



## MAGACELL COLORIMETER



## USER MANUAL

Read carefully this instruction manual before installing and using the equipment. The manual contains safety instructions, advice and useful information. Use the colorimeter following the instructions in this booklet: it will work correctly and satisfy your expectations as user.

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## Important Safety Instructions

### General Safety Precautions

- Keep this instruction manual always at hand. It should be kept with the device when moved to a different place or handed to a new owner.
- This device should be repaired only by personnel authorized by the manufacturer. This includes repairing and substituting the power cord. Any piece or accessory supplied by the manufacturer should only be used for repair. Otherwise, the equipment could be damaged or cause harm or lesions.
- The device lacks electric input only when unplugged from the socket. Always unplug the equipment before any cleaning or maintenance work. (Do not pull the cord to unplug it). If access to the plug is difficult, disconnect the device from the electrical current.
- Do not extend the power cord.
- Make sure the power cord is not pressed, crushed or damaged by the back of the device. The cord may overheat and cause a fire.
- Do not place heavy objects or the device itself on the cord. There is a risk of short-circuit and fire
- Do not change or remove the power cord by pulling it, specially when moving the equipment to a different place. A damaged cord may cause short-circuits, fire and/or electric shock.
- A damaged power cord should be replaced by a certified technician or qualified staff
- If the power cord is loose, do not plug it into the power socket or the electrical outlet. There is a risk of shock or fire.

## General Information

The following considerations aim to guarantee correct reception and operation of the equipment, as well as user's safety. We recommend you to read this manual in detail before unpacking the colorimeter and any further use.

The user of the equipment should always have this manual at hand.

Unpack the device carefully, checking the content matches the packing list. Notify any incident immediately.

To preserve the equipment in good condition, do not install it in areas with corrosive atmospheres or exposed to liquid sprinkles.

Do not operate the device if flammable and explosive gas mixtures could be generated.

In accordance with European Regulation on Use 89/655/EEC, lack of correct maintenance and modification or replacement of any component exempts the manufacturer from all responsibility for any damages that may occur.

Colorimeters delivered to Magapor technical service should be completely clean and disinfected. Otherwise, they will be rejected and returned to the owner under collect on delivery shipment conditions.

The box contains:

- Magacell colorimeter
- Power cord
- Box of square cuvettes
- Case
- User Manual

## Introduction

Magacell colorimeter is a comfortable and easy to use instrument controlled by a microprocessor that confers high precision and quickness in the estimation of seminal doses from boar semen samples.

The sensibility of the colorimeter to detect seminal doses allows to diagnose the quantity of insemination doses that can be obtained from a boar semen sample in comparison to other methods based on visual appreciation.

Magacell includes a default calibration line obtained from semen patterns of various concentrations.

The **calibration line** is set by default. We recommend to draw a new line upon reception of the equipment, so it is adjusted to the boars in the stud (minimum correlation of  $R^2= 0.85$ ). See second hidden menu, option 2 calibration.

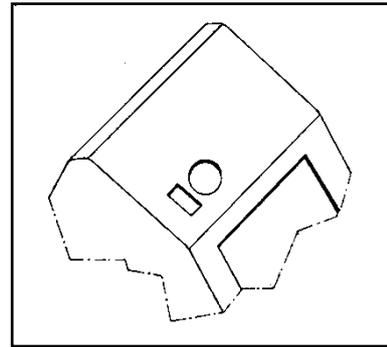
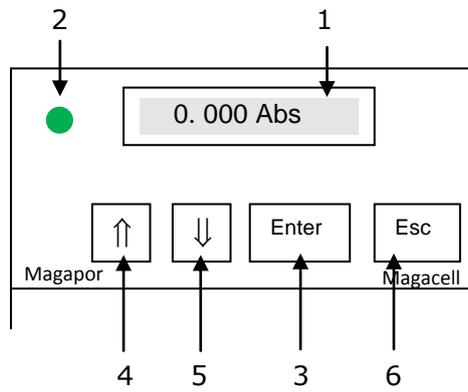
The default line is:

$$Y = 435x - 93$$
$$R^2 = 0.9177$$

The permanent memory of the colorimeter records calibration and may always be recalibrated using a sample of known concentration.

## Description of main parts

1. LCD digital display
2. Operation light
3. "Enter" key
4. Menu selection keys
5. Menu selection keys
6. "Escape" key



## Installation and operation

Magacell colorimeter is used to identify substances and their concentrations.

Matter absorbs energy when placed in front of an energy source. Due to its particular atomic structure, each substance absorbs energy only within determined levels. Energy is proportional to wavelength.

A photometer measures the quantity of light absorbed at different wavelengths of the incident light. Selecting the specific wavelength absorbed by a substance, concentration can be estimated.

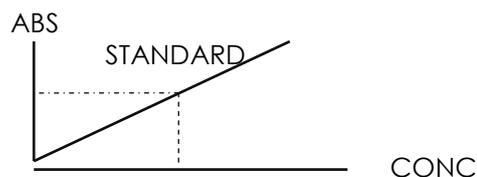
When a light beam shines on a sample, part is absorbed and part is transmitted.

Transmittance (T) is defined as the proportion between intensity transmitted by the light beam (Lt) and initial intensity of the light beam (Lo):  $T = Lt / Lo$

Absorbance (A) is defined as:  $A = \log (1 / T)$

Absorbance can be then deduced to be directly proportional to concentration:  $A = ebC$  where A is absorbance, C concentration (mol / L), b the width of the sample cuvette (cm) and e is a proportional constant denominated molar absorbance (l / mol - cm)

This relation is defined as "Beer's Law", see graph.



Therefore, if we have a standard sample of known absorbance and concentration, it is easy to calculate the concentration of an unknown sample of the same substance applying Beer's Law.

Should Beer's Law work in all cases, we would only need a standard to draw the calibration line. As it is not so, the straight line actually becomes a curve and we need to prepare dilutions of the standard, measure their absorbance and obtain the calibration curve.

### **Power connection**

**Important:** Check that your system voltage corresponds to the voltage in the identification plate of the equipment. It is important, for the safety of users and the device itself, that it should be connected to an efficient ground wire according to Low Voltage Electro technical Regulations.



**The manufacturer accepts no responsibility if these safety measures are not observed.**

## Start up

Plug the supply cord and press the ON/OFF switch at the back of the equipment. The screen will display the message "Magapor S.L." and current date and time. Press ENTER. The screen will display the message "Warning System, please wait" and a 120 second countdown while the equipment warms up and stabilizes. You can wait for the countdown to end or reject it pressing ENTER. In any case, the equipment reaches the following screen 1: SAMPLE READING. Use ↑ or ↓ to shift to the 2 additional options 2: ABSORBANCE and 3: CONFIGURATION.



### Option 1: Sample Reading

Select this mode to read samples and obtain the number of semen doses. Use a pure ejaculate diluted at 1:10.

Select "SAMPLE READING" and press ENTER.

- a. With the message **SAMPLE READING** onscreen, press ENTER.
- b. With the message **PUT ZERO** onscreen, insert a blank sample. Use a square 10x10 plastic cuvette with reconstituted extender as blank. Press enter. Make sure that the light beam passes through the smooth part of the cuvette.



- c. The message **PUT SAMPLE X** (x being the correspondent number of sample) will appear onscreen. Insert the cuvette with the sample to measure (pure ejaculate diluted 1:10). Press ENTER.
- d. The equipment shows the message X Abs: X.XXX (estimated absorbance for the sample analyzed) and Volume: XXX. Use the arrows to increase or reduce the value to the correct one and press ENTER to reach the following position
- e. The message **RELATION** appears. Choose a value from the 5 available (2000, 2500, 3000, 3500 or 4000) to indicate the program how many million sperm should the doses have. Press ENTER when the selected value is onscreen.



- f. It appears **X Abs: X.XXX** and Doses: X onscreen, which indicates the number of semen doses (THEORETICAL) that can be prepared from a sample.
- g. Press ENTER to return to step "c," repeat all the steps till "g" and press  $\uparrow$  or  $\downarrow$  to see the results of previous samples.

\*\* Magacell colorimeter stores the last 50 values of absorbance and no. of doses obtained with that sample as follows:

X Abs: XXX

Doses: X

While working with the equipment, it records the last 50 values of Absorbance and no. of doses obtained.

Example: After analyzing 52 samples, the equipment shows the values of the last 50, i.e., from sample 3 to 52.



To continue with the measurements, press ENTER.

\*\* The values stored are deleted when the equipment is turned off. The count returns to sample 1 once you turn the colorimeter on again.

To finish measuring, press Escape.

## Option 2: Absorbance



Use this option to work with absorbance, i.e., directly reading the absorbance of a sample and working with it afterwards.

- a. Select "ABSORBANCE" and press ENTER.
- b. With the message **PUT ZERO** onscreen, insert the blank in the sample compartment. Use a square plastic 10x10 cuvette with reconstituted extender as blank. Press ENTER. It is highly important to observe the trajectory of the light beam and make sure it hits the smooth side of the cuvette.
- c. The equipment will show the message **PUT SAMPLE X (x being the number of sample analyzed)**. Insert the cuvette with the problem sample (pure ejaculate diluted at 1:10). Press ENTER.

The screen shows the message Sample X, Abs: X.XXX (absorbance of the sample analyzed) Press ENTER to reach the following position. As in Option 3: SAMPLE READING, you can visualize the last 50 measurements. In both modes, you can see the measurements performed in one or another indistinctly.



- e. To end the measurements, press Escape.

## Option 3: Configuration

Select "CONFIGURATION" and press ENTER to access Option 3. This section has some suboptions. Use ↑ or ↓ to select one and ENTER to open it. Within the suboption chosen, use the ↑ or ↓ arrows to enter the values and ENTER again to accept the value selected.



### Suboption 3.1: Curve Calib.

You can edit the default calibration line of Magacell in this suboption.

- a. To see the values of the line entered in the colorimeter, press ENTER to shift from one to the next.

$$Y = A * X \pm B$$

- b. To edit them, follow these steps:
  - Press ENTER. The screen shows **N PARAMETER:A.** and XXX, which corresponds to the A value of the line recorded by default in the colorimeter. Use the arrows to modify the value of the line, without decimals. Press ENTER to confirm and save the value entered.
  - The screen shows the message **N PARAMETER: B** and XXX by default, which allows to edit the B parameter following the same steps described in the previous paragraph. Once modified the parameter, press ENTER to save it.
  - The following parameter is F (set by default as 1, should not be modified) identified onscreen as **N PARAMETER: F.**
  - Once finished, press ENTER to save the new line.

### Suboption 3.2: Sample Calibration.



#### **SAMPLE CALIBRATION**

- a. Press ENTER while the message **CALIBRATION** is onscreen.
- b. The equipment shows the message **CONC. STD.** Enter the known value of the concentration standard - e.g. Bürker chamber in million spz/ml - (do not use semen doses but concentration values from pure ejaculates); increase the value in each position to the correct one using the arrows. Press ENTER to reach the following position and then ENTER again when reaching the last position to pass to the following menu.
- c. With the message **PUT ZERO**, insert the blank in the sample compartment. Use a square plastic 10x10 cuvette with reconstituted extender. Press ENTER.
- d. The colorimeter shows the message **Conc. Std.** Place the standard in the sample compartment. Enter the value of the standard using  $\uparrow$  or  $\downarrow$  and press Enter to save it.
- e. The following message is **Put sample.** Place the sample in the sample compartment and press Enter.
- f. The message **NEW FACTOR: X,XX.** appears, showing the value of the new calibration factor and the possibility of modifying it if necessary, together with the value Abs: X, XXX of the sample inserted. Press ENTER to save any possible changes.

### Suboption 3.3: Date Time



- a. With the message **Date/ Time** onscreen, press Enter.
- b. By pressing Enter, you reach date and time. You can adjust each parameter individually using  $\uparrow$  or  $\downarrow$  and confirm it with Enter. It will appear on the following screen.

### Suboption 3.4: Modbus RS485.

Do not alter this suboption. It contains the parameters necessary to connect the colorimeter to a computer.



## Operation indicators

The following elements of the photometer take part in the measurements previously detailed:

- Tungsten light source - Produces polychromatic light covering the visible region.
- Interferential filter 580 nm
- Cuvette holder - for square 10x10 cuvettes
- Detector - photodiode sensible to light energy received
- Display - digital display that receives the amplified current from the photodiode

## Technical Characteristics

High contrast digital reader in liquid crystal LCD

Range\_\_\_\_\_0,000 - 10,000 semen doses

Response time\_\_\_\_\_3 seconds

Work temperature\_\_\_\_\_+15°C to +35°C

Storage temperature\_\_\_\_\_ -20°C to +50°C

Dimensions\_\_\_\_\_210 x 190 x 70 mm.

Weight\_\_\_\_\_1.5 Kg

Operation\_\_\_\_\_230V / 50-60 Hz. 400 mA

## Maintenance and storage

### Cleaning advice

Do not force or strain the power cord for connection. When plugging or unplugging the power cord, make any strength on the plug, never on the cord. Keep both metallic poles of the power plug clean to guarantee correct electrical contact.

**Attention, danger:** Before any intervention or authorized maintenance, check that the area or element to be handled is not subject to power input: **disconnect the plug from the electric source.**



Note of interest: Disposal of electronic and electrical equipment residue by users in the European Union.

This symbol on the product or on the packing indicates that this can not be disposed of as household waste. You must dispose of your waste equipment by handling it over to the applicable take-back scheme for the recycling of electrical and electronic equipment. For more information about recycling of this equipment please contact your city office, the shop where you purchased the equipment or your household waste disposal service. The recycling of materials will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and environment.

## Troubleshooting

Problem	Possible solutions
Digital display shows no response when a sample is introduced.	<ul style="list-style-type: none"><li>A. Check the battery or the power supply.</li><li>B. Check if the correct wavelength is being used. Check the lamp.</li></ul>
Unstable readings	<ul style="list-style-type: none"><li>A. Patterns may be unstable.</li><li>B. An underdeveloped or deteriorated reaction may cause unstable readings.</li><li>C. When using round cuvettes, check alignment is constant.</li><li>D. Check the lamp bulb. If light flickers, replace it.</li></ul>
The screen shows Neg Cont..	The dilution is out of range. You need a new calibration line.

Conclusion: if these actions fail, contact the Technical Service



## Magapor S.L.

Parque Científico Tecnológico Agroalimentario Valdeferrín-AulaDei

Calle 5 · 50600 · Ejea de los Caballeros · Zaragoza · España

Ph: (+34) 976 662 914 · Fax (+34) 976 671 888

magapor@magapor.com

[www.magapor.com](http://www.magapor.com)



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