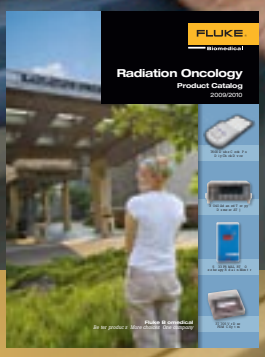
FLUKE®

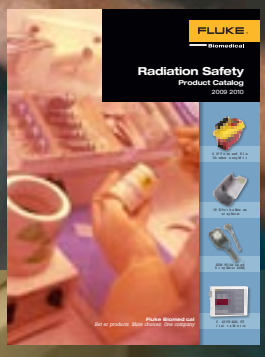
Biomedical

Featured products

Highlights from the Fluke Biomedical digital catalog

2009/2010





Fluke Biomedical.
Better products. More choices. One company.

Featured Products Catalog

2009/2010

FLUKE®
Biomedical

Providing solutions, not just products
Today, biomeds, physicists, RSO's, other medical personnel must meet increasing regulatory pressures, higher quality standards, and rapid technological growth, while performing their work faster and more efficiently than ever. Fluke Biomedical provides a diverse range of software and hardware tools to meet today's challenges.

Service
Fluke Biomedical is dedicated to providing the best service within the healthcare industry. Equipped with the best-credentialed facilities, onsite experts, and full asset-management capabilities, Fluke Biomedical's service team is always on call to take care of its customers. Fluke Biomedical's world-class staff leads the industry in post- and pre-sale support, including helping customers choose the best products and accessories for their needs, technical support, product calibration, and repairs.

Regulatory compliance
Fluke Biomedical's benchmark quality operates to the most rigorous standards in the industry, including compliance with ISO 9001:2000, ISO 13485:2003, FDA/QSR as applicable, and NRC/Part 50, Appendix B/Part 21 and adheres to ISO 17025:2005, ANSI Z540, Mammography MQSA and CNSC. Many of the Fluke Biomedical products are CE-marked and CSA-certified. In addition, the Global Calibration Laboratory holds its NVLAP Lab Code 200566-0 certification and is traceable to both the NIST & PTB.

Legacy
You may be familiar with some of our legacy brand names, including:

- Victoreen®
- Nuclear Associates
- Keithley
- Metron
- DNI Nevada
- Bio-Tek Instruments

Fluke Biomedical has taken the best elements and products of these former brands and has incorporated them into the Fluke Biomedical culture and product line available today.

Our newest catalogs
Our four comprehensive digital catalogs are available on CD-ROM and are also available electronically on the Fluke Biomedical website. For more information about any of Fluke Biomedical's products and services, visit our website at www.flukebiomedical.com.

Comprehensive digital catalogs are available for the following product lines:

- Biomedical Test
- Diagnostic Imaging QA
- Radiation Safety
- Radiation Oncology QA

About Fluke Biomedical

Fluke Biomedical leads the world in the manufacture of biomedical test and simulation products, including standalone electrical safety testers to fully integrated and automated performance testing and documentation systems. Fluke Biomedical also provides some of the most trusted and accurate radiation safety, medical imaging, and oncology quality-assurance solutions for regulatory compliance.

About Fluke Corporation

Fluke Biomedical is a division of Fluke Corporation. Fluke Corporation is the world leader in the manufacture, distribution, and service of electronic test tools and software and is a wholly owned subsidiary of Danaher Corporation (NYSE:DHR).

Featured Products Catalog

FLUKE® Biomedical

Contents

Browse our featured products in this selection:

For a complete listing of Fluke Biomedical products and services, please view our four digital catalogs on the attached CD-ROM. See pages 53-55 for a complete listing of each catalog's table of contents.

Fluke Biomedical
6045 Cochran Road
Cleveland, OH 44139-3303 U.S.A.

Fluke Biomedical Europe
Science Park Eindhoven 5110
5692EC Son, The Netherlands

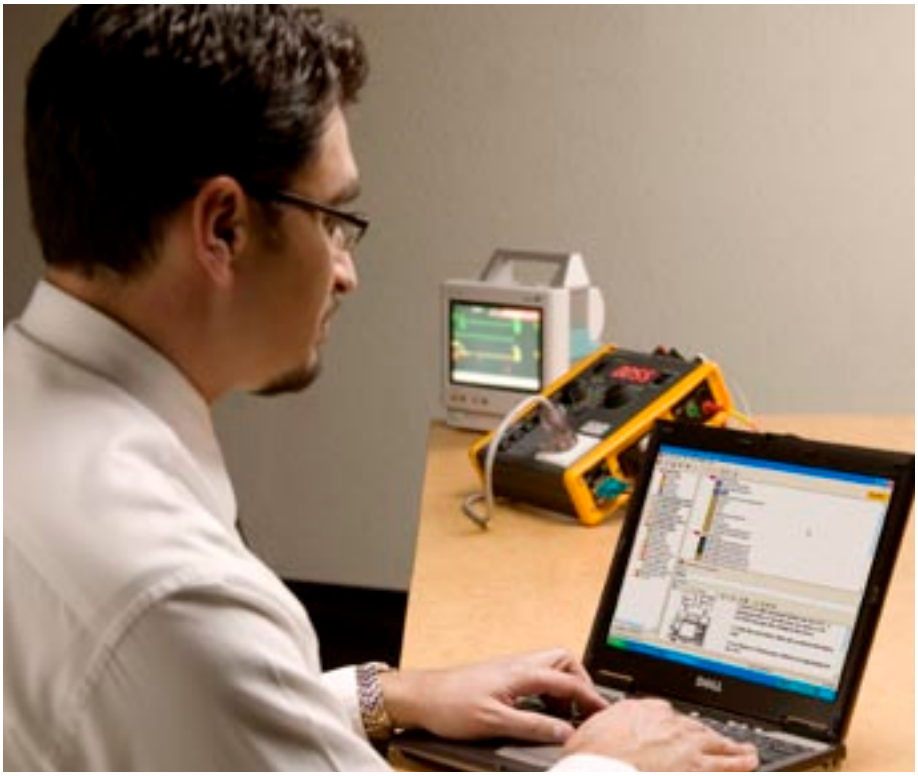
For more information, contact us
In the U.S.A. (800) 850-4608 or
Fax (440) 349-2307
In Europe/M-East/Africa
+31 40 267 5435 or
Fax +31 40 267 5436
From other countries
+1 (440) 248-9300 or
Fax +1 (440) 349-2307
Email:
sales@flukebiomedical.com
Web access:
www.flukebiomedical.com

Service Center/Repair/ Calibration US
Fluke Biomedical
6045 Cochran Road
Cleveland OH 44139-3303
Tel: 440-498-2560
Toll free: 800-850-4608 ext 2564
Email:
globalcal@flukebiomedical.com

Service Center/Repair/ Calibration Europe
Fluke Biomedical Europe
Science Park Eindhoven 5110
5692EC Son, The Netherlands
Tel: +31 (40) 267 5435
Fax: +31 (40) 267 5436
Email: servicedesk@fluke.nl

Ansur

Test Automation Software



Key features

- General framework software for performing all types of tests and inspections
- Remote control of Fluke Biomedical testers, and acquisition of test results via RS-232
- Manual/visual tests, performance tests, and electrical-safety tests all executed in one procedure
- Test-procedure and test-result files stored in industry-standard XML format
- Interface capability with some equipment management systems and computerized maintenance management systems
- Ready-to-use or customized test templates make creating standard work easy
- Compatible with a variety of test instruments by Fluke Biomedical for easy standardization

How well do your PM Inspection and post-repair performance-testing processes eliminate sources of human error?

Wish that all technicians woulddocument results the same way?

Do you have enough time to complete all PM Inspection and repair work on your shelf?

Ansur offers a solution:

Repeatability—Creates standard work since everyone tests the same way every time

Quality—Can automatically configure and collect data from the compatible test devices to minimize human error and save time

Productivity—Ensure that the amountof time required to perform testing is uniform and therefore predictable

Ansur test automation system collects all the observe-and-record manual entries as well as automated measurements from compatible simulators and performance analyzers from Fluke Biomedical.

Automate with Ansur

Look for this logo in the Fluke Biomedical product catalog to see where test automation can benefit you.

Specifications

PC requirements	64 MB RAM
	50 MB unused hard drive space for software
	IBM PC/XT compatible Pentium 266 MHz or faster processor
	Hard drive space for result and template files
	32-bit Microsoft Windows® operating system (2000/XP/Vista)
	RS-232 ports or USB-RS-232 adapter
Other requirements	License key for each Fluke Biomedical or Metron simulator/analyzer plug-in (accesses full functionality of Ansur and its plug-ins)
	One or more Ansur-compatible Fluke Biomedical or Metron simulators/ analyzers (ensures best results for minimizing human error and opportunity for best productivity)

Ansur

Test Automation Software

FLUKE® Biomedical

"We used Ansur to create test sequences that match service manual procedures so every inspection is done the same way every time. We improved quality and uniformity by creating standard work."

-Robert Dorrian, TBS U.K. Telematic & Biomedical Services Ltd. Hope Hospital

Ordering information

2462982 Ansur Test Executive

Plug-ins available: Purchase the modules you need, and then add modules as you acquire new Fluke Biomedical analyzers and simulators.

2755836 BP Pump 2
2556755 ESA601
3454829 ESA612
3116463 ESA620
2817641 Impulse 4000
3091370 Impulse 6000D/7000DP
2461775 QA-40M/45
2463016 QA-90
2462644 QA-1290
2461802 QA-ES
2461979 QA-IDS/lagu
2463002 QA-ST
2462024 QA-VTM
2817226 QED 6
3337356 TNT 12000

Test Automation Bundles available: Purchase modules along with the Fluke Biomedical instrument of choice

3334821 BP Pump 2L NIBP, US 120V w/Test Automation
3334839 BP Pump 2l NIBP, AUS 250V w/Test Automation
3334842 BP Pump 2L NIBP, DEN 250V w/Test Automation
3334856 BP Pump 2L NIBP, SHK 250V w/Test Automation
3334863 BP Pump 2L NIBP, ISR 250V w/Test Automation
3334874 BP Pump 2L NIBP, ITAL 250V w/Test Automation
3334888 BP Pump 2L NIBP, IND 250V w/Test Automation
3334895 BP Pump 2L NIBP, SWZ 250V w/Test Automation
3334901 BP Pump 2L NIBP, UK 250V w/Test Automation
3334912 BP Pump 2M NIBP, US 120V w/Test Automation
3334920 BP Pump 2M NIBP, AUS 250V w/Test Automation
3334935 BP Pump 2M NIBP, DEN 250V w/Test Automation
3334947 BP Pump 2M NIBP, SHK 250V w/Test Automation
3334958 BP Pump 2M NIBP, ISR 250V w/Test Automation
3334964 BP Pump 2M NIBP, ITAL 250V w/Test Automation
3334973 BP Pump 2M NIBP, IND 250V w/Test Automation
3334986 BP Pump 2M NIBP, SWZ 250V w/Test Automation
3334999 BP Pump 2M NIBP, UK 250V w/Test Automation
3334732 ESA601, 230V AUS w/ Test Automation
3334744 ESA601, DEU 230V SHK w/Test Automation
3334759 ESA601, FRA 230V SHK w/Test Automation
3334767 ESA601, ITA 230V SHK w/Test Automation
3334771 ESA601, ISR 230V w/ Test Automation
3334780 ESA601, 230V SHK w/ Test Automation
3334798 ESA601, 230V UK w/ Test Automation
3334800 ESA601, 115V IEC w/ Test Automation
3334817 ESA601, 115 AAMI w/ Test Automation
3460932 ESA612, US 115 V w/ Test Automation
3460959 ESA612, EUR 230 V w/ Test Automation
3460944 ESA612, FR 230 V w/ Test Automation
3460967 ESA612, ISR 230 V w/ Test Automation
3460971 ESA612, AUS 230V w/ Test Automation
3460980 ESA612, UK 230 V w/ Test Automation
3460998 ESA612, SWI 230V w/ Test Automation
3461001 ESA612, THAI 230V w/ Test Automation
3462285 ESA612, JPN 230V w/ Test Automation
3326935 ESA620, US 115V 20A w/Test Automation
3326947 ESA620, EUR 230V w/ Test Automation
3326958 ESA620, FR 230V w/ Test Automation
3326964 ESA620, ISR 230V w/ Test Automation
3326986 ESA620, AUS 230V w/ Test Automation
3326999 ESA620, SWI 230V w/ Test Automation
3327002 ESA620, UK 230V w/ Test Automation
3326874 Impulse 7KDP, US 120V w/Test Automation
3326888 Impulse 7KDP, SHK w/ Test Automation
3326895 Impulse 7KDP, UK w/ Test Automation
3326901 Impulse 7KDP, JPN w/ Test Automation
3326912 Impulse 7KDP, AUS w/ Test Automation
3326920 Impulse 7KDP, IN w/ Test Automation
3319736 QA-ES, US 115V w/ Test Automation
3319749 QA-ES, SHK 230V w/ Test Automation
3319751 QA-ES, UK 230V w/ Test Automation
3319760 QA-ES, AUS 230V w/ Test Automation
3319772 QA-ES, JPN 100V w/ Test Automation
3327016 Kit, TA-LAGU, 1 Channel Lagu, with Test Automation
3327025 Kit, TA-LAGU, 2 Channel Lagu with Test Automation
3335538 TNT 12000, w/Test Automation
3340639 TNT 12000WD, w/Test Automation

Impulse 6000D/7000DP

Defibrillator/Transcutaneous Pacemaker Analyzer

FLUKE® Biomedical

The Impulse 6000D Defibrillator Analyzer and Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer Test Systems are rugged, portable precision test instruments that ensure proper operation and ultimate performance of critical life-support cardiac-resuscitation equipment. The Impulse 6000D and Impulse 7000DP test capabilities encompass the spectrum of worldwide-established pulse shapes, showcase breakthrough AED technology compatibility, and outperform in accuracy and standards. Additionally, the Impulse 7000DP incorporates the tests and the extensive range of test loads and measurement algorithms needed to test external transcutaneous pacemakers.

In conjuntion with an Impulse 7000DP, the Impulse 7010 Defibrillator Selectable Load Accessory provides multiple loads of 25 Ω, 50 Ω, 75 Ω, 100 Ω, 125 Ω, 150 Ω, 175 Ω, and 200 Ω for defibrillator performance testing. A standard USB interface enables computer control and data transfer, and optional Ansur PC-based automation software increases productivity by outfitting users with an easy-to-use method to standardize testing procedures and capture, print and document data.

N10140

test automation software Ansur plug-in

Key features

- Impulse 7010 Defibrillator Selectable Load Accessory provides multiple loads of 25 Ω, 50 Ω, 75 Ω, 100 Ω, 125 Ω, 150 Ω, 175 Ω, and 200 Ω to comply with IEC 60601-2-4 standard (optional)
- Lown, Edmark, trapezoidal, biphasic and pulsed biphasic defibrillation technology compatibility
- AED technology compatibility
- First-class measurement accuracy: ± 1 % of reading 0.1 J
- Intuitive user interface and backlight, easy-to-ready display
- Portable, rugged, easy to carry
- Long-lasting, rechargeable battery
- Internal pacer brand selections
- Pacer input protected against defibrillator output (7000DP only)
- 10 isolated ECG electrodes that provide 12 combinations for standardized clinical signals
- Flexible heart-rate settings (1 BPM step) facilitate rate meter accuracy and alarm testing
- DSP-based measurements enable future firmware and waveforms upgrade
- Unique integrated posts for secure connections
- Optional Ansur test automation software to standardize testing procedures, capture waveforms, and print and document test result

Product comparison chart

Model	QED 6	Impulse 6000D	Impulse 7000DP
Monophasic and dc biphasic energy capability	Yes	Yes	Yes
Pulsed biphasic engery capability	No	Yes	Yes
Defibrillator tests	Output energy	Output energy	Output energy
	Cardioversion	Cardioversion	Cardioversion
	Peak measurements	Max energy/charge-time overshoot	Max energy/charge-time overshoot
	–	Peak and average current	Peak and average current
	–	Voltage measurement	Voltage measurement
Normal ECG/performance waves	No	Yes	Yes
Transcutaneous pacer tests	No	No	Yes

Impulse 6000D/7000DP

Defibrillator/Transcutaneous Pacemaker Analyzer

FLUKE®
Biomedical

Specifications

Defibrillator Analyzer

Energy output measurement	Compatible defibrillator waveshapes: Lown, Edmark, trapezoidal, dc bi-phasic, and ac pulsed bi-phasic
Autoranged measurement	0.1 J to 600 J
Accuracy	0.1 J to 360 J: ± 1 % of reading +0.1 J 360 J to 600 J: ± 1 % of reading +0.1 J, typical Note: For pulsed bi-phasic defibrillator, specified accuracy is ± (1.5 % of reading + 0.3 J) on both ranges
Load resistance	Resistence: 50 Ω
Accuracy	1 %, non-inductive (< 2 µH)
Charge time measurement	Range: 0.1 s to 100 s
	Accuracy: ± 0.05 s, typical
Synchronization test (cardioversion)	**Delay time measurement**
	• Timing window: ECG R-wave peak to the defib pulse peak • Range: -120 ms to 380 ms; measures timing from 120 ms prior to the R-wave peak to up to 380 ms following the R-wave peak
	Automated defibrillator test ECG waves
	• Normal sinus: 10 BPM to 300 BPM in 1 BPM steps • Ventricular fibrilation: Coarse and fine • Monomorphic ventricular tachycardia: 120 BPM to 300 BPM in 1 BPM steps • Polymorphic ventricular tachycardia: 5 types • Asystole
ECG waves	
ECG general	Lead configuration: 12-lead simulation; RA, LL, LA, RL, V1-6 with independent outputs
Lead to lead impedance	1000 Ω
Rate accuracy	± 1 % nominal
ECG amplitudes	Reference lead: Lead II (default) or Lead I
	Settings: 0.05 mV to 0.45 mV by 0.05 mV and 0.5 mV to 5 mV by 0.05 mV
	Accuracy: ± 2 % of setting (Lead II), ± 5 % for all other leads and defib paddles
ECG normal sinus	Rates: 10 BPM to 360 BPM in 1 BPM steps
ECG on defibrillator input load	Same as the Lead II amplitude but limited to ± 4 mV
ECG performance waves	Square wave: 2 Hz and 0.125 Hz
	Triangular wave: 2 Hz and 2.5 Hz
	Sine waves: 0.05 Hz, 0.5 Hz, 5 Hz, 10 Hz, 40 Hz, 50 Hz, 60 Hz, 100 Hz, 150 Hz, and 200 Hz
	Pulse: 30 BPM and 60 BPM, 60 ms pulse width
R-wave detection	Waveform: Haver-triangle
	Rate: 30 BPM, 60 BPM, 80 BPM, 120 BPM, 200 BPM, and 250 BPM
	Widths: 8 ms, 10 ms, 12 ms, and 20 ms to 200 ms in 10 ms steps
	Accuracy: ± 1 % setting 0.2 mV
Noise immunity	Wave sine
	Line frequency: 50 Hz or 60 Hz (± 0.5 Hz)
	Amplitude: 0 mV to 10 mV (by 0.5 mV ± 5 %)
Arrhythmia selections	Pacer interactive (Impulse 7000DP only) Supraventricular Premature Ventricular Conduction Transveneous paced with selectable pacer spike amplitudes and widths

Impulse 6000D/7000DP

Defibrillator/Transcutaneous Pacemaker Analyzer

FLUKE® Biomedical

Specifications

Transcutaneous Pacemaker Analyzer (Impulse 7000DP only)

Defibrillator input	Fixed load: 50 Ω Accuracy: ± 1 %, non-inductive (< 2 µH)
Pacemaker input	Variable load: 50 Ω to 1500 Ω by 50 Ω Accuracy: ± 1 %, non-inductive (< 2 µH)
Manufacturer specific algorithms	• Medtronic/Physio Control LIFEPAK • Philips/Agilent/HP • ZOLL Medical • GE Responder (1500 and 1700) • MRL/Welch Allyn • Schiller Medical • MDE300 (Medical Data Electronics), plus a general purpose default algorithm selection
Current	Range: 4 mA to 250 mA Accuracy: ± 1 % of reading +0.02 mA
Pulse rate	Range: 5 PPM to 800 PPM Accuracy: ± 0.5 % of reading +0.1 PPM
Pulse width	Range: 1 ms to 100 ms Accuracy: ± 0.5 % of reading +0.01 ms
Demand and asynchronous mode test	Underdrive rate: 10 BPM minimum Overdrive rate: 300 BPM maximum
Sensitivity test	**Automatic interactive threshold detection**
	Compatible pacer rates: 30 PPM to 120 PPM
	ECG R wave
	Waveforms: Square, triangle, sine
	Widths: 1 ms to 19 ms (by 1 ms), 20 ms to 95 ms (by 5 ms), 100 ms to 300 ms (by 25 ms)
	Accuracy: ± 5 % of setting
	Amplitude: 0.05 mV to 0.95 mV (by 0.05 mV), 1 mV to 5 mV (by 0.5 mV)
	Accuracy: ± 5 % of setting
Refractory period tests	Paced refractory period 20 ms to 500 ms Sensed refractory period 15 ms to 500 ms Accuracy: ± 1 ms

General information	
Dimensions (LxWxH)	32 cm x 24 cm x 13 cm (13 in x 9.5 in x 5 in)
Weight	3.02 kg (6.6 lb)

Standards	
Safety standards	CE: IEC/EN61010-1 2nd Edition; Pollution degree 2; CSA: CAN/CSA-C22.2 NO,61010-1, UL61010-1; C-Tick: Australian EMC

Optional accessories

3091370 Ansur Impulse 6000D/7000DP Plug-In

3065489 MedtronicERS/Physio-Control (FAST PATCH) (set of two): 4 mm defibrillator adapters

3065450 Kimberly Clark/R2 Darox MRL/MDE/NK: 4 mm defibrillator adapters

3065438 Internal discharge paddle contacts (set of two)

3065477 Medtronic ERS/Physio-Control (QUIK PACE) (set of two): 4 mm pacer adapters

3065527 Zoll Medical NTP/PD1400: 4 mm pacer adapters

3065461 Medtronic ERS/Physio-Control (QUIK COMBO): 4 mm defib/pacer adapters

3065492 Philips/Agilent/HP (CODEMASTER Series-Round): 4 mm defib/pacer adapters

3065509 Philips/Agilent HEARTSTART FR2/MRX: 4 mm defib/pacer adapters

3065511 Zoll PD-2200 Multi-Function PD-Series, M-Series, M-Series CCT, AED PRO® and AED Plus™ defib/pacer adapters

3065423 GE Marquette (RESPONDER 1500/1700 Series) (set of two): 4 mm defib/pacer adapters

3158544 Impulse 7010 Defibrillator Selectable Load Accessory

Impulse 6000D/7000DP

Defibrillator/Transcutaneous Pacemaker Analyzer

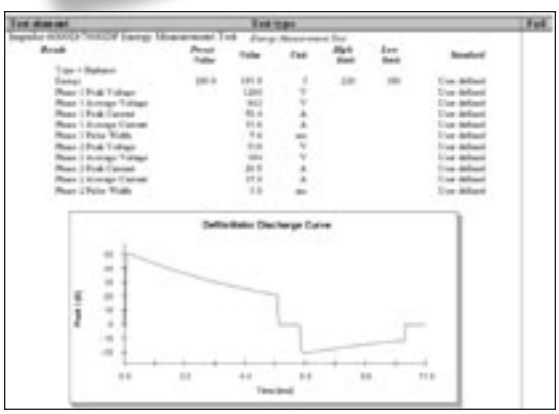
FLUKE® Biomedical

Specifications

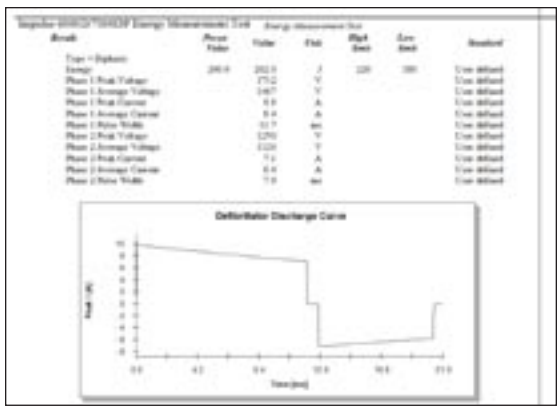
Impulse 7010 Defibrillator Selectable Load Accessory

Maximum voltage	5000 V
Maximum continuous power	12 W, equivalent to 10 defib pulses of 360 J every 5 minutes
Inductance	< 2 µH, @25 Ω < 3 µH, @50 Ω < 4 µH, @75 Ω and 100 Ω < 5 µH, @125 Ω < 6 µH, @150 Ω < 7 µH, @175 Ω < 8 µH, @200 Ω
Temperature	Operating: 10 °C to 40 °C (50 °F to 104 °F) Storage: –20 °C to 60 °C (–4 °F to 140 °F)
Humidity	10 % to 90 % non-condensing
Dimensions (WxDxH)	154 mm x 272 mm x 138.7 mm (6.07 in x 10.71 in x 5.46 in)
Weight (net)	1.54 kg (3 lb 6.2 oz)
Safety class	Complies with EN61010-1 2nd Edition, Class II product
Safety standards	CE: IEC/EN61010-1 2nd Edition; Pollution degree 2; CSA: CAN/CSA-C22.2 NO,61010-1, UL61010-1; C-Tick: Australian EMC
Warranty	Two-year extended warranty (no-cost extended warranty available after first-year calibration at any Fluke Biomedical authorized service center)
Calibration interval	One-year
Electrical specifications (for load accessory and analyzer together)	
Load settings	25 Ω, 50 Ω, 75 Ω, 100 Ω, 125 Ω, 150 Ω, 175 Ω, and 200 Ω ± 1 %
Accuracy	Energy (all except pulsed biphasic): 2 % of reading + 0.1 J with 25 Ω, 75 Ω though 200 Ω loads, 1 % of reading + 0.1 J with 50 Ω load
	Energy (pulsed biphasic): 2.5 % of reading + 0.3 J with 25 Ω, 75 Ω though 200 Ω loads, 1.5 % of reading + 0.3 J with 50 Ω load
	Voltage: 1 % of reading + 2 V with 25 Ω and 50 Ω loads, 2 % of reading + 2 V with 75 Ω through 200 Ω loads
	Current: 2 % of reading + 0.1 A with 25 Ω load, 1 % of reading + 0.1 A with 50 Ω through 200 Ω loads

C US N10140



Discharge curve at 25 Ohms using Ansur and the 7010 load box.



Discharge curve at 175 Ohms using Ansur and the 7010 load box. Note the differences in the shape, the peak currents and the time of the discharges.

Included accessories

3028681 Users Manual CD
3028662 Getting Started Guide
XXXXXXX Battery Eliminator (country specific)
2814980 Carrying Case
2795773 Defibrillator Paddle Contact Plates
1626219 USB Computer Communication Cable

Ordering information

Impulse 6000D Defibrillator Analyzer
2811928 United States, 120 V
3077031 Schuko
3077046 United Kingdom
3077054 Japan
3085270 Australia
3085281 India

Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer
2811919 United States, 120 V
3077005 Schuko
3077010 United Kingdom
3077022 Japan
3085296 Australia
3085308 India

Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer with test automation
3326874 United States, 120 V
3326888 Schuko
3326895 United Kingdom
3326901 Japan
3326912 Australia
3326920 India

FLUKE®
Biomedical

QA-ES Series II

Electrosurgery Analyzer

Key features

- Automatic power distribution measurement, including power, current, peak-to-peak voltage (closed load only), and crest factor
- Oscilloscope output
- High-frequency leakage measurements with accuracy of ± 2 % of reading
- 128 internal user-selectable test loads from 10 Ω to 5200 Ω
- Foot-switch output for triggering the ESU under test
- Ansur QA-ES software plug-in for automated test protocols
- Large display
- RS-232 and Centronic-Printer interface

QA-ES Series II analyzes electrosurgical units quickly and accurately.

A wide load-resistance range provides 128 user-selectable loads, including very low loads for testing many of today's ESUs.

An accuracy of ± 2 % of reading down to 20 mA guarantees reliable high-frequency leakage results. With capability to run an automatic-power-distribution test in as little as 1 minute, the QA-ES works fast so technicians save time.

An Ansur QA-ES software plug-in allows users to create and automatically run tests, capture data, and produce easy-to-read reports with a PC.

Specifications

Modes of operation	
Continuous operation	Continuous measurement of power, current, peak-to-peak voltage (closed load only), and crest factor
Single operation	Single measurement after the set delay time of the ESU output of power, current, peak-to-peak voltage (closed load only), and crest factor
Power distribution	Automatic measurement of power, current, peak-to-peak voltage (closed load only), and crest factor through a user-selectable load range
RF leakage current	Provides connections and load configurations to measure HF leakage from both grounded and isolated equipment
RECQM	Test the "return electrode control quality monitoring using the QA-ES internal loads
Manual/remote	via Ansur test automation software

QA-ES Series II

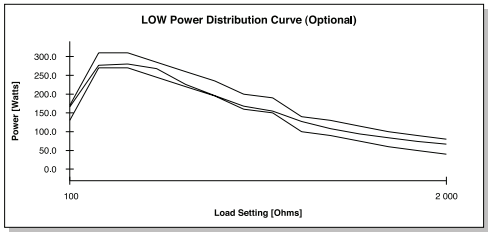
Electrosurgery Analyzer

FLUKE ®
Biomedical

Specifications

Generator output	
Load resistance (128 loads)	10 Ω to 2500 Ω in step of 25 Ω 2500 Ω to 5200 Ω in step of 100 Ω
Measurement	True-rms value of applied waveform
RMS bandwidth	30 Hz to 10 MHz (-3 dB) for instrumentation only 30 Hz to 2.5 MHz (-3 dB) with loads
Low frequency filter	100 Hz filter to avoid low-frequency disturbance or interference
Current	20 mA to 2200 mA
Current accuracy	± 2 % of reading
Additional fixed load	200 Ω 400 W for 30 s; max 15 % duty cycle
Crest factor	The higher of the two peak voltage measurements is used for computation Range: 1.4 to 16 (V peak/V rms).
Foot-switch output	The foot switch output can be used to trigger the electrosurgical unit.
Peak-to-peak voltage	0 kV to 10 kV (closed load only) accuracy: ± 10 % **Note**: Measurement is taken between the active and dispersive electrodes with closed load only.
Oscilloscope output	5 V/A uncalibrated, 100 mA RF current minimum input
Ansur QA-ES plug-In remote control	All functions and tests in QA-ES may be performed from the PC
	User-programmable test sequences
	Allows unlimited numbers of test sequences with user-programmable templates and test limits. These tests include power distribution test, output test, HF leakage, and RECQM verification.
Storage and recall	Protocol formats and data may be stored, recalled, printed out, or transferred.
General information	
Display	LCD graphic display Alphanumeric format 8 lines x 40 characters Graphic mode 240 x 64 pixel matrix
Display control	Five f-keys, enter, cancel, control knob, and an encoder
Data input/outputs	Parallel printer port and bidirectional RS-232
Power	115/230 V ac; 48 Hz to 66 Hz, 35 VA
Housing	Metal case
Dimensions (LxWxH)	39.5 cm x 34.2 cm x 13.2 cm (15.6 in x 13.5 in x 5.2 in)
Weight	9.8 kg (21.6 lb)

Test element			Test type				Fail
LOW Power Distribution Curve (Optional)			*Power distribution test*				
Test Conditions		*Results*					
Power	*Load*	*Low Limit*	*Power*	*High Limit*	*CF*	*Current*	*Vp-p*
150 W	100 Ohms	130	166.0W	170	1.6	1276.0mA	395.0V
290 W	200 Ohms	270	277.0W	310	1.6	1164.0mA	713.0V
290 W	300 Ohms	270	280.0W	310	1.6	960.0mA	880.0V
265 W	400 Ohms	245	268.0W	285	1.5	821.0mA	977.0V
240 W	500 Ohms	220	226.0W	260	1.6	673.0mA	1022.0V
215 W	600 Ohms	195	196.0W	235	1.6	572.0mA	1063.0V
180 W	700 Ohms	160	168.0W	200	1.6	490.0mA	1065.0V
170 W	800 Ohms	150	155.0W	190	1.6	444.0mA	1102.0V
120 W	1000 Ohms	100	127.0W	140	1.6	359.0mA	1135.0V
110 W	1200 Ohms	90	108.0W	130	1.6	302.0mA	1165.0V
95 W	1400 Ohms	75	94.0W	115	1.6	260.0mA	1149.0V
80 W	1600 Ohms	60	84.0W	100	1.6	227.0mA	1206.0V
70 W	1800 Ohms	50	74.0W	90	1.6	201.0mA	1172.0V
60 W	2000 Ohms	40	67.0W	80	1.6	182.0mA	1218.0V



Example of a power distribution curve created in 30 seconds with the Ansur QA-ES plug-in.

Optional accessories

2461794 Carrying Case
2461802 Ansur Test Software, QA-ES plug-in license
2461993 Data Transfer Cable, RS-232
2716059 QA-ES II Calibration Manual
2523266 Clamp, crocodile style, grip C, black
2523275 Clamp, crocodile style, grip C, red

Included accessories

2716044 QA-ES Series II Users Manual (electronic, CD)
2716032 QA-ES Series II Users Manual (printed)
2772171 ESU-Dispersive Safety Lead
2772180 ESU-CQM Safety Lead
2772209 ESU-Jumper Safety Lead
2826194 Test Lead with stackable plugs
1903307 Test Lead Set with retractable sheaths
1610159 Sure-Grip Large Alligator Clip Set
XXXXXXX Power Cord (country specific)

Ordering information

QA-ES Series II Electrosurgery Analyzer
2649769 United States, 115 V
2651725 Schuko, 230 V
2770445 United Kingdom, 230 V
2770450 Australia, 230 V
3096390 Japan, 100 V
3319736 QA-ES, US 115V w/Test Automation
3319749 QA-ES, SHK 230V w/ Test Automation
3319751 QA-ES, UK 230V w/ Test Automation
3319760 QA-ES, AUS 230V w/ Test Automation
3319772 QA-ES, JPN 100V w/ Test Automation

IDA 4 Plus

Multi-Channel Infusion Device Analyzer

FLUKE®
Biomedical

IDA 4 Plus Multi-Channel Infusion Device Analyzer maximizes productivity with multiple, independent channels for testing upto four infusion pumps at once.

The device measures instantaneous flow, average flow, occlusion pressure, and analyzes patient-control analgesia (PCA) units. An optional PCA trigger box provides automated PCA pump control, allowing technicians to set up tests and walk away.

An autostart feature simplifies syringe pump testing or other tests that have long startup times.

With built-in memory, the IDA 4 Plus records test results internally and provides easy-to-read test-result graphs right on the analyzer's screen. The display is so large numbers can be read from across the room

Additionally, the IDA 4 Plus comes with Hydrograph PC software for creating full-color graphs and reports. For automated testing, the IDA 4 Plus is compatible with Fluke Biomedical's medTester 5000C (US only).

CE

N10140

Key features

- Tests up to four infusion pumps simultaneously
- Compatible with virtually any type of infusion device
- Instantaneous and average flow measurement
- Occlusion pressure measurements to 45 psi
- Single- and dual-flow (piggyback) testing
- Full PCA testing (bolus volume, lockout time, and automated external triggering)
- Autostart mode enables unit to begin testing only when fluid is detected
- On-board graphing of pressure and flow
- Built-in memory to save test results for printing or downloading to computer
- Hydrograph graphical software to control unit and display results via PC
- Automated testing through Fluke Biomedical medTester 5000C (US only)
- RS-232 ports
- Optional keyboard, printer, and alarm/PCA

Specifications

Flow-rate measurement	
Technique	Calculated by measuring a volume over time
Range	0.5 ml/hr to 1000 ml/hr
Accuracy	1 % of reading ± 1 LSD for flows of 16 ml/hr to 200 ml/hr for volumes over 20 ml; otherwise, 2 % of reading ± 1 LSD after delivery of 10 ml
Volume measurement	
Technique	Volume measured directly by the transducer in minimum sample sizes of 60 µl
Range	0.06 ml to 9999 ml
Accuracy	1 % of reading ± 1 LSD for flows of 16 ml/hr to 200 ml/hr for volumes over 20 ml; otherwise, 2 % of reading ± 1 LSD after delivery of 10 ml
PCA bolus measurement	
Technique	Volume is measured directly by the transducer in minimum bolus volumes of 0.5 ml. The measurement is made with a continuous rate between 0 ml/hr and 30 ml/hr. The bolus flow rate should be at least four times the basal flow rate for reliable detection of boluses
Minimum bolus volume	0.5 ml
Accuracy	See volume measurement
Pressure measurement	
Technique	Direct occlusion of the infusion line and measurement of pressure prior to the glass transducer
Range	0 psi to 45 psi and equivalents in mmHg and kPa
Accuracy	1 % of full scale ± 1 LSD
Back pressure	-100 mmHg to 300 mmHg

Optional PCA Trigger Box

IDA 4 Plus

Multi-Channel Infusion Device Analyzer

FLUKE® Biomedical

Specifications

Electrical specifications	
Supply voltage	Autoswitching 90 V ac to 260 V ac
Supply frequency	50 Hz to 60 Hz
Supply power	< 30 VA
Fuse	20 mm 250 V, 1 A (T) (slow blow)
Earth leakage current	< 1 mA in single fault condition
Environmental conditions	
Operating temperature	15 °C to 30 °C (59 °F to 86 °F)
Storage temperature	0 °C to 40 °C (32 °F to 104 °F) at 85 % RH or less for storage (Do not leave for more than 48 hours at -20 °C/-4 °F)
General information	
Dimensions (LxWxH)	19.05 cm x 18.11 cm x 30.18 cm (7.5 in x 7.2 in x 11.9 in)
Weight	5 kg (11 lb)

HydroGraph™ Graphics Software

Use the moving color visual advantage of HydroGraph to troubleshoot up to four infusion pumps at once. Data is taken directly off the transducer and transmitted to HygroGraph. The flowing graphs provide an electronic means to display, store, and recall flow patterns for comparison at a later date. Each test window can display instantaneous and average flow rates, cumulative, and bolus volumes; and occlusion pressure.

Optional accessories

2245061 External mini-keyboard, 83-key with PS/2 connector and AT adapter
2238072 Parallel Printer Cable (D25M-36M)
2209703 PCA Trigger/Nurse Call Box
2248899 Printer, Seiko DPU-414-30B (120 V power supply) (additional purchase required: parallel printer cable, p/n 2238072)
2399531 Printer, Seiko DPU-414-30B (220 V power supply) (additional purchase required: parallel printer cable, p/n 2238072)
2235375 Printer (120 V power supply)
2235382 Printer (220 V power supply)
2200102 Interface Cable, medTester to IDA 4 Plus (without wedge adapter) (RS-232; female DB25 to female DB9)
2201042 Interface Cable, medTester to IDA 4 Plus (with or without wedge adapter) (RS-232; female DB9 to female DB25)
2245092 Barcode Scanner (with long-reach coil cable with Y connector for keyboard attachment)
2238626 Null Modem Cable (female DB9 to female DB9)

Included accessories

2213506 Electronic Users Manual and HydroGraph software
2217231 20 ml Priming Syringe
2391750 Luerlock-3 way (one for each channel)
2238909 5-foot Plastic Drain Line
2238626 Null Modem Cable (female DB9 to female DB9)
XXXXXXX Detachable Power Cord (country specific)

Ordering information

IDA 4 Plus One-Channel Infusion Device Analyzer
2250063 United States, 120 V
2394575 Australia, 250 V
2394582 Denmark, 250 V
2394594 Shuko, 250 V
2394608 Israel, 250 V
2394613 Italy, 250 V
2394624 India, 250 V
2394636 Switzerland, 250 V
2394649 United Kingdom, 250 V

IDA 4 Plus Two-Channel Infusion Device Analyzer
Full testing for up to two infusion pumps simultaneously
2250088 United States, 120 V
2394651 Australia, 250 V
2394660 Denmark, 250 V
2394672 Shuko, 250 V
2394685 Israel, 250 V
2394697 Italy, 250 V
2394703 India, 250 V
2394715 Switzerland, 250 V
2394726 United Kingdom, 250 V

IDA 4 Plus Three-Channel Infusion Device Analyzer
Full testing capability for up to three infusion pumps simultaneously
2250109 United States, 120 V
2394732 Australia, 250 V
2394744 Denmark, 250 V
2394759 Shuko, 250 V
2394767 Israel, 250 V
2394771 Italy, 250 V
2394780 India, 250 V
2394798 Switzerland, 250 V
2394800 United Kingdom, 250 V

IDA 4 Plus Four-Channel Infusion Device Analyzer
Full testing capability for up to four infusion pumps simultaneously
2250127 United States, 120 V
2394817 Australia, 250 V
2394821 Denmark, 250 V
2394839 Shuko, 250 V
2394842 Israel, 250 V
2394856 Italy, 250 V
2394863 India, 250 V
2394874 Switzerland, 250 V
2394888 United Kingdom, 250 V

ESA612

Electrical Safety Analyzer

The ESA612 Electrical Safety Analyzer represents the next generation in testers for biomedical professionals that perform field service on medical equipment throughout their facilities, in clinics, and anywhere onsite service is required. Portable, lightweight, and designed for operation in tight spaces, the ESA612 offers the functionality of a simulator, multimeter and electrical-safety analyzer in a single test tool.

With selection of two test loads, this versatile product can be used worldwide to test to preventative maintenance electrical safety standards of choice: ANSI/AAMI ES1:1993 (NFPA-99), IEC62353 (VDE 751), and AN/NZS 3551.

The versatility of the multifaceted ESA612 is further expanded with optional automation software, which speeds and simplifies testing and provides high-end-analyzer productivity at software-level investment. Ansur-automated ESA612 standardizes test procedures, compares results to standards limits, and generates and stores reports for total digital data management.

Key features

- Portable, ergonomic, lightweight and easy to use
- Large, easy-to-read display with adjustable contrast
- Human-factors-designed user interface
- Tilt stand design for stand-up testing in field environments
- Five applied parts jacks and easy ECG snap connection with optional expander box
- ECG waveform tests and dual-lead measurements combine the functionality of a simulator, multimeter and electrical-safety analyzer in a single test tool
- Replaceable mains fuses keep the device in the field and out of the repair shop
- Internal memory for 100 test records
- 20 A at 120 V current capability
- USB connection for use with Ansur and Data Viewer software (for memory download to PC)
- Two-year extended warranty (no-cost, available after first-year calibration at the Fluke Biomedical Cleveland Service Center)
- Optional Ansur automation software standardizes test procedures, compares results to standards limits, generates/stores reports and provides total digital data management
- Rigorously tested for rugged field applications, with CE and CSA in addition to the Fluke-quality-design stamp of approval

Specifications

Voltage	
Range (mains voltage)	90 V ac to 132 V ac rms, 180 V ac to 264 V ac rms
Range (accessible voltage)	0 V ac to 300 V ac rms
Accuracy	± (2 % of reading + 0.2 V)
Voltage tests	Mains and point-to-point
Earth resistance	
Mode	Two terminal
Test current	> 200 mA ac
Range	0 Ω to 2 Ω
Accuracy	± (2 % of reading + 0.015 Ω)
Resistance tests	Earth resistance and point-to-point
Equipment current	
Mode	AC rms
Range	0 A to 20 A
Accuracy	± 5 % of reading + (2 counts or 0.2 A, whichever is greater)
Duty cycle	15 A to 20 A, 5 min on/5 min off, 10 A to 15 A, 7 min on/3 min off, 0 A to 10 A continuous
Leakage current	
Modes*	AC + DC (true-rms)
	AC only
	DC only
*Modes are available in all leakage tests with the exception of MAP leakages that are available only in true-rms.	
Patient load selection (input impedance)	AAMI ES1-1993 Fig. 1, IEC 60601: Fig 15
Crest factor	≤ 3

Optional accessories

1903307 Retractable Test Leads
2242165 Ground Pin Adapter (US receptacle testing ground lug)
3392119 1210 Adapter Box Assembly
3454829 Ansur ESA612 Plug-In License Key

ESA612

Electrical Safety Analyzer

FLUKE® Biomedical

Specifications

Ranges	0 µA to 199.9 µA, 200 µA to 1999 µA, 2 mA to 10 mA	
Frequency response/ accuracy	DC to 1 kHz	± (1 % of reading + (1 µA or 1 LSD, whichever is greater))
	1 kHz to 100 kHz	± (2 % of reading + (1 µA or 1 LSD, whichever is greater))
	1 kHz to 5 kHz (current > 1.6 mA)	± (4 % of reading + (1 µA or 1 LSD, whichever is greater))
	100 kHz to 1 MHz	± (5 % of reading + (1 µA or 1 LSD, whichever is greater))
Note: Accuracy for Isolation, MAP, Direct AP, Alternative AP, and Alternative Equipment leakage tests all ranges are + (2.5 µA or 1 LSD, whichever is greater)		
Leakage tests	Ground wire (earth), Chassis (enclosure), Lead to ground (patient), Lead to lead (patient auxiliary), Lead isolation (mains on applied part), Direct equipment , Direct applied part, Alternative equipment, Alternative applied part, Point to point	
Mains on applied part test voltage	100 % of mains	
Differential leakage		
Ranges	10 µA to 199 µA, 200 µA to 2000 µA, 2 mA to 20 mA	
Accuracy	± 10 % of reading + (2 counts or 20 µA, whichever is greater)	
Insulation resistance		
Ranges	0.5 MΩ to 20 MΩ, 20 MΩ to 100 MΩ	
Accuracy	± (2 % of reading + 0.2 MΩ), ± (7.5 % of reading + 0.2 MΩ)	
Source test voltage	500 V dc , 250 V dc	
Insulation resistance tests	Mains-PE, AP-PE, Mains- PE, Mains-NE (non-earthed accessible conductive part) and AP- NE (non-earthed accessible conductive part)	
ECG performance waveforms		
Accuracy	± 2 % ± 5 % for amplitude of 2 Hz square wave only, fixed at 1 mV Lead II configuration	
Waveforms: rates	ECG complex (BPM): 30, 60, 120, 180, and 240	
	Square wave (50 % duty cycle) (Hz): 0.125 and 2	
Ventricular fibrillation	Sine wave (Hz): 10, 40, 50, 60, and 100	
	Triangle wave (Hz): 2	
	Pulse (63 ms pulse width): 30 BPM and 60 BPM	
Power ratings		
Mains voltage outlet	120 V ac or 230 V ac	
Mains voltage inlet power range	90 to 132 V ac rms	180 to 264 V ac rms
Maximum current	20 A	16 A
Hz	50 or 60	50 or 60
Physical case		
Dimensions (L x W x H)	17.63 cm x 8.38 cm x 28.45 cm (6.94 in x 3.30 in x 11.20 in)	
Weight	1.6 kg (3.5 lb)	
Environmental specifications		
Operating temperature	10 °C to 40 °C (50 °F to 104 °F)	
Storage temperature	-20 °C to 60 °C (-4 °F to 140 °F)	
Operating humidity	10 % to 90 % non-condensing	
Altitude	120 V ac mains supply voltage up to 5,000 m, 230 V ac mains supply voltage up to 2,000 m	
General		
Warranty	Two-year extended warranty (no-cost, available after first-year calibration at the Fluke Biomedical Cleveland Service Center, otherwise standard one-year warranty applies)	

Included accessories

3334509 Operator's Manual (multilingual CD)
3334511 Getting-Started Guide (hard copy, multilingual)
2795488 Ansur ESA612 Plug-In, CD with demo version
1626219 Data Transfer Cable
ESA612 Accessory Kit (country specific)
2195732 15 A to 20 A Adapter (US only)
3326842 Null Post Adapter
3359538 5-to-5 Banana Jack to ECG (BJ2ECG) Adapter
2248650 Carry Case
XXXXXXX Detachable Power Cord (country specific)
Test Lead Set

Ordering information

3367232 ESA612 Electrical Safety Analyzer (US), 115 V 20 A
3367259 ESA612 Electrical Safety Analyzer (Europe), 230 V
3367244 ESA612 Electrical Safety Analyzer (France), 230 V
3367267 ESA612 Electrical Safety Analyzer (Israel), 230 V
3367271 ESA612 Electrical Safety Analyzer (Australia), 230 V
3367280 ESA612 Electrical Safety Analyzer (UK), 230 V
3367298 ESA612 Electrical Safety Analyzer (Switzerland), 230 V
3454793 ESA612 Electrical Safety Analyzer (Thailand), 230 V
3461965 ESA612 Electrical Safety Analyzer (Japan), 100 V
3460932 ESA612 Electrical Safety Analyzer (US), 115 V 20 A w/Test Automation
3460959 ESA612 Electrical Safety Analyzer (Europe), 230 V w/Test Automation
3460944 ESA612 Electrical Safety Analyzer (France), 230 V w/Test Automation
3460967 ESA612 Electrical Safety Analyzer (Israel), 230 V w/ Test Automation
3460971 ESA612 Electrical Safety Analyzer (Australia), 230 V w/ Test Automation
3460980 ESA612 Electrical Safety Analyzer (UK), 230 V w/ Test Automation
3460998 ESA612 Electrical Safety Analyzer (Switzerland), 230 V w/Test Automation
3461001 ESA612 Electrical Safety Analyzer (Thailand), 230 V w/ Test Automation
3462285 ESA612 Electrical Safety Analyzer (Japan), 100 V w/ Test Automation

ESA620

Electrical Safety Analyzer

FLUKE® Biomedical

The ESA620 Electrical Safety Analyzer represents the next generation in manual, portable electrical safety testers. With selections of three test loads, two protective earth test currents, and two insulation test voltages this versatile product can be used worldwide to enhance productivity and test to standards of choice.

New DSP technology offers better accuracy of leakage measurements throughout the ranges specified in the standards.

Equipped with ten safety-enhanced ECG posts, the ESA620 offers simulation of ECG and performance waveforms so both electrical safety and basic tests on patient monitors can be performed with a single connection. When used with optional Ansur computer-based software plug-in, the ESA620 becomes automated. This allows for standardization of test procedures, capturing and storage of results, comparison to standard limits, and printing of reports thus enabling the sophisticated performance of the high-end electrical safety analyzers.

N10140

Specifications

Voltage	
Range (mains voltage)	90 V ac to 132 V ac rms, 180 V ac to 264 V ac rms
Range (accessible voltage)	0 V ac to 300 V ac rms
Accuracy	± (2 % of reading +2 LSD)
Earth resistance	
Modes	Two terminal or four terminal
Test current	> 200 mA ac or 10 A ac to 25 A ac
Ranges	0 Ω to 2 Ω
Accuracy	± (2 % of reading 0.015 Ω)
Equipment current	
Mode	AC rms
Range	0 A to 20 A
Accuracy	± 5 % of reading ± (2 counts or 0.2 A, whichever is greater)
Leakage current	
Patient load selection (input impedance)	AAMI ES1-1993 Fig 1 IEC 60601: Fig 15 IEC 61010: Fig A-1
Crest factor	≤ 3
Ranges	0 µA to 199.9 µA 200 µA to 1999 µA 2.0 µA to 10.0 mA
Frequency response	DC to 1 kHz 1 kHz to 100 kHz 100 kHz to 1 MHz
Accuracy	± (1 % of reading + 1 µA) ± (2 % of reading + 1 µA) ± (5 % of reading + 1 µA)

Key features

- Superior compliance with multiple standards: IEC60601, IEC62353, VDE 751, ANSI/AAMI ES1:1993, NFPA-99, AN/NZS 3551, IEC61010
- Three test loads
- Expanded leakage ranges through 10,000 µA
- Dual-lead resistance, leakage, and voltage tests
- AC only, dc only and true-rms leakage readings
- 100 % and 110 % mains voltage for mains on applied part (lead isolation) test
- 200 mA and 25 A AC PE test current
- DSP filter technology for improved accuracy in leakage measurements
- 20 A equipment current
- More applied parts selections
- ECG and performance waveforms
- Intuitive user interface
- Easy-to-use applied parts (ECG) connections
- Insulation posts on applied parts connections
- Five different insulation tests
- Varying insulation test voltage 500 V dc and 250 V dc
- 2- or (optional) 4-wire ground wire resistance
- Large display with adjustable contrast
- Ergonomic design
- Optional Ansur plug-in software
- USB connection
- CE, C-TICK and CSA for USA and Canada
- RoHS compliance
- Optional Ansur test automation software to standardize testing procedures, capture waveforms, and print and document test result

ESA620

Electrical Safety Analyzer

Specifications

Leakage current (continued)	
Mains on applied part test voltage	110 % of mains @ 230 V for IEC 60601 100 % of mains @ 115 V per AAMI 100 % of mains @ 230 V per 62353
Differential leakage	
Ranges	10 µA to 199 µA 200 µA to 1999 µA 2 mA to 20 mA
Accuracy	± 10 % of reading ± (2 counts or .2 µA, whichever is greater)
Insulation resistance	
Ranges	0.5 MΩ to 20 MΩ 20 MΩ to 100 MΩ
Accuracy	± (2 % of reading + 2 counts) ± (7.5 % of reading + 2 counts)
Source test voltage	500 V dc 250 V dc
ECG performance waveforms	
Accuracy	± 2 % ± 5 % for amplitude of 2 Hz square wave only, fixed @ 1 mV Lead II configuration
Waveforms	**Rates** ECG complex (BPM): 30, 60, 120, 180, and 240
	Ventricular fibrillation Square wave (50 % duty cycle) (Hz): 0.125 and 2 Sine wave (Hz): 10, 40, 50, 60, and 100 Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 and 60
Power ratings	
Mains voltage outlet	120 V ac 230 V ac
Mains voltage inlet power range	90 V ac to 132 V ac rms 180 V ac to 264 V ac rms
Maximum current	20 A @ 120 V ac 16 A @ 230 V ac
Hz	50 or 60
Physical case	
Dimensions (LxWxH)	31 cm x 23 cm x 10 cm (12.2 in x 9 in x 2.9 in)
Weight	4.7 kg (10.25 lb)
Certifications	
Certifications	CE: IEC/EN61010-1 2nd Edition; Pollution degree 2 CSA: CAN/CSA-C22.2 No 61010-1; UL61010-1 C-Tick: Australian EMC
Environmental	
Operating temperature	10 °C to 40 °C (50 °F to 104 °F)
Storage temperature	-20 °C to 60 °C (-4 °F to 140 °F)
Operating humidity	10 % to 90 % non-condensing
Altitude	To 2,000 meters @ 230 V ac (main supply voltage)
	To 5,000 meters @ 120 V ac (mains supply voltage)

Optional accessories

3116463 Ansur ESA620 Plug-In
1903307 Retractable Test Leads
2242165 Ground Pin Adapter
2067864 Kelvin Cable Set for 4-wire Measurement

Included accessories

2814967 Operator's Manual CD
2814971 Multilingual Getting Started Guide
ESA620 Accessory Kit (country specific)
2195732 15 A to 20 A adapter (US only)
2814980 Carry case
1626219 Data Transfer cable
3326842 Null Post assembly
XXXXXXX Detachable Power Cord (country specific)
Test Lead Set

Ordering information

ESA620 Electrical Safety Analyzer
2785725 United States, 115 V, 20 A
3051408 Europe, 230 V
3051390 France, 230 V
3051413 Israel, 230 V
3051436 Australia, 230 V
3051449 United Kingdom, 230 V
3051451 Switzerland, 230 V
3326935 ESA620, US 115V 20A w/Test Automation
3326947 ESA620, EUR 230V w/Test Automation
3326958 ESA620, FR 230V w/ Test Automation
3326964 ESA620, ISR 230V w/Test Automation
3326986 ESA620, AUS 230V w/Test Automation
3326999 ESA620, SWI 230V w/Test Automation
3327002 ESA620, UK 230V w/ Test Automation

FLUKE®
Biomedical

BP Pump 2

Non-Invasive Blood Pressure Simulator

The BP Pump 2 is a second-generation non-invasive blood pressure (NIBP) monitor analyzer that efficiently verifies oscillometric adult and neonatal NIBP. The BP Pump 2's unique feature set includes tests to accurately interrogate wrist-cuff monitors, internal cuff volumes, and optional 5-lead synchronized ECG simulations for spot checks on the monitor. The simulated peripheral pulse is synchronized with this electrical ECG signal for testing NIBP monitors utilizing gated measurement for noise/artifact rejection.

Key features

- Dynamic BP simulators for arm- and wrist-cuff monitors
- ECG and arrhythmia simulation synchronizedwith BP (optional)
- Internal pump for high- and low-pressure release verification, leak testing, and pressure sourcing
- Internal adult/neonatal cuffs elimates need for external cuffs
- Four respiratory artifacts, including spontaneous breathing and controlled ventilation
- Multiple arrhythmia simulations, including premature atrial contractions #1 and #2, atrial fibrillation, and PVCs
- Optional Ansur test automation software to standardize testing procedures, capture waveforms, and print and document test result

Specifications

Pressure generation/ measurement	Static-pressure range: 0 mmHg to 400 mmHg (53 kPa)
	Difference between target pressure and actual pressure: -5 mmHg
	Internal leak rate: < 2 mmHg per minute with minimum volume of 300 cc
Four respiratory artifacts	3 spontaneous breathing; controlled ventilation
Three adult wrist-cuff simulations	Normal, Hyper, Hypo
Pressure source	Specified pressure generated from 50 mmHg to 400 mmHg in selectable increments of 1 mmHg
Pressure gauge	Static pressure measured from 0 mmHg to 400 mmHg at the pressure port
Pressure relief test	Test for the NIBPM pressure relief valve (0 mmHg to 400 mmHg) with display of peak pressure
Neonate internal cuff simulations	Internal neonate cuff; four standard neonate pressures
Neonate simulations	Cuff #1: Blood pressure: 35/15 Heart rate: 120 BPM Pulse volume: 0.3 Cuff #2: Blood pressure: 60/30 Heart rate: 120 BPM Pulse volume: 0.3 Cuff #3: Blood pressure: 80/50 Heart rate: 120 BPM Pulse volume: 0.3 Cuff #4: Blood pressure: 100/70 Heart rate: 120 BPM Pulse volume: 0.3
Irregular pulse	BP and ECG: Premature atrial contractions # 1, premature atrial contractions # 2, premature ventricular contractions, atrial fibrillation and PVCs
User-definable simulations	User-definable systolic and diastolic values, along with heart rate and pulse volume Ranges: Systolic pressure range 20 mmHG to 250 mmHG; Diastolic pressure range 10 mmHG to 200 mmHG; Heart rate 30 BPM to 250 BPM; Pulse volume 0.1 cc to 2.4 cc in increments of 0.1 cc
Simulation parameters performance	Max pulse volume: 2.4 cc
	Max heart rate: 200 BPM at 2.4 cc pulse volume; 250 BPM at 1.2 cc pulse volume
	Internal neonatal cuff volume: 20 cc
	Internal adult cuff volume (including NN volume): 310 cc
	Heart rate setting accuracy: ± 1 BPM
	Simulation units: kPa and mmHg (user selectable)
Pressure leak test	The pressure port is pressurized from 0 mmHg to 400 mmHg and keeps track of the pressure loss over time. Peak pressure and present pressure are displayed at all times; leak rate is displayed when it is available.
Autosequences	Nine autosequences are provided for four tests and up to five simulations
Electrical ECG (optional)	Signals: RA, LA, RL, LL, V
	Waveform: Lead II
	Amplitude: 1 mV peak (± 10 %) NIBP peripheral pulse synchronized with ECG signal
	Connections: Optional external ECG adapter, physiological synchronization with NIBP
Heart rate for NIBP simulations	Heart rate accuracy: + 1 BPM Except for the following: Patient condition weak pulse, tachycardia, obese, geriatric: + 1 % + 1 BPM Patient condition mild exercise: + 1.5 % + 1 BPM Patient condition strenuous exercise: + 3 % + 1 BPM

BP Pump 2

Non-Invasive Blood Pressure Simulator

FLUKE® Biomedical

Serial port	Bidirectional RS-232 port; baud rate of 9600 with no parity, one stop bit, and eight data bits
Pressure measurement	Pressure-measurement units: kPa, mmHg, cmH20, cmH20 and psi (user selectable) Range: 0 mmHg to 400 mmHg
Accuracy	Basic model (BP Pump 2_L): 0 mmHg to 300 mmHg: + 0.5 % of reading + 1 mmHg; 301 mmHg to 400 mmHg: + 2 % of reading High-accuracy version (BP Pump 2_M): < 0.8 mmHg (0.1 kPa) throughout range
Parallel port	25-pin female connector, with D-subminiature style and pinouts conforming to IBM PC printer port (unidirectional), HP and ASCII printers
Sample adult arm-cuff simulation (standard parameters)	Standard set of blood pressures: BP #1: Blood pressure: 120/80 (93) Heart rate: 80 Pulse volume: 0.68 cc BP #2: Blood pressure: 150/100 (116) Heart rate: 80 Pulse volume: 0.65 cc BP #3: Blood pressure: 200/150 (166) Heart rate: 80 Pulse volume: 0.6 cc BP #4: Blood pressure: 255/195 (215) Heart rate: 80 Pulse volume: 0.55 cc BP #5: Blood pressure: 60/30 (40) Heart rate: 80 Pulse volume: 0.75 cc BP #6: Blood pressure: 80/50 (60) Heart rate: 80 Pulse volume: 0.7 cc BP #7: Blood Pressure: 100/65 (76) Heart rate: 80 Pulse volume: 0.69 cc
Patient condition simulations	Healthy heart, weak pulse, mild exercise #1, strenuous exercise #2, obese subject, geriatric subject, tachycardia, bradycardia
Arrhythmia simulations	Premature atrial cont. #1, premature atrial cont. #2, premature ventricular cont., atrial fib and PVCs
Wrist simulations	Simulation #1: Blood pressure 120/80 (93) Heart rate: 80 BPM Pulse volume: 0.5 cc Simulation #2: Blood pressure 160/100 (120) Heart rate: 80 BPM Pulse volume: 0.5 cc Simulation #3: Blood pressure: 80/55 (63) Heart rate: 80 BPM Pulse volume: 0.5 cc
Temperature	Operating: 15 °C to 40 °C (59 °F to 104 °F) Storage: -20 °C to 65 °C (-4 °F to 149 °F)
Display	Bright, large 4-line x 40-character alphanumeric display with backlighting
Dimensions (WxDxH)	25.4 cm x 25.4 cm x 12.7 cm (10 in x 10 in x 5 in)
Weight	3.4 kg (7.5 lb)

Optional accessories

2755836 Ansur BP Pump 2 Plug-in
2222822 Soft-sided Vinyl Carrying Case
2391894 ECG Adapter Block (allows simulation of 5-lead ECG waveforms)
2248899 Printer, Seiko DPU-414-30 B, 120 V power supply
2399531 Printer, Seiko DPU-414-30B, 200 V power supply
2238659 Serial Cable, D9M-D9F
2392328 Neonatal/external cuff mandrel (truncated plastic cylinder diameters: 7.6, 10, and 14 cm)
2391875 Wrist cuff mandrel (adult)

Included accessories

2391882 Accessory Kit (tubings and fittings)
Users Manual
XXXXXXX Power Cord (country specific)

Ordering information

BP Pump 2_L (standard pressure transducer)
2249036 United States, 120 V
2394895 Australia, 250 V
2394901 Denmark, 250 V
2394912 Schuko, 250 V
2394920 Israel, 250 V
2394935 Italy, 250 V
2394947 India, 250 V
2394958 Switzerland, 250 V
2394964 United Kingdom, 250 V
3334821 US 120V w/Test Automation
3334839 AUS w/Test Automation
3334842 DEN w/Test Automation
3334856 SHK w/Test Automation
3334863 ISR w/Test Automation
3334874 ITAL w/Test Automation
3334888 IND w/Test Automation
3334895 SWZ w/Test Automation
3334901 UK w/Test Automation

BP Pump 2_M (high-accuracy pressure transducer)
2249049 United States, 120 V
2394973 Australia, 250 V
2394986 Denmark, 250 V
2394999 Schuko, 250 V
2395003 Israel, 250 V
2395015 Italy, 250 V
2395026 India, 250 V
2395032 Switzerland, 250 V
2395044 United Kingdom, 250 V
3334912 US w/Test Automation
3334920 AUS w/Test Automation
3334935 DEN w/Test Automation
3334947 SHK w/Test Automation
3334958 ISR w/Test Automation
3334964 ITAL w/Test Automation
3334973 IND w/Test Automation
3334986 SWZ w/Test Automation
3334999 UK w/Test Automation

MPS450

Patient Simulator

The MPS450 is Fluke Biomedical's next-generation, portable, multiparameter patient simulator for your comprehensive testing and training needs. Whether it's a quick check on a bedside monitor, arrhythmia recognition training, or pe forming a complete PM on the latest patient-monitoring systems, this simulator is a clear choice with its broad range of physiological wave-forms, easy-to-use interface, and compact, portable size.

Key features

- 12-lead ECG simulation with independent outputs
- 43 arrhythmia selections
- Four invasive BP channels, including Swan-Ganz simulation
- Respiration and temperature simulations
- ECG performance testing, including R-Wave detection
- Large, bright 4-line x 20-character display
- RS-232 serial port
- Expansion port
- Compact and lightweight

MPS450 optional accessories

Specifications

ECG normal sinus rhythm	12-lead configuration with independent outputs
	Amplitude: 0.05 mV to 5.5 mV
	Rates: 30 BPM to 300 BPM
	ECG waveform selections: Adult or pediatric
	Superimposed artifact: 50 Hz and 60 Hz, muscle, baseline wander, respiration
ECG performance	Amplitude: 0.05 mV to 5.5 mV Square wave: 2 Hz , 0.125 Hz Pulse: 30 BPM, 60 BPM, 60 ms pulse width Sine waves: 0.5 Hz to 100 Hz Triangle wave: 2 Hz, 2.5 Hz
ST segments	Elevated/depressed: -0.8 mV to 0.8 mV in 0.1 mV steps; plus -0.05 mV and 0.05 mV steps
Accuracy	All amplitudes ± 2 % of setting Lead II All rates ± 1 % All widths ± 1 %
Arrhythmia selections (43 Total)	Premature rhythms Supraventricular rhythms Ventricular rhythms Conduction defects Pacemaker
Respiration	Baseline impedance: 500 Ω to 2000 Ω, leads I, II, III Impedance variations: 3 Ω, 1 Ω, 0.5 Ω, 0.2 Ω Rates: 15 BrPM to 120 BrPM and APNEA Apnea periods: 12 seconds, 22 seconds, 32 seconds, and continuous

Product comparison chart

Model	MPS450	medSim 300B	PS420	PS415
Arrhythmia selections	43	32	35	14
Respiration	Yes	Yes	Yes	Yes
BP channels	Yes, four	Yes, four	Yes, two	Yes, two
Swan-Ganz procedure	Yes	Yes	Yes	Yes
Temperature channels	Yes, one	Yes, two	Yes, one	Yes, one
User-programmable auto-sequences	Yes (with HHC3)	Yes, internal feature plus HHC3 capability	No	Yes
Cardiac output	Optional	Optional	Standard	No

MPS450

Patient Simulator

FLUKE® Biomedical

Specifications

Blood pressure channels	**Channels** 4; synchronized with normal sinus rhythm rates; tracks arrhythmia activity
	Transducer Exciter voltages: ac and dc compatible Sensitivity: 5 µV/V/mmHg and 40 µV/V/mmHg Calibrated Rate: 80 BPM
Available selections	Static pressure
	Dynamic pressure: Art (120/80), Radial Art (120/80), LV (120/0), RA/CVP (15/10), RV (25/0), PA (25/10), PAW (10/2), and LA (14/4)
	Swan-Ganz procedure: automated and manual control
Temperatures	0 °C, 24 °C, 37 °C, and 40 °C
Cardiac output (optional)	Faulty-injectate curve Left-to-right shunt curve C.O. for 0°: 2.5 l/min, 5 l/min, and 10 l/min C.O. for 24°: 2.5 l/min, 5 l/min, and 10 l/min Cal Pulse: 1.5° for 1 second
Fetal/Maternal ECG and IUP simulations (optional)	Fixed fetal heart rates: 60 BPM to 240 BPM
	Dynamic fetal heart activity: Uniform deceleration, uniform acceleration, early deceleration, late deceleration
	Maternal heart rate: 80 BPM
	Dynamic intrauterine pressure (IUP)
	Waveform: positive bell-shaped pressure curve
	Peak pressure: 90 mmHg, ± 4 mmHg (max)
	Contraction interval: 2 minutes, 3 minutes, and 5 minutes (manual)
	Duration: 90 seconds
Dimensions (WxDxH)	18.4 cm x 19 cm x 5 cm (7.3 in x 7.5 in x 2 in)
Weight	0.6 kg (1.4 lb)

Model	PS410	PS400	DataSim 6100
Arrhythmia selections	35	12	34
Respiration	No	No	Yes
BP channels	No	No	Yes, three
Swan-Ganz procedure	No	No	Yes
Temperature channels	No	No	No
User-programmable auto-sequences	No	No	Yes
Cardiac output	No	No	Optional

Optional accessories

2248623 Soft-Sided Vinyl Carrying Case
2238659 Serial Cable D9M-D9F
2226608 Cardiac-Output Adapter Box
2645641 HHC3 Handheld Controller

Cardiac output adapters

2392285 GE Medical/Marquette Cardiac Output Cable (interface cable for GE Medical/Marquette plus monitors, including in-line switch box to select injectate temperature)
2227016 Gould/Spectramed 1445 Injectate Temperature Adapter (4 pin)
2227025 Gould/Spectramed 1465 Injectate Temperature Adapter (phone jack)
2226973 HP Injectate Temperature Adapter (1/4 in phone plug)
2391990 Universal Injectate Temperature Adapter Pigtail (unterminated)
2392158 General Purpose Connector

For a complete list of temperature and blood-pressure cables, contact us.

Included accessories

2720054 AC Battery Eliminator
2243350 Users Manual

Ordering information

2251364 MPS450 (ECG 12-lead simulation; invasive BP; respiration; temperature; BP in sync with ECG; large, bright 4-line x 20-character display; R-wave-detection test; RS-232 port for computer control; soft-key navigation; universal ECG connectors; and flash memory for easy program upgrade)

2251373 MPS450-CO (base model plus cardiac-output simulation)

2251399 MPS450-FET (base model plus direct fetal/maternal ECG simulations with maternal heart rate, selectable fetal heart rate, and dynamic intrauterine pressure waveform [IUP])

2251386 MPS450-CO/FET (base model plus cardiac-output simulation and direct fetal/maternal ECG simulations with maternal heart rate, selectable fetal heart rate, and dynamic intrauterine pressure waveform [IUP])

FLUKE®
Biomedical

PS320

Fetal Simulator

The PS320 simulates fetal and maternal ECG as well as uterine activity to test and troubleshoot fetal electronic monitors and to train clinical staff.

The unit is battery operated and small enough to fit in a pocket so mobile technicians and clinical instructors can take it anywhere.

The PS320 simulates several fetal parameters, including twins, as well as a wide range of clinical scenarios for training labor-and-delivery staff in how to recognize normal and abnormal responses. An optional mechanical heart creates fetal heart sounds for testing fetal monitor ultrasound cables and transducers.

PS320 offers an easy user interface, providing a 2 x 16-character LCD display with adjustable contrast. The unit operates on a 9 V battery with low-battery monitoring or functions with the supplied battery eliminator.

Key features

- Mechanical heart for ultrasound simulation
- TOCO simulation (External or IUP)
- Ultrasound simulation (including twins)
- Maternal ECG simulation
- Fetal ECG (tracks ultrasound #1)
- Internal (DECG) and external fetal ECG
- Uterine-activity selections
- Fetal beat-to-beat variability
- Periodic and non-periodic fetal ECG changes
- Arrhythmia selections
- Compact, lightweight, pocket-size plastic housing
- Battery operated with status indications
- Special kits available with all required accessories and cables to test fetal monitors for specified manufacturers

Specifications

Fetal ECG	
Static rates	30 BPM, 60 BPM, 90 BPM, 120 BPM, 150 BPM, 180 BPM, 210 BPM, and 240 BPM
ECG sensitivity	50 µV, 100 µV, 200 µV, 0.5 mV, 1 mV, and 2 mV
	US-1 tracks primary fetal ECG rates
	US-2 tracks secondary fetal activity for either independent "normal or "twins simulation, US-2 rate fixed at 140 BPM
Fetal patterns **Note**: US-1 and fetal ECG track these selections. US-2 is in normal pattern, except during TREND #1 selection.	**Trend #1: Twin fetal patterns**
	Normal: Normal pattern Tachycardia: Tachycardia pattern Bradycardia: Bradycardia pattern Arrhythmias: Arrhythmia pattern Late deceler.: Late deceler. Early deceler.: Early deceler. Moderate deceler.: Moderate variable deceler. Acceler.: #1: Acceler. wave #1 Acceler.: #2: Acceler. wave #2 Sinusoidal (high): Sinusoidal pattern, large change Sinusoidal (low): Sinusoidal pattern, small change Severe var. deceler.: #1: Severe deceler. wave #2 Severe var. deceler.: #2: Severe variable deceler Prolonged deceler.: Prolonged deceler Biphasic deceler.: Biphasic deceler Exaggerated deceler.: Exaggerated deceler Non-uniform deceler.: Non-uniform deceler Var. deceler. (u): Variable deceler, "U shaped Var. deceler. Tach: Variable deceler. with high-rate BPM Var. deceler. (v): Variable deceler. "V shaped Var. deceler. (post): Variable deceler. post exaggerated Var. deceler.: Variable deceler. Deceler. (position): Variable deceler. with position changes Long deceler.: Long deceler. Compensatory acceler.: Compensatory acceler

Optional accessories

2647372 Battery Eliminator 100 V ac to 240 V ac
2462177 Carrying Case, Double Pocket
2462478 Philips 50 Series—Ultrasound Cable
2462491 Agilent 50 Series TOCO—External Cable
2462528 Agilent 50 and 8040 Series TOCO—IUP Cable
2462469 Corometrics TOCO—External Cable
2462484 Corometrics—Ultrasound Cable
2462519 Corometrics TOCO—IUP Cable
2462528 HP/AG/PHILIPS IUP TOCO Simulation Cable
2462537 HP (8040 Series) Ultrasound Simulation Cable
2462543 HP (8040 Series) Ext TOCO Simulation Cable
2462555 **2462562** Oxford Ultrasound Simulation Cable 2.0 MHz (blue)
2462570 Oxford IUP Simulation Cable
2462217 RS-232 Cable
2651757 Mechanical Fetal Heart Probe
2462123 Mechanical Fetal Heart Cable

PS320

Fetal Simulator

FLUKE® Biomedical

Specifications

Fetal ECG (continued)	
Variability selections (added to fetal ECG)	Absent variability, low variability, mild variability, high variability severe variability, long-term variability **Note**: These patterns repeat and toco channel will perform toco wave selected.
Optional mechanical heart	Provides a mechanical interface to the ultrasound transducer; can be connected to either ultrasound channels. This option, due to its power consumption, requires an ac adapter to be connected.
Maternal ECG	ECG static rates: 60 BPM, 80 BPM, 100 BPM, 120 BPM, 140 BPM, and 160 BPM ECG sensitivity: 0.5 mV, 1 mV, and 2 mV Pattern selected during Trend #1 selection
Uterine activity **Note**: Toco waveform selection not available during Trend #1.	Execute waveform: Start toco waveform Uterine wave Off: Stop toco waveform Analog 0 V TO 1 V: Analog range 0 V to 1 V (1 V = 100 mmHg) Uterine wave 0 to 25: Range of toco waveform Uterine wave 0 to 50: Range of toco waveform Uterine wave 0 to 100: Range of toco waveform Short duration: Toco waveform of short duration Normal duration: Normal duration of toco waveform Increased duration: Long duration of toco waveform Uterine level = Zero: Zero toco channel (automatic on power up) Uterine static +20: Increase toco static level by 20 mmHg (0 mmHg to 100 mmHg) Incr. resting tone: Resting tone increases Couping: 2 close toco waves Tripling: 3 close toco waves Uterine pressure sensitivity: 5 µV or 40 µV on power up
Important notes	• US-1 tracks the fetal ECG rates • US-2 is the second ultrasound channel with a normal fetal ECG pattern • On the fetal and maternal ECG, the fetal ECG is 1/4 the size of the maternal ECG
The PS320 turns on in the following state:	• Fetal ECG static rate @ 150 BPM • US-1 tracks @ 150 BPM • US-2 normal pattern • Pressure sensitivity @ 5 µV/mmHg • Pressure/Toco set to zero • Maternal ECG rate @ 80 BPM • ECG sensitivity @ 1 mV • Toco wave is normal duration @ 0 to 50 divisions (i.e. 0 mmHg to 50 mmHg)
Temperature	
Operating	15 °C to 35 °C (59 °F to 95 °F)
Storage	0 °C to 50 °C (32 °F to 122 °F)
General information	
Display	2-line x 16-character LCD with keypad
RS-232	Bidirectional interface, 9600 baud
Power	9 V battery/battery eliminator; low battery indication set at 6 V
Housing	Plastic case
Dimensions	15.6 cm x 9.4 cm x 3.4 cm (6.1 in x 3.7 in x 1.3 in)
Weight	0.4 kg (0.9 lb)

Ordering information

2583030 PS320 Fetal Simulator

Kit #1: GE Corometrics
2794057 PS320 Fetal Monitoring Kit, GE Corometrics, includes:
2583030 PS320 Fetal Simulator (includes Operator Manual (2631693), Battery Eliminator (2647372), 9 V Battery)
2651757 MFH-1 Mechanical Fetal Heart Probe [includes Fetal Heart Cable (2462123)]
2397628 Soft-Sided Carrying Case for kit
2462217 17291 RS-232 Cable, PS320/420
2462484 Corometrics Ultrasound Simulation Cable
2462469 Corometrics EXT. TOCO Simulation Cable
2462519 Corometrics IUP TOCO Simulation Cable

Kit #2: Hewlett-Packard, Agilent, Philips Medical
2794069 PS320 Fetal Monitoring Kit, Series 50/8040 Philips Medical, Hewlett-Packard, Agilent, includes:
2583030 PS320 Fetal Simulator (includes Operator Manual (2631693), Battery Eliminator (2647372), 9 V Battery)
2651757 MFH-1 Mechanical Fetal Heart Probe [includes: Fetal Heart Cable (2462123)]
2397628 Soft-Sided Carrying Case for kit
2462217 RS-232 Cable, PS320/420
2462478 HP/AG/PHILIPS (50 Series) Ultrasound Simulation Cable PS320
2462491 HP/AG/PHILIPS (50 Series) EXT TOCO Simulation Cable PS320
2462528 HP/AG/PHILIPS (50 & 8040 Series) IUP TOCO Simulation Cable PS320
2462537 HP (8040 Series) Ultrasound Simulation Cable PS320
2462543 HP (8040 Series) EXT TOCO Simulation Cable PS320

Kit #3: Oxford Medical
2794078 PS320 Fetal Monitoring Kit, Oxford Medical, includes:
2583030 PS320 Fetal Simulator (includes Operator Manual (2631693), Battery Eliminator (2647372), 9 V Battery)
2651757 MFH-1 Mechanical Fetal Heart Probe [includes: Fetal Heart Cable (2462123)]
2397628 Soft-Sided Carrying Case for kit
2462217 RS-232 Cable, PS320/420
2462570 Oxford TOCO IUP Simulation Cable PS320
2462562 Oxford Ultrasound Simulation Cable 2 MHz (blue) PS320
2462555 Oxford Ultrasound Simulation Cable 1.5 MHz (yellow) PS320

Kit #4: Spacelabs Medical
2794040 PS320 Fetal Monitoring Kit, Spacelabs Medical, includes:
2583030 PS320 Fetal Simulator (includes Operator Manual 2631693), Battery Eliminator (2647372), 9 V Battery)
2651757 MFH-1 Mechanical Fetal Heart Probe [includes Fetal Heart Cable (2462123)]
2397628 Soft-Sided Carrying Case for kit
2462217 17291 RS-232 Cable, PS320/420
2462581 Spacelabs Ultrasound Simulation Cable PS320
2462596 Spacelabs TOCO Simulation Cable PS320

Index 2

Pulse Oximeter Simulator

The Index 2 is the most versatile optical simulator for oximeters on the market today. This lightweight, portable tool includes preloaded manufacturers' R-curves and the ability to define other "makes for most pulse oximeters.

Motion presets, player mode, transmission level control (TLC), and computer commands boost testing ability. The Index 2 can also be configured to include an optional electrical simulation feature with probe test. Optical and electrical simulations allow technicians to isolate problems quickly. The probe test identifies defective probes with quantitative test results.

Key features

- Portable
- 10 preloaded manufacturers' R-curves
- User-definable "makes for most other manufacturers
- New R-curves for Masimo, Nonin and Philips Medical Systems (formerly Agilent/H-P) oximeters
- Six downloadable R-curve spaces available
- Simultaneous simulation of motion and arterial-oxygen levels
- Arterial wave-amplitude scale, calibrated in units of perfusion
- Tap/shiver motion simulations to explore the impact of motion
- RS-232 port for computer control
- Physiological finger for complete SpO_2 tests
- Electrical simulations with probe testing (optional)

Specifications

O_2	Range: 35 % to 100 %
	Resolution: 1 %
	Accuracy: 100 % to 75 %: ± 1 % ± accuracy of the pulse oximeter under test; 74 % to 50 %: ± 3 % ± the accuracy of the pulse oximeter under test; < 50 % unspecified
	Repeatability: ± 1 standard deviation
Rate	Range: 30 BPM to 250 BPM
	Resolution: 1 BPM
	Accuracy: 1 % ± 1 BPM
Pulse amplitude	Range: 0 % to 100 % of nominal pleth amplitude
	Resolution: 1 %
	Pulse amplitude is 20 % of maximum pass-through brightness
Probe test	Continuity/resistance test matrix: Measures all combinations of possible interconnections in an XX point matrix
	Range: 250 Ω to 150 kΩ
	Accuracy: ± 5 % of reading
LED/detector voltage test	Test format: Measures the voltage drop across Red LED, infrared LED, and the photo detector when the internally generated test signal is applied
	Test signal: Constant current source @ 1 mA
	Open circuit: 2.5 V max
	Measurement/display range: 0 V to 4 V
	Accuracy: ± 5 % of reading, 0.4 V to 4 V
Dynamic test	Test format: Photodetector/diode response to both the red and infrared light generated by the probe when pulsed by an internal test signal
	Test signal: Pulsed between the two LEDs; constant current level @ 1 mA
	Test results: Nominal range of 0 to 2000
Checksum	Sum of all locations in the program chip; for service use only
General information	
Display	2-line x 24-character super twist LCD
Battery life	At least four hours of continuous use
Dimensions (LxWxH)	45.7 cm x 40.6 cm x 22.9 cm (18 in x 16 in x 9 in)
Weight	4.5 kg (10 lb)

Optional accessories

2204282 Soft Vinyl Carrying Case

2200102 Interface Cable, medTester to Index 2 (RS-232; female DB25 to female DB9)

For a complete list of electrical simulation and probe test cables, contact us.

Included accessories

2226196 Operator's Manual

2521465 Battery Charger

Nellcor and Ohmeda Electrical Simulation and Probe Test Cable (for $Index2_{XLFE}$ only)

Ordering information

Index 2XLF Pulse Oximeter Simulator – Optical Finger Simulation

2250232 United States, 120 V
2395290 Shuko, 250 V
2399900 Australia, 250 V
2399917 United Kingdom, 250 V
2447476 Japan, 100 V

Index 2XLFE Pulse Oximeter Simulator – Optical Finger and Electrical Simulation with Probe Test

2250244 United States, 120 V
2395309 Shuko, 250 V
2399921 Australia, 250 V
2399939 United Kingdom, 250 V
2447465 Japan, 100 V

VT PLUS HF

Gas Flow Analyzer

The VT PLUS HF is Fluke Biomedical's premier general-purpose gas flow analyzer. In addition, special display modes and bidirectional flow make it perfect for fully and efficiently testing both conventional mechanical ventilators and high-frequency ventilators. EC.6.20 now requires 100 % completion of scheduled life-support device preventive maintenance every year, and VT PLUS HF can help meet those requirements. Multiple special-function tests make troubleshooting quick and efficient.

Learning to use the VT PLUS HF is simple. Technicians control the unit using the VT PLUS HF user-friendly command system, or, if they're familiar with the RT-200, they can switch to a special control mode that uses RT-200-style commands.

Key features

- Bidirectional flow, pressure, volume, and oxygen concentration, and pressure measurements
- Low- and high-pressure, and flow measurement capability
- Special HF mode—up to 900 BPM (15 Hz)
- RS-232 and printer ports
- Included Windows-compatible graphics software
- All 21 ventilator parameters displayed at once on one screen
- Operation by user-friendly VT PLUS HF command mode or special RT-200 command mode
- Minimum, maximum, average, absolute, and graph for all parameters
- Multiple special-function tests for efficient troubleshooting

Optional features

- Operation with a variety of precision test lungs available from Fluke Biomedical to complete a fully NIST-traceable ventilator testing system

Specifications

	Low-pressure	High-pressure	Airway-pressure
Range	± 500 mmHg (10 psi)	± 100 psi	± 120 cmH_2O
Accuracy	± 0.5 % of reading or ± 1.5 mmHg, whichever is greater	± 1 % of reading or ± 0.1 psig, whichever is greater	± 0.75 % of reading or ± 0.5 cmH_2O, whichever is greater
Note	Fluid pressure may be applied to the positive port; however, fluids should be kept from entering the pressure port by using a suitable length of connection tubing.		Airway pressure is internally tapped off the proximal-flow sensor port, which is the port closest to the exhaust port on the VT PLUS HF

	Low-flow	High-flow
Flow range	-25 lpm to 25 lpm	-300 lpm to 300 lpm
Accuracy	± 2 % of reading or ± 1 % of range, whichever is greater	± 2 % of reading or ± 2 % of range, whichever is greater
Low-flow dropout	0.01 lpm	–
High-flow dropout	–	25 lpm
Volume range	> ± 60 l	> ± 60 l
Notes	• Tidal-volume accuracy: ± 3 % of reading or ± 2 ml, whichever is greater • Volume accuracy tested to 1 liter • Flow accuracy is specified for dry air or oxygen • Below 3.0 lpm, measurement accuracy is obtained by allowing the VT PLUS HF to fully warm up or manually zeroing before reading or documenting measurement.	• Tidal-volume accuracy: ± 3 % of reading or ± 10 ml, whichever is greater • Volume accuracy tested to 7 liters • Flow accuracy is specified for dry air or oxygen

General	
Dimensions (LxWxH)	25.4 cm x 25.4 cm x 12.7 cm (10 in x 10 in x 5 in)
Weight	4.53 kg (10 lb)

VT PLUS HF standard accessories

VT for Windows PC Software (PC not included)

VT PLUS HF

Gas Flow Analyzer

FLUKE® Biomedical

Specifications

Ventilator parameter	Resolution	Range	Accuracy
Inspiratory and expiratory tidal volume	0.1 ml	As specified in high-flow/low-flow specification	
Expiratory minute volume	0.001 lpm	0 L to 60 L	± 3 %
Breath rate	0.1 BPM	0.5 BPM to 150 BPM	± 1 %
Inspiratory-to expiratory time ratio (I:E ratio)	0.01	1:200 to 200:1	± 2 % or ± 0.1 s
Inspiratory time	0.01 s	0 s to 60 s	± 1 % or ± 0.02 s
Expiratory time	0.01 s	0 s to 90 s	± 1 % or ± 0.01 s
Peak inspiratory pressure	0.1 cmH_20	± 120 cmH_20	± 3 % or ± 1 cmH_20
Inspiratory pause pressure	0.1 cmH_20	± 120 cmH_20	± 3 % or ± 1 cmH_20
Mean airway pressure	0.1 cmH_20	± 80 cmH_20	± 3 % or ± 0.5 cmH_20
Positive end-expiratory pressure (PEEP)	0.1 cmH_20	-5 cmH_20 to 40 cmH_20	± 3 % or ± 0.5 cmH_20
Inspiratory hold time	0.01 s	0 s to 60 s	± 1 % or ± 0.1 s
Expiratory hold time	0.01 s	0 s to 90 s	± 1 % or ± 0.1 s
Peak expiratory flow	0.01 lpm	0 lpm to 300 lpm	± 3 % or ± 2 lpm
Peak inspiratory flow	0.01 lpm	0 lpm to 300 lpm	± 3 % or ± 2 lpm
Lung compliance	0.1 ml/cmH_20	0 ml/cmH_20 to 150 ml/cmH_20	± 5 % or ± 5 ml/cmH_20
	Inspiratory pause time: > 0.5 s		
Flow bias	0.01 lpm	0 lpm to 30 lpm	± 2 % or ± 0.5 lpm
	Expiratory pause time: > 0.5 s		

Optional accessories

2222822 Soft Vinyl Carrying Case for VT PLUS HF

2248587 Hard-sided Protective Carrying Case for VT PLUS HF (limited to stock on hand)

2397628 Soft-sided Carrying Case for ACCU LUNG

Test Lungs

2387318 ACCU LUNG Portable Precision Test Lung (with Soft-sided carrying case for ACCU LUNG, model 2397628)

2251049 Michigan Instruments Non-instrumented Single-adult Test Lung

2251008 Michigan Instruments Non-instrumented Dual-adult Test Lung

2251013 Michigan Instruments Non-instrumented Adult/Infant Test Lung

2213774 Siemens 190 Test Lung

Parabolic Airway Resistors (for use with Michigan Instruments test lungs)

2212830 Parabolic Airway Resistor: RP5

2212934 Parabolic Airway Resistor: RP10

2212848 Parabolic Airway Resistor: RP20

2212853 Parabolic Airway Resistor: RP50

2212918 Parabolic Airway Resistor: RP200

2213140 Parabolic Airway Resistor: RP500

Printers

2248762 Printer 110 V, Citizen IDP 3110

2719653 Printer 220 V, Citizen IDP 3110

2238072 Parallel Printer Cable, D25M-C36M

Accessory Kit Parts

2133712 Filter, External (bacterial), 1 each

2391777 Adapter, DISS O2 nut and nipple with 1/4 in I.D. hose barb, 1 each

2133310 Tubing Adapter, Directional (15 mm OD x 15 mm OD), 2 each

2133305 Tubing Adapter (22 mm OD x 22 mm ID), 2 each

2133291 Tubing Adapter (22 mm OD x 22 mm OD), 2 each

2133269 Tubing Adapter (15 mm OD x 22 mm OD), 2 each

2133278 Tubing Adapter (15 mm OD x 15 mm OD), 2 each

2133284 Tubing Adapter (15 mm ID x 15 mm OD), 2 each

2133322 Tubing Adapter, Narrow Bore, 2 each

2213679 Barb (luer lock – male to 1/89 in ID tubing), 2 each

2133240 Tubing Adapter (1/4 in NPT male to 1/8 in ID tubing barb fitting), 2 each

2133202 Tubing Adapter (luer lock 1/16 in to bulkhead connection), 2 each

Included accessories

2137275 Operator's Manual

2392054 VT for Windows® PC Software

2238659 Serial Cable

2133387 Tilt Stand

Power cord (country specific)

2131367 Accessory Kit (includes 16 accessories)

Ordering information

VT PLUS HF Gas Flow Analyzer

2128272 United States, 120 V

2399376 Australia, 250 V

2399383 Schuko, 250 V

2399390 United Kingdom, 250 V

Premium Precision Ventilator Test Kit

(VT PLUS HF Gas Flow Analyzer; and ACCU LUNG portable precision test lung)

2387329 United States, 120 V

2425682 Australia, 250 V

2425694 Schuko, 250 V

2425701 United Kingdom, 250 V

VT-Plus Upgrades

(adds HF capability and RT-200 mode)

2240945 VT PLUS HF hardware and firmware factory service upgrade (for units lower than hardware v1.01.01; additional flat-rate charge required for factory service/calibration)

DPM4

Parameter Tester

The versatile DPM4 tests and calibrates flow and pressure generators used in many medical devices. With several measurements combined in a single, handheld device, the DPM4 provides a cost-effective solution, eliminating the need for multiple test meters.

The DPM4 features a menu-driven interface for simple operation and an easy-to-read screen that displays multiple parameter measurements simultaneously.

Key features

All models

- Palm size
- High accuracy
- Differential pressure, vacuum, and temperature measurements
- Multiple user-selectable units of measurement
- Simultaneous display of multiple parameter measurements
- Leak-detection/leak-rate calculation
- Peak test function to capture peak pressure
- RS-232 for computer control

Model 1G

- Pressure measurements in -700 mmHg to 5000 mmHg range

Model 1H

- Pressure measurements in -350 mmHg to 350 mmHg range

Model 2G

- Barometric pressure, gas flow, and humidity measurements
- Pressure measurements in -700 mmHg to 5000 mmHg range

Model 2H

- Barometric pressure, gas flow, and humidity measurements
- Pressure measurements in -350 mmHg to 350 mmHg range

Specifications

Model 1H or 2H

Pressure measurement	
Operating range	-350 mmHg to 350 mmHg
Accuracy	± 0.3 % of range
Units of measure	mmHg, mBar, cmH_2O, psi, inHg, inH_2O, kg/cm^2, and kPa

Model 1G or 2G

Pressure measurement	
Operating range	-700 mmHg to +5000 mmHg
Accuracy	± 0.3 % of range for temperatures from 21 °C to 25 °C and relative humidity from 30 % to 70 % ± 0.3 % of range;
	± 0.02 % of range per degree °C for temperatures < 21 °C or > 25 °C with relative humidity from 30 % to 70 %
Units of measure	mmHg, mBar, cmH_2O, psi, inHg, inH_2O, kg/cm^2, and kPa
Temperature measurement (with optional temperature probe)	
Operating range	-40 °C to 200 °C (-40 °F to 392 °F)
Accuracy	± (2 % of reading, + 0.5 °C)
Temperature units	°C, °F

DPM4

Parameter Tester

FLUKE® Biomedical

Specifications

Temperature Probe PT-100 and PT-1000

PT-100 Operating range	-200 °C to 750 °C (-328 °F to 1382 °F)
Accuracy	± 0.13 °C @ 100 °C (0.23 °F at 212 °F) ± 0.1 °C @ 0 °C (0.18 °F @ 32 °F) ± 0.2 °C @ 100 °C (0.36 °F @ 212 °F)
PT-1000 operating range	-200 °C to 750 °C (-328 °F to 1382 °F)
Accuracy	0.3 °C (0.5 °F)

Model 2G or 2H

Note: It is possible to compensate for the sea level and calibrate for offsets.

Pressure measurement	
Operating range	380 mmHg to 825 mmHg
Accuracy	± 2 % of reading
Units of measure	mmHg, mBar, cmH_2O, psi, inHg, inH_2O, kg/cm^2, and kPa
Relative humidity **Note**: An integrated sensor in the instrument determines relative humidity measurements.	
Operating range	12 % RH to 95 % RH
Accuracy	± 3.5 % of reading ± 2 % @ 25 °C (77 °F)
Gas flow **Note**: Gas flow measures with an embedded sensor with 11 calibration points to compensate non-linearity: calibration constants are stored in firmware.	
Gas compatibility	Air, N_2, O_2, CO, NO, CO_2, N_2O, NO_2
Operating range	-750 ml/min to 750 ml/min
Accuracy	± 1 % of range or ± 5 % of reading
Gas flow units	ml/min or sccm (Standard Cubic Centimeter per Minute)
Peak flow test	Peak flow is captured in the unit selected for flow. A reset key allows to restart the test.

Model 1G, 1H, 2G and 2H

Leak test and peak test	
Leak test	Leak rate is computed in the unit selected for pressure over 15, 30, 45 or 60 seconds
Peak test	Peak pressure is captured in the unit selected for pressure. A reset key allows to restart the test.
Temperature	
Operating	15 °C to 35 °C (59 °F to 95 °F)
Storage	0 °C to 50 °C (32 °F to 122 °F)
General information	
Power	9 V alkaline battery RG9 or battery eliminator
Battery life	> 7 hours
Dimensions (LxWxH)	156 mm x 94 mm x 34 mm (6.1 in x 3.7 in x 1.3 in)
Weight	0.4 kg (0.9 lb) with battery

Optional accessories

2462177 Soft-Sided Carrying Case
2461910 PT-100 Temperature Probe
2461922 PT-1000 Temperature Probe
2461905 Expansion Chamber
2461946 Tubing Kit with Inflation Bulb
2462335 RS-232 Cable

Included accessories

2572323 Users Manual
2647372 Battery Eliminator
XXXXXXX Power Cord (country specific)
XXXXXXX One 9 Volt Alkaline Battery

Ordering information

DPM4 Parameter Tester
2583121 Model 1H (± 350 mmHg)
2631330 Model 1G (-700 to 5000 mmHg)
2637760 Model 2H (± 350 mmHg, Press, Temp, Flow, RH)
2637772 Model 2G (-700 to 5000 mmHg, Press, Temp, Flow, RH)

TNT 12000

X-Ray Test Device

The TNT 12000 X-Ray Test Device is the newest and most versatile instrument available for measuring key x-ray imaging parameters. It sets up in seconds and measures kVp, dose, dose rate, time, and half value layer (HVL) in a single exposure. A totally-wireless ZigBee® interface enables quick and easy setup and the wireless detector can be used with the companion wireless display or a laptop computer.

X-ray imaging QA, calibration, and maintenance in today's demanding digital environment require very high productivity and compliance with local and regional regulations. The TNT 12000 delivers high productivity through 100 % wireless connectivity to either a display, which instantly responds with all values in a single exposure, or a laptop, where measured values are displayed and categorized in organized templates. Instant HVL with just a single exposure further enhances productivity.

Featuring all-in-one-exposure measurements and ZigBee wireless communication combined with the rugged, reliable, and accurate design that is a Fluke trademark, the TNT 12000 is truly a new breed of non-invasive x-ray test tool. TNT 12000 is ideal for use by OEM factory and field service engineers, independent service organizations, physicists, biomedical and clinical engineers, and local and regional field inspectors of x-ray imaging equipment. Its small, lightweight design enhances portability and 100 % wireless operation ensures setup can be accomplished in seconds. Because the TNT 12000 measures all parameters with every exposure, there is no need for complicated menu selection, further enhancing user productivity. TNT 12000 always defaults to the last use when powered on, so when used often for repetitive procedures it is truly a one-button (power-on) solution. The TNT 12000 has the expanded functionality needed for modern applications and can be managed with minimum keystrokes. Users can identify and select custom measurement protocols and save them for future use. Full test automation and documentation software is available for TNT 12000, creating the advantage of accurate, repeatable testing processes. Ansur Test Automation Software is only available from Fluke Biomedical.

Primary end benefit

Productivity and accuracy are central goals when performing any maintenance or QA process on diagnostic imaging equipment because image system uptime is critical to patient care objectives. TNT 12000 is small, portable, and wireless. It is easily transported to the imaging room, set up in seconds, and all results are instantly available on the hand-held display or on the user's laptop. The latter application places measured values into templates that are standard with the Excel software provided with TNT 12000. Because the TNT 12000 Excel package is a spreadsheet, users can customize their templates and create their own reports to send to others. Accuracy, reproducibility, and reliability are also critically important and Fluke Biomedical is the industry standard customers count on to deliver uncompromised performance.

Key features

- 100 % ZigBee wireless operation between detector and hand-held display or laptop
- Compact hand-held design for maximum portability and ease-of-use
- Simple user interface with minimum menu routines means setup in seconds
- Fluke Biomedical ruggedness provides reliable operation. It's tough!
- 40 kHz sampling rate to ensure accuracy with the most difficult applications
- Global support network delivering prompt service and peace-of-mind to Fluke Biomedical customers worldwide

TNT 12000

X-Ray Test Device

FLUKE® Biomedical

Specifications

kVp measurements	
Units	kVp Average (average of peaks during a specified interval) kVp Max (highest peak during a specified interval) PPV (peak practical voltage)
Ranges	
Radio/Fluoro modes	40 kV to 150 kV
Mammo modes	Mo/Mo: 22 kV to 35 kV (standard calibration)
	Rh/Rh: 25 kV to 49 kV (optional calibration)
	Mo/Rh: 22 kV to 40 kV (optional calibration)
	Mo/Al: 22 kV to 49 kV (optional calibration)
	Rh/Al: 25 kV to 49 kV (optional calibration)
	W/Rh: (optional calibration)
	W/Ag: (optional calibration)
Resolution	0.1 kV
Accuracy	Radio/Fluoro modes: ± 2 % or ± 1 kV, whichever is greater
	Mammo modes: ± 2 % or ± 0.7 kV, whichever is greater
Reproducibility	± 1 % (std of 5 readings)
Filtration correction range	Radio/Fluoro modes: 1 mm Al to 10 mm Al or equivalent
	Mammo mode: 0 mm Al to 0.4 mm Al added filtration
Dose/exposure measurements	
Units	Roentgens, grays
Range	0.5 mR to 999 R 5 µGy to 999 Gy
Resolution	1 µR 0.01 µGy
Accuracy	± 5 %
Reproducibility	± 0.5 % (std % of five readings)
Filtration correction range	Radio/Fluoro modes: 1 mm Al to 10 mm Al or equivalent
	Mammo mode: 0 mm Al to 0.4 mm Al added filtration
kV correction ranges	Radio/Fluoro modes: 40 kV to 150 kV
	Mammo mode: Mo/Mo: 22 kV to 35 kV
Dose/exposure rate measurements	
Units	Roentgens or grays per hour, minute, second, pulse
Range	8 mR/s to 10 R/s 70 µGy/s to 100 mGy/s 130 µR/pulse to 160 mR/pulse (@ 60 PPS) 12 µGy/pulse to 1.4 mGy/pulse (@ 60 PPS)
Resolution	1 µR/s 0.01 µGy/s 0.02 µR/pulse (@ 60 PPS) 0.2 nGy/pulse (@ 60 PPS)
Accuracy	± 5 %
Filtration correction range	Radio/Fluoro modes: 1 mm Al to 10 mm Al or equivalent
	Mammo mode: 0 mm Al to 0.4 mm Al added filtration
kV correction range	Radio/Fluoro modes: 40 kV to 150 kV
	Mammo mode: Mo/Mo: 22 kV to 35 kV
Exposure time—radiographic modes	
Units	Milliseconds, pulses
Range (@ stated accuracy)	Milliseconds: 10 ms to 9999 ms
	Pulses: 1 pulse to 999 pulses
Resolution	Milliseconds: 0.1 ms
	Pulses: 1 pulse

Optional accessories

35035 mA/mAs Meter
TNT 12000 Ansur Test Automation Software Plug-in

TNT 12000

X-Ray Test Device

FLUKE® Biomedical

Specifications

Accuracy	Milliseconds: 1 % or 0.5 ms
	Pulses: ± 1 pulse
Reproducibility	Milliseconds: 1 % or 0.5 ms
	Pulses: ± 1 pulse
Elapsed time—fluoro modes	
Range	10 sec to 9999 sec
Resolution	0.1 second
Accuracy	1 % or 0.5 sec
Average pulse rate—pulsed fluoro	
Range	1 pps to 999 pps (pulses per second)
Resolution	1 pps
Accuracy	1 pps
Average pulse width— pulsed fluoro	
Range	10 ms to 999 ms
Resolution	0.1 ms
Accuracy	1 % or 0.5 ms
HVL	
Range	Radio/Fluoro modes: 1.2 mm Al to 10 mm Al (equivalent)
	Mammo mode: 0.2 mm Al to 0.6 mm Al (equivalent)
Resolution	Radio/Fluoro modes: 0.1 mm Al (equivalent)
	Mammo mode: 0.01 mm Al (equivalent)
Accuracy	Radio/Fluoro modes: ± 10 % or 0.2 mm Al (equivalent)
	Mammo mode: ± 5 % or 0.05 mm Al (equivalent)
Electrical specifications	
Battery	Battery type: Lithium-ion, 3.7 V, 4000 mAh
	Battery charge time: Approx. 5 hr
	Battery discharge time: Approx. 8 hr
	Battery cutoff voltage: 2.75 V
AC adapter	Input voltage: 100 V ac to 240 V ac
	Input frequency: 50/60 Hz
	Input current: 0.5 A (rms)
	Output voltage: 6 V dc
Environmental specifications	
Operating temperature	0 °C to 35 °C (32 °F to 95 °F)
Storage temperature	-35 °C to 50 °C (-31 °F to 122 °F)
Operating humidity	20 % to 80 % RH (non-condensing)
Physical specifications	
Display	320 × 240 Color LCD
Size (WxDxH)	Display: 15.2 cm x 11.4 cm x 4.45 cm (6 in × 4.5 in × 1.75 in)
	Detector: 15.2 cm x 11.4 cm x 4.45 cm (6 in × 4.5 in × 1.75 in)
Weight	Display: 0.422 kg (0.93 lb)
	Detector: 0.68 kg (1.5 lb)

Optional accessories

3335538 TA-TNT12K, **TNT 12000** with Test Automation

3340639 TA-TNT12KWD, **TNT 12000** Wireless Detector with Test Automation

Ordering information

Kit #1

TNT 12000 X-Ray Test Device

Included accessories

1320005000 TNT 12000WD Wireless Detector

1330005000 TNT 12000D Wireless Display

14-445 (2) AC Adapters/Chargers

50-197 Cable, Type A to Mini B USB

50-198 Cable, Mini A to Mini B USB

1320003000 Excel Software/ User Manual on CD

1320033000 Carrying Case

90-183 ZigBee® USB Dongle

TNT12QRG Quick Start Reference Guide

Kit #2

3335774 TNT 12000WD Wireless Detector

Included accessories

1320005000 TNT 12000WD Wireless Detector

14-445 (1) AC Adapter/Charger

50-197 Cable, Type A to Mini B USB

1320003000 Excel Software/ User Manual on CD

1320033000 Carrying Case

90-183 ZigBee® USB Dongle

TNT12QRG Quick Start Reference Guide

Kit #3

3335795 TNT 12000D Wireless Display

Included accessories

1330005000 TNT 12000D Wireless Display

14-445 (1) AC Adapter/Charger

50-197 Cable, Type A to Mini B USB

50-198 Cable, Mini A to Mini B USB

1320003000 Excel Software/ User Manual on CD

TNT12QRG Quick Start Reference Guide

35080M/199XRAY

Non-Invasive kVp Divider and Medical ScopeMeter

FLUKE®
Biomedical

The winning combination.
The 35080M and 199XRAY are commonly used x-ray tools unmatched by traditional meters. This winning combination allows busy service engineers and biomedical personnel the ability to perform fast and accurate verification of kVp values for calibration or QA assessment. Fluke Biomedical offers this combination in a convenient kit with all the accessories you need to get started.

35080M Non-Invasive kVp Divider
The 35080M Non-Invasive kVp Divider quickly and accurately measures kVp for all modalities. The unit checks both above and below table tubes and displays the direct kVp values on either the 35050AT Dosimeter, the 199XRAY Medical ScopeMeter, or optional Excel Add-in software. The 35080M is highly portable and eliminates the need for bulky and heavy high-voltage divider tanks. In fact, it's so compact in size that it fits into a shirt pocket.

A patented* wide-range filter pack is included with the 35080M and provides accurate readings for the range of 50 kVp to 150 kVp. Four optional filter packs are available for use with the 35080M for CT, mammographic, and mobile applications.

199XRAY Medical Scopemeter
The 199XRAY Medical ScopeMeter has all the normal oscilloscope functions, as well as the speed, performance, and analysis power for more-demanding applications. This high-performance oscilloscope offers the functionality of top-end bench instruments. With up to 200 MHz bandwidth, 2.5 GS/s real-time sampling, and a deep memory of 27,500 points per input, the 199XRAY is ideal for engineers who need the full capabilities of a high-performance oscilloscope in a handheld, battery-powered instrument.

In addition, the 199XRAY is specially designed for use with x-ray systems. This ScopeMeter displays kVp waveforms and direct kVp values simultaneously on an easy-to-read screen, eliminating time-wasting calculations of scope traces to derive kVp values.

Key features

35080M
- New miniaturized configuration for convenient transport to the job site
- Fast/easy non-invasive kVp values for calibration/QA
- Non-invasive technology eliminates the hazards of high-voltage cables and the need for bulky divider tanks
- Auto ON/OFF when connected/disconnected
- Optional filter packs enable testing in all modalities
- Rh/Rh measurement capability when 35080M is used with Cadmium K-Edge and Linear Mammo Filter Pack Pair
- Convenient storage/carrying case

199XRAY
- ScopeMeter displays kVp wave forms and direct kVp values simultaneously on an easy-to-read screen
- No more time spent calculating scope traces to derive kVp values
- Full medical oscilloscope scope functionality with color display
- ScopeMeter triggers on standard interlaced and high-resolution, non-interlaced video systems. Triggers on all lines nonselectively or select an individual video line—up to 2800 lines per frame
- mAs measurement calculates current over time
- Smart averaging capabilities
- Extended vertical offset
- Selectable persistence mode
- Extended video triggering
- FlukeView® for Windows® for documenting, enhancing, waveform analysis, and archiving results

35080M/199XRAY

Non-Invasive kVp Divider and Medical ScopeMeter

FLUKE® Biomedical

Specifications

35080M

Range	50 kVp to 150 kVp, using only the wide-range radiographic filter pack (37617). Range and versatility are extended with the use of special optional filter packs.
Accuracy	± 2 % of reading in the range of 50 kVp to 150 kVp, exclusive of linearity, filtration, and gain effects. Linearity corrections automatically applied when using 35080M with either 35050AT Dosimeter or 199XRAY.
Response time	150 µs (10 % to 90 %)
Calibration	Internally generated signal provides a calibration check
Minimum time for valid reading	1 ms, three-phase; one line cycle, single-phase
Tube current	Wide dynamic range from 4 mA to 3000 mA (three-phase), 2 mA to 1500 mA (single phase). Generator settings will vary in waveform and distance. Less than ± 1 kVp effect for wide-range radiographic filter pack covering 50 kVp to 150 kVp. Specialty filter packs may have different characteristics.
Environmental	Temperature range: 0 °C to 35 °C Relative humidity: 20 % to 80 % Storage temperature: -35 °C to 50 °C
Orientation	Long axis of the Model 35080M Non-invasive kVp Divider oriented perpendicular to axis of x-ray tube to eliminate heel effect.
Power requirements	9 V battery, 60 hours operation
Dimensions (LxWxH)	6 cm x 9 cm x 21 cm (2.38 in x 3.5 in x 8.25 in)
Weight	0.68 kg (1.5 lb)

MA190 Accessory Kit

The MA190 accessory set enables interconnection of the 199XRAY for use in the field of medical imaging and video systems. The kit is included with the 199XRAY as a standard accessory. The accessory kit includes the following:

- FlukeView for Windows software
- 50 Ω BNC feedthrough terminator, in insulated enclosure, to maintain proper termination of test connections during measurement
- 50 Ω BNC terminator with 10:1 signal attenuation, to keep test terminal properly loaded while getting optimum signal amplitude to benefit from the instrument's extended offset range
- 1 Ω current shunt for current measurements, in insulated enclosure
- Safety-designed BNC cable, 1.5 m (5 ft), with plastic connectors for safe connection to test terminals even when not at ground potential
- Insulated BNC (f) to 4 mm banana-plug adapter
- Dual 4 mm banana receptacles (1 red, 1 black)

35080M/199XRAY

Non-Invasive kVp Divider and Medical ScopeMeter

FLUKE® Biomedical

Specifications

199XRAY

Field applications	
Bandwidth	Dual input: 200, 100 or 60 MHz
Real-time sampling rate	Up to 2.5 GS/s
Trigger types	Connect-and-View™ automatic triggering and a full range of manual trigger modes
Extended video triggering	Along with its triggering capability for standard, interlaced TV signals, the instrument also triggers on high-resolution, non-interlaced video systems. The ScopeMeter 199XRAY will trigger on all lines (nonselective), or can select an individual video line from systems with up to 2800 lines per frame.
Persistence	Digital persistence for analyzing complex dynamic waveforms, similar to an analog scope.
Selectable persistence	Persistence mode with selectable decay time helps to find anomalies in the wave shape and optimizes the display for color information when working with composite color video.
Display	Fast-display update rate for seeing dynamic behavior instantaneously
	Automatic capture and replay of 100 screens
Maximum record length	27,500 points-per-input record length using ScopeRecord mode
Trend analysis	TrendPlot paperless chart recorder for trend analysis up to 22 days
Independently floating isolated inputs	Up to 1,000 V
Waveform compare	Waveform reference for visual comparisons and automatic pass/fail testing of waveforms
Vpwm	Vpwm function for motor drive and frequency inverter applications
mA	mAs measurement calculates current over time. Using the cursors, you can now measure directly the amount of radiation produced by x-ray systems, or the total amount of charge applied to a system.
Smart averaging	Smart averaging gives the averaged waveform over successive acquisitions, reducing noise in the displayed waveform. Thanks to smart averaging, you can now also see an incidental curve of a different wave shape with no effect on the averaged curve. This allows you to see the averaged curve of a sequence of video lines, for example, while still seeing the incidental flyback line flash by. The oscilloscope gives an immediate response when the signal makes large changes.
Extended offset	Vertical offset is now extended to a maximum of 16 divisions, allowing vertical zoom-in for study of small details of the signal.
Electrical safety	1000 V CAT II and 600 V CAT III safety certified
Power requirements	Rechargeable NiMH battery pack, four hours operation
Dimensions (LxWxH)	25.6 cm x 16.9 cm x 6.4 cm (10.1 in x 6.6 in x 2.5 in)
Weight	2.0 kg (4.4 lb)

FlukeView® for Windows®

Documenting	Transfer waveforms, screens, and measurement data from the ScopeMeter to a PC. Print or import the data into your report.
Enhancing	Add user text to individual ScopeMeter settings, providing guidance to the operator when recalling a setup.
Archiving	Create a library of waveforms with your comments for easy reference and comparison. Store complete replay cycles for analysis of waveform changes. Store complete memory content of the ScopeMeter on your PC for backup purposes.
Waveform comparison	Store reference waveforms, add operator instructions, and send both to the ScopeMeter for waveform comparison and "Pass/Fail" testing.
Analysis	Use cursors, perform spectrum analysis, or export data to other analysis programs.

Optional accessories

33551 CT filter pack
37351 Linear mammo filter pack
37355 Cadmium K-Edge filter pack
37946 Mobile filter pack
38237 Low range filter pack

Included accessories

35080M/199XRAY
35080M Non-Invasive kVp Divider
199XRAY Medical ScopeMeter
MA190 Medical ScopeMeter Accessory Kit
37617 Wide-range filter pack
121002900 Carrying Case

199XRAY
MA190 Medical ScopeMeter Accessory Kit

35080M
37617 Wide-range filter pack
1210029000 Carrying case

Ordering information

35080M/199XRAY kVp Divider and Medical ScopeMeter Kit
199XRAY Medical ScopeMeter with kVp capabilities
35080M Non-Invasive kVp Divider

07-CRXW and 07-QRX

Wireless CR RADCHEX and QA RADCHEX

The wireless 07-CRXW CR RADCHEX and 07-QRX QA RADCHEX are factory radiation-calibrated, NISTtraceable light meters that can be used to calibrate (balance) CR plate readers (also radiation-calibrated light meters) in the field. The CR plate reader in the field will be calibrated and traceable to the Fluke Biomedical factory radiation-calibrated and traceable x-ray-produced light exposure.

CE

Both 07-CRXW and 07-QRX have the same x-ray energy response as a CR system (x-ray-to-light conversion efficiency is the same for various beam conditions). This enables them to be used as accurate and precise replacements for the plate reader's light measurement value (exposure index value).

Most importantly, the 07-CRXW and 07-QRX can save valuable time when calibrating or accessing CR readers and AEC used with multiple x-ray systems. These x-ray systems may have different filtration and beam characteristics even when located in the same department or imaging center. Balancing system performance and dose is an important QA requirement best satisfied with either the 07-CRXW or 07-QRX.

Applications

The wireless 07-CRXW is ideal for use by service engineers to initially calibrate and troubleshoot the CR plate reader, AEC, and density selector settings. Physicists use 07-CRXW to assess the performance of CR-AEC for compliance to clinical system speed objectives and patient dose. Radiology managers can use 07-CRXW to assist in the establishment of technique charts and training to determine ALARA techniques for various exam types. QA personnel can use 07-CRXW to periodically document the performance of the CR system and to compare CR to film/screen systems regarding desired ALARA objectives. The 07-CRXW uses Bluetooth® to communicate with a laptop computer so that the CRLU (CR Light Units), EI (Exposure Index) and estimated mR values measured by the electronic cassette are automatically recorded and displayed on the laptop screen.

Benefits

Using the 07-CRXW to calibrate x-ray system AEC and CR plate readers instead of a dosimeter can improve productivity significantly. A full system AEC and CR plate reader calibration process can take as much as six hours. Employing the 07-CRXW the process can be completed in under two hours. A substantial productivity gain for service, biomedical or physics professionals.

Essentially, the wireless 07-QRX performs all of the functions of the 07-CRXW, however CRLU and speed numbers (representing the relative system speed of the CR system compared to a film/screen system) are displayed on a LCD readout built into the electronic cassette. A pressure sensitive On/Off switch activates the 07-QRX and is used to reset the meter between exposures. The values may be manually entered into the software program on a laptop or PC if desired but a laptop is not required to use the 07-QRX. The 07-CRXW and 07-QRX are designed to work with all major brands of CR equipment.

The 07-QRX QA RADCHEX is ideally suited for fast and easy daily checks of AEC and CR system exposure continuity. Data obtained from daily checks can be used for trend analysis of individual systems as well as a way to monitor the balanced performance of CR systems throughout the healthcare enterprise.

Key features

- Calibrates computed radiography (CR) plate readers and automatic exposure control (AEC)
- Assesses ongoing performance of CR plate reader, AEC, and automatic programmed radiography (APR)
- Sets and maintains desired clinical system speed (dose) of the CR system
- Calibrates CR plate readers in the field to be traceable to a factory radiation-produced light condition
- Links radiation exposure (mR) to the front of the plate accurately and predictably to a CR light measurement value (CRLU)
- Provides a reliable and reproducible method of accurately maintaining a CR manufacturers' specific factory calibration
- Provides three different tube-head filtration choices for users who desire a non-filtered beam condition for field plate reader calibration
- Software selections of multiple beam conditions for different CR manufacturers
- Ideal tools for service engineers, physicists, and quality assurance personnel

07-CRXW

Wireless CR RADCHEX

FLUKE® Biomedical

Specifications

X-ray energy dependence	Simulates relative light output of photostimulatable phosphor plate (PSP) within ± 3 % over kVp range of 60 kVp to 120 kVp and a patient equivalent thickness range of 5 cm to 35 cm (within specified operating rates)
Digital range	Computed radiography light units: CRLU (AEC#); 0 to 500 CRLU (AEC#); 0 to 5000 (07-QRX)
Minimum CRLU rate	1.5/sec (approx. 0.15 mR/sec entrance exposure rate), 7/sec (approx. 0.7 mR/sec entrance exposure rate) (07-QRX)
Maximum CRLU rate	2500/sec (approx. 250 mR/sec entrance exposure rate), 25000/sec (approx. 2500 mR/sec entrance exposure rate) (07-QRX)
Power on/off	Manual switch
Controls	Wireless communications with computer software; Bluetooth wireless communications (07-CRX only)
Functions	Measures CRLU (AEC#); converts CRLU to CR manufacturers specific CR plate reader light exposure index value (EI); user selectable; calculates cassette input exposure values for various x-ray beam conditions (exposure in mR plus backscatter)
Power requirements	Built-in NiMH rechargeable battery pack (9.6 V)
Typical battery life between charging	5 hours, 20 hours (07-QRX)
X-ray beam filter	1.5 mm copper (B152-110); 6 in x 6 in complete with velcro straps to attach to x-ray tube collimator housing
Environmental requirements	Operating temperature: 15 °C to 35 °C (59 °F to 95 °F)
General information	
Electronic cassette dimensions (WxDxH)	30 cm x 24 cm x 1.3 cm (12 in x 10 in x 0.5 in)
Weight	1.8 kg (3.9 lb)
Computer software	CD-ROM containing Microsoft® Excel program
Computer requirements	Computer capable of running Windows® 98 or higher with Microsoft Excel, Computer not required to operate (07-QRX). Software is provided with (07-QRX) to manually enter values if desired

Optional accessories

07-AEC6 For film/screen applications to assess and calibrate automatic exposure control (AEC) – radiographic and mammographic systems

07-AEC6M For film/screen applications to assess and calibrate automatic exposure control (AEC) – mammographic systems

Ordering information

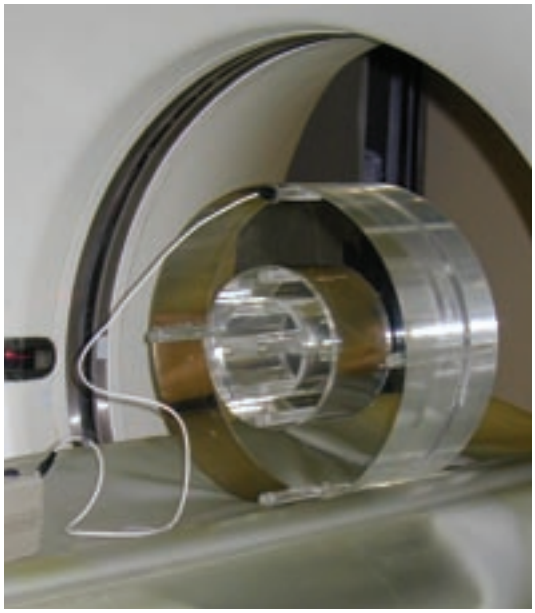
07-CRXW Wireless CR RADCHEX, including PC-based Excel documentation software

07-QRX Wireless QA RADCHEX, including PC-based Excel documentation software

FLUKE®
Biomedical

76-424-4156

Nested CT Dose Phantom Kit for Pediatric/Adult Head and Body



The innovative nested CT Dose Phantom can be used with any computed tomography (CT) system designed to image pediatric and adult head and body. Each phantom segment can provide separate dose information. When performing dose profile measurements, the dose phantoms allow the user to collect information for the maximum, minimum, and mid-range value of the nominal tomographic section thickness.

This essential phantom kit consists of three parts: an adult body phantom, an adult head phantom that doubles as a pediatric body phantom, and the new pediatric head phantom, nested together for easy storage and convenient transport. All are made of solid acrylic with diameters of 32 cm, 16 cm and 10 cm, respectively. Each part contains four probe holes around the perimeter, 90° apart and 1 cm from the edge and the pediatric head (center insert) has one probe hole in its center. The inside diameter of the holes is 1.31 cm. Each part includes five acrylic rods for plugging all the holes in the phantom. A sturdy storage and carrying case with wheels and pull handle that holds all three phantoms is included. An optional smaller case without wheels is available.

The CT Dose Phantoms were designed in accordance with the Food and Drug Administration's performance standard for diagnostic x-ray systems, which includes regulations specifically applicable to CT systems (21 CFR 1020.33).

Key features

- Uniquely designed for pediatric and adult computed tomography dose index (CTDI) in a lightweight 20 kg (44 lb) total package
- Can be used with new multi-detector (MDCT) units
- Meets requirements of FDA performance standards
- All new carrying case with wheels and pull handle
- Case includes space for CT Ion Chambers (purchased separately)

76-424-4156 Kit: Adult body phantom, adult head phantom, pediatric head phantom, and acrylic rods

Optional accessories

89-419 Carrying Case with wheels and pull handle for 76-419-4150

89-414 Carrying Case for 76-414-4150

Specifications

76-424-4156	
Adult body phantom	Dimensions: (LxØ): 15.5 cm x 32 cm
	Weight: 11.3 kg (25 lb)
Adult head/pediatric body phantom	Dimensions: (LxØ) 15.5 cm x 16 cm
	Weight: 2.3 kg (5 lb)
Pediatric head phantom	Dimensions: (LxØ) 15 cm x 10 cm
	Weight: 1.3 kg (3 lb)
3 nested phantoms	Weight: 15 kg (33 lb)

76-419-4150	
Weight	Body phantom: 14.5 kg (32 lb)
	Head phantom: 3.6 kg (8 lb)

76-414-4150	
Weight	Body phantom: 14.5 kg (32 lb)
	Head phantom: 3.6 kg (8 lb)
	Pediatric head phantom: 1.3 kg (2.85 lb)

Ordering information

76-424-4156 Nested CT Dose Phantom Kit for Pediatric/Adult Head and Body including carrying case with wheels and pull handle

76-424-4150 Nested CT Dose Phantom Kit for Pediatric/Adult Head and Body including carrying case without wheels and pull handle

76-414-4150 CT Dose Phantom Kit for Adult Head and Body including carrying case

76-419-4150 CT Dose Phantom Kit for Pediatric/Adult Head and Body including carrying case with wheels and pull handle

76-419 CT Pediatric Head Dose Phantom with five plugs

76-414 CT Head Dose Phantom with five plugs

76-415 CT Body Dose Phantom with five plugs

FLUKE®
Biomedical

18-220

Mammographic Accreditation Phantom

The 18-220 Mammographic Accreditation Phantom will assist you in complying with MQSA and the American College of Radiology (ACR) Quality Control Programs. This phantom is intended for use as an integral part of the Mammographic Quality Control Program, and when used to perform routine mammographic QC, it will help you quickly, easily, and accurately evaluate the overall imaging performance of your mammographic system. This phantom will detect imaging changes so you can make the necessary corrections in order to maintain your system at peak performance.

The 18-220 Mammographic Accreditation Phantom was designed to test the performance of a mammographic system by a quantitative evaluation of the system's ability to image small structures similar to those found clinically. Objects within the phantom simulate calcifications, fibrous calcifications in ducts, and tumor masses.

The phantom is also designed to determine if a mammographic system can detect small structures that are important in the early detection of breast cancer. Test objects within the phantom range in size from those that should be visible on any system, to objects that will be difficult to see even on the best mammographic system.

Key features

- Helps ensure optimum image quality and peak performance of the mammographic system
- Essential for MQSA compliance
- Complies with ACR phantom specifications and QC requirements
- Contains test objects to simulate indications of breast cancer; punctuate calcifications, tissue fibrillar extensions in adipose tissue, and tumor like masses
- Ideal for monitoring the overall performance of your mammographic imaging system, x-ray generator, film processor, and screen-film combination
- Equivalent in x-ray attenuation to a 4.5 cm compressed "average" breast

Optional are two 2 cm acrylic plates. The addition of these two plates, when combined with the overall 4.4 cm thickness of the phantom, will allow the system image quality to be checked in varying thicknesses of 2 cm to 8.5 cm. Both of these items are recommended by ACR in their Mammography Quality Control Procedure.

Specifications

Phantom body		
Material	Acrylic	
Dimensions	Overall (WxDxH): 10.15 cm x 10.8 cm x 4.4 cm (4 in x 4.25 in x 1.75 in)	
	Acrylic base: 3.4 cm in thick (1.375 in)	
	Cover: 3 mm thick (0.128 in)	
	Acrylic contrast test disk: 1 cm Ø x 4 mm	
Weight	0.55 kg (1.2 lb)	
Wax insert		
Nylon fibers	**Al2O3 Specks**	**Masses (thickness)**
1) 1.56 mm	7) 0.54 mm	12) 2 mm
2) 1.12 mm	8) 0.4 mm	13) 1 mm
3) 0.89 mm	9) 0.32 mm	14) 0.75 mm
4) 0.75 mm	10) 0.24 mm	15) 0.5 mm
5) 0.54 mm	11) 0.16 mm	
6) 0.4 mm		

Optional accessories

18-237 Acrylic Plates, 10 cm x 10 cm x 2 cm thick, set of 2
18-205 Acrylic Contrast Test Disc, 1 cm Ø x 4 mm
89-220 Carrying Case

Included accessories

Acrylic contrast test disk, faxitron x-ray image, and magnifying glass

Ordering information

18-220 Mammographic Accreditation Phantom

FLUKE®
Biomedical

451B

Ion Chamber Survey Meter with Beta Slide

The auto-ranging 451B measures radiation rate and accumulated dose from beta, gamma and x-ray radiation sources. The 451B's site surveying capabilities make it well suited for a wide range of end users, including: police and fire departments, x-ray manufacturers, government agencies, state inspectors, emergency response and HAZMAT teams, nuclear medicine labs, hospital radiation safety officers, and nuclear power workers.

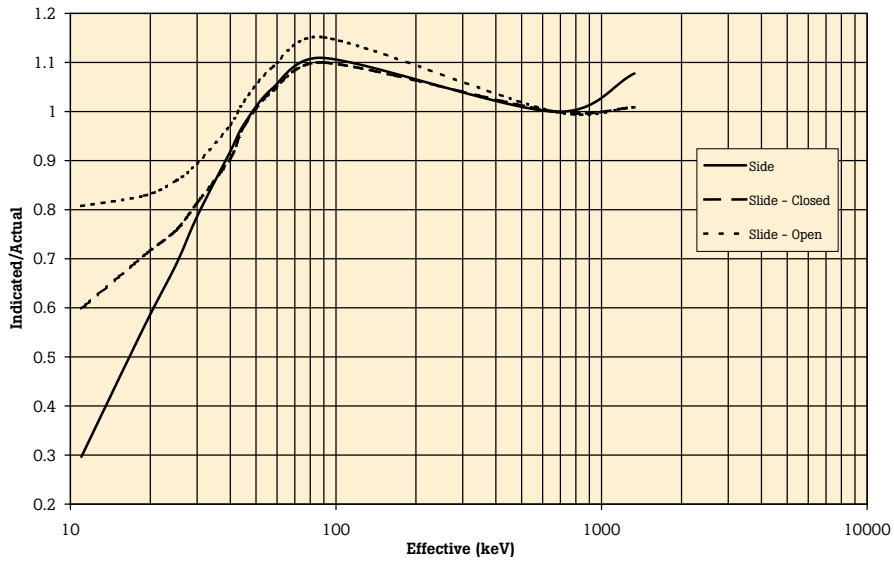
The ion-chamber detector allows for a fast response time to radiation from leakage, scatter beams and pinholes. Additionally, the low-noise chamber bias supply provides for fast background settling time. A sliding beta shield serves as an equilibrium thickness for photon measurements and enables beta discrimination.

The digital display features an analog bar graph, 2.5 digit digital readout, low battery and freeze ("peak hold") mode indicators, and an automatic backlight function. User controls consist of an ON/OFF button and a MODE button. The case is constructed of lightweight, high-strength materials and is sealed against moisture. The RS-232 interface can be connected directly to a computer for use with the Excel add-in for Windows® (451EXL), enhancing the functionality of the instrument. This software allows for data retrieval, user parameter selection and provides a virtual instrument display with audible (requires sound card) and visual alarm indication.

Key features

- High sensitivity measurement of rate and dose simultaneously, with the capability to record peak rate
- Auto-ranging and auto-zeroing
- RS-232 communications interface with optional Windows-based Excel add-in for data logging
- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod mount
- Programmable flashing LCD display and audible alarm
- Easily-accessible battery door (operated by two 9-volt alkaline batteries) on the outside of the bottom case
- Available with dose equivalent energy response (SI units)
- Shoulder strap and handle which can be easily decontaminated (Nuclear Power plant specific unit)

451B typical energy dependence



FLUKE®
Biomedical

451B

Ion Chamber Survey Meter with Beta Slide

Specifications

Radiation detected	Alpha above 7.5 MeV, Beta above 100 keV, and Gamma above 7 keV	
Operating ranges		
	0 to 5 mR/h or 0 to 50 µSv/h	
	0 to 50 mR/h or 0 to 500 µSv/h	
	0 to 500 mR/h or 0 to 5 mSv/h	
	0 to 5 R/h or 0 to 50 mSv/h	
	0 to 50 R/h or 0 to 500 mSv/h	
Accuracy	Within 10 % of reading between 10 % and 100 % of full scale indication on any range, exclusive of energy response. Calibration source is ^{137}Cs.	
Detector		
Chamber	349 cc volume air ionization	
Chamber wall	246 mg/cm^2 thick phenolic	
Chamber window	6.6 mg/cm^2 mylar, protected by steel mesh, 46 cm^2 detection area	
Beta slide	440 mg/cm^2	
451B-DE-SI	In order to achieve energy response consistent with measurements of H*(10) as required by ICR4–47, aluminum has been added to the back wall, 38 % of the side wall area, and to the beta slide. With the Beta Shield open, the 451B can measure skin dose at 10*(0.07), and Deep Dose H*(10) with Beta Shield closed.	
Controls	ON/OFF and MODE	
Automatic features	Auto-zeroing, auto-ranging, and auto-backlight	
Response time	**Range**	**Response**
	0 to 5 mR/h (0 to 50 µSv/h)	8 s
	0 to 50 mR/h (0 to 500 µSv/h)	2.5 s
	0 to 500 mR/h (0 to 5 mSv/h)	2 s
	0 to 5 R/h (0 to 50 mSv/h)	2 s
	0 to 50 R/h (0 to 500 mSv/h)	2 s
Display LCD analog/digital with backlight		
Analog	100 element bar graph 6.4 cm long. Bar graph is divided into 5 major segments, each labeled with the appropriate value for the range of the instrument.	
Digital	2.5 digit display is followed by a significant zero digit depending on the operating range of the instrument. The units of measurement are indicated on the display at all times. Digits are 6.4 mm (0.25 in) high. Low battery and freeze indicators are also provided on the display.	
Modes		
Integrate mode	Operates continuously 30 seconds after the instrument has been turned on. Integration is performed even if the instrument is displaying in mR/h or R/h.	
Freeze mode	Will place a tick mark on the bar graph display to hold on the peak displayed value. The unit will continue to read and display current radiation values.	
Environmental		
Power requirements	Two 9 V alkaline, 200 hours operation	
Warm-up time	One minute	
Temperature range	-20 °C to 70 °C (-4 °F to 158 °F)	
Relative humidity	0 to 100 %, @ 60 °C	
Geotropism	Less than 1 %	
Dimensions (WxDxH)	10 cm x 20 cm x 15 cm (4 in x 8 in x 6 in)	
Weight	1.11 kg (2.5 lb)	

Optional accessories

451EXL 451 Assistant for Excel, includes RS-232 interface cable

190HPS Single Unit Carrying Case

450UCS Check Source, ^{238}Uranium, 0.064 µCi, impregnated 2 x 2 in yellow card

Ordering information

451B-RYR Ion Chamber Survey Meter with Beta Slide and standard chamber

451B-DE-SI-RYR Ion Chamber Survey Meter with Beta Slide and dose equivalent chamber

FLUKE Biomedical

451P

Pressurized µR Ion Chamber Survey Meter

The auto-ranging 451P features a pressurized ion chamber, providing enhanced sensitivity (µR resolution) and improved energy response to measure radiation rate and dose from x-ray and gamma sources. Originally designed to measure leakage and scatter around diagnostic x-ray and radiation therapy suites, the 451P's site surveying capabilities make it well-suited for a wide range of end users, including: x-ray manufacturers, government agencies, state inspectors, biomedical technicians, and maintenance technicians for airport baggage scanners.

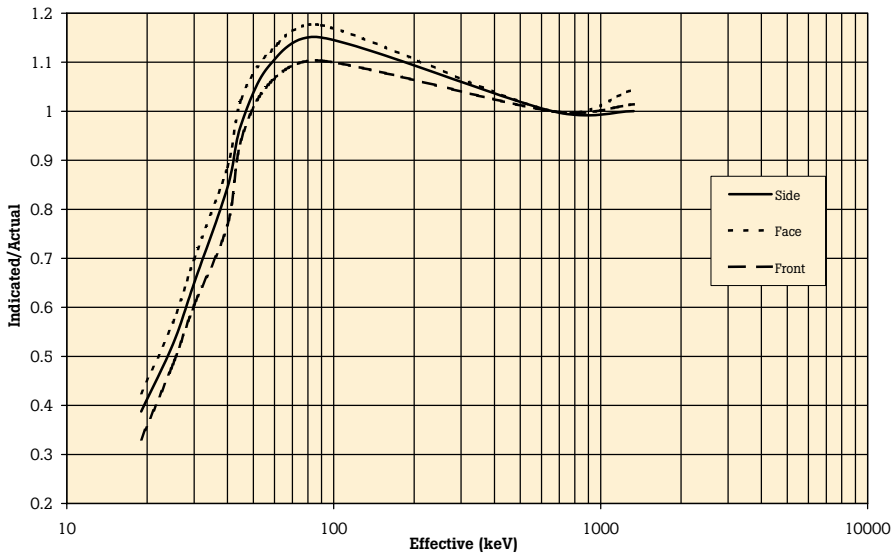
The ion chamber detector allows for a fast response time to radiation from leakage, scatter beams and pinholes. Additionally, the low noise chamber bias supply provides for fast background settling time.

The digital display features an analog bar graph, 2.5 digit digital readout, low battery and freeze ("peak hold") mode indicators, and an automatic backlight function. User controls consist of an ON/OFF button and a MODE button. The case is constructed of lightweight, high strength materials and is sealed against moisture. The RS-232 interface can be connected directly to a computer for use with the Excel add-in for Windows (451EXL), enhancing the functionality of the instrument. This software allows for data retrieval, user-parameter selection and provides a virtual instrument display with audible (requires sound card) and visual alarm indication.

Key features

- High sensitivity µR measurements of rate and dose simultaneously, with the capability to record peak rate
- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod mount
- Programmable flashing LCD display and audible alarm
- Easily-accessible battery door (operated by two 9-volt alkaline batteries) on the outside of the bottom case
- RS-232 communications interface with optional Windows-based Excel add-in for data logging
- Available with dose equivalent energy response (SI units)
- Shoulder strap and handle which can be easily decontaminated (Nuclear Power plant specific unit)

451P typical energy dependence



Typical energy dependence

[16]Nitrogen gamma rays are 110 % to 120 % of indicated readings as determined at the University of Lowell

FLUKE®
Biomedical

451P

Pressurized µR Ion Chamber Survey Meter

Specifications

Radiation detected	Beta above 1 MeV, Gamma and x-rays above 25 keV	
Operating ranges		
	0 to 500 µR/h or 0 to 5 µSv/h	
	0 to 5 mR/h or 0 to 50 µSv/h	
	0 to 50 mR/h or 0 to 500 µSv/h	
	0 to 500 mR/h or 0 to 5 mSv/h	
	0 to 5 R/h or 0 to 50 mSv/h	
Accuracy	Within 10 % of reading between 10 % and 100 % of full scale indication on any range, exclusive of energy response. Calibration source is ^{137}Cs	
Detector		
Chamber	230 cc volume pressurized air ionization chamber to 8 atmospheres or 125 psi	
Controls	ON/OFF and MODE	
Automatic features	Auto-zeroing, auto-ranging, and auto-backlight	
Response time Analog response time from 10 % to 90 % of reading for a full scale step increase is dependent on operating range. Response time for a step increase in radiation exposure rate from background:	**Step increase, background to**	**Time to reach 90 % of final value**
	400 µR/h	4.8 s
	4 mR/h	3.3 s
	10 mR/h	4.3 s
	40 mR/h	4.5 s
	100 mR/h	2.7 s
	1 R/h	2 s
	4 R/h	2.7 s
This table shows time measured from 10 % to 90 % of final value for a step increase or decrease in exposure rate such that a range change does not occur. These values are the response times for the various ranges:	**Range**	**10 % to 90 %**
	0 to 500 µR/h (5 µSv/h)	5 s
	0 to 5 mR/h (50 µSv/h)	2 s
	0 to 50 mR/h (500 µSv/h)	1.8 s
	0 to 500 mR/h (5 mSv/h)	1.8 s
	0 to 5 R/h (50 mSv/h)	1.8 s
Analog/Digital display LCD with backlight		
Analog	100 element bar graph 6.4 cm (2.5 in) long. Bar graph is divided into five major segments, each labeled with the appropriate value for the range of the instrument.	
Digital	2.5 digit display is followed by a significant zero digit depending on the operating range of the instrument. The units of measurement are indicated on the display at all times. Digits are 0.25 inches (6.4 mm) high. Low battery and freeze indicators are also provided on the display.	
Modes		
Integrate mode	Operates continuously 30 seconds after the instrument has been turned on. Integration is performed even if the instrument is displaying in mR/h or R/h.	
Freeze mode	Will place a tick mark on the bar graph display to hold on the peak displayed value. The unit will continue to read and display current radiation values.	
Environmental		
Power requirements	Two 9 V alkaline, 200 hours operation	
Warm-up time	Less than two minutes for initial operation when the instrument is in equilibrium with ambient temperature.	
Temperature range	-20 °C to 50 °C (-4 °F to 122 °F)	
Relative humidity	0 to 100 %	
Geotropism	Negligible	
Dimensions (WxDxH)	10 cm x 20 cm x 15 cm (4 in x 8 in x 6 in)	
Weight	1.07 kg (2.4 lb)	

Optional accessories

451EXL 451 Assistant for Excel, includes RS-232 interface cable

190HPS Single Unit Carrying Case

62-103 Check Source, ^{137}Cs, 10 µCi. Flat disc, 1 inch diameter

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Ordering information

451P-RYR Pressurized µR Ion Chamber Survey Meter with standard chamber

451P-DE-SI-RYR Pressurized µR Ion Chamber Survey Meter with dose equivalent chamber

Note: Due to the pressurized ion chamber, the 451P is considered U.S. Department of Transportation (DOT) "Dangerous Goods" and must be shipped via IAW DOT special permit DOT-SP 13187.

FLUKE®
Biomedical

ASM-990 Series

Advanced Survey Meter

The ASM-990 Series Advanced Survey Meter can detect alpha, beta, gamma, or x-ray radiation within an operating range of 1 µR/hr to 1 R/hr (1 to 5,000,000 CPM), depending on the selected probe (Geiger-Mueller, neutron, proportional counter, scintillation). With the proper probe combination, this meter can be used as a general survey meter, an area monitor, a wipe-test counter, and a contamination monitor.

Designed to meet the high-technology requirements of health physics, medical physics, and nondestructive testing applications, the ASM-990 Series is well-suited for a wide range of end users, including: radiation safety officers, nuclear medicine laboratories, diagnostic x-ray and hospital emergency-room technicians, environmental-health physicists, and emergency responders.

The unit, with purchased probe, is shipped calibrated and ready-to-use and includes a MHV connector to ensure compatibility with all Fluke Biomedical probes. The 992 includes a fully-calibrated internal energy-compensated 1 R/hr GM detector. The 993 features a fully-calibrated internal pancake detector as well as an internal energy-compensated 1 R/hr GM detector.

Key features

- Simultaneous auto-scaling measurement of rate and dose with the capability to record peak rate
- Up to five different probes can be calibrated with one unit
- Data-logging survey mode feature allows user to store up to five separate survey sequences
- Saved data can be uploaded to a PC via included Infrared Data (IrDA) transmitter
- Easy-to-use multifunction keypad for intuitive menu navigation
- Backlit analog/digital LCD display with full-range audio output capability
- Barcode scanner (optional)
- Auto power-down feature extends battery life

Specifications

ASM-990 and ASM-992

Operating modes	• Rate • Integrate	• Scaler (dual option: "based on measurement" or "based on time")	• Timed Peak Hold • Data Logging
Operating rate ranges (dependent on selected probe)	**µR/hr**	**mR/hr**	**R/hr**
	µrem/hr	mrem/hr	rem/hr
	µSv/hr	mSv/hr	Sv/hr
	CPM	CPS	
	DPM ^{99m}Tc	DPS ^{131}I	
	Bq ^{125}I	kBq ^{123}I	MBq ^{201}Tl
	µCi ^{67}Ga	mCi ^{18}F	Ci ^{57}Co
	µR	**mR**	**R**
	µrem	mrem	rem
Complementary units in the integrate mode with the integrated time value in seconds	µSv	mSv	Sv
	C (counts)	kC	MC
	D (distintigrations)	kD ^{99m}Tc	MC ^{131}I
Accuracy (dependent on selected probe)	Within 10 % of reading between 10 % to 100 % of full scale indication on any range, exclusive of typical energy dependence		
Detector	Accepts GM detectors and scintillation probes operating at high voltages between 500 volts and 1300 volts		
Temperature range	-10 °C to 50 °C (14 °F to 122 °F)		
Relative humidity	0 % to 95 %, non-condensing		
Warm up time	5 second diagnostic check		
Check source	Natural uranium, mounted on the case		
Power requirements	Two "D" cells, 150 hours operation, automatically indicates when battery is low		
Housing material	Proprietary polycarbonate, splash-proof case		
Display	Liquid crystal display, 5.6 cm x 5.6 cm (2.2 in x 2.2 in)		

ASM-990 Series

Advanced Survey Meter

Data logging modes
The ASM-990 Series Log Data feature can easily be accessed via the setup sub-menu. The unit can log/save a maximum of 500 data points in any of three separate modes (manual and survey modes can utilize the optional barcode scanner.)

Manual: Individual rate data points can be saved by pressing the Start/Stop/Rst/Save button.

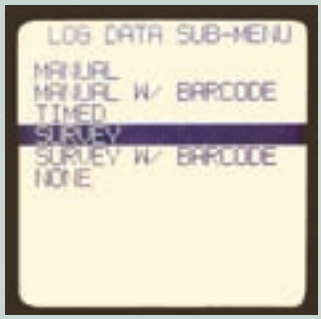
Timed: Data points automatically saved at user-selectable time intervals in the range of 1 second to 255 seconds.

Survey: Programmed sequences accessed via the menu system. Pressing the Start/Stop/Rst/Save button saves the current reading and displays the next survey location.

Programming of survey sequences, as well as retrieval of logged data, is accomplished via the built-in IrDA port.

Label names up to 20 characters can be programmed into the unit to identify the individual survey locations.

Probe connector: The unit is available with a MHV connector. The unit can be used with multiple probes (5 total) by selecting the appropriate probe from the main menu. All calibration data for each probe is stored in the unit's EEPROM.

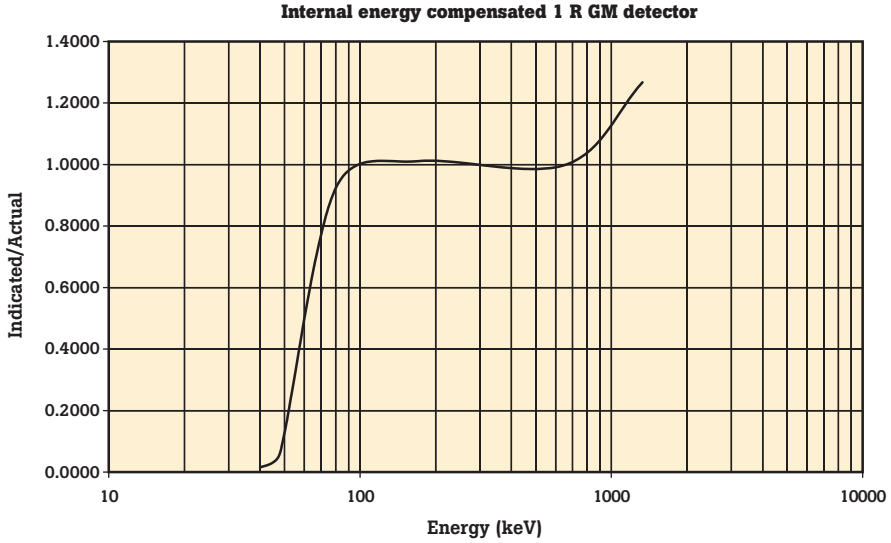


Specifications

ASM-992 and ASM-993

Range	0.1 mR/hr to 1 R/hr
Radiation detected	Gamma above 60 keV
Accuracy	± 10 % of reading between 10 % and 100 % of full scale on any range, exclusive of energy dependence
Weight (without probe)	ASM 990, 992: 0.95 kg (2.1 lb) ASM 993: 1.09 kg (2.4 lb)
Dimensions (WxDxH)	10.47 cm x 27.71 cm x 6.35 cm (4.125 in x 10.91 in x 2.5 in)

Typical energy dependence



ASM-990 Series

Advanced Survey Meter

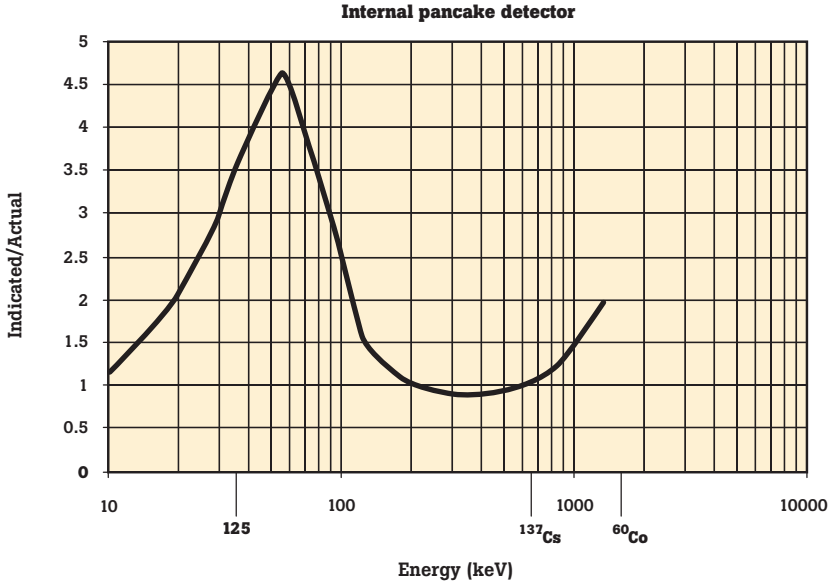
FLUKE Biomedical

Specifications

ASM-993

Radiation detected	Alpha above 3.5 MeV, beta above 35 keV and gamma above 6 keV	
Range	Background to 80 mR/hr	
Window	15 cm^2 (1.75 in Ø) mica, 1.4 mg/cm^2 to 2.0 mg/cm^2	
Typical background	30 CPM	
Protective screen	Stainless steel, hexagonal pattern providing 86 % open area	
Accuracy	± 10 % of reading between 10 % and 100 % of full scale on any range, exclusive of energy dependence (protective cover open)	
Efficiency The internal pancake detector efficiency is shown below. In a recent performance check, the numbers shown represent typical results obtained:	**Isotope**	**%Efficiency**
	^{14}C	5 %
	^{99}Tc	12 %
	^{137}Cs	24 %
	^{90}Sr	59 %
	^{36}Cl	26 %
	^{241}Am	8 %
Note: The efficiency formula used to calculate the %Efficiency is: Eff. % = (CPM x 100)/DPM	^{129}I	2 %
	^{230}Th	15 %
	^{239}Pu	12 %

Typical energy dependence



Model comparison

Model	Advanced survey meter	Barcode reader	Internal energy compensated 1 R/hr GM detector	Internal pancake detector
990	•			
990BC	•	•		
992	•		•	
992BC	•	•	•	
993	•		•	•
993BC	•	•	•	•

Optional accessories

990-IR-USB USB Port IrDA Adapter
990CC Carrying Case
990WM Wall Mounting Bracket
990PH Probe Holder for 489-110D
990UPH Universal Probe Holder
990SH Soft-Sided Holster
990SA Shoulder Strap Assembly

Note: The shoulder strap assembly is only available for the ASM-993 and must be ordered with the instrument and factory installed.

Note: The ASM-990 Series, with the customer-selected probe is calibrated to NIST standards. The ASM-990 series with GM probe standard calibration is in R, Sv, and rems. Scintillation detectors are calibrated in counts. Radionuclide-specific efficiency calibrations are available upon request. For probe selection and calibration services, see next page.

Due to recent international airline shipping policies/restrictions, radioactive "Check Source" will not be shipped with the main unit outside US.

Ordering information

990 Advanced Survey Meter
990BC Advanced Survey Meter with barcode reader
992 Advanced Survey Meter with an internal 1 R GM detector
992BC Advanced Survey Meter with an internal 1 R GM detector and barcode reader
993 Advanced Survey Meter with an internal 1 R GM detector and internal pancake detector
993BC Advanced Survey Meter with an internal 1 R GM detector, internal pancake detector, and barcode reader

FLUKE®
Biomedical

05-437

PRIMALERT® 35 Area Radiation Monitor

The PRIMALERT 35 Area Radiation Monitor contains an energy-compensated GM detector and has six range indicators (1, 2, 4, 8, 16, and 32 mR/hr) that can clearly display an increase or decrease in radiation levels. The visible and audible alarms can be set at any of the six levels by a front-panel, screwdriver-adjustable control. When each preset radiation level is exceeded, personnel are alerted by bright flashing red lights (visible over a 180° field) and a loud intermittent audio signal. The alarms stop automatically when the radiation level falls below each of the preset values. This permits instant radiation-level recognition not readily distinguishable on meter-type instruments.

Fail-safe operation is assured by a light which continuously indicates background radiation and provides visual proof that the unit is functioning. The monitor will not jam or show false readings in high radiation fields. A mounting bracket and a 110 V ac adapter/power converter are also included.

Key features

- Provides continuous visual indication of radiation levels and produces audible and/or visual alarms at any of six programmable radiation levels
- Assures reliable, continuous monitoring wherever radioactive materials are present
- Displays the radiation level in bright color-coded lights
- Optional Primalarm Remote Alarm, which functions up to 100 feet from monitor

Specifications

Power requirements	105 V to 125 V/60 Hz/8 W
Dimensions (WxHxT)	9 cm x 15 cm x 4 cm (3.5 in x 6 in x 1.5 in)
Weight	0.9 kg (2 lb)

Optional accessories

62-103 Check Source, ^{137}Cs, 10 µCi. Flat disc, 1 in diameter

Included accessories

AC adapters, specify with order
14-314 110 V ac 12 V dc 500 mA (USA, Japan)
14-400 230 V ac 12 V dc 500 mA (Europe)
14-417 230 V ac 12 V dc 580 mA (UK)
14-436 230 V ac 12 V dc 580 mA (Australia)

Ordering information

05-437 Primalert 35 Area Radiation Monitor

FLUKE Biomedical

7600

Double Check® Pro Daily Check Device

The 7600 Double Check Pro is a portable, easy-to-use daily check device for therapy beam quality assurance. Ten ion chambers are positioned to simultaneously check beam constancy, symmetry, flatness, and energy constancy. Nine ion chambers are used for verification of flatness, symmetry, and dose constancy while a special filtered ion chamber provides energy constancy information. A brightly-colored LCD touch-screen display and intuitive user interface make the unit easy to use. Internal and external Flash memory along with several different computer interfaces allow flexible measurement storage, comparison and archival record keeping.

The Double Check Pro consists of a detector array and software for performing linear accelerator quality assurance using physicist-preferred air ion chamber technology for dose measurement, avoiding the radiation damage issues of diode detectors. Windows® CE based software acquires beam profile data from the detector array. The beam profile is displayed numerically or graphically. Beam profile analysis such as flatness and symmetry is performed and saved in a database resident on the unit, facilitating daily, weekly, yearly checks to follow the guidelines in TG-40. The data is also available for correlation to TG-51 data.

Specifications

Display	
Dot pixels	320 x 3 [RGB] (w) x 240
Dot size (WxH)	0.10 mm x 0.34 mm
Dot pitch (WxH)	0.12 mm x 0.36 mm
Viewing area (WxH)	122.0 mm x 92.0 mm
LCD type	F-STN/color-mode/transmissive
Backlight	Cold cathode fluorescent lamp
Detector	
Material	Acrylic
Standard field size	20 cm x 20 cm or 10 cm x 10 cm
External chamber cavity	Side cavity provided for farmer-type ion chamber (0.6 cc), allowing central axis calibration
Ion chamber buildup (all chambers)	5 mm acrylic, 0.28 mm polycarbonate; 0.8 mm polyethylene
Ion chambers	Ten air vented
Ion chamber configuration	One central axis; four 4 cm off-axis; four 8 cm off-axis; energy constancy chamber for external filters @ 9 cm off-axis
Ion chamber nominal bias voltage	300 V dc
Ion chamber diameter/volume	1.27 cm/0.65 cc
System	
Dose range	50 to 1000 rad/min; 0.50 Gy to 10 Gy/min
Beam type energy	Photons: 2 mV to 25 mV
	Electrons: 2 MeV to 25 MeV
Operating temperature	Minimum 10 °C, maximum 40 °C
Dimensions (WxDxH)	23 cm x 47.9 cm x 5.8 cm (9 in x 18.9 in x 2.3 in)
Weight	2.88 kg (6.34 lb)

Key features

- Daily check device including 10 air-vented ion chambers
- Efficient workload planning
- Wireless state-of-the-art communications (optional—wireless feature not available with Argus Argus software does not support wireless communications with the Double Check Pro)
- Limitless data storage
- User-friendly interface
- Thorough data analysis
- Automatic atmospheric beam corrections
- Flexible weekly scheduling
- User created protocols
- Tabular or graphical data presentation
- Large, bright, easy-to-use color touch screen

Optional accessories

7600KBD Compact Keyboard, USB

7600CAB 23 m (75 ft) Communications Cable includes ethernet crossover RJ-45

7600WCF Wireless Compact Flash Card, 802.11b

7600CFM Compact Flash Memory Card, 256 MB

7600WR Wireless Router, 802.11b

7600WLS Victoreen Double Check Pro Wireless Kit. Includes Wireless Compact Flash Card, 802.11b; Wireless Router, 802.11b; and 23 m (75 ft) Communications Cable

Included accessories

7600USB USB Cable, 6 ft

7200-50 Stainless Steel Filter Set: 0.46, 0.61, 0.76, 0.91, 1.5, 1.9, 3.0, 3.6, 5.0, 10, 15, 30 mm

171063 Buildup Plates, 1 cm, 3 each

7600AC Universal 6 V dc ac Adapter

Ordering information

7600 Double Check Pro Daily Check Device

7020 and 7040

THEBES® II Therapy Beam Evaluation System

FLUKE® Biomedical

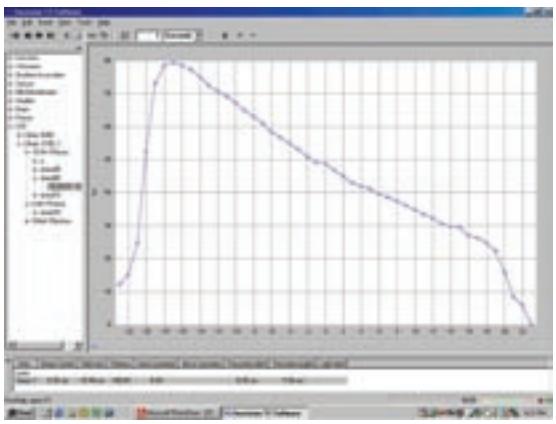
The THEBES II* (THErapy Beam Evaluation System) consists of a linear ion chamber array, electrometer, communicator, THEBES II Contour Manager software, wall mount power supply, interconnecting cable, and carrying case. An acrylic base plate that holds the ion chamber array and build up plates are also provided. The linear ion chamber array is permanently connected to the electrometer by a 1.5 m shielded multiconductor cable to eliminate radiation damage to the electrometer. The THEBES II linear ion chamber array is a waterproof, linear array of 47 ion chambers on 0.5 cm centers. The total active length of the array is 23.42 cm. The THEBES II communicator provides power and the communication interface for the THEBES II electrometer. THEBES II Contour Manager Software is a Windows based application that acquires beam contour data from the detector array and displays it graphically.

The THEBES II is used to perform linear accelerator quality assurance using physicist-preferred air ion chamber technology for dose measurement, avoiding the ion transport issue of the competing liquid chamber technology and radiation damage issues of diode detectors. The detector array consists of 47 waterproof air ion chambers in a linear array. Two detector arrays are being offered: 7020 with 47 ion chambers on a 0.5 cm pitch (23.42 cm total active length) and 7040 with 47 ion chambers on a 1 cm pitch (46.88 cm total active length). The software performs beam contour analysis such as flatness and symmetry. Beam contour data is saved in an Access compatible database, facilitating daily, weekly, and yearly checks, aiding in following the guidelines in TG-40 and TG-51.

**US Patent No. 6,885,007.*

Key features

- Linear array of 47 air ion chambers
- 0.5 cm spacing for 7020
- 1.0 cm spacing for 7040
- Central axis chamber
- Waterproof and vented
- Simultaneously checks symmetry, flatness, light field vs. radiation field coincidence, field size, beam center, penumbra, constancy, and integrated
- Real-time dose maps for service and setup
- No electronics in or near the beam
- Windows® applications software



60 degree dynamic wedge

7020 and 7040

THEBES® II Therapy Beam Evaluation System

FLUKE Biomedical

Specifications

Linear ion chamber array	
Detector type	Ionization chambers, waterproof and vented
Number of detectors	47
Dimensions (WxDxH)	7020: 6.2 cm x 30.2 cm x 3.7 cm
	7040: 6.2 cm x 53.5 cm x 3.7 cm
Active area	7020: 1.0 cm x 23.42 cm (23 cm center to center)
	7040: 0.88 cm x 46.88 cm (46 cm center to center)
Detector spacing	7020: 0.5 cm
	7040: 1.0 cm
Inherent buildup	0.5 cm polystyrene, .02 cm polycarbonate
Inherent backscatter	Without mounting plate: 0.3 cm acrylic
	With mounting plate: 0.3 cm acrylic, 1.0 cm acrylic
Radiation detected	Photons: ^{60}Co to 25 MV
	Electrons: 6 to 25 MeV
Beam limits	Maximum dose/pulse: 12.5 mGy per pulse
	Maximum pulse rate: 1000 pulses per second
	Maximum continuous dose rate: 500 cGy/min
Ion chamber dimensions (WxDxH)	7020: 0.42 cm x 0.95 cm x 0.50 cm
	7040: 0.88 cm x 0.88 cm x 0.50 cm
Ion chamber nominal volume	7020: 0.17 cm^3
	7040: 0.36 cm^3
Ion chamber alignment	± 0.3 mm chamber outline on top of array in all axes
Nominal bias voltage	-300 V
Weight	0.34 kg (0.75 lb)
Electrometer	
Number of channels	48
Amplifiers	Non-multiplexed, low leakage, mosfet operational amplifier
Array scan time	1.1 ms
Frame rate	5 frames/sec
Status indicators	4
Dimensions (WxDxH)	10.9 cm x 21.6 cm x 3.2 cm
Communicator	
Computer interface	RS-232, DB-9 connector
Power requirements	12 V dc, 1 A
Communication interface	Connector: RJ-45
	Baud rate: 57.6 K
Dimensions (WxDxH)	4.2 cm x 8.8 cm x 2 cm
System	
Power requirements	Input: 120 V ac, 60 Hz, 22 W
	Output: 12 V dc, 1 A
Computer requirements	Computer IBM® compatible PC, Intel® Pentium® 90 or higher with at least one unused COM port
Operating system	Microsoft Windows XP®, 2000
Hard disk space	64 MB of available space
Mounting plate dimensions (WxDxT)	7020: 22.8 cm x 30.5 cm x 2.5 cm
	7040: 22.8 cm x 53.8 cm x 2.5 cm
Calibration	Accuracy: 2 %
	Reproducibility: 1 %
	Long term stability: 1 %
	Linearity: 1 %
Environmental	Operating temperature: 10 °C to 40 °C (50 °F to 104 °F)
	Storage temperature: -25 °C to +65 °C (-13 °F to +149 °F)
	Relative humidity: 20 % to 75 %, non-condensing
Weight	10 kg (21 lb)

Optional accessories

57-051 Lead Foil for TG-51, 1 mm x 20 cm^2

7020

7020BP95 9.5 cm Buildup Plates
7020AA ARM 3D Watertank Adapter
7020MA Multidata Watertank Adapter
7020WDA Wellhöfer (Dovetail) Watertank Adapter
7020WPA Wellhöfer Blue (Pin) Watertank Adapter
7020VA Tray Adapter Kit, Varian Type 3
7020EA Tray Adapter Kit, Elekta
7020SA Tray Adapter Kit, Siemens

7040

7040BP95 9.5 cm Buildup Plates
7040VA Tray Adapter Kit, Varian Type 3
7040EA Tray Adapter Kit, Elekta
7040SA Tray Adapter Kit, Siemens

Included accessories

AC adapters, specify with order
14-328 110 V ac 12 V dc 1000 mA USA, Japan
14-401 230 V ac 12 V dc 1000 mA, Europe
14-414 230 V ac 12 V dc 1000 mA, UK
14-414 and **14-416** adapter 230 V ac 12 V dc 1000 mA, Australia

7020

7020CBL Communication Cable, 23 m (75 ft)
7020TER Terminator, 120
7020COM Communicator
7020BP10 1 cm Buildup Plate
7020BP25 2.5 cm Buildup Plate

7040

7040CBL Communication Cable, 23 m (75 ft)
7040TER Terminator, 120
7040COM Communicator
7040BP10 1 cm Buildup Plate
7040BP25 2.5 cm Buildup Plate

Ordering information

7020 THEBES II 20 cm Field Size Array
7040 THEBES II 40 cm Field Size Array

35040

Advanced Therapy Dosimeter

FLUKE® Biomedical

Specifications

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 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	18 °C to 28 °C (64 °F to 82 °F); charge ± (0.20 % reading plus two counts); current ± (0.20 % reading plus two counts)
Bias	Eleven user-programmable steps from -500 to +500 V in 0.1 volt increments; accuracy ± 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 V ac to 240 V ac (47 Hz to 63 Hz)
Connectors	Triax BNC front/rear 35040; Triax TNC front/rear 35040TNC
Dimensions (WxDxH)	21.6 cm x 26 cm x 8.9 cm (9.4 in x 10 in x 4 in)
Weight	4.6 kg (10 lb)

Optional accessories

86120 Extension Cable, 20 ft, Triax BNC to BNC

30-356 BNC to TNC Converter

External chamber accessories

30-344 Semiflex™ Ionization Chamber, 0.125 cm^3, Waterproof

30-316 Semiflex™ Ionization Chamber, 0.3 cm^3, Waterproof

30-353 PinPoint™ Ionization Chamber, 0.015 cm^3, Waterproof

30-332 Roos™ Electron Ionization Chamber, 0.35 cm^3, Waterproof

30-353 Advanced Markus™ Electron Ionization Chamber, 0.02 cm^3, Waterproof

Ordering information

35040 Advanced Therapy Dosimeter

35040TNC Advanced Therapy Dosimeter, TNC option

Service and Calibration

World-class facility. World-class service.

Fluke Biomedical's Global Calibration Lab is NVLAP Lab Code 200566-0 accredited, adheres to ISO 17025:2005, ANSI Z540, Mammography MQSA, and CNSC, and is traceable to national and international standards.

Fluke Biomedical offers one-stop, bulk contracts for managing larger instrument pools, including various asset-management alternatives for pools larger than 150 units. Fluke Biomedical's asset-management program takes over your grueling task of instrument tracking and allows you to use your time more productively.

If you have a large number of instruments that require service, you can greatly benefit from this quality service. Proper protocols are strictly followed, eliminating the problems with inspectors and audits that can result when other less-qualified labs perform the calibrations. Instrumentation includes Fluke Biomedical as well as other industry models.

Fluke Biomedical's Global Calibration Laboratory is equipped to calibrate and repair the following types of instruments:

- Area Monitors
- Barometers
- Blood Pressure Simulators
- Defibrillators/External Pace Maker Analyzers
- Densitometers
- Diode Detectors
- Dosimeters
- Electrical Safety Analyzers
- Incubator Analyzers
- Ion Chambers
- IV Pump Analyzers
- kVp Meters
- mAs Meters
- Electrical Multimeters
- Oscilloscopes
- Patient Simulators
- Pressure Meters/Parameter Testers
- Radiation Multimeters
- Sensitometers
- SpO_2 Simulators/Analyzers
- Thermometers
- Test Lungs
- Ultra Sound Analyzers
- Velometers
- Ventilators/Gas flow Analyzers

Calibration Beam Specifications

Tungsten Anode

NIST-Traceable Techniques

Equivalent Beam Code	Potential (kV)	Filtration				HVL mm Al
		mm Al	mm Cu	mm Sn	mm Pb	
L20	20					0.07
L100	100	1.98				2.75
M30	30	0.50				0.33
M50	50	1.00				0.98
M60	60	1.50				1.68
M80	80	2.6				2.98
M100	100	5.0				5.1
M150	150	5.0	0.25			10.2
M200	200	4.1	1.12			14.9
M250	250	5.0	3.2			18.5
H50	50	4.0			0.12	4.4
H60	60	4.0	0.6			6
H100	100	4.0	5			13.5
H150	150	4.0	4	1.5		16.8
H200	200	4	0.6	4	0.7	19.5
H250	250	4	0.6	1	2.7	21.5

PTB-Traceable Techinques

Equivalent Beam Code	Potential (kV)	Filtration				HVL mm Al
		mm Al	mm Cu	mm Sn	mm Pb	
DV30	30	2.5				0.98
DV40	40	2.5				1.44
DV50	50	2.5				1.81
DV60	60	2.5				2.13
DV70	70	2.5				2.45
DV80	80	2.5				2.78
DV90	90	2.5				3.1
DV100	100	2.5				3.48
DV120	120	2.5				4.15
DV150	150	2.5				5.36
DH40	40	4				2.2
DH50	50	10				3.75
DH60	60	16				5.35
DH70	70	21				6.77
DH80	80	26.0				8.12
DH90	90	30.0				9.26
DH100	100	34.0				10.15
DH120	120	40.0				11.67
DH150	150	45.0				13.36

Service and Calibration

FLUKE® Biomedical

World-class facility. World-class service.

Calibration Beam Specifications

Molybdenum/Rhodium Anode

NIST-Traceable Techniques					
Equivalent Beam Code	Potential (kV)	Filtration			HVL mm Al
		mm Mo	mm Rh	mm Al	
Mo/Mo 28	28	0.032			0.33
Mo/Mo 35	35	0.032			0.39
Mo/Rh 28	28	0.029			0.41
Rh/Rh 25	25		0.029		0.35
Rh/Rh 40	40		0.029		0.56
Mo/Mo28x	28	0.030		2	0.63
Rh/Rh/35x	35		0.029	2	0.898

PTB-Traceable Techinques					
Equivalent Beam Code	Potential (kV)	Filtration			HVL mm Al
		mm Mo	mm Rh	mm Al	
MV20	20	0.030			0.223
MV25	25	0.030			0.282
MV30	30	0.030			0.337
MV35	35	0.030			0.374
MV40	40	0.030			0.402
MV50	50	0.030			0.440
MV20	20	0.030		2	0.450
MV25	25	0.030		2	0.580
MV30	30	0.030		2	0.670
MV35	35	0.030		2	0.749
MV40	40	0.030		2	0.825
MV50	50	0.030		2	0.968

Service Center/Repair/Calibration US
Fluke Biomedical
6045 Cochran Road
Cleveland OH 44139-3303
Tel: 440-498-2560
Toll free: 800-850-4608 ext 2564
Email: globalcal@flukebiomedical.com

Service Center/Repair/Calibration Europe
Fluke Biomedical Europe
Science Park Eindhoven 5110
5692EC Son, The Netherlands
Tel: +31 (40) 267 5435
Fax: +31 (40) 267 5436
Email: servicedesk@fluke.nl

www.flukebiomedical.com/service

Biomedical Test CD-ROM Catalog

FLUKE® Biomedical

Table of Contents

For comprehensive information about the complete line of Biomedical Test products and services, view the entire product selection on the attached CD-ROM.

Diagnostic Imaging CD-ROM Catalog

FLUKE® Biomedical

Table of Contents

For comprehensive information about the complete line of Biomedical Test products and services, view the entire product selection on the attached CD-ROM.

Radiation Safety and Oncology CD-ROM Catalogs

FLUKE® Biomedical

Table of Contents

For comprehensive information about the complete line of Biomedical Test products and services, view the entire product selection on the attached CD-ROM.

Radiation Safety Catalog

Radiation Oncology Catalog

FLUKE ®
Biomedical

Publications

For a complete listing of Fluke Biomedical products and services, please view our four digital catalogs on the attached CD-ROM.

Fluke Biomedical Test

The Biomedical Test catalog emphasizes the complete line of biomedical test and simulation products for Biomedical/Clinical Engineers and Technicians. The catalog contains information about Fluke Biomedical's test and simulation products, including standalone electrical safety testers, patient simulators, and performance analyzers, as well as fully integrated and automated performance-testing and documentation systems.

For more information, contact sales@flukebiomedical.com

Fluke Biomedical Diagnostic Imaging QA

The Diagnostic Imaging QA catalog is a comprehensive source book of solutions for the Imaging QA Technologist, Physicist, Biomedical/Clinical Engineer, or Service Engineer. The catalog contains information about the test devices, phantoms, and accessories needed to manage diagnostic imaging QA and maintain regulatory-compliance.

For more information, contact sales@flukebiomedical.com

Fluke Biomedical Radiation Safety

The Radiation Safety catalog highlights devices used to measure radiation levels, manage regulatory QA requirements, and aide in radiation emergencies. These devices are intended for Radiation Safety Officers (RSOs), Health Physicists, Emergency Responders and other radiation-minded professionals. The catalog contains information about a variety of survey meters and probes, area monitors, and other radiation-monitoring accessories.

For more information, contact sales@flukebiomedical.com

Fluke Biomedical Radiation Oncology QA

The Fluke The Radiation Oncology QA catalog provides a full range of QA solutions for the Radiation Oncology Physicist, Therapist, and Dosimetrist. The catalog contains information about the linear accelerator QA instruments, radiation oncology chambers, phantoms, and accessories needed to manage radiation oncology QA and maintain a safe, regulatory-compliant facility.

For more information, contact sales@flukebiomedical.com

Your authorized Fluke Biomedical distributor

riešenia na presné meranie™

Elso Philips Service; tel: +421 32 6582410
email: elso@elso.sk; web: www.elso.sk

Fluke Biomedical.
Better products. More choices. One company.

Fluke Biomedical
6045 Cochran Road
Cleveland, OH 44139-3303 U.S.A.

Fluke Biomedical Europe
Science Park Eindhoven 5110
5692EC Son, The Netherlands

For more information, contact us:
In the U.S.A. (800) 850-4608 or
Fax (440) 349-2307
In Europe/M-East/Africa +31 40 267 5435 or
Fax +31 40 267 5436
From other countries +1 (440) 248-9300 or
Fax +1 (440) 349-2307
Email: sales@flukebiomedical.com
Web access: wwww.flukebiomedical.com