

# MIR Spiro



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Contact the manufacturer or your local distributor if your product has a problem.

**MIR pursues an improvement policy to continuously evolve the technology of our products. That's why we reserve to update these user instructions if needed. Please email any suggestions to: [mir@spirometry.com](mailto:mir@spirometry.com). Or use the "Leave feedback" function on your MIR Spiro.**

**The manufacturer cannot be held responsible for any damage caused by users failing to follow these instructions and/or the warnings contained in this manual.**

**Due to printing limitations, the images contained in this manual may differ from the actual device and/or the keys' symbols.**

**It is prohibited to copy this manual in whole or in part.**

## 1 INTRODUCING MIR SPIRO

**MIR Spiro** is a database for managing spirometry and oximetry tests acquired from compatible spirometers. The connected spirometers carry out all the measurement functions and calculate spirometric and oximetric parameters. The software provides a series of parameters related to human respiratory function.

MIR Spiro's potential is endless.

### **Spirometry**

Connected to a compatible device, MIR Spiro runs spirometry tests in real-time or downloads the data in the device's memory.

### **POST spirometry**

#### **BRONCHIAL CHALLENGE**

The bronchial provocation test with methacholine (TPBM) represents a widely used test in pulmonology, where it is used to study bronchial hyper-reactivity

**MIR Spiro** displays data that you can use to assess the effects resulting from the administration of a specific drug (bronchodilator or bronchoconstrictor), linking the obtained results to a particular dosage and protocol.

### **Oximetry**

Likewise, the data of the tests made with devices in standalone mode can be archived. Alternatively, you can run online tests.

**MIR Spiro** creates a patient database, allowing you to compare session tests and handle the patient's information.

### **Software update**

**MIR Spiro** updates your device's software in real-time.

### **Interoperability**

**MIR Spiro** allows you to exchange data with other medical applications (Electronic Medical Records)

### 1.1 Intended use

This software is for medical or paramedical staff and must be used under the supervision of a physician. Moreover, it must be used and serviced by qualified personnel. This software is to be used at a doctor's practice or hospital ward.

### 1.2 Use restrictions - Counterindications

Analysis of the spirometry test results alone are not enough to diagnose a patient's clinical condition. You also need a medical examination that takes their clinical history into account, as well as any other tests recommended by the doctor. Comments, diagnosis and appropriate treatments given only by a doctor. Any symptoms must be evaluated before running the spirometry tests. Users must first check the patient's mental and physical skills to evaluate their suitability and the level of cooperation. Users are responsible for the test's acceptability. Particular attention must be paid when patients are elderly, children or people with disabilities. Do not use the software if you detect or suspect the presence of faults or malfunctions that can compromise the test results.

### 1.3 Improved features

MIR Spiro allows you to use and manage archives easier. You can access information and carry out operations more quickly. With MIR Spiro, you can:

- Access patients' information.
- Run bronchial stimulation tests
- Have more reliable data thanks to paediatric incentive techniques
- Receive data from the spirometer and associate it with patients.

### 1.4 License Agreement and mandatory registration

This software is protected by copyright law and international copyright treaties, as well as other intellectual property laws and treaties. In many countries, copyright and other intellectual property laws protect and grant software owners exclusive rights, including the right to reproduce or “copy” the software. Duplicating the software without the owner's permission is a “violation of copyright law” and carries hefty penalties.

Registration allows you to receive information concerning its update and have technical support.

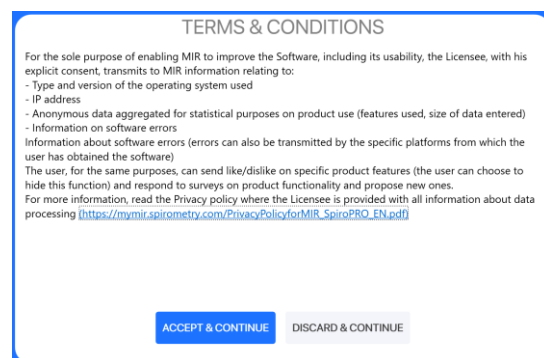
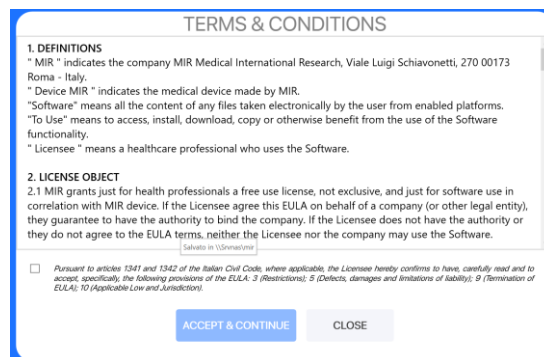
Registering MIR Spiro is mandatory. Follow the instructions provided in the next sections to register your MIR Spiro.



**Windows users must control the mirspiro folder (C:\MIR\MIRSPIRO\). This means they must have all read/write/edit permissions**

#### 1.4.1 Activating MIR Spiro

MIR Spiro asks users to activate the product.




MIR Spiro asks users to password protect work



 **WARNING**

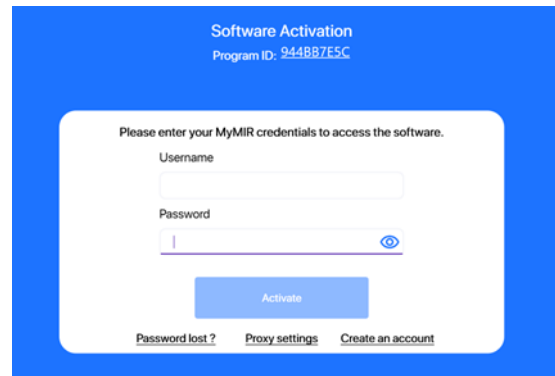
To activate MIR Spiro, you must be registered (have a valid account) on

<https://mymir.spirometry.com/Login.aspx>  MyMIR  
MIR Spiro cannot be used if it is not active.

Follow the instructions below to activate MIR Spiro:

Enter your email in the window that appears upon launching the program (use the email you used to register on spirometry.com).

Click on Activate Now, and if the email matches with the one you used to register on spirometry.com, you can start using MIR Spiro.



If you are not registered on spirometry.com, enter your email and click “Confirm”. MIR Spiro will take you to [www.spirometry.com](http://www.spirometry.com), where you can register by filling in the required fields in the NEW REGISTRATION area.

Once you enter the registration page, fill in the required fields and press “Confirm”.

At this point, a message warns you about the result of your registration. MIR Spiro will be activated the next time you will start the program.

## 1.5 Minimum system requirements

Before installing MIR Spiro, make sure that your PC is compatible with:

### WINDOWS

- Windows 8 (32 bit/64 bit), Windows 10 (32 bit/64 bit), Windows 11 (32 bit/64 bit)
- RAM: 1 gigabyte (GB) for 32 bit or 2 GB for 64 bit.
- 1 gigahertz (GHz) or faster processor, with two or more cores in a 64-bit processor
- Display resolution XGA at 1024 × 768 pixels or higher
- 1Gb of free hard disk space
- Administrative privileges for the operating system
- USB port
- Support for Bluetooth Low Energy (Smart Bluetooth) to connect medical devices with Bluetooth Low Energy connection
- Internet connection required (minimum 512 kbits/s)

### MAC OS

- Operating system 10.13
- Gb RAM (recommended 4 Gb)
- 1Gb of free hard disk space
- Administrative privileges for the operating system
- USB port
- Support for Bluetooth Low Energy (Smart Bluetooth) to connect medical devices with Bluetooth Low Energy connection
- Internet connection required (minimum 512 kbits/s)

### WARNING

The program may not run correctly if the system does not have these characteristics.

## 1.6 Platinum subscription plan

1 year, 2 years, 5 years.

To subscribe to a Platinum Subscription Plan please ensure that:

1) that you have installed and activated MIR Spiro software with a version of 2.0 or higher.

If you have an earlier version, remember to update it.

2) that you are in possession of the Platinum Subscription code, an eight-digit alphanumeric code.

How do I get the Platinum Subscription code?

You can obtain the Platinum Subscription code either on MyMIR, by accessing your reserved area, or from your trusted MIR distributor by purchasing the MIR Spiro Platinum Card or supplied with all MIR professional products at the time of purchase

1) Once you have your Platinum Subscription code, open MIR Spiro software, click on the main menu and then select the item "Enter code" at the bottom right.

2) Enter your Platinum Subscription code.

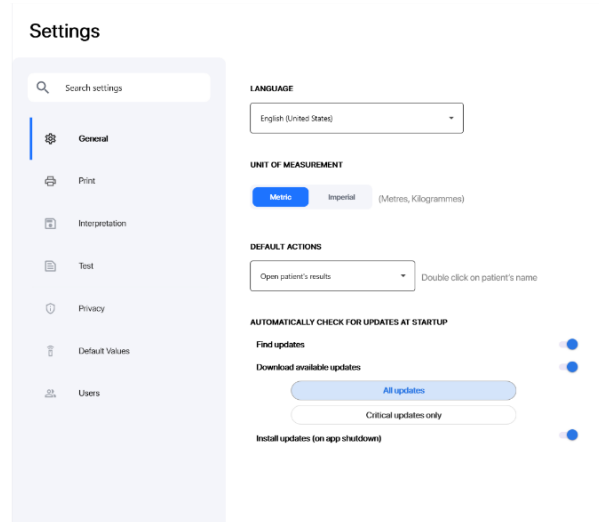
You can now use MIR Spiro Platinum Software and access all its benefits.

## 1.7 Opening MIR Spiro for the first time

Now that MIR Spiro is installed, it's time to set the main software-management parameters from the "Settings" section:

- language
- unit of measurement
- turbine used for spirometry in the "Test" window

These settings are saved automatically, and you can keep using the program. Moreover, you can change them at any time.



## 1.8 Users and password



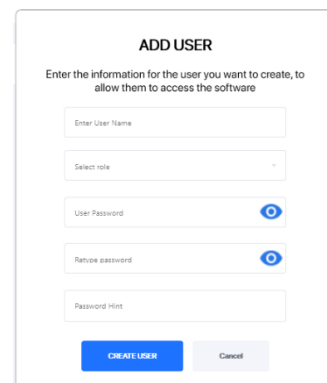
**This MIR Spiro function is for User Supervisors, who can access it by choosing Settings/Users.**

### Creating the credentials for a new user:

To add a new user, click the "Settings" icon from the main menu and then the "Users" section

Click  and fill in the relevant fields:

- Username
- User's role
- Password
- Confirm
- Password hint



The entered data is saved automatically. Repeat the previous steps to create a sequence of other users.

Use the toolbar in the "Users" section to:

- ✓ Add new users,
- ✓ Edit name and password of the selected user
- ✓ Save the changes made
- ✓ Delete the profile of the selected user
- ✓ Cancel the changes made

You'll be asked to enter the password upon starting **MIR Spiro** unless you have free access. In this case, you will always have the same authorisations as a user supervisor. If MIR Spiro is used by several users, you can set it so that each user has their password.

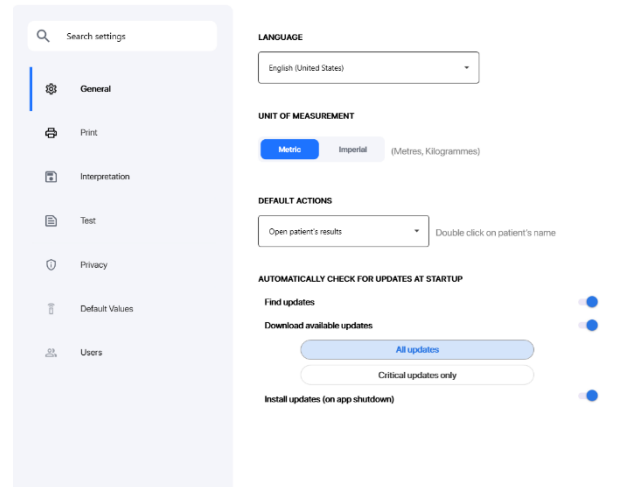
## 1.9 Initial settings

From the main menu, click “Settings” to change the software’s basic settings.

The “General” section allows you to specify:

- The language
- The unit of measurement
- The default action after double-clicking the patient’s name
- The update management

### Settings



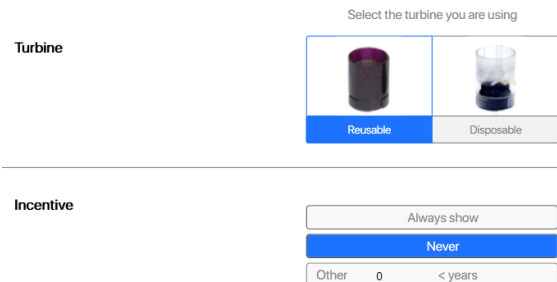
The “Print” section allows you to customise the printout header for the user. It also allows you to specify:

- the path where the image containing the header logo is found
- size of the printout sheet

Other customised options are available in the print preview

The “Test” section allows you to specify:

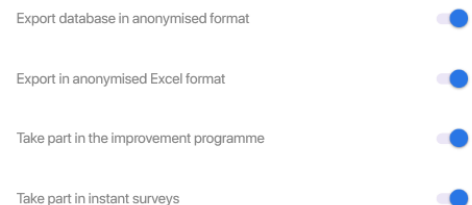
- the turbine in use for the test (\*)
- the incentive (you can choose whether to view it during the FVC test and until what age to show it)



The “Privacy” section allows you to enable and disable:

- export of database in anonymized format (Platinum Edition only)
- export of Excel database in anonymized format (Platinum Edition only)
- the authorisation to help improve the program
- the authorisation to participate in instant surveys

### Privacy



### (\*) WARNING

**It is recommended to use FlowMIR® Turbines only with MIR spirometers and/or certified by MIR; a list of certified spirometers is available at [www.spirometry.com](http://www.spirometry.com)**  
**CAUTION** use of the FlowMIR® Disposable Turbine with mouthpiece (and MIR's reusable turbines) with spirometers not manufactured and/or certified by MIR may result in erroneous and unreliable readings.

### 1.10 Predicted sets

You can set the standard to be used among those indicated in the drop-down menu from the “Interpretation” section in the “Settings” menu.

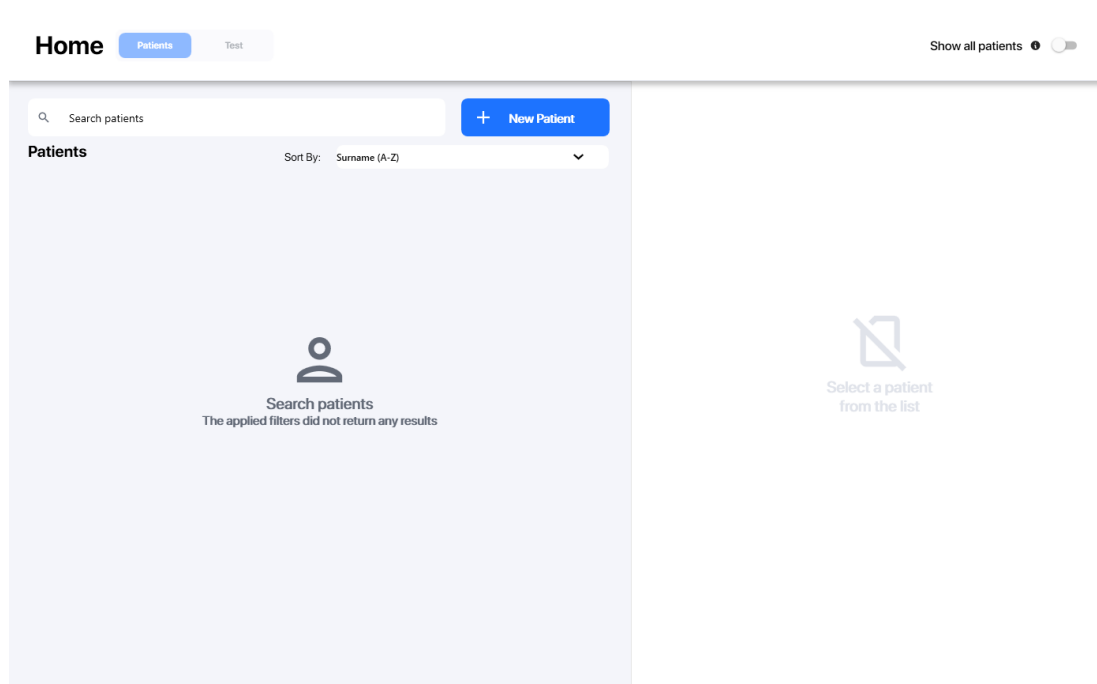
GLI is the new standard issued by the European Respiratory Society (ERS) to establish improved reference values for the spirometry test.

You can choose the primary and secondary author. MIR Spiro will use the equations of the secondary author only for the parameters for which the equations have not been provided by the primary author. In the **Platinum Edition** only, clicking on "Let the software decide for you" MIR Spiro will automatically select the most suitable author.

<b>Primary author</b> Reference spirometry values	GLI
	<a href="#">Let the software choose for you</a>
<b>Secondary author</b> Reference spirometry values	<input checked="" type="radio"/>
	Knudson
	<a href="#">Let the software choose for you</a>
	<a href="#">Why do I need to select a secondary author?</a>

### 1.11 Researching information in the archive

When you open the program, MIR Spiro shows the following screen



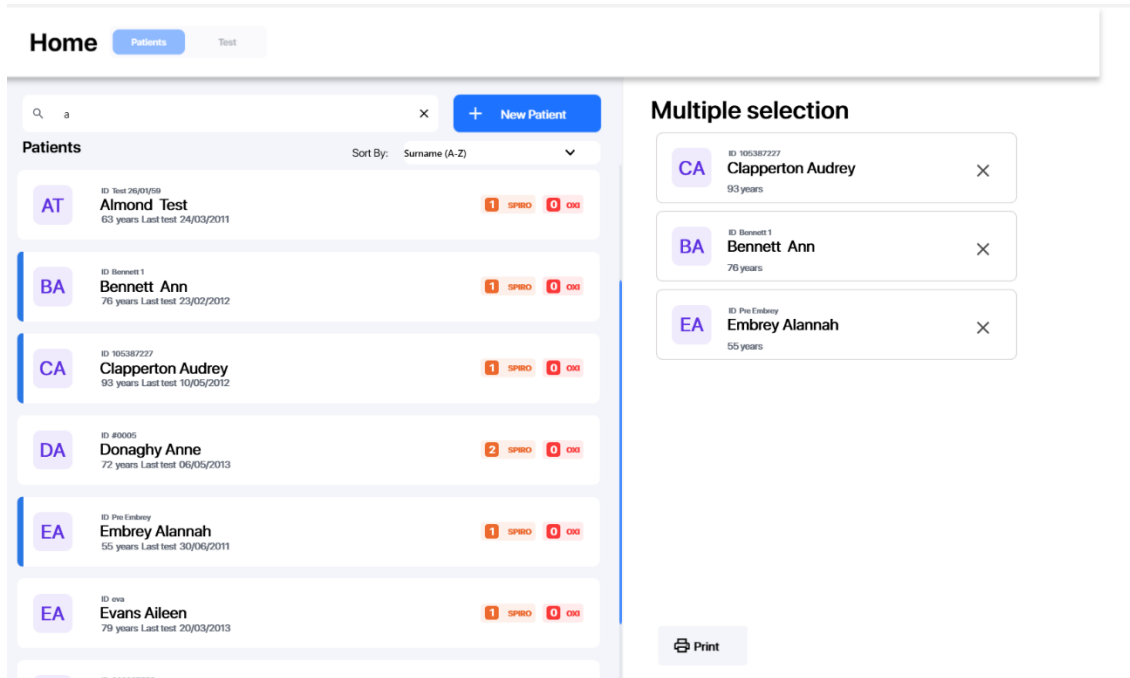
After entering some characters in the “Search patients” box and pressing Send from the keyboard, you can view the list of patients matching the entered characters. From here, you can choose the order of the patients on the list from the drop-down menu (Sort By). Once you select a patient, you can access the list of tests completed by double clicking the patient’s name or the key:

[View all tests](#)

on the bottom right side of the patient’s section.

Through the **Show all patients** button located at the top right of the Home screen, the user can decide to show the whole Patient List. By disabling this option the user can be compliant with privacy protection laws.

From the Patient List, you can select multiple patients by pressing “Ctrl + Click mouse” simultaneously on Windows Operative Sistem or by pressing “Shift + Click mouse” on MacOS. The patients included in the multiple selection appear on the screen right side.

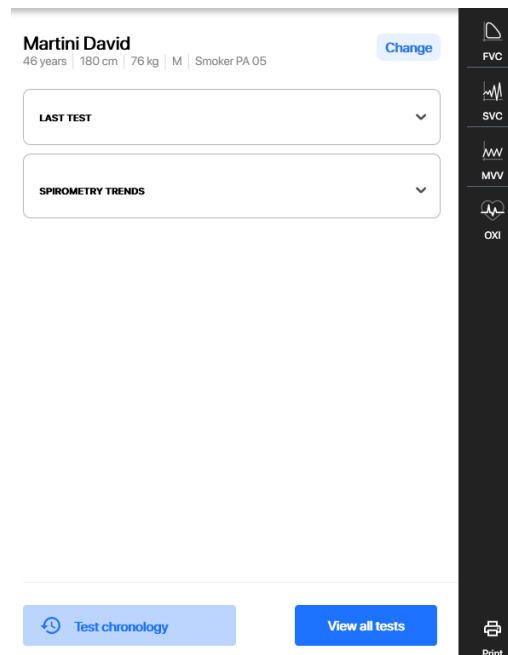


You can also remove single patients from the selection or generate a printout or a .pdf file (clicking on Print) of the selected patients' latest tests.

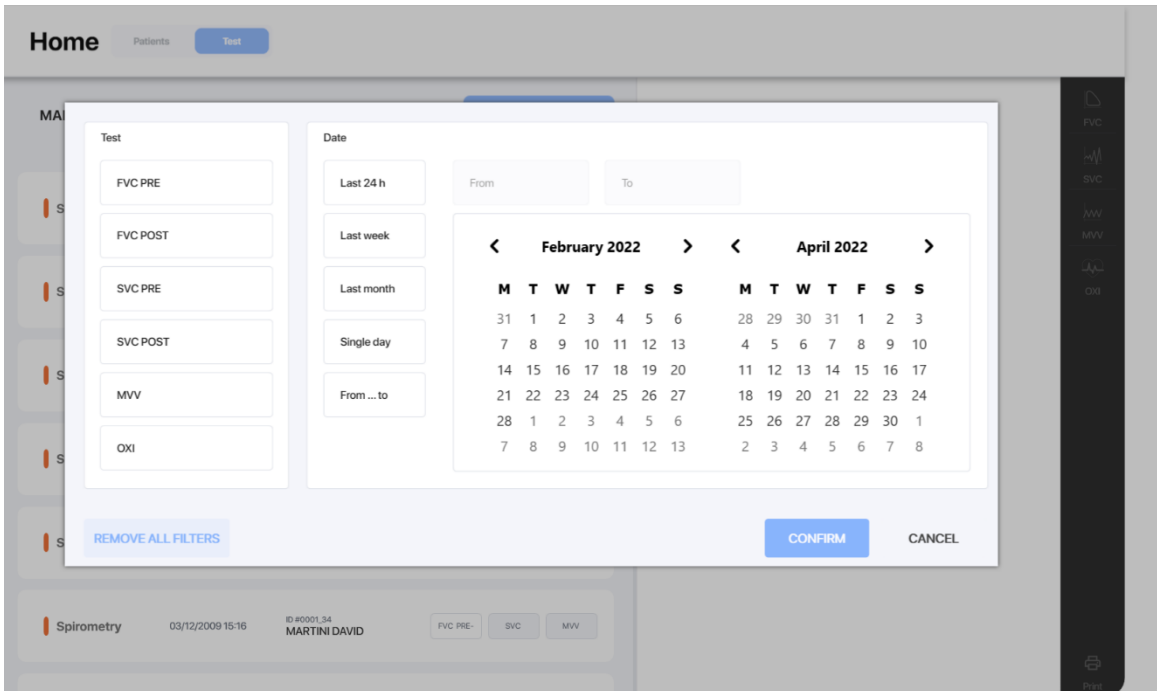
The patient's section displays the following information:

- the patient's characteristics entered during registration
- the last test (spiro and oxi) sessions performed
- the patient's spirometry trends.

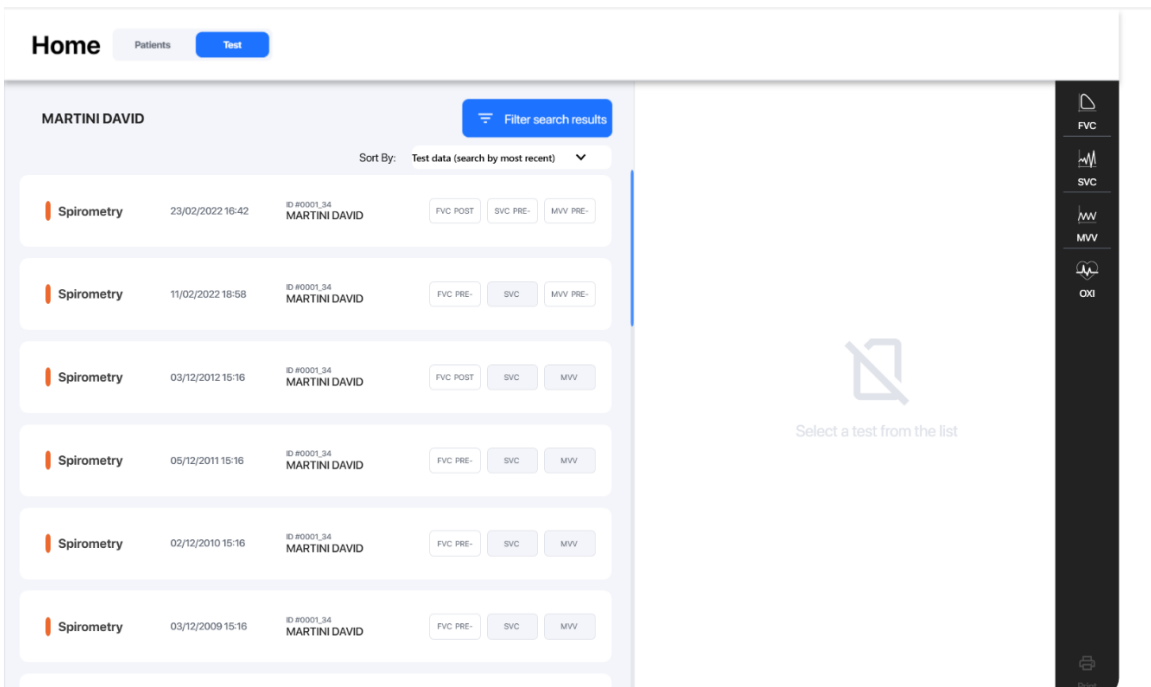
Once you select a patient, you can access their tests through the test menu (black column on the right side of the page).



Here, you can carry out advanced research by clicking “Filter your research” in the “Test” section. This function allows you to set filters to the patient’s test archive. For example, you can search one or more types of tests by selecting them from the Test column, as shown below, within a time range (by entering the details in the “Date” section, see figure below).



If the research is successful, the results will be shown in the following way:



However, you can browse the results like in a normal internet browser.

## 2 CONFIGURATION (BASIC ARCHIVES)

MIR Spiro manages every patient’s basic archives. To access these archives, select a patient, click the Edit icon and enter the “Risk factors and symptoms” section:

Setting the patient’s characteristics inside the archives allows doctors to read spirometry data more accurately and, thus, provide a more reliable diagnosis. In particular, defining ethnic groups and related corrections is crucial because they can link data to the patient’s physical characteristics.

Every archive window includes a bar with icons that allow you to carry out the following operations:

	Add risk factors		
	Add symptoms		Confirm to save
	Delete the selected element		Cancel to go back

Modifying elements in the archive is critical. Therefore, they are archived with the user’s data in the critical operation log.

## 3 PATIENTS

To create a patient sheet, select “New patient” from the Home menu and the patient window or click “Change” after selecting an existing patient.

The window on the right side shows the fields (those with an asterisk are required), which you must fill in.

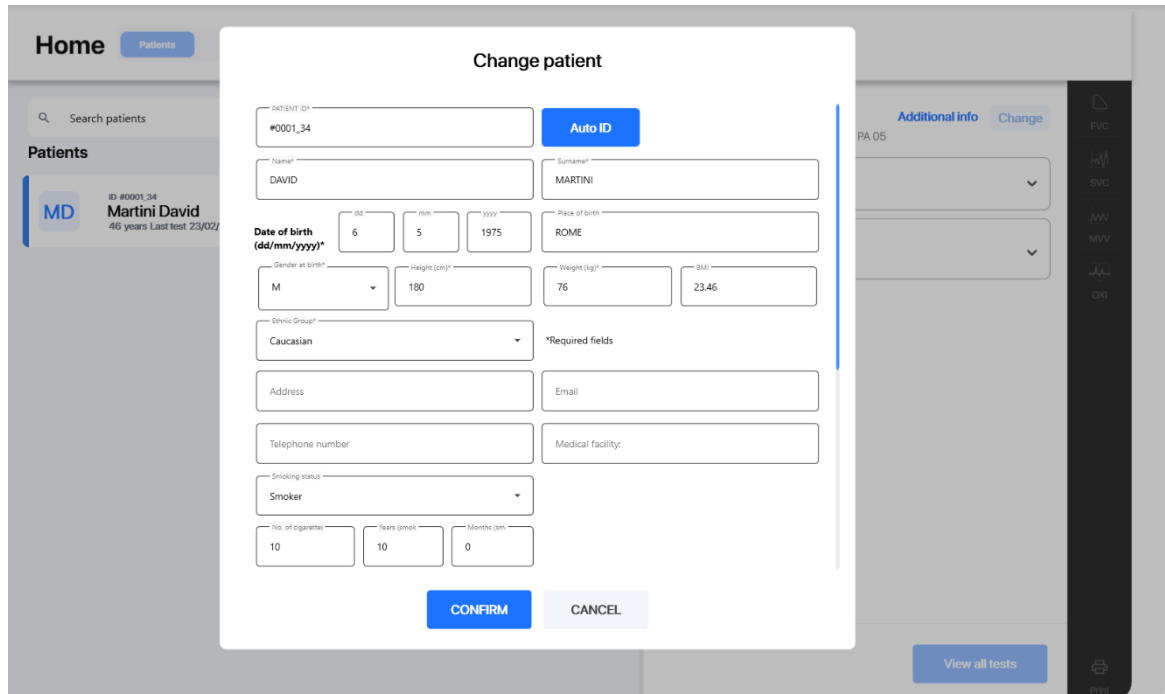
In the Date of Birth box, you can digit the date by clicking the day, month, and year.

**Date of birth (dd/mm/yyyy)\***

dd	mm	yyyy
1	1	2000

To modify the patient's data, you can use the icon **Change** in the toolbar after selecting a patient.

Select a patient



to open their master file.

The patient archive allows you to manage their personal data and details. By deleting a patient, you will also delete all their data, including visits and tests. To delete a patient, open the menu by double clicking the right-hand button of the mouse.

Moreover, the patient archive allows you to manage anthropometric data, risk-related information, symptoms, smoking status. Information concerning symptoms and risks, for example, can be selected from preloaded lists or added from appropriate sections.

General information, such as lung diseases or other diseases, can be added to the Notes.

BMI and Pack/Years are calculated automatically by the system based on the entered data, which cannot be edited.

Editing variable data, such as height and weight, does not affect the completed tests.

On the other hand, editing non-variable data, such as date of birth or ethnic group, result in a recalculation of the predicted values in the completed test sessions. Such change is recorded on a log file as a critical operation. From that moment, you will receive a notification for each re-printed test session.

A Worklist can be created by entering a group of patients that can be processed. (Platinum version only)



## Worklist

In this case click on the icon

You will get the following screen:

## Worklist

By clicking



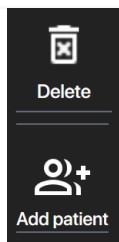
### Crate a new worklist

Write the Worklist name here...



In the white box, enter the name of the Worklist you want to assign.

(e.g. Chemical Industry)

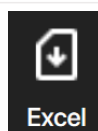


Select the patient to be assigned

Search patients + New Patient

### Chemical Industry

- TT ID #0004 Test Tre 23 years
- DT ID #0003 Due Test 24 years
- BT ID #0001, 1741686479 Bra Test 63 years
- S+ ID #0002 Spirotest\* 124 years



you have created a worklist with the chosen name.

In order to change it, press the right mouse button inside the box (edit) and rename it

You can delete the worklist by clicking on the following symbol.

Enter the list of patients who will be part of the same worklist

Write the first or last name to be entered

As per example.

You can export the worklist to an Excel file

Position	First Name	Surname	Date of Birth	Sex at birth	Ethnic Group	Height	Weight
1	TRE	TEST	15/05/2001	Male	Caucasian	170	88
2	TEST	DUE	15/05/2000	Male	Caucasian	170	80
3	TEST	BRA	15/05/1961	Male	Caucasian	170	88
4	*	SPIROTEST	01/01/1900	Male	Caucasian	180	70

## 4 CALIBRATION

### WARNING

Before calibrating the turbines via MIR Spiro, make sure that the device is set to the turbine in use. Calibration can be made on reusable and disposable turbines, provided that they are in use on the devices. The disposable turbine is for one patient only and can be used for one spirometry session. It provides accurate measurements, as proven by the quality checks made during production. Every turbine comes already calibrated and ready for use.

The disposable turbine is bagged and inserted into a contamination- and shock-proof packaging. Its prolonged use is not allowed. However, it can be calibrated before using it on a patient. Although, it would be of no practical use for a diagnostic instrument, which must ensure consistent accuracy.

You can check the turbines' operation. For this purpose, you can check its accuracy using a calibrated syringe through the FVC test. Keep in mind that results will be expressed at BTPS (Body Temperature Pressure Saturated) conditions.

Since the syringe replaces the patient in this type of test, you should remember how the BTPS value is calculated automatically.

**EXHALATION:** the gas exhaled from the mouth is at a temperature ranging between 33 and 34 °C, which means a BTPS expiratory value equal to 1,026.

**INHALATION:** the inhaled gas depends on the room temperature. For example, if the room is at a temperature of 20 °C, the BTPS inhalation value is equal to 1,115.

This corresponds to a 10% increase in inhaled volume!

This is perfectly normal if you think that a volume of inhaled gas at a temperature of 20 °C heats up when it reaches the lungs and expands due to the body temperature higher than 17 °C compared to the room temperature (37°C - 20°C = 17°C).

Keeping in mind these considerations, if you run a test using a 3-litre syringe and the turbine runs properly, the FVC value (i.e. the syringe volume) will be:

**EXHALATION:**  $FVC (BTPS) = 3.00 \text{ L} \times 1,026 = 3.08 \text{ L}$

**INHALATION:**  $FVC (BTPS) = 3.00 \text{ L} \times 1,115 = 3.34 \text{ L}$

The turbine is accurate if the FVC value does not deviate from the expected value by  $\pm 3\%$ .

In the example above, we have:

**EXHALATION:** Expected FVC (BTPS) = 3.08    Acceptability limits at  $\pm 3\%$     2.98 - 3.17 Litres

**INHALATION:** Expected FVC (BTPS) = 3.34    Acceptability limits at  $\pm 3\%$     3.24 - 3.44 Litres

To access the calibration function, connect the device and click "Calibration". This function runs a calibration check. Depending on its result, the system will display the message PASS or FAIL without sending any correction coefficient to the device.

Users can send correction coefficients to the device if the result is FAIL and the detected error falls within ATS acceptability limits.



Home



Worklist



Calibration



Device



Settings

The calibration window is divided into the following areas:

**Calibration**

Calibrate turbine List of calibrations

Flow-Volume Curve

Flow (L/s)

Volume (L)

Calibration

Expiratory Flow

Inspiratory Flow

Fast

Average

Slow

Press the start button to launch calibration

Turbine

Reusable

Reusable

Syringe

3L

CANCEL

START

Field of Flow-Volume Curve

Turbine in use

Syringe in use

Cancel Calibration

Start Calibration

Previous calibrations can be checked using the “List of calibrations” icon inside the “Calibration” window. A printable list of the calibrations made on different devices appears.

The following window appears when you select a test. This window allows you to analyse calibration-related data, which you can print or save in .pdf format.

This way, you can also print the calibration freshly carried out

**Calibrations**

P Spirodoc  
W12862 | 07 April 2022 17:39

F Spirodoc  
W12862 | 07 April 2022 17:38

F Spirodoc  
W12862 | 07 April 2022 17:37

Chiudi

Turbine calibration check report

Flow (L/s)

Volume (L)

Date: 07/04/2022 17:39:37 Pass

Syringe Volume: 3.00 L

Stannic Pressure: 760 mmHg

Temperature: 24°C (75°F)

Turbine Type: Reusable

	Fast Flow	Medium Flow	Slow Flow	Flow %
FVC (L)	3.10	2.90	2.94	-0.88
Avg Flow Ex. (L/s)	10.18	8.63	2.00	
FVC (L)	3.08	3.11	3.12	3.45
Avg Flow In. (L/s)	0.05	0.05	3.30	

Signature: oooooo

Instrument Used: Spirodoc W12862

MIR Medical International Research

Page 1 of 1

Save PDF

Print

Cancel

**⚠ WARNING**

Some calibration syringes are fitted with an air-volume adjustment valve. Before calibration, check the position of the syringe plunger O-ring, which must be set to the chosen volume value. For example, if you use a 3l syringe, the adjustment position must be set to 3.

Follow the instructions below to start calibration:

- 1 Connect the device to be calibrated to the PC via USB
- 2 Install the turbine on the device
- 3 Apply the turbine to the calibration syringe output using the paper or plastic mouthpiece with an outer diameter of 30 mm

**⚠ WARNING**

Place the device so that the turbine cannot move.

- 4 Check the indicated device type and serial number on the top right side of the “Spirometer calibration test” window. The calibration will involve the indicated device

**⚠ WARNING**

Only devices with a USB connection to the PC can be calibrated online. Devices using Bluetooth Low Energy connection cannot be calibrated

- 5 Select the calibration syringe based on the maximum volume it can provide
- 6 Click “Start” to launch the calibration;

### Calibration

Calibrate turbine

List of calibrations

**Flow-Volume Curve**

**Calibration**

Expiratory Flow

Fast

Average

Slow

Inspiratory flow

Fast

Average

Slow

0.00 0.21 3.00

**Turbine**

**Spirodoc**  
Reusable

Reusable

---

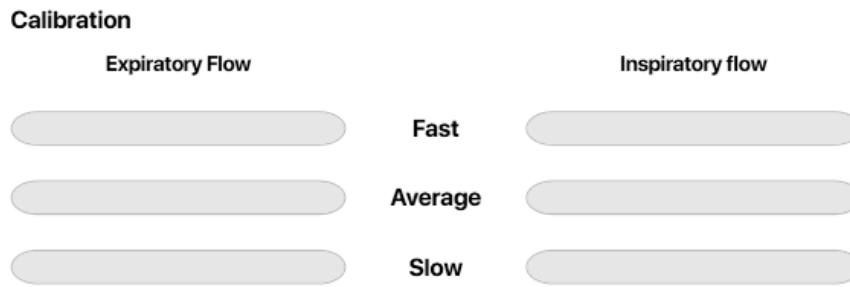
**Syringe**

3 L

CANCEL

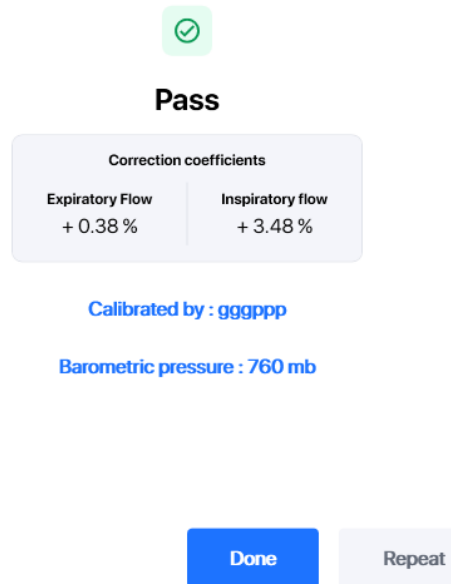
START

7 Inspire and expire with the calibration syringe, reproducing various flows so as to cover various ranges defined in the “Calibration” area. Use the indications on the progress bars and horizontal flow indicators in the Calibration area to help you carry out the operations;



8 When all progress bars turn green, the test ends, and the following screen is displayed:

ration



Click “Repeat” to run a new calibration.

9 While inspiring and expiring, the system displays the Flow/Volume curve on the left side of the window. The operator can inhale and exhale for maximum 20 times. The calibration process fails if, after such a number, the progress bars do not turn green.

In this case, check the turbine as described in the device’s user manual and clean it if necessary before running a new calibration test.

## Calibration

The screenshot displays the calibration interface with the following components:

- Calibrate turbine** (tab)
- List of calibrations** and **Factory reset** buttons.
- Flow-Volume Curve**: A graph showing Flow (L/s) on the y-axis (ranging from -14 to 14) and Volume (L) on the x-axis (ranging from -3 to -0,5). The curve shows multiple cycles of flow and volume.
- Spirobank II** device information:
  - Serial: Y26183
  - Version: 2
  - Graphic: 0
  - Free Memory: 100 %
  - Battery Level: 100 %
- Calibration (BTSPS 1,073)** section:
  - Correction coefficients:
 

Expiratory Flow	Inspiratory flow
- 3,30 %	+ 0,97 %
  - Calibrated by: (Missing)
  - Barometric pressure: 760 mb
  - Temperature (°C): 29
  - Humidity: 0 %
  - Buttons: **Do you want to correct your device?** (with **Close** and **Repeat** options).
- Disposable** and **Syringe** selection options.
- 3 L** volume selection.
- CANCEL** and **START** buttons.

At the end of a calibration you can manually add humidity, pressure and even choose your own temperature (or leave the one calculated by the device).

**Environment conditions**

Automatic Calculated Temperature

Temperature (°C):

Pressure (mmHg):

Humidity (%):

Humidity must be a number between 1 and 99

**CONFIRM** **CANCEL**

**⚠ WARNING**

The test is interrupted, and default values are set if the test fails to start within 20 seconds after clicking "Start" or if it starts 10 seconds after the last inhalation or exhalation but does not reach the end

**⚠ WARNING**

Correction values saved in the device are deleted every time a calibration test is launched.

**⚠ WARNING**

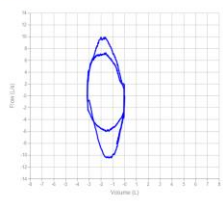
If the test is interrupted after its launch, click "Delete" to run a new calibration test

**⚠ WARNING**

During the calibration test, Flows and Volumes are measured based on ATP (Ambient Temperature and Pressure) conditions. During the spirometry test, all parameter values are measured based on (Body Temperature and Pressure, Saturated) conditions.  
For example, a 3 L volume (ATP) provided by a syringe equals a 3.08 L volume (BTPS).

Once the test is complete, you can print the test report in the calibration list by accessing the “List of calibrations” and selecting the freshly completed calibration test

**Tubine calibration check report**



Date: 31/05/2024 11:58:12 Pass with correction

Syringe Volume: 3.00 L  
 Barometric Pressure: 980 mmHg  
 Temperature: 20°C (68°F)  
 Tubeine Type: Disposable  
 Humidity: 65%

	Fast Flow	Medium Flow	Slow Flow	Error %
FVC (L)	3.14	3.13	3.13	4.53
Avg Flow (L/s)	0.19	0.20	0.24	
FVC (L)	3.16	3.14	3.16	4.97
Avg Flow (L/s)	0.65	0.62	0.78	

Signature: \_\_\_\_\_ Instrument used:  
SpiroPro v10 02080

MIR - Powered by MIR Spiro 2.1.0.0 Page 1 of 1

Settings

---

Save PDF

Print
Cancel

## 5 RUNNING TESTS

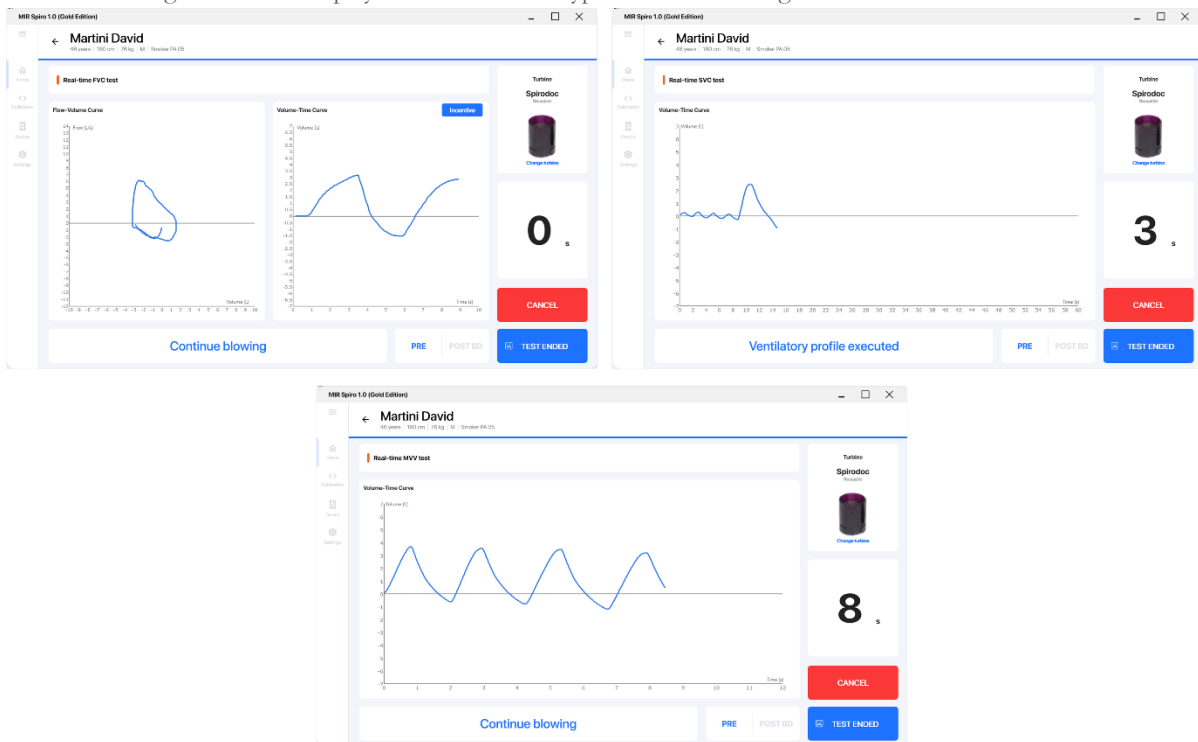
### 5.1 Spirometry (FVC – SVC – MVV)

**MIR Spiro** runs (PRE and POST) FVC - VC – MVV (MVV POST is available only for **Platinum Edition**) – OXI tests. If not registered, insert the patient’s name and details in the system before running a test. Or select a recorded patient.

Now, click one of the icons on the bar on the right side to start the spirometry or oximetry test.



One of the following windows is displayed for these three types of tests showing their real-time trend:



Remember to set the turbine before each test as they will calculate the test’s output data. If necessary, change the turbine by clicking “Settings” in the “Test” section.

Every test window includes the following commands and functions:

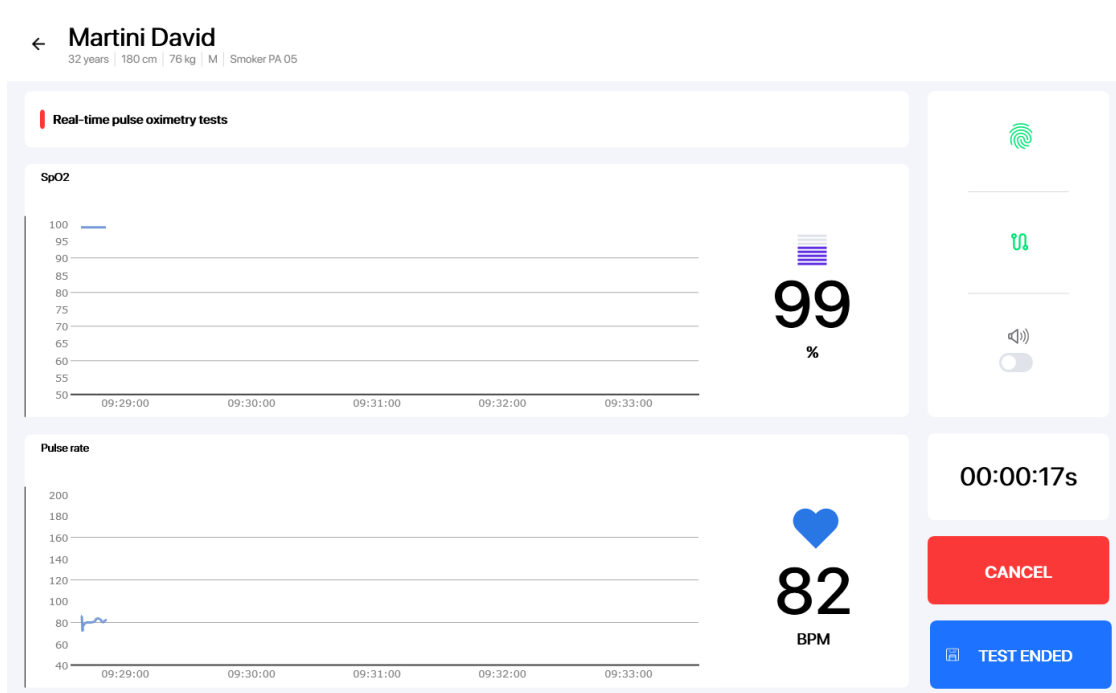
Command	Function
Start	To start receiving data from the connection device
Test ended	To save the test's data
Cancel	To block a test when not correct. The collected data will not be saved
Delete	To delete the test, select it and right-click "Delete" using the mouse

When the test ends, if no command is given or the "Test ended" command is given, the operation is saved, and a test report window appears.

## 5.2 Oximetry



The  icon opens a window that allows you to monitor the oximetry test trend.



This window displays the test's time trend for the SpO2 and heart rate values. The right side of the window shows the instant value of the two parameters. The icons you need to check whether the device used gets the signal, and the cable is connected correctly are on the right side of the page. The following icons allow you to customise the settings of the alarms related to the measured values and choose whether to use the beep during the test.

Also in this case, the commands on the bottom of the page allow you to start, cancel or end a test.

## 6 RESULTS

By clicking the patient's name, you access the Results archive of the tests completed. Here, you can select the tests icons and consult the test sessions through the drop-down menu:

**Martini David**  
37 years | 180 cm | 76 kg | M | Smoker PA 05

**Spirometry** 03/12/2012 15:16 FVC POST

**Flow-Volume Curve** Reference curve

**Volume-Time Curve**

**Result** PRE 1 / 1 POST 0 / 1 ACCEPTABLE

Variability: FEV1 - Reference ERS ECSS Knausson  
FVC - Reference

Temperature: 24°C (75°F) Quality level: D/E

BTSP: 1,097

Mild obstruction

Significant bronchodilatation with FEV1 >= 80% pred.

Notes: Salbutamol 400 mcg

Parameters	PRED	PRE	%PRED	3:16:07	POST	%PRED	%CHG	4:28:15
FVC (L)	5,06	3,95	78	3,95	6,20	123	+57	6,20
FEV1 (L)	4,17	3,13	75	3,13	4,80	115	+53,4	4,80
FEV1/FVC (%)	80,5	79,2	98	79,2	84,7	105	+6,9	84,7
PEF (L/s)	9,61	8,50	88	8,50	10,25	107	+20,6	10,25
ELA (Years)	37	80	216	80	37	100	-53	35
FEF2575 (L/s)	4,60	3,50	76	3,50	4,59	100	+31,1	4,59
FET (s)	6	2,06	34	2,06	5,70	95	+176,7	5,70

Buttons: PRE, POST BD, START, Print

The “Print” icon on the bottom right-hand bar allows you to print the selected test session. The print preview includes a drop-down menu that you can use to select:

- the display standard
- the “Print” icon to select a printer

the “Save PDF” icon to save the pdf format locally

You can configure the test parameter table by clicking on the icon . In this way, you can choose whether to display columns with PREDICTED or LLN values, just as you can choose whether to display columns with %PREDICTED or Z-SCORE values.

For the **Platinum Edition** only, the icon allows you to customize the results table by choosing from the list which parameters to display. You can customize the order in which parameters should be displayed in the table by interacting with the button or by dragging the parameter in the desired position.

Clicking on the "Original Settings" button will restore the initial configuration.

### NOTE

Changing the parameters and columns of the table does not affect the printing of the tests.

**Parameters**

PREDICTED LLN %PREDICTED Z-Score

FVC	<input checked="" type="checkbox"/>
PEF	<input checked="" type="checkbox"/>
FEV1/FVC	<input checked="" type="checkbox"/>
FEV1	<input checked="" type="checkbox"/>
ELA	<input checked="" type="checkbox"/>
FEF2575	<input checked="" type="checkbox"/>

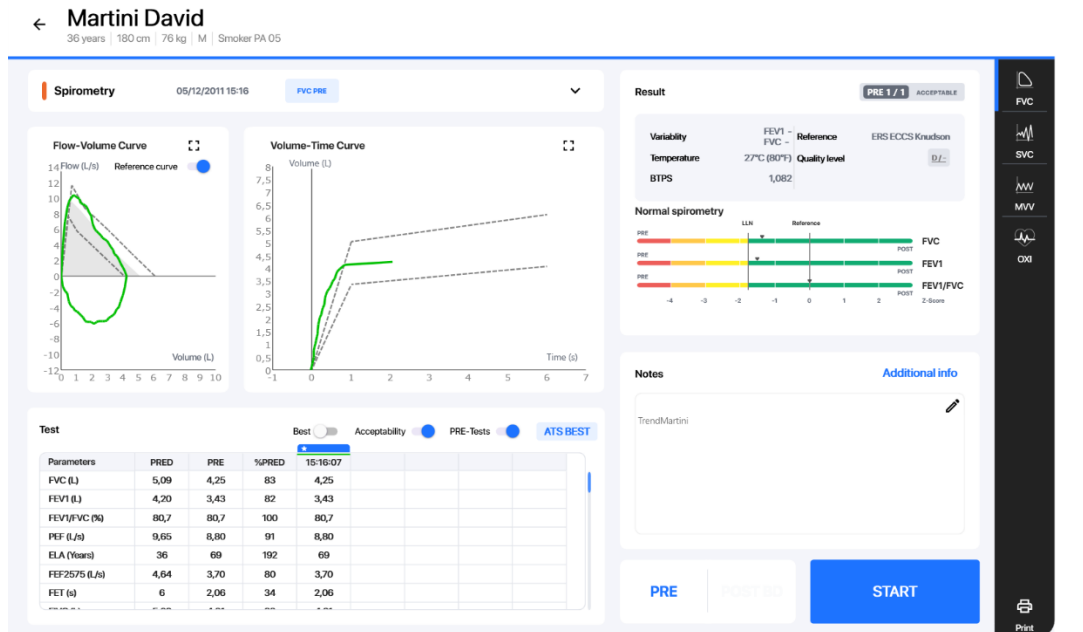
ORIGINAL SETTINGS

CONFIRM CANCEL

## 6.1 Spirometry

At the end of a real-time spirometry test, or if you click “FVC”, “SVC” or “MVV” in the main page’s toolbar, the system displays the test results for the patient selected in the combined box.

The results window shows the patient’s overall situation, displaying personal and anthropometric information, parameters, diagnosis, and the test preview.



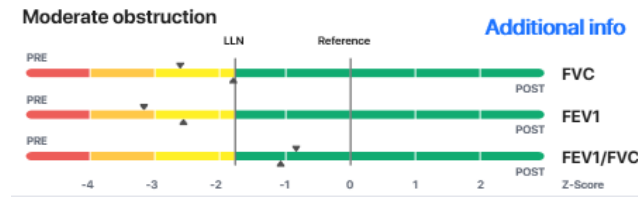
Click the connections to access the details of the single tests. For example, the “FVC PRE” key will open the page of the available PRE FVC tests.



In the window displaying FVC results, you can:

- view parameters and curves
- only for FVC tests, the system displays the estimated LLN and ULN curves as indicated in the ATS 2019 guidelines
- via key: **Reference curve**   you can also view the predicted curve
- modify the BEST test by selecting the one of your interest from the table and right-clicking “Best”
- delete saved tests by right-clicking on them and then clicking “Delete” after having selected them from the result table
- exclude some tests by right-clicking “Disable”. In this case, the test will not be deleted but just excluded from the result calculations. A disabled test can be enabled again by right-clicking “Enable”.

The pictogram shows the standard deviation of the BEST test's main parameters compared to their predicted values. It is indicated as follows:  
The arrows on the bars indicate the position of the parameters (FVC, FEV1, e FEV1%) in the BEST test compared to the limits.



**Significant bronchodilatation with FEV1 < 80% pred.**

The result of the Automatic Interpretation calculation based on ATS guidelines is above the pictograms. In the case of a POST test, the system indicates whether the bronchodilation was significant or not.

Platinum Edition only: the additional info (in the Automatic Interpretation section) helps the doctor to better understand the automatic interpretation self calculated by the software in the following ways:

- Description of the physio-pathological condition of the patient
- Advices for the doctor (for instance recommended a Post-test if required)
- Description of the relationship between the shape of the flow volume curve and the kind of disease detected

On the result page, if you click on more info in the bottom right-hand box, you open a window where you can:

- specify the patient's position during the test
- specify the barometric pressure (set to the sea level pressure by default)
- the date of the last calibration test performed on the connected device
- a box dedicated to the reproducibility of the performed trials carried out in the PRE test and one dedicated to the POST test appears. This box contains constant parameters between the two best tests (acceptable even if the device used is of ATS 2019 type)
- Two boxes where you can indicate who has performed and who has reported the test session

**Position of patient**

Not specified     Standing     Sitting

Barometric pressure  
760

Performed by

Report by

Last calibration

Reproducibility PRE

Reproducibility POST

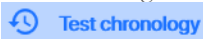
**Close**

### 6.1.1 Diagnostic trend

The right side of the screen dedicated to the patient allows you to open the diagnostic trend in read-only mode. The chart on the right side shows the FEV1 parameter trend for the selected patient. The chart shows the best FEV1 values for each of the 5 spirometry sessions performed.

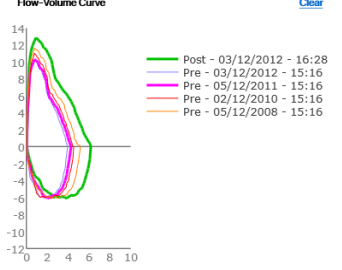
The screenshot displays the patient management interface for 'Martini David'. On the left, a search bar contains 'Martini David' and a 'New Patient' button. Below is a list of patients with 'Martini David' selected, showing ID #0001\_36, 46 years old, and a last test on 03/12/2012. The right panel shows patient details: 46 years, 180 cm, 76 kg, M, Smoker PA 05. A 'LAST TEST' dropdown is set to 'LAST TEST'. The 'SPIROMETRY TRENDS' section shows 'Reduction FEV1 (ml/year)' at -300 and 'Lung age (years)' at 80. A line chart plots 'Parameter (LFE)' on the y-axis (ranging from -2 to 7) against 'Time (date)' on the x-axis (ranging from 01/12/2008 to 02/12/2012). The chart shows five data points: three green points at approximately 4.5, 4.5, and 4.0, and two yellow points at approximately 3.5 and 3.5. At the bottom, there are buttons for 'Test chronology' and 'View all tests'. A vertical sidebar on the right contains navigation icons for FVC, SVC, MVV, and OXI, and a 'Print' icon at the bottom.

### 6.1.2 FVC Chronology

After selecting a subject from the Patient List, the patient's complete FVC testing history can be accessed through the  button located at the bottom right of the screen.

**Martini David**  
51 years | 180 cm | 76 kg | M | Smoker PA 05

**Flow-Volume Curve** Clear





Select the FVC tests you want to compare from the list below

Date	03/12/2012 16:28	03/12/2012 15:16	05/12/2011 15:16	02/12/2010 15:16	03/12/2009 15:16	05/12/2008 15:16	02/12/2007 16:47
Phase	Post	Pre	Pre	Pre	Pre	Pre	Post
FVC (L)	6.2	3.95	4.25	4.55	4.84	5.15	5.69
FEV1 (L)	4.8	3.13	3.43	3.73	4.03	4.33	5.01
FEV1/FVC (%)	84.7	79.2	80.7	81.9	83	84	88
PEF (L/s)	10.25	8.5	8.8	9.1	9.4	9.69	12.36

**Tests**

Date	<input checked="" type="checkbox"/> 03/12/2012 16:28	<input type="checkbox"/> 03/12/2012 15:16	<input checked="" type="checkbox"/> 05/12/2011 15:16	<input type="checkbox"/> 02/12/2010 15:16	<input type="checkbox"/> 05/12/2008 15:16	Delta
Phase	Post	Pre	Pre	Pre	Pre	
FVC (L)	6.2	3.95	4.25	4.55	5.15	45.88
FEV1 (L)	4.8	3.13	3.43	3.73	4.33	39.94
FEV1/FVC (%)	84.7	79.2	80.7	81.9	84	4
PEF (L/s)	10.25	8.5	8.8	9.1	9.69	16.48
ELA (Years)	37	80	69	59	39	-46.38

 Export data  
 Print

From the table above, you can select FVC trials that belong to different sessions through clicking on the columns of the trials. This operation allows you to populate the curve graph and the lower table and to perform a comparison between temporally distant trials. Checking two trials of interest will populate the delta calculation as the last column. In the delta column the comparison between the parameters of the two trials always follows the chronological order: if the more recent trial shows an improvement, in the specific parameter, compared to the less recent trial, the delta will be positive; negative otherwise.

Using the menu at the bottom right, it is possible to generate a .csv file with the details of the selected trials or to run a printout of them.

The screenshot displays the MIR Spiro software interface. On the left, there is a 'Patient Data' section with the following information:

Patient ID	#0001_36	Age	51
Surname	MARTINI	Gender	M
Name	DAVID	Height	180 cm
Date of birth	06/05/1971	Weight	76 kg
Ethnic group	Caucasian	BMI	23.46
Smoke	Smoker	Pack-Year	05
Patient Group			

Below the patient data is a table for 'Forced vital capacity' with columns for DATE, TIME, PHASE, FEV1, FEV1/FVC, FEV6, FEV1/FEV6, and PEF. The table contains data for four different dates and times, with a 'DELTA' column for the difference between the first and last entries.

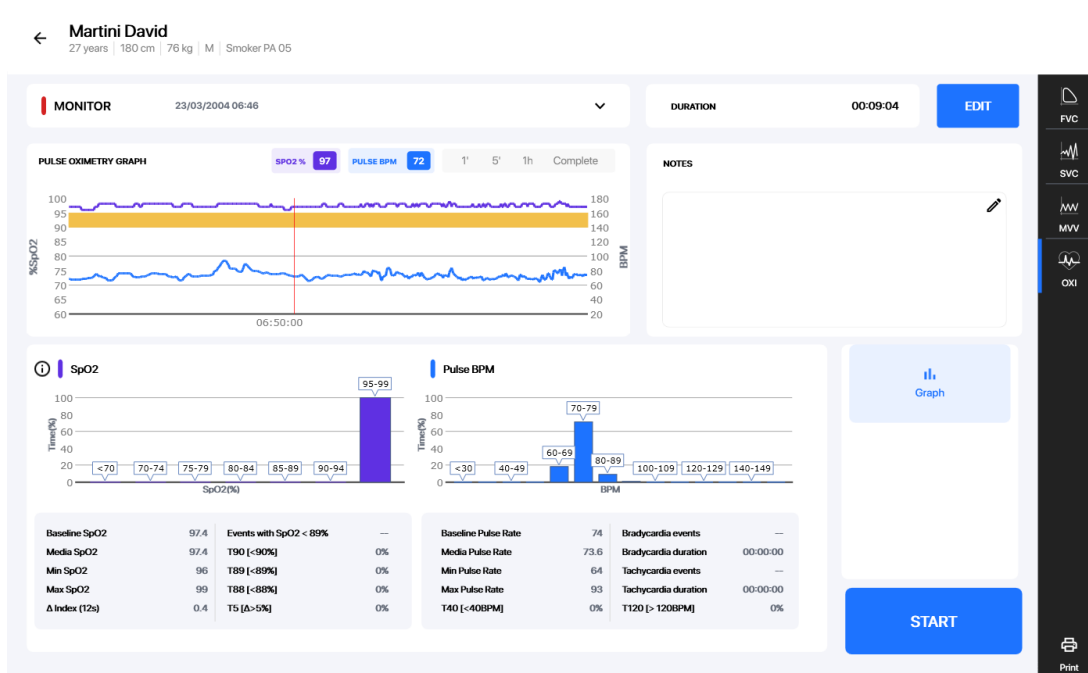
The main area of the interface shows two flow-volume graphs. Each graph plots Flow (L/s) on the y-axis (ranging from -10 to 14) against Volume (L) on the x-axis (ranging from 0 to 8). The graphs show multiple blue curves representing different respiratory trials.

On the right side of the interface, there is a 'Settings' button with a gear icon. Below it are two search icons (magnifying glasses) and a 'Save PDF' button with a PDF icon. At the bottom right, there are 'Print' and 'Cancel' buttons.

By clicking on "Settings" it is possible to choose whether to show patient data in the printout, which parameters to include in the printout and also the sorting of them.

## 6.2 Oximetry

The following window provides an overview of the oximetry test performed. You can access this window at the end of a real-time oximetry test or by pressing OXI on the right-hand bar.

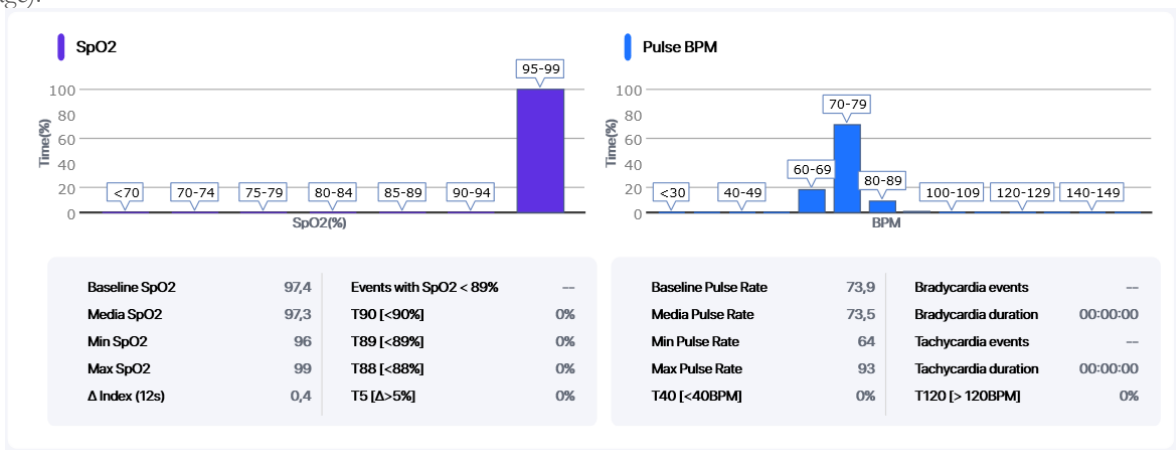


The top-left side of the screen shows the list of oximetry tests recorded for the selected patient. You can focus on a specific portion of the chart by clicking the red bar, which follows the cursor's movement, and selecting a time zoom (one minute, five minutes, or one hour) using the relevant icons: 1' 5' 1h Complete

The position of the red bar indicates the start of the chosen zoom window. For each test, you can view the test date, time and duration on the right side.

Moreover, the top-right section of the window allows you to write down comments to associate with tests and take note of any element that can help you interpret the results correctly.

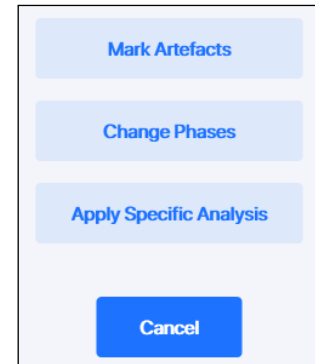
Opening an oximetry, you will find the Graph button (Graph) selected in the lower right part of the screen. In this case, test graphs will be shown in the lower part of the screen. Opening an oximetry, you will find the GRAPH button selected in the lower right part of the screen. In this case, in the lower part of the screen, test graphs will be shown (as in the following image):



Next to the saturation bar graph is the icon: ⓘ This provides access to a file containing the definition of the oximetry parameters shown (see Appendix A).

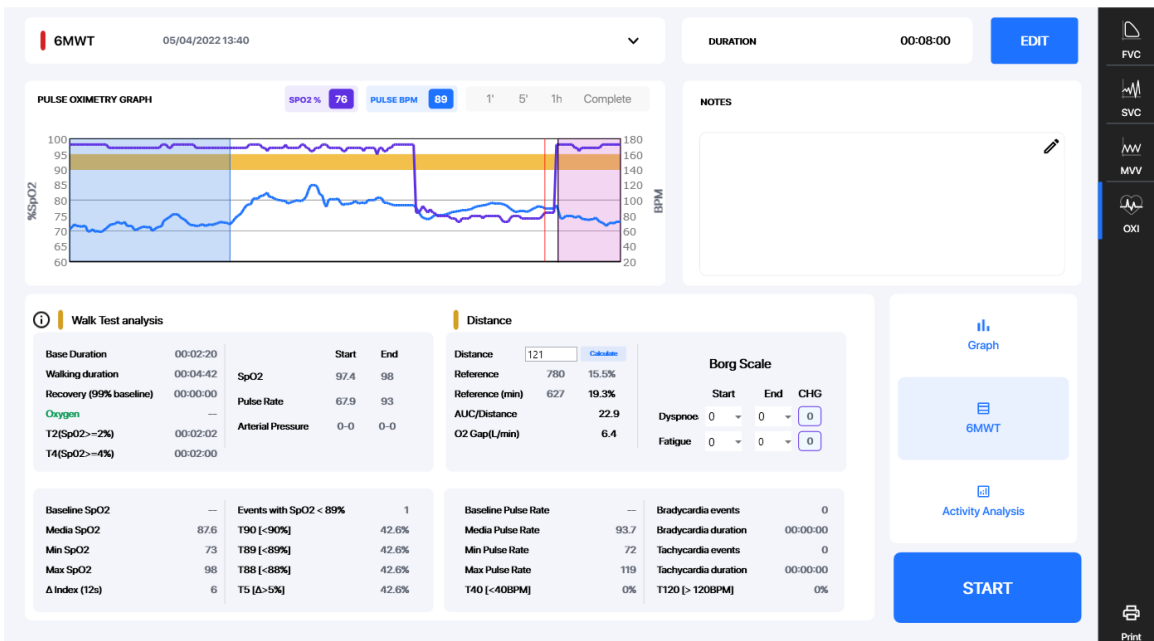
the **EDIT** button at the top right of the screen allows you to:

- Define and mark artefact on oximetry curve: click on "Mark Artefacts" to show the graph of the oximetry test, where artifacts can be highlighted by double-clicking on the graph. When finished, close the graph to save the changes
- Define and mark oxygen and phases on oximetry curve: clicking on "Change Phases" allows you to change the different phases of oximetry by simply dragging the areas of interest; you can also enter the phases of oxygen administration to the patient by double-clicking in the O2 field below the graph.
- Change oximetry type: This allows you to change the oximetry type and therefore the related specific analysis. For example, you can transform a monitor test into a 6-Minute Walking test



### 6.2.1 Six-Minute Walking Test

If you import an oximetry session carried out based on the “Six Minute Walking Test” (6MWT) protocol, you can interact with it in the result screen:



Take a look at the chart. The first and second rest periods are indicated with a shaded blue and shaded pink part, respectively. The non-shaded interposed section reflects the walking period.

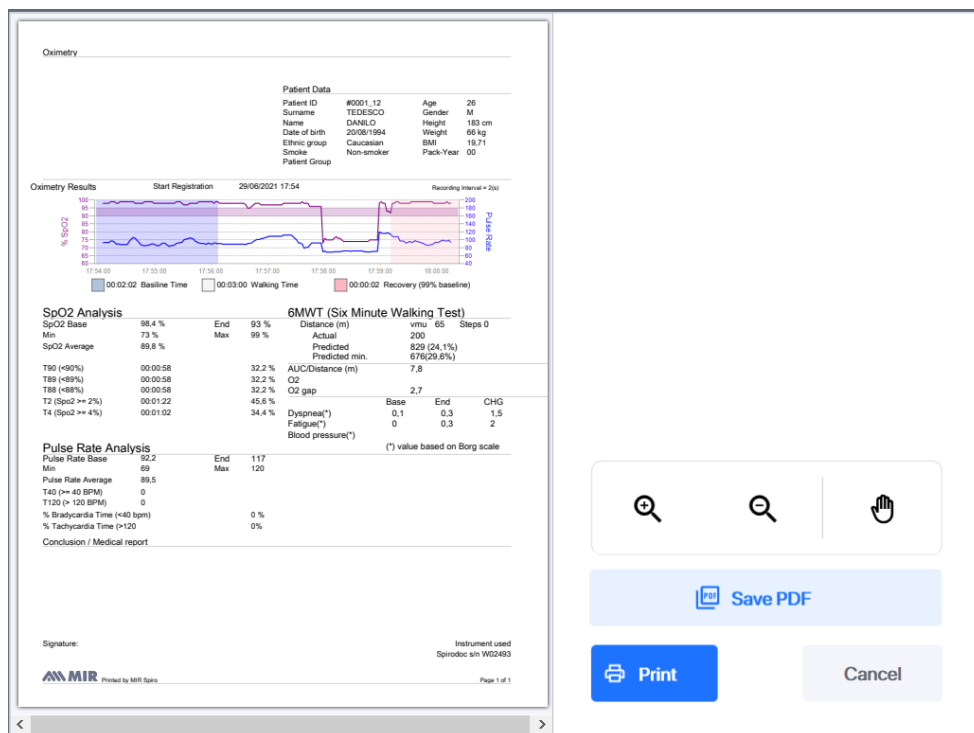
By clicking the **6MWT** icon, you can view the 6MWT parameters.

By means of the **Calculate** key, the software converts the distance covered in steps into an estimate of the distance covered in metres.

If the oximetry test was performed with a device that allows motion detection, clicking on the **Activity Analysis** icon provides access to the analysis of the subject's physical activity while performing the oximetry test.

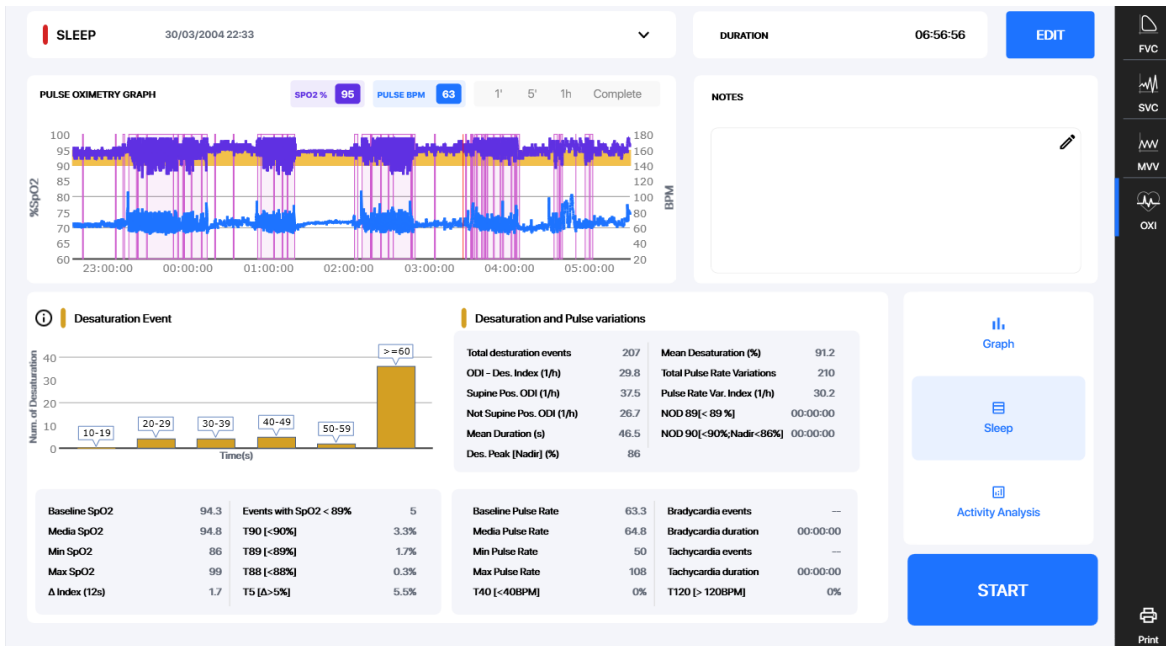


You can print or save a .pdf file of the test performed by clicking “PRINT” on the bottom right side of the screen. This way, you open the print preview page:



## 6.2.2 Sleep Oximetry

If you import an oximetry session performed on the “Sleep Oximetry” (OXISLEEP) protocol, you can interact with it in the result screen:



Take a look at the graph. Through the pink areas, the main graph shows the desaturation events that occurred during the test.

By clicking the **Sleep** icon, you can view the Sleep Oximetry parameters related to the desaturation analysis, pulse variations analysis, and NOD (Nocturnal Oxygen Desaturation) analysis.

If the oximetry test was performed with a device that allows motion detection, clicking on the **Activity Analysis** icon provides access to the analysis of the subject's physical activity while performing the oximetry test.



You can print or save a .pdf file of the test performed by clicking “PRINT” on the bottom right side of the screen. This way, you open the print preview page:

**Sleep Oximetry**

**Patient Data**

Patient ID	#0001_36	Age	32
Surname	MARTINI	Gender	M
Name	DAVID	Height	180 cm
Date of birth	06/06/1971	Weight	76 kg
Ethnic group	Caucasian	BMI	23.46
Smoker	Smoker	Pack-Year	05
Patient Group			

**Oximetry Results** Start Registration: 30/03/2004 22:33 Recording: 201 Desaturation: 4% Desaturation Research: 4-45(s)

**SpO2 Analysis**

SpO2 Base	94.3 %	Max	99 %
Min	86 %	ODI - Desaturation Index	29.8
SpO2 Average	94.8 %	Supine Positional ODI (1/6h)	37.5
T90 (<90%)	00:13:52	Non-Supine Positional ODI	26.7
T89 (<89%)	00:07:00	Mean Duration (s)	46.5
T88 (<88%)	00:01:24	Longest Duration (s)	210
T2 (SpO2 >= 2%)		Desaturation Peak (Nadir)	86
T4 (SpO2 >= 4%)		Mean Desaturation (%)	91.2
		NOD <[D_SpO2]>=4 %	00:00:00
		NOD <[SpO2] %	00:00:00
		NOD <[<90%_Nadir<86%]	00:00:00

**Pulse Rate Analysis**

Pulse Rate Base	63.3		
Min	50		
Max	108		
Pulse Rate Average	64.8	% Bradycardia Time (<40)	0 %
T40 (>= 40 BPM)	0	% Tachycardia Time (>120)	0 %
T120 (> 120 BPM)	0		

Conclusion / Medical report

Signature: \_\_\_\_\_ Instrument used: SPIROTEL s/n 000000

**Settings**

🔍 🔍

**Save PDF**

**Print** Cancel

### 6.3 Whole Session Results view

Once you have selected a patient, opened his or her test list, and selected a session, you can see on the right side of the screen all the best test results (FVC, SVC, MVV, OXI) performed in that session. Such an overview of the patient's clinical situation was developed to enable the physician to make a quick diagnosis. At the bottom of that section are the notes and comments written by the clinician in relation to the tests performed. However, it is always possible for the physician to access the details of all trials of the different tests performed, by opening the session of interest.

Home
Patients **Test**
Show all patients ●

**MARTINI DAVID** Filter search results

Sort By: Test data (search by most recent)

- Spirometry** 03/12/2009 15:16 ID #0001\_36 MARTINI DAVID FVC PRE SVC MVV
- Spirometry** 05/12/2008 15:16 ID #0001\_36 MARTINI DAVID FVC PRE SVC MVV
- Spirometry** 02/12/2007 14:34 ID #0001\_36 MARTINI DAVID FVC POST SVC PRE MVV PRE
- Pulse oximetry** 02/12/2007 13:41 ID #0001\_36 MARTINI DAVID OXIM/MT
- Spirometry** 15/04/2004 10:03 ID #0001\_36 MARTINI DAVID FVC POST SVC MVV
- Spirometry** 14/04/2004 09:02 ID #0001\_36 MARTINI DAVID FVC POST SVC MVV

**MARTINI DAVID** Additional info

32 years | 180 cm | 76 kg | M | Smoker PA 05

02/12/2007 14:34

Parameters	PRED	PRE	%PRED	Z-Score	POST	%PRED	CHG
FVC (L)	5.45	5.68	104	0.35	5.69	104	+0.2
FEV1 (L)	4.52	5.12	113	1.13	5.01	111	-2.1
FEV1/FVC (%)	83.10	90.10	108	1.12	88.00	106	-2.3
FEV1/VC (%)	83.10	83.70	101	0.10			

Parameters	PRED	PRE	%PRED	Z-Score
VC (L)	5.45	6.11	112	1.02
IC (L)	3.67	4.05	110	0.00
ERV (L)	1.78	2.06	116	0.00

Parameters	PRED	PRE	%PRED	Z-Score
MVV (L/min)	150.60	164.20	109	0.00

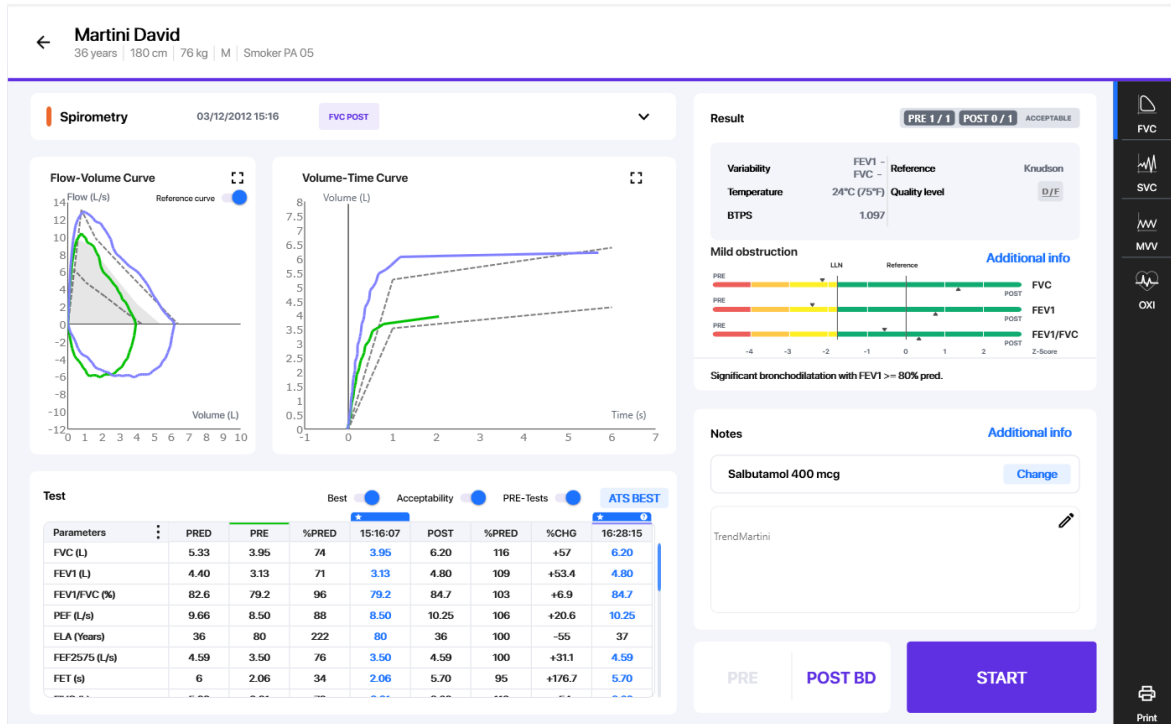
**Notes**

TrendMartini

## 7 PHARMACOLOGICAL BRONCHODILATION TEST (POST)

By clicking “Post DB” on the FVC or SVC or MVV test’s toolbar, you open the bronchodilation test window for the selected patient. MVV test post-assumption of bronchodilator is only available in MIR Spiro Platinum Edition. The green curve indicates the best PRE session of the tests in progress.

You can’t perform a POST test before a PRE test in the same session. To run a PRE test after a POST test, users can decide to open a new PRE session

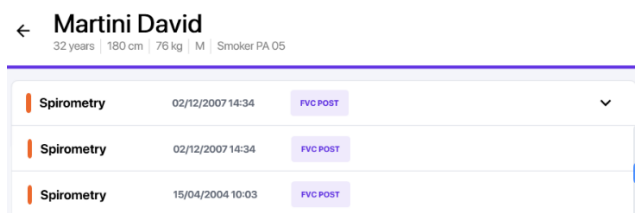


To start a POST test, select a patient and click the FVC or SVC or MVV (Platinum Edition only) icon on the right-hand toolbar.

In the test window, you can recognise the POST test setting from the icon at the bottom of the window indicating “Post DB”.

The chart shows the PRE curve and the POST curves. The parameter table includes predicted and measured values of the PRE test and the POST test.

By using the drop-down list (“Session List”), you can view the results of the patient’s test sessions.



You can disable or enable one or more tests in the chart by selecting them and right-clicking “Disable” or “Enable”. The “Print” key on the bottom right side of the program allows you to print the viewed curves and/or save the results in .pdf on the local disc in use.

By activating the “Pre Trial” option, you can view the parameter table (in addition to the BEST PRE) and other reference PRE tests.

## 7.1 TEST BRONCHO CHALLENGE

Consideration:

the broncho challenge test is used primarily for bronchial asthma, which is an inflammatory airway disease characterized by increased bronchial reactivity (nonspecific bronchial hyperresponsiveness, IBA) that can lead to bronchial obstruction. Bronchial hyperresponsiveness is the increase in normal bronchial tone in response to stimuli of various types.

Normally, the bronchial tract, when subjected to inhalation of noxious or irritating substances, as a self-defense reacts with the coughing stimulus, which serves to preserve the lower airways from substances that could damage them. The exacerbation of this mechanism is called bronchial hyperreactivity and generates acute airway obstruction i.e. bronchospasm, which is the basic symptom of asthmatic disease

### BRONCHO CHALLENGE

To do the broncho challenge test click on the icon  will open the broncho challenge test window for the patient selected in the combo box.

To have this feature available you must purchase the Platinum version




Click on “Buy it here” and follow the on-screen instructions.

On the other hand, if you have the Platinum version, after performing an FVC test, the message appears:

**Did you really want to do a Bronchial Challenge test ?**



You enable the icon  and click start to begin the trial.

You cannot run a Challenge trial if there is not at least one PRE trial on the same day for the patient.

Select the methacholine drug or add a new drug if the desired drug is not present

### BC Agents

Search BC agent to use

**Methacoline**

+ Add BC agent

### BC Agent Methacoline

*For the first test the dosage and concentration have to be zero.*

Dosage: 0,0000  Unit of measure: micro-g

Concentration: 0,0000  Unit of measure: mg/ml

+ Add a measure unit

### Risks of new BC Agent

#### SABUTAMOLO

The choice of a different BC Agent for indirect testing is your responsibility.

For more information about the medical guide lines, click on this link :

[Medical guidelines](#)

I accept my choice and take responsibility for it.

By clicking on ASSOCIATE.

Click Save.

N.B. for the first test you cannot change the dosage and concentration

Should you choose a drug other than methacholine, the following message will appear:

in which case click on the guidelines that will lead to the following address:

[ERS technical standard on bronchial challenge testing: pathophysiology and methodology of indirect airway challenge testing | European Respiratory Society \(ersjournals.com\)](#)

For more information.

When the spirometry test is finished, we will have the following screen:

**Test Test**  
44 years | 180 cm | 70 kg | M | Non-smoker

**Spirometry** 05/06/2024 12:05 **FVC BC**

**Flow-Volume Curve** **VT Curve** Broncho CH Curve

**Result** PRE 1 / 1 ACCEPTABLE

Variability: FEV1-FVC- Reference: GLI  
Temperature: 33°C (91°F) Quality level: (G)-  
BTPS: 1,063

**Normal spirometry**

**BRONCHIAL CHALLENGE INFO**  
Step 5 : Methacoline 30,0000 micro-g  
FEV1 variation from Pre: 0,0 L (0%)  
FEV1 variation from last test: 0,1 L (-2%)

Parameters	PRED	LLN	PRE	%PRED	Z-Score	12:05:33	12:29:46	12:29:21	12:14:44	12:12:58	12:05:56
FVC (L)	5,30	4,19	5,28	99,62	-0,03	5,28	4,68	4,36	6,17	5,70	5,87
FEV1 (L)	4,21	3,32	3,72	88,36	-0,92	3,72	3,72	3,65	4,02	4,37	4,44
FEV1/FVC (%)	79,80	69,30	70,50	88,35	-1,47	70,50	79,50	83,70	65,20	76,70	75,60
PEF (L/s)	9,39	5,97	9,94	105,86	0,27	9,94	8,29	8,01	6,41	10,86	10,99
ELA (Years)	44	-	59	134	-	59	-	-	-	-	-
FEF2575 (L/s)	3,96	2,24	2,36	59,60	-1,52	2,36	3,32	3,83	2,33	3,65	3,57
FET (s)	6,00	-	13,13	218,83	-	13,13	3,22	2,50	6,36	5,88	6,61
FVC (L)	5,30	4,19	4,07	76,79	-1,82	4,07	-	-	-	-	-
FEV1/FVC (%)	-	-	-	-	-	-	-	-	-	-	-
FEV1 (L)	5,28	4,18	5,07	94,77	-0,41	5,07	4,68	4,36	6,16	5,70	5,87

**START**

The green color curve represents the best PRE of the current test session.

Further FVC testing can be done by entering the dosage and concentration of methacholine.

### BC Agent Methacoline

Dosage	<input type="text" value="0,0000"/>	Unit of measure micro-g
Concentration	<input type="text" value="0,0000"/>	Unit of measure mg/ml

[+ Add a measure unit](#)

To start the Challenge trial, for the current step, click the start button.

CAUTION: Activate the step you want to run before proceeding to start the trial.

The recommended procedure in this case is:

- Selecting the active protocol step
- Administration of the substance in the amount provided by the activated step
- Performance of spirometric tests related to the current step
- Selection of the next step

If the test is deemed acceptable, it is automatically saved.

The bronchial provocation test consists of several steps defined in the active bronchodilation protocol for the user.

information is shown below.

**Test Test**  
44 years | 180 cm | 70 kg | M | Non-smoker

**Spirometry** 05/06/2024 12:05 **FVC BC**

**Flow-Volume Curve**  
Flow (L/s) vs Volume (L)

**VF Curve Broncho CH.Curve**  
Volume (L) vs Time (s)

**Result** PRE 1 / 1 ACCEPTABLE

Variability	FEV1-FVC-	Reference	GLI
Temperature	31°C (87°F)	Quality level	DI-
BTPS	1,063		

**Normal spirometry**

**BRONCHIAL CHALLENGE INFO**  
Step 5 : Methacoline 30,0000 micro-g  
FEV1 variation from Pre: 5,0 L (9%)  
FEV1 variation from last test: 0,1 L (-2%)

**Notes** Additional info

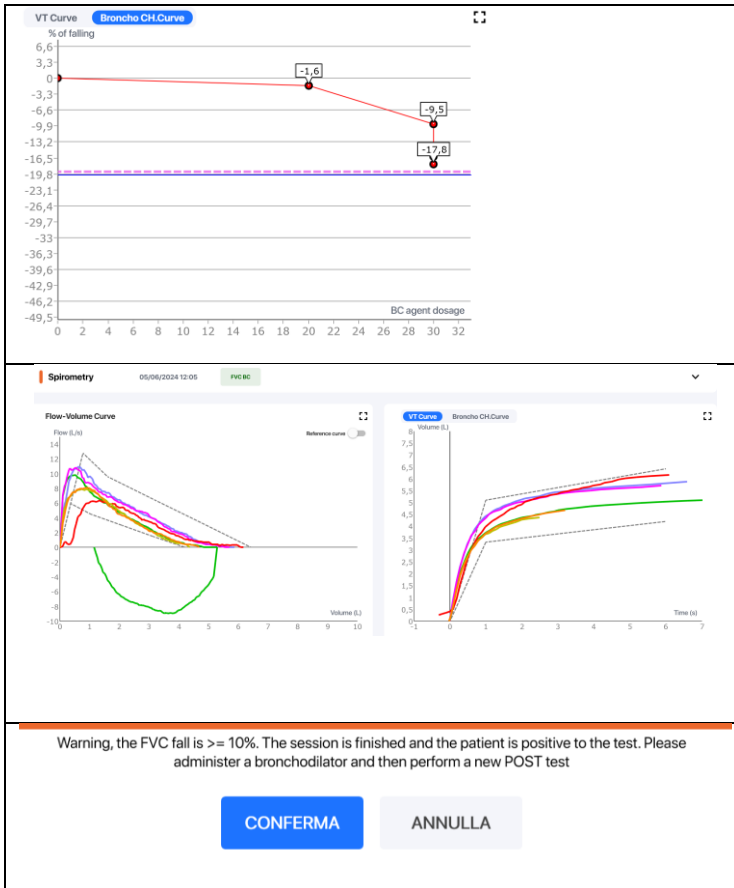
**Test**

Parameters	PRE	LLN	PRE	%PRE	Z-Score	12:05:33	12:29:46	12:29:21	12:14:44	12:12:58	12:05:56
FVC (L)	5,30	4,19	5,28	99,62	-0,03	5,28	4,68	4,36	6,17	5,70	5,87
FEV1 (L)	4,21	3,32	3,72	88,36	-0,92	3,72	3,72	3,65	4,02	4,37	4,44
FEV1/FVC (%)	79,80	69,30	70,50	88,35	-1,47	70,50	79,50	83,70	65,20	76,70	75,60
PEF (L/s)	9,39	5,97	9,94	105,86	0,27	9,94	8,29	8,01	6,41	10,86	10,99
ELA (Years)	44	-	59	134	-	59	-	-	-	-	-
FEF25-75 (L/s)	3,96	2,24	2,36	59,60	-1,52	2,36	3,32	3,83	2,33	3,65	3,57
FET (s)	6,00	-	13,13	218,83	-	13,13	3,22	2,50	6,36	5,88	6,61
FVC (L)	5,30	4,19	4,07	76,79	-1,82	4,07	-	-	-	-	-
FEV1/FVC (%)	-	-	-	-	-	-	-	-	-	-	-
FEV1/F1	5,30	4,19	5,09	96,23	-0,41	5,09	4,68	4,36	6,17	5,70	5,87

**START**

**Broncho CH.Curve**

Click on START icon to start the next step provided by the active protocol, if instead you want to view the list of steps, use the button [Broncho CH.Curve](#)



The Flow/Volume graph shows the PRE curve and the best Challenge curves. The parameter table contains the theoretical and measured values of the PRE test and best Challenge curves.

The Dose/Response graph shows the FEV1 trend (red line). As soon as the fall in FEV1 exceeds the limit predicted by the protocol

the test result is automatically displayed on the graph

The print-out of report broncho challenge is for explanatory use only

**Bronchial challenge report**

MIR  
MEDICAL INTERNATIONAL RESEARCH  
spa

Trial date 05/06/2024 12:05

Patient ID: #0001\_1707838832  
Surname: test  
Name: test  
Date of birth: 01/01/1980 (44 year)  
Ethnic group: Caucasian  
Smoke: Non-smoker  
Worklist: Non-smoker

Gender: M  
Height: 180 cm  
Weight: 70 kg  
BMI: 21,6  
Pack-Year: 00

**FEV1 response curve with Methacoline**

**F/V PRE**

**F/V Bronch Ch**

hh:mm:ss	Phase	Dosage	FEV1	% Δ	%Chg	FVC	%Chg	PEF	%Chg	FEF <sub>25-75</sub>	%Chg
12:05:33	PRE		3,72			5,28		9,94		2,36	
12:05:56	BC Agent		4,44		-19,35	5,87	11,17	10,99	10,56	3,57	51,27
12:12:58	Methacoline (1 mg/ml)	20	4,37	-1,68	-1,58	5,7	7,95	10,86	9,26	3,65	54,66
12:14:44	Methacoline (10 mg/ml)	30	4,02	-8,01	-9,46	6,17	16,86	6,41	-35,51	2,33	-1,27
12:29:21	Methacoline (10 mg/ml)	30	3,65	-9,2	-17,79	4,36	-17,42	8,01	-19,42	3,83	62,29
12:29:46	Methacoline (100 mg/ml)	30	3,72	1,92	-16,22	4,68	-11,36	8,29	-16,6	3,32	40,68

**PC20 = 0,40 mg/mL** Guide lines for the interpretation of the bronchial challenge session **PD20 = 30,00 mg**  
**PC20 mg/mL Interpretation**

> 16 Normal Bronchial responsiveness      1 - 4 Mild hyperresponsiveness  
 4 - 16 Borderline bronchial hyperresponsiveness      < 1 Moderate to severe bronchial hyperresponsiveness

**Conclusion / Medical report**

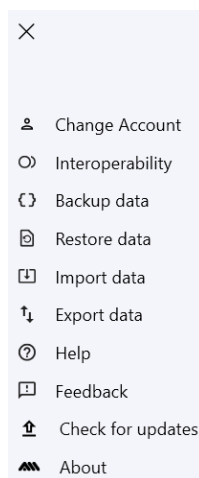
Doctor Signature \_\_\_\_\_ Technician Signature \_\_\_\_\_ Instrument used Spirobank II Smart s/n U03667

## 8 EXPORTING THE ARCHIVE

This function allows you to export the archive (fully or partially) in various formats:

- Electronic spirometry report (ATS)
- CSV file: this allows you to generate a .csv file and manually select the tests you want to export
- GDT file
- HL7 file
- MIR Spiro DB (Platinum Edition only): this allows you to export databases in .mirddb format of your copy of MIR Spiro. In combination with the .mirddb format import function (see Ch. 10) this allows MIR Spiro users to easily share their databases with each other.

To access this function, click the  icon on the top left side of the screen and select “Export data”



The main steps are the following:

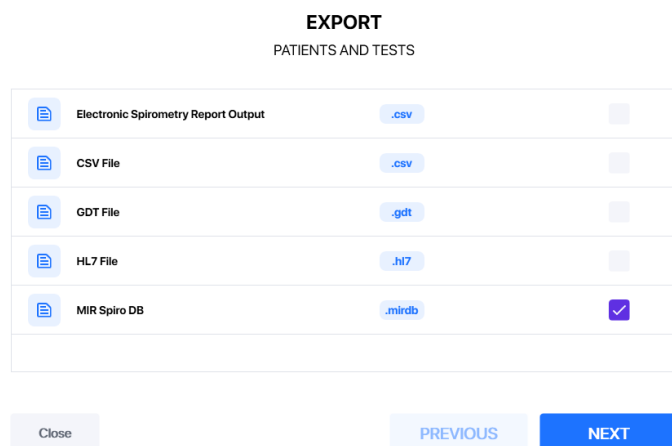
### Step one:

Choose the export format.



You can choose among the following options:

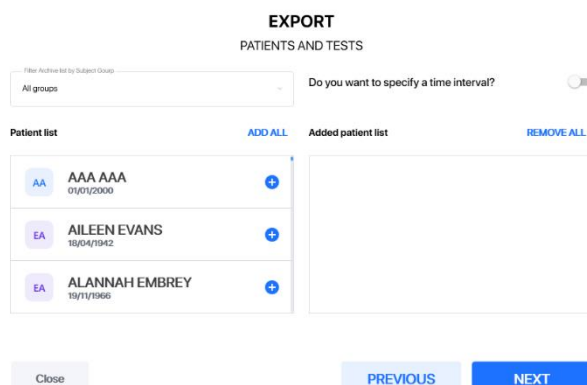
- Electronic spirometry report (ATS)
- CSV file
- GDT file
- HL7 file
- MIR Spiro DB (Platinum Edition only)

then, click the format you have chosen.



### Step two:

select the patient(s) to export and click the  icon or use the “Add all” icon to transfer all the patients in the archive. The selected patients will be displayed on the top-right side of the window. The “Remove all” icon allows you to deselect the patients chosen, as well as by clicking  next to the patient’s name. At the end of the procedure, click “Next” to proceed.



**Step three:**

For CSV file you can also export all tests of the selected patients. This window allows you to choose the parameters, which are grouped in types of tests (FVC, SVC, MVV, SpO2);

**EXPORT**

TEST PARAMETERS

FVC  [Select all](#)
SVC  [Select all](#)
MVV  [Select all](#)
SpO2

FVC <input checked="" type="checkbox"/>	EVC <input type="checkbox"/>	MVV <input checked="" type="checkbox"/>
FEV1 <input type="checkbox"/>	IVC <input checked="" type="checkbox"/>	
PEF <input checked="" type="checkbox"/>	IC <input checked="" type="checkbox"/>	
FEF75 <input checked="" type="checkbox"/>	VC <input checked="" type="checkbox"/>	
FEF2575 <input type="checkbox"/>	ERV <input type="checkbox"/>	
FET <input type="checkbox"/>	TV <input type="checkbox"/>	
FFV/MVC <input type="checkbox"/>	VF <input type="checkbox"/>	

Close
PREVIOUS
NEXT

**WARNING**

You must select at least one element to proceed with the export procedure.

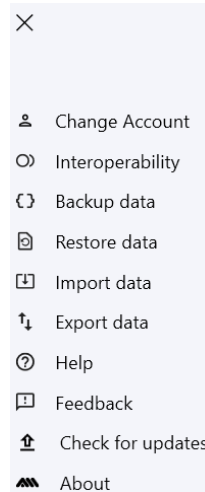
As in the previous windows, click “Confirm” to continue.

At this point, a file will be created in the format previously chosen. You can save the file in the desired position as usual.

## 9 IMPORTING ARCHIVES

The import function allows you to import information from another database inside the program, provided that this data is in a compatible format.

To enable this function, click the  icon on the top left side of the window and then click “Import data”.



The next step involves selecting the format of the file you wish to import. You can choose from the following formats:

- **.mir** (Platinum Edition only): this allows you to import MIR or MIRX files i.e., you can upload to MIR Spiro the device archives saved through WinspiroPRO software (MIR files) or through MIR Spiro software (MIRX files)
- **.wdb**
- **.xml**
- **.hl7** (Platinum Edition only): this option allows you to import databases into the most popular standard in healthcare data exchange.
- **.mirdb** (Platinum Edition only): this allow you to import the databases belonging to another copy of MIR Spiro. In combination with the export function in .mirdb format (see Ch. 9), this allows MIR Spiro users to easily share their databases with each other.



The next step requires the identification of the file to be imported.

The import procedure starts when you select the file.

Use the “Cancel” icon if you want to interrupt the import procedure.

Once the operation is complete, close the window (click “Close”). You will automatically return to the main window.

## 10 PRINT

### 10.1 Printing a spirometry test

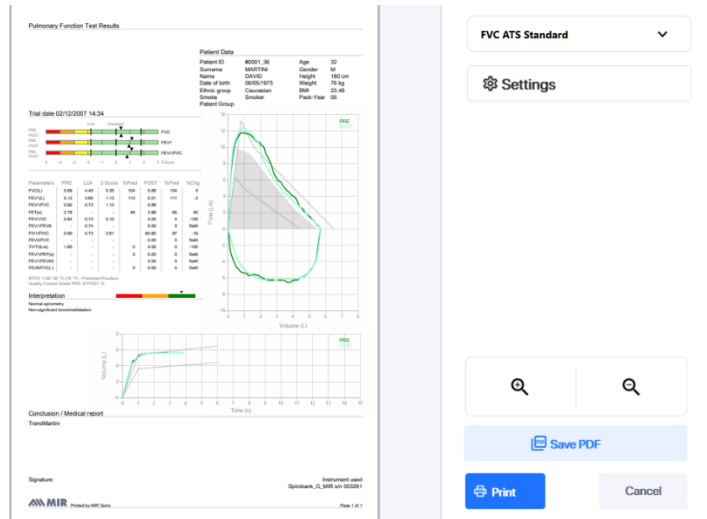
#### 10.1.1 FVC Printout

You can print the best FVC test by using the “Print” icon from the test report view, the test session in progress, or by selecting a patient.

By opening the drop-down menu, the print option window allows you to customise the printed document with the following characteristics.

- FVC ATS Standard
- FVC Niosh Osha (Platinum Edition only)
- WinSpiroPro Classic
- FVC SVC ATS Standard

The left side of the screen shows the print preview depending on the selected standard.

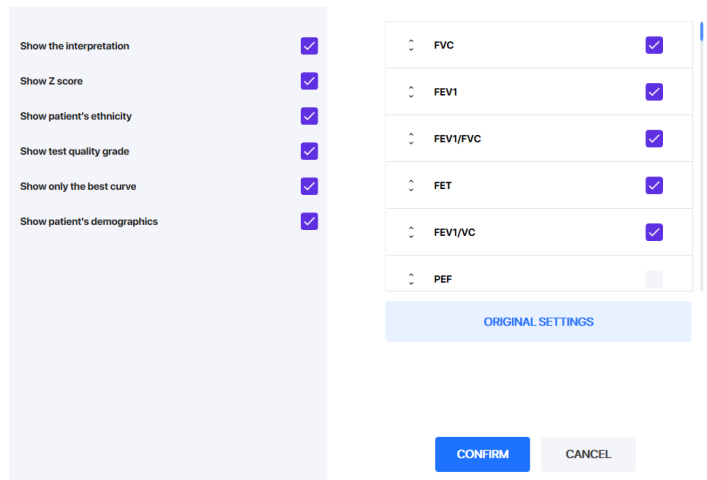


#### NOTE

**The FVC SVC ATS option is available only if the patient has performed FVC and SCV tests in the same session. This option allows you to print the FVC and SVC tests on two separate pages.**

Only in the Platinum Edition, it is possible to customize the printout through the "Settings" button by going to select and deselect the options available on the left side of the screen.



In addition, you can choose (with the  key) and sort (with the  key) the parameters to be displayed in the printout.

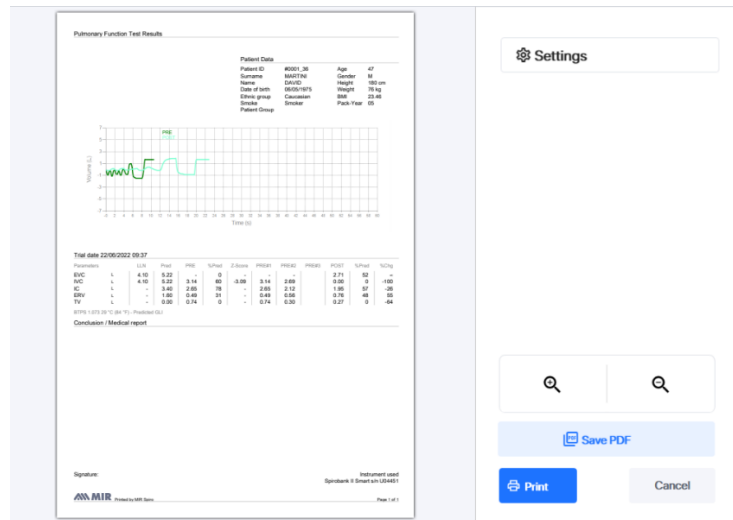


### 10.1.2 SVC Printout

You can print the best SVC test by using the “Print” icon from the SVC test report view.

Only in the Platinum Edition, it is possible to customize the printout through the "Settings" button by going to select and deselect the options available on the left side of the screen.

In addition, you can choose (with the  key) and sort (with the  key) the parameters to be displayed in the printout.



**Pulmonary Function Test Results**


**Patient Data**

Patient ID	#0001_38	Age	47
Surname	MASTIYO	Gender	M
Name	DAVID	Height	180 cm
Date of birth	04/02/1975	Weight	78 kg
Ethnic group	Caucasian	BSA	23.88
Smoker	Smoker	Smoker	23.88
Patient Group	Smoker	Pack Year	33



**Parameters**


Parameters	Unit	FEV1	FVC	Tidal	Z Score	FEV1/FVC	FEV1/FVC	FEV1/FVC	FEV1/FVC	FEV1/FVC
FEV1	L	4.10	3.22	1.14	0	3.38	3.14	2.88	2.71	32
FVC	L	4.10	3.22	3.14	0	3.38	3.14	2.88	2.71	32
FEV1/FVC	%	1.00	2.85	78	-	2.85	2.12	1.95	57	28
Tidal	L	1.00	0.80	74	-	0.80	0.68	0.70	68	32
TV	L	0.90	0.74	0	-	0.74	0.50	0.27	51	44



**Conclusion / Medical report**

**Signature:**  **Instrument used:** Spirobank 9 Smartwin (234857)

**Settings**

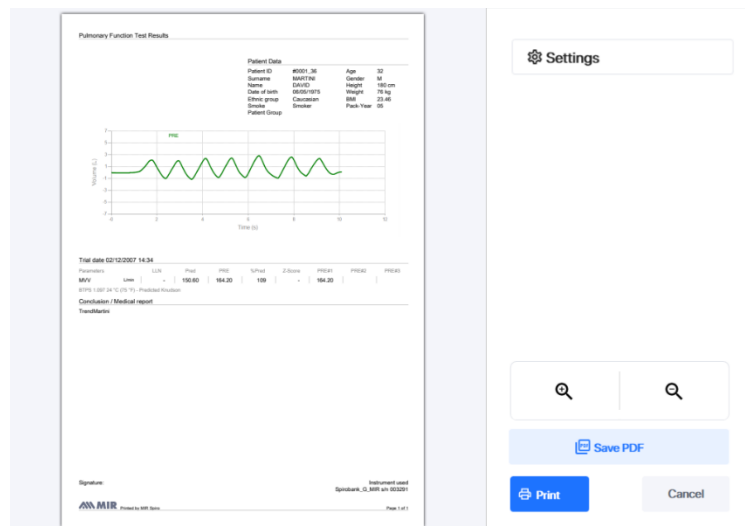
 Save PDF

 Print  Cancel

### 10.1.3 MVV Printout

Only in the Platinum Edition, you can print the best MVV test by using the “Print” icon from the MVV test report view.

It is possible to customize the printout through the "Settings" button by going to select and deselect the options available on the left side of the screen.



**Pulmonary Function Test Results**


**Patient Data**

Patient ID	#0001_36	Age	32
Surname	MASTIYO	Gender	M
Name	DAVID	Height	180 cm
Date of birth	10/03/1983	Weight	75 kg
Ethnic group	Caucasian	BSA	23.46
Smoker	Smoker	Pack Year	28



**Parameters**


Parameters	Unit	FEV1	FVC	Tidal	Z Score	FEV1/FVC	FEV1/FVC	FEV1/FVC	FEV1/FVC	FEV1/FVC
MVV	L/min	150.80	164.20	159	-	164.20	162.00	162.00	162.00	162.00



**Conclusion / Medical report**

**Signature:**  **Instrument used:** Spirobank 9 Smartwin (234857)

**Settings**

 Save PDF

 Print  Cancel

## 10.2 Printing an oximetry test

To print the data of an oximetry test, follow the procedure described in the previous section to display the preview of the selected test.

**Oximetry**

**Patient Data**

Patient ID	#0001_34	Age	28
Surname	MARTINI	Gender	M
Name	DAVID	Height	180 cm
Date of birth	06/05/1975	Weight	76 kg
Ethnic group	Caucasian	BMI	23.46
Smoker	Smoker	Pack-Year	05
Patient Group			

**Oximetry Results** Recording Interval = 20s

Start Registration: 23/03/2004 06:46      Total valid time analyzed: 00:00:00

**General Analysis**

SpO2 Average	97.4 %	SpO2 Base	97.4 %
Pulse Rate Average	73.6 BPM	Pulse Rate Base	74 BPM

**SpO2 Analysis**

T90 (<90%)	0 %
T85 (<85%)	0 %
T88 (<88%)	0 %

**Pulse Rate Analysis**

% Bradycardia Time (<40 bpm)	0 %
% Tachycardia Time (>120 bpm)	0 %

Conclusion / Medical report

Signature: \_\_\_\_\_

Instrument used  
SPIROTEL s/n 000000

**MIR** Powered by MIR Spiro Page 1 of 1

+ - 👤


Save PDF

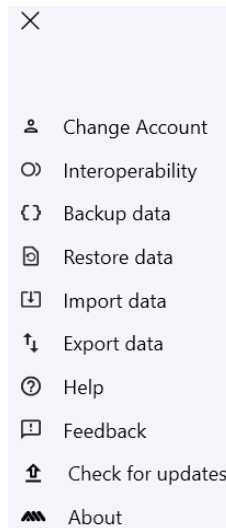
Print


Cancel

## 11 DATABASE BACKUP

With Backup, you can create a copy of all the data on a hard disk. If the data copied on a hard disk is deleted, overwritten, or inaccessible, you can use the copy to restore it.

To create a backup copy, click the  icon and “Backup data”. MIR Spiro will open a window to allow you to select the folder where the database file is stored.

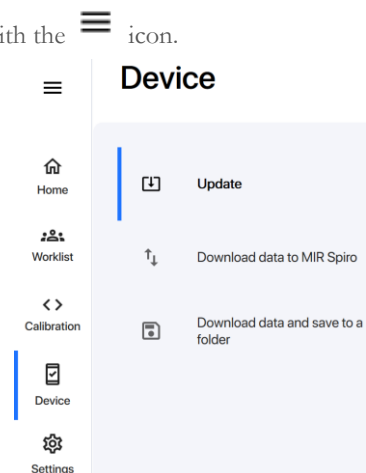


You can also make a backup copy in a folder of your choice. In this case, click the  icon, then “Backup data”, and specify where to save the file.

If necessary, restore the lost data. Use the “Restore data” command on the same menu with the  icon.

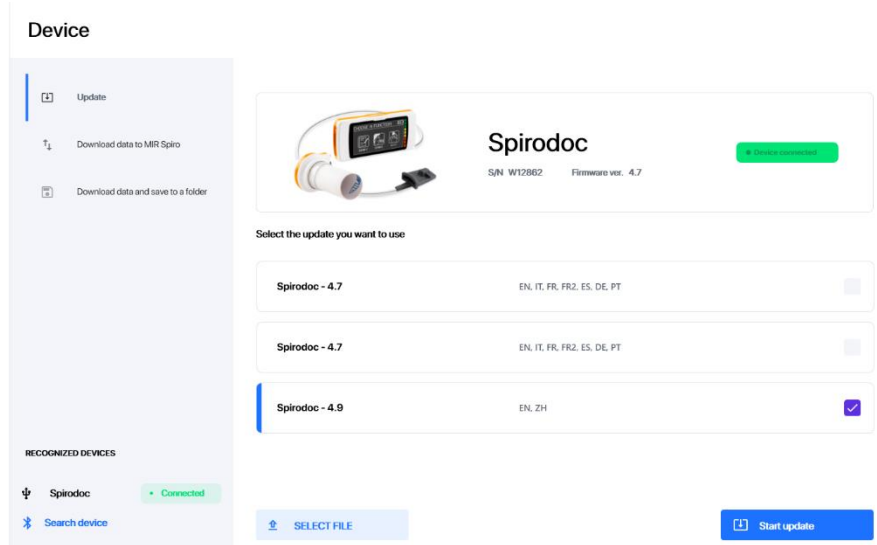
**MIR Spiro** allows you to download the data recorded on a device and save it on your PC as a .mirx file.

To do this, open the “Device” sheet and select “Download data and save to a folder”.

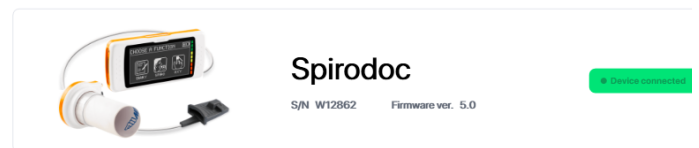


## 12 UPDATING THE SPIROMETER SOFTWARE

With **MIR Spiro**, you can update the software version. If the latest version is available online or you need to update the software to use **MIR Spiro**, you need to access this function first. Select the “Device” window from the menu and click the bottom right-hand icon “Start update”.



The first step of the guided procedure is to make sure that the software recognises the device. To do so, check the device’s name and information in the right-hand window.



The second step consists in searching the .tsk file to install on the device. MIR Spiro will download the compatible tsk files from the dedicated Cloud service. You can decide whether to select a file on your PC or local network by browsing the system resources.

## 13 INFORMATION FOR CONNECTING THE DEVICES TO THE PC VIA USB AND BLE

 **WARNING** Install the MIR Spiro software before carrying out any activity.

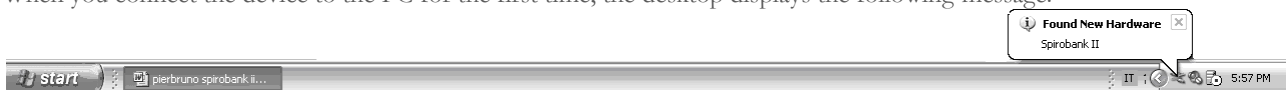
### 13.1 Mirspiro/PC: minimum installation requirements

- Windows Seven (32 bit/64 bit), Windows 8 (32 bit/64 bit), Windows 10 (32 bit/64 bit), Windows 11 (32 bit/64 bit)
- Pentium III PC (500 MHz or higher recommended)
- RAM 128 MB (preferred 256 MB)
- Display set for XGA resolution at 1024 × 768 pixels or higher
- Free hard disk space 500MB
- Administrative privileges on the operating system
- USB port
- USB-RS232 serial port or converter for devices with an RS232 connection

We recommend having an additional 100 MB of free space on the hard disk for using Windows during installation. The program may not run correctly if the system does not have these characteristics. Once **MIR Spiro** is installed, connect the device to the PC through the USB port.

### 13.2 Connecting a MIR device to the PC with a USB connection

When you connect the device to the PC for the first time, the desktop displays the following message:



Since MIR devices are Microsoft-certified for Windows XP 32bit, Windows Vista (32 and 64bit) Windows Seven (32 and 64bit) and Windows 10 (32 and 64bit), the driver is installed automatically within 3 to 5 seconds. Then, the device is ready for use.

Now you can open **MIR Spiro** and run tests with your device.

### 13.3 Connecting a MIR device to the PC with a BLE (Bluetooth Low Energy) connection

 **WARNING**

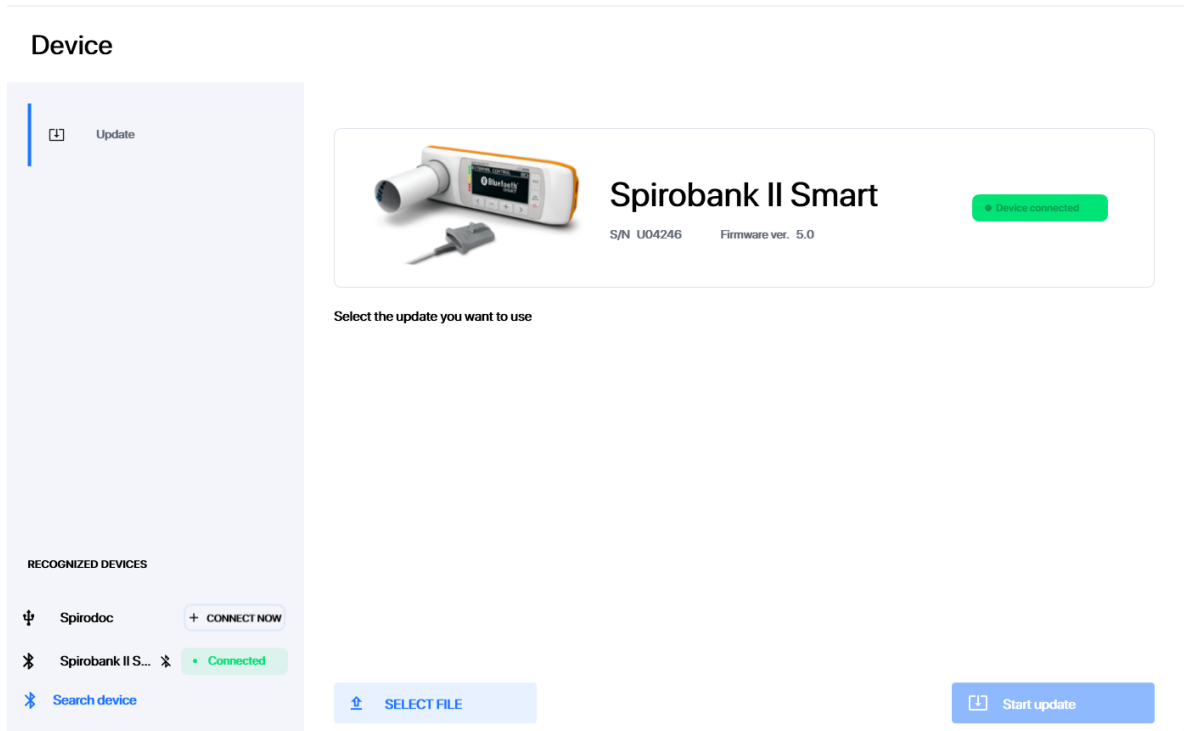
In a Windows environment, the Bluetooth Low Energy connection is supported only by operating systems from Windows 10 upwards

Select “Device” from the menu on the left side of the window to connect a device fitted with BLE technology to your MIR Spiro.

Click the “Search device” key (  ) to search the device you want to connect

Once the device is found (make sure that the serial number on the device back matches), click “CONNECT NOW” (  ).

You can monitor the connection status from the “Device” window or the device itself (the message “External Control” must be visible). On the bottom left side of the window, you can search for a device again or view the devices available for connection.



You can disconnect the connected device via BLE by clicking the ✕ icon.

**⚠ WARNING**

- Before connecting the device, make sure that the PC’s Bluetooth is enabled
- The BLE connection has priority over the USB connection. Therefore, if connection via BLE is enabled, connecting a second device via USB would not automatically enable it inside MIR Spiro. For this purpose, you should make the connection manually by clicking “CONNECT NOW” next to the recognised device
- The BLE connection has priority over the USB connection. Therefore, if you associate a second device through the BLE connection, despite the first device being connected via USB, the second device would be automatically enabled via BLE

### 13.4 Procedure for checking the correct connection of the device to the PC

MIR Spiro allows you to check whether the device-software connection is correct.

Click “Device” on the menu bar. The system will display the following messages “Device connected” or “Device not connected”.

In the latter case, reconnect the USB cable. If the problem is not solved, repeat the installation procedure previously described, paying attention to your Windows version, or follow the instructions provided in the following sections.

## APPENDIX A

# Definitions for the Oximetry Parameters

Error! Hyperlink reference not valid.

### General Definitions for the SpO2 Analysis

<b>Baseline SpO2</b>	SpO2 Average in first three minutes
<b>Mean SpO2</b>	SpO2 Average during period of analysis
<b>Min SpO2</b>	SpO2 Minimum during period of analysis
<b>Max SpO2</b>	SpO2 Maximum during period of analysis
<b>Delta Index [12 s]</b>	Index of SpO2 fluctuation calculated in intervals of 12 seconds
<b>SpO2 &lt;89% Events</b>	Fall of SpO2 below 89% for at least 20 seconds
<b>T90 [&lt; 90%]</b>	Time passed with SpO2 < 90 %
<b>T89 [&lt; 89%]</b>	Time passed with SpO2 < 89 %
<b>T88 [&lt; 88%]</b>	Time passed with SpO2 < 88 %
<b>T87 [&lt; 87%]</b>	Time passed with SpO2 < 87 %
<b>T5 [<math>\Delta</math> &gt;5%]</b>	Time passed with SpO2 $\leq$ 5 % with respect to SpO2 Mean

### General Definitions for the Pulse Analysis

<b>Baseline Pulse Rate</b>	Average pulse frequency in the first 3 minutes
<b>Mean Pulse Rate</b>	Average pulse frequency during the period of analysis
<b>Min Pulse Rate</b>	Minimum pulse frequency during the period of analysis
<b>Max Pulse Rate</b>	Maximum pulse frequency during the period of analysis
<b>T40</b>	Time passed with pulse frequency < 40 BPM
<b>T120</b>	Time passed with pulse frequency > 120 BPM
<b>Tachycardia Event</b>	Tachycardia event of at least increase in pulse frequency above 120 BPM 20 seconds
<b>Tachycardia Events</b>	Tachycardia events during the entire period of analysis
<b>Tachycardia Duration</b>	Total duration of tachycardia events during the entire period of analysis
<b>Bradycardia Event</b>	Bradycardia event Fall of pulse frequency below 40 BPM for at least 20
<b>Bradycardia Events</b>	Bradycardia events in the entire period of analysis
<b>Bradycardia Duration</b>	Total duration of the bradycardia events during the entire period of analysis

## Relative Definitions for Sleep Oximetry

<b>Desaturation Event</b>	Desaturation events SpO <sub>2</sub> fall $\geq 4\%$ in a limited period of 8- 40 sec and successive rise $\geq 2\%$ within a compressive period of 150 sec..
<b>Total Desaturation Events</b>	Desaturation events during the entire period of the analysis
<b>ODI - Desaturation Index (1/h)</b>	Desaturation events by hour of analysis
<b>Mean Duration (s)</b>	Average duration of desaturation events
<b>Longest Duration (s)</b>	Longest duration of desaturation events
<b>Desaturation Peak [Nadir] (%)</b>	Minimum SpO <sub>2</sub> during desaturation events
<b>Mean Desaturation (%)</b>	Average desaturation peak
<b>Mean Drop [Delta SpO<sub>2</sub> %]</b>	Average SpO <sub>2</sub> fall with respect to baseline during the desaturation events
<b>Maximum Fall (Delta SpO<sub>2</sub> %)</b>	Maximum fall of SpO <sub>2</sub> with respect of baseline during the desaturation events
<b>Total Pulse Rate Variation</b>	Pulse rate rise $\geq 10$ BPM in limited period of 8-40 sec and successive fall $\geq 8$ BPM during compressive period of 150 sec.
<b>Total Pulse Rate Variation</b>	Variation of pulse frequency events during the entire period of the analysis
<b>Pulse Rate Variation Index (1/h)</b>	Variation of pulse frequency by hour of analysis
<b>NOD 4 [<math>\Delta</math> SpO<sub>2</sub> <math>\geq 4\%</math>]</b>	Time passed with SpO <sub>2</sub> $< 4\%$ with respect to SpO <sub>2</sub> base for continual periods above 5 minutes
<b>NOD 89 [<math>&lt; 89\%</math>]</b>	Time passed with SpO <sub>2</sub> $< 89\%$ for continued periods above 5 minutes
<b>NOD 90 [<math>&lt; 90\%</math>; Nadir <math>&lt; 86\%</math>]</b>	Time passed with SpO <sub>2</sub> $< 90\%$ for continual periods above 5 minutes with minimum value $< 86\%$ (Nadir)

## Relative Definitions for the Walk Test

<b>Initial SpO<sub>2</sub></b>	SpO <sub>2</sub> average before walking
<b>Postwalk SpO<sub>2</sub></b>	SpO <sub>2</sub> after walking
<b>Initial Pulse Rate</b>	Average pulse frequency before walking
<b>Postwalk Pulse Rate</b>	Pulse frequency after walking
<b>T2 [<math>\Delta</math>SpO<sub>2</sub><math>\geq 2\%</math>]</b>	Time passed during walking test with SpO <sub>2</sub> $< 2\%$ with respect to SpO <sub>2</sub> base
<b>T4 [<math>\Delta</math>SpO<sub>2</sub><math>\geq 4\%</math>]</b>	Time passed during SpO <sub>2</sub> walking test $< 4\%$ with respect to SpO <sub>2</sub> base
<b>Total Distance Walked</b>	Distance covered during walking
<b>AUC/Distance</b>	Area under SpO <sub>2</sub> curve base relative to distance covered
<b>Initial Dyspnea</b>	Grade of dyspnea before walking
<b>Postwalk Dyspnea</b>	Grade of dyspnea after walking
<b>Dyspnea CHG</b>	Variation in grade of dyspnea during walking
<b>Initial Fatigue</b>	Level of fatigue before walking
<b>Fatigue at end of test</b>	Level of fatigue after walking
<b>Fatigue CHG</b>	Variations in level of fatigue during walking
<b>Predicted Distance</b>	Theoretical standard distance
<b>% Predicted</b>	% in variations of the distance covered with respect to theoretical standard distance
<b>Min Predicted Distance</b>	Theoretical minimum distance
<b>% Min Predicted</b>	% of variations of distance covered with respect to theoretical minimum distance