



## Welcome to Biosan Product Catalogue 2013–2014

Our mission is the development, production and supply of innovative modern safe and efficient laboratory equipment developed on the base of the uppermost advanced scientific and manufacturing technologies.

For more than 20 years Biosan has been a reliable partner for everyone who chooses innovative laboratory equipment for working in the fields of biomedical diagnostics, biotechnology and Life sciences. Biosan catalogue 2013–2014 presents devices for mixing, centrifugation, incubation, cultivation, PCR–cabinets for working with DNA/RNA molecules, devices, ensuring biosafety of laboratory staff, as well as the analytical equipment for DNA analysis, immunochemical analysis and cell biology. Additional information about the products can also be found on the website [www.biosan.lv](http://www.biosan.lv), for example the product videos that demonstrate functional characteristics of the equipment.

**Solutions for Sample Preparation.** Biosan Research&Development team is constantly focused on solving irreproducibility problems of experimental data that is usually caused by the complexity of biological material sample preparation. The lack of strict regulation in sample preparation determines the most errors during the reproduction of the method. Errors accumulate due to the decrease of the reactant's volume, the absence of intermediate temperature logistics of mixing, the lack of air decontamination systems in laboratories during the working process, and no regulations for cellular material storage. We offer new developments only after making sure they do bring the needed sample preparation solution.

**World of Biotechnomica.** In 2005 Biosan put forward the concept of the **World Biotechnomica** (see page 110) following which we are ready to offer you not only already known devices, but brand new unique equipment. The orbits of the **World Biotechnomica** were filled by the new satellites, such as **RTS-1** (see page 30), Reverse Spinner — real time cell growth logger — a device that will provide reproducibility of cell preparation for cryopreservation or obtaining the transformants at a given phase of cell growth. That will not only make the research process easier, but will also provide reproducible manipulations of complex biological structures, which are the cells of the micro- and macroorganisms. In addition to this innovation we have developed ultra efficient shaker, **MPS-1** (see page 14) designed for deepwell, PCR, microtest plates and tubes mixing. You can find, **CV-U** (see page 42) — Centrifuge-Vortex for PCR plates which was a long waited product on world market of life sciences. The expected product for the year 2014 is the temperature controlled Laminar Flow Cabinet BSC Class II, **TLC-S** (see page 93) that provides active and reproducible temperature shelf control during manipulation with cell cultures, as well as the comprehensive inactivation of amplicons by the UV lamps mounted inside laminar flow chamber.

**Customer Support.** Our team of highly skilled specialists provides prompt solutions in questions of product ordering, operation and maintenance. (We advise our customers on the stage of equipment ordering and pay attention to all requests and wishes). Company's professionals provide solutions to the problems occurring during operation and maintenance of equipment, as well as quickly and efficiently solve the issues of the warranty and post-warranty service. We always encourage our customers to visit our production department and complete the training for operation and maintenance of our products.

**Vision.** We are planning to continue constant development and improvement to be on the leading positions of fast emerging World of Biotechnomica. It allows us to open new opportunities and to enter new markets, thus staying in one line with the leading bioengineering companies in the European Union.

I will be happy if you are interested in Biosan products.

Thank you for the cooperation!

Vasily Bankovsky, Doctor of Biological Sciences, R&D director, Chairman of the Board at Biosan.



## Rockers, Shakers, Rotators

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**Rockers:** MR-1, MR-12

**Shakers:** 3D, Multi Bio 3D, PSU-10i, PSU-20i, MPS-1, PSU-2T

**Rotators:** Bio RS-24, Multi Bio RS-24, Multi RS-60

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**Thermostated Water Baths :** WB-4MS, T100, OLS 200, GLS Aqua Plus

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# Rockers, Shakers, Rotators



## MR-1, Mini Rocker-Shaker

Mini Rocker-Shaker MR-1 shaker provides reliable continuous operation and smooth platform motion at lower speed. Non-stop mode up to 7 days and over 2 years of trouble-free operation are guaranteed due to direct drive mechanism and brushless motor.

MR-1 provides regulated gentle rocking motion of the platform and mixing of liquid components.

It is a compact, noiseless device designed for personal use.

Ideal for minigel destaining after electrophoresis, conducting reactions of Northern, Southern and Western blots.

Non-slip rubber mat located on the shaker's platform provides stable position for vessels during shaking.

MR-1 can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### Specifications:

Mixing frequency range	5–30 oscill/min
Fixed tilt angle	7°
Max. continuous operation time	168 hrs
Direct drive mechanism	
Digital time setting	1 min–24 hrs / non-stop
Non-slip rubber mat is supplied as standard	
Maximum load	0.5 kg
Display	LED
Platform working area	200 × 200 mm
Overall dimensions (W × D × H)	220 × 205 × 120 mm
Weight	2.1 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
Warranted service life	24 months

### Accessories for the standard platform:

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

### Catalogue number:

MR-1 with standard platform Bio PP-4S	BS-010152-AAG
PDM	PDM

### MR-1 with Petri dishes



Rocking uni-rotation



Product video  
is available  
on the website

PDM, dimpled mat



MR-1 with PDM dimpled mat



## MR-12, Rocker-Shaker




  
 0–10°
   
 Rocking uni-rotation
   
 with adjustable tilt

**Upgraded**
  
 New Enclosure



**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).

Rocker-Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### Specifications:

Mixing frequency range	1–99 oscill/min (increment 1 oscill/min)
Tilt angle range (for 1–50 oscill/min)	0°–10° (increment 1°)
Fixed tilt angle (for 51–99 oscill/min)	10°
Digital time setting	1 min–99 hrs 59 min (increment 1 min) / non-stop
Display	LCD, 16 × 2 signs
Maximum continuous operation time	168 hrs
Maximum load	5 kg
Platform working area (Platform with non-slip rubber mat is included in standard set)	460 × 360 mm
Overall dimensions (W × D × H)	400 × 480 × 250 mm
Weight	11.6 kg
Input current/power consumption	12 V, 1.1 A / 13 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

### Catalogue number:

**MR-12** with standard platform PP-480

BS-010130-AAI

## 3D, "Sunflower" Mini-Shaker

"Sunflower" 3D Mini-Shaker provides adjustable three-dimensional smooth rotation of the platform. The platform is suitable for placing a versatile dimpled PDM mat for different size tubes.

The Mini-Shaker is a compact device with low energy consumption. Non-slip rubber mat (supplied with product) on the shaker platform provides stable position for vessels during shaking.

Use of direct drive and brushless motor allows continuous mixing during up to 7 days and guarantees reliable operation for more than 2 years.

The Mini-Shaker is designed for mixing blood samples, for minigel staining and destaining, sample washing, blot hybridization reaction.

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



Product video is available on the website



3D — uni-rotation

3D with a gel tank



### Specifications:

Speed control range	5–60 rpm
Fixed tilt angle	7°
Direct drive mechanism	
Max. continuous operation time	168 hrs
Maximum load	0.5 kg
Platform working area	200 × 200 mm
Overall dimensions (W × D × H) with platform installed	235 × 235 × 140 mm
Weight	1.2 kg
Input current/power consumption	12 V, 260 mA/3.1 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V
Warranted service life	24 months

### Accessories for the standard platform:

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

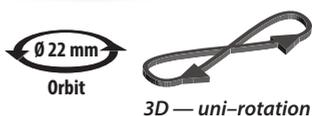
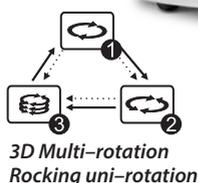
### Catalogue number:

3D with standard platform Bio PP-4S	BS-010151-AAG
PDM	PDM

PDM, dimpled mat



## Multi Bio 3D, Programmable 3D "Sunflower" Shaker



Product video is available  
on the website

Multi Bio 3D with PDM mat



PDM, dimpled mat



Programmable Shaker **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.

The **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.

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 rubber mat located on the shaker platform provides stable position for vessels during shaking.

Programmable shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### Specifications:

❶ Speed control range (Orbital and reciprocal motion)	1–100 rpm
❷ Turning angle (Reciprocal motion)	0°–360° (increment 30°)
❸ Rocking angle (Vibro motion)	0°–5° (increment 1°)
Fixed platform tilt angle	7°
Orbit	22 mm
Platform working area	200 × 200 mm
Non-slip rubber mat is supplied as standard	
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) with platform installed	235 × 235 × 140 mm
Weight	1.8 kg
Input current/power consumption	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

### Catalogue number:

<b>Multi Bio 3D</b> with stand. platform <b>Bio PP-4S</b>	BS-010125-AAG
<b>PDM</b>	PDM

## PSU-10i, Orbital Shaker

Orbital Shaker **PSU-10i** design incorporates a direct drive system, a brushless motor with guaranteed service life up to 35,000 hours and an automatic loading balancing system. These innovations make the new series of shakers even more reliable, especially for the long non-stop operation, and essentially expands the product performance range in both high and low limits.

The shaker is designed for application both in small specialised biotechnological laboratories and in large multidisciplinary laboratories: a choice of five interchangeable platforms provides the possibility of performing various procedures and techniques.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### Specifications:

Speed control range 50–450\* rpm (increment 10 rpm)  
\* max. speed depends on the load and vessels' shape

Digital speed control

Max. continuous operation time 168 hrs

Orbit 10 mm

Digital time setting 1 min–96 hrs / non-stop

Maximum load 3 kg

Overall dimensions (W×D×H) 220×205×90 mm

Weight 3.4 kg

Input current/power consumption 12 V, 800 mA/9.6 W

External power supply Input AC 100–240 V; 50/60 Hz;  
Output DC 12 V

### Catalogue number:

**PSU-10i** without platform BS-010144-AAN

**UP-12** BS-010108-AK

**Bio PP-4** BS-010116-AK

**P-6/250** BS-010108-DK

**P-12/100** BS-010108-EK

**P-16/88** BS-010116-BK



Product video is available on the website



Platform Bio PP-4



Platform P-6/250

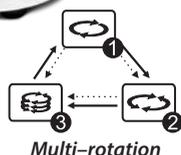


Platform Bio PP-4



Description and pictures of all platforms can be found on page 12

## PSU-20i, Multi-Functional Orbital Shaker



Platform PP-20/4



The shaker is designed for application both in small specialised laboratories and in large multidisciplinary laboratories: 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.

**PSU-20i** is an ideal instrument for different biopharmaceutical and biomedical profile laboratories.

Operation of the instrument is noiseless and reliable; the shaker can provide stable continuous mixing for up to 7 days thanks to a direct drive system and a brushless motor with service life up to 35,000 hours.

Shaker **PSU-20i** is a part of Biosan multi-functional device range. The shaker provides three motion types, which can be performed separately, pairwise and sequentially in repeated cycles. Description of the operation modes is shown in a table below.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### Specifications:

Speed control range 20–250\* rpm (increment 5 rpm)  
\* max. speed depends on the load and vessels' shape

Digital speed control

Max. continuous operation time 168 hrs

Orbit 20 mm

Digital time setting 1 min–96 hrs / non-stop  
(increment 1 min)

Maximum load 8 kg

Overall dimensions (W×D×H) 410×410×130 mm

Weight 11.7 kg

Input current/power consumption 12 V, 3.2 A / 40 W

External power supply Input AC 100–240 V; 50/60 Hz;  
Output DC 12 V

Motion types	Description	Speed range	Turning angle	Motion timer *	General operation timer (1 min step)
①  Orbital	Simple orbital motion with an option of shifting direction (clockwise/anticlockwise) after set time	20–250 rpm	—	0–250 sec	1 min–96 hrs
②  Reciprocal	Orbital motion with shifting direction of rotation	20–250 rpm	0°–360° (30° increment)	0–250 sec	1 min–96 hrs
③  Vibrating	High speed, low amplitude motion	—	0°–5° (1° increment)	0–5 sec	1 min–96 hrs

\* for switching to the next motion in the cycle

Description and pictures of all platforms can be found on page 13

### Catalogue number:

**PSU-20i** without platform BS-010145-ACI

Cat. numbers of all platforms can be found on page 13

## Platforms for PSU-10i and ES-20

Platform	Description	Dimensions	Working Area	Used on	Cat. Number
1 UP-12	Universal platform with adjustable bars for different types of flasks, bottles and beakers with non-slip rubber mat	285 × 220 × 40 mm	270 × 195 × 40 mm	PSU-10i, ES-20	BS-010108-AK
2 Bio PP-4	Flat platform with non-slip rubber mat for Petri dishes, culture flasks, agglutination cards	255 × 255 mm	230 × 230 mm	PSU-10i	BS-010116-AK
3 PP-4	Metallic flat platform with non-slip rubber mat	220 × 220 mm	215 × 215 mm	ES-20	BS-010108-BK
4 P-12/100 <b>U†</b>	Platform with clamps for flasks, 100–150 ml (12 places)	250 × 190 mm	250 × 190 mm	PSU-10i, ES-20	BS-010108-EK
5 P-6/250 <b>U†</b>	Platform with clamps for flasks, 250–300 ml (6 places)	250 × 190 mm	250 × 190 mm	PSU-10i, ES-20	BS-010108-DK
6 P-16/88	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	PSU-10i, ES-20	BS-010116-BK

1 UP-12



2 Bio PP-4



3 PP-4



4 P-12/100

**Upgraded**  
Holders with springs



5 P-6/250

**Upgraded**  
Holders with springs



6 P-16/88



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

Platform	Description	Dimensions	Working Area	Used on	Cat. number
1 UP-330	Universal platform with adjustable bars for different types of flasks, beakers	345 × 430 × 105 mm	300 × 400 × 80 mm	PSU-20i	BS-010145-AK
2 P-30/100 Ut	Platform with 30 clamps for 100 ml flasks	360 × 400 mm	360 × 400 mm	PSU-20i, ES-20/60	BS-010135-BK
3 P-16/250 Ut	Platform with 16 clamps for 250 ml flasks	360 × 400 mm	360 × 400 mm	PSU-20i, ES-20/60	BS-010135-CK
4 P-9/500 Ut	Platform with 9 clamps for 500 ml flasks	360 × 400 mm	360 × 400 mm	PSU-20i, ES-20/60	BS-010135-AK
5 P-6/1000	Platform with 6 clamps for 1000 ml flasks	360 × 400 mm	360 × 400 mm	PSU-20i, ES-20/60	BS-010135-DK
6 PP-400	Flat platform with non-slip silicone mat	360 × 400 mm	400 × 360 mm	ES-20/60	BS-010135-FK
A PP-20	One-level flat platform with non-slip rubber mat	480 × 380 mm	465 × 365 mm	PSU-20i	BS-010126-BK
B PP-20/2	Two-level flat platform with non-slip rubber mat	480 × 380 × 170 mm	465 × 365 × 170 mm	PSU-20i	BS-010126-CK
C PP-20/3	Three-level flat platform with non-slip rubber mat	480 × 380 × 340 mm	465 × 365 × 340 mm	PSU-20i	BS-010126-DK
D PP-20/4	Four-level flat platform with non-slip rubber mat	480 × 380 × 510 mm	465 × 365 × 510 mm	PSU-20i	BS-010126-EK

1 UP-330



5 P-6/1000



2 P-30/100

**Upgraded**

Holders with springs



6 PP-400



3 P-16/250

**Upgraded**

Holders with springs

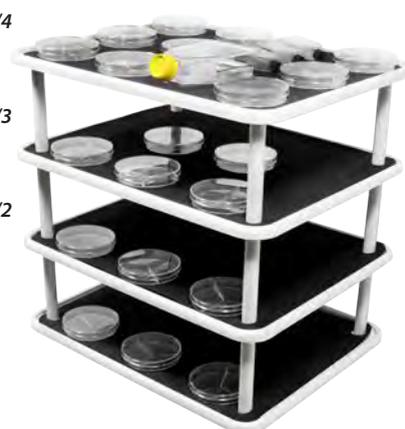


D PP-20/4

C PP-20/3

B PP-20/2

A PP-20



4 P-9/500

**Upgraded**

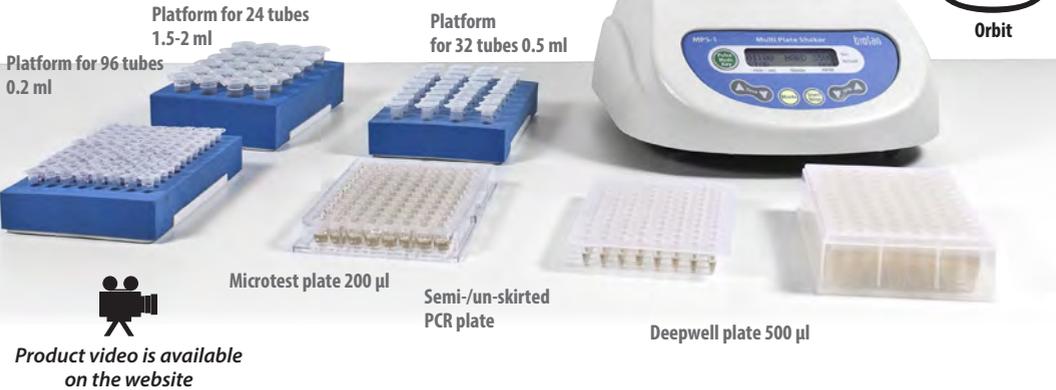
Holders with springs



## MPS-1, High-Speed Multi Plate Shaker

# Shaker for Various Applications

**New!**



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.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

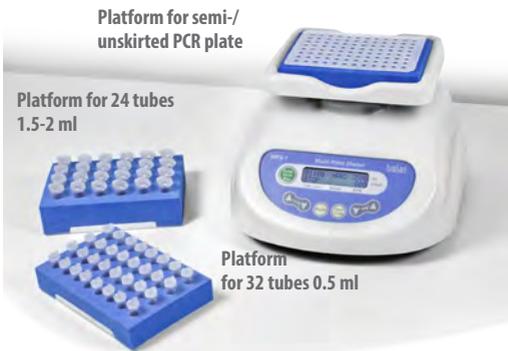
**MPS-1** features **Pulse Mode** mixing function that works on the principle of giving a periodic impulse: the tube is accelerated to the set speed, holds it for 3 seconds and then drops the speed to zero. This motion is repeated until the timer runs out. This method provides a constant state of resuspension 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
Smooth mixing with 3 mm orbit	
Mixing presets	
<b>Pulse Mode</b> mixing function	
Quiet operation — low noise at maximum speed	
High stability — stationary at maximum speed	
Universal platform holder for Deepwell plates and Microtest plates	
Additional platforms for semi- and unskirted PCR plates as well as for tubes from 0.2 to 2 ml	
Can be used in cold rooms or incubators (temperature range +4°C to +40°C)	

### Catalogue number:

<b>MPS-1</b>	BS-010216-A03
<b>P-02/96</b>	BS-010216-CK
<b>P-2/24</b>	BS-010216-AK
<b>P-05/32</b>	BS-010216-BK
<b>P-02/05</b>	BS-010216-DK



# MPS-1, High-Speed Multi Plate Shaker

## Specifications:

Mixing Speed control range	300–3,200 rpm (100 rpm increment)
Platform options	For microtest tubes for 0.2, 0.5, 1.5, 2 ml Microtest plate (U, V or flat-bottomed) or PCR plate (96-wells 150 µl, 384-wells, 45 µl, fully-/semi-/unskirted) or Deepwell plate (250, 500, 1000, 2000 µl)
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 <b>Pulse Mode</b> mixing function	
Features a Vortex function	
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

Vortexing a 50 ml tube



Vortexing a 15 ml tube



## Examples of possible applications

Deepwell plate  
1000 µl



Deepwell plate  
500 µl



Microtest plate  
200 µl



Platform for 24 tubes  
1.5-2 ml



Platform for  
32 tubes 0.5 ml



Platform for 96 tubes  
0.2 ml or semi-/  
unskirted PCR plate



# PSU-2T, Mini-Shaker for Immunology

Mini-Shaker **PSU-2T** provides reliable continuous operation and smooth platform motion at lower speed. Non-stop mode up to 7 days and over 2 years of trouble-free operation are guaranteed due to direct drive mechanism and brushless motor. Display switches between time and speed readings.

**PSU-2T** provides adjustable mixing of reagents in microtest plates. The shaker is a compact and user-friendly device; it occupies small space on a desk. The instrument is designed for immunoassay. The shaker is ideal for personal use.

Shaker can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### 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	
Warranted service life	24 months
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

### Platforms for microtest plates:

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

### Catalogue number:

<b>PSU-2T</b> with stand platform <b>IPP-2</b>	BS-010155-AAG
<b>IPP-4</b>	BS-010102-AK



Product video is available on the website

**A** Platform IPP-2



**B** Platform IPP-4



## Bio RS-24, Mini-Rotator for Vacutainers® and Tubes



Product video is available on the website

Bio RS-24 in operation



Vertical rotation 360°



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.

Rotator can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### 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
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

### Catalogue number:

<b>Bio RS-24</b> with standard platform PRS-22	BS-010133-AAG
<b>PRS-4/12</b>	BS-010117-AK
<b>PRSC-18</b>	BS-010117-EK

Platform	Capacity	Tube Volume	Tube Diameter Ø	Cat. number
❶ PRS-22 (standard)	22	1.5–15 ml	10–16 mm	BS-010117-FK
❷ PRS-4/12 (optional)	4 and 12	up to 50 and 1.5–15 ml	20–30 mm and 10–16 mm	BS-010117-AK
❸ PRSC-18 (optional)	18	15 ml	15–20 mm	BS-010117-EK

**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).

❶ PRS-22



❷ PRS-4/12



❸ PRSC-18



## Multi Bio RS-24, Programmable Rotator

Programmable Rotator **Multi Bio RS-24** performs several motion types in one module. Microprocessor control allows performing not only **1 Vertical rotation** of the platform, but also **2 Reciprocal rotation** as well as **3 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 Rotator 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.

Programmable Rotator can be used in cold rooms or incubators, operating at ambient temperature range +4°C to +40°C. Low voltage external power supply (12 V) provides electrical safety in humid environment.

### 1 Vertical rotation:

Speed control range	1–100 rpm (increment 1 rpm)
Vertical rotation movement	overhead, 360°
Time setting range	0–250 sec

### 2 Reciprocal rotation:

Speed control range	1–100 rpm (increment 1 rpm)
Tilt angle range	1°–90° (increment 1°)
Time setting range	0–250 sec

### 3 Vibro rotation:

Tilt angle range	0°–5° (increment 1°)
Pause / Vibro time setting range	0–5 sec

### General specifications:

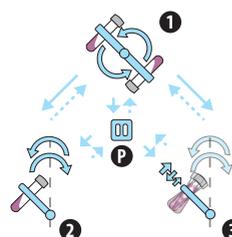
Digital time setting	1 min–24 hrs / non-stop (increment 1 min)
Maximum load	0.5 kg
Overall dimensions (W×D×H)	365 × 195 × 155 mm
Weight	1.8 kg
Input current/power consumption	12 V, 660 mA / 8 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

### Catalogue number:

<b>Multi Bio RS-24</b> with standard platform PRS-26	BS-010117-AAG
<b>PRS-5/12</b>	BS-010117-HK
<b>PRS-10</b>	BS-010117-IK
<b>PRSC-22</b>	BS-010117-LK
<b>PRSC-10</b>	BS-010117-JK
<b>PRS-1DP</b>	BS-010149-DK



Product video is available on the website



Programmable Rotator provides 3 rotation types and Pause

- 1 Vertical rotation
- 2 Reciprocal rotation
- 3 Vibro
- P Pause

Multi Bio RS-24 with standard platform PRS-26



Multi Bio RS-24 with optional platform PRSC-22

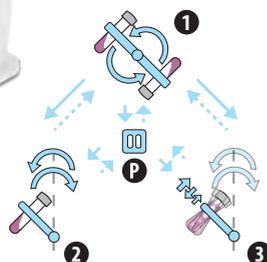


Description and pictures of all platforms can be found on page 20

## Multi RS-60, Programmable Rotator



Product video is available on the website



Programmable Rotator provides 3 rotation types and Pause

- ① Vertical rotation
- ② Reciprocal rotation
- ③ Vibro
- P Pause

Programmable Rotator **Multi RS-60** performs several motion types in one module. Microprocessor control allows performing not only ① **Vertical rotation** of the platform, but also ② **Reciprocal rotation** as well as ③ **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 Rotator 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.

### ① Vertical rotation:

Speed control range	1–100 rpm (increment 1 rpm)
Vertical rotation movement	overhead, 360°
Time setting range	0–250 sec

### ② Reciprocal rotation:

Speed control range	1–100 rpm (increment 1 rpm)
Tilt angle range	1°–90° (increment 1°)
Time setting range	0–250 sec

### ③ Vibro rotation:

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	0.8 kg
Overall dimensions (W×D×H)	430×230×230 mm
Weight	3.8 kg
Input current/power consumption	24 V, 750 mA / 18 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 24 V

Multi RS-60 with standard platform PRS-48



### Catalogue number:

<b>Multi RS-60</b> with standard platform PRS-48	BS-010118-AAI
<b>PRS-8/22</b>	BS-010118-AK
<b>PRS-14</b>	BS-010118-BK

Description and pictures of all platforms can be found on page 20

## Platforms for Multi Bio RS-24

Platform	Capacity	Tube Volume	Tube Diameter	Catalogue number
1 PRS-26 (standard)	26	1.5–15 ml	10–16 mm	BS-010117-GK
2 PRS-5/12 (optional)	5 and 12	up to 50 and 1.5–15 ml	20–30 and 10–16 mm	BS-010117-HK
3 PRS-10 (optional)	10	up to 50 ml	20–30 mm	BS-010117-IK
4 PRSC-22 (optional)	22	15 ml	15–20 mm	BS-010117-LK
5 PRSC-10 (optional)	10	50 ml	20–30 mm	BS-010117-JK
6 PRS-1DP (optional)	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 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

Platform	Capacity	Tube Volume	Tube Diameter	Catalogue number
1 PRS-48 (standard)	48	1.5–15 ml	10–16 mm	BS-010118-CK
2 PRS-8/22 (optional)	8 and 22	up to 50 and 1.5–15 ml	20–30 and 10–16 mm	BS-010118-AK
3 PRS-14 (optional)	14	up to 50 ml	20–30 mm	BS-010118-BK

1 PRS-48



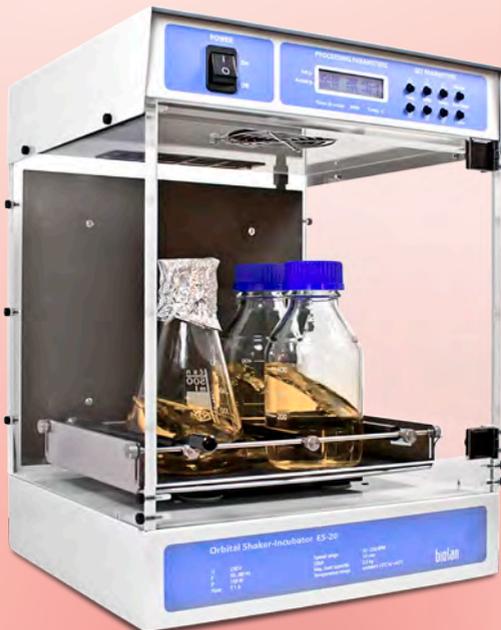
2 PRS-8/22



3 PRS-14



# Thermo-Shakers, Shakers-Incubators, Real Time Cell Growth Logger



## PST-60HL, PST-60HL-4 and PST-100HL Plate Thermo-Shakers

Plate Thermo-Shakers are designed for shaking and thermostating 1–4 standard 96-well microplates.

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.

### Plate Shaker–Thermostat provides:

Soft or intensive sample shaking

Rotation speed regulation, stabilization and indication

Even rotation amplitude throughout the Thermo-Shaker platform

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

### Application fields:

Cytochemistry — for in situ reactions

Immunochemistry — for immunofermentative reactions

Biochemistry — for enzyme and protein analysis

Molecular biology — for micro array analysis

### Catalogue number:

<b>PST-60HL</b>	BS-010119-AAI
<b>PST-60HL-4</b>	BS-010128-AAI
<b>PST-100HL</b>	BS-010142-AAI



PST-60HL



Product video is available on the website



PST-60HL-4



PST-100HL



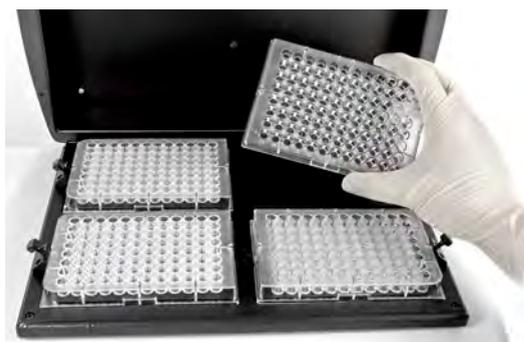
## PST-60HL, PST-60HL-4 and PST-100HL Plate Thermo-Shakers

Specifications	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	±0.25°C	±0.2°C
Double heating contour of the platform and heated lid			
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	210×290 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		

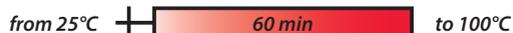
### Heat up time PST-60HL and PST-60HL-4



PST-60HL-4



### Heat up time PST-100HL



PST-60HL



## TS-100, Thermo-Shaker for Microtubes and PCR plates

Thermo-Shaker **TS-100** provides intensive mixing and temperature control of samples in microtest tubes or PCR plate. Functions of heating and mixing can be performed both simultaneously and independently, i.e. the unit implements three devices in one:

1. Shaker;
2. Dry-block Thermostat;
3. Thermo-Shaker.

**TS-100** is used for DNA analysis sample preparation, for extraction of proteins, polysaccharides, lipids and other cellular components.

Heating source is a printed heating board (12 V). Mixing is provided by movement of orbital type.

The instrument is applicable in:

- DNA analysis — DNA extraction;
- Biochemical study of enzymatic reactions and processes;
- Extraction of metabolites from cellular material.

### Specifications:

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 accuracy @ +37°C	±0.5°C
Average heating speed from +25°C to +100°C	4°C/min
Temperature uniformity over the block:	
@ +37°C	±0.1°C
@ +60°C	±0.2°C
@ +100°C	±0.2°C
Temperature calibration coefficient range	0.936...1.063 (± 0.063)
Speed control range	250–1,400 rpm
Acceleration time	3 sec
Orbit	2 mm
Microprocessor controlled temperature, mixing speed and operation time	
Display	LCD, 16 × 2 signs
Digital time setting	1 min–96 hrs (1 min increment)
Maximum continuous operation time	max. 96 hours
Overall dimensions (W × D × H)	205 × 230 × 130 mm
Weight	3.2 kg
Input current/power consumption	12 V, 3.5 A / 42 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

### Catalogue number:

**TS-100** without block BS-010120-AAI

Catalogue numbers and descriptions of all blocks can be found on page 26



Product video is available on the website



Mixing Efficiency Video is available on the website

### Heat up times for TS-100



### Temperature Calibration Function

With the help of the temperature calibration function the user can calibrate the unit approx. ±6% of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers.

### TS-100 with block SC-24



## TS-100C, Thermo-Shaker with Cooling for Microtubes and PCR plates

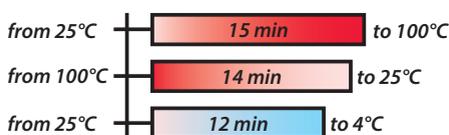


Product video is available on the website



Mixing Efficiency Video is available on the website

### Heat up and cool down times for TS-100C



### Temperature Calibration Function

With the help of the temperature calibration function the user can calibrate the unit approx.  $\pm 6\%$  of the selected temperature to compensate differences in the thermal behaviour of tubes from different manufacturers.

### TS-100C with block SC-96AC



### Catalogue number:

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

Catalogue numbers and descriptions of all blocks can be found on page 26

Thermo-Shaker **TS-100C** provides intensive mixing and temperature control of samples in microtest tubes or PCR plate. This model of Thermo-Shaker differs from TS-100 with a possibility of cooling samples down to  $+4^{\circ}\text{C}$ . Features of **TS-100C** meet the highest expectations of users according to many parameters:

1. Fast reaching of specified mixing speed and maintenance of equal amplitude of rotation throughout the Thermo-Shaker block;
2. Stability of maintaining the preset temperature in a wide range throughout the Thermo-Shaker's block surface;
3. LCD display indicates preset and current values of temperature, speed and time of operation;
4. Quiet motor operation, compact size, prolonged service life.

Functions of heating and mixing can be performed both simultaneously and independently

There are five heating and cooling blocks available, including a block with a plastic lid for the PCR-plates. All blocks are mutually interchangeable and can be easily installed on Thermo-Shaker. Pictures and description of the blocks are provided on the page 26.

The instrument is applicable in:

- Genetic analysis — in extraction of DNA, RNA and further sample preparation;
- Biochemical study of enzymatic reactions and processes;
- Extraction of metabolites from cellular material.

### Specifications:

Temperature setting range	$+4^{\circ}\text{C} \dots +100^{\circ}\text{C}$
Temperature control range	$15^{\circ}\text{C}$ below ambient... $+100^{\circ}\text{C}$
Temperature setting resolution	$0.1^{\circ}\text{C}$
Temperature stability	$\pm 0.1^{\circ}\text{C}$
Temperature accuracy @ $+37^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
Temperature uniformity over the block:	
@ $+4^{\circ}\text{C}$	$\pm 0.6^{\circ}\text{C}$
@ $+37^{\circ}\text{C}$	$\pm 0.1^{\circ}\text{C}$
@ $+100^{\circ}\text{C}$	$\pm 0.3^{\circ}\text{C}$
Average heating speed: from $+25^{\circ}\text{C}$ to $+100^{\circ}\text{C}$	$5^{\circ}\text{C}/\text{min}$
Average cooling speed: from $+100^{\circ}\text{C}$ to $+25^{\circ}\text{C}$	$5^{\circ}\text{C}/\text{min}$
from $+25^{\circ}\text{C}$ to $+4^{\circ}\text{C}$	$1.8^{\circ}\text{C}/\text{min}$
Temperature calibration coefficient range	$0.936 \dots 1.063 (\pm 0.063)$
Speed control range	$250 \text{--} 1,400 \text{ rpm}$
Acceleration time	3 sec
Orbit	2 mm
Display	LCD, $16 \times 2$ signs
Microprocessor controlled temperature, mixing speed and operation time	
Digital time setting	1 min–96 hrs (1 min increment)
Maximum continuous operation time	max. 96 hours
Overall dimensions (W×D×H)	$205 \times 230 \times 130 \text{ mm}$
Weight	3.7 kg
Input current/power consumption	12 V, 4.9 A / 60 W
External power supply	Input AC 100–240 V 50/60 Hz; Output DC 12 V

## Interchangeable Blocks for TS-100

Block	Capacity	Tube volume	Catalogue 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 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

Block	Capacity	Tube's volume	Catalogue 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 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



Cooling element  
(Peltier)



## TS-DW, Thermo-Shaker for Deep Well Plates



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

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

- Incubator;
- Plate shaker;
- Thermo-Shaker.

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

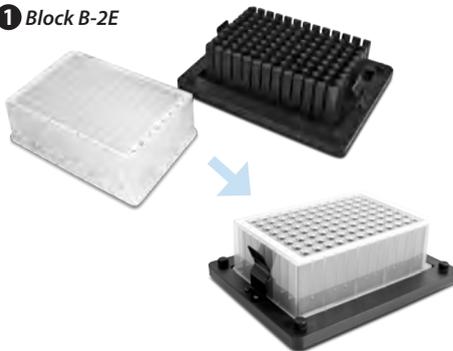
### Application fields:

- Cytochemistry — for in situ reactions
- Immunochemistry — for immunofерmentative reactions
- Biochemistry — for enzyme and protein analysis
- Molecular biology — for nucleic acid extraction

### 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
- 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

### 1 Block B-2E



**Separate blocks to accommodate different deepwell plates will be released during year 2014. For example:**

Deep Well Plates NUNC®	96/2000 µl
Deep Well Plates Axygen®	96/0.6 ml
Deep Well Plates Axygen®	96/2 ml
Deep Well Plates Eppendorf®	96/0.5 ml

Please, visit web-site or inquire for up-to-date information on availability and cat. numbers

### 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
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)	205 × 230 × 130 mm
Weight	3.2 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

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

### Catalogue number:

TS-DW without block BS-010143-AAI

Block	Type	Catalogue number
1 B-2E	Block for one deep-well plate Eppendorf® 96/1000 µl	BS-010159-AK

## ES-20, Orbital Shaker–Incubator

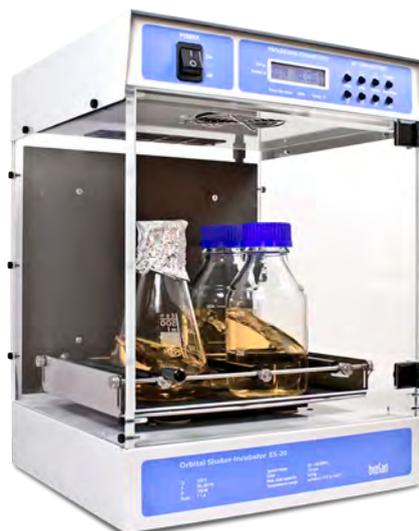
The **ES-20** is a compact bench–top Shaker–Incubator used for mixing of biological liquids as well as for incubation and cultivation of biological liquids according to the operator set program

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.

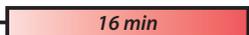
Orbital shaking is controlled by the digital tachometer (rpm) and Digital time setting regardless of the temperature. The unit is equipped with the direct–drive system ensuring most reliable stable long–time operation (up to 30 day nights).

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.

ES-20 with platform UP-12



Product video is available on the website

**Heat up time for ES-20**  
from 25°C +  to 42°C

ES-20 with platform P-6/250



### Specifications:

Temperature setting range	+25°C... + 42°C
Temperature control range	5°C above ambient... + 42°C
Setting resolution	0.1°C / 1 rpm
Temperature stability	±0.5°C
Speed control range	50–250 rpm
Orbit	10 mm
Display	LCD, 2 × 16 signs
Digital time setting	1 min–96 hrs / non–stop (increment 1 min)
Plexiglas walls thickness	7 mm
Load capacity	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
Voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Current/power consumption (230 / 120 V)	160 W (0.7 A) / 170 W (1.6 A)

### Five interchangeable platforms allow using the ES-20 for:

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

### Catalogue number:

**ES-20** without platform                      BS-010111-AAA

Description and pictures of all platforms can be found on page 12

## ES-20/60, Orbital Shaker–Incubator

ES-20/60 with platform PP-6/1000



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

from 25°C + 90 min to 80°C

ES-20/60 with platform PP-400



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. 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.

### Specifications:

Speed control range	50–250 rpm (increment 10 rpm)
Temperature setting range	+25°C... +80°C
Temperature control range	10°C above ambient... +80°C
Temperature setting resolution	0.1°C
Temperature stability	±0.5°C
Maximum load	8 kg
Orbit	20 mm
Digital time setting	1 min–96 hrs / non-stop (1 min increment)
Display	LCD, 2 × 16 signs
Maximum continuous operation time	30 days
Overall dimensions (W × D × H)	590 × 525 × 510 mm
Dimensions of the inner chamber	460 × 400 × 310 mm
Weight	41.1 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230 / 120V)	450 W (2 A) / 450 W (4.5 A)

### Catalogue number:

<b>ES-20/60</b> without platform	BS-010135-AAA
<b>PP-400</b>	BS-010135-FK
<b>P-30/100</b>	BS-010135-BK
<b>P-16/250</b>	BS-010135-CK
<b>P-9/500</b>	BS-010135-AK
<b>P-6/1000</b>	BS-010135-DK

Description and pictures of all platforms can be found on page 13

## RTS-1 and RTS-1C, Single-Use Mini-Bioreactors with Real Time Cell Growth Logging and Innovative Reverse-Spin® Mixing Technology

### Features:

- Innovative mixing due to reverse spinning of the sample around its own axis
- Due to innovative mixing technology it is possible to measure optical density of the probe in real time non-invasively
- Software has been developed to display, analyse and store the data in real time
- Reverse Tube Spinner is a compact device with low profile and small footprint for personal application
- Temperature control allows to use RTS-1 as an incubator, for example for cells growth
- The possibility of changing the parameters, such as temperature, revolution per minute and period of spinning in one direction allows to achieve consistent and repeatable results
- Cycling/profiling of cultivation parameters such as temperature, agitation, change of rotation direction upon reaching certain time or OD values
- The ability to remotely monitor the process of cultivation

### Specifications:

Measurement range	0–10 OD (0–25 OD $\lambda_{600\text{ nm}}$ equivalent)
Wavelength ( $\lambda$ )	850 nm
Measurement Precision	$\pm 3\%$
Light source	IR Light diode
Measurement periodicity per hour	1–60
Cultural media volume	5–30 ml
Type of tube for aerobic cultivation	50 ml TubeSpin® (TPP®)
Type of tube for anaerobic cultivation	50 ml Falcon®
Temperature setting range for RTS-1 (heating only)	+25°C ... 70°C
Temperature setting range for RTS-1C (with cooling)	+4°C ... +70°C
Temperature control range	5°C above ambient ... 70°C or 15°C below ambient ... +70°C respectively
Stability	$\pm 0.1^\circ\text{C}$
Speed control range	250–2,000 rpm
Max. number of units connected to the software	10
Display	LCD
PC system requirements	Intel/AMD Processor, 1 GB RAM, Windows XP/Vista/7/8, USB port
Overall dimensions (W×D×H)	130×212×200 mm
Weight	1.5 kg
Input current/power consumption	12 V DC, 3.3 A / 40 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 12 V
Type of tube for aerobic cultivation	50 ml tube with membrane filter (e.g. TubeSpin® Bioreactor 50, TPP®).
Type of tube for anaerobic cultivation	50 ml tube

**New!**



Product video is available on the website



Innovative Mixing Technology: Reverse-Spin®

**See the Reverse-Spin® Technology — Innovative Principle of Microbial Cultivation on page 112**



### Catalogue number:

**RTS-1 (with heating only)** BS-010158-A04

**RTS-1C (with cooling)** BS-010160-A04

### 50 ml tubes with membrane filter

(e.g. TubeSpin® Bioreactor 50, TPP®), 20 pcs./bag

BS-010158-AK

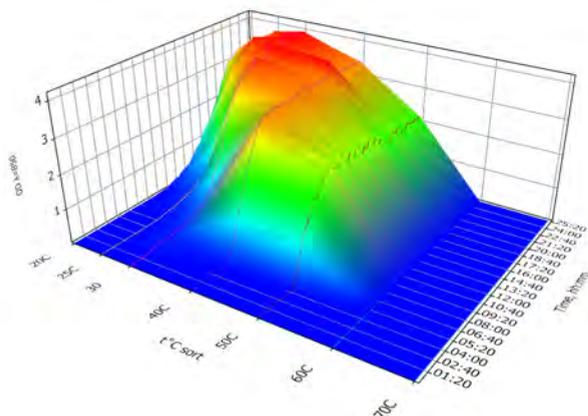
## RTS-1, Single-Use Mini-Bioreactor with Real Time Cell Growth Logging and Innovative Reverse-Spin® Mixing Technology

The dependence of the growth kinetics of *E. coli* BL21 at different temperatures in the 3D format. The experiment was conducted on 7 RTS-1 in parallel

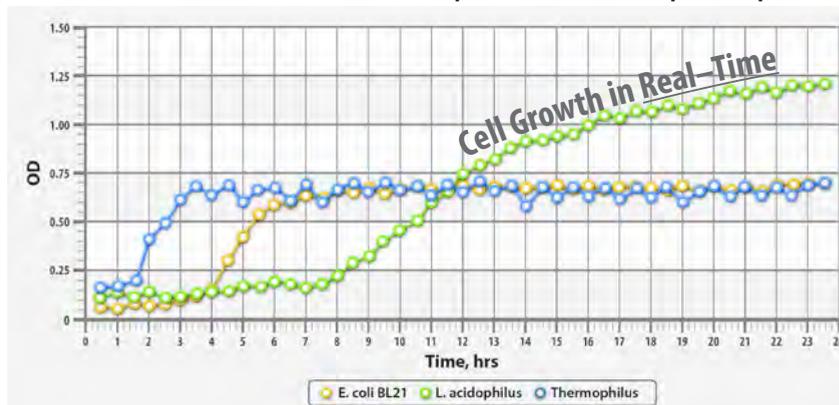


**Software features:**

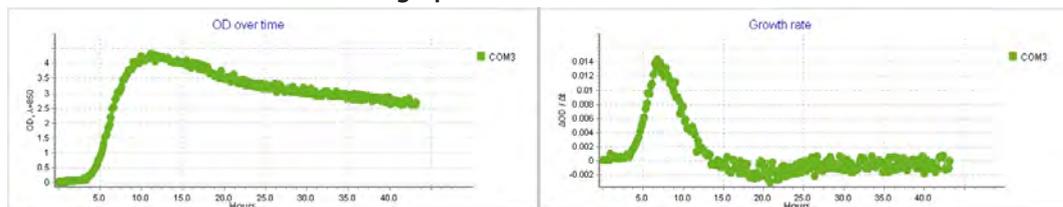
- Real-Time cell growth logging
- 3D graphical representation of OD or growth rate over time over unit
- Pause option
- Save/Load option
- Report option: PDF and Excel
- Connect up to 10 units simultaneously
- Remote monitoring option (requires internet connection)
- Cycling/Profiling options



### Growth Kinetics of *E. coli* BL21, *L. acidophilus* and *Thermophilus* sp.



### Growth Kinetics and Growth Rate graphs of *E. coli* BL21





# Vortexes



## V-1 plus, Personal Vortex for Tubes

Vortex **V-1 plus** is an ideal instrument for gentle mixing to vigorous resuspension of cells and biological and chemical liquid components in tubes using eccentric mechanism.

**Vortex has two modes:**

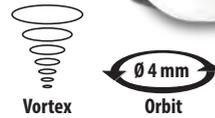
1. Continuous operation;
2. Impulse operation (activated by pressing the cap with the tube's bottom).

### Specifications:

Eccentric mixing principle	
Speed control range	750–3,000 rpm
Mixing module for tubes	from 0.2 to 50 ml
Maximum mixing volume	30 ml
Orbit	4 mm
Overall dimensions (W×D×H)	90×150×80 mm
Weight	0.8 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

### Catalogue number:

V-1 BS-010203-AAG



## V-32, Multi-Vortex for Tubes

Platform PV-32



Multi-Vortex **V-32** is intended for intensive stirring of bacterial and yeast cell, washing from the culture medium and extraction of metabolites and enzymes from cells and cell cultures.

It is different from V-1 by the possibility of mixing up to 32 tubes simultaneously.

**Vortex is applicable for:**

- Performing various DNA operations — deproteinisation of DNA/ protein complexes;
- Purification of low-molecular DNA/RNA fragments in PCR-diagnostic.

**Multi-Vortex has two operation modes:**

1. Continuous operation;
2. Impulse operation.

**V-32** is supplied with a 32-socket universal platform for Eppendorf type tubes up to 1.5 ml (1.5/0.5/0.2 ml — 16/8/8 sockets) and **PL-1** platform for mixing single tube up to 15 ml.

An optional 6-socket platform **PV-6/10** for 10 ml tubes (max. tube diameter 15 mm) can be supplied on request.

Platform PV-48



**Specifications:**

Speed control range	500–3,000 rpm
Acceleration time	3 sec
Orbit	2 mm
Continuous / impulse operation	
Maximum load	70 gr
Maximum continuous operation time	8 hrs
Dimensions	120×180×100 mm
Weight	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

**Catalogue number:**

<b>V-32</b> with standard platforms <b>PL-1</b> and <b>PV-32</b>	BS-010207-AAG
<b>PV-6/10</b> optional platform	BS-010207-BK
<b>PV-48</b> optional platform	BS-010207-GK

Platform PV-6/10



Platform PL-1



## MSV-3500, Multi Speed Vortex

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

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.

**MSV-3500**  
with platform **SV-8/15**



**MSV-3500** with platform **SV-4/30**



### Specifications:

Speed control range	300–3,500* rpm
	* Maximum speed depends on load
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

### Catalogue number:

**MSV-3500** with all 4 platforms BS-010210-TAH

**MSV-3500** without platform BS-010210-AAH

For separate platforms catalogue numbers see table below

## Interchangeable Platforms for MSV-3500

Platform	Description	Cat. Number
① <b>SV-16/8</b>	Platform for 16 × 1.5 ml + 8 × 0.5 ml + 8 × 0.2 ml microtubes, Ø 11/8/6 mm	BS-010210-CK
② <b>SV-10/10</b>	Platform for 10 × 10 ml tubes 12 mm diameter	BS-010210-BK
③ <b>SV-8/15</b>	Platform for 8 × 15 ml tubes 16 mm diameter	BS-010210-DK
④ <b>SV-4/30</b>	Platform for 4 × 50 ml tubes 30 mm diameter	BS-010210-AK

① **SV-16/8**



② **SV-10/10**



③ **SV-8/15**



④ **SV-4/30**



# Micro-Spins, Combi-Spins, Multi-Spins, Microcentrifuges, Centrifuges



## FV-2400 Micro-Spin, Mini-Centrifuge/Vortex

Mini-centrifuge/vortex Micro-Spin **FV-2400** is specially designed for genetic engineering research (for PCR-diagnostics experiments). Units can be used in microbiological, biochemical, clinical laboratories and industrial biotechnological laboratories.

Micro-Spin provides simultaneous mixing and separation of samples, using centrifuge and mixing modules, located on the common spin-module.

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



Specifications:		
Rotation speed (fixed)	2,800 rpm	3,500 rpm
Max. RCF	450×g	700×g
Continuous and impulse operation modes		
Overall dimensions (W×D×H)	120×170×120 mm	
Weight	1.4 kg	
Nominal operating voltage	120 or 230 V; 50 Hz	120 or 230 V; 60 Hz
Power consumption (120 / 230 V)	30 W (0.27 A) / 30 W (0.13 A)	30 W (0.27 A) / 25 W (0.1 A)

### Catalogue number:

**FV-2400** white BS-010201-AAA  
with standard rotor R-1.5M and R-0.5/0.2M

## Interchangeable Rotors for FV-2400

Platform	Description	Capacity	Type	Cat. Number
❶ R-0.5/0.2M	12 × 0.5 ml and 12 × 0.2 ml microtubes	24	Standard	BS-010201-BK
❷ R-1.5M	12 × 1.5 ml microtubes	12	Standard	BS-010201-AK
❸ R-2/0.5	8 × 2.0 ml and 8 × 0.5 ml microtubes	16	Optional	BS-010205-CK
❹ R-2/0.5/0.2	6 × 2.0 ml, 6 × 0.5 ml and 6 × 0.2 ml microtubes	18	Optional	BS-010205-DK
❺ SR-16	Two 8-section strips for 0.2 ml microtubes	16	Optional	BS-010202-AK
❻ SR-64	Eight 8-section strips for 0.2 ml microtubes	64	Optional	BS-010201-EK

❶ R-0.5/0.2M



❷ R-1.5M



❸ R-2/0.5



❹ R-2/0.5/0.2



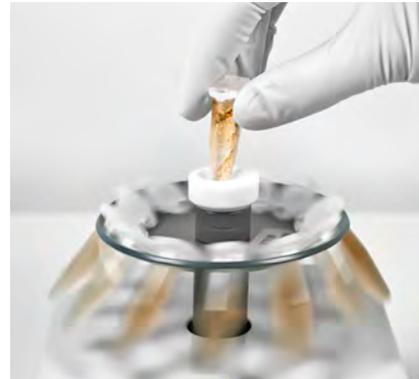
❺ SR-16



❻ SR-64



Tube vortexing on FV-2400



## FVL-2400N Combi-Spin, Mini-Centrifuge/Vortex



Product video is available  
on the website



Mini-centrifuge/vortex Combi-Spin **FVL-2400N** is specially designed for genetic engineering research (for PCR-diagnostics experiments). Units can be used in microbiological, biochemical, clinical laboratories and industrial biotechnological laboratories.

Combi-Spin provides simultaneous mixing and separation of samples, using centrifuge and mixing modules, located on the common spin-module.

**FVL-2400N** is provided with protection mechanism that stops the rotor motion when the lid is opened.

### Specifications:

Rotation speed (fixed)	2,800 rpm	3,500 rpm
Max. RCF	450 × g	700 × g
<b>Continuous and impulse operation modes</b>		
Safety	Stop at open lid	
Overall dimensions (W×D×H)	190×235×125 mm	
Weight	1.7 kg	
Nominal operating voltage	120 or 230 V; 50 Hz	120 or 230 V; 60 Hz
Power consumption (120 / 230 V)	30 W (0.27 A) / 30 W (0.13 A)	30 W (0.27 A) / 25 W (0.1 A)

### Catalogue number:

**FVL-2400N** with standard rotors  
R-1.5 and R-0.5/0.2

BS-010202-AAA

## Interchangeable Rotors for FVL-2400N

Platform	Description	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 ml microtubes	12	Standard	BS-010205-AK
③ R-2/0.5	8 × 2.0 ml and 8 × 0.5 ml microtubes	16	Optional	BS-010205-CK
④ R-2/0.5/0.2	6 × 2.0 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

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



## MSC-3000 and MSC-6000, Centrifuge/Vortex Multi-Spins

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  $800 \times g$   
**MSC-6000:** up to  $2,350 \times g$
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".



MSC-6000



MSC-3000



2 ×  Both product video is available on the website

### Comparison of FVL-2400N, MSC-3000 and MSC-6000

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



Specifications:	FVL-2400N	MSC-3000	MSC-6000
Speed control range max.	2,800 rpm	3,500 rpm	6,000 rpm
RCF max.	$700 \times g$	$800 \times g$	$2,350 \times g$
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	25 sec	15 sec
for 100 microtubes	60 min	15 min	10 min
Unit price ratio	1 ×	1.6 ×	1.7 ×

## MSC-3000 and MSC-6000, Centrifuge/Vortex 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

### Rotor R-1.5



#### Catalogue 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

### Interchangeable rotors for MSC-3000 and MSC-6000

Platform	Description	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 ml microtubes	12	Standard	BS-010205-AK
③ R-2/0.5	8 × 2.0 ml and 8 × 0.5 ml microtubes	16	Optional	BS-010205-CK
④ R-2/0.5/0.2	6 × 2.0 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

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



## CV-U, Centrifuge/Vortex for PCR plates and Microtubes

After many years of Combined Centrifuge/Vortex concept success, we are proud to introduce the long awaited Centrifuge/Vortex for PCR plates, **CV-U**, to the sample preparation market. Although the main use of the **CV-U** would be PCR plates — the application range is not limited to them: with the addition of different custom rotors any types of microtubes can be used.

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.

**CV-U** 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. **CV-U** is 4 devices combined in 1:

1. Centrifuge — Maximum RCF:  $500 \times g$  (2500 rpm)
2. Vortex (300–1,500 rpm; Vortexing regulation timer 0–60 sec)
3. Centrifuge/Vortex
4. SMS-cycler for realization of the "sms-algorithm"

### Specifications:

Speed regulation range in centrifuge mode	300–2,500 rpm ( $500 \times g$ )
Speed and vortex regulation range in centrifuge–vortex mode	300–1,500 rpm ( $200 \times g$ )
Setting resolution	100 rpm
Display	LCD, $64 \times 128$ pixels
Digital time setting for centrifuge	0–30 min (increment 1 sec ... 1 min)
Digital time setting for vortex	0–60 sec (increment 1 sec)
Number of cycles	1–999
Chamber diameter	210 mm
Overall dimensions (W×D×H)	285 × 350 × 190 mm
Weight	6.15 kg
Input current/power consumption	24 V, 1 A / 24 W
External power supply	Input AC 100–240 V 50/60 Hz, Output DC 24 V

**Special rotors can be ordered on request**

**For catalogue numbers and updates check the website: [www.biosan.lv](http://www.biosan.lv)**

**New!**



*Custom rotor for microtubes*



# High-speed Mini-centrifuge Microspin 12



Protection lid



Product video is available on the website

Built-in rotor MSR-12 and a protection lid



## 1 A-02 Adapters



## 2 A-05 Adapters



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

**Microspin 12** is used for extracting 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 rotor provides noiseless performance at the maximal speed and long service life. An angular rotor is designed for accommodation of 12 Eppendorf microtubes. 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 +25°C).

### Specification:

Speed control range	100–14,500 rpm (100 rpm increment)
Relative centrifugal force control range	50–12,400 × g
Digital time setting	1–30 min (increment 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

### Standard set:

Built-in rotor MSR-12 with protection lid	12 places for microtubes 1.5/2 ml
1 A-02 adapter	12 pieces for microtubes 0.2 ml
2 A-05 adapter	12 pieces for microtubes 0.5 ml

### Catalogue number:

<b>Microspin 12</b> with standard set	BS-010213-AA1
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## LMC-3000, Laboratory Centrifuge

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

### Features:

- Soft start and run-down of the rotor;
- User-friendly setting of centrifugation parameters (speed and time) 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;
- Wide choice of accessory rotors (see page 46).

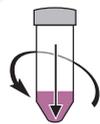
### Specifications:

Speed regulation range for centrifuge tubes	100–3,000 rpm (1,700×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)

### Catalogue number:

<b>LMC-3000</b> without rotors	BS-010208-AAA
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*Rotor R-12/15*



Product video is available on the website

*Rotor R-24GC*

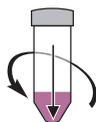


**Rotors description, pictures and catalogue numbers can be found on page 46**

## LMC-4200R, Laboratory Refrigerated Centrifuge



Product video is available on the website



Rotor R-12/10 and icy layer on the chamber walls



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

### Catalogue number:

LMC-4200R without rotors BS-010212-AAA

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 and tubes from 10 to 50 ml.

### Features:

- Effective way of acceleration and deceleration:  
Run-up time 15 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;
- Wide choice of accessory rotors (see page 46).

### 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 (3,370×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	635 × 580 × 335 mm
Weight	56 kg
Nominal operating voltage	230 V, 50 Hz
Power consumption (230 V)	990 W (4.3 A)

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



R-2, Swing-out rotor for standard 96-well microtitre plates



Rotor type	Swing-out
Dimensions (w × l)	128 × 85.6 mm
Max. height	up to 45 mm
Capacity	2
Max. speed	2,000 rpm
<i>Max. RCF:</i>	
<b>LMC-3000</b>	560 × g
<b>LMC-4200R</b>	560 × g
<i>Manufacturers:</i> Nunc, Greiner, Sarstead, Corning, Greiner Bio-one, etc.	
Catalogue number	BS-010208-AK



R-12/10, Swing-out rotor for round bottom centrifuge tube



Rotor type	Swing-out
Dimensions (Ø × length)	16 × 105 mm
Capacity	12
Tube's volume	10–15 ml
Max. speed	4,200 rpm
<i>Max. RCF:</i>	
<b>LMC-3000</b>	1,700 × g
<b>LMC-4200R</b>	3,370 × g
<i>Tube Manufacturers:</i> Nunc, Greiner, Greiner Bio-one, etc.	
Catalogue number	BS-010208-BK

Additional adapter sets* for R-12/10:	Description	Dimensions (Ø × length)	Catalogue number
BN-13/75	for vacutainers® 2–5 ml	13 × 75 mm	BS-010208-PK
BN-13/100	for vacutainers® 4–8 ml	13 × 100 mm	BS-010208-QK
BN-16/100	for vacutainers® 8–9 ml	16 × 100 mm	BS-010208-RK

\* — Set of 12 adapters, made of POM-C (polyacetal). Max temperature +100°C



R-12/15, Swing-out rotor for conical bottom centrifuge tube



Rotor type	Swing-out
Dimensions (Ø × length)	17 × 120 mm
Capacity	12
Tube volume	15 ml
Max. speed	4,200 rpm
<i>Max. RCF:</i>	
<b>LMC-3000</b>	1,700 × g
<b>LMC-4200R</b>	3,370 × g
<i>Tube Manufacturers:</i> Falcon, Greiner bio-one, Sarstead, Corning, Nunc, etc.	
Catalogue number	BS-010208-EK

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



Specifications:	Rotor R-6	Rotor R-6P
Tube holders material	Aluminium	POM Kocetal
Rotor type	Swing-out	
Dimensions (Ø × length)	29 × 115 mm	
Capacity	6	
Tube volume	50 ml	
Max. speed	4200 rpm	
Max. temperature	-	150 °C
Max. RCF: LMC-3000 LMC-4200R	1,700 × g 3,370 × g	
Tube Manufacturers:	Falcon, Greiner Bio-one, Sarstead, Corning, Nunc, etc.	
Catalogue number	BS-010208-DK	BS-010208-XK

**New!**



RR-U

**RR-U**, Rack for rotors

Catalogue number

BS-010208-UK



**R-24GC**, Rotor for Gel Cards

**R-24GC**, Rotor for Gel Cards for blood group serology testing (Forward Group, Reverse Group, RhD Type and 3 cell antibody screen)

Maximum speed 1,500 rpm

Centrifugation Time 9 minutes

Capacity 24 Gel Cards

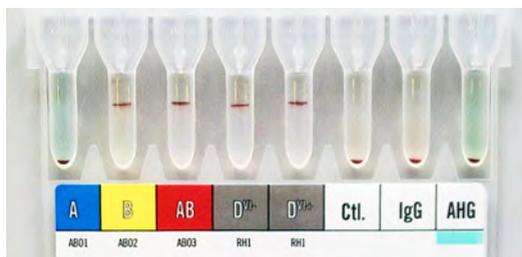
Dimensions of a gel card (l × w) 53 × 74 mm

Gel card Manufacturers:  
Grifols®, DiaMed®, etc.

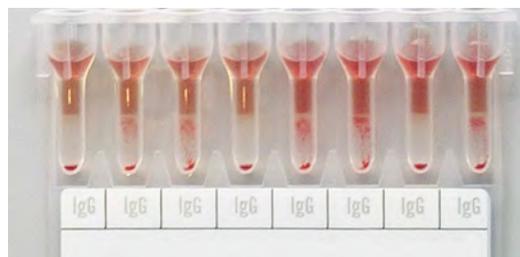
Rotor type Swing-out

Catalogue number BS-010208-VK

Results after 1,500 rpm spin for 9 minutes  
using Grifols® Lateral Gel Cards



Results after 1,500 rpm spin for 9 minutes  
using Grifols® Lateral Gel Cards





# Thermostats, Dry Block Heating/Cooling Systems



## Bio TDB-100, Dry Block Thermostat

**Bio TDB-100** is a compact easy-to-use dry block thermostat designed for long incubation processes at various temperatures. The universal aluminium block can accommodate 3 most popular microtest tubes' types.

Simultaneous indication of set and actual temperature and time.

### Specifications:

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
Digital time setting	1 min–96 hrs / non-stop (increment 1 min)
Display	LCD, 2 × 16 signs
Block diameter / depth	Ø 130 mm / 45 mm
Block capacity:	24 × 2/1.5 ml + 15 × 0.5 ml + 10 × 0.2 ml microtubes
Overall dimensions (W × D × H)	210 × 230 × 115 mm
Weight	2.8 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230 V)	200 W (870 mA)

### Catalogue number:

**Bio TDB-100** with built-in block BS-010412-AAA



### Heat up times for Bio TDB-100



# TDB-120, Dry Block Thermostat

TDB-120 with block A-103



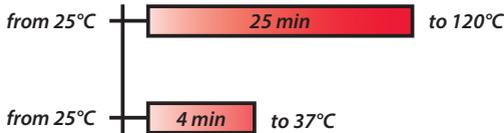
**TDB-120** is a traditional Biosan's dry block thermostat for laboratory analysis. Thermostat is designed for maintaining constant temperature of samples in tubes inserted in the aluminium block sockets. Unprecedented high precision and uniformity of temperature over the block. **TDB-120** is widely used for PCR-analysis.

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

### Specifications:

Temperature setting range	+25°C ... +120°C
Temperature control range	5°C above ambient ... +120°C
Temperature setting resolution	0.1°C
Temperature stability @ +37°C	±0.1°C
Temperature uniformity @ +37°C	±0.1°C
Display	LCD, 2 × 16 signs
Digital time setting	1 min–96 hrs (increment 1 min)
Overall dimensions (W×D×H)	230×210×110 mm
Weight	2.8 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz
Power consumption (230 V)	200 W (870 mA)

### Heat up times for TDB-120



### Blocks\* specifications:

Two models are available offering a choice of tube configurations to meet the needs of many standard laboratory procedures:

- 1 Block A-103 21 × 0.5 ml + 32 × 1.5 ml + 50 × 0.2 ml microtubes
- 2 Block A-53 21 × 0.5 ml + 32 × 1.5 ml microtubes

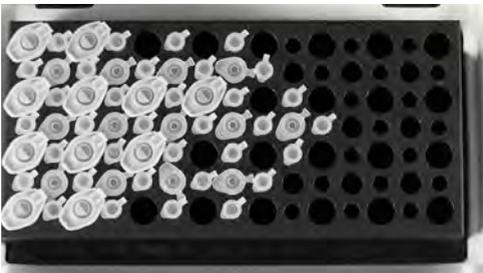
\* — the blocks are built-in

### Catalogue number:

TDB-120 with block A-103	BS-010401-QAA
TDB-120 with block A-53	BS-010401-PAA



1 Block A-103



2 Block A-53



## DB-10C, Dry Block Thermostat for Spectrocells

**DB-10C** Dry block thermostat is designed for sample thermostating in cuvettes before optical density measurements.

Together with any photometer **DB-10C** is the basic set for conducting biochemical indicators diagnostics methods (enzyme reaction intensity and metabolite concentration).

### Specifications:

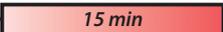
Temperature setting range	+25°C ... +42°C
Temperature control range	5°C above ambient ... +42°C
Temperature setting resolution	0.1°C
Temperature stability	±0.1°C
Temperature uniformity @ +37°C	±0.3°C
Digital time setting	1 min – 96 hrs / non-stop (increment 1 min)
Temperature display	LCD, 2 × 16 signs
Digital indication of temperature and time	
Number of sockets	10 cuvettes (10 mm optical pathway)
Overall dimensions (W×D×H)	140 × 120 × 70 mm
Weight	0.8 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

### Catalogue number:

<b>DB-10C</b>	BS-010417-AAG
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### Heat up time for DB-10C:

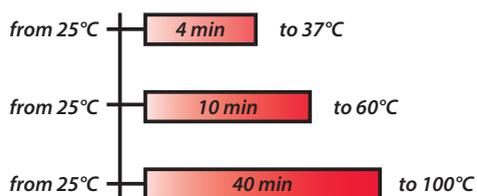
from 25°C +  to 42°C



## DB-4S, Dry Block Thermostat for Strips/Microtest Tubes



### Heat up time for DB-4S:



Thermostat **DB-4S** is designed for maintaining constant temperature of samples in tubes inserted in the aluminium block sockets. Unprecedented high precision and uniformity of temperature over the block. **DB-4S** is widely used for PCR-analysis.

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

### Specifications:

Temperature setting range	+25°C ... +100°C
Temperature control range	5°C above ambient ... +100°C
Temperature setting resolution	0.1°C
Temperature stability @ +37°C	±0.1°C
Temperature uniformity over the block:	
@ +37°C	±0.1°C
@ +60°C	±0.3°C
@ +100°C	±1.2°C
Digital time setting	1 min–96 hrs / non-stop (increment 1 min)
Display	LCD, 2 × 16 signs
Digital indication of temperature and time	
Number of sockets	0.2 ml × 32 tubes or 4 × 0.2 ml PCR strips
Overall dimensions (W × D × H)	140 × 120 × 70 mm
Weight	0.7 kg
Input current/power consumption	12 V, 850 mA / 10.2 W
External power supply	Input AC 100–240 V; 50/60 Hz; Output DC 12 V

### Catalogue number:

<b>DB-4S</b>	BS-010420-AAA
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## CH-100, Heating/Cooling Dry Block

**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.

### 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
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

### Blocks\* 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

\* — the blocks are built-in

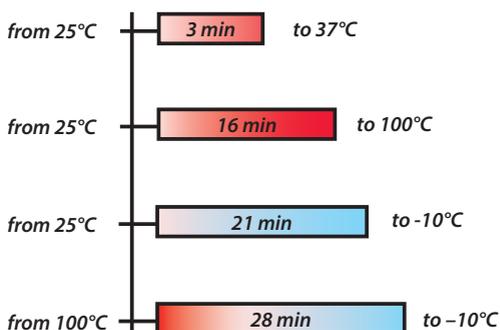
### Catalogue number:

<b>CH-100</b> with block CH-1	BS-010410-BAI
<b>CH-100</b> with block CH-2	BS-010410-CAI
<b>CH-100</b> with block CH-3	BS-010410-UAI

### Ice on block CH-2



### Heat up and cool down times for CH-100



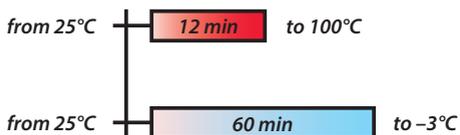
## CH3-150, Heating and cooling thermostat, Combitherm-2



Combitherm-2 **CH3-150** is specially designed to thermostabilise materials at temperatures from  $-3^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  according to methods of analysis. To obtain useful functionality and decrease foot-print of instruments Combitherm-2 consists of 2 independent cooling and heating plug-in 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  $+150^{\circ}\text{C}$ .

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

### Heat up and cool down times for CH3-150



### Interchangeable thermoblocks:

- |   |         |            |                     |
|---|---------|------------|---------------------|
| 1 | B2-50   | 2 sockets  | $\varnothing$ 50 mm |
| 2 | B10-16  | 10 sockets | $\varnothing$ 16 mm |
| 3 | B6-25   | 6 sockets  | $\varnothing$ 25 mm |
| 4 | B23-1.5 | 23 sockets | 1.5 ml microtubes   |

*Different block types can be provided on request*

#### 1 B2-50



#### 2 B10-16



#### 3 B6-25



#### 4 B23-1.5



### Heating block specifications:

Temperature setting range	$+25^{\circ}\text{C}$ ... $+150^{\circ}\text{C}$
Temperature control range	$5^{\circ}\text{C}$ above ambient ... $+150^{\circ}\text{C}$
Setting resolution	$1^{\circ}\text{C}$
Stability	$\pm 0.1^{\circ}\text{C}$

### Cooling block specifications:

Temperature setting range	$-3^{\circ}\text{C}$ ... $+20^{\circ}\text{C}$
Temperature control range	$23^{\circ}\text{C}$ below ambient ... $5^{\circ}\text{C}$ below ambient
Setting resolution	$0.1^{\circ}\text{C}$
Stability	$\pm 0.1^{\circ}\text{C}$

### 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)	$295 \times 285 \times 220$ mm
Weight, not more	6 kg
Heating power	500 W
Nominal operating voltage	230 V, 50/60 Hz
Power consumption	420 W (1.8 A)

### Catalogue number:

<b>CH 3-150</b> without blocks	BS-010418-AAA
<b>B2-50</b>	BS-010418-AK
<b>B10-16</b>	BS-010418-BK
<b>B6-25</b>	BS-010418-CK
<b>B23-1.5</b>	BS-010418-DK



# Thermostated Water Baths



## WB-4MS, Stirred Water Bath

Water bath-thermostat **WB-4MS** is designed for chemical, pharmaceutical, medical and biological laboratory research.

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

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

### 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)

### Catalogue number:

<b>WB-4MS</b> with base BP-1 and lid	BS-010406-AAA
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*WB-4MS with base BP-1 (on the bottom)*



*Платформа BP-1*



## T100, Stirred Thermostatic Baths and Heating Circulators

Equipment presented on pages 59-76 is produced by Grant Instruments (Cambridge) Ltd. Biosan is a sole distributor of Grant Instruments products in Russia, CIS and the Baltic States (Latvia, Lithuania, Estonia) and an official distributor for a number of other regions.

More information about offered Grant Instruments products can be found on Biosan web-site [www.biosan.lv](http://www.biosan.lv)

T100-ST5

**New!**



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 stirred baths and circulators easy
- Robust, durable construction — for longevity, reliability and long-term low cost of ownership

### 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.

T100-ST12



### Specifications\*:

Cooling**/heating range	
T100-P5	amb. +15 ... 99°C
T100-P12	+5 ... 99°C
T100-ST5	+15 ... 100°C
T100-ST12	0 ... 100°C
Stability @ 70°C	±0.05°C
Uniformity @ 70°C	±0.1°C
Setting resolution	±0.1°C
Tank volume	5 or 12 litres
Display	4 digit LED
No. of pre-set temperatures	3
Recalibration points	2
Safety overtemperature	fixed
Heater power (230 V)	1.3 kW
Height above tank rim	200 mm
Depth below tank rim	135 mm

\* — for T100 + 5/12 litres plastic/stainless steel bath (other thermostats and water bath combinations available, see page 71)

\*\* — operation below ambient temperature requires accessory cooling C1G **A**

**A** Accessory cooler, C1G



### Catalogue number:

T100-P5 (plastic, 5 litres)	T100-P5 EURO
T100-ST5 (stainless steel, 5 litres)	T100-ST5 EURO
T100-P12 (plastic, 12 litres)	T100-P12 EURO
T100-ST12 (stainless steel, 12 litres)	T100-ST12 EURO

**All available accessories can be found on page 60**

## Accessories for T100 with 5/12 Litres Steel/Plastic Tanks

Accessories						
	<b>Lids</b> to help reduce evaporation/ heat loss and avoid sample contamination	<b>Rack systems</b> to optimise use of available bath capacity (no. of racks accommodated)	<b>Raised shelves</b> to allow shallow vessels to be accommodated	<b>Accessory cooling systems</b> 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		
				<b>Refrigerated immersion coolers</b> Consist of a cooling coil connected to a refrigeration unit by a flexible pipe. Extract heat continuously, with the bath control unit controlling temperature	<b>Heat exchange coil</b> 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)
<b>ST5 – 5 L</b> stainless steel 3 kg h: 200 mm l: 330 mm w: 180 mm 	<b>STL5</b> flat stainless steel 	<b>1 x QR</b> 	-		-	
<b>ST12 – 12 L</b> stainless steel 4.5 kg h: 200 mm l: 360 mm w: 330 mm 	<b>STL12</b> gabled, hinged (removable) stainless steel 	<b>2 x VR</b> 	<b>RS14</b> 		-	
<b>P5 – 5 L</b> plastic 3.5 kg h: 180 mm l: 415 mm w: 350 mm 	<b>PL5</b> flat, stainless steel 	<b>1 x QR</b> 	-	-	-	-
<b>P12 – 12 L</b> plastic 5 kg h: 180 mm l: 600 mm w: 365 mm 	<b>PL12</b> curved plastic 	<b>2 x VR</b> 	<b>RS14</b> 	-	-	-

VR Racks	Tube size Ø	Capacity	J2 Racks	Tube size Ø	Capacity
VR-13	10-13 mm	65	QR-13	10-13 mm	30
VR-19	16-19 mm	36	QR-19	16-19 mm	16
VR-24	24 mm	23	QR-24	24 mm	10
VR-30	30 mm	14	QR-30	30 mm	5
VR-SE	0.5 ml	102	QR-SE	0.5 ml	44
VR-LE	1.5 ml	75	QR-LE	1.5 ml	35

## Combined Orbital/Linear Shaking Bath OLS200



The Grant **OLS200** orbital/linear shaking bath combines Grant's high precision temperature control with a robust high quality shaking mechanism that works smoothly and consistently in demanding laboratory applications.

High quality, robust design with unique magnetically coupled shaking mechanism for maximum reliability, consistency and quiet operation.

Combined linear/orbital shaking bath for supreme flexibility.

Wide range of accessories to provide exactly the right solution for your application.



Lid

Accessory cooler, CS200G



### Specifications:

Temperature range	0°C* ... 99°C (increment 0.1°C)
* Accessory cooling required for operation below ambient	
Minimum working volume	9 litres
Stability	±0.1°C
Uniformity	±0.1°C
Temperature setting/display	digital/LED
Display resolution	0.1°C
Shaking Speed control range:	
Orbital	20–200 rpm
Linear	40–360* strokes/min
	* depending on load
Linear — Stroke length	18, 28, 36 mm
Orbital — orbit radius	9 mm
Display resolution	1 rpm
Flask immersion (min / max)	0 / 90 mm
Shaking tray area (W×D)	375×235 mm
Overall dimensions (W×D×H)	555×325×300 mm
Safety	Overtemperature adjustable cut-out
Weight	15 kg
Voltage	230 VAC
Overall power consumption	1.5 kW

### Catalogue number:

OLS200 includes polycarbonate gabled lid, OLS200 EURO  
an accessory tray is required see page 63

Description and pictures of all available accessories can be found on page 63

## Linear shaking bath — GLS Aqua Plus series

Grant quality and design combined with the temperature stability and functions you need in a linear shaking bath for your laboratory. The baths now share the same stylish, modern looks associated with the Grant Aqua Plus range.

### Features:

- Ambient + 5°C to 99°C operation
- Digital PID control for quick heat-up and precision control throughout the temperature range
- Stability  $\pm 0.1^\circ\text{C}$
- Programmable temperature and shaking presets
- User-settable sample protection and fixed thermal cut-out
- Choice of two models — 12 and 18 litre
- Front panel lock-out
- 3-year warranty

### Specifications:

Minimum working volume	5 litres (GLS Aqua12 Plus) 8 litres (GLS Aqua18 Plus)
Temperature range	ambient +5 to 99°C
Stability @ 37°C	$\pm 0.1$
Uniformity @ 37°C	$\pm 0.1$
Temperature setting / display	digital / 3-digit LED
Display resolution	0.1°C
Linear — Shaking Speed control range	40–400* strokes/min * depending on load

Linear — Stroke length	18 mm
Display resolution	1 strokes/min

<b>GLS Aqua 12 Plus</b>	
Shaking tray area (W×D)	240×235 mm
Overall dimensions (W×D×H)	335×390×270 mm

<b>GLS Aqua 18 Plus</b>	
Shaking tray area (W×D)	420×235 mm
Overall dimensions (W×D×H)	335×570×270 mm

Flask immersion, min/max	0/60 mm
Overall consumption	0.8 kW
Safety	Overtemperature adjustable cut out
Electrical supply	230 V, or 120 V
CSA approved	yes

### Catalogue number:

GLS Aqua 12 Plus includes polycarbonate gabled lid, an accessory tray is required	GLS AQUA 12 PLUS EURO <i>see page 63</i>
GLS Aqua 18 Plus includes polycarbonate gabled lid, an accessory tray is required	GLS AQUA 18 PLUS EURO <i>see page 63</i>

GLS Aqua 12 Plus



Product video is available on the website

GLS Aqua 18 Plus



Description and pictures of all available accessories can be found on page 63

## Accessories for Linear Shaking Baths: GLS Aqua Plus series and OLS200

Shaking water baths — summary of accessories		Catalogue number		
		Orbital/ linear shaking bath	Linear shaking baths	
Accessory	Picture	OLS200	GLS Aqua12 Plus	GLS Aqua18 Plus
<b>Replacement polycarbonate lids, blue</b>		AQL26*	AQL12	AQL26
<b>Stainless steel sloping lid (optional)</b>		LS200	LU14	LU28
<b>Universal tray - with springs</b> Designed for ultimate versatility as to the types and sizes of vessel which can be accommodated. Adjustable spring configuration for maximum flask capacity		UT200	UT12	UT18
<b>Plain tray</b> Will accommodate containers, bags and miscellaneous vessels		UTP	UTP12	UTP18
<b>Test tube tray</b> Compatible with H1 Test tube racks		TT200	TT12	TT18
<b>Test tube racks</b> Choice of 7 variants to accommodate different tube diameters and microtubes		H1** (Holds up to 5 H1 racks)	H1** (Holds up to 3 H1 racks)	H1** (Holds up to 5 H1 racks)
<b>Base trays</b>		–	SBT14	SBT28
<b>Immersion cooler</b> Accessory cooling is required for operation around or below room temperature		CS200G	–	–
<b>Heat exchange coil</b> Fits underneath the shaking tray and is designed to be attached to a supply of cooling tap water or a refrigerated circulator. Can be used down to 2°C above the temperature of the coolant.		CW200	–	–

\* AQL26 for OLS200 not suitable if using cooling coil/chiller

\*\*H1 rack options;

Catalogue number	Capacity
H1-10	48 × 10mm tubes Ø 10mm
H1-13	44 × 13mm tubes Ø 13mm
H1-16	24 × 16mm tubes Ø 16mm
H1-19	21 × 19mm tubes Ø 19mm
H1-25	12 × 25mm tubes Ø 25mm
H1-30	10 × 30mm tubes Ø 30mm
H1-LE	48 × 1.5ml microtubes



# Grant Instruments Heating/Cooling Circulators, Dry-block Thermostats

**Grant**



## 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 Nova** - general purpose water bath range with a choice of 4 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.



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



Biosan is a sole distributor of Grant Instruments products in Russia, CIS and the Baltic States (Latvia, Lithuania, Estonia) and an official distributor for a number of other regions.

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 page 67–68 and Biosan web-site [www.biosan.lv](http://www.biosan.lv)

## SUB Aqua Pro Digital Unstirred Water Bath



In Russia, CIS and Baltic countries (Latvia, Lithuania, Estonia) this type of water bath will be available under Biosan-Grant WB-Plus label\*

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  $\pm 0.2^\circ$
- Adjustable over temperature alarm - protect samples from over heating
- Advanced dry start and run dry protection
- Three programmable temperature presets
- 3 year warranty

Specifications	SUB Aqua Pro digital unstirred water bath range – summary of specifications								
	SAP2S	SAP2	SAP5	SAP12	SAP18	SAP26	SAP34	SAPD	
	*WB2S PLUS	*WB2 PLUS	*WB5 PLUS	*WB12 PLUS	*WB18 PLUS	*WB26 PLUS	*WB34 PLUS	*WB DUAL PLUS	
									
	3 kg l: 215 mm w: 335 mm h: 150 mm	3 kg l: 200 mm w: 185 mm h: 200 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: 590 mm 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 (shallow)		2 L	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	$\pm 0.2^\circ\text{C}$								
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 mins								
Working volume w/l/h mm	289 × 139 × 47	131 × 117 × 132	281 × 131 × 132	306 × 281 × 132	281 × 485 × 132	278 × 481 × 182	281 × 635 × 180	281 × 131 × 132 + 306 × 281 × 132	
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								
	CE and CSA approved								

## SUB Aqua Pro Digital Unstirred Water Bath

Options and accessories							
SAP2	SAP2S	SAP5	SAP12	SAP18	SAP26	SAP34	SAPD
2 L	2 L	5 L	12 L	18 L	26 L	36 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 и 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

## Optima™ Series, Stirred Thermostatic Baths and Heating Circulators

TX150-ST26



TXF200-ST38



T100-ST5



TX150-ST18



TC120-ST12



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 stirred 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 Grant for advice.

### Model selection (see page 70):

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.

T100-P5



T100-P12 with lid



Heating Circulators Specifications on page 71 and all available accessories on page 72

# Optima™ Series, Heating Circulators Specifications

T100



TC120



TX150



TXF200



Grant Optima™ Heating Circulators Specifications		General purpose Digital		Digital High Performance	
		T100	TC120	TX150	TXF200
Stability (DIN 12876) @ 70°C	°C	± 0.05°C	± 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 9,999 mins	1 min to 99 hrs 59 mins	
No. preset temperatures		3	3	3	3
Two point re-calibration		+	+	+	+
Offset adjustment		–	–	+	+
Socket for external probe (TXPEP, TXSEP)		–	–	+	+
Communication interface		–	–	USB & RS232	USB & RS232
Programmable		–	–	remote via PC 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 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
<b>Grant Optima™ thermostat pumps (integral)</b>					
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			
<b>Catalogue numbers</b>		<b>T100 EURO</b>	<b>TC120 EURO</b>	<b>TX150 EURO</b>	<b>TXF200 EURO</b>

## Optima™ Series, Water Bath Combinations and Accessories

Capacity (L) Outer tank dimensions	<ul style="list-style-type: none"> <li>• Working area (L × W)</li> <li>• Min/max liquid depths</li> <li>• Inner tank dimensions (L × W × H)</li> <li>• Overall dimensions incl. controller (L × W × H)</li> </ul>	T100 Temperature setting range	TC120 Temperature setting range	TX150 Temperature setting range	TXF200 Temperature setting range
ST5 – 5 L stainless steel h: 175 mm d: 325 mm w: 175 mm Cat.num.: STL5	<ul style="list-style-type: none"> <li>• 150 × 150 mm</li> <li>• 80/140 mm</li> <li>• 300 × 150 × 150 mm</li> <li>• 325 × 175 × 355 mm</li> </ul>	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 h: 175 mm d: 350 mm w: 325 mm Cat.num.: STL12	<ul style="list-style-type: none"> <li>• 210 × 300 mm</li> <li>• 80/140 mm</li> <li>• 325 × 300 × 150 mm</li> <li>• 350 × 325 × 355 mm</li> </ul>	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 h: 225 mm d: 530 mm w: 325 mm Cat.num.: STL18	<ul style="list-style-type: none"> <li>• 390 × 300 mm</li> <li>• 70/30 mm</li> <li>• 505 × 300 × 150 mm</li> <li>• 530 × 325 × 405 mm</li> </ul>	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 h: 225 mm d: 530 mm w: 325 mm Cat.num.: STL26	<ul style="list-style-type: none"> <li>• 390 × 300 mm</li> <li>• 120/180 mm</li> <li>• 505 × 300 × 200 mm</li> <li>• 530 × 325 × 405 mm</li> </ul>	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 h: 225 mm d: 730 mm w: 325 mm Cat.num.: STL38	<ul style="list-style-type: none"> <li>• 580 × 300 mm</li> <li>• 120/180 mm</li> <li>• 690 × 300 × 200 mm</li> <li>• 720 × 325 × 405 mm</li> </ul>	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 h: 180 mm d: 240 mm w: 330 mm Cat.num.: PL5	<ul style="list-style-type: none"> <li>• 120 × 150 mm</li> <li>• 80/140 mm</li> <li>• 240 × 160 × 150 mm</li> <li>• 390 × 200 × 360 mm</li> </ul>	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 h: 180 mm d: 415 mm w: 350 mm Cat.num.: PL12	<ul style="list-style-type: none"> <li>• 210 × 280 mm</li> <li>• 80/140 mm</li> <li>• 325 × 280 × 150 mm</li> <li>• 415 × 350 × 360 mm</li> </ul>	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 h: 180 mm d: 600 mm w: 365 mm Cat.num.: PL18	<ul style="list-style-type: none"> <li>• 280 × 325 mm</li> <li>• 80/140 mm</li> <li>• 510 × 290 × 150 mm</li> <li>• 600 × 350 × 360 mm</li> </ul>	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
<b>Options and accessories</b>					
Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture (see p. 16.1 for more information)		–	–	+	+
External probes (optional)					
for monitoring and controlling temperature of remote loads FF17 flexible nylon probe, 2 m cable 100 mm × Ø 4.5 mm		–	–	+	+
LL17 stainless steel probe, 2 m cable 125 mm × Ø 5 mm		–	–	+	+
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 max. pressure 1,000 mbar max. flow 9 L/min		+	Required only where application demands a higher pressure than that delivered by the internal pump to maintain flow		
VTP 2 max. pressure 1,650 mbar max. flow 12 L/min		+			

## Optima™ Series, Water Bath Accessories

Accessories						
	<b>Lids</b> to help reduce evaporation/heat loss and avoid sample contamination	<b>Rack systems*</b> to optimise use of available bath capacity (no. of racks accommodated)	<b>Raised shelves</b> to allow shallow vessels to be accommodated	<b>Accessory cooling systems</b> 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		
				<b>Refrigerated immersion coolers</b> Consist of a cooling coil connected to a refrigeration unit by a flexible pipe. Extract heat continuously, with the bath control unit controlling temperature	<b>Heat exchange coil</b> 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)
<b>ST5 – 5 L</b> stainless steel 3 kg h: 200 mm l: 330 mm w: 180 mm 	<b>STL5</b> flat stainless steel 	<b>1 × QR*</b> 	–		–	
<b>ST12 – 12 L</b> stainless steel 4.5 kg h: 200 mm l: 360 mm w: 330 mm 	<b>STL12</b> gabled, hinged (removable) stainless steel 	<b>2 × VR*</b> 	<b>RS14</b> 		–	
<b>ST18 – 18 L</b> stainless steel 7 kg h: 200 mm l: 540 mm w: 330 mm 	<b>STL26</b> gabled, hinged (removable) stainless steel 	<b>4 × VR*</b> 	<b>RS22</b> 		–	
<b>ST26 – 26 L</b> stainless steel 7.5 kg h: 255 mm l: 540 mm w: 330 mm 	<b>STL26</b> gabled, hinged (removable) stainless steel 	<b>4 × VR*</b> 	<b>RS28</b> 			
<b>ST38 – 38 L</b> stainless steel 11 kg h: 255 mm l: 730 mm w: 330 mm 	<b>STL38</b> gabled, hinged (removable) stainless steel 	<b>6 × VR*</b> 	<b>RS28 or RS38</b> 			
<b>P5 – 5 L</b> plastic 2.5 kg h: 180 mm l: 240 mm w: 330 mm 	<b>PL5</b> flat, stainless steel 	<b>1 × QR*</b> 	–	–	–	–
<b>P12 – 12 L</b> plastic 3.5 kg h: 180 mm l: 415 mm w: 350 mm 	<b>PL12</b> curved plastic 	<b>2 × VR*</b> 	<b>RS14</b> 	–	–	–
<b>P18 – 18 L</b> plastic 5 kg h: 180 mm l: 600 mm w: 365 mm 	<b>PL18</b> curved plastic 	<b>4 × VR*</b> 	<b>RS22</b> 	–	–	–

\* — for Rack Systems description see page 60

## Optima™ R series, Refrigerated Thermostatic Baths and Circulators



The Grant Optima™ LTC2 Kit includes TC120 heating circulator and R2 tank/refrigeration unit



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

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
- A complete range — 18 models to cover basic through to sophisticated needs
- All refrigeration products come with market-leading 3-year warranties

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 Grant for advice.

### Model selection (see page 74):

The four Grant Optima™ thermostats can be combined with the five Grant refrigeration units to provide a choice of 18 models.

Heating Circulators Specifications on page 71 and all available accessories on page 74

## Optima™ R series, Refrigerated Thermostatic Baths: Combinations and Accessories

Capacity (L) Outer tank dimensions	• Working area (L × W) • Min/max liquid depths • Weight	<b>T100</b> h: 315 mm d: 145 mm w: 115 mm <i>Cat.num.: R1</i>	<b>TC120</b> h: 315 mm d: 145 mm w: 115 mm <i>Cat.num.: R1</i>	<b>TX150</b> h: 315 mm d: 145 mm w: 115 mm <i>Cat.num.: R1</i>	<b>TXF200</b> h: 315 mm d: 145 mm w: 115 mm <i>Cat.num.: R1</i>
<b>R1 – 5 L stainless steel</b> h: 410 mm d: 410 mm w: 230 mm <i>Cat.num.: R1</i>	• 110 × 145 mm • 80/140 mm • 19.2 kg	T100-R1	TC120-R1	TX150-R1	TXF200-R1
<b>R2 – 5 L stainless steel</b> h: 410 mm d: 410 mm w: 230 mm <i>Cat.num.: R2</i>	• 110 × 145 mm • 80/140 mm • 19.2 kg	T100-R2	TC120-R2	TX150-R2	TXF200-R2
<b>R3 – 5 L stainless steel</b> h: 410 mm d: 410 mm w: 230 mm <i>Cat.num.: R3</i>	• 110 × 145 mm • 80/140 mm • 19.2 kg	–	–	TX150-R3	TXF200-R3
<b>R4 – 20 L stainless steel</b> h: 530 mm d: 490 mm w: 390 mm <i>Cat.num.: R4</i>	• 230 × 305 mm • 80/140 mm • 37.8 kg	T100-R4	TC120-R4	TX150-R4	TXF200-R4
<b>R5 – 12 L stainless steel</b> h: 585 mm d: 575 mm w: 415 mm <i>Cat.num.: R5</i>	• 260 × 115 mm • 120/180 mm • 47 kg	T100-R5	TC120-R5	TX150-R5	TXF200-R5
<b>Options and accessories</b>					
Labwise™ PC software (optional)					
Allows two-way communication for status display, programming and data capture (see p. 16.1 for more information)	–	–	+	+	
External probes (optional)					
for monitoring and controlling temperature of remote loads	–	–	+	+	
FF17 flexible nylon probe, 2 m cable 100 mm × Ø 4.5 mm	–	–	+	+	
LL17 stainless steel probe, 2 m cable 125 mm × Ø 5 mm					
Remote switching device (optional)					
For switching appliances on and off (up to max. 8 Amps)	–	–	1	2	
<b>Vertical turbine pumps (optional)</b>					
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			
<b>VTP 1</b> max. pressure 1,000 mbar; max. flow 9 L/min	+				
<b>VTP 2</b> max. pressure 1,650 mbar; max. flow 12 L/min	+				

## QB Series, Dry Block Heating Systems with Interchangeable Blocks



Product video is available on the website

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.

QBD4 with a lid



QBH2



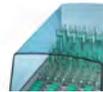
Accessories



Specifications:			
Model (Cat. Num.)	QBD1 / QBD2 / QBD4	QBH2	QBA1 / QBA2
Type	Digital	Digital	Analogue
Number of blocks	1 / 2 / 4	2	1 / 2
Temperature range	amb. +5°C to 130°C	amb. +5°C to 200°C	amb. +5°C to 100°C
Temperature setting range	+15°C to 130°C	+15°C to 200°C	15°C to 100°C
Temperature stability @ 37°C	±0.1	±0.1	±1
Temperature uniformity within the block @ 37°C	±0.1	±0.1	±1
Display / Resolution	LED / 0.1°C	LED / 0.1°C	n/a
Safety: Overtemperature	Thermal fuse		
Timer with a sound alarm	1 min up to 72 hrs		n/a
Heat up time from 25°C to 100°C	15 min		25 min
Power consumption	150 / 300 / 600 W	300 W	150 / 300 W
Power supply	115 V or 230 V		

All available accessories can be found on page 76

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

Interchangeable blocks (Cat. Num.)		QBD1	QBD2	QBD4	QBH2	QBA1	QBA2
<b>No. of blocks</b>		1	2	4	2	1	2
<b>QB-0</b> Plain block without holes		+	+	+	+	+	+
<b>QB-10</b> 24 × 10 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
<b>QB-12</b> 24 × 12 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
<b>QB-13</b> 12 × 13 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
<b>QB-16</b> 12 × 16 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
<b>QB-17H</b> for 10 × Falcon tubes tall 17 mm diam, 75 mm deep		+	+	+	+	+	+
<b>QB-18</b> 12 × 18 mm Ø holes, 50 mm hole depth		+	+	+	+	+	+
<b>QB-24</b> 5 × 24 mm Ø holes and universal bottles, 50 mm hole depth		+	+	+	+	+	+
<b>QB-50</b> 4 × 50 ml centrifuge tubes, glass universals, 50 mm hole depth		+	+	+	+	+	+
<b>QB-H</b> 56 × 0.2 ml microtube, 14 mm hole depth		+	+	+	+	+	+
<b>QB-E0</b> 24 × 0.5 ml microtube, 30 mm hole depth		+	+	+	+	+	+
<b>QB-E1</b> 24 × 1.5 ml microtube, 35 mm hole depth		+	+	+	+	+	+
<b>QB-E2</b> 24 × 2.0 ml microtube, 14 mm hole depth		+	+	+	+	+	+
<b>QB-DN</b> Dolphin nose tube 24 × Ø 11.13 mm to Ø 6.1 mm		+	+	+	+	+	+
<b>External Pt1000 temperature probe</b>							
	<b>QBEP</b> 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	+	+	+	+	-	-
	<b>QBEP-WM</b> 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	+	+	+	+	-	-
<b>Microplate blocks of molecular biology and biotechnology applications</b> Double-size blocks 140 × 100 × 75 mm supplied with additional extraction tool							
	<b>QDP-H</b> 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	-	+	-	+	-	+
	<b>QDP-FL</b> 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	-	+	-	+	-	+
<b>Safety covers (not required with QDP-FL Microtiter blocks)</b>							
	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

# Magnetic Stirrers, Overhead Stirrers



## MS-3000 and MMS-3000, High Speed Magnetic Stirrers

**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 3000 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 stirrers are ideal laboratory instruments 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%.

*MS-3000*



### Catalogue number:

<b>MS-3000</b>	BS-010301-AAF
<b>MS-3000 blue (on request)</b>	BS-010301-ABF
<b>MMS-3000</b>	BS-010305-AAF

*MMS-3000 with a stand*



*MS-3000*



## MS-3000 and MMS-3000, High Speed Magnetic Stirrers

Specifications:	MS-3000	MMS-3000
Speed control range	0–3,000 rpm	
Stirring volume up to (H <sub>2</sub> O)	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	12 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	

MMS-3000



MMS-3000



## MSH-300 and Intelli-Stirrer MSH-300i, Magnetic Stirrers with Hot Plate

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%.

### Catalogue number:

**MSH-300 with stand** BS-010302-OAA

**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.

\* — *Temperature control with external temperature probe is available from product version V.2 produced after 25.01.2012 (product version is indicated on serial number label).*

### External temperature probe\*:

Probe type Thermocouple

Connection type K

A 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

### Catalogue number:

**Intelli-Stirrer MSH-300i with stand** BS-010309-AAA

**External temperature probe** BS-010309-BK

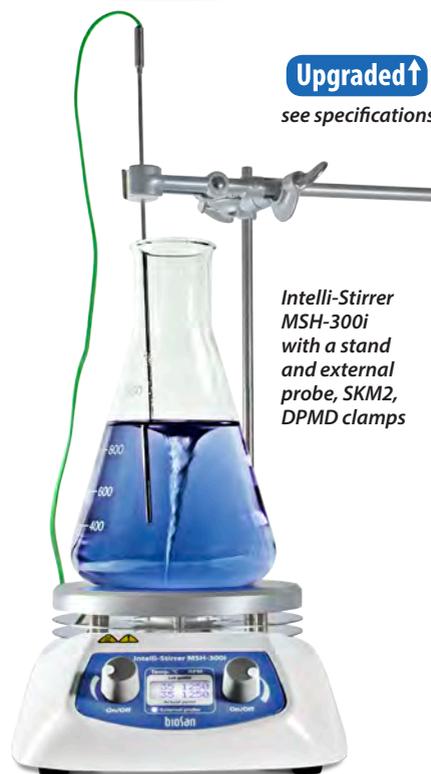
**SKM2 (Clamp)** BS-010309-AK

**DPMD (Double clamp)** BS-010309-CK

MSH-300  
with a stand



**Upgraded ↑**  
see specifications



**Upgraded ↑**  
see specifications

Intelli-Stirrer  
MSH-300i  
with a stand  
and external  
probe, SKM2,  
DPMD clamps

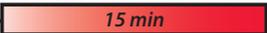


Intelli-Stirrer MSH-300i video  
is available on the website

## 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 <sub>2</sub> O)	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	
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	
Warranted service life	24 months	

### Plate heat up time for MSH-300

from 25°C —  to 330°C

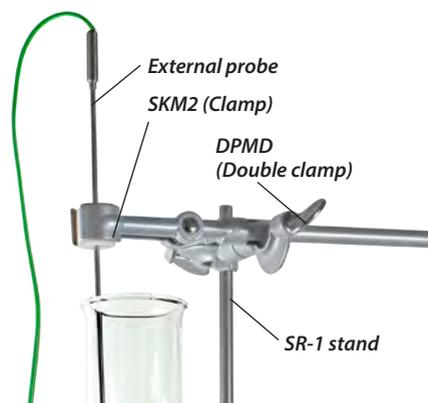
### Plate heat up time for Intelli-Stirrer MSH-300i

from 25°C —  to 330°C

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



DPMD (Double clamp) with holder for external probe



## 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 micro-processor 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.

*MM-1000 on a stand*



**G** Support rod and base

### 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°)
Time	0–5 sec

### General Specifications:

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

### Catalogue number:

<b>MM-1000</b> without stirrers	BS-010306-AAH
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All available accessories can be found on page 83

Optional accessories for MM-1000	Type	Dimensions	Catalogue number:
<b>A</b> MP-1	Paddle stirrer	378 × (70 × 70) × 8 mm	BS-010306-AK
<b>B</b> MP-2	Propeller stirrer	2 folding blades (326 × 55 × 8 mm)	BS-010306-BK
<b>C</b> MP-3	Propeller stirrer	3 folding blades (325 × 50 × 8 mm)	BS-010306-CK
<b>D</b> MA-1	Anchor stirrer	332 × 90 × 8 mm	BS-010306-DK
<b>E</b> MC-1	Centrifugal stirrer	358 × 60 (110) × 8 mm	BS-010306-EK
<b>F</b> Double clamp	—	For device mounting	VELA00001301
<b>G</b> Rod and base (page 82)	—	For device mounting, 40 × 30 × 87cm	VELA00001300

**A** MP-1



**B** MP-2



**C** MP-3



**D** MA-1



**E** MC-1





# BIOSAFETY EQUIPMENT: UV Cabinets, UV Air Recirculators, Class II Biological Safety Cabinet, Laboratory Furniture



## UVR-M and UVR-Mi, UV-Air Flow Cleaner–Recirculators

**UVR-M** and **UVR-Mi** are applicable for UV air inactivation in research laboratory rooms, waiting rooms in outpatients departments, surgeries and veterinary stations.

The devices provide complete protection from direct ultraviolet radiation.

### Advantages of UVR-Mi:

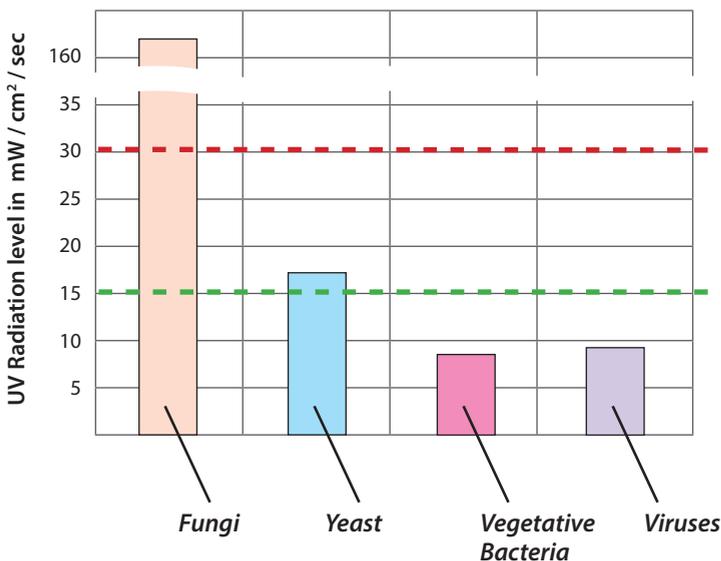
- UVR-Mi is the more powerful model of UV air flow cleaner with two UV-lamps
- Full user protection from direct UV radiation;
- Two operation modes — short time (under timer control) and continuous operation;
- Indication of UV lamps working hours.

### Recirculators fixation:

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



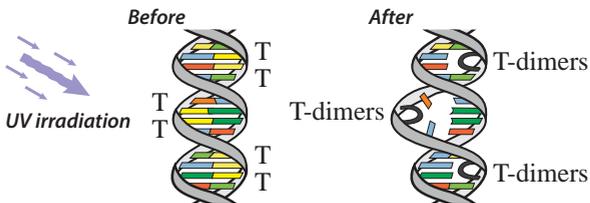
### Microorganisms sensitivity to UV radiation



## UVR-M and UVR-Mi, UV-Air Flow Cleaner–Recirculators

Specifications:	UVR-M	UVR-Mi
UV radiation source: 25W Bactericidal (Philips), TUV25WG13 UV-C	1 lamp	2 lamps
UV radiation level	15 mW / cm <sup>2</sup> / sec	30 mW / cm <sup>2</sup> / sec
Air-flow productivity	14 m <sup>3</sup> /hour	
Full user protection from direct UV light	Yes	
Display	—	LCD
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	110×130×660 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

**See UVR-M and UVR-Mi, UV-air flow Cleaner–Recirculators Test Report on page 125**

#### Catalogue number:

<b>UVR-M</b>	BS-040105-AAA
<b>UVR-Mi</b>	BS-040110-AAA
<b>UVR-S (tripod)</b>	BS-040105-AK



## DNA/RNA UV-Cleaner Boxes

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 provide 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 92).

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 boxes are 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 tables (with wheel locks) with a drawer are 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 92.*

### Advantages of Biosan UV-cleaner boxes:

- Ozone free high density UV decontamination
- Long living UV lamps (8,000 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

UVC/T-M-AR



UVC/T-AR



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



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

LF-1, laboratory chest of drawers

**New!**



UVT-S-AR



Product video  
is available  
on the website



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

See the UV Air Recirculators, DNA/RNA UV-cleaner box, Laboratory Furniture, Thermostated Laminar Flow Cabinet on page 117

**Catalogue 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

**Catalogue number:**

UVT-S-AR with internal sockets	BS-040107-AAA
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## DNA/RNA UV-Cleaner Boxes: Specifications

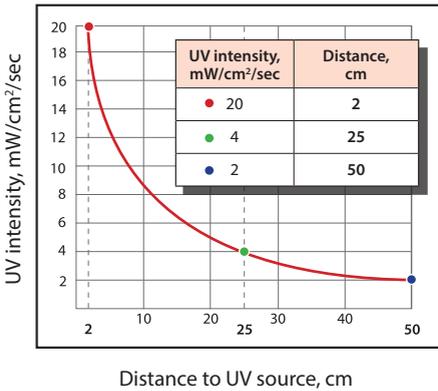
### Specifications:



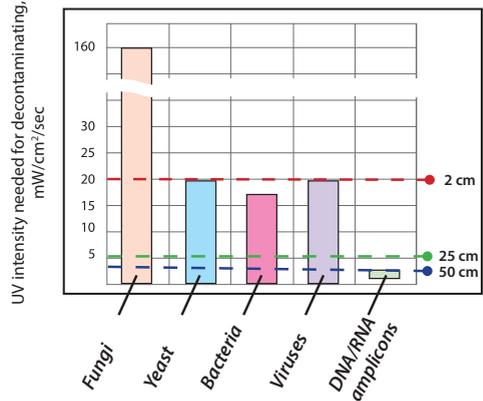
Model	UVC/T-AR (compact)	UVC/T-M-AR (compact)	UVT-B-AR (compact)	UVT-S-AR (double size)
Wall materials	Plexiglas: Polymethyl methacrylate (ALTUGLAS EX)	Rear: stainless steel Sides and front: glass (EUROGLASS, Germany)	Rear: stainless steel, Sides: steel with chemical resistant powder coating Front: glass (EUROGLASS, Germany)	Rear: stainless steel Sides and front: glass (EUROGLASS, Germany)
Working surface material	Steel with chemicals resistant powder coating	Stainless steel		
Open UV-lamp	1 × 25W built-in bactericidal (Philips), TUV25WG13 UV-C			2 × 30W built-in bactericidal lamps (Philips), TUV30WG13 UV-C
UV radiation level	15 mW / cm <sup>2</sup> / 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 work- ing 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			1200 × 520 mm
Safety features	Automatic open UV-lamp switch off when screen is open			
Power outlets inside the unit	Inlet for power cords	Inlet for power cords or 1 Built-in socket, max. 1,000 W (pls, order respectively)		3 Built-in sockets max. 1,000 W
Nominal operating voltage	100–240 V, 50/60 Hz			230 V, 50 Hz or 120 V, 60 Hz
Power consumption (230 / 120 V)	67 W			315 VA (1.4 A) / 530 VA (4.5 A)
Overall dimensions (W × D × H)	690 × 535 × 555 mm		690 × 585 × 555 mm	1245 × 585 × 585 mm
Weight (net / gross)	23 / 33 kg	31 / 39 kg	32 / 42 kg	58 / 68.5 kg
Optional table	<b>T-4</b> (W × D × H: 800 × 600 × 750 mm)			<b>T-4L</b> (W × D × H: 1290 × 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/cm <sup>2</sup>	3,600-5,400 mW/cm <sup>2</sup>
Side walls (10-60 cm)	1,800-5,400 mW/cm <sup>2</sup>	3,600-9,000 mW/cm <sup>2</sup>
Front window (10-60 cm)	1,800-5,400 mW/cm <sup>2</sup>	3,600-9,000 mW/cm <sup>2</sup>

See the article on page 117 for full information

UVC/T-AR



UVC/T-M-AR



*LF-1, laboratory chest of drawers*



*Table T-4*



*Table T-4L-P*



*Table T-4L, with PCR-cabinet UVT-S-AR, 2 chests of drawers LF-1 and equipment for nucleic acid extraction*



*Table with shelves T-4L-P, chests of drawers LF-1 and equipment for nucleic acid extraction*



**Specifications T-4:**

Weight	23 kg
Overall dimensions (W×D×H)	800×600×770 mm

**Specifications T-4L:**

Weight	36 kg
Overall dimensions (W×D×H)	1290×600×770 mm

**Specifications T-4L-P:**

Weight	54 kg
Overall dimensions (W×D×H)	1290×600×1670 mm

**Specifications LF-1:**

Weight	28 kg
Overall dimensions (W×D×H)	300×450×705 mm

**Catalogue number:**

T-4	BS-040101-BK
T-4L	BS-040107-BK
T-4L-P	BS-050101-CK
LF-1	BS-050101-BK

# TLC-S, Thermostated Laminar Flow Cabinet, Class II Biological Safety Cabinet

**Announcement!**



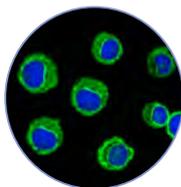
**Market: Biotechnology, biomedical diagnostics, cell biology, and stem cells technology.**

**Unique on the market of life sciences and cell culture bioprocessing market.**

Stem cells technology



Cell biology



Biotechnology



Molecular biology



## 2. Physical Inactivation of DNA/RNA Inside Air Flow

The TLC-S cabinet is equipped with the UV air recirculation system — using 4 UV lamps installed inside the rear wall which disinfect the laminar air flow. UV- air recirculation systems - as been shown earlier by BioSan [1] — are highly effective against infectious biomaterials that are much smaller than HEPA filter's pores (less than 0.3 μm), such as viruses, and DNA/RNA fragments and amplicons.

[1] — *Development and evaluation of DNA amplicon quantification.*

**For catalogue numbers and updates check the website: [www.biosan.lv](http://www.biosan.lv)**

Thermostated Laminar Flow Cabinet TLC-S is a Class II Biological Safety Cabinet (BSC), specially designed for cell culture bioprocessing. Additionally, when connected to exhaust, TLC-S protects from exposure to vapours, gases, fumes and particulates.

Besides HEPA-filtered sterile air flow the TLC-S has 2 additional options:

1. Temperature controlled (at 50°C), sterilized laminar air flow.
2. UV-air recirculation systems for DNA/RNA inactivation in the recirculated air.

## 1. Thermostated Air Flow

Due to the recirculation of the preheated air we guarantee not only temperature controlled working surface (at 50°C), but also uniformity of temperature inside the whole working space.

As a result, instruments (e.g. rollers, rockers, vortexes and pipettes), materials (e.g. racks and pipette tips), reagents (e.g. kits for cell line expansion and differentiation, culture media and supplements), and cell lines or cell culture inoculum — all kept at the same temperature.

The preheated air flow protects cell lines from possible thermal shock and prevents condensation of liquid on the upper side of culture vessels, due to the even temperature distribution inside the cabinet.

## Specifications:

Biological Class Safety (EN 12469)	Class II
HEPA Filter Seal Type EN 1822-1:2009	H14
Standard inflow velocity	0.35 m/s ±20%
Illumination of the working area	1000 Lux
Temperature setting range	+25°C ... +50°C
Temperature control range	+10°C above ambient ... +50°C
Recirculation of air inside the cabinet	70 %
Noise level	not more than 57 dB
Integrated socket	1
Power consumption	1100 W
Maximum permissible outlet	600 W
Daylight lamp (for working area illumination)	2 × 24 W
Bactericidal UV lamp in the working chamber (Philips), TUV25WG13 UV-C	1 × 25 W
Bactericidal UV lamp inside the recirculator (Philips), TUV25WG13 UV-C	4 × 25 W
Working chamber material	Stainless steel
Working chamber dimensions (W × D × H)	645 × 580 × 485 mm
Overall dimensions (W × D × H)	700 × 705 × 1025 mm
Weight	98 kg

Specification of the table — please, request separately.



# Densitometers, FEP Product Line, Fluorometer



## DEN-1 and DEN-1B, Densitometers (Suspension Turbidity Detector)

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

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

**DEN-1B:** 0.0–6.0 McFarland units  
( $0$ – $180 \times 10^7$  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 18 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 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.

Following calibration kits are available on request:

- **CKG16** for glass tubes with diameter 16 mm;
- **CKG18** for glass tubes with diameter 18 mm.

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

Two versions of the product are available:

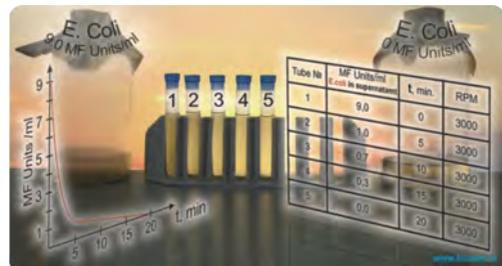
1. **DEN-1** powered from external energy supply;
2. **DEN-1B** powered both from external energy supply and from batteries (AA). Besides, **DEN-1B** operates with higher precision of measurements (up to 0.01 McF).



**A** A-16



DEN-1B rear side with calibration controls



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

## DEN-1 and DEN-1B, Densitometers (Suspension Turbidity Detector)

Specifications	DEN-1	DEN-1B
Light source	LED	
Wavelength	$\lambda = 565 \pm 15 \text{ nm}$	
Measurement range	0.3–15.0 McF	0.00–15.00 McF
Display resolution	0.1 McF	0.01 McF
Accuracy, of the full scale	$\pm 3\%$	
Measurement time	1 sec	
Sample volume	not less than 2 ml	
Tube external diameter	18 mm (without adapter) or 16 mm (using optional <b>A-16</b> adapter)	
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

**DEN-1B**



**Catalogue number:**

<b>DEN-1</b>	BS-050102-AAF
<b>DEN-1B</b>	BS-050104-AAF
<b>CKG16</b>	BS-050102-BK
<b>CKG18</b>	BS-050102-CK
<b>A-16</b>	BS-050102-AK

**Technology: DNA/RNA Extraction and PCR Products' Analysis**



**Stages:**

Centrifugation for DNA Extraction

Microspin 12  
page 43



Centrifugation for DNA Extraction in plates

LMC-3000  
page 44



Sample preparation: Smooth resuspending and centrifugation

MSC-6000  
page 40



or similar, see Multi-Spins page 40 and Combi-Spins page 38, 39

Sample preparation in UV-Cabinet for PCR

UVC/T-M-AR  
page 88



or similar, see UV-Cabinet for PCR page 88

Sample Thermostating and Incubation

TDB-120  
page 51



TS-100C  
page 25



Amplification

Thermocyclic amplifier



Fluorescence End-Point Analysis

ALA-1/4 page 99



Electrophoresis

Electrophoresis systems



Real-time Amplification

Real-time Amplificator



## ALA-1/4, 4-channel Fluorometer



Software video is available  
on the website

### Viewing Results



#### Software specifications:

Register, interpret and store the results obtained on PC  
Simultaneously detect a variety of infections pathogens  
Save/Load the previously obtained results  
Edit existing or create new test-systems  
Option for results interpretation in gel electrophoresis image simulation

#### Channels' specifications:

FAM: (excitation / emission $\lambda$ )	460 nm / 515 nm
HEX: (excitation / emission $\lambda$ )	532 nm / 570 nm
ROX: (excitation / emission $\lambda$ )	570 nm / 610 nm
CY-5: (excitation / emission $\lambda$ )	630 nm / 670 nm

**ALA-1/4** is the first multi channel rotor type fluorescence detector that allows detection of the fluorophores lights emission in the reaction mixes with a closed-tube method immediately after PCR.

**ALA-1/4** is a four-channel high speed detector of fluorescence/quenching ratio of DNA probe combined with a fluorescence/quenching molecules. Level of fluorescence depends on the quantity of the positive amplification after thermocycling of DNA probes. The instruments substitutes for electrophoresis and gel-documentation step of amplicon detection. The closed-tube method ensures biosafety conditions in the DNA diagnostic Labs.

Biosan FEP (Fluorescence detection with End Point analysis) is the revolutionary approach that allows to:

- Carry out the experiment with closed test tubes, thus eliminating the probability of contamination;
- Perform the amplification and detection processes in the same room with reduced personnel costs;
- 4-channels detection: FAM, HEX, ROX, CY-5;
- Register, interpret and store the results obtained on PC;
- Simultaneously detect a variety of infections pathogens;
- Eliminate the need for electrophoresis and gel run storing instruments.

#### General specifications:

Excitation source	Light diode (Luxeon) through interference filter
Interference filter transmission spectrum half-width	7 nm
Detector	Photomultiplier
Full rotor's measurement time	30 sec/channel
<b>Rotors capacity:</b>	
R-36/0.5	36 microtubes (0.5 ml)
R-48/0.2	48 microtubes (0.2 ml)
Software	Open Type
Communication Interface	USB
PC system requirements:	1000 MHz PIII Intel, 124 MB RAM Windows 2000/XP/Vista/7/8 USB port
Overall dimensions (W×D×H)	400×250×190 mm
Weight	8.5 kg
Nominal operating voltage	230 V, 50/60 Hz
Power consumption	30 W

#### Catalogue number:

<b>ALA-1/4</b> with standard rotors	BS-050106-AAA
R-36/0.5, R-48/0.2	



# Washers, Aspirator



## IW-8, Intelspeed Washer



**Intelspeed Washer IW-8** is designed for washing of standard flat-bottom 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.

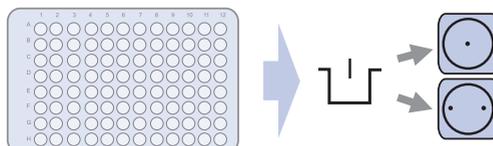
The unit is designed for washing standard 96-well plates during analyses.

### The unit provides:

- Washing mode
- Rinsing mode
- Mixing mode
- Double 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

### Catalogue number:

<b>IW-8</b>	BS-060106-AAI
<b>4 CHW Logger</b>	BS-060102-AK



## IW-8, Intelispeed Washer



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

### 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 in plate well	no more than 2 µl
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 (increment 5 sec)
Number of washed rows	1–12
Time of plate single wash (350 µl), no more	45 sec
Number of programs	100
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	11 kg
External power supply	DC 12 V, 5 A
Consumed power, not more	60 W
The unit is designed for use in closed laboratory rooms at temperatures from +10 to +35°C and relative humidity up to 80% at +25°C decreasing linearly to 50% relative humidity at 35°C	

## 3D-IW8, Inteliwasher



Product video is available on the website



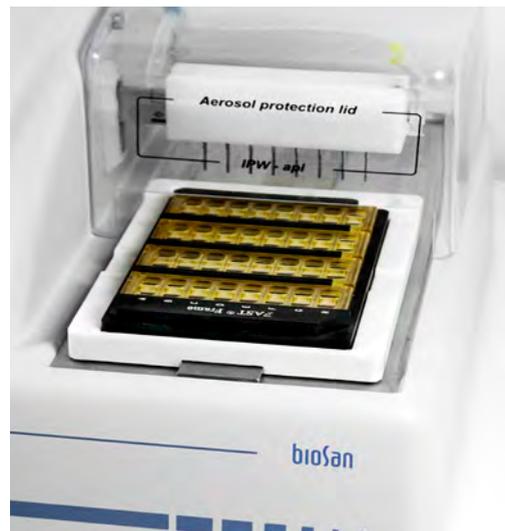
Inteliwasher 3D-IW8 series microplate washer is designed for washing various types of standard 96-well microtitre plates, microstrips as well as microarrays on FastFRAME (rectangular well shape). It is suitable for washing wells with different bottom shapes: flat, U-shape and V-shape. The unit is fully 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

### Catalogue number:

3D-IW8	BS-060102-AAI
4 CHW Logger	BS-060102-AK

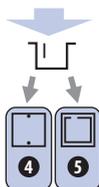
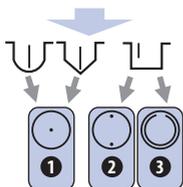
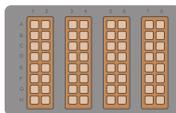
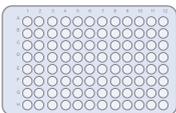




The unit has 50 programs divided into 5 following aspiration categories (see figure below):

- 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.
- 5 **Type 5** (5.0–5.9) **FastFRAME-C** is intended for multi-slide\* plate with rectangular wells.

\* — 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.



## Specifications:

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 kg
External power supply	DC 12 V, 4.16 A
Consumed power, not more	60 W

The unit is designed for use in closed laboratory rooms at temperatures from +10°C to +35°C and relative humidity up to 80% at +25°C decreasing linearly to 50% relative humidity at 35°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

## FTA-1, Aspirator with Trap Flask

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 micro-compressor. 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 re-used.

### 1 Suction microbiologic hydrophobic filter type 2200/02:

Suction microbiologic filter eliminated 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 efficiencies up to 99.99999% particles bigger than 0.027 micron (which is smaller than Hepatitis A, B and C).

**Applications:** Suction filter located behind output of the jar in front of the vacuum source. The filter put on so as the side of filter marked „IN“ was directed to the jar and the side without marked to the vacuum source.

**Exchange:** The filter is necessary replaced, as it is glazed with dirtiness or by liquid sucked. Maximum using time is 30 days. After ending of suction of infection patient we recommended immediately exchanged the filter. It prevents spread of infection.

### Specifications:

Vacuum	-500 mbar
Trap flask's volume	1 litre
Dimensions (W×D×H) with trap flask	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



Product video is available on the website

### Catalogue number:

<b>FTA-1</b> with 1l trap flask	BS-040108-AAG
<b>MA-8</b>	BS-040108-BK
Suction microbiologic hydrophobic filter D40-0044-1	



### 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: requirements for laboratory equipment for the thermostating equipment, IEC 61010-2-020: for centrifugation equipment, IEC 61010-2-051: for magnetic stirrers.

### 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.

### 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.

### Environmental Conditions

Biosan laboratory equipment is designed for indoor use in laboratory conditions, with room temperature between +4°C and +40°C, and 80% relative humidity up to +31°C unless stated otherwise.

### Quality

The Biosan Quality Management System complies with the requirements of LVS EN ISO 9001:2009, 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 9001:2009 compliance (certified since 2004).

### 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. 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](mailto:service@biosan.lv) or forms available at Technical Support section of Biosan web-site.

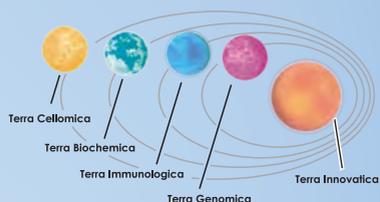
### World Wide Availability and Support for Biosan Laboratory Equipment

Biosan laboratory equipment and specialist technical support is available world-wide. Please contact customer service at [service@biosan.lv](mailto:service@biosan.lv) or visit <http://www.biosan.lv> for further product information and to locate your locally appointed distributor and support centre.

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



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*“In the act of creation, man steps beyond himself as a creature and rises above passivity and the coincidence of his existence into the realm of freedom and meaning. In this need to transcend can be found one of the roots not only of love, but of art, religion and material production ”*

— Erich Fromm

## The World of Biotechnomica

The concept of development for Biosan called The World of Biotechnomica. Four planetary systems with satellites — devices revolve around Terra Innovatica (biomaterial under research). We have marked out four planets — 4 contemporary diagnostic levels:

1. Terra Genomica — diagnostics at the level of genes (DNA-analysis, oligonucleotide and mononucleotide polymorphism — ONP, SNP);
2. Terra Immunologica — diagnostics at the level of immunology (detection of polymorphism of antibodies and immune response);
3. Terra Biochemica (metabolomics) — diagnostics of metabolism products and ferment activity;
4. Terra Cellomica — diagnostics at the 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, animals and plants — further affecting the immune response (defence reaction) and changes in biochemical status, and finally cellular morphogenesis as well — we believe that simultaneous multilevel diagnostics 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; hence, the multidagnostic technology, though expensive, is the only solution as of today.

Although the classic determinism in 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



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

in the World of Biotechnomica, which develops, produces and distributes instrument lines for all 4 levels of diagnostics. These satellites of 4 planets are specialised devices providing the instrumental basis for multilevel diagnostics, whereas the reagent sets make these satellites move. On this account, the term Biotechnomica in our understanding means the branch of biotechnology responsible for the development of multilevel laboratory diagnostics sets (instrument lines). In the future perspective, multidagnostic chips may appear with the development of chip technologies, allowing to unify all the aforesaid technologies in one chip. Biosan plans to be active in this field in the next few years.

I am pleased to point out that many of our ideas and products have been developed as a result of long-standing cooperation of scientists from the Institute of Microbiology of the Latvian Academy of Science (where our company was founded 22 years ago and where it is presently located) 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 Western 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 Biotechnomica.

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

TLC-S, Thermostated Laminar  
Flow Cabinet  
ES-20,  
Shaker-Incubator

RTS-1, Real Time Cell  
Growth Logger

Multi Bio 3D,  
Multi 3D-Shaker

**Terra Cellomica**



PSU-20i, Orbital  
Shaker  
LMC-4200R,  
Refrigerated Centrifuge

DEN-1B,  
Densitometer

MR-1, Rocker

WB-4MS, Stirred Water  
Bath

V-32, Vortex

**Terra Biochemica**

MSH-300i,  
Magnetic  
Intelli-Stirrer



Multi Bio RS-24,  
Multi Rotator



DB-10C,  
Dry-block for  
optical cuvettes

FVL-2400N,  
Centrifuge-Vortex

3D-IW8, Intelli-Washer

LMC-3000, Bench-top  
centrifuge

PSU-2T, Mini-Shaker

FTA-1, Aspirator

PST-60HL,  
Thermo-Shaker  
for plates

**Terra Immunologica**

**The  
of World  
Biotechnomica**

MCF-48T, Isothermal  
Fluorometer

**Terra Genomica**

CH-100, Dry-Block  
with cooling

MPS-1, High Speed  
Ultra Efficient  
Mini-Shaker

MSC-6000,  
Centrifuge-Vortex



TDB-120,  
Dry-Block

CV-U,  
Centrifuge-Vortex  
for PCR plates and  
microtubes

**Terra Innovatica**

Microspin12,  
Microcentrifuge



TS-100C,  
Thermo-Shaker  
with cooling for  
microtubes



UV/T-M-AR,  
DNA/RNA  
UV-Cleaner  
Cabinet

# 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, J. Eskin, A. Dišlers,  
R. Rozenstein, V. Saricev, S. Djacenko, V. Makarenko,  
U. Balodis.

This paper presents theoretical and experimental studies of the microorganism growth using Reverse-Spin Technology (RST). Reverse-Spinner — is a thermostating device with very low energy consumption that realizes innovative type of mixing, where liquid (cells in liquid medium) is mixed by the tube rotation around its axis, leading to highly efficient Vortex Type Mixing (VTM).

Present work is the first to show experimental results of cell growth kinetics obtained by using disposable falcon tubes agitated on a principle of RST. Growth conditions for several model microorganisms (facultative anaerobe *E.coli* BL21, extreme aerobic microorganism *Thermophilus* sp., and anaerobic bacteria *Lactobacillus acidophilus*) have been optimized. Scientific and applied valuable aspects of single-used tube RS-Reactors 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. Non invasive mixing technology includes a different way of tubes agitation as shown in the table 1.

Absence of agitators inside the reactor gives opportunities to use Reverse Spinner as a rotating spectrophotometer (spectra-cells), which measures optical density in the reactor in Real-Time.

Software makes it possible to set optimal parameters of fermentation, registers and logs all parameters (mixing intensity, temperature of the process, optical density and cell concentration, speed of the growth, etc.).

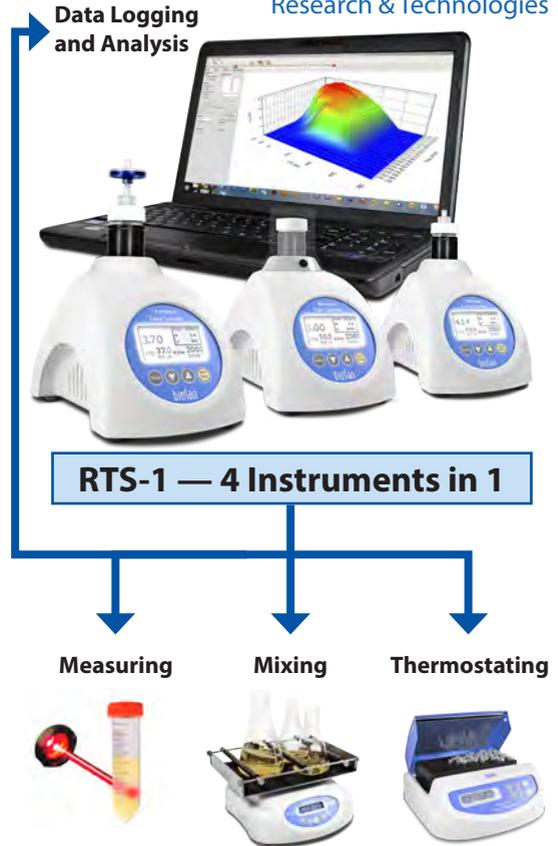
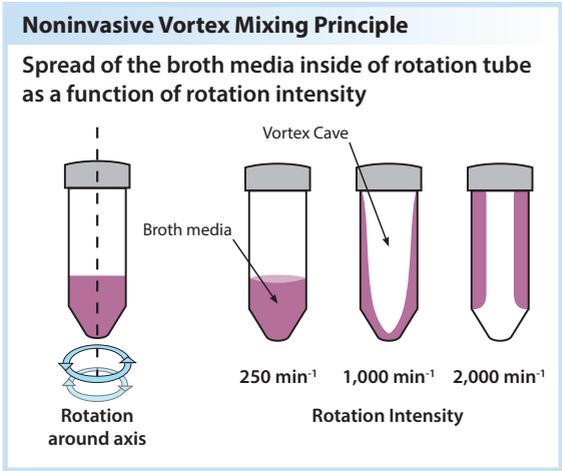


Table 1, Comparison of Non invasive mixing methods

#	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

Initiation of the Vortex Type Mixing (VTM) and depth of the Vortex cave depend on 1) angular speed of RS-Reactor 2) time from initiating rotation of RS-Reactor 3) growth media viscosity 4) temperature. These parameters, also, determine the angular speed of rotating Vortex Layer (VL) and transition 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 the same and VL looks like a monolithic Vortex cavity. Common rules regulating Vortex type mixing processes may be stated as follows: the more time has passed since Vortex formation, the more obvious is a transition from IRV to the RV. The concept of the Reverse-Spin mixing is based on these assumptions.



### Reverse Spinning vs Orbital Shaking

#### Symmetrical vs Asymmetrical broth media distribution

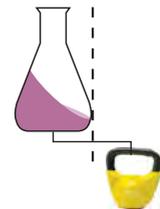
#### Reverse Spinning



#### Features:

- Fits any diameter of the rotating vessel
- Natural centric auto-balancing
- Simplicity
- No power consumption for contra-balancing
- Self cleaning optical cells

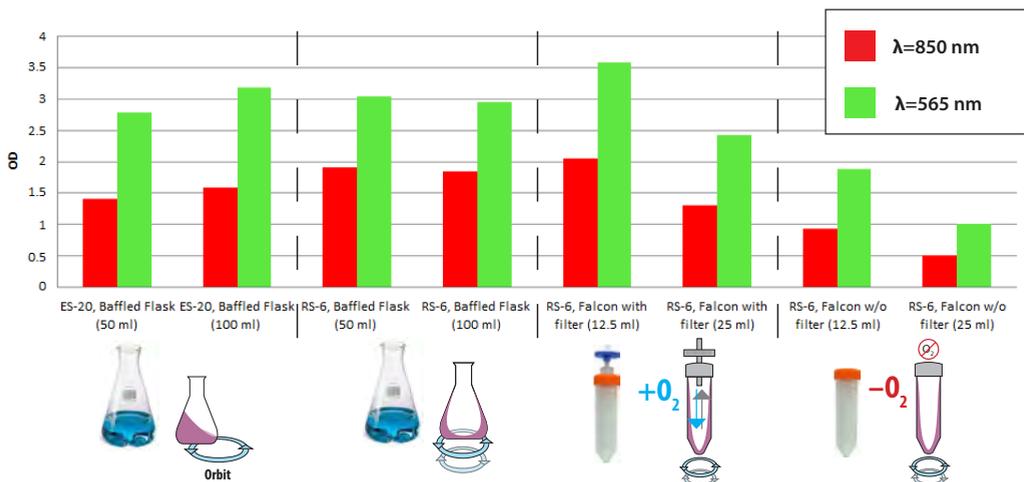
#### Orbital Shaking



#### Features:

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

Fig 1. Aeration effect on *E.coli* BL21 growth using different growth techniques



The fig. 1 shows a comparative data of the biomass yield obtained for the E.coli night culture cultivated in LB medium in Erlenmeyer flasks (Shaker-Incubator ES-20, BioSan) and in test-tube reactors, RTS-1. Biomass yield is presented in the optical densities measured at 600 nm and 850 nm wavelengths. The results obtained for a tube rotating around its own axis at a speed up to 2,000 revolutions per minute.

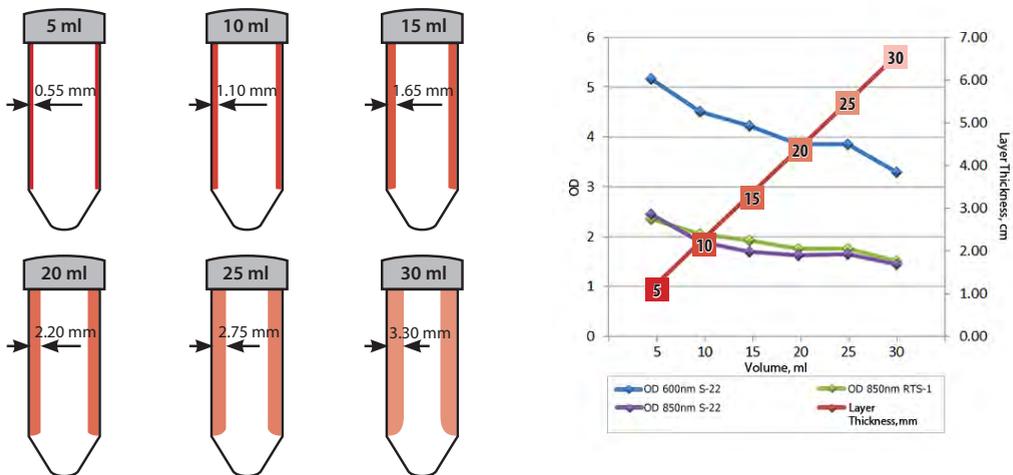
The experimental data suggests that biomass yield obtained using the Reverse Spin Technology is not lower than biomass amount obtained by traditional methods of cultivation and, as is the case of cultivation in Erlenmeyer flasks, depends on the volume of medium in the flask, all other parameters being equal.

Next, we concentrated our efforts on the development of correct cell concentration measurement technology in Real-Time. As you may know, the final concentrations of E. coli cells in LB medium significantly exceed OD=1.0 at  $\lambda=600$  nm, which requires stopping the process of growing cells, sterile sampling 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 behav-

our of light in dense cell suspensions (see fig. 5) is very interesting and at more than 2 OD at 600 nm it is almost impossible to measure the concentration of cells directly (unless you measure the Rayleigh scattering).

We approached this problem from a different side. It is known that the shorter the optical path is, the more accurately it is possible to measure the concentration of cells, even at high densities (up to 10 OD). For this purpose, test tubes containing different volumes of medium are intensely rotated ( $2,000 \text{ min}^{-1}$ ) and as a result, a monolayer of medium is generated, which thickness is directly proportional to the volume of culture medium in the tube (see fig. 2 below). Previously, we achieved linearity in the data, when measuring cell concentrations from 1–10 OD in the optical path of 1 mm, therefore correction coefficients were introduced in the program of RTS-1, which allows to measure concentrations of cells in a wide range. The algorithm for determining the concentration of bacterial cells in Real-Time includes the formation of the monolayer at given intervals and cell concentration measuring process. The process takes 5–10 seconds and then initially set parameters for the cell growth automatically restore. The graph shows that the cell concentration range optimal for measurement is 5–30 ml of culture medium in the reactor.

Fig 2. The effect of Media Volume on it's Layer Thickness (mm) during Reverse-Spin cycle



#	V, ml	RTS-1, OD 850nm	RTS-1, Layer Thickness, mm	RTS-1, Optical Path, mm	S-22, OD <sub>off-line</sub> 850nm, 1mm cuvette	S-22, OD <sub>off-line</sub> 600nm, 1mm cuvette	Cells Yield, 600 nm
1	5	2.45	0.55	1.10	2.35	5.17	25.8
2	10	1.92	1.10	2.20	2.05	4.51	45.1
3	15	1.71	1.65	3.30	1.92	4.22	63.3
4	20	1.62	2.20	4.40	1.75	3.85	77.0
5	25	1.65	2.25	5.50	1.75	3.85	96.2
6	30	1.45	3.30	6.60	1.50	3.30	99.0

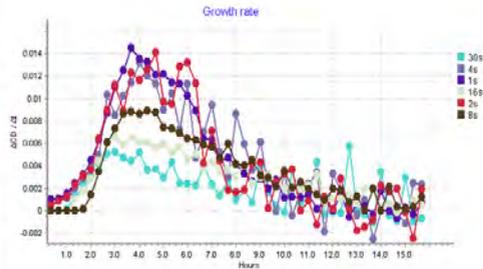
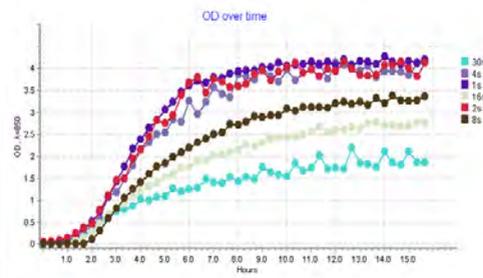


Fig 3. Influence of Frequency of Reverse Spinning on the Growth kinetics and Growth Rate ( $\Delta OD(\lambda=850nm)/\Delta t$ ) vs Time of fermentation (hrs).

Legend of experiment: Real Time Cell Growth Logger was used — RTS-1 with 850 nm LED, Volume of LB media in 50 ml Falcon = 15 ml approx., Reverse Spin Frequency (RSF) 1, 2, 4, 8, 16, 30  $sec^{-1}$ , Measurements frequency (MF) is 10  $min^{-1}$  approx., Rotation speed of reactor = 2,000 rpm, temperature 37°C, Diameter of filters' pores (for aeration) = 0.25  $\mu m$ .

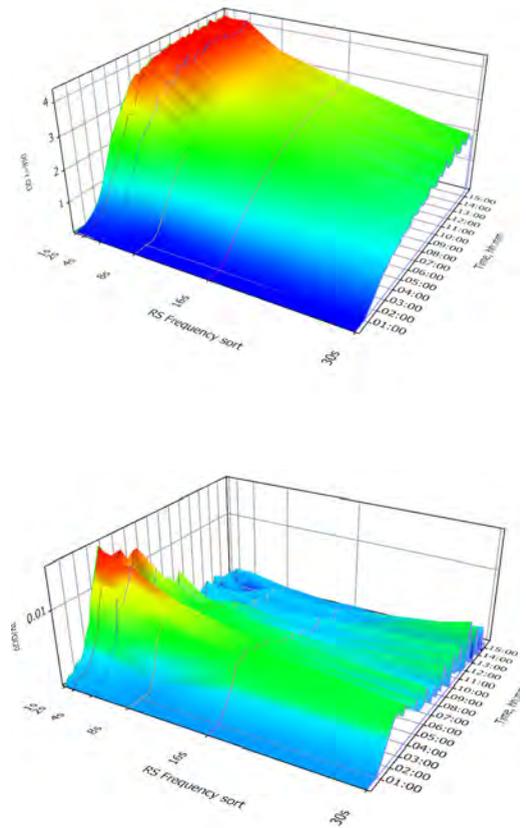
Results obtained indicate that the maximum rate of cell division is detected at a frequency of 1 Reverse Spin per second (1  $sec^{-1}$ ) at a speed of 2,000 rpm. The increase of pause between reverse spins reduces cell growth rate, reaching 50% of the maximum value, when RS freq. = 30 sec (see fig 3).

For a better visual representation of the results, the data of three factor interdependence experiments are presented in the form of the 3D graph (see fig. 4). Display of the experimental results in the 3D format has one more advantage that the obtained data provides a clear visual tool for the analysis of the complex interrelated processes of cell growth and allows to find the optimal and reproducible parameters obtained for the output of the cell material.

Growth rate versus time data, presented in the graph, was obtained during 20 hours long fermentation process and optical density was measured in a 10 minutes interval. The optical density was determined in the monolayer of growing cells and growth media formed as a result of a Vortex (as described in the legend to fig. 3). Volume of the culture medium is taken into account when calculating the length of the optical path of the rotating tube that allows to calculate the optical density in standard values familiar for biotechnologists ( $\lambda=600$  nm, optical path: 10 mm).

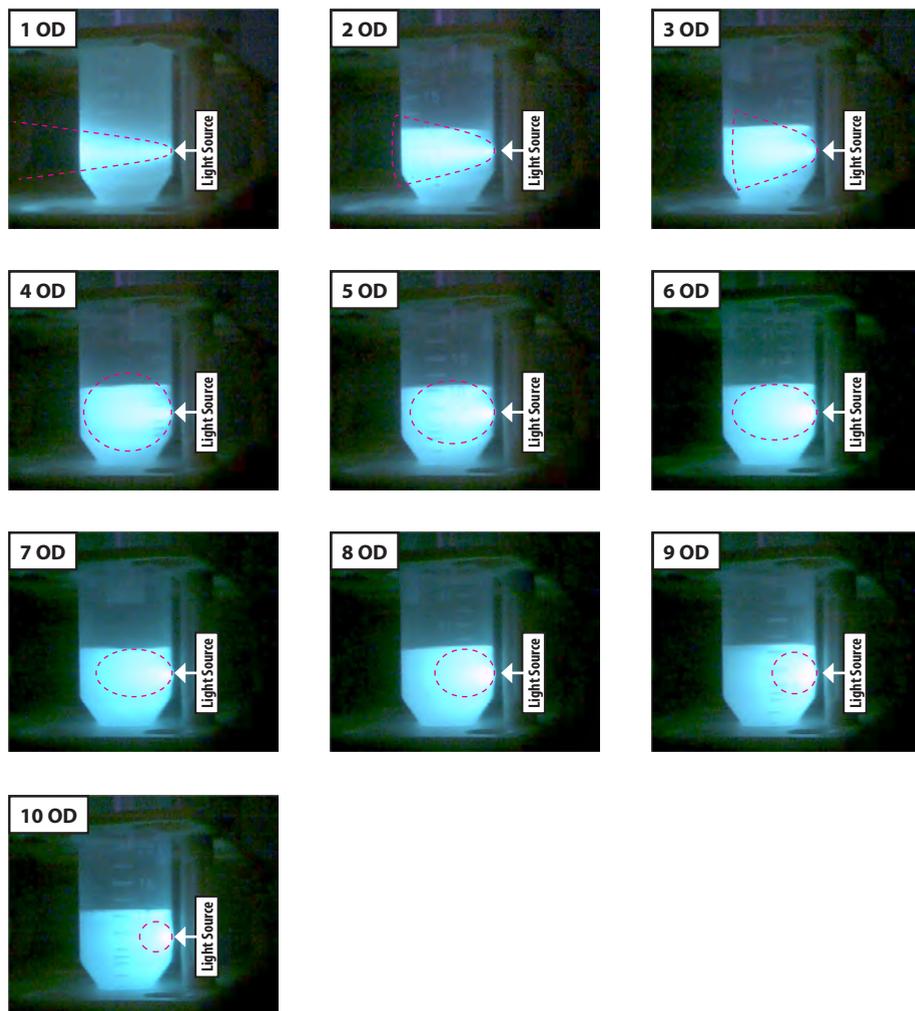
Classical 2D data view of cell growth versus time obtained at the endpoint or during cell growth when cell density was measured at intervals of 1–4 hours do not provide such opportunity.

Fig 4. Influence of Frequency of Reverse Spinning on the Growth Kinetics vs Time of fermentation of E.coli BL21 in a 3D model.



## The Things to Think About: Behaviour of Light in the Environment of Different Densities

Fig 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.



### Conclusion

RTS-1 — Reverse Tube Spin cultivation based on the new method of external agitation of cultivation media, has been shown to be efficient for cultivation of aerobic microorganisms and cell growth logging.

Effective growth of *E. coli* on LB media has been demonstrated under extremely high speed rotation of the reactor (2,000 rpm).

To increase an OD measurement range we investigate near infrared (IR) spectra and showed that a 850 nm wavelength is sufficient to measure increased cell concentrations. Such wavelength shift (from traditional 600 nm to 850 nm) strongly

expanded a range of correct OD measurements.

Moreover, we propose a new technology of a non-contact high biomass measurements during fermentation based on a formation of a thin layer of cultivation media, giving a correct data of bacteria concentration in a rotating reactor.

As a result, proposed RTS-1 technology excludes sampling and dilution procedure that is especially dangerous for harmful bacteria, pathogens or microorganisms living in extreme conditions, like *Thermophilus*. Results will be published in next issue of BioSan Analytica Journal.

# 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

*Biotechnomica:* Marina Tarvida, Julija Isakova,  
Vasily Bankovsky

*Biosan:* Arturs Kigitovics, Vadim Gimelfarb



## Introduction

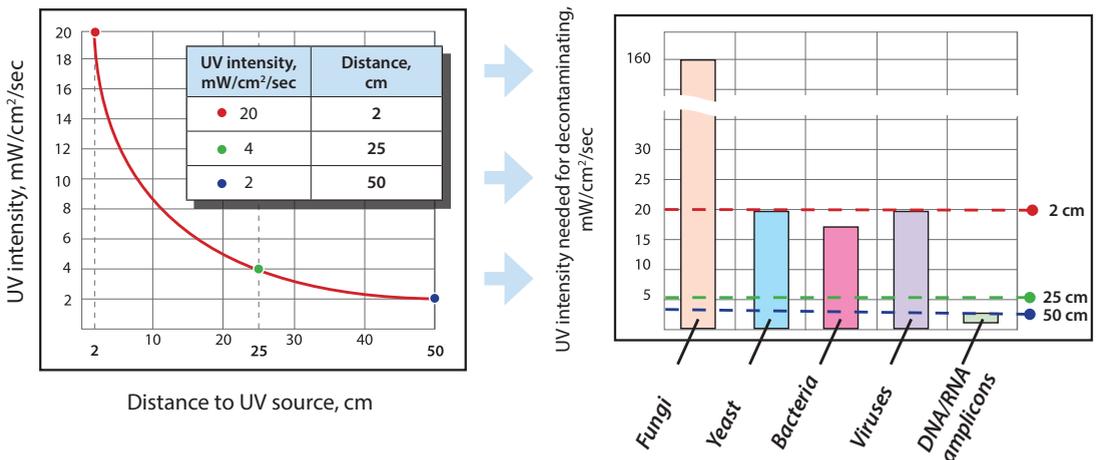
Personal and product safety during clinical and laboratory studies have stimulated the development of sterile cabinets and special laboratory safety techniques, to protect the environment, operator, and product. Monitoring DNA/RNA amplicon concentration in laboratory air in sterile cabinets has become 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 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<sup>2</sup>) and the time of exposure ( $t$ , seconds) resulting in units of mJ/cm<sup>2</sup> for UV dose [1] (Fig. 1).

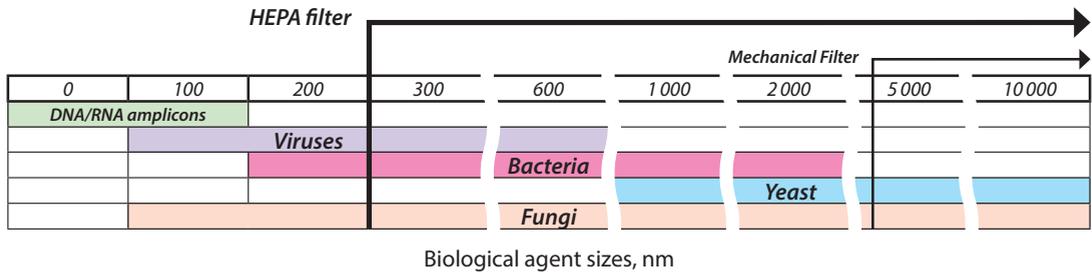
### Air flow organization through HEPA filter

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 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



## 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<sup>3</sup>.

## 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 m<sup>3</sup> 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 than 0.3 µm.

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 than 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 cyclor 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

### 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<sub>2</sub>O), 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:

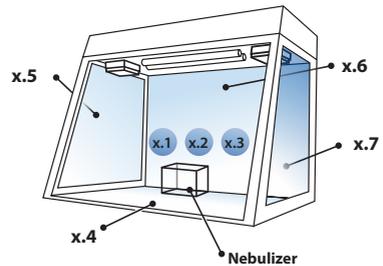
2-FL : 7 µl; dNTP's : 2.5 µl; Forward Primer : 1 µl;  
Reverse Primer : 1 µl; DNA probe : 1 µl; Template DNA : 10 µl;  
Water, nuclease-free to : 25 µl; Total volume : 25 µl

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

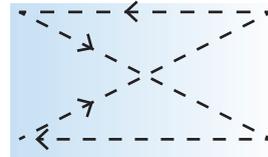
Fig. 3, Air and surface samples and surface sample taking path



### 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)

### Sample taking path



**A Air / B Surface samples**

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

**DNA extraction:**

**A From Air Samples :**

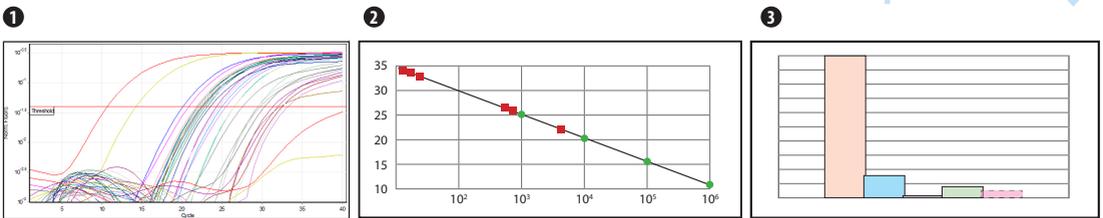
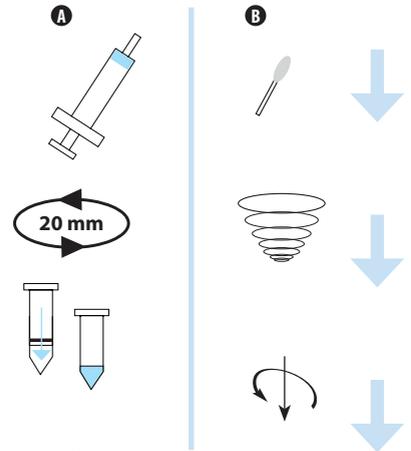
- Incubation on Shaker OS-20 (BioSan) 180 rpm 15'
- Spin columned (GeneJet Plasmid Miniprep Kit, Thermo Fisher Fermentas )

**B From Surface Samples:**

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

**Isolated DNA:**

- 1 Real time PCR amplification (Fig. 7)
- 2 Detection of Ct values and normalization of data (Fig. 8)
- 3 Copy number estimation on cabinet volume and surface area



**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

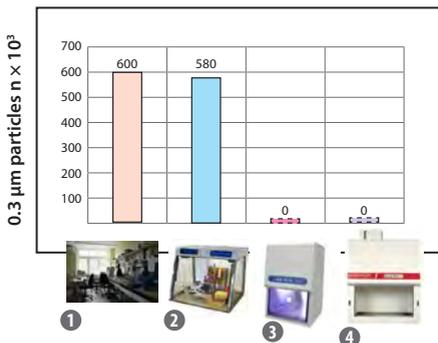
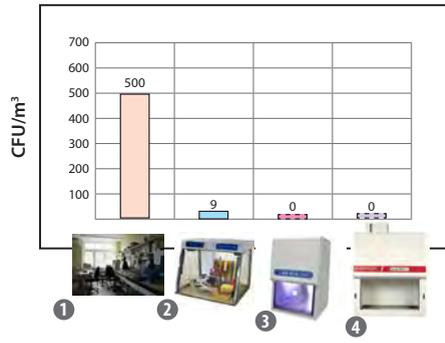


Fig. 6, Microbial contamination



**Legends for figures 5 and 6:**

- 1 Positive control (laboratory air)
- 2 UV Cabinet (UVC-T-M-AR, Biosan, Latvia)
- 3 Laminar flow cabinet (HEPA BSC II Cabinet prototype, Biosan, Latvia)
- 4 BSC II Cabinet (ABS Cabinet Class II, Microflow, UK)

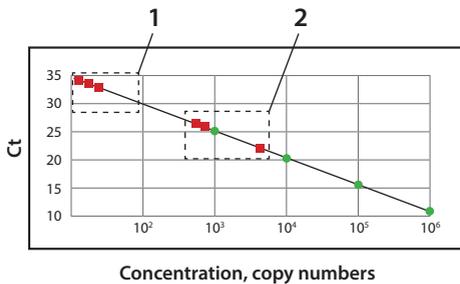
## Amplicon contamination-inactivation efficiency:

### 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 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

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%

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

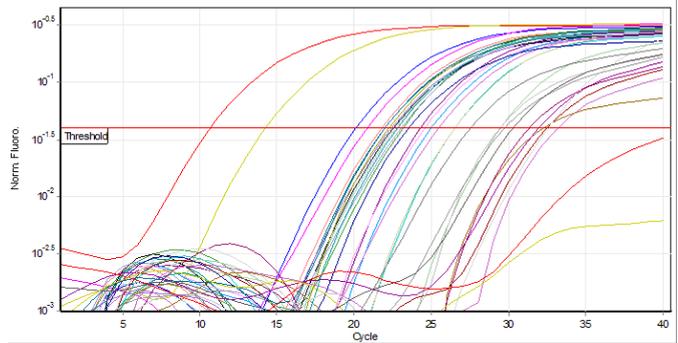
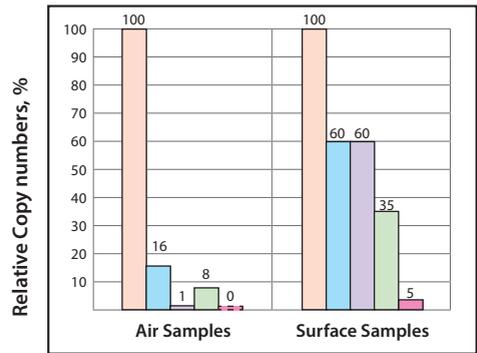


Fig. 9, Effect of direct and indirect UV irradiation on the amplicon concentration inside PCR cabinet UVC/T-M-AR, Biosan, Latvia



- 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.

## 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/cm<sup>2</sup> to 2 mW/sec/cm<sup>2</sup> 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/cm<sup>2</sup> to 20 mW/cm<sup>2</sup> (Fig. 10).

UV dosage during treatment = UV intensity at specific distance (mW/cm<sup>2</sup>/sec) × time of irradiation (sec)

UV dosage during 15 min: gradient from 1,800-18,000 mW/cm<sup>2</sup>

UV dosage during 30 min: gradient from 3,600-36,000 mW/cm<sup>2</sup>

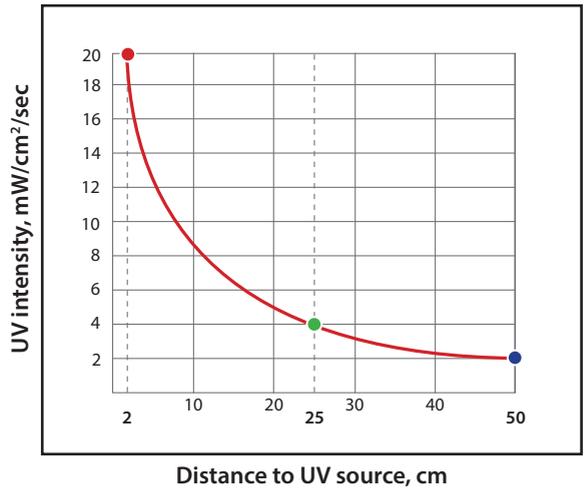
#### Cabinet's Surface treatment:

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

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/cm <sup>2</sup>	3,600-5,400 mW/cm <sup>2</sup>
Side walls (10-60 cm)	1,800-5,400 mW/cm <sup>2</sup>	3,600-9,000 mW/cm <sup>2</sup>
Front window (10-60 cm)	1,800-5,400 mW/cm <sup>2</sup>	3,600-9,000 mW/cm <sup>2</sup>

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



UV intensity, mW/cm <sup>2</sup> /sec	Distance, cm
● 20	2
● 4	25
● 2	50

### 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 m<sup>3</sup>/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/cm<sup>2</sup> (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/cm<sup>2</sup>
- During 30 min recirculation: 780 mW/cm<sup>2</sup>

#### 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 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 <sup>a</sup> 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 <sup>b</sup>	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 <sup>c</sup>	No
Effluent treatment	No	No	Yes/No <sup>c</sup>	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 <sup>d</sup>	No	No	Desirable	Yes

<sup>a</sup>Environmental and functional isolation from general traffic.

<sup>b</sup>Dependent on location of exhaust (see Chapter 4 of Laboratory Biosafety Manual).

<sup>c</sup>Dependent on agent(s) used in the laboratory.

<sup>d</sup>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%20uvrm%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](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

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# UVR-M and UVR-Mi, UV Air Recirculators Test Report



# UVR-M and UVR-Mi, UV air recirculators

## Test Report



Medical-Biological  
Research & Technologies

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.

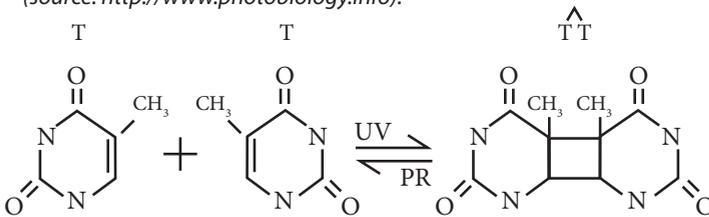


### General information

#### 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>).



UVR-M



UVR-Mi



#### 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 cm <sup>2</sup>	Other microorganisms	Energy: mW seconds per cm <sup>2</sup>
Bacillus anthracis	8.7	<b>YEAST</b>	
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
<i>List continues on the next page ...</i>		<i>List continues on the next page ...</i>	

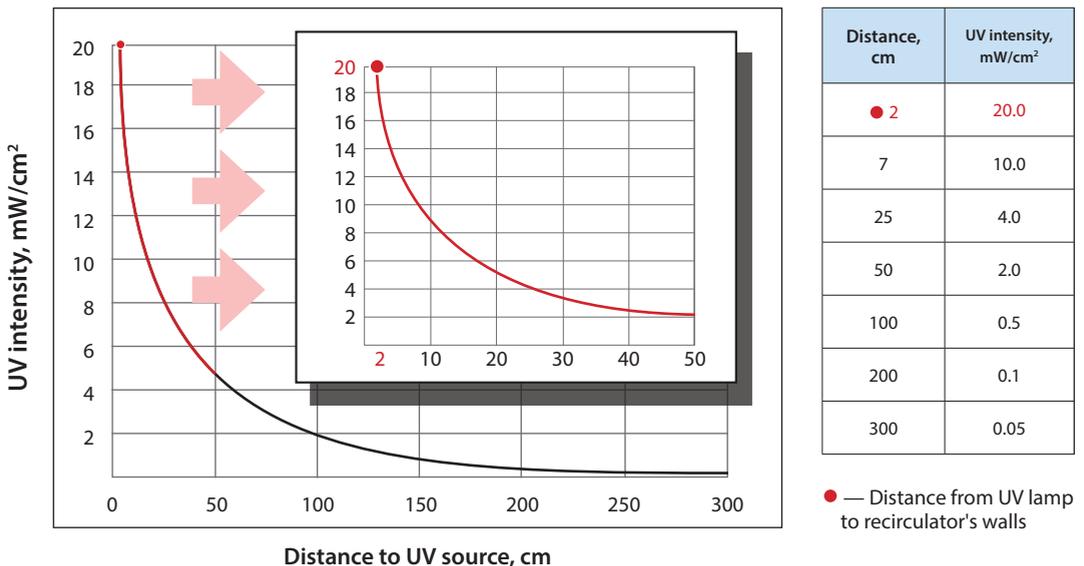
Bacteria organisms	Energy: mW seconds per cm <sup>2</sup>	Other microorganisms	Energy: mW seconds per cm <sup>2</sup>
<i>... List continued from the previous page</i>		<i>... List continued from the previous page</i>	
Clostridium tetani	22.0	<b>MOLD SPORES</b>	
Corynebacterium diphtheriae	6.5	Penicillium roqueforti	26.4
Eberthella typosa	4.1	Penicillium expansum	22.0
Escherichia coli	6.6	Penicillium digitatum	88.0
Micrococcus cadidus	12.3	Aspergillus glaucus	88.0
Micrococcus sphaeroides	15.4	Aspergillus flavus	99.0
Mycobacterium tuberculosis	1.0	Aspergillus niger	330.0
Neisseria catarrhalis	8.5	Rhisopus nigricans	220.0
Phytomonas tumefaciens	8.5	Mucor racemosus A	35.2
Proteus vulgaris	6.6	Mucor racemosus B	35.2
Pseudomonas aeruginosa	10.5	Oospora lactis	11.0
Pseudomonas fluorescens	6.6		
S. typhimusium	15.2	<b>VIRUS</b>	
Salmonella	10.0	Bacteriophage (E. coli)	6.6
Sarcina lutea	26.4	Tobacco mosaic	44.0
Sarratia marcescens	6.1	Influenza	6.6
Dysentery bacilli	4.2		
Shigella paradyserteriae	3.2	<b>PROTOZOA</b>	
Spirillum rubrum	6.1	Paramecium	200.0
Staphylococcus albus	5.7	Nematode eggs	92.0
Staphylococcus aureus	6.6	Chlorella vulgaris (algae)	22.0
Streptococcus hemolyticus	5.5		
Streptococcus lactis	8.8		
Streptococcus viridans	3.8		

## Results

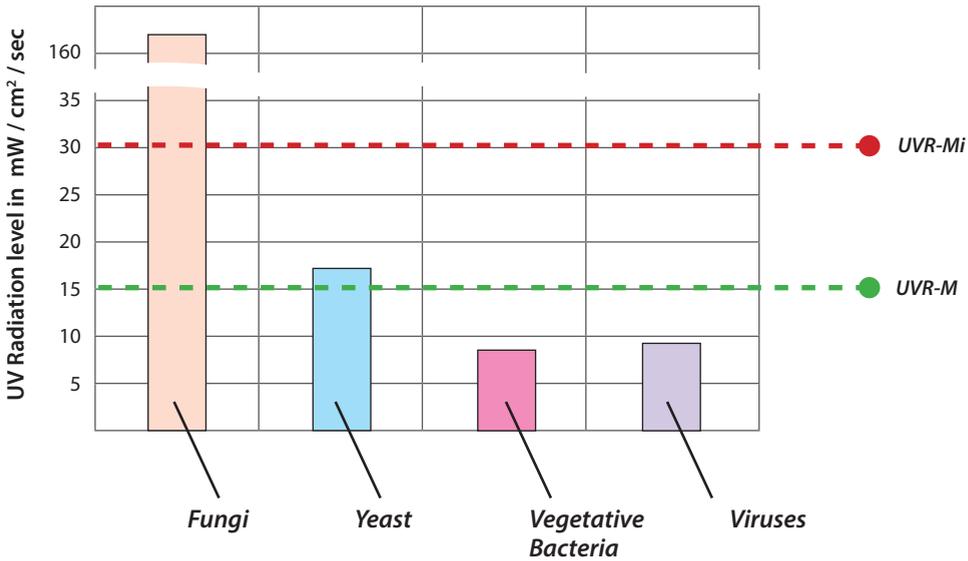
### UV Intensity measurements of Philips 25W bactericidal UV lamp

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



# 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



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# User's Guide: How to Choose a Proper Shaker, Rocker, Vortex

**Level of liquid**

**10<sup>3</sup> ... 10<sup>2</sup> ml**  
*Erlenmeyer flasks and Cultivation flasks*

**10<sup>1</sup> ml**  
*Petri dishes, vacutainers and tubes up to 50 ml*

**10<sup>0</sup> ... 10<sup>-3</sup> ml**  
*PCR plates, microtest plates and Eppendorf type tubes*

**PSU-20i**  
**ES-20/60 (with heating)**  
**PSU-10i**  
**ES-20 (with heating)**  
**MR-1**  
**MR-12**

**Applications:**  
 • Microbiology  
 • Extraction  
 • Cell growing

**Applications:**  
 • Agglutination  
 • Extraction  
 • Gel staining/  
 destaining

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

**Multi Bio RS-24**  
**Multi RS-60**  
**Bio RS-24**  
**RTS-1**  
**MSV-3500**  
**MR-1**  
**Multi Bio 3D**

**Applications:**  
 • Microbiology  
 • Extraction  
 • Cell growing

**Applications:**  
 • DNA-analysis  
 • Genome sequence

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

**Multi Bio RS-24**  
**PST-60HL-4 (with heating)**  
**PST-100HL (with heating)**  
**TS-DW**  
**PST-60HL (with heating)**  
**PSU-2T**  
**MPS-1**  
**CV-U**  
**TS-100 (with heating)**  
**TS-100C (with heating and cooling)**  
**V-32**

**Applications:**  
 • ELISA analysis  
 • Hybridization

**Applications:**  
 • PCR plates, microtest plates and Eppendorf type tubes

**New!**  
**New!**  
**New!**  
**New!**

# Product Line Examples

## Technology: DNA/RNA Extraction and PCR Products' Analysis



### Stages:

Centrifugation for  
DNA Extraction

Microspin 12  
page 43



Centrifugation for  
DNA Extraction in plates

LMC-3000  
page 44



Sample preparation: Smooth  
resuspending and centrifugation

MSC-6000  
page 40



or similar,  
see Multi-Spins page 40  
and Combi-Spins page 38, 39

Sample preparation in  
UV-Cabinet for PCR

UVC/T-M-AR  
page 88



or similar, see UV-Cabinet  
for PCR page 88

Sample Thermostating  
and Incubation

TDB-120  
page 51



TS-100C  
page 25



Amplification

Thermocyclic amplicator  
(on request)



Fluorescence End-Point  
Analysis

ALA-1/4 page 99



Electrophoresis

Electrophoresis Systems  
(on request)



Real-time Amplification

Real-time Amplicator

or

or

## Technology: Microbial Cell Cultivation



### Stages:

Sample Preparation in  
temperature controlled  
BSC class II cabinet

TLC-S page 93



Cultivation

ES-20 page 28



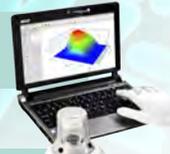
ES-20/60 page 29



or

Results Reading

DEN-1B or DEN-1,  
page 96



Cultivation and Real-time  
Results Logging

RTS-1, page 30



## Technology: DNA/RNA Extraction



### Stages:

Sample preparation in  
UV-Cabinet for PCR

UVC-T-M-AR page 91



or similar,  
see PCR cabinets page 91

Sample and Reagents  
Resuspending

MPS-1 page 14



or similar,  
see Vortexes page 33

High Speed  
Centrifugation

Microspin 12 page 43



Vacuum Aspiration

FTA-1 page 106



Incubation

TDB-120 page 51



# Technology: ELISA for the Detection of HBs-antigen

## Stages:



Sample Preparation in  
temperature controlled  
BSC class II cabinet

TLC-S page 93



Incubation

PST-60 HL page 22



PST-60 HL-4 page 22



Washing (Automated)

IW-8 page 102



Washing (Manual)

FTA-1 with MA-8 page 106



Analysis

ELISA reader  
(on request)



**Biosan, SIA**

Ratsupites 7, build. 2,  
Riga, LV-1067, Latvia

Phone: +371 674 261 37

Fax: +371 674 281 01

E-mail: [marketing@biosan.lv](mailto:marketing@biosan.lv)

<http://www.biosan.lv>