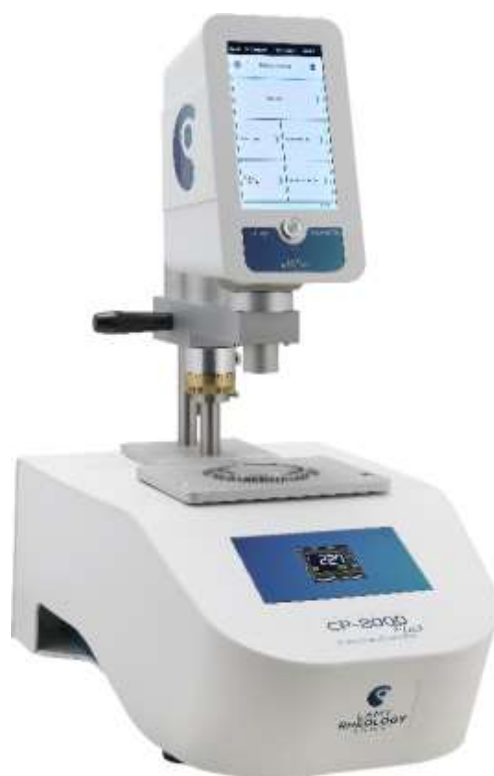


**USING MANUAL**  
**RM 100 CP2000 PLUS**





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## 1. INTRODUCTION

The RM 100 CP2000 PLUS is a device able to measure the viscosity, which is the capacity of a product to resist to the flow.

The fluid is forced to a shear rate (rotational speed) and the shear stress (motor torque) is measured. The values of shear rate and shear stress then make it possible to calculate the viscosity using the Newton equation and the constants associated with the mobile used.

Equation of Newton is:  $\eta = \frac{\tau}{\dot{\gamma}}$

With  $\eta$  for viscosity in Pa.s,  $\tau$  for shear stress in Pa and  $\dot{\gamma}$  for shear rate in s<sup>-1</sup>.

Shear stress and shear rate are calculated by using constants of each measuring system as:

$\tau = M \times K_{\tau}$  with M for motor torque in mNm and  $K_{\tau}$  in Pa/mNm.

$\dot{\gamma} = n \times K_D$  with n for rotational speed in rpm and  $K_D$  in s<sup>-1</sup>/ rpm.

The viscometer calculates the viscosity by dividing the shear stress by the shear rate for each measuring point. The  $K_{\tau}$  and  $K_D$  constants used depend on the measuring system selected for the measurement.

Viscosity depends on the temperature, then it must be essential that all viscosity values are associated to a reading of the sample temperature, in order to compare viscosity for different samples.

There are some products for which the viscosity, to a constant temperature, stay unchanged, even if we change the shear rate. Those samples are named **Newtonian fluids**, i.e. : Oils, Water, Glycerol, etc...However, many substances have a variation of viscosity in function of speed of shearing, and the Flow Behaviour of those samples could be determined with measuring instruments able to set many speeds of rotation.

The viscometer is constituted with a continuous current motor and an optical encoder, in order to warranty a great accuracy of rotational speed, on all torque range.

The viscometer has an easy touch screen display, on which you could read the **speed, shear rate** (according to spindle) **measuring spindle** reference, the measured torque and the dynamic **viscosity** in **mPa.s (=cPoises) or Pa.s**.

The Viscometer RM 100 CP2000 PLUS can be used with different measuring system. You will find below a list of compatible measuring system with this viscometer..

- **MS CP:** Measuring systems cone or plate compatible with DIN 53019 / ISO 3219 / ASTM D4278-D7395 (316L Stainless Steel). These systems make it possible to set the shear rate in order to carry out viscosity measurements or to obtain curves to study flow behavior, yield stress or thixotropy. They are particularly suitable for measurements on very small quantities for control or development of homogeneous products with or without particles (size <100µm), guaranteeing easy cleaning. Usable only with temperature unit CP-1 PLUS.

## 1.1. COMPONENTS

Viscometer is delivered inside a foam protection to avoid any problem during transport. RM100 CP2000 PLUS is delivered mounted. You will find some cable, measuring system (according to order) and some tools for installation and using.

In detail, you will find different part in your box as shown below.



RM100 CP2000 PLUS



Cable and power supply for measuring head



Cable for CP2000



Tool for levelling of RM100 CP2000 PLUS



Level indicator



Cable for connexion of measuring head with CP2000 temperature control.



Bottom plate 40mm or 60 mm (according to order)

## 1.2. GENERAL VIEW OF YOUR DEVICE

Once your device will be mounted and installed, it looks like this;

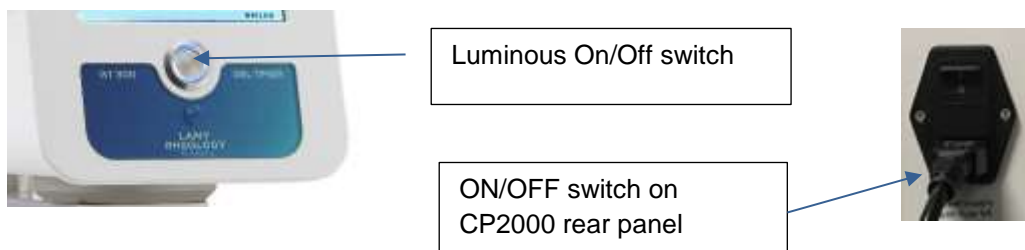


- TOUCH Screen

The new PLUS series is equipped with a 7" colour touch screen. It gives you greater working comfort and a clearer view of your data and analysis results.

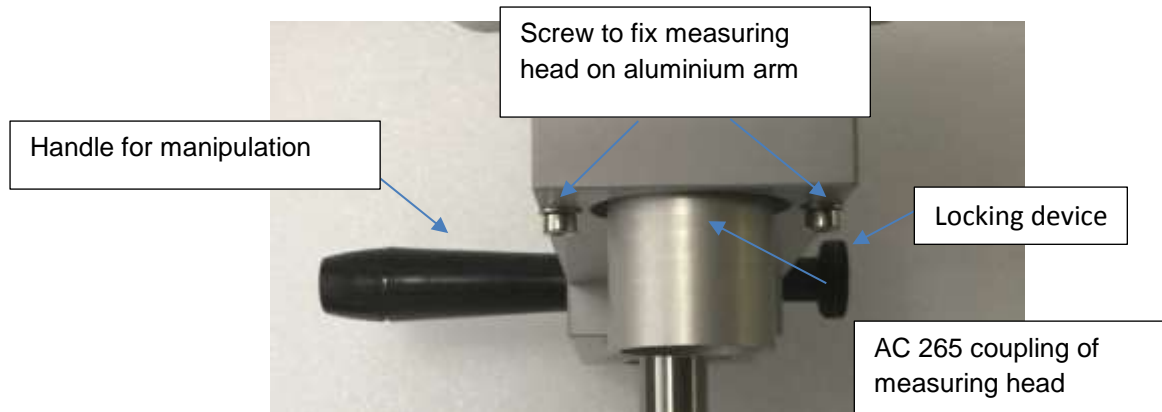
- On / Off Switch

Always with the aim of improving your experience, LAMY RHEOLOGY has decided to equip all of its PLUS range with a luminous and design switch. It has been placed in the centre of the device for greater intuitiveness.



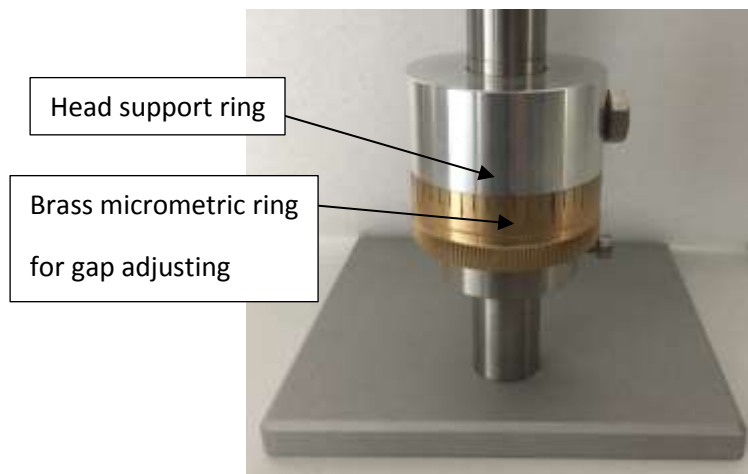
- Aluminium arm

The aluminium arm is equipped with the clamping knob allows you to maintain the height of the measuring head and a handle for easy handling. The measuring head is fixed to the arm by one screw.



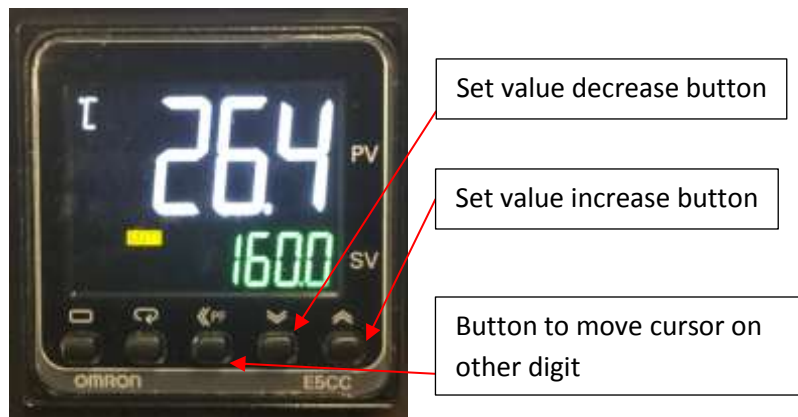
- Stainless steel rod

The support rod is made of stainless steel for a solid hold of the measuring head. It has a very long life. One of them is equipped with a support ring for the head in the measuring position and the micrometric ring for adjusting the air gap.



- Temperature unit CP2000

This device regulates the temperature of your sample. It is equipped with a display / regulator (programmer for certain model) OMRON. It exists in Peltier or electric version.



The lower plate is interchangeable to accommodate the diameter of the measuring geometry.



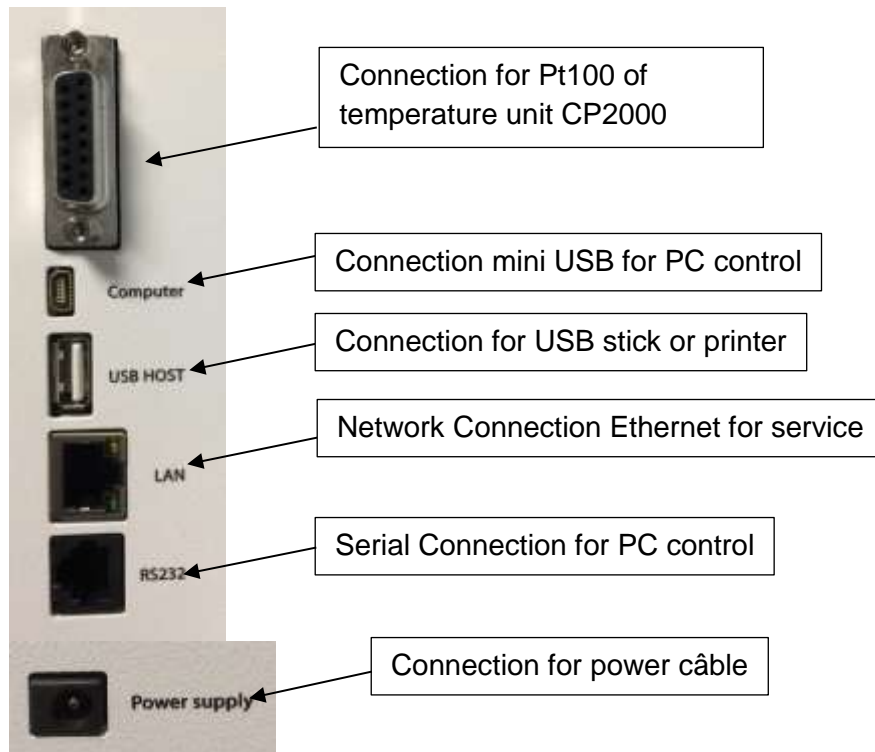
The CP2000 is also equipped with a white cable to make electrical contact between the measurement cone and the lower plate.



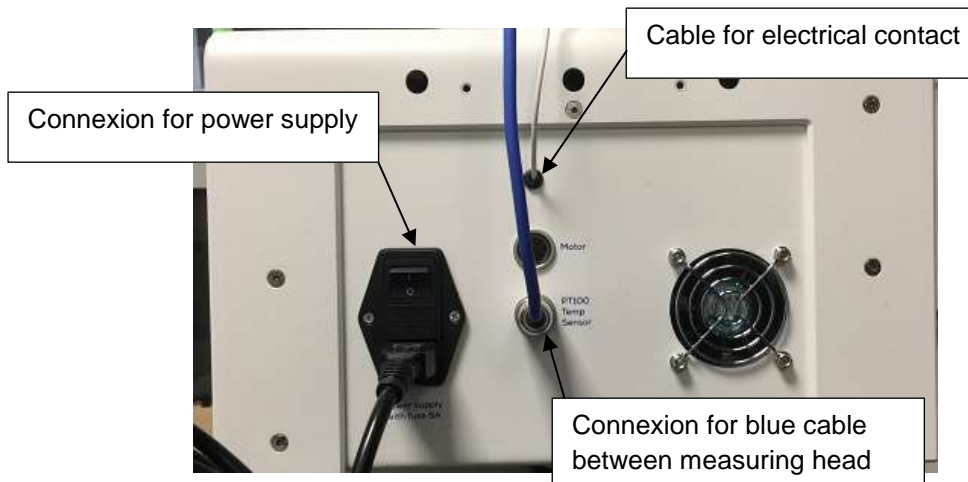


### 1.3. CONNEXIONS

According to your order, rear panel of device get this available connexions.



The rear panel of the CP2000 support has these connections.



#### 1.4. SPECIFICATIONS

**Type of instrument:** Rotating springless viscometer with 7" Touch screen

**Rotation speeds:** Unlimited number of speeds between 0.3 and 1500 rpm

**Torque range:** Standard Version: 0.05 to 30 mNm.

**Temperature:** The RM 100 CP2000 PLUS has a PT100 sensor which indicates temperatures between -50 °C to + 300 °C

**Accuracy:** +/- 1 % of the full scale

**Repeatability:** +/- 0,2%

**Display:** Viscosity – Speed – Torque – Time – Temperature, Choice of viscosity units: cP/Poises or mPa.s / Pa.s – Shear rate

**Language:** French/English/Russian/Spanish

**Compatible measuring system:** MS CP

**Supply voltage:** 90-240 VAC 50/60 Hz

**Analog output:** 4 - 20 mA

**PC connections:** RS232 Port and USB

**Printer connexion:** USB Host Port – Compatible PCL/5

**Options:** Software (PN 311003)

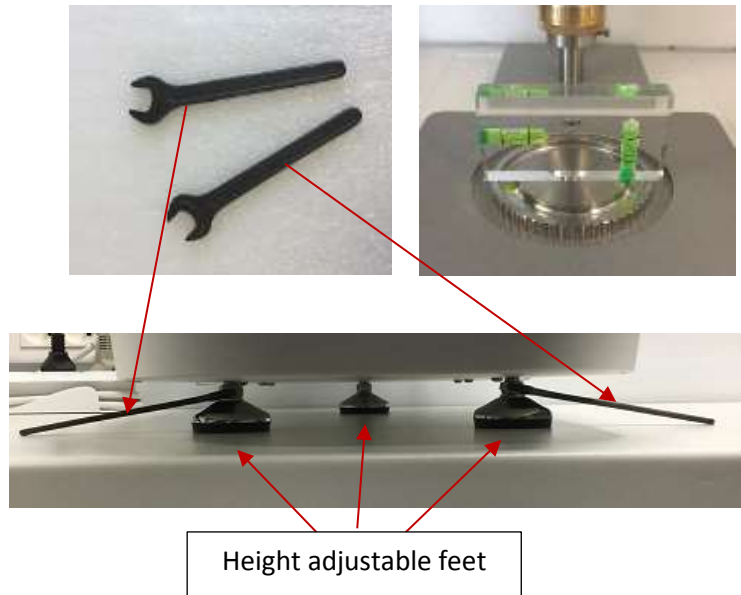
**Dimensions and weight:** Head: L180 x W135 x H250 mm, Stand for CP 2000: D610 x W340 x H650 mm, Weight: 22 kg.

This is the available models.

Part Number Instrument	Designation Instrument
N170000	RM 100 CP2000 PLUS VISCOMETER Peltier air-air (+10 to +70°C)
N170100	RM 100 CP2000 PLUS VISCOMETER Peltier air-air (+10 to +70°C) with programmer
N170200	RM 100 CP2000 PLUS VISCOMETER with liquid Peltier (-20 to +120°C)
N170300	RM 100 CP2000 PLUS VISCOMETER with liquid Peltier (-20 to +120°C) with programmer
N170400	RM 100 CP2000 PLUS H VISCOMETER (Room to +300°C)
N170500	RM 100 CP2000 PLUS H VISCOMETER (Room to +300°C) with programmer
N170600	RM 100 CP2000 PLUS VISCOMETER Peltier air-air high power (+5 to +80°C)
N170700	RM 100 CP2000 PLUS VISCOMETER Peltier air-air high power (+5 to +80°C) + programmer
N170800	RM 100 CP2000 PLUS VISCOMETER Peltier air-air (+10 to +100°C)
N170900	RM 100 CP2000 PLUS VISCOMETER Peltier air-air (+10 to +100°C) + programmer

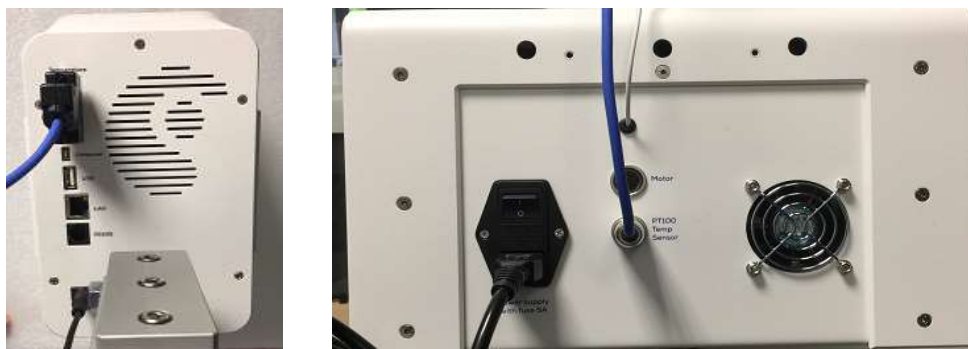
## 1.5. INSTALLATION

Install the CP2000 on a solid bench. Place the level on the plane and adjust the level using the 2 keys provided by playing on the three adjustable feet in height.



Connect the power cable. Connect the temperature reading cord (blue): SUB-D 15 connector on rear of the RM PLUS to the DIN plug on the back of the CP-2000 stand

Connect the RM100 PLUS and CP2000 power cable.



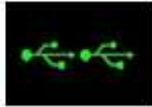






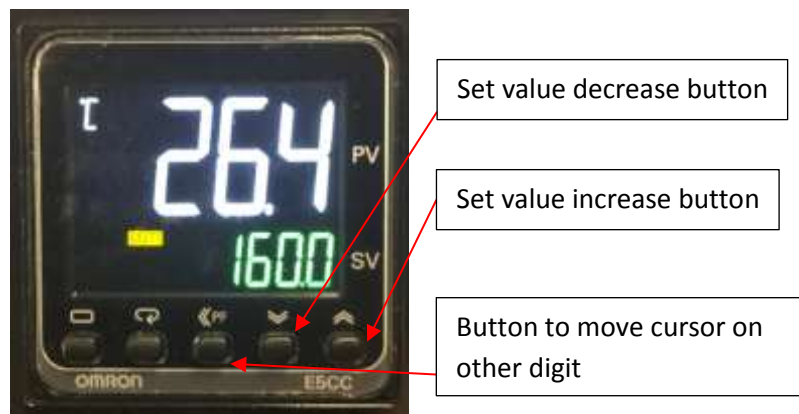
## 2. GETTING STARTED

Once power cable has been plugged on rear panel of device (see section 1.5), you can click on button to switch on your device.

### 2.1. STATE ICONS


Once your device is switched on, you will see some icons on Touch Screen.

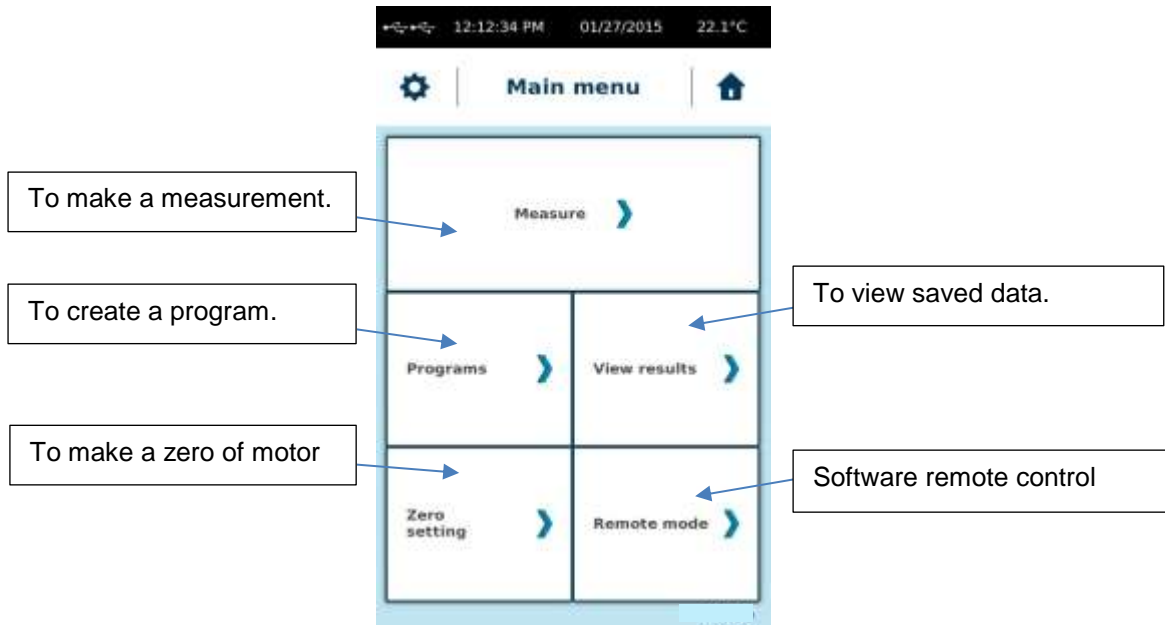
	No Device is connected to the instrument.
	Only one Device is connected to the instrument.
	Two Devices are connected to the instrument.
	Give you the temperature of probe in the sample.
	Enable to go to parameters of instrument.
	Enable to come back to Main Menu.
	Enable to come back to previous menu.



## 2.2. PRIMARY CONCEPTS

### 2.2.1. Main Menu

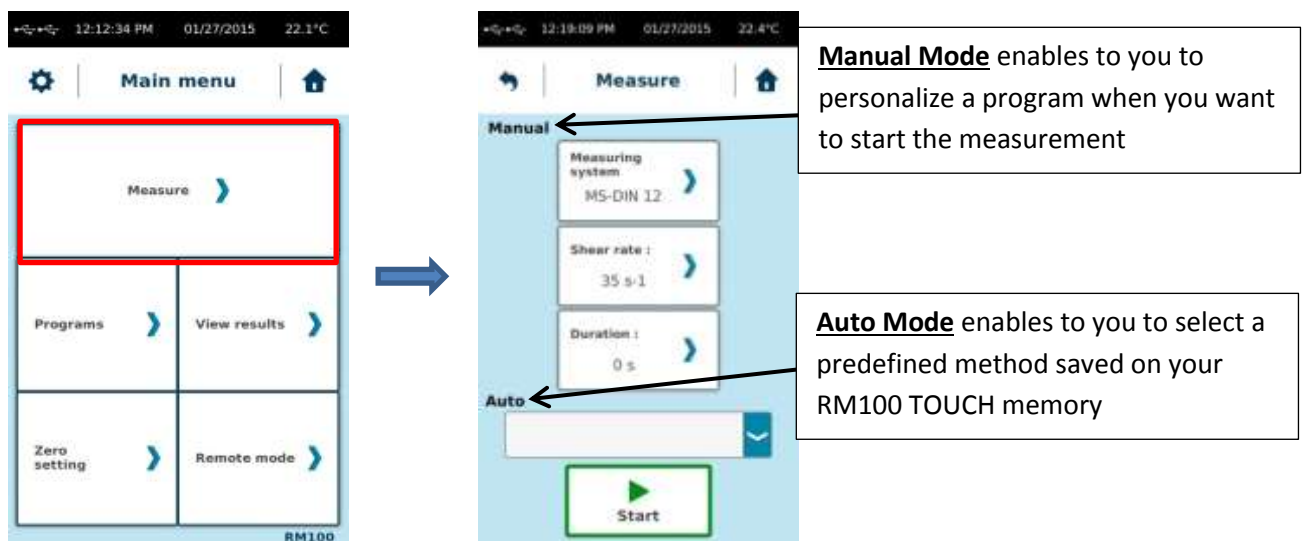
Main menu enable to you to browse between different tabs of your RM 100 CP2000 PLUS. Acces is always available by clicking 



### 2.2.2. Measure

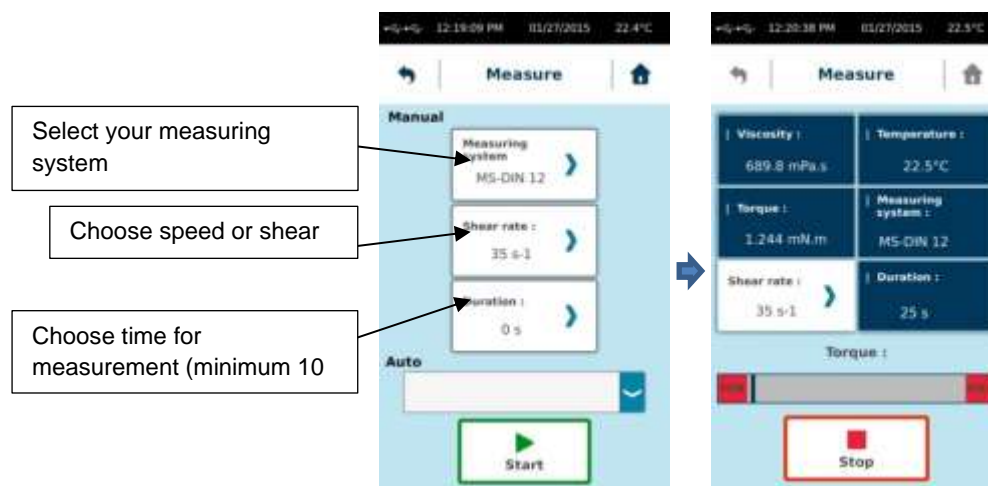
Measure tab is central part of your RM 100 CP2000 PLUS. Before to use it, you should install your measuring system and your sample. Please see section 3.

Then you click on “Measure”, you will see a new window.



**Manual** Mode enables to choose your measurement parameters like «Measuring System », « Speed or shear rate» then « Time of measurement ».

Click Start to start your measurement. When it is finished, you will see the results of your measurement and can choose to save and / or print your result (if a printer is connected).



**Rq :** If « Time » = 0, you could modify « speed » during the measurement. This could help you to define the best conditions to work on your sample.

If your measuring system is not in list, you may have to create it. Please refer to section 2.2.7.6.

Choice between “Speed” or “Shear rate” is according to your measuring system. For MS CP you should have only possibility to set the shear rate. If you need to know what is the corresponding speed then you are using shear rate, you have to use constant  $K_D$  of your measuring system (information available in section 2.2.7.6).

$$\text{SPEED} = \text{SHEAR RATE} / K_D$$

With speed unit in rpm, shear rate in  $\text{s}^{-1}$  and  $K_D$  is  $\text{rpm}/\text{s}^{-1}$ .

**Auto** mode allows you to select pre-recorded programs. Select the program from the list and click "Start" to start your measurement. The display automatically adjusts to show the current measurement.



Then your settings are ok, you can click “Start” to start your measurement. While your measurement, you will see a torque gage. Please try to not be closed to the upper and lower limit. Please increase speed or take a bigger measuring system if you are close to the lower limit. Please decrease speed or choose smaller measuring system if torque reading is close to the upper limit.

Picture below show how should be the closer position regarding lower limit.

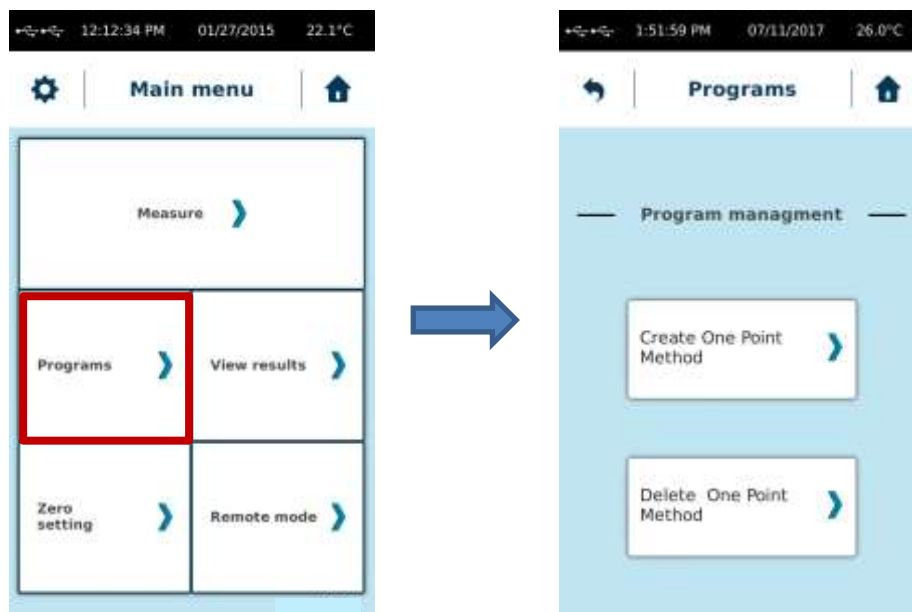


Then your measurement is finished, you will get this windows below. You will find all data you need and get possibility to save them into internal memory or to print it (if a printer is connected). If you choose “Save”, viscometer will ask you to give a name of your measurement. You will have after possibility to read it later (see section 2.2.4.).



### 2.2.3. Programs

With **Programs** tab, you could define parameters for your standard measuring program and also delete it. We have one kind of program: “One point method”.

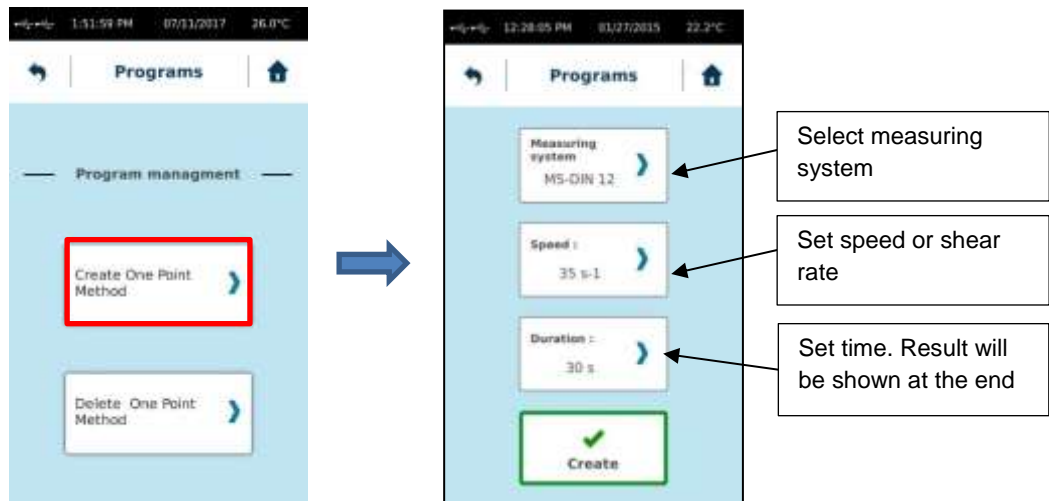


In One point method, you will have one viscosity value at one speed or one Shear rate

When your Program is created, you will find it in **AUTO** list of **Measure** tab.

Click on “Create One Point Method” to start programming.

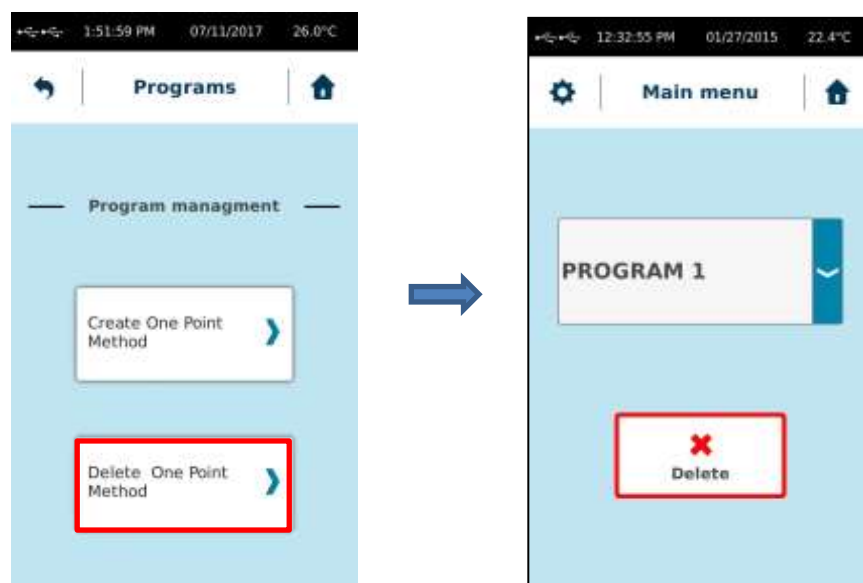




Then you click on create, you will get this screen where name of program need to be given.

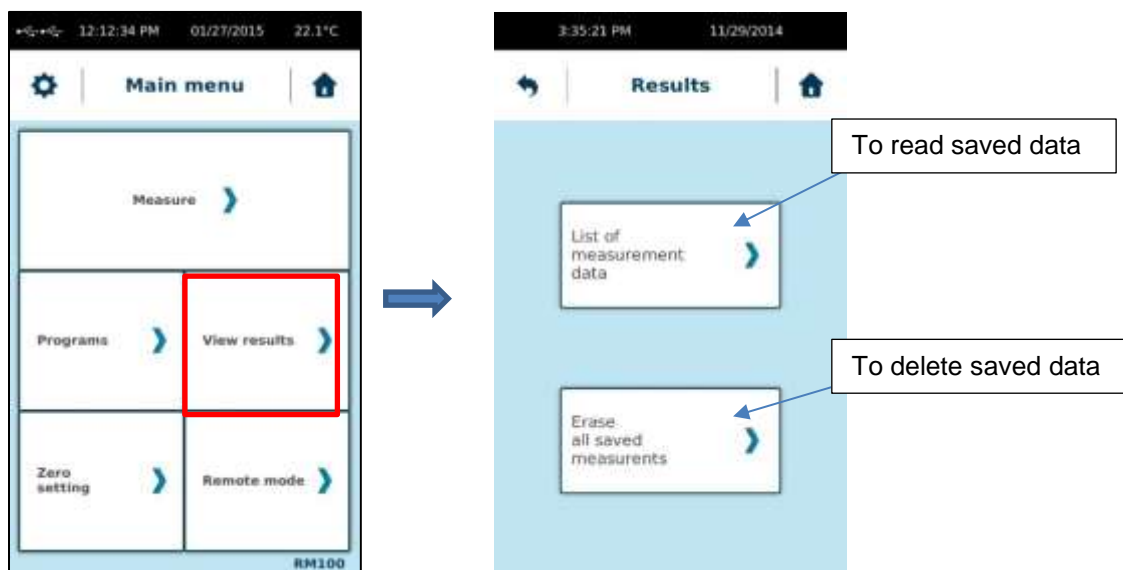


To delete “One Point Method”, please do like this



### 2.2.4. View Result

This menu allow you to read or delete data from internal memory. Press on « View results » tab in Main menu.



#### 2.2.4.1. Read saved data

By click on tab “List of measurement data” you could see all saved measurement made with your RM 100 CP2000 PLUS. You could select which one you want to read.



Then you selected a measure, you will see result and get possibility to print it if a printer is connected.

By clicking on “Global Export”, you will have possibility to transfer all saved measure on USB stick (if connected).

The format of the data generated and saved by the viscometer is ASCII (\*.csv). Once your data has been copied to the USB drive, you can open the files using the EXCEL spreadsheet. To do this, simply copy the data from the USB key to your computer. Then open Excel, choose "File", "Open", taking care to select "All files \*.\*". Excel will offer you to convert your data by displaying three successive windows. Be careful not to change the options offered except on

the second where it will be necessary to choose the option "semicolon" for the separation of the columns. You can then see your measurement results with the possibility to save a new file in Excel format.

#### 2.2.4.2. Delete saved data

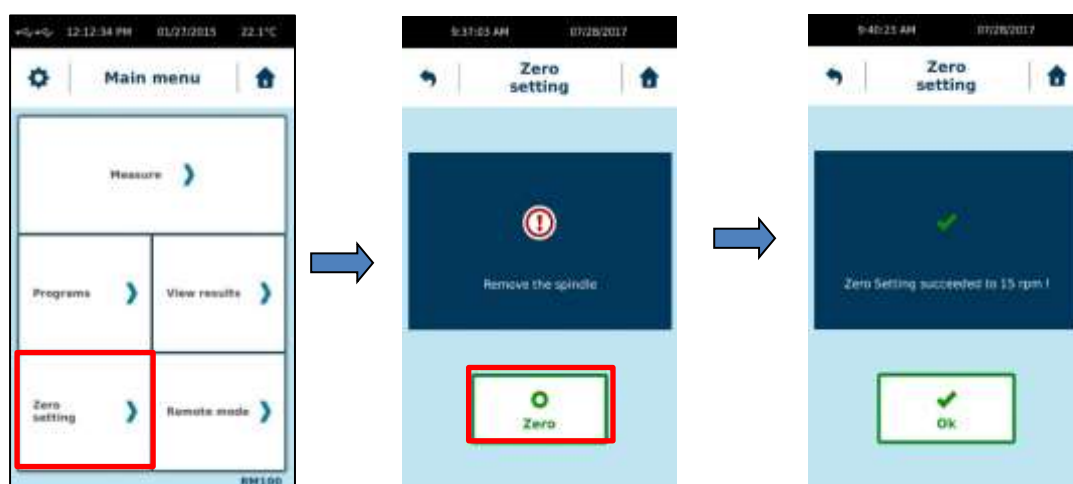
By click on tab you could delete saved measure one by one as you want from your RM 100 CP2000 PLUS memory



Then you click on “Delete”, saved data will be completely deleted from internal memory without any new confirmation.

#### 2.2.5. Zero setting

The zero setting allows you to calibrate your RM 100 CP2000 PLUS to take account of the engine's empty friction. This operation must be done without measuring system. The rotational speed for zero adjustment is set at the factory. But if you want to change it, you can change it by going to the "Parameters" menu (see section 2.2.7.8). The shifting allows you to give you much more accurate measurements at specific speeds. The best speed for zero setting should be the same as for your measurement.



Then zero is finish you can click on OK and internal motor friction will be automatically saved inside memory of viscometer. If problem occur during zero setting, please try again. If problem still present, please contact your local distributor or society LAMY RHEOLOGY.

### 2.2.6. Remote mode

This mode enables to drive RM 100 CP2000 PLUS by external VISCO RM software, supplied on option.

You must select the type of connection: USB or RS232 and connect the appropriate cable (delivered with software) to the computer, open the software, select the right COM port you're using on "SYSTEM" "CONFIGURATION" menu of software and press "Start" to establish connection with external software.



**Rq :** With mini USB connection, respect strictly the order to start, and if any communication is possible re-connect the USB cable on computer and wait it is recognized before start the communication.

### 2.2.7. Parameters

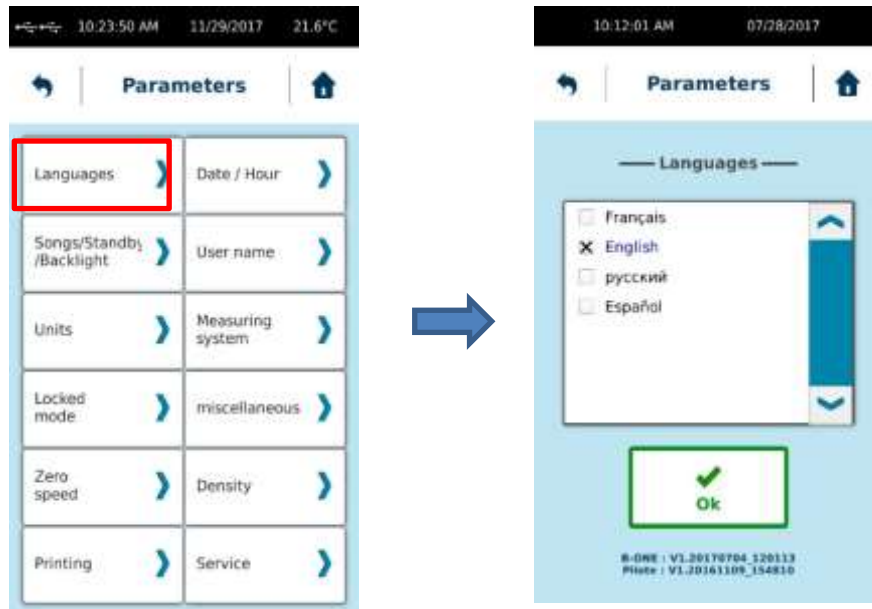
This parameters menu allow you to change settings of your device. It is reachable by clicking on icon "wheel" in upper left corner of touch screen.

This icon is only available then you are in "Main menu".



### 2.2.7.1. Languages

Enable you to select language of your RM 100 CP2000 PLUS. You have choice between French, English, Russian and Spanish. Then you have selected your desired language, you have to click on “Ok” and device will reboot automatically to show new language. In this menu you will be able to see Firmware version of your device.



### 2.2.7.2. Date / Hour

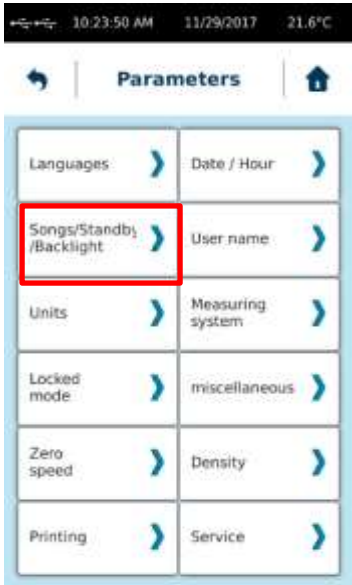
Enable you to adjust hour and date of your RM 100 CP2000 PLUS.



### 2.2.7.3. Sounds/Standby/Lighting

Allow you to modify sounds, lighting and activate or not the Standby mode of your RM 100 CP2000 PLUS.

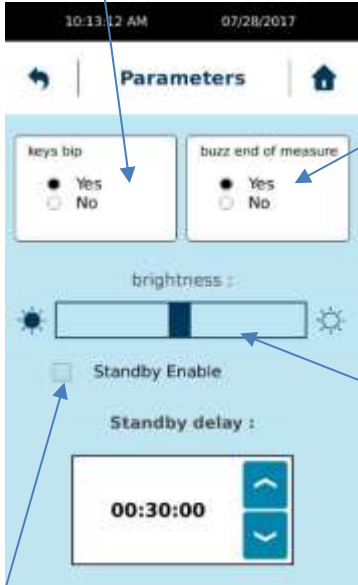
Choose if you want to get sound during using touch screen.



Choose if you want to get sound then measurement is finished.

Choose if you want to change brightness of Touch Screen.

Choose if you want to switch off automatically your device after no using. After selecting "Standby enable", you will have to set time. Your device will be switch off after this time.



### 2.2.7.4. User Name

Operator mode will allow you to create different operators for your RM 100. The use of the operators makes it possible to identify the person making the measurement. Operator management must always begin with the creation of the first account, which will become the administrator and thus create or delete another operator account.



→



After specifying the name and password, the administrator will be named in red in the list.

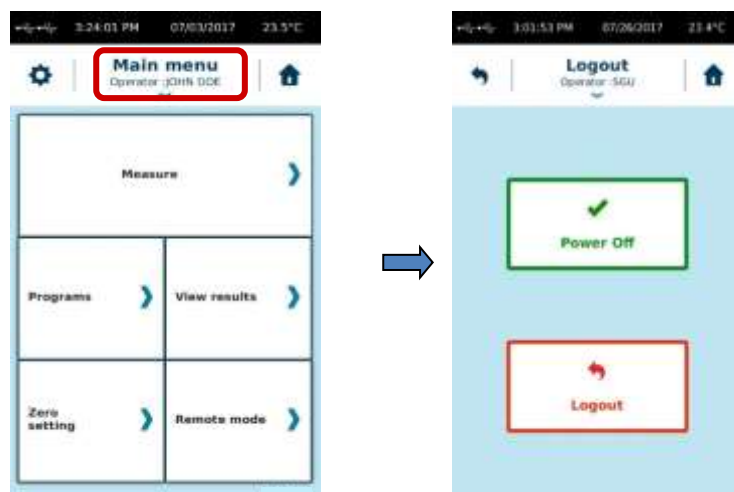


You can now create another operator. The account of an operator may or may not be associated with a password (here called PIN code).

To delete an account, the administrator account must be used. Select the account you want to delete from the list and click on "Delete user name".



To use the operator accounts you must activate the mode. Device will ask you to select user name you want to use. By returning to the Main Menu, you will see the name of the operator in use. By clicking on the arrow below the name of the operator, you can switch off the RM 100 or change operator.





If the instrument is switched off while operator mode is activated, device will ask you to select the operator you want use then device will be switched ON.



#### 2.2.7.5. Units

Enable to you to change unit of viscosity values.



#### 2.2.7.6. Measuring System

Allows you to add or remove a Measuring System.





To create a measurement system, the instrument will ask for both constants and the name. You will find below list of measuring system compatible with your device and corresponding constant. You are not allow to change constant of existing measuring system. If you want to use new constant, you have to create a new measuring system with name as "Copy of..." and enter constant you want to use. Please remember that Constant  $K_D$  is use to convert speed in shear rate and  $K_{\tau}$  to convert torque in shear stress. As shear rate and shear stress are using to calculate viscosity value, if you use different constant value, you will get different viscosity result.

### **MS CP**

SYSTEM	K $\tau$ / 1 mNm in Pa	K $d$ / 1 RPM in S-1	R $i$ / R $a$
CP 2005	477.5	12	1
CP 2015	477.5	3.8	1
CP 2020	477.5	3	1
CP 2045	477.5	13.3	1
CP 2405	276.3	12	1
CP 2420	276.3	3	1
CP 2445	276.3	13.3	1
CP 2520	244.5	3	1
CP 3020	141.5	3	1
CP 3520	89.1	3	1
CP 4005	59.7	12	1
CP 4015	59.7	3.8	1
CP 4020	59.7	3	1
CP 4040	59.7	1.5	1
CP 4221	51.6	3.8	1
CP 4530	41.9	2	1
CP 5005	30.6	12	1
CP 5010	30.6	6	1
CP 5020	30.6	3	1
CP 6005	17.7	12	1
CP 6010	17.7	6	1
CP 6020	17.7	3	1
PP 25 0.5	326	2.618	1
PP 25 (1mm)	326	1.309	1
PP 25 (2mm)	326	0.654	1
PP 40 (0.5mm)	79.5	4.188	1
PP 40 (1mm)	79.5	2.094	1
PP 40 (2mm)	79.5	1.047	1

#### 2.2.7.7. Locked Mode

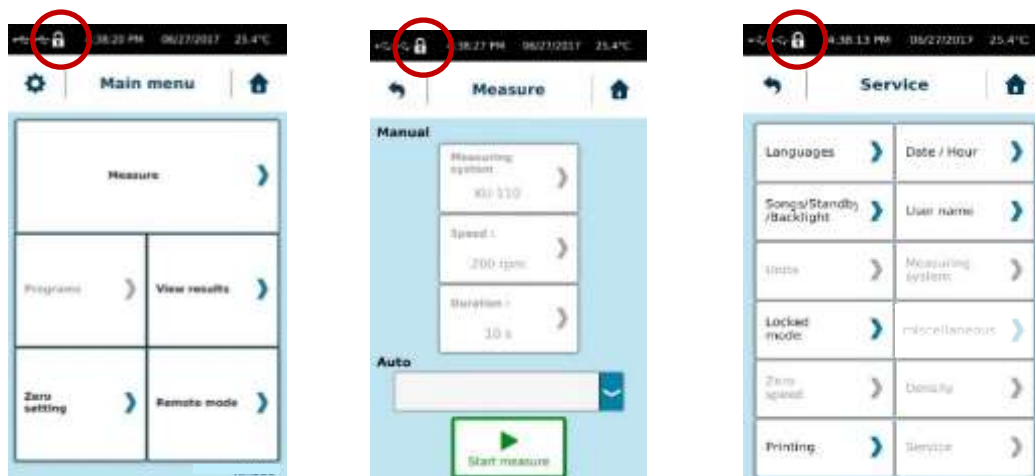
This option allow you to block measuring parameters and settings of your device. It should be set by an administrator or responsible of the device.

This function is not comparable to the "User name" menu (please see section 2.2.7.4). It should be use if you want to protect few settings on your device. All settings will be not locked by this function. You will see below which settings are concerned.

This function will block also parameters for measure. In this way, if you want to use all the time same parameters for measurement, you should enable this locked mode to be sure that nobody will change settings for measurement.



When you click "Enable", the RM 100 will ask you to save a 4-digit code that will be required to disable this protected mode. Each activation is independent and can be done with a different code. The protected mode is indicated by the presence of a padlock-like icon. **BUT TO DISABLE THIS LOCKED MODE, YOU SHOULD USE 4-digit CODE USED TO ENABLE IT.** Once protected mode is activated, you will see this icone on RM 100 Screen (see picture below). Protected mode protect programs, measuring parameters and some menu as shown on pictures below.



To disable protected mode, you have to go again in service and “Locked mode” and click on disable. You will have to use password.

#### 2.2.7.8. Zero Speed

Enable you to adjust the rpm value for the zero adjustment.

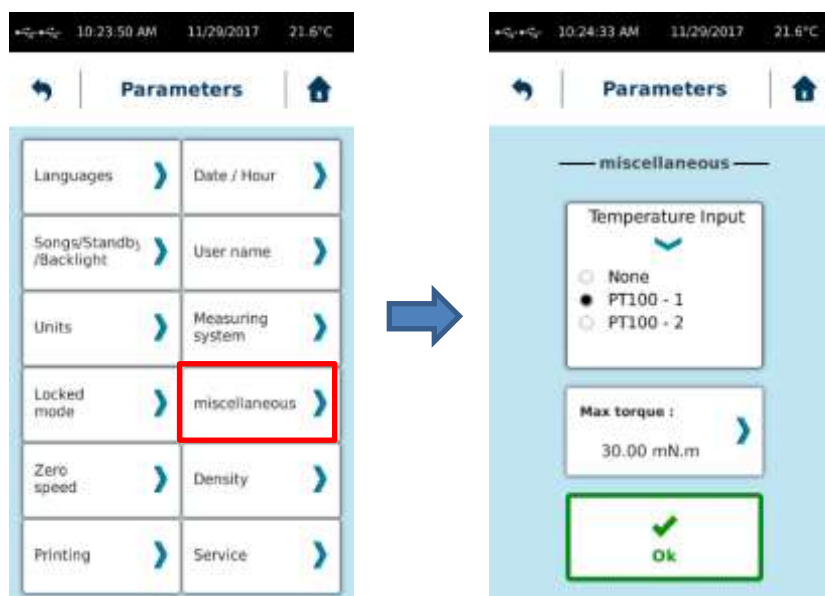


You have to use the same speed as for your viscosity measurement. Then zero setting is finished, you have to click “Ok” to validate it.

#### 2.2.7.9. Miscellaneous

This menu allow you to choose which temperature sensor will be used by the device (Internal of external). By default, PT100-2 is selected and corresponding to PT100 of CP2000 unit. Pt100-1 is not available on RM 100 CP2000 PLUS.

Allows you to change the maximum torque that will be sent to the analogue recorder that will be connected (oscilloscope or card). This function does not allow to limit the torque of the RM 100 CP2000 PLUS during a measurement.



#### 2.2.7.10. Density

Enable you to enter density value of your product in order to measure his kinematic viscosity.



If you set a density value, you will get all the time viscosity in cStoke. Please remove density information if you want to get back Pa.s or Poise for unit of viscosity.

#### 2.2.7.11. Printing

Allows you to connect a printer, print a test page, and choose the print interval time you want during measurement.

The RM 100 can be connected to all printers with a PCL5 print protocol. This includes many A4 printers. The connection is made to the "USB host" port on the back of the instrument.

Once the printer is connected, simply click on "Install Printer"



Then you print data at the end of measure or a saved file, you will have only information shown on device screen as final result. If you want to have more data printed, you have to select "Interval printing" time to get data printed between start and end of your measurement.

### 2.2.7.12. Service

Reserved to LAMY RHEOLOGY engineers.



## 3. MEASURING WITH YOUR DEVICE

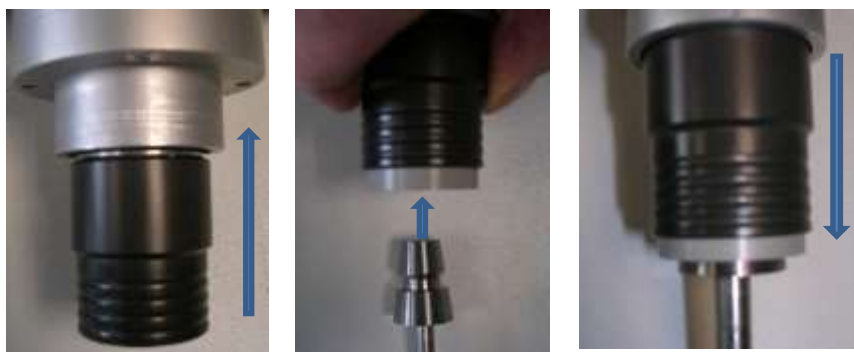
This section will show how use the different measuring system with your device.

Viscometer need to be installed before next section of this manual (see section 1.5).

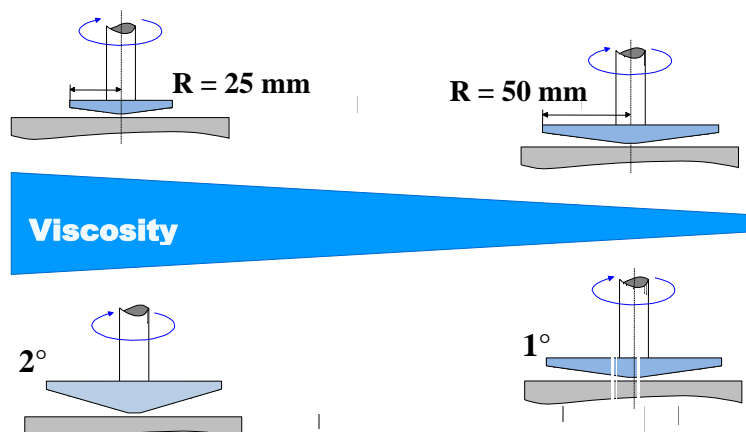
### 3.1. INSTALLATION OF MEASURING SYSTEM

Read the installation of your measuring system in the following sections before inserting it on your viscometer. Indeed some measuring systems require the installation of accessory before the insertion of the spindle. Don't forget also to make a zero of measuring head before installing of measuring system (see section 2.5).

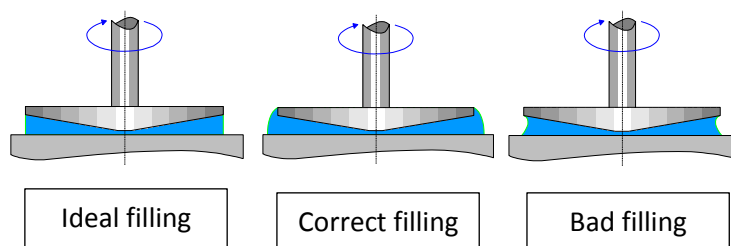
Unlike the RM100 PLUS, the CP2000 version can only be used with cone-plane or plane-to-plane geometries. The coupling of the RM 100 CP2000 PLUS is of type AC 265. It is a system allowing the insertion and the quick fixing of the measuring mobiles. A simple vertical action of the ring upwards (release) or downwards (locking) allows easy manipulation of the measuring tool.



Choice of measuring system must be done according to the product to be measured. Favor wide diameters for low viscosities as shown on diagram below.



The amount of sample should be sufficient to completely fill the space between the cone and the bottom. In the case of a liquid sample, you can take the recommended volume for the dimensions of your cone-plane (see table below). For thicker samples, you need to draw enough with a spatula or similar tool.



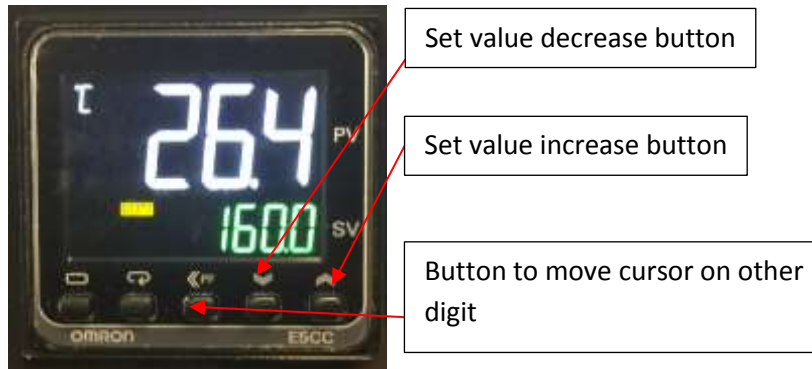
Sample volume for Plate measuring system depends on gap used. But filling need to be perfect as for cone.

Diameter (mm)	Angle (°)	Sample volume (ml)
10	0.5	0.0023
20	0.5	0.018
20	0.5	0.018
20	1.59	0.058
20	2	0.073
24	0.5	0.031
24	2	0.126
40	0.5	0.146
40	1.59	0.465
40	2	0.585
40	4	1.17
50	0.5	0.285
50	2	1.142
60	0.5	0.5
60	1	1
60	2	2
60	3	3

### 3.2. TEMPERATURE SETTING

The value read on this display is the set temperature. The value read on the screen of the RM 100 CP2000 PLUS is the actual value of temperature.

To change the set point, press the arrows to adjust the desired temperature, the new set point will be taken into account after a few seconds without validation.



### 3.3. GAP SETTING

Your RM 100 CP2000 PLUS is equipped with a manual adjustment of the gap. This setting is very important for the measurement position to be as ideal as possible. This adjustment must be made with the mobile but without sample. And it is necessary to do this at the measuring temperature.

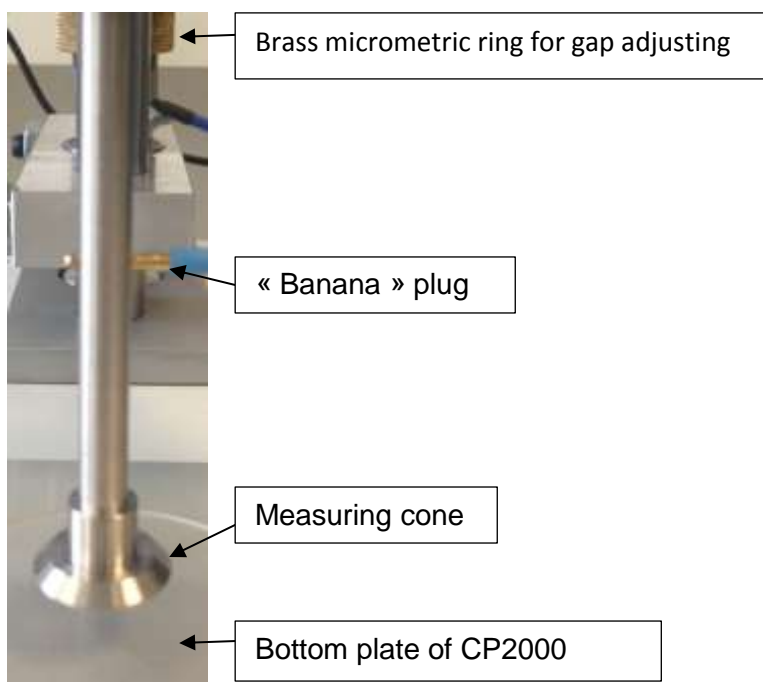
Some cone used with RM100 CP2000 PLUS are truncated. It means that tip of cone is cut at 50  $\mu\text{m}$ . Measuring systems truncated get part number with three first number « 365... ». For these cones, you should use 50  $\mu\text{m}$  metallique spacer that will be place between cone and bottom plate.

The first step is to heat up your measuring plate (see paragraph 3.2). Also, especially if the test temperature is different from that of the room, place the measuring geometry on the bottom plate to also bring it to temperature.

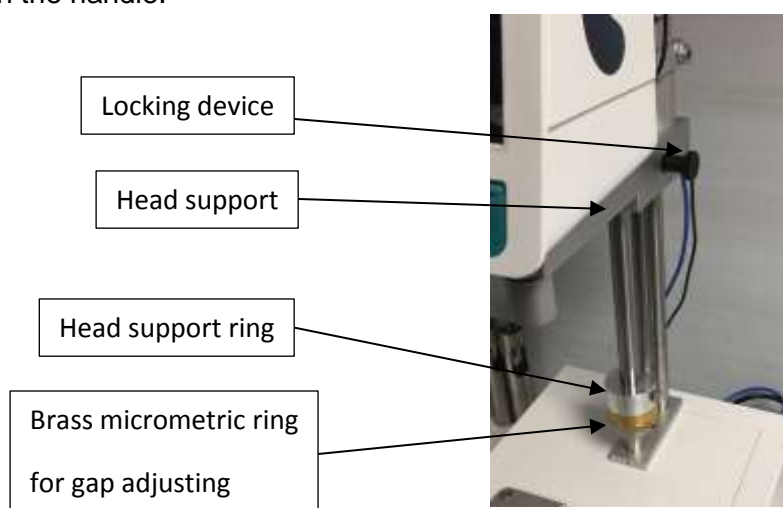


When the temperature has stabilized, you must leave your geometry in this position for a minimum of 5 minutes.

You must then attach the mobile to the viscometer (see paragraph 3.1). Insert the "banana" plug located at the end of the white wire into the hole located on the axis of the measuring cone. This makes it possible to establish an electrical contact between the measuring cone and the lower plane.



Lower the arm of the RM 100 CP2000 PLUS by pulling on the locking device and holding the head with the handle.







Go to its low position in such a way that the arm rests on the grey ring. If a beep sounds and the head cannot be lowered completely because the geometry already touches the plate of the RM 100 CP2000 PLUS before the arm is in contact with the grey ring, it is important not force and raise the head completely up to the upper stop. Before descending the head, turn the brass ring a few turns anticlockwise to raise it. Move the head down again until it stops on the grey support ring, making sure that the geometry does not touch the plate of the RM 100 CP2000 PLUS. Repeat the operation on the brass ring if it is not.

Gently turn the bronze ring clockwise to gently lower the arm of the RM 100 CP2000 PLUS until the "beep" is heard; this means that the measuring cone is in contact with the lower plane. Then remove banana plug from axis and keep it in your hand and start a measurement without sample (for example put time at 0 and shear rate at 250 s<sup>-1</sup> to get continuous rotation). During rotation, touch axis with banana and earl if a continuous "bip" is present. If this is not the case, use brass ring to get a constant "bip". Then you get it, stop the test. Raise your measurement head, release banana plug place your sample and then go to measure. The gap is then adjusted for the cone used. Do not touch the brass ring again and raise the RM100 PLUS head. See section 2.2.2 for your measure.



#### 4. VERIFICATION OF YOUR DEVICE

Your device has been calibrated and checked before delivery according to an internal procedure using a cylindrical MS DIN 11 mobile, an oil viscosity 1000 mPa.s and a temperature control system (EVA DIN) at 23 ° C.

We inform you that the cone-plane geometries are never used internally for our checks and calibrations. Indeed, this type of geometry can lead to measurement errors due, for example, to the problems of gap filling, slippage, product ejection or wrong gap distance.

You can nevertheless check your RM 100 CP2000 PLUS using your own geometry and a Newtonian standard oil of known and certified viscosity (preferably close to 1000 mPa.s). The tolerance on the accuracy of the viscosity measurement is at best 10% of the expected value with a cone-plane at a temperature whose viscosity value is known.

Here is the procedure to follow for your verification:

- 1) Perform a motor zero (see section 2.2.5).
- 2) Warm up your geometry and the lower plate according to the procedure described in paragraphs 3.2 and 3.3.
- 3) Install your measuring system (see section 3.1).
- 4) Set Gap as described in section 3.3.
- 5) Put standard oil on lower plate and lowering measuring cone in measuring position (see section 3.1 to check good filling of gap).
- 3) Select a measurement method in manual mode by choosing a measuring time of 120s minimum and a shear of 100 s<sup>-1</sup> (see section 2.2.2).

**The measured value must be within the tolerance of 10%. If the value is out of tolerance, check that all previous steps have been completed. If the problem persists, please contact LAMY RHEOLOGY.**





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