

# **BIOMIXER**

# **BM 323**

**Operator's Manual**

**Ljungberg & Kögel AB**

# Important notes

## Warranty

Ljungberg&Kögel AB hereby warrants to the original purchaser that Biomixer BM323 is manufactured in a professional and quality manner and, when properly used, will be free from all defects in material and workmanship, for a period of 12 months after delivery from Ljungberg&Kögel AB. The warranty includes equipment or components that proves to have faults during the warranty period.

Ljungberg&Kögel AB will without cost for the customer, repair or replace the faulty equipment. The warranty is not valid if the equipment has been repaired by anyone else than qualified personnel, approved by Ljungberg&Kögel AB. The warranty is not valid for the battery since it is considered to be an expendable supply. The warranty is not valid if the equipment has been changed in any way that according to Ljungberg&Kögel AB:s opinion, affects the reliability or stability of the instrument. The warranty is not valid when the serial number has been changed, crossed-out or been removed, or if the fault has been caused by misuse or abnormal use. In these cases Ljungberg&Kögel AB or their representative will inform the customer about the decision, and if wished by the client, will repair the equipment for normal rate. An estimated price can be given on request. One important condition for this warranty to be effective is that the BM323 is used in accordance with the instructions in this operator's manual.

## The operator's manual

This operator's manual is written for the person or persons responsible for the operation of Biomixer BM323. The methods and routines are developed and tested to ensure a reliable, safe and efficient operation of BM323. It is important that the operator has studied and fully understood the contents of this manual before using BM323.



***This blood mixer is a precision weighing instrument.***

***In order to maintain high accuracy the mixer should be handled with care and the scale must not be overloaded.***

Abelko Innovation is committed to develop high-quality equipment and technical services to all our customers. We welcome any inputs on technical issues that are encountered so that they can be resolved quickly and in the most appropriate manner. Please submit your comments/feedbacks through your local distributors or alternatively email us directly at [info@abelko.se](mailto:info@abelko.se)

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Abelko Innovation also manage logistics, service and technical support.

BM330 is owned and marketed by Ljungberg & Kögel AB, Box1032, SE-251 10 Helsingborg,

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Spare parts are to be ordered by Ljungberg & Kögel.

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## Revision history:

Rev 2005-12-23: Page 10: Collection may continue if something falls on tray. Collection time is measured until pressing Pause. Page 12: Do not use bleach. Page 13: Collected volume 50-999ml.  
Rev 2006-08-07: Page 9: Place the blood bags with the tube inlet to the right on the tray.  
Rev 2007-04-19: Page 2: : Battery excluded from warranty  
Rev 2008-10-08: Page 8, 12 positioning peg removed  
Rev 2009-03-03: Page 10, Stop collection  
Rev 2009-11-03: Page 6,18 : Battery charger BM12-12 expired and is left out. Page 19, change year of directive. Page 16 Trouble shooting completed  
Rev 2010-02-24: Page 10: Warning use of mobiles removed, not needed any longer. Page 17 Time inaccuracy completed  
Rev 2010-08-09: Page 2, elucidation of manufacturer and marketing companies, Page 19, change back year of directive  
Rev 2012-11-13: Page 2: Added Abelko Innovation commitment concerning technical feedback  
Rev 2013-06-14: Page 17: 10 hours operation time changed to 12 hours  
Rev 2014-04-17: Page 19: Updated address in DoC, Page 6: Added note about transport and placement

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## ***System description***

BM323 is a blood collection, mixing and weighing instrument powered by internal battery for mobile use as well as stationary use in blood centers.

## ***Features***

### ***Adjustable alarm levels***

Alarm levels for min/max flow and time are easily set by setup menus from keyboard. The settings are stored in a non-volatile memory.

### ***Battery for mobile use***

Built in rechargeable battery for about 12 hours operation.

### ***Large display***

Large LCD display with 1x16 8mm characters for continuous display of collected volume, flow and time during collection. The display also shows alarms. The text on display can be selected in different languages. (Except for test and setup menus which are always in English).

### ***Automatic calibration***

Calibration is done automatically by using a calibration weight.

### ***Quick selection of preset volumes***

By pressing the "SET"-button you can quickly and easily select between two preset collection volumes.

### ***Accurate volume measuring***

The collected blood is measured with a weighing sensor and converted to volume with the factor of 1/1.06 which is the specific gravity for normal blood. The measuring accuracy is better than  $\pm 1\%$ .

### ***Automatic tare***

BM323 automatically deducts the weight of the blood bag and anticoagulant solution. All types of bluebags or set of blood bags can be used.

### ***Homogeneous mixing***

The tray is moving in a well-tested seesaw motion to agitate and mix blood and anticoagulant in an efficient way.

### ***Continuous blood flow check***

BM323 checks the blood flow continuously during the collection. If the flow is below or exceeds the set alarm limits, alarm will sound and be shown on display.

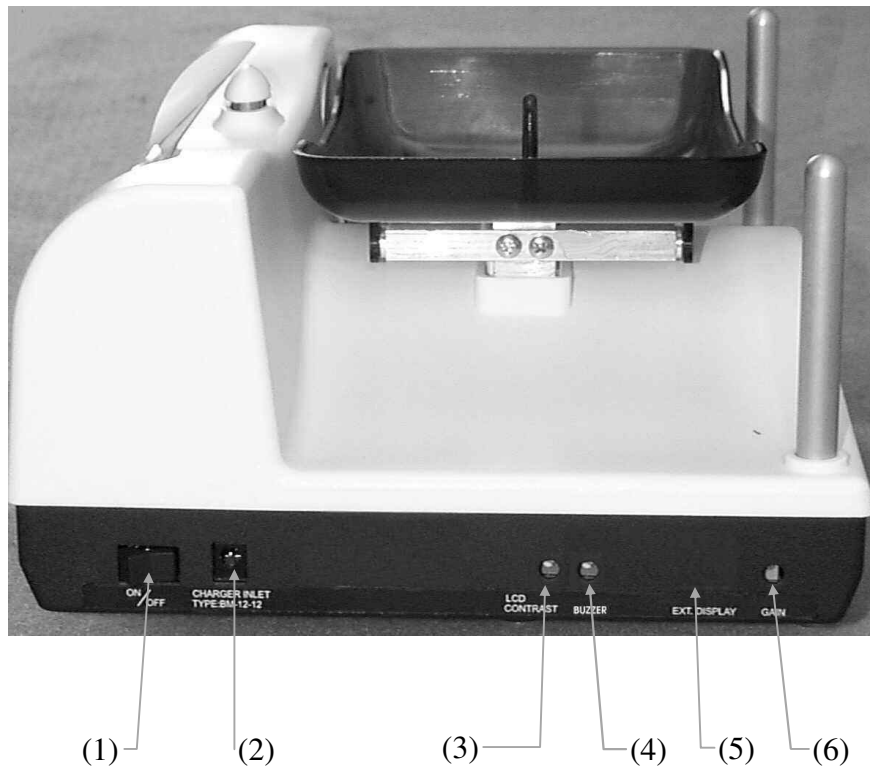
### ***Check of collection time***

Collection time is checked and if set limit is passed the alarm will sound and be displayed.

### ***Automatic stop***

When the predetermined volume of blood has been collected the tube clamp closes automatically and a ready-signal sounds to inform of the completion of donation sequence.

## *Connections*



- (1) Switch ON/OFF.
- (2) Inlet for battery charger (mains adaptor).
- (3) Contrast setting for the LCD window.
- (4) Potentiometer for buzzer sound level adjustment.
- (5) Output for external display (optional).
- (6) Potentiometer for gain calibration of measuring amplifier.

## ***Installation***



*If BM323 has been cooled down to a temperature below +2 °C, please wait at least 2 hours before start up to make the damp evaporate.*

### ***Battery charger (mains adapter)***

Check that the charger's AC supply voltage marking agrees with the local mains supply.  
Connect the charger to the inlet marked "Charger inlet" and connect it to the mains output.  
The charger should always be connected to keep the battery fully charged.

### ***Battery charging***

If the mixer is to be used mobile (without access to mains supply) the battery must be charged. Connect the charger and charge the battery for at least 6 hours if battery is emptied to <20%.  
The capacity is shown on display at power on and when it drops to less than 30% it should be recharged.  
When capacity drops below 20% start of collection is prohibited and an alarm is activated (see also the chapter *Alarms and error messages*). Started collection can however be completed.  
If BM323 is to be used stationary with access to mains supply the charger should always be connected.  
During long time storage the battery should be recharged every 6 months.

### ***Placement***

In stationary conditions, it is recommended to use the mixer with BIOLIFT 410 (separate manual).  
BIOLIFT 410 is a mobile table, with a moving shelf (up and down) designed to fit the mixer.

### ***Transport***

Before transporting the mixer, it should be set in parking mode. In the main menu, press the RESET key. The mixer should be transported in a transport case suitable for BM323 (available by Ljungberg & Kögel).

### ***Start-up***

Put the switch in "ON"- position.

Now the BM323 functions are automatically checked and possible errors are indicated on display and with an intermittent sound-signal.

The following checks are made:

- The internal memory is checked.
- The stepping motor operating the tube clamp are driven to its starting position (fully open).
- The tray makes one seesaw motion and stops in the weighing position.
- The display shows the start menu: Battery condition and the program version

BAT=99% VER 1.00

After ca 3 seconds the main menu is shown: Preset volume to be collected and the clamp status:

SET=450 OPENED

## *Keyboard functions*



START	Start of collection. The tray makes a seesaw motion to secure that the tray is in weighing position, tare occurs, clamp is opened and the mixing and time measuring starts.
PAUSE AL. OFF	Stops the mixing temporary during collection. If there is an alarm the sound-signal is silenced with the first press and after that the mixing can be stopped with another press on PAUSE ALOOF. This button is also used to check calibration by putting the tray in constant weighing position when activated from the main menu.
CLAMP	Opens and closes the tube clamp. Display will show OPENED or CLOSED.
SET	Used for setting of desired collection volume. Every press on SET switches between two pre-set volumes. The settings can be done before collection with the keys "+" or "-" ending with SET. "SET" is also used for some setup adjustments.
+	Used for increasing a value on display.
-	Used for decreasing a value on display.

## Setup

Settings of alarm limits and functions are done in SETUP-menus which are entered by pressing the SET key during power up. The menus for SETUP are in English no matter of choice of language for the collection menus. Scrolling through the menus is done with the SET key. Settable values or functions are shown blinking and increasing/decreasing is done with the keys + and -.

This are the existing SETUP menus:

- Alarm limit low flow.
- Alarm limit high flow.
- Alarm limit collection time.
- Calibration.
- Choice of language.

*Note ! Changed values and functions are saved in memory when next menu is selected with "SET".*

**Alarm limit low flow**

LOW FLOW 140

**Alarm limit high flow**

HIGH FLOW 345

**Alarm limit collection time**

TIME ALARM 10min

**Calibration.**

CALIBRATION VOL

Make sure the tray is empty and moves freely. Start the calibration by pressing "+", after which zero balancing and tare is done. The display shows:

PUT 450 ON TRAY

Put the reference weight for 450 ml on the centre of the tray and press "+".

*Note! The reference weight must be 450 ml i.e. 477g. (450x1.06). Reference weights can be ordered from Ljungberg & Kögel AB.*

CAL OK 441 > 450

The calibration is now performed automatically and the result is shown on display.

The value 441 in the example above is the measured weight (volume) and 450 is the reference weight. The ratio for 450/(read volume) gives a conversion factor. The BM323 microprocessor automatically adjusts the read volume to be 450 ml by multiplying with this conversion factor and the calibration is done when "+" is pressed.

If the divergence is to big (more than  $\pm 20\%$ ) an error message is shown :

ERR: ADJUST GAIN



If this happens, manual adjustment with the potentiometer GAIN must be performed. This GAIN-potentiometer is accessible behind a plastic cover on the side of the mixer.  
Press "+" and remove the plastic cover and adjust with a small screwdriver until the read value becomes 450 ml.

ADJUST 359 > 450

Press "+" :

REMOVE REFWEIGHT

Remove the reference weight and make a new taring by pressing once on "+", a new taring is done. Put the reference weight back again and repeat adjustments until the read value is within  $\pm 5$ ml.

*Note! Always end with automatic calibration, without manually adjusting GAIN, to get the correct conversion factor.*

### **Language.**

LANGUAGE : ENG

Select the language by pressing "+" and "-"

*Note! The language setting is only for collection menus, not the setup menus.*

## Collection

### Power on

- Turn on the mixer by setting the switch ON/OFF in ON position. Let the starting sequence proceed as described in chapter *Start-up* for automatic check of functions and possible error indications. Check battery condition in the startup menu:

BAT=99% VER 1.00

### Setting of desired volume

- Two standard volumes can be preset. Selection and change of this volumes can be made in the main menu.

SET=450 OPENED

A press on "SET" makes the set volume change between the two preset volumes.

With a press on "+" or "-" this values can be changed. The set volume starts to blink on display and further presses on "+" or "-" makes the value increase or decrease. If the key is pressed continuously more than 1 second a rapid change with 10-ml each step will occur. To replace the earlier preset value the changed settings must be confirmed with a press on "SET".

### Start of collection.

- Place the blood bag or sets of blood bags with the tube inlet to the right of the tray when the mixer is viewed from the keyboard/display side.
- Put the tube in the tube clamp and leave at least 25 cm of tube free between the clamp and the tray allowing the tube to move with no affection to the weighing accuracy.
- Press "CLAMP" to close the tube clamp. CLOSED is shown on display.

SET=450 CLOSED

Perform venipuncture.

- Press "START" to begin collection. The tray makes a seesaw motion to secure freewheel, tare is deducted, clamp will open and mixing starts. The regular menu during collection shows:

372 142 05:34

In example above:

372 = current collected volume in ml.

142 = measured flow in ml/min.

05:32 = time in minutes and seconds since start of collection.

### ***Pause during collection.***

- In case you have to pause the tray movement during collection, press "PAUSE AL.OFF". The tray will stop in its weighing position, the clamp remains open and the measuring continues. The display will show a P indicating paused:

372 142 05:34P

- A press on "CLAMP" will close the clamp. The display will show a C indicating closed:

372 142 05:34C

- The mixing will continue again with another press on "PAUSE AL.OFF" and the clamp will open automatically if closed.

### ***Stop collection***

If it by some reason is necessary to stop collection before set volume is reached, press "PAUSE AL.OFF" and then "-". Display will show - TO EXIT and another press on "-" will stop collection.

### ***Termination of blood collection***

- When internal calculations by the microprocessor, based on current flow, shows that next mixing cycle will imply that remaining volume will be less than 10 ml the trays movement will stop. The volume is measured continuous and when 1 ml remains the clamp closes.
- A continuous ready signal sounds. The red lamp in the front is lit. The sound signal can be silenced with "PAUSE, AL.OFF".

*Note! The mixing will continue and the collection time is measured until Pause/Alarm off is pressed.*

- Free the tube by pressing "CLAMP". The display will show:

SET=450 OPENED

- During the collection all possible errors are also registered. Those can be taring error, motor error, low battery, flow fail or time fail. More about error handling in the chapter: *Alarm- and error messages*.

*Note! If something falls on the scale making the set volume reached, the collection can be continued after removal of the object and pressing "Start" button.*

## ***Alarm and error messages***

Low flow and high flow alarm and alarm for exceeding max collection time is announced with a blinking corresponding value in the main menu and an intermittent sound signal, two short signals with a pause, and a blinking red lamp. The sound signal is silenced with a press on "PAUSE AL.OFF". Other possible errors: LOWBATT XX%, MOTOR, TARE are shown blinking intermediate with the current menu.

### ***Alarm and error messages before and during collection***

#### ***Battery alarm***

If the battery capacity drops below 20% a warning is given with a sound signal and a blinking text : "ERR: LOWBATT 20%". If a collection has started it can be completed but no further collections can be started without battery recharging. Charge of battery can be done at the same time as collection.



*If a battery alarm occur the battery should at once be recharged. If recharging can't be done the mixer has to be turned off because deep discharge is shortening the batteries length of life.*

#### ***Taring error***

Automatic tare deduction is always done before collection. If this fails an error message is given with blinking text and sound. Collection can not proceed. Check that the tray is in its weighing position and moves freely.

#### ***Motor error***

If the mixing motor do not start or not find the home-position (weighing position) there is an error message and collection is stopped. Check that the tray can move freely.

#### ***Flow alarm***

If the blood flow is below or exceeds the set limits an alarm is given with flow value blinking in the collection main menu and an intermittent signal sounds. Flow alarm are prohibited during the first 50 ml of collection because blood flow disturbance is liable to occur.

#### ***Time alarm***

If collection time exceeds set time limit, an alarm is activated with collected time blinking on the collection main menu and an intermittent signal sounds.

#### ***Volume=EEE***

Indicates overweight, measuring range is exceeded. Check if something is weighing down the tray.

#### ***Volume= - - -***

Indicates underweight. Measuring range is below limit. The tray has become lighter since tare deduction (by any reason) or is touching something when it is in the weighing position.

## ***Remaining error messages***

### ***Setup error.***

When the mixer is powered on all settings and functions are checked. If the setup, stored in non-volatile memory (EEPROM), has been changed i.e. checksum is not the expected, ERR: SETUP is displayed and a new setup has to be done. See chapter *Setup*.

## ***Service and maintenance***

### ***Cleaning***

BM323 tray, keyboard and cover can be cleaned with a soft cloth and a mild detergent. The tray should be kept steady during cleaning and no violence must be used in order to keep the weighing accuracy.



*Do not use liquids with bleach since this may affect the plastic cover quality and make it fragile.*

### ***Calibration (check of weighing accuracy)***

The weighing accuracy should be checked regularly e.g. once per month with a reference weight corresponding to 450 ml (477g). *We recommend use of reference weights from Ljungberg & Kögel AB.*

1. Start-up the mixer and let it warm up for about 5 min. (It takes some minutes for the measuring circuits to stabilize for highest accuracy).
2. Press the key "PAUSE AL.OFF". Now is a normal taring (zero balancing) done and after this the mixer is in a continuous weighing position. Check that the value reads  $0 \pm 1$  ml.
3. Put the reference weight 450 ml on the centre of the tray and read the result
4. If the divergence is too large an adjustment must be done, see chapter "Setup-Calibration"
5. End calibration with a press on "PAUSE AL.OFF"

*Notes!*

- *In this "continuous weighing mode" the mixer operates like a scale, showing the weight placed on tray adjusted for the specific gravity of blood ( /1.06).*
- *If the mixer have been exposed to a big temperature difference, e.g. been moved from a cold environment to a warm, it must have some time to obtain a stable temperature.*

### ***LCD contrast setting***

If the display shows weak or unsharp characters the contrast may be adjusted with a little screwdriver turning the potentiometer inside the plastic cover marked "LCD CONTRAST".

### ***Buzzer sound level***

The internal buzzer sound level can be changed with a potentiometer behind a plastic cover on the side of the mixer. See figure on page 5.

### ***Storage***

During long time storage the battery should be recharged every 6 months.

### ***Change of battery***

When the battery no longer is sufficient for one day collections it has to be changed.

- Turn the mixer off with the switch ON/OFF and pull out the contact from the charger.
- Place the mixer so it supports against the pillars on the backside.
- Unscrew the 2 screws holding the battery hatch.
- Take out the battery and change it to the new one that must be of the same type : 12V/3,5 Ah
- Connect the red wire to + and the black to -
- Put the battery back and screw the hatch.



**Pb**

*The battery contains lead and worn out batteries must be left to a recycling station.*



### ***Tray parking position***

During transportation of BM323 the tray should be placed in horizontal position by pressing "SET+PAUSE/AL.OFF" simultaneous (from the main menu).

Repeated press on "SET+PAUSE/AL.OFF" or power off and on again will cancel the parking position.

## ***BM323 Trouble Shooting Guide***

1. **Mixing** - The mixing angle and the mixing speed cannot be adjusted. If the blood centre is seeing that the anti-coagulant in the collection bag is not mixing properly with the whole blood at the beginning of collection please check the following items:
  - a. Make sure the collection bag is completely separated from the other bags in the collection set. Depending on the collection set manufacturer, sometimes the bags come out of their packaging stuck together. Make sure the collection bag is able to flow freely as it fills with whole blood.
  - b. Make sure the collection set is centred in the mixing tray. If the side of the bags are resting on the sides of the mixer this could cause a seam in the collection bag causing the whole blood not to mix with the anticoagulant properly.
2. **Leave bag in mixer until complete** – Occasionally collection staff will realize they have forgotten to attach whole blood numbers (labels) to the bags and will remove bag set from mixing to attach labels during collection. Do not remove the bag once collection has begun. The alarm will sound because weight/volume is unsure and this could cause the clamp to close and the mixer to reset.

### ***More trouble shooting and actions***


When more advanced troubleshooting is needed, down to circuit level, we refer to the BM323 Service Manual with circuit descriptions, schematics, component placing, etc. which can be ordered from Ljungberg&Kögel AB.

Ljungberg&Kögel AB also supports technical training for service personnel.



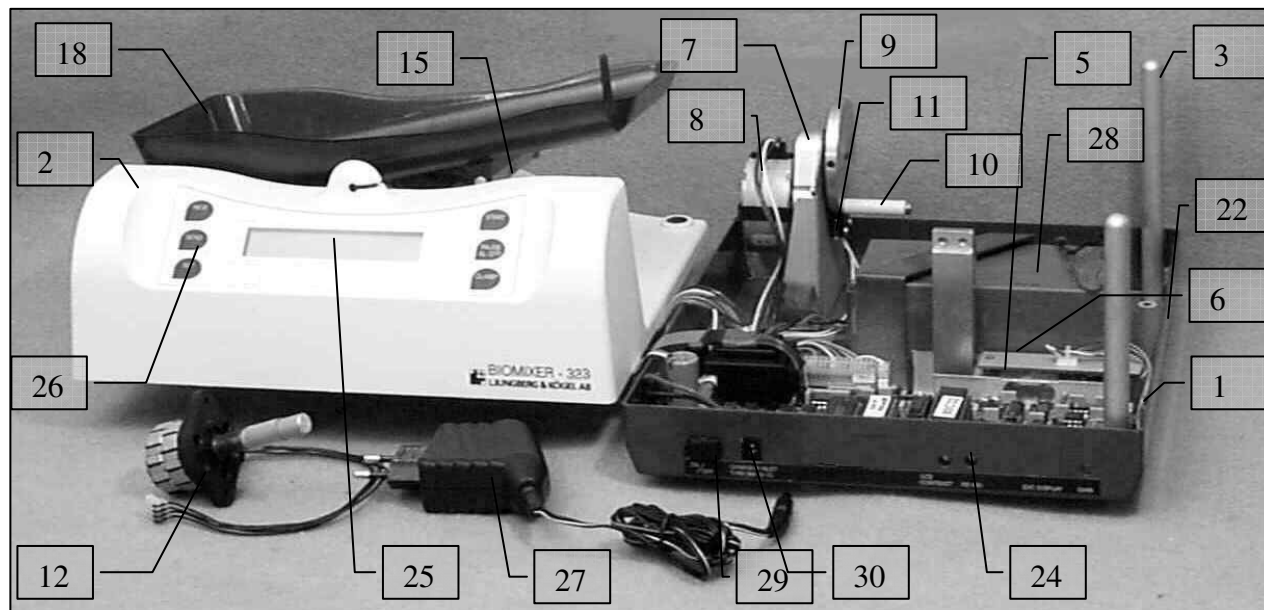
## Technical specifications

### Technical data

Power supply.....	Mains adaptor, BM12-12, 100-240VAC, (14V/1A (also operates as a battery charger) and/or internal battery 12V/3.5Ah for approximately 12 hours operation between charges.
Power consumption.....	Max 10VA
Fuses (built in).....	PTC (self recovery for overload protection)
Collection volume.....	(Collected blood) 50-999 ml.
Accuracy.....	<1% of max weight $\pm 1$ ml.
Taring range .....	0-600g
Mixing cycle.....	16 cycles/min.
Time measure inaccuracy.....	<1%
Tube clamp operation.....	Linear step motor
Mixing plate operation.....	AC-driven synchronous motor
Relative humidity incl. storage and transportation.	10-95 %, not condensing
Operating temperature.....	+10 - + 40 °C.
Storage and transportation temperature.....	- 40 - + 70 °C.
Dimensions .....	290 (L) x 253 (W) x 150 (H) mm.
Weight... ..	4.8 kg incl. battery.
Protective classification.....	Class II, type B.
Symbol:  .....	Protection type B equipment
Registered at FDA, number BO24145	



*Spare Parts*



32301-00	Chassis, bottom plate
32302-00	Cover
32303-00	Pillars x 2
32305-00	Load cell complete with stop screws
32306-00	Circuit board complete
32307-00	Motor plate
32308-00	Motor 24VAC/50-60 Hz
32309-00	Driver wheel complete with magnet
32310-00	Roller with screw and housing
32311-00	Position sensor, complete
32312-00	Step motor complete with piston (clamp)
32315-00	Bearing rod
32318-00	Scale (mixing tray)
32322-00	Rubber foot, x 4.
32324-00	Plastic cover, x 3
32325-00	Display
32326-00	Keyboard
32327-00	Battery charger
32328-00	Battery 12V/3.5Ah
32329-00	On/off switch
32330-00	Charger inlet

*MDD Declaration*

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# DECLARATION OF CONFORMITY

according to the  
***LFVS 2003:11 corresponding to the Medical Devices Directive, 93/42/EEC***

STANDARDS TO WHICH CONFORMITY IS DECLARED:

***EN 60 601-1 (SEMKO certificate 9725103/01)***

***EN 60 601-1-2 (Enator test report TR 976119)***

***Including: EN 55011 Kl B, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5***

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*Type of Equipment:* Blood mixer  
*Model:* BM323  
*Product class:* Class 1

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.

*Date of issue:* 17 April 2014

*Signature:*



/ Thommy Lundström

*Position/title:* President

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**Ljungberg & Kögel AB**