

CALIBRATION CERTIFICATE

No. 210626801



PTW-Freiburg, Lörracher Str. 7, 79115 Freiburg, Germany ☎ +49-(0)761- 49055-0 FAX +49-(0)761- 49055-70 E-Mail info@ptwdosimetry.com

Calibration Object

Radiation Detector

Detector [REF] TM30013 [SN] 010820
Detector Type Ionization Chamber

Manufacturer PTW-Freiburg

Customer PTW Dosimetria Iberia S.L.U

Order No. R213522 Calle Profesor Beltran Baguena
Order Date 2021-12-17 no 4
E-46009 Valencia



Calibration Results

Measuring Quantity Absorbed Dose to Water (D_w)
Detector Calibration Factor $N_{D,w} = 5.396 \cdot 10^7 \text{ Gy / C}$

Beam Quality	Correction Factor k_Q	Uncertainty
^{60}Co	1.000	1.1 %

Reference Conditions	Beam Quality:	^{60}Co
	Temperature:	293.2 K (20°C)
	Air Pressure:	1013.25 hPa
	Relative Humidity:	50%
	Chamber Voltage / Polarity:	+ 400 V
	Potential at the chamber thimble:	+ 400 V
	Potential at the Central Electrode:	0 V
	Ion Collection Efficiency:	100 %

Calibration Date **2021-12-22**

Freiburg, 2021-12-23

PTW-Freiburg
Physikalisch-Technische
Werkstätten Dr. Pöchlau GmbH

(Signature)

Calibration Conditions and Set-up

Climatic Conditions	Temperature Range: (294.2 ± 3) K / (21 ± 3) °C Air Pressure Range: (1000 ± 50) hPa Rel. Humidity Range: (40 ± 20) %				
Beam Quality and Geometry	Quality	Filter [mm]	HVL [mm]	SDD [cm]	Size [cm]
	⁶⁰ Co	-	-	100	10 x 10
	Quality:	Beam qualities according to DIN 6809-5 / DIN 6809-4			
	Filter:	Total filtration (inherent and additional filters)			
	HVL:	Half value layer at the point of measurement			
	SDD:	Distance between radiation source and reference point			
	Size:	Field size at reference point, diam. = Field Diameter			
	Reference depth:	5 g cm ⁻² H ₂ O			
Detector Arrangement	Chamber axis perpendicular to radiation beam axis Line on chamber stem faced towards the radiation source Reference point position at stated measuring depth / distance to the radiation source (For further information see manual and data sheet of detector.)				
Dose and Dose Rate	Absorbed Dose To Water : min.: 5.0 · 10 ⁻² Gy / max.: 5.0 Gy Absorbed Dose To Water rate : min.: 50 mGy/min / max.: 300 mGy/min				
Polarity Effect	≤ 0.2 % (not accounted for in the detector calibration factor)				
Saturation Correction Factor	k _S = 1.000				
Leakage	Negligible during calibration				

Remarks

1. The uncertainty stated corresponds to the double standard deviation (k=2). The standard deviation was calculated according to ISO GUM from the partial uncertainties arising from the standard used, the calibration procedure, the environmental conditions and short time effects of the object of measurement. The uncertainties stated are composed of the uncertainties of the calibration procedure and those of the specimen during calibration. A share for the long-term instability of the object under calibration is not included.
2. The calibration is traceable to national standards of the German National Laboratory, PTB, Braunschweig. This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. This certificate is valid only with the ionization chamber showing the intact sticker with the certificate number. Calibration factors of chambers having been opened for repair are not comparable to previous calibrations. Calibration certificates without signature are not valid.
3. Please take note of the polarity definition by the electrometer manufacturer. For PTW electrometers the voltage to be set is equal to the chamber voltage value.
4. The components of the calibration object fully comply with the respective specifications given in the data sheet and user manual.
5. The calibration factor presented in this certificate can be equally used for Absorbed-Dose-To-Water determination with dosimetry protocols IAEA TRS 398, AAPM TG-51 and DIN 6800-2. However, it must be guaranteed that the reference temperature given in this certificate is in agreement with the reference temperature of the chosen dosimetry protocol. In the case of disagreement of reference temperatures an appropriate correction of the presented calibration factor with respect to the dosimetry protocols reference temperature must be applied.