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**TABLE OF CONTENTS**

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1. Description	3
2. Operation	3
3. Connections	4
3.1 Battery	4
3.2 AC adapter	4
3.3 Precision probes	4
4. Settings	4
4.1 Mute	4
4.2 Reset	4
4.3 Calibration	4
5. Screen information	5
6. Measurements and functions	6
7. Settings	7
8. Switching on the device	7
8.A Measuring tension of unloaded batteries	7
8.B Measuring tension of under load batteries	8
8.C Measuring the movement supply voltage	9
8.D Measuring the coil resistance	10
8.E Unjamming the wheel trains	11
8.F Measuring (gain/loss) the stability of the rate of a watch or movement	11
8.G Checking the correct functioning of the circuit	12
8.H Measuring the consumption of a watch during its operation	14
8.I Settings	15
9. Safety precautions	16
10. Charter of consumption of electronic circuits / coils resistance	18

# 1. DESCRIPTION

**HOROTEC® Flashtest** is a multifunctional portable touchscreen tester, specifically designed for the control of watches and quartz mechanisms. This precision device is easy to handle and is intended to test analogue quartz watches and movements with both closed and open watchcases. **HOROTEC® Flashtest** is able to:

- A. Measuring tension of unloaded batteries from 0 to 19.999 V. **BATTERY** + **BATTERY TEST**
- B. Measuring tension of batteries under load from 0 to 19.999 V. **BATTERY** + **BATTERY TEST** + **SIMUL**
- C. Measuring the movement supply voltage (1.5 V or 3.0 V). **BATTERY** + **SUPPLY 1.5V** ou **SUPPLY 3.0V**
- D. Measuring the coil resistance. **COIL**
- E. Unjamming the wheel trains. **TURBO**
- F. Measuring (gain/loss) the stability of the rate of analogue quartz watches. **ACCURACY**
- G. Checking the correct functioning of the circuit : **CIRCUIT**
  - a. Electrical impulse **CIRCUIT** + **IMPULSE**
  - b. Measuring the consumption of the electric circuit. **CIRCUIT** + **1.5V CONSUMPTION** or **3.0V CONSUMPTION**
- H. Measuring the consumption of a watch during its operation. **CIRCUIT** + **1.5V CONSUMPTION** or **3.0V CONSUMPTION**

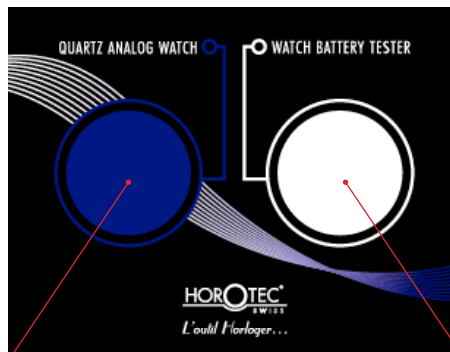
# 2. OPERATION

**WATCH BATTERY TESTER** : The following tests are made on the metal plate on the right of the device :

- A. Measuring tension of unloaded batteries.
- B. Measuring tension of batteries under load.

**QUARTZ ANALOG WATCH** : The following tests are made on the blue velvet plate on the left of the device :

- E. Unjamming the wheel trains.
- F. Measuring (gain/loss) the stability of the rate.
- G. Checking the correct functioning of the circuit : electrical impulse and measuring the consumption of the electric circuit.



- E. Unjamming the wheel trains.
- F. Measuring (gain/loss) the stability of the rate.
- G. Checking the correct functioning of the circuit.

- A. Measuring tension of unloaded batteries.
- B. Measuring tension of batteries under load.



### 3. CONNECTIONS

**1. Battery** : unscrew the battery cover on the back of the **HOROTEC® Flashtest** and insert the 9 V battery delivered with the device  
*Note: change the battery if the symbol «discharged battery» appears on the screen of the HOROTEC® Flashtest when the device is on.*

**2. AC adapter** : connect the 12 V adapter to rear jack of the device **HOROTEC® Flashtest**. Connect the cord of the AC adapter to the power sector (115 or 230 V). Once the device is connected to the power sector, the 9 V battery is automatically disconnected to allow its economy.

**3. Precision probes** : connect the two precision probes to the jacks on the rear plate of the **HOROTEC® Flashtest** (plug the black probe in the black jack and the red probe in the red jack).

**HOROTEC® Flashtest** is delivered with two precision probes, a 12 V adapter (input 115 - 230 V AC / output 12 V DC), a 9 V battery and a manual. HOROTEC® is a registered trademark in Switzerland, United States, European Union and many other countries.

Connections to the rear panel of the device :



Connection for the calibration	Positive probe	Negative probe	Power supply sector 110 - 220 V	Button ON/OFF
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### 4. SETTINGS

**1. Mute** : silent mode or sound mode. **MUTE** see paragraph 8.12 on page 15

**2. Reset (values reset)** : resets the real value of the corrupted zero by external factors such as temperature or humidity or by the aging of the electronic components of the device. **RESET** see paragraph 8.12 on page 15

**3. Calibrage** : calibration of the built-in quartz oscillator. During the conception of our HOROTEC® Flashtest, we focused on the measurement accuracy. To ensure this accuracy we fitted in the device a calibration function ensuring the continuous checking of the device and the correction of errors due to the quartz aging. The calibration is a very simple process. **CALIBRATION** see paragraph 8.12 on page 15

Recommendations :

It is not always possible to realise some tests or measurements with the watchcase closed, especially with a steel and/or thick watchcase. In this case, the case back has to be open.

When operating on battery, we recommend to limit the duration of some tests, such as battery tests or the turbo function, in order to avoid a too fast discharge of the battery.

Do not touch the watch batteries with your hands to avoid a redox reaction on the surface of the battery.

## 5. SCREEN INFORMATION



When this symbol is visible, the device emits sound signals.

When this symbol does not appear on the screen, the **MUTE** function is activated and the device is silent.

To activate/deactivate the **MUTE** function. see paragraph 8.12 on page 15



When this symbol is visible, the device runs on the battery. The number of green bars indicates the battery charge level.



When this symbol is visible, the device is connected to the power sector 115 - 230 V.

The battery is automatically disconnected to allow its economy.



Return to the main menu.

Press this icon at any time to return to the main menu.



Settings. see paragraph 8.1 on page 15

### **Sleep mode screen :**

1. When the device is connected to the power sector (115 - 230 V), the screen goes to sleep mode after 2 minutes without use. To reactivate its operation, press the ON/OFF button located at the rear panel of the device.



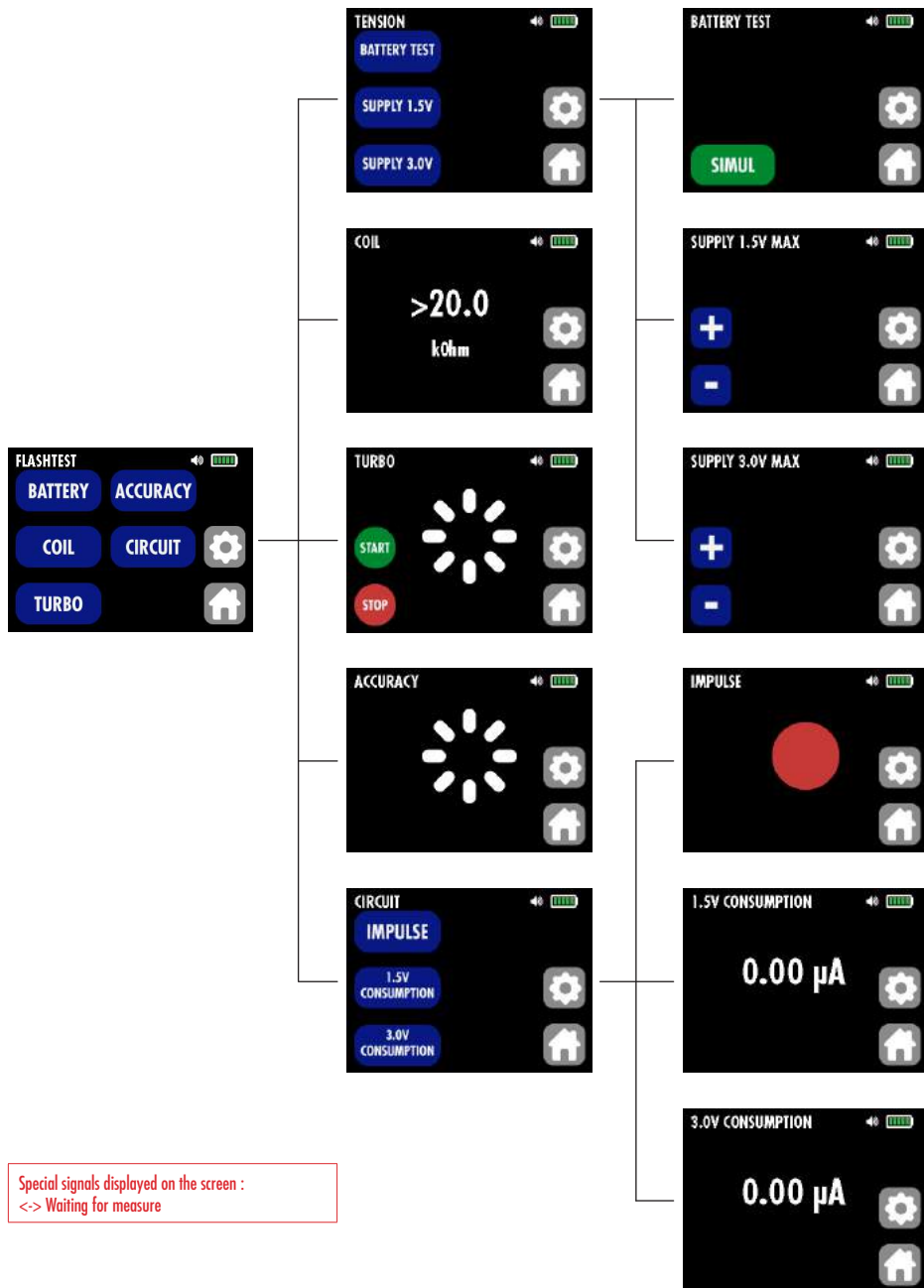
Display in sleep mode.

*Touch the screen to return to the main menu.*

2. When the device is running on the battery, the screen goes to sleep mode after 2 minutes without use. To reactivate its operation, press the ON/OFF button located at the rear panel of the device.



## 6. MEASUREMENTS AND FUNCTIONS





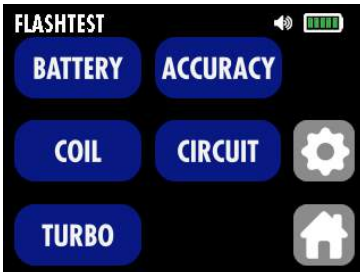
Display when using the GPS MSA19.108-E

see paragraph 8.1 on page 15

## 8. SWITCHING ON THE DEVICE

Whatever the used mode is, power sector (115 - 230 V) or battery, press the ON/OFF button located at the rear panel of the device to turn it on.

The following screen displays :



Display of the main menu **FLASHTEST**

Key **BATTERY**

- A. Measuring tension of unloaded batteries
- B. Measuring tension of batteries under load
- C. Measuring the movement supply voltage

Key **COIL**

- D. Measuring the coil resistance

Key **TURBO**

- E. Unjamming the wheel trains

Key **ACCURACY**

- F. Measuring (gain/loss) the stability of the rate

Key **CIRCUIT**

- G. Checking the correct functioning of the circuit
- H. Measuring the consumption of a watch during its operation

### A. Measuring tension (V) of unloaded batteries

A1. Press the **BATTERY** key on the main menu **FLASHTEST** to measure the unloaded battery voltage (V) (non-operating).

The following screen displays :

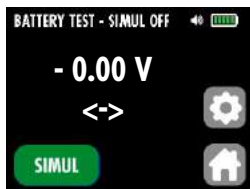


Display of the submenu **TENSION**



A2. Press the **BATTERY TEST** key of the submenu **TENSION**

The following screen displays :

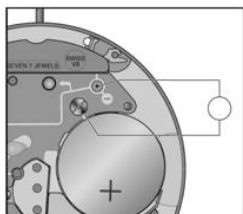


Display of the sub-submenu **BATTERY TEST**

There are 2 possibilities to measure the voltage of an unloaded battery :

- Battery only : **place the battery on the metal plate of the device.**  
Place the positive pole (+) of the battery on the metal plate, so the negative pole (-) will be positioned upwards. Use the black precision probe (-) and place it on the negative pole (-) of the battery. Read the battery voltage on the screen of the device.
- Movement with battery : **place the movement with the battery on the metal plate.**

See the sketch below.



Note : in this case, only the unloaded battery voltage can be measured !

Illustration refers to movement ETA 955112.

**Caution :** we recommend to limit the duration of the battery test to avoid that the battery discharges too quickly. Do not touch the watch batteries with your hands to avoid a redox reaction on the surface of the battery

## **B. Measuring tension (V) of batteries under load**

B1. Press the **BATTERY** key on the main menu **FLASHTEST** to measure the battery voltage under load (V) (operating).

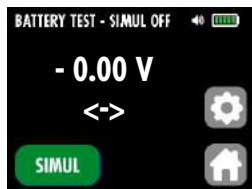
The following screen displays :



Display of the sub-submenu **TENSION**

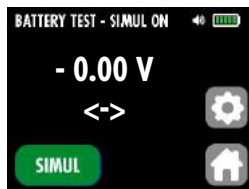
B2. Press the **BATTERY TEST** key of the submenu **TENSION**

The following screen displays :



Display of the sub-submenu **BATTERY TEST**

(1)



(2)

This measurement is performed only with the single battery : **place the battery on the metal plate of the device.**

Place the positive pole (+) of the battery on the metal plate, so the negative pole (-) will be positioned upwards. Use the black precision probe (-) and place it on the negative pole (-) of the battery.

Press the **SIMUL** key to simulate the power consumption of the watch with a 1000 Ohm resistance. Read the battery voltage (under load) on the screen of the device (2). Press again the **SIMUL** key to remove the load of 1000 Ohm (1).

**Caution :** we recommend to limit the duration of the battery test to avoid that the battery discharges too quickly.  
Do not touch the watch batteries with your hands to avoid a redox reaction on the surface of the battery.

### C. Measuring the movement supply voltage

Connaître le point d'arrêt d'un mouvement est une information très importante permettant de définir l'origine de la panne.

Si la tension d'arrêt indiquée à l'écran est supérieure à celle donnée par le fabricant (exemple : mouvement ISASWISS 1198, tension d'arrêt 0.8 V), cela signifie que le mouvement est encrassé ou endommagé. Ceci explique le besoin d'énergie supplémentaire.

Dépannage : nettoyer ou changer le rouage.

C1. Press the **BATTERY** key on the main menu **FLASHTEST** to measure the movement supply voltage.

The following screen displays :



Display of the sub-submenu **TENSION**

C2a. Press the **SUPPLY 1.5V** key of the submenu **TENSION** if the watch is supplied with 1.5 V.

The following screen displays :



Display of the sub-submenu **SUPPLY 1.5V**





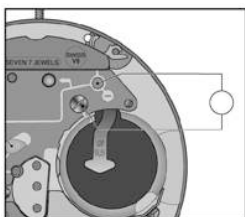
**C2b.** Press the SUPPLY 3.0V key of the submenu TENSION if the watch is supplied with 3.0 V.

The following screen displays :



Display of the sub-submenu **SUPPLY 3.0V**

Use the probes to supply the movement as shown on the sketch below.



- To reduce the tension, press the key **-** (or the key **+** to increase it), by steps of 0.1 V for a supply of 1.5 V or 0.2 V for a supply of 3.0 V.
- Identify on the screen the voltage displayed during the movement supply voltage and compare it with the data of the manufacturer.

## D. Measuring the coil resistance

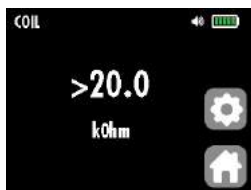
The measuring range is 0 - 20 k $\Omega$ .

The voltage of the ohmmeter is 0.2 V during the operation (a higher voltage than this value could corrupt the measurement).

**Caution :** always remove the battery before measuring. The coil should not receive electrical energy during the measurement.

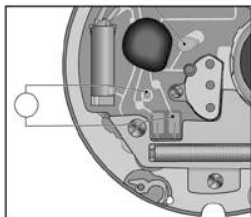
**D1.** Press the **COIL** key on the main menu **FLASHTEST** to measure the coil resistance.

The following screen displays :



Display of the sub-submenu **COIL**

Use the probes and place them as shown on the sketch below.



The measured resistance values indicate the following problems :

- **Broken coil :** resistance = > 20.0 kOhm
- **Shortcut coil :** resistance = 0
- **Not suitable coil :** when the measured value is different from the one indicated by the manufacturer. The «not suitable» status generates additional consumption and shorten the battery life. Compare the measured value to the one specified by the manufacturer.

## E. Unjamming the wheel trains

It is possible that a watch does not restart immediately after a battery change or a prolonged stoppage. It is then necessary to generate a powerful magnetic field to test or unjam the wheel train.

If during this action the hands do not make a fast rotation, it means that a wheel (or wheels) is broken or that the wheel train is too dirty.

E1. Press the **TURBO** key on the main menu **FLASHTEST** to unjam the wheel trains.

The following screen displays :



Display of the sub-submenu **TURBO**

Place the watch on the blue velvet plate.

Press the key **START** and check if the hands have a fast rotation. Press to **STOP** the test.

**Note 1** : when operating on battery, reduce the test duration to preserve the capacity of the device battery.

**Note 2** : it is sometimes necessary to move or turn the watch on the sensor plate to find the ideal position.

## F. Measuring the stability of the rate (gain/loss) of a watch or movement

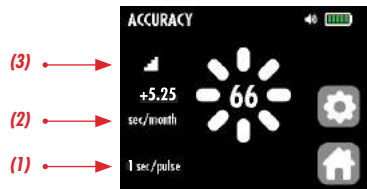
The tester for analogue quartz watches receives magnetic signals from the motor of the watch. The device measures the stability of the rate of the watch and calculates an average by a specific method from the received impulses (the average is given in sec/month).

F1. Press the **ACCURACY** key on the main menu **FLASHTEST** to measure the stability of the rate.

The following screen displays :



Display of the sub-submenu **ACCURACY**



Example : 66 = current cycle time

Place the watch on the blue velvet plate.

The generation time of signals (1, 2, 5, 10, 20, 30 or 60) will appear on the screen after a few seconds (sec/pulse). (1)

In the middle of the screen the number of required impulses at the beginning of the analysis (60/generation time of signals) will be displayed. The software starts a countdown by pulsations. Once the countdown is finished, the rate accuracy of the watch will be displayed on the screen (in sec/month, for example : -1.75 sec/month). (2)

There are 5 signal levels. The more bars displayed (1 bar = low, 3 bars = medium, 5 bars = optimal), the more the measurement precision. (3)

If a watch is detected when the main menu **FLASHTEST** is displayed or the device is in sleep mode, the screen will automatically switch to the submenu **ACCURACY**.



## G. Checking the correct functioning of the circuit

### Electric pulse

**Ga1.** Press the **CIRCUIT** key on the main menu **FLASHTEST** to check the electric impulses.

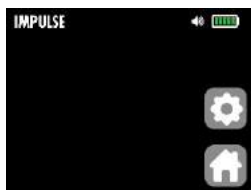
The following screen displays :



Display of the sub-submenu **CIRCUIT**

**Ga2.** Press the **IMPULSE** key of the submenu **CIRCUIT**.

The following screen displays :



Display of the sub-submenu **IMPULSE**

Place the watch on the blue velvet plate of the **HOROTEC© Flashtest** to make the fast test mentioned below (without precision probe).

The sensor receives the impulses of quartz mechanisms and represents them on the screen with a red circle (see picture below) and sound signals (beep) :

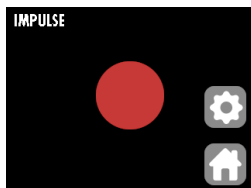
- Every second for «seconds» watches
- Every 5, 10, 20, 30 or 60 seconds for other watches
- **Note** : it is sometimes necessary to move or turn the watch on the sensor plate to find the ideal position for the perception of signals

Place **the open watch** or the mechanism on the blue velvet plate. Account should be taken of the fact that certain mechanisms generate signals every second, while others only generate every 5, 10, 20, 30 or 60 seconds.

- If the **HOROTEC© Flashtest** receives impulses, but the hands do not turn, there is a mechanical problem.

**Troubleshooting** : check and/or clean the mechanical parts of the watch (blocked hands, dust, etc.).

- If the watch does not work, although it receives impulses, check the status of the coil as indicated previously. [see paragraph 8.D on page 10](#)

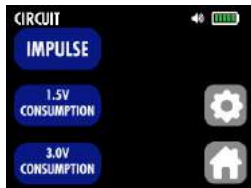


## G. Checking the correct functioning of the circuit (continued)

### Measuring the consumption of the electric circuit

Gb1. Press the **CIRCUIT** key on the main menu **FLASHTEST** to measure the consumption of the electric circuit.

The following screen displays :



Display of the sub-submenu **CIRCUIT**

Gb2. Press the **1.5V CONSUMPTION** key of the submenu **CIRCUIT** if the watch is supplied with 1.5 V.

The following screen displays :



Display of the sub-submenu **1.5V CONSUMPTION**

Gb3. Press the **3.0V CONSUMPTION** key of the submenu **CIRCUIT** if the watch is supplied with 3.0 V.

The following screen displays :



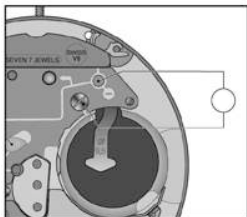
Display of the sub-submenu **3.0V CONSUMPTION**

- Measuring range : 0 ... 19.999  $\mu$ A

- **PULL THE WINDING STEM FULLY**

- Remove the battery.

**Caution** : always choose the right polarity. NEVER CHOOSE the function 3.0 V for a 1.5 V watch.



Use the probes and place them as shown on the sketch below.

Compare the measured value to the one specified by the manufacturer or in this manual.

- A zero consumption (0) indicates a breakdown of circuit.

**Troubleshooting** : change the circuit.

- If the consumption is higher or lower than the one stated by the manufacturer, the circuit is defective.

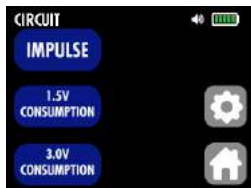
**Troubleshooting** : it is strongly recommended to change the circuit.



## H. Mesurer la consommation d'une montre pendant son fonctionnement

H1. Appuyer sur la touche **CIRCUIT** du menu principal **FLASHTEST** pour mesurer la consommation de la montre.

The following screen displays :



Display of the sub-submenu **CIRCUIT**

H2a. Appuyer sur la touche **1.5V CONSUMPTION** du sous-menu **CIRCUIT** si la montre est alimentée en 1.5 V.

The following screen displays :



Display of the sub-submenu **1.5V CONSUMPTION**

H2b. Appuyer sur la touche **3.0V CONSUMPTION** du sous-menu **CIRCUIT** si la montre est alimentée en 3.0 V.

The following screen displays :



Display of the sub-submenu **3.0V CONSUMPTION**

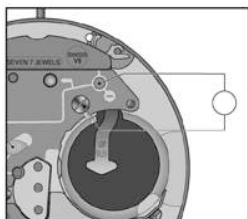
- Measuring range : 0 ... 19.999 µA

- Remove the battery

- **PRESS THE WINDING STEM TO ACTIVATE ALL FUNCTIONS.**

**Caution :** always choose the right polarity. NEVER CHOOSE the function 3.0 V for a 1.5 V watch.

**Note :** wait 5-10 seconds to get reliable results.



Use the probes and place them as shown on the sketch below.

Compare the measured value to the one indicated in the manual. If the consumption is different than the one stated by the manufacturer :

- The wheel trains are dirty or damaged which increases the friction of parts and the energy requirements of the wheel trains.

**Troubleshooting :** clean, set up or change the wheel trains.

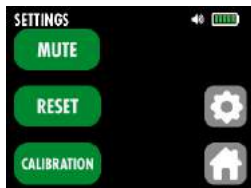
- The hands touch the dial or the watch crystal or they are loose.

**Troubleshooting :** adjust, clean or change the hands.

## I. Settings

11. Press the  key on the main menu **FLASHTEST** to set up the device.

The following screen displays :



Display of the sub-submenu **SETTINGS**

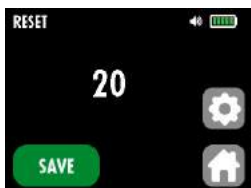
### 12. **MUTE** mode

Press the **MUTE** key, the symbol  disappears (silent mode) or appears (sound mode).

### 13. **RESET** mode

**Values reset** : resets the real value of the corrupted zero by external factors such as temperature or humidity or by the aging of the electronic components of the device.

Press the **RESET** key, the following screen displays :



Display of the sub-submenu **RESET**

The displayed value is the value to be corrected. Press the **SAVE** key to save the counter-value.  
The saved value "0" is displayed. The reset is complete.

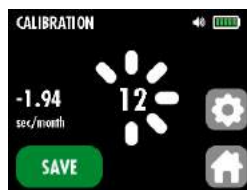
**Note** : when restarting the device, the reset is done automatically.

### 14. **CALIBRATION** mode

Press the **CALIBRATION** key, the following screen displays :



Display of the sub-submenu **CALIBRATION**



Using the GPS MSA19.108-E (item sold separately), it is possible to proceed regularly with the calibration of the device.

Connect the GPS MSA19.108-E to the rear panel of the device. [see paragraph 3 on page 4](#)

- The following screen displays. **(1)**

- The calibration value is displayed on the screen. As soon as the calibration value stabilizes (example -1.94), press the **SAVE** key. The saved calibration value appears in green.

- The calibration is complete. Disconnect the GPS MSA19.108-E.

- Press the  key to return to the main menu **FLASHTEST**.





## 9. SAFETY PRECAUTIONS

Copyright law protects the contents of this operating manual. Law prohibits reproduction, and using its elements without the written consent of the manufacturer and the importer.

Before you use the **HOROTEC® FlashTest** product, read all operating instructions because it can provide optimum performances and longer service life for your device. Save all manuals and documentation for future reference.

The manufacturer reserves the right to modify or update the information contained in this guide.

	<p><b>CAUTION !</b>                  RISK OF ELECTRIC SHOCK                  DO NOT OPEN                  CAUTION : TO REDUCE THE RISK OF ELECTRICAL SHOCK,                  DO NOT REMOVE THE COVER.                  NO USER SERVICEABLE PARTS INSIDE.</p>	
---	--	---



**WARNING !**

Danger of electrocution.  
 To avoid the risk of electric shock, do not remove the cover.  
 No user serviceable parts inside.



An exclamation mark enclosed in a triangle alerts the user to important operating and maintenance instructions in the documentation provided with the product.



**DANGER !** If the product is used without observing the information given under this symbol, serious injury or death may result.



**WARNING !** If the product is used without observing the information given under this symbol, serious injury or death may result.



**ATTENTION !** If the product is used without observing the information given under this symbol, minor personal injury, damage to the equipment, or loss of valuable data may result.

**General precautions :**

Read all instructions :	Before you use the product, read all operating instructions
Cleaning :	Always unplug this product from the wall outlet before cleaning. Use only a damp cloth for cleaning. Never use any type of fluid or aerosol cleaner, or any type of organic solvent to clean this product.
Accessories :	For your safety, and to avoid damaging the product, use only accessories recommended by HOROTEC SA
Water/Moisture:	Do not use the product near a water or moisture source.
Power supply :	Connect this product only the power source described on the product label.
Lightning :	If a lightning storm occurs while using an AC adapter, remove it from the wall outlet immediately
Heat :	Never use or store this product near any heat source such as a radiator, heat register, stove, or any type of equipment or appliance that generates heat

## Handling of the HOROTEC® Flashtest :



### WARNING !

Do not use the product near flammable or explosive gases.

Stop using the product immediately if you notice any unusual odours, noise, or smoke around it.

Do not leave the product in places where it may be subject to extremely high temperatures.

In use, the internal power source (battery or rechargeable battery) become warm

After long-term use, the device may feel warm.

Be careful with the measuring cables. They could easily catch on stray objects and cause serious damages.

Follow these important guidelines to prevent batteries from leaking overheating, burning, exploding, or causing electrical shocks or burns.

### WARNING !

**HOROTEC® Flashtest** operates only with a 9 V battery.

Do not use any other type of network adapters than those with your device.



Never heat or incinerate batteries. Take precautions when carrying or storing batteries to prevent them from coming into contact with any metal objects such as jewellery, pins, fasteners, etc.

Never store batteries where they will be exposed to direct sunlight, or subjected to high temperatures in a hot vehicle, near a heat source, etc.

Never attempt to disassemble a battery or modify it in any way, solder, etc.

Keep always the batteries away from children.

### CAUTION !



Always use only recommended batteries.

Keep the batteries dry at all times.

Do not use a battery if it is cracked or broken.

Never subject batteries to strong shocks or continuous vibrations.

## FOR OUR EUROPEAN CUSTOMERS :



«CE» mark indicates that this product complies with the European requirements for safety, health, environment and customer protection.



This symbol (crossed-out wheeled bin WEEE Annex IV) indicates separate collection of waste electrical and electronic equipment in the EU countries. Please do not throw the equipment into the domestic refuse. Please use the return and collection systems available in your country for the disposal of this product.



This symbol (crossed-out wheeled bin Directive 2006/66/EC Annex II) indicates separate collection of waste batteries in the EU countries. Please do not throw the batteries into the domestic refuse. Please use the return and collection systems available in your country for the disposal of the waste batteries.

## Registered trademarks :

Microsoft and Windows are registered trademarks by Microsoft Corporation.

Other registered marks (company name and product brands) belong to the said company.





## 10. CHARTER OF CONSUMPTION OF ELECTRONIC CIRCUITS / COILS RESISTANCE

ETA				FE			
Cal.	$\mu A$ . Ic	$\mu A$ . Mvrt	Coil k $\Omega$	Cal.	$\mu A$ . Ic	$\mu A$ . Mvrt	Coil k $\Omega$
201001		0.35	1.20-1.60	5120-30	<0.30	0.40-0.80	1.50
205911		1.10	0.20-0.40 gen.	5820-6120	<0.30	0.40-0.80	1.50
210001-11		0.70	1.25-1.55	6130	<0.30	0.50-1.10	1.50
251252		3.10		6320	<0.30	0.40-0.80	1.50
		1.00 set		70200-10	<0.40	0.60-1.40	1.20-1.40
		5.80 chr	1.50-2.50 red	7021-22-24	<0.40	0.60-1.40	1.20-1.40
			1.00-2.00 green	71200-20	<0.40	0.60-1.40	1.20-1.40
251262		3.20		7121-22	<0.40	0.60-1.40	1.20-1.40
		0.50 set		7220B	<0.40	0.60-1.40	1.20-1.40
		5.80 chr	1.50-2.50	7221-22-28	<0.40	0.60-1.40	1.20-1.40
			1.00-2.00 green	7224-34-44	<0.40	0.60-1.40	1.20-1.40
251265		4.60		73310	<0.40	0.60-1.40	1.20-1.40
		2.50 set		7331-34-35	<0.40	0.60-1.40	1.20-1.40
		7.20 chr	1.50-2.50 red	75210	<0.40	0.60-1.40	1.20-1.40
			1.00-2.00 green	7524-29	<0.40	0.60-1.40	1.20-1.40
251272			1.50-2.50 red	7532-36-39	<0.40	0.60-1.40	1.20-1.40
			1.00-2.00 green	7549-91-99	<0.40	0.60-1.40	1.20-1.40
251471		3.20					
		0.50 set		ISA			
		5.80 chr	1.50-2.10 red	Cal.	$\mu A$ . Ic	$\mu A$ . Mvrt	Coil k $\Omega$
			1.20-1.80 green	1198		2.00	
255111-22	0.50	1.50	3.50-4.00	120		0.90	
255265	0.50	1.50	3.50-4.00	122-128		0.65	
255411	0.50	1.50	3.50-4.00	125-127		0.38	
255431-41	0.50	0.70	3.50-4.00	130-138		0.90	
255461-81	0.50	1.50	3.50-4.00	257		0.40	
255483	0.50	1.50	3.50-4.00	307-317		1.80	
256031	0.40	0.75	1.30-1.60	317/103.05		2.40	
256041	0.40	0.75	1.30-1.60	317/703 solar		1.00	
256101-11	0.40	1.10	1.30-1.60	317/705 electrolum		1.70	
256461	0.45	1.20	1.80-2.00	320-321		1.00	
280002		0.70	1.55-1.85	326-328		0.90	
282001		0.50	1.20-1.50	326/168 small sec		1.20	
551411		2.20	1.90-2.40	8153		2.35	
555415		1.80	3.40-3.70	8154-61-62		1.70	
555419	0.55	1.80	3.40-3.70			12.00 chr	
579001	0.50		3.40-3.70	8155		2.35	
579105	0.50	1.80	1.40-1.60	K62		0.35	
802001		1.40	1.30-1.95	K63		1.70	
802101		1.40	1.30-1.45	K63/302 ana digi		2.00	
803111-21		1.40	1.20-1.40	K83		1.55	
804111-21		1.40	1.20-1.60				
805111-24		1.40	1.20-1.60	RONDA			
805144		1.40	1.20-1.60	Cal.	$\mu A$ . Ic	$\mu A$ . Mvrt	Coil k $\Omega$
901001-05		0.45	0.80-1.20	1062		0.35	2.70-2.90
902002-05	0.70	0.70	0.90-1.40	1063-64-65-60		0.72	2.70-2.90
902101	0.40	1.10	0.90-1.40	312		1.35-1.85	1.75-1.95
902105	0.40	1.10	0.90-1.40	3125		2.11-2.45 sec h	1.75-1.95
902501	0.40	1.10	0.90-1.40			2.63-2.95 sec	
926301		1.80	2.00-3.00	315		1.35-1.85	1.75-1.95
955102-32	0.50	1.30	1.30-1.80	505-509		1.35-1.85	1.75-1.95
955402-12	0.50	1.30	1.30-1.80	515		2.11-2.45 sec h	
955432	0.50	0.70	1.30-1.80			2.63-2.95 sec d	2.45-2.55
956114-24	0.35	1.35	3.70-4.10	519		2.11-2.45 sec h	
956414	0.35	1.35	3.70-4.10			2.63-2.95 sec d	2.45-2.55
976001		0.60	2.10-2.40	705		0.85	
978002		0.70	2.10-2.40	706-706.1		0.80-1.13	1.75-1.95
980003-05	0.50	0.60	1.45-1.75	706.B		1.65-1.85	1.75-1.95
980105-06	0.50	1.00	1.45-1.75	726		0.75	
980108	0.50	1.00	1.45-1.75			3.95 chr	2.55-2.85
980153-63	0.50	1.00	1.45-1.75	751		0.40	2.65-2.90
E01001		0.50	0.90-1.20	753		0.71	2.65-2.90
E01401		0.50	0.90-1.20	762		0.40	2.65-2.90
G10211		3.60		763		0.71	2.65-2.90
		6.60 chr		772-73-82-85		0.90	1.75-1.95

SEIKO			SEIKO				
Cal.	$\mu$ A. Ic	$\mu$ A. Mvt	Coil k $\Omega$	Cal.	$\mu$ A. Ic	$\mu$ A. Mvt	Coil k $\Omega$
1E20	-	0.30	1.60-2.80	V220	0.30	0.60	1.40-2.00
1F20	0.25	0.30	2.00-2.60	V33F	0.40	1.20	3.00-3.40
1N00	0.25	0.30	1.70-2.00	V33G	0.40	1.20	3.00-3.40
1N01	0.25	0.90	2.70-3.30	V33J	0.40	1.20	3.00-3.40
2A23	0.60	1.00	2.80-3.40	Y400	0.30	0.50	2.00-2.40
2A27	0.60	1.10	2.30-2.80	Y401	1.30	1.10	2.10-2.50
2C21	0.40	0.80	2.80-3.40	Y421	-	2.20	1.50-1.90
2E20	0.30	0.60	1.40-2.00	Y501	-	1.60	-
2F50	0.20	0.30	2.00-2.40	V506	-	1.60	-
2Y00	0.30	0.40	2.10-2.60	V507	-	2.30	-
3M22	0.40	0.80	2.40-3.20	V515	-	1.60	-
			AG Coil 330-430 $\Omega$	V536	-	2.20	-
4N00	0.30	0.50	2.00-2.40	V537	-	2.20	-
4N01	0.30	1.10	2.10-2.50	V654	1.65	3.00	1.80-2.50
4N20	0.30	0.50	2.00-2.40	V655	1.65	3.00	1.80-2.50
5A50	-	0.30	1.80-2.60	V656	1.65	3.00	1.80-2.50
5M22	0.50	1.00	2.90-3.40	V657	1.65	3.00	1.80-2.50
			gen. coil resist.	V671	0.70	2.90	2.30-2.90
			280 $\Omega$ -380 $\Omega$	V681	0.80	3.00	1.60-2.00 4002456
5M42	0.50	0.90	1.70-2.10				1.20-1.60 4002454
			AG Coil new 1.90-2.30	V682	0.80	3.00	1.60-2.00 4002456
			old 280-380 $\Omega$				1.20-1.60 4002454
5M43	0.50	0.90	1.70-2.10	V69F	0.88	1.40	1.20-1.60
			AG Coil new 1.90-2.30	V707	0.28	1.40	0.90-1.30
			old 280-380 $\Omega$	V733	0.40	1.30	2.40-2.80
5T52	1.80	2.50	1.40-2.40 4002701-11	V736	0.40	1.30	2.40-2.80
			1.70-2.30 4002700	V742	0.40	1.30	2.40-2.80
6M13	0.80	3.00	1.20-1.60 4002454	V743	0.40	1.30	2.40-2.80
			0.80-1.20 4002455	V782	0.28	1.40	0.90-1.30
			1.50-2.10 4002456	V789	0.28	1.40	0.90-1.30
6M15	0.80	3.00	1.20-1.60 4002454	V810	-	1.40	-
			0.80-1.20 4002455	V827	-	1.60	-
			1.50-2.10 4002456	VX32A	-	1.85	-
6M23	0.80	3.00	1.20-1.60 4002454	VX39	-	1.20	-
			0.80-1.20 4002455	VX82	-	1.10	-
			1.50-2.10 4002456	VX89	-	1.10	-
6M26	0.80	3.00	1.20-1.60 4002454	W040	0.28	1.40	130-180 $\Omega$ spk
			0.80-1.20 4002455	W041	0.28	1.40	130-180 $\Omega$ spk
			1.50-2.10 4002456	W205	0.30	0.50	-
6M37	0.80	3.00	1.20-1.60 4002454	W206	0.50	0.70	-
			0.80-1.20 4002455	W309	1.50	1.70	50-90 $\Omega$ spk
			1.50-2.10 4002456	W339	3.00	4.00	140-180 $\Omega$ spk
7C17	0.30	1.50	2.00-2.50	W349	-	4.00	-
7C46	0.30	1.50	2.10-2.50	W357	3.00	4.00	50-90 $\Omega$ spk
7M22	0.50	1.50	1.70-2.40	W358	3.00	4.00	50-90 $\Omega$ spk
			AG Coil 300-400 $\Omega$	W359	3.00	4.00	60-80 $\Omega$ spk
7N00	0.50	0.60	1.90-2.30	W620	-	4.40	-
7N01	0.40	1.30	2.40-2.80	W650	-	4.40	-
7N07	0.40	1.30	2.40-2.80	W680	-	5.50	-
7N08	0.40	1.30	2.40-2.80	W700	3.00	4.00	140-180 $\Omega$ spk
7N82-83	0.40	1.30	2.40-2.80	W800	-	5.00	125-175 $\Omega$ spk
7N85	0.40	1.30	2.40-2.80	W801	-	6.50	125-175 $\Omega$ spk
7N89	0.40	1.30	2.40-2.80	W802	-	4.00	125-175 $\Omega$ spk
7T27	1.80	2.50	1.20-1.60 4002711	W810	-	4.50	125-175 $\Omega$ spk
			1.70-2.30 4002700	W820	-	4.00	125-175 $\Omega$ spk
7T32	1.80	2.50		Y121E	-	1.90	-
		10.00 chr	1.40-2.40 4002701-11	Y143	0.40	1.90	2.20-2.80
			1.70-2.30 4002700	Y150	0.25	0.30	2.00-2.60
7T34	1.80	2.50		Y187	1.80	2.50	
		10.00 chr	1.40-2.40 4002701-11			10.00 chr	1.20-2.40 4002710-11
			1.70-2.30 4002700				1.70-2.30 4002700
7T52	1.80	2.50	1.40-2.40 4002701-11	Y481	-	1.20	3.00-3.40
			1.70-2.30 4002700	Y799	2.30	2.30	-



CITIZEN			MIYOTA				
Cal.	$\mu$ A. Ic	$\mu$ A. Mvt	Coil k $\Omega$	Cal.	$\mu$ A. Ic	$\mu$ A. Mvt	Coil k $\Omega$
0310		0.90	2.90-3.50	2025		1.30	2.80-3.40
0312		0.90	2.90-3.50	2033		1.30	2.80-3.40
0317		0.90	2.90-3.50	2034		1.30	2.80-3.40
0321		0.90	2.90-3.50	2035		1.30	2.80-3.40
0327		0.90	2.90-3.50	2036		1.30	2.80-3.40
0328		0.90	2.90-3.50	2039		1.30	2.80-3.40
0330		0.90	2.90-3.50	203A		1.30	2.80-3.40
0337		0.90	2.90-3.50	2045		1.30	2.89-3.40
0410		0.70	2.90-3.50	2105		1.50	1.90-2.40
0510		1.60	1.80-2.40	2115		1.50	1.90-2.40
			1.80-2.30 sec chr	2115/6		1.50	1.90-2.40
0530		1.60	1.80-2.40	213D		1.50	1.90-2.40
			1.80-2.30 sec chr	3510/3H		3.00	0.80-1.30
0531		1.60	1.80-2.40				1.70-2.10
			1.80-2.30 sec chr				2.40-3.00
0560		1.60	1.80-2.40	3510/4H		3.00	0.80-1.30
			2.0-2.50				1.70-2.10
0570		1.60	1.80-2.40				2.40-3.00
			2.00-2.50	3510/6H		3.00	0.80-1.30
0610		3.10	1.80-2.40				1.70-2.10
			2.00-2.50				2.40-3.00
			1.80-2.30	3531		3.00	0.80-1.30
0730		0.90	1.90-2.30				1.70-2.10
0850		1.80	1.10-1.30 coil 1				2.40-3.00
			1.90-2.30 coil 2-3	3560		3.00	0.80-1.30
0855		1.80	1.10-1.30 coil 1				1.70-2.10
			1.90-2.30 coil 2-3				2.40-3.00
0870		1.80	1.10-1.30 coil 1-3				
			1.90-2.30 coil 2				
1002		0.90	1.20-1.70	<b>INTERCHANGEABILITY SYSTEM BETWEEN CITIZEN AND MIYOTA CALIBRES</b>			
1012		0.90	1.20-1.70				
1020		0.90	1.50-1.90				
1022		0.50	1.20-1.70				
1030		0.90	1.50-1.90	<b>MIYOTA</b>		<b>CITIZEN</b>	
1102		0.90	1.20-1.70				
1112		0.90	1.20-1.70	M	=	0	
2200		0.20	1.70-2.10	N	=	1	
2870		1.30	1.70-2.10	P	=	2	
2930		0.90	2.60-3.20	R	=	4	
3100		1.00	2.60-3.20	S	=	5	
3110		1.00	2.60-3.20	T	=	6	
3220		0.50	1.90-2.50	U	=	7	
3330		0.80	2.20-2.80	W	=	8	
3331		0.80	2.20-2.80	Y	=	9	
3570		3.00					
1000		0.90	1.50-1.90				
1010		0.90	1.50-1.90	Examples :			
1032		0.90	1.50-1.90				
1100		0.90	1.50-1.90	3510	=	3510	
2201A		0.20	1.70-2.10				
2722		1.20	2.60-3.20	6870	=	6W70	
2731		1.20	2.60-3.20				
2854		1.20	2.90-3.50				
3510		3.00	0.80-1.30				
			1.70-2.10				
			2.40-3.00				
3531		3.00	0.80-1.30				
			1.70-2.10				
			2.40-3.00				
0540		1.60	1.80-2.40				
			1.80-2.30 sec chr				
2010		1.50	1.90-2.40				
2000		1.50	1.90-2.40				