

Agrosta®Belle C

Texturometer for soft materials, semi-solids and gels, pharmacy, food



User guide Belle C®



Texture analyzer for food and pharmacy with temperature regulated table

Thanks for having acquired BelleC, it comes with :

- The machine itself
- The power module
- The manual with 2 apps downloadable : One for Windows and the other one for android
- The certificate of conformity

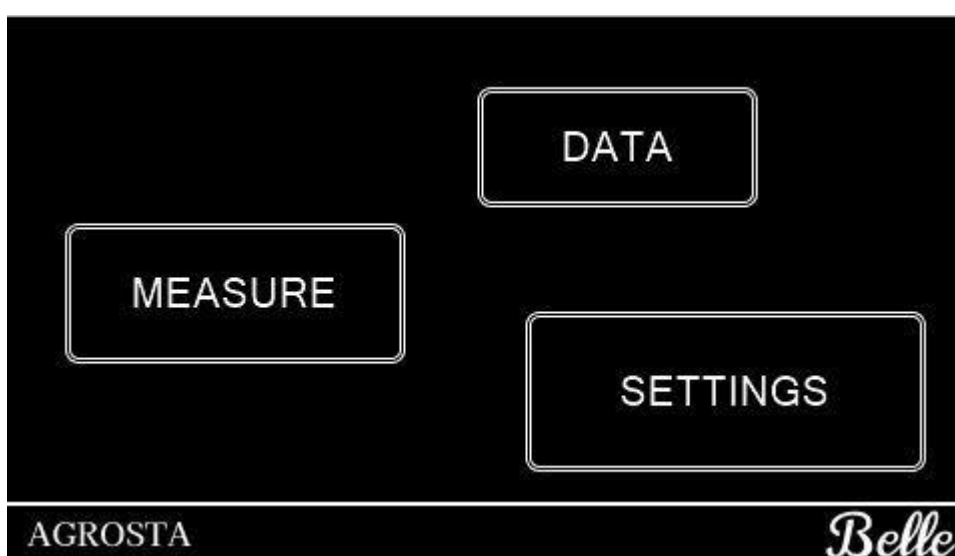
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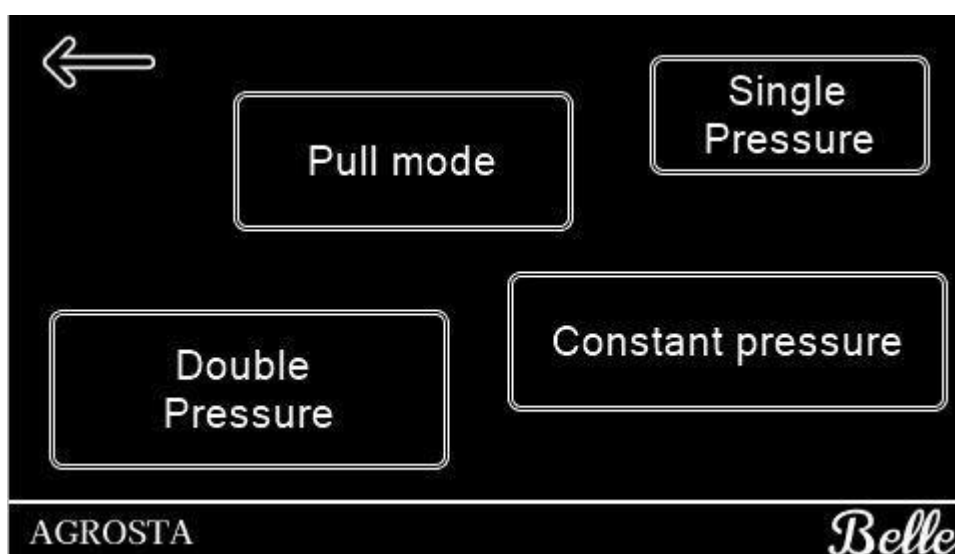
Please note that when you connect the power plug to the machine, the touchscreen
restarts after 3 seconds

Touchscreen interface



[1] Home page

This homepage allows you to navigate through the many features of our texturometer. From there, you can set up your device, view your data and initiate measurements.



[2] MEASURE page

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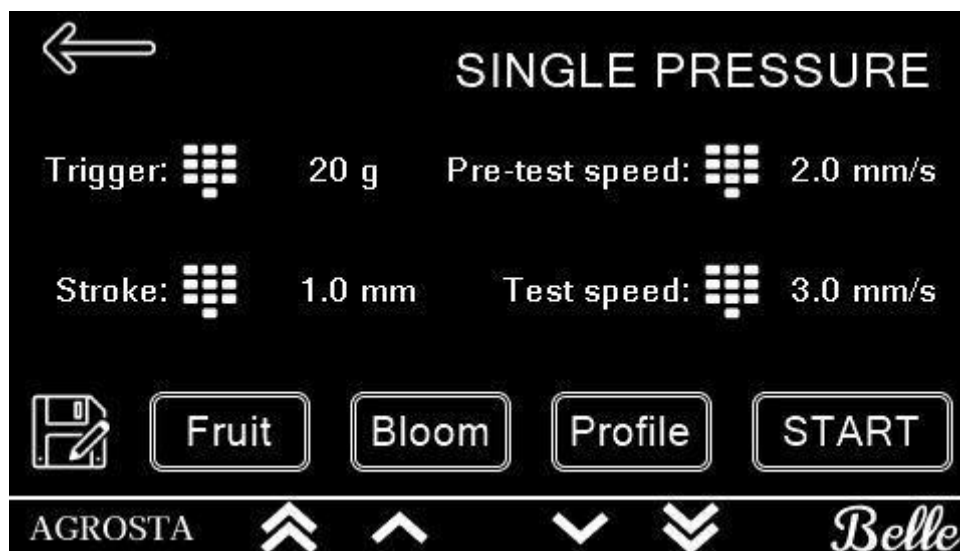


Belle C® allows you to perform 4 tests to meet all your

needs, here is the data it gives you:

- **SINGLE PRESSURE:** Hardness, fracturability, adhesiveness, resilience.
- **DOUBLE PRESSURE:** Hardness, fracturability, adhesiveness, resilience, gumminess, springiness, chewiness, cohesiveness.
- **PULL MODE:** Max pressure, fracturability.
- **CONSTANT PRESSURE:** Initial deflection (once we first reach the load), final deflection (at the end of the measure).

Our texturometer is designed to provide the greatest flexibility, which is why you can change every parameter. Here is an overview of customization for each mode. If you have any questions, please send us a message at lak@agrosta.org.



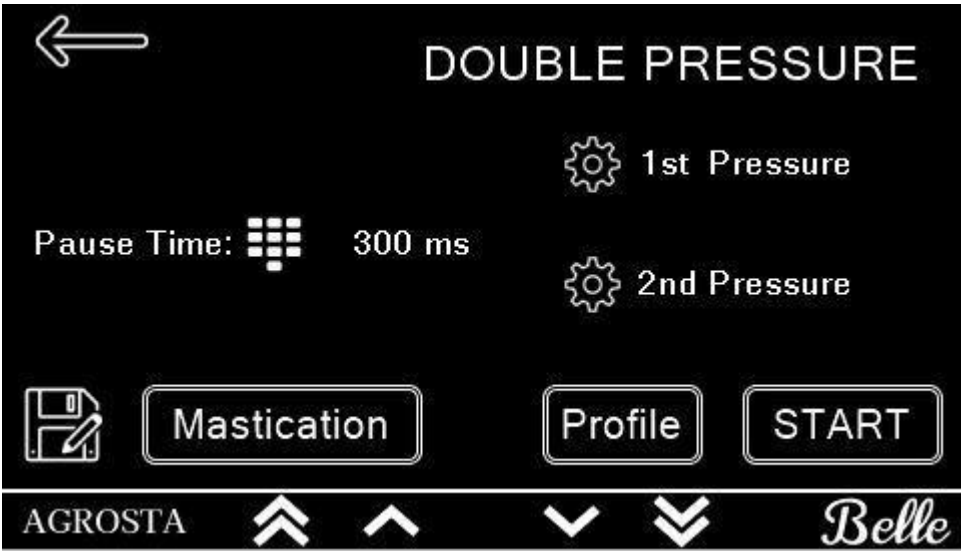
[3] Single pressure

Fruit and Bloom initializes a predefined set of parameters optimized to perform tests on fruits and gelatins.



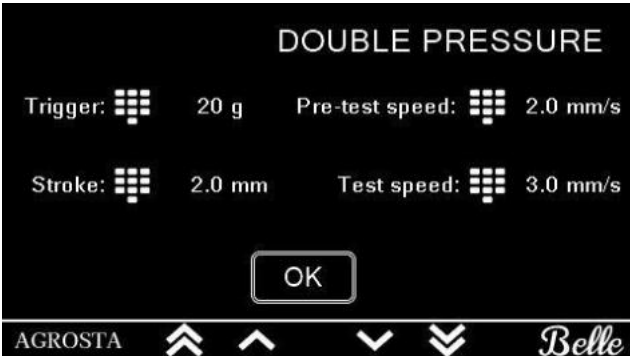
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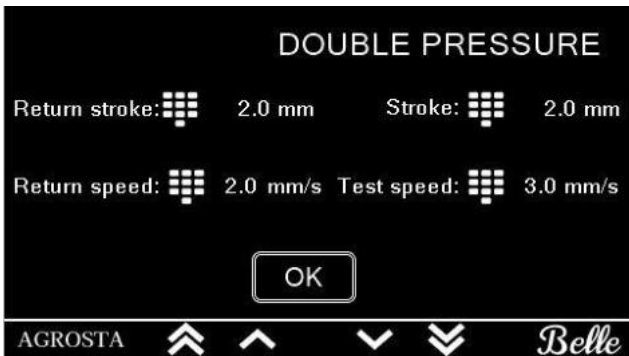


[4] Double pressure

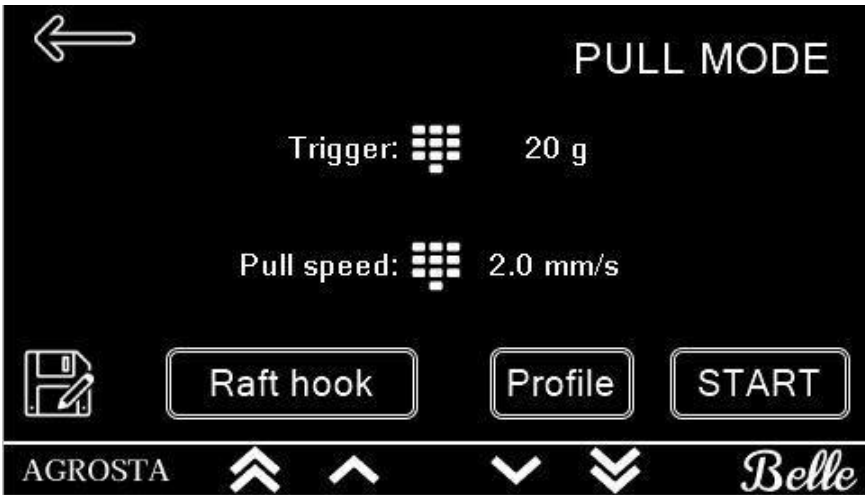
Mastication initializes a predefined set of parameters optimized to reproduce mastication.



[4.a] Double pressure (1st pressure)



[4.b] Double pressure (2nd pressure)

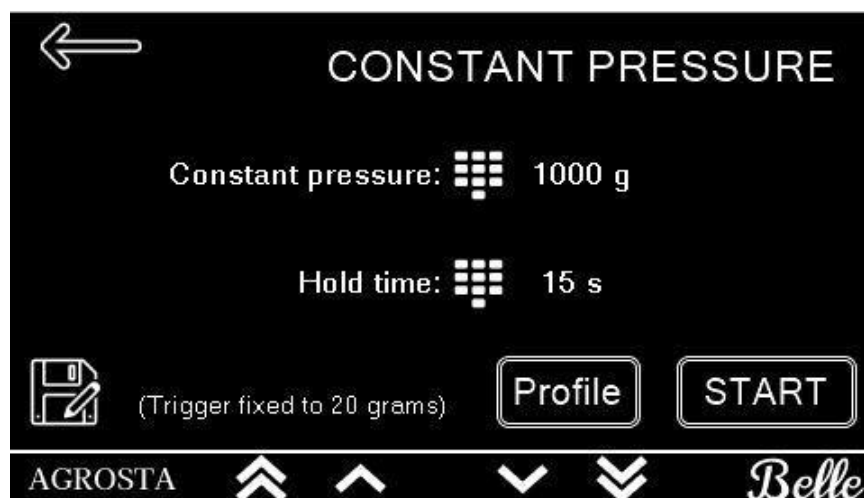


[5] Pull mode



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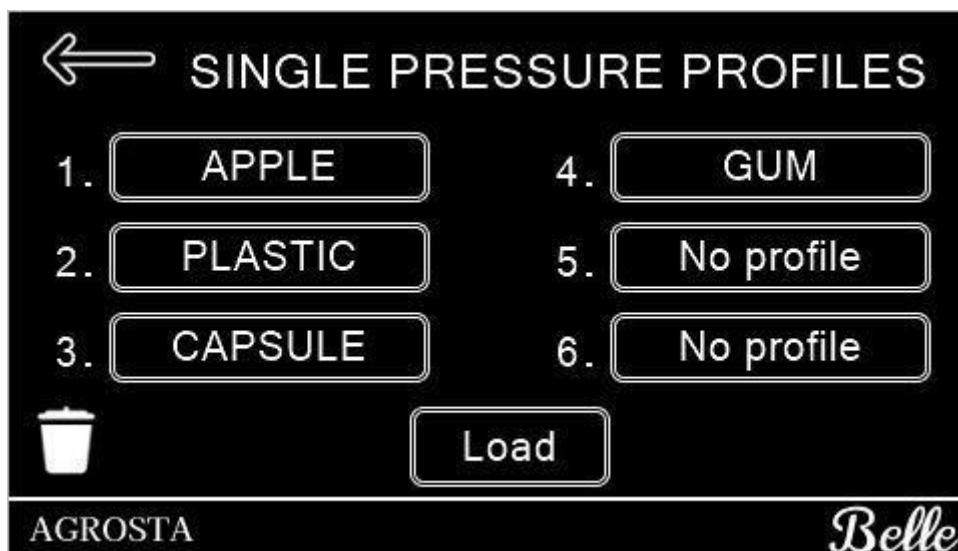
[6] Constant pressure

In order to optimize your time once you have set your parameters, each mode allow you to save up to 6 profiles (6 set of parameters)

by clicking the button



At any time you can reach your profiles by clicking the button
bring you to this page:

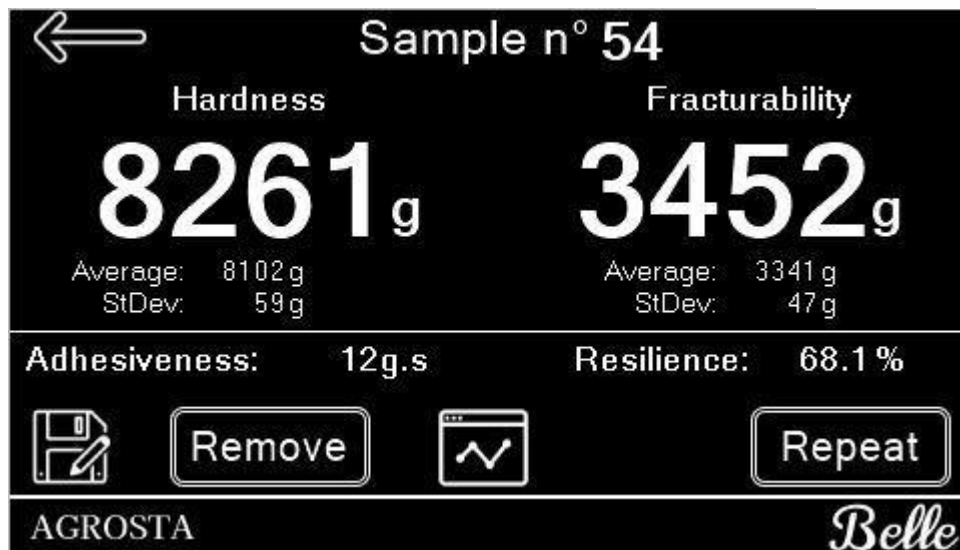


[6] Typical profiles page

Once everything is set, you can start the measurement, you will be redirected to the results page. Here you will have access to all the data of your mode and see the AVERAGE and STANDARD DEVIATION (StDev) of the most important data.

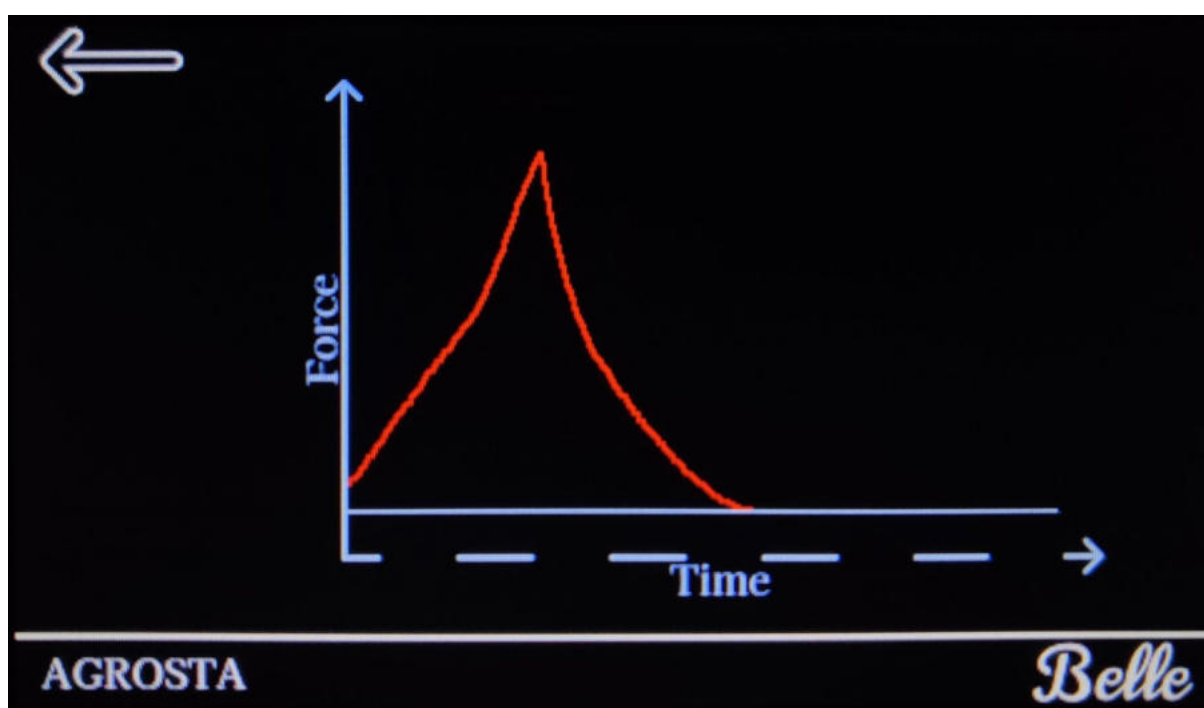
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[7] Example of a result page (here the simple pressure mode)

If a sample is corrupted you can remove it from the batch. Each batch can have **300 measures**. For each sample you can see the measure graph by clicking the button



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Once you are done you can save the data of the batch by clicking on the save button, then tap the keyboard to enter the batch name. At any time you can see your saved data by clicking the DATA button on the [1] **Home page**.

By doing so you'll see your data table:

← SINGLE MODE DATA				
Batch	Hardness (g)		Fracturability (g)	
	Average	StDev σ	Average	StDev σ
BATCH5	8102	59	3341	47
BATCH4	8356	84	3512	62
BATCH3	8004	54	3316	39
BATCH2	7994	42	3210	24
BATCH1	8523	99	3841	90
18.01	5123	562	265	12
-----	0	0	0	0
-----	0	0	0	0
-----	0	0	0	0
-----	0	0	0	0
AGROSTA < 1 / 5 > Belle				

The settings in [1] **Home page** allow you to choose the unit of result data: either **gram** or **mlb**. You can also select the maximum pressure of the device to keep your sample safe: 1Kg - 2Kg - 5Kg - 10Kg - 17Kg.

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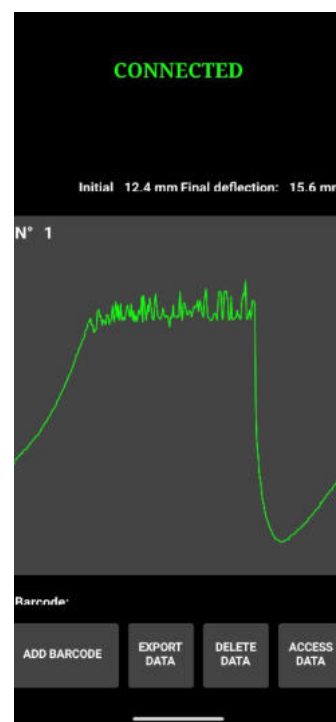


App for android

- First, switch on your Belle2 and associate it to your phone or tablet
- For this, go in PARAMETERS / BLUETOOTH and click on "Add device"

You can download the app here : <https://agrosta.org/BELLE.apk>

Or scan this QR code :



The app comes with a barcode scanner

The data is stored under CSV format and can be accessed on your phone or tablet in this directory : **Android/data/com.lak.BELLE/files**



App for windows

You can download the Windows application for your Belle 2 device using the links below:

- [Download the Belle 2 Bluetooth Version](#)
- https://www.agrosta.org/install_belle_bluetooth.zip
- [Download the Belle 2 USB Version](#)
- https://www.agrosta.org/Install_BELLE.zip

Important:

There are two versions of the software available:

- 1. Bluetooth Version: For connecting your Belle 2 device via Bluetooth.**
- 2. USB Version: For connecting your Belle 2 device directly to your PC using the supplied USB cable.**

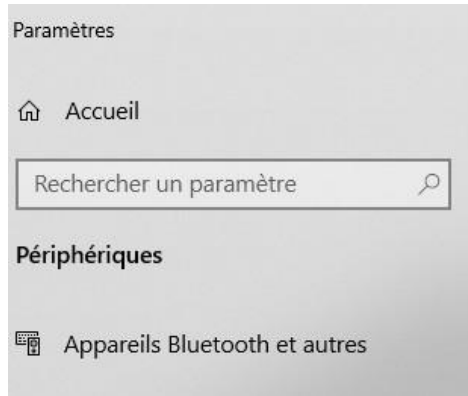
Setting Up Bluetooth Communication (Bluetooth Version)

First, you need to add the Bluetooth device to your PC :

- _ Switch on the Belle 2**
- _ On your computer, go the parameters, and then Bluetooth devices:**

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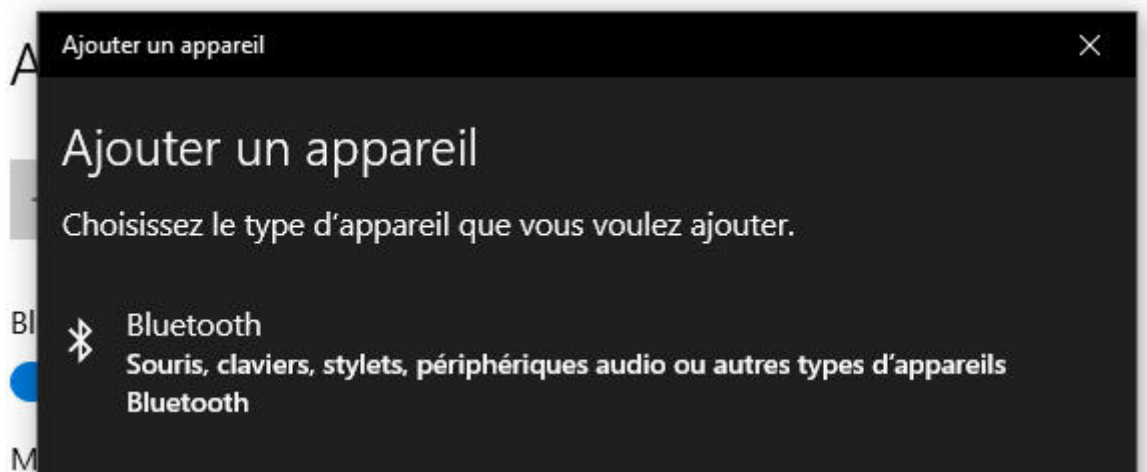
Appareils Bluetooth et autres

 Ajouter un appareil Bluetooth ou un autre appareil

Bluetooth

 Activé

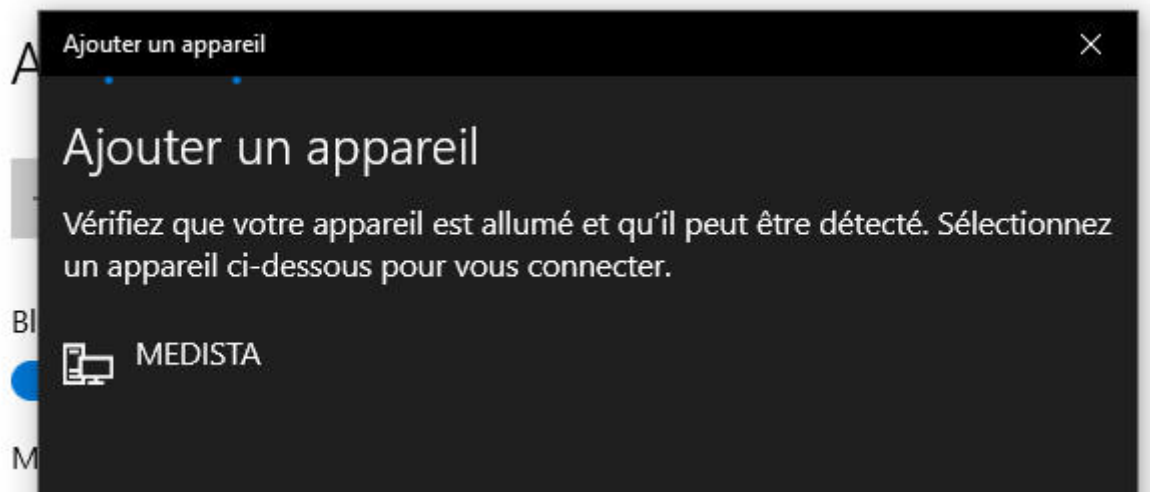
- _ Click on “Add a Bluetooth device”, and check that the Bluetooth is activated
- _ Then click on the first category : Bluetooth keyboards, mouse, audio and others :



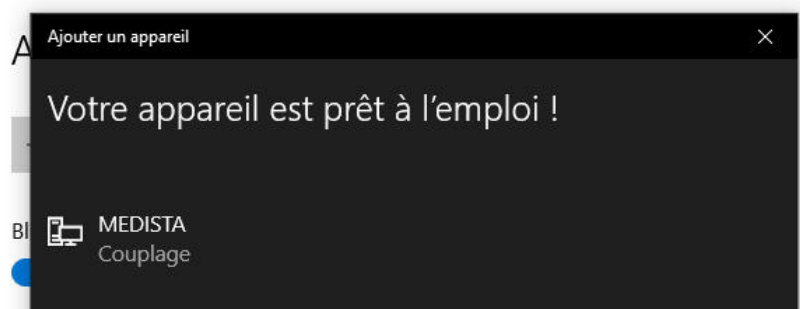
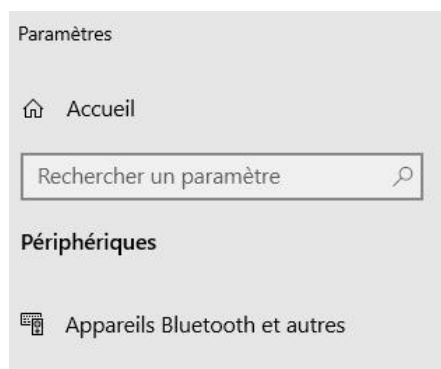
Then click on “BELLE”

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- Once you have clicked on “BELLE”
- Your computer indicates : “the device is ready to use”



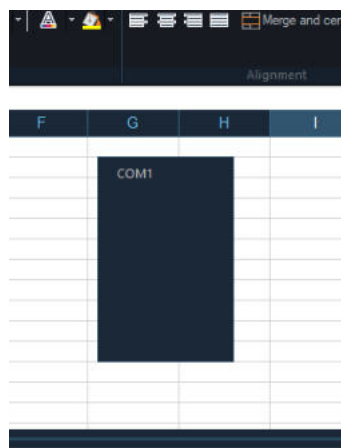
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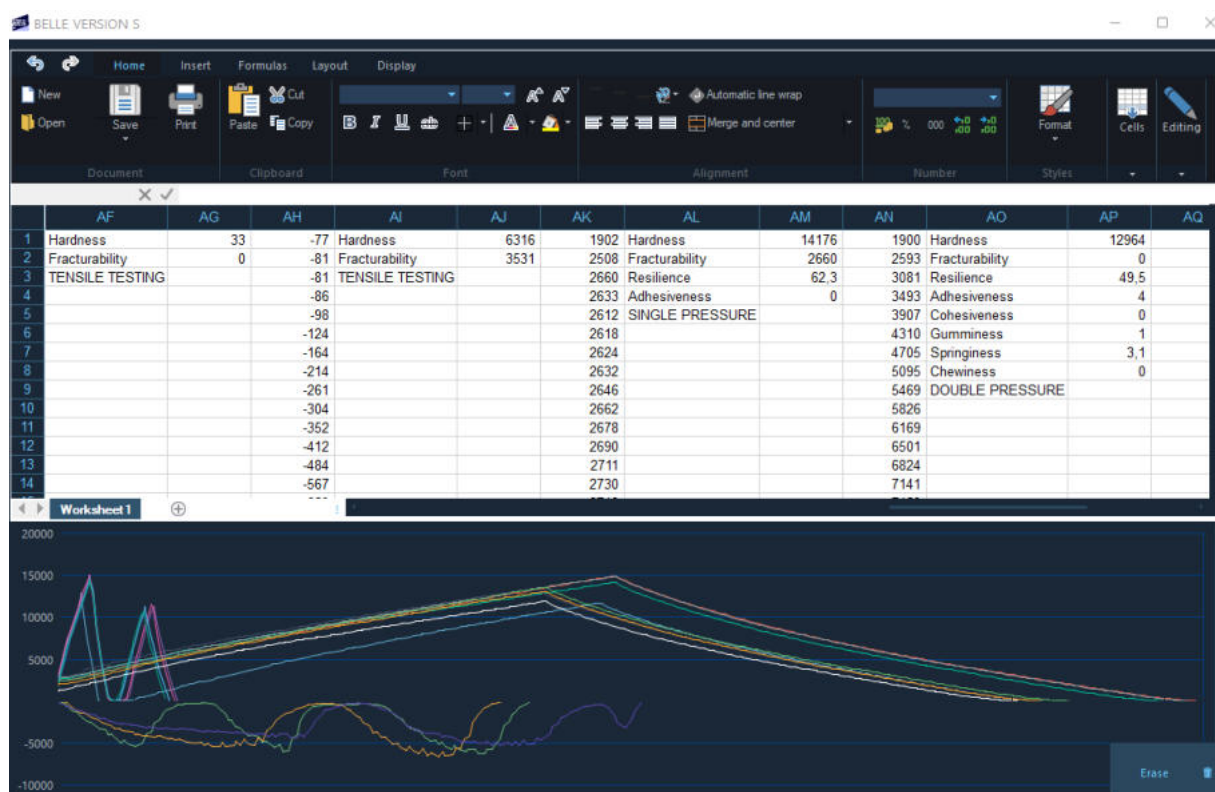


Start the software – One of the COM indicated in the middle corresponds to your device

Click on it 2 times



If you have selected the right COM, the data will arrive automatically when you are doing some tests





Setting Up USB Communication (USB Version)

Follow these steps to connect your Belle 2 device to your PC via USB:

1. Plug in the USB Cable:

Use the **supplied USB cable** to connect the Belle 2 device to your computer.

2. Connect the Power Cable:

Ensure the **power cable is plugged in**, and the device is powered on.

3. Launch the USB Version of the Software:

Open the **USB version** of the Belle 2 application on your PC.

4. Wait for the Connection Confirmation:

Once the device is connected, **do not take any action**.

A message will automatically appear on the screen, confirming that the connection is successful.



Texture Profile Analysis (TPA) Parameters

Texture Profile Analysis (TPA) is a widely accepted method used to objectively characterize the mechanical and sensory properties of foods, pharmaceutical products, gels and other soft materials. During a TPA test, the sample is compressed once or twice under controlled conditions, and the resulting force–time or force–distance curve is analyzed to calculate several texture parameters.

Hardness

Hardness is the maximum force recorded during the first compression cycle. It represents the resistance of a sample to deformation and is generally considered the objective equivalent of firmness.

A high hardness value indicates that the material requires a greater force to compress, while a low value corresponds to a softer product. Hardness is one of the most frequently used parameters for comparing products during manufacturing, storage or ripening.

Fracturability

Fracturability (also called brittleness) is the force at which the sample first fractures, cracks or breaks during compression.

Brittle materials exhibit a sudden drop in force immediately after reaching this point. Products such as biscuits, crackers or fragile tablets generally have a well-defined fracturability, whereas elastic or ductile materials may not exhibit any fracture point.

Adhesiveness

Adhesiveness is the work required to separate the probe from the sample after compression. It corresponds to the negative area of the force curve when the probe withdraws from the material.



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This parameter reflects the stickiness of a product. Highly adhesive materials, such as gels, creams, doughs or certain pharmaceutical formulations, require more energy to detach from the probe and therefore exhibit higher adhesiveness values.

Resilience

Resilience describes the ability of a material to recover its original shape immediately after the first compression. It is calculated as the ratio of the energy recovered during unloading to the energy applied during loading.

Unlike springiness, resilience evaluates the instantaneous elastic recovery occurring directly after deformation. Materials with high resilience rapidly recover their shape, whereas plastic or permanently deformed materials show lower values.

Cohesiveness

Cohesiveness measures the internal structural strength of a material and its ability to withstand a second deformation after the first compression.

It is calculated as the ratio of the work performed during the second compression to that of the first compression.

A highly cohesive sample maintains its internal structure after the first compression and therefore resists subsequent compression efficiently. Low cohesiveness indicates that the material has been significantly damaged during the first compression.

Formula:

$$\text{Cohesiveness} = \text{Area2} / \text{Area1}$$

Springiness

Springiness (also called elasticity) represents the extent to which a compressed sample returns to its original height before the second compression.

It is calculated from the recovery distance or recovery time between the two compression cycles.



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Highly elastic materials recover almost completely before the second compression, while materials with poor elasticity remain permanently compressed.

Gumminess

Gumminess is the energy required to disintegrate a semi-solid food until it is ready for swallowing.

This parameter is mainly used for semi-solid materials such as cheese, gels, doughs or processed foods.

It combines hardness and cohesiveness according to the relationship:

Gumminess = Hardness × Cohesiveness

Higher gumminess values indicate materials that require greater effort to manipulate before swallowing.

Chewiness

Chewiness represents the total energy required to chew a solid food until it is ready for swallowing.

It combines three mechanical properties: hardness, cohesiveness and springiness.

Formula:

Chewiness = Hardness × Cohesiveness × Springiness

Chewiness is particularly relevant for solid foods such as meat, confectionery, fruits and bakery products, where both structural integrity and elasticity contribute to the chewing effort.

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Summary

Parameter	Physical meaning
Hardness	Maximum force required for the first compression
Fracturability	Force at which the sample first breaks
Adhesiveness	Energy required to separate the probe from the sample
Resilience	Immediate recovery after the first compression
Cohesiveness	Ability of the material to withstand a second compression
Springiness	Recovery of sample height between two compressions
Gumminess	Energy required to disintegrate a semi-solid product ($\text{Hardness} \times \text{Cohesiveness}$)
Chewiness	Energy required to chew a solid product ($\text{Hardness} \times \text{Cohesiveness} \times \text{Springiness}$)



Temperature regulated table

The heated table is powered independently through a separate power supply and operates completely autonomously. It is **not connected to the texture analysis software** and does not exchange any data with the Belle C texture analyzer.

The temperature is adjusted directly on the temperature controller using the following buttons:

- **SET**: Enter or modify the temperature setpoint.
- **▲ / ▼**: Increase or decrease the desired temperature.
- **ENT**: Confirm and save the selected value.

The heated table has a **maximum power output of 350 W**, allowing rapid heating and stable temperature regulation throughout the test.

For best measurement repeatability, it is recommended to allow the heated table to reach the desired temperature and stabilize before starting any texture measurements.



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To prevent damage to the plastic components of the instrument and to accessories made from ceramic composite materials, it is recommended not to set the heated table above 90 °C.

