

Manual

Radon Scout Professional

Professional Radon Monitor / Personal Dosimeter

Version April 2023

Referenced documents

Software-Manual Radon Vision

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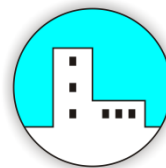


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Applications

Highly sensitive radon monitor in dosimeter format.

Can be used as well for ventilation control and as a personal dosimeter.

A new detector technology defines a new level: outstanding sensitivity at dosimeter size.

The instrument will not be affected by any variation of temperature and humidity, external radiation, mechanical shock or vibration. Two AAA batteries are good for several months of autonomous operation. These features as well as the additionally integrated sensors for temperature, humidity, barometric pressure and CO₂ (both optional) are making the Radon Scout Professional the very first choice for short and long term radon sampling, as well as for personal dosimetry. The fast and statistical accurate measurement allows—in combination with the optional switch output—the direct control of ventilation systems to maintain the statutory radon threshold.

In the case of lower concentrations and longer times in radon atmospheres, this device should be used due to its sensitivity.

The silent, battery-operated device is used in **living rooms and bedrooms**, among other things.

The instrument

Controls

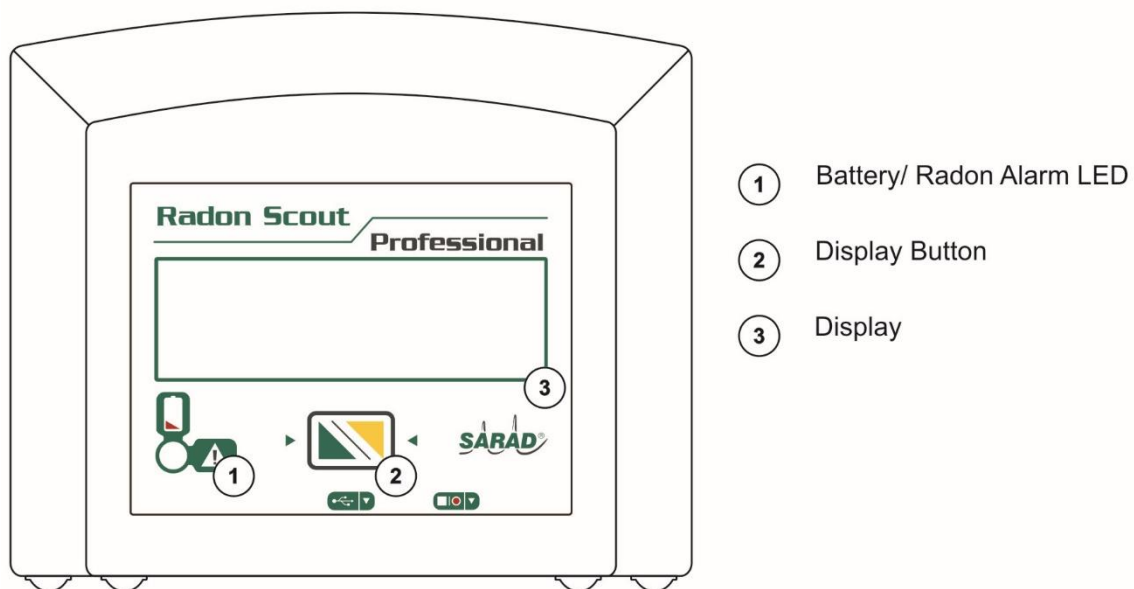


Fig. 1. – Front panel controls.

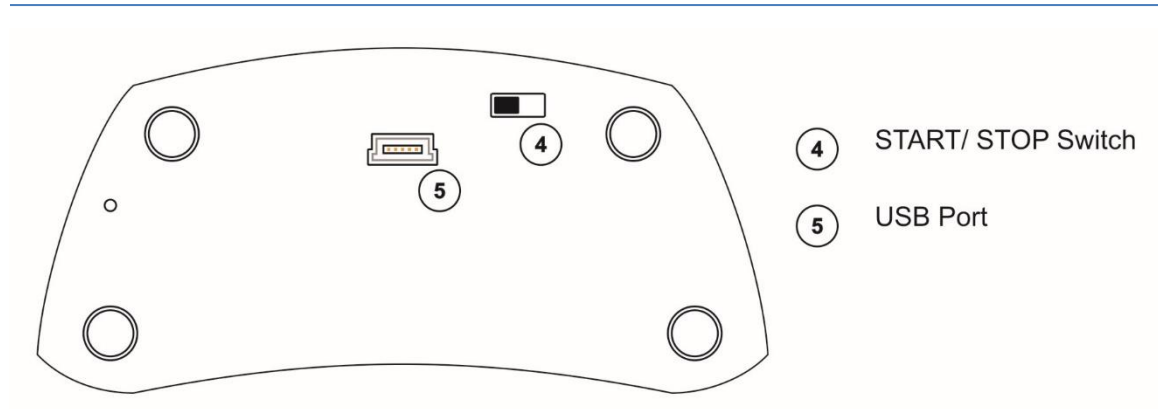




Fig. 2. – Bottom panel controls.

	One LED flash each four seconds	Battery low
	Four LED flashes each four seconds	Radon Alarm

Tab. 1. – LED signaling.

Power supply

The power supply of the RADON SCOUT PROFESSIONAL is realised by two AAA size (LR3) batteries. For battery replacement, the rear cover has to be removed. To do that, the both screws (B in fig. 4) at the backside must be unscrewed at first. After that, the cover can be detached by tilting as shown in picture 5. Please pay special attention to the correct polarity of the batteries when inserting them (fig. 6). Change both batteries at the same time because differing charging levels may lead to failures. Use always batteries of the same type.

The RADON SCOUT PROFESSIONAL can be powered also through its USB socket using a commercial AC/DC adapter. The instrument should not be used without batteries even if it is supplied by the USB socket. If the AC/DC adapter is connected, the batteries will not be discharged. They will work as a buffer in case of mains power interruption.

Make sure that the instrument has entered the standby mode (display off) before changing the batteries. An additional capacitor supplies the instrument during the battery replacement for a few seconds. If the battery cannot be replaced within this time span, the batteries should be kept out for at least 30 minutes for proper power on reset. In that case, the real time clock of the instrument must be set by software after inserting the batteries. Data stored inside the instrument is not affected by battery replacement.

The instrument accepts alkaline as well as NiCd or NiMH batteries. ATTENTION! Do not use Lithium ion batteries because their cell voltage is 3 or 3.6 V.

For maximum operational period we recommend the usage of alkaline batteries which are optimized for low loads.

If the cell voltage drops below 1.1 V, the red LED at the front panel starts blinking (one single flash each four seconds). The measurement will be continued until the voltage drops below 0.95 V. Then, the measurement will be stopped and the instrument enters standby mode.

Battery replacement



Fig. 3. – Set the sliding switch (A) to the left position (no sampling) and wait until the instrument enters standby mode (display off).

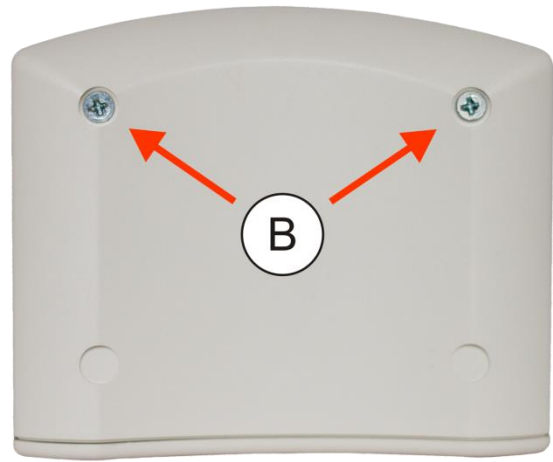


Fig. 4. – Remove the both screws (B) at the rear panel.



Fig. 5. – Remove the rear cover. Tilt it at the round edge as shown.

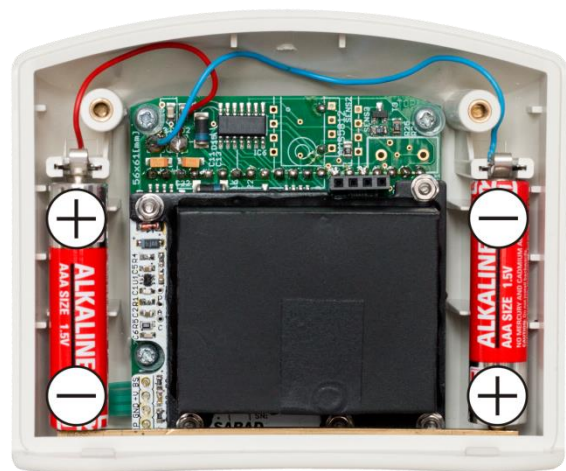


Fig. 6. – Insert batteries (AAA/LR3) left and right (take care for right polarity).

Selection of the right location for exposure

The instrument should be placed at a location which is representative for the indoor air quality of a room. Direct light incidence and exposure to strong heat sources should be avoided. For permanent installation, the RADON SCOUT PROFESSIONAL can be mounted on a wall using the wall mounting clip (accessory). Attention has to be paid because the wall itself could be the origin of the Radon inside a room. This would result in an increased concentration in the surrounding of the surface. Some comparative measurements at the preferred mounting position and in the middle of the room (each at least a few days under similar weather conditions) will show if this is the case or not.

For the usage as personal dosimeter, the instrument can be worn in the pockets of breathable clothing without influence to the measurement.

Selection of the right integration interval

It is possible to adjust the sampling interval of the RADON SCOUT PROFESSIONAL between 1 and 255 minutes. From the physical point of view it makes no sense to choose intervals smaller than 30 minutes because the response time of the instrument is in that order. If the expected Radon concentrations are in the order or less than the statutory reference level of 300 Bq/m^3 , an interval of 60 minutes should be used. Frequent zero readings for individual sampling intervals indicate that the chosen interval is too short.

Short sampling intervals (for example 5 minutes) are recommended if the instrument is used as personal dosimeter. In that case only the dose as accumulated value for the entire sampling period is of interest. Note that the running sampling interval will be discarded in the moment when the measurement will be stopped. Therefore, the period from the last completed interval to this moment would not be included in the dose calculation.

Operation

Start of a measurement

To start a measurement, the display button (2) must be pressed to wake up the instrument from the standby mode (display turns on). Now, the sliding switch (4) at the bottom panel can be shifted to the right into the "Start" position. The display shows the time remaining to the presentation of the first result. Newly acquired sampling results will be appended periodically to the previously stored results and shown on the display.

If the sliding switch was already in "START" position during battery replacement it is necessary to shift it back to "STOP" (left) at first and set it to "START" again.

The display turns off automatically after fifteen seconds and may be re-activated by pressing the display button (2). After finishing the first sampling interval this button is used to toggle between two display pages:

Page 1

- Date and time
- Recent Radon concentration

- Average Radon concentration (“AVG”) or accumulated equivalent dose (“DOS”) since start of the measurement

Page 2

- Temperature
- Relative Humidity
- CO2 concentration or atmospheric pressure (if available)
- Battery voltage

All results will be presented in the physical unit system which has been selected by software (SI or US).

Repeated pressing of the display button turns on/off the display backlight.

Stopping of a measurement

To stop a running measurement, the sliding switch must be set to the position “STOP”. This is not possible if the lock function is enabled (see chapter “Lock function”). The instrument cancels the sampling without finishing of the actual sampling interval. The last stored sampling interval is the last one which has been completed.

After stopping the measurement, the display shows either the average concentration or the accumulated dose of the entire sampling period. Furthermore, the time stamps of the beginning and the end of the sampling period are shown. If the first sampling interval was not completed “Radon-Scout PRO” appears on the display.

Carrying out a measurement

Prior to each new measurement campaign, the voltage of the batteries should be checked. This can be done by software in standby mode or during the first sampling interval (when the display shows no results yet). Older data in the memory which shall not be written into the data file together with the new data can be deleted by software.

If the Radon concentration exceeds the adjusted alert threshold, the red LED (1) at the front panel starts blinking (four consecutive flashes each four seconds). For instruments with switching output the contacts become closed (see chapter “Alert switch”).

Lock function

To avoid a sudden or unintended interruption of a measurement campaign by unauthorised staff, the toggle switch as well as the display output can be locked by software setup. It is possible to activate the lock function during sampling.

Movement detection

The standard version of the RADON SCOUT PROFESSIONAL contains a movement sensor alternatively to the switch output. A relocation of the instrument is assumed if the sensor detects a movement within three sequent four-second intervals. These intervals will be marked later on in the chart view of the PC software. The movement sensor is very sensitive. Therefore, the instrument should not be placed on vibrating parts.

Dose calculation

The RADON SCOUT PROFESSIONAL offers the possibility to show the equivalence dose derived from the Radon exposure. The dose value on the display means the accumulated dose from the start of a measurement until the end of the last completed sampling interval. To calculate the dose, a dose conversion coefficient must be defined with respect to the local statutory regulations. The factory setting of the dose conversion coefficient follows the recent ICRP 2018 recommendations for indoor workplaces (predominantly sedentary activity; $F * 16.8 \text{ mSv/MBqhm}^{-3}$). An equilibrium factor F of 0.5 is assumed resulting in a pre-set value of $8.4 \text{ mSv/MBqhm}^{-3}$ ($8.4 \text{ nSv/Bqhm}^{-3}$).

If the average Radon concentration for the entire sampling period shall appear on the display instead of equivalence dose, the dose conversion coefficient must be set to zero. To change the dose conversion coefficient (or to set it to zero), the initialisation software for the instrument is required.

CO₂ sensor

The integrated CO₂ sensor uses the non-dispersive infrared (NDIR) operational principle. This requires an infrared source which cannot be supplied by the internal batteries due to the increased power consumption. Therefore, an external supply (AC/DC adapter or power bank) must be connected to the USB socket.

Continuous operation

The automatic calibration procedure of the sensor uses the CO₂ concentration of fresh air (400 ppm) as reference. The instrument must be exposed to this "fresh air concentration" at least once during the last 24 hours. This can be achieved by short ventilation of the room. If there are no persons inside a room for a while (for example overnight), the concentration goes back to 400 ppm.

ATTENTION! If the reference concentration cannot be reached within the past 24 hours, the sensor interprets the lowest measured result as 400 ppm. This results in a systematically increasing display value.

If the CO₂ concentration exceeds the recommended threshold of 1000 ppm, the display backlight turns on. It will turn off as soon as the concentration drops below 1000 ppm.

Occasional operation

If the CO₂ sensor is used for sampling periods less than 24 hours no calibration procedure as described above is carried out. Therefore it is recommended to operate the sensor at least once per week for a period longer than 24 hours to force a calibration. Of course, the instrument must be exposed to the fresh air concentration of 400 ppm during that time.

USB interface

The communication port according USB standard (5 in fig. 2) is used to read out measurement data and to adjust the measurement parameter of the RADON SCOUT PROFESSIONAL. The interface requires a software driver which can be downloaded from the SARAD website. Click on the downloaded exe-file to install the driver. The communication path appears as an additional COM port in Radon Vision.

The display is permanently activated while the instrument remains connected with a computer or any other power source through the USB port.

Alert switch

The RADON SCOUT PROFESSIONAL is equipped with a switch output which can be used for ventilation control or alert indication. The potential-free contacts of the switch will be closed at the end of the sampling interval if the measured Radon concentration exceeds the threshold. The output will be deactivated one minute before the subsequent interval ends. Therefore, the sampling interval must be set at least to two minutes. The alert threshold is factory-set to 300 Bq/m³ (statutory reference value of the Radiation Protection Act) and may be changed by the user with respect to local regulations (instrument setup in Radon Vision).

As an accessory, we offer a wireless power switch which can be used for direct ventilation control. The switch includes a transmitter unit to be connected to the alert switch output of the instrument, and a plug adaptor (receiver) which can be placed between the wall outlet and the power cable of the ventilation unit. Optionally, a flush-mounting power switch is also available. The plug adaptor offers an additional timer function to define the duration of the ventilation period independent from the sampling interval of the instrument (for example 15 minutes on while the sampling interval is 60 minutes). The wireless switch is coded - that means, several transmission lines can be established within one building. The assignment between transmitter and receiver is easily done by a push button.

The sampling interval should be set to a value of 60 or 120 minutes if the threshold level is lower than 300 Bq/m³.

Technical data

Radon Scout Professional

Operational principal	Lucas cell with gross alpha counting
Sampling method	Diffusion
Sensitivity	3,3 cpm/(kBq/m ³)
Range	0 ... 1 MBq/m ³
Accuracy	<=6%
Sample interval	1 ... 255 minutes adjustable
Ambient	-10 ... 50 °C; 0 ... 100 %rH non condensing
Pressure sensor ¹⁾	800 ... 1100 mbar
CO₂ sensor ¹⁾	400 ... 5000 ppm
Switch output ²⁾	Optical relay with potential-free contacts; max. switch current 0.2 A; max. switch voltage 40 V; 2 pin socket Lemo series 00B
Movement detection ²⁾	2G sensor; sensitive against tilt and vibration
Memory	16383 data records (approx. 2 years at 60 min sampling interval)
Power supply	2 batteries type AAA/LR3 1,5 V; AC/DC adapter connected to USB socket (required for CO ₂ sensor operation) approx. 3 month at 20 °C depending on battery type and usage profile
Interface	USB
Controls	Start/stop with sliding switch (with lock function); push button for display control; LCD display with backlight
Dimensions	82 mm x 96 mm x 44 mm
Weight	approx. 150 g incl. batteries
Scope of supply	Power supply adapter (5V), USB data cable, Batteries, 2 x Type AAA Transportation case, User manual & SW (electronic version) Calibration certificate

¹⁾ Options;

²⁾ Switch output or movement detector are available alternatively - standard is movement detector

Wireless switch

Transmitter	2 inputs	<i>e.g. additional input for manual switch</i>
Frequency	433 MHz	<i>With coding for safe transmission</i>
Range	approx. 30 m	
Power supply	Battery CR2032	<i>Good for 20,000 switching cycles</i>
Load switch (plug adapter)	220 V/50 Hz	<i>6 programmable groups (e.g. to connect more than one Radon monitors)</i>
Max. switching load	3500 VA	
Adjustable timer	7s, 5min, 30min, 1h, 2h, 4h, 8h	<i>If the timer function is not used, the power switch follows the state of the switch contact at the instrument</i>