

Correction factors for DIADOS /E measurements in heavily filtered beams before a phantom or a patient according to DIN EN 61267

Prior to a measurement the buttons KV and FILTER (DIADOS) respectively APPL. and FILTER (DIADOS E) must be used to select the calibration factor corresponding to the beam quality RQR (2.5 mm Al).

1. RQR Filtration according to DIN EN 61267

One of the standard ranges of use for the DIADOS /E diagnostic dosimeter in conjunction with detector T60004 comprises radiation qualities with (45 - 150) kV and a total filtration of 2.5 mm Al. Within this quality range, the energy dependence of the DIADOS /E is smaller than $\pm 5\%$, typically $\pm 3\%$. The correction factors k_Q for energy dependence are noted in each specific calibration certificate which is enclosed with the detector. Hence, air kerma is easily obtained from the formula

$$K_a = k_Q \cdot M \quad (I)$$

where M is the reading of the DIADOS /E, including the calibration factor for reference conditions.

2. RQR Filtration according to DIN EN 61267 and additional copper filters

In some applications (e.g. pediatric and angio examinations) additional Cu filters between 0.1 and 3.0 mm in thickness are used. DIADOS /E is not calibrated for these radiation qualities because of the lack of national calibration standards for this quality range. PTW-Freiburg has determined typical correction factors k_{Cu} for different kV settings and copper thicknesses:

Add. Filt. [mm]	0.1 Cu	0.2 Cu	0.3 Cu	0.4 Cu	0.5 Cu	1.0 Cu	1.5 Cu	2.0 Cu	2.5 Cu	3.0 Cu	20 Al 2 Cu	25 Al 2 Cu	20 Al 4 Cu
RQR 3 (50 kV)	1.00	1.01	1.02	1.05	1.05	-	-	-	-				
RQR 5 (70 kV)	0.99	1.00	0.98	0.99	0.97	-	-	-	-				
RQR 7 (90 kV)	0.99	0.97	0.97	0.97	0.97	0.95	0.94	0.92	0.90	0.92	0.91	0.92	0.89
RQR 9 (120 kV)	0.99	0.99	0.98	0.98	0.99	0.99	0.97	0.94	0.99	0.99	0.93	0.95	0.98
RQR 10 (150 kV)	1.00	1.00	0.99	1.00	1.00	1.01	1.02	1.03	1.05	1.06	1.03	1.03	1.08

Air kerma is obtained from the following formula:

$$K_a = k_Q \cdot k_{Cu} \cdot M \quad (II)$$

Please note that this formula and the k_{Cu} values are valid for a permanent filtration of 2.5 mm Al (according DIN EN 61267). If no additional copper is used, k_{Cu} equals 1, and formula II is equivalent to formula I.

Correction factors for DIADOS /E measurements in heavily filtered beams behind a phantom or a patient according to DIN EN 61267

Prior to a measurement the buttons KV and FILTER (DIADOS) respectively APPL. and FILTER (DIADOS E) must be used to select the calibration factor corresponding to the beam quality RQA (23.5 mm Al).

3. RQA Filtration according to DIN EN 61267

One of the standard ranges of use for the DIADOS /E diagnostic dosimeter in conjunction with detector T60004 comprises radiation qualities with (45 - 150) kV and a total filtration of 6.5 mm Al to 47.5 mm Al according to DIN EN 61267. Within this quality range, the energy dependence of the DIADOS /E is smaller than $\pm 5\%$, typically $\pm 3\%$. The correction factors k_Q for energy dependence are noted in each specific calibration certificate which is enclosed with the detector. Hence, air kerma is easily obtained from the formula

$$K_a = k_Q \cdot M \quad (I)$$

where M is the reading of the DIADOS /E, including the calibration factor for reference conditions for this filtration.

4. RQA Filtration according to DIN EN 61267 with additional copper filters

In some applications (e.g. pediatric and angio examinations) additional Cu filters of up to 2 mm Cu thickness are used. DIADOS /E is not calibrated for these radiation qualities because of the lack of national calibration standards for this quality range. PTW-Freiburg has determined typical correction factors k_{Cu} for different kV settings and copper thicknesses:

Add. Filt. [mm]	1.0 Cu	1.5 Cu	2.0 Cu
RQA 5 (70 kV / 23.5 mm Al)	0.99	0.99	0.97
RQA 7 (90 kV / 32.5 mm Al)	0.99	0.99	0.98

Air kerma is obtained from the following formula:

$$K_a = k_Q \cdot k_{Cu} \cdot M \quad (II)$$

Please note that this formula and the k_{Cu} values are valid for the RQA qualities according to DIN EN 61267, plus the additional copper filtration in the table. If no additional copper is used, k_{Cu} equals 1, formula II is equivalent to formula I, and the total filtration accords to the RQA qualities to DIN EN 61267.