

DIODES, DOSIMETERS & ELECTROMETERS

VERIDOSE PDMQC SYSTEM

Two Systems In One



Diodes Sold Separately

Use VeriDose PDMQC as a patient dose monitor and when needed, just simply plug in the Veridose QC Module and VeriDose PDMQC is transformed into a precision linear accelerator quality control device.

VeriDose PDMQC is actually two radiation oncology products in one. It's a linear accelerator quality control device (it measures beam constancy, which includes flatness and symmetry). It's a five-channel patient dose monitoring system that records patient dose verification data from actual radiation measurements made on the patient during treatment.

Accuracy

- Measurements and updates are provided in real time, accurate to within 1% or better
- Automatically adjusts the proper offset voltage for each detector, resulting in up to ten times less drift than other products

Time-Savings

VeriDose PDMQC stores up to 25 separate calibration sets. A calibration set can be created for up to 5 diodes at a time. As a result, the frequency of calibrations you do is significantly reduced. Setup time and error potential are also dramatically reduced, leaving more time for patient treatment.

Documentation

- When interfaced with a standard printer, you can print:
 1. Patient treatment dose reports
 2. Date and time of procedure
 3. Diode detector group and serial number
- In vivo measurements with VeriDose PDMQC as a patient dose monitor are reimbursable under CPT-4 Section 77331 Special Dosimetry

Specifications

VeriDose PDMQC Electrometer

Input Circuitry: Five electrometer channels with digital zeroing and gain control; bi-polar

Rate Range: 1.0 cGy/minute to 1000 cGy/minute

Dose Range: 0.1 cGy to 1000 cGy

Sensitivity Adjustment: 0.1 nC/cGy to 10 nC/cGy

Display: 240 x 64 dot LCD; 8 lines x 40 characters, with CCF backlight

Clock: Real time clock, battery operated, USA or European format

Alarm: User-selectable level for each channel

User Controls: On-Off switch, 5-column select soft-keys for control functions, scroll-up, scroll-down, and enter key for data entry

User Setup Parameters: Stored in non-volatile, battery-backup RAM

Computer Interface: RS-232C, 19.2 K BAUD, 8, N, 1; data format: standard decimal points or Euro-commas

Printer Interface: Parallel, selectable drivers for: LaserJet, Label printer; ASCII Format only.

Storage Temperature: 0° C to 70° C

Operating Temperature: 10° C to 30° C

Relative Humidity: 5% to 95% non-condensing

Connector: BNC-F Coax

Power: 120 VAC, 60 Hz or 230 VAC, 50 Hz to 12VDC @ 1A; AC adapter, UL, CSA, CE

Dimensions: 9" W x 8.5" D x 2.5" H (EMI shielded)

Weight: 2.5 lbs

VeriDose PDMQC Phantom Module

Detector: Five diode detectors

Energy Range: Photon: 4 MV to 25 MV

Electron: 5 MeV to 25 MeV

Sensitive Volume: 0.25 mm³

Sensitivity: 1.5 nC/cGy

Diode Polarity: Negative

Rad Damage at 10 kGy: <15%

Detector Configuration:

Flatness/Symmetry: One central axis

Four orthogonally-positioned at 8 cm off central axis in the transverse and radial dimensions off-axis detectors are positioned at 80% of field size for flatness and symmetry measurements

Energy Constancy: Detector Depth Positions: 4.5, 12.5, 20.5 cm

Interface Cable: 15 meters (50 feet)

Build-up: 1.9 cm acrylic (2.3 g/cm²)

Dimensions: 9.85" sq. x 1.5" H

Weight: 5.25 lbs

VeriDose PDMQC System Includes: Electrometer, Windows® Excel software, and Phantom Module.

Item 322-908 - Add-in software is needed for additional machines.

Note: Recommend negative polarity diodes with VeriDose PDMQC System

Item #	Description
322-902	VeriDose PDMQC System
322-902-1	VeriDose V Electrometer ONLY
322-908	VeriDose Excel Add-in Software

DIODE HOLDER



Diodes Sold Separately

Item #	Description
322-930	Diode Holder with Five Slots

VERIDOSE GANTRY HOLDER



The gantry holder secures the VeriDose PDMQC Phantom Module at 100 cm (to the chambers) with four nylon thumb screws. Acrylic build-up plates are made to fit around the support posts and secured in place with two locking rings that are mounted on the support posts. When ordering please give contact person, phone number, accelerator model and target to bottom of treatment tray slot, photon and/or electron measurement and tray coding.

Item #	Machine Description
322-970-__	VeriDose Gantry Holder
322-980	1/32" (0.8 mm) Acrylic Build-up Plate
322-981	1/16" (1.6 mm) Acrylic Build-up Plate
322-982	1/8" (3.2 mm) Acrylic Build-up Plate
322-983	1/4" (6.4 mm) Acrylic Build-up Plate
322-984	3/8" (9.5 mm) Acrylic Build-up Plate
322-985	1/2" (12.7 mm) Acrylic Build-up Plate
322-986	1" (25.4 mm) Acrylic Build-up Plate

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DIODES, DOSIMETERS & ELECTROMETERS

VERIDOSE SOLID-STATE DIODE DETECTORS



Using the VeriDose PDMQC in conjunction with VeriDose Diode Detectors, you can verify the given dose quickly and accurately during treatment, thus avoiding potential misadministration of radiation.

VeriDose Diode Detectors are solid-state silicon-based radiation detectors that utilize a p-n junction. These rugged diodes are encased within a biocompatible polystyrene material. A low noise coaxial cable is used to connect the diode to an electrometer. When attached to an electrometer, these diodes provide enhanced sensitivity and instantaneous response time.

- Designed to provide superior response, reliability, and performance
- Long-lifetime diodes. Tested 2×10^6 cGy in high-energy electron beam, the most damaging radiation
- Very low dose rate and temperature dependence
- Hemispherical shape improves isotropic response and reduces angular and field-size dependencies

Features

- Waterproof design with appropriate build-up for all clinical photon and electron energies
- Flat bottom permits secure, easy placement on the patient

- Color-coded for ease of identification
- Dose rate independent
- Responds to photons and electrons
- Responds to dose rates of 1.0 cGy/min to 1000 cGy/min
- Can be used on continuous (^{60}Co) X-ray beams, pulsed (linear-accelerator) X-ray beams, and electron beams
- Optimized for use with Patient Dose Monitors and high-quality medical-grade ionization chamber electrometers
- All diodes are supplied with a non-crimp repairable cable with BNC connector

Specifications

Photon and Electron Diode Detectors

Nominal Sensitivity: 1.5nC/cGy

Sensitivity Volume: 0.25 mm³

Output Polarity: Positive/Negative

Linearity: <.1% for dose ranges from 0.01 Gy to 10 Gy
<.1% for dose rates 3 to 5 Gy/min

Reproducibility: 0.2%

Angular Dependence: <2% \pm 60° for lower energy diodes (Item 322-913). <2% \pm 10°; <5% \pm 60° for higher energy photon diodes and electron diodes.

Sensitivity Loss at 10 kGy: <15%

Cable Length: 3 meters

Connector: Coaxial BNC-M

Dimensions: 8 mm \varnothing

Weight: 42 gm

Item #	Description	Range	Polarity/Color	Build-Up Type	Build-up (g/cm ²)
322-912	Photon Diode Detector	1-4 MV	Negative/Blue	Cu	0.732
322-913	Photon Diode Detector	5-11 MV	Positive/Yellow	Cu	1.359
322-914	Photon Diode Detector	5-11 MV	Negative/Yellow	Cu	1.359
322-915	Photon Diode Detector	12-17 MV	Positive/Red	Tu	2.606
322-916	Photon Diode Detector	12-17 MV	Negative/Red	Tu	2.606
322-917	Photon Diode Detector	18-25 MV	Positive/Green	Tu	3.574
322-918	Photon Diode Detector	18-25 MV	Negative/Green	Tu	3.574
322-919	Electron Diode Detector	5-25 MeV	Positive/Gray	-	0.284
322-920	Electron Diode Detector	5-25 MeV	Negative/Gray	-	0.284
322-928	9 Meter (30 Foot) Diode Extension Cable BNC-M to BNC-F				

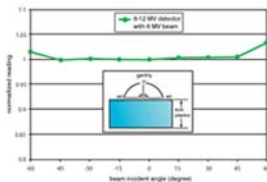
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DIODES, DOSIMETERS & ELECTROMETERS

QED™ DIODE DETECTORS



- Radiation hardened silicon diode
- Active dimension of 0.8 x 0.8mm
- 32 nC/Gy sensitivity
- Flat design allows for easy and reliable placement on patient skin surface
- Advanced p-type die design is accurate and responsive
- Compatibility with any diode based dosimetry system
- Long lifetime if handled properly



The QED™ features a flat design for easy patient placement. It is ideal for treatments where diode placement is normal to the beam. QED's are available in three photon energy ranges, and a single range for all electron energies.

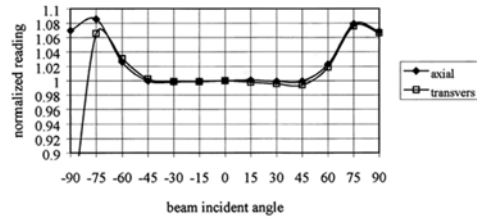
QED™ Applications

QED™ diode detectors should be used in situations where the beam is normal or close to normal to the patient skin surface.

Accuracy

The QED™ offers exceptional accuracy for a flat diode detector. When tested on top of 6 cm of virtual water, variation in directional response is $\pm 0.5\%$ for 30° , and $\pm 1.0\%$ for 45° for 6MV beams.

Angular dependence for 6 MV:



QED™ detectors offer three different buildup configurations (just as the ISORAD™) for each of the low, medium and high photon energy ranges. There is also a skin (scatter) QED™ detector which has no buildup. The QED™ is ideal for treatments where diode placement is relatively normal to the beam.

Clinical Characteristics

Superior Radiation Resistance - The radiation degradation rate is 1.5% per kGy at 10 MeV and $< 0.5\%$ per kGy at 6 MV.

Minimized Instantaneous Dose Rate Dependence - Normalized to 100cm SSD, the diode response variation is less than $\pm 1.5\%$ for both 6 and 18 MV beams from 80 cm to 130 cm.

Reproducible - QED reproducibility error is less than 0.5% for measurements $> 1\text{cGy}$.

Specifications

Cable Diameter: 0.1" (2.5 mm)

Cable Length: 9.75' (3 m)

Cable Connector: Lemo

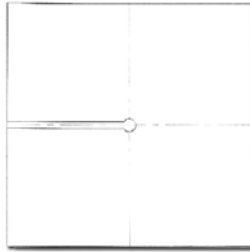
QED	Item 322-112 Item 322-122	Item 322-113 Item 322-123	Item 322-114 Item 322-124	Item 322-115 Item 322-125	Item 322-116 Item 322-126
Color	GREY	BLACK	BLUE	YELLOW	RED
Voltage Range	ELECTRON	SKIN	1-4 MV	6-12 MV	15-25 MV
Buildup Material	Acrylic	None	Aluminum	Brass	Brass
Buildup (g/cm²)	0.36	0.11	1.09	1.91	3.10
Energy Used for Directional Response	6 MeV	Co-60	Co-60	6 MV	18 MV
Response (30°)	104.0%	101.5%	99.50%	100.5%	98.50%
Response (45°)	-	103.5%	99.50%	101.5%	97.50%
Response (60°)	-	-	100.0%	103.5%	97.00%
Detector Area (mm²)	0.64				
Active Dimension (mm)	0.8 x 0.8				
Dose Rate Dependence	$\pm 1\%$, 75 - 250 cm SSD				
Detector Sensitivity (nC/Gy)	27.0				
Detector Stability	0.5% / kGy at 6 MV				
Negative Output Item #	322-112	322-113	322-114	322-115	322-116
Positive Output Item #	322-122	322-123	322-124	322-125	322-126

Item #	Accessories
322-884	Connector Adaptor Lemo- F to BNC- M
322-886	Coax Cable Extension w/Lemo-F to BNC-M Connector 10 m
322-888	Coax Cable Extension w/Lemo-F to BNC-M Connector 15 m
322-890	Coax Cable Extension w/Lemo-F to BNC-M Connector 20 m

Item #	Accessories
322-891	Coax Cable, Diode, BNC-F to BNC-M, 32' (10 m)
322-892	Coax Cable, Diode, BNC-F to BNC-M, 49' (15 m)
322-893	Coax Cable, Diode, BNC-F to BNC-M, 65' (20 m)

DIODES, DOSIMETERS & ELECTROMETERS

EQUIDOSE II DIODE PHANTOM



Specifications

Material: Polystyrene

Size: 9.8" x 9.8" x 1" (25 x 25 x 2.54 cm)

This phantom is also available in other materials. Call RPDinc for more information.

Item #	Description
638-000	Equidose II Diode Phantom

IBA DOSIMETRY DIODE DETECTORS



Applications

The IBA Dosimetry Diode Detectors are designed for depth dose and profile measurements in water and in air and for output factor measurements in small photon beams.

The IBA Dosimetry Diode Detectors are an excellent choice in relative field analysis as well as output factor measurements. They are based on the 3rd generation of pSi semiconductors. The high doped p-type silicon detector chips, specifically designed for radiation therapy applications, have since their introduction in 1992 been the natural choice for measurements where high spatial resolution is required. The accuracy and lifetime of the diode detectors is unsurpassed in the field of radiation therapy today.

Item 300-605 EFD^{3G} Electron Diode and Item 300-615 SFD Stereotactic Diode provides direct electron depth dose, no need for ionization to dose conversion.

- **Waterproof**
- **Have a proven dose rate and energy independence**
- **Have a high uniform spatial resolution in the beam plane and precise definition of the measurement depth (accurately shaped penumbras in the whole beam plane using the same detector orientation)**
- **Independent of bias, pressure and moisture, very robust, always reliable, no "warm-up" time**
- **High durability: 3 year warranty - low lifetime costs**

Diode	Item 322-600	Item 322-605	Item 322-610	Item 322-615
Effective Measurement Point	< 0.9 mm	< 0.9 mm	NA	< 0.9 mm
Chip Size (Side / Thickness)	2.5 / 0.5 mm	2.5 / 0.5 mm	2.5 / 0.5 mm	0.95 / 0.5 mm
Geometric Form of Active Area	Circled	Circled	Circled	Circled
Diameter of Active Area	2 mm	2 mm	2 mm	0.6 mm
Thickness of Active Volume	0.06 mm	0.06 mm	0.06 mm	0.06 mm

Item #	Description
322-600	PFD ^{3G} Photon Diode Detector
322-605	EFD ^{3G} Electron Diode Detector
322-610	RFD ^{3G} Reference Diode Detector
322-615	SFD Stereotactic Diode Detector

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DIODES, DOSIMETERS & ELECTROMETERS

ISORAD™ DETECTORS

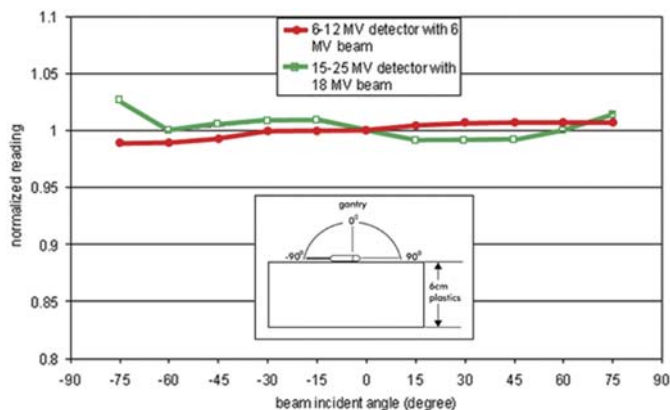


- ISORAD is the only available diode with Cylindrical Symmetry, angular corrections are not required
- Compatibility with any diode based dosimetry system
- Very good reproducibility (= 1% for measurements >1 cGy)
- Long lifetime when handled properly

Accuracy

The ISORAD™ offers exceptional accuracy for a flat diode detector. When tested on top of 6 cm of virtual water, variation in directional response is $\pm 0.5\%$ for 30° , and $\pm 1.0\%$ for 45° for 6MV beams.

Axial Directional Response on Phantom:



ISORAD™ is the only available cylindrical (isotropic) diode detector. The ISORAD's™ cylindrical design allows it to have nearly zero angular dependence along the axial axis, this makes it an ideal choice for tangential treatment cases where it is difficult to predict angle of incidence. ISORAD's™ are available in three photon energy ranges. Each energy range uses a different buildup material designed to give a reading at d_{max} , therefore, no additional buildup is required. ISORAD™ - Angular Independent Dose Monitoring.

ISORAD™ Applications

- A situation where a surface mounted diode is needed to verify patient dose.
- Tangential treatments where the angle of incidence is difficult or impossible to predict.
- Can be used in conjunction with some solid phantoms and the IVD to verify complex treatment plans.

IsoRad	Item 322-162 Item 322-166	Item 322-163 Item 322-167	Item 322-164 Item 322-168
Color	BLUE	YELLOW	RED
Voltage Range	1-4 MV	6-12 MV	15-25 MV
Buildup Material	Brass	Molybdenum	Tungsten
Buildup (g/cm²)	1.4	1.6	2.6
Energy Used for Directional Response	Co-60	6 MV	18 MV
*Axial Angular Response 1 (0° ~ 360°)	99.5% ~ 100.5%	99.5% ~ 100.5%	99.5% ~ 100.5%
**Axial Angular Response 1 (-60° ~ +60°)	99.5% ~ 101.0%	100.0% ~ 101.0%	99.5% ~ 100.0%
**Transverse Angular Response (-30° ~ +30°)	97.5% ~ 102.0%	99.0% ~ 100.5%	99.5% ~ 104.0%
Detector Area (mm²)	0.97		
Active Dimension (mm)	1.4 diameter		
Dose Rate Dependence	$\pm 1\%$, 75 - 250 cm SSD		
Detector Sensitivity (nC/Gy)	27.0		
Detector Stability	0.5% / kGy at 6 MV		
Negative Output Item #	322-162	322-163	322-164
Positive Output Item #	322-166	322-167	322-168

*Tested in air

**Tested on a 6 cm plastic phantom

DIODES, DOSIMETERS & ELECTROMETERS

22D DUAL DIODE DOSIMETER



- **Dual digital display**
- **Two calibrations per channel**
- **Accepts a wide variety of positive or negative diode detectors**
- **Slanted front panel for easy reading and control**

The Dual Diode Dosimeter is a compact, economical, battery-operated, dual channel diode detector monitor designed for simplicity of operation without compromising accuracy and reliability.

The user-friendliness is immediately apparent by its sloping control panel that allows operation from a convenient angle. Collected exposure data from both channels is read simultaneously on two large, easy-to-read liquid crystal displays without switching. Two independent calibration potentiometers for each channel allow individual custom calibration settings for up to two sets of diode detectors or two beams. Operation is simple, only four switches are needed to select the calibration factors, dose or dose rate and to reset display to zero. It is powered by a single, easily accessible 9 volt battery. An input jack is provided for the UL-listed wall-mount transformer in case AC line operation is desired.

A special inherent feature of the Dual Diode Dosimeter is its compatibility with both negative and positive current output diode detectors: EquiDose™, Isorad, QED, or VeriDose. This flexibility allows utilization of existing diode detectors and future standardization. When using with diode detectors that have a 2 or 3 meter cable, one extension cable of suitable length is needed per each channel.

When using with EquiDose™ diode detectors, an extension cable with Lemo and BNC-M connectors will be needed.

Specifications

Display: Two displays, one per each channel, 1/2" LCD 3 1/2 digit

Range: 0-1999 cGy and 0-1999 cGy/min

Accuracy: ±1% dose and dose rate

Zero Drift: <0.1 cGy/min

Linearity: ±0.1% + 1 digit

Input Connector: Coaxial BNC-F

Power: One 9 V alkaline battery, NEDA 1604, External UL-Listed 115VAC wall-mount transformer

Battery Life: Approx. 50 hrs. continuous, 100 hrs. intermittent

Size: 10" x 8" x 4.1"

Weight: 1.75 lbs

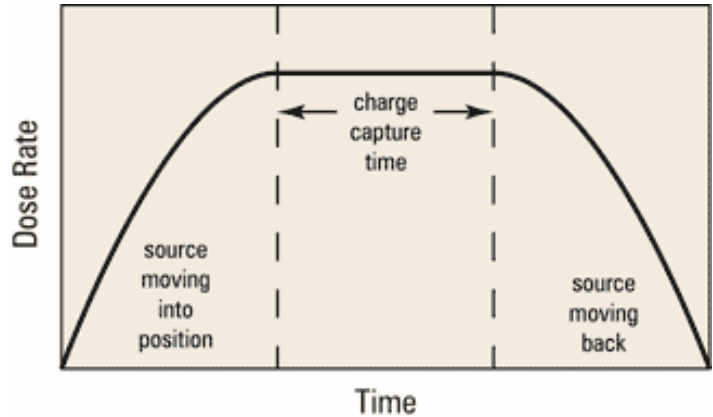
Item #	Description
348-022	22D Dual Diode Dosimeter
348-024	115 Vac Wall-Mount Transformer, Replacement

For Diodes - See Equidose II, Isorad, QED and Veridose

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DIODES, DOSIMETERS & ELECTROMETERS

CDX 2000B ELECTROMETER



P Versatile, Affordable

The compact, stable, lightweight and easily transported CDX 2000B has wide amp and coulomb ranges for both external beam dosimetry measurements and precise HDR brachytherapy calibrations.

Exceptional Range for Many Applications

The CDX 2000B's wide range make it an excellent instrument for absolute dosimetry measurements with standard Farmer-type ion chambers and parallel plate ion chambers. It is extremely reliable and precise for HDR brachytherapy calibrations.

Wide range for both external beam and brachytherapy measurements.

Low Noise and Stable Repeatability

A powerful digital microprocessor provides 0.1% repeatability and exceptionally low leakage of less than 5 fA. The digital filter nearly eliminates the effects of noise, resulting in extremely stable readings.

Easy to use pressure sensitive buttons control the operations. With user activated zeroing, just press the button and it is ready to measure. The rechargeable battery operation, with percent of battery charge displayed on the screen, provides convenient use.

Unique Timing Capabilities

The unique timing feature is ideally suited for HDR brachytherapy calibration measurements. The CDX 2000B can capture charge for a selected amount of time during an exposure, thereby eliminating end effects or other variable portions of an exposure.

This application is very useful during the measurement of high dose rate brachytherapy sources allowing the measurement of charge only during the time the source is in place and the rate is constant.

Specifications

Rate Mode: 0.01 nA - 195.00 nA

Charge Mode : 0.01 nC - 999,999 nC

Combined: Accumulated charge and current are displayed simultaneously

Timed: User set duration (Range: 0-600 sec; Increment: 15 sec;

Resolution: 1 sec)

Max Run: Unlimited duration with manual stop

Short Term Repeatability: $\pm 0.1\% \pm 1$ count

Long Term Repeatability: $\pm 0.2\%$ (maximum change over two years)

Signal Setting Time (typical): 1 sec

Linearity: $\pm 0.06\%$ typical

Zero Drift: < 5 fA @ STP

5 User Bias Settings: -300, -150, 0; 150, 300 (VDC)

Bias Accuracy: ± 0.3 volt

Display: LCD, 2 x 20 with 5/16" characters

Input: BNC-F two lug, triaxial connector

Bias Voltage: Nominal ± 300 volt bias.

Power: UL listed and CE marked wall-mounted power supply, 110 or 220 VAC input, 9VDC@300 mA output. Internal battery: 10 hrs/charge

Zeroing: Automatic zero function, user activated.

Output: Isolated RS-232, bi-directional, 19,200 baud rate, 8 data bits, no parity, 1 stop bit

Dimensions: 8.24" W x 9" L x 2.75" H

Weight: 3 lbs



CE0413, Externally certified IEC 60601-1, IEC 60601-1-2, Designed to meet IEC 60731

Item #	Description
321-450	CDX 2000B Electrometer
321-405	Carrying Case for CDX2000B Electrometer

DIODES, DOSIMETERS & ELECTROMETERS

MAX 4000 ELECTROMETER



Versatile and Accurate: Reference grade instrument for use in a wide range of radiation therapy applications, including external beam, low dose, high dose, intravascular brachytherapy, diagnostic x-ray, and mammographic x-ray

Automatic Threshold Detection: Already one of the easiest and most widely used electrometers, threshold detecting trigger mode makes the MAX 4000 even more versatile. The MAX 4000 automatically detects the start and stop of radiation exposure by measuring the current crossing predetermined limit thresholds. This allows you to take sequential measurements without the need to manually reset the electrometer.

Low Noise and Stable Repeatability: A powerful digital microprocessor provides 0.1% repeatability and exceptionally low leakage of less than 1 fA. The built-in digital filter nearly eliminates the effects of noise, resulting in stable and exact measurements.

Powerful Data Management: Connect the MAX 4000 to a PC and use the included MAX COMM™ Software for fast, comprehensive control of dose and dose rate measurements, chamber libraries, remote operations, data logging, and many other advanced features.

New! Wide Range, Superior Sensitivity

0.001 pA to 500.00 nA range

0.01 pC to 999,999 nC range

Features and Benefits

Powerful Measurement Capabilities

- Triggered collection with automatic start, stop and reset of charge collection based on specific threshold detection levels for flexibility needed in clinical and research applications
- Timed collection from 0-600 seconds and continuous mode provide additional charge collection options
- Built-in digital filter virtually eliminates the effect of noise, resulting in stable and exact measurements

Simple, Intuitive Interface

- NEW! Large, easy to read backlit LCD display is visible from a distance and in low light
- Simultaneous display of amp, coulomb, and collection time minimizes the need to switch screens
- User activated, automatic zeroing function

Measure with Confidence

- Designed to exceed AAPM, ADCL and reference grade instrument specifications
- Designed to meet or exceed requirements of IEC 60731 for reference grade instruments

MAX COMM Software

- NEW! Automatic acquisition of a series of timed charge collections
- NEW! Continuous collection of rate measurement points over a user defined interval with a choice of two frequencies — Useful for basic beam profiling
- Chamber library allows a chamber or system factor to be applied, facilitating calculation & read out of integrated dose and dose rate in Gy, Sv, R, Gy/min, Sv/hr, R/min, or Gym²/hr
- Apply temperature and pressure correction to measurements
- Export data in a Microsoft® Excel compatible format

Applications

- NEW! Extended bias settings of ± 0 -450 VDC for TG-51 and 1/3 ratio IAEA TRS-398 measurements
- External Beam IMRT – Quick measurements of even the smallest volume ion chambers, such as those used in IMRT or stereotactic radiosurgery.
- LDR or HDR Brachytherapy – Exceptional sensitivity and a wide range make the MAX 4000 the electrometer of choice for brachytherapy measurements. It provides quick measurements of low activity isotopes. A 0.27 mCi iodine seed, measured in the HDR 1000 Plus Well Chamber, gives a typical signal of 1.458 pA. The MAX 4000 also measures 10 Ci and higher iridium sources
- Other Applications – Ideally suited for ion chambers typically used for data acquisition in water phantoms and with chambers used for quality assurance tests. Works exceptionally well with mammographic, conventional radiology, and CT scanning applications

Specifications

Height: 7 cm (2.75 in)

Width: 22.2 cm (8.24 in)

Length: 23 cm (9 in)

Weight: 1.4 kg (3.0 lbs)

Three Modes:

RATE: Low Range 0.001 pA – 1000.00 pA, 1 fA resolution

High Range 0.001 nA – 500.00 nA, 1 pA resolution

CHARGE: Low Range 0.01 pC – 999,999 nC, 10 fC resolution

High Range 0.01 nC – 999,999 nC, 10 pC resolution

COMBINED: Accumulated charge and the current readings are displayed simultaneously

Charge Collections:

TRIGGER: Automatic start, stop, and reset based on user defined thresholds (Start: 0.02 – 9.99 pA; Stop: 0.01 – 9.98 pA)

TIMED: User set duration (Range: 0 – 600 sec; Increment: 15 sec; Resolution: 1 sec)

MAX RUN: Unlimited duration with manual stop

Range Switching: User selectable - High or Low

Repeatability:

SHORT TERM: $\pm 0.1\% \pm 1$ count

LONG TERM: $\pm 0.2\%$ (maximum change over two years)

SIGNAL SETTling TIME (typical): Low Range: 12 sec; High Range: 3 sec

Linearity: $\pm 0.06\%$ typical for all rate and charge settings

Zero Drift: < 1 fA @ STP

Display: Backlit LCD, 2 x 20 with 5/16" characters

Input: BNC two lug, triaxial connector

Bias Voltage: Nominal ± 450 volt bias

5 USER BIAS SETTINGS:

-450, -300, -150, 0; 150, 300, 450 (VDC)

ACCURACY: ± 0.3 volt

Zeroing: Automatic zero function, user activated

Output: Isolated RS-232; bidirectional 19,200 baud rate; 8 data bits; no parity; 1 stop bit; compatible with Argus QC4 software

Power: 100-240 VAC, 0.5 A max, 50/60 Hz input to external power supply, 9 VDC, 1.7 A power supply output to electrometer input, UL/TUL listed power supply; internal battery: 8 hrs/charge

CE 93/42/EEC

Item #	Description
321-400	MAX 4000 Electrometer
321-405	Carrying Case for MAX 4001 Electrometer

DIODES, DOSIMETERS & ELECTROMETERS

35040 ADVANCED THERAPY DOSIMETER

- Now with timer function and wider dynamic range
- Ultra long-term stability error of approximately 0.1% per five years.
- Virtually removes effects of system leakage during measurement. Uncorrected leakage <10 fA over temperature range
- Eleven user-defined bias settings from -500 V to +500 V
- Read out in C, A, R, Gy, Sv, Bq, and more



Specifications

Dose and Rate Display

Charge Full Scale	Charge Sensitivity	Current * Full Scale	Current * Sensitivity
200.00 pC	0.01 pC	200.0 pA	0.1 pA
2.0000 nC	0.0001 nC	2.000 nA	0.001 nA
20.000 nC	0.001 nC	20.00 nA	0.01 nA
200.00 nC	0.01 nC	200.0 nA	0.1 nA
2.0000 µC	0.0001 µC	1.000 µA	0.001 µA
20.000 µC	0.001 µC		
200.00 µC	0.01 µC		
2.0000 mC	0.0001 mC		
20.000 mC	0.001 mC		

* Average current is displayed with ten times greater resolution

Effective Exposure Time Ranges

Full Scale Range	Display Resolution
59.99 s	0.01 s
5 hrs 33 min 19.9 s	0.1 s

Stability: Designed for ultra long-term stability error of approximately 0.1% per five years.

Leakage: Virtually removes effects of total system leakage during measurement. Uncorrected leakage <10 fA over temperature range.

Linearity: Maximum non-linearity variation from straight line of 0.1% of all charge and current ranges.

Resolution: 0.005% of range (4.5 digits) for charge, dose, average rate and average current; 0.05% of range (3.5 digits) for current and rate.

Warm-up: Fully meets specifications within five minutes of applying power.

Measurement Accuracy: 18° C to 28° C (64° to 82° F)

Charge ± (0.20% readings plus two counts)

Current ± (0.20% reading plus two counts)

Bias: Eleven (11) user-programmable steps from -500 V to +500 V in 0.1 volt increments. Accuracy ±0.3 volt for loads <0.2 mA. Front panel selectable.

Ion Chamber Calibration Factors: Thirty-two (32) user-programmable calibration factors. Front panel selectable.

Display Unit: All practical radiation and electrical units.

RS-232 Computer Configuration: For customizing and data transfer.

Physical Dimensions: 9.4" W x 10" D x 4.0" H

Weight: 10 lbs.

Power: Internal Lead Acid Battery; Integral Charger Operates 100 to 240 Vac (47 - 63 Hz)

Connectors: Triax BNC-F front/rear or Triax TNC-F/M front/rear

The 35040 Advanced Therapy Dosimeter is a reference grade instrument used to measure the charge and current from ion chambers in Radiation Therapy, and provides bias voltage for all commonly used chambers. The ATD large clear display offers direct readings of charge, current, time and radiation units over a wide range. The user can customize the display for basic use or for specialized applications such as brachytherapy. The 35040 Advanced Therapy Dosimeter exceeds the recommendations of calibration laboratories for leakage, linearity, and stability by a wide margin.

The 35040 Advanced Therapy Dosimeter, provides the long-term stability and accuracy demanded for calibrations, quality assurance programs, and protocols in Radiation Therapy.

The 35040 Advanced Therapy Dosimeter is fully stable within five minutes. In battery operation or using AC Line, the ATD measures dose and effective exposure time in a single exposure, thus eliminating the need for multiple exposures for Cobalt 60 and brachytherapy measurements. Front panel controls select ion chamber calibration factors, facilitate entry of temperature and pressure values for air density correction, allow bias voltage selection, threshold level, timer control, and choice of display screens. The user-customized display screens can simultaneously show dose, exposure time, dose rate, effective exposure time, average current/rate, accumulated charge/dose, bias voltage, leakage, and other important information that ensures the validity of the instrument.

The customization software allows design of 16 screens that display conditions, parameters, values and text. Up to 32 chambers factors, 11 bias voltages can be programmed. It is PC compatible and connects via a RS-232 cable.

Features

- Wide measurement range, up to 1,000 µA and 19.999 mC for HDR Brachytherapy applications
- Automatic reset and hold of measured valued between exposures
- Front panel adjustment of exposure threshold and user disable of threshold to permit manual operation
- Thirty-two ion chamber calibration factors
- Automatic power-down after user-specified time period, when operating from battery supply
- Annunciators warn of low battery, low bias, and operational errors
- Large capacity battery provides eight hours of continuous operation; fast recharge in less than three hours, even during operation
- AC line operation over the range 100 to 240 VAC and 47 to 63 Hz without operator intervention
- Charge and current calibration factors entered by calibration laboratories at user's option
- Front and rear panel ion chamber connections

Item #	Description
321-005	35040 Advanced Therapy Dosimeter -BNC-F
321-006	35040 Advanced Therapy Dosimeter - TNC-F/M

DIODES, DOSIMETERS & ELECTROMETERS

PTW UNIDOS® E Universal Dosemeter



Easy to use reference class or field class dosimeter for routine dosimetry.

Features

- An economical high quality dosimeter for universal use in radiation therapy and diagnostic radiology
- Complies with the following standards:
IEC 60731 as a field class dosimeter
IEC 60731 as a reference class dosimeter (option)
IPEM guidelines on dosimetry transfer instruments as a secondary standard dosimeter (option)
IEC 61674 as a diagnostic dosimeter
- High accuracy, excellent resolution (1 fA) and wide dynamic measuring ranges
- HV power supply (0...±400) V in increments of ±50 V
- Measures integrated dose (or charge) and dose rate (or current) simultaneously
- RS232 interface for device control and data output

The lightweight and compact UNIDOS E is an easy to use dosimeter, mainly used for daily routine dosimetry in radiation therapy. Ion chambers and solid-state detectors can be connected. A chamber library makes it possible to store calibration data. Air density corrections are done by keying in air pressure and temperature. UNIDOS E displays the measured values of dose and dose rate in Gy, R, Gy/min, R/min or Gy•m. The electrical values charge and current are measured in C and A. The large, high-contrast LC display is easy to read. The device includes automatic leakage compensation and an RS232 interface. The high voltage between the ion chamber electrodes is checked automatically. UNIDOS E features both mains and battery operation.

Specifications

- Resolution for current measurements:** $1 \cdot 10^{-15}$ A
- Resolution for charge measurements:** $1 \cdot 10^{-14}$ C
- Measuring range for current measurements:** ($2 \cdot 10^{-13}$ to $1 \cdot 10^{-5}$) A
- Measuring range for charge measurements:** ($2 \cdot 10^{-12}$ to $6.5 \cdot 10^{-2}$) C
- Measuring range with 0.5% resolution (with Farmer Ionization Chamber Type 30001 (Item 322-001):**
Dose Rate: 0.6 mGy/min to 3000 Gy/min
Dose: 0.1 mGy to 3.0 MGy
- Long Term Stability:** $< \pm 0.5\%$ according to IEC
- Non-linearity:** $< \pm 0.5\%$ acc. to IEC for dose measurements $< \pm 1.0\%$ acc. to IEC for dose rate measurements
- Internal Adjustment Time:** < 1.5 s
- Accuracy of Current and Charge Measurement:**
 $< \pm (0.5\% \pm 1 \text{ count})$
- Interval Time:** 1 - 9999's
- Nominal Useful range:**
- Temperature Range:** $10^\circ - 40^\circ$ C
- Air Pressure Range:** 700 - 1060 mbar
- Humidity Range:** 10 - 75% rel. humidity; 20 g/m³ max.
- Leakage Current (Zero Drift):** $< \pm 10^{-15}$ A
- Zeroing of the Amplifier:** Automatically in approx. 50 s
- Warming-Up Period:** 15 minutes
- Chamber Voltage:** 0 - ± 400 V in 50 V-increments
- Power Supply:** Main Power 115-230 V; 50/60 Hz or from rechargeable NiCd batteries, operating time: 3 - 4 hrs.
- Time Constant for Current and Dose Rate Measurements:**
Low: 350 ms, Medium: 200 ms, High: 200 ms
- Weight:** Approximately 1.5 lbs
- Outer Dimensions:** 9.8" W x 6.3" D x 3.9" H
- Connectors:** Triax BNC-F or Triax TNC-F/M

Item #	Description
321-021-10	Unidos® E - BNC-F Connector (Standard)
321-021-9	Unidos® E - TNC F/M Connector
321-022	Reference Class Certificate
321-023	Carrying Case

DIODES, DOSIMETERS & ELECTROMETERS

MODEL K602 ELECTROMETER

Modified Keithley 602



The Keithley Model 602 is a high quality, general purpose electrometer capable of measuring low currents, low voltage levels and high resistances. It is best known in the industry for its stability and extremely low input offset current on the order of less than 5 fA.

This electrometer is modified to make is expressly suited for medical dosimetry applications. The modifications include:

- Installation of a 150/300 volt electronic bias supply with reversible polarity
- Replacement of the analog meter with a 4 1/2 digit LCD
- Installation of a single 12V rechargeable battery with wall-mount
- UL listed transformer/charger
- Installation of circuitry to allow bias voltage and battery condition to be read on the display
- Installation of a metal connector cap with retaining chain
- Color-coding of switch positions for ease of use
- Coulomb scale calibration to $\pm 0.1\%$ and complete QA at checkout

Specifications

Display: LCD, 4 1/2 digit, 0.48" high

Range: Charge: $.0001 \times 10^{-10}$ to $12.000 \times 10^{-7} \text{C}$

Current: $.0001 \times 10^{-11}$ to $12.000 \times 10^{-1} \text{A}$

Overrange: Indicated by 1 followed by blanks

Accuracy: $\pm 0.1\%$ of reading + 1 digit

Linearity: $\pm 0.1\%$ + 1 digit or precision of reading

Leakage: $< 5 \times 10^{-15} \text{A}$

Calibration: coulomb scale to $\pm 0.1\%$

Input Impedance: $> 1 \times 10^{14} \text{ohm}$

Temp. Coefficient: 0.2%/EC

Bias: internal electronic bias supply; -150V, -300V, OFF, +300V, +150V, selectable on front panel, bias voltage may be read on display

External Bias: Binding posts for banana plugs

Input: Triaxial BNC-F with cap & chain

Power: rechargeable 12V 1.2 AH gel-cell battery, voltage may be read on display, low battery indicator, 120VAC UL listed wall-mount charger provided (240VAC optional)

Current Drain: 57mA

Dimensions: 7" Wide x 10.75" High x 11.5" Deep

Weight: 14.5 lbs

Range	Current		Charge	
	2V	10V	2V	10V
10^{-11}	19.999 pA	120.00 pA	-----	-----
10^{-10}	199.99 pA	1.2000 nA	199.99 pC	1.2000 nC
10^{-9}	1.9999 nA	12.000 nA	1.9999 nC	12.000 nC
10^{-8}	19.999 nA	120.00 nA	19.999 nC	120.00 nC*
10^{-7}	199.99 nA	1.2000 μA	199.99 nC	1200.0 nC
10^{-6}	1.9999 μA	12.000 μA	-----	-----
10^{-5}	19.999 μA	120.00 μA	-----	-----
10^{-4}	199.99 μA	1.2000 mA	-----	-----
10^{-3}	1.9999 mA	12.000 mA	-----	-----
10^{-2}	19.999 mA	120.00 mA	-----	-----
10^{-1}	199.99 mA	1200.0 mA	-----	-----

* Normal range for use with a 0.6cc Farmer-Type Ion Chamber

Item #	Description
321-602	Model K602 Electrometer

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DIODES, DOSIMETERS & ELECTROMETERS

MODEL 206 DOSIMETRY ELECTROMETER



Electrometer Features

- External feedback module interface
- 2,000 hour operation on "D" cell batteries
- Less than 3 fA leakage current
- 4 1/2 digit custom LCD
- Internal electronic bias (±300V / ±150V)
- A/D voltage reference - band gap diode
- Analog electrometer output
- Auto-ranging
- Instant on - no stabilization period

Removable Feedback Module

User selectable feedback element:

- Provides probe calibration
- Sets measurement range
- Defines input (floating or grounded)
- Selects appropriate display units
- Triax BNC-F input
- Calibration adjustment
- Charge, rate or both

The Model 206 Dosimetry Electrometer maintains the simplicity of classic electrometer styling while utilizing contemporary design and state-of-the-art electronics. It is simple to operate. All controls are located on the front panel. The value is displayed in easy-to-read 0.7" digits. A tilt bail is provided for optional viewing angles. The Model 206 Electrometer has a broad range of operation and can accommodate any size ion chamber utilizing any type of connector.

The versatility of the Model 206 Electrometer stems from its innovative modular design. The amplifier feedback element is contained in an external module. This module is removable and can be exchanged with any number of modules. Each module changes the measurement features of the electrometer. In this way, a single electrometer can be configured to satisfy a wide range of applications. By pairing an ion chamber with a specific module, full calibration, of all chambers, on a single electrometer can be achieved.

The Model 206 Electrometer is designed for long term reliability. Leakage currents as low as 1 fA are achieved due to the selection of special components and the implementation of proprietary production techniques. All feedback elements are extensively evaluated to insure long-term stability.

Removable feedback modules

One 200nC (*206-110) feedback module with a triaxial BNC-F connector, optimized for beam calibrations with a 0.6cc Farmer type ionization chamber, is supplied with each Model 206 Electrometer. This feedback module may be substituted at no additional cost, or additional feedback modules may be purchased to suit multiple applications. Feedback module connection is a triaxial BNC-F.

Specifications

Display: 0.7", 4 1/2 digit custom LCD with floating decimal point, display hold and low battery indications

Display Update: 1 sec.

Accuracy: ±0.2% of full scale

Repeatability: ±0.03% of full scale

Linearity: ±0.05% of full scale

Stability: long term (1 year) ±0.1% of full scale

Units: feedback module selected

Electrometry Units: pA, nA, μA, pC, nC

Dosimetry Units: R or Gy with μ, m, c, prefix

Rate Units: in s, min, h

Input Leakage Current: Less than 3 fA

Preamp Output: 2V, banana jack (back panel) 10kΩ

Internal Bias: Electronic, ±300V and ±150V, ±300V and ±100V optional

External Bias: Via banana jacks (back panel)

Ranges: Three decade autoranging, unit powers up in high range with manual increase in sensitivity

Electrometer Range: With appropriate module selection capable of: Current: 0.001pA to 1999.9μA

Charge: 0.0001pC to 19999nC

Standard Range: 200nC module - 0.0001 to 199.99nC

Exposure/Dose: Determined by multiplying the above by the chamber calibration factor

Module Storage: Rear panel compartment holds up to three accessory feedback modules

Input: Triax BNC-F

Power: Six "D" cell batteries, 2000 hours of continuous operation (access panel on bottom)

Size: 5.2" W x 8.4" H x 7.9" D

Weight: 10 lbs

Item #	Description		
321-008	Model 206 Dosimetry Electrometer w/One Feedback Module		
Optional Feedback Modules			
Item #	Nominal Range	Min. - Max. Reading	Chamber Size
Charge			
206-108	20,000 nC	00.01 - 19,999 nC	Any
206-109	2,000 nC	0.001 - 1,999.9 nC	Any
* 206-110	200 nC	.0001 - 199.99 nC	Any
206-111	20,000 pC	00.01 - 19,999 pC	Any
206-112	2,000 pC	0.001 - 1,999.9 pC	Any
206-113	200 pC	.0001 - 199.99 pC	Any
Current			
206-120	2,000 pA	0.001 - 1,999.9 pA	Any
206-121	20,000 pA	00.01 - 19,999 pA	Any
206-126	200 nA	.0001 - 199.99 nA	Any
206-127	2,000 nA	0.001 - 1,999.9 nA	Any

DOSE-1 ELECTROMETER



The DOSE 1 is a portable, single channel, high-precision reference class electrometer that significantly exceeds the recommendations of the IEC 60731 and the AAPM ADCL. It combines superior accuracy with an excellent resolution in a wide dynamic range. The electrometer can be used with ionization chambers, semiconductor detectors and diamond probes for measurements of absorbed dose. In combination with radioactive check sources the response stability of the ionization chambers is verified and the cross calibration performed.

Hardware

- Large and high contrast graphic electro luminescent display with a wide viewing angle (160°) for complete and comprehensive display of all measured values, chamber and correction factors
- Ergonomic design of the operator interface, intuitive easy to use soft keys, pop-up menus
- Dose, dose rate, average dose rate, charge, current and dose per monitor unit measurements are displayed simultaneously
- For verification of instrument, connecting cable and proper sensor operation, an electrical check source as well as leakage and bias voltage testing are included as standard built-in features
- Possibility to store up to 40 different sensors, same number of correction factors and up to 10 radioactive check sources

Software

- Separate measurement or performance of a whole queue of batches (Batch measurement consists of doing several measurements, and to compute the average)
- Automatic starting and stopping function when running a batch measurement
- Fully automated calculation of average and normalization to a reference value (e.g. automated output factor determination)
- Visibility of old results due to saving of measurements in a database or file
- Results are collected and sent from the electrometer to the PC continuously

- Results can be presented on the screen as tables or graphics
- The communication between the DOSE 1 and the PC is realized via RS-232 serial interface
- Result of individual measurements as well as batch summaries can be adapted and saved in text and XML formats for data import, e.g. into Excel for further analysis
- The administration software allows the management of detectors, correction factors and radioactive check sources with PC

Specifications

Bias Voltage: ±500 V, programmable in steps of 1 V

Sensor Connector Types

Standard Option: Triaxial TNC (threaded) in combination with triaxial BNC (bayonet)

Alternative "Convertible Option": M-Type, BNC/Banana and triaxial TNC, triaxial BNC

Temperature Range: 15 - 35°

Relative Humidity: 10 - 80% rel. humidity

Absolute Humidity: Max. 20 g/m³

Power Supply (Mains): 100 - 240 V, 50/60 Hz

PC Interface: Bidirectional RS-232, configuration and measurement software

Outer Dimensions: 10.2" W x 10.2" L x 6.5" H (259 x 259 x 165 mm)

Weight: 7.7 lb (3.5 kg)

Measuring Modes/Range

Charge (Dose): 40pC to 1.0C at 0.1pC resolution

Current (Dose Rate): 40pA to 1000nA at 0.1pA resolution

Measuring Quantities and Units

Electrical: charge (C), Current (A)

Integrate: Gy, Sv, R, rad, rem

Time Base for Rate: Second, minute, hour

Interval Time Range: 1 to 9999 sec

Accuracy/Repeatability: ±0.2%

Leakage Current: ≤±10fA, typically 1fA

Linearity: <±0.25% in whole range

Stability: <±0.25% per year

Display: Graphic electro luminescent, 160° viewing angle

Zero: Automatic, within 60 sec.

Memory: All setup and detector parameters stored in EEPROM

Background Compensation: On/off mode with memory

Computer Requirements

Operating System: Windows® XP Pro, Windows® 2000

Interface to Dose1: RS232



Item	Description
321-100	DOSE-1 Electrometer

MOSFET DOSIMETERS



- One calibration factor for all photon and electron modalities in the radiotherapy energy range
- Isotropic ($\pm 3\%$ or better for 360°)
- Active region of 0.2×0.2 mm
- Permits pinpoint measurement without patient shielding
- Dose-rate and temperature independent
- Unobtrusive in procedures
- Lightweight and flexible
- Multiple dosimeter capability with one reader

Reinforced MOSFET Dosimeter - Now Standard

Reinforcing the MOSFET dosimeter increases its durability during procedures that may cause high stress to the dosimeter. A thin layer of protective plastic coating is added to the tip of the dosimeter, which hardens, strengthens and protects the sensor.

High Sensitivity MOSFET Dosimeter

The high sensitivity MOSFETs are three times as sensitive as the standard MOSFETs and help to maintain reproducibility at low doses. The high sensitivity MOSFETs are ideal for scatter doses to regions at risk, or radiology dose measurements.

MicroMOSFET Dosimeter

With a width of 1.0 mm and an extra long 375 mm flex, the microMOSFET dosimeter is small enough and long enough for use inside a 6 Fr catheter.

Radio-opaque Marker for Visualization

A tiny tungsten radio-opaque marker is added to the tip of the MOSFET dosimeter for localizing the dosimeter with OBI, or other imaging procedures. Additionally, these dosimeters are fully coated with a special plastic material that makes them more durable for repeated insertions inside a catheter.

Plain MOSFET Dosimeter

The plain MOSFET dosimeter does not have the protective plastic coating. Customers using phantoms with tight tolerances may require the plain dosimeter otherwise the reinforced dosimeter is recommended.

Linear 5ive Array

The Linear 5ive Array incorporates five (5) sensors separated 20 mm, center to center, on one 460 mm flex with a tungsten radio-opaque marker at the tip. The length of the dosimeter flex is fully coated with a special plastic material for greater durability during catheter insertions.

DIODES, DOSIMETERS & ELECTROMETERS

MOSFET DOSIMETERS

Flex Dimensions*	Standard MOSFETs	microMOSFETs	Linear 5ive Arrays
Width of Flex	2.5 mm	1.0 mm	1.8 mm
Thickness of Flex (flat part of flex)	0.3 mm	0.3 mm	0.6 mm
Length of Flex (from end of gray cable)	200 mm	375 mm	460 mm
Thickness of Bulb	1.3 mm	1.0 mm	1.4 mm
Length of Bulb	8.0 mm	3.5 mm	5.0 mm
Distance to Center of Chip (from end of bulb)	4.0 mm	1.75 mm	2.5 mm
Common Uses	Dose verification during radiotherapy treatments; beam QA	Fits down a 6Fr catheter for dose verification during HDR procedures	Measurement of urethral dose during prostate brachytherapy

*Measurements listed above are average values and are meant to serve as a guide for the use of MOSFET dosimeters. For phantom use and tolerances, please contact Best Medical Canada directly for more detailed information.

Radiotherapy Applications**

Typical Applications	Radiotherapy Dose	Recommended Dosimeter	Recommended Bias Supply
Scatter Dose / Research	1 to 20 cGy	High Sensitivity Dosimeter	High Setting
Central / Scatter Doses	20 to 100 cGy	Standard Dosimeter	High Setting
TBI / Central Dose	> 100 cGy	Standard Dosimeter	Standard Setting
HDR Brachytherapy	> 20 cGy	Standard Linear 5ive Array	Standard Setting
LDR Brachytherapy	1 to 20 cGy	High/Extreme Sensitivity Linear 5ive Array	High Setting

** Pertains to the standard MOSFET dosimeter, the microMOSFET dosimeter, and the Linear 5ive Array Dosimeter

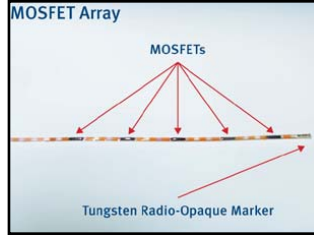
Item #	MOSFET Dosimeter	Quantity	Item #	MicroMOSFET Dosimeter	Quantity
322-320	Plain	2	322-335	Plain	2
322-321	Plain	5	322-336	Plain	5
322-322	Reinforced	2	322-337	Reinforced	2
322-323	Reinforced	5	322-338	Reinforced	5
322-324	Reinforced with Radio-opaque Marker	2	322-339	Reinforced with Radio-opaque Marker	2
322-325	Reinforced with Radio-opaque Marker	5	322-340	Reinforced with Radio-opaque Marker	5
322-326	Plain High Sensitivity	2	322-342	Plain High Sensitivity	2
322-327	Plain High Sensitivity	5	322-342	Plain High Sensitivity	5
322-328	Reinforced High Sensitivity	2	322-343	Reinforced High Sensitivity	2
322-329	Reinforced High Sensitivity	5	322-344	Reinforced High Sensitivity	5
322-330	Reinforced High Sensitivity with Radio-opaque Marker	2	322-345	Reinforced High Sensitivity with Radio-opaque Marker	2
322-331	Reinforced High Sensitivity with Radio-opaque Marker	5	322-346	Reinforced High Sensitivity with Radio-opaque Marker	5

MOSFET Dosimeters are available with a 10' (3 m) cable upon request.

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DIODES, DOSIMETERS & ELECTROMETERS

LINEAR 5IVE MOSFET ARRAY™



The Linear 5ive MOSFET Array is ideal for LDR/HDR Brachytherapy and IMRT QA.

- Suitable for in-vivo dosimetry and beam QA
- For use in both electron and photon modalities
- Isotropic response for 360° gantry angles
- Dose rate and energy independent
- Visible under CT or Fluoroscopy imaging
- Waterproof, resistant to body fluids and liquid sterilization
- Small, lightweight, flexible, and rugged for extensive handling

The Array contains five isotropic, energy independent MOSFET dosimeters, at 2cm intervals. The MOSFETs on the array can be read simultaneously, facilitating multiple dose measurements at several spatial points. The radio-opaque marker, located at the tip of the array, enables visualization under X-Ray imaging (CT, Fluoroscopy), allowing for five dosimetry points to be accurately located and easily compared to target doses.

Applications

The isotropic Linear 5ive Array, with excellent reproducibility and linearity, is the tool of choice for a variety of radiotherapy applications such as in-vivo dosimetry and Beam Quality Assurance.

LDR Implant/ HDR Brachytherapy - The array can be used effectively for direct measurement of intra-cavitary dose profiles. For example, during gynecological and prostate procedures, five dose points can be read directly from a computer, displaying the dose profile of the organ at risk in real-time. This is then compared to the planned target dose, allowing for immediate assessments of post-implant base and apex dose, as well as the dose to the organs at risk (eg. urethra, rectum, or bladder).

Beam Quality Assurance - Two arrays crossing at the isocenter of a beam will provide quick 2D dose profiling with 10 simultaneous dose point readings for the X and Y-axes. Since arrays are isotropic, multiple beams at different gantry angles, as in IMRT, can be accurately and quickly checked.

Dynamic Dose Measurements for Brachytherapy Dosimetry

The Linear 5ive MOSFET Array™, when used in combination with the

mobileMOSFET™, is the first and only commercially available combination that allows for real-time quality assurance of all brachytherapy procedures, without a significant investment in extra time.

Real-time dose profiling is provided by the in-vivo use of a mobileMOSFET Wireless Dosimetry System. the Linear Array is used for various HDR applications such as prostate and gynecological brachytherapy using Item 322-360.

When placed on the surface of the breast, the array can also validate Mammosite™ treatments. Implant and LDR dosimetry is performed using the higher sensitivity model, Item 322-362.

When inserted directly into a urethral catheter, the dose results provide immediate assessment of post-implant base and apex dose coverage, as well as the dose to organs at risk such as the urethra, rectum or bladder. This real-time dose feedback allows assessing the quality of the seed implant program in LDR and HDR brachytherapy. Absolute dose measurements or dose rate measurements are obtained in real-time. This helps to validate the quality of the treatment, and ultimately the quality of life for the patient.

Compatibility

- mobileMOSFET Dose Verification System
- AutoSense Dose Verification System & Dual Bias Supply for Linear 5ive MOSFET Array
- Not compatible with MOSFET 20 Dose Verification System

Radiation Characteristics

- 20,000 mV lifetime (~20,000 cGy on standard sensitivity setting)
- Five active detection points (0.04 mm² each)
- Suitable for photon and electron modalities
- Isotropic response ($\pm 3\%$ for 360°)
- Temperature independent
- Visible under CT or Fluoroscopy with a radio-opaque tungsten marker at the tip

Additional Applications

- IMRT IGRT, IORT, QA and In vivo
- Rectal Dose Measurements
- Skin Dosimetry
- Beam Profiling
- Fluoroscopy / CT Dose Verification
- External beam radiotherapy / TBI

Dimensions

1.5 mm W x 46 cm L x 1.3 mm T
2 cm Inter-MOSFET Spacing

Three linear arrays with different sensitivities are offered to accommodate all clinical and research applications

Linear 5ive Array	Common Use	Standard Sensitivity Bias	High Sensitivity Bias
322-360	HDR brachytherapy, MammoSite	0.98 mV/cGy (for ¹⁹² Ir)	1.38 mV/cGy (for ¹⁹² Ir)
322-362	LDR brachytherapy	11.1 mV/cGy (for ¹²⁵ I)	15.2 mV/cGy (for ¹²⁵ I)
322-364	LDR brachytherapy, diagnostic x-rays	25.8 mV/cGy (for ¹²⁵ I)	37.2 mV/cGy (for ¹²⁵ I)

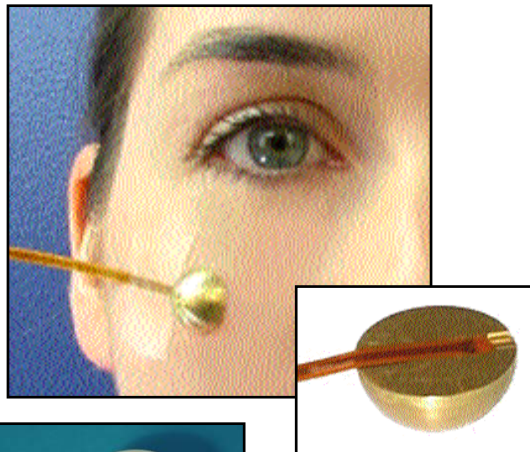
Note: sensitivities noted above are under full build-up (⁶⁰Co)

All of these arrays continue to yield dose reproducibility at standard sensitivity bias at 1 σ

Linear 5ive Array	20 cGy	200 cGy
322-360	< 2%	< 1.0%
322-362	< 2%	< 1.5%
322-364	< 2%	< 1.5%

Item #	Description
322-360	Linear 5ive MOSFET Array, Standard Sensitivity
322-362	Linear 5ive MOSFET Array, High Sensitivity
322-364	Linear 5ive MOSFET Array, Extreme Sensitivity

WIDE ENERGY HEMISPHERICAL BUILD-UP CAPS FOR MOSFET DOSIMETERS



Hemispherical Build-up Caps

MOSFET dosimeters have only 0.8 mm inherent build-up, which allows for flexibility in measuring surface dose as well as dose at Dmax. In order to measure dose at Dmax, build-up is required. This custom designed Build-up Cap for use with MOSFET Dosimeters allows for depth dose measurements over a wide range of energies.

Full Photon Range & 15 MeV - 18 MeV Electrons Brass Build-up Caps - 0.635 cm Radius

In order to maintain the isotropic characteristics of the MOSFET dosimeter ($\pm 2\%$ for 360°) and allow for one calibration factor for all energies and modalities, it is recommended that a hemispherical build-up cap be used. This small brass hemisphere is specially grooved for precise placement of the MOSFET and maintains the characteristics which distinguish these devices from other types of dosimeters.

The brass build-up cap is very lightweight (only 4g) and small (radius: 0.635 cm), which makes it ideal for placement on patients.

This build-up cap may be affixed to the MOSFET for the duration of its life, i.e. 200 doses. Using just one build-up cap for all Photons and some Electron energies makes the dosimeters easier to use.

Why Brass? Brass is a metal alloy containing mainly copper and zinc compounds. Due to its high density (8.5g/cm^3) and to its high Z number ($Z\sim 30$), it provides the minimal amount of metal needed to achieve full build-up at Dmax for a range of photon energies (4, 6, 10 and 18MV) and some electron energies (15-18MeV)* at a very practical size.

*Note: For low electron energies, it is suggested that no build-up is used. However, if desired, one can use the 1.5 cm radius tissue equivalent build-up cap.

MOSFET Correction Factors (CR) Under Brass Build-Up Caps

To directly correct for dose readings at Dmax, the system's software allows for Correction Factor (CR) values to be entered which then convert MOSFET response to dose.

These CRs vary between 0.8 and 1.1 and are Linac and calibration set-up dependent. They must be determined for any new MOSFET/Cap combination. These CRs may be stored in the system's software dose measurement template.

For example, two sets of CRs were obtained with a Siemens Mevatron Linac at 6 and 18MV photon energies, with a nominal dose of 200 cGy at Dmax in water and $10 \times 10 \text{ cm}^2$ field size (100 cm Source Axis Distance): See Below

Typical Correction Factors for Brass Build-up Caps:

- 6 MV Energy - Correction Factor "CR": 1.10
- 18 MV Energy - Correction Factor "CR": 0.84

Note: The Correction Factor "CR" is the value used in the system software, along with the Calibration Factor "CF" to convert MOSFET response to dose. (Please refer to Operators' Manuals for further details).

Tissue Equivalent Hemispherical Build-up Cap

These plastic water build-up caps come in sizes of 1.0 cm, 1.5 cm and 2.0 cm for various energies. The build-up caps have grooves specifically made for MOSFET dosimeters, allowing accurate measurements. A 3.0 cm build-up cap made of polystyrene is also available.

Handling and Cleaning

Brass build-up caps are easily attached to the MOSFET. Circular adhesive patches are provided with the caps to fasten the MOSFET dosimeter to the build-up cap for the duration of the lifetime of the dosimeter. The cap/MOSFET is then adhered to the patient's skin using paper tape.

Cleaning - use rubbing alcohol or alcohol swabs.

Custom Build-Up Caps

Build-up caps for MOSFET dosimeters can also be custom made per customers specifications.

Item #	Description
322-375	Brass Build-up Cap
322-377	1 cm Tissue Equivalent Build-up Cap
322-379	1.5 cm Tissue Equivalent Build-up Cap
322-381	2.0 cm Tissue Equivalent Build-up Cap
322-383	Set of 3 Tissue Equivalent Build-up Caps: 1, 1.5 & 2 cm
664-603	3.0 cm Tissue Equivalent Build-up Cap

MOSFET CALIBRATION JIG



Calibration jig shown with mobileMOSFET

- Quick and easy calibration
- Consistent positioning
- Reproducible calibrations
- Quick verification of beam flatness and symmetry
- Better degree of accuracy in high field gradients (IMRT)
- Allows for customization of build-up
- Surface entrance dose and radiology applications

The MOSFET Calibration Jig is designed for consistent and reproducible MOSFET calibration with a simple set-up configuration. The jig reference lines can be easily aligned with the positioning lasers and linear accelerator light fields for 10 x 10 cm, 20 x 20 cm, and 30 x 30 cm fields. The use of the jig promotes easy and consistent positioning at the beam isocenter and, thereby, reproducible calibrations.

The MOSFET placement indentations not only aid positioning, but also prevent accidentally damaging the MOSFETs with build-up material during calibration. The staggered positioning reduces the influence of scatter from adjacent MOSFETs and the symmetrical design allows comparison of opposing MOSFETs to each other, and quick verification of beam flatness and symmetry.

The relatively thin 1 cm thickness of the MOSFET Calibration Jig provides a moderate amount of backscatter, but is thin enough to permit customized irradiation set-up with additional backscatter and build-up materials.

Calibration with the mobileMOSFET Calibration Module Software
Calibration becomes even easier when the MOSFET Calibration Jig is combined with the mobileMOSFET Dose Verification System. The mobileMOSFET is completely software driven and contains a Calibration Module. The Calibration Module collects the calibration dose repetitions in a viewable pool of data. The software automatically calculates the Calibration Factor (CF), the average CF and the percent standard deviation for each MOSFET dosimeter. The CF data file can also be printed, saved, loaded, and edited.

Other Applications

In addition to calibration, the simplicity of the calibration jig lends itself to customized use in phantom-based measurements. The MOSFET arrangement can be used for dose measurement as a two-dimensional array that provides an inexpensive and quick validation of dose distribution. Due to the small active volume of the MOSFET ($2 \times 10^{-5} \text{ mm}^3$), there is limited dose averaging and therefore a better degree of accuracy in high field gradients. The standardized set-up geometry provides simple entry of positional data to treatment planning software, which can be compared to absolute MOSFET dosimeter measurements. The MOSFET dosimeters are also isotropic ($\pm 2\%$ for 360°) and have negligible energy dependence, which makes them an ideal dosimeter for IMRT validation.

Typically calibration measurements are done at D_{max} , but the MOSFET Calibration Jig places the dosimeters on the surface of the jig to allow for customization of build-up. With no build-up applied, the Calibration Jig can be used for entrance CF estimation during surface dose measurements in radiotherapy or radiology applications.

Specifications:

Material: Acrylic (PMMA)

Size: 11.8" x 11.8" x 0.4" (30 cm x 30 cm x 1 cm)

Field Sizes: 10 x 10 cm; 20 x 20 cm; 30 x 30 cm

MOSFET grooves: 5

Weight: 2.4 lb (1.07 kg)

Item #	Description
322-301	MOSFET Calibration Jig

MOSFET XWU-IMRT PHANTOM

Phantom for MOSFET Dosimeters & Superimposed Film / Ion Chamber



The XWU-IMRT Phantom is ideal for obtaining qualitative dose measurements for film and MOSFET dosimetry. This 20 x 20 cm block phantom houses film and a minimum of nine MOSFET dosimeters on two orthogonal planes. One of the planes,

containing five MOSFET detection points, is the dividing plane of the two sub-phantoms where a film is housed. Five absolute MOSFET dose points on the plane of the film provide dose verification. Easy to use cassettes come with pre-manufactured slots for the dosimeters and allow for greater versatility.

Advanced Applications: IMRT

Reliable and efficient MOSFETs are well suited for Quality Assurance in IMRT programs because they provide quantitative dose measurements. Due to their small size and excellent isotropic response, MOSFETs can be positioned in the XWU-IMRT Phantom for treatment planning QA of IMRT procedures. This can be done with single dosimeters or with the Linear 5ive Array, both in the phantom and on the patient.

Item #	Description
322-303	MOSFET XWU-IMRT Phantom

DIODES, DOSIMETERS & ELECTROMETERS

PORTABLE DOSIMETER FOR MOSFET DOSIMETERS



After every measurement the dosimetry data is automatically stored to memory for later viewing and can be downloaded to a computer via a USB connection and the PortableDose Connect software. A simple, menu driven interface allows customization of calibration factors, dose units and operational settings directly on the Portable Dosimeter. To save you time, a library of default calibration factors is stored in the memory, but the user also has the choice of entering their customized calibration factors.

For one-to-two dose points, the Portable dosimeter is a fast, simple solution for patient dosimetry that can be used for a wide range of applications in radiotherapy and radiology.

Supported MOSFET Dosimeters

All single MOSFETs* are supported by the Portable Dosimeter including, Standard and High Sensitivities, microMOSFETs, Heat shrink Reinforced, and Radio-opaque Marker dosimeters.

*Linear 5 Array is not supported.

Note: It is recommended that a Brass Build-up Cap (322-375) be included with this dosimeter. Order 322-375 Separately.

Item 322-370 Portable Dosimeter for MOSFET Dosimeters Includes

- Portable Dosimeter Reader Module
- PortableDose Connect Software
- USB Cable (PC-to-Reader connection)
- Medical Universal Power Adapter (to recharge Reader Module)
- (2) Standard Sensitivity Reinforced MOSFET Dosimeters
- (1) Brass Build-Up Cap
- Carrying Case

Specifications

Units: Gy, cGy, mGy, rad, mV

Internal clock: Time and date in 24 hour format

Bias settings: High and Standard for customized sensitivity

Batteries: Two AA batteries. Estimated battery life of more than 1 month

Rechargeable: Integrated recharging circuit for NiMH AA batteries

Software: PortableDose Connect software provides data download support with Windows 2000/XP/Vista

Resolution: 0.1 mV over an accumulated total of 20,000 mV

Linearity: ± 1 mV for the total 20,000 mV

Dose Range: Typically 20,000 cGy for standard sensitivity and 7,000 cGy for high sensitivity

- Stand-alone reader with LCD
- Portable and compact
- Quick set-up time
- Simple menu operation
- Supports two MOSFET dosimeters
- Supports all single MOSFETs
- Optional data export via USB and PortableDose Connect software
- Calibration factor library
- Long rechargeable battery life
- Manual measurement mode, or Automatic Sequential mode
- No software or computer necessary

Applications

Radiotherapy

- In vivo dose – photon or electron
- Skin entrance and exit dose (TBI)
- D_{max} dose measurements
- IMRT and Tomotherapy
- Brachytherapy

Radiology

- Pediatric CT dose
- Fluoroscopy dose

The Portable Dosimeter is an economical, compact, stand-alone system for radiation dose measurement. Patient dosimetry measurements are available at the touch of a button and display on the integrated LCD, without the need for software or a computer. Additionally, the rechargeable battery powered dosimeter allows easy transportation from room-to-room, or hospital-to-hospital.

The Portable Dosimeter supports up to two simultaneous dose points with any of the single MOSFETs on standard or high bias setting for optimal dose reproducibility. An automatic mode is available to continuously sample dose data at a fixed time interval during a session.

Dose Reproducibility (^{60}Co , 1 σ)

Dose	Bias Setting	
	High	Standard
200 cGy	<1%	<2%
20 cGy	<1%	<3%

Item	Description
322-370	Portable Dosimeter for MOSFET Dosimeters
322-375	Brass Build-Up Cap for MOSFET Diode

DIODES, DOSIMETERS & ELECTROMETERS

mobileMOSFET WIRELESS DOSE VERIFICATION SYSTEM



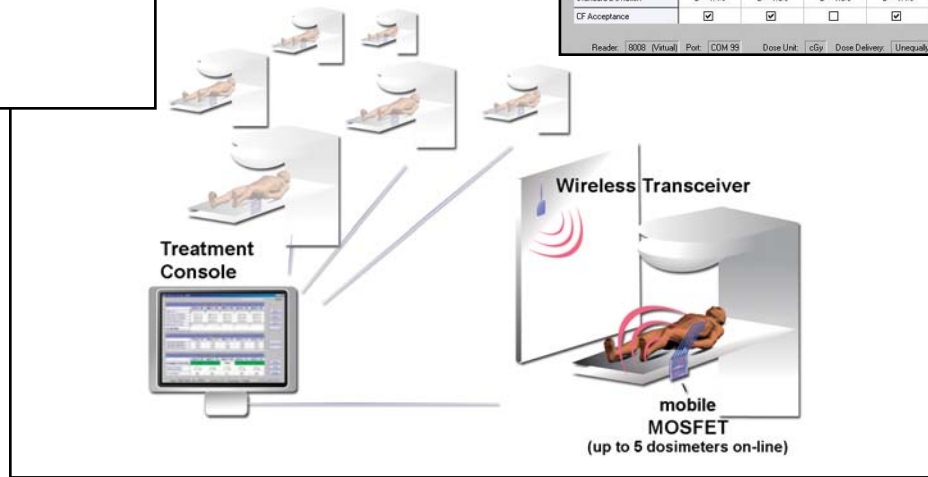
LabStation (Reader Setup) In Simulation Mode

Raw CF Measurement					
MOSFET ID	MOSFET #1	MOSFET #2	MOSFET #3	MOSFET #4	MOSFET #5
Start Value (10.49.00)	2441.41 mV	2440.47 mV	2435.51 mV	2446.86 mV	2434.08 mV
Read Value (10.49.05)	2643.68 mV	2647.42 mV	2645.31 mV	2649.30 mV	2639.42 mV
Read Start Difference	202.27 mV	206.95 mV	209.80 mV	202.44 mV	205.34 mV
Delivered Dose (cGy)					
CF (mV/cGy)					

Raw CF Pool					
MOSFET #1	MOSFET #2	MOSFET #3	MOSFET #4	MOSFET #5	
14/07/04 10:48:45 AM	18.45	18.75	18.77	18.42	18.44
14/07/04 10:48:30 AM	19.06	18.97	18.23	19.05	18.51
14/07/04 10:48:11 AM	18.89	18.19	18.87	18.92	18.83

Final CF (Averaged from Pool)					
MOSFET #1	MOSFET #2	MOSFET #3	MOSFET #4	MOSFET #5	
Averaged CF (mV/cGy)	18.90	18.64	18.62	18.90	18.59
Raw CF Count and Standard Deviation	N = 3 D = 1.4%	N = 3 D = 1.8%	N = 3 D = 1.5%	N = 3 D = 1.4%	N = 3 D = 0.9%
CF Acceptance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Reader: 8008 (Virtual) Port: COM 99 Dose Unit: cGy Dose Delivery: Unequally mobileMOSFET



On-line Wireless Dosimetry

The mobileMOSFET Dose Verification System takes MOSFET Dosimetry to the next level. The mobileMOSFET is an easy to use, seamlessly integrated system, that minimizes dosimetry and QA time.

This wireless system is entirely software driven, allowing for complete control of one or more systems from a remote PC. The system consists of Remote Monitoring Dose Verification Software, wall-mounted Bluetooth™ Wireless Transceiver and a small Reader Module acting as a channel between the MOSFET and software. Up to five MOSFETs or one Linear 5ive Array can be plugged into one module. This provides easy mobility within the treatment room. The PC is on-line with the Reader Module and dose is obtained in real-time.

Applications

- Routine In-vivo Dosimetry
- 1-2 Fields / Patient starts
- First Dose; Treatment Plan Verification
- IMRT QA and Phantom Work
- Brachytherapy
- IGRT / Tomotherapy
- Radiology
- Intracavitary Measurement

Dose Points

- 1 - 5 on-line
(Up to 40 on-line with additional Reader Modules and transceivers)

Software Features

- Interactive, 2-way on-line communication between a PC and the Reader Module

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- Dose obtained in real-time
- Performs all dose data measurements with a few mouse clicks
- Calibration feature enables quick and easy calibration of the MOSFETs
- Capability to assign Calibration Factors, Correction Factors and Target Dose to each MOSFET. Final dose and percent deviation from target are automatically calculated
- Export to Excel™
- Set interval read times to sample multiple doses during treatment (automatic or manual control)
- With multiple systems and transceivers, one PC can read MOSFETs in multiple treatment rooms simultaneously
- Patient records can be saved, imported, and/or printed and are password checked

The MOSFET Dosimeter

- One dosimeter/calibration factor for all photon/electron modalities
- Isotropic (± 2% for 360°)
- Active region of 0.2 x 0.2 mm
- Permits pinpoint measurement without patient shielding
- Dose-rate and temperature independent
- Lightweight and flexible
- Multiple dosimeter capability with one Reader
- Standard MOSFET is 2.5 mm wide
- microMOSFET is 1 mm wide
- Linear 5ive Array - 5 dose points on one flex

Wireless Room Expansion Package

Your mobileMOSFET system with Bluetooth™ can easily be used in multiple rooms with the installation of Wireless Room Expansion Packages. The package is also compatible with previously installed mobileMOSFET wireless dosimetry systems.

DIODES, DOSIMETERS & ELECTROMETERS

Hardware Features

- Bluetooth™ transceiver (wall mounted)
- Reader Module (17.8 cm x 15.9 cm x 4.2 cm)
- Wireless (up to 10 meters), portable and mobile
- Contains reader, Bluetooth™ transceiver, dual bias supply settings (high and standard), ports for 5 MOSFETs and a port for 1 Linear 5ive Array
- One Reader Module can be used for 1-5 MOSFETs or one Linear 5ive Array
- Battery Operated (Rechargeable; >20 hours of typical use)
- Built-in smart charger (<3 hours)
- Software supports up to 8 readers and 40 MOSFETs simultaneously
- Portability between multiple treatment rooms

MOSFET Sensitivity

Under Full Build-Up: 1 mV/cGy on standard bias
2.7 mV/cGy on high sensitivity bias

Under X-Ray Energies: 9 mV/R on high sensitivity bias

Dose	BIAS SUPPLY	
	Standard	High
200 cGy	<2%	<0.8%
100 cGy	<3%	<1.2%
20 cGy	<8%	<3%

System Dose-to-Dose Reproducibility at 1 σ

Item #	mobileMOSFET	Software	Dose Points	Reader Modules	Bluetooth™ Connection
322-349	Wired	*	5	1	
322-350	Wireless	*	5	1	*
322-351	X Wireless	*	10	2	*
322-352	XX Wireless	*	20	4	*

mobileMOSFET Component Details

Item 322-349 mobileMOSFET Wired Dosimetry System

The system is entirely software driven allowing for complete control of the system and paperless recording of patient dose data. The Reader module is directly connected to the PC with a 50' (15 m) cable that can be extended up to 150' (45 m) for five simultaneous dose points.

System Components Include:

- mobileMOSFET Remote Monitoring Dose Verification Software - Includes: two (2) years of software support/upgrades, one (1) license (additional licenses available) and one (1) USB-to-Serial Converter
- Reader Module (bias, battery, 5 ports for single MOSFETs dosimeters and one port for the Linear 5ive Array, 5 dose points.)
- 50' (15 m) RS-232 Extension Cable (PC to Reader connection)
- Universal power adapter for recharging the Reader Module
- (5) Standard Sensitivity Reinforced MOSFET Dosimeters

Item 322-350 mobileMOSFET Wireless Dosimetry System (5 Dose Points, 1 Reader Module)

A wireless Bluetooth™ connection allows for complete control of the system from a remote PC outside the treatment room and eliminates cables running across the floor. Additional Bluetooth™ transceivers expand the use of the system to more treatment rooms.

System Components Include:

- mobileMOSFET Remote Monitoring Dose Verification Software - Includes: two (2) years of software support/upgrades, one (1) license (additional licenses available) and one (1) USB-to-Serial Converter
- Reader Module (wireless transceiver, bias, battery, 5 ports for single MOSFETs dosimeters and one port for the Linear 5ive Array, 5 dose points.)
- 50' (15 m) RS-232 Extension Cable (Transceiver extension, PC to Reader connection)

- Universal power adapter for recharging the Reader Module
- (5) Standard Sensitivity Reinforced MOSFET Dosimeters
- Bluetooth™ wireless transceiver (external/wall mounted) and a 6' (2 m) cable
- Carrying Case
- Calibration Jig (acrylic, 30cm x 30cm x 1cm, MOSFET grooves)
- (2) Hemispherical brass build-up caps (0.63cm radius, photons)

Item 322-351 mobileMOSFET X Wireless Dosimetry System (10 Dose Points, 2 Reader Modules)

The standard mobileMOSFET system is expanded to ten dose points by the addition of a second Reader module. Both Readers are controlled from the same PC through a single Bluetooth™ wireless transceiver. Additional Bluetooth™ transceivers expand the use of the system to more treatment rooms.

System Components Include:

- mobileMOSFET Remote Monitoring Dose Verification Software - Includes: two (2) years of software support/upgrades, one (1) license (additional licenses available) and one (1) USB-to-Serial Converter
- (2) Reader Modules (wireless transceiver, bias, battery, 5 ports for single MOSFETs dosimeters and one port for the Linear 5ive Array, 5 dose points.)
- 50' (15 m) RS-232 Extension Cable (Transceiver extension, PC to Reader connection)
- (2) Universal power adapters for recharging the Reader Module
- (10) Standard Sensitivity Reinforced MOSFET Dosimeters
- Bluetooth™ wireless transceiver (external/wall mounted) and a 6' (2 m) cable
- Calibration Jig (acrylic, 30cm x 30cm x 1cm, MOSFET grooves)
- (2) Hemispherical brass build-up caps (0.63cm radius, photons)

Item 322-352 mobileMOSFET XX Wireless Dosimetry System (20 Dose Points, Four Reader Modules)

The standard mobileMOSFET system is expanded to twenty dose points by the addition of more Reader Modules. All four Readers

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are controlled from the same PC through a single Bluetooth™ transceiver. The system can accommodate up to eight (8) Reader Modules simultaneously for a total of forty (40) dose points.

System Components Include:

- mobileMOSFET Remote Monitoring Dose Verification Software - Includes: two (2) years of software support/upgrades, one (1) license (additional licenses available) and one (1) USB-to-Serial Converter
- (4) Reader Modules (wireless transceiver, bias, battery, 5 ports for single MOSFETs dosimeters and one port for the Linear 5ive Array, 5 dose points.)
- 50' (15 m) RS-232 Extension Cable (Transceiver extension, PC to Reader connection)
- (4) Universal power adapters for recharging the Reader Modules
- (20) Standard Sensitivity Reinforced MOSFET Dosimeters
- Bluetooth™ wireless transceiver (external/wall mounted) and 6' (2 m) cable
- Calibration Jig (acrylic, 30cm x 30cm x 1cm, MOSFET grooves)
- (2) Hemispherical brass build-up caps (0.63cm radius, photons)

Wireless Room Expansion Packages

- **Item 322-353 One Additional Room**
- **Item 322-354 Two Additional Rooms**
- **Item 322-355 Three Additional Rooms**

The mobileMOSFET Reader Module can easily be shared with an additional room by the installation of a wireless room expansion package.

Package Components Include:

- Bluetooth™ wireless transceiver (external/wall mounted) and 6' (2 m) cable
- 50' (15 m) RS-232 Extension Cable (Transceiver cable extension, PC to Reader connection)
- Additional single user software license

Item #	mobileMOSFET
322-349	Wired Dosimetry System, 5 Dose points
322-350	Wireless Dosimetry System, 5 dose points
322-351	X Wireless Dosimetry System, 10 dose pts
322-352	XX Wireless Dosimetry System, 20 dose pts
322-353	Wireless Room Expansion Pkg, 1 Add'l Rm
322-354	Wireless Room Expansion Pkg, 2 Add'l Rms
322-355	Wireless Room Expansion Pkg, 3 Add'l Rms
322-356	50' (15 m) RS-232 Extension Cable

Item 322-356 Additional Cable

- 50' (15 m) RS-232 Extension Cable (PC to Reader connection)

Item 322-357 Single User mobileMOSFET Software License

- Includes two years of software support and upgrades

Item 322-358 mobileMOSFET Software License for 2-9 Users

- License for software installation on 2 to 9 PC workstations

Item 322-359 mobileMOSFET Software License for 10+ Users

- License for software installation on 10 or more PC workstations

Item 322-365 Carrying Case

- Padded, cloth, laptop style carrying case for transporting your equipment (Black)

Item 322-366 Additional Reader Module

Includes a universal power adapter.

Item 322-367 Additional USB-to-Serial Converter

one (1) included with system.

Item 322-384 Optional mobileMOSFET Extended Warranty

The extended warranty is available for all new system purchases. Price is per year, per Reader module and is available for up to two (2) extra years (total of three years coverage). Terms and conditions are as per the original warranty, excluding dosimeters and batteries.

Item 322-385 Optional mobileMOSFET Service Contract

The service contract is under the same terms as the warranty, with the additional option to return the system once a year for annual maintenance. The service contract is available up to five (5) years from the time of purchase and covers parts and labor as per the original warranty, excluding dosimeters and batteries. Volume discounts for multiple Reader Modules are available.

Item #	mobileMOSFET
322-357	Additional Software License, Single user
322-358	Additional Software License, 2 to 9 users
322-359	Additional Software License, 10+ users
322-365	Carrying Case, Black
322-366	Additional Reader Module
322-367	Additional USB-to-Serial-Converter
322-384	Extended Warranty (Per Year)
322-385	Service Contract (Per Year)

DIODES, DOSIMETERS & ELECTROMETERS

UNIDOSE webline UNIVERSAL DOSIMETER



The ethernet interface based on the TCP/IP protocol allows to integrate the UNIDOS webline in a LAN for remote access and e-mail capability. Its big, user-configurable TFT display guaranties visibility from wide angles. A comprehensive chamber

library makes it possible to store the calibration data of the chambers. Air density corrections are done by keying in air pressure and temperature, ir by means of radioactive check devices. The check device data are stored in a database. An internal clock calculates the decay of the isotope radioactivity. It features both means and battery operation. The delivery includes a manual in English.

The new UNIDOS webline differs from previously known dosimeters with its completely new operating concept and network capability.

The simple and clear user-prompting with help texts and a navigation button make operating instructions almost superfluous. Every function can be set quickly and easily, and every setting option is explained by help texts. Menu-prompting is in the selected language. The measurement values are also clearly readable at greater distances. In addition to simultaneous display of dose and dose rate, all selected detector settings are shown. The bright color display can be configured according to user requirements.

UNIDOS webline has a relay output, an RS-232 interface and a TCP/IP interface. The dosimeter can be integrated into a network via the TCP/IP interface. UNIDOS webline can be operated remotely from any PC in a network using a VNC client. The complete user interface is displayed on the networked PC. As a result, measurements can be started, measurement results retrieved and settings changed conveniently from a workstation. The dosimeter can send an alarm via e-mails if the set dose or dose rate threshold is exceeded. In addition, comprehensive status and service functions can be queried per e-mail. This makes remote maintenance possible.

UNIDOS webline exceeds the requirements for a reference class dosimeter according to IEC 60731 as well as the requirements according to the IPEM Secondary Standard. The resolution for 1 fA / 10 fC.

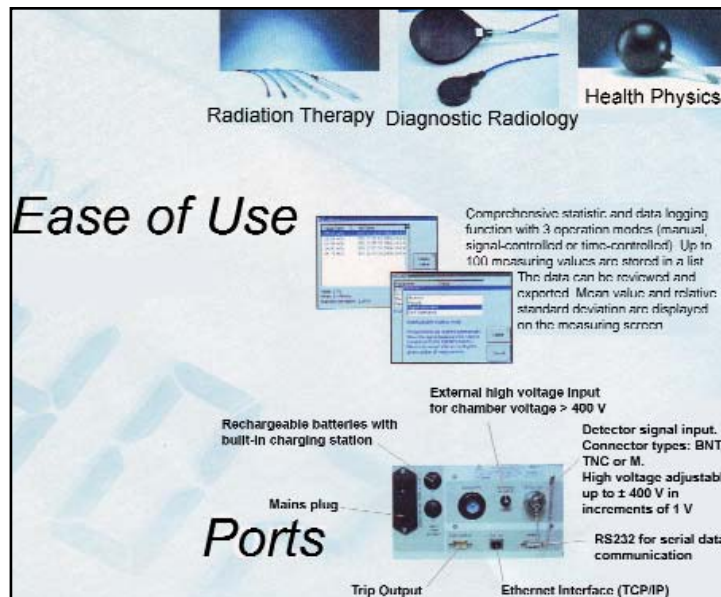
Classification

Highest classification in all applications (radiation therapy, diagnostic radiology, health physics).

Surpasses the requirements for reference class dosimeters according to IEC 60731, the IPEM secondary standard dosimeter guidelines, IEC 61674 for diagnostic radiology and IEC 60846 for health physics.

High performance secondary standard and reference class dosimeter/electrometer with integrated network features.

- High quality reference class dosimeter for radiation therapy, diagnostic radiology and radiation protection.
- Integration in a LAN with the internet standard TCP/IP
- Remote access functionality
- E-mail capability, eg. to initiate self tests and to send a status report
- Active, configurable TFT display with wide viewing angles
- Easy and fast menu-driven handling with navigation knob and help system



Specifications:

Type of Product: High precision dosimeter according to IEC 60731, IEC 61674 and IEC 60846

Application: Dose and dose rate measurements (charge and current measurements) in radiation therapy, X-ray diagnostics and radiation protection/

Measuring Quantities/Units: Absorbed dose to water (Gy), Air Kerma (Gy), Photon equivalent dose (Sv), Ambient dose equivalent H*(10), Exposure (R), Dose length product (Gy-cm), Activity (Bq), (Ci), Corresponding rates of before mentioned- Charge (C), Current (A).

Measuring Ranges:

Charge: 2 pC...8.991 C
Current: 200 fA...2.5µA

Resolution:

Charge: 10 fC
Current: 1 fA

Long-term Stability: < ± 0.1 % p.a.

Non-linearity: < ± 0.25 % according to IEC

Interval Time: (1...9999) s

Temperature Range: (10...40)°C, (50...104)°F

Relative Humidity: (20...80)%, max 20 g/m

Leakage Current: < ± 1 fA

Amplifier Zeroing: automatically within approx. 75 s

Chamber Voltage: (0...± 400) V in 1 V increments

Interfaces: IEEE802 (TCP/IP), RS232

Power Supply: (85...265) VAC, (50...60) Hz resp. rechargeable batteries AA (NiMH)

Dimensions: 152 mm x 257 mm x 262 mm

(H xW xD) 5.98 in x 10.12 in x 10.31 in

Weight: Approx. 5.9 kg, 13.0 lbs

Item #	Description
321-015	UNIDOS webline Universal Dosimeter
321-024	Carrying Case for UNIDOS webline

DIODES, DOSIMETERS & ELECTROMETERS

IVD 2 / rf-IVD 2 DOSE MONITORING SYSTEMS



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- Simple to install and easy to use
- Automatic patient temperature compensation
- Real-time wireless available (rf-IVD 2), safely keep cables off the treatment floor
- Use with Control Module or PC Software
- Patient database and correction factor tools
- Accuracy and reliability proven worldwide

Hardware

- Choose four (wired) or eight (wireless) input channels
Expand to 52 inputs for TBI
- Programmable Control Module
- Use with industry standard re-usable detector options
QED - flat for easy patient placement
ISORAD - cylindrical for isotropic response

IVD 2

- Real-time wired operation
- Four standard channels, Expandable to 52
- Standard Control Module and PC Software

rf-IVD 2 Adds

- Wireless operation, No cables on treatment floor
- Eight standard channels

Control Module

- PC not required
- Takes up less space, Wall mountable

PC Software Adds

- Patient database
- Automatic correction factors
- Record and Verify interface
- Additional measurement options

Software

- Networkable patient database for storing results
- Programmable templates
- 'Single Measurement' and 'Patient Measurement' mode, For multiple fraction dose recording
- Expected vs measured dose difference and visual indicator
- Automatically apply selected correction factors
- Password protection
- Electronic signatures
- Record & Verify (R&V) interface links

Patient Measurement

- Start/Stop measurement buttons
- Channel results
- Measured, expected dose and percent difference
- Option to change SSD prior to measurement
- Accept or reject collected measurement
- Select patient, fraction and field

Patient Database

- Database edit toolbar
- Patient specific tests
- Measurement results per channel (up to 52)
- Correction factors applied per test

Correction Factors

- Correction factor type
- Instructions for setting up correction factor
- Currently selected correction factor

Pods

Channels:

Standard: 4 (IVD 2), 8 (rf-IVD 2)
Maximum: 52

Temperature Compensation:

Automatic within 0.1°C (Neg. polarity only)

Repeatability: ±0.2% or ±0.1cGy

Polarity: Bipolar (negative or positive polarity detectors)

Leakage: Automatic compensation

Calibration: User calibrated

Warm-up time: < 30 seconds

Wireless frequency (MHz):

rf-IVD 2: USA 916.5, EU 433.92
IVD 2: N/A

Power: rf-IVD 2: Rechargeable NiMH battery (12 hr)

IVD 2: Power supply

Dimensions: 2.8" x 4.7" x 1.2" (7 x 12 x 3 cm)

Weight: 12 oz (0.34 kg)

Control Module

Display Range: 0 to 99.999 Gy; 0 to 9999.9 cGy; 0 to 9999.9 R

Display: LCD, 2 line, 16 characters/line

Power: Medical power supply operating on 100-240 VAC, 47-63Hz mains, providing 18 VDC output

Size: 5.5" x 6.3" x 1.4" (14 x 16 x 3.5 cm)

Weight: 1.7 lb (0.78 kg)

Item 322-133 rf-IVD 2 Wireless Dose Monitoring System and Item 322-135 IVD 2 Wired Dose Monitoring System Includes

Control Module: Standard

PC Software: Standard

Number of Pods: IVD 2: One (four channels)

rf-IVD 2: Two (eight channels)

Wall mounted charging cradle: Standard

Item #	Description
322-133	rf-IVD 2 Wireless Dose Monitoring System
322-134	Additional Detector Pod for rf-IVD 2, 4 channel pod
322-143	Printer for rf-IVD 2 (322-133)
322-135	IVD 2 Wired Dose Monitoring System
322-136	Additional Detector Pod of IVD 2, 4 channel pod
322-140	Printer for IVD 2 (322-135)