

Manual

Radon Scout eXpert

Highly sensitive Radon Monitor for reference measurements

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Referenced documents

Software-Manual Radon Vision

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Table of content

TABLE OF CONTENT	2
THE INSTRUMENT	3
Controls.....	3
Power supply	5
Battery replacement.....	6
SELECTION OF THE RIGHT LOCATION FOR EXPOSURE	7
SELECTION OF THE RIGHT INTEGRATION INTERVAL	7
OPERATION	7
Start of a measurement.....	7
Stopping of a measurement	8
Carrying out a measurement.....	8
Lock function.....	8
DOSE CALCULATION	8
CO₂-SENSOR	9
COMMUNICATION INTERFACES	9
USB.....	9
Wi-Fi.....	10
ALERT SWITCH	10
TECHNICAL DATA	12
Radon Scout eXpert	12
Wireless switch	13

The instrument

Controls

- ① Display
- ② Toggle Button
- ③ Light Button
- ④ Battery Lid
- ⑤ Power Plug



Fig. 1. – Front panel controls.



- 6 Antenna
- 9 LED Green
- 7 LED Red
- 10 ON/OFF Switch
- 8 Relay
- 11 USB Port

Fig. 2. – Side panel controls.

●	One red LED flash each four seconds	Battery low
● ● ● ●	Four red LED flashes each four seconds	Radon Alarm
●	One green LED flash each four seconds	Measurement running
● ● ● ●	Four green LED flashes	Measurement cycle completed

Tab. 1. – LED signaling.

Power supply

The power supply of the Radon Scout eXpert is realised by a commercial 5V AC/DC adapter (Fig. 1). The instrument should not be used without batteries. 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. During power supply failure the instrument will continue to measure Radon for a number of consecutive days without interruption. If the instrument works only with batteries the Wi-Fi interface and the CO2 Sensor (when present) will be deactivated.

Make sure that the instrument has entered the standby mode before changing the batteries (Fig. 3). The battery compartment can be accessed after opening (unscrewing) the round battery cover (Fig. 4). Please pay special attention to the correct polarity of the batteries when inserting them (Fig. 5). Change both batteries at the same time because different charging levels may lead to failures. Use always batteries of the same type.

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

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

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

The real time clock of the instrument must be set by software after changing the batteries. Corresponding reminder will be displayed. The stored data inside of the instrument are not affected by battery replacement.

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. – Unscrew the battery cover (B) at the side panel.



Fig. 5. – Replace the batteries (C). Take care for right polarity.

Selection of the right location for exposure

The instrument, depending on case scenario e.g.: laboratory, test chamber or other locations, should be placed at a spot which is representative for the measurement. Direct light incidence and exposure to strong heat sources should be avoided.

For permanent installation attention has to be paid to building materials 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 placing 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.

Selection of the right integration interval

It is possible to adjust the sampling interval of the Radon Scout eXpert between 1 and 255 minutes. If the expected Radon concentrations are in the order or less than the statutory reference level of 300 Bq/m³, 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 toggle button (2 in Fig.1) must be pressed to wake up the instrument from the standby mode (display turns on). Now, the sliding switch (10 in Fig.2) at the side panel can be shifted to the right into the "Start" position. The display shows the time remaining to the presentation of the first measurement 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 toggle 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).

Pressing light button (3 in Fig.1) turns the display backlight ON.

Stopping of a measurement

To stop a running measurement, the sliding switch (10 in Fig.2) 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 eXpert” with device serial number 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 in Fig.2) at the side panel starts blinking (four consecutive flashes each four seconds). The contacts of the switching output 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.

Dose calculation

The Radon Scout eXpert 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 8.4mSv/MBqhm^{-3} (8.4nSv/Bqhm^{-3}).

To disable the presentation of equivalence dose on the display 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 optional 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) must be connected to the instrument.

Continuous operation

The automatic calibration procedure of the sensor uses the CO₂ concentration of fresh air (400ppm) 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 400ppm.

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.

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 400ppm during that time.

Communication interfaces

USB

The communication port according USB standard (11 in Fig. 2) is used to read out measurement data and to adjust the measurement parameter of the Radon Scout eXpert. 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 software.

The display is permanently activated while the instrument remains connected with a computer or any other power source through the USB port. At the same time, as long as the USB connection persists, the Wi-Fi interface will be disabled.

Wi-Fi

The Radon Scout eXpert is equipped with Wi-Fi interface. This feature allows to integrate the device within Local Area Network. After connecting the device to the local Wireless Access Point data download and device configuration can be performed by means of Radon Vision software. Following steps are required to obtain wireless connection with the device:

- PC with Radon Vision software installation has to be present in the same LAN as Wireless Access Point.
- IP address of the PC has to be known.
- You have to connect the device with USB cable to the PC and access the setup in Radon Vision.
- Subsequent parameters have to be entered in the Wi-Fi section:
 - SSID: Name of the local Wi-Fi
 - PASS: Wi-Fi password
 - IP: IP address of the PC
 - Port: 50002
- After cancelling the USB connection and restarting the device through detaching and connecting the power supply unit once more, the device will be selectable in the device list of Radon Vision.

After completing the above steps the device will be accessible from all PCs present in the same LAN with Radon Vision installation. The only requirement is that the PC, which IP address is written into the Radon Scout eXpert, has to be active. It is also possible to access the device with means of internet connection from outside of the LAN. This is additional service. Please, contact SARAD GmbH to acquire the conditions!

Alert switch

The Radon Scout eXpert 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 300Bq/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). The output connector for the alert switch can be found on the side panel (8 in Fig. 2).

As an accessory, we offer a wireless power switch which can be used for direct ventilation control. The switch includes a transmitter unit which has 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 between 30 to 60 minutes if the threshold level is lower than $300\text{Bq}/\text{m}^3$.

Technical data

Radon Scout eXpert

Operational principal	Lucas cell with gross alpha counting
Sampling method	Diffusion
Sensitivity	> 25.0 cpm/(kBq/m ³)
Range	1 Bq/m ³ ... 1,000,000 Bq/m ³
Uncertainty	< ±2% over the entire range
Sample interval	1 ... 255 minutes adjustable
Ambient conditions	-10°C ... 50°C, 0%rH ... 100%rH non-condensing
Temperature sensor	0°C ... 100°C
Humidity Sensor	0%rH ... 100%rH
Pressure sensor ¹⁾	700 mbar ... 1200 mbar
CO₂ Sensor ¹⁾	400 ppm ... 5000 ppm
Switch output	Optical relay with potential-free contacts; max. switch current 0.2A; max. switch voltage 40V; 2 pin socket Binder Series 712
Display	20x4 characters LCD with backlighting
Staus LEDs	Red and green LED for alert, battery and cycle status.
Memory	16383 data records (approx. 2 years at 60 min sampling interval)
Power supply	5V AC/DC adapter required for operation with CO ₂ or Wi-Fi, otherwise 2 x AA batteries
Autonomous operation	Approx. 1 month at 20°C depending on battery type and usage profile
Interface	USB Wi-Fi Switch output (potential-free contacts)
Controls	Start/stop with sliding switch (with lock function); two push buttons (backlight and toggle between result pages)
Dimensions	168 mm x 240 mm x 36 mm + Wi-Fi antenna
Weight	ca. 1.240 g incl. Batteries

¹⁾ Options

Wireless switch

Transmitter	2 inputs	<i>Additional input for a manual switch for example</i>
Frequency	433 MHz	<i>With coding for safe transmission</i>
Range	approx. 30 m	
Stromversorgung	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	7 s, 5 min, 30 min, 1 h, 2 h, 4 h, 8 h	<i>If the timer function is not used, the power switch follows the state of the switch contact at the instrument</i>