

Local Rules for use of portable X-Ray Fluorescence (XRF) equipment

Purpose:

To provide clear, concise policies relating to the use, storage and monitoring of a potentially hazardous piece of equipment.

Date Last Updated:

3 August, 2021

Introduction:

These rules are provided in compliance with the Ionising Radiations Regulations 2017 (IRR17) and strict adherence to the rules is a legal requirement. The Local Rules cover a variety of analysers that are identified in the table beneath:

Manufacturer/Brand	Model	Maximum Energy Output (kV)
Thermo Scientific	XL2t	45
Thermo Scientific	XL3	50

1. Description of the Radiation Source

Hand-held XRF units utilise 45 – 50 kV x-ray beams for the analysis of trace materials by x-ray fluorescence. Units are battery operated and portable permitting great flexibility over the range of samples that can be analysed.

2. Notification Requirements

If you intend to start work with ionising radiation for the first time you need to register with HSE. This is a requirement of the Ionising Radiations Regulations 2017 (IRR17). If you have already notified HSE for the same type of work, you do not need to reapply. Registration link can be found at:- <https://services.hse.gov.uk/bssd/>

3. Risk Assessment

All users should be familiar with the risk assessment document. Please refer to the separate risk assessment document. The control measures specified within the risk assessment are required to

prevent the possibility that an overexposure to the whole body, skin or lens of the eye may occur, and to limit the probability and extent of any exposure as far as is reasonably practicable.

4. Contingency Plans

The following procedures must be initiated by the operator in the event of the following situations:

a) In the event of Fire:-

- i. Stop using the unit and remove battery pack
- ii. Evacuate according to local instructions
- iii. Do not use unit
- iv. Return unit to supplier reporting condition

b) In the event of a dropped unit (or other damage):-

- i. Do not use unit
- ii. Remove battery pack
- iii. Return unit to supplier stating condition

c) In the event of failure of the x-ray beam to terminate:-

- i. Do not remove the unit from the test stand
- ii. Remove battery pack
- iii. Confirm beam terminated by use of monitor
- iv. Take unit out of use
- v. Return unit to supplier stating condition

d) In the event of theft of the unit:-

- i. Risk of exposure implications minimised by storing battery and unit separately
- ii. Inform police and supplier.

5. Radiation Protection Supervisors

Will Russell:	Operations Supervisor
Michael Holyoake:	Technician
James Huff:	Technician
Luke Walker:	Technician
Josh Thomas:	Senor Sales Manager
Ben Travis:	Regional General Manager
Sabine Didd:	Customer Service Advisor

6. Radiation Protection Adviser

Les Fullerton
Peak RPA Ltd
PO Box 85
Buxton
Derbyshire SK17 6WT
01298 27466 or 07900001250

7. Designated Areas

The instruments must only be used when they are mounted in the mobile test stand. No use as a hand held unit is permitted on-site. As such, there is no need to set-up, clearly mark and maintain a controlled area. The area around the test stand will be designated a Supervised Area.

8. Monitoring Routines

The Mini 900E (Geiger-Mueller based) instrument will be used as a monitoring device. The instrument is ideal for the detection and dose estimation of low energy x-ray photons. As the effective energy of the x-ray beams used has been determined to be 15 -17 keV, the monitor will give an approximate response of 3 cps for a dose rate of $1\mu\text{Svhr}^{-1}$ in this effective energy range. As the background on this instrument is generally about 0.5 cps, this does not represent a particularly high reading in relation to the level of dose rate. Therefore, a count rate of approximately 20 cps will be equivalent to a whole body dose rate of $7.5\mu\text{Svhr}^{-1}$ (ie the boundary limit for a Controlled area).

The maximum dose rate detectable from the stand should be underneath – where the xrf is connected to the stand. This dose rate is of the order of $10\mu\text{Svhr}^{-1}$ or 30 cps on the Mini 900 E monitor. At a distance of 30cm this drops off to $1\mu\text{Svhr}^{-1}$ or 3 cps on the Mini 900 E.

Great care must be taken when using this monitor as minor readings above background represent significant levels of dose rate.

The instrument will be used regularly to demonstrate that leakage radiation from the unit is within an acceptable range.

9. Personal Dosimetry

As the units will only be used mounted in the mobile test stand meaning there is no controlled area the use of personal dosimetry devices, such as Thermoluminescent Dosimeters (TLD) ring badges, is not required.

If in the future the XRF units are to be used out of the mobile test stand then it should be noted that all users of this equipment will have exposure measured by the use of Thermoluminescent Dosimeters (TLD) ring badges as these dosimeters have a detection range of 15 keV to 10MeV for skin. It is advisable that these ring badges are worn during operation of the device and returned to HPA on a monthly basis. If no significant radiation skin doses are detected, then it will be appropriate to increase the change cycle to 3 months. Badges can be obtained from:

Personal Dosimetry Service
Health Protection Agency
Chilton,
Didcot
Abingdon
T: 01235 822723
Badge Type: XRNGRH

When sending these badges back to HPA, it is important to state on the documentation that they have been used to monitor use of a 40 - 50keV xray beam of effective energy 13 – 17 keV.

10. Dose Investigation Level

A dose investigation will be carried out in the event of a persistent, unusually high reading on the Mini 900E radiation monitor which is used when using the XRF units.

11. System of Work – Written arrangements for non-classified workers working within Controlled Area (Not used in hand-held mode on site).

- a) Even though the units will only be used in the mobile test stand, ensure that there is appropriate signage, which is a Radiation trefoil and/or “Danger – X-Ray Hazard”
- b) Ensure that the XRF is used in conjunction with a calibrated monitor such as the Mini 900 E (See above). This allows simple visual and audible indication of dose levels.
- c) The XRF analyser should never be discharged into air or pointed at any person.
- d) A flashing amber warning light indicates that the unit is generating x-rays.

- e) Never analyse samples while seated at a wooden desk –due to potential exposure of legs.
- f) Ensure that testing times are minimised to a level that gives the required accuracy.
- g) Never hold samples by hand for testing. All samples must be placed in the test stand and only analysed when the test stand lid is properly closed.
- h) The XRF analyser should be stored in a lockable and secure location when not in use. Due to the security alarm, access restrictions and key card access it is deemed that Ashtead’s facility in Sandy is sufficiently secure.
- i) For maximum safety and to minimise potential exposure to unauthorised users, the analysers should be stored with the battery pack removed from the unit when not in use, even for short periods of time.