Lovibond® Water Testing

Tintometer® Group

BD 600 GLP

Instruction Manual Addendum

GB

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IMPORTANT !

This manual is an addendum to the standard manual of the BD 600 system called "BOD-system BD 600, Instruction manual".
It describes the differences and different handling procedures of the BD 600 for GLP to the standard system. This Addendum together with the instruction manual of the standard BD 600 system forms the documentation for the BD 600 GLP system.

Read both manuals carefully before use!

Carefully read and follow the SAFETY INSTRUCTIONS at the beginning of standard manual!

The system may only be used by qualified persons!

Keep this manual for later reference!

Also observe important notices in order to avoid malfunctions and faults.

Content

1 Important information

The BD 600 GLP is a BD 600 device that contains a special firmware that contains optimized procedures to ensure GLP conformity.

As GLP defines some requirements regarding data validity there are important differences between the standard BD 600 system and the BD 600 GLP system respectively the data storage and user interface. Some of them lead to a different handling and user interface in the software.

In case of such a difference the procedure described in this manual addendum shows the correct way of handling of the GLP version, the procedure described in the standard manual is no longer applicable.

The BD 600 GLP contains an internal live time data memory. To protect this from manipulation the SD card slot of the BD 600 GLP is closed and also the screws of the rack housing are sealed. A firmware update cannot be performed by user. Extracting or changing the internal memory card can only be done by the manufacturer without unsealing or damaging the system.

2 Disposal

No addendum.

3 The Measurement System

3.1 Principle of the method

BOD measurement by means of pressure differential in a closed system (respirometric BOD measurement). The measurement system records a measurement in one selected of the four following modes with the following measurement intervals:
5 days I = every 2 hours, **28 days** = every 12 hours, **60 days** = every 24 hours and **90 days** = every 24 hours the first 30 days and every 48 hours the last 60 days. In addition a separate measuring mode will be used during calibration of sensor heads: **5 days II** = every six hours.

3.2 Area of application

BOD_5 measurement, BSB_7 measurement, OECD 301F / biological degradability testing under GLP / further bio-technical applications in aqueous solutions. For use by qualified personnel only.

The measuring time is adjustable in the pre-set configurations mentioned above (5 days, 28 days, 60 days and 90 days).

3.3 Device view and scope of delivery

Figure 1

- 1 x BOD base unit with integrated bottle rack
- 6 x BOD sensor (material ABS)*
- 6 x BOD bottles
- 6 x rubber gaskets (6.5 cm length)
- 6 x magnetic stir bar
- 3 x battery, alkali manganese (C / LR14)
- 1 x retaining tube for batteries
- 1 x stirrer drive
- 1 x mains adapter + primary adapter plug
- 1 x Y-cable
- 1 x USB cable
- 1 x nitrification inhibitor
- 1 x potassium hydroxide solution (KOH solution)
- 1 x Allen key
- 1 x operating manual
- 1 x EC Declaration of Conformity

* for non-aqueous samples: check material compatibility with the sample prior to use. All BOD sensors need to be validated before usage. A validated sensor head keeps this status for 12 months until it needs to be validated again. See also XX.

4 Information about the method

4.1 Biochemical Oxygen Demand (BOD)

No addendum.

4.2 Measuring principle

No addendum.

4.3 Sample preparation / brief summary

No addendum regarding BOD measurement.

Sample handling and preparation of biological degradation testing see OECD 301F standard.

As some substances are easy to degrade and may produce a high amount of carbon dioxide during the period of 28 days testing, it is necessary to use more KOH solution as described for BOD measurement. It is also possible to use sodium hydroxide or potassium hydroxide pellets. Use at least 140 mg sodium hydroxide or 200 mg potassium hydroxide per bottle. This is about one to two pellets. In case of use of the KOH solution dose at least 10 drops into the rubber gasket.

Start 28 days or longer testing only by using the 6.5 cm long rubber gaskets instead of the 4.5 cm rubber gaskets that are also available for the BD 600. For the OECD biodegradability testing choose the sample volume according to the ThOD value (theoretical oxygen demand) of the solution that should be tested.

It is only possible to use sensor heads, which take a validity status for the whole planned measuring period. If the validity status ends before planned end of measurement, the sensor head will not be accepted and need to be validated before further use.

It is only possible to start a new measurement at a rack position where no measurement series is currently active. Such measurements need to be finished at first or be stopped manually before a new measurement series can be started at that rack position.

To get the best results it is important that the samples and bottles are at the temperature inside the incubator already before the measurement is started and the rack is been placed into the incubator.

5 Operation

5.1 Keys

No addendum.

5.2 Initial commissioning

No addendum.

5.3 Switching on and off

No addendum.

5.4 Replacing batteries

No addendum.

5.5 General menu information

To change settings at the BD 600 GLP that will affect measurements in a measurement series you need to login by using the general password ‚**2017**' and a name (at least two letters) which will appear in the log file afterwards.

5.5.1 Main menu

No addendum.

5.5.2 Start measurement/measurement series

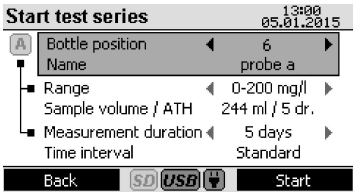

Figure 6

The GLP version runs always withy deactivated Autostart mode. So the A-symbol is always greyed out and in the submenue ‚Options' is no setting for Autostart available.

Bottle position / name:
The ‚Name' of a bottle is just a label to make identification of samples easier. The GLP compliant sample tracing is ensured via the unchangeable head-ID locked in the measurement value data file, which will be saved for each measurement series on the rack.
The name of a bottle can only be set prior to starting a new measurement series.

The head-ID, the name, the starting time and date of the series, the measurement duration and interval and the chosen measuring range can be displayed in the ‚Display test series' menu (see 5.5.4) or in the sub menu ‚Stop test series' by pressing the backspace key (see 5.5.2.1) after the measurement series has been started.

Measuring range / sample volume / ATH: After a measurement series or a calibration measurement has been started on a head, changes are not possible anymore. To be able to change the running measurement series at that head need to be stopped at first (see 5.5.2.2).

Measuring duration / measuring interval: After a measurement series or a calibration measurement has been started on a head, changes are not possible anymore. To be able to change the running measurement series at that head need to be stopped at first (see 5.5.2.2).

It is only possible to start a new measurement series on a head if no other measurement series on that head is running and the head is valid for the chosen duration. In case of trying to start a measurement at a head where already a measurement series is pending the info ‚On the device there is already a measurement running with the head ID' appears on the display and need to be confirmed to go ahead.

5.5.2.1 Handling of measurement series with the BD 600 GLP

In the BD 600 a sensor head stores all the data of the currently running measurement series. These data can be stored manually on a memory device like an USB stick or SD card. In difference to that the BD 600 GLP rack ensures that all measurement data of a head are stored automatically to the internal memory (internal SD card, that only allows read access and cannot be extracted or changed by user).

To give you the most possible flexibility a head/bottle position can be changed on the rack even when a measurement series is active. This will not affect the consistency of data storage. In addition it is possible to start a measurement series at one rack, do several measurements there, put the head/bottle afterwards to different rack and let the measurement series continue on the new rack.

To continue the already started measurement on the new rack it is important to tell the new rack that there is a new bottle which measurement series should be continued. To do so go into ‚Start test series' menu and select the position of the bottle. The system is showing now the parameters of the running measurement series of that new bottle. Because this measurement series is still active it is not possible to change these parameter. To continue this measurement series at this rack press ‚Start' (F2).

After this the measurement series will be continued on this rack until it is over. A new data storage file for this measurement series will be created also on this rack. This will contain all setting for the series as well as all already measured values in this series even if those were performed on a different rack before.

In such a case two data storage files of the measurement series exist. One series on the rack where the series has been started and one on the rack where the series will be finished. The first one will contain only measurement values until the time of replacing the bottle plus several entries of ‚Sensor head not accessible' until it will be finished or it will be stopped manually. The second rack will contain all measurement data including one entry ‚The test series has been continued' at that measurement entry that the first measurement on the new rack represents.

So in consequence the complete data record of a measurement series can always be found at that rack where a measurement series has been finished.

In opposite to bottles with active measurement series bottles with an active calibration measurement cannot be continued on a different rack. Calibration measurements need to be performed completely at one rack. If a bottle/head with an active calibration measurement is been placed to a different rack the only option there is to stop that calibration series manually (see 5.5.2.2) to be able to use that head for new test series.

If a bottle/head with a finalised measurement series has been placed on the rack and the ‚Start' (F2) has been pushed in this menu, the user can choose whether he likes to start a new measurement series by overwriting the data inside the head memory (the test series has been stored on the rack, where the series has been finished) or if he likes to download the finalised test series to the memory of this rack. The latter helps if one rack should be used as a data transfer hub to a PC system. After download the test series data file is on this rack and also on the rack where the measurement has been completed.

5.5.2.2 Stop measurement series

By pressing the backspace key  in the menu ‚Start test series' the submenu ‚Stop test series' appears.

This sub menu displays all active measurement series on the rack. An active measurement series on the rack does not mean that the head/bottle that belongs to that series has to be still on the rack. A measurement series is active until it reaches its scheduled end or it will be stopped manually.

Each measurement series is listed by a number. This number is independent from the number of the bottle position on the rack!

So for example a measurement series started at bottle position 1 can get the number 6 in this list. This is because the position of a bottle on the rack can be changed freely. Because of the Head-ID the rack can identify the measurement series that belongs to each rack bottle position automatically and so it ensures correct data assignment and data storage.

If a bottle has been replaced from the rack a started measurement series will still be active and listed here until the scheduled end of the series. In such a case the data file of the measurement series gets an entry ‚Sensor head not accessible' for each measurement where the bottle is not back on the rack. After a replaced bottle has been returned to the rack, the rack will automatically continue the pending measurement series.

By pressing the number keys the details of the active measurement series of the rack can be displayed. If less than six series are active the list shows also empty entries. Only if less than six (measurement or calibration) series are active a new series can be started. It is only possible to run up to six measurement series at the same time.

Calibration measurements of sensor heads are listed like a measurement series as well. They use always the time interval ‚5 days II' and can be identified by this. A measurement series that is not a calibration can be continued on a different rack (see 5.5.2.1).

To stop a measurement series manually select it by using the number keys. Afterwards press ‚Stop' (F2). The BD 600 GLP is asking for the password and your name (see 5.5 addendum). After

confirmation the chosen series will be stopped. The data file of this series will contain the entry ‚Stopped by operator' plus the entered name.

A measurement series that is complete contains the entry ‚Test series stopped regularly' below the last measurement value and stops automatically.

5.5.3 Display current values

No addendum.

5.5.4 Display measurement values

The head information like head-ID, name, starting time and date of the series, measurement duration and interval and chosen measuring range can be displayed in the header by using the right ► or left ◄arrow key.

It is only possible to display measurement values of active measurement series in this mode. In addition the head/bottle of that series need to be on the rack.

5.5.5 Export measurement series

The BD 600 GLP can export measurement series data been stored in heads that are placed on the rack to an external USB memory device. On contrary to a normal BD 600 the GLP version cannot export these data to SD cards as this port is used for the internal life time memory.

The file exported to USB is very similar to the measurement series data file stored automatically inside the rack (see 5.5.5.2). But it does not contain the CPU-ID for identification of the rack and further entries that are stored together with a calibration measurement (batch no, test value and tolerance of the used test tablets). Instead of these it tells you the bottle position on the rack.

5.5.5.1 Exporting data files from the rack memory to a PC

A BD 600 GLP rack has a life time memory to store all measuring data and calibration data produced from heads that have been placed to that rack and the log files of the rack.

To export these data files to a PC the BD 600 GLP and the PC need to be connected via an USB cable. After this it is necessary to set the rack into the ‚data transfer mode' . Switch the rack off and hold afterwards the list key  while pressing the on/off key  .

The rack will reboot now and display that the ‚data transfer mode' is active. When the rack has been connected to a PC via USB interface, the internal memory of the BD 600 GLP now is visible as an external storage device with read access only. All measurement series data files can be found inside the folder ‚data'. All calibration series data files can be found inside the folder ‚calib'. And the log files that contains all changes of parameters and options of the rack can be found inside the folder ‚log'. You can all desired files copy now from the rack to the PC.

As long as the ‚data transfer mode' is been active, no measurement will be performed on the rack. After 90 minutes the data transfer mode ends automatically and the system returns back into the normal operation mode. If you want to go back from ‚data transfer mode' to normal operation mode manually just press the list key  .

To prevent that the system is missing to execute a measurement during being in the ‚data transfer mode' the transfer mode should be started at a time where the next scheduled measurement is longer than 90 minutes away. To display when the next measurement will happen on the rack press the on/off key  just once before you activate the ‚data transfer mode'. The data transfer mode is needed to ensure that all data files that you like to copy are not under access of the normal measuring routine at the same time to prevent corrupted data.

5.5.5.2 Data file structure

The BD 600 GLP stores all values of a measurement series and all values of a calibration series in dedicated files on the internal memory. The measurement series data are stored inside the folder ‚data' and the calibration series data are stored inside the folder ‚calib'.

The measurement data files are named as followed:
nnnnn_HEAD-ID_name_date_starting-time.csv
nnnnn is a steadily increasing number that is rack dependent
HEAD-ID is the unchangeable identification number of the used sensor head
name is the name that was given to a sample (see 5.5.2 and 5.6.4)
date and starting time is linked to the start of the measurement series

Example of a measurement data file. *.csv as seen in Excel (semicolon used as separator):

CPU-ID:	335556620 - 2924158247 - 1417818825 - 4110425221		
Head ID:	65535-255-65535		
Head Name:	Example		
Range:	0-400 mg/l		
Sample volume / ATH:	157 ml / 5 Tr.		
Measurement Duration:	5 days		
Time Interval:	5 days I		
Date (format):	31.12.2014		
Time (format):	24h		
Measurement	Date	Time	BOD \ mg\l
0	17.05.2017	16:15	0
1	17.05.2017	18:15	5
The test series has been continued.	17.05.2017	19:18	-
2	17.05.2017	20:15	8
3	17.05.2017	22:15	10
4	18.05.2017	00:15	13
5	18.05.2017	02:15	17
6	18.05.2017	04:15	19
7	18.05.2017	06:15	19
8	18.05.2017	08:15	19
9	18.05.2017	10:15	20
10	18.05.2017	12:15	20
Stopped by operator.	18.05.2017	13:50	Operator X

The file contains also parameters and measurement values of a measurement series and in addition the unchangeable identification number of the rack (CPU-ID) and messages related to the measuring series.

The calibration data files are named as followed:
nnnnn_calib_HEAD-ID_name_date_starting-time.csv
nnnnn is a steadily increasing number that is rack dependent
calib is a phrase tagged to a calibration data file for easy identification vs. measurement data
HEAD-ID is the unchangeable identification number of the used sensor head
name is the name that was given to a sample (see 5.5.2 and 5.6.4)
date and starting time is linked to the start of the measurement series

Example of a calibration data file. *.csv as seen in Excel (semicolon used as separator):

CPU-ID:	335556620 - 2924158247 - 1417818825 - 4110425221
Head ID:	65535-255-65535
Head Name:	CalibrationExample
Range:	0-400 mg/l
Sample volume / ATH:	157 ml / 5 Tr.
Measurement Duration:	5 days
Time Interval:	5 days II
Date (format):	31.12.2014
Time (format):	24h
Name:	Operator X
Batch No.:	P07A
Test value:	330 mg\l
Tolerance:	±30 mg\l

Measurement	Date	Time	BOD \ mg\l
0	12.05.2017	09:01	0
1	12.05.2017	15:01	250
2	12.05.2017	21:01	311
3	13.05.2017	03:01	325
4	13.05.2017	09:01	325
5	13.05.2017	15:01	326
6	13.05.2017	21:01	326
7	14.05.2017	03:01	326
8	14.05.2017	09:01	326
9	14.05.2017	15:01	326
10	14.05.2017	21:01	326
11	15.05.2017	03:01	326
12	15.05.2017	09:01	326
13	15.05.2017	15:01	326
14	15.05.2017	21:01	326
15	16.05.2017	03:01	326
16	16.05.2017	09:01	326
17	16.05.2017	15:01	326
18	16.05.2017	21:01	326
19	17.05.2017	03:01	326
20	17.05.2017	09:01	326
Test series has stopped regularly	17.05.2017	09:01	-
Head is valid. Next test before: 11.11.2017	17.05.2017	09:01	-

5.6 Options

No addendum.

5.6.1 Autostart

The autostart function is generally be disabled in the BD 600 GLP version.
This means the system will directly begin to save all measurement values and will not wait until pressure drops slightly inside a bottle.
In consequence to this a sample need to have the temperature of the incubator already before the measurement starts.
If the temperature of a sample would be higher, a pressure decrease caused by cooling down of the gas atmosphere above the sample would create a slight pressure decrease that would create an offset to the measurement values. In opposite a lower temperature of the sample than in the incubator would create a slight expansion of the gas atmosphere above the sample, which would lower the result a bit.

5.6.2 Brightness

No addendum.

5.6.3 Contrast

No addendum.

5.6.4 Naming heads

The name of a bottle can only be set prior to starting a new measurement series in the ‚Start test series' menu (see 5.5.2). The menu entry to change the name in the ‚Options' menu is not available in the GLP version of the BD 600.

5.6.4b Calibration

The BD 600 GLP contains an additional entry in the ‚Options' menu to start a calibration procedure. Every sensor head need to be checked regularly (after half a year) if it is working within its specifications. This is done by using the calibration procedure. After selection of this entry in the ‚Options' menu choose the bottle with the head that you like to check.

To perform a calibration use a test kit (part no. 2418328) and work according to the test kit instructions. In difference to the instruction of the test kit use this calibration mode and not the normal BOD measurement mode.

After a sample bottle with the head to be tested has been prepared select the position of that bottle on the rack and press Start (F2).

To get access the password and a name that will be documented in the calibration value data file need to be put in. Afterwards the software is requesting the batch number of the test tablets (see tablet packaging), the reference value that should be reached during the test (see also tablet packaging) and the acceptable tolerance value (see the value after the ± sign at the tablet packaging). Put in all these values and select the correct range that fits for the used test kit tablets (see instruction of the test kit, typically 0-400 mg/l). After confirmation a calibration series will start on the rack.

The calibration series can be identified as it uses the ‚5 days II' interval (to display data of an active series see also 5.5.2 and 5.5.2.2).

After a calibration procedure has been performed successfully (measured value meets the reference value within given tolerances) the sensor head gets a new validity status for half a year (183 days). After that period of time the calibration procedure needs to be performed again.

If the calibration procedure fails, the sensor head is no longer valid and gets a fictive validity date that is in the past (31.12.2014). The calibration data file gets the entry , Head is invalid. Next test before: 31.12.2014'

A measurement series can only be started with a sensor head that has got sufficient time left, before its validity status will end.

In contrary to a normal measurement series a calibration series cannot be continued on a different rack and must be finished at the same rack where it has been started.

5.6.5 Language

The BD 600 GLP does not allow to change the language as long as a measurement or calibration series is active on the rack (and/or a connected sensor head). This change of language would affect the stored measurement data file content.

5.6.6 Date / Time

The BD 600 GLP does not allow to change date and time as long as a measurement or calibration series is active on the rack (and/or a connected sensor head). This change would affect the stored measurement data file content.

5.6.7 Date (format)

The BD 600 GLP does not allow to change date format as long as a measurement or calibration series is active on the rack (and/or a connected sensor head). This change would affect the stored measurement data file content.

5.6.8 Time (format)

The BD 600 GLP does not allow to change time format as long as a measurement or calibration series is active on the rack (and/or a connected sensor head). This change would affect the stored measurement data file content.

5.6.9 Auto-Off

No addendum.

5.6.10 Remote control

No addendum.

5.6.11 Device ID

The device ID is just for using the remote control. The distinct identification of the rack is ensured via the CPD-ID (see 5.5.5.2).

5.6.12 Update

To ensure data consistency and integrity of the BD 600 GLP user cannot perform a software update. This need to be done by the manufacturer or involved dealer.

5.7 Interfaces

① **SD card holder:** The BD 600 GLP does not allow free access to the SD-card as it stores the life time data memory. The slot is closed with a plastic shield. To remove the card the plastic shield need to be damaged.

5.8 Remote control

No addendum.

5.9 Error messages and notices

Message in the display	Meaning
The tolerance may amount to up to 20% of the reference value.	During setting up a calibration measurement a non-valid tolerance value was chosen. The correct tolerance value can be found at the test kit packaging. A typical value is 30 mg/l
The reference value must be between 0 and 4000 mgl/l.	During setting up a calibration measurement a non-valid reference value was chosen. The typical value is close to 300 mg/l and can be found at the test kit packaging.
Setting the language and date/time formats during running test series is not possible.	You can only change the language, date, time and the format of these at a rack where no measurement series or calibration series is active. Setting of these parameters will be logged in the internal memory in the file logfile.txt inside the folder ‚log'
The test series has been stopped.	Occurs after manual stopping of an active measurement series. This line in a measurement or calibration series indicates that the series has been stopped manually. The name of the operator is printed in the last row of this entry.
No more than 6 test series are possible at the same time!	As a rack has got only capacity for six bottles only six measurement or calibration series can be active at the same time. Stop one series first before starting a new one
On the device there is already a measurement running with the Head ID.	An active measurement or calibration series is already pending on the rack with the same head ID. This could be, if a bottle was replaced and set back to the rack afterwards.
Differing measurement parameters in the head. The measurement has been automatically terminated.	An active measurement or calibration series is already pending on the rack with the same head ID but different setup values. This could be, if a bottle was replaced to another rack and the measurement was stopped manually there. After starting a new measurement with that sensor head and putting it back to the first rack this message will be displayed. To overcome this, at first the active (old) measurement need to be stopped as it is no longer valid. Afterwards the new measurement series can be activated on this rack.
The head will not be valid by the end of the test series.	The validity status of this sensor head expires before the chosen measurement series will be finished.
Sensor head not accessible.	If a scheduled measurement is pending and the bottle was replaced this message will be placed in the measurement series data file. After replacing the bottle the measurement series will be continued automatically.
An error occurred during a running measurement!	If no manual bottle replacement during a measurement could be the case control the contact surfaces of the sensor head and the corresponding rack place. If everything is clean and gets contact please get in contact with Lovibond or your local dealer.
No more storage space left on the SD card!	This indicates that the internal memory is full. As about 50.000 measurement series can be stored, this case is very unlikely.
SD card error!	Indicates a problem with the internal memory. Please contact Lovibond or your local dealer.

6 Determining the BOD

No addendum.

7 Instructions for evaluation of results

No addendum.

8 Testing the measurement system

The testkit (part no. 2418328) can be used to check the validity of sensor heads for the BD 600 GLP. Work in accordance to the test kit instructions. In difference to this use the calibration mode, you can find in the ‚Options' menu. Do not use the normal BOD measurement mode (see also 5.6.4b).

You can only perform measurement series with sensor heads which have successfully passed the calibration procedure within the last half a year. If a calibration test is not successful the validity-status of that sensor head will directly be set to invalid no matter the status was before. After a successful calibration test, the sensor head gets a new validity status for half a year (183 days).

9 Maintenance and care

No addendum.

10 Inductive stirring system

No addendum.

11 Decommissioning

No addendum.

12 Technical data

12.1 BOD Measurement System

Type	BD 600 GLP
Measuring principle	Respirometric; electronic pressure sensor
Measurement ranges [mg/l O_2]	0 - 40, 0 - 80, 0 - 200, 0 - 400, 0 - 800, 0 - 2000, 0 - 4000
Applications	BOD_5, BOD_7, OECD 301 F, etc.
Display	Graphic display, 16 grey levels, 240 pixels wide, 128 pixels high
Internal memory	1 GB or up to 50.000 measurement or calibration series
Available measurement modes	**5 days I** = every 2 hours, **28 days** = every 12 hours, **60 days** = every 24 hours and **90 days** = every 24 hours the first 30 days and every 48 hours the last 60 days. For calibration measurements: **5 days II** = every six hours
Autostart	Can be switched off; controlled by pressure drop in the bottle
Buffer batteries	3 alkali-manganese cells, type C / LR14
Power supply	15 V DC via supplied mains adapter plug, low-voltage barrel connector, max. power requirement 600 mA
Time	Real-time clock, supported by the batteries if the device is not provided with an external power supply
Interfaces	USB host (only for USB stick), USB device
Dimensions, without stirrer drive, W x D x H	182 mm x 376 mm x 213 mm
Weight, with batteries and empty bottles, without mains adapter plug and stirrer drive	4139 g
Environmental conditions	2 – 40°C, 5 – 80 % relative air humidity, non-condensing
Test approvals, EMC	CE, EMC in accordance DIN EN 61326, basic requirements

12.2 Stirrer unit

Type	Inductive stirring system
Number of positions	6
Stirring output	7 W
Speed	320 rpm, brief centring phase every 40 s
Dimensions (W x D x H) [mm]	270 x 180 x 25
Stirring position spacing	88 mm
Weight (stirrer drive)	1204 g
Housing material	PVC
Environmental conditions	-10°C to +56°C, 95 % relative air humidity
Operating voltage	15 V DC
Test approvals, EMC	CE, DIN EN 61326:2013

12.3 Mains adapter

Type	SWP1502300P
Design	Mains adapter plug, switching power supply
Input voltage, frequency	100 – 240 V, 50 / 60Hz
Input current	1000 mA
Primary adapter	Europe, UK, Australia, USA
Protection class	II
Output voltage, frequency	15 V, DC
Max. output current	2300 mA
Output protection	Short-circuit-proof
DC cable length approx.	1800 mm
Environmental conditions	0°C to 40°C, with max. 93 % relative air humidity
Energy efficiency class	VI
Safety standard	EN 609501
EMC	EN 55022
Dimensions [mm]	62 x 84 x 53
Weight, with EU adapter	258 g
Approval, EMC	CE, EN 55024

13 Accessories and spare parts list

Article	Order code
Spare BOD sensor, valid and with certificate	2444470-GLP
Mains adapter plug	444454
Inductive stirrer drive, with mains adapter	2444456
Y-cable BD 600	2444475
Test kit for system testing	2418328
Potassium hydroxide solution, 50 ml	2418634
Nitrification inhibitor B, 50 ml	2418642
BOD bottle	418644
Rubber gasket 4.5 cm length (for BOD only)	418636
Rubber gasket 6.5 cm length (for BOD and OECD 301F)	418676
Rubber gasket 6.5 cm length, 500 pieces	418677
Magnetic stir bar	418633
Magnetic stir bar, 100 pieces	418633-100
Magnetic stir bar remover	418638
Overflow volumetric flask, 428 ml	418660
Overflow volumetric flask, 360 ml	418659
Overflow volumetric flask, 244 ml	418658
Overflow volumetric flask, 157 ml	418657
Overflow volumetric flask, 94 ml	418656
Overflow volumetric flask, 56 ml	418655
Overflow volumetric flask, 21.7 ml	418664
Complete set of overflow volumetric flasks	418654
Remote control	2444481
Thermostatic cabinets with glass door, see our catalogue	

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