Operating instructions for Dosereader DR030

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1 INTRODUCTION

1.1 IMPORTANT INFORMATION

- Read this document carefully prior to using the Dose Reader DR030.
- Damage to property can occur If the operating instructions or the technical data is not followed.
- Improper use of the dose reader DR030 can lead to malfunctions of the device.
- The guaranteed liability for the device expire in the event of improper use and / or treatment.

1.2 SAFETY INSTRUCTIONS

- Do not expose the Dose Reader DR030 to moisture or water.
- Do not expose the Dose Reader DR030 to extreme temperatures or open flames.
- Do not open the Dose Reader DR030 when connected to the power grid. The inside contains electrical parts that can cause injury.
- When handling the Dose Reader DR030, do not lift it by the measuring head.

2 FUNCTION

2.1 THEORY OF OPERATION

The DR030 is a photometer in which a thin irradiated film is measured using the change of the optical density of the film.
The film contains pararosaniline cyanide as the radiation-sensitive element. When exposed to radiation the film undergoes a color change in the red area, which is related to the amount of ionizing radiation energy that has been absorbed by the film, i.e. the dose. The relationship of color change and dose is known and thereby the dosage could be detected.

The measured dose is an average value corresponding to the color change through the thickness of the film. The measuring process determines the radiation dose which is calculated in kGy
(1 kGy = 1 J / g).

2.2 INTENDED USE

The DR030 is designed to measure the radiated dose in industrial applications where quality control is essential. Electron irradiation, in the range of 80 – 300 KeV, is used in various areas, e.g. lacquer crosslinking, vulcanization, sterilization or foil processing/irradiation.

! Using the device to measure doses from other ionizing radiation sources is only possible when using appropriate dose references. Use it at your own discretion.

This manual covers the evaluation of dosimetry film on flat surfaces, but irradiation profiles can also be determined for 3-D parts. However, one must then take into account the different penetration depths, distances and irradiation angles.

3 ACCESSORIES

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Items included in the DR030 Case:

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No:	Description:	
1	DR030 Device	
2	Adhesive tape	
3	Scissors	
4	PVC insulation tape	
5	Paper clamp	
6	Hex key	2.5 mm
7	Antistatic pistol	Zerostat 3 MILTY
8	Dosimetry note strips	100 x 20 mm
9	Sample box container	
10	Dosimeter film in container	Art. No. 6 710 062
11	USB cable	A - B
12	Plug-in power supply	7.5V / 1A, plug 5.5 / 2.1

Items available on the website:

DR030 Software	
Dose measurements sheet (normal)	Art. No. 28 000 001
Dose measurements sheet (dose depth)	Art. No. 28 000 002

The dose measurements sheet are templates that can be used for noting the relevant data during irradiation and measurements.

3.1 HOW TO USE THE ANTISTATIC PISTOL

Point the Zerostat at the dosimeter film at a distance of about 30 cm.

Slowly press the trigger and a powerful stream of positive ions are directed towards an area up to 40 cm across.

Antistatic pistol

003

Now let go of the trigger slowly and negative ions will be produced.

4 DOSE READER DR030 DEVICE

DR030 device

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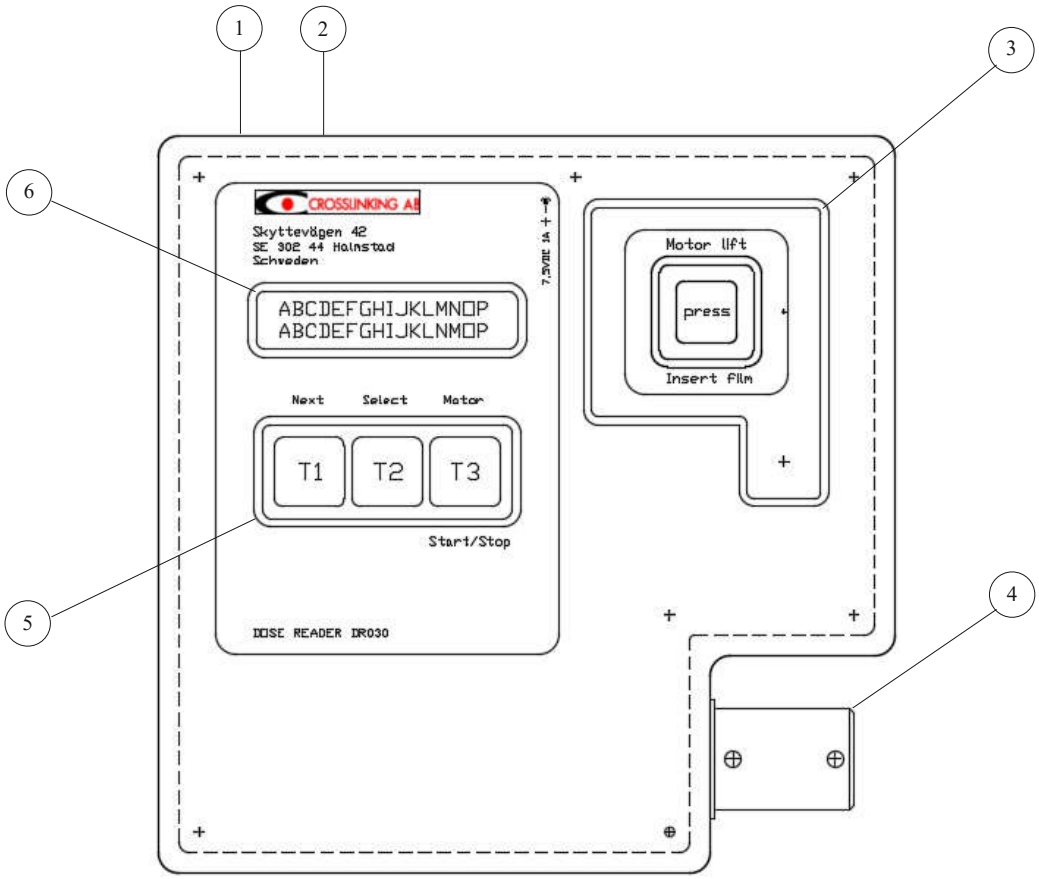
The closed stainless-steel housing shields the electronics of the device from interference. The display on the top shows dose readouts and other parameters. All functions of the device are carried out with just 4 buttons. The device has an internal memory bank that can store data which later can be transferred to a computer for evaluation via the USB cable.

The Dose Reader is easy to use. The irradiated and heat-treated dosimetry film is evaluated in the measuring gap on the measuring head. The measuring head contains optical components and mechanical parts.

The measured values are saved to memory manually in individual steps by hand, or automatically in mm steps using the motor feed.

4.1 DR030 INTERFACE



No:	Description:	Section:
1	Power connection	4.1.1
2	USB connection	4.1.2
3	Measuring head	4.1.3
4	Pick-up roller	4.1.4
5	Buttons	4.1.5
6	Display	4.1.6

4.1.1 POWER CONNECTION

DR030 is designed for continuous operation. Power is supplied via an included plug-in power supply unit.

4.1.2 USB CONNECTION

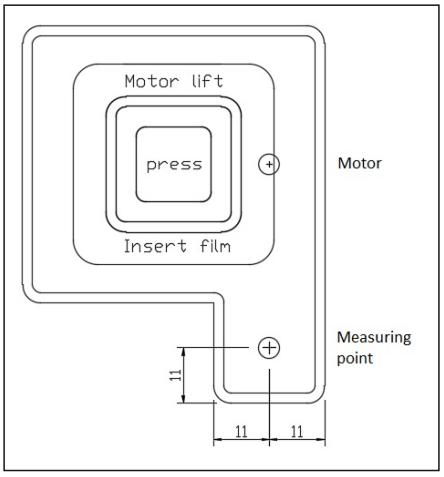
The associated software can be used to transfer and save the data to the PC via the USB connection. The switched-on DR030 device is recognized directly by the PC after connecting the USB cable and the drivers that are necessary are installed automatically.

4.1.3 MEASURING HEAD

The measuring head is located on top of the device and has a button that commands the motor lift. When pressed the transport roller goes up so that the dosimetry film can be pushed through.

The measuring point marks where the optical sensor is situated. The optical sensor has an area of 2.7 x 2.7 mm that will give an average value of the measured area.

The measuring head interface



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The motor mark shows where the transport roller is located.

4.1.4 PICK-UP ROLLER

The pick-up roller is a cylindrical rotatable part on the side of the device in front of the measuring head. There are two guide pins that can be protruded with the Hex key included in the accessories.

When the guide pins are positioned inside, the pick-up roller is suitable for a roll of dosimetry film.

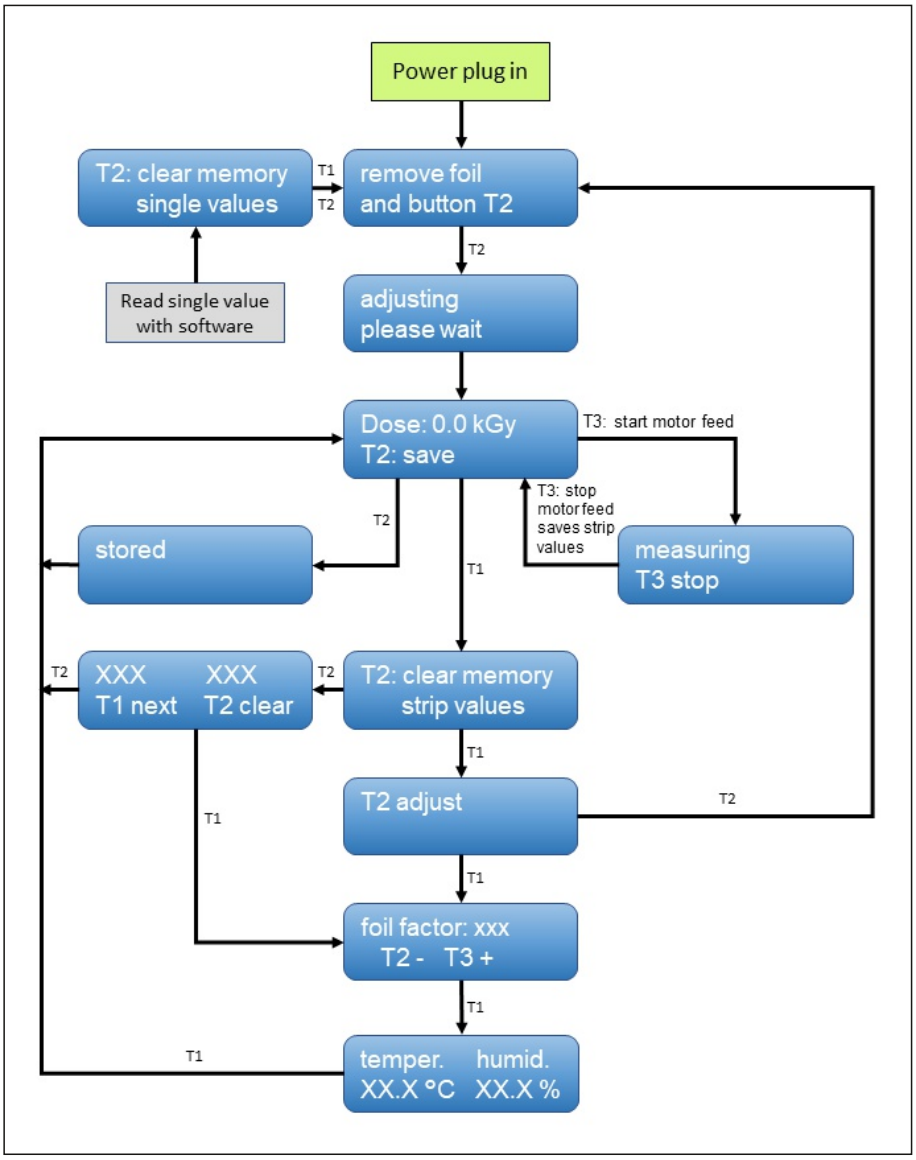
4.1.5 BUTTONS

If there is no other information on the display:

T1 – Continue to the next menu (Next)
T2 – Menu selection (Select)
T3 – Start motor and measurement / Stop motor and save

4.1.6 DISPLAY

Display menu tree



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The display has a simple interface with a menu that can be navigated with 3 buttons. By pressing the T1 button (next) you will navigate through the menu and T2 lets you select your desired option.

4.2 STORAGE / MEMORY

The internal memory on the device can be used for:

- Storage of individual measured values (single).
- Storage of multiple values (strip) via motor feed.

! The single memory has a capacity of max 128 data records.

! The strip memory storage space allows values from a dosimetry film with a theoretical length of >4 m to be saved.

Multiple measurements can be saved in sequence. Stored single or strip data can easily be deleted using buttons on the device.

! When the memory is full the oldest data will be overwritten.

4.3 TECHNICAL DATA

Dimensions	Approx. LxWxH 180x180x85 mm
Weight	Approx. 1.6 kg
Power supply	7,5 V / 1 A, socket 5.5 / 2.1
Data connection	USB type B socket
Connected load max	1 watt / 4 watt with motor
USB license	www.obdev.at

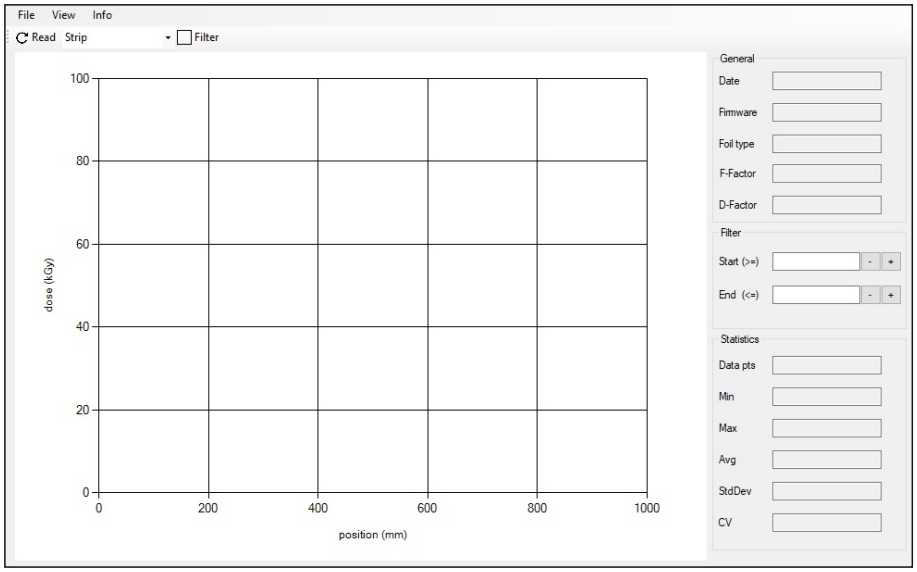
4.4 TOLERANCES

The Dose Reader DR030 is an accurate device when used correctly, but the overall system tolerance depends very much on the handling of the device and the measuring film (and its placement), irradiation and the heat treatment.

Tolerance of the measuring device	< +/- 1%
Distribution between all manufactured measuring devices	< +/- 1%
Total measurement accuracy	+/- 5%

5 SOFTWARE

DR030 software



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The software provided communicates with the DR030 via the USB interface. The latest files can be found on the Electron Crosslinking website for download. Please go to the download section on www.crosslinking.com for further information.

! It is not necessary to install the program to use the DR030.

Associated files:

doseReaderDR030.exe	Program start file and program interface.
doseReaderDR030DLL.dll	Interface to the device and data transmission.
DR030.ico	Icon for linking the program to the desktop or to the start bar.

Note: The Microsoft Visual C ++ Redistributable is required for the software to function, without a DLL an error is displayed. This DLL file is usually included within Windows. A new software version of the C++ Redistributable does not necessarily replace the old one, but is installed in parallel. Both the 32-bit (x86) and the 64-bit versions (x64) are often installed on a 64-bit operating system.

https://support.microsoft.com/de-de/help/2977003/the-latest-supported-visual-c-downloads

6 DOSIMETER FILM

Dosimetry film roll with container

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The dosimetry film is sensitive to ionizing radiation from UV, gamma, X-ray and electron radiation sources, also at lower energy levels. Films that are radiated, heat-treated and stored under laboratory conditions without exposure to light, are stable for a long time and can be evaluated again later on.

The film is available in different thicknesses and is attached to a separable 50 µm carrier strip. Depending on the application the user is offered the most suitable alternative.

The DR030 is **ONLY** compatible with dosimeter films from Electron Crosslinking, that are intended for heat treatment in 60 °C for 10 minutes.

Since the film is very thin and fragile it is important that it is handled with care.

! Handle the film with clean fingers and avoid contact with nails.

! Do not bend the dosimetry films.

! Avoid handling the film on dirty or greasy surfaces.

! With long measuring strips there is a risk of dust contamination on the film. To reduce electrostatic charges, use the included antistatic gun.

! Do not store, prepare or evaluate the dosimeter films in sunlight / UV, or expose the film to lamps that generate UV.

6.1 STORAGE TEMPERATURE

The dosimetry film has the maximum storage temperature of +35 °C. Exceeding this value before the heat treatment will cause pre-stablizing and may render the film useless.

! Maximum storage temperature for irradiated and heat treated films are 40 °C. Treated films can be kept in the included light-tight Sample box container, see section 3.

6.2 HEAT TREATMENT OF THE FILM

After the irradiation, the dosimetry film must be heat treated. This process stabilizes the film so that it can be used for evaluation.
The dosimetry film must be tempered at 60 °C for 10 minutes with a following cool down of at least 5 minutes in room temperature.

! Irradiated dosimetry films that are not temperature treated cannot be evaluated.

6.3 DOSE RANGE

The power introduced during irradiation generates additional heat in the product. The total temperature depends on the dose, the specific heat capacity of the substrate and the ambient temperature. This limits the maximum dose that can be used.

! The maximum dose for the dosimetry film is 50 kGy.

! The temperature during the irradiation must not be higher than the maximum storage temperature for irradiated films, which is 40 °C.

7 HOW TO MEASURE DOSE

In short: A dosimetry test should always be as similar to the real operation as possible.

In different applications it is not always possible to measure under process conditions, e.g. rapid motion of product. Nevertheless, it is possible to control the emitted beam power.

The dose on the product is a linear relationship between beam current and exposure time. Thus it is always possible to determine the dose with half the transport speed and half the beam current.

It is important that values that are too small are not set as this increases the measurement error. So, 0.5mA at 10 mA is 5%, and only 1% at 50 mA. The same applies to the irradiation time, transport speed and dose. Therefore, a reasonable size of the parameters should always be selected during the measurement.

! When doing repeated dosimetry measurements, the dosimetry films should always be irradiated on the same surface or support. If two identical films are irradiated on two different surfaces, e.g. paper and metal, the measurement results will not be the same. Depending on the density of the material, significantly more electrons are backscattered on metal (than on paper) and are thereby dispersed back into the dosimetry film after the penetration. If it's not possible to directly attach the measuring film to your product, this deviation must be taken into account.

! The dosimetry film must always be irradiated with the film side up and the carrier side against the surface or the support.
The carrier can also be removed before irradiation. For the dosimeter film itself, without a carrier, it does not matter which side is up.

Measurement results are influenced by:

- Incorrect storage of the dosimetry film e.g. exposure to high temperature, light / sun or humidity.
- Reflected electrons from the peripheral zone or from the surface (transmission).

- Incorrect temperature treatment of the dosimetry film.
- Measuring device not calibrated.
- Temperature too high during the irradiation, as the radiation also generates temperature.
- Distance from accelerator window to product/dosimetry film.
- Dosimetry film is turned upside down during irradiation so that the carrier strip is laid above.

With regular repetitive measurements for product control on a system, possible errors arise due to changing parameters during the irradiation. Therefore, repeated measurements should be made with specified parameters, recorded in a measurement protocol.

Good preparatory work is necessary for good measurement results.

7.1 DEVICE PREPARATIONS

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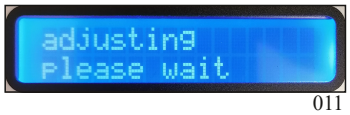

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After connecting the power supply the user is requested to remove any foil that may be in the measuring head. Make sure there is no dosimetry film in the device and press the T2 button. The device is automatically adjusted; this can take up to approx. 20 s when restarting.

! Before the first measurement, the device must be connected to supply voltage for at least 30 minutes. The power on time stabilizes the temperature in the electronics of the device. It is then recommended performing a subsequent adjustment.

7.1.1 ADJUSTMENT OF THE DEVICE

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The adjustment can be manually executed by navigating through the menu with T1 to the “Adjustment screen” and be repeated at any time.

! There must be no film in the measuring head during the adjustment.

Adjustment of the DR030 should be carried out in the user's environment under the conditions of actual use.

! Adjustment is recommended if the DR030 is exposed to temperature fluctuations during measurements.

! Adjustment is recommended if there are long pauses between measurements.

7.1.2 FOIL FACTOR - FoF

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The foil factor is linked to the dosimetry film. The correct foil factor must be set on the measuring device. This is normally configured by the manufacturer and does not change. The foil factor (FoF) is stated on the packaging of the Dosimetry film but may differ with a new batch.

7.1.3 TEMPERATURE / HUMIDITY SENSOR

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The DR030 device has an integrated temperature / humidity sensor which enables values (measured in °C and %) to be displayed and noted as an influencing variable in the dose measurements.

7.1.4 CLEAR SINGLE DATA FROM DEVICE MEMORY

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When single values are loaded into the software from the device, the menu “T2: Clear memory single values" appears on the display. Press T2 to delete all saved sessions or T1 to abort.

7.1.5 CLEAR STRIP DATA FROM DEVICE MEMORY

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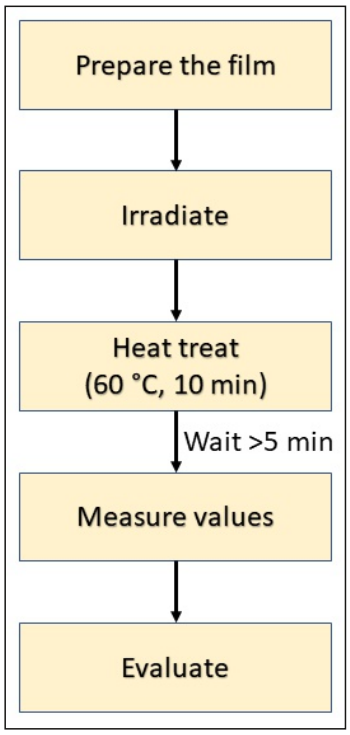
To delete strip data on the device, navigate through the menu with the T1 button and press T2 at the Clear memory strip values screen.

The two separate values on the next screen ranges between 0 - 512 and are details about the storage space.

Press T2 to clear the memory. The two numbers will now be the same and equal to the previously upper value.

7.2 SINGLE MEASUREMENT



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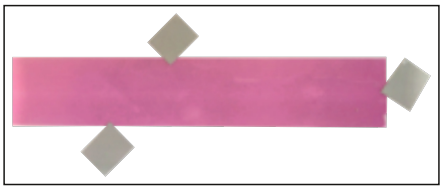
The single measurement is suitable for checking one or more measuring points or for penetration stack measurements. Dosimetry film sections should be approx. 40 mm long so that 3 measurements can be made over the length.

The procedure steps must be executed in the order described in image 018 to achieve measurement results for evaluation. Between the steps, remember to always keep the dosimetry film in darkness.

7.2.1 PREPARATION OF THE FILM

Fasten the dosimeter film on a paper, size A5 (approx. 150x200mm), at both ends with adhesive tape. It is important to place the film with the carrier side against the paper. The area that the adhesive tape covers of the measuring film should be minimized. Only place the corners of the small tape pieces upon the film.

Ideally, use small pieces of the included PVC insulating tape. These can easily (but with care) be removed from the measuring film.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Preferably use 3 strips on a measurement sheet so that a dose average can be determined. The paper with dosimetry film can be prepared in such a way that it can be attached directly to the product or to a running web.

! When preparing several measuring sheets, always keep them in darkness.

7.2.2 IRRADIATION

Irradiate the prepared sheet and write down the relevant radiation data on the Dose measurement sheet.

7.2.3 HEATING

Perform the heat treatment. Heat the film at 60 °C for 10 minutes with a following >5 minutes cool down in room temperature.

7.2.4 MEASURE VALUES

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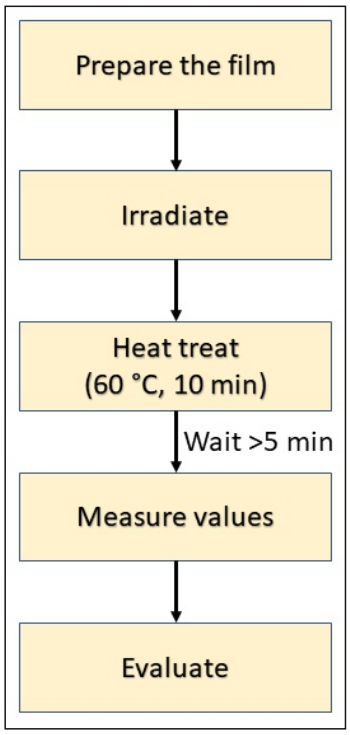
Remove the dosimeter film from the sheet and also remove the carrier strip before inserting it into the gap under the measuring head. The measured value is displayed immediately and can be saved to memory by pressing T2 or written down onto a paper if desired.

! Measurement values of a session (without switching off the device in between) are saved under the same session number. After power off, the session number is increased by 1. Several sessions can be appended one after the other. Note that when the memory is full, the oldest data will be overwritten.

7.2.5 EVALUATION

It is not necessary to use the associated software as the measured values are displayed immediately on the device. Stored values can, however, be loaded into the software for further evaluation. See section 8.

7.3 STRIP MEASUREMENT



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With strip measurements the length of the film can be utilized to evaluate the dose in different ways. For example, the homogeneity of the radiation can be analysed over the working width of the electron beam by placing the strip perpendicular to the direction of movement.

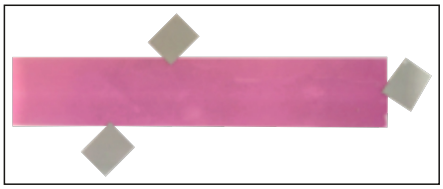
The motor function on the measuring head is used to pull strips through the measuring gap. Several series of measurements can be appended one after the other without deleting stored data from the memory. Note that when the memory is full the oldest data will be overwritten.

The procedure steps must be executed in the order described in image 018 to achieve measurement results for evaluation. Between the steps, remember to always keep the dosimetry film in darkness.

7.3.1 PREPARATION OF THE FILM

Cut the dosimetry film to desired length and place it on a piece of paper with the carrier side against the sheet. Fix the strip to the paper sheet at both ends and along the length with small strips of adhesive tape. The area that the adhesive tape covers of the measuring film should be minimized. Preferably, only place the corners of the small tape pieces upon the film.

Ideally, use small pieces of the included PVC insulating tape. These can easily (but with care) be removed from the measuring film.


019

If desired, the beginning/end or the middle of the measuring range can be marked on the dosimetry film with a black pen to be later used as a reference point for the evaluation.

! For the evaluation via the motor feed, the dosimetry film must be prepared regardless of the length.

7.3.2 IRRADIATION

Irradiate the prepared sheet and mark the film in one or more corners to keep track of which side is up and the direction of movement.

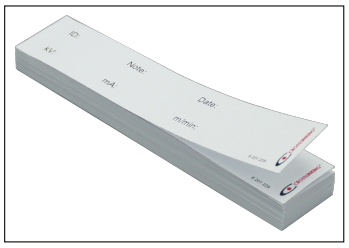
Write down the relevant radiation data on the Dose measurement sheet.

7.3.3 HEATING

Perform the heat treatment. Heat the film at 60 °C for 10 minutes with a following >5 minutes cool down in room temperature.

7.3.4 MEASURE VALUES

Remove the dosimetry film from the sheet and also remove the carrier.

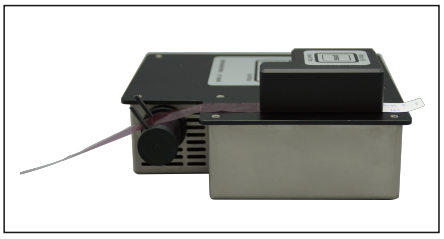


022

Attach the adhesive end of a dosimetry note strip to the edge of the film that you want to use as the starting/first point when measuring. Fill in the relevant data on the paper strip.

! Make sure that the glue on the Dosimetry note strip is fully covered by the dosimetry film, otherwise the strip might get stuck under the measuring head.

Start position with guide pins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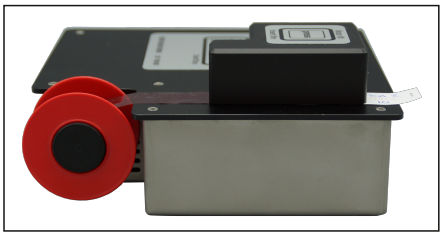
Start position with roll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Slide the Dosimetry note strip with the film through the measuring head and press and hold the motor lift button so that the paper strip lies under the transport roller. Release the motor lift button. Place the dosimetry film in between the two guide pins on the pick-up roller for directional support, see image 023.

Alternatively, screw in the guide pins and place a roll of dosimetry film on to the pick-up roller. See image 024.

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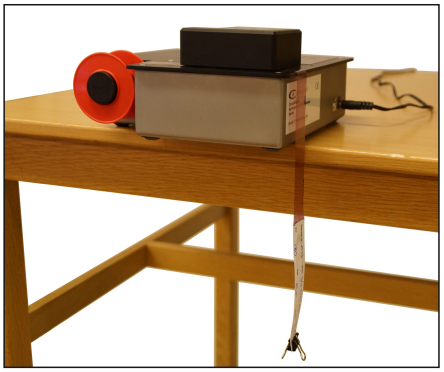
Pull the dosimetry film with T3 (motor start) through the measuring head. Push T3 to stop the motor when the film has passed the measuring point (see image 006). The measured values are now saved to the device memory. Press the motor lift to release the dosimetry film from the transport roller. Remove the strip and store it in darkness, e.g. in the sample box container.

! There must be enough space at the outlet of the device for the dosimetry film to run out.


026

For long films it is also possible place the device on the edge of the table so that the film can fall freely. It can be advantageous to attach the included paper clamp as a weight, at the furthermost end of the dosimetry note strip. See image 027.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Caution Risk of tipping when buttons on the device are pressed.

7.3.5 EVALUATION

The software is required to evaluate stored strip measurements. See section 8.

7.4 DOSE DEPTH (PENETRATION STACK MEASUREMENTS)

For dose depth measurements at higher acceleration voltages, sections of the dosimetry film can be laid stepwise in layers. This gives a grid for penetration depth evaluation, that increases with the thickness of the film for each layer. The average dose can then be calculated in each step.

! Remember to remove the carrier from the film.

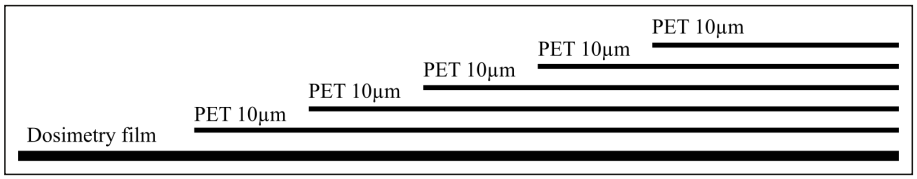
For more precise dose depth measurements with better resolution, we recommend an arrangement with a dosimetry film and thin, staggered polyester foils. This polyester foil stack can be prepared and used for many measurements. See image 028.

Use e.g. 10 µm thin polyester foils in stacks on top of the dosimetry film when irradiating. The depth dose will then be mapped in steps on the film, corresponding to the density of the PET foil. The thickness of the PET foils can vary depending on the application and acceleration voltage.

! The density of the polyester foils that are used must be known.

! Mind that the measured value by the dosimeter is the average dose through the thickness of the film.

PET stack



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8 EVALUATION WITH THE SOFTWARE

After starting the program, Strip (dosimetry strips) or Single (single data) can be selected in a scrollable list. The default is Strip.

8.1 STRIP DATA

Strip data derives from series of saved values when strips are measured with motor feed at millimeter intervals.

! There can be a slight length deviation of the measuring film caused by the heat treatment.

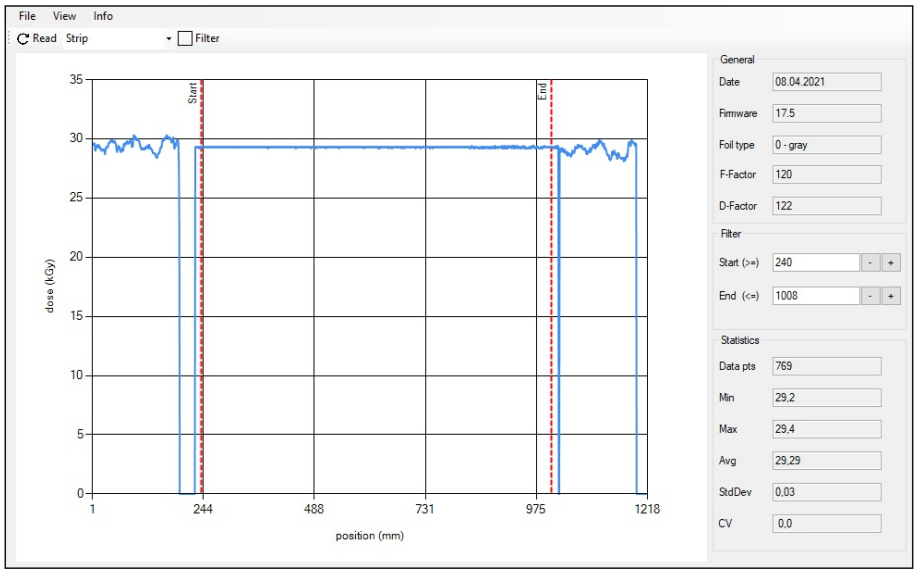
! 0-values stored in the device are also displayed and counted.

8.1.1 READ STRIP DATA FROM THE DEVICE

When the Read button is pressed all strip (and single) data, with statistics and other associated information, are loaded from the device.

For Strip there are 3 views available: Chart, Table and Text.

Chart view from strip data



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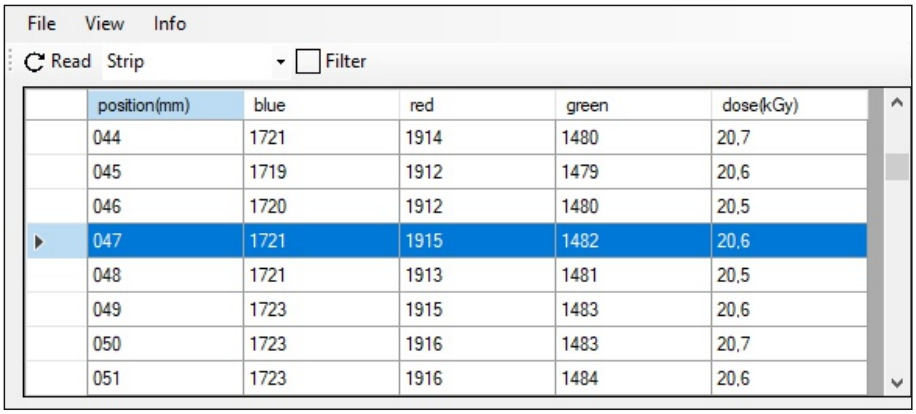
! The values in the statistics are measured between the start and end markers.

Table view when loading strip data



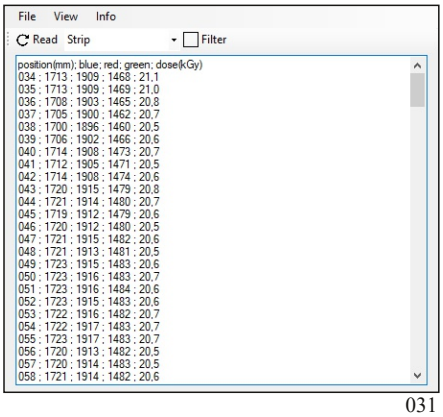
position(mm)	blue	red	green	dose(kGy)
044	1721	1914	1480	20,7
045	1719	1912	1479	20,6
046	1720	1912	1480	20,5
047	1721	1915	1482	20,6
048	1721	1913	1481	20,5
049	1723	1915	1483	20,6
050	1723	1916	1483	20,7
051	1723	1916	1484	20,6

030

The table view has the following columns:
position(mm), blue, red, green and dose(kGy), where blue, red and green are the LED emission.

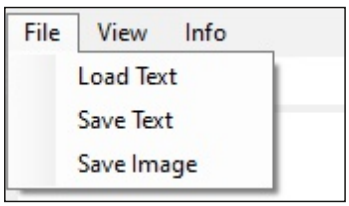
The Text view shows the same data as in the Table view but in a text only format. The data can be marked, copied, deleted or edited in the Text view window. With the copy command the data can be pasted into a spreadsheet.

Text view when reading strip data



031

8.1.2 SAVE/LOAD STRIP DATA FILE



032

Load file: The .csv files saved with this program can be reloaded for further analyze and processing.

Save file: A dialog box for saving data appears. Files are saved in the *.csv format. These can be further processed in a spreadsheet.

Save Image: Saves the current view in a *.png image.

! When loading a .csv file or reading from the device, the currently displayed data will be overwritten.

8.2 SINGLE DATA

The single data derives from a series of values measured in one or more measuring points or from penetration stack measurements.

! 0-values stored in the device are also displayed and counted.

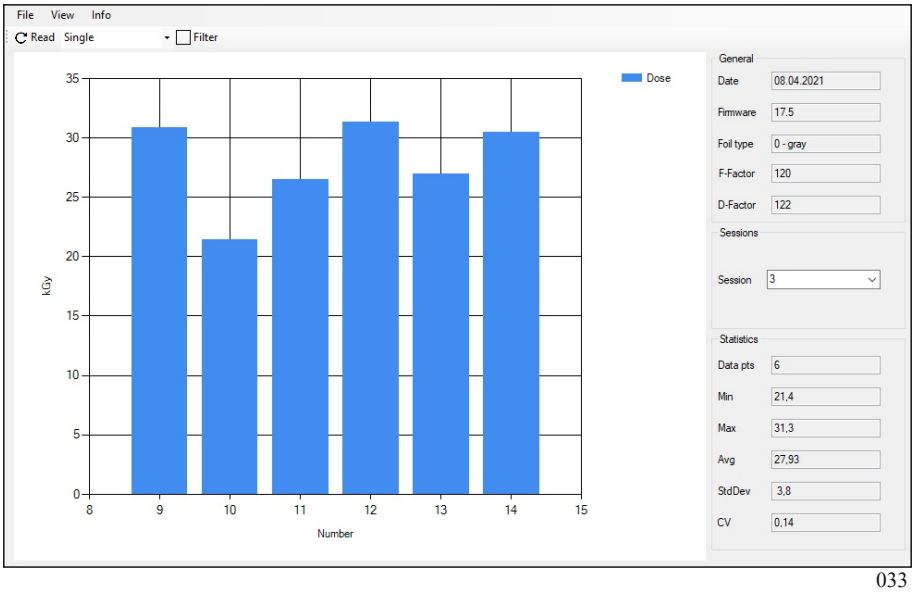
When the device is switched off a new session is created. This means that the next time the device is turned on all new measured values will be stored under the next session. Several measuring strips can by this way be sorted for the subsequent evaluation with the software. (Note the session numbers in image 035).

8.2.1 READ SINGLE DATA FROM THE DEVICE

When the Read button is pressed all single (and strip) data, with statistics and other associated information, are loaded from the device.

For Single there are 3 views available: Chart, Table and Text

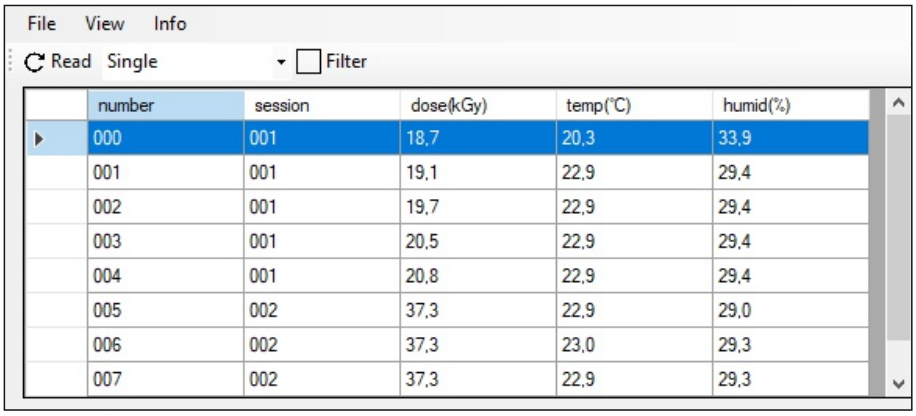
Chart view for single data



033

Select "Chart" from the View menu to display measured single values with statistics analysis together with other relevant information. The desired session can be selected in this view.

Table view when loading single data

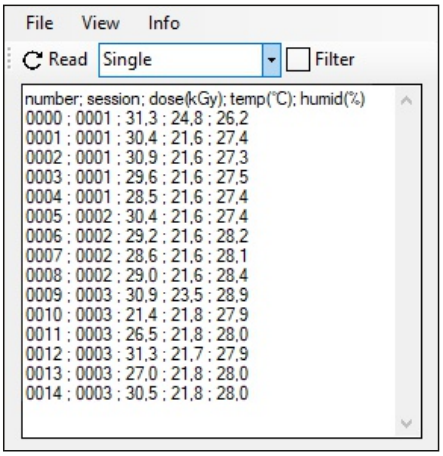


034

The table view has the following columns: number, session, dose(kGy), temp(°C) and humid(%).

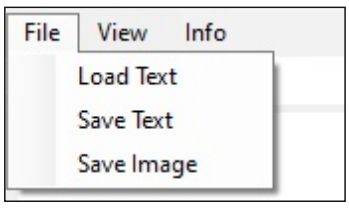
The Text view shows the same data as in the Table view but in a text only format. The data can be marked, copied, deleted or edited in the Text view window. With the copy command the data can be pasted into a spreadsheet.

Text view when reading single data



035

8.2.2 SAVE/LOAD SINGLE DATA FILE



032

Load file: The .csv files saved with this program can be reloaded for further analyze and processing.

Save file: A dialog box for saving data appears. Files are saved in the *.csv format. These can be further processed in a spreadsheet.

Save Image: Saves the current view in a *.png image.

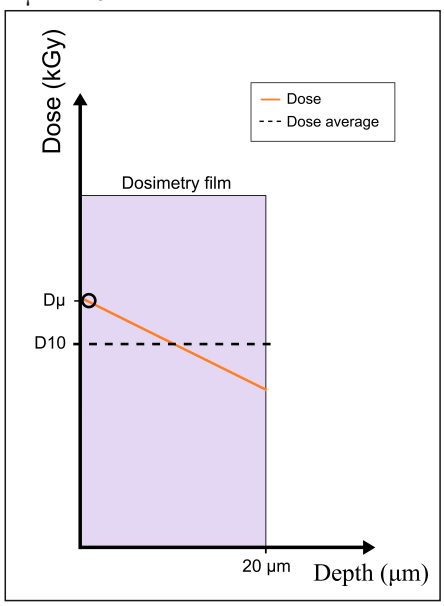
! When loading a .csv file or reading from the device, the currently displayed data will be overwritten.

9 THE THEORY OF Dμ / D10

Irradiation with low-energy electrons (80-300 keV) leads to dose gradients across the thickness of the dosimetry film, depending on used energy.

Therefore, for certain applications and in order to compare different dosimeters, the measured results are mathematically calculated on Dμ, which corresponds to the measured dose in the first μm of the substrate.

Dμ / D10



036

The measured dose by the dosimeter, when measuring film with thickness of 20 μm (20 g / m^2), refer to D10 and is an average of the dose over the depth even if it is not evenly distributed over the film thickness.

The firmware has been validated by Crosslinking using Monte Carlo calculations and irradiation of reference films from the Risø High Dose Reference Laboratory, Denmark.

The validation was carried out exclusively with 20 μm measuring films, therefore the dose measurement is equal to D10 which corresponds to 10 g / m^2 (density of the measuring film).

To use the DR030 to make absolute measurements for comparison with other dosimeters, a calibration must be done. Contact Electron Crosslinking for price offer and more info.

Read full article at:

https://orbit.dtu.dk/en/publications/d-mu-a-new-concept-in-industrial-low-energy-electron-dosimetry

10 MAINTENANCE AND STORING

A prerequisite for the device to function properly is that it is handled appropriately.

In addition to the electronics, the device also contains mechanical parts. If the device is opened, the light path must not be dismantled. Not the main board nor the LED board. All devices have a so-called apparatus factor ApF. This is the electronic compensation in the firmware for mechanical inaccuracy and tolerances of the optical components. This factor is preset and the user has no access for modification.

If malfunctions occur, disconnect the device from the power grid for approx. 10 s and switch it on again.

If paper or film gets stuck in the device the measuring head can be removed. See section 10.2.1.

10.1 STORAGE

When not in use, store the DR030 in a dry environment in the case it arrived in. This protects the device and the accessories from moisture, dust and shock damage.

! Do not store the case in an environment with higher temperature than 35 °C.

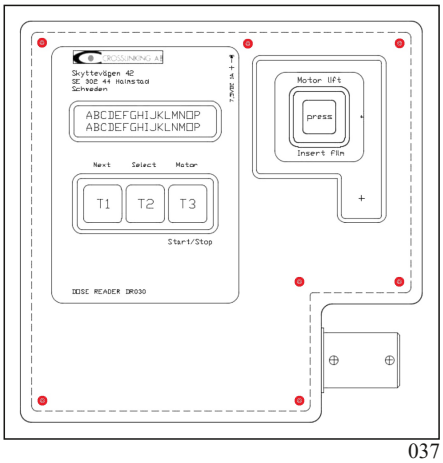
10.2 CLEANING

Lens cleaning wipes are ideal for removing dust from the measuring gap or cleaning the exterior of the device.

10.2.1 REMOVING THE MEASURING HEAD

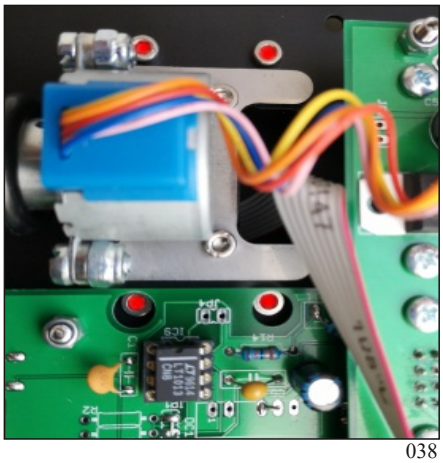
If remnants of film or paper get stuck in the measuring gap, the housing of the measuring head can be removed from the device for cleaning.

Screws on front panel



037

Measuring head screws



038

Unscrew the 7 screws (TX10) on the front panel. See image 037.

! Everything is attached to the front panel.

After loosening the panel, carefully lift it and unplug the cables for the USB and power connections on the board.

Loosen the 4 screws (hex 2.5 mm, red in picture) around the motor to remove the cover. See image 038.

! The light path, the main board or the LED board must not be dismantled. See section 10.

11 SERVICE

If the device is used as intended, no service is usually required.

If the Dose Reader DR030 requires service, contact Electron Crosslinking AB. See contact information below:

ELECTRON CROSSLINKING AB
Skyttevägen 42
SE-302 44 Halmstad
Sweden

E-mail: service@crosslinking.com
Phone: +46 (0)35 15 71 30
Fax: +46 (0)35 14 82 06
Internet: www.crosslinking.com

12 CE DECLARATION OF CONFORMITY

Dose Reader

Type:	**DR030**
Comm. No.:	**98-0149 / 1 100 601**
Year:	**2021**

1. The unit is designed and constructed in accordance to

2014/30/EU	EMC directive
2014/35/EU	Low voltage directive

CE

2. This unit has been CE marked.
This declaration will be void if the equipment is changed without our written consent.

Halmstad, 2021-03-01
For Electron Crosslinking AB

B. Laurell
CEO

13 WARRANTY

Electron Crosslinking AB offers a 12 months warranty.

If warranty claims are made, these must be notified immediately after the defect has been established in writing to the Electron Crosslinking AB company, stating the order number and the exact designation of the unit or part.
If errors or damages are remedied by the customer or by a third party without the prior consent of Electron Crosslinking, Electron Crosslinking AB is not obliged to acknowledge claims or demands.

Change log

Rev.	Comment	Section	Rev. by	Date
00	First initial version	All	FR	2021-04-22