SAF'IR™ EVOLUTION
EVIDENTIAL ANALYSER

Instruction manual

SAF'IR EVOLUTION

PORTABLE ETHYLOMETRE CERTIFIED

ACCORDING TO THE **OIML R 126**

National approval
This device conforms to the model specifications of DOT

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OIML R126/1998-ES1-09.02
Compliance certification issued by:
Centro Español de Metrología
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The SAF'IR EVOLUTION is a portable ethylometre that is certified according to the International Recommendation R.126 of the International Organization of Legal Metrology concerning ethylometres, 1998 Edition.

The SAF'IR EVOLUTION measures the concentration of ethanol in exhaled breath. Numerous studies carried out worldwide have shown that the ratio of blood alcohol concentration (BAC) to exhaled alveolar breath alcohol concentration (BrAC) is a constant.

The SAF'IR EVOLUTION is a self-contained, portable instrument that may be used either indoors or outdoors. The results of the tests present evidential accuracy and the printed confirmation may be used in court, according to the local regulations.

Terms used in this manual:

BrAC = breath alcohol concentration

BAC = blood alcohol concentration

Legal limit = set according to each country's local regulations

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SAFETY AND PRECAUTIONS

Take the following precautions to ensure smooth and uninterrupted use of the SAF'IR EVOLUTION:

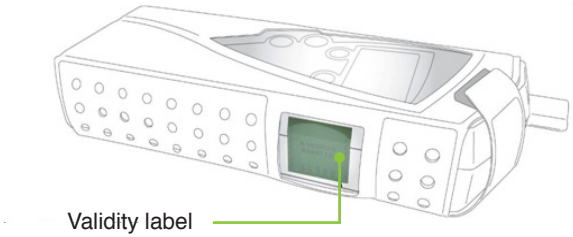
- Use this device for its intended purpose only
- Do not open the SAF'IR EVOLUTION's case or the printer (when provided). Doing so will void the warranty and may also damage the internal components
- Follow the instructions displayed on the front label of the device prior to taking a test

  NOTE: If the subject undergoing the test has ingested alcohol recently, some trace amounts may reside in the upper respiratory tract, causing a misleading result. The SAF'IR EVOLUTION is designed to detect mouth alcohol and displays a cycle error message in such a case.
- Use a new mouthpiece for each test
- It is also advisable to use the SAF'IR EVOLUTION with the provided pouch

MARKING AND SEALINGS

VALIDITY LABEL

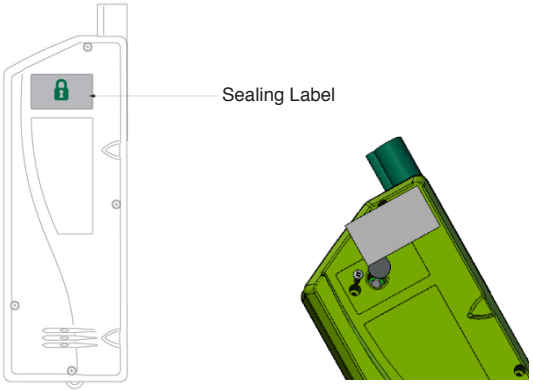
This green label confirms that the periodic (or, in the case of a new instrument, initial) inspection has been performed by an authorized body and notes the inspection expiry date. The seal is placed on the right side of the device and may only be removed by an authorized body. No measurement should be taken if the device's expiry date has been exceeded.



SEALING

The sealing system affixed to the bottom of the device guarantees the proper functioning of the instrument and may only be removed by an authorized body. In case of absence or deterioration of this one, no measuring shall be performed.

The sealing system is put in place in order to prevent any internal intervention or modification of the device and its parameters (calibration factor). A screw constitutes a mechanical blocking and a safety part prevents the access to the push button. The set is covered with a tearable label.



LABORATORY MODE

Pressing the push-button enables the access to the laboratory mode. It allows the:

- Display of the 0.001 mg/L indication step for the metrologic check operations
- Modification of calibration factors
- Modification of parameters CO^2 et H^2O for the calibration

1. Press the push-button at the back of the device.
2. When the device is ready, a pictogram indicates that the laboratory mode is enabled.
3. The display of the measurement result is indicated with a 0.001 mg/L step.

Parameters, which can be adjusted, are accessible through the configuration menu. Access to this one is made when « menu » is displayed on the screen.

1. Scroll through the options by pressing the *down* button.
2. On ‘’Configuration‘’ press **ok**.

MEASURING CALIBRATION

1. On ‘’Measuring calibration‘’ press **ok**.
2. Press **change**.
3. Use to increment, or to decrement values.
4. Press ok to modify and to validate or back to cancel.

MEASUREMENT COMPENSATION

1. On ‘’ Meas. Compensation ‘’ press **ok**.
2. Press **change**.

FLOW CALIBRATION

1. On ‘’ Flow calibration ‘’ press **ok**.
2. Press **change**.
3. Use to increment, or to decrement values.
4. Press ok to modify and to validate or back to cancel.

EXITING THE LABORATORY MODE

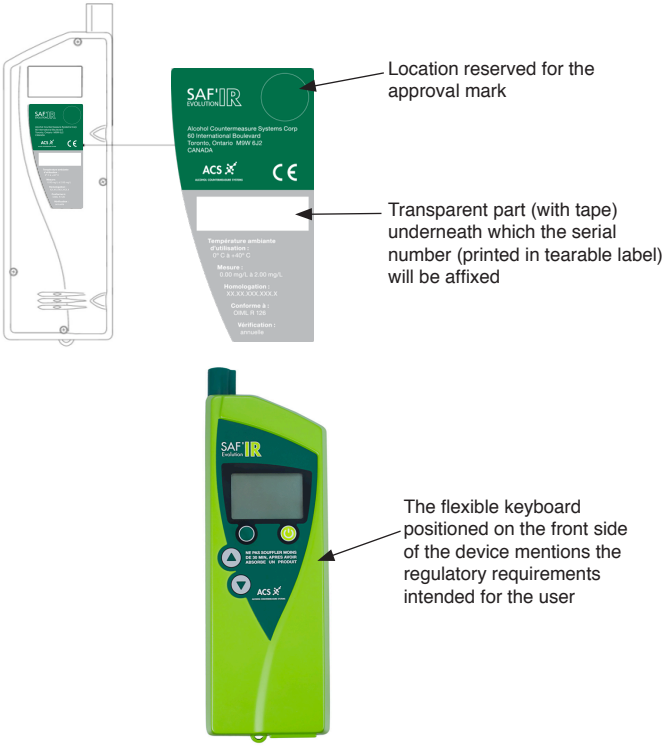
To exit the laboratory mode, simply press the push-button again or switch off the device.

1. Press the **push-button** at the back of the device.

IDENTIFICATION

The identification plate indicates the useful information:

- Approval mark (following a successful model test)
- Manufacturer's name
- Designation
- Serial Number
- Measuring range
- Ambient temperature range in which the ethylometer can be used
- Period of time allowed between maintenance operations



SOFTWARE SECURITY

The device memory is located in two components, the microprocessor that contains the program and a 256 kbit EEprom whose memory is split into three areas, one for the test storage, one for the event storage and a third one for the parameter storage (calibration factors, printer parameters, display parameters, …).

CHECKSUM AND PROGRAM MEMORY

Upon device start-ups, the program memory is fully scanned and a CRC16 algorithm is applied bit per bit to get the checksum. The result of this checksum is displayed with the program version upon start-up.

The expected checksum is stored in hard on the board. If for any reason (program modified, memory area damaged, …) the checksum found is different, the device displays an error message and it is impossible to perform measurements (only to enter the menu for reading or switching off the device)

For the software initially introduced for the type-examination, the expected checksum must be equal to **0x1eed**.

STORAGE OF THE TESTS

A test describes a complete measurement cycle i.e. if a test requires two blows (in normal mode in case the first one would be positive) it is only considered a one test. All the blows in metrological mode for the checking of the device are also considered as tests.

The device has a counter that enables the numbering of tests from the origin of 0 to 65536 (65536 is a threshold number the device should never reach; however should it be the case, the counter would reset to 0).

The device allows to keep in memory the last 1240 tests, identified by their number and available for consultation in the menu « History »

NOTE: if the device is in metrological mode, the history is displayed with a three-digit accuracy.

STORAGE OF THE EVENTS

Every time an action modifying the metrological parameters is performed to the device, it is recorded in the event log. The possible actions considered are the modification of the cycle display mode (the lowest value or the two measurements), the modification of the measuring and flow factors and the modification and the possible recognition of the offsets CO2 and H2O.

The device has a counter that enables the numbering of tests from the origin of 0 to 65536 (65536 is a threshold number the device should never reach; however should it be the case, the counter would reset to 0).

The device allows to keep in memory the last 320 events, identified by their number and available for consultation in the menu « Events »

Information retained are the event number and date, the origin, the type and if a value is concerned, the value that is affected. Concerning the origin, there are three possibilities to modify a parameter, directly on the device in metrological mode (in this case, the origin is « Device »), through a software and a specific connector supplied by the manufacturer (in this case, the modification origin is embedded in the software, it may be « ACS », « LNE », …) and finally by means of a special cable supplied by the manufacturer and a software developed by a third party (in this case the communication protocol forces to identify the modification origin). If however a modification was made through a non-“official” equipment, the modification will still be recorded automatically but the source will be identified as “unknown”.

NOTE: Event No.1 always is the factory settings of the device.

Upon the device start-up, a screen indicates the « display mode » and the date of the last adjustment performed which corresponds actually to the last event date.

USING THE SAF'IR EVOLUTION

FIRST USE

Ensure that the battery is fully charged before using the device for the first time.

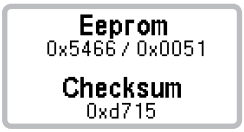
Use the AC adapter provided to recharge the battery, as shown below:

POWER UP SEQUENCE

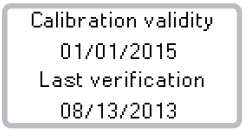
Press the start button

The screen illuminates and displays the ACS logo.

The name of the device and version number are displayed.



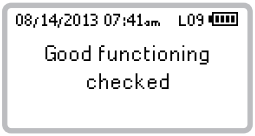
The application initializes.



The calibration validity and last verification date are displayed.

The measuring chamber warms up.

The operational check cycle is completed.

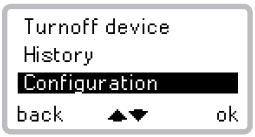


The internal check is confirmed.

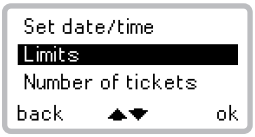
The device beeps and **Ready** is displayed.

LIMIT SELECTION

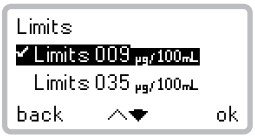
At the **Ready** screen, press the green button ● to select **menu**.



In the **menu** screen, scroll between the options by pressing the *up* or *down* buttons ▲ ▼ to select **Configuration**. Press the start button ⏻ to confirm the selection.



In the **Configuration** menu, scroll between the options by pressing the *up* and *down* buttons ▲ ▼ to select **Limits**. Press the start button ⏻ to confirm the selection.



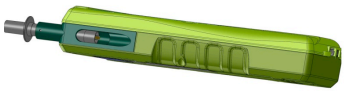
In the **Limits** menu, scroll between the preset limits by pressing the *up* and *down* buttons ▲ ▼. Press the start button ⏻ to confirm the selection.

NOTE: Limits are predetermined by the local authorities. Always check the legal limits before continuing.

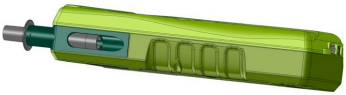
INSERTING THE MOUTHPIECE

When the instrument is ready for a test, remove a new mouthpiece from its wrapper and insert it as shown below:

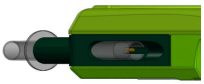
Insert the mouthpiece into the sampling port on the upper left part of the device.



Slide the mouthpiece into place and turn it slightly, if necessary.



Push the mouthpiece in full lock.



The mouthpiece should fit in the notch.

Each test requires a new mouthpiece. Change the mouthpiece for each subsequent retest.

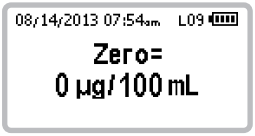
1 MOUTHPIECE = 1 TEST

TEST

To begin a test cycle, ensure that the printer you are using is on and that the display reads **Ready**.

Press the start button to select **meas.** to begin a breath test.

The sampling pump activates to purge the measuring chamber.

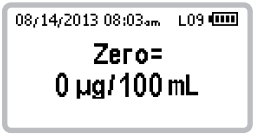


The base line is measured.

The device verifies the calibration electronically.

The limit is measured.

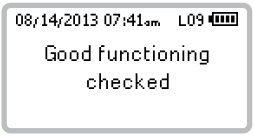
The sampling pump activates to purge the measuring chamber.



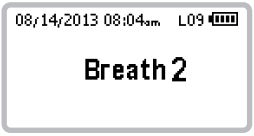
The base line is measured.

A countdown and **Blow** will be displayed. Blow into the mouthpiece with sufficient flow until the tone ends.

The operational check cycle is completed.

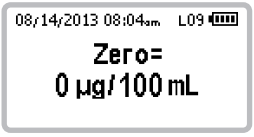


The internal check is confirmed. The test is valid.



The device will beep and begin the next cycle for the second breath test.

The sampling pump activates to purge the measuring chamber.

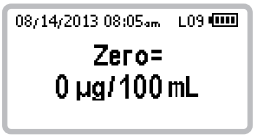


The base line is measured.

A countdown and **Blow** will be displayed. Blow into the mouthpiece with sufficient flow until the tone ends.

The operational check cycle is completed.

The sampling pump activates to purge the measuring chamber.

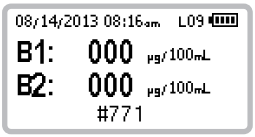


The base line is measured.

The device verifies the calibration electronically.

The limit is measured. Analyzing time is 10 seconds.

The internal check is confirmed. The test is valid.



The results are within the range of tolerance.

The results are displayed and recorded. Press the start button to exit the screen.

NOTES

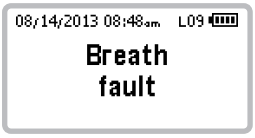
After each measurement, the SAF'IR EVOLUTION checks internal components and the validity of the measurement cycle.

If the breath sample is validated, proper functioning of the instrument is verified.

The internal check is confirmed. The test is valid.

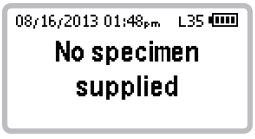
The test cycle will be cancelled if:

A sufficient breath sample was not provided. You must restart the cycle by pressing the start button to select **retry**.



The breath sample was unacceptable.

The deviation between the breath sample and the preset limit is too high.



A breath sample was not provided within the time allotted. Wait a few seconds for the test cycle to restart.

DATA STORAGE

The SAF'IR Evolution shall save the following data in a log in its internal memory:

1. The unique ID number of the Instrument.
2. Software version.
3. Date of the most recent calibration.
4. Time of the most recent calibration.
5. Type of calibration (calibration or calibration test).
6. Calibration value in mg/L.
7. Date of the most recent service.
8. Date of the most recent data transfer.
9. Police authority (to be developed).
10. Organization (to be developed).
11. Operator's service number (to be developed).

The SAF'IR Evolution shall save the following data from a measurement:

1. Measurement number.
2. Date.
3. Time.
4. Measured value in mg/L.
5. Cause code.
6. Type.

VERIFICATION MODE

You must input a password to enter **Verification mode**. The Verification mode confirms that the device is calibrated and ready for use. The device will automatically lock if it's not calibrated within 12 months.

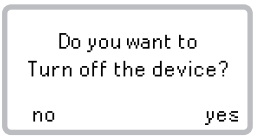
To obtain a verification code or to fix a locked device, contact ACS or a certified service provider.

The device is now ready for a breath sample. The flashing 'v' at the top of the screen indicates **Verification mode**. To exit this mode, simply turn the device off by pressing and holding the start button .

TURNING OFF

Press the green button to select **menu**.

Press the start button to select **ok**.



Press the start button to select **yes**.

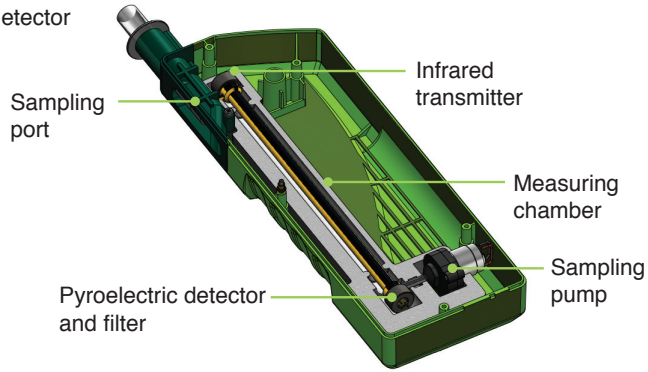
NOTE: You can also turn the device off at any time by pressing and holding the start button.

MEASUREMENT PRINCIPLE

The SAF'IR EVOLUTION uses infrared technology to measure the absorption of monochromatic light by the ethanol molecule. The absorption value is directly proportional to the alcohol concentration, which is used to calculate the BrAC in the breath sample provided.

As soon as the exhalation reaches the minimum flow required, the sampling pump activates. Air exhaled through the mouthpiece is then sampled in the measuring system, which consists of a:

- Infrared transmitter
- Pyroelectric detector
- Infrared filter



MONITORING EXHALATION FLOW

A flow pressure sensor, connected to the sampling port, monitors exhaled air pressure. A tone is heard when the flow reaches 7.5 hPa. The tone then stops when the required volume of breath is delivered.

STANDBY MODE

The **Standby** screen is displayed when the device is switched off and connected to a main power supply. The device can be turned on at any time while connected to a main power supply by pressing the start button ⏻.

MENU OPTIONS

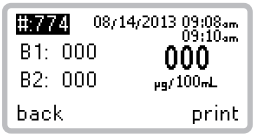
RECALLING A TEST RESULT

The SAF'IR EVOLUTION stores the results of the tests it performs, which may be recalled at any time.

Press the green button ● to select **menu**.

In the menu screen, scroll through the options by pressing the *up* and *down* buttons ▲ ▼ to select **History**. Press the start button ⏻ to confirm the selection.

To view other results, press and hold the *up* button ▲ for 5 seconds. A password is needed to gain access to the rest of the test results.



Press the *up* and *down* buttons ▲ ▼ to scroll through the measurement history.

Press the green button ● to select **back** and return to the previous screen.

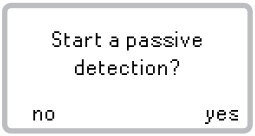
Continue to press the green button ● to return to the test screen.

PASSIVE DETECTION

For passive testing, simply hold the SAF'IR EVOLUTION and point the opening on the left side of the sampling port towards the mouth of the subject being tested (no mouthpiece is required). This feature may also be used to test beverages or the ambient environment that potentially contains alcohol.

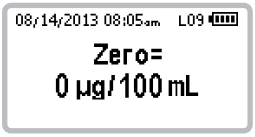
Press the green button to select **menu**.

In the **menu** screen, scroll through the options by pressing the *up* and *down* buttons to select **Passive detection**. Press the start button to confirm the selection.



Press the start button to select **yes**.

The sampling pump activates to clean the measuring chamber.



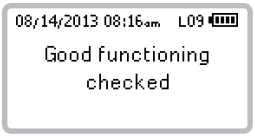
The base line is measured.

At this point, place the SAF'IR EVOLUTION with the sampling port pointing towards the subject.

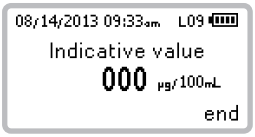
A countdown and **Sampling?** will be displayed. Press the start button to select **start**.

A loud tone will be heard as the device collects a passive air sample.

The operational check cycle is completed.



The internal check is confirmed. The test is valid.

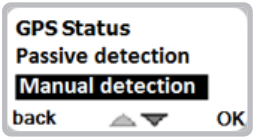


The results are within the range of tolerance. Press the start button to select end.

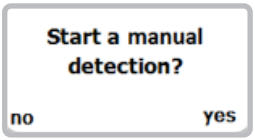
MANUAL DETECTION

An officer may choose to operate in manual mode if an individual does not want to, or is too impaired to, provide an automatic triggered sample.

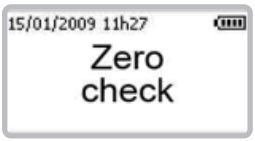
Press the green button to select **menu**.



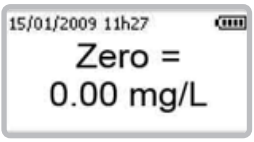
Scroll down the menu options using the *down* button and select **Manual detection**. Press the start button to select **ok**.



Press the start button to select **yes.**

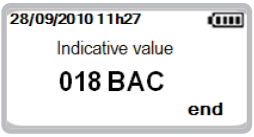


The sampling pump activates to clean the measuring chamber.



The base line is measured.

Press the start button to select **start.**

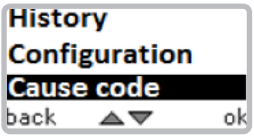


Check the result on the display. Press the start button to select **end** and return to **Ready.**

CAUSE CODE

The SAF'IR EVOLUTION allows you to select a cause code from a list of 20 predefined items. The last cause code selected is saved as the default until the user selects a new one.

Press the green button to select **menu**.

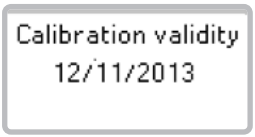


Scroll down the menu options using the *down* button and select **Cause code.** Press the start button to select **ok**.

Scroll the list by using *up* and *down* buttons of items to select the default **Cause code**, press the start button to select **ok**.

CALIBRATION INTERVAL

The SAF'IR EVOLUTION must be calibrated every 12 months.



The display indicates the calibration validity date when the unit is turned **ON**.

If calibration interval is exceeded, date appears in a black background and a sound is emitted.

And it is not possible to carry out any measurement.

MENU CONFIGURATION

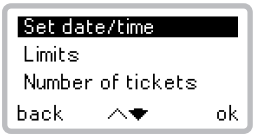
Some parameters may be adjusted by the operator.

Press the green button ● to select **menu**.

In the **menu** screen, scroll through the options by pressing the *up* and *down* buttons ▲ ▼ to select **Configuration**. Press the start button ⏻ to confirm the selection.

The **Configuration** menu allows several adjustments:

DATE AND TIME



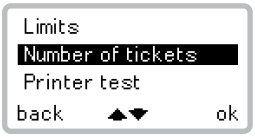
On **Set date/time** menu**,** press the start button to select **ok**.

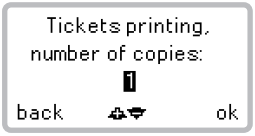
The format used is DD/MM/YYYY for the date and HH/MM for the time.

Use the *up* and *down* buttons to adjust the values accordingly.

Press the start button to save the changes or the green button to select **back** and exit without saving.

NUMBER OF TICKETS TO PRINT

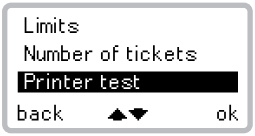


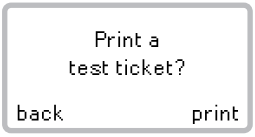


In the **Configuration** menu, scroll through the options by pressing the *up* and *down* buttons to select **Number of tickets**. Press the start button to confirm the selection.

Scroll through the number of copies by pressing the *up* and *down* buttons Press the start button to save the changes or the green button to select **back** and exit without saving.

PRINTER TEST





In the **Configuration** menu, scroll through the options by pressing the *up* and *down* buttons to select **Printer test**. Press the start button to confirm the selection.

Press the start button to print the test ticket or the green button to select **back** and exit.

PRINTING THE RESULTS

An optional printer can be purchased to print the BAC results on site. This rechargeable battery operated printer connects to the SAF'IR EVOLUTION using a cable or a Bluetooth wireless connection. The printer kit includes:

- Portable printer
- Paper roll
- Power adapter
- Battery pack
- Rubber case

INSTALLING THE PRINTER BATTERY

Before using the printer for the first time:

1. Remove it from the rubber case.
2. Open the battery compartment located in the bottom of the printer.
3. Remove the yellow plastic label from the battery pack/printer.
4. Reinstall the battery and the rubber case.

CHARGING THE PRINTER BATTERY

1. Connect the printer to the power adapter provided.
2. Plug the power adapter to the main power supply.

The red LED indicates that the battery is being charged. The LED will turn off when the battery is full.

NOTE: Make sure the yellow plastic label is removed from the battery compartment prior to charging.

LOADING THE PAPER ROLL

1. Remove the printer from the rubber case and open the printer's top cover.
2. Insert the shaft into the new paper roll and place the roll in the paper compartment.
3. Feed enough paper into the slot and close the top cover.

NOTE: Contact the dealer or ACS directly to order paper rolls for the printer.

PRINTER LED STATUS CODE

	Constantly lit	The Bluetooth module is available
	Flashing	Data transaction via Bluetooth
	Constantly lit	Power on, normal status
	Flashing	Data transaction via USB
	Constantly lit	Charging
	Flashing intermittently with blue LED	Error (see Error codes below)
	Off	The battery is fully charged

PRINTER LED ERROR CODE

INDICATOR	DESCRIPTION	ACTION
	Out of paper	Replace the paper roll
	The top cover is open	Close the top cover
	Transmission error	Check the transmission status
	Print head has overheated	Wait until the print head cools down
	The battery is too low	Recharge the battery

FUNCTIONING

OPERATING ICONS

Indicates the current battery level or that the device is being charged. The icon flashes when the battery level is too low.

Indicates that the SAF'IR EVOLUTION has just been connected to a main power source. The battery is charging.

Indicates that the battery is fully charged.

Indicates that the SAF'IR EVOLUTION is connected to the data transfer port.

Indicates that the measuring chamber is warming up.

Indicates that the SAF'IR EVOLUTION is in standby mode.

Indicates that the SAF'IR EVOLUTION is in laboratory mode.

Indicates that the breath alcohol concentration (BrAC) level measured is equal or above the legal limit.

Indicates that the BrAC level measured is below the legal limit.

The *up* button is used to scroll up the list.

The *down* button is used to scroll down the list.

Indicates that the *up* button is inactive.

Indicates that the *down* button is inactive.

Indicates that the *up* button allows increments.

Indicates that the *down* button allows decrement.

ACCESSORIES

The SAF'IR EVOLUTION is delivered with the following accessories:

- Carrying case
- Handstrap
- AC adapter
- Protective pouch
- Quick guide for operation
- Mouthpieces
- Cigarrete lighter adapter
- Portable printer (optional) – features cable or Bluetooth wireless connection

REPLACEMENT PARTS

Contact the dealer or ACS directly to order replacement parts. Use the part numbers provided below:

- SAF'IR mouthpieces - bag of 25: ACS #95-000255
- Printer paper roll: ACS #59-200032

TECHNICAL SPECIFICATIONS

STORAGE CONDITIONS

The SAF'IR EVOLUTION must be stored between -25 and 70 °C, preferably in a dry place.

OPERATING TEMPERATURE

The SAF'IR EVOLUTION is designed to operate between -10 and 50 °C.

PERIODIC INSPECTIONS

The SAF'IR EVOLUTION must be calibrated every 12 months. Failure to do so will result in a lockout. Contact your dealer or ACS for calibration.

BATTERY LIFE

The SAF'IR EVOLUTION is equipped with a rechargeable nickel metal hydride battery pack (NiMH), which may only be replaced by an authorized repair facility. Depending on the ambient temperature, approximately 300 tests can be performed before recharging the battery.

WARM-UP TIME

The warm-up time of the measuring chamber is from 1 to 5 minutes, depending on the ambient temperature.

SIZE AND WEIGHT

Weight: 600 grams

Length x Height x Width: 85 mm x 260 mm x 46 mm

MEASURING RANGE

The SAF'IR EVOLUTION is designed to measure concentrations between 0.00 μg/100 mL and 300 μg/100 mL of alcohol in exhaled air, using a 1 μg/100 mL scale.

RESULTS

Based on local regulations, the SAF'IR EVOLUTION is set to indicate whether the BrAC value is considered positive (above the legal limit) or negative (no alcohol detected or below the legal limit).

The measurement unit is set at the factory and is available in the following formats:

IN BREATH	IN BLOOD
μg/100 mL	mg/dL
µg/L	g/dL
mg/L	g/L

DATE AND TIME FORMAT

The date and time format is set at the factory and selected according to the standard of the country where the instrument is to be used.

TROUBLESHOOTING

WARRANTY

All ACS products are warranted to be free of defects in workmanship and materials for a period of one year from the date of shipment.

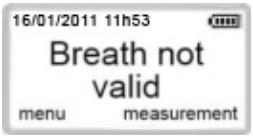
ACS agrees to replace or repair any defective unit, provided the defect was not caused by misuse or mishandling.

Any unit being returned for warranty repair must be properly packaged and shipped prepaid to the authorized dealer's facility.

ALARMS

The battery needs to be recharged.

The volume of breath required has not been reached or the breath sample was interrupted.



The instrument probably detected mouth alcohol. Restart the test cycle by pressing the start button to select **measurement**.

The alcohol concentration measured exceeds the instrument's operating range. Restart the test by pressing the start button to select **meas**.

MAINTENANCE

To clean the SAF'IR EVOLUTION, disconnect all cables and turn it off. Use a soft, lint-free and slightly damp cloth to clean the instrument. Do not use abrasive cleaners or solvents. Prevent moisture from entering the instrument.

RECYCLING

The SAF'IR EVOLUTION contains electronic components and a battery. It must therefore be disposed of separately from household refuse. For more information about disposal and recycling options, contact your local authorities or send the SAF'IR EVOLUTION back to Alcohol Countermeasure Systems.

The mouthpieces used for the SAF'IR EVOLUTION are made of recyclable plastic. After the tests, mouthpieces should be disposed according to the local waste management regulations for recyclable materials.

ACS AND THE ENVIRONMENT

In an effort to reduce its ecological footprint, Alcohol Countermeasure Systems has ecodesigned the SAF'IR EVOLUTION to limit the consumption of natural resources and optimize the impact on both the environment and human health throughout its life cycle.

REDUCTION OF ENERGY CONSUMPTION: The SAF'IR EVOLUTION uses 15 times less energy than the previous generation of evidential breath analyzers, thanks to optimized management.

USE OF RECYCLABLE MATERIALS: Compliance with the EU RoHS Directive relating to limitations on the use of certain hazardous substances, such as lead, mercury, cadmium and hexavalent chromium, as well as polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants, in electrical and electronic equipment.

PREVENTION OF WASTE: Reduction in the number of components and tooling to reduce waste generation. Reduction in packaging by using the case for carrying. Reduction in overall dimensions compared to the previous generation of evidential breath analyzers.

ACS
ALCOHOL COUNTERMEASURE SYSTEMS

IRM-SW-ENG-20130821