

BIOPROCESSING:

# CO<sub>2</sub> INCUBATOR, SHAKER-INCUBATORS, PERSONAL BIOREACTORS



**S-Bt Smart Biotherm**  
Compact CO<sub>2</sub> Incubator



**ES-20/80**  
Shaker-Incubator



**RTS-1 and RTS-1C**  
Personal Bioreactors

## S-Bt Smart Biotherm, Compact CO<sub>2</sub> Incubator NEW

### DESCRIPTION

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

Built-in infrared CO<sub>2</sub>-sensor allows accurate control of the CO<sub>2</sub> level. The sensor makes measurement non-sensitive to changes in temperature and humidity inside the incubator.

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

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

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

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

Unit is equipped with a "black box" system that records temperature, humidity and CO<sub>2</sub> levels, as well as statuses for door opening, UV lamp, fan and errors, to the internal memory.

Bluetooth® connection to PC is available.

### SPECIFICATIONS

Chamber Material	Stainless steel (1 mm)
Temperature setting range	+25°C ... +60°C
Temperature stability	±0.1°C
Temperature uniformity @37°C	±0.3°C
Timer sound signal	yes
Working volume	46 l
Number of shelves	3 (max 6)
Inner door	Glass
Relative humidity	>90% @ 37°C
Humidity delivery	Water bath
CO <sub>2</sub> control range*	0–20%
CO <sub>2</sub> sensor	Infrared sensor
Temperature and CO <sub>2</sub> level input	Digital
UV lamp	1 × 6 W, TUV G6T5
Data transfer	Wireless
Access port	1 (Ø 26 mm)
Working voltage	230V, 50/60 Hz; 115 V, 50/60 Hz
Power consumption	600 W
Weight	37.7 kg
Dimensions (W×D×H)	500 × 560 × 550 mm
Inner chamber dimensions (W×D×H)	350 × 330 × 390 mm

\* — At set temperature from ambient to 50 °C



Bluetooth® connection



Product video is available on the website

### APPLICATION AREAS

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

### FEATURES

- Six-sided heating provides uniform distribution of the temperature inside the chamber;
- Infrared CO<sub>2</sub> sensor, non-sensitive to temperature and humidity changes;
- UV recirculation system for decontamination cycles;
- Bluetooth data transfer to PC;
- «Black box» parameter logging system;
- Error tracing and alarm system;
- Separately heated lockable port for chamber access for cables.

## S-Bt Smart Biotherm, Compact CO<sub>2</sub> Incubator

Simple CO<sub>2</sub> tank connection

Air UV recirculation system in the chamber



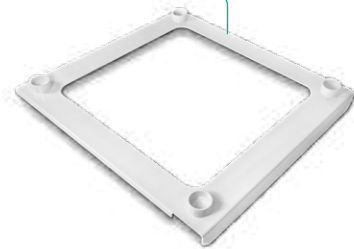
Gas purification filter



PC software



Incubator stacking device



RS6, rack with 3 shelves

### ORDERING INFORMATION

S-Bt Smart Biotherm, PC software included + RS6, rack with 3 shelves

S-Bt Smart Biotherm, PC software included + RS2, rack for CPS-20 installation

#### Optional accessories:

CPS-20, CO<sub>2</sub> Shaker

Shelf

USB Bluetooth® adapter

Incubator stacking device

Cat. number 

BS-010425-A01

BS-010425-A10

BS-010172-A01

BS-010425-AK

BS-010425-FK

BS-010425-CK

## CPS-20, CO<sub>2</sub> Shaker NEW

DESCRIPTION

CO<sub>2</sub> Shaker **CPS-20** provides regulated orbital motion of the platform and is designed for use in Biosan's S-Bt CO<sub>2</sub> Incubator. **CPS-20** is specifically designed for unnecessary harsh environments such as CO<sub>2</sub> and humidity and provides reproducible results for cell culture growth. A choice of five interchangeable platforms provides the possibility of performing various procedures and techniques in various cultivation vessels.

**CPS-20** incorporates a brushless motor with a guaranteed service life of up to 35,000 hours. The unit is equipped with a triple eccentric mechanism for platform motion that provides supreme balancing characteristics, superior reliability and quiet operation. The specially designed remote controller allows for the protection of electronics from a CO<sub>2</sub> incubator environment, as well as, the remote control minimizes interference with the incubator environment and the ongoing experiment.

SPECIFICATIONS

Speed control range	50–250 rpm (increment 10 rpm) max. speed depends on the load and vessels' shape
Digital time setting	1 min–96 h/non-stop (increment 1 min)
Digital speed control	+
Maximum continuous operation time	168 h
Orbit	20 mm
Maximum load	3 kg
Overall dimensions (WxDxH)	255 × 255 × 100 mm
Weight	3.4 kg
Input current/power consumption	470 mA / 5.7 W
External power supply	Input AC 100–240 V; 50/60 Hz Output DC 12 V



RS2, rack for CPS-20 installation



## Platforms for CPS-20

Platform	Description	Dimensions (mm)	Working Area (mm)	Cat. number
<b>UP-12</b> 	Universal platform with adjustable bars for different types of flasks, bottles and beakers with silicone mat	285 × 220 × 40	270 × 185 × 40	BS-010108-AK
<b>Bio PP-4</b> 	Flat platform with silicone mat for Petri dishes, culture flasks, agglutination cards	255 × 255	230 × 230	BS-010116-AK
<b>P-12/100</b> 	Platform with clamps for flasks, 100–150 ml (12 places)	250 × 190	250 × 190	BS-010108-EK
<b>P-6/250</b> 	Platform with clamps for flasks, 250–300 ml (6 places)	250 × 190	250 × 190	BS-010108-DK
<b>P-16/88</b> 	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	275 × 205 × 75	BS-010116-BK

S-Bt Smart Biotherm, Compact CO<sub>2</sub> Incubator

## ORDERING INFORMATION

CPS-20, CO<sub>2</sub> Shaker

RS2, rack for CPS-20 installation

Cat. number

BS-010172-A01

BS-010425-HK

## RTS-1 and RTS-1C, Personal bioreactors

USB  
connectionProduct video is available  
on the websiteReverse-Spin®  
Innovative Mixing TechnologyUsers articles: [biosan.lv/report](http://biosan.lv/report)

## SPECIFICATIONS

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

\* — Highest k<sub>a</sub> (h<sup>-1</sup>) is achieved at 5 ml working volume which is optimal for aerobic cultivation\*\* — Conversion coefficients from OD<sub>850</sub> to OD<sub>600</sub> vary between strains and phases of growthSee the Reverse-Spin® Technology — Innovative Principle  
of Microbial Cultivation on web page [biosan.lv/rts-tech](http://biosan.lv/rts-tech)

## RTS-1 and RTS-1C, Personal bioreactors

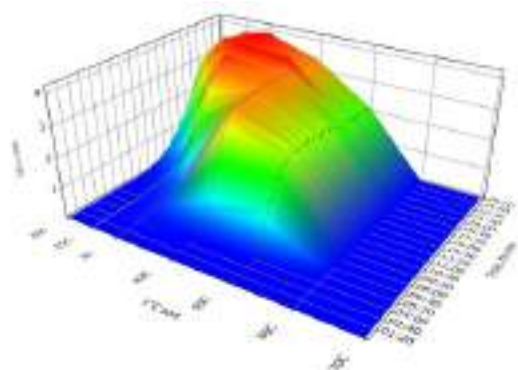
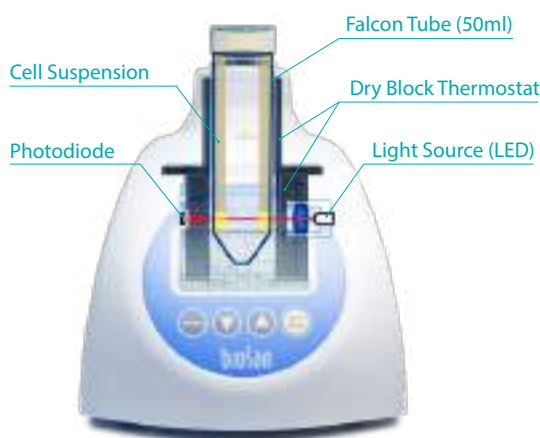


Figure 1. 3D graph of *E.coli* BL21 growth kinetics showing the effect of different temperatures in 7 parallel RTS bioreactors.

### TYPICAL APPLICATIONS

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

### ORDERING INFORMATION

RTS-1C including TubeSpin® Bioreactor 50, TPP®, 20 pcs.

RTS-1 including TubeSpin® Bioreactor 50, TPP®, 20 pcs.

#### Optional accessories:

TubeSpin® Bioreactor 50, TPP®, 20 pcs.

TubeSpin® Bioreactor 50, TPP®, 180 pcs.

USB 2.0 Hub 10 × ports

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

### FEATURES

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

### SOFTWARE FEATURES

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

Cat. number

BS-010160-A04

BS-010158-A04

BS-010158-AK

BS-010158-CK

BS-010158-BK



## RTS-1 and RTS-1C, Personal bioreactors

### Recommendations for creating personal settings for cultivation of microorganisms.

#### Points that should be considered:

1. The growth rate directly depends on the tube's rotation speed, since it is directly proportional (in the range from 1,500 to 2,500 rpm) with the rate of saturation of the medium with oxygen.
2. Naturally, with aerobic metabolism, the change in OD over time will also proportionally increase depending on same as above.
3. This will also affect the specific growth rate  $\Delta OD/\Delta t$ .
4. As well as the time for the growth curve to reach the stationary growth phase during aerobic fermentation (the higher the tube rotation speed, the faster the culture's exit to the stationary phase)
5. The saturation of the medium with oxygen will depend on the frequency of switching the tube rotation to the opposite (RST) (the more often the direction of rotation of the tube is reversed, the higher the oxygen mass transfer)
6. OD  $\lambda=850$  — this wavelength is used to measure microorganism cell concentration because nutrient media and microorganism cells have colour. This must be taken into account when monitoring the specific dynamics of microorganism growth. In order to go into the "shadow" region (independent of the colour of the medium and microorganism), we offer the near infrared (not visible to the human eye) light scattering measurement range of — 850 nm. Since we are still in the sensitive range and, at the same time, are independent of the natural colouration of microorganism colonies. The conversion factor  $OD_{850}/OD_{600}$  is about 2.

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

### Cell growth depending on rotation intensity

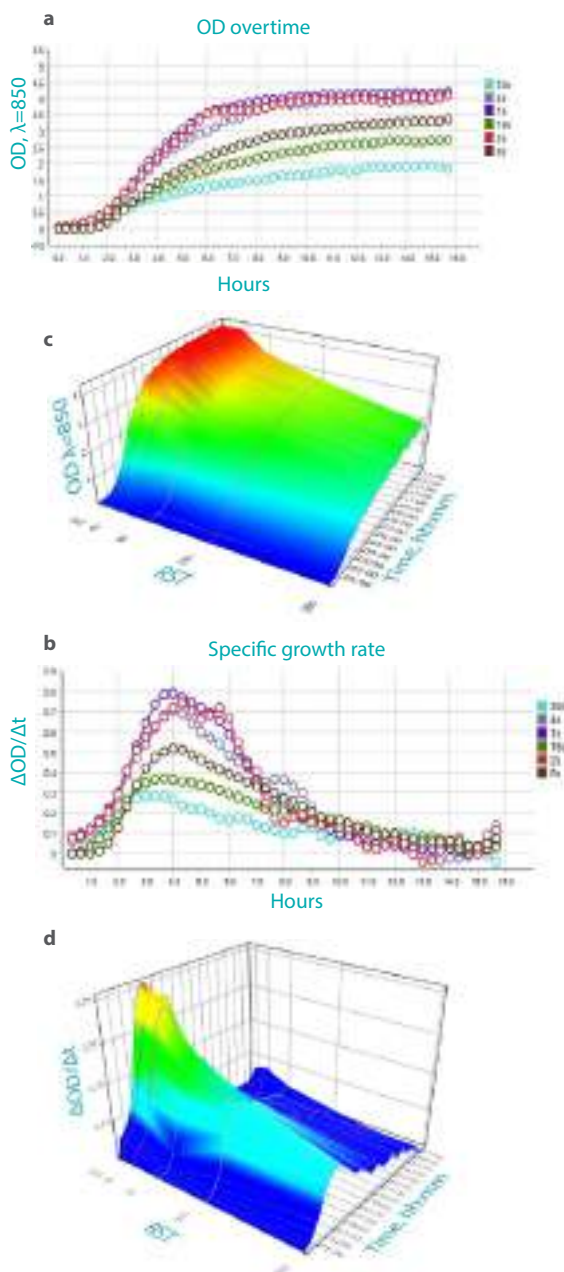


Figure 2, a-c. Influence of Reverse Spin Time (RST) on growth kinetics of *E.coli* BL21 in OD<sub>600</sub>. (a-c) Biomass growth; (b-d) Specific growth rate; throughout cultures were grown in 50 ml TPP Bioreactor tubes, 30% filling volume, 2,000 RPM, RST 1, 2, 4, 8, 16, 30 seconds, LB medium and 37°C temperature, to convert OD<sub>850</sub> to OD<sub>600</sub> simply multiply OD<sub>850</sub> by 1.9.



## RTS-1 and RTS-1C, Personal bioreactors

### $k_{i,a}$ (h<sup>-1</sup>) results in RTS-1/C

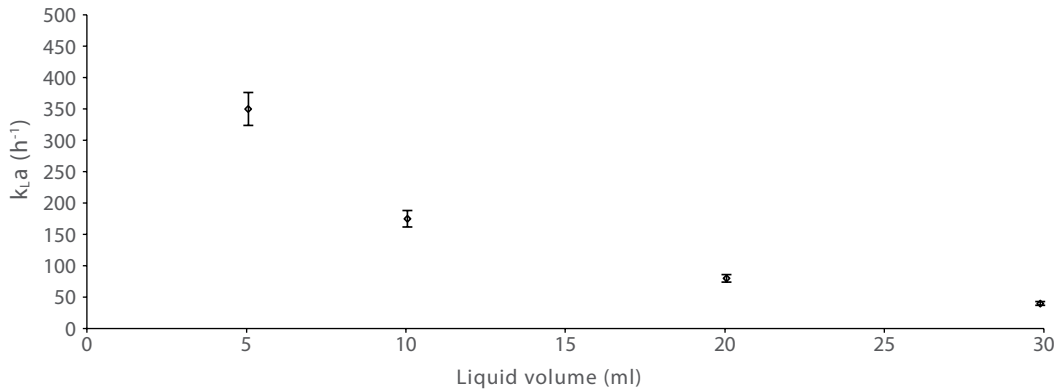


Figure 3. Determination of  $k_{i,a}$  in 50 ml TPP Bioreactor tubes. The bioreactor vessels were filled with 5, 10, 20, 30 ml deionized water, and measurements were made by non-invasive O<sub>2</sub> sensors and optics (PreSens, Regensburg, Germany) at 37°C using the gassing-out method. Mean and standard deviation of at least five independent experiments are shown.

The  $k_{i,a}$  was measured in 5, 10, 20, 30 ml of deionized water in 50 ml TPP Bioreactor tubes at agitation rate of 2,000 rpm and 1 s RST, this agitation rate was found optimal for Reverse-Spin® mixing principle during initial optimization studies. Over the working volume range, the  $k_{i,a}$  increased with the decrease of liquid volume (Figure 3). At the smallest working volume of 5 ml, the highest  $k_{i,a}$  of 350 ± 26 h<sup>-1</sup> was reached.

### Cells successfully cultivated

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

### Types of recommended tubes

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

### Factory calibration particle size and calibration coefficients 600nm/850nm

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

### Factory calibration growth phase influence on measurement accuracy

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

### Conversion rate coefficient of user calibration

Optical density OD<sub>850</sub> to OD<sub>600</sub> nm conversion rate coefficient depends on the cell size and volume. Therefore, the coefficient will be different for other cell sizes. The device can be calibrated at desired reference wavelength to meet user's needs, e.g. OD<sub>600</sub>.

### Do you want to test this system?

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

## RTS-8 and RTS-8 Plus, Multi-channel Bioreactors NEW

DESCRIPTION

**RTS-8** and **RTS-8 plus** are multi-channel bioreactors that utilise patented Reverse-Spin® technology that applies non-invasive, mechanically driven, low energy consumption, innovative type of agitation where cell suspension is mixed by the single-use falcon bioreactor tube rotation around its axis with a change of direction of rotation motion resulting in highly efficient mixing and oxygenation for aerobic cultivation.

Combined with a near-infrared measurement system, it is possible to register cell growth kinetics and additionally on **RTS-8 plus** fluorescence and luminescence measurement systems used to register pH and O<sub>2</sub> non-invasively in real-time. For pH and O<sub>2</sub>, innovative single-use sensor spots are used inside the tubes. Although O<sub>2</sub> supply is one of the major issues in the cultivation of aerobic organisms, especially in oxygen-limited conditions, adequate methods for real monitoring of dissolved oxygen were missing, and sufficient O<sub>2</sub> supply was usually assumed. Innovative non-invasive oxygen sensors integrated into falcon tubes now enable online oxygen monitoring and give new insights into metabolic activities.

The pH is one of the major issues in the cultivation of cells, yeast or bacteria. Cultivation vessels, that are sensor-limited, are widely applied in academic and industrial bioprocess development. As adequate methods for real monitoring of pH were not available, cumbersome at-line sampling was used, lacking high data density and interfering with growth. Non-invasive real-time pH measurement provides new insights into metabolic activity and changes in metabolic pathways.

### SOFTWARE FEATURES

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



#### only RTS-8 Plus

- Real-Time pH and O<sub>2</sub> measurement and logging

Tube for RTS-8 Plus with sensor



### Smart Plus Product Class



#### Reverse-Spin®

Innovative Mixing Technology

### FEATURES

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



#### only RTS-8 Plus

- Non-invasive O<sub>2</sub> and pH measurement allows for accurate monitoring of metabolic activities cultivation while at home or using a mobile phone

#### Advantages of the sensor spots:

- They are small;
- Their signal does not depend on the flow rate of the sample;
- They can be physically divided from the measuring system which allows a non-invasive measurement;
- They can be used in disposables;
- Therefore, they are ideally suited for the examination of small sample volumes, highly parallelized measurements in disposables, and biotechnological applications.

**NEW** **RTS-8 and RTS-8 Plus, Multi-channel Bioreactors**


USB  
connection



Product video  
is available  
on the website

**TYPICAL APPLICATIONS**

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

**SPECIFICATIONS**

	RTS-8	RTS-8 Plus
Light source		Laser
Measurement wavelength (λ)		850 ±15 nm
Measurement range		0–100 OD <sub>600</sub>
<i>E. coli</i> factory calibration measurement range		0–50 OD <sub>600</sub>
<i>P. pastoris</i> factory calibration measurement range		0–100 OD <sub>600</sub>
Achievable user calibration measurement error (range 0.1–3 OD <sub>600</sub> )		±0.3
Achievable user calibration measurement error (range 3–100 OD <sub>600</sub> )		≤15%
Measurement periodicity per hour		1–60 (increment 1 min)
Temperature setting range		+15°C ... +60°C
Temperature control range		+15°C below ambient ... +60°C (increment 0.1°C)
Temperature stability		±0.2°C
Sample temperature accuracy (20–37°C)		±1°C
Tube sockets		8
Sample working volume range		3–50 ml
Speed control range		150–2,700 rpm (increment 1 rpm)
Display		LCD
Dimensions (WxD×H)		350 × 690 × 300 mm
Weight		20 kg
Nominal operating voltage		AC 230 V, 50 Hz
Power consumption		3.15 A / 500 W
O <sub>2</sub> sensor*	—	+
pH sensor**	—	+

**\*O<sub>2</sub> sensor**

Range	0–100%
Accuracy	±0.05% O <sub>2</sub> at 0.2%, ±0.4% O <sub>2</sub> at 20.9%
Drift	<0.03% O <sub>2</sub> within 30 days
Temperature range	up to 40°C
Response time (t <sub>90</sub> )	<6 s
Storage stability	18 months

**\*\*pH sensor**

Range	4.0–8.5 pH
Accuracy	±0.10 pH at pH 7
Drift	<0.005 pH per day
Temperature range	up to 40°C
Response time (t <sub>90</sub> )	<120 s
Storage stability	18 months

**ORDERING INFORMATION**

Cat. number

**RTS-8** including TPP TubeSpin® Bioreactor vessels 50ml, 20pcs.

BS-010168-A01

**RTS-8 Plus** including TPP TubeSpin® Bioreactor vessels 50ml, 20pcs and sterile TPP TubeSpin® Bioreactor vessels, 50ml, with pH and O<sub>2</sub> sensors, 10pcs

BS-010170-A01

**Optional accessories:**

TubeSpin® Bioreactor 50, TPP®, 20 pcs.

BS-010158-AK

TubeSpin® Bioreactor 50, TPP®, 180 pcs.

BS-010158-CK

USB 2.0 Hub 10 × ports

BS-010158-BK

 Sterile TPP TubeSpin® Bioreactor vessels, 50 ml, with pH and O<sub>2</sub> sensors

200001368

## ES-20/60, Orbital Shaker–Incubator

DESCRIPTION

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

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

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

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

Premium  
Product Class

Ø 20 mm  
orbit



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

from 25°C + 90 min to 80°C

## ES-20/80, Orbital Shaker–Incubator NEW

DESCRIPTION

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

A built-in heat-resistant brushless fan provides precise temperature distribution inside the chamber (from 5°C above ambient up to +80°C). Additionally, excellent sample temperature uniformity of  $\pm 0.3^{\circ}\text{C}$  at 37°C is achieved. The inner chamber is made of stainless steel. State-of-the-art motor, thermal insulation materials and parameter PID–control decrease the energy consumption and make the shaker-incubator highly energy efficient despite its relatively large size.

Smart Plus  
Product Class

Ø 20 mm  
orbit



Bluetooth®  
connection



50-400 rpm

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

from 25°C + 75 min to 80°C

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

	ES-20/60	ES-20/80
Temperature setting range	+25°C... +80°C	
Speed control range	50–250 rpm	50–400 rpm
Temperature control range	10°C above ambient ... +80°C	5°C above ambient ... +80°C
Setting resolution	0.1°C; 10 rpm	0.1°C; 10 rpm
Temperature stability	±0.5°C	±0.1°C at 37°C
Temperature accuracy	±0.5°C	±0.1°C at 37°C
Temperature uniformity	±0.5°C	±0.3°C at 37°C
Orbit	20 mm	
Display	LCD, 2×16 signs	TFT, 5 inches
Digital time setting	1 min–96 h/non-stop (1 min increment)	
Timer sound signal	yes	
Maximum load	8 kg	10.6 kg
Data transfer	—	Bluetooth®
Stacking	—	up to 3*
Overall dimensions (W×D×H)	590 × 525 × 510 mm	620 × 530 × 510 mm
Dimensions of the inner chamber	460 × 400 × 310 mm	
Weight	41.1 kg	48 kg
Nominal operating voltage	230 V, 50/60 Hz or 120 V, 50/60 Hz	230 V, 50/60 Hz
Power consumption	450 W (2 A)/450 W (4.5 A)	500 W (2.2 A)
Software	—	yes

\* Additional stacking kit required

## ORDERING INFORMATION

Cat. number 

**ES-20/60** without platform

BS-010135-AAA

**ES-20/80** with software, without platform

BS-010167-A05

## Optional accessories:

USB Bluetooth® adapter

BS-010425-FK

Stacking kit for 2× **ES-20/80**

BS-010167-OK

Stacking kit for 3× **ES-20/80**

BS-010167-PK

Platforms cat. numbers for **ES-20/60** can be found on page 23

Platforms cat. numbers for **ES-20/80** can be found on page 126



Description of all platforms  
for ES-20/60 on page 23



Description of all platforms  
for ES-20/80 on page 126

## Platforms for ES-20/80

Platform	Description	Dimensions (Working Area)	Cat. number
<b>HSP-30/100</b> 	Platform with 30 tight fit clamps for 100–150 ml flasks	360 × 400 mm (360 × 400 mm)	BS-010167-KK
<b>HSP-16/250</b> 	Platform with 16 tight fit clamps for 250–300 ml flasks	360 × 400 mm (360 × 400 mm)	BS-010167-MK
<b>HSP-9/500</b> 	Platform with 9 tight fit clamps for 500 ml flasks	360 × 400 mm (360 × 400 mm)	BS-010167-NK
<b>HSP-6/1000</b> 	Platform with 6 tight fit clamps for 1,000 ml flasks	360 × 400 mm (360 × 400 mm)	BS-010167-LK
<b>PP-400</b> 	Flat platform with non-slip silicone mat	360 × 400 mm (360 × 400 mm)	BS-010135-FK
<b>UP-168</b> 	Tight fit clamp for 50, 100, 250, 500, 1,000 ml flask (for UP-168)	360 × 400 mm (360 × 400 mm)	BS-010135-JK
<b>HSC-50</b> <b>HSC-100</b> <b>HSC-250</b> <b>HSC-500</b> <b>HSC-1000</b>	Tight fit clamp for 50, 100, 250, 500, 1,000 ml flask (for UP-168)	Ø 50 mm Ø 65 mm Ø 85 mm Ø 105 mm Ø 130 mm	BS-010167-DK BS-010167-EK BS-010167-FK BS-010167-JK BS-010167-IK
<b>NEW</b> <b>SPML</b> 	Set of 3 double-sided adhesive strips as an alternative for regular flask clamps (for UP-168)	390 × 80 × 3 mm (2 per platform)	BS-010135-MK
<b>TR-21/50</b> 	Test tube rack for 50 ml with 21 drillings (for UP-168)	340 × 124 mm (2 per platform)	BS-010135-KK
<b>TR-44/15</b> 	Test tube rack for 15 ml with 44 drillings (for UP-168)	340 × 124 mm (2 per platform)	BS-010135-LK

**Basic Plus**  
Product Class

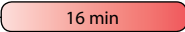
Ø 10 mm  
orbit



Product video is available on the website



#### Heat up time for ES-20:

from 25°C  16 min to 42°C



#### ORDERING INFORMATION:

Cat. number

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

#### Optional accessories:

Platforms:	<b>UP-12</b>	BS-010108-AK
	<b>PP-4</b>	BS-010108-BK
	<b>P-12/100</b>	BS-010108-EK
	<b>P-6/250</b>	BS-010108-DK
	<b>P-16/88</b>	BS-010116-BK

## ES-20, Orbital Shaker-Incubator

DESCRIPTION

The **ES-20** is a compact bench-top Shaker-Incubator used for mixing of biological liquids and 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 plexiglass 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 a direct-drive system, ensuring the most reliable, stable long-time operation (up to 30 day nights).

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

#### DIFFERENT INTERCHANGEABLE PLATFORMS ALLOW USING ES-20 FOR:

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

SPECIFICATIONS

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

**Description of all platforms for ES-20 on page 22**