



INTRODUCTORY USER MANUAL

TITAN

Handheld XRF Analyzer
for Elemental Analysis

Innovation with Integrity

For Sales & Service Contact

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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections are included in subsequent editions. Suggestions for improvement are welcome.

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1 General Information

The TITAN XRF spectrometer is based on a proven technology platform for handheld XRF devices.

Its ease of use and rugged design enable rapid identification and quantification of the elemental composition of samples across a wide range of applications. The analyzer's virtually unlimited applications include alloy identification and quality control, as well as the determination of major and trace elements in mining, soils, and environmental applications. Since it is a non-destructive analytical method, the TITAN can be used on individual samples as well as in production lines.

Instrument highlights:

- Latest graphene window SDD technology
- Patented TITAN DetectorShield™ for guaranteed detector protection
- Latest optimized X-ray source
- Superior count rate of up to 800.000 cps enables fast analyses
- Excellent trace element sensitivity and very low detection limits
- Two distinct collimator sizes for either high signal intensities or small sample spot sizes
- Camera and small spot options for accurate measurement positioning
- Wide range of matrix matched calibrations available
- Fully customized calibrations available

1.1 Introduction

The TITAN spectrometer's non-destructive XRF method is ideal for mobile and precise elemental analysis. Thanks to features such as its lightweight design, ergonomic grip, bright LCD screen, and smartphone-like user interface, the device can be used comfortably all day long. The latest X-ray source and state-of-the-art signal processing technology for the detector enable faster measurements than ever before.

The user documentation for the TITAN XRF spectrometer consists of a series of manuals, each intended for a specific purpose. This introductory manual contains information on the:

- Safety precautions
- Safety features
- Instrument description
- Basic use.

1.2 Intended usage

The TITAN XRF spectrometer is intended for material analysis, particularly for the determination of element composition of materials and the distribution of elements.

The TITAN XRF spectrometer shall only be operated by trained and authorized personnel in compliance with all safety instructions covered in these operating instructions. Only accessories and equipment's supplied and approved by the manufacturer may be used with the TITAN. Safe operation can only be guaranteed if the instrument is used as defined by these operating instructions.

Usage outside the instruction described is considered as non-intended usage. The operator, not the manufacturer, assumes sole liability for all personal injury and damage arising from non-intended usage.

The following applications are explicitly excluded from the definition of intended usage:

- Medical and biological applications of any sort
- Radiographic applications
- Online process analytical applications in industry and research
- Analysis of aggressive chemical or radioactive substances

1.3 User information

The manual is divided into several sections. You can find the section heading in the header line on every page. The footer line contains the name of the user manual and the page number.

1.3.1 Warning signs, labels and symbols

The following warning symbols and information symbols as well as signal words are used in this operating instruction:

	Danger! Warning of a potential danger to life and limb.
	Danger! Warning of a potential danger to life and limb from X-ray radiation.
	Danger! Warning of a potential danger to life and limb from electrical current.
	Danger! Warning of a potential danger to life and limb from exposure to poison.
	Caution! Warning of possible material damage or damage to machinery.
	Note Tips on usage and useful information.
	Note Information on protecting the environment.

Read chapter 2 for more information about the risks.

1.3.2 Certifications and regulations

The TITAN XRF analyzer complies with part 15 of the FCC (Federal Communications Commission) rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

TITAN contains FCCID: TFB-1004.

1.3.3 Contacting Bruker

Parameter	Description
Email	Support.hmp@bruker.com
Web	bruker.com/service
Adress	Bruker Nano GmbH Am Studio 2D 12489 Berlin Germany

1.4 Warranty and Liability

The general conditions of sale and supply as passed to the operator of the TITAN XRF spectrometer by Bruker Nano GmbH strictly apply. Warranty and liability claims for personal and material damage are excluded if they are a result of one or more of the following reasons:

- Non-intended usage of the TITAN
- Improper installation, startup, packaging and transport or operation of the TITAN
- Operation of the TITAN while the protective housing is not completely closed or in case it is damaged, with faulty safety equipment or not properly attached.
- Non-compliance of the safety regulations and instructions within this document or the training
- Improper connection and improper cabling of the TITAN and its safety equipment
- Use of control software other than the TITAN software included in the delivery
- Use of accessories and/or equipment other than that included in the delivery or approved by the manufacturer.

2 Safety Standards and Instructions

The following chapters include safety information, instructions and features of the instrument, which are required to safely operate it.

2.1 Radiation safety information


Danger!

Warning of a potential danger to life and limb. General safety norms must be followed when using the TITAN XRF spectrometer.


Danger!

Warning of a potential danger to life and limb from X-ray radiation. General safety standards and all instructions from the product documentation must be followed when using the TITAN XRF spectrometer.

This section describes the radiation profiles of the TITAN X-ray warnings, and safety recommendations. When the instrument is used properly, X-ray radiation from instrument poses no harm to the user or others. Use the instrument for only its intended use. A radiation profile is measured for each device before it leaves the factory, and this profile is included with the delivered device.

Safe use of any XRF device is based on the principles of:

Table 1 XRF safety principles

Principle	Description
Time	Managing the amount of time during which X-rays are produced
Distance	- Keeping all parts of the user's body as far away from the X-ray producing nose as possible. - Pointing the analyzer away from others. - Keeping others away from the instrument during use
Shielding	- Ensuring that the instrument is mechanically intact and sound. - When measuring small samples that might allow X-ray radiation to escape, use the backing plate behind the sample. If in doubt, use the radiation shield, a benchtop or desktop stand and close the lid.

Collectively, these practices are known as "As Low as Reasonably Achievable" (ALARA). Safe practice is further discussed during user training. For more details, please refer to the Radiation Safety Manual.

Adhere to the legal limit of radiation exposure in your country.

2.2 Precautions

- Improper handling or use may result in radiation exposure.
- Only allow trained personnel to operate the device.
- Sell or transfer the device only to people registered to receive it.
- Notify your competent regulatory authority of the transfer or disposal of the device.
- Follow all instructions and labels provided with the device.
- Before pressing the trigger, pay attention to the direction in which the X-rays are traveling.
- Do not hold any part of your body, especially your eyes or hands, near the X-ray source during measurement.



Fig. 1 Improper use of the TITAN XRF spectrometer

- Do not hold a sample against the window with your hand for analysis. Instead, hold the window against the sample.
- Occasionally, a sample may not be reflective enough to trigger the proximity sensor. Place a piece of white paper or other reflective material between the sample and the sensor. If necessary and permitted by law, a supervisor can disable the proximity sensor.
- To test small, thin, or low-density materials such as plastic, wood, soil, paper, or ceramics, use the optional backplate, radiation shield, or table stand.



Fig. 2 Intended and safe use of the TITAN XRF spectrometer

- If required by a regulatory authority, wear an appropriate dosimeter.
- The device must remain in the operator's possession at all times during use.
- Always store the device in a secure location.
- Keep the device cool and dry, even during transport.
- Always keep track of the device's location. Record all devices, their assigned operators, locations of use, storage, removal, and transport.

	Caution!
	If the analyzer is damaged, even if it remains operational, immediately: 1. Remove the battery pack and disconnect all power sources. 2. Notify Bruker Nano GmbH Berlin at https://www.bruker.com/en/meta/forms/bna-form-pages/bna-support-contact-form.html.

	Caution!
	If the analyzer is lost or stolen, immediately notify: 1. The appropriate regulatory agency in the state or country where the device was located. 2. Local law enforcement authorities. 3. Bruker Nano GmbH at https://www.bruker.com/en/meta/forms/bna-form-pages/bna-support-contact-form.html.

	Caution!
	Never remove labels from the analyzer. Doing so will void the device's regulatory approval.

If you have any questions, please contact your radiation safety officer or a Bruker radiation safety officer at <https://www.bruker.com/en/meta/forms/bna-form-pages/bna-support-contact-form.html>.

2.3 Safety features

The TITAN is equipped with a fail-safe electronic interlock system that performs the following functions:

- Assists in the safe use of the instrument
- Prevents accidental radiation exposure
- Prevents radiation emission from the device in the event of damage.

Like any safety control system, this system cannot prevent injuries resulting from intentional misuse. Never attempt to disable or otherwise bypass the safety controls.

Table 2 Safety features

Feature	Description
Power switch interlock	A main power switch controls the power supply to all components. The switch must be activated before any further operations can be initiated. After powering on, the X-ray warning lights flash, and the touchscreen appears after a few seconds.

Feature	Description
User name and password	Once the instrument initializes, it will prompt you for a username and password. Without a valid password, the analyzer cannot be operated or generate X-rays.
X-ray warning	Once the password has been entered successfully, an X-ray radiation warning will appear. To continue, press and release the trigger.
Proximity sensor	The proximity sensor detects when an object is within the detection range of the examination window and therefore blocks the X-ray beam path in front of the backplate. X-rays can only be generated when the sensor detects an object.
Trigger interlock	X-rays are generated when the trigger is pressed. When using the manual trigger setting, the trigger must be held down continuously during the measurement. As soon as the trigger is released, X-ray generation stops.
Minimum backscatter	During each measurement, the X-ray count rate is continuously monitored. If the count rate falls below the permissible threshold - as would be the case without a sample - the X-ray radiation is interrupted, thereby minimizing potential radiation exposure.
X-ray warning lights	When X-rays are generated, red lights along the top of the device illuminate. The lights are equipped with redundant LED elements to enhance reliability. If more than two red LED elements fail, X-rays cannot be generated.
Buzzer	In Canada, an audible alarm sounds when the trigger is pressed to indicate that X-rays are being generated.
Automatic log off	If the analyzer remains inactive for longer than the time specified in Supervisor mode (5 minutes by default), the user will be logged out. When the user logs back in, the previous session will be restored.

Feature	Description
Labels	Warning labels indicate that the analyzer emits radiation. The manufacturer's nameplate on the bottom of the device contains regulatory information (see Fig. 12). The labels must not be tampered with or removed.

2.4 Safe measurements – Best practises

Ensure that no one is ever positioned in the direction of the X-ray beam or directly in the beam path. Always perform measurements with an X-ray-absorbing material behind the sample. Use the back panel for highly scattering or small samples. If in doubt, use the radiation shield to protect the operator from scattered radiation. Less absorbent materials such as paintings, glass, or a desk do not completely attenuate the X-ray intensity, so people behind them could potentially be harmed.

2.5 Radiation profile

2.5.1 Testing standards

The radiation profile reflects the radiation conditions when the device is operating under worst-case conditions (high voltage, high power).

The “IEC 61010-1 Clause 12.2.1” was used as a guide to establish radiation profiles, following these steps:

- The analyzer was set at the maximum voltage and current established for analysis, with a standard material sample over the examination window.
- Per the guide, measurement of stray radiation (leakage and scatter) was conducted at 10-centimeter distances from the surface.
- Additionally, the geometric size of the X-ray beam and the open beam radiation dose equivalent rates were recorded at 50 centimeters.

2.5.2 Instrumentation and methods

The measurements of the instantaneous dose equivalent rate were performed using a Victoreen 470A Panoramic Survey Meter and an ATOMTEX AT1103M X-ray dosimeter.

- The Victoreen 470A is an open-air ionization chamber designed to detect X-rays. The detector was calibrated in a certified laboratory using an Am241 reference source (60 keV).
- The ATOMTEX AT1103M X-ray dosimeter was calibrated in a certified laboratory using an Am241 reference source (60 keV).

The TITAN XRF spectrometer has been evaluated under the most unfavorable conditions with regard to emitted radiation: X-ray tube operating at 50 kV high voltage and 0.1 mA current (at maximum power of 5 W), no filter on the X-ray beam (empty position), and an 8 mm spot size.

The test specimen was a steel disc (AISI 316L, 3.16 mm thick) that comes into contact with the instrument's frontal nose.

2.5.3 Radiation survey results

Dose measurements were taken in various directions and positions around the device at a distance of 10 cm from the instrument case (in accordance with IEC 61010-1 Clause 12.2.1), with the uncovered front of the ATOMTEX and Victoreen dosimeters always facing the TITAN. For the radiometric analysis of scattered radiation, only the solid angle behind the front of the device that was in contact with the sample was examined.



Fig. 3 Instrument in contact with the sample, background plate over the table

Table 3 lists the dose equivalent values for various angles and directions around the TITAN.

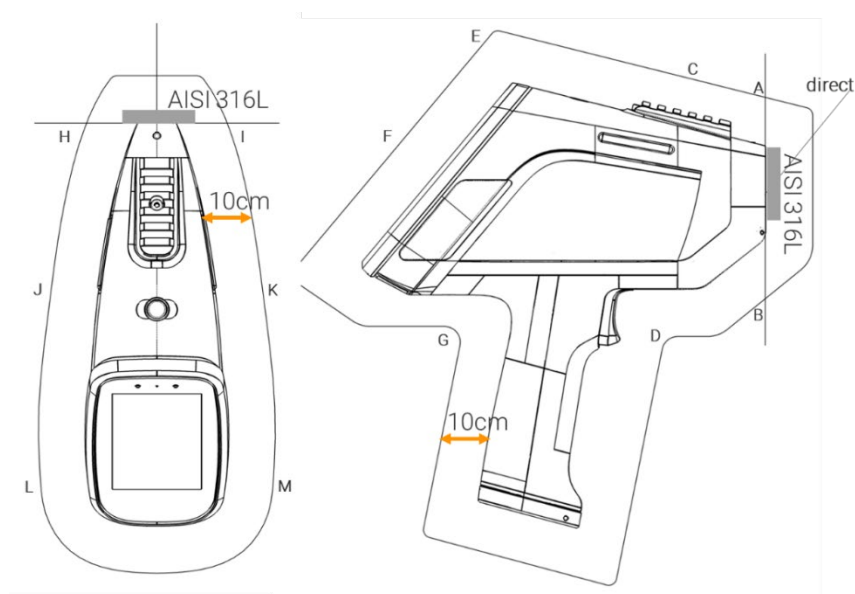


Fig. 4 Technical drawing of the radiation profile measurement distance

Table 3 Radiation profile measurement points marked in Fig. 4

Position	Dose (μSv)	Position	Dose (μSv)
A	< 0.1	H	< 0.8
B	< 0.1	I	< 0.8
C	< 0.1	J	< 0.1
D	< 0.1	K	< 0.1
E	< 0.1	L	< 0.1
F	< 0.1	M	< 0.1
G	< 0.1		

Conditions: 50 kV, 0.1 mA, 8 mm spot size, no filter, steel sample in contact, dose measured at 10 cm from the instrument. The data in the table were recorded using an ATOMTEX dosimeter (calibrated dose). A Victoreen dosimeter was used solely to monitor the measurement.

2.5.4 Direct beam radiation survey results

A measurement of the primary beam dose (in accordance with IEC 61010-1 Clause 12.2.1.2) was performed under the following conditions:

X-ray tube high voltage 50 kV, no filter on the primary beam, varying X-ray tube current and beam collimator (spot size), no sample in front of the device. The Victoreen ionization chamber was aligned with the main beam (direct beam) at a distance of 50 cm from the TITAN so that it completely intercepted the primary X-ray beam generated by the device within a small solid angle.

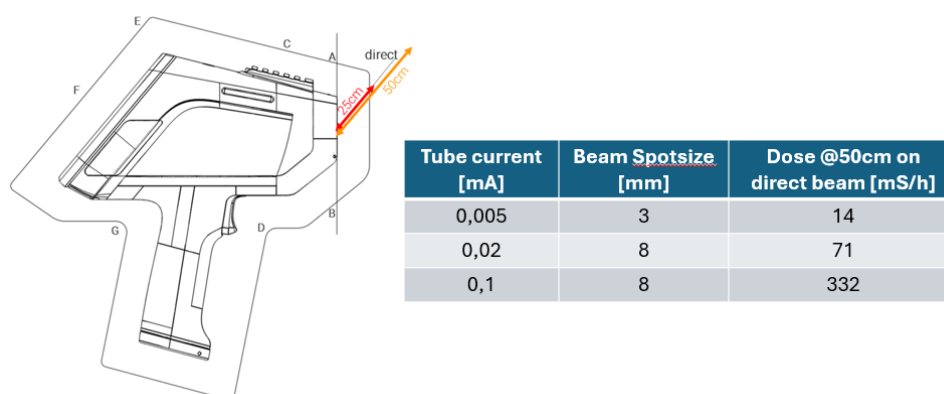


Fig. 5 Technical drawing and measurement data of direct beam path



Fig. 6 Measurement setup for direct beam measurement at 50 cm

Conditions: 50 kV, no filter, tube current and spot size reported as per Fig. 5, no sample in front of the device. Under these conditions, the TITAN can only be operated using internal technical settings, with the standard safety functions disabled.

2.5.5 Desktop stand accessory radiation survey results

In addition, a radiation measurement was performed using the TITAN device, which was mounted on the desktop stand accessory (hereinafter referred to as DTS). The DTS is made of thick, X-ray-absorbing material and is designed to be placed on the device and positioned around the sample area to contain direct or scattered radiation.

The radiation dose was measured in all directions around TITAN at a distance of 10 cm using a DTS setup (in accordance with IEC 61010-1, Clause 12.2.1), with three different samples positioned in front of the device's nose:

- Steel AISI316L, 2.5 x 2.5 x 2.5 cm³
- Teflon sample (considered the worst-case scenario for the dose generated by scattering),
- No sample (considered the worst-case scenario for direct radiation).

The device settings used were 50 kV, 0.1 mA, 8 mm spot size, and no filter. The maximum measured dose was always below 0.25 μ Sv/h under all measurement conditions.



Fig. 7 TITAN with desktop stand (DTS) setup

2.6 Electrical safety and specifications



Danger!

The instrument is powered by electrical current.

The TITAN XRF spectrometer complies with European and FCC safety regulations.

The device can be powered by the following sources:

- Lithium (Li-) ion battery 14.4 V / 3.25 Ah / 47 Wh, part number B-0000-4094K
- AC adapter 24 V / 2.71 A / 65W, part number B-0000-4638K.
- Supply voltage 100-240 V / 50-60 Hz / 1.4 A max

The batteries can be charged via:

- an external battery charger stand 24 V / 2.5 A, part number B-0001-2119K
- the TITAN instrument itself, when battery is inserted into instrument and AC adapter is connected to instrument



Caution!

Use only batteries and power supplies provided by Bruker Nano GmbH. The use of batteries or power supplies from other manufacturers may damage the analyzer and will void the warranty.

High voltage is generated inside the TITAN instrument to activate the X-ray radiation and bias the X-ray detector. These circuits are isolated and inaccessible to the operator.

2.7 Environmental specifications

Table 4 Environmental specifications

Parameter	Dimensions
Operating temperature	0°C to + 50°C
Long term storage	10+ years in dry environment
Typical storage and shipping conditions	-20°C to +50°C, 10 to 90% humidity non-condensing

2.8 X-ray safety



Danger!

Warning of a potential danger to life and limb from X-ray radiation. The instrument generates X-ray radiation up to 50 keV and must therefore only be operated by trained and authorized personnel. All safety guidelines in this manual and all regulations defined by the responsible radiation safety officer and local laws have to be followed.

The TITAN is equipped with an X-ray generator (maximum voltage 50 kV, maximum power 5 W). During operation, an X-ray beam is emitted from the front of the device.

The TITAN's analytical capabilities are based on X-ray fluorescence (XRF). In XRF analysis, a sample is irradiated with X-rays emitted by the instrument. To collect data with the TITAN XRF spectrometer, the customer must comply with local radiation safety regulations. Bruker assumes no responsibility for the customer's or the TITAN operator's compliance with radiation safety regulations.

2.8.1 X-ray safety at data acquisition

After the TITAN is turned on, a special self-test routine checks whether all safety-critical peripheral devices are functioning properly. If an error occurs, the device notifies the user and disables the function for generating and emitting X-rays.

To start a measurement and thus emit X-rays from the device, the user must:

- Log in to the device using the appropriate screen. Passwords may only be shared with authorized users.
- Confirm the radiation warning by pressing and releasing the trigger.
- The ARMED mode (see Fig. 31) is activated when all safety functions have been completed and the user has selected the corresponding menu in the user interface (UI) to start a measurement. In ARMED mode (indicated by a yellow LED light on the top of the device), the TITAN initiates a measurement each time the start trigger is pressed, thereby directing X-rays at the sample.
- In X-Ray ON mode (see Fig. 32), the device emits X-rays onto the sample and records the corresponding data as a measurement result. The X-Ray ON mode is indicated by an animation featuring red light bars at the top of the device, a corresponding icon on the screen, and other configurable signals (e.g., a buzzer). In X-Ray ON mode, all safety functions are continuously monitored to ensure user safety. A critical failure of the safety functions would cause the device to switch to safety mode and prevent further attempts to start a new measurement. If no failure occurs, the measurement ends with a proper trigger-STOP event, and the system returns to ARMED mode, where it waits for a new trigger-START.

2.8.2 General guidelines for the use of X-ray emitting devices

- To operate the TITAN XRF spectrometer, the customer or the operator must comply with local laws and regulations in terms of radiation safety.
- X-ray sources must never be directed at people.
- The TITAN spectrometer must only be used for its intended purpose.
- To ensure radiation safety, the customer must not disassemble or modify the device.
- The TITAN software is password-protected. We strongly recommend that access be restricted to trained personnel only and that the password be changed as needed.

3 Instrument Description

3.1 Scope of supply

The TITAN package includes standard accessories that come with every unit, some of these are listed in Table 5.

Table 5 Scope of supply

No.	Item/Description	Part number	Quantity
1	Pelican case (options) ▪ Small ▪ Large ▪ Travel	▪ B-0000-7791K ▪ B-0000-7807K ▪ B-0000-7792K	1
2	AC adapter	B-0000-4638K	1
3	Power cord (options) ▪ UK ▪ EU ▪ NA/Japan ▪ Australia ▪ China	▪ A10047 ▪ A10048 ▪ A10053 ▪ A10054 ▪ A10056	1
4	Protective window (10 pieces)	B-0001-2658	1
5	Battery	B-0000-4094K	2
6	Battery charger	B-0001-2119K	1
7	USB-C cable	B-0000-7793K	1
8	Micro-SD card	B-0000-7794K	1
9	Nose flap	B-0000-1055	1
10	Wrist strap	B-0000-7795K	1

Additional optional accessories are available.

3.2 Instrument components

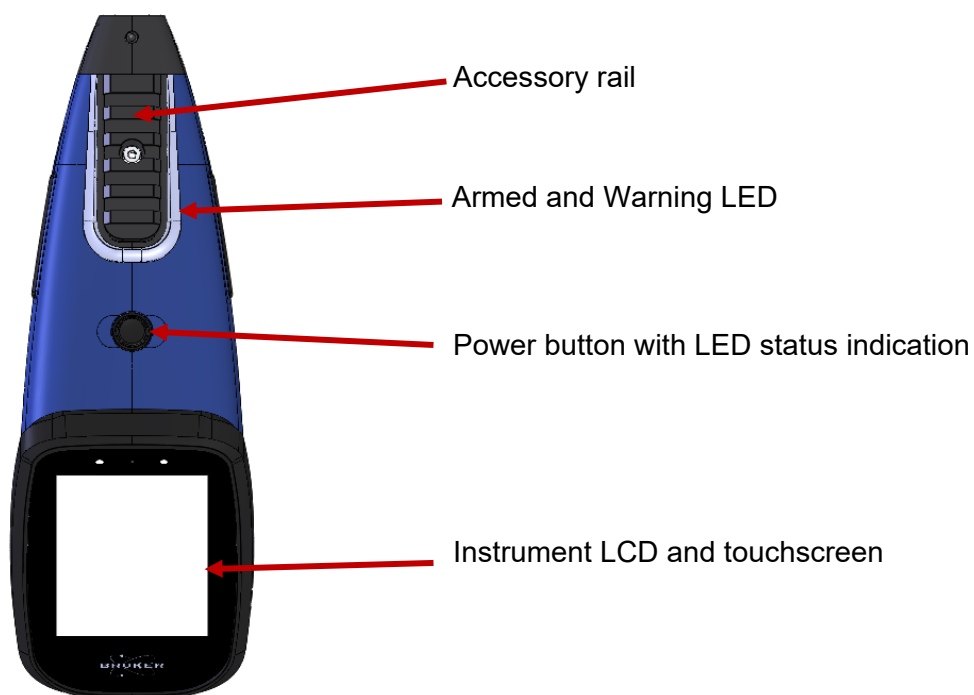


Fig. 8 Top view of the TITAN XRF spectrometer

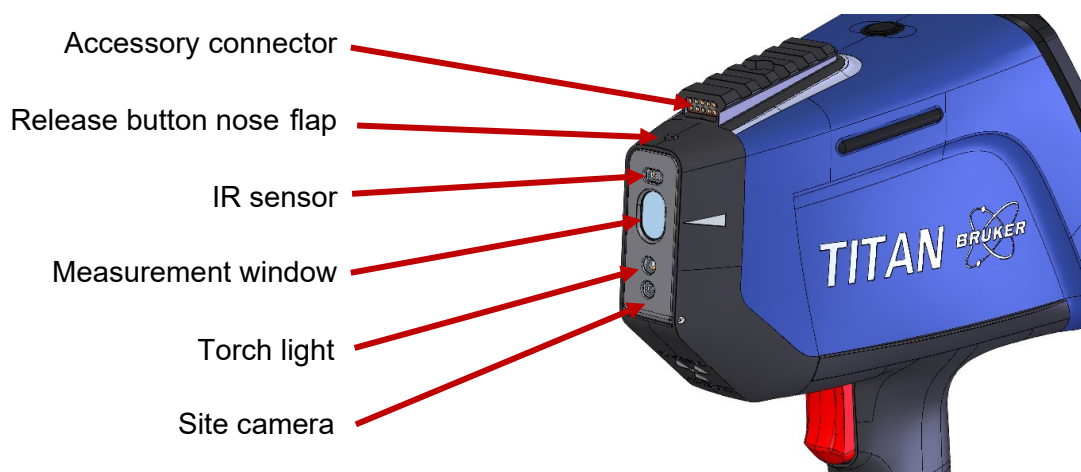


Fig. 9 Components at the nose of the TITAN XRF spectrometer



Fig. 10 Side view of the TITAN XRF spectrometer

3.3 Instrument labels

3.3.1 Manufacturer label

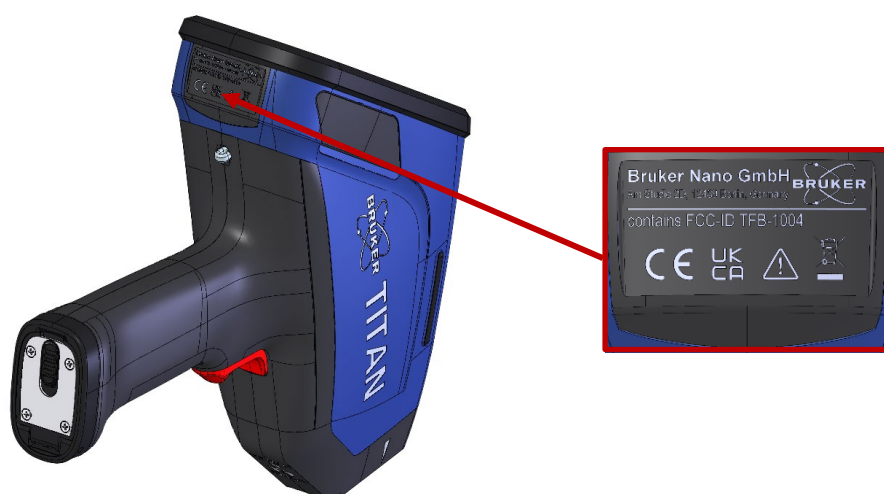


Fig. 11 Manufacturer label

3.3.2 Radiation warning label



Fig. 12 Radiation warning label

3.3.3 Serial label

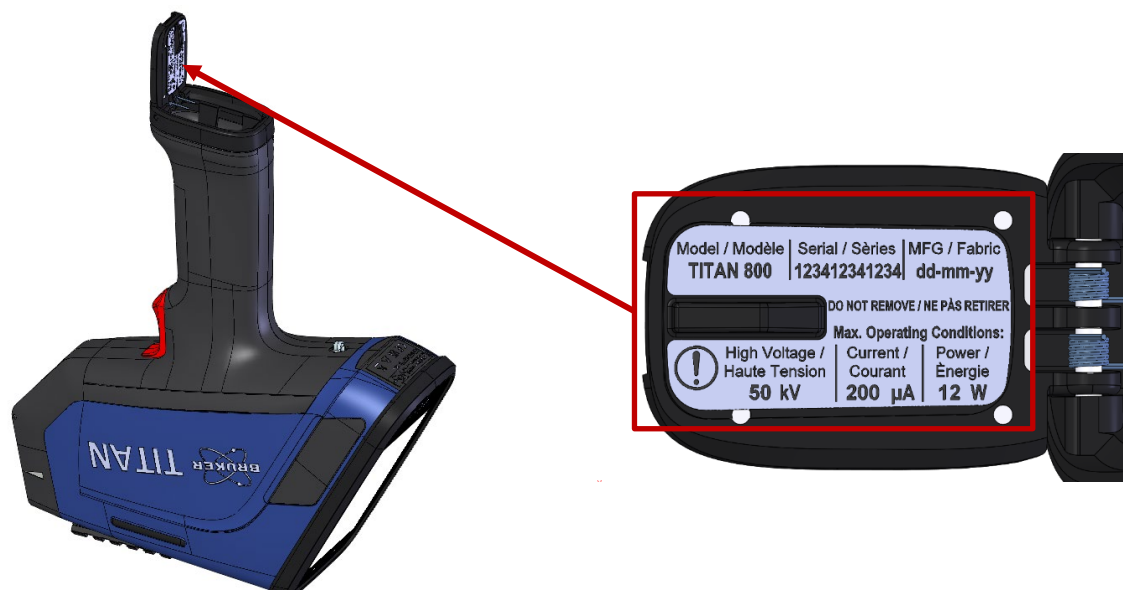


Fig. 13 Serial label

3.4 Power sources

The TITAN can be powered by a rechargeable battery or an AC adapter. Both are included with the device. The AC adapter can be used to power the device and charge the battery inside it, or to use the external charger.

If the battery needs to be replaced, the device can remain turned on; the hot-swap function allows the user to replace the battery while the device is on.

During battery replacement, the device enters power-saving mode and displays a timer that disappears once the battery is reinserted. The user has 30 seconds to replace the battery before the device begins the shutdown process.

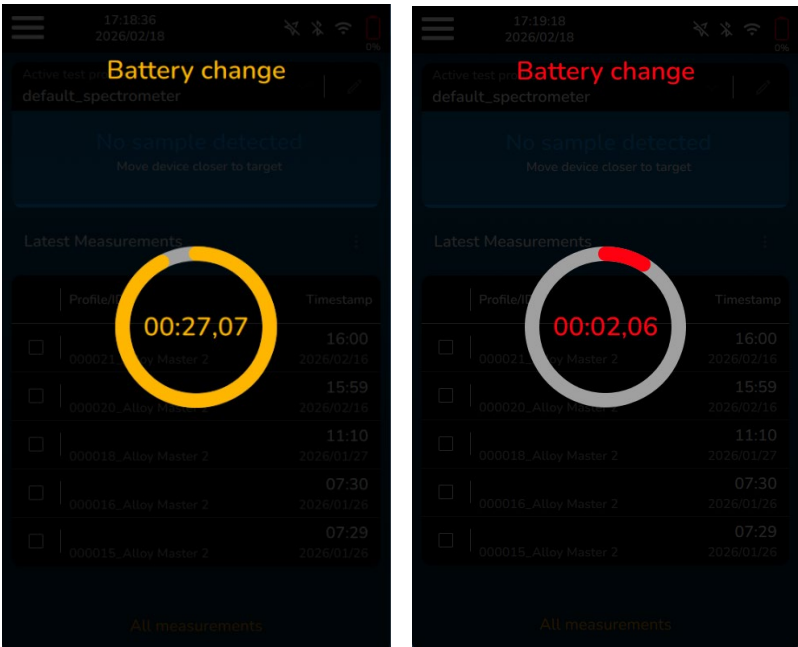
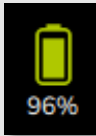
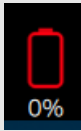
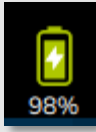
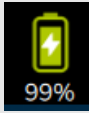


Fig. 14 Battery replacement screen

The operating status is displayed in the status bar of the user interface and by the LED ring around the power switch. The possible power statuses are listed in Table 6.

Table 6 Power states

No.	Power State	LED Ring	UI Status Bar
1	Device off	Off 	N/A
2	Device off AC connected and battery charging	Flashing yellow  	N/A
3	Device off AC connected and battery fully charged	Solid yellow 	N/A

No.	Power State	LED Ring	UI Status Bar
4	Device on Battery inserted	Solid white 	
5	Device on Battery level low	Flashing white  	
6	Device on AC connected and battery charging	Flashing green  	
7	Device on AC connected and battery fully charged	Solid green 	
8	Power down	Solid red 	N/A
9	Hot swap	Solid dark blue 	N/A
10	Power saving	Solid light blue 	N/A

To remove the battery, slide the tab on the battery compartment cover back to open it, and then pull the battery out with its latch. To insert the battery, slide it in so that its grooves align with the pins in the compartment. Pull the slide back until the latch clicks into place. The indicator shows the charging state.



Fig. 15 Battery replacement procedure

A small indicator on the opposite end of the battery shows the approximate remaining charge; one bar represents 20 percent, and up to 5 bars are visible.

To charge the battery carry out the steps listed in Table 7. To extend the battery's service life, make sure the ambient temperature is between +5 °C and +45 °C (40 °F and 115 °F) while charging.

Table 7 Steps to charge the battery

Step	Action
1	Plug the power adapter into the back of the charger.
2	Plug the power cord into the power adapter.
3	Plug the power cord into an outlet.
4	Insert the battery so that its grooves align with the pins on the charger.

The green LED flashes while the battery is charging. When the green LED stays on, the battery is fully charged. For more information, refer to the manufacturer's user manual for the charger.

Table 8 Best practices for battery usage

Item	Description
Duration	A single battery charge lasts for about four to eight hours, depending on how the device is used.
Warnings	Do not: ▪ disassemble, crush, or puncture the battery ▪ throw the battery into fire or water ▪ charge the battery only with the charger provided ▪ short-circuit the battery terminals by allowing them to come into contact with metal ▪ dispose batteries in household trash.
Disposal	To dispose a battery: ▪ Contact your local waste management company regarding disposal and recycling programs. ▪ If there is no local disposal program, return used Bruker batteries to Bruker Nano GmbH. A small shipping fee applies. ▪ If a battery does not function properly within the warranty period, return it to Bruker for evaluation and repair.
Using AC adapter	Optionally, the device can be powered using the AC adapter. To power the analyzer using an AC adapter: 1. Connect the AC adapter to a 90 - 240 V AC power outlet using the supplied cable. 2. Connect the AC adapter to the analyzer's power connector.

**Caution!**

Using an adapter from another brand may damage the analyzer and will void the warranty.

3.5 External connections

The TITAN's external ports are located under the I/O flap on the right side of the device. The flap can be easily opened by pulling out the rubber cover. The ports consist of an AC power port, a microSD slot and a USB-C and USB-A port for data transfer.



Fig. 16 External port flap and enlarged view of the external ports

The latch for the wrist strap is located at the top of the back of the handle.



Fig. 17 Wrist strap hook

4 Start of Operation

4.1 Power-up

To use the TITAN XRF analyzer, it must be turned on and logged in. To turn on the TITAN, briefly press the power button, the status LED will light up white.



Fig. 18 Position of the power button

The screen shown in Fig. 19 will appear during startup. Please be patient while this is happening.

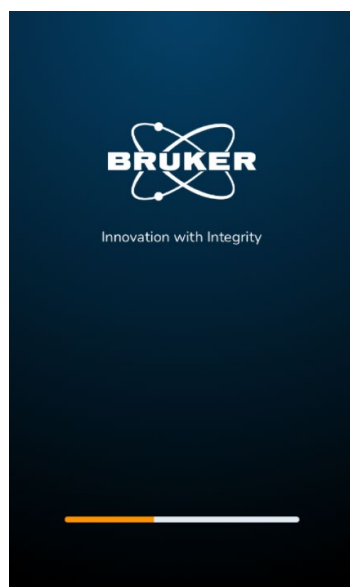


Fig. 19 Startup screen

In addition, the emission LEDs will flash, and you will hear (if applicable) the filter wheel and collimator starting up.

The device takes a few moments to start up, as indicated by the loading bar. It is ready for use as soon as the login screen (see Fig. 20) appears.

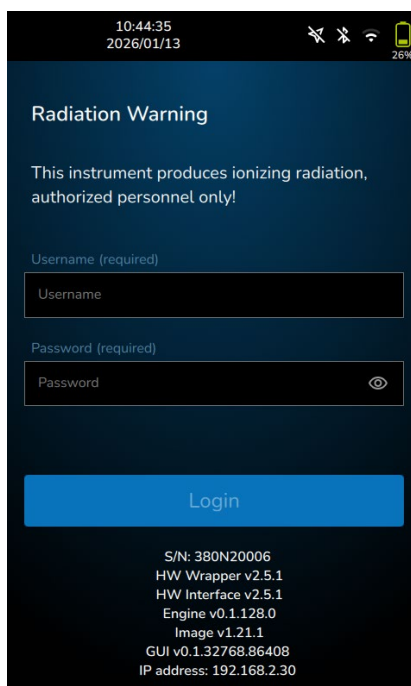


Fig. 20 Login screen

4.2 Touchscreen and virtual keyboard

The TITAN is primarily operated via the built-in touchscreen on the back shown in Fig. 21.



Fig. 21 TITAN touchscreen

Depending on the input field, different virtual keyboard layouts are displayed. For text fields, the following standard virtual keyboard layout is used; you can switch between entering letters and entering numbers and special characters.

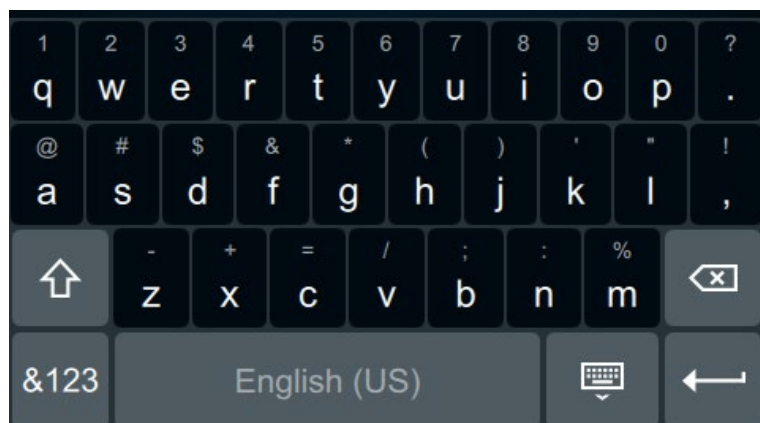


Fig. 22 Alphabetical keyboard layout

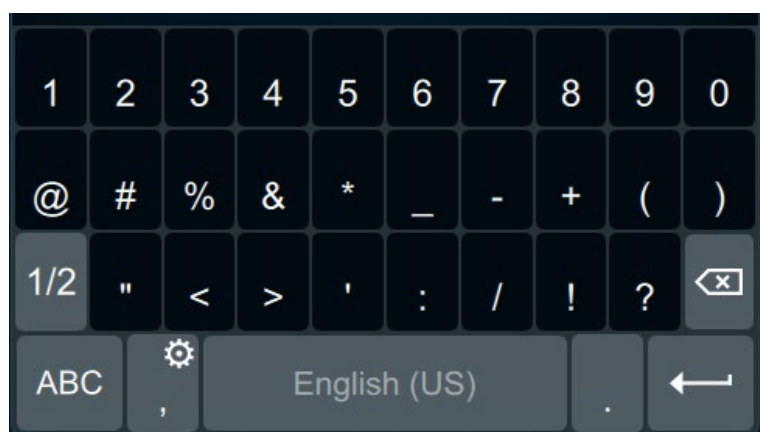


Fig. 23 Numeric and symbol keyboard layout

To switch between the two layouts, use the following icons in the lower-left corner of the virtual keyboard:



The virtual keyboard layout shown in Fig. 24 is used for numeric input fields.

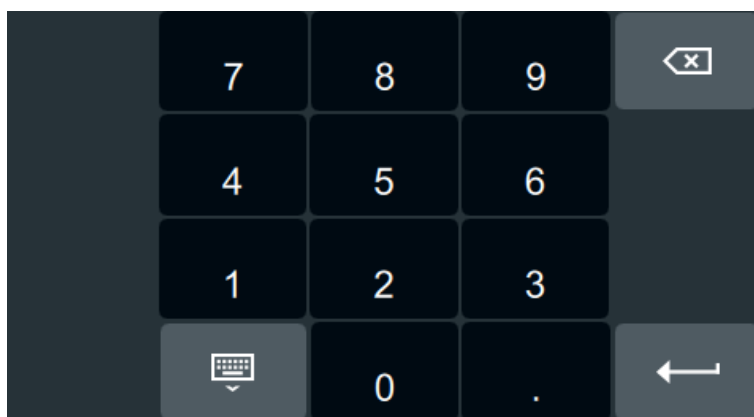


Fig. 24 Virtual keyboard layout



To hide the virtual keyboard, use the icon.

4.3 User login

Enter your login credentials - username and password - and click the **Login** button.

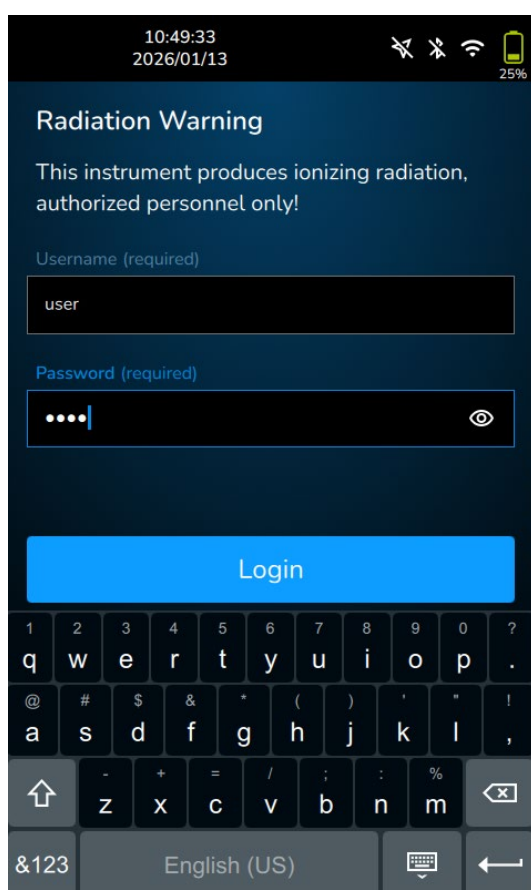


Fig. 25 User login

After successful registration, a radiation warning will appear, which can be confirmed by pulling the trigger.

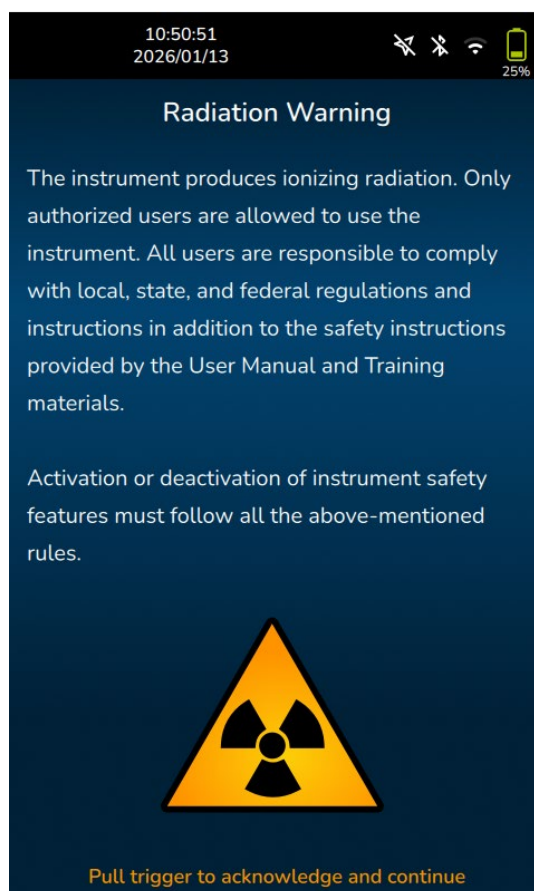


Fig. 26 Radiation warning

4.4 Startup screen

The initial screen shows:

- Status bar
- Active measurement profile
- Latest measurements

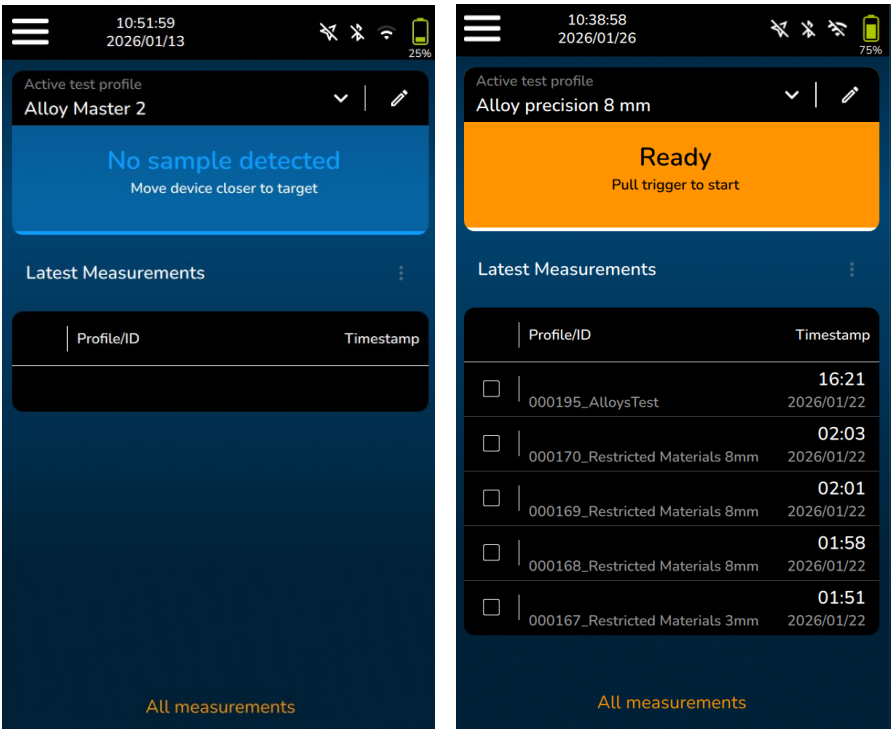


Fig. 27 Initial screens

Fig. 27 left shows the screen without any previous measurements and without a detected sample. Fig. 27 right shows a detected sample (and thus an activated device) as well as previous measurements.

4.5 Status bar

The status bar is located at the top of the screen. It displays (from left to right) the main menu, the date and time, the status of GPS, Bluetooth, and Wi-Fi, and the battery level.

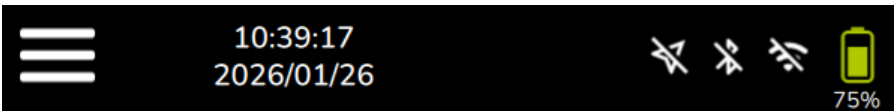


Fig. 28 Status bar

5 Performing a Measurement

5.1 Preparatory tasks

Very few preparatory steps are required to set up the TITAN XRF analyzer. Make sure that the environment meets radiation safety requirements and that the battery is charged or the device is connected to the power adapter. Check that the device's protective window is undamaged and clean and replace it if necessary.

5.2 Profile selection

On the **New Measurement** screen (accessible from the main menu), you can select one of the predefined profiles from the drop-down menu. The **New Measurement** screen can be accessed via the main menu. Select the measurement profile intended for your sample type and measurement objectives. The measurement profile contains the settings relevant to your measurement, including the application, calibration method, measurement conditions, and the type of result display.

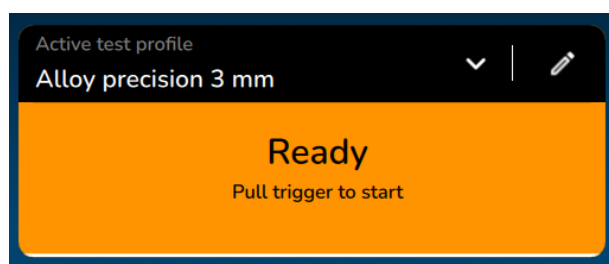


Fig. 29 Magnification of the screen showing the measurement profile

The profile to use is selected at the top. You can customize the profile using the pencil icon, which will permanently change it. The active profile is displayed in the list.

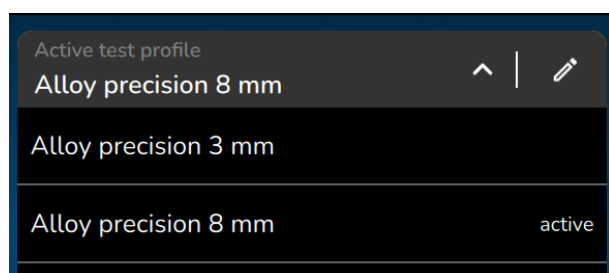


Fig. 30 Measurement profile selection window

5.3 Sample detection

Place the TITAN's nose against a sample and use the guiding arrows on the side of the nose to align it correctly with the desired measurement range. As soon as the nose touches the sample, the device's status changes to **ARMED**, the LEDs around the accessory rail begin to flash yellow, and the status indicator on the LCD display changes to **Ready** (see Fig. 31).

The TITAN XRF is equipped with a proximity sensor that detects when an object is within the detection range of the inspection window. X-rays can only be generated if the sensor detects an object. This prevents the device from being activated without a sample in place. In this case, **No sample detected** is displayed on a blue background. If a sample is in contact with the device's measuring tip and the proximity sensor is covered, **Ready** is displayed on an orange background.

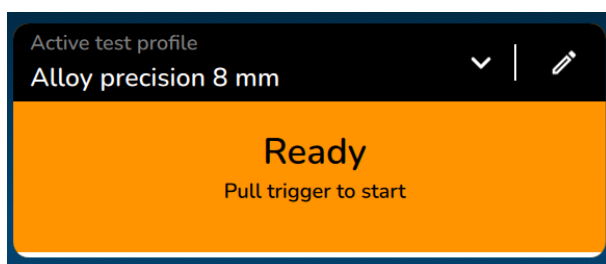


Fig. 31 Magnification of the screen showing an armed device

5.4 Performing a measurement

Follow these steps to take a measurement.

1. Hold the TITAN XRF analyzer so that it touches the sample and both the proximity and measurement windows are covered. Do not press the TITAN into the sample. The proximity indicators will light yellow, and the device display will show the **Ready** status.
2. Press and hold the trigger. The **X-ray on** indicator flashes red, and the display indicates that the measurement has begun.
3. Hold the TITAN upright and steady during the measurement. If necessary, hold the TITAN XRF analyzer with both hands, keeping them away from the sample. The results screen updates approximately every second.
4. Release the trigger to end the measurement. The measurement ends, and the TITAN XRF analyzer displays the result. Repeat these steps to perform the next measurement. Swipe left or right on the screen to view additional results.



Fig. 32 Radiation warning while X-rays are emitted

5.5 During the measurement

During the measurement, the message **Warning: Radiation!!!** flashes on the device's screen. The simple results screen is displayed during and after the measurement. It consists of the status bar at the top of the screen and the measurement display below it. In this example, the results screen displays an orange **Analyzing** indicator for the current measurement, including the information that one second of the set measurement time has already elapsed in the second of two phases (Fig. 33 left). Once the measurement is complete, the orange indicator appears in the status bar, indicating that the device is ready for the next measurement (Fig. 33 right).

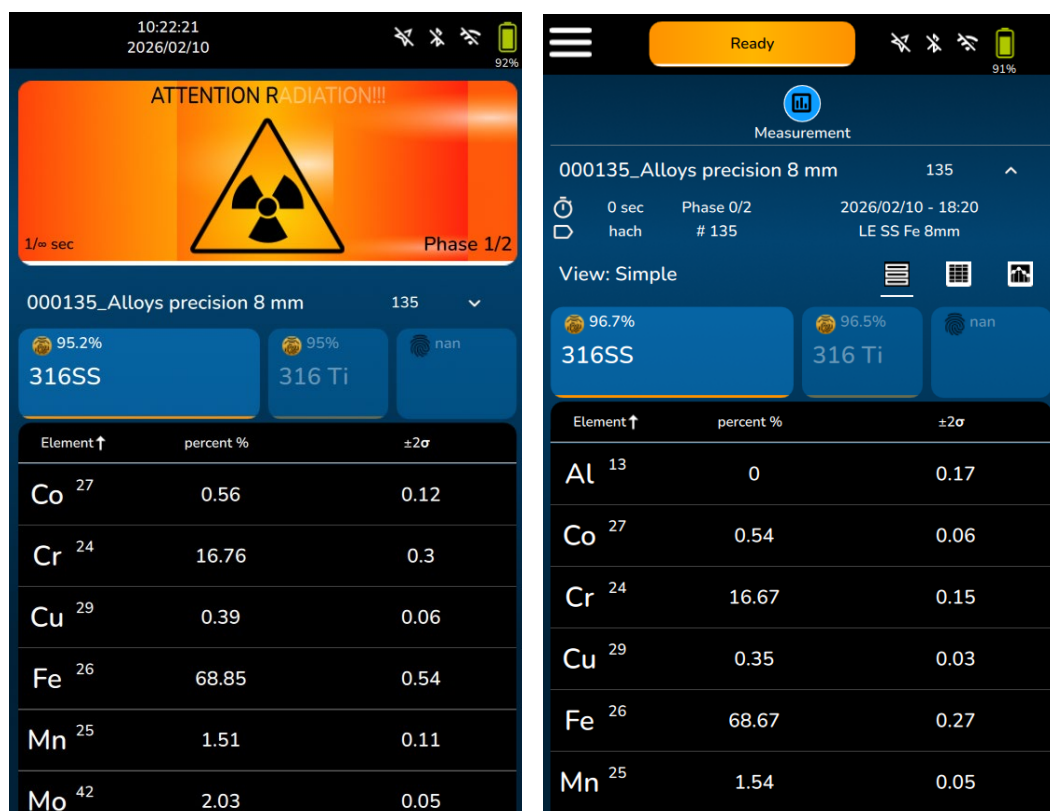


Fig. 33 Screen during and after measurement

From top to bottom, the screen displays the name of the measurement, the three most likely quality levels, and the results table. The quality levels include a percentage indicating the degree of agreement between the quality level table and the measurement result. The results table contains the quantified elements, the quantity of each element, and the measurement error (in the selected format).

5.6 Sample and site camera

During the measurement, the sample and location cameras can be used to take pictures of the exact measurement point and the area in front of the device. To use the camera, it must be selected as a measurement step in the measurement profile, as shown in the step bar at the top of the measurement screen. To take a picture with the respective camera, click the **+** icon in the field assigned to that camera (see Fig. 34).

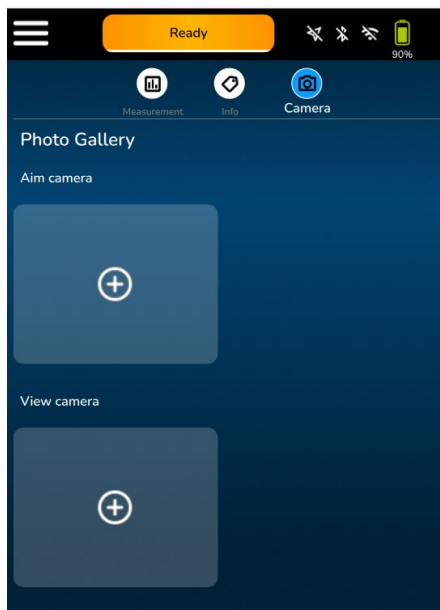


Fig. 34 Photo gallery screen

The camera screen displays the live images, the brightness control below the images, the button for switching cameras, and the shutter button. The photo gallery can be accessed in the bottom-right corner of the screen (see Fig. 35).

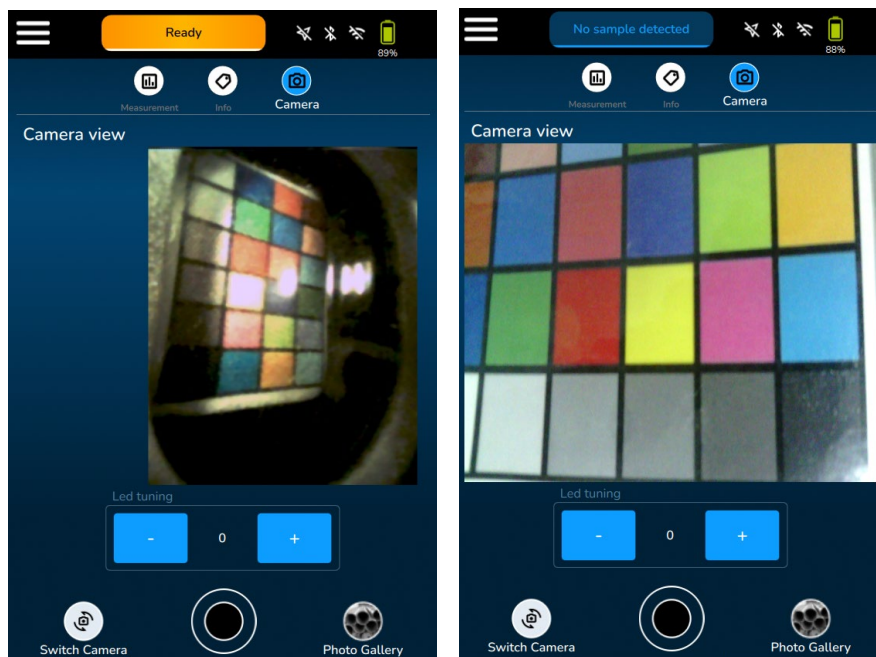


Fig. 35 Camera screen

You can use the gallery to adjust the selection of photos and delete unwanted ones (see Fig. 36).

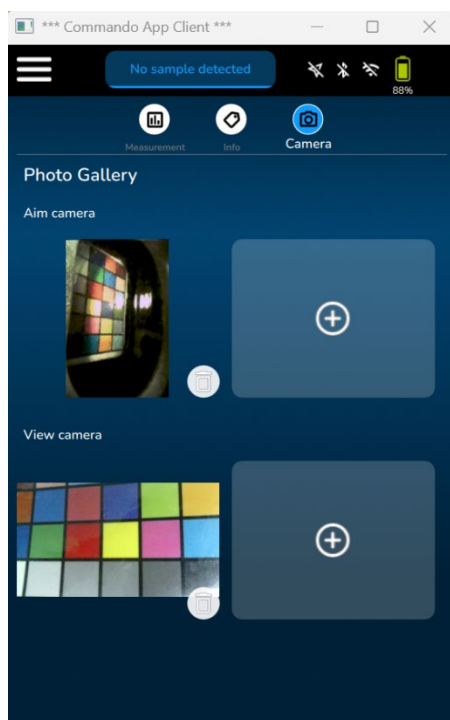


Fig. 36 Populated gallery screen

5.7 Latest measurements

Current measurements can be viewed and edited on the **All measurements** screen via the main menu (Fig. 37). On the left side of the list, you can select individual measurements or all measurements. You can then edit or delete the measurements using the edit menu. Using the filter icon, you can filter the measurements by date, name, or measurement conditions, for example.

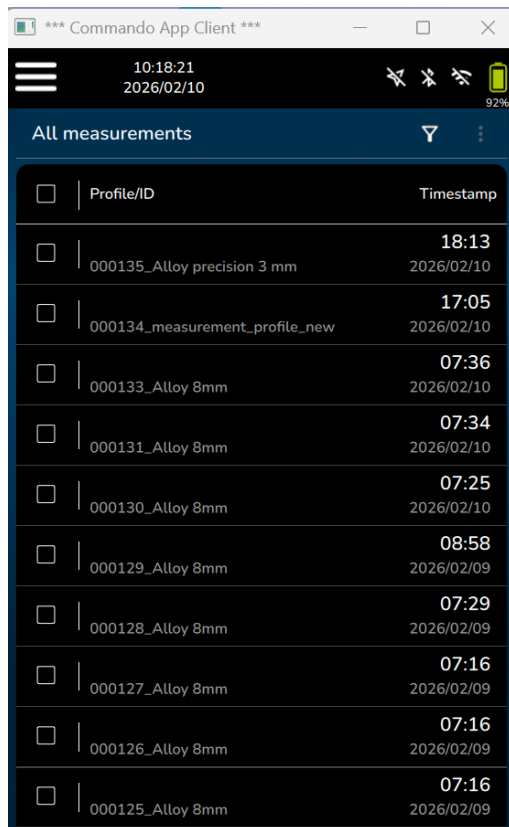


Fig. 37 All measurements screen

5.8 Delete a measurement

To delete a measurement, it must first be selected (see Fig. 38).

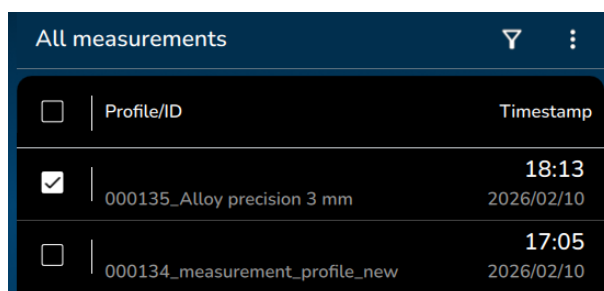


Fig. 38 Selected measurement

You can edit or delete the measurement using the **Edit** menu (Fig. 39).

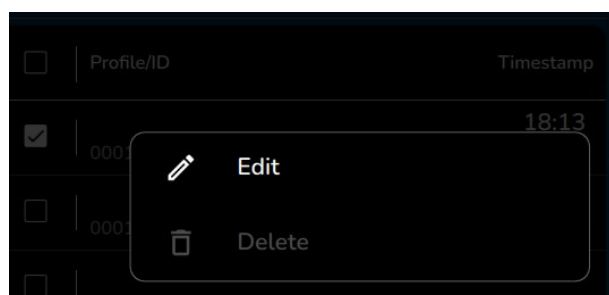


Fig. 39 Edit menu

5.9 Best practices for measurements

5.9.1 Safety-related recommendations

- **Radiation Safety:** Always follow local radiation safety guidelines. Do not point the XRF device at people.
- **Personal Protective Equipment (PPE):** Wear appropriate PPE (e.g., gloves, safety goggles) if required at your workplace or in the specific measurement environment.
- **Shields and Barriers:** Use shields or barriers to reduce radiation exposure when measuring in confined spaces.
- **For thin samples or samples containing light elements,** the use of a “background plate” (Bruker P/N B-0000-8361) behind the sample is recommended to completely block the primary beam and minimize any backscatter from materials located behind the sample
- **For thin samples or samples containing light elements,** the use of the “Radiation Shield” accessory (Bruker P/N B-0000-6351) is recommended to reduce scattered radiation
- **Training:** Ensure that users are trained in radiation safety and the proper operation of the instrument.

5.9.2 Sample preparation

- **Clean surfaces:** Remove dirt, corrosion, paint, or other contaminants from the surface to avoid inaccurate results.
- **Flat surfaces:** Whenever possible, measure on a flat, smooth surface to ensure even contact and minimize variations.
- **Homogeneous samples:** Ensure that the sample is homogeneous in composition, as the XRF measures only a relatively small area.

5.9.3 Calibration and standardization

- Ensure that the TITAN XRF calibration is working properly by performing a system check using the supplied test sample.
- Select a method that is suitable for the type of sample you are measuring.

6 Powering Down the Instrument

The instrument must be switched off for transport, for service purposes and can be switched off when it is not used for a longer period of time. To shut down the TITAN, press and hold the power button until the LED indicator turns red, or select **Exit** from the main menu and then **Power Off**.

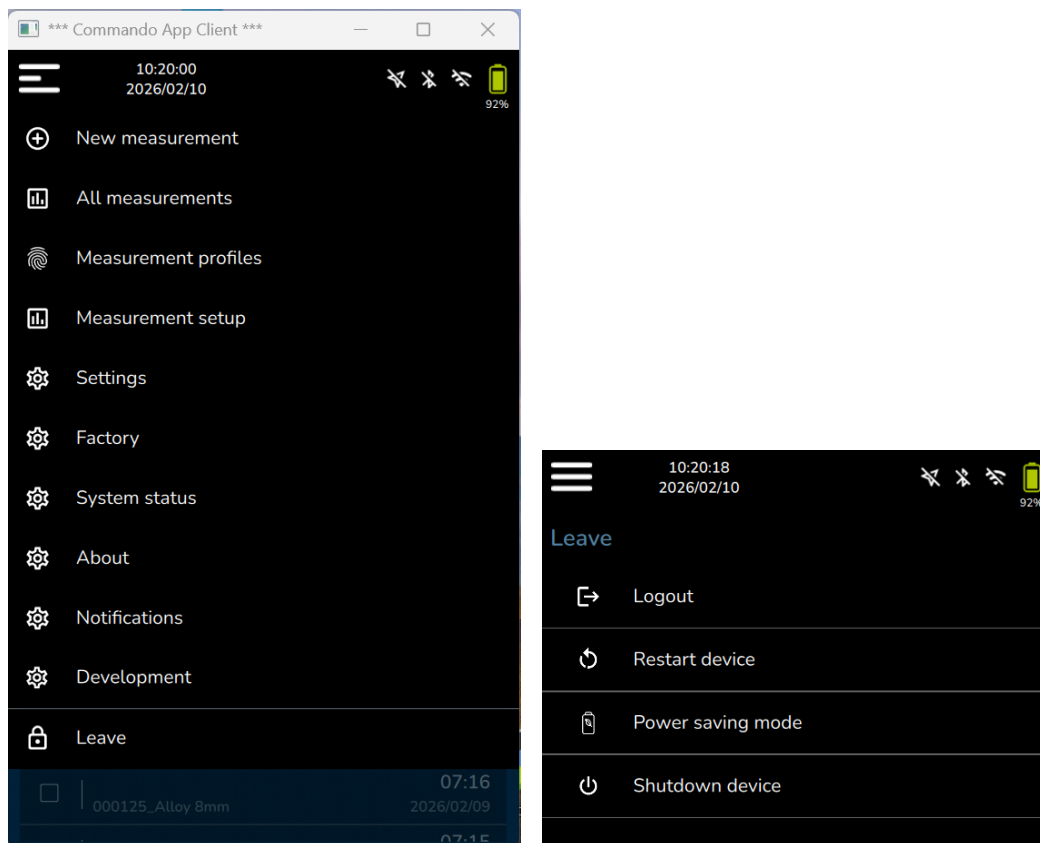


Fig. 40 Main and Leave menu

When the device is shutting down, the following screen appears and the power LED lights up red.

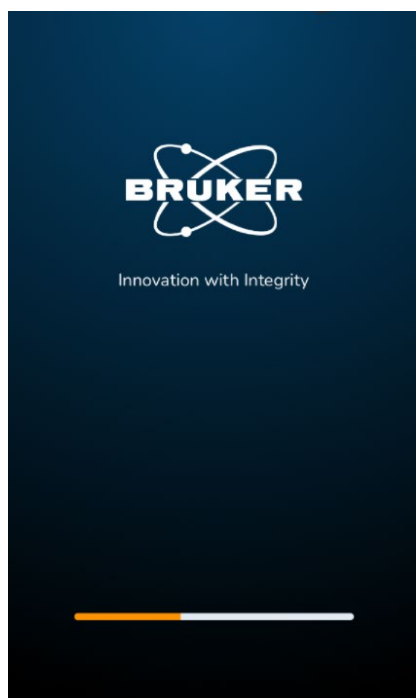


Fig. 41 Power down screen

The device begins the shutdown process, this is complete as soon as the LED indicator goes out.

7 Maintenance of the TITAN

7.1 General care and maintenance

When used properly, the device should require very little maintenance, apart from

- Calibrating and recharging the battery (refer to section 3.4 Power sources)
- Replacing the window
- Cleaning up data and clearing the memory
- Testing a check sample.

The touchscreen contains sensitive electronics and should be cleaned regularly with soft, lint-free cloth or a microfiber cloth.

Do not:

- Do not use cleaning agents, as they can damage the screen.
- Do not use compressed air.
- Do not place the analyzer in a location where the touchscreen is exposed to direct sunlight.

If the analyzer's housing is dirty, wipe it gently with a damp, lint-free cloth. Avoid using harsh solvents or compressed air. Do not use adhesives to repair damaged parts.

7.2 Changing windows

The protective window must always remain intact; it prevents contamination of the internal spectrometer components. If dust or other contaminants get behind the film due to a damaged protective window, the measurement results may be permanently distorted, and the internal components may be permanently damaged. Do not use compressed air, solvents, or tools to clean the area, as this could damage sensitive components inside the device.

To replace the protective window, follow the instructions in

Table 9.

Table 9 Replacement procedure for protective window

Step	Description	Image
1	Press the button on the nose, and the nose flap will pop out.	
2	Remove the damaged or dirty protective sticker from the window.	
3	Remove the bottom protective film from the sticker.	

Step	Description	Image
4	Stick the sticker on the nose, align it with the notches, and press it down gently so that it adheres well all over.	
5	Remove the top layer of the sticker (if this is not removed, the test results will be inaccurate).	

Replacement windshields can be ordered as follows:

- TITAN PROLENE™ Window (10), order no. B-0001-2658
- TITAN PROLENE™ Window (50), order no. B-0001-2659
- TITAN PROLENE™ Window (100), order no. B-0001-2660

If you have any questions, please contact the service department team using the link below.

<https://www.bruker.com/en/meta/forms/bna-form-pages/bna-support-contact-form.html>

8 Transportation

	Caution! Danger of instrument damage due to vibration, impacts, improper packing and environmental conditions. The transportation must be performed carefully. The instrument must not be exposed to intensive vibrations or impacts. During transport and storage, the instrument must be protected from moisture and environmental conditions outside of the specifications. The instrument must be packed in the transport packaging provided with the delivery.
---	--

The TITAN comes in a carrying case.



Fig. 42 TITAN transport cases

Please do not discard the packaging materials included with your delivery.

For shipping, all components must be packed in the carrying case and shipped in the original packaging that was included with the delivery.

If you are sending a device to our service center, please follow the instructions below.

- First, fill out the RMA form and the non-contamination declaration, sign the non-contamination declaration, and send both documents to the following email address: support.baxs.aftermarket@bruker.com.
- Please include the case number from your email correspondence with the technical team in the subject line.
- Once we have processed the documents, we will send you an RMA number.
- Do not ship the device before an RMA number has been generated.
- Please write the RMA number on the outside of the package and include a copy of the forms inside the package. Please also attach the non-contamination declaration along with the packing slip to the outside of the box. **This is important because our receiving department is not permitted to open packages without a non-contamination declaration.**

- Please pack and ship the TITAN in its original carrying case. We also ask that you place the carrying case inside a cardboard box for additional protection during shipping, along with all test samples that were originally included with the device.
- Please send only the analyzer and the control samples. Please keep all accessories and consumables, including batteries, on-site unless otherwise specified by the technical team or administrators. If batteries must be shipped, ensure that their charge level is below 30%. They must also be declared as hazardous materials in the shipping documents.
- Create a backup copy of your Titan's analysis data and save it to a local storage medium.
- Make a note of all special settings, calibration coefficients, or device configurations for later restoration. It may be necessary to reset the operating settings to the original factory defaults.
- **Please provide us with the tracking number after shipping.**

If you have any questions, please contact the service department team using the link below.

<https://www.bruker.com/en/meta/forms/bna-form-pages/bna-support-contact-form.html>

9 Disposal

	Danger! Danger of poisoning with beryllium. The X-ray tube contains the toxic substance beryllium. The disposal of this component must be performed by the manufacturer.
	Note The remaining components of the TITAN must be disposed environmentally friendly or must be recycled.



Before disposing of the device, accessories, or batteries, please check and comply with local laws and regulations.

In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste but must be collected separately. Please contact your local Bruker sales representative regarding the return and/or pickup of systems available in your country.

Please send any parts that need to be disposed of to the following address:

Bruker Nano GmbH
Am Studio 2D
12489 Berlin
Germany

For more information contact the service department team using the link below.

<https://www.bruker.com/en/meta/forms/bna-form-pages/bna-support-contact-form.html>

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