

TRACERCO™ PERSONAL ELECTRONIC DOSIMETER (PED) USER MANUAL



CONTENTS

1. ABOUT YOUR TRACERCO PED	3
2. TRACERCO™ PED OPERATION	4
2.1 Physical Description	4
2.2 Wearing the TRACERCO PED	5
2.3 Start up and shut down	5
2.4 Readings screen	6
2.5 TRACERCO PED navigation schematic	7
2.6 TRACERCO PED functions	8
2.6.1 Alarms	8
2.6.2 Tasks	8
2.6.3 Flip screen function	9
2.6.4 Screensaver	9
2.6.5 Power status	10
2.6.6 Monitor details	10
2.6.7 Time zone	11
2.6.8 Language selection	11
2.6.9 Activity Sounder	11
2.7 TRACERCO PED errors and recovery actions	12
2.7.1 Status warning messages	12
2.7.2 Critical malfunction warnings	13
2.7.3 Response to dose rate overload	14
3. DOSEVISION™ SOFTWARE	15
3.1 Recommended host PC requirements	15
3.2 Software installation	15
3.3 TRACERCO PED connection to PC	15
3.4 Transferring data from the TRACERCO PED	16
3.5 Viewing data	16
3.5.1 Date range selection and navigation	17
3.5.2 Data display options	17
3.5.3 Exporting data	18
3.6 Changing TRACERCO PED settings with DoseVision	19
3.6.1 Alarm settings	19
3.6.2 Time settings	19
3.6.3 Data logging mode	20
3.6.4 Changing TRACERCO PED units	20
3.6.5 Setting the folder for data storage	21
3.7 User Settings	
3.7.1 Adding and Deleting Users	21
3.7.2 Assigning Users to the PED	21
3.7.3 Viewing User Data	21
3.7.4 User Reports	21
3.8 TRACERCO PED Firmware and Software Upgrade	21
3.8.1 Firmware Upgrades	21
3.8.2 Dose Vision Software Upgrades	21
3.9 Access security	22
4. MAINTENANCE AND CALIBRATION	23
4.1 Charging the TRACERCO PED	23
4.2 Cleaning	23
4.3 Handling	23
4.4 Screen protection	24
4.5 Calibration	24
4.6 TRACERCO PED software and firmware upgrades	24

CONTENTS (continued)

4.7 Essential safety information	.25
4.7.1 Hazardous area approval	.25
4.7.2 Approval standards	.25
4.7.3 Repair and maintenance of the TRACERCO PED	.25
4.7.4 Use of the TRACERCO PED docks	.26
4.7.5 Electromagnetic interference	.26
4.7.6 Device heating	.26
5. TECHNICAL SPECIFICATIONS	.27
5.1 Radiological performance	.27
5.2 Hazardous area approval	.30
5.3 EMC	.30
5.4 Battery	.30
5.5 Mechanical	.30
5.6 Environmental	.31
5.7 Data logging	.31
6. ACCESSORIES FOR THE TRACERCO PED	.32
7. MONITORS PRODUCT RANGE	.33
APPENDIX A - Type Test Report Summary	.34

1. ABOUT YOUR TRACERCO PED

The TRACERCO PED is a personal electronic dosimeter that has been approved for use in explosive atmospheres. The TRACERCO PED measures radiation equivalent dose, Hp(10), accumulated in X and gamma radiation fields in the energy range of 33keV to 1.25MeV and in dose rates between 0.1 $\mu\text{Sv/h}$ and 100 mSv/h.

The TRACERCO PED reflects TRACERCO'S 50 years of experience in industrial and environmental radiation measurement by combining new design features with major advances in display technology to increase ease of operation in the field.

The Geiger Müller tube is used for radiation detection and the device has been specially designed to be lightweight but robust. The soft polymer case is resistant to chemicals and offers a high level of protection for use in all environments.



2. TRACERCO PED OPERATION

2.1 PHYSICAL DESCRIPTION



(1) System check light

LED will periodically flash green while the TRACERCO PED is functioning correctly. The LED will flash red if the instrument is in a critical status (see section 2.7 for possible critical status messages).

(2) Dose rate alarm light

Flashes amber while the amber dose rate alarm is exceeded. Flashes red while the red dose rate alarm is exceeded.

(3) Dose alarm light

Flashes amber when the amber dose alarm has been passed. Flashes red when the red dose alarm has been passed. Will continue to flash until the data has been transferred to a PC, using DoseVision.

(4) Screen

An AMOLED screen is used to display readings and menus. The screen can be programmed to display the information you want using DoseVision. The screen is coated with an antistatic material. See section 4 for maintenance tips.

(5) Case

The TRACERCO PED case is constructed from a robust, durable polymer that has inherent antistatic properties. See section 4 for maintenance tips.

(6) Button

The TRACERCO PED utilises a single button for selection and navigation. A long press is used to turn on the TRACERCO PED, open the menu system and to make a selection. A short press is used to scroll. This button is also used to silence alarms.

(7) Speaker

The speaker is used for audible alarms.

(8) Geiger Müller tube window

The Geiger Müller tube has a small window to allow increased low energy response.

(9) Clip

The clip is used for fixing the TRACERCO PED to the users clothing.

(10) Contacts

When placed in the TRACERCO PED dock the contacts are used to transfer data and charge in the instrument.

2.2 WEARING THE TRACERCO PED

The TRACERCO PED is worn on the users upperbody.

 Note that the calibration will be invalid if the TRACERCO PED is not worn on the upper body. The TRACERCO PED must not be used as a handheld radiation monitor.

The clip may be used to fix the TRACERCO PED to the users belt or some other area of work clothes. The TRACERCO PED must be worn with the screen facing outwards. It is best to wear the TRACERCO PED on the outer layer of clothing for easy readings and to make sure alarm lights are visible.



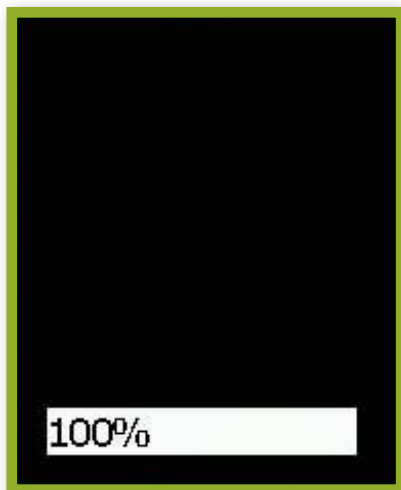
The clip may be removed by simply pulling one side of the clip saddle away from the TRACERCO PED. The clip is reinstalled by pushing the clip saddle fixing points into the small cavities on either side of the rear of the TRACERCO PED.



To offer additional security a lanyard may be fixed to the clip hinge section.

2.3 START UP AND SHUT DOWN

To turn the TRACERCO PED on, press & hold the button for a few seconds until the status bar says 100%. During start up a screen showing the assigned user is displayed, assuming there are no alarms or warnings present. This screen is followed by a button operation message. The alarms are tested when the TRACERCO PED is starting up, so the device should flash and make a load beep sound.



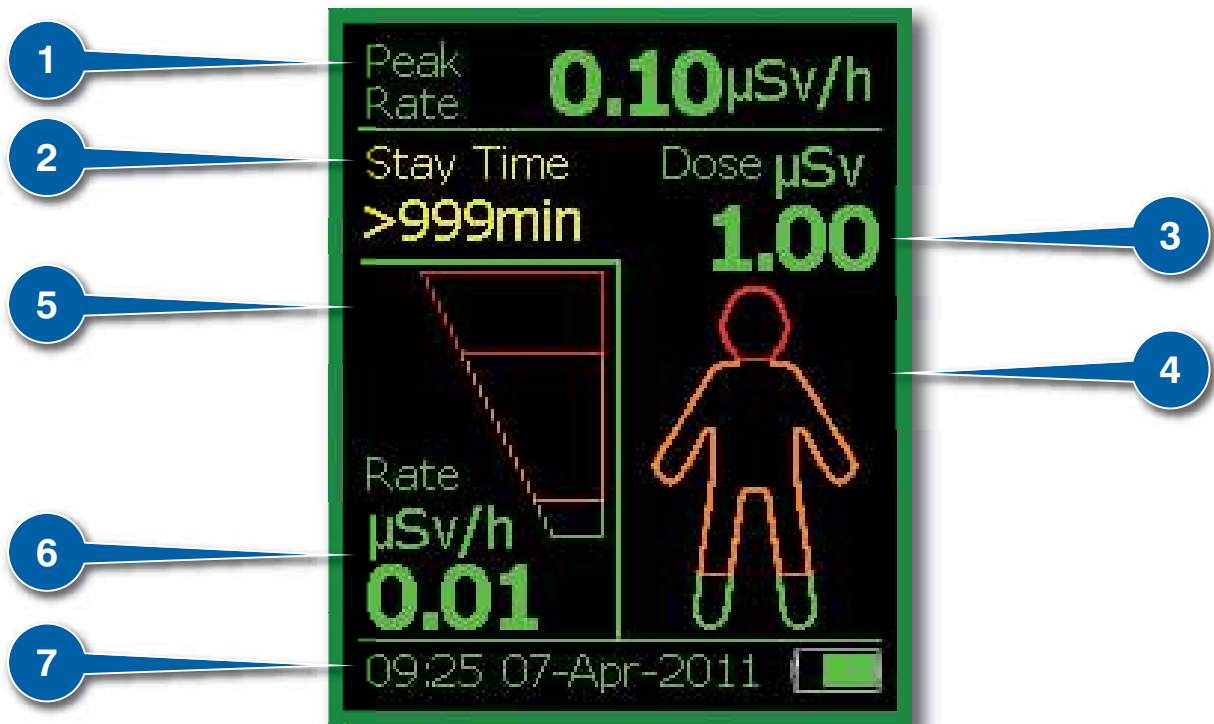
The readings screen is automatically displayed after start up.

If the dose stored on the TRACERCO PED is higher than the dose alarm level the TRACERCO PED will bypass the start up screens to go straight to the readings screen and sound the alarm and beep.

The TRACERCO PED is turned off by entering the main menu and selecting the "switch off" option. See section 2.5 for menu navigation.

2.4 READINGS SCREEN

The readings screen is the main data display screen.



(1) Peak reading

This is the highest rate of dose detected since the last time the readings were transferred onto DoseVision. Displayed in either $\mu\text{Sv/h}$ or mRem/h . See section 3.6.4 for units selection. This section of the screen changes to a task dose display whilst tasks are running.

(2) Stay time

This is an estimate of the time you have left at current dose rate, until you reach the red dose alarm. It is displayed in minutes with a range of 0 to 999 minutes.

(3) Dose

This is the total dose of radiation a person has received since the last readings were added onto DoseVision. Displayed in either μSv or mRem . See section 3.6.4 for units selection.

(4) Dose Man display

Graphical display of accumulated dose level. The Dose Man will fill from the bottom as dose is accumulated. Orange and red dose alarm thresholds are displayed on the Dose Man. See section 3.6.1 for alarm threshold selection.

(5) Dose rate bar graph

Graphical display of current dose rate (linear scale). Orange and red dose rate alarm thresholds are displayed on the bar graph. See section 3.6.1 for alarm threshold selection.

(6) Rate

Current dose rate. Displayed in either $\mu\text{Sv/h}$ or mRem/h . See section 3.6.4 for units selection.

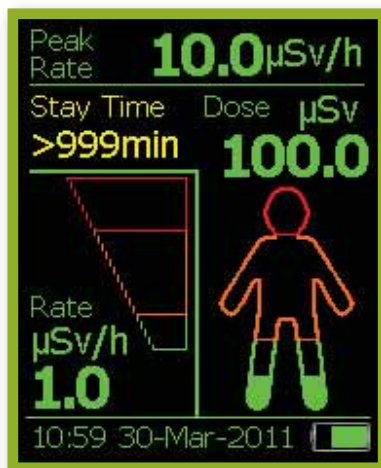
(7) Status bar

Displays time, date and battery capacity. This display alternates with instrument status notices if any are current.

2.5 TRACERCO PED NAVIGATION SCREENS

Readings screen

Hold button to enter main menu



Main menu

Press button to scroll then hold to select



- Alarm levels
- Task menu
- Screen saver
- Flip screen
- Switch off
- Show reading screen
- Settings / status

Settings / status menu

Press to scroll then hold to select



- Power status
- Monitor details
- Language
- Time zone
- Back
- Activity Sounder

See section 2.6 for further explanation of these screens and functions.

2.6 TRACERCO PED FUNCTIONS

2.6.1 Alarms

The TRACERCO PED has two adjustable alarm levels for both dose and dose rate. The alarm levels can be set using the DoseVision software.

The LEDs for dose and dose rate alarms will flash amber when the first alarm is reached and red for the second alarm. See section 2.1 for how the dose and dose rate alarm LEDs are positioned.

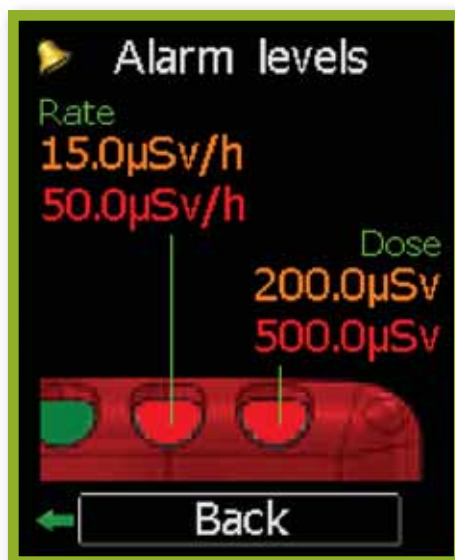
The TRACERCO PED will make a loud beeping noise for the audio alarm.

The dose rate alarms will continue until the dose rate drops below the alarm level. The dose alarm will continue until the total dose history has been transferred to the PC using DoseVision.

If the TRACERCO PED button is pressed during an alarm the audio alert will be silenced and the vibrate alert will stop. The relevant LED will continue to flash.

Dose and dose rate alarm levels are checked every second.

The TRACERCO PED alarm settings may be viewed in the alarm levels screen. See section 2.5 for navigation to this screen. The alarm settings may only be changed via the DoseVision software.



2.6.2 Tasks

A special function of the TRACERCO PED is the capability to allow users to monitor dose and peak dose rate over particular time periods or tasks. Tasks are started from the Task Menu screen. See section 2.5 for navigation to this screen. Tasks will continue to record, until stopped by the user.



Current tasks are highlighted by a green light. A trefoil/stop watch icon shows completed tasks. Current and completed task details may be viewed by selecting that task.



It is possible to record up to 9999 tasks on the TRACERCO PED. The four most recent tasks may be reviewed through the task details screen. Note;all task data logging periods may be displayed when data is viewed in DoseVision.

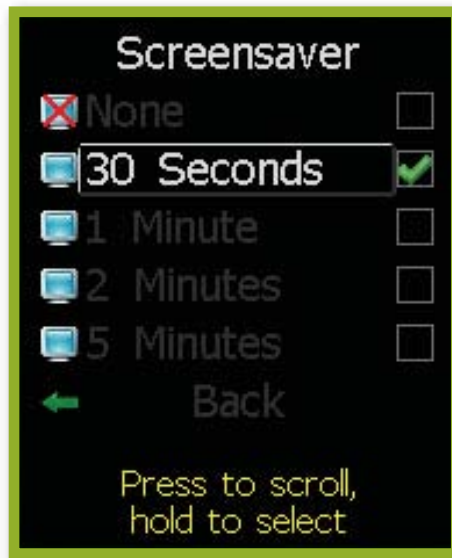
Task details may be cleared from the TRACERCO PED after data has been transferred to the PC using the DoseVision software.


2.6.3 Flip screen function

To aid the user in viewing readings during operations the TRACERCO PED has the special capability to flip the orientation of the screen. See section 2.5 for navigation to this function.

2.6.4 Screensaver

The TRACERCO PED screensaver is a blank screen. The screensaver can be switched off by pressing the TRACERCO PED button. The user may select the time period before screensaver activation. See section 2.5 for navigation to this screen.



 TRACERCO recommend that the time period before screensaver activation should be kept as low as practical. Long periods of screen activity will reduce the lifetime of the PED screen and deplete the battery more quickly.

2.6.5 Power status

The remaining battery capacity may be viewed in the power status screen. This screen also provides the user with an estimate of the run time left, both with the screensaver on or off. See section 2.5 for navigation to this screen.



The estimates run time are based on a battery monitoring algorithm and are therefore only approximate. The accuracy of the estimated run time also depends on the ambient temperature.

2.6.6 Monitor details

The monitor details screen shows various useful pieces of information about the TRACERCO PED and its status. Calibration contact details can also be found here. See section 2.5 for navigation to these screens.



2.6.7 Time zone

To make sure the dose history data is secure, it is not possible for the user to change the time and date stored on the TRACERCO PED. However, it is possible to change the displayed time to current local time through the time zone selection in the time zone screen.

The time zone screen displays the current time, date and time zone. See section 2.5 for navigation to this screen.

Note that the time and date stored on the TRACERCO PED can be set via the DoseVision software to the time (GMT) stored on the PC DoseVision is installed on.

2.6.8 Language selection

A unique feature of the TRACERCO PED is the capability to change the displayed text language. See section 2.5 for navigation to this function.

2.6.9 Activity Sounder

An activity sounder can be activated in this screen. Typical background radiation will produce approximately 12 counts per minute. The divide options allow the user to manage the 'click' event interval.

Selecting $\div 1$ means that a 'click' is generated every time a radioactive particle is detected. Selecting $\div 30$ will give a 'click' interval of about 2.5 minutes.

2.7 TRACERCO PED ERRORS AND RECOVERY ACTIONS

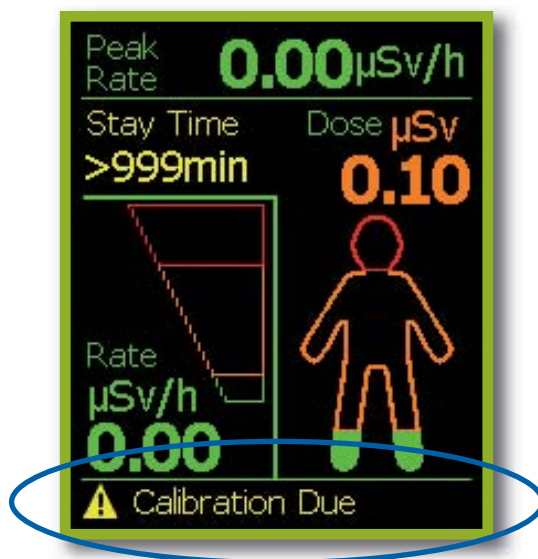
The TRACERCO PED has been designed to communicate to the user, through easy-to-understand messages, when the instrument has an error.

The system check light on the top of the TRACERCO PED will flash green when the device is operating normally and red if the device has an error.

2.7.1 Status warning messages

Status warnings are given when the TRACERCO PED is in a condition that requires action, but will still operate correctly.

Status warning messages are displayed on the readings screen status bar.



The possible status warning messages and appropriate actions are described in the table below.

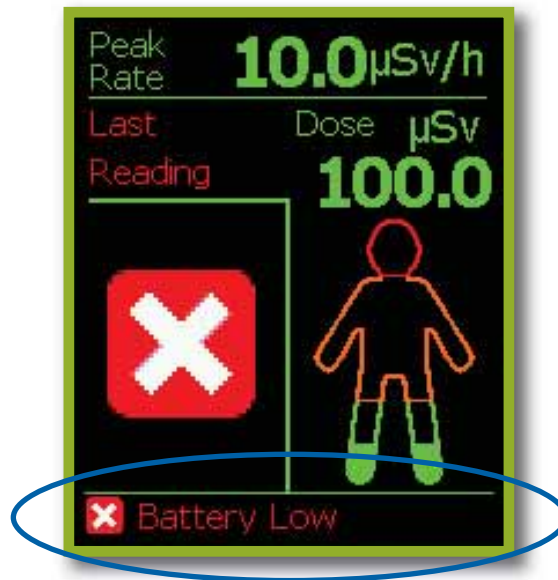
Warning message	Comments	Action
Battery Low	Remaining battery capacity is approximately 8 hours at background radiation levels.	The device should be recharged.
Memory Low	Memory low warning displayed when memory is more than 70% full.	Data should be transferred to PC using DoseVision.
Calibration Due	Indicates that more than one year has elapsed since previous calibration. Annual calibration is recommended.	TRACERCO PED should be returned to TRACERCO for re-calibration.
Default Cal Data	Default (factory set) calibration values are set.	TRACERCO PED should be returned to TRACERCO for calibration.
Warning	An undefined warning has occurred.	Return to TRACERCO for full diagnosis.

2.7.2 Critical malfunction warnings

A critical malfunction is a device error that will prevent accurate TRACERCO PED operation.

If the TRACERCO PED is on when a malfunction occurs an alarm will sound to make the user aware. The malfunction alarm sound is shorter and less frequent beep than the radiation alarm beeps.

The dose rate area of the readings screen will be replaced by a white cross on a red square background and the error will be stated. The Stay Time will be removed and a message saying "Last Reading" will be shown to indicate the last dose reading before the critical malfunction occurred.



If a critical malfunction has occurred and the TRACERCO PED is turned off it is not possible to perform a full restart. Pressing the button will cause the relevant malfunction message to be displayed at the opening screen. When the button is released (or after 1 second for a dead battery) the TRACERCO PED screen will switch off.

The possible critical malfunction messages and appropriate actions are described in the table below.

Warning message	Comments	Action
Battery critical	This indicates that the battery charge is approaching a level where radiological performance cannot be guaranteed. The TRACERCO PED will shut down after 10 seconds. Further restarts should be avoided to preserve the internal clock.	The device must be recharged.
Detector failure	In order to recognise a GM tube malfunction in areas of extremely low background radioactivity, the TRACERCO PED will assume detector failure if no counts are recorded over a period of 2 minutes.	If the user is confident the TRACERCO PED is in an area where normal levels of background radiation could be expected the device should be returned to TRACERCO for full diagnosis.
Calibration	Calibration factors are out of the recommended range of values.	TRACERCO PED should be returned to TRACERCO for re-calibration.
Clock Failure	Real time clock failure. This may occur if the battery becomes fully drained.	The user will be prompted to reset the TRACERCO PED clock. Care must be taken to ensure that the reset time corresponds to the time on the PC used for data transfer using DoseVision.
System Failure	The device is experiencing a malfunction that may affect accuracy.	Return to TRACERCO for full diagnosis.
Memory Full	Warning displayed when memory is 95% full. When memory is completely full the TRACERCO PED will continue to measure and display the true current accumulated dose, but new date/time information will not be recorded.	Data must be transferred to PC.
Error	An undefined error has occurred.	Return to TRACERCO for full diagnosis.

2.7.3 Response to dose rate overload

The TRACERCO PED will operate accurately in dose rates up to 100 mSv/h (10 Rem/h). The accuracy of measured dose rates cannot be guaranteed above 100 mSv/h and consequently there is potential for inaccuracies in subsequent accumulated dose values from the time of overload until the data has been cleared and a new accumulation started.

During exposure above 100 mSv/h the top of the readings screen will show "Overload" and dose rate will be displayed as ">100mSv/h" (note that the actual measured dose rate values will still be recorded and readable when transferred to a PC using DoseVision). Dose values will still be displayed, but will flash to indicate possible inaccuracies. The status bar will show a warning symbol and "Dose Error?" message. An alarm will sound continuously until the button is pressed.

After exposure above 100mSv/h the top of the screen will return to standard conditions. The dose rate display will return to live values. Total dose values will continue to flash (this will only be cleared once the data has been transferred to the PC using the DoseVision software). The status bar will continue to show a warning symbol and "Dose Error?" message. This message will only be cleared once the data has been transferred to the PC using DoseVision. The alarm will continue to sound until the button has been pressed.

3. DOSEVISION™ SOFTWARE

The DoseVision software is used to transfer dose history data from the TRACERCO PED to a PC and to view the data in graph form. DoseVision also allows you to adjust your settings such as changing alarm settings and assigning the TRACERCO PED to a user.

3.1 RECOMMENDED HOST PC REQUIREMENTS

Operating systems	Windows XP (32 -bit), Windows Vista (32-bit) and Windows 7 (32bit and 64-bit)
Minimum screen resolution	800 x 600
Minimum memory required	500 MB
Minimum spare disk space	5GB

3.2 SOFTWARE INSTALLATION

The TRACERCO PED comes with the DoseVision software. The installation programme will auto run when the CD with DoseVision is inserted in the PC. If auto run does not happen the installation programme may be started from Windows Explorer. The installation programme provides step-by-step instructions during the installation process.

The latest DoseVision software may also be downloaded from the TRACERCO web site (www.tracerco.com/monitors). The dock should not be plugged in during installation.

Once installation is finished DoseVision may be opened by double clicking on the desktop icon.



3.3 TRACERCO PED CONNECTION TO PC

The TRACERCO PED is loaded into a TRACERCO PED dock, which is connected to the PC via a USB cable. The TRACERCO PED should be pushed into the dock so that it clicks into place. Once DoseVision has detected the TRACERCO PED the **Home** tab will change from searching mode to displaying the last measured values on the TRACERCO PED readings screen.



Home tab in searching mode



Home tab with PED connected

⚠ Note that whilst in the dock the TRACERCO PED does not measure or record dose data.

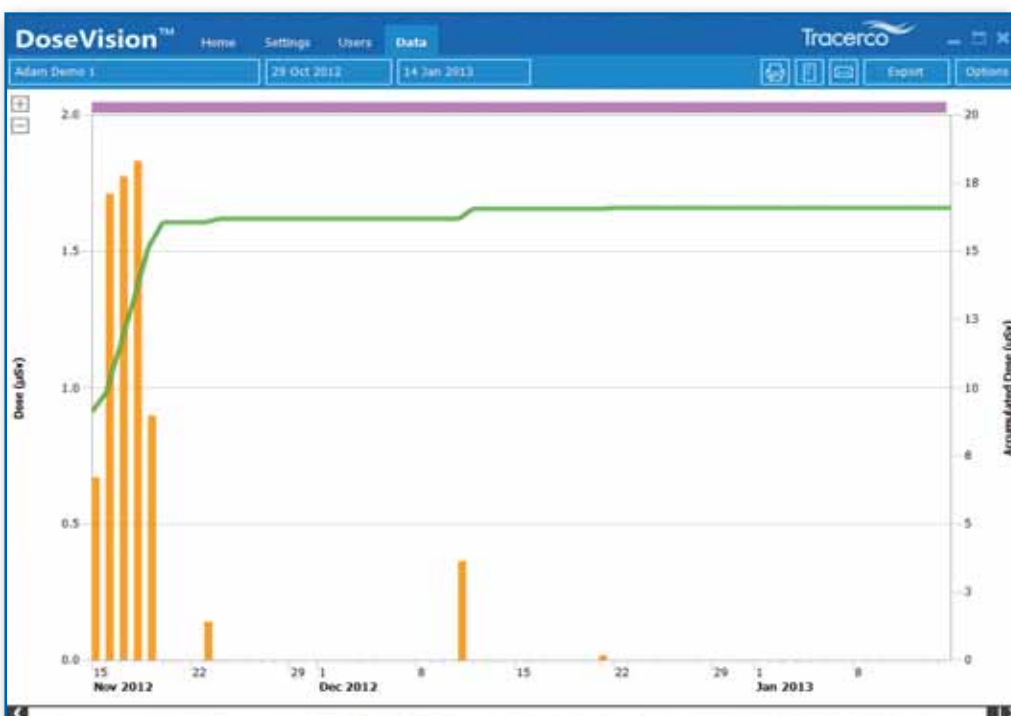
3.4 TRANSFERRING DATA FROM THE TRACERCO PED

Data can be transferred from the TRACERCO PED by clicking the **Get Dose Data from PED** button on the home page. The transferred data will then be saved in the data folder (see section 3.5) and will also be displayed in the **Data** tab.

Data can be cleared from the TRACERCO PED by clicking the **Clear Dose Data in PED** button. This command requires administrator access to the TRACERCO PED (see section 3.9). If the data is cleared all unsaved data on the TRACERCO PED is saved. If the data is cleared all unsaved data on the TRACERCO PED is saved to the user folder, the accumulated dose is set to zero and all logs and tasks on the TRACERCO PED are cleared.

3.5 VIEWING DATA

Data is viewed in the **Data** tab.



3.5.1 Date range selection and navigation

Calendar controls are provided on the DoseVision toolbar. Select start and end dates for the period of interest; or **Show all data** to view full historical record for the selected **User**.

Navigate the graph with a mouse using any of following methods:

- Left-click the +/- icons (screen top-left) to zoom in/out;
- Hover over the graph and use left and right mouse keys to zoom in/out;
- Hold down the left mouse key and drag the graph;
- Use the horizontal scroll bar under the graph



3.5.2 Data display options

The **Options** command button allows you to choose the format in which the data is presented. Normally the user will be interested in viewing either dose or dose-rate. In the case of dose rate the user is given the choice to view *Averaged Dose Rate* or *Peak Dose Rate*.

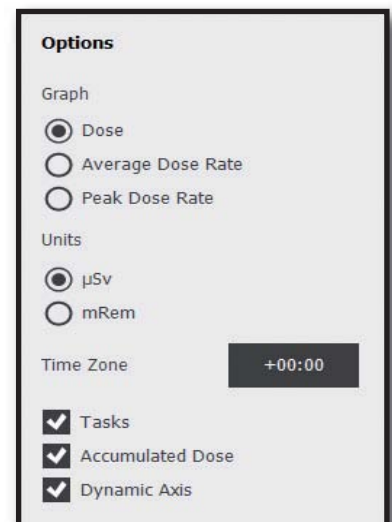
Dose – shows the total accumulated dose (green line) over the data period selected. The orange histogram indicates accumulated dose for each minute, hour or day depending upon the resolution selected by zoom control (See 3.5.1)

Average Dose Rate – switches the view to dose rate histogram showing averaged dose rate for each interval on the horizontal axis. The minimum averaging period is 1 minute, followed by 1 hour then 1 day.

Peak Dose Rate – allows the user to view non-averaged dose rate data at each resolution. In this case the *peak* for each period is shown in histogram form. This peak data would normally be lost if integrated over the 1 minute minimum resolution of the *Average Dose Rate view*.

3.5.3 Viewing Task Data

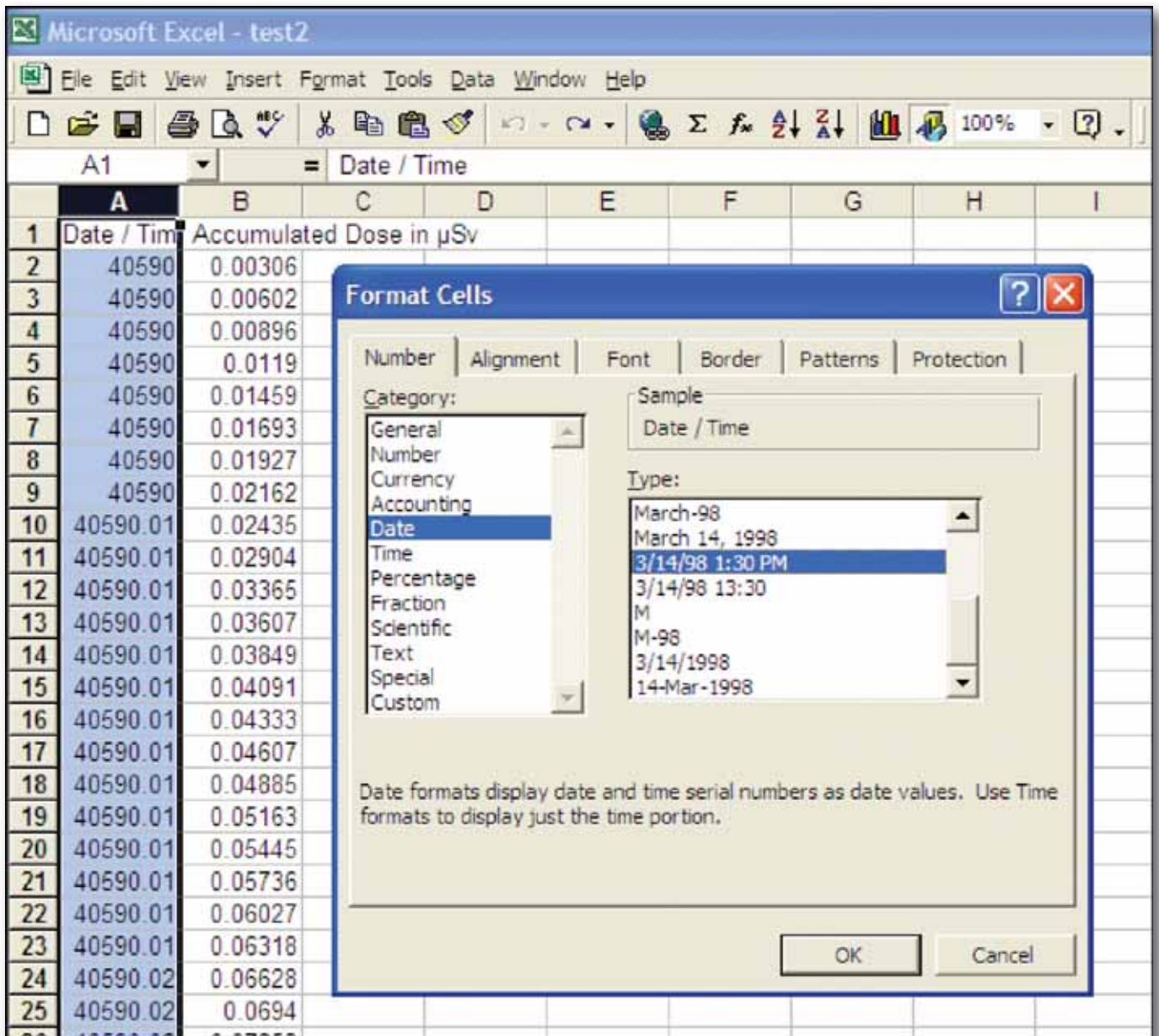
In the case where the PED user has chosen to record data with the **Task** function then DoseVision provides a useful tool to select these specific data sets. Enable task view within the **Options** menu; purple markers will appear above the graph. Double click the purple bar to show task data only.



3.5.4 Exporting Data

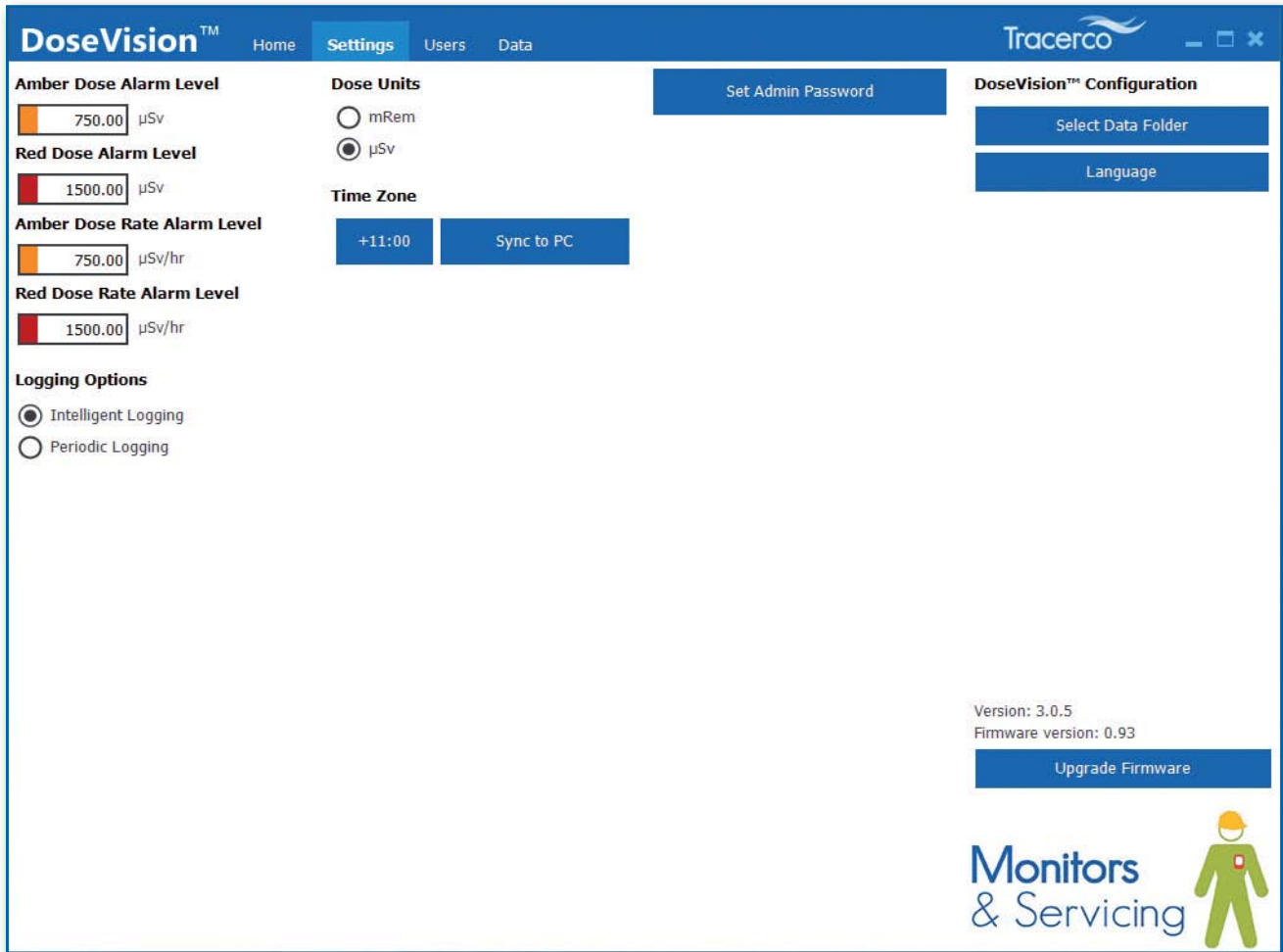
Data from the PED is securely stored to the User file each time the **Get/Clear Dose Data on PED** operation is carried out. This data may be recalled at any time using DoseVision. In order that data may be viewed, stored or distributed in other formats a number of export functions are provided.

- Print. Select the printer icon on the Data window. A copy of the current view will be sent to the printer.
- Report. Select the text icon next to the right of printer. The user is presented with options to select *User(s)* as well as report format. The report may be viewed then saved or emailed direct from DoseVision.
- Email to DVM (DoseVisionMobile). Selecting the email icon will take the currently data view, convert into DVM format and email to a compatible IOS device running the DVM app.
- Export. The *Export* button exports IOS data in csv format suitable for manipulation and/or storage in Excel.



3.6 CHANGING TRACERCO PED SETTINGS WITH DOSEVISION

Settings on the TRACERCO PED may be changed through the DoseVision software. Note that access to some of these functions is restricted to administrator level access (see section 3.9 for details). TRACERCO PED settings are changed in the **Settings** tab.



3.6.1 Alarm settings

The dose and dose rate alarm levels can be set in the **Settings** tab. After entering the new alarm level value into the box the **Apply** button must be clicked. The user is not allowed to set the amber alarm to a higher value than the red alarm.

Hint: *If only a red alarm is required the amber and red alarms should be set to the same value.*

3.6.2 Time settings

The internal clock on the TRACERCO PED may be changed to match the time and date (in GMT) stored on the PC. Time setting changes are made by clicking the **Sync to PC** button.

The time displayed on the TRACERCO PED may be adjusted to suit the local time in which the user is working. This change may be made by clicking the **Time Zone** button. Note that dose data will still be recorded relative to GMT.

3.6.3 Data logging mode

It is possible to change the TRACERCO PED data-logging mode in the **Settings** tab. Data is recorded by the TRACERCO PED in either Periodic Logging or Intelligent Logging mode.

In Periodic Logging mode the TRACERCO PED will record the accumulated dose every minute. Periodic Logging is not preferred when deployed in low dose rate areas as many data points will show zero changes and will unnecessarily use TRACERCO PED memory.

Hint: *Select Periodic Logging only if the TRACERCO PED is to be deployed in areas where the dose rate will be consistently above background, and/or rapid dose rate fluctuations are not anticipated.*

Whilst in intelligent logging mode the TRACERCO PED will log the accumulated dose for every 0.01 μSv change in dose. In normal circumstances the TRACERCO PED memory is used most efficiently by employing intelligent logging. Intelligent logging is the default mode on the TRACERCO PED.

The logging mode is selected by clicking the desired mode in the settings tab then clicking the **Apply** button.

3.6.4 Changing TRACERCO PED units

The units in which the TRACERCO PED displays dose and dose rate data can be changed between mSv (and mSv/h) and mRem (and mRem/h). This change is made by selecting the relevant Dose unit in the settings tab.

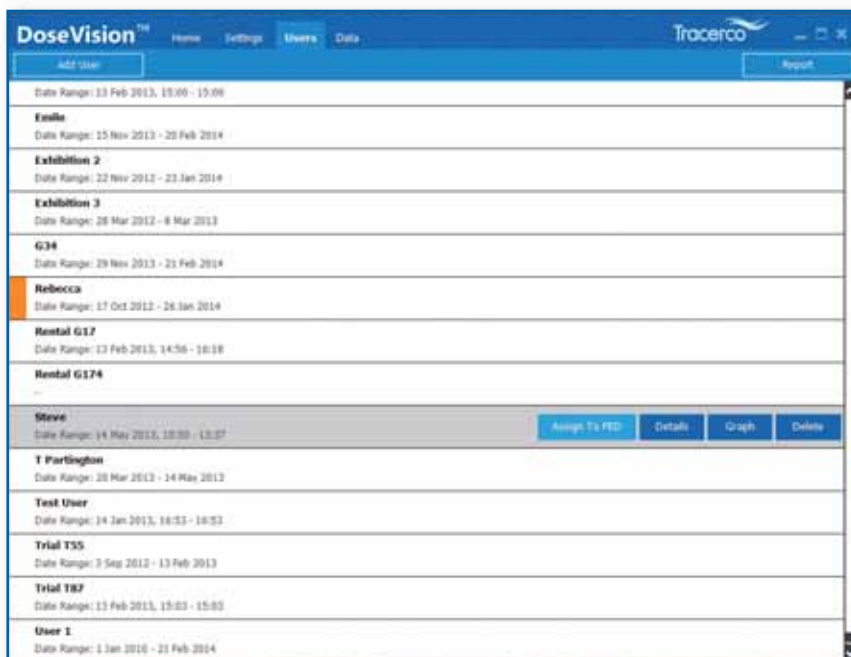
3.6.5 Setting the folder for data storage

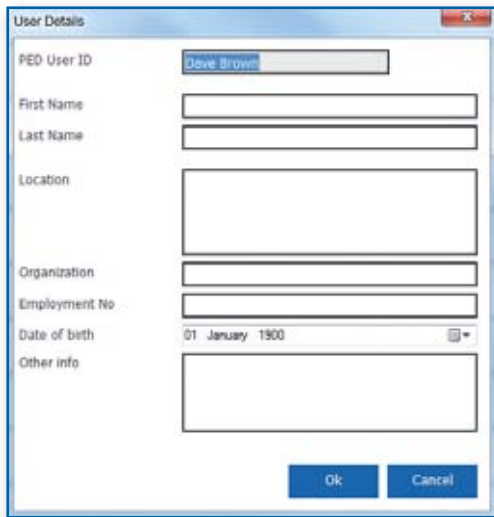
The folder used for storing dose history data is selected when DoseVision is installed for the first time.

It is possible to change the data storage folder or create a new folder by clicking on the **Set Data Folder** button on the **Settings** tab.

3.7 USER SETTINGS

In the Users tab, you can add, edit and delete users, view data and create reports.





3.7.1 Adding and Deleting Users

Users may be created by typing the user name in the box on the Users tab and clicking OK. When you add a new user a User Details box will appear. You can then enter additional information about the user such as Date of Birth and Employment Number. This additional information will appear when Reports are created. (See 3.7.4)

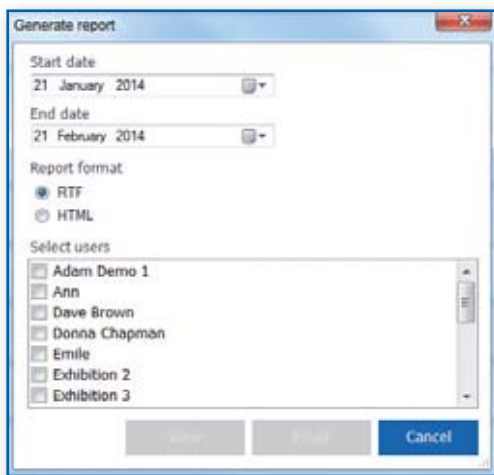
Users can be deleted by selecting the user from the list in the Users tab and clicking 'Delete'

3.7.2 Assigning Users to the PED

It is possible to assign the TRACERCO PED to another user by selecting a user from the list and clicking on the 'Assign to PED' button.

3.7.3 Viewing User Data

To view data from within the Users Tab, select the user from the list and click on the 'Graph' button.



3.7.4 User Reports

To view a report for Multiple users, click on the Report in the Users tab.

You can then select your chosen date range and pick users from the list. Reports can be generated in RTF or HTML format and either viewed on screen or added to an email as an attachment.

3.8 TRACERCO PED FIRMWARE AND SOFTWARE UPGRADES

The latest version of the TRACERCO PED DoseVision Software and Firmware may be downloaded from the TRACERCO website (www.tracerco.com/monitors <<http://www.tracerco.com/monitors>>)

3.8.1 Firmware Upgrades

Once the latest firmware has been saved DoseVision may be used for installing it onto the TRACERCO PED. The firmware upgrade is performed by clicking the Upgrade Firmware button in the Settings tab and selecting the relevant Hex file from the explorer window. The TRACERCO PED must be docked for this operation.

3.8.2 DoseVision Software Upgrades

Instructions for DoseVision upgrades are provide on the website.

3.9 ACCESS SECURITY

Upon receipt of a TRACERCO PED the DoseVision software should be installed on a nominated "Administrator" PC.

The TRACERCO PED is supplied without password protection. When a TRACERCO PED that is not password protected is in the dock, a password may be set using the **Set Admin Password** button in the Settings tab.

User names are not associated with the password. The password is held in the TRACERCO PED and applies whichever PC the TRACERCO PED is connected to.

Subsequent connection of password protected TRACERCO PEDs to the Administrator PC will not require password entry as the password will be cached on the PC. Access security for TRACERCO PEDs on the Administrators PC is effectively provided by the PC Windows login.

Hint: *The dose history data is normally downloaded to a folder in application data, which is visible only to the user who first runs DoseVision on the PC. If wider access is required for the dose history data the administrator can choose to change the data folder to a more public one, e.g. a folder within shared docs. See section 3.6.6 for changing the data storage folder.*

If a TRACERCO PED that has had a password applied is connected to a different PC (with DoseVision installed) the password will be required to gain access to administrator level functions. User level functions can still be freely accessed. Users level access is restricted to the following functions:

- Transferring and viewing current data
- Viewing old data for the assigned user that is stored on the PC
- Changing the data storage folder
- Exporting data
- Changing the data logging mode
- Setting the time zone
- Changing the TRACERCO PED measurement units

Administrator level access to a TRACERCO PED can be acquired on any PC by clicking the **Get Administrator Access** button and giving the password. Once the password has been given for a particular TRACERCO PED, it is not necessary to re-enter it in the future as the password is cached on the PC.

It is possible to view the password on a docked TRACERCO PED by clicking the "Show Admin Password" button on the advanced tab. This requires administrator level access and may be used when the user of a different PC requires administrator access and the password has been forgotten.

In the unlikely circumstances of the administrator PC losing the cached password, Tracerco can provide a pass code that will allow the administrator to read the TRACERCO PED password. Click on the **Get Forgotten Password** button and follow the instructions.

4. MAINTENANCE AND CALIBRATION

The TRACERCO PED has been designed for reliable operation in heavily industrialised environments and should provide many years of effective service provided attention is paid to basic operational maintenance.

4.1 CHARGING THE TRACERCO PED

The TRACERCO PED is charged by inserting it into a charger dock. The charger dock has a micro USB connection that will allow charging via a mains supply, 12v car supply or connection to a PC USB port.



⚠ Note that only charger accessories supplied by TRACERCO are recommended. See section 6 for further information on TRACERCO PED accessories.

During charging an estimation of battery capacity and a lightning flash icon is displayed. When the estimated battery charge is greater than 95% the display will show full charge. Active warning messages are also displayed during charge.

A fully charged TRACERCO PED can be expected to last for greater than 300 hours in normal operating conditions before recharge is required. A low battery warning will be provided when only 8 hours remaining capacity is estimated. When the battery charge reaches a critically low level the TRACERCO PED will close down to preserve stored data. Further drain on the battery may result in loss of the TRACERCO PED real time clock.

⚠ The user must not attempt to change the TRACERCO PED battery.

Note that during charging the TRACERCO PED does not record data.

4.2 CLEANING

The TRACERCO PED features a soft polymer over mould that has been manufactured from materials with excellent chemical resistance and inherent antistatic properties. The over mould may be cleaned by wiping with a slightly moistened cloth. A mild detergent may be used if required.

The TRACERCO PED screen is manufactured from a tough polymer with antistatic coating. Care must be taken when cleaning that the antistatic coating is not removed. The screen may be cleaned by gently wiping with a slightly moistened soft cloth. A mild detergent may be used if required.

4.3 HANDLING

Maintenance of the mechanical integrity and antistatic properties of the TRACERCO PED housing are critical for use in explosive atmospheres. While the TRACERCO PED has a tough design, unnecessary impacts, abrasions or contact with harmful chemicals should be avoided. TRACERCO recommend that the TRACERCO PED is transported in an approved case and pouch. See section 6 for further information on TRACERCO PED accessories.

⚠ The user must not attempt to open the TRACERCO PED. The TRACERCO PED must be returned to TRACERCO for repair.

4.4 SCREEN PROTECTION

The TRACERCO PED screen graphics have been designed to maximise screen life and minimise power consumption. However, TRACERCO recommend that the time period before screensaver activation should be kept as low as practical. Long periods of screen activity will reduce the lifetime of the TRACERCO PED screen.

4.5 CALIBRATION

Ionising radiation legislation recommends that all operational radiation measurement devices are subjected to regular inspection and testing. This recommendation includes performance checks and where appropriate, recalibration of the monitor.

The TRACERCO PED should be calibrated with the display screen facing the radiation beam. The position of the GM detector is clearly marked by the detector window near the bottom of the front face. An ISO phantom or suitable correction factor should be employed during calibration.



Note that the calibration will be invalid if the TRACERCO PED is not worn on the torso during operations. The TRACERCO PED must not be used as a handheld device.

A special feature of the TRACERCO PED is the provision of a warning message to notify the user when calibration is due. The next calibration due date may be found in the monitor details screen. Calibration contact details are also contained here. See section 2.5 for navigation to this screen.

All TRACERCO PEDs are checked and calibrated immediately prior to despatch to the customer. Following this initial procedure (or the regular inspection and calibration check) TRACERCO operatives will re-set the next calibration check due date within the software of the PED.

To assist in providing customers with a more efficient and comprehensive service, TRACERCO has developed a proprietary database, which holds records of all monitors supplied to customers, including details of inspections, repairs, replacements and calibrations. This database provides a cradle-to-grave history for the tracking of radiation monitors.

TRACERCO has several calibration and repair facilities throughout the world. Contact TRACERCO customer services to find your nearest facility.

Tracerco Customer Services

UK (Global Headquarters)

Tel: +44 (0)1642 375171
Email: radiation.monitors@tracerco.com
Web: www.tracerco.com/monitors

USA

Tel: +1 281 291 7769
Toll Free: 1 800 288 8970
Email: tracerco.@tracerco.com

Malaysia

Tel: +603 7803 4622 (GL)
Email: robert.yong@tracerco.com

Australia

Tel: +61 (0)8 9209 3905
Email: colin.foley@tracerco.com

Brazil

Tel: +55 21 3535-7600
Email: tracerco.brasil@tracerco.com
Web: http://www.tracerco.com.br

4.6 PED SOFTWARE AND FIRMWARE UPGRADES

A special feature of the TRACERCO PED and DoseVision is the ability to upgrade to the latest software and firmware. This allows users to benefit from the latest TRACERCO PED improvements.

The latest version of the TRACERCO PED firmware and DoseVision may be downloaded from the TRACERCO website (www.tracerco.com/monitors). Once the latest firmware has been saved DoseVision may be used for installing onto the TRACERCO PED.

4.7 ESSENTIAL SAFETY INFORMATION

4.7.1 Hazardous area Approval dependant on version ordered and described on equipment label

The TRACERCO PED model T404-A-1 is suitable for operation in hazardous areas, zones 0, 1 & 2.

ATEX Certificate: Baseefa11ATEX0045

IECEX Certificate IECEX BAS11.0027;

FM Approval: 3041519

ATEX/IECEX Mark:

 ATEX: II 1G

Electrical code: Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ +50°C)

USA Mark:

IS Class I, Div1, Groups ABCD, T4 (-20°C ≤ Ta ≤ +50°C)

Class I, Zone 0, AEx ia IIC T4 Ga (-20°C ≤ Ta ≤ +50°C)

Canadian Mark:

Class I, Zone 0, Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ +50°C)

The ATEX coding declares the equipment is for non-mining use (II) with very high protection (1) for gas (G) atmospheres. The electrical coding is for intrinsically safe equipment (ia) and may be used in flammable gas groups IIA, IIB and IIC and with a temperature class of T1, T2, T3, and T4. The equipment is only certified for use in ambient temperatures -20°C to +50°C inclusive.

4.7.2 Approval standards ATEX/IECEX/FM/CSA

BS EN 60079-0:2006 & 2009

BS EN 60079-11:2007

FM Class 3600 / 3610 / 3810

CSA-C22.2 60079-0 / E60079-11 / 1010.1

4.7.3 Repair and maintenance of the TRACERCO PED

Repair of the equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. **IEC/EN 60079-19**

All parts used in the repair of the TRACERCO PED must be supplied by TRACERCO.

The screen of the TRACERCO PED has a conductive coating to prevent the build up of a static charge. The screen and the body of the equipment may be cleaned using water and a mild detergent. There will normally be no danger of ingress as the body is sealed to IP67 meaning it is submersible in water up to 1 metre deep. Do not use anything abrasive.

The following materials are used in the construction of the TRACERCO PED:

- Clip and bracket (Static dissipative Polycarbonate/ABS alloy)
- Rear case (Static dissipative Polycarbonate/ABS alloy with a static dissipative TPE overmould)
- Front case (polycarbonate with a static dissipative TPE overmould)
- Screen coated with Indium Tin Oxide (ITO)

Note - If the equipment is likely to come into contact with aggressive substances, it is the responsibility of the user to take suitable precautions to ensure the type of protection provided by the equipment is not compromised.

4.7.4 Use of the TRACERCO PED docks

The T409 and T410 docks are used for charging and communicating with the TRACERCO PED

These docks are the only equipment which may be used to communicate with the TRACERCO PED. **The docks must not be used in a hazardous location.**

$U_m = 253V_{AC}$.

This is the maximum voltage which may be applied to the docks without invalidating the type of protection. This is not the dock supply voltage. The nominal supply for the docks is +5V +/- 5%.

Repair of the docks shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. **IEC/EN 60079-19**

All parts used in the repair of the TRACERCO PED docks must be supplied by TRACERCO. The dock cases are ABS and may be cleaned with a damp cloth.

4.7.5 Electromagnetic interference

Whilst the TRACERCO PED has undergone rigorous EMC testing it is advisable that care is taken when used in close proximity to medical devices such as pacemakers.

4.7.6 Device heating

The TRACERCO PED may become warm during charging and normal use.

For technical support contact:-

Tracerco Customer Services

UK (Global Headquarters)

Tel: +44 (0)1642 375171
Email: radiation.monitors@tracerco.com
Web: www.tracerco.com/monitors

USA

Tel: +1 281 291 7769
Toll Free: 1 800 288 8970
Email: tracerco@tracerco.com

Malaysia

Tel: +603 7803 4622 (GL)
Email: robert.yong@tracerco.com

Australia

Tel: +61 (0)8 9209 3905
Email: colin.foley@tracerco.com

Brazil

Tel: +55 21 3535-7600
Email: tracerco.brasil@tracerco.com

United Arab Emirates

Tel: +9712 554 1672
Email: tracerco@tracerco.com

5. TECHNICAL SPECIFICATIONS

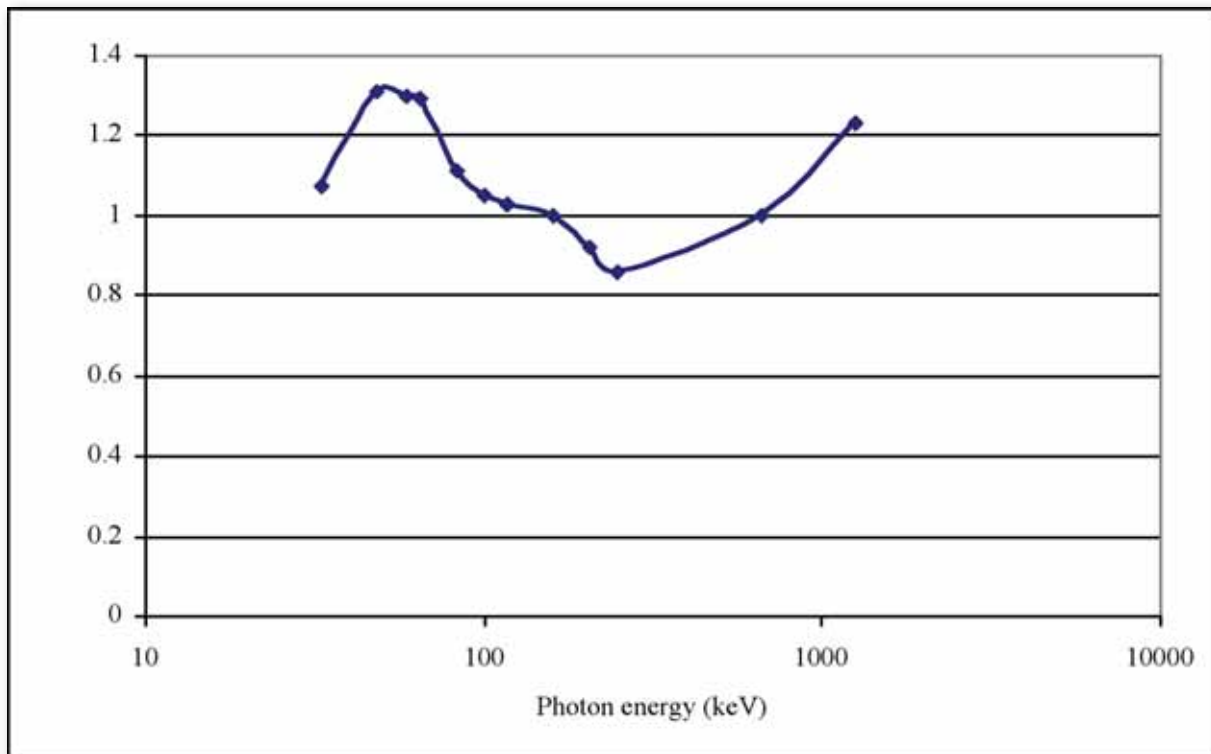
The TRACERCO PED has been tested in accordance with EN 61526:2007 (Radiation Protection Instrumentation – Measurement of personal dose equivalents Hp(10) and Hp(0.07) for X, gamma, neutron and beta radiations – Direct reading personal dose equivalent meters and monitors).

Further details of type tests may be found in Appendix A.

5.1 RADIOLOGICAL PERFORMANCE

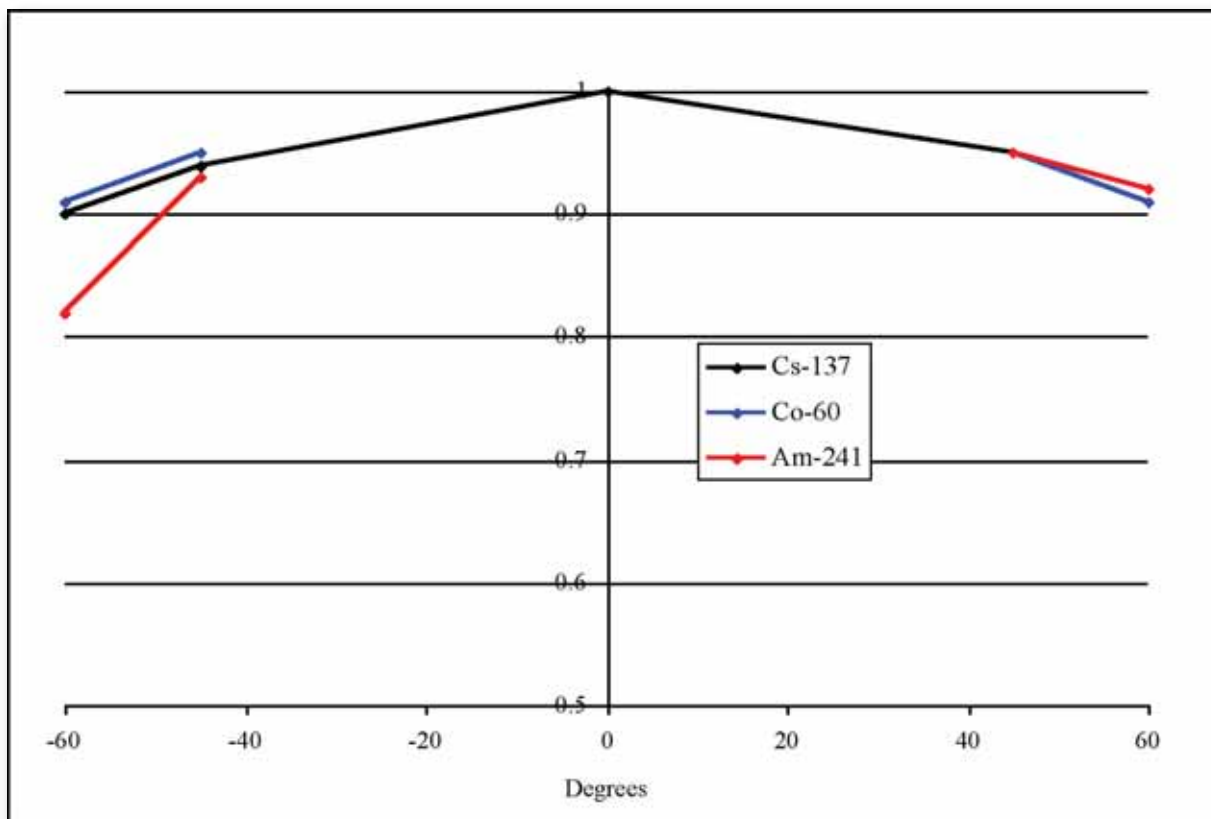
Radiation detected	X-rays and gamma rays in range 33 keV to 1.25 MeV.
Sensor	Single, energy compensated geiger müller tube.
Units	Sieverts or Rem (may be selected in DoseVision software)
Radiation dose rate	Bargraph display 0 to 100 mSv/h or 0-10 Rem/h Digital numeric 0 to 100 mSv/h or 0-1000 Rem
Accumulated dose	Dose "man" display 0 to 10 Sv or 0-1000 Rem Digital numeric 0 to 10 Sv or 0-1000 Rem
Peak radiation dose rate	Digital numeric 0 to 100 mSv/h or 0-10 Rem/h
Alarms	Two alarm levels for both dose and dose rate. Alarm levels set via DoseVision software. Dedicated LEDs for dose and dose rate will flash amber for first alarm level and red for second alarm level. Loud beep and powerful vibrate alerts occur during alarm.
Overload Response	PED gives clear indication of overload when above 100mSv/h. A special feature of the Tracerco PED is continued indication of possible accumulated dose inaccuracy due to overload. This indication is provided on both the PED and in the data in DoseVision.
Variation with Temperature	Less than $\pm 10\%$ over temperature range -20°C to $+50^{\circ}\text{C}$.
Dose rate linearity	$\pm 16\%$ over the range $2 \mu\text{Sv/h}$ to 100 mSv/h

TRACERCO PED energy response



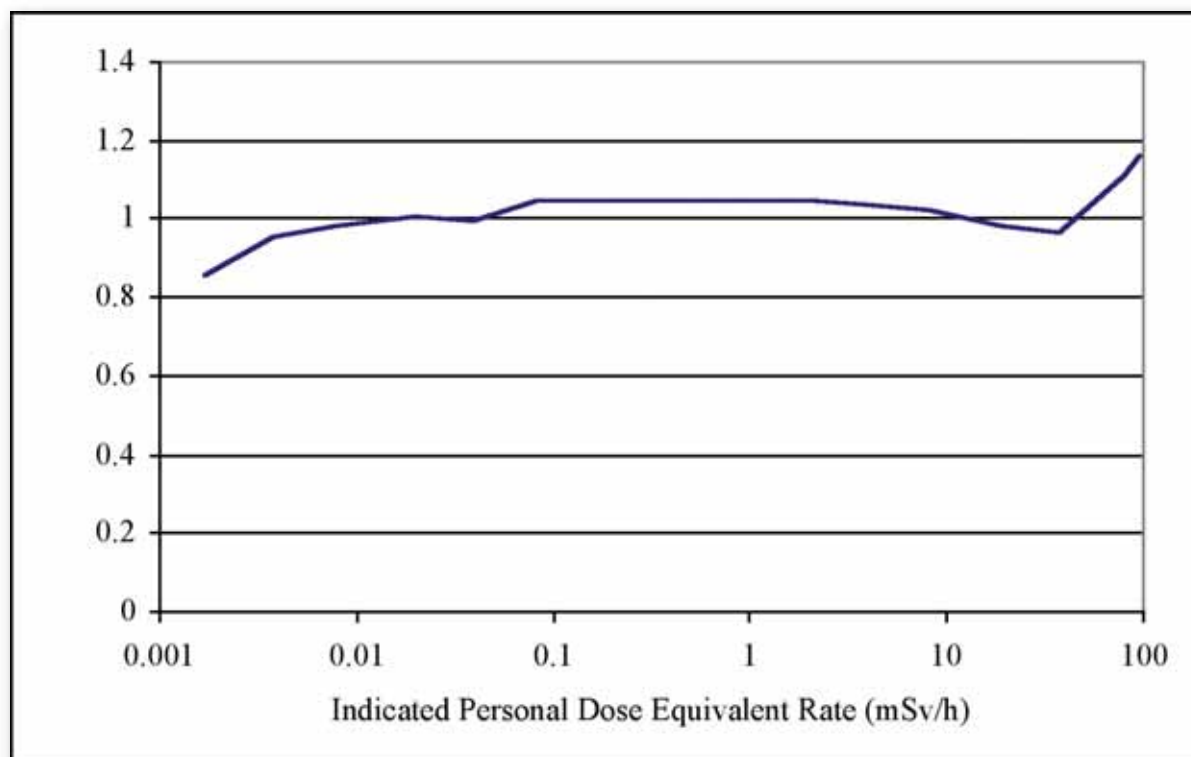
TRACERCO PED energy response results from tests performed by the UK Health Protection Agency. Responses are normalised to Cs-137.

TRACERCO PED angular response



TRACERCO PED angular response results from tests performed by the UK Health Protection Agency. Responses are normalised to Cs-137.


TRACERCO PED dose rate response



TRACERCO PED dose rate response results from tests performed by the UK Health Protection Agency.

5.2 HAZARDOUS AREA APPROVAL

ATEX/IECEX APPROVAL DEPENDANT ON VERSION ORDERED AND DESCRIBED ON EQUIPMENT LABEL

Certification numbers	ATEX certificate number: Baseefa11ATEX0045 IECEX certificate number: IECEX BAS11.0027
ATEX coding	 II 1G
Electrical coding	Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ + 50°C)

USA/CANADA APPROVAL DEPENDANT ON VERSION ORDERED AND DESCRIBED ON EQUIPMENT LABEL

FM Approval Certificate Number	3041519
USA Mark	IS Class I, Div 1, Groups ABCD, T4 (-20°C ≤ Ta ≤ + 50°C) Class I, Zone 0, AEx ia IIC T4 Ga (-20°C ≤ Ta ≤ + 50°C)
Canadian Mark	Class I, Zone 0, Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ + 50°C)

5.3 EMC

EMC compliance	2004/108/EC Electromagnetic Compatibility Directive (including amendments). Tested and passed according to EN61526.
----------------	--

5.4 BATTERY

Battery	Rechargeable lithium ion
Battery life (with screen saver on)	Greater than 300 hours typical battery charge with background radiation and room temperature. Tested and passed according to EN61526.
Low battery indication	Approximately 8 hours available life left with background radiation. Tested and passed according to EN61526.
Time to Recharge	2 hours from flat

5.5 MECHANICAL

Case material	Tough polymers with antistatic surface properties.
Size	10 x 6 x 2 cm
Weight	160g approx

5.6 ENVIRONMENTAL

Operating temperature range	-20 to 50°C Temperature stability tested and passed according to EN61526. Temperature shock tested and passed according to EN61526.
Humidity range	Up to 95% Tested and passed according to EN61526.
Vibration	20 ms ⁻² for 15 mins in each of 3 orthogonal directions in the range 10 to 33Hz. Tested and passed according to EN61526.
Shock	6 x 1m drops onto concrete, 1 drop on each face of TRACERCO PED. Tested and passed according to EN61526.
Microphonics	60 x 10cm drops onto hard steel surface, 10 shocks on each of the main 6 faces. Tested and passed according to EN61526.
Ingress protection rating	IP67

5.7 DATA LOGGING

Memory	125,000 data point capacity. Includes dose measurements and alarms/fault events.
Memory retention	Serial non-volatile memory. 10 year data retention.
Dose data log interval	Intelligent mode: log every 0.01 μSv Periodic mode: log every 1 minute Logging mode selected in DoseVision.

6. ACCESSORIES FOR THE TRACERCO PED

There are several accessories available for use with the TRACERCO PED.



Portable dock: for charging and transferring data.



Desktop dock: for charging and transferring data.



In car charger



Pouch



Lanyard



Tough Transit Case

Multi-region mains adapter.

7. TRACERCO MONITORS PRODUCT RANGE



We offer a number of monitors for sale and hire including a range of intrinsically safe monitors, which are suitable for use in a potentially explosive environment:

- TRACERCO Intrinsically Safe range
 - T201 Radiation Contamination Monitor
 - T202 Radiation Dose Rate Monitor
 - T404 TRACERCO PED.
- TRACERCO range
 - T401 Contamination Monitor
 - T402 Dose Rate Monitor
 - T403 Contamination Monitor
 - T406 X-Ray Monitor.

We also offer for sale a Mud Monitor for detecting dislodged sources during drilling operations.

APPENDIX A - Type test report summary

Test	Acceptance criteria	Result
Dose response Relative intrinsic error was determined using ¹³⁷ Cs gamma radiation at approximately 20%, 40% and 80% of each order of magnitude. A single measurement was performed at each point.	EN 61526:2007 requires: +/- 15%	Within +/- 7%
Dose rate response Dose rate response was determined using ¹³⁷ Cs at approximately 20%, 40% and 80% of each order of magnitude over the full working range of the TRACERCO PED. A single measurement was performed at each point	EN 61526:2007 requires: +/- 20%	Within +/- 16%
Variation of response with Photon Radiation Energy Determined over the energy range 33 keV to 1.25 MeV. An x-ray source (ISO) was used to generate energies up to 248 keV. Gamma radiation emitted from ²⁴¹ Am, ¹³⁷ Cs and ⁶⁰ Co sources provided the response to energies 60 keV, 662 keV and 1.25 MeV respectively.	EN 61526:2007 requires: -29% to +67%	-14% to +31%
Variation of response with angle of incidence Angular dependence determined using ¹³⁷ Cs, ⁶⁰ Co, ²⁴¹ Am and 33 keV x radiation. The measurements were performed at angles of incidence up to ±60°	EN 61526:2007 requires: -29% to +67%	-26% to +18% (33keV response limited to +/-45°)
Dose rate overload TRACERCO PED exposed to 500 mSv ⁻¹ for a period of five minutes.	EN 61526:2007 requires: indication of overload	TRACERCO PED displayed >100 mSv h ⁻¹ for entire duration of the overload
Response time Time to increase from background to more than 80% of the true dose rate. Time to decrease to less than 20% of the true dose rate.	EN 61526:2007 requires: < 10 s response time	< 8s increasing < 5s decreasing
Beta and neutron radiation response Dose rate response to beta radiation determined using ⁹⁰ Sr/ ⁹⁰ Y (15000 μSv/h) Dose rate response to neutron radiation determined using and ²⁴¹ Am/Be (122.39 μSv/h)	EN 61526:2007 requires: response to be stated by the manufacturer	Beta response is 4% of actual dose. Neutron response is 4% of actual dose.

Full type test details are available upon request.