

# Advanced Therapy Dosimeter

Model 35040



## Introduction

The Model 35040 Advanced Therapy Dosimeter (ATD) 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 Advanced Therapy Dosimeter exceeds the recommendations of calibration laboratories for leakage, linearity, and stability by a wide margin. This instrument raises the standard of Radiation Therapy measurements.

## Applications

Radiation Therapy requires great accuracy in the measurement of dose and dose rate values associated with linear accelerators and radioactive sources. The Model 35040 Advanced Therapy Dosimeter provides the long-term stability and accuracy demanded for calibrations, quality assurance programs, and protocols in Radiation Therapy. A unique electrometer design provides more accuracy than high meg resistor or capacitor feedback electrometers.

The Advanced Therapy Dosimeter is fully stable within five minutes, a fraction of the time of conventional dosimeters. The flexibility of the instrument optimizes user efficiency and saves time. 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  $^{60}\text{Co}$  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 chamber factors, 11 bias voltages can be programmed. It is PC compatible and connects via a RS-232 cable.

- 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 to + 500 V
- Read out in C, A, R, Gy, Sv, Bq and more

## Features

- Wide measurement range, up to 1.000  $\mu\text{A}$  and 19.999 mC for HDR Brachytherapy applications
- Automatic reset and hold of measured values 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
- Optional carrying case (Model 37780)

## Front Panel Features

- **Power On/Off key** All front panel settings are stored at power-down and recalled at power-up
- **Test Function key** Sequence of screens to display firmware revision, last calibration date, leakage and current, bias voltage and battery voltage level, and charge and current calibration factors, and times settings
- **Detector Select key** User selection of one of 32 user-programmed ion chamber calibration factors with descriptive text, units, and calibration factors
- **Air Density key** User entry of ambient temperature and pressure; displays calculated air density corrections; symbol appears on screen when air density correction is active
- **Units Select key** User selection of rate measurement time base (s, min, and hr)
- **Bias Select key** User selection of one of 11 user-programmed ion chamber bias voltage settings from - 500 to + 500 V; displays measured output bias voltage
- **Reset/Measure key** Displays measurement screen; resets displayed charge and dose measurement values to zero, re-initializes the measurement system, and starts/stops the time dose measurement. Up and down arrows select one of 16 user-designed measurement screens
- **4-line by 20-character vacuum fluorescent display** Provides excellent visibility in all lighting conditions

## 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 $\mu$ C	0.0001 $\mu$ C	1.000 $\mu$ A	0.001 $\mu$ A
20.000 $\mu$ C	0.001 $\mu$ C		
200.00 $\mu$ C	0.01 $\mu$ C		
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 hr 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** 64° to 82°F (18° to 28°C); charge  $\pm$  (0.20% reading plus two counts); current  $\pm$  (0.20% reading plus two counts)

**Bias** Eleven user-programmable steps from - 500 to + 500 V in 0.1 volt increments; accuracy  $\pm$  0.3 V for loads < 0.2 mA; front panel selectable

**Ion chamber calibration factors** Thirty-two user-programmable calibration factors; front panel selectable

**Display units** All practical radiation and electrical units

**RS-232 computer configuration** For customizing and data transfer

**Power requirements** Internal lead acid battery; Integral charger operates 100 to 240 VAC (47 to 63 Hz)

**Connectors** Triax BNC front/rear 35040; Triax TNC front/rear 35040TNC

**Dimensions** 9.4 (w) x 10 (d) x 4 in (h) (21.6 x 26 x 8.9 cm)

**Weight** 10 lb (4.6 kg)

### Optional accessories

**Carrying Case** (Model 37780)

**Extension Cable, 20 ft, Triax BNC to BNC** (Model 86120)

**Adapter, Triax BNC plug to TNC jack** (Model 500-111)

### External chamber accessories

**Farmer-Type Radiation Therapy Waterproof Ionization Chamber** (Model 580-006-WP)

**Semiflex™ Ionization Chamber, 0.125 cm<sup>3</sup>, Waterproof** (Model 30-344)

**Semiflex™ Ionization Chamber, 0.3 cm<sup>3</sup>, Waterproof** (Model 30-316)

**PinPoint™ Ionization Chamber, 0.015 cm<sup>3</sup>, Waterproof** (Model 30-353)

**Roos™ Electron Ionization Chamber, 0.35 cm<sup>3</sup>, Waterproof** (Model 30-332)

**Advanced Markus™ Electron Ionization Chamber, 0.02 cm<sup>3</sup>, Waterproof** (Model 30-353)

### Available model(s)

**35040** Advanced Therapy Dosimeter

**35040TNC** Advanced Therapy Dosimeter, TNC option

For more information, receive our full product catalog, or order online, contact **Radiation Management Services** business of **Fluke Biomedical**: 440.248.9300 or [www.flukebiomedical.com/rms](http://www.flukebiomedical.com/rms).

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35040-ds Rev 4 20 sept 05