

USING MANUAL FIRST PRO PLUS LR



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1. INTRODUCTION

The FIRST PRO 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 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:

$\tau = M \times K_{\text{Tau}}$ 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⁻¹/ 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 of bob, 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 FIRST PRO PLUS can be used with different measuring system. You will find below a list of compatible measuring system with this viscometer.

- **MS ASTM:** 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.

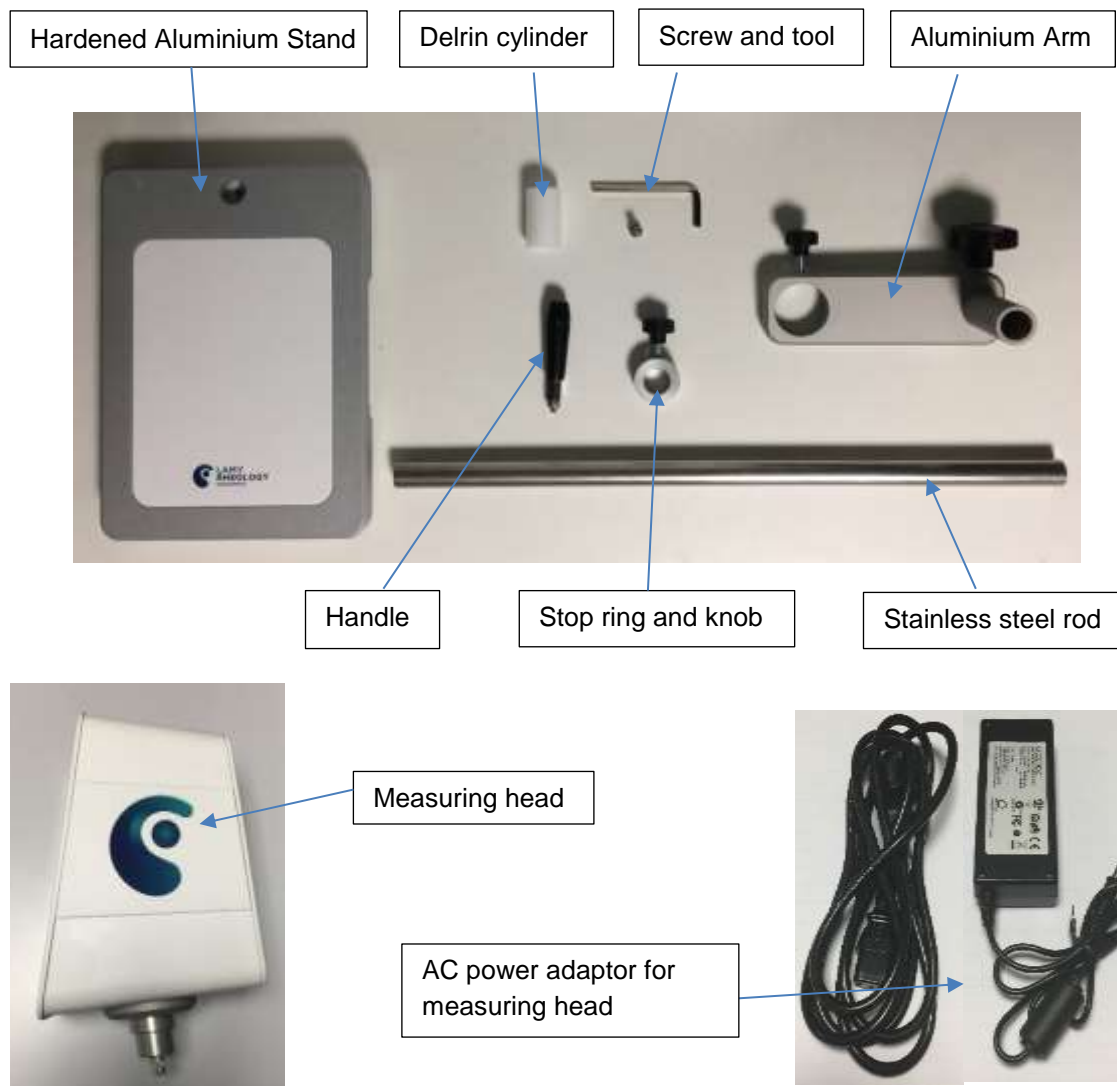
- **MS ULV:** Measuring system (Aluminium) for low viscosities usable with instruments LR version. This system, unlike the MS-ASTM or MS-DIN systems, makes it possible to measure low viscosity products in control by applying a shear rate. Its advantage is to be compatible with instruments in LR version unlike all other measuring systems.

1.1. COMPONENTS

Viscometer is delivered inside a foam protection to avoid any problem during transport. According to your order this foam can be inside a box or a carrying case and can contain measuring system.

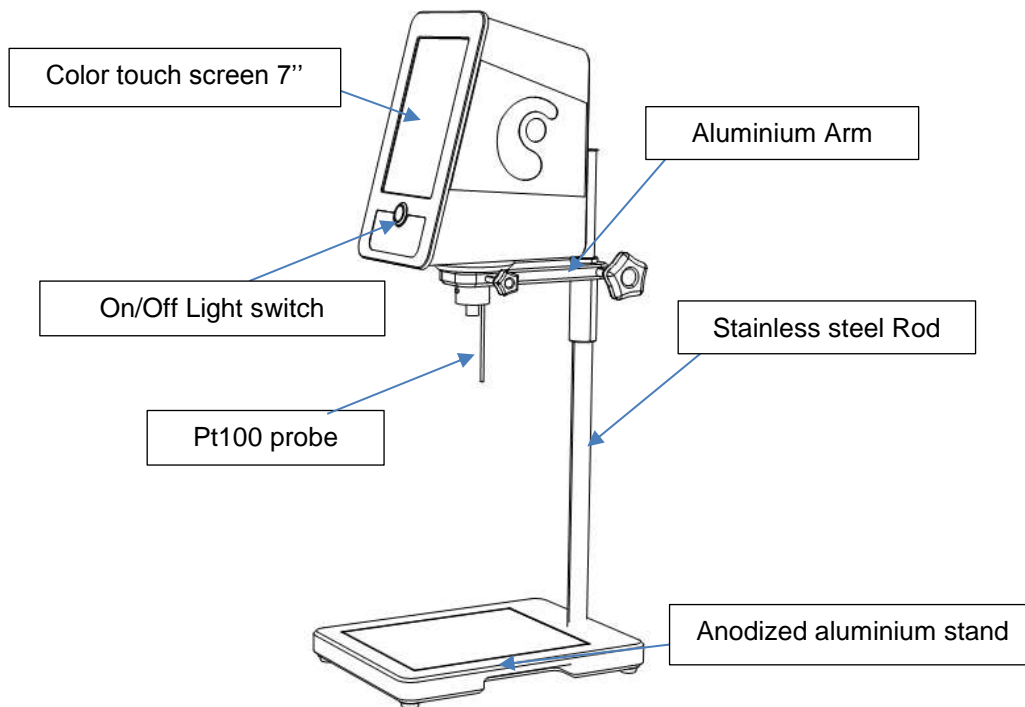


In detail, you will find different part in your box as shown below.



1.2. GENERAL VIEW OF YOUR DEVICE

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

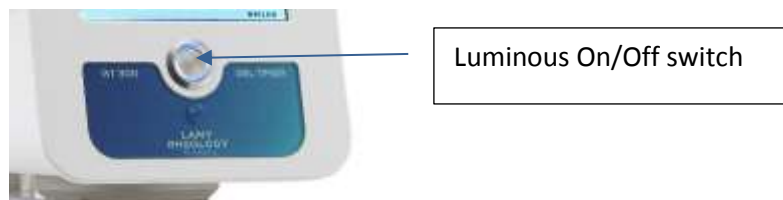


- TOUCH Screen

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.



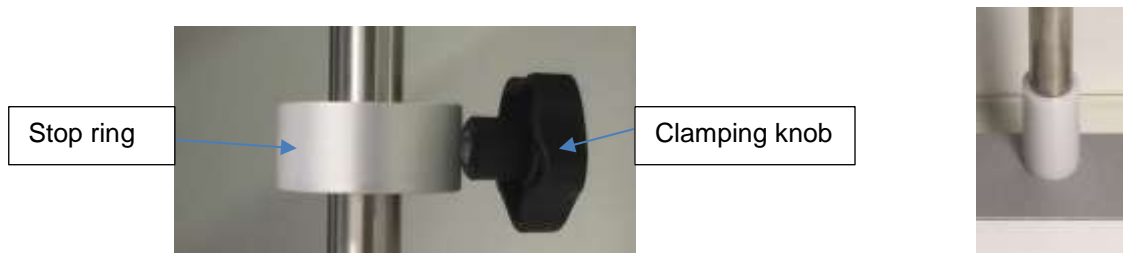
- Aluminium arm

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. It is equipped with a ring with a clamping button that is used as a stop for a repeatable positioning during the measurement.



The rod is equipped with a white Delrin ring acting as a stop, thus avoiding the arm being in a position that is too low.

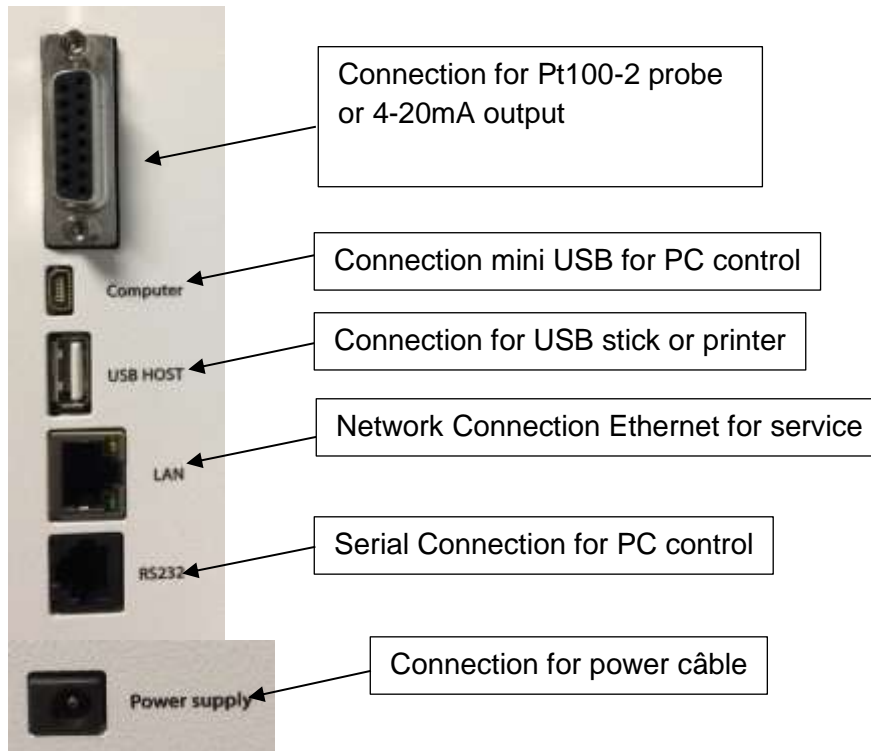
- Anodized aluminium support

The stand is entirely made of anodized aluminum. It gives our instruments a very good stability (the maximum permissible temperature on the white part is 50 ° C).



1.3. CONNEXIONS

According to your order, rear panel of device get this 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 250 rpm

Torque range: LR Version: 0.005 to 0.8 mNm.

Temperature: The FIRST PRO 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 ASTM, MS ULV,

Compatible temperature control: EVA DIN, EVA LR, RT1

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: Carry case (PN 100500), Rack stand (PN P008000), Software (PN 311003)

Dimensions and weight: **Head:** L180 x W135 x H250 mm, Hardened steel stand: L280 x W200 x H30 mm, Stainless steel rod: Length 500 mm, Weight: 6.7 kg

1.5. INSTALLATION

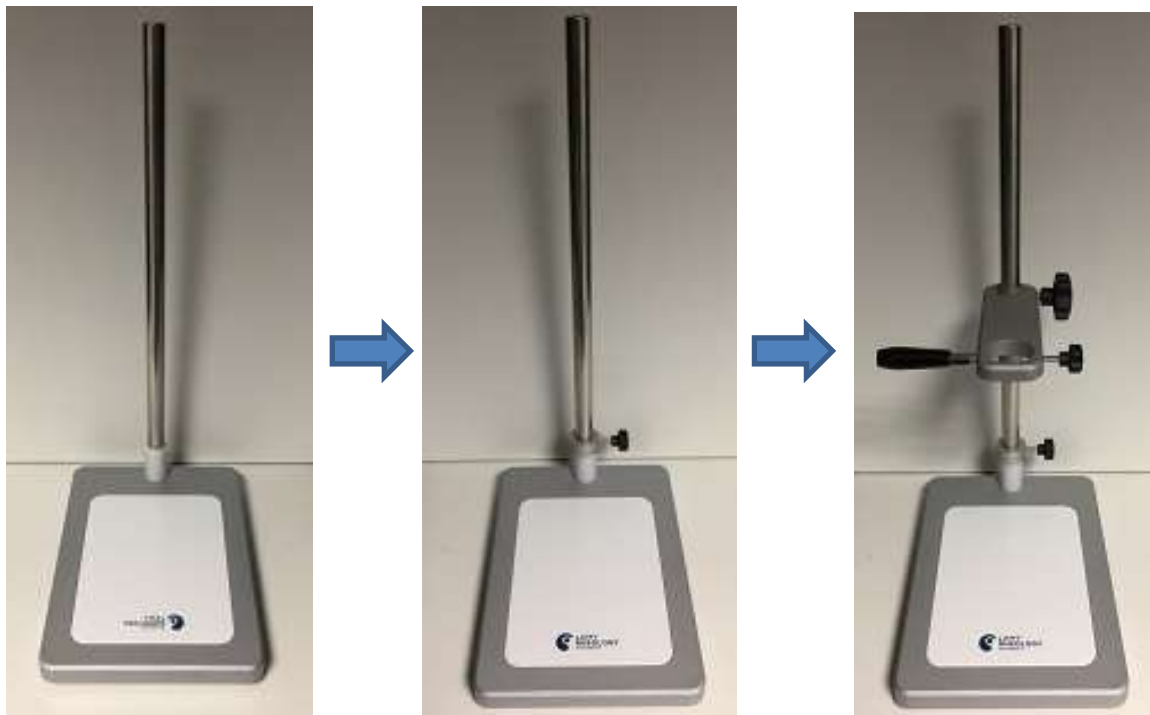
Your viscometer should be installed in a clean, vibration-free environment. Even if no level is necessary, choose a stable and flat table.

This installation notice concern only viscometer without any temperature device. If you have it, please refer to specific notice of temperature unit for installation.

After unpacking all accessories from the box (or case if it is supplied), you must first screw the rod to the base with screw and key provided.



Then make sure to insert the white Delrin cylinder and set it to the lowest position. Then place the stop ring on the stainless steel rod. Then place arm on rod, respecting the direction as described below. The arm is equipped with two buttons and a handle. You can change them for your convenience if you are left-handed.



You can then put the viscometer on the arm, taking care not to touch the motor shaft or temperature sensor (if your device has one). Align the measuring head correctly and secure it with the screw 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 1.2).

2.1. STATE ICONS

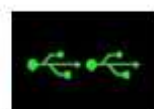
Once your device is switched on, you will see some icons on Touch Screen.



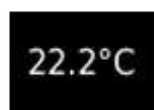
No Device is connected to the instrument.



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.

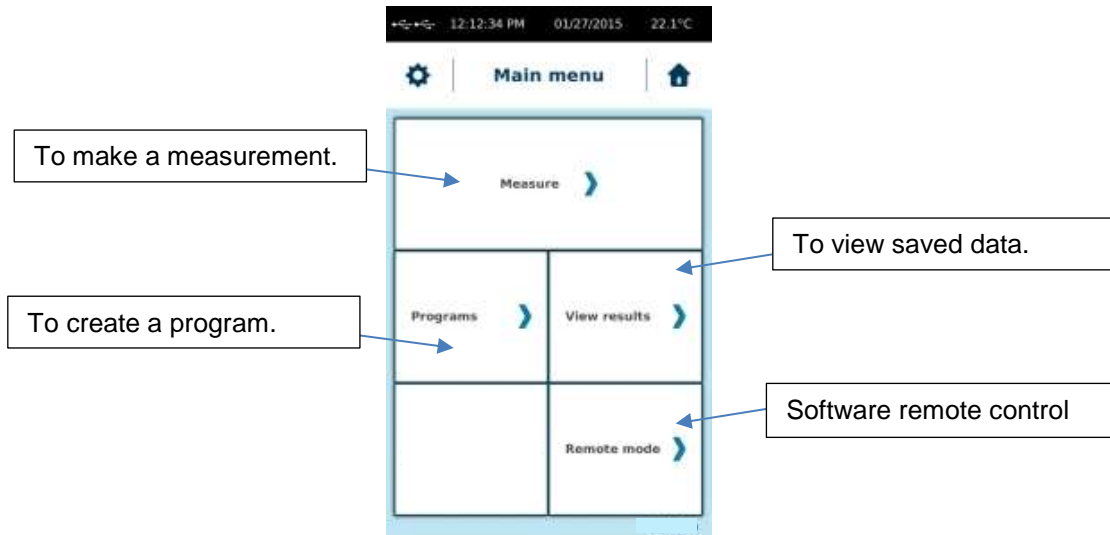


Enable to come back to previous menu.

2.2. PRIMARY CONCEPTS

2.2.1. Main Menu

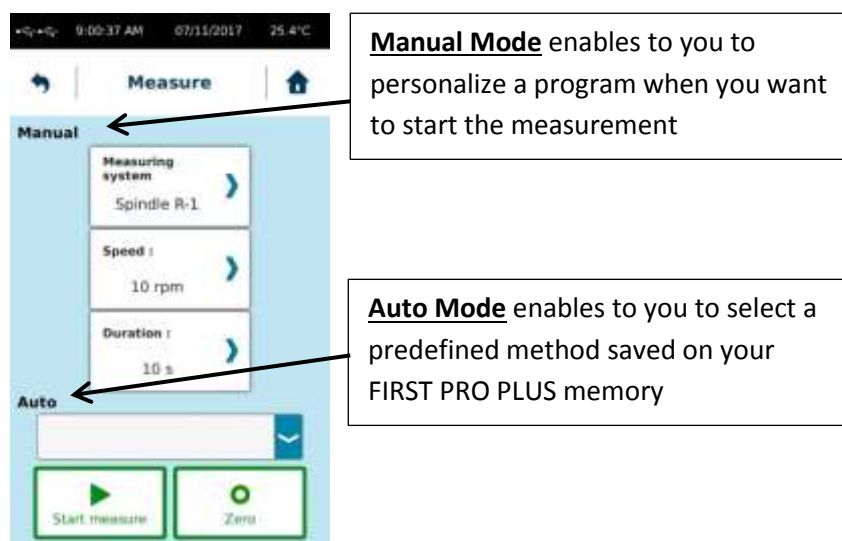
Main menu enable you to browse between different tabs of your FIRST PRO PLUS LR. Acces is always available by clicking 



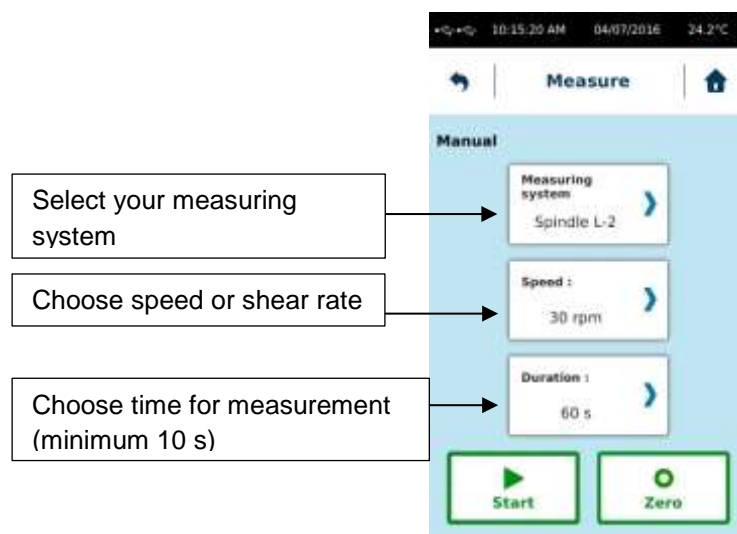
2.2.2. Measure

Measure tab is central part of your FIRST PRO PLUS LR. 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 ».



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 2.2.6.6.

Choice between “Speed” or “Shear rate” is according to your measuring system. For MS ASTM, MS BV, MS KREBS and MS VANE, you should have only possibility to set the speed. For all other measuring system, you have to use 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 2.2.6.6).

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

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

Then your settings are ok, you must do a zero. All LR models require zeroing before measurement. The zero is done with the mobile and same speed as for measure. Once the zero has been completed, the instrument will prompt you to place the mobile in the product for measurement (see section 3).



Then 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. If you change speed or spindle, you will need to make a new zero adjustment.

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 printer is connected, see section 2.2.6.10). 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.).



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 saved settings.



In the same way as for the "Manual" mode, a zero must be made before the measurement. By default, the zero will be at the speed displayed (here 10tr / min). In the case of selecting a single-point method, the parameters displayed will be those of the method. The zero will therefore be carried out at the speed of the measurement.

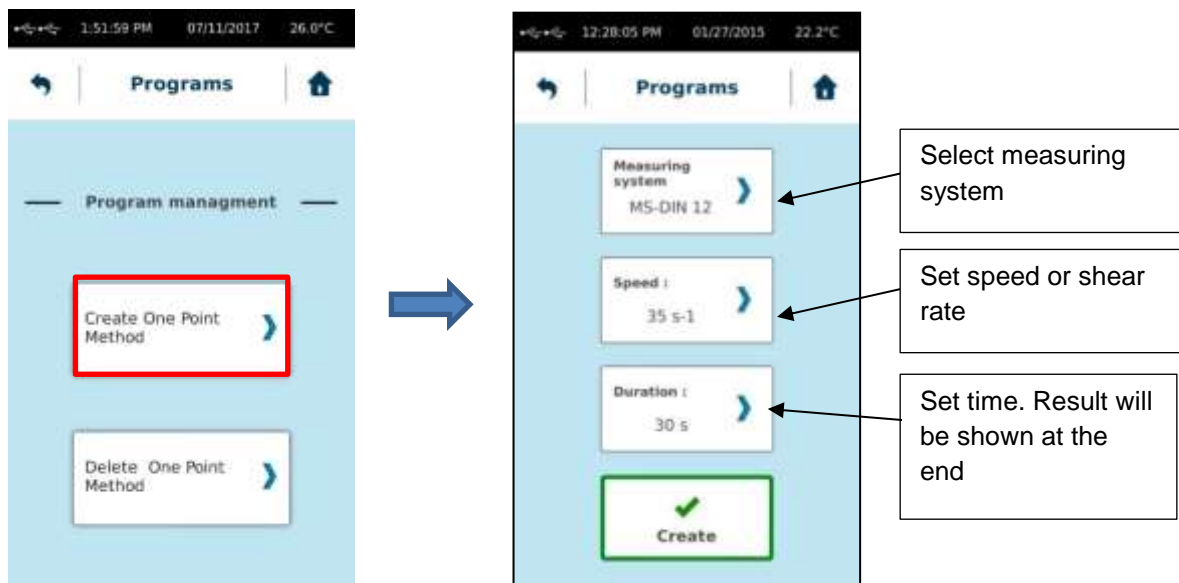
2.2.3. Programs

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".



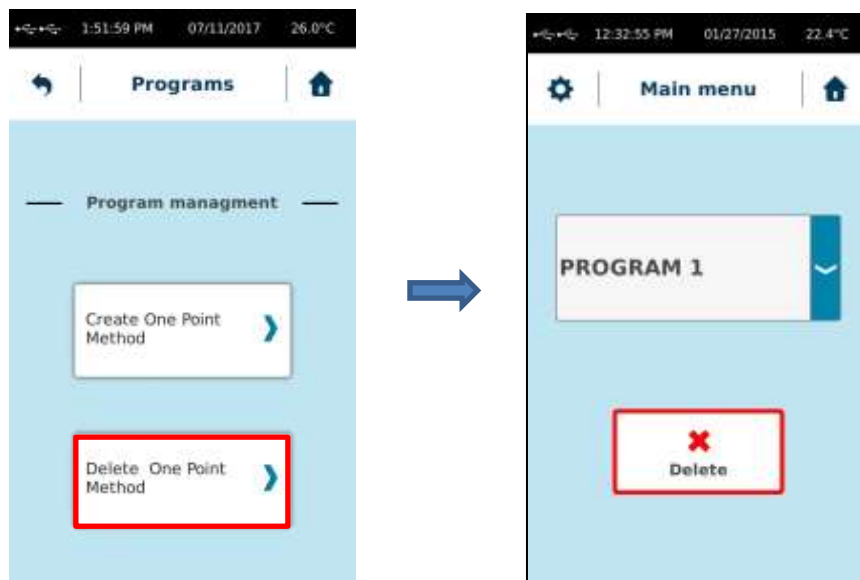
In One point method, you will have one viscosity value at one speed. When your Program is created, you will find it in **AUTO** list of **Measure** tab.

Click on “Create One Point Method” to start programming



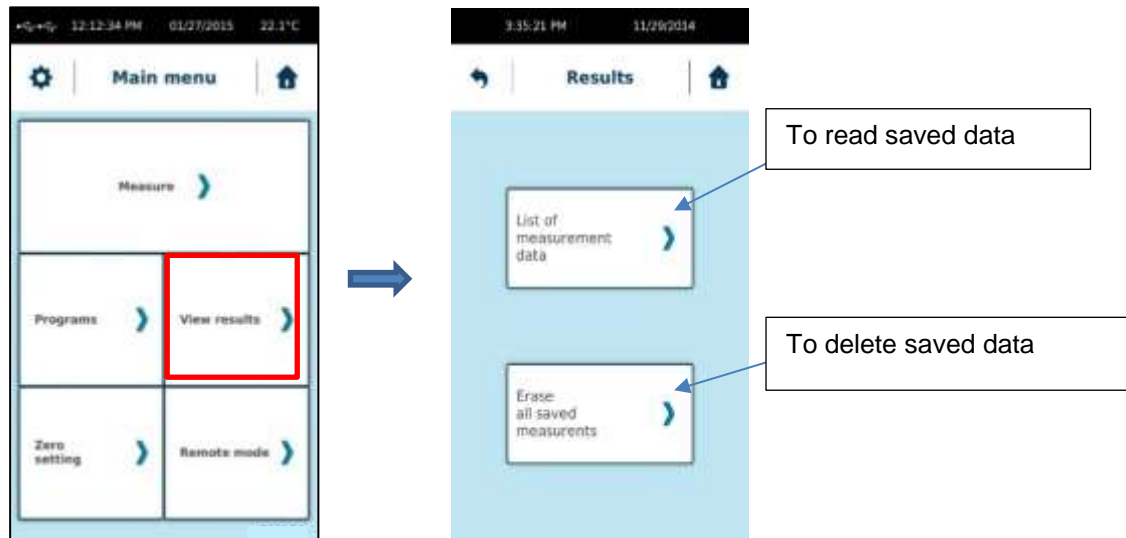
Then you click on create, you will get this screen where name of program need to be enter

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.



You will have two choice: See list of data to read them or delete data.

2.2.4.1. Read saved data

By click on tab “List of measurement data” you could see all saved measurement made with your FIRST PRO PLUS LR. 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 FIRST PRO PLUS LR memory.

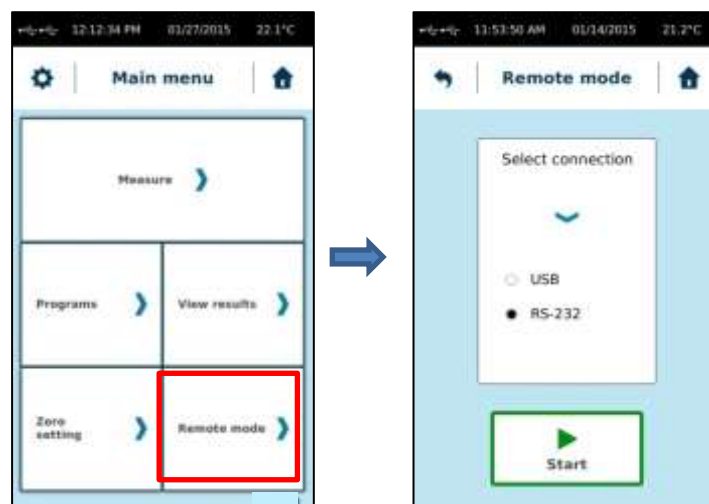


Then you click on "Delete", saved data will be completely deleted from internal memory without any new confirmation.

2.2.5. Remote mode

This mode enables to drive FIRST PRO 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.

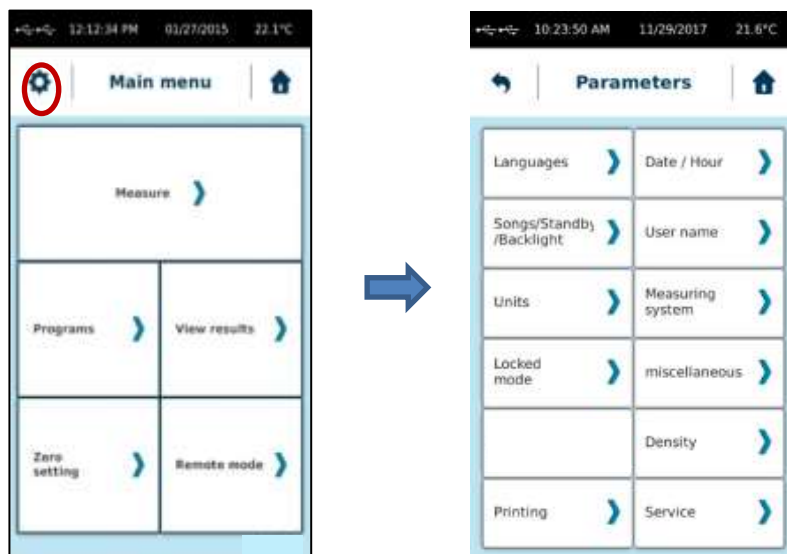


Rq : With mini USB connection, respect strictly the order to start, and if any communication is possible re-connect the USB cable on computer and wait it is recognized before start the communication.

2.2.6. Parameters

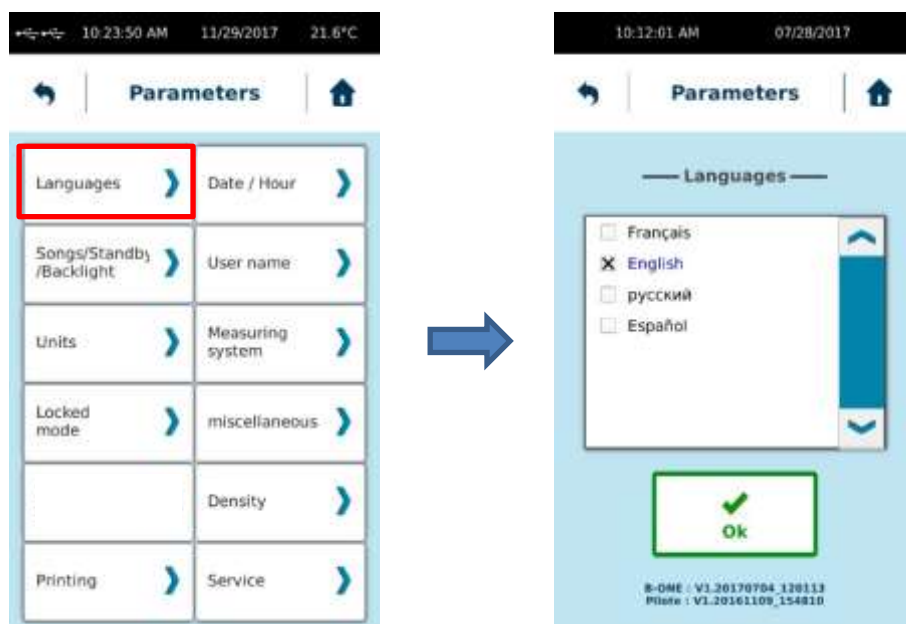
This parameters menu allow you to change settings of your device. It is reachable by clicking on icon “wheel” in upper left corner of touch screen.

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



2.2.6.1. Languages

Enable you to select language of your FIRST PRO PLUS LR. 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.



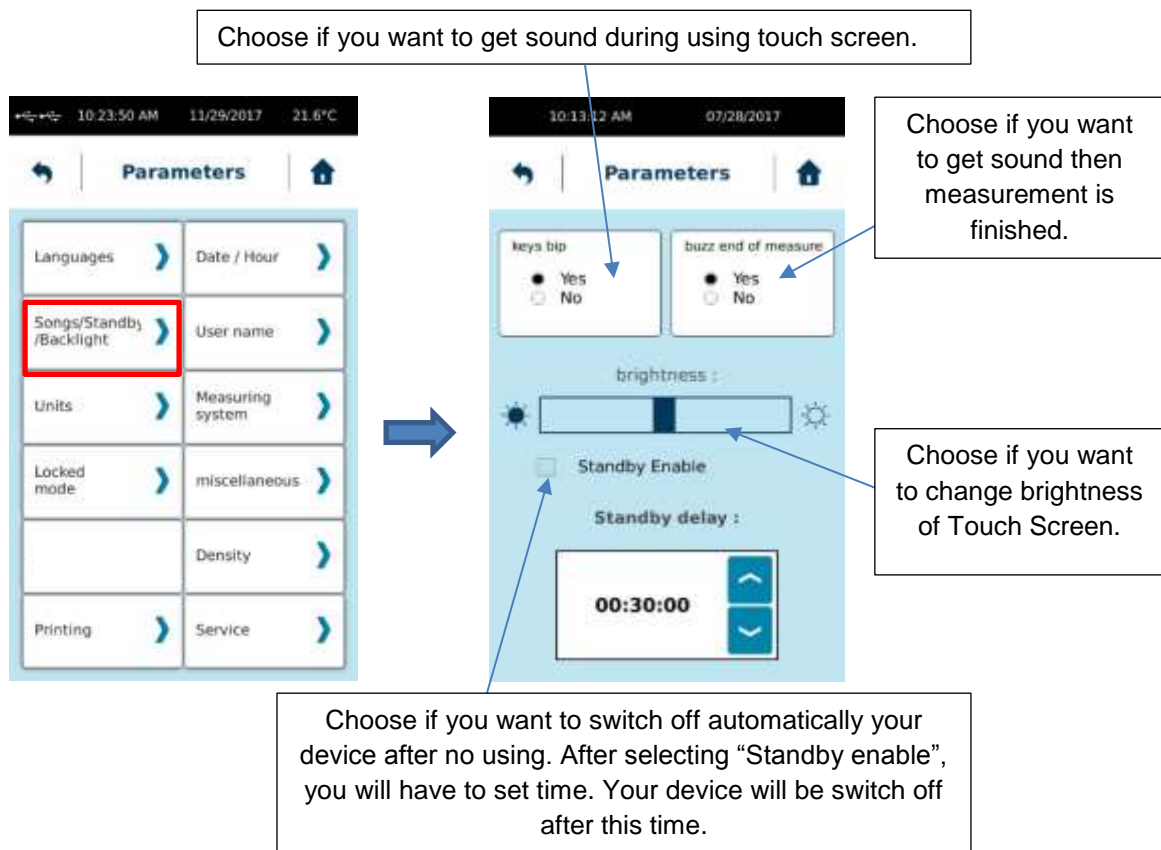
2.2.6.2. Date / Hour

Enable you to adjust hour and date of your FIRST PRO PLUS LR.



2.2.6.3. Sounds/Standby/Lighting

Allow you to modify sounds, lighting and activate or not the Standby mode of your FIRST PRO PLUS LR.



2.2.6.4. User Name

Operator mode will allow you to create different operators for your FIRST PRO PLUS LR. 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.

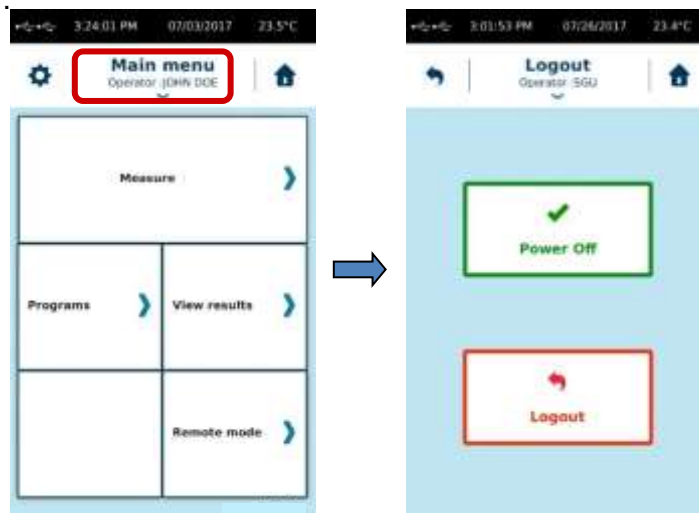


You can now create another operator. The account of an operator may or may not be associated with a password (here called PIN code).

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 FIRST PRO or change operator.

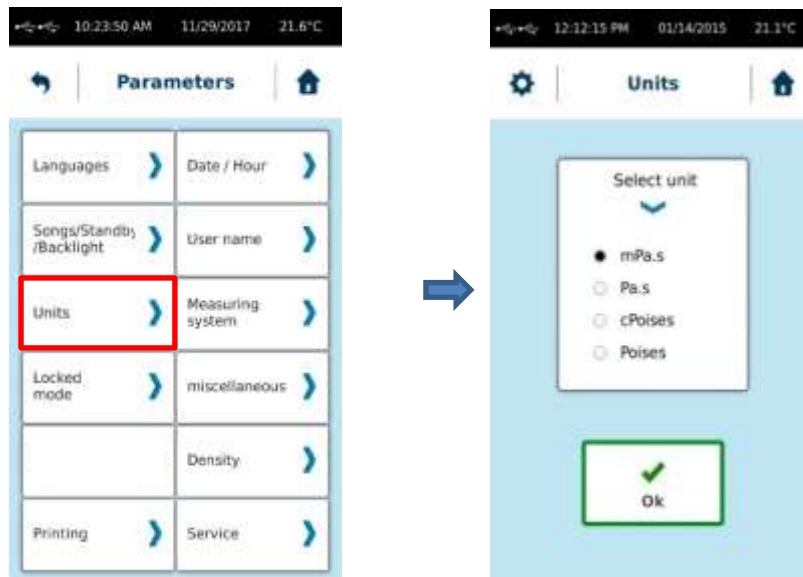


If the instrument is switched off while operator mode is activated, device will ask you to select the operator you want use then it will be switched ON.



2.2.6.5. Units

Enable you to change unit of viscosity values.



2.2.6.6. 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 example "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 ASTM

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	100	1	1
LV 2	500	1	1
LV 3	1900	1	1
LV 4	8600	1	1
LV 5	17826	1	1

MS ULV

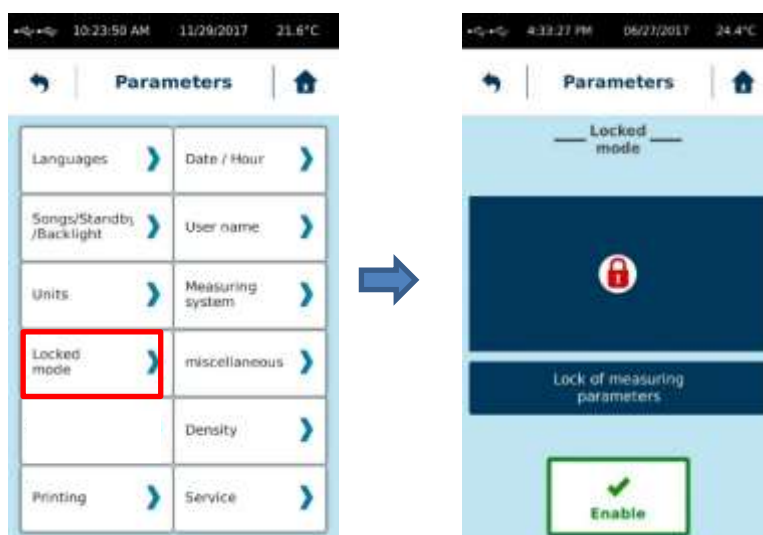
SYSTEM	Ktau / 1 mNm in Pa	Kd / 1 RPM in S-1	Ri / Ra
MS-C19	33.17	2.04	0.95

2.2.6.7. 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 2.2.6.4). 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 FIRST PRO 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 icon on FIRST PRO Screen (see picture below). Protected mode protect programs, measuring parameters and some menu as shown on pictures below.



2.2.6.8. Miscellaneous

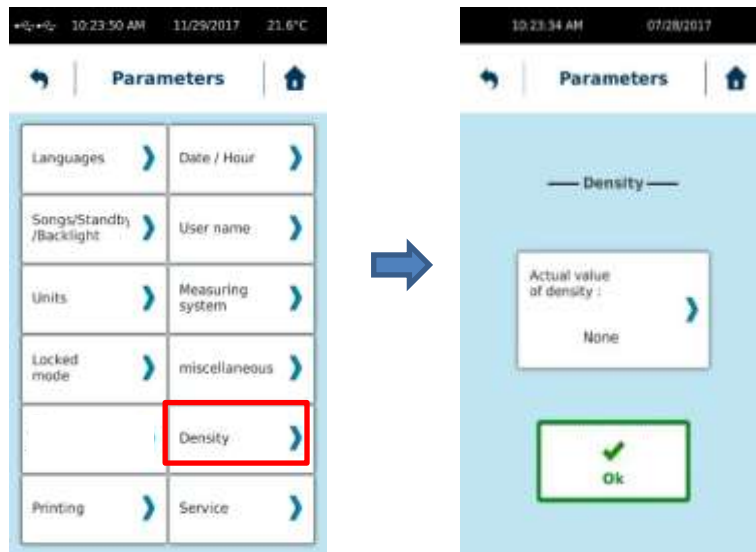
This menu allow you to choose which temperature sensor will be used by the device (Internal of external). By default, PT100-1 is selected and corresponding to PT100 of measuring head.

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 FIRST PRO PLUS during a measurement.



2.2.6.9. Density

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



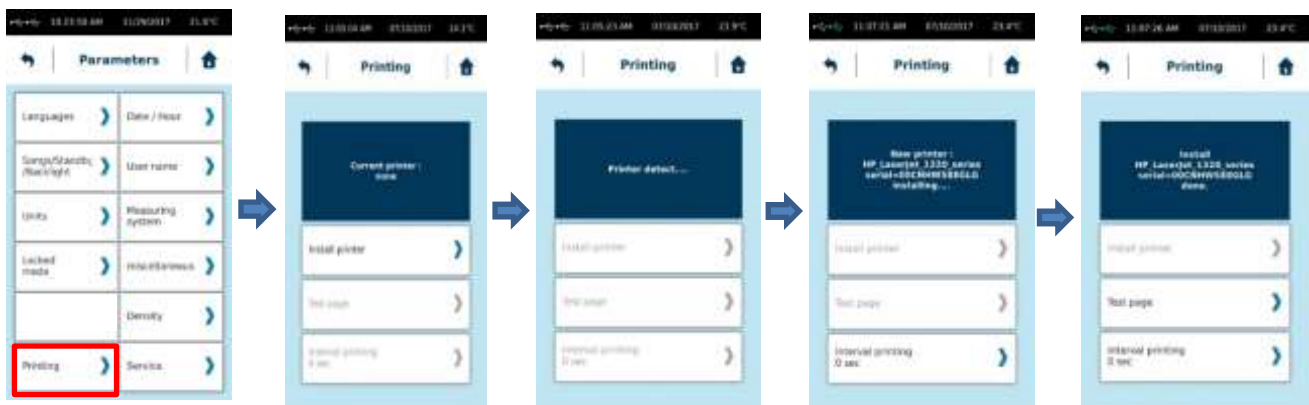
If you set a density value, you will get all the time viscosity in cStoke. Please remove density information if you want to get back Pa.s or Poise for unit of viscosity.

2.2.6.10. Printing

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

The FIRST PRO 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 on 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.

2.2.6.11. Service

Reserved to LAMY RHEOLOGY engineers.



3. MEASURING WITH YOUR DEVICE

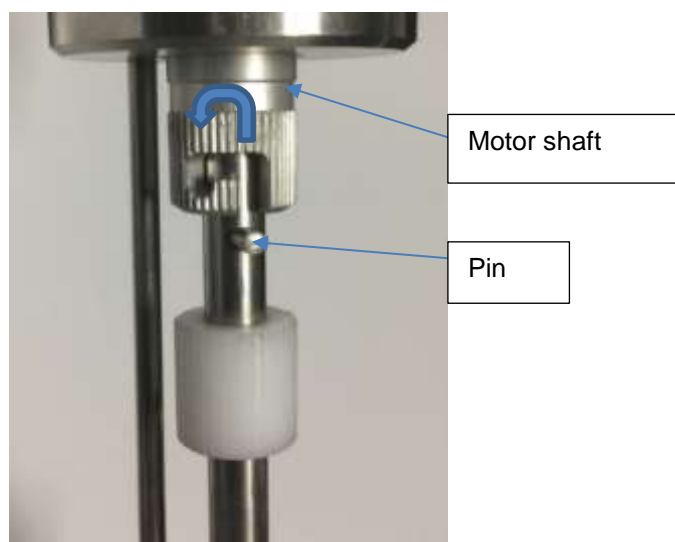
This section will show how use the different measuring system with your device. Viscometer need to be installed as shown in section 1.5 before read following section.

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.

As the FIRST PRO PLUS LR get only one kind of bayonet coupling system, way to install measuring bob on shaft of viscometer is always the same. You will find below how to install your measuring bob. But please refer to specific section according to your measuring system to get more information.

Insert the measuring system with the bayonet coupling into the motor shaft by pushing and turning slightly so that the pin is lodged in the space provided.



3.2. MS ASTM

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)	
L-1 spindle	111010	Ø 18,80 - L 65,1	
L-2 spindle	111011	Ø 18,72 - L 6,86	
L-3 spindle	111012	Ø 12,60 - L 1,78	
L-4 spindle	111013	Ø 3,20 - L 31	
Axis R 1-6 without disc	111000	Threaded axis	
R-1 Disc	111001	Ø 56,26	
R-2 Disc	111002	Ø 46,93	
R-3 Disc	111003	Ø 34,69	
R-4 Disc	111004	Ø 27,30	
R-5 Disc	111005	Ø 21,14	
R-6 Disc	111006	Ø 14,62	
Axis R-7	111007	Ø 3,20	

These spindle 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):

Designation spindle	Part Number Spindle	Part Number Complete set ^{b)}		Viscosity range for version LR (mPa.s)
RV1	111001 ^{a)}		111948	Not Usable
RV2	111002 ^{a)}	111947		200 to 0.14M
RV3	111003 ^{a)}			300 to 0.37M
RV4	111004 ^{a)}			400 to 0.74M
RV5	111005 ^{a)}			500 to 1.4M
RV6	111006 ^{a)}			1200 to 3.7M
RV7	111007			4500 to 15M
LV1	111010	111014		15 to 0.25M
LV2	111011			50 to 1.3M
LV3	111012			200 to 5M
LV4	111013			1000 to 22M

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. You can use either a thermostatic bath or the EVA LR PLUS temperature control system.

Place the viscometer on its support (see section 1.5). 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.

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

- For measurement of a low viscosity product, choose ASTM L-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.

Place the measuring head in the highest position (use screw on aluminium arm as wrote in section 1.2) and insert the measuring system with the bayonet coupling in the motor shaft (see section 3.1). Go to "Measure" menu (see section 2.2.2), select speed and measuring system and make a zero.

Then zero is finished, device ask you to immerge spindle in sample. Use handle to manipulate the device (see section 1.2), release screw on aluminium arm and go down to immerge the mobile in the product. Beware of air bubbles under the disk!



Adjust the position of the viscometer in the sample to immerge the mobile to the predefined mark (the lowest for discs # 2 -6, the highest for disc # 1), so as to immerge the Pt100 probe at least 3 mm (only for models equipped with a temperature probe integrated into the measuring head. If an external temperature sensor is used, the liquid level must always be in

the mark on the axis mobile). 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, use screw on arm to block height of measuring head. After you can use the stop ring on the support rod to memorize the position.



Wait until the temperature of the sample is within the prescribed limits (if you have temperature probe with your device).

Start the measurement at the desired speed (same as zero adjustment).

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 with screw on aluminium arm as wrote in section 1.2. Remove the measuring spindle to clean it.

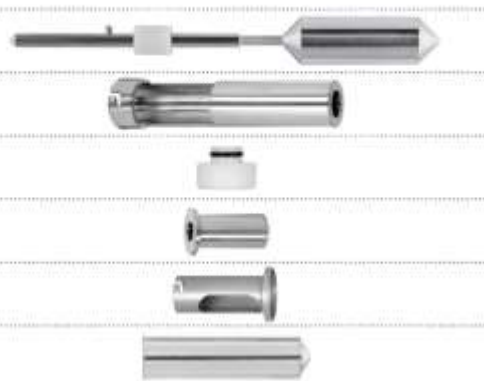
3.3. MS ULV

Measuring system for low viscosities usable with instruments LR version (Aluminium).

This system, unlike the MS-ASTM or MS-DIN systems, makes it possible to measure low viscosity products in control by applying a shear rate. Its advantage is to be compatible with instruments in LR version unlike all other measuring systems.

Here are the available measuring system:

Name	Part number	Dim. (mm)
MK-C19	116016	Ø 19
C Tube with insert	116001	Ø 20
Delrin cap	116005	-
C Insert	111934	-
ST-R centring tool	114436	-
MB-C Alu Cup	114306	Ø 20



All this part can be combined to create two different measuring system.

Designation Measuring system	Part Number Measuring system	Diameter (mm)		Volume sample (ml)	Shear rate range ^{c)} (s-1)	Viscosity range ^{c)} (mPa.s)
		Int.	Ext.			
MS-C19(light)-C	116030 ^{a)}	19	20	11	1 to 510	1 to 26K
MS-C19(light)-C(disposable)	116031 ^{b)}	19	20	11	1 to 510	1 to 26K

M for million, K for thousand

a) Not compatible with oven RT1. Can be used without temperature control

b) Delivered with 100 disposable cup

c) Data calculated for speed range of 0.3 to 250 rpm

The part number 116030 include item 116016, 116001 and 116005. This system can be used with temperature control EVA DIN PLUS and CT DIN or alone without any other accessory.

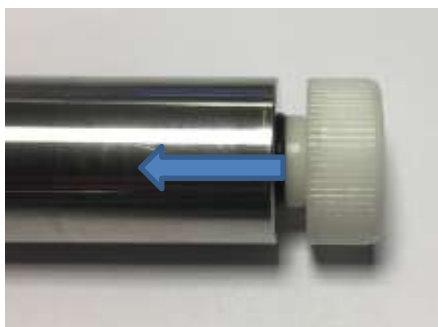
The part number 116031 is dedicated for measurement with disposable cup and include item 116016, 111934, 114436 and 114306 (100 disposable cup). It must be used with a temperature control as EVA DIN, CT DIN or RT-1 PLUS and can't be used alone.

3.3.1. Use of Item 116030

This system can be used with or without a heating unit (DIN EVA and CT DIN). The cup used for these systems is the PN116001. This is fixed directly to the base of the viscometer.

The measuring head must first be installed on the temperature control unit (see installation instructions supplied with the temperature control) or on the standard support if you not use a heating system (see section 1.5).

The first step is to install the cap on the tube as shown in the photo below. Also check that the gasket is properly installed on the plug.



The first insertion of the cap can be difficult. You must use some silicone grease to facilitate installation.

You can then put the product to be measured in the cup. The necessary volume is indicated in the table in section 3.3 according to the system used.

You can then install the cylinder on the bayonet coupling of the viscometer.

Go to section 2.2.2, select spindle, shear rate and time and make a zero.

You can then present the tube with the product from the bottom up slowly and making sure to align with the cylinder. Also place the mark on the tube facing you as shown in the picture below). When you are close enough to the Viscometer base, you must rotate the tube to place the pin in the mark of the tube.



Once the tube is properly installed, check that the temperature sensor on the viscometer is at least one centimetre deep into the liquid.

When using your viscometer with a temperature control system (EVA MS DIN or CT DIN), you must then lower the measuring head so that the tube fits into the chamber provided for this purpose. Check that there is no product on the outer wall of the tube. Use the handle and screw on arm (see section 1.2) to gently lower the measuring head. The tube should be easily housed in the hole of temperature controller. If this is not the case, do not force it and contact your local distributor or LAMY RHEOLOGY. When the measuring head is properly positioned, there is no need to lock the position using the screw on the arm. Also, be sure to allow sufficient time for stabilization if the measurement temperature is different from the room temperature (at least 10 minutes) before taking your measurement



Once the setup is complete, you can do your measurement by clicking on “Start” (see section 2.2.2).

When your measurement is complete, it is recommended to remove the cylinder from the viscometer shaft. It will rest in the tube. Rise the measuring head to the highest position by blocking the stem with the screw provided (see section 1.2). Then remove the tube containing the product and the cylinder, being careful if the temperature is high. You can then remove the cylinder from the tube to clean it. Remove the cap from the tube to clean it. Clean the temperature sensor.

3.3.2. Use of Item 116031

The measuring head must first be installed on the heating unit (see installation instructions supplied with the temperature control).

The first step is to place the screw on the centring piece and then install the latter on the base of the viscometer.



The screw locks the centring piece on the base of the viscometer.

You can then set up the cylinder on the bayonet coupling of the viscometer (see section 3.1).



Go to section 2.2.2, select spindle, shear rate and time and make a zero.

Place the disposable cup holder in the well of the temperature control.

Take a disposable cup, fill it with your product (see table on the previous page for the volume of product to be put into the measuring cup). Then place it in the disposable cup holder.



Use handle and screw of arm (see section 1.2) to gently lower the measuring head. The centring piece must completely cover the edge of the disposable cup holder.



When the measuring head is properly positioned, there is no need to lock the position using the screw on the arm. Also, be sure to allow sufficient time for stabilization if the measurement temperature is different from the room temperature (at least 10 minutes) before taking your measurement.

You can do your measurement by clicking on "Start" (see section 2.2.2).

Once the measurement is complete, unlock the mobile from the viscometer axis and rise the measuring head. Remove the mobile to clean it. Remove the disposable cup holder and remove disposable cup. Also clean the temperature probe and the centring piece. It can stay in place on the basis of the viscometer for a next measurement.

4. VERIFICATION OF YOUR DEVICE

Your instrument is calibrated at the factory with an ASTM L2 mobile and a certified oil with a viscosity close to 1000 mPa.s.

Viscosity measurement on a 1000 mPa.s standard silicon oil with ASTM 2555 L2 measuring system.

- Fill the 600ml beaker with the standard oil.
- Insert the 600ml beaker in a controlled temperature unit like EVA LR system or thermostatic bath.
- See section 3.1 and install spindle L2.
- See section 2.2.2. Select spindle L2 and speed 60 rpm. Make a zero adjustment.
- See section 3.2 and immerge the spindle in the oil at the good level (mark on the spindle).
- Wait for 15 minutes until the standard oil rise the good temperature.
- Select 60 seconds for the measuring time, and start the measurement at 60 rpm.

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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