Health Physics Division

DIS-1 Dosimeter

User's Manual

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NOTE

This document is a User's Manual for the DIS-1 Dosimeter.

The manufacturer withholds the right to make changes in the contents of this document without prior notice.

If you have any comments or suggestions for additions concerning either the products or this document send them to:

Mirion Technologies (RADOS) Oy
PO Box 506
FI-20101 TURKU, FINLAND

Fax **+358 2 468 4601**
Phone **+358 2 468 4600**
Email **info-fi@mirion.com**

There is a feedback form attached to the end of this document.

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INTRODUCTION

The new Mirion DIS-1 personal dosimeter is based on an ionisation chamber combined with a modern electronic **D**irect **I**on **S**torage (**DIS**) memory cell. The Ion chamber is widely used as a reference detector in radiation detection and is now available in everyday Dosimetry applications. The DIS-1 Dosimeter could be described as a passive electronic TLD or Film badge, which can be read infinitely and non-destructively without any loss of dose information. This unique feature allows the user of the DIS-1 to instantly read his/her accumulated doses whenever necessary. The DIS-1 Badge has a small, lightweight, rugged and watertight construction, which makes the DIS-1 badge reliable and easy to use.
The radiological range of the DIS-1 covers the entire Hp(10) and Hp(0.07) photon and beta energies without any compromises. The wide dose and energy range, the ability to operate in pulsed fields and the performance at high dose rates make DIS-1 an ideal device for all kinds of radiation Dosimetry applications. The DIS-1 allows for the detection of heavy, high-energy ions and its immunity to any external interference is unequalled. There are no deviations in the dose readings even at very high EM or RF fields.

Figure 1

The excellent radiological features and the easy and fast reading of the DIS-1 Dosimeter makes the new DIS based Mirion's Dosimetry System superior to any Film Dosimetry or TLD system without the need for complicated processing systems.

The doses in the DIS-1 dosimeter are read by using the **DBR** (**D**IS **B**adge **R**eader). To obtain the most recent dose values of Hp(10) and Hp(0.07), the user simply plugs the dosimeter into the reader head and the values are displayed in the display of the reader in a few seconds. The reader can be operated in various modes. It can be set in a standalone mode where the reader only performs the measurements and displays the doses or it can be set as a System Reader device for the WinELD Dosimetry system, providing the range of the dose management features. The DBR Reader can be connected to a PC either using the RS-communication port or the local area network port (LAN).

The instant reading capability of the dosimeter allows the user to observe the accumulated doses even on a daily basis. This property makes the DIS-1 practical when eliminating unnecessary doses (principle of **ALARA** = **A**s **L**ow **A**s **R**easonably **A**chievable), something that is not possible with other types of passive dosimeters such as: Film, TLD or OSL where the accumulated dose is revealed once per month or less frequently. Combining the features of unlimited dose read-outs together with the possibility of storing dose information automatically into a database every time a read-out is performed means that up-to-date information of doses is always available and the concept of the control period has a completely new approach. While other passive dosimeters require to be sent to a specific laboratory for read-outs once per month or once per three months (once within a control period) the DIS-1 can be read locally with only the data being sent forwards. The dosimeter needs to be sent to a laboratory only if the required check-out period has elapsed or the accumulated dose has reached a pre-determined threshold value. This means that the amount of the manual labor required in handling the dosimeters on a regular basis is decreased significantly.

With the sensitivity of the DIS-1 dosimeter and the versatility of the DBR Reader either in stand-alone or System Reader Mode, the WinELD System is ideal for all types of control and/or legal Dosimetry applications.

The DIS-1 has the added flexibility of storing and measuring/recording

a) The total dose received to the badge since the last Hard Reset/Calibration
b) The assignment Dose of the user since the issuing date, as well as
c) The session dose measurement

This feature allows the dose record to be kept for legal Dosimetry reporting, but allows the dosimeter to be reset and to receive doses for either specific time periods (Day, Week or Month) or specific tasks. DIS-1 also makes it possible to optimize the TOTAL number of dosimeters required in a session where the number of controlled individuals changes due to the fact that issuing the dosimeter to a new person is easy.

TERMINOLOGY

The following table summarizes some of the most frequently used terms of DIS-technology:

DIS	**D**irect **I**on **S**torage: This describes the basic method of operation, the charge or the ions are stored directly in the analog memory element.
DIS-1	Dosimeter (also Dosemeter); Direct Ion Storage Detector / Gamma & Beta & X-Ray Detector. Standard measuring element. The DIS-detector is a combination of an Ion Chamber (IC) and an **A**nalog **M**emory **E**lement (**AME**) that converts the charge induced by the dose in the ionizing chamber into electronically readable voltage information.
DBR	Dosimeter Badge Reader (DIS Badge Reader) A reading device that measures the dose dependent voltage and converts it to the corresponding dose of the element.
Element	The Element is the basic detection unit within the DIS-based product. There can be several elements inside one DIS-product with different types of sensitivities or mechanical constructions meaning that the elements are able to measure different types of radiation. Occasionally this element is referred to as a channel or a chamber. Currently there are two main types of elements in use: The DIS-detection element and the MOSFET-detection based element. There are five elements in the DIS-1: three DIS-elements and two MOSFET-elements. The elements are: DS, DL, DH, SL and SH. These are symbolical names, where the D stands for 'Deep Dose' element (Hp(10)) and the first letter S stands for 'Shallow/Skin Dose' element (Hp(0.07)). The second letter gives the proximal dose measuring range: S (Sensitive Range) = 0 … max. 6000 µSv L (Low Range) = 0 … max. 1000 mSv H (High Range) = 0.1 … 40 Sv
Channel	Channel is for connecting the element with the measuring electronics. Sometimes this term is used instead of the term 'element'. It should not be mixed with a channel of the spectrometer.
Chamber	The chamber can be assumed to be a cavity filled with gas and surrounded by walls (an ion chamber). This term has been used occasionally when discussing one element of the DIS-1.

MOSFET	This is a special type of an element, where the radiation detection is based on the measurement of the V_{GS}-parameter of the MOSFET transistor.
Hard Reset	Hard Reset is a procedure, where the physical state of the dose information of the memory element is changed with a special procedure. This means that the charge, which has been stored in the AME, is set to the zero dose state. This procedure is irreversible once it has been completed.
Assignment Reset "$AR_{D,i}$"	Assignment Reset is performed when the dosimeter is given to a new user (assigned or issued). This occurs at the start of the control period. The performed reset is a purely "digital operation", where the currently measured dose information is stored into a digital memory of the dosimeter for each corresponding element. The successive dose read-outs are compared to these stored values and the difference is indicated. The procedure does not change the physical state of the elements.
Session Reset "$SR_{D,i}$"	Session Reset is an operation, where the new offset dose is measured and stored in the digital memory of the DIS-1. The measurements are later compared to these stored offset values to give the current doses. Other naming conventions are: Virtual Reset, Soft Reset or Offset Calculation.
Total Dose "$D_{T,i}$"	Measured internal Dose value of element "i" is $D_{T,i}$
Assignment Dose "$D_{A,i}$"	DBR gives Hp(10) $D_{A,DEEP}$ Hp(0.07) $D_{A,SKIN}$ Dose Displayed $D_{A,i} = D_{T,i} - AR_{D,i}$
Session Dose "$D_{S,i}$"	DBR gives hp(10) $D_{S,DEEP}$ hp(0.07) $D_{S,SKIN}$ Dose Displayed $D_{S,i} = D_{T,i} - AR_{D,i} - SR_{D,i}$
Generation	Generation is unique digital signature information that is used to specify the physical and logical parameters of the dosimeter. It describes possible special features of the dosimeter to the reader and system (memory size, filtration of MOSFET elements and PTB approval).

PRINCIPLE OF DIRECT ION STORAGE

In the original non-volatile solid-state memory cell, information is stored in the form of an electronic charge trapped in the floating gate of a MOSFET transistor. Originally the memory was used only to store digital information. In practical applications this means that the signal is read from a memory cell when the charge exceeds a certain threshold value. In the new type of non-volatile memory, the amount of the charge in each memory cell has been made fully variable, which in turn controls the output signal of the element. Now the memory cell can be used to store analogue information.

Figure 2 shows the structure of a standard analogue-EEPROM memory cell. The charge in the floating gate can be set to a predetermined level by tunnelling electrons through the oxide layer. The charge is then stored permanently in the gate due to the fact that in the normal operating temperature range the electrons have a very low probability of exceeding the energy barriers in the metal-oxide and oxide-silicon interfaces. A high purity level is essential in the silicon dioxide formation process during the manufacture of these devices to free the oxide in any mobile charge carriers, of which Na-ions are usually the most dominant. Today it is possible to manufacture memory cells that are capable of retaining a stored charge for hundreds of years.

Reading the stored information is carried out by measuring the channel conductivity of the transistor without disturbing the stored charge.
In order for the ionising radiation to have an effect on the stored charge, either a new charge has to be brought to the gate or an existing charge be removed. Ionising radiation incident on the oxide layer will produce electron-ion pairs but due to the very low mobility of the charge carriers in the oxide, recombination occurs with a high efficiency and most of the free charge is neutralised before it is able to pass the metal-oxide interface. Therefore MOS dosimeters, which are based on this principle, have a very low level of sensitivity to ionising radiation and are not sensitive enough for radiation protection applications.

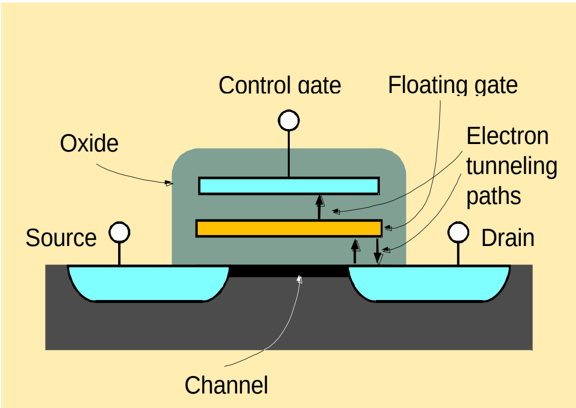

Figure 2 Analog EEPROM memory cell

In the DIS dosimeter the oxide layer surrounding the floating gate has an opening allowing the surface of the floating gate to be in direct contact with the surrounding air (or any other gas). Now any ionising radiation incident in the air or gas produces electron-ion pairs with extremely high mobility and in case there is an electric field surrounding the floating gate, these charge carriers will be transferred efficiently to the gate before any recombination occurs.
The structure of the DIS memory cell is illustrated in Figures 3-4.

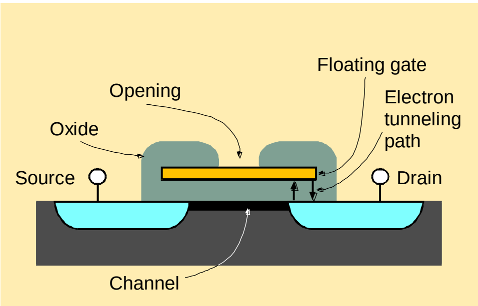

Figure 3 DIS memory cell

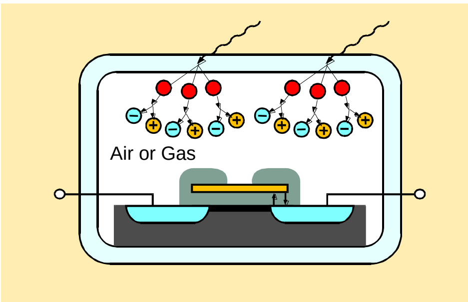

Figure 4 DIS memory cell surrounded by a conductive wall

The ion chamber is effectively formed between the wall and the floating gate by surrounding the entire structure with a conductive wall as illustrated in Figure 4. For photon radiation, the initial interactions take place in the wall material and the formed secondary electrons ionise the air or gas between the wall and the gate. If the wall is sufficiently thin, the charged particles are allowed to transfer all or part of their energy directly into the air or gas space.

CONSTRUCTION

The DIS-1 Badge consists of two parts; the DIS-1 Dosimeter and the DDH Holder with a Clip. The dosimeter can be easily removed from the DDH-2 Snap-on Holder. Figures 5 and 6 shows the front and the back side of the DIS-1 Dosimeter. There is a beta window in the round area in the upper left corner of the dosimeter. In order to allow the beta particles to penetrate the filter and enter the chambers, the beta window filter is made of a thin foil*). Normally the holder protects the electrical connector in the back of the DIS-1 Dosimeter.

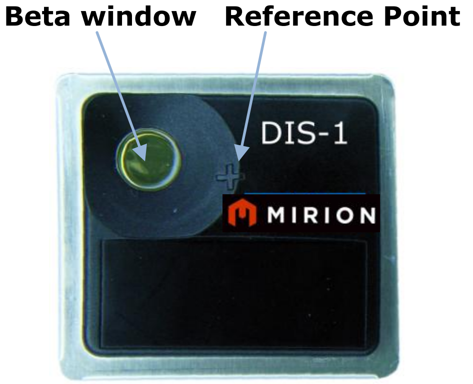

Figure 5 The DIS-1 front view

Figure 6 The DIS-1 back view

***) PLEASE NOTE THAT TOUCHING THE BETA WINDOW WITH A SHARP ITEM MAY CAUSE DAMEGE TO THE DOSIMETER. THIS AREA MUST NEVER BE OBSCURED.**

THE FIVE MEASUREMENT CHAMBERS

The five elements of the DIS-1 are positioned inside a hermetically sealed housing measuring 41x44x12 mm (Figure 7). The weight of the DIS-1 dosimeter without the holder is approx. 25 g. Three of the five elements are DIS based ionization chambers and two are MOSFET detectors. The DS-element for the Hp(10) dose has a measuring range from 1µSv to max. 6000 µSv. The DL- and SL-elements for Hp(10) and for Hp(0.07) respectively have measuring ranges from 0.01 mSv to max. 1000 mSv. The DH- and SH-elements are MOSFET transistors measuring doses above 1.0 Sv up to 40 Sv. A regular check of the dosimeter is required whenever a dose of 10 Sv is accumulated.

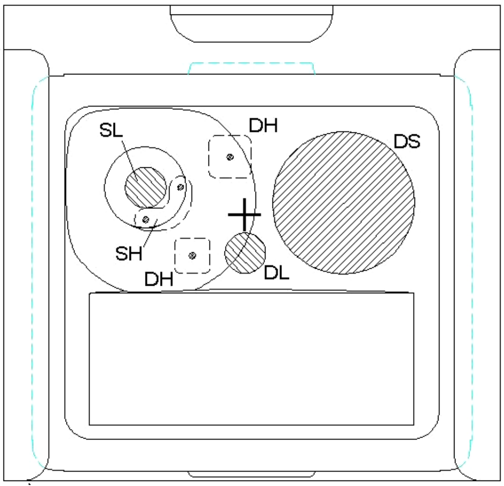

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Figure 7 The five chambers of DIS-1

The Measurement ranges and resolutions of the different elements:

Element	Range	Generation 9 and older	Resolution of display
DS	1 …max. 6000 µSv	1 … 4000 µSv	1 µSv
DL	4 …max. 1000 mSv	4 … 500 mSv	0.01 mSv
DH	1.0 Sv … 40 Sv *)	0.5 … 40 Sv *)	100 mSv
SL	0.01 …max. 1000 mSv	0.01 … 500 mSv	0.01 mSv
SH	1.0 … 40 Sv *)	0.5 … 40 Sv *)	100 mSv

*) Re-calibration needed for every 10 Sv

OPERATION

All the chambers of the DIS-1 measure continuously. It is not possible to switch off any of the elements. When the received dose exceeds the maximum of the range of the DS-element, the readout is continued with the DL-element. When the dose of the DL-element exceeds the maximum of the range, the read-out is switched to the DH-element. The same applies to the SL and SH elements.

Resetting the dose of the DIS-1 using the DBR-1 Reader can be carried out in three ways. In the Session Reset, the current dose reading is stored in the DIS-1 internal memory and subtracted from the total dose upon a read-out. In this case the stored physical dose information is not lost but can be recalled at any time with the DBR-1 Reader. It is recommended to use the Session Reset only when the accumulated dose is low and there is a need to reset the dose frequently (daily or weekly).

The Assignment Reset should be used only when the dosimeter is issued to a new user. The Assignment Reset does not perform the physical hard reset but enables the reader to operate as if the hard reset were performed.

In order to remove the dose permanently from one or more of the elements, a Hard Reset is performed. The Hard Reset removes the charge physically from the floating gate of the detector memory element. The Hard Reset should only be used when necessary. The Hard Reset is controlled by the DBR-1 Reader after the user has activated it. The DBR-1 Reader will not perform the Hard Reset if the accumulated dose is less than the predetermined threshold dose. This threshold dose element is element dependent and is approx. 10% of the maximum of the range for the DS element, and approx. 2% of the maximum of the range for the DL/SL elements. If any successive hard resets are attempted, only the assignment reset will be performed. An annealing shall be performed after a hard reset.

As stated earlier, there are five elements in DIS-1. The elements are: DS, DL, DH, SL and SH. The DH and SH elements are constructed according to a design, which makes it impossible to perform the Hard Reset.

Figure 8 gives two types of information. Firstly, it illustrates how the measuring ranges of all the elements are located within the total measurement range of the DIS-1. This means that when the DIS-1 is set to measure the Hp(10) dose quality from 0 to 40 Sv, the range is measured using the information from three separate DIS-1 elements. Secondly, the picture illustrates the sub-parts of all the element measurement ranges. The DBR-1 reader treats these sub-parts differently during the Hard Reset procedure.

As illustrated in Figure 8, the measuring range of the DS, DL and SL channels are divided into three sub-parts: the **"No Hard Reset"** -range, the **"Normal"** -range and the **"Hard Reset"** -range. There is also a **"MOSFET"** –range. These sections are described as follows:

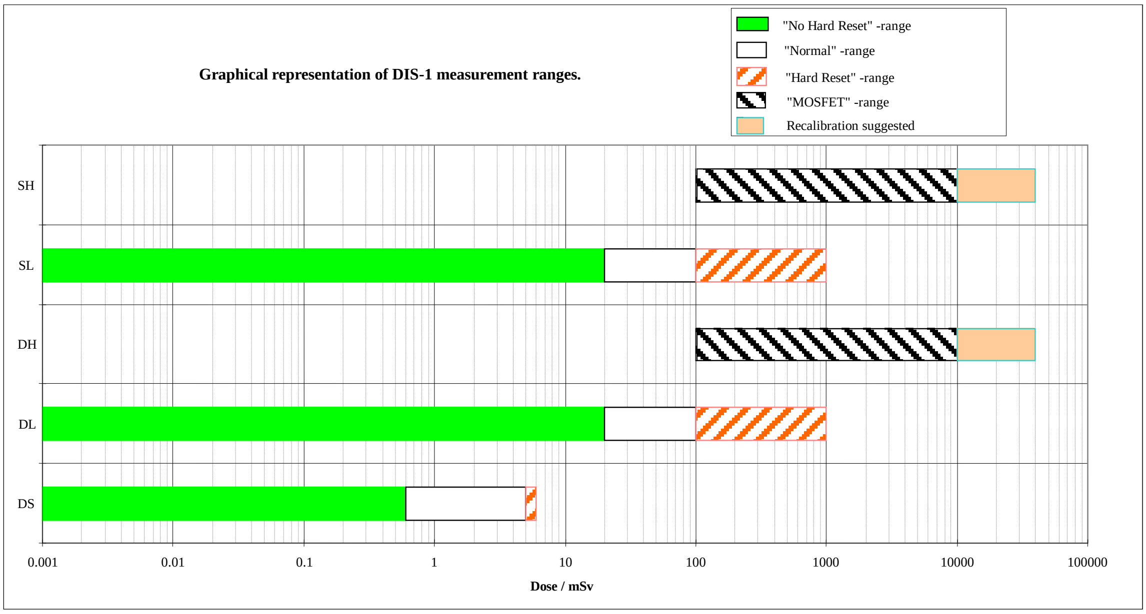

Figure 8 DIS-1 measurement ranges for various chambers

Sections of range

The **"No Hard Reset"**-range:
The DBR-1 Reader does not perform any physical Hard Reset actions if the total dose is within this range. The assignment dose display is set to zero when the current dose value is set as the new reference point. The element that is not in the "Hard Reset"-range will be treated as in the case of the Assignment Reset.

The**"Normal"**-range:
In typical applications the Hard Reset is not necessary within this range. It may be beneficial that the Hard Reset is performed within this sub-part if the the expected dose accumulation will be greater than the remaining measurement capacity of the DS-element and the highest deep dose resolution is required. If these conditions are met, it is possible to perform a Hard Reset even if the total dose is still within the "Normal" –range.

The **"Hard Reset"**-range:
When the total dose of a channel is within this range, it is advised to perform the Hard Reset.

The **"MOSFET"**–range:
This is the measuring range of the DH- and SH-elements. These elements are constructed according to a design that makes it impossible to perform a Hard Reset. The detection methodology is different from the other elements.

Note: The operational range of each element is the total range defined by these sub-parts. Each measuring application is a unique method and the execution of the Hard Reset has to be determined according to the case at hand.

HARD RESET PROCEDURE

After carrying out the hard reset in the DBR-1 Reader, it is required to anneal the dosimeter at a temperature of 60-65 °C for a period of min. 4 hours after the hard reset. The Assignment Reset function should be performed when the DIS-1 has cooled down to room temperature. If the Assignment Reset is performed immediately after the Hard Reset without any annealing, a small dose of approx. a few hundred μSvs may remain in the DIS-1, depending upon the element.

- Hard Reset the DIS-1
- Anneal DIS-1 at 62.5 ± 2.5 °C at least 4 hours, max.48 hours; preferably 16 hrs.
- Cool down to room temperature at least 1 hour
- Perform an Assignment Reset to DIS-1

Longer annealing times and cooling times may be used to assure a more stable performance.

The Maximum annealing time of 2 days at 65 °C should not be exceeded.

The Maximum temperature of 70 °C shall never be exceeded.

WEARING THE DIS-1 DOSIMETER

The DIS-1 Badge is supplied with a clip. It is recommended to wear the DIS-1 dosimeter on the chest on top of the clothing. Special attention should be paid at having the beta window of the dosimeter opposite the body side (see Figures 9-10). Although the DIS-1 has a rugged and watertight construction, the best measurement results will be achieved with careful handling of the Dosimeter.

Figure 9 Wearing the DIS-1 Badge

Figure 10 The body side of the DDH-2 Holder

MAINTENANCE AND CALIBRATION

Calibration

The DIS-1 is calibrated with a sophisticated automatic system. The calibration values are not expected to change during normal use.

In case the radiological calibration coefficients require to be adjusted, an optional software and maintenance calibrator may be used.

During the calibration, the calibration factors for one or more of the elements may be set.

Cleaning of the Electrical Contacts

If the dosimeter is used in a dusty environment, it is important to clean the connector contacts regularly before making any read-outs. The cleaning should be carried out immediately if there are any problems with reading the dosimeter in the DBR-1 Reader. Remove the DIS-1 element from the holder for the cleaning of the connector area (Figure 11). Use a soft cotton swab and ethanol to clean the connector area.

Note: To preserve the connectivity of the gold plated contacts, it is not advisable to use any excessive mechanical or abrasive cleaning methods.

Note: When removing the Dosimeter from the holder, it should not be pressed against the holder, while this makes the locking tighter. In case the Dosimeter is set very tightly, a thin and at least 2 cm wide plastic plate can be gently forced between the top of the Dosimeter and the edge of the holder. The Dosimeter can be released from the holder by slightly bending the tool. No screwdriver or other narrow pointed tools should be used to release the Dosimeter from the holder.

Figure 11 Removing the DIS-1 from the badge

Cleaning/Decontamination

DIS-1 has a hermetically sealed metal case made of aluminum, a polyimide window for the Hp(0.07) measurements and gold plated reading contacts. The holder of the DIS-1 is made of anodized aluminum and includes a stainless steel contact protection spring, a locking spring and a plastic part with a nickel-plated clip construction.

The following items are required during the decontamination procedure:

- Cleaning solution with neutral pH (non-corrosive preferred)
- A cotton swap, paper tissue, etc.

Check that the surface of the DIS-1 window is smooth and that is has a concave shape at normal room temperature. This indicates that the DIS-1 is still hermetically sealed. Should the surface be extensively ruffled it is possible that the DIS-1 is mechanically damaged. It is not advisable to place the DIS-1 into the decontamination solvent before the mechanical properties have been checked.

Should there be any adhesive residues from labels or tapes on the surface of the DIS-1 or holder, it is advisable to clean the surfaces with a suitable solvent. Any adhesive residues on the window of the DIS-1 should be left untouched to avoid any possible damage to the filter. It must be noted that any labels over the window may decrease the performance of the beta and low energy photon measurements.

If the dosimeter is only 'dry-cleaned', it is not necessary to remove the DIS-1 from the holder. When the unit is decontamined by immersing it into a solution, it is advisable to remove the unit from the holder to prevent any of the decontamination solution and water from remaining between the holder spring and the holder, which might cause stability or corrosion problems in the long run.

Remove the DIS-1 from the holder and decontaminate the DIS-1 and the holder separately. Immerse the DIS-1 into the decontamination solution for a couple of minutes. The temperature of the solution should be approx. 30 - 35 °C. To increase the cleaning effect, the DIS-1 may be shaken while immersed in the solution. Ultrasonic cleaning is not recommended as it may harm the beta window of the DIS-1.

After washing, remove the DIS-1 from the solution and allow any excessive solution to drip back into the washing container (If in holder: Open the protective steel spring by inserting the DIS-1 in a special tool). Wipe the contact area with a cotton pad. Do not use excessive force while wiping.

Rinse the DIS-1 thoroughly by first using water in a suitable container (to dissolve any possible contamination into the water) and finally under running water. Any remaining decontamination solution should be wiped from the surfaces of the DIS-1.

Drying the DIS-1

Dry the DIS-1 with soft tissue. Place the DIS-1 in an oven at +50 °C for 16 hours. Use purified alcohol and a cotton pad to wipe the contact area.

When drying the holder of the DIS-1, use e.g. a cool air blower to dry the water on the surface of the holder. Use soft tissue to dry the parts of the holder and place the parts in an oven.

RECYCLING DIS-1 MATERIALS

When the lifespan of the dosimeter has come to an end, the dosimeter can be recycled as a normal non-RoHS type electronic instrument. The following clauses give the rough description of the main materials and methods of disassembling the dosimeter.

Main Parts of DIS-1

Part	**Material**
Energy compensating filter	Black polycarbonate, fixed with urethane
Case Cover	Aluminium, includes small amount of polyimide, glued with epoxy glue
Case Bottom	Aluminium
Contact board	FR4 epoxy, contains some standard SMD-components and Lithium coin battery pack
Battery pack	Lithium coin batteries
Chamber board	FR4 epoxy board, contains polystyrene plastic parts and some standard SMD components
Holder frame	Anodized aluminium
Strap	Nylon plastics, nickel plated steel and spring steel
Locking spring	Spring steel
Contact protection spring	Spring steel

Disassembly

Since the dosimeter is a hermetically sealed instrument, the disassembly can only be done by taking the instrument apart. There is a lithium battery inside the case so the disassembly must be carried out in a controlled way.

A large screwdriver and an adjustable wrench are needed in the disassembly. Also, a file bench is needed to hold the dosimeter rigid while disassembling.

1. Remove the dosimeter from the holder.
2. Disassemble the holder and place the mechanical parts according to the raw materials in suitable bins.
3. Place the dosimeter into the file bench with the black cover upwards.
4. Adjust the wrench tightly around the energy compensating plate and slowly rotate the wrench to pull the plate out.
5. Push the tip of the screwdriver through the cover of the dosimeter right in the middle of the surface.
6. Force the cover open by twisting the screwdriver and bending so that the tip of the screwdriver goes towards the beta window. The battery is located in the lower part of the dosimeter, just above the connector area.
7. When the cover is open, the chamber board can be removed and the plastic part can be separated from the board.
8. Placing the case with the bottom upside down on a firm table, the connector board can be removed by hitting the connector board so that the board becomes loose.
9. The battery pack is glued on the connector board and can be recycled accordingly.
10. All the metal parts can now be placed into suitable recycling bins.

SPECIFICATIONS

Radiation detected:	Gamma-, x-ray and beta.	
Detector type:	Three ™DIS (Direct Ion Storage) detectors, and two MOSFET detectors.	
	H_p(10):	**H_p(0.07):**
Energy range:	15 keV - 9 MeV.	photons 6 keV and higher beta: 240 keV - 2.2 MeV.
Dose measurement range:	1 µSv to 1 Sv (0.1 mrem to 100 rem). partially up to 40 Sv (4000 rem) *)	10 µSv to 1 Sv (1 mrem to 100 rem). partially up to 40 Sv (4000 rem) *)
Calibration accuracy:	± 5 % at 1 mSv Cs-137.	± 10 % at 10 mSv Cs-137 **)
Energy response:	± 30 % between 15 keV - 9 MeV. (e.g. Cs-137, Average 662 keV)	± 30 % for photons 6 keV and higher. -20 % - +35 % for beta, E_{mean}=240-800 keV
Directional response:	± 20 % up to 60° at 65 keV.	± 20 % up to 60° at 65 keV.
Maximum possible measurement time: *)**	6 months. (5 years for H_p(10) below 5 mSv)	
Power supply:	No external power needed for measurement.	
Dose read-out:	Through a 14-pin connector with a DBR Dosimeter Reader.	
Temperature range:	Operation: -10 ºC - +50 ºC. Annealing: up to 65 ºC, max. 48 h per reset. Storage: -20 ºC - +60 ºC.	
Operational humidity:	Up to 90% relative humidity.	
Casing:	Resistant to static discharge, RF-interference, magnetic fields and EMP. Withstands multiple 1 meter drops onto concrete. An anodized aluminum snap-in holder.	
Enclosure class:	IP 67 (waterproof).	
Dimensions:	41 x 44 x 12 mm, in holder 47(95 with strap) x 49 x 13 mm.	
Weight:	25 g (in holder 43 g).	

*) Non-resetability, limited energy range, recalibration needed after every 10 Sv of total dose.

**) With a 6 mm build-up plex at a distance of 15 cm in front of the dosimeter.

***) t_{MAX} as specified in the IEC 61066 standard.

Range of DIS technology based products

Order number:

1237-019	DIS-1 Dosimeter with DDH-2 Snap-in Holder
1237-035	DIS-1 Dosimeter without holder
1237-044	DIS-1H3 Dosimeter with DDH-2 Snap-in Holder
1237-045	DIS-1H3 Dosimeter without holder
1237-027	EDIS-1 Dosimeter with DDH-E Snap-in Holder
1237-024	EDIS-1 Dosimeter without holder
1237-017	DDH-2 Snap-in Holder
1237-038	DDH-E Snap-in Holder
1237-006	DBR-1 Reader for DIS-1 (Firmware release v1.17.xx for WinELD)
1237-006	DBR-2 Reader for DIS-1 (Firmware release v1.17pxx for WinELD)
1237-021	WinELD Light Read-out and Dose Collection software
1237-032	WinELD Pro Dose Management software
1237-020	RDC-1 Dosimeter Configuration software

FEEDBACK FORM

We are continuously working hard at supplying you with correct and easy-to-read technical documents. However, complex systems are often difficult to document, describe and understand, and mistakes and inadequacies may occur occasionally during the documentation process. We would like to hear your opinion on this document and to correct any possible errors.

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Mirion Technologies (RADOS) Oy / Technical Documents
P.O. Box 506, FI-20101 Turku, Finland
Fax: +358-2-468 4601
Email: info-fi@mirion.com

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Notes on this document

Name of the document: DIS-1 Dosimeter User's Manual, Ver.1.05	**Issue date**: 17. 11. 2014	
Description of the mistake or problem	**Correction**	**Page no.**

Notes on the product

Name of the product: DIS-1	**Version or model:**	
Description of the mistake or problem	**Correction**	

General Notes

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