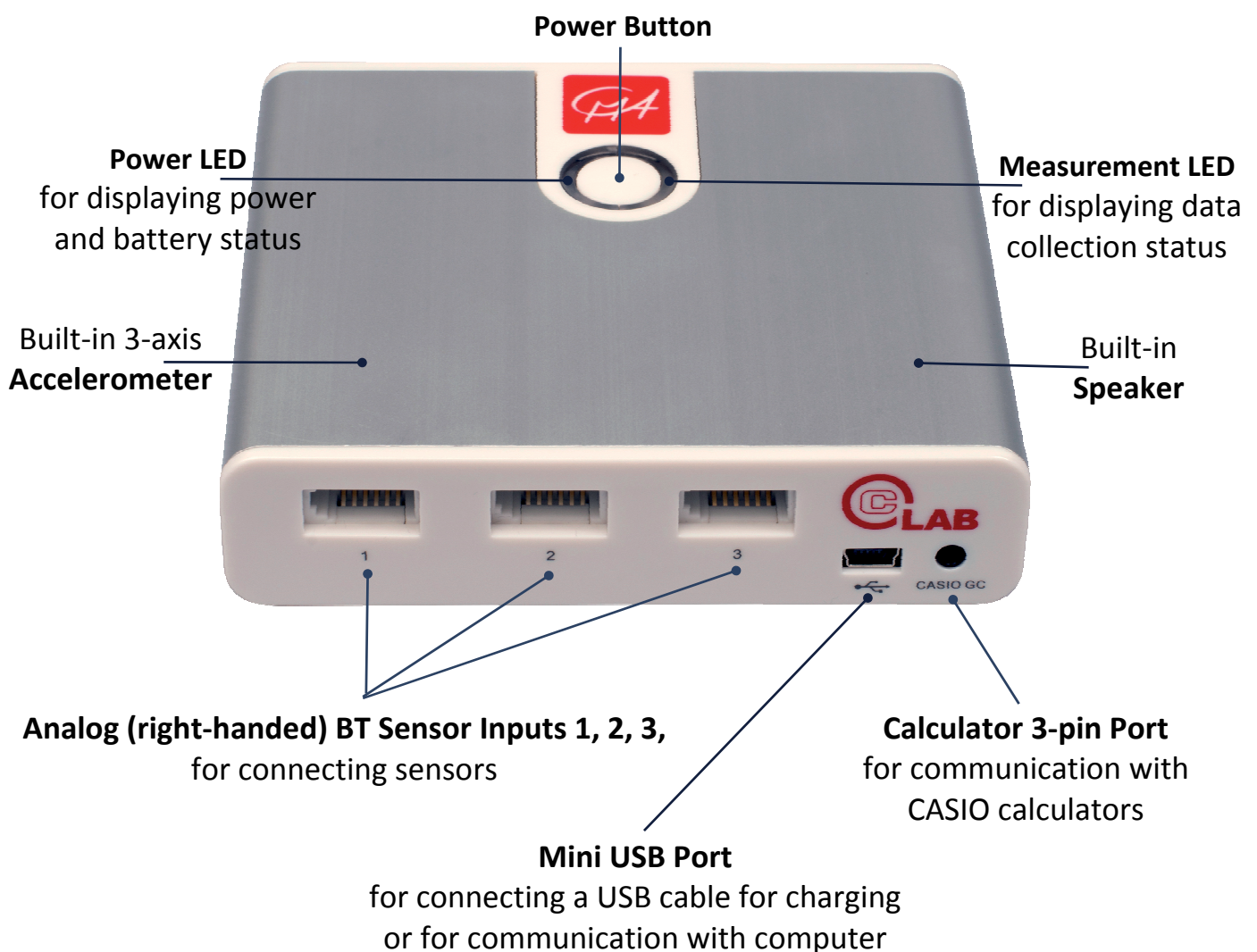


CLAB is an easy-to-use portable data-logger for Mathematics, Science and Technology Education that can be used with a CASIO Graphic Calculator equipped with the E-CON program, with a PC computer and standalone, in the field and in the classroom.

CLAB is equipped with its own processor and memory, enabling measurements at high sampling rates up to 100 000 Hz with accurate independent timing. It has FLASH memory to allow easy upgrade of the internal system software and to store measured data.

For connecting sensors CLAB has three BT (right-handed) sensor inputs, which support CMA sensors. Additionally CLAB has a built-in 3-axis accelerometer*.



The full CLAB User's Guide can be downloaded from CMA website www.cma-science.nl.

ITEMS INCLUDED WITH CLAB

CLAB is delivered with:

- USB Cable,
- USB Power Adapter,
- BT01 Temperature sensor (-40 .. 140 °C), and
- BT02 Voltage sensor BT02 (-10 .. 10 V).



POWER BUTTON

CLAB Status	POWER BUTTON	ACTION
OFF	Press	Turns CLAB on The left LED blinks red and turns green when the device is ready.
ON	Press and hold for 2 sec and release	Turns CLAB off Press until the left LED becomes red then release, the device turns off.
ON	Press and hold for 6 sec and release	Resets CLAB (use only when the device does not respond) Press and hold, after 2 sec the left LED becomes red, after 6 sec the LED starts to blink, then release, CLAB starts.
ON CLAB waiting for triggering	Press	Manually triggers the data collection Press the button when the right LED is blinking blue.
ON CLAB is sampling	Press	Stops data collection Press the button when the right LED is blinking green.
ON CLAB ready for data collection	Press	Starts data collection or collects a single measurement (Only available when the device works standalone *) Press the button when the right LED is blue.

POWERING CLAB

A rechargeable battery (Lithium-Ion battery, 3.7 V, 1200 mAh) located in the internal battery compartment, powers **CLAB**. **CLAB** is delivered with its battery partially charged. Use **ONLY** the approved rechargeable batteries provided by CMA.

To charge battery

- Connect the provided USB cable to the mini USB port of **CLAB**.
- Connect the other end of the USB cable to the provided USB power adapter and plug this adapter into a standard power outlet.
- Or connect the other end of the USB cable to a free USB port of your computer. Notice, that the efficiency of charging via a USB port, is limited by the maximal current provided by the USB socket.



Backside of **CLAB** with a battery placed in its battery compartment.

POWER LED

The left **Power LED** indicates the power and battery status.

To prolong battery life, CLAB turns automatically off after 10 minutes of inactivity.

POWER LED	CLAB STATE
OFF	CLAB is turned Off and not being charged
ON, together with right LED The LED color depends on the battery level Orange: battery is being charged Green: battery fully charged	CLAB is turned Off and being charged
ON The LED color depends on the battery level Green: battery full (battery level is between 80% and 100%) Blue: battery good (battery level is between 20% and 80%) Red: battery low (battery level is less than 20% and needs to be charged)	CLAB is turned On and not being charged Note: powering CLAB in this situation may cause faulty battery level indication

MEASUREMENT LED

The right **Measurement LED** indicates the data-collection status.

MEASUREMENT LED	CLAB STATE
OFF	No data collection
ON Blue	Ready for data collection
ON Blinking Blue	Waiting for trigger conditions. Data collection starts automatically after the trigger conditions are met. To start the data collection manually, press the Power Button.
ON Blinking Green	Sampling data
ON Red	Error

SPEAKER

Built-in speaker generates sounds to indicate different events. See **CLAB User's Guide** for details.

SENSOR INPUTS

For connecting sensors **CLAB** has three analog BT sensor inputs with input voltage ranges 0 .. 5 V and -10 .. 10 V. These inputs support all CMA sensors (for a complete list of available CMA sensors consult the CMA website www.cma-science.nl). Digital sensors, such as a Photogate, a Radiation Sensor or a Motion detector, are provided by CMA with analog BT (right-handed) plugs and can be connected to **CLAB**.



Provided by CMA Motion Detector BT55i has an analog BT (right-handed) plug and can be directly connected to **CLAB**.

WAYS OF WORKING WITH CLAB

CLAB with a CASIO Graphic Calculator

CLAB can be used with CASIO Graphic Calculators on which the E-CON program is installed. When connected to a calculator **CLAB** is controlled by the E-CON program, running on the calculator. The collected data are transferred to the calculator and the measurement can be followed and analyzed on the calculator. To connect **CLAB** to a CASIO Calculator you need a data communication cable with 3-pin jack connectors. This cable is provided with your CASIO calculator. Detailed information about the use and features of E-CON can be found in the respective calculator manual.



CASIO Calculator fx-CG 20 connected to **CLAB** via a data communication cable.

Calculator manuals can be found on the CASIO website (<http://edu.casio.com/support>).

CLAB with a PC computer

Via the provided USB cable **CLAB** can be connected to a USB port of a PC computer and work as a lab interface. The Coach or Coach Lite programs (version 6.6 or newer) running on the PC controls **CLAB**. The collected data are transferred to the computer and the measurement can be followed and analyzed on the computer screen. The USB cable is provided with your **CLAB** data-logger.

CLAB standalone^{*}

When using **CLAB** as a standalone device, **CLAB** controls the data collection process; it collects and stores the measurement data. This is very useful for remote data collection e.g. outside the school. The experimental setup is prepared using the E-CON application on a CASIO Graphical Calculator or the Coach software on a computer and uploaded to **CLAB**. The measured data are stored in the **CLAB** memory and can be downloaded into a calculator or a computer after the measurement is finished.

^{*} This functionality will be available starting from April 2015. Firmware update will be needed. Check the CMA website www.cma-science.nl for the latest updates.