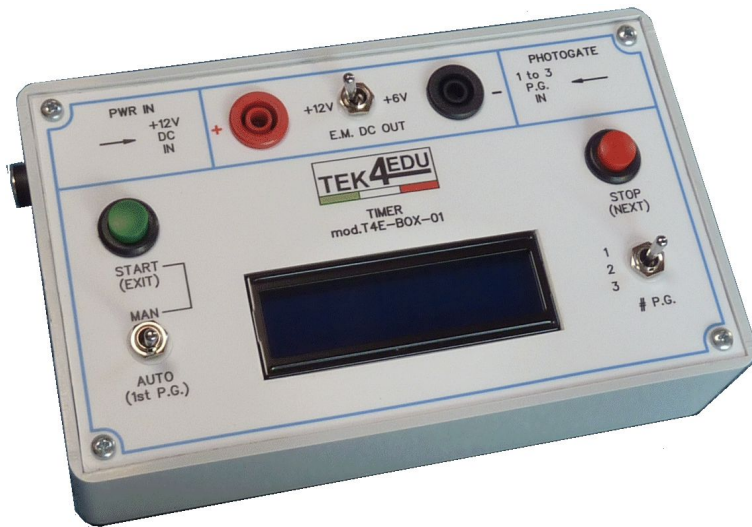


TIMER mod.T4E-BOX-01



**T4E-BOX-01-BT
version**

TECHNICAL SPECIFICATIONS (cont.)

The **Timer mod.T4E-BOX-01** unit is a modern and compact time counter (chronometer) managed by a microcontroller that can directly manage **an external electromagnet** and **from one up to three photogates** with a resolution of 1/100000 sec (0.01ms).

It's available a **Bluetooth** version with **Android App** that allows simultaneous display of all data collected on a larger screen (smartphone or tablet).

It can be used in experiments for the calculation of "g" or with use of rail.

It has two operating modes (switch selectable): **Manual** and **Automatic**.

Manual: the electromagnet is powered and when the operator presses the green **START** button, the electromagnet is de-energized and the measurement starts.

It is possible to connect **from one to three** photogates.

Automatic: the electromagnet is not powered and the measurement starts "automatically" (without pressing any key from the operator) when the object crosses the first photogate.

It is possible to connect **two to three** photogates: the first photogate is necessary to start the measurement.

In both **manual** and **automatic** modes it is possible to use the red **STOP** button to stop the measurement instead of the photogate. In this way it is possible to use the Timer for experiments in which photogates are not used, such as a **manual stopwatch**.

TECHNICAL SPECIFICATIONS

Measurements:

- time interval from the start of the measurement until the arrival at the photogate (**T1**, **T2** and **T3**): 999999 ms max
- time interval that the object takes to cross the photogate (**w1**, **w2** and **w3**): 9999 ms max
- measurement resolution: 1, 1/10, 1/100 of a ms (automatic)

Display:

- 16 characters x 2 lines, blue LCD with white LED backlight
- displays the measurements of the input voltage (P.S.) and the output voltage supplied to the electromagnet
- displays step-by-step information that helps to perform the correct setting up of the measurement and the choice of settings to be made on the unit
- displays information on any errors or wiring anomalies: for example excessive current absorption or short circuit of e.m.
- displays information on the status of the unit based on the selections: eg. electromagnet output enabled or disabled

Microcontroller:

- manages displays, switches, power supply section, electromagnet output and photogates input

Power supply:

- the unit is powered by an external power supply (100-240VAC) (**included**) protected against short circuits
- the input of the unit is protected by reverse voltage: protects the unit if an external power supply that uses reverse polarity is connected

Photogates management:

- the unit has only one input (**1 to 3 P.G. IN**) which can manage up to three photogates
- connection in series: the first photogate is connected to the input of the unit. The next photogate will be connected to the first photogate (and not to the Timer unit) and so on
- each **optional** photogate includes a 1.5m cable for a total length of 4.5m

Electromagnet management:

- the unit can directly manage an electromagnet (for the launch or release system) without the need for additional power supplies or external accessories
- the electromagnet is connected directly to the two protected sockets (red and black, 4mm safety standard) on the panel
- the voltage supplied to the electromagnet can be selected between + 12VDC (1A) and + 6VDC (500mA)
- the output that powers the electromagnet is protected against short circuits and overloads
- the electromagnet (**optional**) for measuring "g" is available

Dimensions and weight:

- Dimensions: 165x105x60 mm
- Total weight: 0.5 kg

Accessories included:

- **Operating manual**
- **Mains power supply: 90-264VAC/47-63Hz**

The unit is available in two versions:

- **Standard** mod.T4E-BOX-01
- **Bluetooth ver. with Android App** mod.T4E-BOX-01-BT

Options:

- **Photogate (max 3)** mod.T4E-TAC-01
- **Photogate stand (max 3)** mod.T4E-TAC-02
- **"g" measurement kit** mod.T4E-TAC-03

TIMER OPERATION MODE

Measurements in MAN mode: start by pressing the START button

Manual mode (MAN):

The electromagnet is powered.

When the operator presses the green **START** button, the electromagnet is de-energized and the measurement starts.

It is possible to connect **from one to three** photogates.

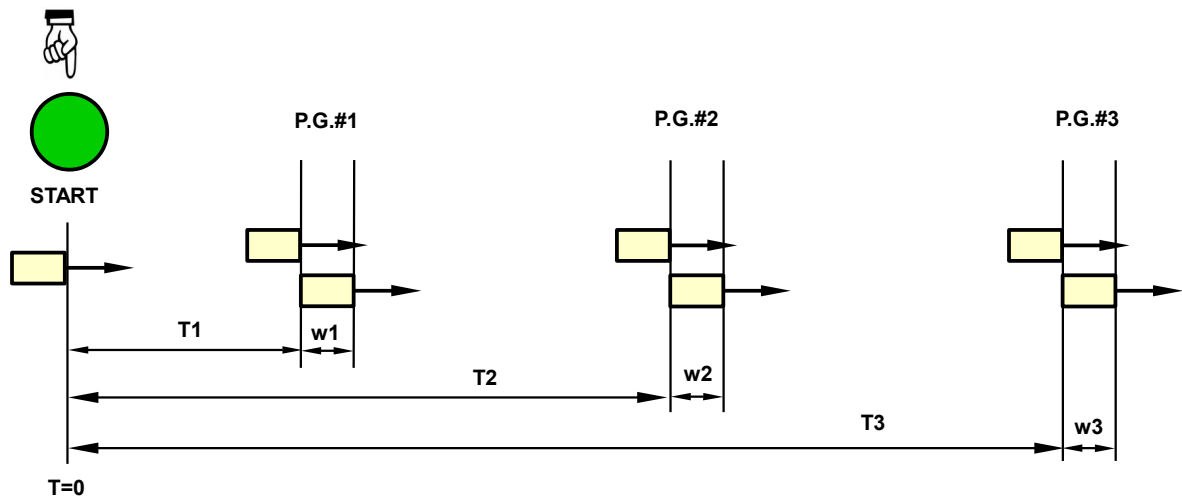
The Timer measures:

- the time elapsed from start-up ($T=0$) until arrival at the first photogate ($T1$), and
- the crossing time of the first photogate ($w1$).

Similar measurements will follow for the subsequent photogates.

For example for the second photogate will be measured:

- the time elapsed from start-up ($T=0$) to the arrival at the second photogate ($T2$), and
- the crossing time of the second photo frame ($w2$).



Measurements in AUTO mode: start the arrival of the object on the first photogate P.G.#1

Automatic mode (AUTO):

The electromagnet is not powered.

The measurement starts "automatically" (without the operator pressing any button) when the object arrives at the first photogate.

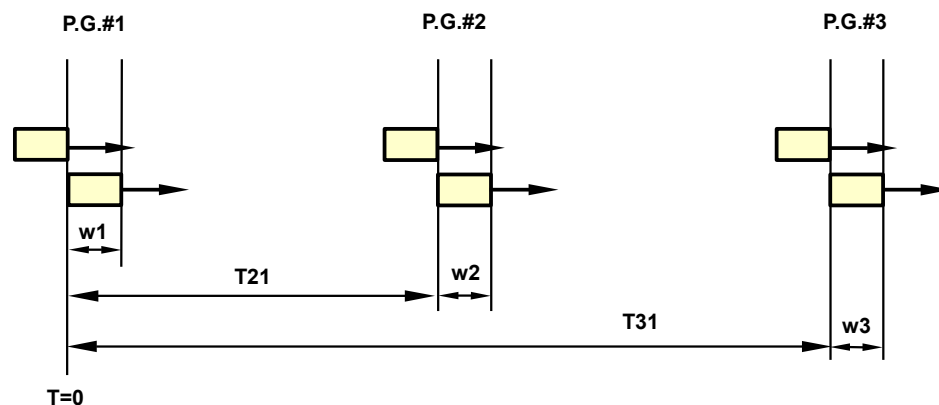
It is possible to connect **from two to three** photogates: first photogate is necessary to start the measurement.

For example, with two photogates, the Timer measures:

- the elapsed time from arrival to the first photogate ($T=0$) until the arrival at the second photogate ($T21$),
- the crossing time of the first photogate ($w1$), and
- the crossing time of the second photogate ($w2$).

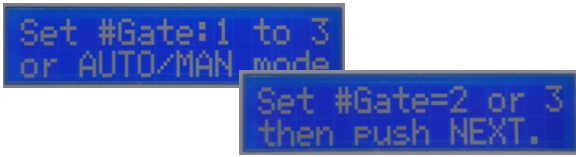
If the third photogate is also connected, the Timer also measures:

- the time elapsed from arrival to the first photogate ($T=0$) until the arrival at the third photogate ($T31$), and
- the crossing time of the third photogate ($w3$).



EXAMPLES OF MESSAGES SHOWN ON THE DISPLAY
(Italian version, available other languages)

- Selection of the number of photogates (P.G.) to be used depending on the mode (MAN/AUTO) set:



- setting and measurement of the voltage supplied to the electromagnet (E.M.):



- Information on the E.M. enabled in MAN mode:



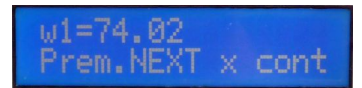
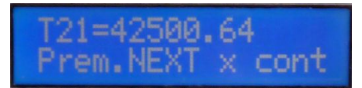
- Timer waiting for the object to reach the first photogate (P.G.):



- Timer waiting for the object to reach the second P.G. after having correctly acquired the times relating to the first P.G. (G1):



- Measurements (AUTO mode) of the time interval T21 spent to reach from the first to the second photogate and the crossing time w1 of the first P.G.:

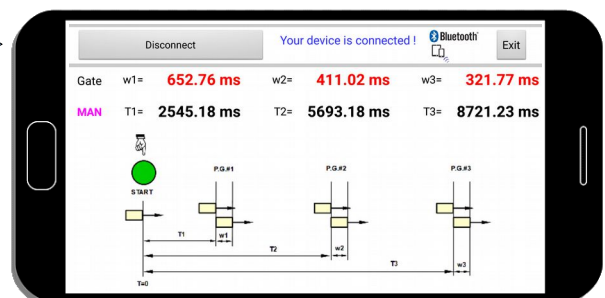


TIMER CONNECTION DIAGRAM



Optional accessories:

- E.M.: electromagnet for "g" measurement complete with stand, ball, plex. tube and cable L=1.5m
- P.G.: photogate (1 to 3) complete with support rod and cable L=1.5m
- Photogate stand: one for each photogate (not visible in this image)



Android App myTIMER
(only for Bluetooth version
mod. T4E-BOX-01-BT)

AVAILABLE OPTIONS FOR TIMER

Photogate mod.T4E-TAC-01 (max.N.3)

- cable L.1.5m
- aluminum fixing rod L.150mm D.10mm M8 compatible with other **support systems (stand) with D.10mm**
- aluminum support rod L.150mm D.10mm M8
- possibility of fixing the rod to the photogate on two sides allowing every possible position of the photogate itself
- free space available between the sensors: 60x47mm
- photogate dimensions: 120x80x27mm

Cable L.1.5



Photogate



Detail of fixing system on P.G.
#2 M8 nut (90°)

Photogate stand mod.T4E-TAC-02 (max.N.3)

- height 370mm
- compact, light and resistant structure made by aluminum rods, plastic joint and base
- you must use a stand for each photogate mod.T4E-TAC-01

Photogate stand with photogate

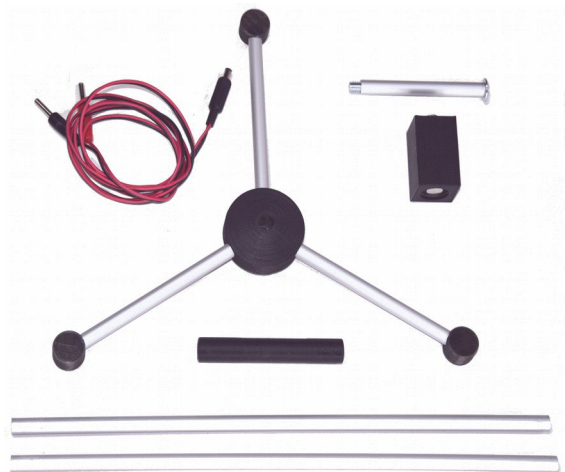


Elettromagnet "g" (stand included) mod.T4E-TAC-03

- cable L.1.5m
- total stand height 1m
- E.M. power 3W
- compact, light and resistant stand made by aluminum rods, plastic joints and base
- E.M. dimension: 30x30x50mm
- transparent plexiglass tube ideal for conveying the object falling from the electromagnet to the table surface, consisting of two pieces that can be assembled (0.5m each)
- steel ball



Detail of E.M., ball, tube



Detail of stand, cable, E.M.