

Biomedical

Product Catalog 2012





ProSim 8 Vital Signs Simulator



ESA612 Electrical Safety Analyzer



Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer



IDA 4 Plus Multi-Channel Infusion Device Analyzer

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

Why Fluke Biomedical is the Industry Standard

Innovative Design from Customer Feedback

Fluke Biomedical strives to lead our market segments through ongoing improvement of current offerings and creative solutions to customer needs. The multi-functional project teams have a remarkable in-house knowledge base; including expertise in mechanics, electronics, software, systems, engineering, service, and manufacturing technology. Through participation in a wide range of industry associations, conferences, and speaking events, Fluke Biomedical pays careful attention to trends in evolving technology and new applications to provide a fresh perspective when contemplating new products or current product enhancements.

Customer Satisfaction Demanded

When you invest in the best products, you deserve the best support. Fluke Biomedical has several world-class service centers, including the world's largest commercial laboratory. The Fluke Biomedical service centers are extremely versatile and can service over 1000 different models. With extensive experience in full-asset management, the highly-accredited program is equipped to give you OEM firmware and product updates that won't be received elsewhere, NIST-traceable calibration, 90-day warranty on repairs, and fast turnaround from their state-of-the-art facilities.

The Fluke Biomedical customer service department handles all of your product specification, pricing, and delivery questions, working closely with the field sales representatives to address the needs of each individual customer. Fluke Biomedical's pride in fostering good customer relationships is evident in the dedication of these employees.

High Standards for Quality Assurance Utilizing ISO 9001

Fluke Biomedical employees are committed to maintaining the high quality of our products and services. Fluke Biomedical solicits customer input on quality and product features and then designs, validates, manufactures, and services these to requirements. Fluke Biomedical shows its ongoing commitment to quality through the continuous improvement process required by our internationally recognized ISO 9001 Quality System registration.

Fluke Biomedical's benchmark quality operates to the most rigorous standards in the industry, including compliance with ISO 9001:2000, ISO 13485:2003, QSR, 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.

About Fluke Biomedical

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

Today, medical device manufacturers, biomedical professionals, physicists, field service, and other medical personnel must meet increasing regulatory guidelines, 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.

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).

With over 30 years' experience serving biomedical test customers; Fluke Biomedical is positioned to bring innovation and value to the healthcare support organizations.

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Featured Products Catalog

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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

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Ansur

Test Automation Software



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

Wish that all technicians would document 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 amount of time required to perform testing is uniform and therefore predictable

Specifications

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.

Ansur plug-in

PC requirements	64 MB RAM
	50 MB unused hard drive space for software
	IBM PC/XT compatable 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)

"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

Key features

• General framework software for performing all types of tests and inspections

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- 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

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Impulse 6000D/7000DP Defibrillator/Transcutaneous Pacemaker Analyzer



The Impulse 6000D Defibrillator Analyzer and Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer Test Systems are rugged, portable precision test instruments that encompass the spectrum of worldwide-established pulse shapes, showcase breakthrough AED testing 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 testing defibrillator impedance—sensing technology.



Key features

• Lown, Edmark, trapezoidal, biphasic and pulsed biphasic defibrillation technology compatibility

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- AED technology compatibility
- First-class measurement accuracy: ± 1 % of reading 0.1 J
- Portable, rugged, easy to carry
- Long-lasting, rechargeable battery
- Internal pacer brand selections
- 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

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.

Specifications

Defibrillator Analyzer

Compatible defibrillator waveshapes: Lown, Edmark, trapezoidal, dc bi-phasic, and ac pulsed bi-phasic
0.1 J to 600 J
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 \pm (1.5 % of reading + 0.3 J) on both ranges
Resistence: 50 Ω
1 %, non-inductive (< 2 μH)
Range: 0.1 s to 100 s
Accuracy: ± 0.05 s, typical
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 Asystele

Impulse 6000D/7000DP

Defibrillator/Transcutaneous Pacemaker Analyzer

Specifications

ECG waves	
ECG general	Lead configuration: 12-lead simulation; RA, LL, LA, RL, V1-6 with independent outputs
Arrhythmia selections	Pacer interactive (Impulse 7000DP only)
	Supraventricular
	Premature
	Ventricular
	Conduction
	Transveneous paced with selectable pacer spike amplitudes and widths
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
Noise immunity	Wave sine
	Line frequency: 50 Hz or 60 Hz (± 0.5 Hz)
	Amplitude: 0 mV to 10 mV (by 0.5 mV \pm 5 %)

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 μ H)
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: \pm 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
Coneral information	

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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)

Optional accessories 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

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Ordering information

Impulse 6000D Defibrillator Analyzer

IMPULSE 6000D United States, 120 V IMPULSE 6000D-01 Schuko IMPULSE 6000D-02 United Kingdom IMPULSE 6000D-03 Japan IMPULSE 6000D-04 Australia IMPULSE 6000D-05 India IMPULSE 6000D-06 Brazil

Impulse 7000DP Defibrillator/

Transcutaneous Pacemaker Analyzer IMPULSE 7000DP United States, 120 V IMPULSE 7000DP-01 Schuko IMPULSE 7000DP-02 United Kingdom IMPULSE 7000DP-03 Japan IMPULSE 7000DP-04 Australia IMPULSE 7000DP-05 India IMPULSE 7000DP-06 Brazil

Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer with test automation

TA-IMP7KDP United States, 120 V TA-IMP7KDP-01 Schuko TA-IMP7KDP-02 United Kingdom TA-IMP7KDP-03 Japan TA-IMP7KDP-04 Australia TA-IMP7KDP-05 India TA-IMP7KDP-06 Brazil

Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer with Impulse 7010 and test automation

TA-IMP7K/7010US United States, 120 V

TA-IMP7K/7010SHK Schuko TA-IMP7K/7010UK United Kingdom TA-IMP7K/7010JPN Japan TA-IMP7K/7010AUS Australia TA-IMP7K/7010BRA Brazil

Included accessories

CD-ROM Users Manual CD MANUAL Getting Started Guide Battery Eliminator (country specific) SOFT CASE Carrying Case FBC-IMP7000-8003 Defibrillator Paddle Contact Plates CABLE ASSEMBLY USB Computer Communication Cable

QA-ES Series II

Electrosurgery Analyzer





QA-ES Series II analyzes electrosurgical units quickly and accurately. An accuracy of ± 2 % of reading down to 20 mA guarantees reliable highfrequency leakage results. With capability to run an automatic-powerdistribution test in as little as 1 minute, the QA-ES works fast so technicians save time.

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

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

Specifications

Modes of operation			
Continuous operation	Continuou	is measurement of power, current, peak-to-peak voltage (closed load only), and crest factor	
Single operation	Single me only), and	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 of	connections and load configurations to measure HF leakage from both grounded and isolated equipment	
A			
Generator output			
Load resistance (128 loa	ads)	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		\pm 5 % of reading for loads from 100 to 2000 ohms	
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: \pm 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	t	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	
Power		115/230 V ac; 48 Hz to 66 Hz, 35 VA	
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)	

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riešenia na presné meranie

Multi-Channel Infusion Device Analyzer





IDA 4 Plus Multi-Channel Infusion Device Analyzer maximizes productivity with multiple, independent channels for testing up to 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 fullcolor graphs and reports. For automated testing, the IDA 4 Plus is compatible with Fluke Biomedical's medTester 5000C (US only).

Flow-rate measurement	
Technique	Calculated by measuring a volume over time
Range	0.5 ml/hr to 1000 ml/hr
Accuracy	$1~\%$ of reading $\pm~1$ LSD for flows of 16 ml/hr to 200 ml/hr for volumes over 20 ml; otherwise, 2 $\%$ of reading $\pm~1$ 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 $\pm~1$ LSD for flows of 16 ml/hr to 200 ml/hr for volumes over 20 ml; otherwise, 2 $\%$ of reading $\pm~1$ 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

Specifications

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 down-loading 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

Optional accessories

 $9513\mathchar`-0.512$ External mini-keyboard, 83-key with PS/2 connector and AT adapter

71072 Parallel Printer Cable (D25M-36M)

44277 PCA Trigger/Nurse Call Box **PRINTR/414-US120V** Printer, Seiko DPU-414-30B (120 V power supply) (additional purchase required: parallel printer cable, p/n 71072)

PRINTR414-SHK22OV Printer, Seiko DPU-414-30B (220 V power supply) (additional purchase required: parallel printer cable, p/n 71072)

61096 Printer (120 V power supply) 61097 Printer (220 V power supply)

3010-0441 Interface Cable, medTester to IDA 4 Plus (without wedge adapter) (RS-232; female DB25 to female DB9)

3010-0598 Interface Cable, medTester to IDA 4 Plus (with or without wedge adapter) (RS-232; female DB9 to female DB25)

9513-0221 Barcode Scanner (with long-reach coil cable with Y connector for keyboard attachment)

75029 Null Modem Cable (female DB9 to female DB9)



IDA 4 Plus

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Multi-Channel Infusion Device Analyzer

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 PCA Trigger Box



Ordering information

IDA 4 Plus One-Channel Infusion Device Analyzer

IDA-4P/1-US120V United States, 120 V IDA-4P/1-AUS250V Australia, 250 V IDA-4P/1-DEN250V Denmark, 250 V IDA-4P/1-SHK250V Schuko, 250 V IDA-4P/1-ISR250V Israel, 250 V IDA-4P/1-ITAL250V Italy, 250 V IDA-4P/1-IND250V India, 250 V IDA-4P/1-SWZ250V Switzerland, 250 V IDA-4P/1-UK250V United Kingdom, 250 V IDA-4P/1-BRAZ Brazil

IDA 4 Plus Two-Channel Infusion Device Analyzer

Full testing for up to two infusion pumps simultaneously IDA-4P/2-US12OV United States, 120 V IDA-4P/2-AUS25OV Australia, 250 V IDA-4P/2-DEN25OV Denmark, 250 V IDA-4P/2-SHK25OV Schuko, 250 V IDA-4P/2-ISR25OV Israel, 250 V IDA-4P/2-ITAL25OV Italy, 250 V IDA-4P/2-IND25OV India, 250 V IDA-4P/2-SWZ25OV Switzerland, 250 V IDA-4P/2-UK25OV United Kingdom, 250 V IDA-4P/2-BRAZ Brazil

IDA 4 Plus Three-Channel Infusion Device Analyzer

Full testing capability for up to three infusion pumps simultaneously IDA-4P/3-US120V United States, 120 V IDA-4P/3-AUS250V Australia, 250 V IDA-4P/3-DEN250V Denmark, 250 V IDA-4P/3-SHK250V Schuko, 250 V IDA-4P/3-ISR250V Israel, 250 V IDA-4P/3-ITAL250V Italy, 250 V IDA-4P/3-IND250V India, 250 V IDA-4P/3-SWZ250V Switzerland, 250 V IDA-4P/3-UK250V United Kingdom, 250 V IDA-4P/3-BRAZ Brazil

IDA 4 Plus Four-Channel Infusion Device Analyzer

Full testing capability for up to four infusion pumps simultaneously IDA-4P/4-US120V United States, 120 V IDA-4P/4-AUS250V Australia, 250 V IDA-4P/4-DEN250V Denmark, 250 V IDA-4P/4-SHK250V Schuko, 250 V IDA-4P/4-ISR250V Israel, 250 V IDA-4P/4-ITAL250V Italy, 250 V IDA-4P/4-IND250V India, 250 V IDA-4P/4-SWZ250V Switzerland, 250 V IDA-4P/4-UK250V United Kingdom, 250 V IDA-4P/4-BRAZ Brazil

Included accessories

48456 Electronic Users Manual and HydroGraph software
49964 20 ml Priming Syringe
48457FG Luerlock-3 way (one for each channel)
76044 5-foot Plastic Drain Line
75029 Null Modem Cable (female DB9 to female DB9)
Detachable Power Cord (country specific)

Infusion Device Analyzer

http://www.elso.sk

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ESA612 Electrical Safety Analyzer







Specifications

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 electricalsafety 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.

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	\pm (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	\pm 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		
	O A to TO A continuous		
Leakage current			
Modes*	AC + DC (true-rms)		
	AC only		
	DC only		
*Modes are available in all leakage	e 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		
Ranges	Ο μΑ to 199.9 μΑ 200 μΑ to 1999 μΑ 2 mA to 10 mA		

Key features

• Portable, ergonomic, lightweight and easy to use

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- 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 duallead measurements combine the functionality of a simulator, multimeter and electricalsafety 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 firstyear 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

Electrical Safety Analyzer



Specifications

Frequency response/ accuracy	DC to 1 kHz	\pm (1 % of reading + (1 μ A 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, + (2.5 µA or 1 LSD, whichever is g	l Direct AP, Alternative AP, and Alternativ reater)	re Equipment leakage tests all ranges are		
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	75 μA to 199 μA 200 μA to 2000 μA 2 mA to 20 mA			
Accuracy	\pm 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	\pm (2 % of reading + 0.2 MΩ) \pm (7.5 % of reading + 0.2 MΩ)			
Source test voltage	500 V dc 250 V dc	500 V dc 250 V dc		
Insulation resistance tests	Mains-PE, AP-PE, Mains- PE, 1 accessible conductive part) and conductive part)	Mains-NE (non-earthed d AP- NE (non-earthed accessible		
ECG performance waveforms	5			
ECG performance waveforms Accuracy	s ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration	uare wave only, fixed at 1 mV		
ECG performance waveforms Accuracy Waveforms: rates	± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12	uare wave only, fixed at 1 mV 0, 180, and 240		
ECG performance waveforms Accuracy Waveforms: rates	± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle)	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation	± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60,	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation	<pre>\$ ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 </pre>	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation	<pre>\$ ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1</pre>	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings	<pre>± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 100 Hz 200 Hz</pre>	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range	± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current U	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical page	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 3 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H)	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 	uare wave only, fixed at 1 mV D, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in)		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in)		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in)		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications Operating temperature	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) S 10 °C to 40 °C (50 °F to 104 °F) 20 % ac 0.20 / 4 % Hz to 50 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in)		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications Operating temperature Storage temperature	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 2 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) S 10 °C to 40 °C (50 °F to 104 °F) -20 °C to 60 °C (-4 °F to 140 °F) 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in)		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications Operating temperature Storage temperature Operating humidity Utitude	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) s 10 °C to 40 °C (50 °F to 104 °F) -20 °C to 60 °C (-4 °F to 140 °F) 10 % to 90 % non-condensing 120 % ac maine sumply voltage 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in)		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications Operating temperature Storage temperature Operating humidity Altitude	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) S 10 °C to 40 °C (50 °F to 104 °F) -20 °C to 60 °C (-4 °F to 140 °F 10 % to 90 % non-condensing 120 V ac mains supply voltage to 230 V ac 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in) up to 5,000 m, up to 5,000 m, up to 2,000 m		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications Operating temperature Storage temperature Operating humidity Altitude General	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) 10 °C to 40 °C (50 °F to 104 °F) -20 °C to 60 °C (-4 °F to 140 °F) 10 % to 90 % non-condensing 120 V ac mains supply voltage to 230 V ac 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in) up to 5,000 m, up to 5,000 m, up to 2,000 m		
ECG performance waveforms Accuracy Waveforms: rates Ventricular fibrillation Power ratings Mains voltage outlet Mains voltage inlet power range Maximum current Hz Physical case Dimensions (L x W x H) Weight Environmental specifications Operating temperature Storage temperature Operating humidity Altitude General Warranty	 ± 2 % ± 5 % for amplitude of 2 Hz sq Lead II configuration ECG complex (BPM): 30, 60, 12 Square wave (50 % duty cycle) Sine wave (Hz): 10, 40, 50, 60, Triangle wave (Hz): 2 Pulse (63 ms pulse width): 30 1 120 V ac or 230 V ac 90 to 132 V ac rms 20 A 50 or 60 17.63 cm x 8.38 cm x 28.45 cm 1.6 kg (3.5 lb) s 10 °C to 40 °C (50 °F to 104 °F) -20 °C to 60 °C (-4 °F to 140 °F) 10 % to 90 % non-condensing 120 V ac mains supply voltage to 230 V ac Two-year extended warranty (r 	uare wave only, fixed at 1 mV 0, 180, and 240 (Hz): 0.125 and 2 and 100 BPM and 60 BPM 180 to 264 V ac rms 16 A 50 or 60 (6.94 in x 3.30 in x 11.20 in) up to 5,000 m, up to 2,000 m 100-cost, available after first-year		

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

Ordering information

ESA612 United States, 115 V 20 A ESA612-02 Europe, 230 V ESA612-01 France, 230 V ESA612-03 Israel, 230 V ESA612-05 Australia, 230 V ESA612-06 United Kingdom, 230 V ESA612-07 Switzerland, 230 V ESA612-08 Thailand, 230 V ESA612-09 Japan, 100 V ESA612-10 North America, 220 V TA-ESA612-US United States, 115 V 20 A w/Test Automation TA-ESA612-EUR Europe, 230 V w/Test Automation TA-ESA612-FR France, 230 V w/Test Automation TA-ESA612-ISR Israel, 230 V w/Test Automation TA-ESA612-AUS Australia, 230 V w/Test Automation TA-ESA612-UK United Kingdom, 230 V w/Test Automation TA-ESA612-SWI Switzerland, 230 V w/Test Automation TA-ESA612-THAI Thailand, 230 V w/Test Automation TA-ESA612-JAPAN Japan, 100 V w/Test Automation TA-ESA612-NA220V North America. 220 V, w/ Test Automation **Included accessories CD-ROM** Operator's Manual (multilingual CD) MANUAL Getting-Started Guide (hard copy, multilingual) CABLE ASSEMBLY Data Transfer Cable ESA612 Accessory Kit (country specific) 2719-0154 15 A to 20 A Adapter (US only) esa620-npa Null Post Adapter esa612-2016 5-to-5 Banana Jack to ECG (BJ2ECG) Adapter 9530-0075 Carry Case Detachable Power Cord (country specific)

Included accessories for ESA612 with test automation

All of the above, plus: **ANSUR ESA612** Ansur Test-Automation Software ESA612 plug-in

ESA620 Electrical Safety Analyzer



The ESA620 Electrical Safety Analyzer represents the next generation in manual, portable electrical safety testers. With selections of three test loads, 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.

Voltage	
Range (mains voltage)	120 V model: 90 V ac to 132 V ac rms 230 V model: 180 V ac to 264 V ac rms
Accuracy	± (2 % of reading + 1 V)
Range (accessible voltage)	0 V ac to 300 V ac rms
Accuracy	± (2 % of reading + 2 LSD)
Voltage tests	Mains, Accessible, and Point to Point
Earth resistance	
Modes	Two terminal or four terminal
Test current	> 200 mA ac or 10 A ac to 25 A ac
Ranges	0Ω to 2Ω
Accuracy	± (2 % of reading 0.015 Ω)
Equipment current	
Mode	AC rms
Range	0 A to 20 A
Accuracy	\pm 5 % of reading \pm (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	\pm (1 % of reading + 1 µA or 1 LSD, whichever is greater) \pm (2 % of reading + 1 µA or 1 LSD, whichever is greater) \pm (5 % of reading + 1 µA or 1 LSD, whichever is greater)

Specifications

Key features

• Superior compliance with multiple standards: IEC60601-1(partial), IEC62353, VDE 751, ANSI/AAMI ES1:1993, NFPA-99, AN/NZS 3551, IEC61010

FLUKE ®

Biomedical

- 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
- 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



Electrical Safety Analyzer



Specifications

Leakage current (continued	a)
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
	Note: For Alternative and Direct applied parts leakage tests, the leakage values are compensated for nominal mains as per 62353. Thus, the accuracy specified for other leakages is not applicable. The actual leakage readings given during these tests will be higher
Differential leakage	
Ranges	50 μA to 199 μA 200 μA to 1999 μA 2 mA to 20 mA
Accuracy	\pm 10 % of reading \pm (2 counts or 20 $\mu\text{A},$ whichever is greater)
Insulation resistance	
Ranges	0.5 MΩ to 20 MΩ 20 MΩ to 100 MΩ
Accuracy	\pm (2 % of reading + 2 counts) \pm (7.5 % of reading + 2 counts)
Source test voltage	500 V dc 250 V dc
ECG performance wavefor	ms
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 ANSUR ESA620 Ansur ESA620 Plug-In

Ordering information

ESA620 United States, 115 V, 20 A ESA620-02 Europe, 230 V ESA620-01 France, 230 V ESA620-03 Israel, 230 V ESA620-05 Australia, 230 V ESA620-06 United Kingdom, 230 V ESA620-07 Switzerland, 230 V ESA620-08 Thailand, 230 V ESA620-10 230VBRAZ Brazil, 230 V TA-ESA620-USA ESA620, United States 115V 20A w/Test Automation TA-ESA620-EUR ESA620, Europe 230V w/Test Automation TA-ESA620-FR ESA620, France 230V w/Test Automation TA-ESA620-ISR ESA620, Israel 230V w/Test Automation TA-ESA620-AUS ESA620, Australia 230V w/Test Automation TA-ESA620-SWI ESA620, Switzerland 230V w/Test Automation TA-ESA620-UK ESA620, United Kingdom 230V w/Test Automation Included accessories

CD-ROM Operator's Manual CD

MANUAL Multilingual Getting Started Guide ESA620 Accessory Kit (country specific) 2719-0154 15 A to 20 A adapter (US only) SOFT CASE Carry case Detachable Power Cord (country specific)

Included accessories for ESA620 with test automation

All of the above, plus: ANSUR ESA620 Ansur Test-Automation Software ESA620 plug-in CABLE ASSEMBLY Data Transfer Cable

ProSim 8 Vital Signs Simulator





The 8-in-1 ProSim 8 Vital Signs Simulator offers fast and comprehensive preventative maintenance (PM) testing for your entire patient monitor fleet. Designed to get you in and out of most PM locations in minutes, this multifunction simulator tests ECG (including fetal ECG and arrhythmias), respiration, tempera-

ture, IBP, cardiac output/cardiac catheterization, NIBP, SpO₂, and is capable of testing Rainbow multi-wavelength waveforms. Featuring specialized stay-connected ECG posts for secure lead connections, physiologically-synchronized pulses across all parameters, and customizable patient pre-sets and autosequences, the ProSim 8 patient simulator provides unbeatably fast and easy complete monitor testing. Barcode-scanner compatibility and wireless PC interface, direct printing, data transfer and reporting, along with advanced and integrated technologies allow top confidence in patient monitor fleet performance and supports passing regulatory audits with ease.

Specifications

Normal-sinus-rhyth	m waveform			
Normal sinus rhythm	12-lead configuration with independent outputs referenced to right leg (RL) Output to 10 universal ECG jacks, color-coded to AHA and IEC standards			
High-level output	0.5 V/mV ± s connector	5% of the ECG amplitude setting available on a BNC		
Amplitude	0.05 mV to 0	0.5 mV (0.05 mV steps); 0.5 mV to 5 mV (0.25 mV steps)		
ECG rate	10 BPM to 3	60 BPM in 1 BPM steps		
ECG waveform selection	Adult (80 ms	Adult (80 ms) or pediatric (40 ms) QRS duration		
ST-segment elevation	Adult mode Additional s	Adult mode only0.8 mV to +0.8 mV (0.1 mV steps). Additional steps: + 0.05 mV and - 0.05 mV		
Pacemaker wavefor	rm			
Pacer pulse	Amplitude	0 (off), ± 2 , ± 4 , ± 6 , ± 8 , ± 10 , ± 12 , ± 14 , ± 16 , ± 18 , ± 20 , ± 50 , ± 100 , ± 200 , ± 500 , and ± 700 mV for lead II (reference lead)		
Pacer pulse width	0.1 ms, 0.2	ms, 0.5 ms, 1 ms, and 2 ms ± 5 %		
Paced arrhythmias	Atrial 80 BPM			
	Asynchronous 75 BPM			
	Demand with frequent sinus beats			
	Demand with occasional sinus beats			
	Atrio-ventricular sequential			
	Noncapture	(one time)		
	Nonfunction			
Arrhythmia				
Baseline NSR	80 BPM			
PVC focus	Left focus, st	andard timing (except where specified)		
Supraventricular arrhythmia	Atrial fibrilla beat (one tin rhythm; and	tion (coarse or fine); atrial flutter; sinus arrhythmia; missed ne); atrial tachycardia; paroxysmal atrial tachcardia; nodal supraventricular tachycardia		

Key features

- All-in-one complete monitor testing 80 % smaller and 17 lbs/7.7 kilos lighter than predecessor technology
- 8-in-1 multifunction simulator tests ECG (including fetal ECG and arrhythmias), respiration, temperature, IBP, cardiac output/cardiac catheterization, NIBP, SpO₂, and Rainbow multiwavelength waveforms
- Stay-connected ECG posts for easy/secure ECG snap and lead connections
- Custom SpO₂ r-curve for accurate testing of the latest and future oximetry technologies
- Static pressure linearity testing
- Repeatable NIBP simulation (+/- 2 mmHg) for dynamic pressure repeatability testing
- Physiologically synchronized pulses across all parameters
- Barcode scanning and direct data capture and printing functionality
- Onboard, customizable patient pre-sets and autosequences for fast/easy testing
- Multi-language user interface offers choice of language selection
- Integrated, easily-replaceable long-life battery
- Optional PC-interface software offers customizable procedures/ checklists to replace bulky service manuals and automated data capture/storage*
- Wireless communication for remote PC control of test device, as well as data transfer and automated regulatory reporting*

*You must have Ansur Test Executive version 2.9.6 or greater on your PC to communicate with the product

ProSim 8 **Vital Signs Simulator**



Premature arrhythmia	Premature atrial contraction (PAC); premature nodal contraction (PNC); PVC1 left ventricular; PVC1 left ventricular; PVC1 left ventricular; PVC1 left ventricular; PVC2 right ventricular; PVC3 right ventricular; PVC3 right ventricular; PVC4 right		
Ventricular arrhythmia	PVCs 6, 12, or 24 per minute; frequent multifocal PVCs; bigeminy; trigeminy; multiple PVCs (one-time run of 2, 5, or 11 PVCs); mono-ventricular tachycardia (120 to 300 BPM in 5 BPM steps); poly-ventricular tachycardia (5 types); ventricular fibrillation (coarse or fine); and asystole		
Conduction defect	First-, second-, or third-degree heart block; and right- or left-bundle-branch block		
Advanced cardiac life support	Shockable pulseless arrest rhythms	Ventricular fibrillation (coarse), ventricular fibrillation (fine), unstat polymorphic ventricular tachycardia	
	Non-shockable pulseless arrest rhythms	Asystole	
	Symptomatic bradycardia	Sinus bradycardia (< 60 BPM) 2nd degree AV block, mobitz type I 2nd degree AV block, mobitz type II Complete/3rd degree AV block Right bundle branch block Left bundle branch block	
	Symptomatic tachycardia: regular narrow-	Sinus tachycardia > 150 BPM	
	complex tachycardia (QRS < 0.12 seconds)	Supraventricular Tachycardia	
	Symptomatic tachycardia: regular wide-complex	Sinus tachycardia > 150 BPM	
	tachycardias (QRS \geq 0.12 seconds)	Supraventricular tachycardia SVT with aberrancy	
	Irregular tachycardia	Atrial fibrillation (coarse and fine), atrial flutter, unstable mono- morphic ventricular tachycardia (120 BPM to 300 BPM), torsade de pointes/polymorphic ventricular tachycardia (long QT interval)	
ECG Performance testing	9		
Amplitude	0.05 mV to 0.5 mV (0.05 mV steps)		
	0.5 mV to 5 mV (0.25 mV steps)		
Pulse wave	30 BPM, 60 BPM, with 60 ms pulse width		
Square wave	0.125 Hz, 2 Hz, 2.5 Hz		
Triangle wave	0.125 Hz, 2 Hz, 2.5 Hz		
Sine wave	0.05 Hz, 0.5 Hz, 1, 2 Hz, 5 Hz, 10 Hz, 25 Hz, 30 Hz,	40 Hz, 50 Hz, 60 Hz, 100 Hz, and 150 Hz	
R-wave detection	Waveform	Triangular pulse	
	Rate	30 BPM, 60 BPM, 80 BPM, 120 BPM, 200 BPM, and 250 BPM	
QRS detection	Rate	30 BPM, 60 BPM, 80 BPM, 120 BPM, 200 BPM, and 250 BPM	
Tall T-wave rejection	Waveform	QT Interval 350 ms	
		T-Wave width 180 ms	
		T-Wave shape ½ sinewave	
	Rate	80 BPM	
ECG artifact			
Туре	50 Hz, 60 Hz, muscular, baseline wander, respiration	on	
Size	25%,50%,100% of the normal sinus R-Wave for	each lead	
Lead select	All, RA, LL, LA, V1, V2, V3, V4, V5, V6		
Fetal/Maternal ECG			
Fetal heart rate (fixed)	60 BPM to 240 BPM in 1 BPM steps		
Fetal heart rate (IUP)	140 BPM at beginning, then varies with pressure		
Intrauterine-pressure waveforms	Early deceleration, late deceleration, and acceleration		
Wave duration	90 seconds, bell-shaped pressure curve, from 0 mr	nHg to 90 mmHg and returning to 0	
Invasive blood pressure			
Channels	2, each independently settable with identical para	meters and are individually electrically isolated from all other signals	
Transducer sensitivity	5 (default) or 40 μV/V/mmHg		
Static pressure	- 10 to + 300 mmHg in 1 mmHg steps		
Pressure units	mmHg or Kpa		
Swan-Ganz sequence	Right atrium, right ventrical (RV), pulmonary artery	(PA), pulmonary artery wedge (PAW)	
Cardiac catheterization	Chambers	Aortic, pulmonary valve, and mitral valve	
Respiration artifact	Arterial, radial artery, and left ventricle		
PD output		S mmHg or 10 mmHg	
DE OUTOUT	Loucoat DIN D-PIU		

ProSim 8

Vital Signs Simulator



Pre-Defined Simulations
Normal
Hypertensive
Hypotensive
Tachycardic
Bradycardic
Ventricular fibrillation
Asystole
Autosequences (default)
Monitor testing sequence
Medical training sequence
Oximeter testing sequence
Cardiac failure sequence
Arrhythmia sequence
Exercise sequence
Respiration sequence
Performance wave test
IBP testing sequence
Temperature sequence

General specifications			
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	·	
Altitude	3,000 meters (9,843 ft)		
Dimensions (L x W x H)	14.5 cm x 30.2 cm x 8.6 cm (5.7 i	n x 11.9 in x 3.4 in)	
Display	LCD color display		
Communication	USB device upstream port	Mini-B connector for control by a computer	
	USB host controller port	Type A, 5 V output, 0.5 A max load. Connector for keyboard, barcode reader, and printer	
	Wireless	IEEE 82.15.4 for control by a computer	
Power	Lithium-ion rechargeable battery		
Battery charger	100 V to 240 V input, 15 V/2.0 A output. For best performance, the battery charger should be connected to a properly–grounded ac receptacle		
Battery life	Nine hours (minimum), 100 NIBP cycles typical		
Weight	1.87 kg (4.2 lb)		
Safety standards	EN/IEC 61010-1:2001		
Certifications	CE, CSA, C-TICK N10140, RoHS		
Electromagnetic compatibility (EMC)	IEC 61326-1:2006		





Optional accessories

2392199 CI-3 Cardiac Output Box 3408564 Mini-DIN to DIN IBP Adapter 3890640 NIBP Test Chamber 500ML 4034627 Ansur Test Software ProSim 8 Plug-In

Cable kits

3984910 ProSim 8 Accessory Kit (includes DIN to minDin adapter, HP/Philips Intellivue IBP cable, GE Marquette Eagle/Dash/Solar IBP cable, Welch Allyn Propaq/SpaceLabs Ultraview IBP cable, USB wireless dongle, YSI400 series temperature cable, YSI700 series temperature cable, CI-3 Cardiac Output Box, spare battery pack)

3984922 HP/Philips Intellivue Cable Set

3984968 GE Marquette Eagle/Dash/ Solar Cable Set

3984946 ProSim 8 SpaceLabs Ultraview Cable set

3984979 Welch Allyn/Propaq Cable Set

3984993 Drager Infinity Cable Set **3985009** ProSim 8 Nihon Kohden Cable Set

Ordering information

ProSim 8 ProSim 8 Vital Signs Simulator **ProSim SPOT** ProSim SpO₂ Test

Module

ProSim RAINBOW ProSim Rainbow Sensor

Included accessories

3980671 ProSim 6/8 Users Manual **3980667** ProSim 6/8 Getting start manual

3938110 ProSim 6/8 Battery Pack **1626219** USB Cable

2392173 IBP Cable, unterminated

3987170 ProSim 6/8 Carrying Case **2392370** Adult Cuff Mandrel End Blocks

2392381 Adult Cuff Mandrel Spacer Blocks

2392328 Neonatal Cuff Mandrel 2391882 Set of NIBP Cuff Adapters 2184298 AC/DC Power Supply Power cord (country-specific)

AC Power cords

2201437 ProSim 8 AC power cord Schuko

2201455 ProSim 8 AC power cord USA 2201428 ProSim 8 AC power cord UK 2201419 ProSim 8 AC power cord Japan

2201443 ProSim 8 AC power cord Australia

3930831 ProSim 8 AC power cord Brazil

http://www.elso.sk

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Vital Signs Simulator

ProSim 4



ProSim 4 Vital Signs Simulator with breakthrough touchscreen technology offers quick and simple one-tap testing for patient monitor performance checks and troubleshooting. Designed to get you in and out of most locations in 60 seconds, this quick-check device offers 12-lead ECG simulation, respiration, IBP and NIBP testing in the palm of your hand. Featuring specialized stay-connected ECG posts to ensure secure lead connections and nohassle testing, ProSim 4 is the perfect patient simulator for first-call patient monitor quality assurance and safety professionals.

Specifications

Normal-sinus-rhythm wavef	orm
Normal sinus rhythm	12-lead configuration with independent outputs referenced to right leg (RL). Output to 10 universal ECG Jacks, color- coded to AHA and IEC standards
Amplitude	1 mV
ECG rate	30 BPM, 60 BPM, 80 BPM, 90 BPM, 120 BPM, 150 BPM, 180 BPM, 210 BPM, 240 BPM, 270 BPM, 300 BPM, and 320 BPM. Preset and monitor testing sequence hypotensive condition is at 40 BPM
ECG waveform selection	Adult (80 ms) or neonatal (40 ms) QRS duration
Arrhythmia	
Atrial fibrillation	Coarse or fine
Premature ventricular contraction	Left ventricular
Ventricular tachycardia	160 BPM or 200 BPM
Ventricular fibrillation	Coarse or fine
Transvenous pacer pulse	75 BPM, left arterial, 3 mV amplitude on lead II, accuracy \pm 10 %, 1.0 ms width
2nd degree AV block	Туре 1
3rd degree AV block	3rd degree AV block
Asystole	Asystole
ECG performance testing	
Amplitude	1 mV
Square wave	60 ms at 2 Hz
Respiration	
Rate	O (OFF), 10 BrPM to 100 BrPM in 10 BrPM steps
Impedance variations ($\Delta \Omega$)	1 Ω
Baseline	500 Ω to circuit common, giving 1000 Ω between any two leads

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Key features

• Portable multifunction tester offers 12-lead ECG, respiration, IBP and NIBP simulation

FLUKE

Biomedical

- 90% smaller and lighter than combined technology of legacy products
- Breakthrough touchscreen technology
- One-tap testing for most performance tests and checks
- Easy quick-check patient monitor testing in one minute or less with onboard, customizable patient pre-sets and autosequences
- Integrated, easily-replaceable battery capable of running quick checks all day
- Stay-connected ECG posts for secure lead connections
- Repeatable NIBP testing within 2 mmHg independent of device under test
- Multi-language user interface offers choice of language selection
- Tilt stand design for operation in tight spaces and better viewing angle

ProSim 4

Vital Signs Simulator



Invasive blood pressure				
Channels	1 electrically isolated from all other signals			
BP output	Circular DIN 5-pin			
Transducer sensitivity	5 μV/V/mmHg			
Static pressure	0 mmHg, 80 mmHg, 160 mm	nHg, and 250 mmHg		
Dynamic waveforms	Synchronization	To ECG heartrate		
Non-invasive blood pressure				
Pressure units	mmHg			
Manometer (pressure meter)	Range	10 mmHg to 400 mmHg		
	Accuracy	± (1 % reading + 1 mmHg)		
Pressure source	Inflation bulb or device und	er test		
NIBP simulations	Pulse	2 mmHg max into 500 ml NIBP system		
	Volume of air moved	1 ml max		
	Simulations	Adult: 60/30 (40), 120/80 (93); 150/100 (117); and 200/150 (167)		
		Neonatal: 35/15 (22) and 70/40 (50)		
	Repeatability	Within \pm 2 mmHg (at maximal pulse size independent of device under test)		
	Synchronization	To ECG heartrate (maximal rate 120 BPM)		
Leak test	Target pressure	20 mmHg to 400 mmHg		
	Leakage rate 1 mmHg/minute to 200 mmHg/minute			
Pressure relief test range	100 mmHg to 400 mmHg			

General specifications			
Humidity	10% to 90% non-condensing		
Dimensions (L x W x H)	18 cm x 9.3 cm x 5.5 cm (7.1 in x 3.7 in x 2.2 in)		
Display	LCD touch-screen color display		
Communication	USB port (for calibration and firmware updates only)		
Power	Lithium-ion rechargeable battery		
Battery life	Four hours (minimum), 40 NIBP cycles typical		
Weight	0.88 kg (1.93 lb)		
Safety standards	IEC 61010-1:2001		
Certifications	CE, CSA, C-TICK N10140, RoHs		
Electromagnetic compatibility (EMC)	IEC 61326-1:2006		

Optional accessories

3984878 ProSim 4 Accessory Kit, includes: Unterminated IBP cable, HP-3 IBP cable, MQ-3 IBP cable, TK-1 IBP cable, Adult cuff Mandrel spacer block (3), Adult cuff Mandrel end block (2), Neonatal Mandrel, USB cable, Spare Battery pack, ECG Snap/banana adapter 2392328 Neonatal Cuff Mandrel 2392370 Adult Cuff Mandrel End Blocks (2 needed) 2392381 Adult Cuff Mandrel Spacer Blocks (3 needed) 4026551 ECG Snap Adapter 4 mm and 3.2 mm ECG Banana Adapter Converter Modules (international only)

Ordering information

ProSim 4 Prosim 4 Vital Signs Simulator

Included accessories

3931478 ProSim 4 Getting Started Manual

3931519 ProSim 4 Users Manual CD
2461946 Manual Inflation Bulb
2391882 Set of NIBP Cuff Adapters
3986253 ProSim 4 Battery Pack
4026773 ProSim 4 Power Supply
Line Cord ProSim 4 Line Cord
(country-specific)
4026799 ProSim 4 Carrying Case

VT PLUS HF Gas Flow Analyzer





Ansur Plug-m

General

Weight

Dimensions (LxWxH)

The VT PLUS HF is Fluke Biomedical's premier general-purpose gas flow analyzer. With special display modes and bidirectional flow for fully and efficiently testing both conventional mechanical ventilators and high-frequency ventilators. 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.

25.4 cm x 25.4 cm x 12.7 cm (10 in x 10 in x 5 in)

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

4.53 kg (10 lb)

VT MOBILE Portable Gas-Flow Analyzer



The VT MOBILE is a compact and portable general purpose gas-flow analyzer designed to meet the needs of the traveling technician or engineer. This versatile tool evaluates performance of a wide variety of medical gas-flow/pressure devices and measures 16 ventilator parameters.

The base unit measures high- and low-flow ranges, volume, pressure, and oxygen concentration. Additionally, the temperature and relative humidity option can be ordered separately to ensure the most accurate gas-flow measurements.



Key features

- Bidirectional flow (high- and low-flow ranges), volume, vacuum, pressure and oxygen concentration measurements
- 16 ventilator parameter measurements
- Trending and statistical analysis of all measured values
- Onboard graphical display
- Portable and compact
- RS-232 for computer control
- Memory for storing results
- Optional sensor assembly for temperature and humidity measurements

General	
Dimensions (LxWxH)	20 cm x 10 cm x 3.8 cm (8 in x 4 in x 1.5 in)
Weight	0.45 kg (1 lb)

VT PLUS HF/VT MOBILE

Gas Flow Analyzer/Portable Gas-Flow Analyzer



Specifications

Model	VT PLUS HF	VT MOBILE	
Pressure measurement range	High: ± 100 psi Low: ± 500 mmHg (± 10 psi) Airway: ± 120 cmH ₂ 0 Barometric pressure: 4 to 18 psia (400 mmHg to 900 mmHg)	High: O to 100 psi Low: -20 to +120 cmH_2 O Airway: -20 to +120 cmH_2 O Barometric pressure: 8 to 18 psia (400 mmHg to 900 mmHg)	
Selectable units of measure	Pressure: mmHg, mBar, bar, cmH2O, PSI, inHg, inH ₂ O, PSIG, atm, and kPa Flow: LPM, CFM, LPS, ml/sec, ml/min Volume: l, ml, CF Compliance: ml/cmH ₂ O Oxygen concentration: %	Pressure: mmHg, mBar, bar, cmH ₂ O, PSI, inHg, inH ₂ O, PSIG, atm, and kPa Flow: LPM, CFM, LPS, ml/sec, ml/min Volume: l, ml, CF Oxygen concentration: %	
Gas temperature and RH measure- ment (for improving flow accuracy)	No (manual entry of gas and ambient temperature and RH) Manual input; 0 °C to +50 °C	Yes (with optional temperature and RH sensor) 0 $^\circ$ C to + 50 $^\circ$ C	
Barometric pressure	Yes	Yes	
Flow measurement technology	Screen pneumotach	Fixed oriface pneumotach	
Flow range	25 to 300 l/min (high flow channel) O to 25 l/min (low flow channel)	25 to 200 l/min (high flow sensor) O to 25 l/min (low flow sensor)	
Bidirectional flow measurement	Yes	Yes	
0 ₂ Concentration	Yes	Yes	
Gas density compensation: Air, O_2 , N_2O , CO_2 , Heliox, N_2 bal O_2 , N_2O bal O_2 , He bal O_2 , user defined	Yes	Yes	
Sensors	High flow (internal)	High flow (external)	
	Low flow (internal)	Low flow (external; optional)	
	Oxygen (internal)	Oxygen (external)	
	Pressure (internal)	Pressure (internal)	
	Temp/RH (Manual entry)	Temp/RH (external; optional)	
Measurement accuracy	Low pressure: \pm 0.80 % of reading or \pm 1.5 mmHg (whichever is greater) Airway pressure: \pm 0.75 % of reading or \pm 0.5 mmHg (whichever is greater) High pressure: \pm 1 % of reading or \pm 0.3 psig (whichever is greater) Barometric pressure: \pm 1 % of reading or \pm 0.1 mmHg (whichever is greater)	Low/airway pressure: $\pm 2 \%$ of reading or $\pm 1.5 \text{ mmHg}$ (whichever is greater) High/barometric pressure: $\pm 2 \%$ of reading or $\pm 0.2 \text{ psig}$ (whichever is greater)	
	High flow: $\pm 2 \%$ of range Low flow: $\pm 1 \%$ of range	High flow: \pm 3 % of reading or \pm 2 % range (whichever is greater) Low flow: \pm 3 % of reading or \pm 1 % range (whichever is greater)	
	Barometric pressure: ± 2 % of rdg		
	RH: manual entry: ± 2 % of rdg	RH: ± 10 % of rdg	
Power	110/230 V ac 50/60 Hz only	9 V dc alkaline battery (included) with >7 hours continous use; 110/230 V ac 50/60 Hz (battery eliminator, optional)	
Environmental specifications	Operating temperature: 10 °C to 40 °C (50 °F to 104 °F) Operating humidity: 80 % relative humidity up to 31 °C (88 °F), decreasing linearly to 50 % relative humidity at 40 °C (104 °F)		
	Storage temperature: -25 °C to +50 °C (-13 °F to +122	2 °F); Storage humidity: 95 %	
Overpressure limit		Low pressure: 5 psig High pressure: 125 psig	
Ventilator parameters/number of screens	21 parameters/1 screen	16 parameters/5 screens	
Special modes	Trend test, leak test, stacked volume test, HFOV, RT-200 emulation	Trend test	
On-board memory, data storage/ playback	No	Yes	

For detailed specifications, see our catalog cd, or go to www.flukebiomedical.com

TNT 12000 X-Ray Test Tools

FLUKE ® Biomedical





Delivering unprecedented versatility in the first advanced wireless system with unbeatable accuracy, reliability and simplicity. TNT 12000 X-Ray Test tools offer comprehensive compli-

- Radiographic
- Fluoroscopic
- CT imaging systems

The TNT 12000 platform offers the versatility required by today's imaging systems. Get in and out fast with these new streamlined, easy-to-use devices.

System components **TNT 12000WD Wireless Detector**

Featuring all-in-one-exposure measurement and wireless communication combined with the rugged, reliable, and accurate design that is a Fluke trademark, the TNT 12000WD provides TRIAD and NERO quality in the palm of your hands.

TNT 12000 DoseMate dosimeter

The TNT 12000 DoseMate with ion chambers provides the precision dose measurement needed for absolute dose measurement integrity. Offering customizable measurement protocols. DoseMate is compatible with existing TRIAD and NERO external ion chambers, offering the newest dosimeter technology with minimum investment.

mA/mAs measurement

Integrated mA/mAs measurement capability is available with both the TNT 12000WD and the TNT 12000 DoseMate. A mA/mAs-standard invasive shunt or optional non-invasive clamp device are availabel to meet challenges of mAs measurement with all types of x-ray systems.

TNT 12000D Wireless Display

The TNT 12000D Wireless Display has been specifically designed with user productivity in mind and displays all measured results, as well as identifying information, battery level, calibration date and more. Wireless interface from the test device offers targeted communication to the mating display for speedy results reading up to 100 feet from the test device. Wireless communication and intelligent device interface allows the user to perform multiple exposures without leaving the radiation-shaded area, thus allowing complete test protocols to be performed with minimum travel between operator and test device.

Key features

- Choice of all-in-one detector, dosimeter, integral mA/mAs, handheld display or user's own laptop interface
- Compact handheld design
- Displays all values in one shot (TNT 12000WD)
- 40 kHz kV sampling rate to ensure accuracy with the most difficult applications (TNT 12000WDI
- Global support network delivers prompt service and peace of mind worldwide

Accurate

- Best-in-industry sampling rate
- Proprietary smart detection system with Smart Optimization algorithm
- DoseMate ion chamber accuracy

Simple

- Advanced wireless platform sets up in seconds for oneexposure testing
- Minimal navigation through customizable protocols
- Automated compliance reporting

Versatile

- Unique, customizable platform accommodates work model to your requirements
- Choice of automated reporting systems designed for AARC, AAPM, and MOSA compliance
- Full functionality across all modalities: radiographic, mammographic, dental, fluoroscopic, and CT imaging systems

Reliable

- Long, proven battery life to accomplish full-days work
- No moving parts
- Award-winning design rugged enough to handle bumps/drops and transport

TNT 12000 X-Ray Test Tools

Compliance made easy TNT 12000 Excel add-in software

- Increased productivity and reduction of human error with measurements automatically recorded on template worksheets
- Single page results report can be printed for verification and compliance
- Template worksheets and reports can be customized to fit user needs
- MQSA-compliant templates included



Medical Design Excellence Award Winner







Ansur standardization and reporting software Standardizes testing for your entire fleet

- Matches test procedure to service manual protocol
- Reduces, if not eliminates, human error through electronic data collection and transfer from test devices
- Guides users through step-wise testing process to minimize dependence on training
- Automatically completes documents per requirements to ensure regulatory compliance
- Offers easy data traceability with electronic archival of detailed preventative maintenance and repair records



FLUKE ®

TNT 12000

X-Ray Test Tools



Specifications

TNT 12000 X-Ray Test T	ools	
Physical specifications		
Display	320 x 240 Color LCD	
Size (WxDxH)	TNT 12000D Display	15.5 cm x 11.4 cm x 4.1 cm (6.1 in x 4.5 in x 1.6 in)
	TNT 12000WD Wireless Detector	17 cm x 11.4 cm x 4.4 cm (6.7 in x 4.5 in x 1.75 in)
	TNT 12000 DoseMate Dosimeter	
Weight	TNT 12000D Display	0.422 kg (0.93 lb)
	TNT 12000WD Wireless Detector	0.7 kg (1.5 lb)
	TNT 12000 DoseMate Dosimeter	0.5 kg (1.1 lb)
Electrical specifications		
Battery	Туре	Lithium-ion 3.7 V 4000 mAh
	Charge time	Approximately 5 hr
	Operating duration	Approximately 8 hr minimum
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 specificati	ons	
Operating temperature	0 °C to 35 °C (32 °F to 122 °F	·)
Operating temperature Storage temperature	-35 °C to 50 °C (-31 °F to 122 °F	2°F)

Optional accessories

96020C Diagnostic Ionization Chamber, 150 cc

96035B Diagnostic Ionization Chamber, 15 cc

500-200 CT Ion Chamber, 10 cc **500-100** CT Ion Chamber, 3.2 cc **6000-532** scatter chamber, 400cc **86020** Triax Cable, Male to Male, BNC, 20 ft **EM4524-C-240** mA Cable Assembly,

Male to Female, BNC, 20 ft (mAs options only)

PROBE Clamp, Probe, AD/DC mA

Leakage (mAs options only) ANSUR TNT 12000 TNT 12000 Ansur Test Automation Software Plug-In

(TNT 12000WD only)

TNT 12000WD Wire	eless Detector			
kVp measurements				
Units	kVp Average (average of peaks during a specified interval)			
	kVp Max (highest peak	kVp Max (highest peak during a specified interval)		
	PPV (peak practical vol	tage)		
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	22 kV to 49 kV (optional calibration)		
	W/Rh	(optional calibration)		
	W/Ag	(optional calibration)		
Resolution	0.1 kV			
Accuracy	Radio/Fluoro modes	\pm 2 % or \pm 1 kV, whichever is greater		
	Mammo modes	\pm 2 % or \pm 0.7 kV, whichever is greater		
Reproducibility	± 1 % (std of 5 reading	le)		
Filtration	Radio/Fluoro modes	1 mm Al to 10 mm Al or equivalent		
correction range	Mammo modes	0 mm Al to 0.4 mm Al added filtration		

TNT 12000



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TNT 12000 DoseMate Dosimeter			
Accuracy			
Exposure and exposure rate accuracy	\pm 1 % of reading \pm 2 range resolution steps over range of 18 °C to 28 °C and \pm 2 % of reading \pm 2 range resolution steps over the full operating temperature range of 0 °C to 50 °C		
	3 % NIST-traceable calibration is provided with each system and includes effects of 96035B, and 96020C		
Measurement modes			
Dose	Autoranging across five decades of sensitive ranges		
	Automatic drift and offset compensation		
	Automatic post-exposure display hold		
Rate	Measurement range covers a span from low-level image intensifier measurements to unattenuated, direct beams		
	Automatic offset compensation and nonlinear filtering		
	Autoranging provides five decades of sensitivity ranges		
	Display updates once per second		
Low rate mode			
This mode is only for making very low do and autoranging provide five decades of s In this mode, automatic current offset and system can display very low dose rates Power requirements	ose rate measurements. Nonlinear digital filtering sensitivity ranges. Display updates once per second. d drift compensation are disabled. As a result, the		
Bias voltage supply	Fixed electronic bias (~300 V)		
	Bias voltage removed from triaxial input connector at instrument turnoff		
Connections			
Ion chamber input	Triax, BNC		
	Collector and guard positive-biased relative to ion chamber body and service dosimeter chassis		
Power	Same as TNT 12000WD		
General information			
Display	Wirelong 7igPee or optional USP interface to		

Display	Wireless ZigBee or optional USB interface to TNT 12000 display indicates all ion chamber identification information, numerical measurement results, battery level, calibration date, and other information
Weight	≈ 0.68 kg (1.5 lb)
Maximum dimensions (WxDxH)	15.2 cm x 11.4 cm x 4.45 cm (6 in x 4.5 in x 1.75 in)

Ordering information

TNT-ALLN1-TNT TNT 12000WD Wireless Detector with mAs + TNT 12000 DoseMate + TNT 12000D Display TNT-ALLN1-DM TNT 12000WD Wireless Detector + TNT 12000 DoseMate with mAs + TNT 12000D Display TNTWD-RO-MAS TNT 12000WD Wireless Detector with mAs + TNT 12000D Display TNT-DM-MAS-RO TNT 12000 DoseMate with mAs + TNT 12000D Display TNTWD-DM-RO TNT 12000WD Wireless Detector + TNT 12000 DoseMate + TNT 12000D Display TNT 12000 TNT 12000WD Wireless Detector + TNT 12000D Display TNT-WMAS-DM TNT 12000WD Wireless Detector with mAs + TNT 12000 DoseMate TNTWD-DM-MAS TNT 12000WD Wireless Detector + TNT 12000 DoseMate with mAs TNTWD-DM TNT 12000WD Wireless Detector + TNT 12000 DoseMate TNTWD-MAS TNT 12000WD Wireless Detector with mAs TNT12K-DM-MAS TNT 12000 DoseMate with mAs TNT 12000WD TNT 12000WD Wireless Detector TNT 12000D TNT 12000D Wireless Display TNT12K-DM TNT 12000 DoseMate Dosimeter TNT12K-DM-RO TNT 12000 DoseMate + TNT 12000D Display **Included accessories** • TNT 12000 EXL add-in reporting software places measured values into Microsoft® Excel templates • ZigBee USB dongle facilitates direct wireless interface between the detector instrument and the user's PC

- USB cable enables PC interface, Excel reporting, and Ansur test automation
- AC power adapters
- Customized carrying case

*Customized configurations also available. For more information, contact Fluke Biomedical.

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76-424-4156

FLUKE ®

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).

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	Dimensions: (LxØ) 15.5 cm x 16 cm
phantom	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)

http://www.elso.sk

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 multidetector (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)

Optional accessories

89-419 Carrying Case with wheels and pull handle for 76-419-4150 **89-414** Carrying Case for 76-414-4150

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

 $\textbf{76-415}\ \text{CT}\ \text{Body}\ \text{Dose}\ \text{Phantom}\ \text{with}\ \text{five}\ \text{plugs}$



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

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 mammo-graphic 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.

Specifications

Phantom body			
Material	Acrylic		
Dimensions	Overall (WxDxH): 10.15 cm x 10.8 c	cm x 4.4 cm (4 in x 4.25 in x 1.75 in)	
	Acrylic base: 3.4 cm in thick (1.37	5 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	A12O3 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			

Key features

• Helps ensure optimum image quality and peak performance of the mammographic system

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- 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 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

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.

Ordering information 18-220 Mammographic Accreditation Phantom

Included accessories

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

riešenia na presné meranie

451B Ion Chamber Survey Meter with Beta Slide



Typical energy dependence

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, highstrength 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

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- Auto-ranging and auto-zeroing
- RS-232 communications interface with optional Windowsbased 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 Ion Chamber Survey Meter with Beta Slide

Specifications

Radiation detected	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 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	n 10 % and 100 % of full		
	scale indication on any range, e	exclusive of energy response.		
	Calibration source is ¹⁵⁷ Cs			
Detector				
Chamber	349 cc volume air ionization			
Chamber wall	246 mg/cm ² thick phenolic			
Chamber window	area	steel mesh, 46 cm ² detection		
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 $H^{*}(0.07)$, and Deep Dose $H^{*}(10)$ with Beta Shield closed			
Controls	ON/OFF and MODE			
Automatic features	Auto-zeroing, auto-ranging, and	l 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 op	eration		
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

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451EXL 451 Assistant for Excel, includes RS-232 interface cable **190HPS** Single Unit Carrying Case **450UCS** Check Source, ²³⁸Uranium, 0.064 μCi, impregnated 2 x 2 in yellow card **62-103** Check Source, ¹³⁷Cs, 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

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

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.

Typical energy dependence

 $^{16}\mbox{Nitrogen}$ gamma rays are 110 % to 120 % of indicated readings as determined at the University of Lowell.



Key features

 High sensitivity µR measurements of rate and dose simultaneously, with the capability to record peak rate

FLUKE

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- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod mount
- 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 Pressurized µR Ion Chamber Survey Meter

Specifications

	1			
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 betwe	en 10 % and 100 % of full		
	scale indication on any range,	exclusive of energy response.		
Deterter	Cambration source is 1970s			
Chamber	220 ag volume progravized ei	ionization showher to 9		
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 a	nd auto-backlight		
Response time	Step increase background	Time to reach 90 % of final		
Analog response time from	to	value		
10 % to 90 % of reading for	400 µR/h	4.8 s		
a full scale step increase is	4 mR/h	3.3 s		
dependent on operating range.	10 mR/h	4.3 s		
increase in radiation exposure	40 mR/h	4.5 s		
rate from background:	100 mB/h	2.7 s		
	1 B/h	2.8		
	4 B/h	27 \$		
This table shows time measured	Bange	10 % to 90 %		
from 10 % to 90 % of final value	0 to 500 uB/h (5 uSy/h)	5 °		
for a step increase or decrease	0 to 5 mB/h (50 uSv/h)	2 9		
in exposure rate such that a	$0 to 50 mB/h (500 \mu Sv/h)$	1.8 c		
range change does not occur.	$0 to 500 \text{ mR/h} (500 \mu \text{SV/h})$	1.0.5		
times for the various ranges:	0 to 5 R/h (50 mSv/h)	1.0 5		
Analog/Digital display I CD wi	th backlight	1.0 5		
Analog 100 element har granh 6.4 cm (2.5 in) long. Bar granh is				
Analog	divided into five major segments each labeled with the			
	appropriate value for the range	e of the instrument		
Digital	2.5 digit display is followed by a significant zero digit			
	depending on the operating range of the instrument. The			
	times Digits are 6.4 mm (0.25	in high Low battery and		
	freeze indicators are also prov	ided on the display		
Modes		J		
Integrate mode	Operates continuously 30 seco	onds after the instrument		
5	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 h	oar graph display to hold on		
	the peak displayed value. The	unit will continue to read and		
Environmental		ە ر		
Power requirements	Two Q V alkaline 200 hours of	neration		
Worm up time	I ong than two minutas for init	interaction when the		
waim-up time	instrument is in equilibrium w	iai operation when the		
Temperature range	-20 °C to 50 °C (-4 °F to 122 °F			
Relative humidity	0 to 100 %	1		
Geotronism	Negligible			
Dimensions (WyDyH)	10 cm y 20 cm y 15 cm l in y	8 in x 6 in)		
Weight				
weidin	1.01 MY (4.4 IN)			

Optional accessories

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451EXL 451 Assistant for Excel, includes RS-232 interface cable **190HPS** Single Unit Carrying Case **62-103** Check Source, ¹³⁷Cs, 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

 $\begin{array}{l} \textbf{451P-DE-SI-RYR} \ \text{Pressurized} \ \mu R \ \text{Ion} \\ \text{Chamber Survey Meter with dose} \\ \text{equivalent chamber} \end{array}$

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 CarePlans Priority services to keep you up and running



Look for the CarePlans logo in this catalog for products with available extended service and support plans. Fluke Biomedical's CarePlan packages offer comprehensive priority service and support to help you get the most out of your test equipment investments. Our CarePlan members enjoy priority bench service, extended warranties, value pricing on services, VIP technical support, expedited return shipping, productivity consultation services, educational training, and more. Take advantage of CarePlan priority service and support and let us take care of you.

Choose the best plan for you

	Gold	Silver	Bronze
First-on-bench priority service	•	•	•
Reminder notifications 60 and 30 days prior to expiration of calibration	•	•	•
Discounts on additional service requests	•	•	•
VIP access to technical support hotline	•	•	•
Turn-around time for repair	3-day	3-day	5-day
Turn-around time for calibration	1-day	3-day	5-day
Operational upgrades	•	•	
Accredited calibration to manufacturer's specifications	•	•	
OEM onsite calibration (where available) ensuring manufacturer's specifications	•	•	
One-year extended warranty beyond your original fac- tory warranty. No-cost repair service.	•		•
1-day turnaround time for calibration	•		
No-cost loaner units during extended repair	•		
24x7 web user training	•		
Protocol development to increase productivity	•		



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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 a variety of Service Options to meet your needs. These options include Asset-Management for pools larger than 150 units, On-Site calibration and Care Plan Options.

Asset-Management: Takes over your grueling task of instrument tracking and allows you to use your time more productively. Proper protocols are strictly followed, eliminating the problems with inspectors and audits that can result when other less-qualified labs perform the calibrations.

On-Site Calibrations: Minimizes downtime and is scheduled when convenient for you. Calibrations are to OEM requirements, completed OEM upgrades, and Automatic OEM updates.

Care Plan Options: Fluke Biomedical's Care Plan packages offer comprehensive priority service and support to help you get the most out of your test equipment investments. As a member enjoy priority service, extended warranties, value pricing on service, VIP technical support, xpedited return shipping, and more.

Calibration beam specifications

Radionuclide calibrations		
Radionuclide sources	Minimum rate	Maximum rate
2000 Ci Cs-137	0.02 R/hr	850 R/hr
20 Ci Cs-137	0.1 mR/hr	4 R/hr
4 Ci Cs-137	0.5 mR/hr	1 R/hr
500 mCi Cs-137	0.04 mR/hr	150 mr/hr
1300 Ci Co-60	0.01 R/hr	450 R/hr
Collimated 2200 Ci Co-60	2575	3530

Calibrate the following

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- 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
- SpO₂ Simulators/Analyzers
- Thermometers
- Test Lungs
- Ultra Sound Analyzers
- Velometers
- Ventilators/Gas flow Analyzers

Contact information

Service Center/Repair/Calibration US Fluke Biomedical a division of Fluke Electronics 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





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