



LAMY
RHEOLOGY
INSTRUMENTS

USING MANUAL

RM 100 CP1000 PLUS

VERSION N° RM1CP1000-UK04/2023



TABLE OF CONTENTS

1	INTRODUCTION	4
1.1	Components	5
1.2	GENERAL VIEW OF YOUR DEVICE	5
1.3	Connexions	7
1.4	Specifications	8
1.5	Installation	8
2	GETTING STARTED	9
2.1	State icons	9
2.2	Main Menu	10
2.3	Measure menu	10
2.3.1	Manual measure mode	11
2.3.2	Automatic measure mode	13
2.4	View results menu	16
2.4.1	Show results	16
2.4.2	Export results	17
2.4.3	Delete results	18
2.5	Zero setting	18
2.6	Parameters menu	19
2.6.1	Languages	20
2.6.2	Date / Hour	20
2.6.3	Sounds/Standby/Lighting	21
2.6.4	User Name	21
2.6.5	Units/Density	23
2.6.6	Measuring System	23
2.6.7	Locked Mode	26
2.6.8	Torque range	27
2.6.9	Miscellaneous	27
2.6.10	LIMS mode	28
2.6.11	Printing	28
2.6.12	Service	29
2.7	Remote mode menu	29
2.8	Programs menu	29
2.8.1	Create new program	30
2.8.2	Edit program	34
2.8.3	Delete program	34
3	MEASURING WITH YOUR DEVICE	34
3.1	Installation of measuring system	34
3.2	MS RV/LV	35
3.3	MS BV	37
3.4	MS VANE	39
3.5	MS KREBS	41
3.6	MS CP/MS-PP	42
4	VERIFICATION OF YOUR DEVICE	47

1 INTRODUCTION

The instrument is a device able to measure the viscosity, which is 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.

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

With η for viscosity in Pa.s, τ for shear stress in Pa and $\dot{\gamma}$ for shear rate in s⁻¹.

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

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

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

The instrument 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 instrument is constituted with a continuous current motor with an optical encoder, in order to warranty a great accuracy of the speed of rotation of bob, on all torque range.

The instrument has an easy touch screen display, on which you could read the **speed, measuring spindle reference, temperature, the measured torque and the dynamic viscosity in mPa.s (=cPois) or Pa.s.**

The instrument can be used with different measuring system. You will find below a list of compatible measuring system with this instrument.

- **MS RV/LV:** Measuring spindles according to ASTM / ISO 2555 (316L stainless steel). These systems are ideally suited for simple viscosity measurement at controlled rotational speed in all areas of activity. The standard recommends use of 600ml beaker for measurement.

- **MS BV:** Measuring spindle for 150ml beaker (316L stainless steel). These spindles are ideally suited for simple viscosity measurement at a rotating speed in control in all areas of activity. They are appreciated for their ease of use and the low volume of product needed compared to the MS ASTM spindles.

- **MS VANE:** Measuring spindles with blades (316L stainless steel). These systems are ideal for viscosity measurement (value or curve) in control or development of all types of products even of very high viscosity with or without particles (size <5mm). They can be used for direct measurement in user's containers or in tubes of MS-DIN systems.

- **MS KREBS:** Krebs type measuring spindles compatible with ASTM D562 standard (316L stainless steel). These systems are ideal for viscosity measurement in Krebs units in control of all types of products. They can be used for direct measurement in user containers or in 600 or 150ml beakers.

- **MS CP/MS-PP:** 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 behaviour, 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.

1.1 Components

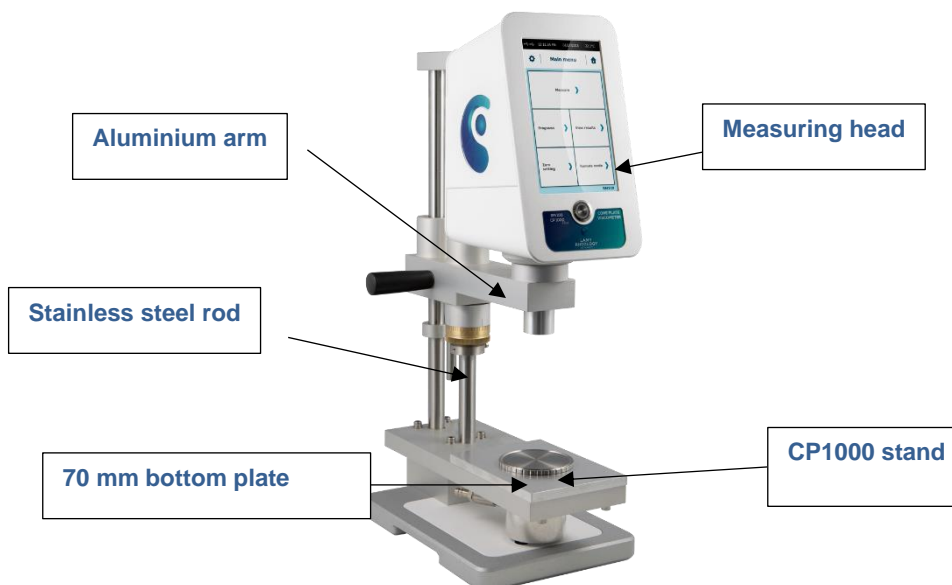
Viscometer is delivered inside a foam protection to avoid any problem during transport. RM 100 CP1000 PLUS is delivered unmounted. You will find some cable, measuring system (according to order) and some tools for installation and using.

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



1.2 GENERAL VIEW OF YOUR DEVICE

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

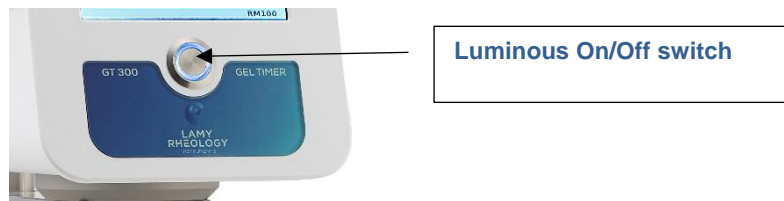


- **TOUCH Screen**

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.

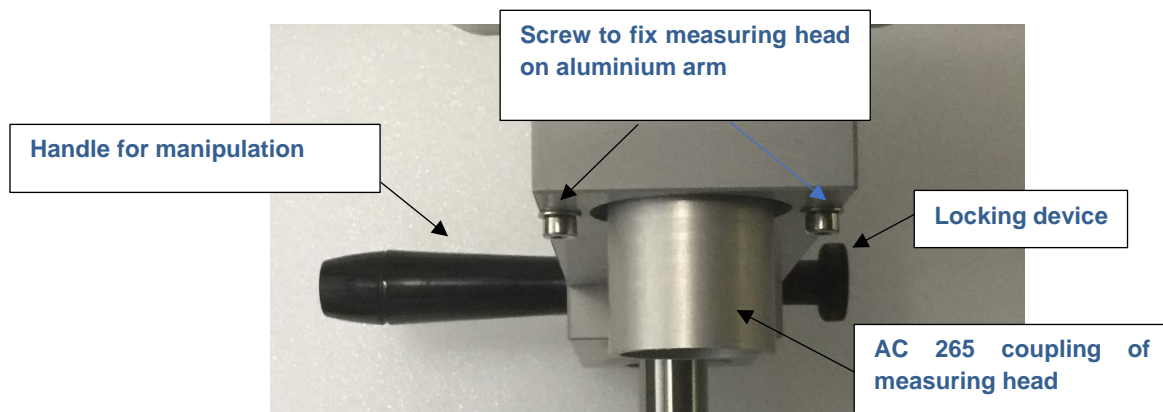
- **On / Off Switch**

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.



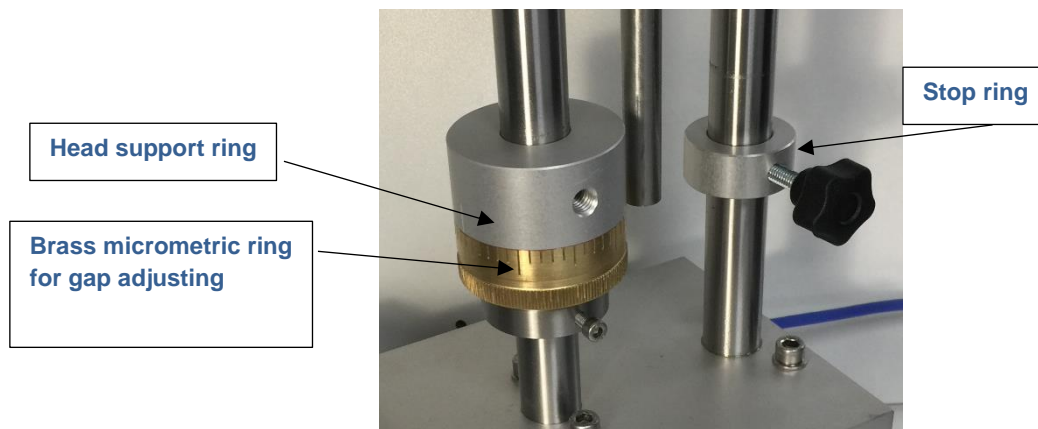
- **Aluminium arm**

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. Other is equipped with stop ring when stand is used with MS RL/LV, MS KREBS, MS VANE, MS BV. It allows lock of measuring position according to spindle.

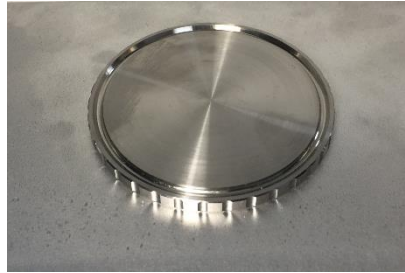


- **Stand CP1000**

This device doesn't regulate itself the temperature of your sample. It requires water chiller to set or maintain temperature between +5°C to +65°C. Two inlet are provided to allow pipe connection from chiller. No matter circulating sense.

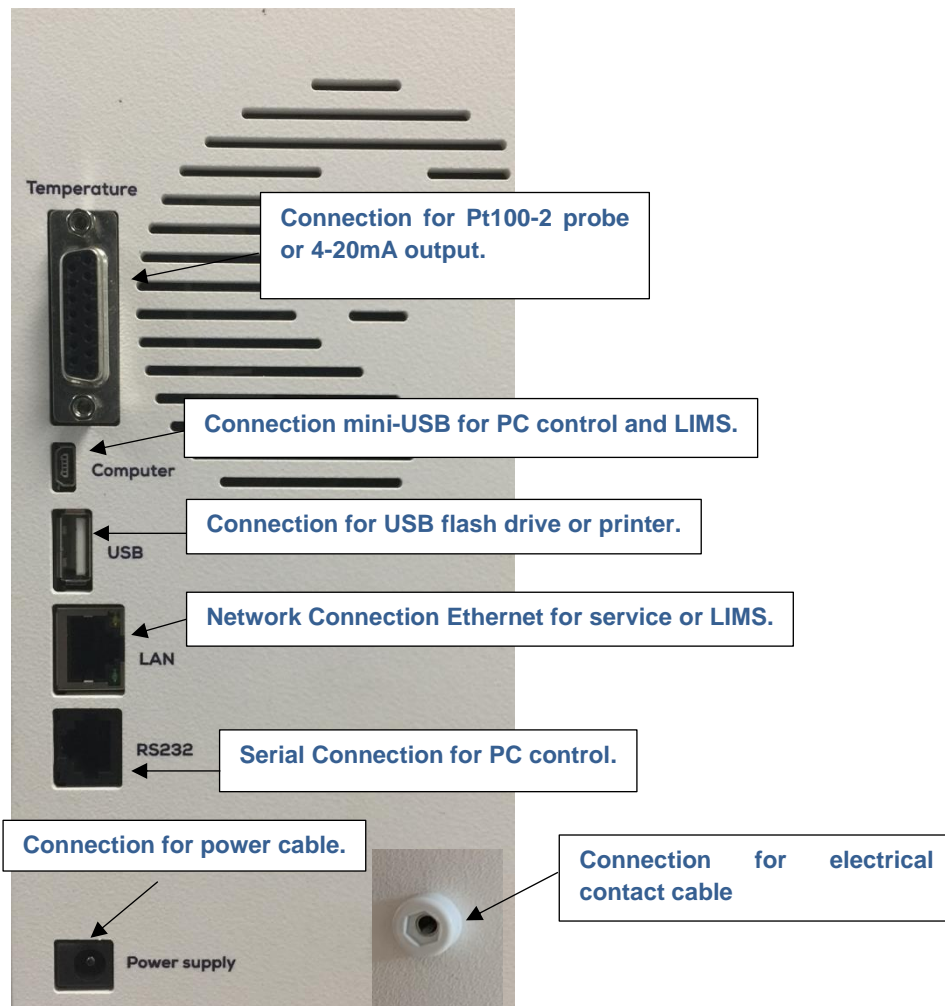
It is equipped with Pt100 temperature probe connected to measuring head with blue cable (need to be connected on rear panel of RM100 PLUS Head – see section 1.5).

The lower plate is removable to get flat surface when you need to install beaker for measurement with other spindle as MS RV/LV or MS KREBS.



1.3 **Connexions**

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



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: From 0.05 to 30 mNm.

Temperature: The RM 100 CP1000 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, Shear stress.

Language: French/English/Russian/Spanish/Turkish/German

Compatible measuring system: MS RV/LV, MS BV, MS VANE, MS CP

Supply voltage: 90-240 VAC 50/60 Hz

Analog output: 4 - 20 mA

PC connections: RS232 Port and USB (Some device with Bluetooth)

Printer connections: USB Host Port – Compatible PCL/5

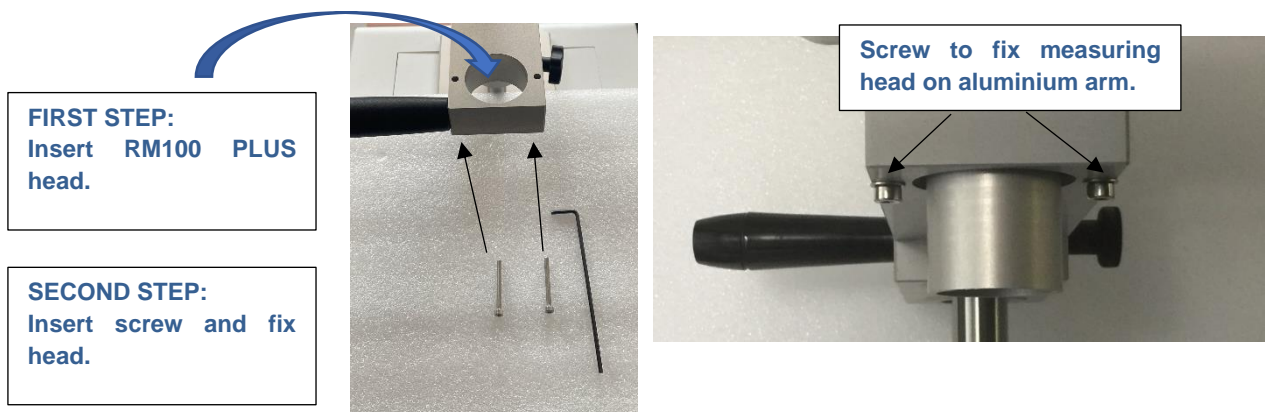
Options: See brochure.

Dimensions and weight: D320 x H550 x W200 mm. Weight: 14 kg

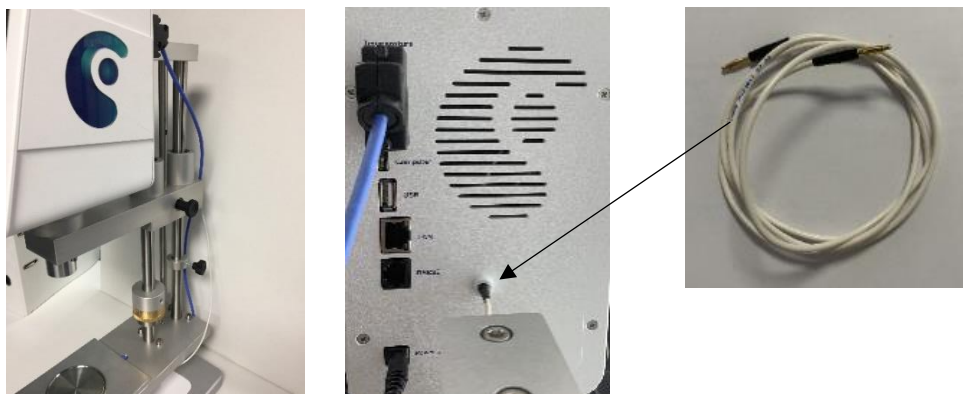
1.5 Installation

Your viscometer should be installed in a clean, vibration-free environment. Even if no level is necessary, choose a stable and flat table.

Place RM100 PLUS head on aluminium arm, use the two provided screw and fix it.



Connect cable for electrical contact on rear panel of device. Connect blue cable from CP1000 stand on rear panel of RM100 PLUS head.



Connect your CP1000 stand to chiller with provided pipe if you need to control temperature.

Connect your viscometer by plugging power cable on to rear panel of device. And cable for software connection when it is provided.



Your viscometer will be used with different measuring system. To know how to mount and use it, please refer section 3.

2 GETTING STARTED

Once power cable has been plugged on rear panel of device (see section 1.3), you can click on button to switch on your device (see section 3).

2.1 State icons


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

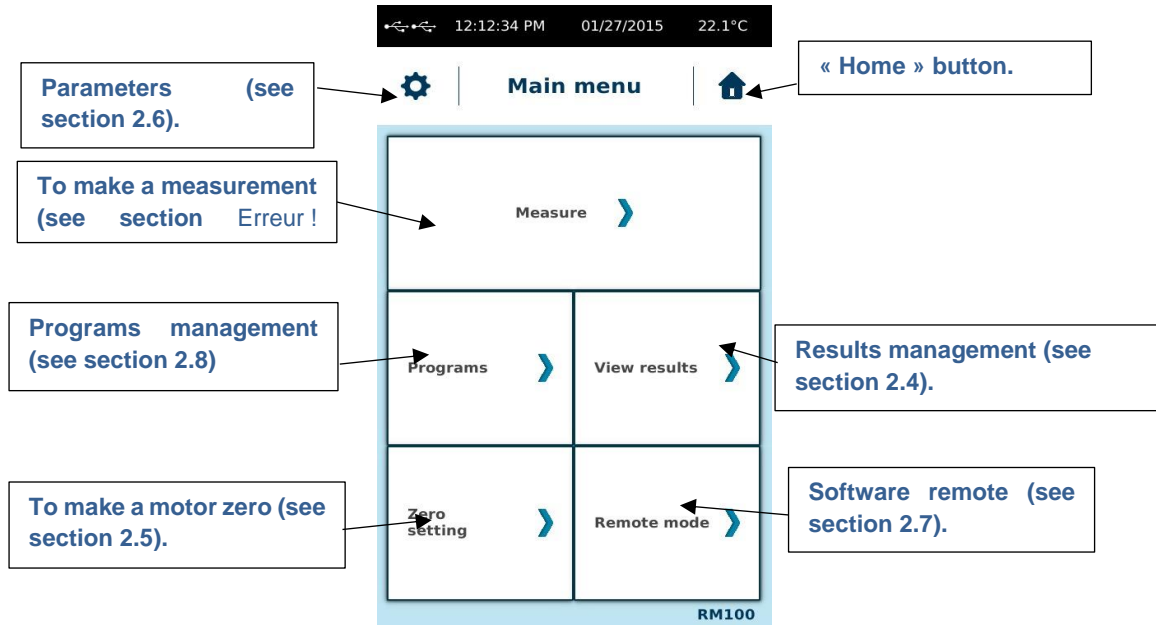
	No Device is connected to the instrument.
	Only one Device is connected to the instrument.
	Two Devices are connected to the instrument.
	Give you the temperature of probe in the sample.
	Enable to go to parameters of instrument.
	Enable to come back to Main Menu.
	Enable to come back to previous menu.

Some instruments are equipped with an external temperature sensor. When it has been ordered, the temperature display is shown at the top right of the screen. If this is not the case, see section 2.6.9 to enable reading. The USB

port icon indicates that a USB flash drive has been connected. This is used to update the firmware or to transfer the results.

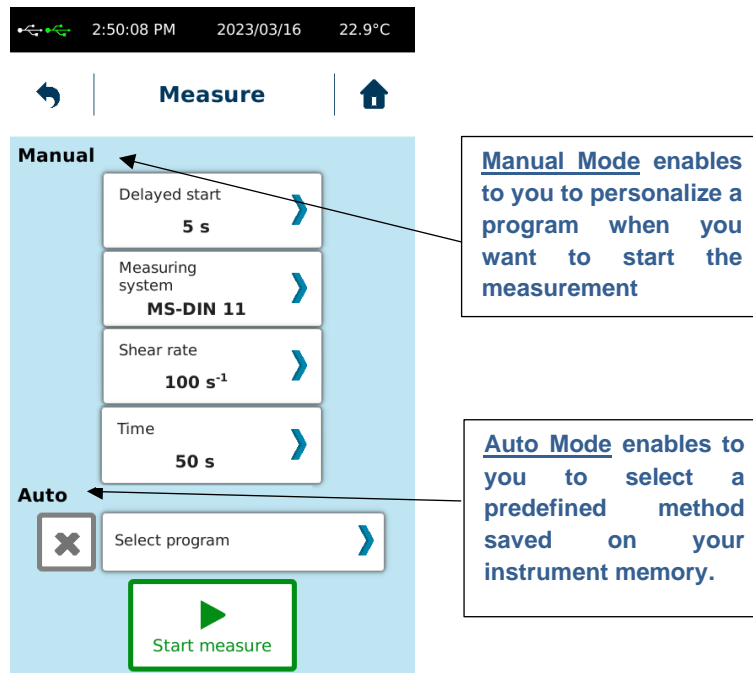
2.2 Main Menu

Main menu enable you to browse between different tabs of your instrument. Acces is always available by clicking. 



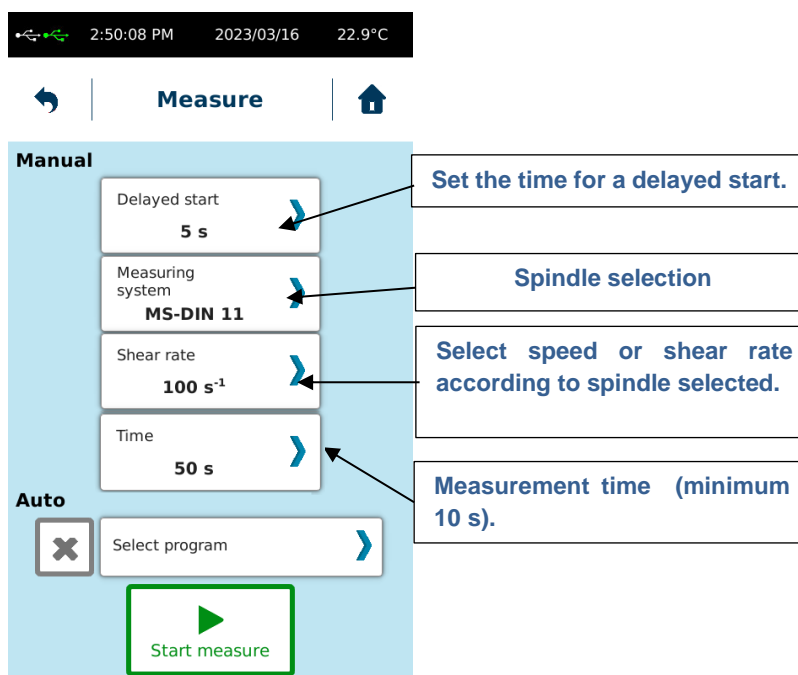
2.3 Measure menu

Measure tab is central part of your instrument. Before to use it, you should install your measuring system and your sample (please see section 3).



2.3.1 Manual measure mode

Manual Mode enables to choose your measurement parameters like “Measuring System”, “Speed or shear rate”, “Time of measurement” and “Delayed start”.



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 2.6.6.

Choice between “Speed” or “Shear rate” is according to your measuring system. For MS RV/LV, MS BV, MS KREBS and MS VANE, you should have only possibility to set the speed. For all other measuring system, you can use shear rate or speed if you force it to show rpm (see section 2.6.9). 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 2.6.6).

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

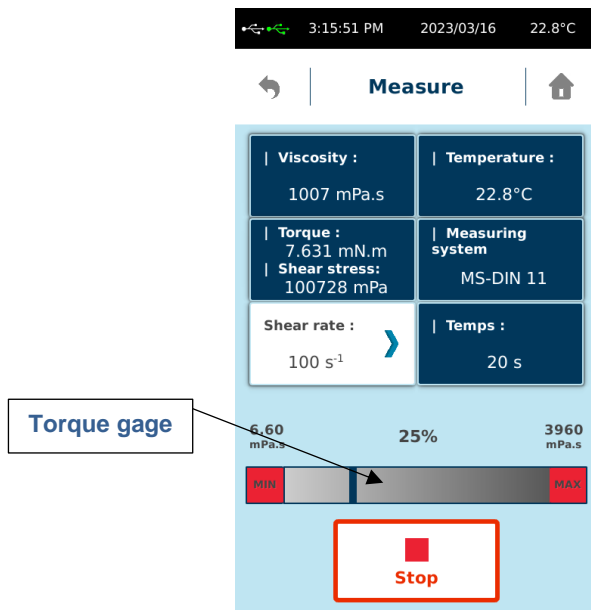
With speed unit in rpm, shear rate in s⁻¹ and K_D is rpm/s⁻¹.

When your parameters are entered, make sure that the zero adjustment of the motor has been performed before starting your measurement. Depending on the model of instrument you have, the procedure may be different (see section 2.5).

Make sure that the measuring system you are using has been correctly installed (see section 3).

When all these checks have been carried out, you can click on "Start measure" to start your measurement.

If a delayed start has been requested, the instrument displays a countdown then switches to the next view.

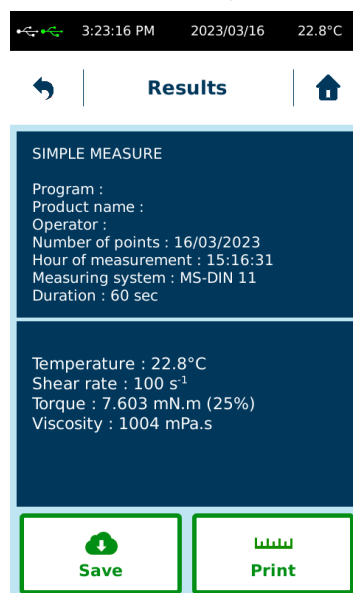


While measurement in manual mode you will see a torque gage (on the bottom side of the display). Boundaries of this gage give you minimum and maximum viscosity you can measure with your selected spindle and set speed/shear rate. You have also value in % corresponding of measured torque vs maximum torque of device. This maximum torque or viewing % can be set on device (see section 2.6.8 and 2.6.9).

You must verify that the measured torque is not too close to the upper or lower limit, because you can get message as “Lower Torque” or “Torque Overload” and measurement will stop automatically. If this is the case, increase speed/shear rate or take a larger measurement system if you are close to the lower limit. Please decrease speed/shear rate or choose a smaller measurement system if the torque reading is close to the upper limit.

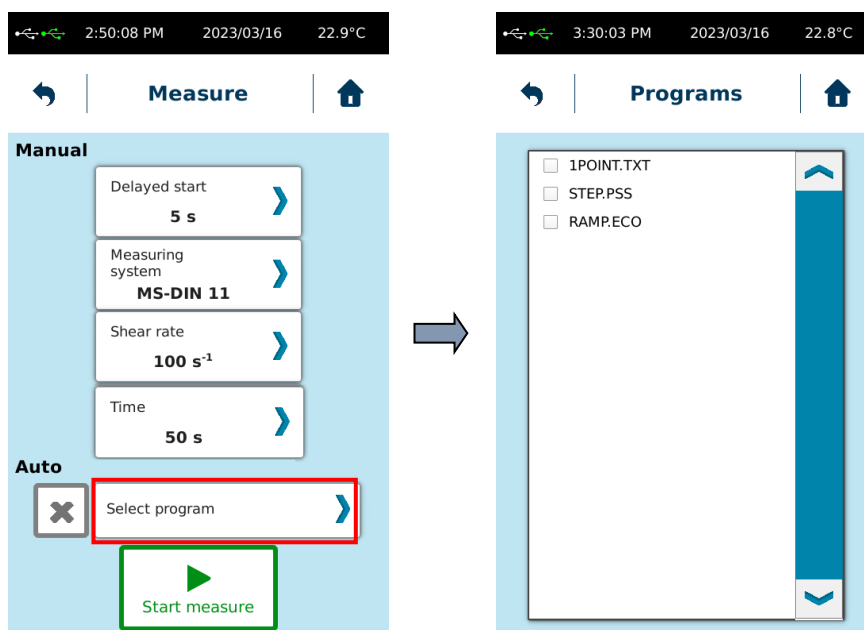
You will find several information available on the screen such as torque (mN.m), Shear stress (Pa, can be set on section 2.6.9), temperature (° C), time (s) or viscosity (mPa.s). If the units do not suit you, you can change them in parameters (see section 2.6.5).

Then your measurement is finished, you will get this window below. You will find all data you need and get possibility to save them into internal memory or print it if printer is connected. If you choose “Save”, instrument will ask you to give a name of your measurement. You will have after possibility to read it later (see section 2.4).



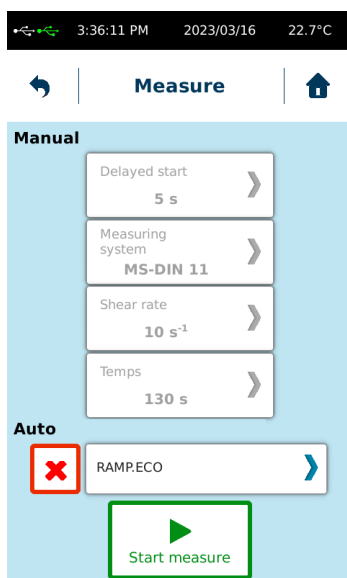
2.3.2 Automatic measure mode


Auto mode allows you to select pre-recorded programs (see section 2.8). Press "Select program" to see the list of saved method.



The extension shown next to the program name indicates the type of method according to: "*.TXT" for 1-point method, "*.PSS" for step method and "*".

Select the program to use. The instrument displays the measurement view with some information from the selected method.



If you made a mistake in choosing the method, you can use the symbol  to allow you a new selection.

When your parameters are entered, make sure that the zero adjustment of the motor has been performed before starting your measurement. Depending on the model of instrument you have, the procedure may be different (see section 2.5).

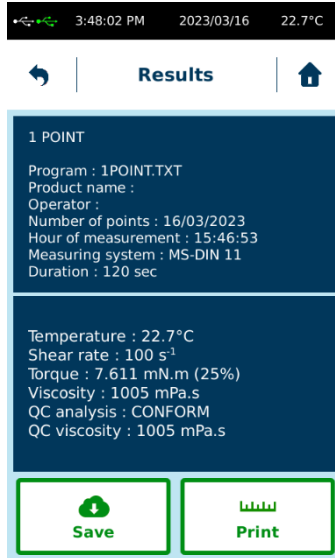
Make sure that the measuring system you are using has been correctly installed (see section 3).

When all these checks have been carried out, you can click on "Start measure" to start your measurement.

2.3.2.1 1 point method measure mode

The results displayed during the measurement is no different from the manual mode with simple measurement (see paragraph 2.3.1).

At the end of measure, instrument show you this new window with important information according to settings of your method.



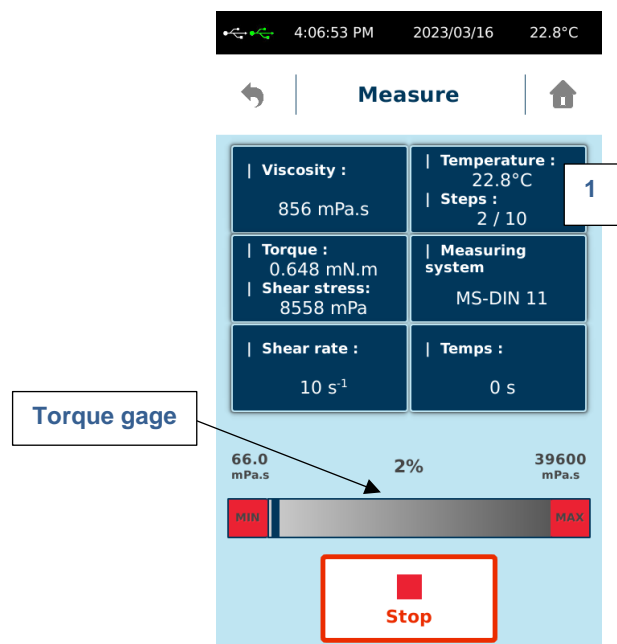
Additionally, to explication on section 2.3.1, you see type of method with name of program on first part of display. On second part of display, you show information about QC analysis if your program had it (see section 2.8.1.1). “QC viscosity” is the measured value used for “QC analysis”.

You will find all data you need and get possibility to save them into internal memory or print it if printer is connected. If you choose “Save”, instrument will ask you to give a name of your measurement. You will have after possibility to read it later (see section 2.4).

2.3.2.2 Step method measure mode

After starting the measurement using a step method, the instrument asks you for a file name to save in its memory.

If a delayed start has been requested, the instrument displays a countdown then switches to the next view.



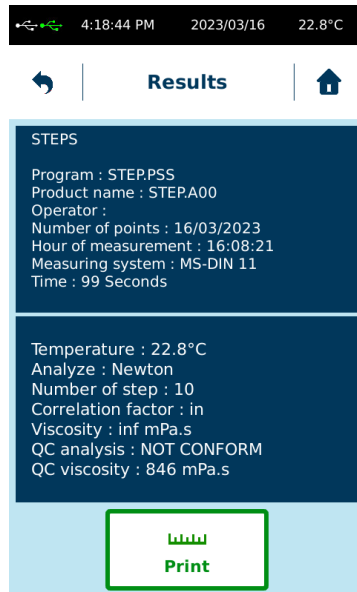
During your measurement, the instrument displays several information. The case marked "1" displays current temperature and the step in progress.

The instrument displays a torque gauge with displayed viscosity limits calculated according to measuring spindle used and the speed or shear rate of each step in progress. The percentage value indicates the ratio between the measured torque and the total torque of the instrument. This maximum torque or percentage display can be set on the device (see section 2.6.8 and 2.6.9).

You must check that the measured torque is not near the upper or lower limit, because you may get the message "Torque too low" or "Torque too high" and the measurement will stop automatically. If so, increase the speed or shear rate of your method's steps or use a larger measuring system if you are near the lower limit. Please decrease the speed or shear rate or choose a smaller measurement system if the torque reading is near the upper limit.

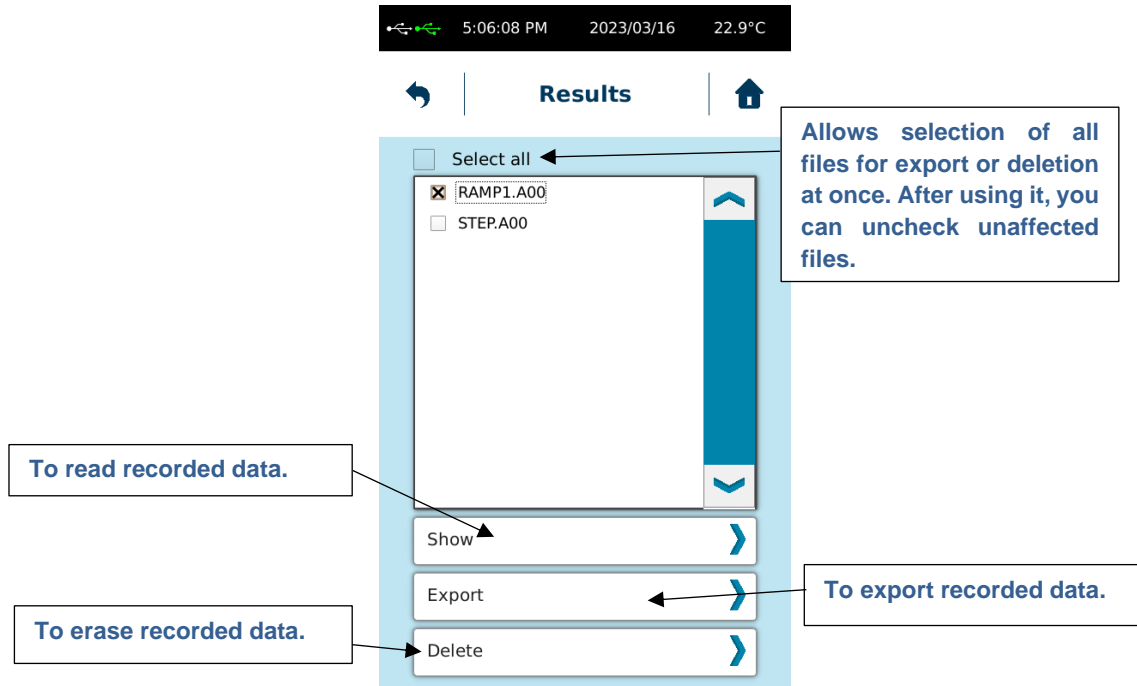
You will find several information available on the screen such as torque (mN.m), stress (Pa) (see section 2.6.9 to display this variable), temperature (°C), time (s) or viscosity (mPa.s). If the units do not suit you, you can change them in the settings (see section 2.6.5).

When your measurement is finished, you will get the window below. You will find all the data you need and will be able to print it if a printer is connected. The instrument displays the results of the rheological analysis and the "QC limits" analysis if your method includes these options (see paragraph 2.8.1.2). Note that the "QC Limits" analysis is performed on the viscosity measured during the last measured step (displayed on the screen after "QC Viscosity"). The data having been automatically saved in memory and you will then be able to read them later (see section 2.4).



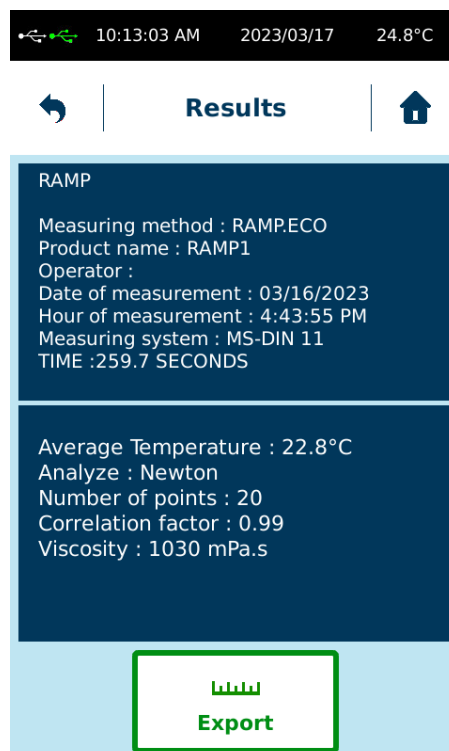
2.4 View results menu

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



2.4.1 Show results

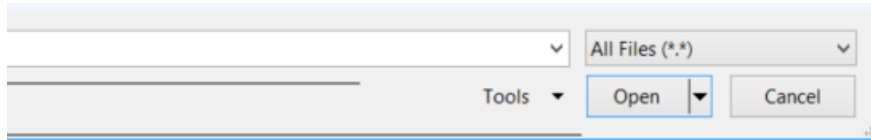
By clicking on this tab, you will be able to view the information concerning the selected measure. The data display format is the same as the one you get at the end of the measurement (see paragraph 2.3.2). You also have the possibility of printing or exporting depending on whether a printer or a USB key is connected to the instrument.



2.4.2 Export results

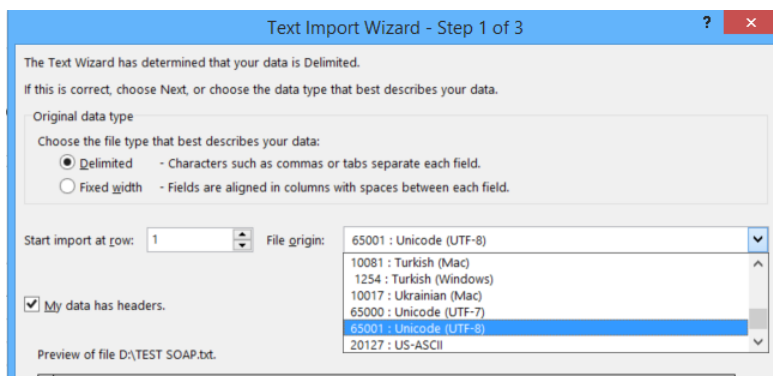
By clicking on "Export" you can transfer the measurements recorded to a USB key if it is connected to the back (see section 1.3). The "Select all" function allows you to export all the measurements at once.

The format of the data generated and saved by the instrument is ASCII (*.txt). 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 *. *".

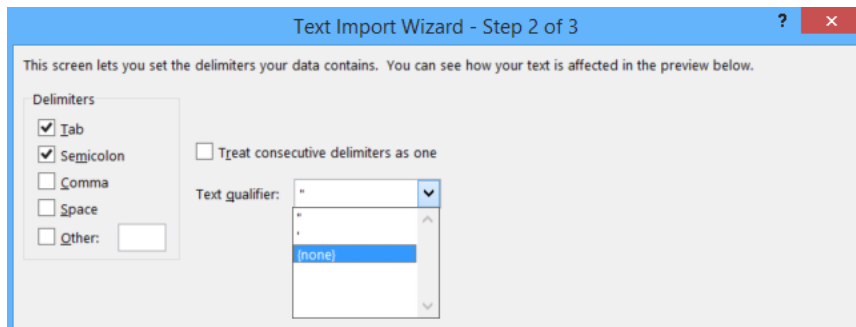


Find your file and click "Open". Excel will offer you to convert your data by displaying three successive windows.

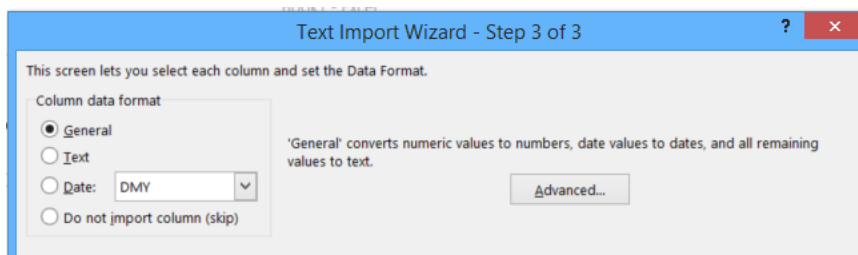
Select "Unicode UTF8" and "My data has Header" (last selection available according Office version) and click "Next".



On second step, it will be necessary to choose the option "Tab" and "Semicolon" for separation of the columns. For "Text qualifier", you should set "none".



On last step, please choose "General" and click "Finish".

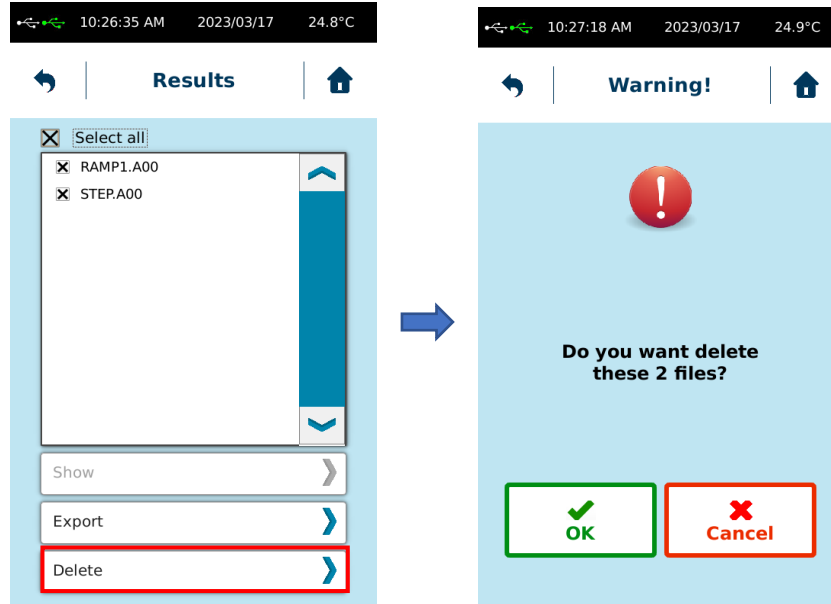


You can then see your measurement results with the possibility to save a new file in Excel format.

2.4.3 Delete results

By clicking on this tab, you can delete all the measurements recorded on your instrument. The "Select all" function allows you to delete all the measurements at once.

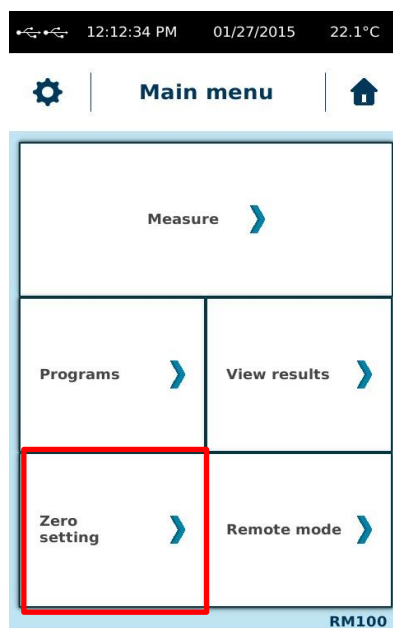
When you click "Delete", the recorded data will be completely deleted from the internal memory after further confirmation from you.



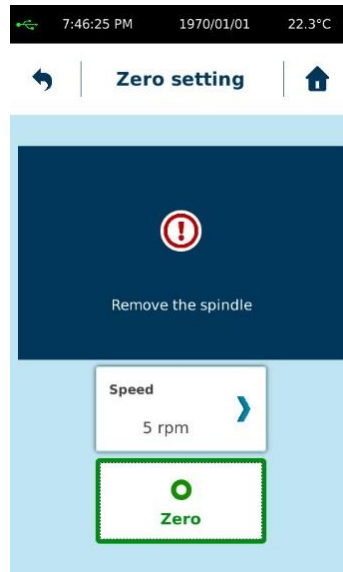
2.5 Zero setting

The zero setting allows you to calibrate your instrument to take account of the engine's empty friction.

Zero setting allows you to calibrate your instrument and take care of motor internal friction.




For standard instruments, this operation must be done without mobile. The rotational speed for zero adjustment is available on the same window. The rotation speed for zero adjustment can be changed to suit your needs, giving you much more accurate measurements at specific speeds near to your measurement parameters.

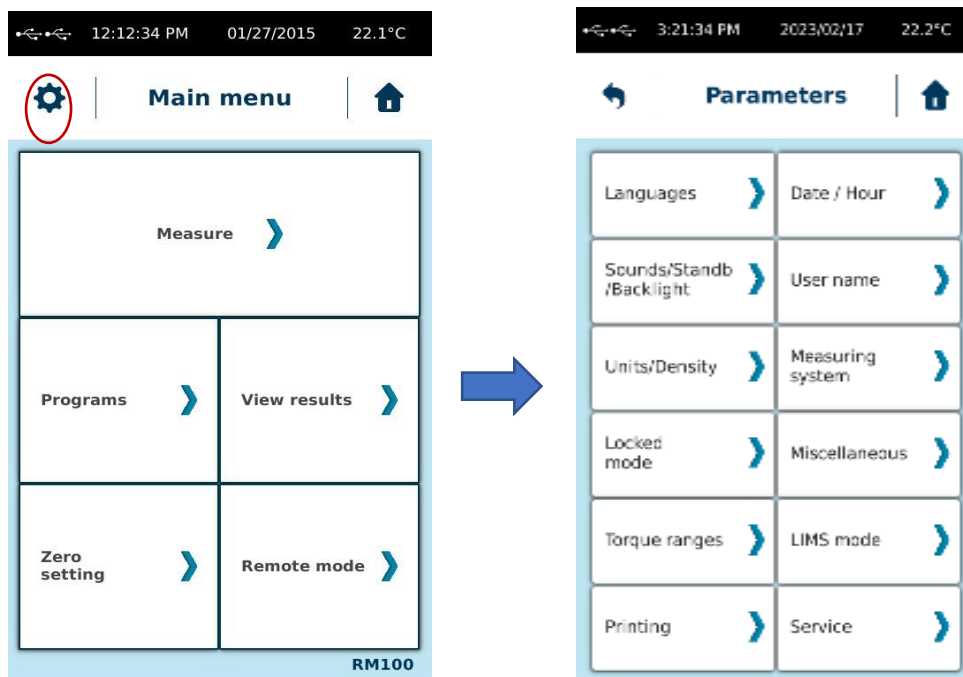


Then zero is finish you can click on OK and internal motor friction will be automatically saved inside memory of instrument. If problem occur during zero setting, please try again. If problem still present, please contact your local distributor or society LAMY RHEOLOGY.

2.6 Parameters menu

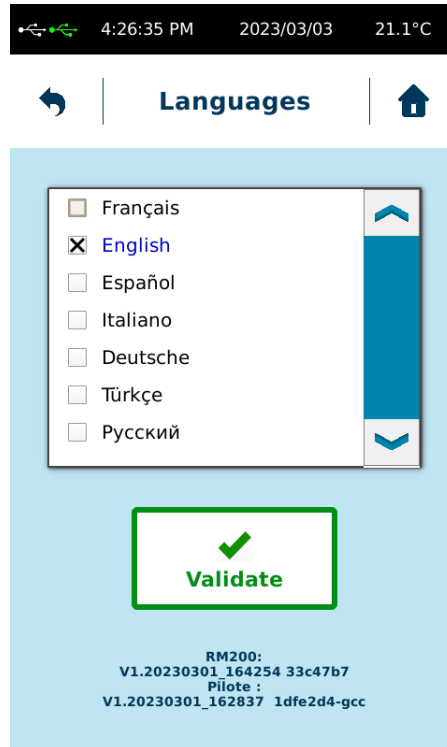
This parameters menu allows you to change settings of your device. It is reachable by clicking on icon “” in upper left corner of touch screen.

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



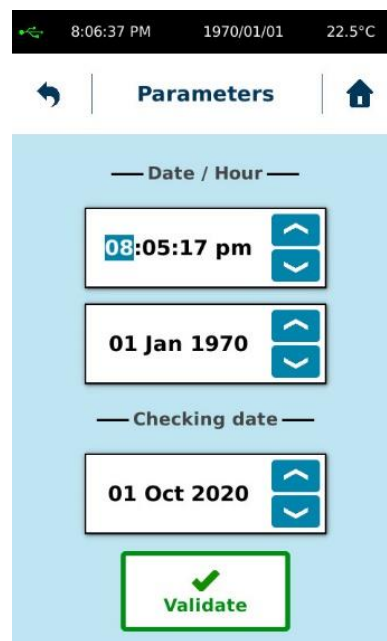
2.6.1 Languages

Enable you to select language of your instruments. You have choice between French, English, Russian, Turkish, Deutsche, Italian 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.



2.6.2 Date / Hour

Enable you to adjust hour and date of your instrument. On this location, you can also set date for next checking of device. Soon this date will be reached, device will show you message as device need to be checked.



2.6.3 Sounds/Standby/Lighting

Allow you to modify sounds, lighting and activate or not the Standby mode of your instrument.

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.

The screenshot shows the 'Parameters' menu with the following options: 'keys bip' (Yes/No), 'buzz end of measure' (Yes/No), 'brightness' (slider), 'Standby Enable' (checkbox), and 'Standby delay' (00:30:00). Arrows point from the text boxes to the corresponding UI elements.

2.6.4 User Name

Operator mode will allow you to create different operators for your instrument. The use of the operators makes it possible to identify the person making the measurement (to save name on saved file and see later who made this measurement) or lock some function on device for simple user.

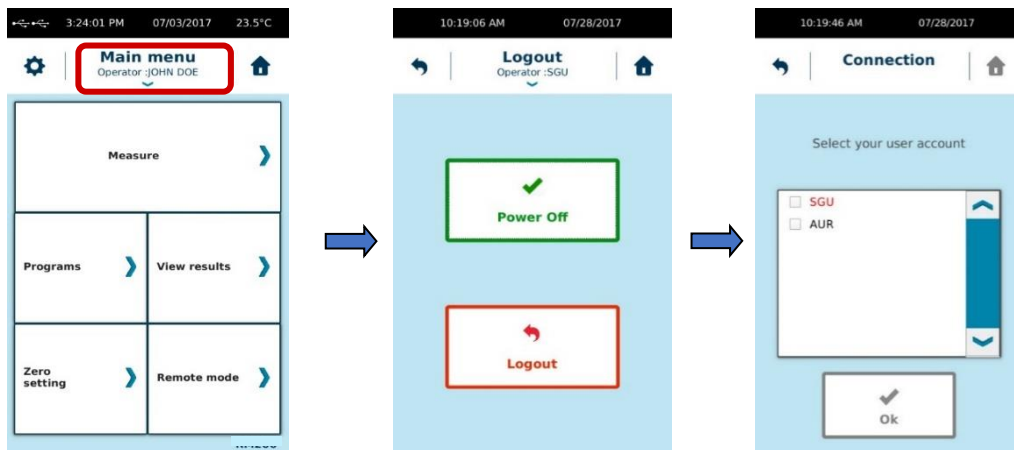
Operator management must always begin with the creation of the first account, which will become the administrator and thus create or delete another operator account. Click on "Create new user with PIN code". After specifying the name and password, the administrator will be named in red in the list.

The image shows two screenshots of the 'Parameters' menu. The first screenshot shows the 'Create new user with PIN code' option highlighted in red. The second screenshot shows the 'Create new user with PIN code' option highlighted in red, and the 'Create new user with PIN code' option highlighted in red. A blue arrow points from the first screenshot to the second.

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

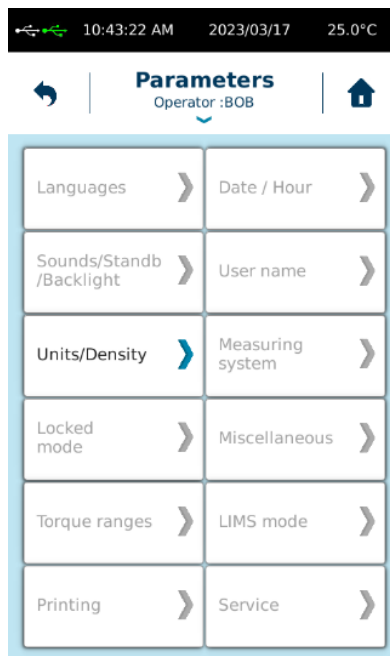
To delete an account, the administrator account must be used. Select the account you want to delete from the list and click on "Delete user name".

To use the operator accounts you must activate the mode by click "Enable User 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 instrument or change operator. Click on "Logout" and device will ask you operator account you want to use



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

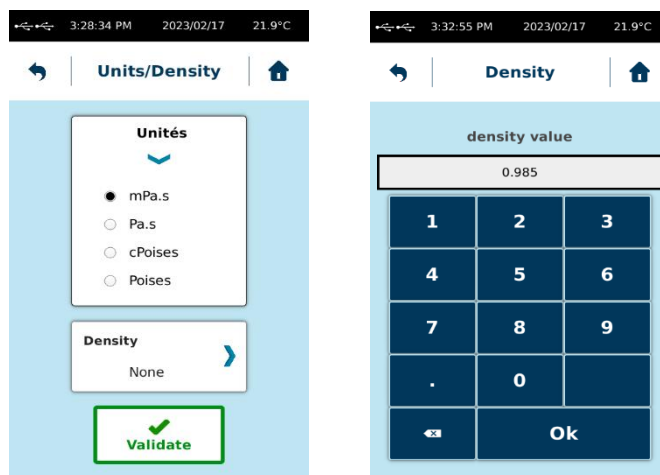
When User mode is enabled, some functions will be not editable for simple user as picture below shows it.



2.6.5 Units/Density

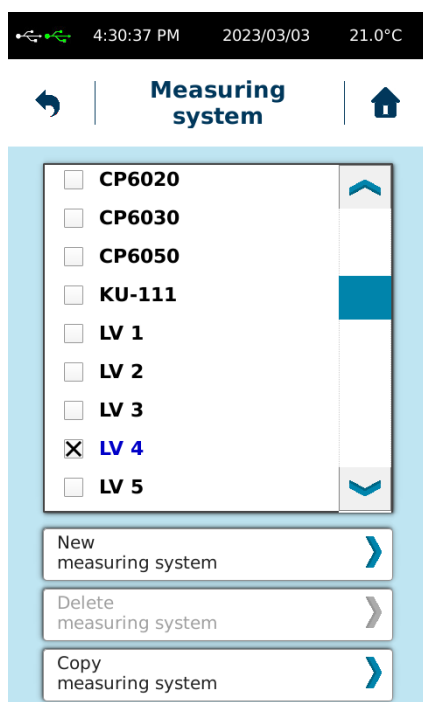
Enable you to change unit of viscosity values and to enter density value of your product to measure in order to calculate its kinematic viscosity.

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



2.6.6 Measuring System

Allows you to add, copy or delete a Measurement System.



All measurement systems stored by default in memory are not removable. Only those you have created yourself can be removed. To delete a measuring system, select it from the list and choose "Delete Measuring System". If this function remains greyed out when you have selected a system, it is part of the default mobile stored in the instrument's memory.

To add a new measuring system, you can use "New measuring system" or "Copy measuring system" functions. Device will ask you name and constants for this measuring system. In case of copy, device will propose you to keep constant from previous measuring system but you can modify them.

You are not allowed to change the constant of an existing measuring system. If you want to use a new constant for an existing measuring system, you have to copy and modify it. Note that the KD constant is used to convert rotational speed to shear rate and K τ to convert torque to shear stress. Shear rate and shear stress are used to calculate the viscosity value. If you use a different constant value, you will get a different viscosity result.

Here is the list of constants used for measuring systems compatible with the instrument.

MS BV

SYSTEM	Ktau / 1 mNm in Pa	Kd / 1 RPM in S-1	Ri / Ra
BV 1	6,1	1,001	1
BV 10	25,5	0,5	0,7
BV 100	76,5	0,15	0,5
BV 1000	510	0,1	0,5

MS RV/LV

SYSTEM	Ktau / 1 mNm in Pa	Kd / 1 RPM in S-1	Ri / Ra
RV 1	13,91	1	1
RV 2	55,65	1	1
RV 3	139,1	1	1
RV 4	278,2	1	1
RV 5	556,5	1	1
RV 6	1391	1	1
RV 7	5565	1	1
LV 1	106	1	1
LV 2	500	1	1
LV 3	1900	1	1
LV 4	8600	1	1
LV 5	17826	1	1

MS VANE

SYSTEM	Ktau / 1 mNm in Pa	Kd / 1 RPM in S-1	Ri / Ra
V71	36.5	1	0.5
V72	157	1	0.5
V72/2	270	1	0.5
V72/4	400	1	0.5
V72/6P	150	1	0.5
V-73	785	1	0.5
V-74	7850	1	0.5
V-75	2965	1	0.5
VT105	2180	1	0.5
VT2010	410	1	0.5
VT2020	59	1	0.5
VT3015	80	1	0.5
VT4020	34	1	0.5
VT4040	7.4	1	0.5
VT5025	17	1	0.5
VT6015	43	1	0.5
VT6030	10	1	0.5
VT608	150	1	0.5
VT8040	4.2	1	0.5
VT8070	1.2	1	0.5

MS CP/MS-PP

SYSTEM	Ktau / 1 mNm in Pa	Kd / 1 RPM in S-1	Ri / Ra
CP1005	3820	12	1
CP1010	3820	6	1
CP1020	3820	3	1
CP1030	3820	2	1
CP06	1380	3.3	1
CP03	552	13.3	1
CP05	552	3.3	1
CP09	552	2	1
CP2005	477.5	12	1
CP2010	477.5	6	1
CP2015	477.5	3.8	1
CP2020	477.5	3	1
CP02	276	13.3	1
CP2404	276	13.3	1
CP2405	276.3	12	1
CP51Z	276	4	1
CP04	276	3	1
CP2420	276.3	3	1
CP52Z	276	2	1
CP01	139	13.3	1
CP10	139	5	1
CP08	139	2	1
CP3510	89	6	1
CP4005	59.7	12	1
CP4010	59.7	6	1
CP4015	59.7	3.8	1
CP4020	59.7	3	1
CP4040	59.7	1.5	1
CP07	35	2	1
CP40Z	35	7.5	1
CP42Z	35	4	1
CP41Z	35	2	1
CP5005	30.6	12	1
CP5010	30.6	6	1
CP5020	30.6	3	1
CP6005	17.7	12	1
CP6010	17.7	6	1
CP6020	17.7	3	1
CP6030	18	2	1
CP6050	18	1.2	1
PP20*	636	1.04	1
PP25*	326	1.31	1
PP28*	232	1.47	1
PP35*	119	1.83	1
PP40*	79.5	2.1	1
PP50*	41	2.6	1

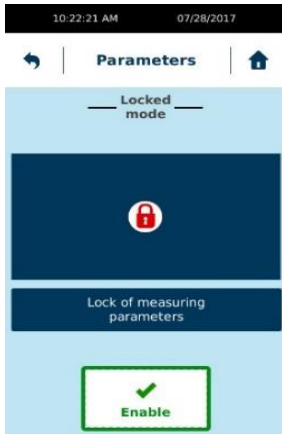
* Given values for gap 1mm.

2.6.7 Locked Mode

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

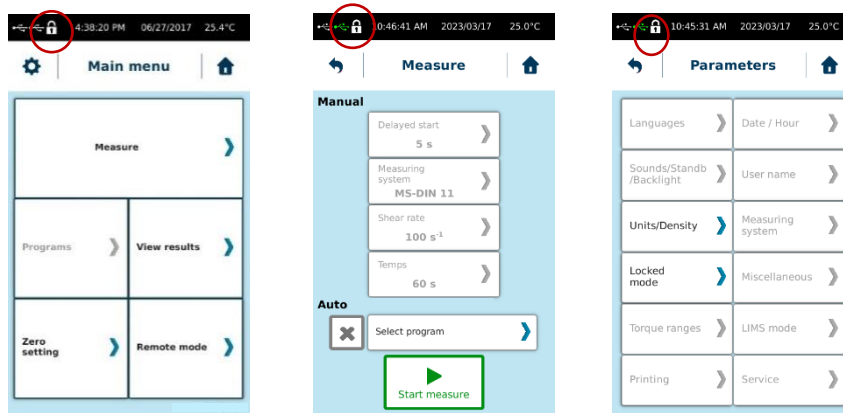
This function is not comparable to the "User name" menu (please see section 2.6.4). It should be use if you want to protect measurement settings on your device. All settings will be not lock by this function. You will see below which settings are concerned.

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 instrument 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.**

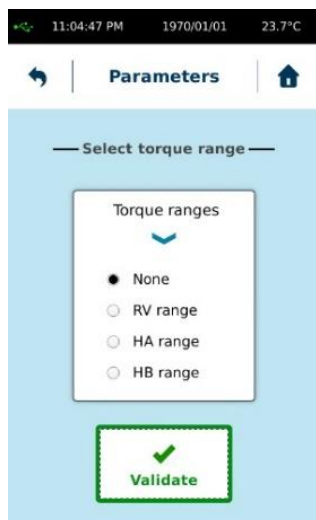
Once protected mode is activated, you will see this icone on instrument's screen (see picture below). Protected mode protect programs, measuring parameters and some menu as shown on pictures below.



To disable "Locked mode", you must return to service and "Locked mode" and click on "Disable" by entering the 4-digit code.

2.6.8 Torque range

Enable you to adjust the torque range of device according to spring instrument technology. This setting will have effect on torque in % shown while measurement and viscosity limits.

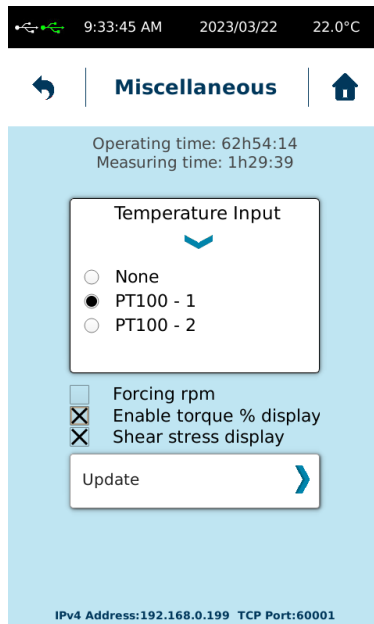


Please see below torque covered by specific range:

- RV Range : From 0.07187 to 0.7187 mNm.
- HA Range : From 0.1437 to 1.4374 mNm.
- HB Range : From 0.5749 to 5.7496 mNm;
- None means no limits. So it will be complete range (from 0.05 to 30 mNm for RM100, RM200 and DSR500 – 0.05 to 13 mNm for standard B-ONE PLUS, FIRST PLUS, FIRST PRO and FIRST PRODIG – 0.005 to 0.8 for all LR device).

2.6.9 Miscellaneous

This menu allows you to select the temperature sensor used by the instrument. The instrument allows the use of an external probe (Pt100-2) which must be connected to the back of the instrument (see section 1.3). This setting is not available by default on instrument if this device is delivered without external temperature probe. If you buy it later and want to activate this function, please contact your local agent or LAMY RHEOLOGY.



“Update” function is used when updating the machine software is necessary. Do not go in this menu without being invited by the company LAMY RHEOLOGY. The update is done via a USB key connected to the "USB" port. You can then click on "Update" to update your instrument. At the end, your device will turn off and you will have to turn it on again.

“Operating time” and “Measuring time” settings indicate time while device has been switched ON and time while it was used for measurement.

“Forcing rpm” allow you to force device setting only speed in rpm instead shear rate (s-1) when you are using measuring system compliant with DIN 53019 norm (as MS DIN, MS ULV, MS SV).

“Enable torque % display” allow device to show torque in % above torque gage while measurement.

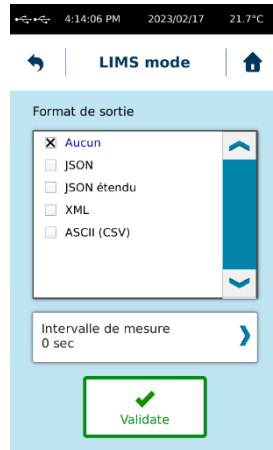
“Shear stress display” function will provide you shear stress value while measuring.

On bottom part of this view, you see information about network identification of this instrument. It helps you to identify instrument when you want to use LIMS function (see section 2.6.10). These parameters can be changed in menu Service (check with your local contact or Lamy Rheology to provide you access).

2.6.10 LIMS mode

This menu allows you to select format of data for LIMS function. Like this you will be able to collect the data stored inside memory of instrument under desired format. The connection used will be Ethernet (LAN) or USB in rear panel of instrument. IP adress of instrument for LAN connection can be changed in service menu. To do that, please contact LAMY RHEOLOGY or your local contact to provide you password for acces.

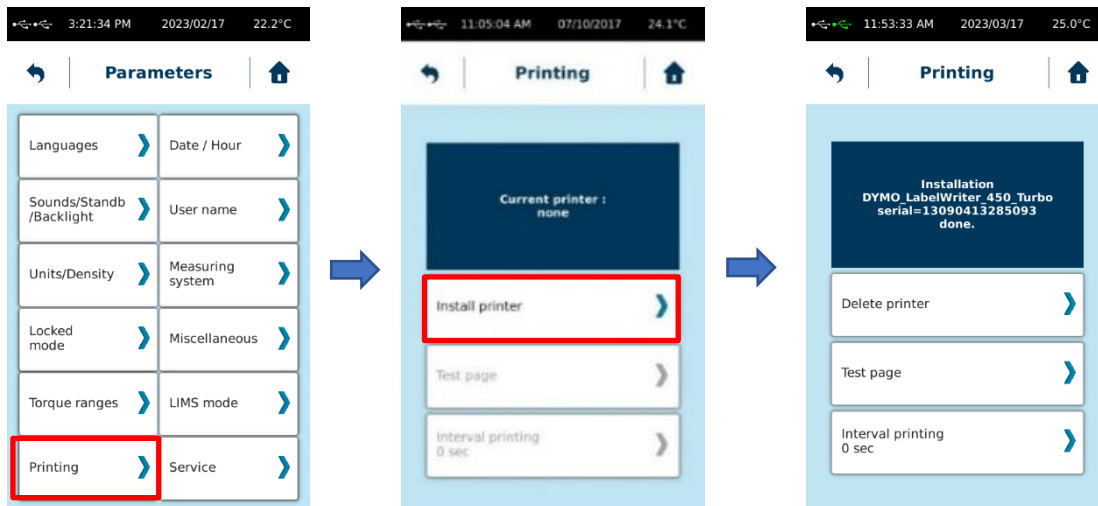
Intervall time will be used by device to store data point inside memory after defined time for LIMS function.



2.6.11 Printing

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

The instrument 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".

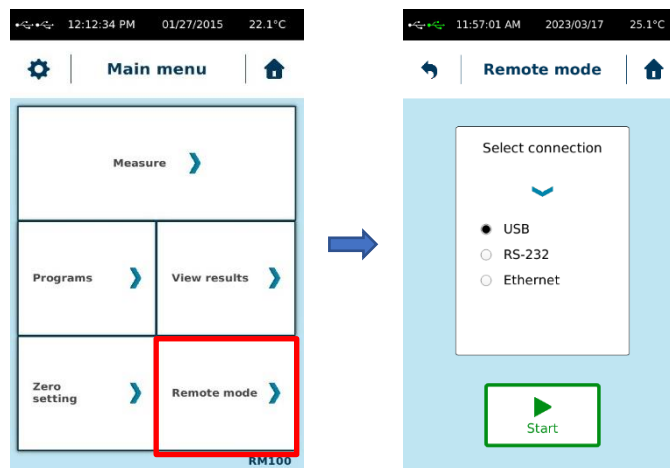
You can also print page for test or set time interval for automatic printing. Then you print data at the end of measure or a saved file, you will have only information shown on device screen as final result. If you want to have more data printed, you have to select "Interval printing" time to get data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

2.6.12 Service

Reserved to LAMY RHEOLOGY or local partner engineers.

2.7 Remote mode menu

This mode enables to drive instrument by external RheoTex software (supplied on option) or for LIMS connection (see section 2.6.10). This function is available on the main menu.



Once the device is connected to the PC, you must select the type of port (USB - RS232 for RheoTex or USB – Ethernet for LIMS) and click on "Start" to launch the communication. As long as communication is not established, a "Waiting Connection ..." message appears on the screen. Then launch the software and check that the screen switches to the display below. If this is not the case, check the connections and make sure that the COM port number set in the default settings of the RheoTex software is correct and identical to that recognized by WINDOWS in "Control Panel", then "System and "Device Management" (see the operating instructions for the RheoTex software).

2.8 Programs menu

In the programs tab you will be able to configure, modify or delete your measurement methods. The saved programs can be found in the "Auto" tab of the "Measure" menu (see section 2.3.2).

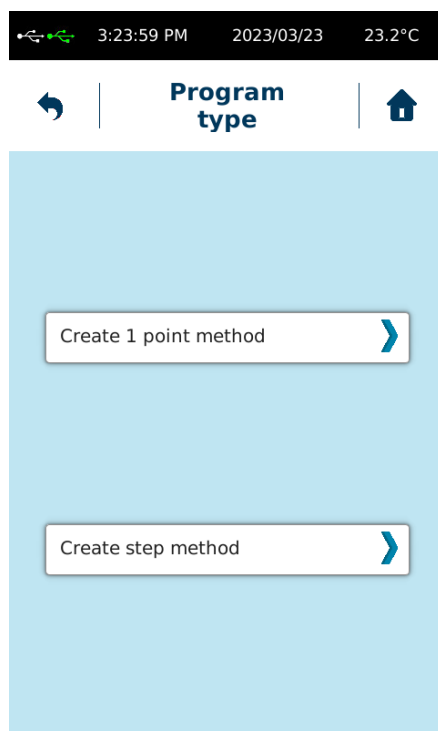
When you select the "Programs" function, you get a new window where you can see your recorded methods and functions as "Create program", "Edit Program" or "Delete a program". The "Select all" function can only be used for the deletion of methods.

The extension after the program name indicated the type of method according to: " *.TXT" for 1 point method, " *.PSS" for step method.



2.8.1 Create new program

By selecting "Create program", the instrument displays the following view.

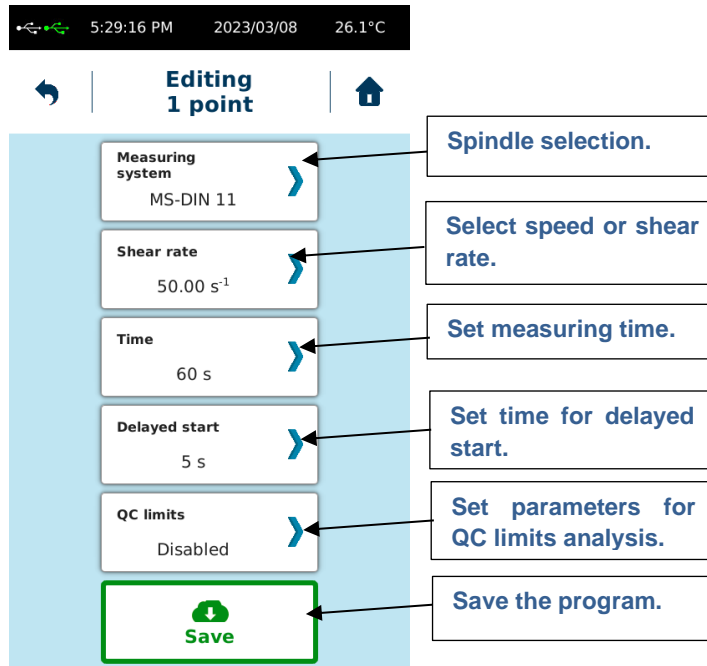


The "1 point method" makes it possible to measure your product viscosity at constant rotation speed or constant shear rate during a defined time. The instrument will display measured viscosity at the end of this measurement time.

The "Step method" allows you to fix measurement intervals at different rotation speed or shear rate in order to obtain viscosity values under different shear conditions. It also makes it possible to obtain a flow curve by fixing interval by interval the shear rate and time.

2.8.1.1 1 point method

When you choose 1 point method, the instrument displays the following view.

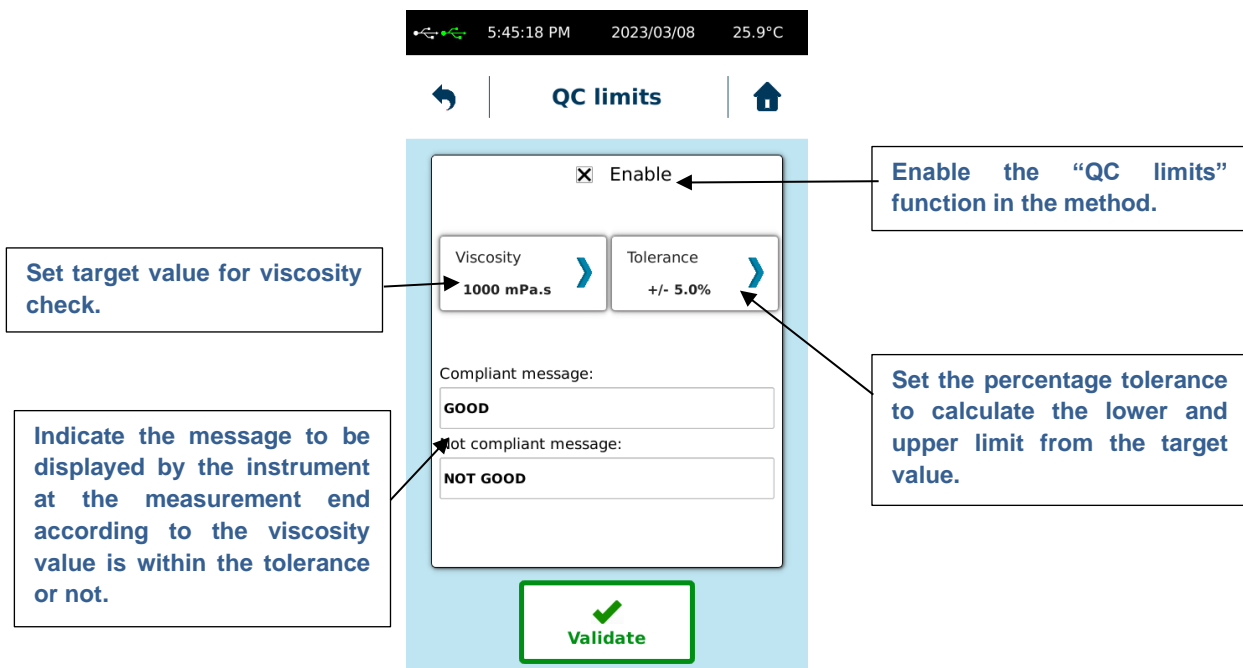


When creating a new method, the next buttons is activated after your validations progresses.

According to the selected mobile, the instrument will offer you to fix the shear rate (s^{-1}) instead speed (rpm) as that is the case for MS-CP measuring systems. To force rotation speed in rpm, please read section 2.6.9 of this user manual.

The "Delayed start" function allows you to set a waiting time before the measurement. This time will be deducted as soon as you launch the measurement (see section 2.3).

The "QC limits" function makes it possible to verify that the measured viscosity value is between two limits that you have previously set. When choosing this function, the instrument displays the following view.

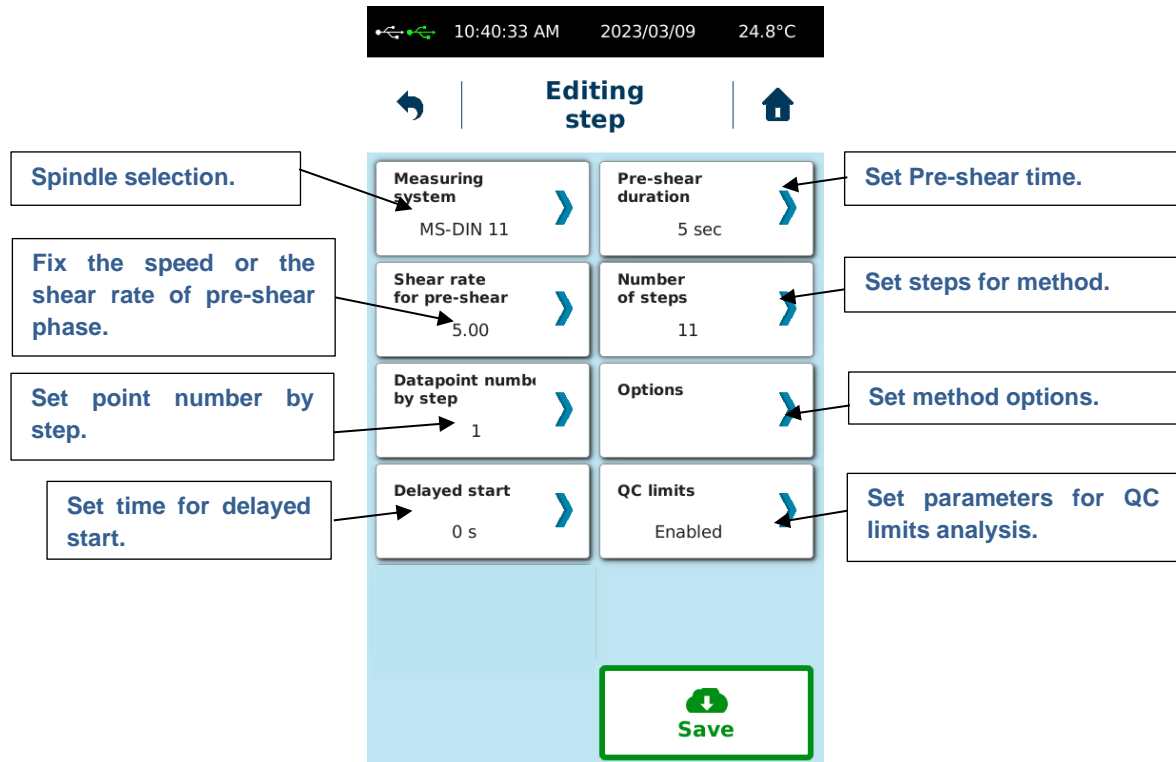


Do not forget to activate the "QC limits" function before validating to exit this window, otherwise the information will not be saved. At the measurement end according to the viscosity value is within the tolerance or not, the instrument will display the message that you have indicated in the "Compliant message" or "Not compliant message" fields.

Once you have finished setting up your method, you can save it by choosing "Save".

2.8.1.2 Step method

When you select step method, you will get the following view.



When creating a new method, the next buttons is activated after your validations progresses.

According to the selected mobile, the instrument will offer you to fix the shear rate (s^{-1}) instead speed (rpm) as that is the case for MS-CP measuring systems. To force rotation speed in rpm, please read section 2.6.9 of this user manual.

The "Delayed start" function allows you to set a waiting time before the measurement. This time will be deducted as soon as you launch the measurement (see section 2.3).

The "QC limits" function is identical as defined in paragraph 2.8.1.1.

When you select the “Number of steps” button, the instrument displays a new view.

The screenshot shows the 'Step editor' interface. At the top, there is a status bar with the time 11:11:16 AM, date 2023/03/09, and temperature 24.5°C. Below the status bar are navigation icons for back, home, and a central title 'Step editor'. The main area contains a list of steps from 1 to 10. Step 1 is selected, showing a duration of 5 s and a shear rate of 5.00 s⁻¹. Below the list are four buttons: 'Add new step', 'Delete step', 'Edit duration', and 'Edit value'. The 'Edit duration' button shows '5 s' and the 'Edit value' button shows '5.00 s⁻¹'. Callout boxes provide instructions for each element.

Allows you to select the step for copy, edit or delete.

To delete selected step.

Allows you to change the speed or shear rate of selected step.

Allows you to copy selected step and then add it after it.

Allows you to modify the selected step duration.

Once changes have been done, you can use the button to return to the previous screen. The instrument will display the new number of steps.

The “Options” function allows you to integrate a rheological analysis or a temperature setting condition as described in the following view.

The screenshot shows the 'Options' interface. At the top, there is a status bar with the time 11:22:10 AM, date 2023/03/09, and temperature 24.7°C. Below the status bar are navigation icons for back, home, and a central title 'Options'. The main area contains several options: 'Decreasing ramp' (checked), a rheological model selection (Newton selected), 'Use all points' (checked), 'Use falling curve' (checked), 'First step' (1), and 'Last step' (11). A 'Validate' button is at the bottom. Callout boxes provide instructions for each element.

Select this function if you want the instrument to chain the same succession of steps but in the opposite direction.

Allows a rheological analysis to be carried out on the measurement results.

Allows you to indicate on which step you wish to perform a rheological analysis. These buttons are disabled if "Use All Points" is selected.

Allows you to use all measuring points for your rheological analysis.

Allows you to use the points generated by the steps used in the opposite direction. This option is only available if you have checked “Decreasing ramp” down”.

The "Decreasing ramp" option is interesting if you want to use the step method to generate a flow curve. This descending part will be carried out following the first succession of steps. The term "Decreasing" means that the instrument will decrease the speed or the shear rate. It is therefore important that, during the first succession of stages, the speed or the shear rate are increasing.

2.8.2 Edit program

This function allows you to modify an existing method. Select a method by checking the corresponding box. The "Edit program" function becomes active and allows you to navigate through the parameters in the same way as described in paragraph 2.8.1. After modifying the method, you have the option of saving it under another name or overwriting the existing method name.

2.8.3 Delete program

This function allows you to delete a method from the instrument memory. Select the method concerned by checking the corresponding box. You can delete them all at the same time by selecting the "Select all" function.

3 MEASURING WITH YOUR DEVICE

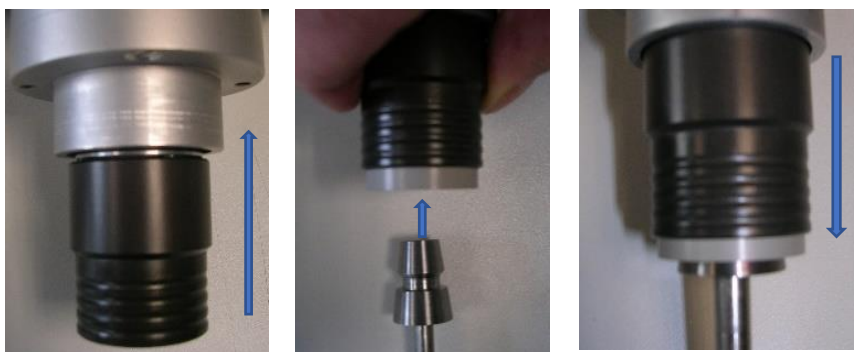
This section will show how use the different measuring system with your device.

Instrument 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).

The coupling of RM 100 CP1000 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.



And adaptor AC265-BAYONET is provided with your device. It allow using of bayonet coupling spindle as MS RV/LV, MS KREBS, MS VANE or MS BV. To use it, you have to remove a littl bit screw on this adaptor, insert bayonet side of spindle inside hole and lock it with provided tool. Please do not insert it too much and check that only conical part of bayonet spindle shaft is visible.




3.2 MS RV/LV

Measuring spindles according to ASTM / ISO 2555 (316L stainless steel).

These systems are ideally suited for simple viscosity measurement at controlled rotational speed in all areas of activity. The standard recommends use of 600ml beaker for measurement.

Here below are all available mobiles:

Name	Part number	Dim. (mm)	
LV-1 spindle	111010	Ø 18,80 - L 65,1	
LV-2 spindle	111011	Ø 18,72 - L 6,86	
LV-3 spindle	111012	Ø 12,60 - L 1,78	
LV-4 spindle	111013	Ø 3,20 - L 31	
Axis R 1-6 without disc	111000	Axe fileté	
RV-1 Disc	111001	Ø 56,26	
RV-2 Disc	111002	Ø 46,93	
RV-3 Disc	111003	Ø 34,69	
RV-4 Disc	111004	Ø 27,30	
RV-5 Disc	111005	Ø 21,14	
RV-6 Disc	111006	Ø 14,62	
RV-7 Spindle	111007	Ø 3,20	

These spindles are composed of two groups. The mobiles L are intended for low viscosity fluids and R mobiles for medium to high viscosities (see tables below with viscosity range in mPa.s):

Designation spindle	Part Number Spindle	Part Number Complete set**	RM 100 CP1000 PLUS
RV1	111001*	111947 / 111948	50 to 1.4M
RV2	111002*		100 to 5.5M
RV3	111003*		150 to 14M
RV4	111004*		200 to 28M
RV5	111005*		300 to 55M
RV6	111006*		500 to 130M
RV7	111007		2K to 550M
LV1	111010	111014	35 to 10M
LV2	111011		170 to 50M
LV3	111012		650 to 190M
LV4	111013		3K to 860M

M for millions, K for thousand

a) Need additional axis (PN111000)

b) Complete set (delivered with axis PN 111000 only for RV spindle)

The spindle L are delivered complete, while the R discs must be screwed on the R1-6 axis (Ref 111000).

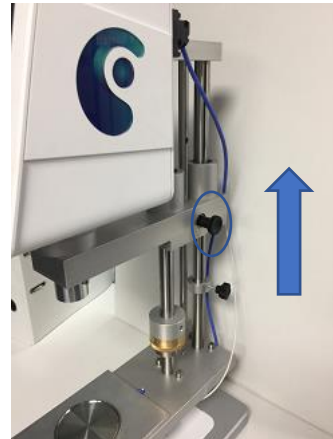
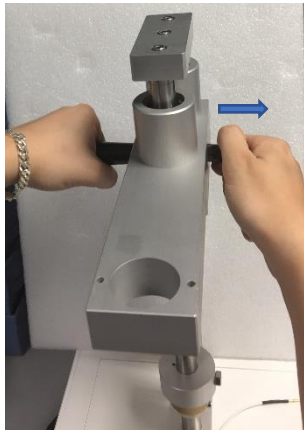
When measuring, it is strongly recommended to heat the 600ml beaker.

Fill the beaker with 500 ml of product to be tested, taking care not to introduce air bubbles.

Place it in a bath (if you have one) for a sufficient time to reach the desired temperature.

If the product contains volatile or hygroscopic material, cover the beaker for the duration of the operation.

Place the measuring head in the highest position. Hold handle, release button, rise head and find new hole where button can fit in automatically.



You must choose the measuring spindle according to the viscosity you wish to measure:

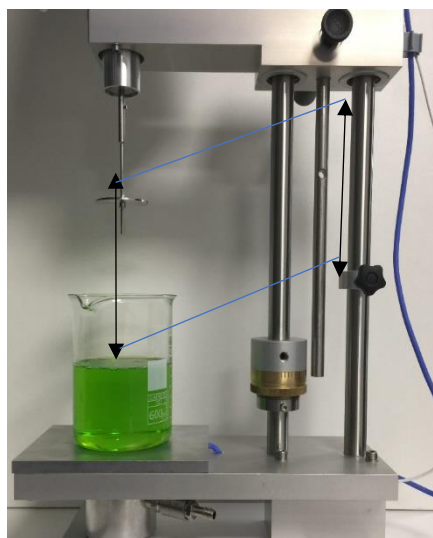
- For measurement of a low viscosity product, choose ASTM R-2 and run the unit at a high speed, such as 100 rpm.
- For the measurement of a high viscosity product, choose ASTM R7 and run the machine at low speed, for example 1 rpm.

Make a zero of your viscometer (see section 2.5).

Insert the measuring system with the bayonet coupling adaptor in the motor shaft (see section 3.1).

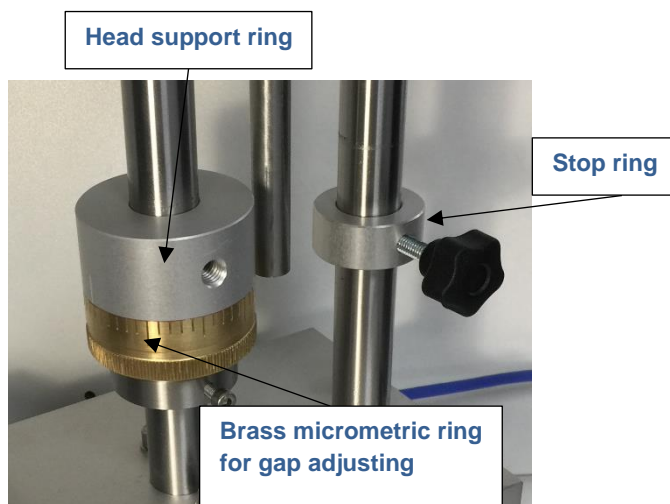
Place beaker with sample on base plate. You can remove bottom plate use for MS CP to get larger flat surface.

Check distance between mark on spindle shaft and liquid level.



Report same distance on metallic rod with stop ring and lock it with button.

Use handle to manipulate the device, release screw and move down measuring head to reach stop ring. Normally liquid level should be in same position as mark on spindle shaft.



Start the measurement at the desired speed and after choose the right measuring system (see section 2.3).

The torque measurement is indicated on the instrument screen using a gage. Ensure that the measured torque is always sufficiently far from the lower and upper limits (at least 5% above and below). If this is not the case, you can either change the measuring spindle or change the rotating speed.

Then your measurement is finished, raise the measuring head and lock it. Remove the measuring spindle to clean it.

3.3 MS BV

Measuring spindle for 150ml beaker (316L stainless steel).

These spindles are ideally suited for simple viscosity measurement at a rotating speed in control in all areas of activity. They are appreciated for their ease of use and the low volume of product needed compared to the MS RV/LV spindles.

Here below are all available spindle:

	Name	Part number	Dim. (mm)
	BV 1-100 Axis	117102	-
	BV centring device	117202	-
	BV Disc n°1	117001	Ø 45
	BV Disc n°10	117010	Ø 40
	BV Disc n°100	117100	Ø 20
	BV 1000 Axis	117101	Ø 4

These spindles allow you to make measurements on huge viscosity range as showing below.

Designation	Part Number**	Part number complete Set***	Viscosity range RM 100 CP1000 PLUS
BV1	117001*	117000	2 to 0.6M
BV10	117010*		17 to 5.1M
BV100	117100*		170 to 51M
BV1000	117101		1.7K to 510M

M for millions, K for thousand

Use specific glass Beaker (PN117150 for 10pcs) or specific plastic beaker (PN117155 for 10 pcs).

a) Need additional axis (PN 117102)

b) Need to be used with Centring piece (PN 117202)

c) Complete set delivered with axis (PN117102) and centring tool (PN 117202)

The BV 1000 Axis can be used like this. But for BV Disc 1, 10 and 100, you should screw it on BV 1-100 Axis.

When measuring, it is strongly recommended to heat the 150ml beaker.

Fill the beaker with 120 ml of product to be tested, taking care not to introduce air bubbles.

Place it in a bath (if you have one) for a sufficient time to reach the desired temperature.

If the product contains volatile or hygroscopic material, cover the beaker for the duration of the operation.

Place the measuring head in the highest position. Hold handle, release button, rise head and find new hole where button can fit in automatically (see section 3.2 for more detail).

Make a zero of your viscometer (see section 2.5).

Insert the measuring system with the bayonet coupling adaptor in the motor shaft (see section 3.1).

Place beaker with sample on base plate. You can remove bottom plate use for MS CP to get larger flat surface.

Check distance between mark on spindle shaft and liquid level (see section 3.2).



Use handle to manipulate the device, release screw and move down measuring head to reach stop ring.

When the measurement height is optimum, you can use stop ring to block height of measuring head Adjust the position of the viscometer in the sample to immerse the mobile to the predefined mark. Be careful that the tip of the mobile is 10 mm or more from the bottom of the beaker.

Start the measurement at the desired speed and after choose the right measuring system (see section 2.3).

The torque measurement is indicated on the instrument screen using a gauge. Ensure that the measured torque is always sufficiently far from the lower and upper limits (at least 5% above and below). If this is not the case, you can either change the measuring spindle or change the measuring speed.

Then your measurement is finished, raise the measuring head and lock it. Remove the measuring spindle to clean it.

3.4 MS VANE

Measuring spindles with blades (316L stainless steel).

These systems are ideal for viscosity measurement (value or curve) in control or development of all types of products even of very high viscosity with or without particles (size <5mm). They can be used for direct measurement in user's containers.



Here below are all available spindles with viscosity range:

Designation	Part Number	Diameter (mm)	Length (mm)	RM 100 CP1000 PLUS
MK-V71	111114	34.39	68.78	2,4 to 700K
MK-V72**	120017	21.67	43.38	9,4 to 2,8M
MK-V73**	111108	12.67	25.35	46 to 13M
MK-V74**	111115	5.89	11.76	463 to 139M
MK-V75**	111111	8.026	16.05	185 to 55M
MK-V72/2**	111112	21.67	20	90 to 27M
MK-V72/4**	111113	21.67	10	133 to 40M
MK-V72-6P*	111121	21.67	43	50 to 15M
MK-VT105**	440105	5	10	726 to 218M
MK-VT2010**	442010	10	20	137 to 41M
MK-VT2020**	442020	20	20	20 to 5,9M
MK-VT3015**	443015	15	30	27 to 8M
MK-VT4020**	444020	20	40	11 to 3,4M
MK-VT4040	444040	40	40	2,5 to 740K
MK-VT5025**	445025	25	50	6 to 1,7M
MK-VT6015	446015	15	60	15 to 4,3M
MK-VT6030	446030	30	60	3,5 to 1M
MK-VT608	446008	8	60	50 to 15M
MK-VT8040	448040	40	80	2 to 420K
MK-VT8070	448070	70	80	1 to 120K

M for million, K for thousand

* VANE 6 BLADES.

** These items can be used with tube MB-DIN1 (P.N.112932).

All data given in this table are given for information and can be changed according container which is used for measurement. And most of the time, you will be able to use only speed for your viscosity measurement and not the shear rate.

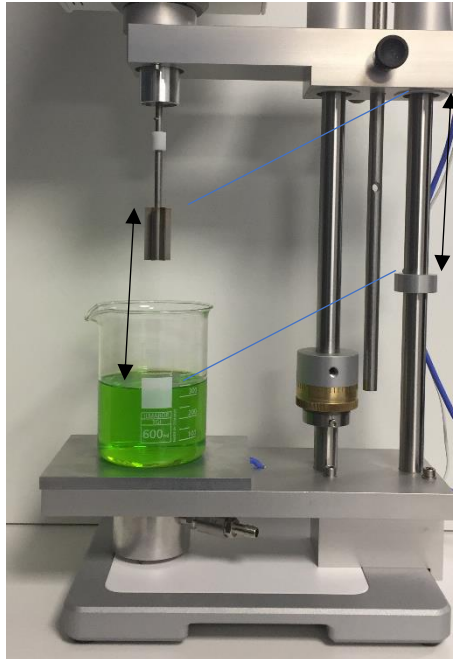
Place the measuring head in the highest position. Hold handle, release button, rise head and find new hole where button can fit in automatically (see section 3.2).

Make a zero of your viscometer (see section 2.5).

Insert the measuring system with the bayonet coupling adaptor in the motor shaft (see section 3.1).

Place beaker with sample on base plate. You can remove bottom plate use for MS CP to get larger flat surface.

Check distance between top of blades and liquid level.

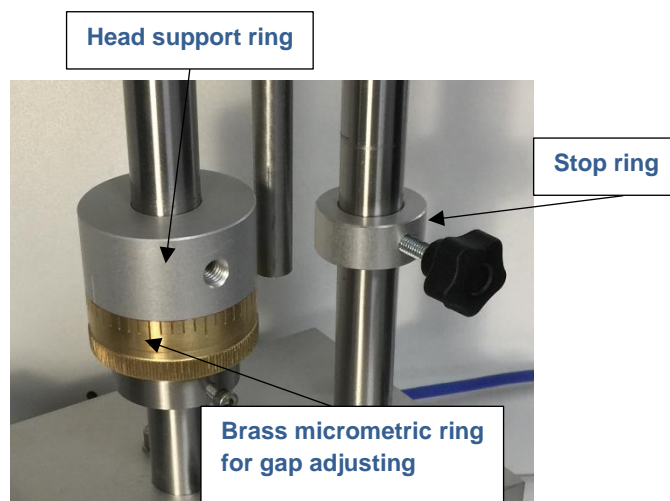


Report same distance +1cm on metallic rod with stop ring and lock it with button.

Use handle to manipulate the device, release screw and move down measuring head to reach stop ring (see section 3.2).

Adjust the position of the viscometer in the sample to immerse blade part at least 1 cm below surface. Be careful that the tip of the mobile is 10 mm or more from the bottom of the beaker.

When the measurement height is optimum, you can use stop ring to block height of measuring head.



Start the measurement at the desired speed and after choose the right measuring system (see section 2.3). If your Vane measuring system is not in the list, please refer to section 2.6.6 to create it.



The torque measurement is indicated on the instrument screen using a gage. Ensure that the measured torque is always sufficiently far from the lower and upper limits (at least 5% above and below). If this is not the case, you can either change the measuring spindle or change the rotating speed.

Then your measurement is finished, raise the measuring head and lock it. Remove the measuring spindle to clean it.

3.5 MS KREBS

Krebs type measuring spindles compatible with ASTM D562 standard (316L stainless steel). These systems are ideal for viscosity measurement in Krebs units in control of all types of products. They can be used for direct measurement in user containers or in 600 or 150ml beakers.

Here below are all available spindle:

Name	Part number	Dim. (mm)	
MK-KU 1-10	111100	L. 54,11	
MK-75Y	111103	L. 34,58	

For your information, only MK-KU1-10 is compliant to the norm ASTM D562.

To get KU unit for your viscosity measurement with your viscometer, you must choose the measuring spindle MK-KU1-10 and speed at 200 rpm. For all other speed and measuring spindle, you will get viscosity value in Pa.s.

Range for these spindles with standard model (for LR on demand):

- MK KU1-10: 20-500mPa.s and 40-140KU (at 200 rpm).
- MK-75Y: 100-50000 mPa.s.

Place the measuring head in the highest position. Hold handle, release button, rise head and find new hole where button can fit in automatically (see section 3.2).

Make a zero of your viscometer (see section 2.5).

Insert the measuring system with the bayonet coupling adaptor in the motor shaft (see section 3.1).

Place beaker with sample on base plate. You can remove bottom plate use for MS CP to get larger flat surface.

Check distance between top of blades and liquid level.

Report same distance +1cm on metallic rod with stop ring and lock it with button.

Use handle to manipulate the device, release screw and move down measuring head to reach stop ring (see section 3.2).

Adjust the position of the viscometer in the sample to immerse blade part at least 1 cm below surface. Be careful that the tip of the mobile is 10 mm or more from the bottom of the beaker.

When the measurement height is optimum, you can use stop ring to block height of measuring head.

Start the measurement at the desired speed (200 rpm to get KU unit) and choose the right measuring system (see section 2.3).

The torque measurement is indicated on the instrument screen using a gage. Ensure that the measured torque is always sufficiently far from the lower and upper limits (at least 5% above and below). If this is not the case, you can either change the measuring spindle or change the rotating speed.

Then your measurement is finished, raise the measuring head and lock it. Remove the measuring spindle to clean it.

3.6 MS CP/MS-PP

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 behaviour, 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.



You will find below list of compatible measuring system with RM 100 CP1000 PLUS.

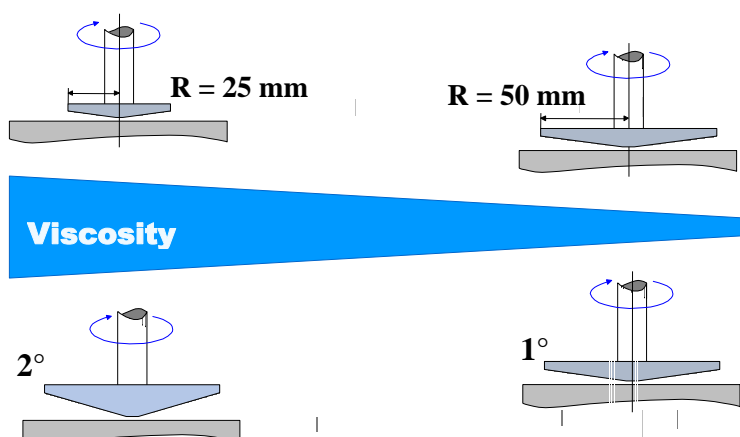
Designation	Part number	Diameter (mm)	Angle (°)	Volume (ml)	Shear rate (s ⁻¹)	RM 100 CP1000 PLUS
MK-CP1005	265115	10	0.5	0.0023	12N	106 to 318M
MK-CP1020	265120	10	2	0.01	3N	424 to 1270M
MK-CP1030	265130	10	3	0.01	2N	637 to 1910M
MK-CP06	2651418	14.04	1.8	0.02	3,3N	139 to 418M
MK-CP03	2651945	19.06	0.45	0.015	13,3N	14 to 41M
MK-CP05	2651918	19.06	1.8	0.05	3,3N	56 to 167M
MK-CP09	2651930	19.06	3	0.1	2N	92 to 273M
MK-CP2005	265205	20	0.5	0.018	12N	13 to 39M
MK-CP2015	265215	20	1.59	0.058	3,8N	42 to 125M
MK-CP2020	265202	20	2	0.073	3N	53 to 159M
MK-CP02	2652445	24	0.45	0.03	13,3N	7 to 20M
MK-CP2405	265245	24	0.5	0.031	12N	8 to 23M
MK-CP51Z	2652415	24	1.5	0.1	4N	23 to 69M
MK-CP04	2652418	24	1.8	0.12	3,3N	28 to 83M
MK-CP2420	265242	24	2	0.126	3N	31 to 92M
MK-CP52Z	265243	24	3	0.2	2N	46 to 138M
MK-CP01	265345	30.2	0.45	0.06	13,3N	3 to 10M
MK-CP10	2653012	30.2	1.2	0.15	5N	9 to 27M
MK-CP08	2653030	30.2	3	0.38	2N	23 to 69M
MK-CP4005	265405	40	0.5	0.146	12N	2 to 5M
MK-CP4010	265401	40	1	0.29	6N	3 to 10M
MK-CP4015	265515	40	1.59	0.465	3,8N	5 to 15M
MK-CP4020	265402	40	2	0.585	3N	7 to 20M
MK-CP4040	265404	40	4	1.17	1,5N	13 to 40M
MK-CP07	2654830	48	3	1.5	2N	6 to 17M

Designation	Part number	Diameter (mm)	Angle (°)	Volume (ml)	Shear rate (s ⁻¹)	RM 100 CP1000 PLUS
MK-CP40Z	265488	48	0.8	0.4	7,5N	2 to 4M
MK-CP42Z	2654815	48	1.5	0.76	4N	3 to 8M
MK-CP41Z	265483	48	3	1.5	2N	6 to 17M
MK-CP5005	265505	50	0.5	0.285	12N	1 to 2M
MK-CP5020	265502	50	2	1.142	3N	3 to 10M
MK-CP6005	265622	60	0.5	0.5	12N	1 to 1M
MK-CP6010	265610	60	1	1	6N	1 to 3M
MK-CP6020	265602	60	2	2	3N	2 to 6M
MK-CP6030	265603	60	3	3	2N	3 to 9M
MK-PP20*	265020	20		0,314	1N	200 to 61.1M
MK-PP25*	265025	25		0,491	1,3N	83 to 24.8M
MK-PP28*	265028	28		0,616	1,5N	52 to 15.7M
MK-PP35*	265035	35		0,962	1,8N	22 to 6.5M
MK-PP40*	265040	40		0,63	4,2N	6 to 1.9M
MK-PP50*	265005	50		1	5,2N	3 to 0.78M

M for million, K for thousand, N for rotational speed (rpm).

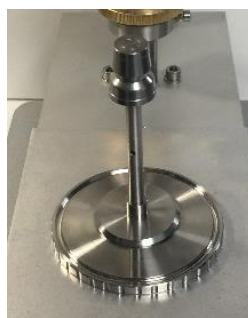
* Given values for gap 1mm

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.



Your RM 100 CP1000 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.

The first step is to heat up your measuring plate if you want to measure at temperature different to ambient. Refer to user manual of water circulating bath to set correctly the temperature (temperature should be from +5°C to 65°C). 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.



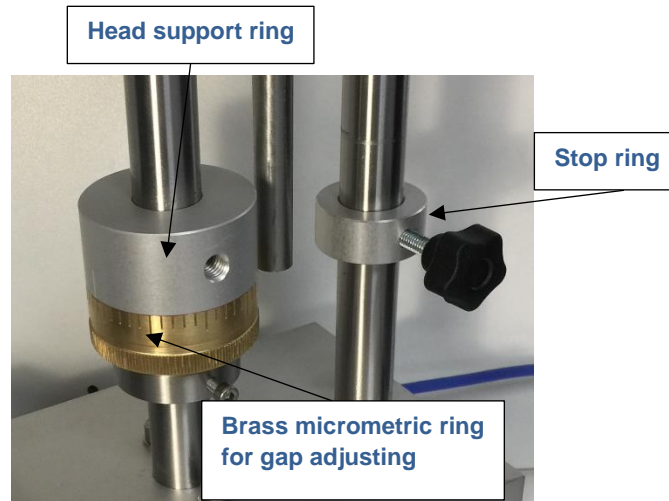
When the temperature has stabilized, you must leave your geometry in this position for a minimum of 5 minutes.

Place the measuring head in the highest position. Hold handle, release button, rise head and find new hole where button can fit in automatically (see section 3.2).

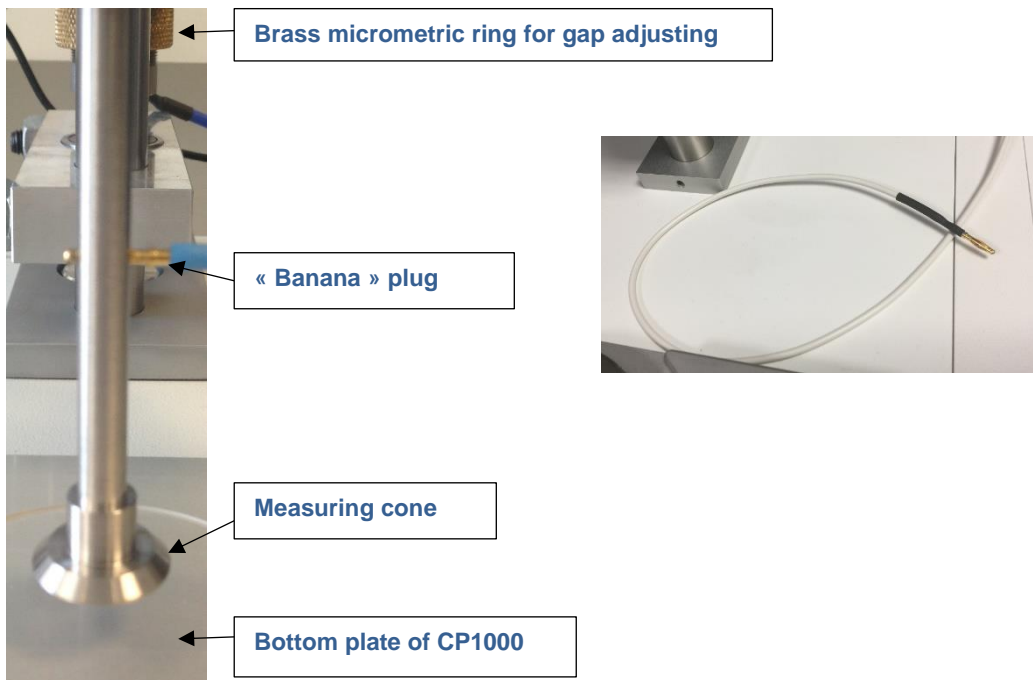
Make a zero of your viscometer (see section 2.5).

You must then attach the mobile to the viscometer without use of Bayonet-AC265 adaptor (see paragraph 3.1).

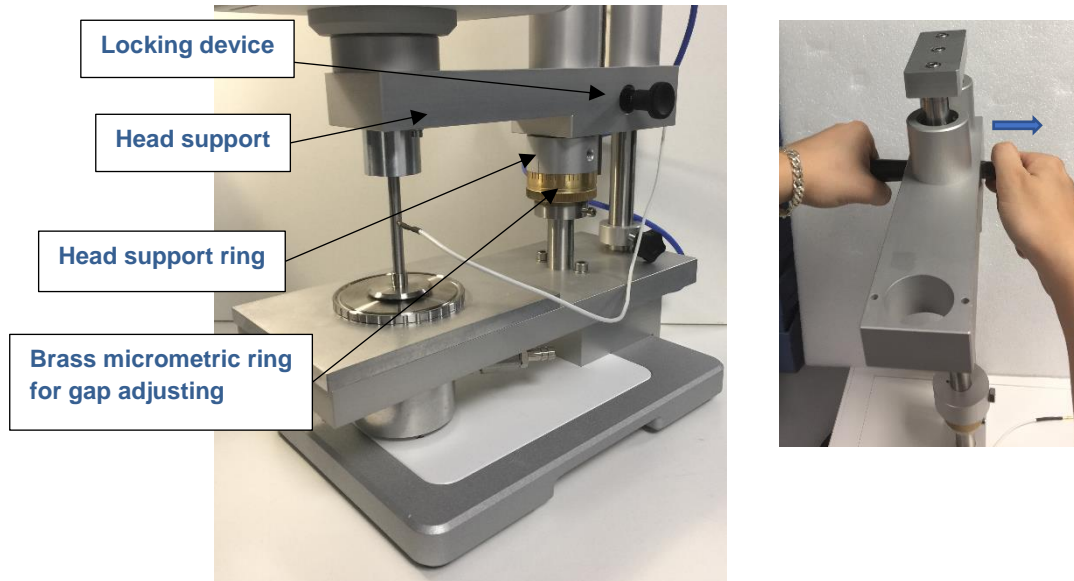
Release Stop ring and move down it at lowest position.



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 CP1000 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 CP1000 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 CP1000 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 CP1000 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⁻¹ to get continuous rotation). During rotation, touch axis with banana and hear 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.



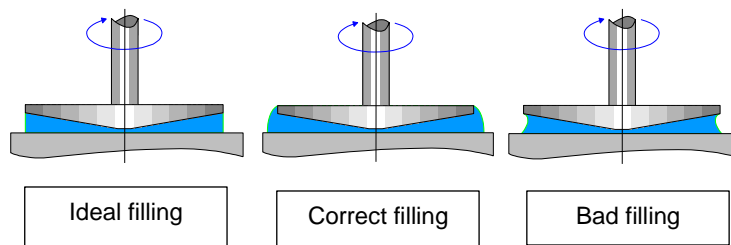
Then you are using a plate-plate measuring system, you have to set in same way the contact position as explained previously. But contact position need to be done by inserting metallic spacer (optional item 100047 as shown on picture above) between MS-PP and 70mm bottom plate. Choice of spacer need to be done according to gap you would like to use with MS-PP measuring system for measurement.

Raise your measurement head. The gap is then adjusted for the cone or plate used.

Do not touch the brass ring again and raise the RM 100 CP1000 PLUS head.

Place sample on 70 mm bottom plate. Move down measuring head to lower position in such a way that the arm will be hold by grey ring.

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



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

Start the measurement at the desired speed or shear rate and after choose the right measuring system (see section 2.3). If your measuring system is not in the list, please refer to section 2.6.6 to create it.

The torque measurement is indicated on the instrument screen using a gage. Ensure that the measured torque is always sufficiently far from the lower and upper limits (at least 5% above and below). If this is not the case, you can either change the measuring spindle or change the rotating speed.

Then your measurement is finished, raise the measuring head and lock it. Remove the measuring spindle to clean it.

4 VERIFICATION OF YOUR DEVICE

Your instrument is calibrated at the factory with an ASTM R2 mobile or MS DIN11 measuring system (see calibration certificate) and a certified oil with a viscosity close to 1000 mPa.s. The verification method differs depending on the measurement system selected. You may decide to perform the verification with your own measurement systems, but it is highly recommended to use one of the two measurement systems mentioned above. In case other systems are used, please contact LAMY RHEOLOGY for the most appropriate verification method.

Viscosity measurement on a 1000 mPa.s standard silicon oil with an ASTM 2555 R2 measuring system.

- See section 3.2 and 3.1 for detail about preparation.
- Adjust the automatic zero in the air at 50rpm, without any spindle, until it stops (see section 2.5).
- Fill the 600ml beaker with the standard oil.
- Insert the 600ml beaker in a controlled temperature unit like EVA LR system or thermostatic bath. Wait for 15 minutes until the standard oil rises to the good temperature.
- Insert the measuring system with the bayonet coupling adaptor in the motor shaft (see section 3.1).
- Immerge the spindle in the oil at the good level (see section 3.2).
- Select on the instrument the measuring system R2, select 50 rpm for the speed, select 60 seconds for the measuring time, and start the measurement (see section 2.3).

Result at the end of the measurement must be within +/-5% of the standard viscosity value. If the measure is out, your instrument might need to be recalibrated.

Check if the error does not come from a wrong filling, a wrong zero adjustment, a wrong spindle rotation, or a wrong temperature value.



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