic microorganisms, it is recommended to use tubes that are supplied by TPP - TubeSpin® Bioreactor 50ml. For obtaining optimal results growing aerotolerant anaerobes, it is required to seal the screw cap of TPP TubeSpin® Bioreactor 50ml by tape or purchase TPP TubeSpin® 50ml falcon tubes without the membrane filter. It is also possible to use other manufacturer tubes of the same type, e.g. Corning® 50ml Mini Bioreactor, but the device rotor must be modified. It is possible to request this specific modification.

FACTORY CALIBRATION PARTICLE SIZE AND CALIBRATION COEFFICIENTS 600nm/850nm

Factory calibration of the instrument is designed for rod-shaped bacteria size of *E.coli BL21*. In case of exceeding this size, the measurement system will not work correctly. Optical density OD_{850} to OD_{600} conversion coefficient of the factory calibration is equal to 1.9.

FACTORY CALIBRATION GROWTH PHASE INFLUENCE ON MEASUREMENT ACCURACY

During the growth transition of Escherichia coli culture from the exponential growth to the stationary phase, a number of morphological and physiological changes take place, including cell volume decrease and cell shape change. Therefore, if cells taken for referent measurement using spectrophotometer at different stages from stationary phase then the correctness of measurement will be worse than specified.

CONVERSION RATE COEFFICIENT OF USER CALIBRATION

Optical density OD_{850} to OD_{600} nm conversion rate coefficient depends on the cell size and volume. Therefore, the coefficient will be different for other cell size. The device can be calibrated at desired reference wavelength to meet the needs of the user, e.g. OD_{600}.

DO YOU WANT TO TEST THIS SYSTEM?

We can provide demo units for 50% the price for testing or creating an application note. For such inquiries please contact our R&D department directly at igor@biosan.lv.

ES-20/60, Orbital Shaker–Incubator

DESCRIPTION

Orbital Shaker–Incubator **ES-20/60** for biotechnological and pharmaceutical laboratories is a professional category equipment designed for cultivation of microorganisms and eukaryotic cells including animal, plant and insect cells. It is also possible to cultivate thermofilic bacteria in **ES-20/60** shaker-incubator.

Shaker is equipped with a direct-drive mechanism for platform motion. It provides reliable and stable operation for the long term experiments needed for cell growth.

Shaker–Incubator **ES-20/60** provides smooth or intensive mixing in flasks installed on the platform.

Built-in noiseless thermoresistant brushless fan provides precise temperature distribution inside the chamber (adjustable for up to +80 °C). The inner chamber is made of stainless steel. State–of–the–art motor, newest thermal insulation materials, soft-start of the platform motion and temperature **PID–control** decrease the energy consumption and make the Shaker–Incubator highly energy efficient despite its relatively large size.

Premium
Product Class

Ø20 mm
Orbit

Heat up time for **ES-20/60**

from 25 °C — 90 min. — *to 80 °C*

ES-20/80, Orbital Shaker–Incubator NEW

DESCRIPTION

ES-20/80 shaker-incubator for biotechnological and pharmaceutical laboratories is a professional category equipment. The typical applications include - microbial and cell culture cultivation, protein expression, solubility studies, general mixing, as well as other various applications in the fields of biology and chemistry. The unit is equipped with a newly developed triple eccentric mechanism for platform motion that provides supreme balancing characteristics, superior reliability and quiet operation. The achieved stability of the unit during vigorous mixing allows for stacking installation of up to 3 units which enables to save space. The new display and easy to use user interface provide a clear and intuitive control of parameters and also allow data logging, storage and display over time. Additional features like out of balance sensor and automatic thermostat failure detection make this shaker-incubator an advanced and safe product. Bluetooth connectivity to PC allows for data management, data logging, parameter control and profiling in a dedicated software that can be requested separately.

A built-in heat-resistant brushless fan provides precise temperature distribution inside the chamber (from 10 °C above ambient up to +80 °C). Additionally, excellent sample temperature uniformity of ±0.3 °C at 37 °C is achieved. The inner chamber is made of stainless steel. State-of-the-art motor, thermal insulation materials and parameter PID-control decrease the energy consumption and make the shaker-incubator highly energy efficient despite its relatively large size.

Smart Plus
Product Class

Bluetooth connection

50-400 rpm

Ø20 mm
Orbit

Heat up time for **ES-20/80**

from 25 °C — 75 min. — *to 80 °C*

ES-20/60 and ES-20/80, Orbital Shakers-Incubators

SPECIFICATIONS

	ES-20/60	ES-20/80
Temperature setting range	+25°C... +80°C	
Speed control range	50–250 rpm	50 - 400 rpm
Temperature control range	10°C above ambient ... +80°C	
Setting resolution	0.1°C; 10 rpm	0.1°C; 10 rpm
Temperature stability	±0.5 °C	±0.1 °C at 37 °C
Temperature accuracy	±0.5 °C	±0.1 °C at 37 °C
Temperature uniformity	±0.5 °C	±0.3 °C at 37 °C
Orbit	20 mm	
Display	LCD, 2×16 signs	TFT, 5 inches
Digital time setting	1 min. – 96 hrs. / non-stop (1 min increment)	
Maximum load	8 kg	10.6 kg
Data transfer	—	Bluetooth
Stacking	—	up to 3*
Overall dimensions (W×D×H)	590 × 525 × 510 mm	620 × 530 × 510 mm
Dimensions of the inner chamber	460 × 350 × 400 mm	460 × 350 × 400 mm
Weight	41.1 kg	48 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz	230 V, 50/60 Hz
Power consumption	450 W (2 A)/ 450 W (4.5 A)	500 W (2.2 A)

* — Additional stacking kit required

ORDERING INFORMATION

	Cat. number
ES-20/60 without platform	BS-010135-AAA
ES-20/80 without platform	BS-010167-A05

Optional accessories:

PC software and Bluetooth adapter for **ES-20/80**	BS-010167-CK
Stacking kit for 2× **ES-20/80**	BS-010167-OK
Stacking kit for 3× **ES-20/80**	BS-010167-PK

Platforms cat. numbers for **ES-20/60** can be found on page 16

Platforms cat. numbers for **ES-20/80** can be found on page 112

Description and pictures of all platforms for ES-20/60 can be found on page 16

Description and pictures of all platforms for ES-20/80 can be found on page 112

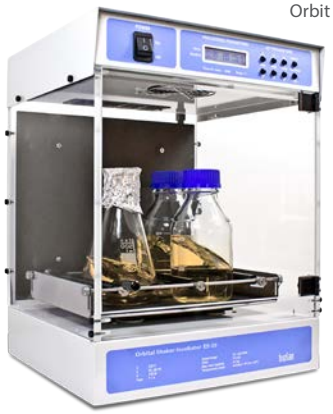
Platforms for ES-20/80

Platform	Description	Dimensions	Working Area	Cat. number
❶ **HSP-30/100** 	Platform with 30 tight fit clamps for 100-150 ml flasks	360×400 mm	360×400 mm	BS-010167-KK
❷ **HSP-16/250** 	Platform with 16 tight fit clamps for 250-300 ml flasks	360×400 mm	360×400 mm	BS-010167-MK
❸ **HSP-9/500** 	Platform with 9 tight fit clamps for 500 ml flasks	360×400 mm	360×400 mm	BS-010167-NK
❹ **HSP-6/1000** 	Platform with 6 tight fit clamps for 1000 ml flasks	360×400 mm	360×400 mm	BS-010167-LK
❺ **PP-400** 	Flat platform with non–slip silicone mat	360×400 mm	360×400 mm	BS-010135-FK
❻ **UP-168** 	Universal platform for different flasks	360 × 400 mm	360 × 400 mm	BS-010135-JK
6.1 **HSC-50** 6.2 **HSC-100** 6.3 **HSC-250** 6.4 **HSC-500** 6.5 **HSC-1000**	Tight fit clamp for 50, 100, 250, 500, 1000 ml flask (for UP-168)	Ø 50 mm Ø 65 mm Ø 85 mm Ø105 mm Ø130 mm		BS-010167-DK BS-010167-EK BS-010167-FK BS-010167-JK BS-010167-IK
6.6 **TR-21/50** 	Test tube rack for 50 ml with 21 drillings	340 × 124 mm	2 per platform	BS-010135-KK
6.7 **TR-44/15** 	Test tube rack for 15 ml with 44 drillings	340 × 124 mm	2 per platform	BS-010135-LK

ES-20, Orbital Shaker–Incubator

Basic Plus
Product Class

Ø10 mm
Orbit



Product video is available on the website

Heat up time for **ES-20**

from 25 °C — 16 min. — *to 42 °C*

ORDERING INFORMATION

	Cat. number
ES-20 without platform	BS-010111-AAA
Optional accessories:	
Platforms: **UP-12**	BS-010108-AK
PP-4	BS-010108-BK
P-12/100	BS-010108-EK
P-6/250	BS-010108-DK
P-16/88	BS-010116-BK

Description and pictures of all platforms for ES-20 can be found on page 16

DESCRIPTION

The **ES-20** is a compact bench–top Shaker–Incubator used for mixing of biological liquids as well as for incubation and cultivation of biological liquids according to the operator set program.

Built–in microprocessor thermocontroller provides constant temperature control in the incubator chamber. Forced heated air circulation inside the transparent plexiglas chamber guarantees even temperature distribution. Dismountable construction makes transportation easy.

Orbital shaking is controlled by the digital tachometer (rpm) and Digital time setting regardless of the temperature. The unit is equipped with the direct–drive system ensuring most reliable stable long–time operation (up to 30 day nights).

The **ES-20** is extremely easy to operate, with very straightforward setup of temperature, speed and time, using the two line set–up and status display, which clearly indicates both set and actual values for each of the three parameters.

DIFFERENT INTERCHANGEABLE PLATFORMS ALLOW USING ES-20 FOR:

- Growing cell cultures in flasks and other laboratory glassware
- Extracting tissue samples at physiological temperatures
- Other sample preparation processes

SPECIFICATIONS

Temperature setting range	+25 °C ... +42 °C
Speed control range	50–250 rpm
Temperature control range	5°C above ambient ... +42 °C
Setting resolution	0.1 °C; 1 rpm
Temperature stability	± 0.5 °C
Temperature accuracy	± 0.5 °C
Temperature uniformity	± 0.5 °C
Orbit	10 mm
Display	LCD, 2 × 16 signs
Digital time setting	1 min. – 96 hrs. / non-stop (1 min increment)
Plexiglas walls thickness	7 mm
Maximum load	2.5 kg
Overall dimensions (W × D × H)	340 × 340 × 435 mm
Dimensions of the inner chamber	305 × 260 × 250 mm
Weight	13.2 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230/120 V)	160 W (0.7 A) / 170 W (1.6 A)

CATALOGUE 2017-2018

LAB DIAGNOSTICS: DNA/RNA PURIFICATION, IMMUNODIAGNOSTICS

MANUAL AND AUTOMATIC DNA/RNA EXTRACTION

STAGES:

Liquid Handling	Assist Series, Pipettes
Incubation	TS-100 or TS-100C
Sample resuspendation and droplet spin down	FVL-2400N
Sample preparation in UV–Cabinet for PCR	UVC/T-M-AR, or similar, see UV–Cabinet for PCR
Mixing and resuspendation	MPS-1
Centrifugation	Microspin 12
Vacuum aspiration	FTA-1 or FTA-2
Incubation	TDB-120
Reagents	Reagents for extraction*

OR

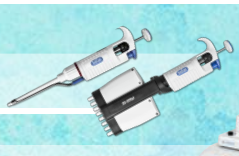
Liquid Handling	Assist Series, Pipettes
Incubation	TS-100 or TS-100C
Sample resuspendation and droplet spin down	FVL-2400N
Automatic extraction	BioMagPure 12 and reagents










* — Information about current offers on the products of other manufacturers are available in the corresponding sections of our site www.biosan.lv/en/products

BioMagPure 12, Compact Bench-Top Robotic Workstation For Automated Nucleic Acid Purification

NEW

3 EASY STEPS

STEP 1: LOAD

STEP 2: RUN

STEP 3: OBTAIN

Product video is available on the website

FEATURES:

- Advanced magnetic bead technology
- Reaction chamber with patented parts
- Piercing-pin system for elimination of cross-contamination
- Walk-away automation
- Reliable quality
- No PC required
- Ready-to-use reagent cartridges
- 3 easy steps: LOAD-RUN-OBTAIN

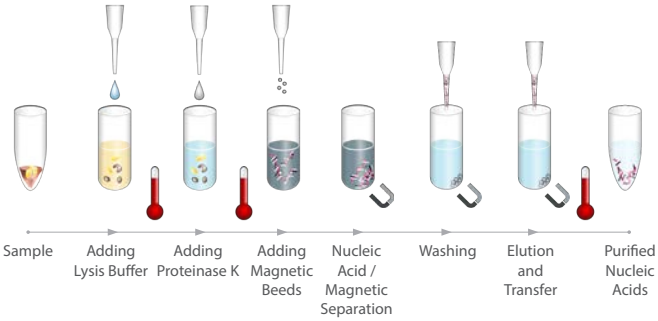
DESCRIPTION

The **BioMagPure 12** consists of compact bench-top robotic workstations for automated nucleic acid purification. Usage of pre-filled reagent cartridges and disposable consumables enable a true walk-away automation and high quality nucleic acid extraction solution. Proven magnetic separation technology makes purification efficient, easy to use, reliable, safe and cost effective.

BioMagPure 12 has an ingeniously designed polygonal reaction chamber with patented parts that ensure high efficiencies of lysis and elution through large contact area of magnet and heating element allowing to maximize magnetic bead recovery, minimize the residues of magnetic beads and alcohols in the final elute product. Specific formation of reaction chamber ensures unrivaled mixing ability and exclude conventional mixing by tip or pipetting thus eliminates cross-contamination possibility.

Reagent kits contains everything for extraction procedure performance including all necessary plastics, pre-filled reagent cartridges, incubation buffers and solutions for sample pre-treatment (if needed),

With the flexibility of processing 1-12 samples per run, the **BioMagPure 12** is tailor-made to fit small clinics and early stage laboratories. By occupying minimal counter space and greatly reducing technician man-hours, this series allows organizations to operate facilities in a much more cost effective fashion.



SPECIFICATIONS

Processing time	30–50 min
Processing capability	1–12 samples per run
Extraction technology	magnetic particle separation technology
Protocol	programmed by scanning a barcode
Protocol input	barcode scanner
Sample volume	100–3,000 µl (depending on the kit)
Elution volume	50–300 µl
Connection to PC	not required
Display	LCD (20×4)
Certification	CE IVD
Nominal operating voltage	110–240 V, 50/60 Hz
Dimensions (W×D×H)	480 × 700 × 520 mm
Weight	43 kg

Reagents for **BioMagPure 12**

ORDERING INFORMATION:

Name	Description	Cat. number
BioMagPure 12	Compact Bench-Top Robotic Workstations For Automated Nucleic Acid Purification	BS-060201-AAA
Blood DNA Extraction Kit 200	Blood DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of DNA from 10-400µl mammalian whole blood, suspension of mammalian blood cells.	BS-060201-AK
Blood DNA Extraction Kit 1200	Blood DNA Extraction Kit is used with the BioMagPure 12 instruments for extraction of gDNA from 400-1000µl mammalian blood, suspension of mammalian blood cells.	BS-060201-BK
Viral Nucleic Acid Extraction Kit	Viral Nucleic Acid Extraction Kit is used with the BioMagPure 12 instrument for extraction of Viral DNA or RNA from human biological specimens such as serum, plasma, and other cell-free fluids.	BS-060201-CK
Tissue DNA Extraction Kit	BioMagPure 12 Tissue DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of genomic DNA from a variety of animal tissues, swab samples and blood stain.	BS-060201-DK
Cultured Cell DNA Extraction Kit	Cultured Cell DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of genomic DNA from culture cells and buffy coat.	BS-060201-EK
Bacterial DNA Extraction Kit	Bacterial DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of genomic DNA from both Gram-positive and Gram-negative bacteria.	BS-060201-FK
HPV DNA Extraction Kit for Swab	HPV DNA Extraction Kit is used with the BioMagPure 12 instrument for DNA extraction of the Human Papillomavirus (HPV) from cervical cell samples which collected by cervical brush or genital swab in liquid-based Medium (e.g. Hologic Thinprep PreservCyt®, BD SurepathTM, etc.) or other STM (sample transport media) preservation solutions(e.g. QIAGEN DNA PAP Cervical sampler, Roche Cobas® PCR Cell Collection Media, Hybribio cell preservation solution, etc.).	BS-060201-GK
TB DNA Extraction Kit	TB DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of genomic DNA of Mycobaceteria spp. (e.g. Mycobacterium tuberculosis) from different specimen	BS-060201-IK
FFPE DNA Extraction Kit	FFPE DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of genomic DNA from FFPE (Formalin-Fixed, Paraffin-Embedded) tissue samples. Providing good quality, high integrity DNA for Molecular diagnosis and research works	BS-060201-JK
Forensic DNA Extraction Kit	Forensic DNA extraction kit is extract and isolate genomic DNA from forensic samples.	BS-060201-KK
Viral/Pathogen Nucleic Acids Extraction Kit A	Viral/Pathogen Nucleic Acids Extraction Kit A is used with the BioMagPure 12 instrument for extraction of Viral and bacterial DNA/RNA from cell-free samples, such as serum, plasma, and other cell-free body fluids.	BS-060201-LK
Viral/Pathogen Nucleic Acids Extraction Kit B	Viral/Pathogen Nucleic Acids Extraction Kit B is used with the BioMagPure 12 instrument for extraction of viral and bacterial DNA/RNA from swab samples (cell-rich samples).	BS-060201-MK
Viral RNA Extraction Kit	Viral Nucleic RNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of Viral RNA from human biological specimens such as serum, plasma, and other cell-free fluids.	BS-060201-NK
Plant DNA Extraction Kit	Plant DNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of genomic DNA from plant (leaf, seeds and spores) and fungal tissues. Up to 100 mg of tissue can be used for purification	BS-060201-OK
Total RNA E xtraction Kit	Total RNA Extraction Kit is used with the BioMagPure 12 instrument for extraction of total RNA from whole blood, blood cells, animal tissue, plant tissue, yeast or cultured cells.	BS-060201-PK
Viral Nucleic Acid Large Volume Extraction Kit	Viral Nucleic Acid Large Volume Extraction Kit is used with the BioMagPure 12 instrument for extraction of Viral DNA or RNA from human biological specimens such as serum, plasma, and other cell-free fluids.	BS-060201-QK
CFC DNA Extraction Kit Large Volume	CFC DNA Extraction Kit Large Volume - is used with the BioMagPure 12 instrument for extracting circulating DNA from plasma serum or cell-free body fluids sample volume ranged: up to 5 ml	BS-060201-RK

MagSorb-16, Magnetic Rack for Manual Nucleic Acid Extraction

DESCRIPTION

Biosan presents the complete line (see page 155) of necessary instrumentation to utilize magnetic bead extraction kits and protocols from various manufacturers and meet the most demanding user requirements.

The one of the foundations of this line is **MagSorb-16** which is a magnetic rack that easily accommodates up to 16 single use tubes (1.5–2 ml). The rack consists of following parts: tube mounting racks and magnetic stand.

Different manufacturers offer wide range of magnetic NA extraction kits, but all of them are based on magnetic particles and utilize the same principles of extraction. Every step of extraction on magnetic particles is crucial, so it is important to choose the right equipment for effective NA purification.

SPECIFICATIONS NEW

Number of places in stand	16
Tube's volume	1.5 - 2 ml
Tube's manufacturer	Eppendorf or equivalent

ORDERING INFORMATION:

	Cat. number
MagSorb-16, mounting racks and magnetic stand	BS-010601

MANUAL DNA/RNA EXTRACTION USING MAGNETIC BEADS TECHNOLOGY STAGES:

Sample resuspendation and droplet spin down	FVL-2400N
Sample preparation in UV–Cabinet for PCR	UVC/T-M-AR, or similar, see UV–Cabinets for PCR
Mixing and resuspendation	MPS-1, V-1 plus, Multi Bio RS-24
Capture of magnetic beads	MagSorb-16
Centrifugation	Microspin 12
Vacuum aspiration	FTA-1 or FTA-2i
Incubation	TDB-120, TS-100C
Reagents	Reagents for extraction*

* — Information about current offers on the products of other manufacturers are available in the corresponding sections of our site www.biosan.lv/en/products

IW-8, Intelispeed Washer

Premium
Product Class

DESCRIOTION

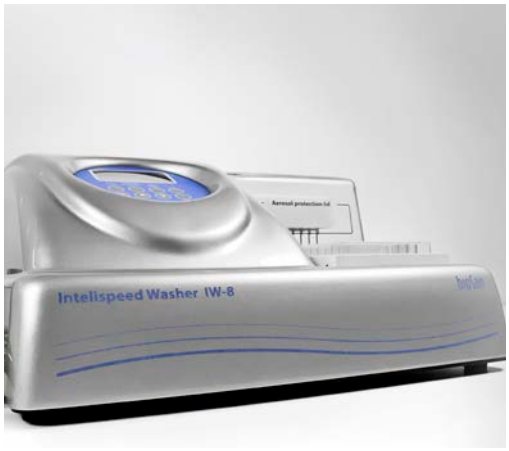
Intelispeed Washer IW-8 is designed for washing of standard flat-bottom (two point aspiration) and U-shape (only in single point aspiration) 96 well plates and microstrips. The unit is fully programmable ensuring multi-step solution ripening, aspiration (aspiration, combination of aspiration/liquid dispensing and soaking, as well as soaking cycle during a particular period of time).

The unit has 100 user-defined programs. Standard version is supplied with 8-channel washing head for dispensing/aspiration, 3 bottles for washing and rinsing solutions, a waste bottle and bottle with filter. Optional 4-channel washing solution weight logger, **4 CHW Logger** is available.

The unit is designed for washing standard 96-well plates during analyses.

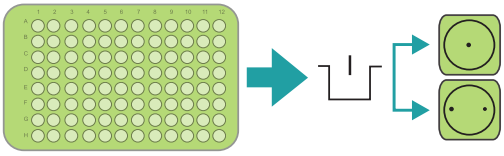
THE UNIT PROVIDES:

- Washing mode;
- Rinsing mode;
- Mixing mode;
- Single point, two point aspiration;
- Possibility of additional solution mixing during time gap between two work cycles;
- Possibility to use microtest plates by different manufacturers, ensured by automated plate set up (adjusting to different depths of plate wells);
- Plate and strip washing mode;
- User-defined programs with adjustable parameters;
- Saving work programs.



ORDERING INFORMATION:

	Cat. number
IW-8	BS-060106-AAI
IW-8 IVD	BS-060106-IVD1
4 CHW Logger	BS-060102-AK



IW-8, Intelispeed Washer

4-channel washing solution weight logger, **4 CHW Logger** provides automatic control of rinsing solutions and waste volume. The washer shows remaining volume for each bottle as percentage and gives a warning message in case of low solution volume or full waste bottle when **4 CHW Logger** is connected.

4 CHW LOGGER SPECIFICATIONS:

Max. loading per scale cup	2 kg
Dimensions	267 × 252 × 97 mm
Weight	3 kg

SPECIFICATIONS

Choice of 3 washing liquid bottles	
Minimum dispense volume	25 µl
Maximum dispense volume	1,600 µl
Dispense increment	25 µl
Dispensing accuracy	±2.5%
Allowed residual liquid volume not more than 2 µl in plate well	
Number of wells washed simultaneously	8
Number of washing cycles for each channel	1–15
Aspiration time	0.2–3 sec
Aspiration/dispensing speed	3 levels
Max. number of channels in a program	2
Soaking time	0–300 sec (increment 10 sec)
Shaking time	0–150 sec (increment 5 sec)
Number of washed rows	1–12
Time of plate single wash (350 µl), not more	45 sec
Number of programs	101
Plate platform and washing head movement	automated
Indication of operation modes	8-line LCD
Dimensions (W×D×H)	375×345×180 mm
Weight with accessories	9.6 kg
External power supply	DC 12 V, 5 A
Consumed power	22 W
The unit is designed for use in closed laboratory rooms at temperatures from +4 to +40 °C and relative humidity up to 80% at +31°C decreasing linearly to 50% relative humidity at 40 °C	

3D-IW8, Inteliwasher

Premium
Product Class

CE IVD Certification available

Product video is available on the website

DESCRIPTION

Inteliwasher **3D-IW8** series microplate washer is designed for washing various types of standard 96-well microtitre plates, microstrips as well as microarrays on FastFRAME (rectangular well shape). It is suitable for washing wells with different bottom shapes: flat, U-shape and V-shape. The unit is fully programmable ensuring multi-step solution ripening, aspiration (aspiration, combination of aspiration/liquid dispensing and soaking, as well as soaking cycle during a particular period of time). Dispense system of liquid dosage for each channel separately.

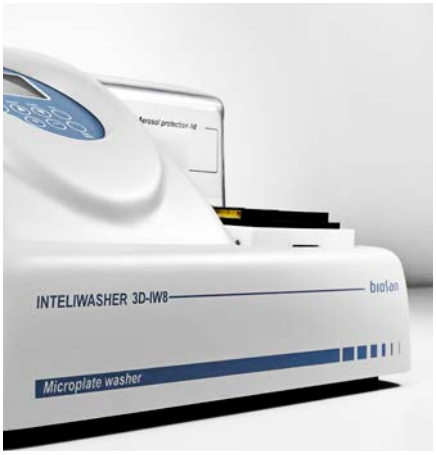
THE UNIT PROVIDES:

- Washing mode;
- Rinsing mode;
- Mixing mode;
- Single point, two point, circular (circle or rectangular path) aspiration;
- Possibility of additional solution mixing during time gap between two work cycles;
- Possibility to use microtest plates by different manufacturers, ensured by automated plate set up (adjusting to different depths of plate wells);
- Round-bottom plate and strip washing mode;
- Possibility of user-defined programs with adjustable parameters.

ORDERING INFORMATION:

	Cat. number
3D-IW8	BS-060102-AAI
3D-IW8 IVD	BS-060102-IVD1
4 CHW Logger	BS-060102-AK

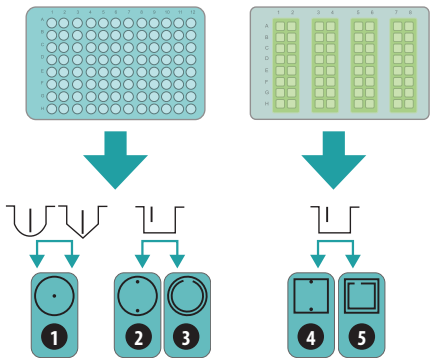
3D-IW8, Inteliwasher



The unit has 50 programs divided into 5 following aspiration categories (see figure bellow):

1. **Type 1** (1.0–1.9) **IPF96 U/V** is intended for round and V-shape immunoplates, 1 point aspiration.
2. **Type 2** (2.0–2.9) **IPF96 FLAT-2** is intended for flat-bottom shape immunoplates, 2 point aspiration.
3. **Type 3** (3.0–3.9) **IPF96 FLAT-C** is intended for rectangular shape immunoplates, full-circle aspiration direction.
4. **Type 4** (4.0–4.9) **FastFRAME-2** is intended for multi-slide plate* with rectangular wells, 2 point aspiration.
5. **Type 5** (5.0–5.9) **FastFRAME-C** is intended for multi-slide* plate with rectangular wells, full-square aspiration direction.

* — The **FastFRAME** (Schleicher&Shuel) multi-slide plate or analog plate of another manufacturer, that is compatible with standard 25×76 mm (1×3 inch) glass slides.



SPECIFICATION

Minimum dispense volume	25 µl
Maximum dispense volume	1,600 µl
Dispense increment	25 µl
Dispensing accuracy	±2.5%
Allowed residual liquid volume in plate well, not more	2 µl
Number of wells washed simultaneously	8
Number of washing cycles	1–15
Aspiration time	1–3 sec
Final aspiration time	1–3 sec
Aspiration/dispensing speed	3 levels
Max. number of channels in a program	2
Choice of 3 washing liquid bottles	
Soaking time	0–300 sec (increment 10 sec)
Shaking time	0–150 sec (increment 5 sec)
Number of washed rows	1–12
Time of one plate wash (300 µl), not more	45 sec
Number of programs	50
Plate platform and washing head movement	automated
Indication of operation modes	LCD, 8-line
Dimensions (W×D×H)	375×345×180 mm
Weight with accessories	9.9 kg
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V
Input current/ power consumption	12 V, 1.8 A / 22 W

The unit is designed for use in closed laboratory rooms at temperatures from +4°C to +40°C and relative humidity up to 80% at +31°C decreasing linearly to 50% relative humidity at 40°C.

4-channel washing solution weight logger, **4 CHW Logger,** provides automatic control of rinsing solution and waste volumes. The washer shows remaining volume for each bottle as percentage and gives a warning message in case of low solution volume or full waste bottle when **4 CHW Logger** is connected.

4 CHW LOGGER SPECIFICATIONS:

Max. loading per scale cup	2 kg
Dimensions	267 × 252 × 97 mm
Weight	3 kg

HiPo MPP-96, Microplate Photometer NEW

DESCRIPTION

Microplate Photometer HiPo is a compact tabletop device for measuring the results of ELISA and microbiological studies in 96-well microplates. Photometer is controlled and outputs data via computer. An extensive range of additional interference filters is available (with average increment of 10 nm).

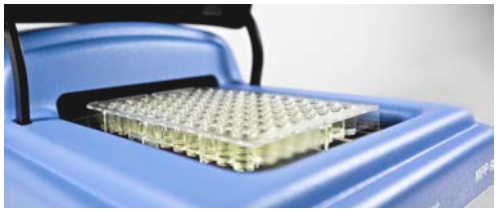
The device is supplied with specialized software **QuantAssay**. Features of **QuantAssay** software:

- ELISA assays of any complexity can be carried out via robust assay editor with help of Assay Wizard
- Quantitative assay includes up to 20 standards
- Avidity/Affinity assays
- Multiplex assays with up to 7 assays on one plate
- Qualitative assay includes up to 11 controls
- BestFit function for selecting the best calibration curve
- User friendly interface: get your results in 3 clicks
- Save, load and export results
- Creates visual reports

Smart Plus
Product Class

USB connection

Product video is available on the website



SPECIFICATION

Detection mode	Absorbance
Light source	LED, self-calibrating
Photodetector	8 silicon photodiodes
Plate type	96-well microplates (including strip-well microplates)
Reading Speed	5 - 8 s per wavelength
Measurement modes	Endpoint, Kinetic
Measurement channels	8
Reference channel	1
Measurement range (max)	0 – 4.3 OD (with standard preinstalled filters 0-3,5 OD)
Resolution	0.0001 OD
Wavelength range	400 – 700 nm
Wavelength selection	up to 8* filters on wheel standard filters 405, 450, 492 and 620 nm
Shaking	4 amplitudes, 4 speeds
Software	**QuantAssay**
PC system requirements	Intel/AMD Processor, 1 GB RAM, Windows Vista/7/8/10, USB
Overall dimensions (W × D × H)	140 × 300 × 130 mm
Weight	4.6 kg
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V

* — It is possible to install up to 4 additional filters on request. Additional filters are available in two specifications: optical absorption not less than 3.5 OD or 4.3 OD

Accuracy (405, 450, 492, 620 nm)	
0.000 – 2.000 OD	≤ (0.5 % ± 0.010 OD) typical
2.000 – 3.000 OD	≤ (1 % ± 0.010 OD) typical
Precision / Reproducibility (405, 450, 492, 620 nm)	
0.000 – 2.000 OD	≤ (0.5 % ± 0.005 OD)
2.000 – 3.000 OD	≤ (1.0 % ± 0.005 OD)

ORDERING INFORMATION: Cat. number

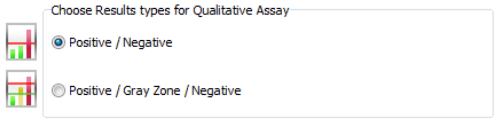
HiPo MPP-96	BS-050108-A02
Optional accessories:	
OD Plate, Verification tool	BS-050108-AK
Additional filters*	On request

Quant Assay, Software for MPP-96

Software video
is available on the website

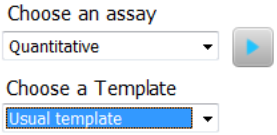
ELISA assays of any complexity can be carried out via robust assay editor with help of **Assay Wizard:**

Qualitative assay includes up to 11 controls;
Results can be outputted as Positive/Negative or Positive/Gray Zone/Negative;
Gray zone can be set as symmetric and non-symmetric;
Positivity ratio can be outputted



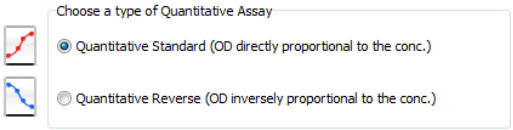
Avidity/Affinity results be outputted as Positive/Negative or Positive/Gray Zone/Negative;
Avidity index margins can be easily set;
Avidity Index can be outputted

User friendly interface: get your results in 3 clicks:
Choose an assay, a template and press Play

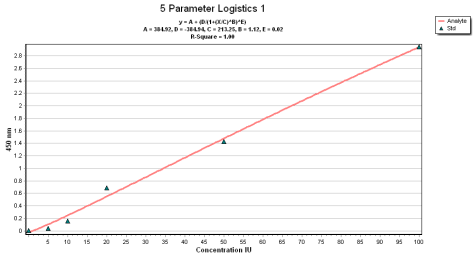


Save, load and export results
Creates reports: Excel, PDF, CSV

Quantitative assay includes up to 20 standards;
User can choose Standard/Reverse type of curves



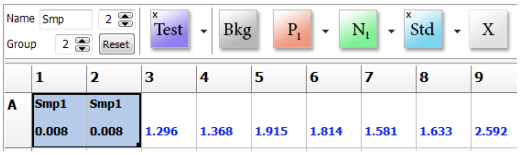
BestFit function for selecting the best calibration curve from following models:
4/5 Parameters logistics, Piece-wise linear, Linear, Index/Logarithm/Exponent regression models



Install up to 7 assays on one plate by using **multiplex**

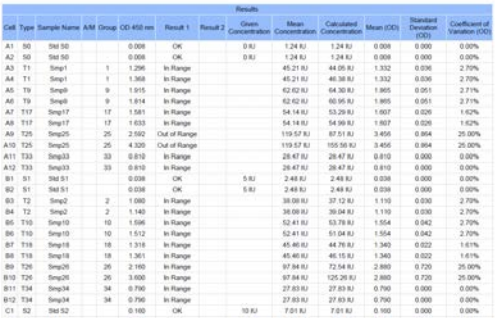
	1	2	3	4	5	6	7
A	Smp1 0	Smp1 1	Smp1 2	Smp1 3	Smp1 4	Smp1 5	Smp1 6
B	Smp2 0	Smp2 1	Smp2 2	Smp2 3	Smp2 4	Smp2 5	Smp2 6
C	Smp3 0	Smp3 1	Smp3 2	Smp3 3	Smp3 4	Smp3 5	Smp3 6

Easy fill of the samples



	1	2	3	4	5	6	7	8	9
A	Smp1 0.008	Smp1 0.008	1.296	1.368	1.915	1.814	1.581	1.633	2.592

PDF report contains: Experiment information, Results table, List of variables and it's calculations, Interpretation parameters



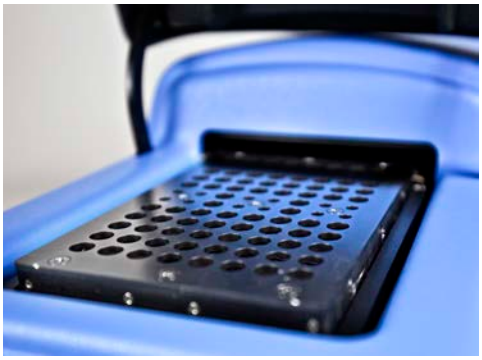
OD Plate, Verification Instrument for MPP-96 HiPo

DESCRIPTION

OD Plate is the measurement verification instrument for microplate photometer MPP-96 HiPo. The instrument is designed to verify the accuracy and precision of measurements of the photometer at 6 levels of nominal optical density: 0.3; 0.6; 1.0; 2.0; 3.0; 4.0 OD. The instrument is supplied with the following verification wavelength range: 405–700 nm.

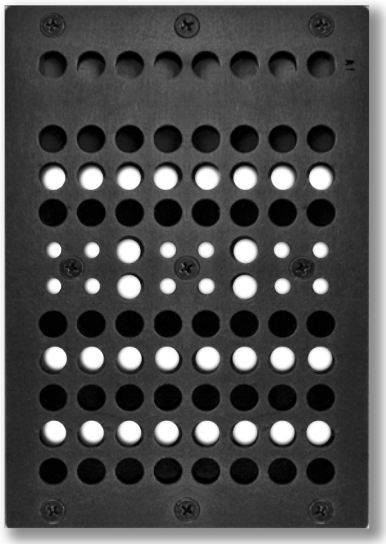
Instrument is provided in a shockproof container with an USB flash drive containing:

- Copy of measurement results
- User manual



SPECIFICATION

Nominal optical density levels	0.3; 0.6; 1.0; 2.0; 3.0; 4.0 OD (±0.1 OD)
Verification wavelength range	405, 414, 450, 480, 492, 515, 540, 550, 560, 568, 580, 594, 620, 630, 650, 690, 700 nm
Instrument dimensions	128 × 86 × 12 mm
Net weight	0.3 kg



ORDERING INFORMATION:

	Cat. number
OD Plate, Verification tool	BS-050108-AK

General Information

SAFETY

All Biosan laboratory equipment meets the requirements of International Standard IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, and applicable specific parts e.g. IEC 61010-2-010: particular requirements for laboratory equipment for the heating of materials, IEC 61010-2-020: particular requirements for laboratory centrifuges, IEC 61010-2-051: particular requirements for laboratory equipment for mixing and stirring.

CE MARK

All Biosan laboratory equipment bears a CE mark to indicate that it meets the requirements of all applicable European Directives.
Compliance with the Low Voltage Directive is demonstrated by meeting EN 61010 (as indicating in paragraph on safety) and the EMC Directive by meeting EN61326-1: EMC requirements for electrical equipment for measurement, control and laboratory use. Some products also fall within the scope of IVD Directive.

ELECTRICAL SUPPLIES

All standard Biosan laboratory equipment is available for voltages within the range 220–240 V, 50 or 60 Hz. Most of the equipment is also available for voltages 100–120 V, 50 or 60 Hz.

QUALITY

The Biosan Quality Management System complies with the requirements of LVS EN ISO 9001:2015, the scope of supply is development, production, sales and service of laboratory equipment.
High quality customer service and readiness to meet ever growing customer requirements to modern equipment are the main goals of ISO 9001 compliance (certified since 2004).

ENVIRONMENTAL CONDITIONS

Biosan laboratory equipment is designed for operation in cold rooms, incubators (excluding CO_2 incubators) and closed laboratory rooms at ambient temperature from +4°C to +40°C in a non-condensing atmosphere and maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

GUARANTEE AND AFTER SALES SERVICE

Biosan equipment is reliable, designed and built to provide years of trouble-free service. Most Biosan equipment is guaranteed for two years against faulty materials and workmanship and premium product class up to 3 years upon registration in our website support section. Warranty terms and conditions are indicated in the product manual. All Grant standard laboratory equipment is guaranteed for three years against faulty materials and workmanship. Local distributors and service centres provide necessary technical assistance within and outside the warranty period.Biosan technical support team provides direct support offering the best solution for assistance upon receipt of request via e-mail service@biosan.lv or forms available at Technical Support section of Biosan web-site.

WORLD WIDE AVAILABILITY AND SUPPORT FOR BIOSAN LABORATORY EQUIPMENT

Biosan laboratory equipment and specialist technical support is available world-wide. Please, visit multilingual (English, French, German, Italian, Latvian, Russian, Spanish) web-site http://www.biosan.lv for further product information (videos, brochures, manuals, articles), placing enquiries and locating your locally appointed distributor or contact customer service direct at service@biosan.lv.

As Biosan is committed to a continuous program of improvement, specifications may be changed without notice.

PRODUCT CLASS FEATURES	Basic Plus Product Class	Premium Product Class	Smart Plus Product Class
Designed to complete basic sample preparation tasks	•	•	•
Designed to complete sophisticated sample preparation tasks		•	•
Advanced specifications and special features		•	•
PC interface for logging, control, programming, alarms, online monitoring functions			•
Modern Bioform design	•	•	•
Small footprint	•	•	•
Low power consumption	•	•	•
Safe 12V DC	•	•	•
High quality	•	•	•
2 year warranty + 3rd year purchased via distributors	•		•
2 year warranty + 3rd year for free upon product registration		•	

Applications and Articles

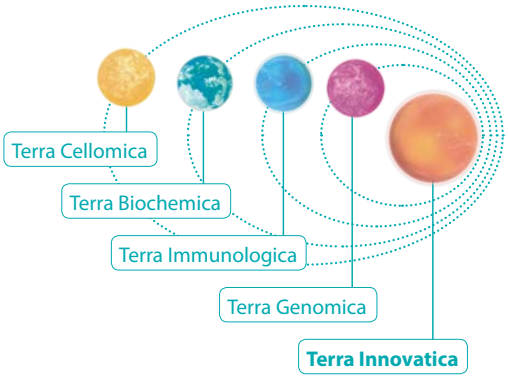
World of Biotech-Innovatica

"Most of the great innovations arose from the interaction of creative personalities with teams that managed to realize their ideas."

— Walter Isaacson

Vasily Bankovsky, Ph.D. (Biology), Head of R&D Department, Chairman of the Board at Biosan

The concept of development for Biosan called World of Biotech-Innovatica. Four planetary systems with satellites — devices revolve around Terra Innovatica (biomaterial under research). We have marked out four planets — 4 contemporary levels of life science research, medical and veterinary diagnostics:



1. **Terra Genomica** — level of genes (DNA-analysis, oligonucleotide and mononucleotide polymorphism — ONP, SNP);
2. **Terra Immunologica** — level of immunology (detection of polymorphism of antibodies and immune response);
3. **Terra Biochemica** (metabolomics) — level of metabolism products and ferment activity;
4. **Terra Cellomica** — level of cellular morphogenesis (cellular polymorphism).

The distance from the planet orbitals to Terra Innovatica corresponds to the time of disease detection at each level (from one week, as in the case of DNA-analysis, to several years, when the changes can be traced at the cellular level). By virtue of genetic nature of the majority of diseases of human beings and animals — further affecting the immune response (defence reaction) and changes in biochemical status, and finally cellular morphogenesis as well — we believe that simultaneous multilevel analysis is reasonable. Since polymorphism at the level of genes leads to the manifestation of polymorphism at all higher levels, it results in the ambiguity (if not more) of any decision made on the basis of the obtained data. The definition comprising the polymorphism of norm and abnormality (disease) is not yet available, this experience is still being gained, hence, the multianalysis technology, though expensive, is the only solution as of today.

Although the classic determinism in life science research and diagnostics has finally yielded its position to the stochastic one, there are still no instrumental solutions allowing to channel our new knowledge into informed and unambiguous decisions. This is the real situation; these are the temporary sacrifice of progress. Biosan is the only company in the World of Biotech-Innovatica, which develops, produces and distributes instrument lines for all 4 levels. These satellites of 4 planets are specialised devices providing the instrumental basis

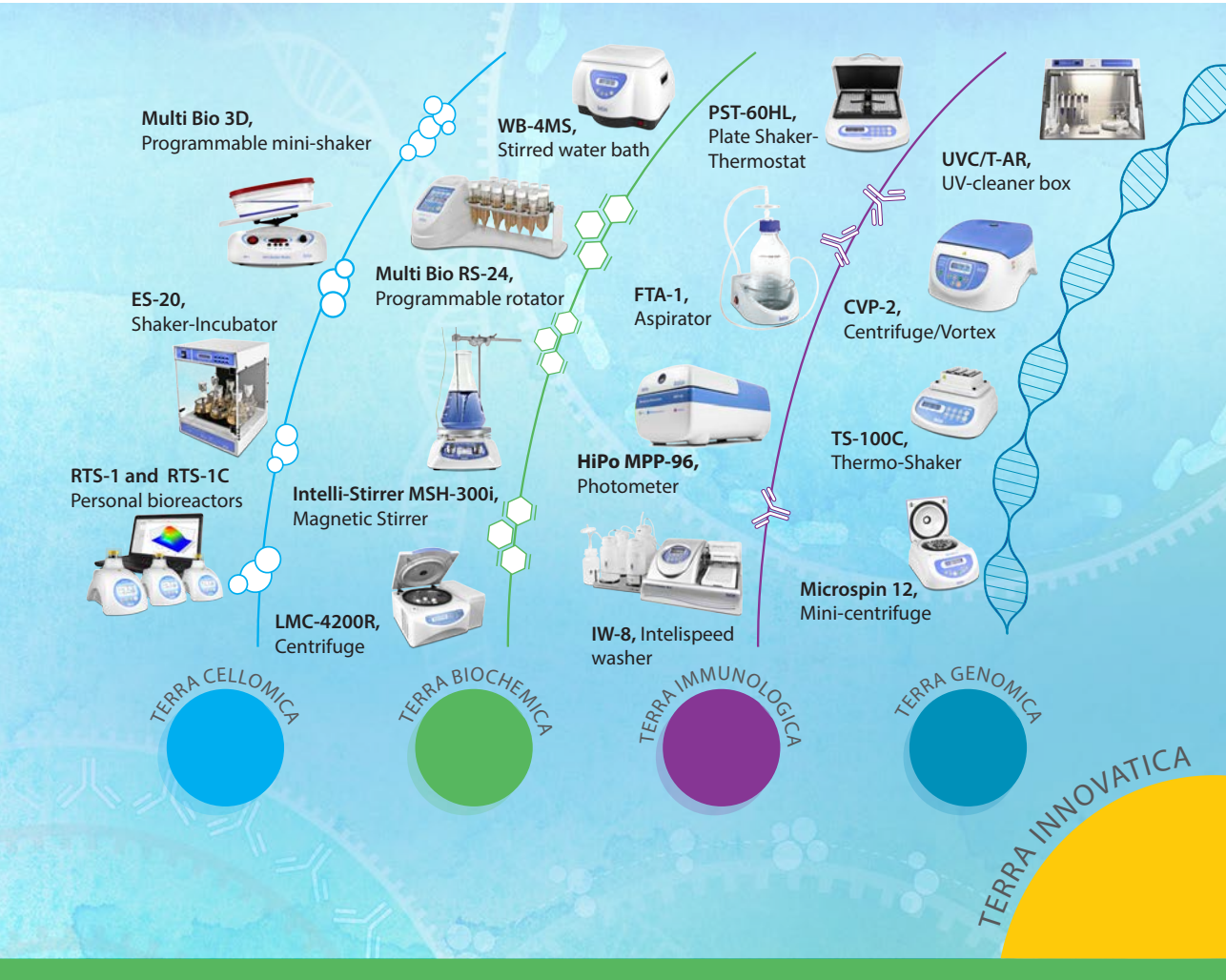
World of Biotech-Innovatica

for multilevel analysis, whereas the reagent sets make these satellites move. Consequently, by the World of Biotech-Innovatica we mean the direction of Biotechnology, responsible for the development of multilevel analysis sets (product lines). In the future perspective, multianalysis chips may appear with the development of chip technologies, allowing to unify all the aforesaid technologies in one chip.

I am pleased to point out that many of our ideas and products have been developed as a result of long-standing cooperation between scientists and developers of Biosan with universities, as well as with academic institutes and institutes of applied sciences and our company customers worldwide.

All our inventions resulted from joint efforts, and today we are still open for collaboration. We will be delighted if the result of our work — which has already received wide recognition of the scientific community — would be also of interest for you, particularly if it would serve as yet another starting point for the development of innovative biotechnologies and appearance of new planets and their satellites in the sky of the World of Biotech-Innovatica.

Sincerely,
Vasily Bankovsky, Ph.D. (Biology)
Head of R&D Department
Biosan, Chairman of the Board



Reverse–Spin® Technology — Innovative Principle of Microbial Cultivation

Medical–Biological
Research & Technologies

Authors
V. Bankovsky, I. Bankovsky, P. Bankovsky, J. Isakova, I. Djackova, A. Sharipo, A. Zhukov, A. Dišlers, R. Rozenstein, V. Saricev, S. Djacenko, V. Makarenko, U. Balodis.

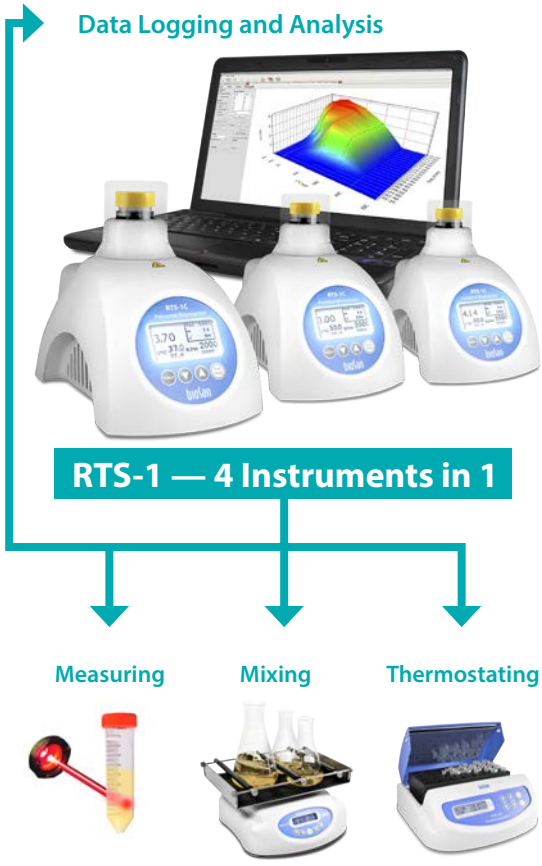
Introduction

This paper presents theoretical and experimental studies of microorganism growth using Reverse-Spin® mixing principle (RS). Reverse–Spinner — is a microbioreactor that applies non-invasive, mechanically driven, low energy consumption, original type of agitation where cell suspension is mixed by the single-use tube (bioreactor) rotation around its axis with a change of direction of rotation motion resulting in highly efficient mixing and oxygenation for cell growth.

Present work is the first to show experimental results of cell growth kinetics obtained by using single-use falcon tubes agitated on a Reverse–Spin® mixing principle. Growth conditions for several model microorganisms like facultative anaerobic *E.coli* and *B.subtilis*, extreme aerobic microorganism *Thermophillus sp.*, microaerophilic *L.acidophilus*, and methylotrophic yeast *P.pastoris* have been optimized. Scientific and applied valuable aspects of single–use personal bioreactors and their potential niche in different biotechnological fields are discussed.

The principles of mixing solutions are among one of the key fields in Bioengineering science. Area of mixing is not limited to bioreactors — mixing is also essential in the study of biochemical and molecular biological processes. Noninvasive mixing technology includes a different way of tubes agitation as shown in the Table 1.

Absence of invasive agitators inside the reactor enables to use Reverse Spinner as a rotating biomass registration device, which measures turbidity of the sample in real time. Intuitive software makes it possible to set optimal parameters of fermentation, registers and logs all parameters (mixing intensity in rpm and Reverse Spin Time (RST), temperature, specific growth rate and biomass in OD_{600} or other units, e.g. g/l).



#	Icon	Motion	Instrument	Max. V
1		Orbital		0.1–5 l
2		Rocking		1–100 l
3		Overhead Rotation		1–50 ml
4		Reciprocal (Hand-type)		1–50 ml
5		Vortex		1–50 ml
6		Reverse Spinning		1–2000 ml

Table 1. Comparison of Non invasive mixing methods

Initiation of the Reverse–Spin® mixing (RS) and depth of the Vortex cave depend on - 1) angular speed of the bioreactor vessel 2) time from initiating rotation 3) RS 4) growth media viscosity 4) temperature. These parameters, also, determine the angular speed of rotating Vortex Layer (VL) and tran¬sition state from the Irrotational Vortex (IRV), when angular speed of the VL is proportional to the radius, to the Rotational Vortex, when the angular speed of the VL is uniform and looks like a monolithic Vortex cavity, as shown in Figures 1-2. Common rules regulating Vortex type mixing processes may be stated as follows: the more time has passed since Vortex formation, the more obvious is the transition from IRV to the RV. In other words, mixing of the fluid media is carried out by rotation, and periodical change of the rotation direction. Rotation multiple times increases the contact area of liquid/gaseous phase and change of the direction of rotation acts as a uniform flow disruptor. These factors significantly increase the efficiency of the liquid mixing as well as liquid-gas interface. Thus, the liquid saturation with gas and gas solubility takes place with greater efficiency than in most standard mixing devices. The concept of the Reverse–Spin® mixing is based on these assumptions.

By exploiting centrifugal forces, bubbles that are created by mixing are pushed into the interface between liquid and gaseous phases, as illustrated in Figure 3, as well as other RTS advantages over shake flasks are described in Figure 4. Small amount of bubbles and the Reverse–Spin® mixing principle allows to use RTS as a biomass register/monitoring device. The final concentrations of *E.coli* cells in rich broth media's significantly exceed 1 OD_{600}, which requires stopping the process of growing cells, with further sterile aliquoting and dilution. This makes the process of growing cells and controlling their concentration very difficult to reproduce. The problem lies in the fact that the turbidimetric coefficients, unlike molar extinction coefficients, are not linear. The behavior of light in dense cell suspensions in 50 ml falcon tubes, as shown in Figure 5, is very interesting and at more than 2 OD_{600} it is almost impossible to measure the concentration of cells directly (unless the Rayleigh scattering is measured). We approached this problem from a different side. The same as in a 10 mm cuvette, when a certain sample concentration is reached, light cannot pass to the photometer's detector and it is required to dilute the sample to the range of 0-0,4 OD_{600}. As shown in figure 6, in the case of RS mixing and the generated monolithic liquid layer, depending on the working volume, serves as a mechanical dilution decreasing the optical path for the measurement to take place, enabling to register turbidity up to ~45 OD_{600} for rod shaped bacteria, e.g. *E.coli, B.subtilis, B.bifidum* and ~75 OD_{600} for yeast *(S.cerevisiae, P.pastoris)*, which is enough for most applications. In other words, bioreactor tubes containing different volumes of medium are intensely rotated (2,000 min^{-1}) and as a result, a monolayer of medium is generated, which thickness

Reverse–Spin® mixing principle

Spread of the broth media inside of rotation tube as a function of rotation intensity

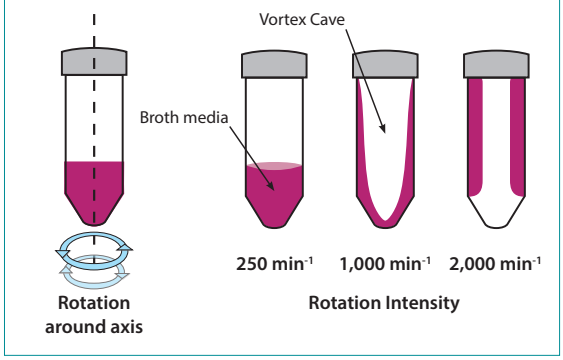


Figure 1

Reverse–Spin® life cycle

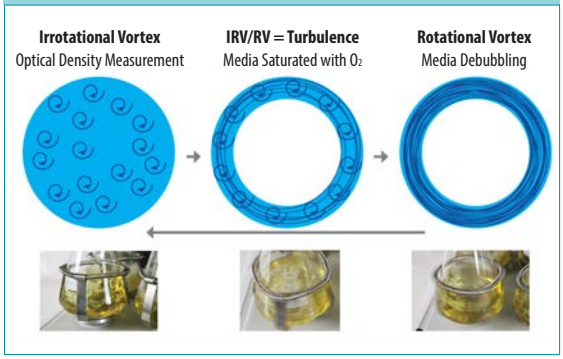


Figure 2

Centrifugal Forces as a Mechanical Defoamer

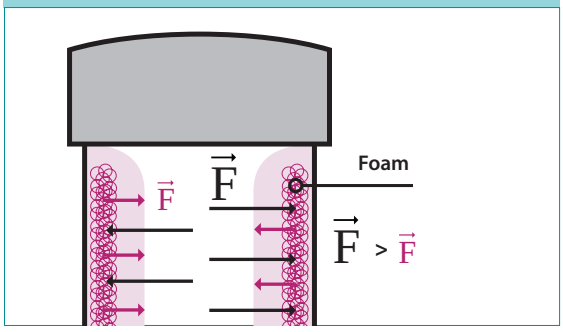
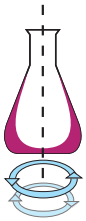


Figure 3

is directly proportional to the volume of culture medium in the tube, as shown in Figure 6, A-B. Consequently, the squared linear correlation coefficient (R^2) between RTS and off-line OD_{600} was 0.99 (Figures 6 and 7) measuring from 0 to 20 OD_{600} for rod shaped bacteria and 0 to 35 OD_{600} for yeast. Higher OD values can be calibrated choosing non-linear calibration models, which can be done automatically during calibration process in RTS software.

**Reverse Spinning vs Orbital Shaking,
Symmetrical vs Asymmetrical broth media distribution**

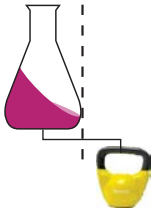
Reverse Spinning



Features:

- Natural centric auto–balancing
- Simplicity
- No power consumption for contra–balancing
- Self-cleaning optical cells
- Mechanical auto defoamer
- Single-use
- Centrifuge ready
- Lightweight

Orbital Shaking



Features:

- Proportionality between orbital diameter and the diameter of the moving vessel
- Artificial hula–hoop auto–balancing
- Complexity
- Extra power consumption for contra-balancing
- Heavy

Figure 4

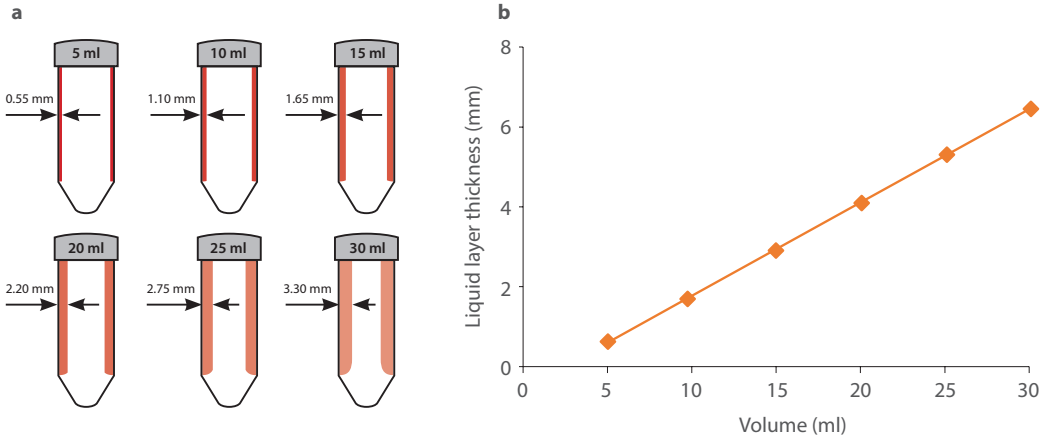


Figure 6 (a, b)

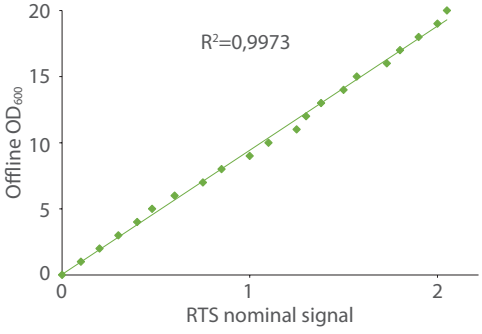


Figure 7. Squared linear correlation coefficient (R^2) between RTS and off-line OD_{600} for rod shaped bacteria.

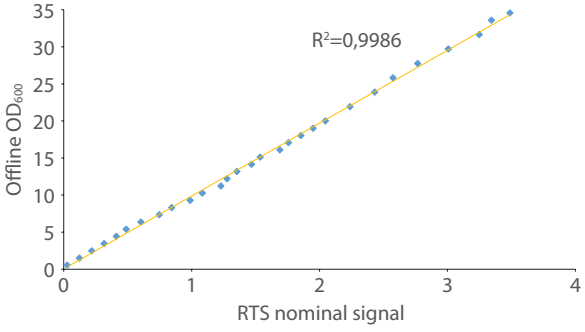


Figure 8. Squared linear correlation coefficient (R^2) between RTS and off-line OD_{600} for yeast.

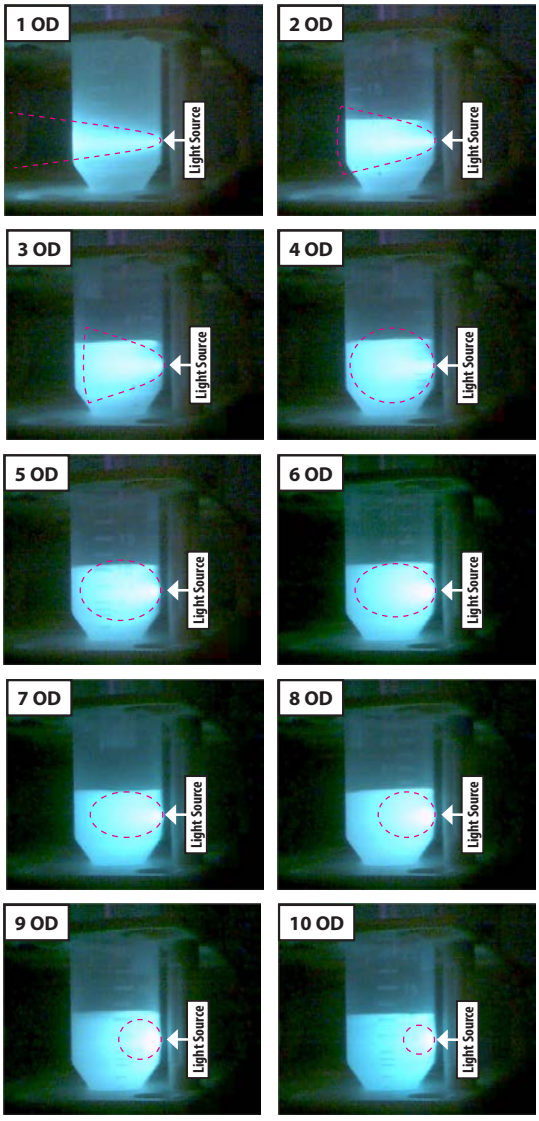
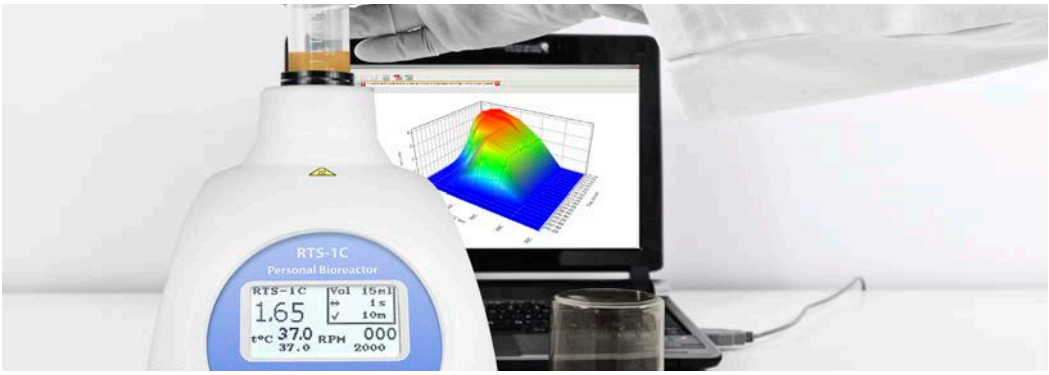


Figure 5. Experiment of Behaviour of Light in the Environment of Different Densities was carried out. Green (535 nm) laser was used in the Saccharomyces Cerevisiae of different optical densities (OD) in the range from 1 to 10 with 1 OD increment.

Examples of RTS bioreactor application

In development of biotechnological process, the need for initial screening of clone candidates and determination of optimal cultivation parameters is essential. Shake flasks are well established mainly due to their historical commonality, flexibility, low cost and ease of operation [1]. Nevertheless, at this initial and crucial stage of bioprocess development it is challenging to monitor or control important cultivation parameters such as biomass, specific growth rate and temperature. Offline sampling for establishing growth kinetics in flasks is troublesome, lacks data density, can create anaerobic stress and carries a risk of contamination. Incubator-shakers do not have individual temperature control for each flask which limits the possibility to have more temperature conditions e.g. for temperature sensitive protein expression. Moreover, the possibility of inadequate supply of oxygen through the gas–liquid interface and cap/closure in shake flasks can result in anaerobic stress and inefficient substrate accumulation resulting in low yield of the desired product [1]. Consequently, there is a niche for new mixing principles that should be introduced on the market as an alternative to solve the limitations of orbital shaken flasks. In comparison, the ability of RTS to register biomass online non-invasively as frequently as 20 seconds between measurements, the possibility to individually rapidly control temperature (0.7°C/min, direct sample temperature) and possibility to match even the most vigorous orbital mixing and consequently k_La conditions is clearly advantageous. Experimental results for k_La (h^{-1}), growth kinetics, relative level of recombinant protein accumulation by SDS-PAGE gel analysis and specific enzymatic activity for *E.coli* and *P.pastoris* (the protein and strain names are confidential by desire of the providing party) cultivated on commercially available broth media's for RTS as an alternative cultivation system that can solve the known limitations of shake flasks.



k_La (h^{-1}) results in RTS-1/C

The k_La was measured in 5, 10, 20, 30 mL of deionized water in 50 ml TPP Bioreaktor tubes at agitation rate of 2000 rpm and 1 s RST, this agitation rate was found optimal for Reverse–Spin® mixing principle during initial optimization studies. Over the working volume range, the k_La increased with the decrease of liquid volume (Figure 10). At working volume of 5 ml, the highest k_La of 350 h^{-1} ± 26 was reached. We think that by selecting lower working volume it is possible to increase the k_La even more since for Reverse–Spin® mixing principle, overall oxygen transfer is proportional to the surface to volume ratio, thus by decreasing the working volume gas–liquid mass transfer rate reaches higher values. All things considered, it was not possible to measure lower working volume conditions due the construction of the optical axis which is located at 5 ml mark of the tube.

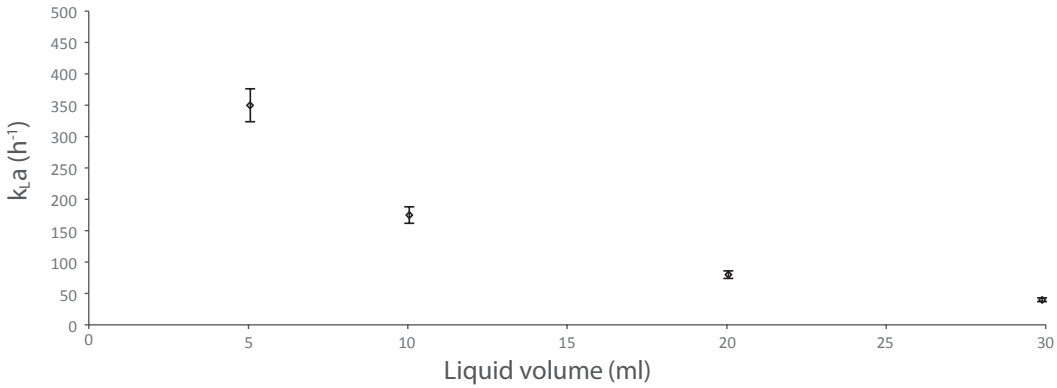


Figure 9. Determination of k_La in 50 ml TPP Bioreaktor tubes. The bioreactor vessels were filled with 5, 10, 20, 30 ml deionized water and measurements were made by non-invasive O_2 sensors and optics (PreSens, Regensburg, Germany) at 30 °C using a gassing-out method. Mean and standard deviation of at least five independent experiments are shown.

E.coli and *P.pastoris* cultivation and recombinant protein production

Non-limiting oxygen availability during screening is required for feasible bioprocess development [1,2] and OTR_{max} and k_La are crucial parameters in scaling up and scaling down the process conditions between shaking vessels and laboratory-scale mechanically stirred bioreactors [3,4,5]. Common conditions for cultivating *E.coli* and *P.pastoris* are orbital mixing, 25-50 mm orbit, 250 RPM, 250 ml shake flasks and 10-30% filling volumes. The k_La estimations for 250 ml flask, 10% filling volume, 25-50 mm orbit and 250 RPM can vary in published literature because of differences in methods and models of calculation. Studies using non-invasive O_2 sensors and optics (PreSens, Regensburg, Germany) have estimated a value of 100 h^{-1} [6,7], yet other studies at similar conditions showed lower k_La [8], which relies on different methodology. In these experiments 250 ml flasks with 10-30% filling volumes were used throughout. In the E.coli experiment of thermosensitive recombinant protein production optimization between RTS and shake flasks at different fermentation temperatures, the influence of k_La on growth kinetics can be clearly seen from Figure 10 a-b and Table 2, where the highest k_La condition of RTS at optimal growth temperature of 37 °C, in comparison to shake flask at the identical temperature, achieved greater biomass yield (24%) and higher specific growth rate (19%). Bacterial cultivation was performed using semi-synthetic medium supplied with 1% glucose, IPTG as expression inductor at 37, 30 and 25 °C throughout. Similiarly, in *P.pastoris* experiment (Table 3), the biomass yield was also 27% higher. Yeast cultivation was performed growing on BMGY medium at 30 °C, with further harvesting and centrifugation for the purpose of 5 times concentrating the cells (up to 200 ± 50 OD_{600}) for later recombinant thermosensitive protein expression using methanol as the carbon source and as a protein expression inductor, performed at 28 °C throughout, using BMMY medium with feeding pulses varying from 0.25 to 1.25% of methanol with pauses of different duration throughout the protein expression process.

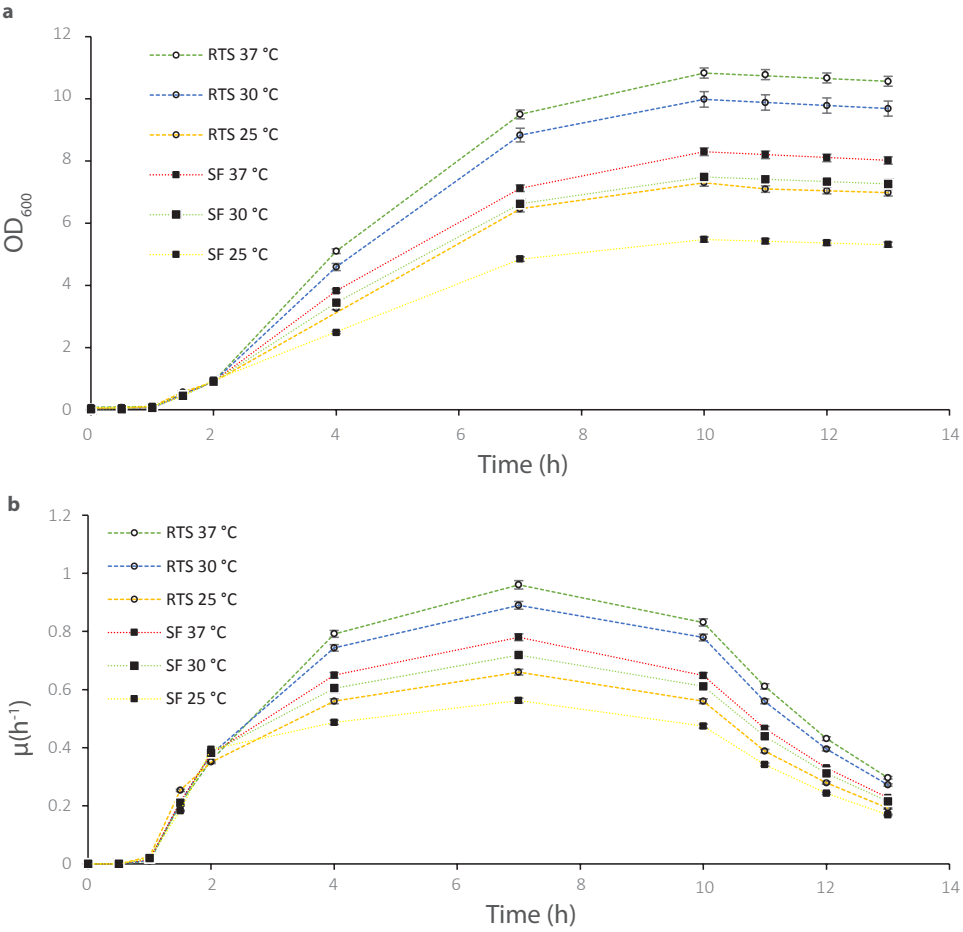


Figure 10 (a,b). Effect of temperature, cultivation method and vessel type on OD_{600} of *E.coli* expressing recombinant thermosensitive 37 kDa protein grown in flasks shaken by incubator-shaker and RTS-1. (RTS) RTS-1 TPP bioreactor tubes; (SF) Shake Flasks; throughout cultures grown in non-baffled shaken flasks (nominal size of 250 ml with 10% of filling volume) with 25 mm 240 rpm incubator-shaker and RTS-1 (50 ml TPP Bioreaktor tubes with 20% filling volume) with 2000 rpm 1 s RST, cultivated using Rich medium (buffered double concentrated LB). Mean and standard deviation of three independent experiments are shown.

Yield	RTS 37 °C	RTS 30 °C	RTS 25 °C	SF 37 °C	SF 30 °C	SF 25 °C
[a]OD_{600}	10.80 ± 0.16	9.98 ± 0.15	7.29 ± 0.11	8.3 ± 0.12	7.48 ± 0.11	5.5 ± 0.1
$\mu_{max}(h^{-1})$	0.96 ± 0.02	0.89 ± 0.014	0.66 ± 0.01	0.78 ± 0.014	0.71 ± 0.01	0.56 ± 0.15

Table 2. *E.coli* end point biomass yield in OD_{600} and maximum specific growth rate results

[a] – Measured in overnight cultures before cell harvest. Mean and standard deviation of three independent experiments are shown.

Yield	RTS 10%	RTS 20%	RTS 30%	SF 10%	SF 20%	SF 30%
[a]OD_{600}	65 ± 1.5	59 ± 2	51 ± 1.5	47.5 ± 2	30 ± 1.3	21 ± 0.7

Table 3. *P.pastoris* end point biomass yield in OD_{600} results

[a] – Measured in overnight cultures before cell harvest, cultivated at 30 °C O/N. Mean and standard deviation of three independent experiments are shown.

A well-known technique to limit the in vivo aggregation of recombinant proteins consists of cultivation at reduced temperatures [9]. This strategy has proven effective in improving the solubility of a number of difficult proteins [10]. In both *E.coli* and *P.pastoris* experiments, relative level of recombinant thermosensitive protein accumulation in the total, insoluble and soluble fractions of the cell lysate under induced cultural conditions was observed by 12% SDS–PAGE (Figure 11). Moreover, specific enzymatic activity U mg^{-1} of biomass was identified. In *E.coli* experiment the effect of temperature on the level of soluble recombinant protein is clearly seen and was the highest at 30 °C in both RTS bioreactors and shake flasks. Yet, the difference could not be clearly observed which mixing principle resulted in the highest relative soluble protein yield. Furthermore, specific enzymatic activity measurements (Figure 12) resulted in 18% higher specific enzymatic activity in RTS 30 °C. In contrast, in the *P.pastoris* experiment, the difference between RTS bioreactors and shake flasks in relative level of recombinant thermosensitive protein could be better observed and was significant (Figure 13). Moreover, specific enzymatic activity results (Figure 14) repeated this correlation, where 20% filling volume RTS was 62% higher than shake flask with identical filling volume percentage. The variables that could be involved in the substantial protein yield difference must be identified and studied further.

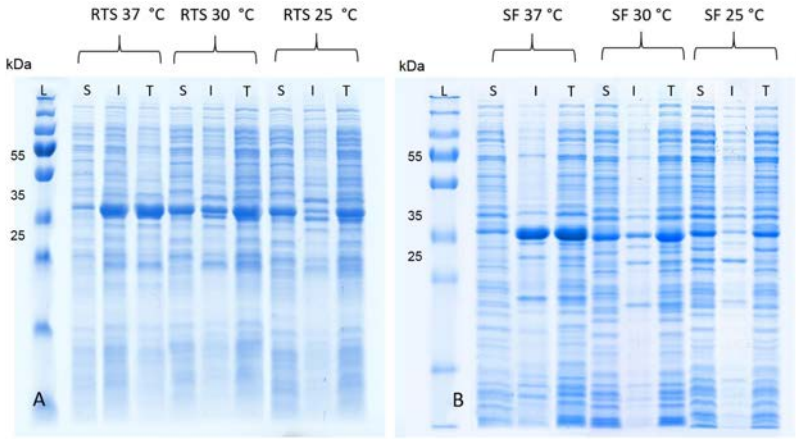


Figure 11. SDS-PAGE images (A and B) of total, solube and insolube recombinant thermosensitive protein fractions of samples of RTS and SF cultures cultivated at different temperature and cultivation vessels. L - Protein size standard (PageRuler™ Plus Prestained Protein Ladder, Thermo Fisher Scientific), T - Total protein fraction, S – Soluble protein fraction and I – Insoluble protein fraction.

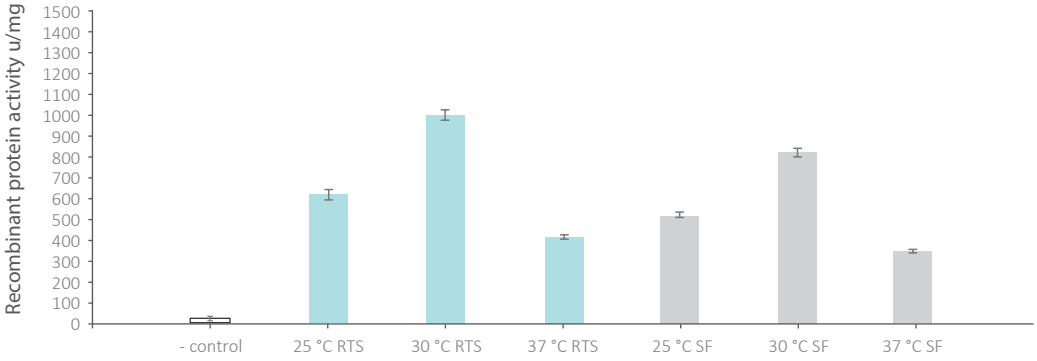


Figure 12. Effect of temperature on specific enzymatic activity (U mg^{-1}) of *E.coli* expressing recombinant thermosensitive protein grown in flasks shaken by incubator-shaker and RTS-1. (RTS) RTS-1 TPP Bioreaktor tubes; (SF) Shake Flasks; (- Control) *E.coli* biomass before induction. Mean and standard deviation of three independent experiments are shown.

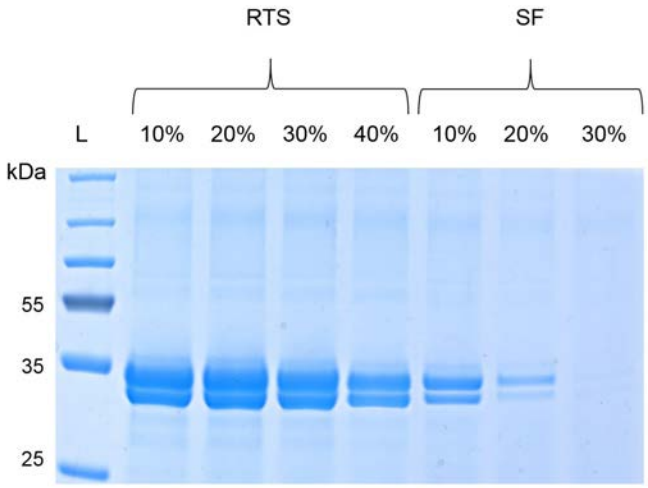


Figure 13. 12% SDS-PAGE image of *P.pastoris* supernatant samples expressing recombinant thermosensitive 37 kDa protein in (RTS) RTS-1 TPP bioreactor tubes; (SF) Shake Flasks; throughout the expression was performed in non-baffled shaken flasks (nominal size of 250 ml with 10, 20, 30% filling volumes) with 25 mm 250 rpm incubator-shaker and RTS-1 (50 ml TPP Bioreaktor tubes with 10, 20, 30 and 40% filling volumes) with 2000 RPM 1 s RST, using BMMY medium with various methanol feeding pulses of 0.25-1.25% with subsequent various feeding pauses. Mean and standard deviation of three independent experiments are shown. L - Protein size standard (PageRuler™ Plus Prestained Protein Ladder, Thermo Fisher Scientific). Protein bands are formed as "doublets" because of different carbohydrate groups attached during secretion.

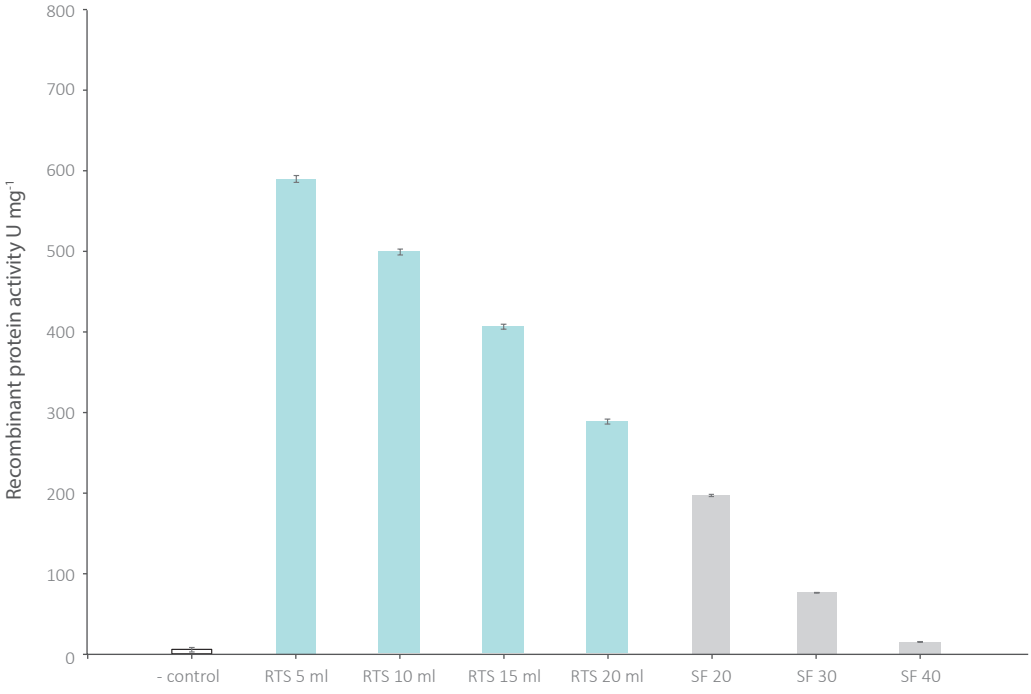


Figure 14. Effect of different filling volumes on specific enzymatic activity (U mg^{-1}) of *P.pastoris* expressing recombinant thermosensitive protein grown in flasks shaken by incubator-shaker and RTS-1. (RTS) RTS-1 TPP Bioreaktor tubes; (SF) Shake Flasks; (- Control) *P.pastoris* biomass before induction. Mean and standard deviation of three independent experiments are shown.

Conclusion

Previous version of RTS article concentrated only at estimating optimal growth conditions until 10 ml working volume. Yet, after additional investigations and modifications leading to the results that are provided in the article it has been found that at 5 ml working volume the k_La dramatically increased by 50%, consequently it is possible to increase the mass transfer coefficient further lowering the working volume. Moreover, as seen from experimental results, with increasing product popularity and received critical feedback it was experimentally proven that RTS system can be successfully used not only for day to day cell cultivation with real time growth kinetics but as an alternative initial screening bioreactor for protein production. Notably, this is not the only possible application for this system because of the possibility to register real time growth kinetics and individual rapid temperature control, which enables RTS to be used in temperature stress and fluctuation, e.g. adaptive laboratory evolution and heat-shock experiments, inhibition and toxicity tests, e.g. lactic acid bacteria inhibition by bacteriophages and media and growth optimization. Further studies to increase the potential of Reverse–Spin® mixing principle will be performed in the future. Additionally, pO_2 and pH noninvasive measurement will be available in the next generation of RTS devices that is planned to be released in the 3rd or 4th quarter of 2017.

Acknowledgments

The authors thank Thermo Fisher Scientific Baltics, in particular Algimantas Markauskas for providing the possibility to work and perform experiments in Thermo Fisher Scientific Baltics site, Dr. Juozas Šiurkus for providing the guidance and strains and Dmitrij Bugajev for assisting in the experiment processes. We gratefully acknowledge the very considerable support for equipment and consumables by Thermo Fisher Scientific Baltics. We also would like to thank VMTKC Competence Center, Dr.sc.ing. J. Vanags and European Regional Development Fund for additional intellectual and financial support on projects KC/2.1.2.1.1/10/01/0065 and 1.2.1.1/16/A/005.

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Development and evaluation of DNA amplicon quantification

Case study: UV–Cabinet with UV Air Recirculator UVC/T-M-AR and Class II Biological Safety Cabinets

Authors

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Biosan: Arturs Kigitovics, Vadim Gimelfarb

Introduction

Personal and product safety during clinical and laboratory studies have stimulated the development of sterile cabinets and special laboratory safety techniques, to protect the environment, operator, and product. Monitoring DNA/RNA amplicon concentration in laboratory air in sterile cabinets has become topical as PCR and isothermal amplification technologies have developed along with wide spread mass analyses.

Development of methods for repeatable DNA/RNA amplicon detection in air samples is now a reality. Recent research "Behaviour of aerosol particles in fibrous structures" (Igor Agranovsky's PhD thesis, 2008, Novosibirsk, Russia) describes the development of samplers and monitoring of DNA/RNA amplicon concentration in the air from sterile cabinets, microbial quantitative analyses.

UVC/T-M-AR, UV–Cabinet for PCR operations

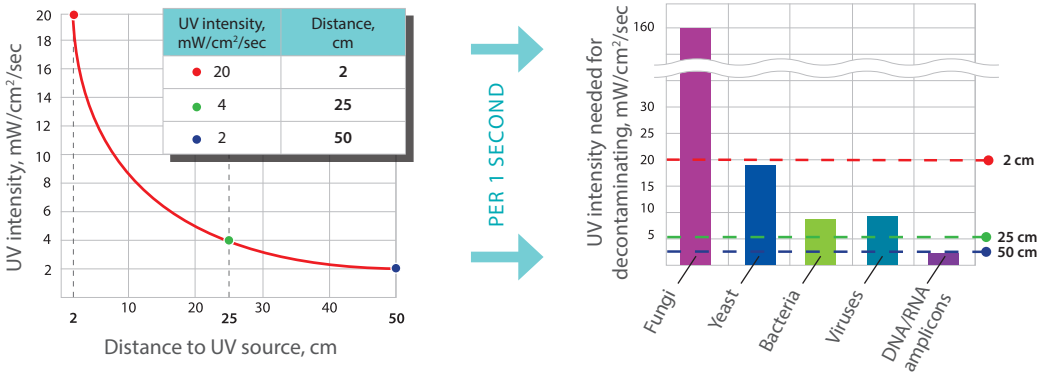


Fig. 1, Germicidal, shortwave (254 nm) ultraviolet energy is used for complete destruction of various biological agents

Aim of the study

The aim of this study is to evaluate the of efficiency of UV cabinets produced by BioSan (Latvia) in comparison to Class II BioSafety cabinets.

UV air treatment

More than a century has passed since the germicidal effect of UV light was recognized by Niels Ryberg Finsen — a Nobel Prize winner in physiology or medicine in 1903 [5], and many researches have been performed on UV induced destruction of DNA and microorganisms.

Low pressure germicidal UV lamps characteristically emit monochromatic low intensity radiation principally at 253.7 nm, within the germicidal wavelength range as defined by the DNA absorbance spectrum. The germicidal UV dose LP-UV lamps is calculated as the product of the volume averaged incident irradiance (E, mW/cm^2) and the time of exposure (t, seconds) resulting in units of mJ/cm^2 for UV dose [1] *(Fig. 1)*.

Air flow organization through HEPA filter

HEPA is an acronym for "high efficiency particulate absorbing" or "high efficiency particulate arrestance" or, as officially defined by the Department of Energy (DOE) "high efficiency particulate air".

The first HEPA filters were developed in the 1940's by the USA Atomic Energy Commission to fulfil a an efficient, effective way to filter radioactive particulate contaminants. HEPA filter technology was declassified after World War 2 and then allowed for commercial and residential use [6].

This type of air filter can theoretically remove at least 99.97% of dust, pollen, mold, bacteria and any airborne particles with a size of 0.3 µm at 85 litres per minute (l/min). In some cases, HEPA filters can even remove or reduce viral contamination. The diameter specification of 0.3 responds to the most penetrating particle size (MPPS). Particles that are smaller or larger are trapped with even higher efficiency [7] *(Fig. 2)*.

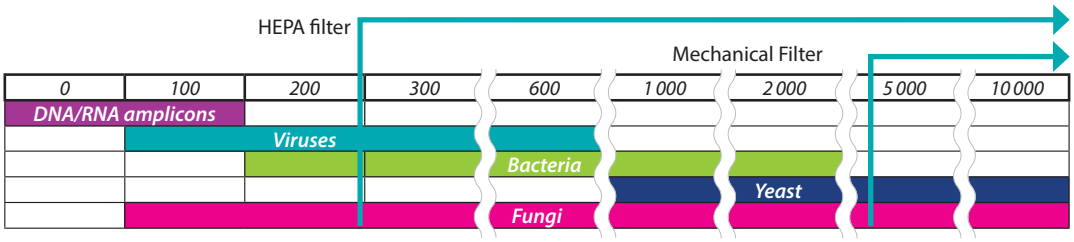


Fig. 2, Biological agent sizes and filters effectivity range, nm

Biological agent sizes, nm

Colony forming units (CFU) test

Media

LBA media was prepared using Standard Methods Agar (Tryptone Glucose Yeast Extract; Becton, Dickinson and Company) and dissolved in 1 litre of purified water. 7.5 grams of Yeast Extract (Biolife S.r.l.) and 5 grams of Tryptone (Difco laboratories) were added to enrich the media. The media was autoclaved at 121°C for 15 minutes. Media control samples were taken to check for presence/absence of colony forming units in media itself and the results were negative (0 CFU per 3 plates).

Experimental setup:

Impaction aerobiocollector airIDEAL 3P (bioMérieuxSA, France) was used to take air samples to test for the presence of colony forming units (CFU). Each sample was exposed to 500 litres of air. Aerobiocollector was set in the middle of the sterile cabinets for test samples and negative control samples, and in specific places in the middle of the laboratory room for positive control. The negative control was taken in Microflow ABS Cabinet Class II. This was repeated three times, the number of colony forming units was counted manually on each plate. Reading tables provided in airIDEAL 3P (bioMérieuxSA, France) The most probable number (MPN) of microorganisms collected per plate was estimated with respect to the number of agglomerates of colonies counted on the plate. (MPN was calculated from the CFU count using FELLER's law). Subsequently results were converted to CFU per m^3.

Mechanical contamination test

Instrument:

Laser particle counter (produced by Met One, USA) was used to determine mechanical contamination in the sterile cabinets and laboratory air as positive control.

Method:

Average amount of particles per litre of air were measured in sterile cabinet/laboratory air. Measurements were performed 9 times and the average value presented in the results as number of particles per m3 of air.

Two channels were used to measure amount of particles of different size: 5 µm and 0.3 µm. Mechanical filter stops particles larger than 5 µm while HEPA filter larger then 0.3 µm.

DNA Amplicon test

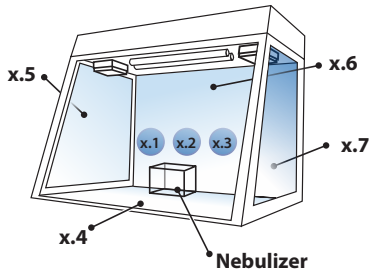
Instruments:

- Nebulizer, BioSan
- Shaker OS-20, BioSan
- Mini–Centrifuge/Vortex FV-2400, BioSan
- Centrifuge Pico 17, Thermo Electron Corp.
- Centrifuge-Vortex MSC-6000, BioSan
- Real–Time PCR cycler Rotor Gene 3000, Corbett Research

Reagents:

- Lambda DNA, Thermo Fisher Fermentas
- GeneJet Plasmid Miniprep Kit, Thermo Fisher Fermentas
- Real Time PCR reagents, Central Research Institute of Epidemiology

Fig. 3, Air and surface samples and surface sample taking path



Samples taken from:

x.1, x.2, x.3	**: Air** (Syringes)
x.4	**: Working surface** (Swab)
x.5, x.7	**: Side walls** (Swabs)
x.6	**: Back wall** (Swab)

Experiment setup:

- Sampling was performed as shown *on Fig. 3*
- Extraction and analyses were performed as shown *on Fig. 4*
- Quantitative PCR (Polymerase Chain Reaction):

  DNA amplicon quantification in sterile cabinets was performed by qPCR. Controls and standards were set in each experiment:

  » 4 standards of Lambda DNA of different concentration prepared in 10 fold dilution: starting concentration 0.6 ng/µl or ≈1,000,000 copies/µl

  » 2 NTC (no template control- sterile H_2O), experiment was considered successful only if control was negative.

After samples were taken and extracted as mentioned above, qPCR reaction master mix was prepared by adding the following components for each 25 µl of reaction mix to a tube at room temperature:

PCR mix:

2-FL : **7 µl**; dNTP's : **2.5 µl**; Forward Primer : **1 µl**;
Reverse Primer : **1 µl**; DNA probe : **1 µl**; Template DNA : **10 µl;**
Water, nuclease-free to : **25 µl**; Total volume : **25** µl

Sample taking path

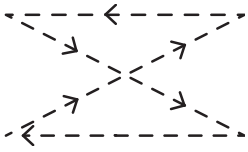


Table 1, Cycling protocol

Three-step cycling protocol steps	Temperature, °C	Time	Number of cycles
Initial denaturation	95	5 min	1
Denaturation	95	5 sec	42
Annealing	60	20 sec	42
Extension	72	15 sec	42

Detection Channel: FAM

Ⓐ Air / Ⓑ Surface samples

DNA extraction:

Ⓐ From Air Samples :

- Incubation on Shaker OS-20 (BioSan) 180 rpm 15'
- Spin columned (GeneJet Plasmid Miniprep Kit, Thermo Fisher Fermentas)

Ⓑ From Surface Samples:

- Vortex 2-3"
- Centrifuge at 13,300 rpm for 2'

Isolated DNA:

❶ Real time PCR amplification *(Fig. 7)*
❷ Detection of Ct values and normalization of data *(Fig. 8)*
❸ Copy number estimation on cabinet volume and surface area

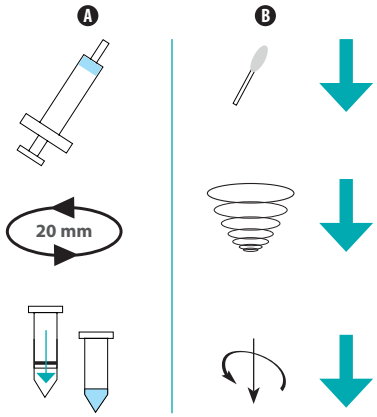
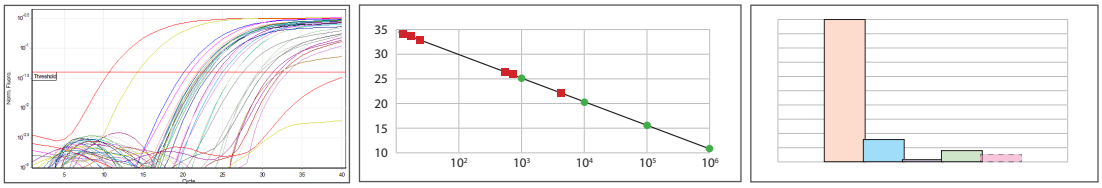


Fig. 4, DNA extraction, samples analyses and result detection

❶ ❷ ❸



Results:

Mechanical contamination

Results of mechanical air contamination in cabinets of two types: PCR cabinet (UVC/T-M-AR, BioSan) and laminar flow cabinets (BioSafety class II cabinet prototype by BioSan and BSC II cabinet ABS Cabinet Class II by Microflow) as the positive control laboratory air samples were taken (*Fig. 5*).

Microbial contamination

Microbial contamination in laboratory air and sterile cabinets. Quantitative results of microbial air contamination in cabinets of two types: PCR cabinet (UVC/T-M-AR, BioSan) and laminar flow cabinets (BioSafety class II cabinet prototype by BioSan and BSC II cabinet ABS Cabinet Class II by Microflow) as the positive control laboratory air samples were taken (*Fig. 6*).

Fig. 5, Mechanical contamination, 0.3 µm particles

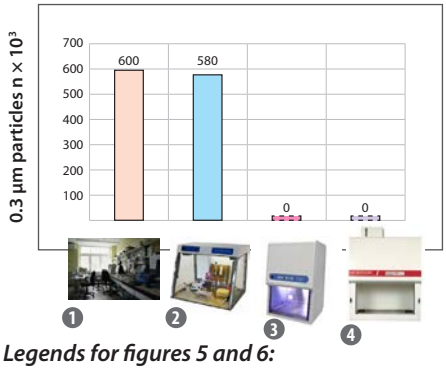
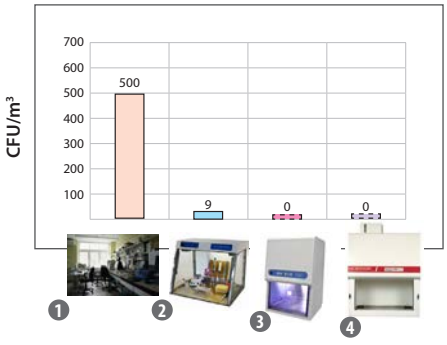


Fig. 6, Microbial contamination



Legends for figures 5 and 6:

❶ Positive control (laboratory air)
❷ UV Cabinet (UVC-T-M-AR, Biosan, Latvia)
❸ Laminar flow cabinet (HEPA BSC II Cabinet prototype, Biosan, Latvia)
❹ BSC II Cabinet (ABS Cabinet Class II, Microflow, UK)

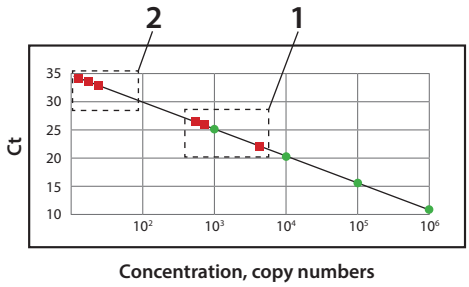
Amplicon contamination-inactivation efficiency:

Results analysis:

Real time PCR ensures product quantification using four standards of different Lambda phage DNA concentration and comparing Ct/Cq values of samples to those of concentration standards, based on standard curve *(Fig. 8)* (see Corbett Research Rotor Gene 3000 manual for more information) Following the amplification Lambda DNA copy number values were estimated for cabinet volume and surface area, results presented in *(Fig. 9)*.

Inactivation efficiency was calculated as ratio of DNA amplicons before and after treatment: direct and indirect UV treatment for 15 and 30 minutes, presented in percents in *table 2*.

Fig. 8, Standard curve, influence of direct and indirect UV irradiation on lambda phage DNA copy number



1 — *Samples after Lambda Phage spraying, no UV irradiation (positive control)*

2 — *Samples after 30 min UV inactivation*

— *Concentration standards*

— *Samples*

Fig. 7, Effect of UV irradiation on Ct/Cq values (raw results)

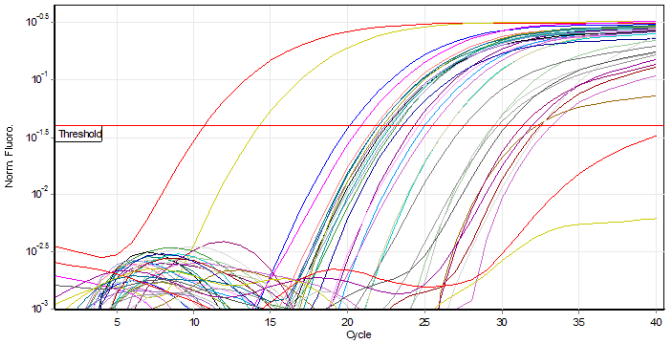
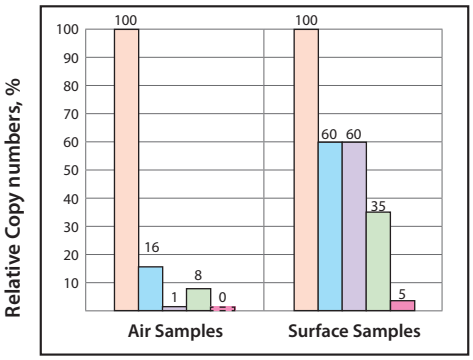


Fig. 9, Effect of direct and indirect UV irradiation on the amplicon concentration inside PCR cabinet UVC/T-M-AR, Biosan, Latvia



After Lambda phage DNA spraying

UV Air Recirculator for 15 min (Closed UV light irradiation, 25 W)

UV Air Recirculator for 30 min (Closed UV light irradiation, 25 W)

Open UV light (25 W) irradiation for 15 min

Open UV light (25 W) irradiation for 30 min

The horizontal axis show: air or surface samples, along with the relative copy number presented on vertical axis. Four series represent inactivation techniques and time of treatment, open UV light and UV air recirculator treatment kinetics are presented in the graph.

Table 2. DNA amplicon inactivation efficiency in PCR cabinet UVC/T-M-AR, Biosan, Latvia

Sample	Inactivation method efficiency			
	15 min of UV Air Rec.	30 min of UV Air Rec.	15 min of Open UV + UV Air Rec.	30 min of Open UV + UV Air Rec.
Air Samples	84%	99%	92%	100%
Surface Samples	40%	40%	65%	95%

Calculation of UV dose for each treatment

Direct UV Irradiation

Cabinet's air treatment

BioSan's cabinet features a single open UV lamp 25 Watt, germicidal UV irradiation (253.7 nm) measurements have been performed and UV intensity were recorded at the level from 20 mW/sec/cm² to 2 mW/sec/cm² at distance to UV source from 2 cm to 50 cm respectively. [2] In PCR cabinet volume following UV intensity gradient is formed: from 2 mW/cm² to 20 mW/cm² *(Fig. 10)*.

UV dosage during treatment = UV intensity at specific distance (mW/cm²/sec) × time of irradiation (sec)

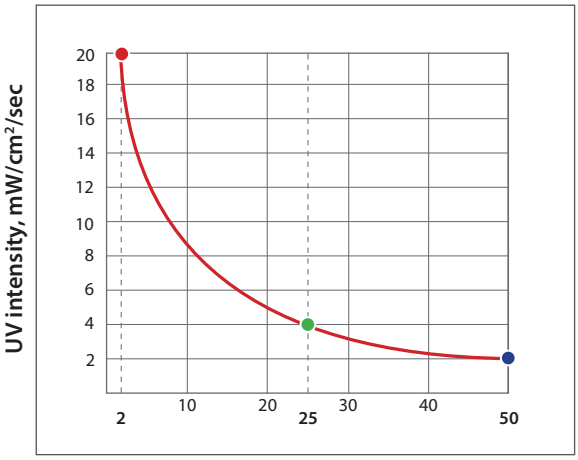
UV dosage during 15 min: gradient from 1,800-18,000 mW/cm²

UV dosage during 30 min: gradient from 3,600-36,000 mW/cm²

Cabinet's Surface treatment:

Distance to UV source ranges between surfaces and consequently the UV intensity *(table 3)*:

Fig. 10, UV intensity dependence on distance to UV tube (measured by radiometer VLX 254, Vilber Lourmat, France)



UV intensity, mW/cm²/sec	Distance, cm
20	2
4	25
2	50

Table 3. Average dosage for different surfaces

Surface	Dosage after 15 min	Dosage after 30 min
Working surface (40-60 cm)	1,800-2,700 mW/cm²	3,600-5,400 mW/cm²
Side walls (10-60 cm)	1,800-5,400 mW/cm²	3,600-9,000 mW/cm²
Front window (10-60 cm)	1,800-5,400 mW/cm²	3,600-9,000 mW/cm²

UV air recirculation:

Cabinet's Air treatment

BioSan PCR cabinets feature UV air recirculator. Recirculator consists of a fan, dust filters and closed UV-lamp (25 W) installed in a special aluminium casing, which is located in the upper hood. Fan's air flow speed is 14 m³/hour, which processes 1.3 cabinet volumes per minute. Distance from closed UV lamp to recirculator's walls is 2 cm at which UV intensity level is 20 mW/sec/cm² *(Fig. 10)*.

UV air recirculators are designed for constant air decontamination during operations.

Resulting in following UV dosage for cabinet's volume:

- During 15 min recirculation: 380 mW/cm²
- During 30 min recirculation: 780 mW/cm²

Cabinet's Surface treatment:

UV Air recirculator does not provide cabinet surface irradiation.

For deactivation of microorganisms and amplicons on the cabinet's surface additional open UV treatment is needed for protection against contamination

Conclusions

Air sampling methods developed by BioSan has been proven to be compatible with real time PCR detection of product. This method enables monitoring of laboratory air and sterile cabinet for presence of target DNA amplicons.

The research was designed to evaluate BioSan PCR cabinets' efficiency in comparison to Class II BioSafety cabinets. Based on the experiment results PCR cabinets prevent microbial contamination with inactivation efficiency up to 96%, but in comparison to Class II BioSafety cabinets do not provide protection against mechanical contamination.

UV air treatment in BioSan PCR cabinets for 30 min provides DNA amplicon deactivation efficiency:

- Combined UV treatment (Open UV and UV air recirculation) provides 100% efficiency
- UV air recirculation provides 99% efficiency
- Open UV irradiation provides 100% efficiency

Based on classification of BioSafety cabinets from European standard EN 12469 *[3]* and experiment results: BioSan PCR Cabinets and Class I, II, III BioSafety Cabinets were compared on product protection ability in *table 4*.

Further studies will be focused on:

- Development of high speed monitoring technology of RNA amplicon concentration in the laboratory air and in sterile cabinets.
- Investigation of Class II BioSafety cabinets efficiency against DNA amplicon contamination. Based on preliminary experiment results: DNA amplicon particles which are not stopped by HEPA filters *(Fig. 2)* can result in constant contamination of cabinets volume.

Table 2. DNA amplicon inactivation efficiency in PCR cabinet UVC/T-M-AR, Biosan, Latvia

Table 4. Classification of sterile cabinets, based on protection against contamination

BioSafety cabinets	Protection against contamination forming units		
	Microorganisms	Viruses	DNA/RNA Amplicons
Class I	+	–	–
Class II (A1, A2, B1, B2)	+	–	–
Class III	+	–	–
BioSan PCR Cabinets	+ / –	+	+

Table 5. Relation of risk groups to biosafety levels, practices and equipment (source: Laboratory biosafety manual, Third edition)

Risk Group	Biosafety Level	Laboratory Type	Laboratory Practices	Safety Equipment
1	Basic — Biosafety Level 1	Basic teaching, research	GMT	None; open bench work
2	Basic — Biosafety Level 2	Primary health services; diagnostic services, research	GMT plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosols
3	Containment — Biosafety Level 3	Special diagnostic services, research	As Level 2 plus special clothing, controlled access, directional airflow	BSC and/or other primary devices for all activities
4	Maximum Containment — Biosafety Level 4	Dangerous pathogen units	As Level 3 plus airlock entry, shower exit, special waste disposal	Class III BSC or positive pressure suits in conjunction with Class II BSCs, double-ended autoclave (through the wall), filtered air

BSC, biological safety cabinet; GMT, good microbiological techniques

Table 6. Summary of biosafety level requirements (source: Laboratory biosafety manual, Third edition)

	Biosafety Level			
	1	2	3	4
Isolation [a] of laboratory	No	No	Yes	Yes
Room sealable for decontamination	No	No	Yes	Yes
Ventilation:				
— Inward airflow	No	Desirable	Yes	Yes
— Controlled ventilating system	No	Desirable	Yes	Yes
— HEPA-filtered air exhaust	No	No	Yes/No [b]	Yes
Double-door entry	No	No	Yes	Yes
Airlock	No	No	No	Yes
Airlock with shower	No	No	No	Yes
Anteroom	No	No	Yes	—
Anteroom with shower	No	No	Yes/No [c]	No
Effluent treatment	No	No	Yes/No [c]	Yes
Autoclave:				
— On site	No	Desirable	Yes	Yes
— In laboratory room	No	No	Desirable	Yes
— Double-ended	No	No	Desirable	Yes
Biological safety cabinets	No	Desirable	Yes	Yes
Personnel safety monitoring capability [d]	No	No	Desirable	Yes

[a] Environmental and functional isolation from general traffic.
[b] Dependent on location of exhaust (see Chapter 4 of Laboratory Biosafety Manual).
[c] Dependent on agent(s) used in the laboratory.
[d] For example, window, closed-circuit television, two-way communication.

Acknowledgement

We acknowledge BioSan for financial support and technical assistance, Anete Dudele for work done in the beginning of the research on microbial contamination in PCR cabinets.

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We acknowledge Paul Pergande for donating his time and expertise by reviewing this article.

References

1. K Linden, A Mofidi. 2004. Disinfection Efficiency and Dose Measurement of Polychromatic UV Light (1-6)
2. BioSan UV-air flow Cleaner-Recirculators test report (http://www.biosan.lv/eng/uploads/images/uvrm%20uvrmi%20article%20eng.pdf)
3. European Committee for Standardization (2000) European standard EN 12469: Biotechnology-Performance criteria for microbiological safety cabinets.
4. Web source: http://nobelprize.org
5. Web source: http://www.aircleaners.com/hepahistory.phtml
6. Web source: http://www.filt-air.com/Resources/Articles/hepa/hepa_filters.aspx#Characteristics
7. Web source: http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf
8. Laboratory biosafety manual, Third edition

UVR-M and UVR-Mi,

UV Air Recirculators Test Report

UVR-M and UVR-Mi, UV air recirculators Test Report

UV air recirculators UVR-M and UVR-Mi, produced by BioSan, are equipped with bactericidal UV lamps (Philips) and are used for air disinfection in research laboratories, hospitals and veterinary clinics.

To show the efficiency of UV air recirculators UVR-M and UVR-Mi, we examined UV intensity in Philips 25W bactericidal UV lamps and an impact of UV radiation on various types of microorganisms.

GENERAL INFORMATION

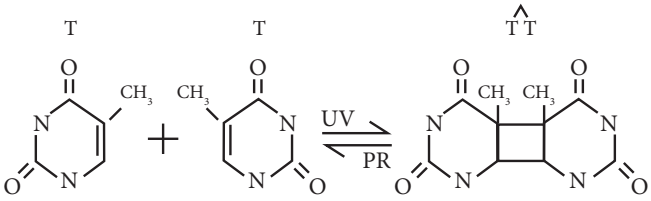
Biotechnomica®

BioSan
Medical–Biological Research & Technologies

Photochemical reaction

UV radiation affects the viability of microorganisms by causing photochemical reactions in the structure of DNA and RNA. Adjacent pyrimidine molecules form dimers and block the reproduction of bacteria, as a result, causing their death.

The diagram below shows the process of formation of pyrimidine dimers using thymine as an example *(source: http://www.photobiology.info)*.



Destruction of microorganisms using UV radiation

The UV intensity needed for the elimination of microorganisms, such as yeasts, bacteria and viruses was previously investigated and reported by UVP Inc. A table below shows an amount of germicidal, shortwave (254 nm) UV energy needed for complete destruction of certain microorganisms.

Table 1, Destruction chart of bacteria and various organisms (source: http://www.uvp.com/pdf/ab-115.pdf)

Bacteria organisms	Energy: mW seconds per cm²	Other microorganisms	Energy: mW seconds per cm²
Bacillus anthracis	8.7	**YEAST**	
S. enteritidis	7.6	Saccharomyces ellipsoideus	13.2
B. Megatherium sp. (veg.)	2.5	Saccharomyces sp.	17.6
B. Megatherium sp. (spores)	5.2	Saccharomyces cerevisiae	13.2
B. parathyphosus	6.1	Brewer's yeast	6.6
B. subtilis	11.0	Baker's yeast	8.8
B. subtilis spores	22.0	Common yeast cake	13.2
List continues on the next page ...		***List continues on the next page ...***	

Bacteria organisms	Energy: mW seconds per cm²
... List continued from the previous page	
Clostridium tetani	22.0
Corynebacterium diphtheriae	6.5
Eberthella typosa	4.1
Escherichia coli	6.6
Micrococcus cadidus	12.3
Micrococcus sphaeroides	15.4
Mycobacterium tuberculosis	1.0
Neisseria catarrhalis	8.5
Phytomonas tumefaciens	8.5
Proteus vulgaris	6.6
Pseudomonas aeruginosa	10.5
Pseudomonas fluorescens	6.6
S. typhimusium	15.2
Salmonella	10.0
Sarcina lutea	26.4
Sarratia marcescens	6.1
Dysentery bacilli	4.2
Shigella paradysenteriae	3.2
Spirillum rubrum	6.1
Staphylococcus albus	5.7
Staphylococcus aureus	6.6
Streptococcus hemolyticus	5.5
Streptococcus lactis	8.8
Streptococcus viridans	3.8

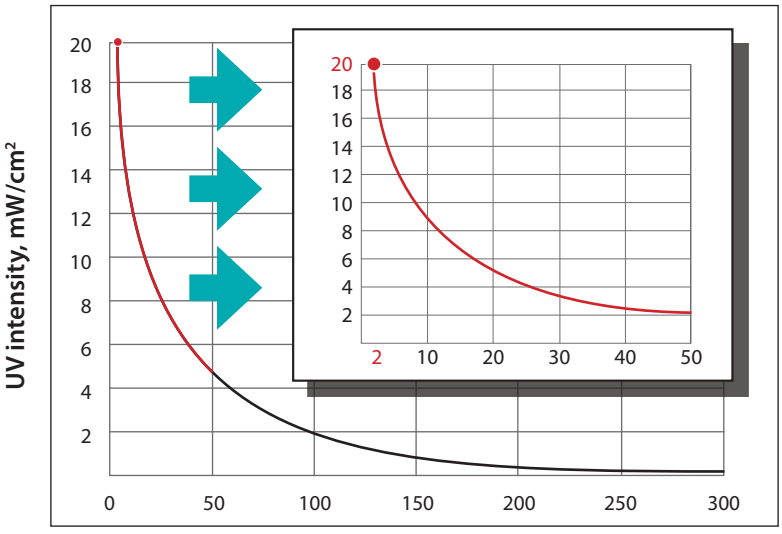
Other microorganisms	Energy: mW seconds per cm²
... List continued from the previous page	
MOLD SPORES	
Penicillium roqueforti	26.4
Penicillium expansum	22.0
Penicillium digitatum	88.0
Aspergillus glaucus	88.0
Aspergillus flavus	99.0
Aspergillus niger	330.0
Rhisopus nigricans	220.0
Mucor racemosus A	35.2
Mucor racemosus B	35.2
Oospora lactis	11.0
VIRUS	
Bacteriophage (E. coli)	6.6
Tobacco mosaic	44.0
Influenza	6.6
PROTOZOA	
Paramecium	200.0
Nematode eggs	92.0
Chlorella vulgaris (algae)	22.0

Results

UV Intensity measurements of Philips 25W bactericidal UV lamp

UV intensity depends on the distance from the UV source. The graph below shows that UV intensity drops dramatically as the distance increases.

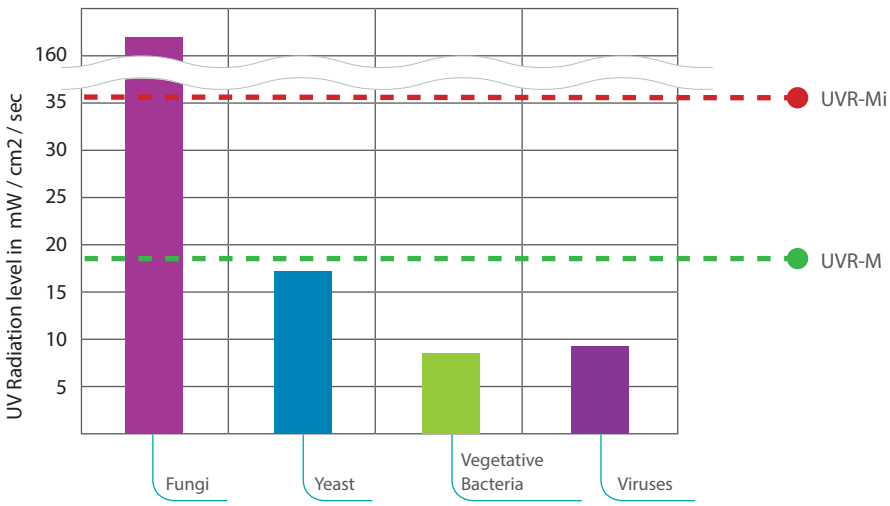
Dependence of UV intensity over distance to the UV source, one lamp 25 W



Distance, cm	UV intensity, mW/cm²
● 2	20.0
7	10.0
25	4.0
50	2.0
100	0.5
200	0.1
300	0.05

● — Distance from UV lamp to recirculator's walls

Sensitivity of microorganisms to UV radiation intensity in UV air recirculators UVR-M and UVR-Mi



Microorganism examples

Yeast

Saccharomyces cerevisiae

Brewer's yeast

Viruses

Bacteriophage *(E. coli)*

Influenza

Vegetative Bacteria

Clostridium tetani

Mycobacterium tuberculosis

Salmonella

Dysentery bacilli

Staphylococcus aureus

Streptococcus hemolyticus

BEFORE AFTER

how to choose
A PROPER SHAKER, ROCKER, VORTEX

biosan
Medical–Biological Research & Technologies

Sample volume 10^3 ... 10^2 ml
Erlenmeyer flask and Cultivation flask

PSU-20i, Orbital Shaker

ES-20/80, Orbital Shaker-Incubator

Applications:
- *Microbiology*
- *Extraction*
- *Cell cultivation*

PSU-10i, Orbital Shaker

ES-20, Orbital Shaker-Incubator

Applications:
- *Agglutination*
- *Gel staining/destaining*

MR-12, Rocker-Shaker

Sample volume 10^1 ml
Petri dishes, vacutainers and tubes up to 50 ml

Multi Bio RS-24, Programmable rotator

Multi RS-60, Programmable rotator

Bio RS-24, Mini-Rotator

Applications:
- *Microbiology*
- *Extraction*
- *Cell cultivation*
- *Hematology*

V-1 plus, Vortex

RTS-1 and RTS-1C, Personal bioreactor

MSV-3500, Multi Speed Vortex

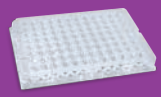
MR-1, Mini Rocker-Shaker

Multi Bio 3D, Mini Shaker

Applications:
- *Agglutination*
- *Extraction*
- *Blot hybridisation*
- *Gel staining/destaining*

Applications:
- *Nucleic acid Analysis*
- *Molecular Analysis*
- *Protein Analysis*
- *Genomic Analysis*

Sample volume 10^0 ... 10^{-3} ml
PCR plates, microtest plates and Eppendorf type tubes



PST-100HL, Thermo-Shaker

PST-60HL-4, Thermo-Shaker

TS-DW, Thermo-Shaker for deep well plates

PST-60HL, Thermo-Shaker

Applications:
- *ELISA Analysis*
- *Genomic Analysis*
- *Hybridization*
- *Immunology*

MPS-1, Multi Plate Shaker

PSU-2T, Mini-Shaker

CVP-2, Centrifuge vortex for PCR plates

TS-100, TS-100C, Thermo-Shakers

V-32, Multi-Vortex

MANUAL AND AUTOMATIC DNA/RNA EXTRACTION

STAGES:

Liquid Handling	Assist Series, Pipettes
Incubation	TS-100 or TS-100C
Sample resuspendation and droplet spin down	FVL-2400N
Sample preparation in UV–Cabinet for PCR	UVC/T-M-AR, or similar, see UV–Cabinet for PCR
Mixing and resuspendation	MPS-1
Centrifugation	Microspin 12
Vacuum aspiration	FTA-1 or FTA-2
Incubation	TDB-120
Reagents	Reagents for extraction*

OR

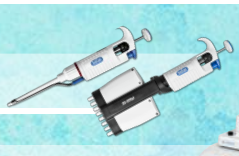
Liquid Handling	Assist Series, Pipettes
Incubation	TS-100 or TS-100C
Sample resuspendation and droplet spin down	FVL-2400N
Automatic extraction	BioMagPure 12 and reagents










* — Information about current offers on the products of other manufacturers are available in the corresponding sections of our site www.biosan.lv/en/products

MANUAL DNA/RNA EXTRACTION USING MAGNETIC BEADS TECHNOLOGY STAGES:

Sample resuspendation and droplet spin down	FVL-2400N
Sample preparation in UV–Cabinet for PCR	UVC/T-M-AR, or similar, see UV–Cabinets for PCR
Mixing and resuspendation	MPS-1, V-1 plus, Multi Bio RS-24
Capture of magnetic beads	MagSorb-16
Centrifugation	Microspin 12
Vacuum aspiration	FTA-1 or FTA-2i
Incubation	TDB-120, TS-100C
Reagents	Reagents for extraction*











* — Information about current offers on the products of other manufacturers are available in the corresponding sections of our site www.biosan.lv/en/products

PCR ANALYSIS
STAGES:

AND

- Sample resuspendation and droplet spin down — FVL-2400N (tubes) or CVP-2 (PCR-plates)

- Reagents — Reagents for amplification*

OR

- PCR–amplification — Thermocycler*

- End point fluorescence analysis of PCR — ALA-1/4

OR

- Electrophoresis — Electrophoretic systems*

OR

- PCR-amplification in real time — Real time PCR amplificator LineGene 9600 Plus

* — Information about current offers on the products of other manufacturers are available in the corresponding sections of our site www.biosan.lv/en/products

ENZYME-LINKED IMMUNOSORBENT ASSAY (ELISA)

STAGES:

Sample Preparation in laminar flow cabinet	Laminar flow cabinet	
Incubation	PST-60HL	 PST-60HL-4 
Washing (Automated)	IW-8 or 3D-IW8	 
Washing (Manual)	FTA-1 with MA-8	 or FTA-2i 
Reading and Analysis	HiPo MPP-96, Microplate Photometer with QuantAssay software	
Reagents	Reagents of ELISA*	

* — Information about current offers on the products of other manufacturers are available in the corresponding sections of our site www.biosan.lv/en/products

MICROBIAL CELL CULTIVATION

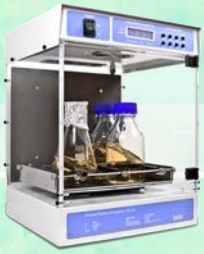
STAGES:

Sample Preparation in laminar flow cabinet

Laminar flow cabinet

Cultivation

ES-20



or ES-20/80

OR

Turbidity Measurement

DEN-1B or DEN-1

Cultivation and Real-time OD Measurements and Logging

RTS-1, RTS-1C