



ugo basile®

TRANSFORMING IDEAS INTO INSTRUMENTS

instruction manual

**GSM Grip Strength Meter
Cat. No. 47200**



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instruction manual

**GSM Grip Strength Meter
Cat. No. 47200**

Serial No.

SAFETY CONSIDERATIONS

ALTHOUGH THIS INSTRUMENT HAS BEEN DESIGNED WITH INTERNATIONAL SAFETY STANDARD, THIS MANUAL CONTAINS INFORMATION, CAUTIONS AND WARNINGS WHICH MUST BE FOLLOWED TO ENSURE SAFE OPERATION AND TO RETAIN THE INSTRUMENT IN SAFE CONDITIONS.

SERVICE AND ADJUSTMENTS SHOULD BE CARRIED OUT BY QUALIFIED PERSONNEL, AUTHORIZED BY UGO BASILE ORGANIZATION.

ANY ADJUSTMENT, MAINTENANCE AND REPAIR OF THE OPENED INSTRUMENT UNDER VOLTAGE SHOULD BE AVOIDED AS MUCH AS POSSIBLE AND, WHEN INEVITABLE, SHOULD BE CARRIED OUT BY A SKILLED PERSON WHO IS AWARE OF THE HAZARD INVOLVED.

CAPACITORS INSIDE THE INSTRUMENT MAY STILL BE CHARGED EVEN IF THE INSTRUMENT HAS BEEN DISCONNECTED FROM ITS SOURCE OF SUPPLY.

Grip Strength Meter

Cat. No. 47200

General

The Ugo Basile Grip Strength Meter automatically measures grip-strength (*i.e.* peak force and time resistance) of forelimb or hindlimb (via the grid) in rats and mice.

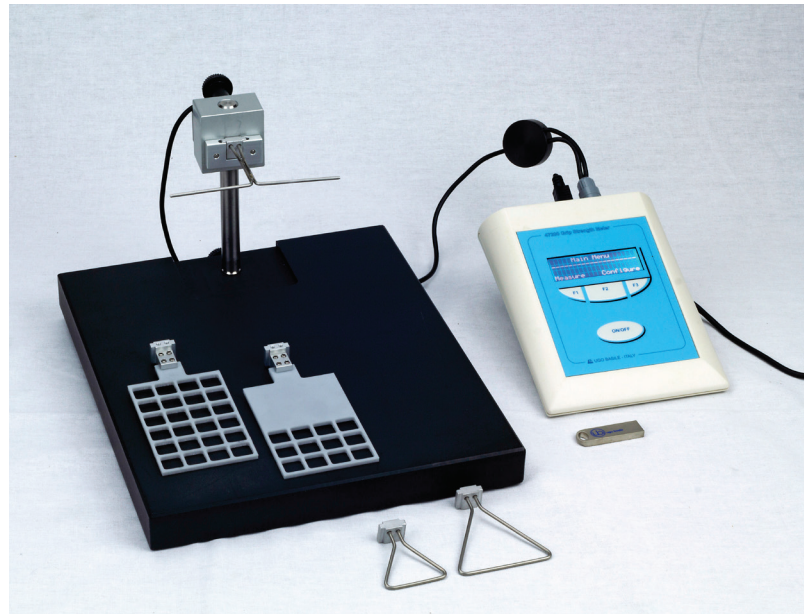
The Grip Strength test is a perfect complement to the gold standard Ugo Basile Rota-Rod device for motor coordination and motor function experiments.

The effects of drugs, toxins, muscle relaxants, disease, ageing or neural damage on muscle strength may be assessed.

The animal is placed over a base plate, in front of a grasping tool (either T-shaped, trapeze-shaped or grid), whose height is adjustable.

The bar is fitted to a force sensor connected to the control unit, which can be used as a stand-alone or connected to a PC via the USB port, for monitoring and data recording, via the **NEW** software provided as standard

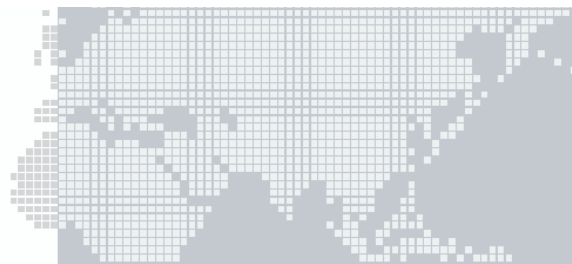
Full Optional
including software
3 grasping tools &
2 grasping grids



Consistency
facilitated by the
force-rate
monitoring tool

for Rats

for Mice



Features and Benefits

- Software included - **NEW 2014 Release**
- Grasping tools and grasping-grids included for rats and mice
- No calibration needed
- Force-rate monitoring (via software or LCD display)
- Grasping bar / grasping trapeze positioned at adjustable height. Optional metal grid available
- Maximum applicable force 1500g; resolution 0.1g



CHECK-LIST

Cat. No. 47200 Grip Strength Meter

CLIENTE / CUSTOMER _____

Ordine No. / Order No. _____ Data / Date ____/____/____

UB code	CAT.No.	✓	Q.ty	DESCRIPTION	DESCRIZIONE
	47200-001		1	ELECTRONIC UNIT	UNITA' ELETTRONICA
	47200-002		1	TRANSDUCER	TRASDUTTORE
	47200-004		1	BLACK PVC BASE W/13mm UPRIGHT	BASE PVC NERO CON STATIVO 13mm
M-LM 590			1	TRAPEZE (RAT)	TRAPEZIO (PER RATTO)
M-LM 588			1	TRAPEZE (MOUSE)	TRAPEZIO (PER TOPO)
M-LM 589			1	T-SHAPED BAR	BARRA A "T"
E-AU 041 USB pen-drive	47200-306		1	INSTRUCTION MANUAL (PDF)	MANUALE D'ISTRUZIONE (PDF)
	DCA		1	DCA SOFTWARE	SOFTWARE DCA
M-CM 458-F-1	38500-303		1	EXTERNAL-TRIGGER PEDAL-SWITCH	TRIGGER ESTERNO (PEDALE)
	52010-325		1	USB CABLE	CAVO USB
	47200-325		1	GRASPING GRID FOR MOUSE	GRIGLIA TOPO
	47200-326		1	GRASPING GRID (PARTLY BLIND)	GRIGLIA TOPO (PARZIALMENTE CIECA)

DATE / /	Serial No.	IMBALLATO DA / PACKED BY
Universal Input 85-264 VAC, 50-60Hz		

IMPORTANT/IMPORTANTE:

Check the shipment for completeness immediately after receipt: should you find any discrepancy, please fill in the following part and transmit it to our fax no. +39 0332 745488

Al ricevimento della merce controllate che la spedizione sia completa: in caso di discrepanza, completate il formulario di seguito riportato ed inviatelo al nostro fax no. 0332 745488

FROM: Name	Company/Institution
DATE	REF.

NOTE

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Grip Strength Meter

Cat. 47200

1 GENERAL

The **47200 Grip Strength Meter** (GSM) measures forelimb grip-strength in rats and mouse.

The effects of drugs, toxins, muscle relaxants, disease, ageing or neural damage on muscle strength may be assessed.

The animal is placed over a base plate, in front of a grasping bar (either T-shaped or trapeze-shaped), whose height is adjustable. The bar is fitted to a force transducer connected to the **Peak Amplifier**.

When pulled by the tail, the animal grasps to the bar; rodents instinctively grab anything they can to try to stop this involuntary backward movement, until the pulling force overcomes their grip strength.

After the animal loses its grip on the grasping bar, a peak preamplifier automatically stores the peak pull force achieved by the forelimbs and shows it on a liquid crystal display.

An integrated measurement of the four limbs can also be obtained by using one of the optional grids available, see paragraph 2.2.1.

1.1 Principle of Operation

The force transducer is mounted in the metal block positioned on the upright fixed to the base plate.

When pulled by the tail, the animal grasps at the bar. Rodents instinctively grab anything they can, to try to stop this involuntary backward movement, until the pulling force overcomes their grip strength.

The completion of each test is indicated by the sudden release of the bar; in alternative, the operator may choose to press the external foot-operated trigger switch provided.

After the animal loses its grip on the grasping bar, the display shows the results of the test (i.e. force and time corresponding to the animal response); the operator may decide to reject the results or to accept them, in which case they are recorded in GSM's internal memory.

The results of, typically, several hundred of tests may be stored in GSM for transfer to a PC when convenient.

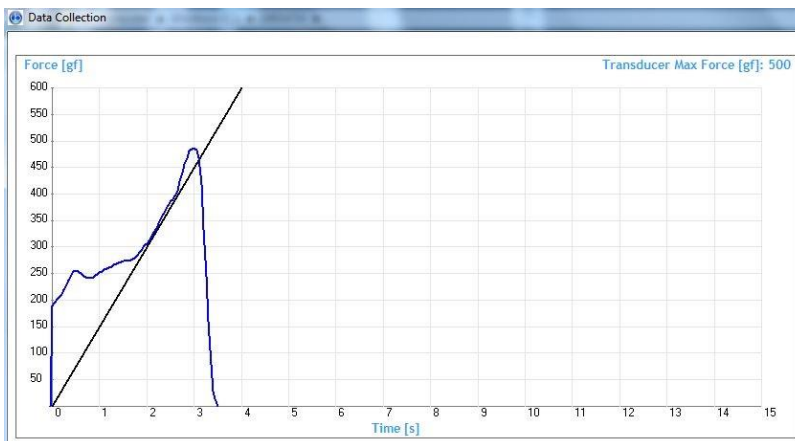
1.1.1 Consistent Results

The GSM device has been designed to make sensitivity experiments easy and consistent, thanks to its:

- Effective **peak detector**, for a reliable and automated detection of the animal response
- **Rate-Meter** (see paragraph 5.4) and Slope features (see paragraph 0), ensuring the desired force is applied at a consistent rate
- **Software**, acting as a quality control tool, by showing the applied pulling force (red line) and the desired target force rate (blue line) in real time.

The rate of application of the force (**target force rate**) is set by the operator from the configuration menu (see section 4.5.1, option 1) and the GSM includes software tools that help the operator in consistently applying the force at the desired rate.

See the below screenshot of the Grip Strength meter software showing the force trace (**in blue**) and the desired target force rate (**in black**).



The experimenter can consistently apply the force (i.e. pull the animal) at the desired rate, by simply making sure that the blue trace lays on the black line.

2 INSTRUMENT DESCRIPTION

The instrument basically consists of:

- 1) an **electronic unit** (peak amplifier)
- 2) a **base plate** of black sand-blasted PVC, complete with a 13mm diam. upright
- 3) a set of **grasping-tools** (three different shapes are provided, trapeze or T-bar) and two **grasping-grids**
- 4) a **force transducer** adjustable in height, provided with connection cable & connector to the peak amplifier

The instrument is delivered in a convenient plastic case which should be retained for the safe storage of GSM and its accessories.

Beside the above listed items, the case contains the following items:

- External foot pedal
- USB Cable
- Power Adapter
- GSM Software (on USB flash drive)
- Operation Manual (on USB flash drive)

2.1 Electronic Unit

The GSM electronic unit is battery operated. Its internal rechargeable battery is charged automatically when external power is supplied to its miniature USB 'B' socket, either from a PC or from a suitable USB power adapter.

A fully charged battery will operate GSM continually with its display at maximum brightness for approximately 16 hours.

When GSM is switched **OFF**, it goes into a standby mode in which it takes almost no current from the battery although it still updates its internal calendar clock. GSM is switched **ON** by pressing the **ON/OFF** button.

GSM uses the three buttons below the display as **soft buttons** whose functions change at different stages of the GSM program.



Figure 1 "GSM Electronic Unit"

The lower line of GSM's 4x20 character display is normally used to indicate the current function of each button.

The instrument can be used as a standalone or connected to a PC via the USB port, for monitoring and data recording, via the software provided as standard.

2.1.1 Autozero Function

When GSM is switched **ON**, the initial menu choice is between making measurements and configuring the instrument to suit the user's specific requirements. The detailed menu options will be discussed later.

As each GSM transducer has a built-in identification chip, its electronics is able to interrogate each transducer and adjust its own internal specification, to match that of the transducer.

Prior to making any measurements, GSM automatically balances out any offsets using its **autozero** function. Thanks to this feature, GSM does not require calibration.

2.2 Base, Grasping Tools & Force Transducer

The grasping tool can be chosen among the three provided as standard: a **T-shaped bar**, **rat trapeze** and **mouse trapeze**), depending on the animal on test, and on personal preference.

All tools may be connected to the same transducer, positioned on the 13mm diam upright, fitted on the PVC base plate.

The transducer height is adjustable.

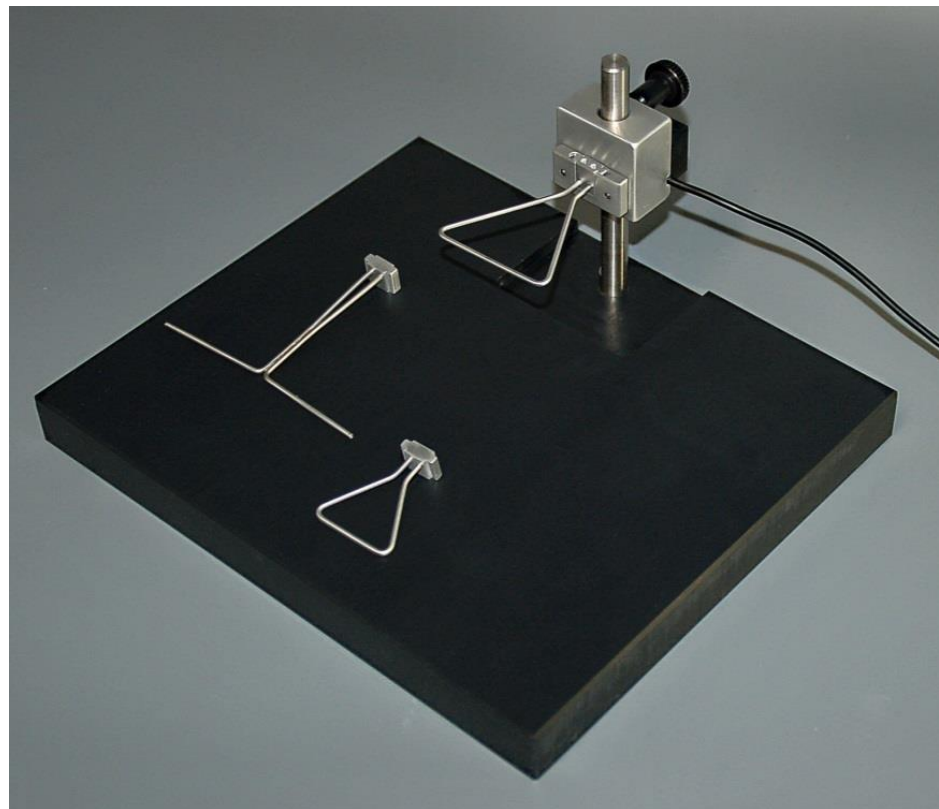


Figure 2 "Base, Grasping Tools and Transducer"

When the pulling force is applied to the transducer, the display on the electronic unit automatically shows the current grip force expressed in grams and in gram decimals.

A sound alarm can be set to advise when the maximum desired force is reached.

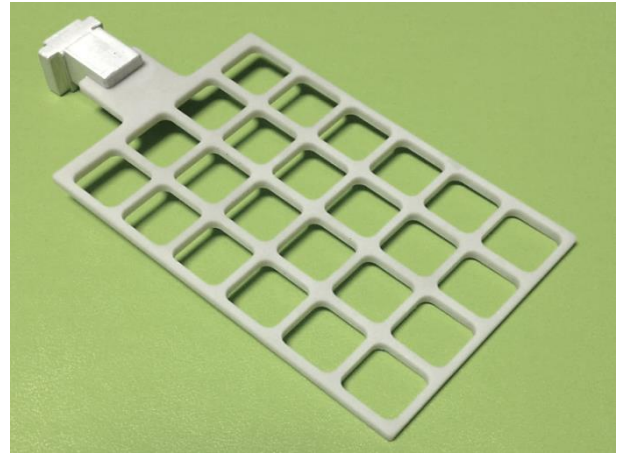
The force transducer has a **resolution of 0.1g** and the **maximum applicable force is 1500g**. The force transducer incorporates a proprietary memory chip to store all calibration parameters, so that no further calibration is required for normal use, see also paragraph 2.1.1.

2.2.1 Grasping Grids

Our Grip Strength Meter was originally designed to test the forelimbs.

An integrated measurement of the four limbs can also be obtained by using the optional **47200-325** grid available.

Measuring the hind limbs with the standard T-bar or trapeze attachment pieces that come with the machine, is hardly feasible; the grid 47200-325 is useful also in this case.



An alternative model has been recently developed, **47200-326**, which has a “blind” side.

The new grid makes it easier to measure the hind limbs, specifically compared to the T or the trapeze.

Both grids are included with the standard package.

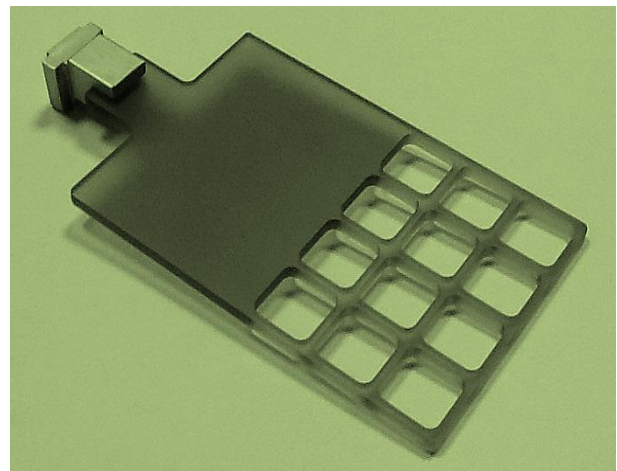


Figure 3 “Grasping-Grids”

3 INSTALLATION

3.1 Unpacking & Preliminary Check

Check the contents of the shipment for completeness, packing list to hand, and visually inspect the instrument as soon you take it out of the packaging. Use the supplied **Check List**.

If the instrument is damaged, inform the carrier immediately, notifying our company. If after having tested it, the GSM fails to meet rated performances, please contact our after sales service, see paragraph 7.3-Customer Support.



Protect the environment!

Dispose of packaging properly, according to existing and applicable waste management rules and regulations.

3.2 Notes on the Instruction Manual

The 47200 Instruction Manual included in package (on the USB pen-drive) is necessary for the correct installation and operation of the instrument.

We recommend reading the manual with attention, as it is essential for the correct installation and operation of the instrument. Please save the manual, ready to be consulted by the qualified personnel who use the instrument. Print it, only if necessary.

Our Instruction Manuals are available as free download on our web. For any additional information and/or assistance, you are welcome to contact our Service Department (see paragraph 7.3-Customer Support), specifying the serial number of the instrument.

3.3 Assembling the Instrument

Position the base plate on a stable and reasonably flat bench or table surface. Fit the transducer on the upright pole, and fix it at the desired height by the black knob.

3.3.1 Connections

Plug the force transducers and - if you plan to use it - the foot pedal into the GSM electronic unit, by using the connectors located in the back panel. Do not connect the electronic unit to the PC yet.

The GSM electronic unit is battery operated; the instrument is shipped with fully charged battery.

Its internal rechargeable battery is charged automatically when external power is supplied to its miniature USB 'B' socket, either from a PC or from a suitable USB power adapter.

3.3.2 Installing the DCA Software

The software provided with the Grip Strength Meter (on the USB pen drive) should be installed on a suitable Windows PC, running Windows Vista, 7, 8 or XP.

First, install the software, by double-clicking on the Start Ugo Basile.exe file; follow the instructions until installation is complete.

Then, connect the GSM via a USB port. The GSM will be automatically recognized and the drivers will install automatically, by simply following the instructions on the screen.

The Ugo Basile DCA Software can now be launched from the desktop icon or from the Program Files folder.

See section 6, for instructions on how to use the Ugo Basile DCA Software.

3.4 Intended Use

The Grip Strength Meter is intended for investigation use on laboratory animals only.

3.5 General Safety Instructions

The following guidelines must be followed to ensure safe operation.

- ! **DO NOT** attempt to open or perform any service work
- ! **DO NOT** connect up human subjects



3.6 Additional Safety Consideration

- a. Use original accessories and spare parts only, see also paragraph 8-ORDERING INFORMATION
- b. Do not operate the instrument in hazardous environments or outside prescribed environmental limitations (i.e. +18C°/+24C°, 60% relative humidity, non-condensing);
- c. Do not spray any liquid on the connectors;
- d. Keep inflammables far from the instruments.

UGO BASILE DOES NOT ACCEPT ANY RESPONSIBILITY FOR PROBLEMS OR HARM CAUSED TO THINGS OR PERSONS, ARISING FROM:

- incorrect electrical supply;
- incorrect installation procedure;
- incorrect or improper use or, in any case, not in accordance with the purpose for which the instrument has been designed and the warnings stated in the instruction manual supplied with the instrument;
- replacement of original components, accessories or parts with others not approved by the manufacturer;
- servicing carried out by unauthorized personnel

see also paragraph 7-MAINTENANCE.

4 OPERATION

The GSM device is a simple and easy-to-use device. As usual in any behavioural measurement, care must be taken by the operation, to guarantee a consistent performance of the test.

When using the GSM, we can envisage two main potential sources of experimental variability: the first is the animal emotional state, which can be overcome by preliminary habituation procedures and the second is the rate at which the operator applies the force.

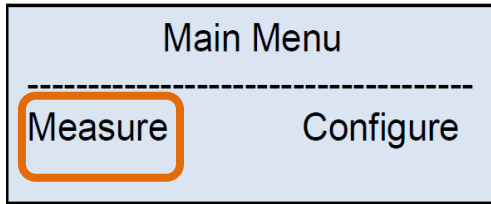
The GSM device incorporates tools to help the operator consistently apply the desired amount and rate of force on the animal; the **ratemeter** on the electronic unit display, and the **slope function**, on the software, see also paragraph 1.1.1. These tools are described in the following paragraphs.

4.1 Getting Familiar with the Command Keys

After charging GSM for at least 1 hour, plug in the transducer and turn the instrument **ON** by pressing the **ON/OFF** button.



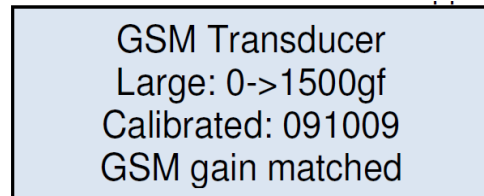
Once the introduction is completed, the initial menu will appear as below.



The lower line of the display indicates the current functions of the three **soft buttons** labelled F1, F2 and F3.

In this case, F1 is **Measure**, F2 is not being used and F3 is **Configure**.

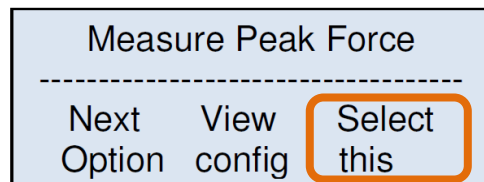
Press **Measure**. A screen will appear similar to:



After a few seconds, the instrument completes an **Autozero** operation and then the display shows.

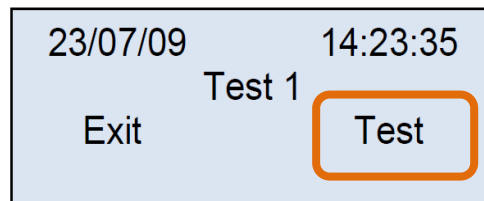


Do not apply force while the instrument is autozeroing



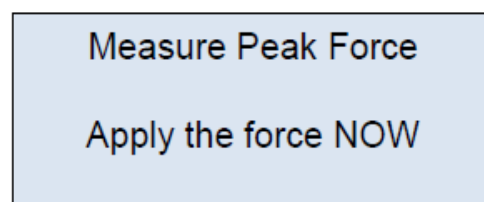
Note that, in this case, all three **soft buttons** are in use.

Press **Select this**. The following display will appear:



Check that no force is being applied to the connected transducer (i.e. do not pull the animal yet), then press **Test**.

The GSM will now check the transducer zero and then display:



At this point the force can be applied to the transducer, (i.e. the animal can be pulled).

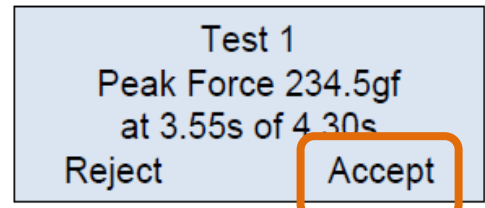


Do not apply more than 1500gf

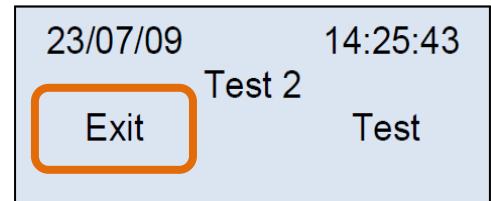
Excessive force can permanently damage the transducer!

For as long as the force is applied steadily, the **Force** value will indicate the pulling force in gf and the **Time remaining** will indicate the number of seconds left to complete the test.

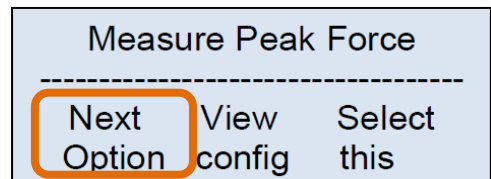
Once the animal releases the grasping tool, the screen changes, indicating the peak force, the total testing time, and the time at which the peak force occurred:



Press **Accept** (or Reject) and the screen changes to:

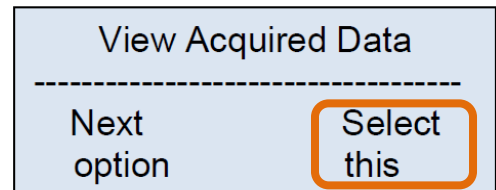


Press **Exit** to return to the Measure menu:



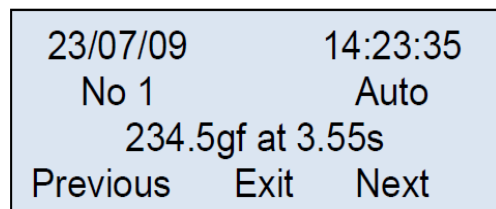
By pressing **Next option** you will reach “View Acquired Data”.

Press **Select this** and the stored data will be loaded in 1-2 seconds.



The display shows the most relevant information for each measurement:

- Date and Time
- Progressive number of the measurement
- Measurement Mode (Automatic or Foot Pedal)
- Peak Force
- Peak Time



The measurements can be browsed by simply pressing **Next** or **Previous**.

Press **Exit** to return to the main menu.

Press the **ON/OFF** button to switch GSM OFF.



NOTE :

If the GSM does not behave as described, please repeat all the steps.

If the problem remains, charge the internal battery and reset the GSM manually by pressing with a needle into the small **reset** hole located to the right of the display.



For further assistance, please contact Ugo Basile, see paragraph 7.3-Customer Support.

4.2 Routine Operation of the Instrument

4.2.1 Turning the instrument ON / OFF

The Grip Strength Meter is turned **ON** from the OFF state, by pressing the **ON/OFF** button.



The same ON/OFF button turns the GSM OFF from most display screens.

4.2.2 Menu Operation

The GSM is operated through a number of menus by pressing the three **soft buttons**, F1, F2 and F3 below the display. The current functions of these **soft buttons** are indicated by the lower line/lines of the display. The upper line shows the current option.

Here's a typical display in the **Measure** menu:

Measure Peak Force		

Next	View	Select
option	config	this

The user steps through the available options by pressing **Next option** and then selects the required option by pressing **Select this**.

4.3 Main Menu

The **Main Menu** is the first menu which appears when GSM is switched **ON**.

Main Menu	

Measure	Configure

Pressing **Measure** leads to the menu of options relating to measurements and data transfer to the PC.

Configure menu allows the user to adjust a number of parameters to suit particular measurement requirements and includes an option to restore the factory default values for these parameters.

4.4 Measure Menu

When **Measure** is selected from the **Main Menu**, the following window appears for a few seconds, showing:

Transducer
47200-002: 0->500gf
Serial No. 070214

- The force range
- The transducer serial number

The available **force ranges** (see paragraph 4.4.4-Change Max Force) are

- 0-100gf
- 0-500gf
- 0-1500gf

GSM will then automatically complete an **Autozero** routine:

Do not apply force
To the transducer
At this time.
AUTOZEROING

IMPORTANT:

Do not apply force during the Auto-zeroing phase.



Then the initial screen of the **Measure** menu will then be displayed:

Measure Peak Force

Next option	View config	Select this
----------------	----------------	----------------

The **Measure** menu consists of 6 options, which will be described in details in the next paragraphs:

- Measure Peak Force, see paragraph 4.4.1
- View Acquired Data, see 4.4.2
- Transfer Data to PC, see 4.4.3
- Change Max Force, see 4.4.4
- Memory Status, see 4.4.5
- Erase Memory, see 0

The user steps through the available options by pressing **Next option** and then selects the required option by pressing **Select this**.



Please note that the descriptions given below assume the factory default values for the configuration settings.

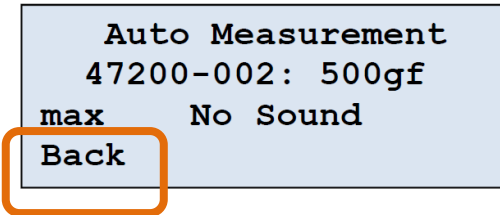
The effects of altering these settings will be discussed later.

4.4.1 Measure Peak Force

Measure Peak Force

Next option	View confia	Select this
----------------	----------------	----------------

In the **Measure Peak Force** menu shown before, press **View config** to view the configuration under use, as shown in the example below.

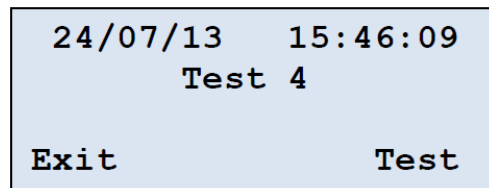


The display shows that:

- the measurement will be terminated automatically by releasing the pressure on the transducer at the end of the test (Auto Measurement), i.e. when the animal loses grip and releases the bar.
- the measurement force-scale is 500gf
- the warning sound above a particular force threshold is switched OFF

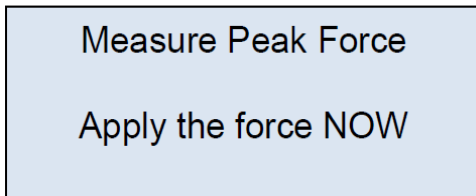
Press **Back** to return to the **Measure Peak Force** display.

Pressing **Select this** at the **Measure Peak Force** screen, gives a display similar to the following, which shows the current date and time and indicates that the next test would be the fourth test to be stored since GSM's memory was last erased.



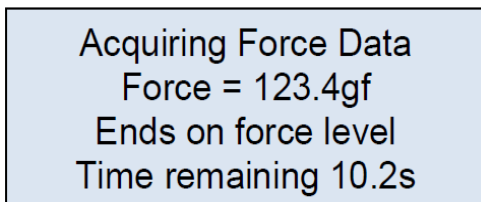
If **Test** is pressed, the instrument first completes the **autozero** and **checking offset** procedures, during which it is important not apply force.

Then the following display appears:



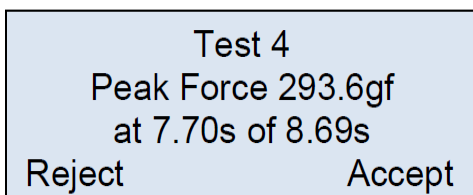
The user should now perform the measurement!

As soon as the initial force threshold is reached (this setting can be changed by the configuration menu, see section 4.5), the display shows:



The **Force** shows the current applied force in gf while **Time remaining** counts down in 0.05s steps from the maximum measurement time which may be adjusted up to 30s (default 15s).

Normally, the test is terminated either by releasing the force on the transducer (default) or by pressing the external foot switch. In either case, the display shows typically:



where the **test number**, the **peak force** appear, and the **time** appear.

Speaking about time, the first figure, 7.70s in our example, indicates the **peak time** (i.e. the latency time of the animal response), while the second figure, 8.69s, indicates the **total length** of the measurement.

At this point, the user must choose whether to **Reject** or **Accept** the results of the test.

If the result is rejected, the user is given the option to repeat the previous test (**Test**) or finish making measurements (by pressing **Exit**, which brings back to the Measure Peak Force Menu).

```

Result Rejected
Repeat this test?

Exit                Test
    
```

Similarly, if the result is **Accepted**, the data are stored in GSM's memory and the user is given the option to finish making measurements (**Exit**) or do another test (**Test**).

If the **Maximum measurement time** is exceeded during the test, the test is terminated automatically.

```

Measurement time
was exceeded

Begin                Repeat
again                test
    
```

Pressing **Begin again** effectively returns the user to the first Measure Peak Force screen, while **Repeat test** allows the user to repeat the current test.

From the Measure Peak Force screen, press **Next option** to View Acquired Data.

4.4.2 View Acquired Data

Selecting **View Acquired Data** from the **Measure** menu and pressing **Select this** displays briefly the total number of stored measurements, and then a screen similar to:

```

16/09/13  10:34:15
No 1                Auto
234.5gf at 003.55s
Previous Exit      Next
    
```

Which shows the first stored test (No. 1).

Press **Next** to view the next stored test (No. 2, in the example), **Previous** to view the test before the one being displayed, or **Exit** to return to option 1 of the Measure menu (i.e. measure peak force).

4.4.3 Transfer Data to PC

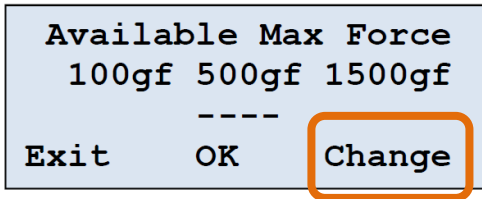
This option allows data stored in GSM's memory to be transferred to a PC. It requires that GSM is connected to a PC via the USB cable supplied and that the PC is running the DCA software provided with the instrument. Detailed operation is covered later in this manual under **PC Software**, see paragraph 6.

If this option is selected when the instrument is not connected to a PC which is running appropriate software, GSM displays **PC not available** for a few seconds and then returns to the first option on the Measure menu.

4.4.4 Change Max Force

The next option enables the user to select the maximum force, among the available ranges:

- 0-100gf
- 0-500gf
- 0-1500gf

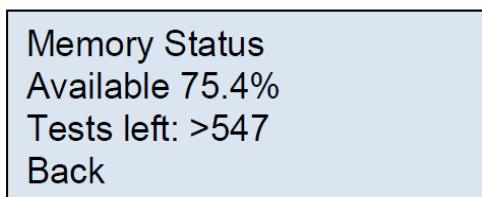


The current selection is indicated by the underlining, in our example 500gf.

Change the setting by pressing **Change**, and confirm with **OK**, or **Exit**, if don't wish to modify the current selection.

4.4.5 Memory Status

It is possible to check the current status of the internal memory (the remaining space and number of tests), by selecting **Memory Status** from the Measure menu:



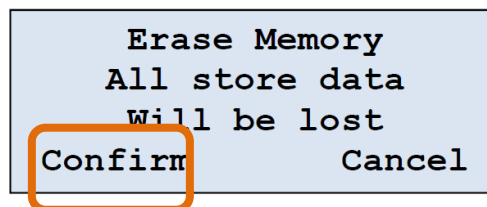
This example indicates that **75.4%** of GSM's data memory is **available** to store further measurements.

The estimate of **>547** for **Tests left** is based on the assumption that future measurements will be similar in length to those already stored; in fact, the number of tests that can be stored, depends on the duration of each test.

Press **Back** to return to the first option in the **Measure** menu.

4.4.6 Erase Memory

Selecting the option Erase Memory from the Measure menu displays:



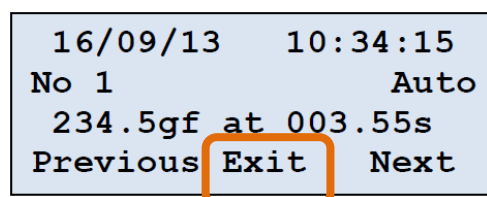
Press **Confirm** if it is your intention to **erase all the data** stored in the memory. The configuration settings will not be changed.

Press **Cancel** to return to the start of the **Measure** menu, without cancelling the data.

The **Erase Memory** option is offered automatically after data are transferred to the PC.

4.4.7 Back to Main Menu

Press **Next option** until you reach any option (except Measure Peak Force), then press **Exit** to return to the **Main Menu**.



4.5 Configure Menu

When **Configure** is selected from the **Main Menu**, the following screen is shown:

```

Configure Menu
-----
Set           Restore
Config Exit Defaults
    
```

The Configure menu allows the user to adjust a number of configuration settings in GSM; these include options related to the measurement process, such as whether the measurement is ended automatically by removing the applied force or manually by pressing the foot trigger switch, but also covers more general settings such as the display brightness setting time and date, etc.

For each configuration option, it is possible to

- Go to the **Next** option
- **Change** the configuration
- **Exit** from the Configuration Menu.

```

Configuration Menu
Target Force Rate
          120gf/s
Next   Exit   Change
    
```

The current value is either indicated in the third line (as in the above example, 120gf/s), or marked by the underlining, as in this screen, where “force lvl” is the selected option.

```

Configuration Menu
Force lvl  Foot pedal
-----
Next   Exit   Change
    
```

Select the correct option, adjust if necessary, go to the next, or press Exit.

When **Exit** is pressed, you will be asked whether to save the changes to configuration, or not.

```

Save Changes
To Configuration

No           Yes
    
```

4.5.1 Configure Menu Options

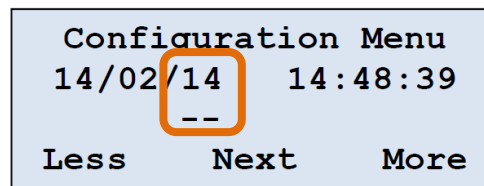
The **Configure** menu consists of **14 screens** by which the user may adjust the following features of GSM.

The factory **default settings** are shown in the brackets, in red color:

1. Adjust the **target force rate**, which is the ideal rate at which the stimulus force should be applied (**120gf/s**). Note that this setting also has an influence on the rate-meter control and the PC slope function (see paragraphs 5.4 and 0)
2. Showing force **rate-meter** or **text** during tests (**Text**). See paragraph 5.4
3. How the measurement is **ended**: force level or foot pedal switch (**Force level**)
4. Make a **warning noise** if a preset force is exceeded (**None**)

5. Adjust the warning **noise threshold** value; it may be adjusted from 100gf to 1500gf in 10gf steps with a default value of **300gf**.
6. Adjust the force value (as a percentage of the full scale range) which **triggers the start** of the measurement, it may be adjusted from 0.4% to 5.0%, in 0.1% steps with a default value of **002.0%**.
7. Adjust the **maximum time** allowed for a measurement; adjustable from 10s to 30s in 1s steps with a default value of **15s**.
8. Use **Subject Numbers** or test only (**only Test**)
9. Store every measurement regardless, or only **good measurements**, i.e. accepted by the user (**Only good**)
10. Store the force **waveform** or only the **peak** value (**Waveform**)
11. Show **abbreviated configuration** settings on the Measure menu (**Do not**)
12. Show the **offset value** before each measurement (**Do not**)
13. Adjust the **display brightness**, from 1 to 10, with a default value of **10**.
14. Adjust Clock (see also paragraph 5.3-Calendar Clock)

To set current date and time, press **Change**; the underlining shows the parameter being changed.

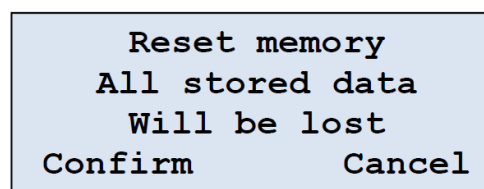


Decrease or increase the value by **Less** or **More**; move to the following parameter (year, month, day, hour, minute, second) by pressing **Next**. After setting seconds, pressing Next will leave the menu level.

Return to the **Main Menu** by pressing **Exit**; you will be asked whether to save the changes to configuration, or not, see paragraph 4.5.

4.5.2 Restore Default Values

Pressing **Restore defaults** on the **Configure Menu** screen shows:



Pressing **Cancel** returns control to the **Main Menu** without altering the configuration settings or the data memory.



Pressing **Confirm** clears the data memory and restores the factory default configuration values as shown above.

5 OTHER RELEVANT FEATURES OF GSM

5.1 Battery Low Warning

The voltage of the internal rechargeable battery used in GSM is monitored continuously during routine operation. Two warning levels are provided.

If the battery is low but still usable, the dashed line of most menus will include **Battery Low**.

For example, the first **Measure** screen will become:

Measure	Peak	Force
----	Battery	Low
Next	View	Select
option	config	this

At this time, GSM may still be used but the USB lead should be connected to an active PC or a USB power adapter to **charge the battery as soon as possible**.

If the battery is so low that GSM cannot operate, then the instrument switches OFF immediately. Data which have been stored will be retained but GSM may not be used until it is connected to an active PC or a USB power adapter using the USB lead provided.

Clearly, it is not advisable to allow the battery to drop to this critical level.

5.2 Memory Limit Warning

Each time the user starts a new measurement, GSM checks that data memory is sufficient to store the new datum.

If the available memory is too low, the request is refused and the user is advised to transfer the stored data to a PC and/or to erase the existing data stored in memory.

In practice, this critical situation should never occur, as the user is given a clear warning each time a measurement is made, when the space available is not sufficient for at least 10 measurements.

The GSM memory will store more than 500 tests.

5.3 Calendar Clock

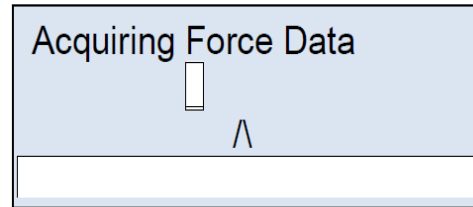
The date and time settings of GSM's internal clock may be adjusted manually, see paragraph 4.5.1, option 14) .

The GSM internal clock, which maintains real time even while GSM is switched off, is synchronised automatically with the PC to which it is attached.

Synchronising occurs when data is downloaded from GSM to the PC and when force measurements are monitored live on the PC.

5.4 Applied-Force Rate-Meter

If the **Rate-Meter** option is selected in the configure menu (see paragraph, option 2), then, during each measurement, the GSM display appears like the one on the right:



The white rectangle on the second line moves left or right of the centre marker when the applied force rate is respectively below or above that required to maintain the selected **target force rate** (see option 1, paragraph 4.5.1).

In the above example, the applied force is below the ideal level for the specified target force rate. Try to **match the rectangle and the marker**, in order to apply a consistent pulling force, and hence obtain consistent results (see paragraph 1.1.1).

The fourth line of the display is a **time progress bar**, indicating how much of the available measurement time has been used.

5.5 Updating the GSM firmware

The hardware used in GSM is very flexible and many of GSM's features are determined by its internal software program or firmware, as it is often called.

When improvements and additions are made to the firmware, existing users may update easily to the new version.

The associated PC software includes an option to update the GSM firmware.

6 USING THE PC SOFTWARE PROVIDED WITH GSM

This section assumes that the **DCA PC** software has been installed successfully as described in paragraph 3.3.2-Installing the DCA Software.

The DCA software manages the GSM, the PAM and eVF instruments by Ugo Basile.

6.1 Note on the GSM PC Software

The DCA software is a guide: specifically, this software is a **monitoring tool** and it is not intended to drive the device (the software does not substitute for the controller); all operations must therefore be driven from the GSM control unit.

This includes changing the slope of the GSM target rate displayed on the PC monitor, which is in fact done from control unit. In fact the slope function on the PC reflects the Target force rate set in the configuration menu, see paragraph 4.5.1-Configure Menu Options.

6.2 Starting the DCA Software

First connect the GSM device to the PC using the supplied USB cord, then run the **Ugo Basile DCA (Data Collection Application) Software** program from the Windows Start Menu or from the DCA icon on the desktop.

In the screen which appears, the Info Panel informs “**Device found**”:



To proceed with the experiment press the “**Use Device**” button.

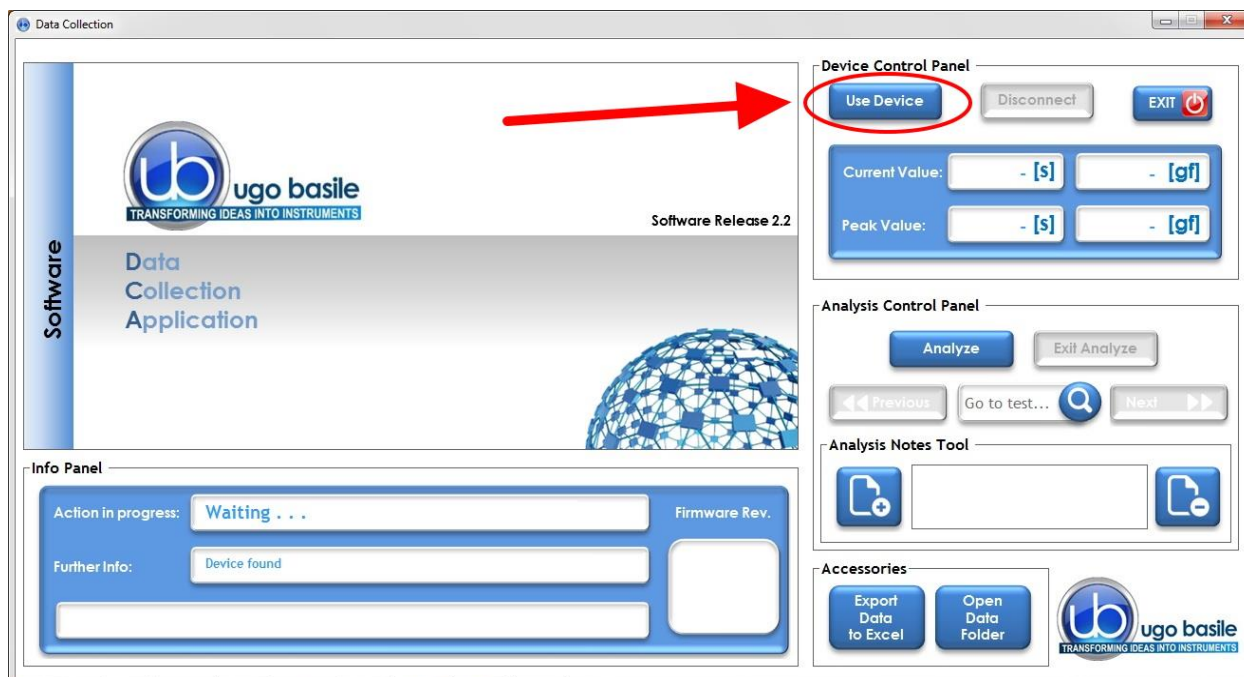


Figure 4 “DCA Software”

Wait until the info Panel confirms “**device connected**”.



6.3 Starting the Experiment

Now that the software is ready to work, the test-monitoring window will appear:



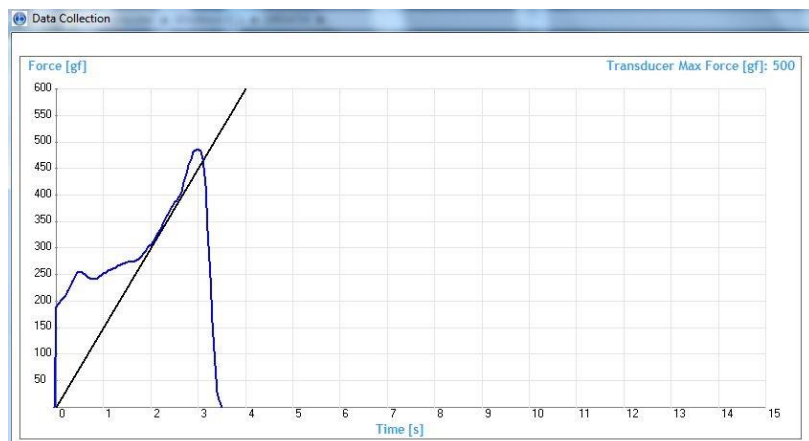
Figure 5 “Test Monitoring”

The test-monitoring window includes the following sections:

6.3.1 Main Box

As soon as the experiment is started from the device, the main box on the left will continuously plot the pulling-force intensity along time.

Note that the pulling force appears as a **blue line**, overlapping a straight black line: the latter indicates the desired target force rate, as set via in the instrument configuration menu (slope feature)



See paragraphs 1.1.1-Consistent Results and 6.5-Slope Function.

This function helps the experiment to apply the pulling force consistently, by simply making sure that the blue trace lays on the black line.

At the beginning of each new trial, the plot window refreshes so that just the current and latest one is visualized.

A caption on the top right of the window reminds the Transducer Max Force, as set in the instrument configuration menu.

6.3.2 Info Panel

The Info Panel indicates the action in progress (in these examples TEST MONITORING, and WAITING) and additional information regarding the action

In addition, the panel shows the current Firmware revision.



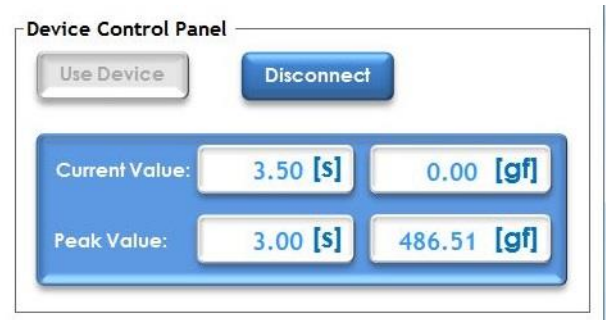
During the data Analysis, the panel shows specific data related to the selected file



6.3.3 Device Control Panel

From the Control Panel it is possible to start the software (USE DEVICE) or to disconnect it (DISCONNECT).

The current value and the overall peak are displayed in the related boxes, together with the time.



6.3.4 Analysis Control Panel and Notes Tool

All data files are stored in the folder **C:\UB Data** in sub-folders which are named according to the date of data transfer, in the format **YYMMDD**; for example, data transferred on July 23rd, 2013 will be found in the folder **C:\UB Data\130723**. All the trials conducted in the same experiment are saved in the same file.

Individual files, containing the downloaded data, are named automatically according to the date, followed by two letters which progress from **AA, AB, AC...** through to **ZZ**.

For example, the third set of data downloaded on July 23rd, 2013 would be stored in the file:

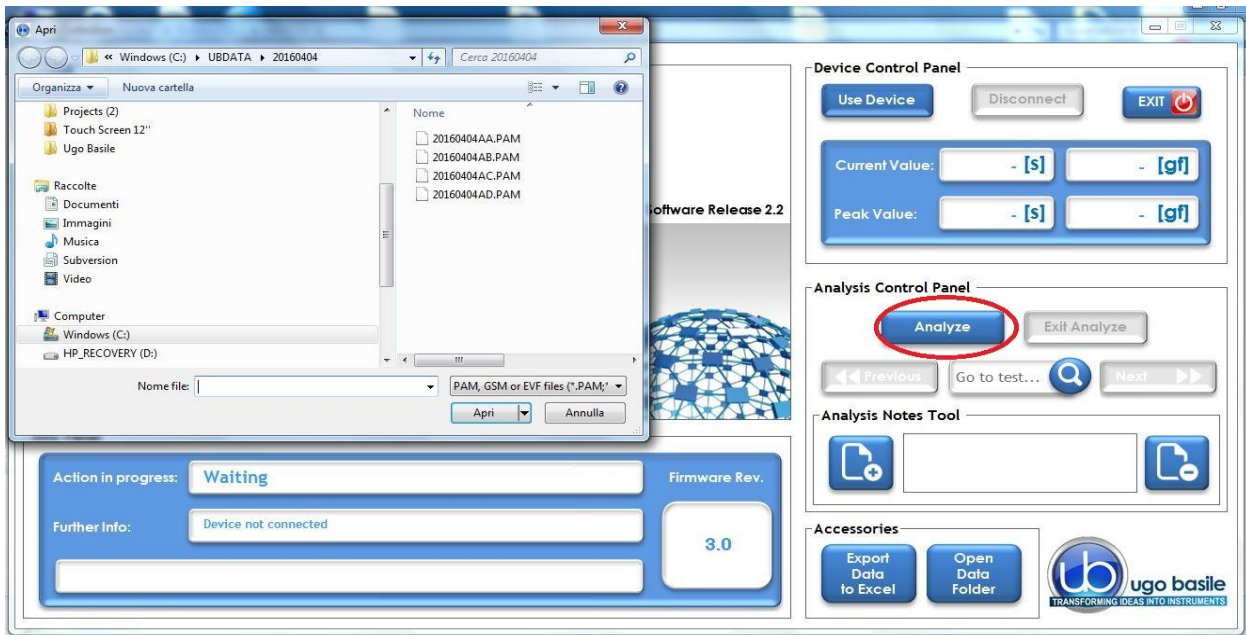
C:\UB Data\13\090723AC.PAM

where "PAM" is the extension of this proprietary software.

During the test, the Analysis panel is not active



Once the experiment is over and the data transmitted from the device to the computer, push the button “**Analyze**” to open the folder where the .PAM files are saved and stored during the test. Select the file from the window which automatically appears:



When opening the selected file, all the plots referring to the trials contained in the related experiment will be shown:

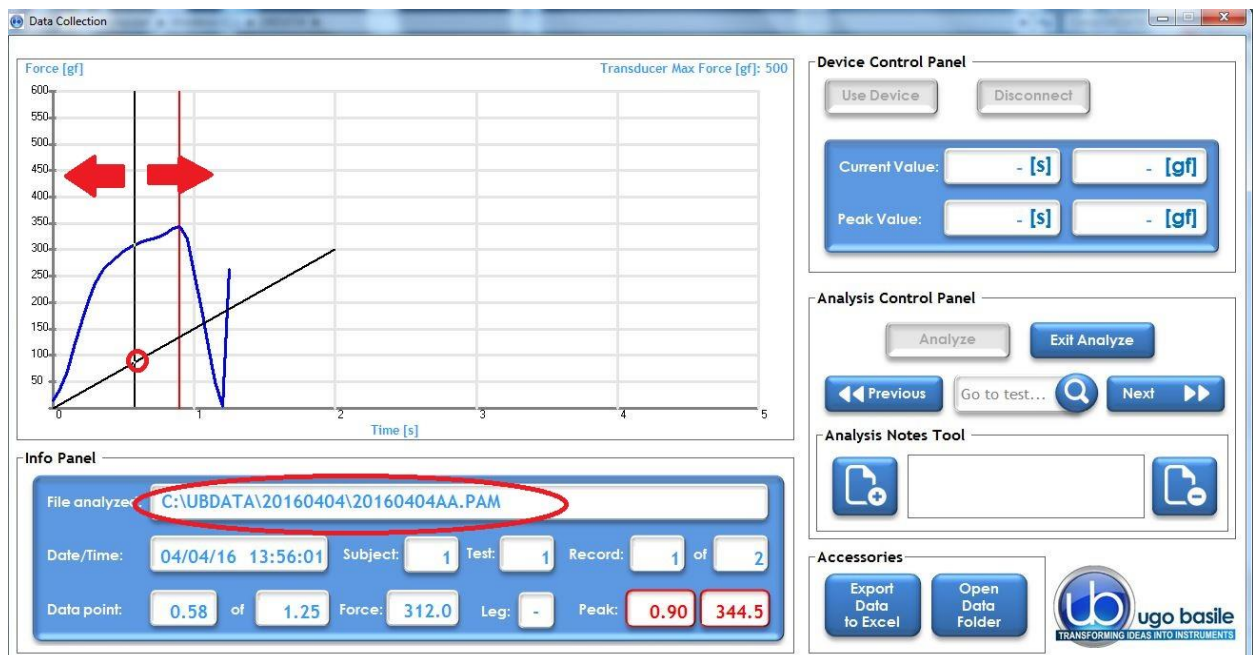
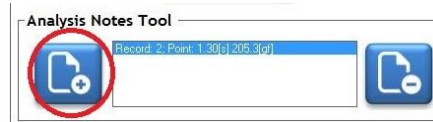


Figure 6 “Test Monitoring”

By moving the **black vertical line** (indicated by the arrows in the above screenshot) left or right along the slope, the user will be able to select a specific moment in the test.

To save it, select the **“Add Note”** button, left on the **“Analysis Notes Tool”**.

The note is remove by the button on the right.



Note that the Info Panel now shows the data relating to the point currently selected.

Moreover, the recorded peak measure is pointed out, associated with time.

6.3.5 Accessories

In this section you will find the Export Data to Excel and the Open Data Folder buttons.



6.4 Exporting and saving data

Once the analysis of the experiment is accomplished, it is possible to export the data to Excel or to open a data folder.



While the DCA PC software is not designed for statistical analysis, exporting the data using the DCA PC software creates a user friendly file compatible with Excel. One will find this automatically generated file to be most useful, because Excel seems to be the most common spreadsheet program which allows a researcher to perform whatever analytical statistics are preferred.

The data in the Excel file consists of columns for measurement number, peak force and peak position, filled with the values for each of the test downloaded.

When all the operations and experiments are completed, it is recommended to click “Disconnect” from the “**Device Control Panel**”, in order to close the connection between the device and the software.



6.5 Slope Function

By the “Slope” function, the experimenter can consistently apply the force (i.e. pull the animal) at the desired rate, by simply making sure that the blue trace lays on the black line, see paragraphs 1.1.1 and 6.3.1.

The graphic screen is a visual guide during the experiments; the applied pulling force is displayed as a blue line, while the straight black line (slope) shows the target force rate set from the device configuration menu, see paragraph 4.5.1-Configure Menu Options, option 1.

The target force is also indicated in the Info Panel, 150gf/s in this example.



The slope represents what it looks like when the force is applied in a linear increasing rate; one should think of the slope as the **ideal**, the “target” that the user should try to match as s/he is applying the force. Matching the two lines will assist an operator in applying the force smoothly and steadily; this is what we call “**slope function**”.

With practice, a researcher can become very skilled at steadily applying force, at a steadily increasing rate of application of the force, and really improve results.

The waveform is displayed until the user Accepts or Rejects the test, by using the buttons on the GSM control unit.

6.5.1 Changing the Slope

Remember, the GSM controller is the brain of the instrument and the software is only reporting information in the brain; the GSM PC software displays information provided by the GSM instrument. As the slope is the visual representation of the rate of application of force, to change the slope of the blue line in the software, one must change the rate of application of force.

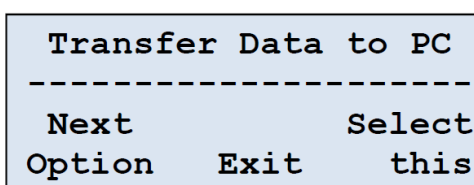
This rate is stored in the GSM controller, so one must return to the GSM controller, toggle through the selected menus to reach the proper instructions. When the rate of application of force is changed in the internal memory of the GSM controller, it will automatically change the slope of the blue line which is displayed in the software.

6.6 Downloading Data from GSM to PC

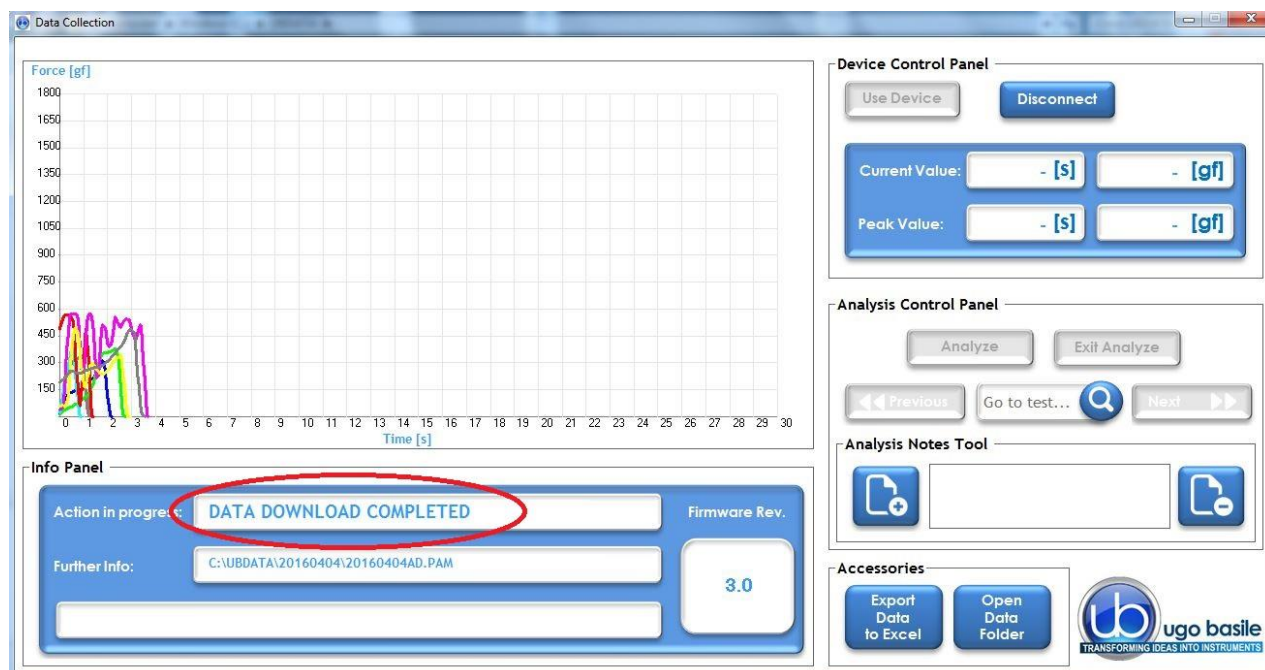
When working with the GSM not connected to the PC, all the data are stored inside the device memory. Data can be saved on the PC; data download is also controlled by the GSM device.

First, ensure that the controller is properly connected to the PC, and that the software is working properly.

Then, using the menu and buttons on the GSM controller, toggle through selections (**Main Menu > Measure > Next Option**) until the Transfer Data to PC appears on the blue display window of the GSM controller.



A progress bar in the Info Panel of the DCA software monitors the download: the same panel will confirm when the data download is complete.



Data can now be analyzed as described in paragraph 6.3.4



The **Transfer Data to PC** operation, also ensures that the GSM clock and the PC clock are synchronized.

If this is performed when the GSM has no stored data, it will only synchronize the GSM and PC clocks.

7 MAINTENANCE

While any service of the instrument ought to be carried out by Ugo Basile personnel or by qualified personnel authorized by UGO BASILE organization, this section of the instruction manuals describes normal maintenance procedures which can be carried out at your facility.

7.1 Charging the Internal Battery

The GSM battery is charged automatically when external power is supplied to its miniature USB 'B' socket, either from a PC or from a suitable USB power adapter.

The instrument is dispatched from the factory with a fully charged battery. However, it is recommended that the battery is charged before initial use. See also paragraph 5.1-Battery Low Warning.

7.2 Long Inactivity

The instrument does not require any particular maintenance after long inactivity.

7.3 Customer Support

For any further information you may desire concerning the use and/or maintenance of the GSM, please do not hesitate to contact our **service department** (or our local distributor) either directly or via our support page <http://www.ugobasile.com/support.html> :



UGO BASILE s.r.l.

Via G. Di Vittorio 2
21036 GEMONIO – Varese, ITALY



Phone : +39 0332 744574



service@ugobasile.com
logistics@ugobasile.com
sales@ugobasile.com

Before sending any instrument to our factory for repair, please contact our logistics department to obtain a return authorization number (RMA) and shipping/packing instructions.

We may not be held responsible for damages during transport due to poor packing; whenever possible, please use the original packing.

8 ORDERING INFORMATION

47200 GSM Grip Strength Meter, consisting of:

- 47200-001 Electronic Unit
- 47200-002 Force Transducer
- 47200-004 Black PVC Base w/13mm Upright
- M-LM 590 Trapeze (Rat)
- M-LM 588 Trapeze (Mouse)
- M-LM 589 T-shaped Bar
- 47200-325 Grasping Grid for Mouse
- 47200-326 Grasping Grid (partly blind)
- 38500-303 External trigger switch (foot pedal)
- 52010-325 USB Lead
- E-AU 059 Universal Power Supply
- E-AU 041 USB pen-drive, including
 - 47200-302 Instruction Manual
 - DCA Software

9 INSTRUMENT SPECIFICATIONS

Operation

Commands	via soft-buttons
Read-out	multifunction graphic display
Starting	via keys on the Controller front panel
Force Ranges	0-100gf, 0-500gf, 0-1500gf
Force Increasing Rate	monitored via the Rate-Meter or via the slope function on the PC
Force Response	in 0.1gf steps
Latency Time	in 0.1s steps
Connection to PC	via USB cable (A to mini-B) and GSM software
Power Requirement	either battery operated, or via USB cable connected to PC or universal converter (85-264 VAC, 50-60Hz)
Operating Temperature	10° to 40° C
Sound Level	Negligible
Pollution Degree	≤ 2

Physical

Total weight	4.8Kg
Shipping Weight	6.5Kg
Packing Dimensions	46x38x27cm

Warranty

47200 is covered by a 24-month warranty

10 BIBLIOGRAPHY

10.1 Papers Mentioning UB Grip Strength Meter - Mouse

- R. Barone et alia: “**Skeletal muscle Heat shock protein 60 increases after endurance training and induces peroxisome proliferator-activated receptor gamma coactivator 1 α 1 expression**” *Scientific Reports* 6(19781), 2016 (Mouse)
- L. Liu et alia: “**Protective role of SIRT5 against motor deficit and dopaminergic degeneration in MPTP-induced mice model of Parkinson's disease**” *Behav. Brain Res.* 281; 215-221, 2015 (Mouse)
- G.J. Huang et alia: “**Ectopic Cerebellar Cell Migration Causes Maldevelopment of Purkinje Cells and Abnormal Motor Behaviour in *Cxcr4* Null Mice**”. *PLoS ONE* 9 (2): e86471, 2014 (Mouse)
- R. Barone et alia: “**Endurance Exercise and Conjugated Linoleic Acid (CLA) Supplementation Up-Regulate CYP17A1 and Stimulate Testosterone Biosynthesis**” *PLoS ONE* 8 (11): e79686, 2013 (Mouse)
- N. Lange et alia: “**Behavioural and Pharmacological Examinations in a Transgenic Mouse Model of 2 early-onset torsion dystonia**” *Pharmacology, Biochemistry and Behavior* 97 (4): 647–655, 2011 (Mouse)
- T.J. Kornecook et alia: “**Isoform-Specific Effects of Apolipoprotein E on Cognitive Performance in Targeted-Replacement Mice Overexpressing Human APP**” *Genes, Brain and Behavior* 9: 182-192, 2010 (Mouse)
- D. Carbajal et alia: “**D-004, a Lipid Extract From Royal Palm Fruit, Exhibits Antidepressant Effects in the Forced Swim Test and the Tail Suspension Test in Mice**” *Pharmacology, Biochemistry and Behavior* 92: 465-468, 2009 (Mouse)
- D. Carbajal et alia: “**D-004, a Lipid Extract From Royal Palm Fruit, Exhibits Antidepressant Effects in the Forced Swim Test and the Tail Suspension Test in Mice**” *Pharmacology, Biochemistry and Behavior* 92: 465-468, 2009 (Mouse)

- D. Lafont et alia: “**A Novel Role for Receptor Like Protein Tyrosine Phosphatase Zeta in Modulation of Sensorimotor Responses to Noxious Stimuli: Evidences from Knockout Mice Studies**” Behav. Brain Res. 201: 29-40, 2009 (Mouse)

10.2 Papers Mentioning UB Grip Strength Meter – Rat

- V. Massicotte et alia: “**Prolonged Performance of a High Repetition Low Force Task Induces Bone Adaptation IN Young Adult Rats, but Loss in Mature Rats**” Exper. Gerontology 72 : 204-217, 2015 (Rat)
 - M. Savic et alia: “**Behavioural Characterization of Four Endemic Stachys Taxa**” Phytother. Res., 2010 (Rat)
 - A. Coluccia et alia: “**Developmental Omega-3 Supplementation Improves Motor Skills in Juvenile-Adult Rats**” Int. J. Devl Neuroscience 27: 599-605, 2009 (Rat)
 - A. Coluccia et alia: “**Late Embryonic Exposure to All-Trans Retinoic Acid Induces a Pattern of Motor**” NeuroToxicology 30: 1120–1126, 2009 (Rat)
-

Notes

A series of horizontal dashed lines for writing notes.



Notes

A series of horizontal dashed lines for writing notes.





CE CONFORMITY STATEMENT

Manufacturer **UGO BASILE srl**
Address Via G. di Vittorio, 2 – 21036 Gemonio, VA, ITALY
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We hereby declare that

Instrument. **GRIP STRENGTH METER**
Catalog number **47200**

*It is manufactured in compliance with the following European Union Directives
and relevant harmonized standards*

- *2004/108/CE relating to electromagnetic compatibility*
- *2011/65/UE on the restriction of the use of certain hazardous substances in electrical and electronic equipment*

Account Manager

Adriano Basile

Nome / Name

April 2014

Date


Firma / Signature