

**FLUKE®**



# Fluke Biomedical Product catalog

**FLUKE®**  
Biomedical

 **RaySafe™**

**LANDAUER®**

## Trusted for the measurements that matter.

Fluke Biomedical leads the world in the design and manufacture of biomedical test and simulation products. Reliability, accuracy and quality are the foundation of our company and products. Empowering you to focus on protecting lives is our goal.

### 1 Innovative design from customer feedback

At Fluke Biomedical, we strive to lead our market segments through creative solutions and ongoing improvement of current offerings. Our multi-functional product development teams are comprised of experts in mechanics, electronics, software, systems, engineering, service and manufacturing technology. This expertise, coupled with intensive customer research, called “voice of customer” helps us develop the devices that address your current and future testing needs. In addition to our VOC research, we actively participate in a wide range of industry associations, conferences and speaking events. We pay careful attention to evolving trends in the industry, applications and what is being asked of you.

### 2 Customer satisfaction demanded

When you invest in the best products, you deserve the best support. We have several world-class service centers, including the world’s largest commercial medical testing device laboratory. Our service centers are extremely versatile and can service over 1,000 different models. With extensive experience in full-asset management, our highly-accredited program is equipped to give you OEM firmware and product updates that can’t be found elsewhere; NIST-traceable calibration, 90-day warranty on repairs and fast turnaround from their state-of-the-art facilities.

### 3 High standards for quality assurance

Our employees are committed to maintaining the high quality of our products and services. We solicit customer input on quality and product features and then design, validate, manufacture and service these to requirements. We show an ongoing commitment to quality through the continuous improvement process required by our internationally recognized ISO 9001 and ISO 13485 Quality System registration.

#### 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 Fortive Corporation (\*NYSE: FTV)

# Featured products catalog

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For a complete listing of Fluke Biomedical products and services, please visit our website at [www.flukebiomedical.com](http://www.flukebiomedical.com).



## New products

### VT650 and VT900 Gas Flow Analyzers



Fluke Biomedical has introduced the VT650 and VT900 Gas Flow Analyzers, which include one-channel, full-range air flow functionality that streamlines testing. The VT650 and VT900 offer accuracy and reliability for gas flow and respiratory medical equipment testing, including all types of ventilators, flow meters, pressure gauges, anesthesia, and other machines.

These analyzers are lightweight (3.6 lbs) and portable, with a removable carrying handle and shoulder strap, making them suitable for on-the-go testing. The large, 7-inch color touch screen can be easily read from 6 feet away, and the global user interface makes operating these devices straightforward and uncomplicated.

What's more, the VT650 features a full-range  $\pm 300$  liter-per-minute (lpm) airflow channel with built-in oxygen, temperature, and humidity measurements. Designed and tested to Molbloc-L calibration specifications, it ensures traceability to global regulatory standards and is suited for basic ventilator and gas-flow testing.

Specifically, the VT900 has all the ease-of-use and features of the VT650, plus an external TTL trigger input and special ultra-low flow and ultra-low-pressure ports for high accuracy in critical low volume and pressure testing, for devices like anesthesia machines and flow meters.

#### Highly accurate. Easily portable. Always reliable.

The new VT650 and VT900 Gas Flow Analyzers from Fluke Biomedical are packed with features for those who need portable, on-the-go testing.

- Test all types of ventilator and respiratory equipment
- Lightweight design, weighing in at 3.6 lbs, featuring a removable handle, mounting capabilities, and a shoulder strap for easy portability
- All-in-one testing—no extra modules to carry around
- Large 7" (17.8 cm) color touch screen—readable at up to 6' (1.8 m) away
- Need ultra-low flow and ultra-low pressure testing? The VT900 is the analyzer for you.
- Conduct ventilator, anesthesia, and flow meter tests that rely on high accuracy
- Traceable to global regulatory standards
- Perfect for OEMs, clinical benchtop testing, government, and field service use

To learn more see pages 15-16.

# ProSim vital signs simulator family

## Comparison guide

							
Functions	ProSim 8 + SPOT	ProSim 8	ProSim 4, ProSim 3, SPOT Light	ProSim 4	ProSim 3	ProSim 2	SPOT Light
ECG simulation	•	•	•	•	•	•	
Arrhythmia waveform selection	50+	50+	43	43	43	43	
Respiration simulation	•	•	•	•	•	•	
IBP simulation (channels)	2	2	4	1	4	2	
Temperature	•	•		•	•	•	•
NIBP simulation	•	•	•	•			
Manometer (pressure meter)	•	•	•	•			
Leak test	•	•	•	•			
Pressure relief test	•	•	•	•			
Fetal ECG/IUP simulation	•	•			•		
Cardiac output	•	•			•		
Rainbow SET (Masimo) test	•						
Optical SpO <sub>2</sub>	•		•				•
Features							
Multi-parameter simulation	•	•	•	•	•	•	
Presets, auto sequences	•	•	•	•			
Multi-language	•	•	•	•			•
PC control software(Ansur)	•	•					
Direct data saving and printing	•	•					
Barcode scanning	•	•					
Wireless control	•	•					
Remote operation	•	•			•	•	
Communication	USB, wireless	USB, wireless	USB	USB	USB	USB	USB
Display	LCD color	LCD color	Touchscreen	Touchscreen	LCD gray	LCD gray	LCD gray
Battery life	9 hours	9 hours	4 hours	4 hours	8 hours	8 hours	10 hours

# ProSim 8

## Vital Signs Simulator



The 8-in-1 ProSim 8 Vital Signs Simulator offers fast and comprehensive preventive 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, temperature, IBP, cardiac output/cardiac catheterization, NIBP, SpO<sub>2</sub>, 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 auto-sequences, the ProSim 8 provides unbeatably fast and easy complete monitor testing.

### Key features

- All-in-one complete monitor testing
- Stay-connected ECG posts for easy/secure ECG snap and lead connections
- Custom SpO<sub>2</sub> r-curve for accurate testing of the latest oximetry technologies
- Static pressure linearity testing
- Repeatable NIBP simulation ( $\pm 2$  mm Hg) for dynamic pressure repeatability testing
- Physiologically synchronized pulses across all parameters
- Barcode scanning and direct data capture, printing functionality
- Onboard, customizable patient pre-sets and auto sequences
- Multi-language user interface
- Integrated, easily replaceable, long-life battery
- 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.

### Specifications

#### Normal-sinus-rhythm 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 $\pm 5\%$ of the ECG amplitude setting available on a BNC connector
Amplitude	0.05 mV to 0.5 mV (0.05 mV steps); 0.5 mV to 5 mV (0.25 mV steps)
ECG rate	10 BPM to 360 BPM in 1 BPM steps
ECG waveform selection	Adult (80 ms) or pediatric (40 ms) QRS duration
ST-segment elevation	Adult mode only. -0.8 mV to +0.8 mV (0.1 mV steps). Additional steps: +0.05 mV and -0.05 mV

#### Pacemaker waveform

Pacer pulse	Amplitude	0 (off), $\pm 2$ , $\pm 4$ , $\pm 6$ , $\pm 8$ , $\pm 10$ , $\pm 12$ , $\pm 14$ , $\pm 16$ , $\pm 18$ , $\pm 20$ , $\pm 50$ , $\pm 100$ , $\pm 200$ , $\pm 500$ , and $\pm 700$ mV for lead II (reference lead)
Pacer pulse width	0.1 ms, 0.2 ms, 0.5 ms, 1 ms, and 2 ms $\pm 5\%$	
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, standard timing (except where specified)
Supraventricular arrhythmia	Atrial fibrillation (coarse or fine); atrial flutter; sinus arrhythmia; missed beat (one time); atrial tachycardia; paroxysmal atrial tachycardia; nodal rhythm; and supraventricular tachycardia
Premature arrhythmia	Premature atrial contraction (PAC); premature nodal contraction (PNC); PVC1 left ventricular; PVC1 left ventricular, early; PVC1 left ventricular, R on T; PVC2 right ventricular; PVC2 right ventricular, early; PVC2 right ventricular, R on T; and multifocal PVCs
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

### Optional accessories

- 2392199 CI-3 Cardiac Output Box
- 3408564 Mini-DIN to DIN IBP Adapter
- 3890640 NIBP Test Chamber 500 ML
- 4034627 Ansur Test Software ProSim 8 Plug-In
- Cable kits
- 3984910 ProSim 8 Accessory Kit
- 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

Arrhythmia continued		
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), unstable 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-complex tachycardia (QRS < 0.12 seconds)	Sinus tachycardia > 150 BPM
		Supraventricular Tachycardia
	Symptomatic tachycardia: regular wide-complex tachycardias (QRS ≥ 0.12 seconds)	Sinus tachycardia > 150 BPM
		Supraventricular tachycardia SVT with aberrancy
Irregular tachycardia	Atrial fibrillation (coarse and fine), atrial flutter, unstable monomorphic ventricular tachycardia (120 BPM to 300 BPM), torsade de pointes/poly-morphic ventricular tachycardia (long QT interval)	
ECG performance testing		
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 Hz, 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		
Type	50 Hz, 60 Hz, muscular, baseline wander, respiration	
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 mmHg to 90 mmHg and returning to 0	
Invasive blood pressure		
Channels	2, each independently settable with identical parameters 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 ventricle (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	5 % to 10 % multiplication
	Other	5 mmHg or 10 mmHg
BP output	Circular DIN 5-Pin	

# ProSim 4 with SPOT Light

## Vital Signs Simulator and SpO<sub>2</sub> Functional Tester

The ProSim 4 Vital Signs Simulator 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 no-hassle testing, the ProSim 4 is the perfect patient simulator for first-call patient monitor quality assurance and safety professionals.

The ProSim SPOT Light SpO<sub>2</sub> Tester is the first comprehensive SpO<sub>2</sub> tester to come in a handheld and easy-to-use device. It's lightweight and flexible with three custom presets specially designed to make it the fastest and easiest to use device on the market for pulse oximeter functional testing.



### Key features

#### ProSim4

- ProSim 4 is a multi-function tester offering 12-lead ECG, respiration, IBP and NIBP simulation
- Touchscreen interface
- One-tap testing for most performance tests and checks
- Easy quick-check patient monitor testing

#### SPOT Light

- SPOT Light preset programs test any combination of saturation, heart rate, perfusion, transmission, artifact noise, and r-curve in 15 seconds or less
- Small, portable and lightweight
- Rechargeable battery lasts 10 hours minimum
- Signal strength indicator
- SpO<sub>2</sub> saturation: 80 %, 85 %, 90 %, 95 %, 97 %, 98 %, 99 % and 100 %
- Heart rate: 30, 40, 60, 80, 90, 100, 120, 150, and 240 BPM
- Perfusion: 0.2 %, 2 % and 10 %
- Transmission: dark/thick, normal and light/thin
- Artifacts: respiration and ambient light
- R-curves: Nonin, Masimo, Nellcor, Nihon Kohden, Mindray, GE, Philips, BCI

### Specifications

Standard compliance	CE, CSA, C-Tick, RoHS
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
ECG accuracy	± 1 % of setting
Arrhythmia	11 waveforms
Respiration rate	0 (OFF), 10 BrPM to 100 BrPM in 10 BrPM steps
Accuracy baseline	± 5 %
Manometer (Pressure meter)	10 mmHg to 400 mmHg
Manometer resolution	0.1 mmHg (for display purposes)
Manometer accuracy	± (1 % of reading + 1 mmHg)
Invasive blood pressure	One channel
Pressure accuracy	± (1 % of setting + 1 mmHg), dc excitation only
Temperature	0 °C (32 °F), 24 °C (75.2 °F), 37 °C (98.6 °F), 40 °C (104 °F)

### 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)



# ProSim 2 and ProSim 3

## Vital Signs Simulator



Don't need a comprehensive patient monitor tester? The ProSim 3 and ProSim 2 Vital Signs Simulators are clear choices for biomedical engineers and field service technicians that need a quality, portable device. Choose one of these modern vital signs simulators for preventive maintenance, troubleshooting and repair.

The ProSim 3 and 2 feature the perfect amount of features for testing in the field. We like to call it the just-right feature set, and it includes:

- ECG
- Pacemaker
- Arrhythmia and performance testing
- Respiration
- Invasive blood pressure
- Temperature
- Cardiac output (ProSim 3 only)
- Fetal/maternal (ProSim 3 only)

### Specifications

Standard compliance	CE, CSA, C-tick, WEEE and RoHS
ECG rate	30 BPM, 40 BPM, 45 BPM, 60 BPM, 80 BPM, 90 BPM, 100 BPM, 120 BPM, 140 BPM, 160 BPM, 180 BPM, 200 BPM, 220 BPM, 240 BPM, 260 BPM, 280 BPM and 300 BPM
ECG accuracy	± 1% of setting
Arrhythmia	43 waveforms
Respiration rate	0 (OFF), 15 BPM, 20 BPM, 30 BPM, 40 BPM, 60 BPM, 80 BPM, 100 BPM, 120 BPM
Accuracy baseline	± 5%
Blood pressure	4 channels
Pressure accuracy	± (2% of setting + 2 mmHg), dc excitation only
Temperature	0 °C (32 °F), 24 °C (75.2 °F), 37 °C (98.6 °F), 40 °C (104 °F)
Temperature accuracy	± 0.1 °C
Cardiac output	2.5, 5, 10 liters per minute ± 5%
Fetal/maternal	Fetal HR: 60 BPM, 90 BPM, 120 BPM, 140 BPM, 150 BPM, 210 BPM and 240 BPM Fetal HR (IUP): 140 BPM, then varies

### Key features

- Portable, multi-parameter patient simulators for evaluating the performance of patient monitors
- Just-right feature set includes: ECG, pacemaker, arrhythmia and performance testing, respiration, invasive blood pressure, temperature, cardiac output (ProSim 3 only), fetal/maternal (ProSim 3 only)
- 43 high-quality waveforms
- With four IBP channels, ProSim 3 can test even the highest accuracy scenarios
- Stay connected ECG posts for secure lead connections
- Improved user interface and online Advantage Training demos
- Upgraded DIN connectors ensure consistency with the ProSim family; minimize cable compatibility issues
- Field upgradeable, and easily paired with other devices for comprehensive testing

### Included accessories

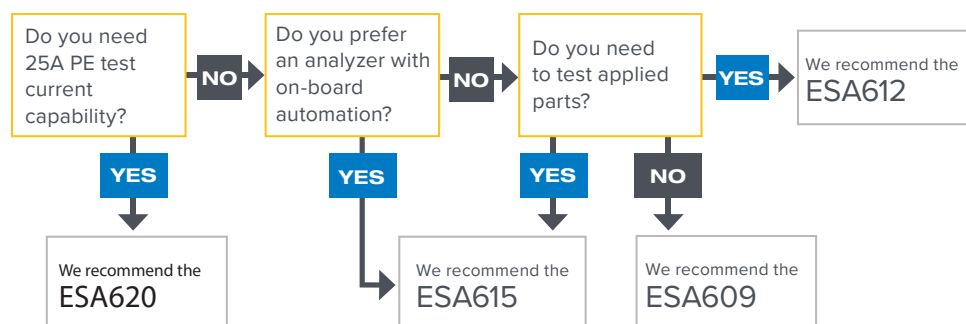
ProSim 2/3 Instruction Sheet (Multilingual)  
4253822 ProSim 2/3 Users Manual CD  
614487 Two 9-volt alkaline batteries (minimum eight hours continuous use)  
2392173 IBP Cable, unterminated  
2392199 3010-0289FG, CI-3 Cable Assembly (Cardiac Output Box; ProSim 3 only)  
1671807 USB cable  
2248623 ProSim 2/3 Carrying Case

### Optional accessories

2523334 YSI 400 Series (UT-4)  
2199019 YSI 700 Series (UT-2)  
4022300 Cardiac output switch for GE

# Electrical safety analyzers

## Comparison guide



	ESA615	ESA612	ESA620	ESA609	601 Pro SeriesXL
<b>Basic overview</b>					
Preferred analyzer for which standard?	IEC62353 and NFPA-99	ANSI/AAMI and NFPA-99	IEC60601-1 2nd, 3rd edition	ANSI/AAMI and NFPA-99	IEC60601-1 2nd edition
Automation inside	•				•
Ansur compatible	•	•	•		
Onboard memory	•	•			•
ECG simulation	•	•	•		•
Handheld	•	•		•	
GFCI protection	•	•	•	•	
DUT load current	•	•	•	•	•
20 A test capability	•	•	•	•	•
25 A test capability			•		•
<b>Detailed comparison</b>					
<b>Test modes</b>	Automated Manual if preferred	Manual Ansur-automatable	Manual Ansur-automatable	Manual	Automated (limited); manual testing required to meet newest standards)
<b>Test loads</b>	AAMI, IEC60601-1	AAMI, IEC60601-1	AAMI, IEC60601-1, IEC61010	AAMI, IEC60601-1	AAMI, IEC60601-1, IEC61010
<b>Mains voltage measurement</b>	All lines	All lines	All lines	All lines	All lines
<b>PE test current</b>	200 mA ac	200 mA ac	200 mA ac, 25 A ac	>200 mA dc	1 A ac, 10 A ac, 25 A ac
<b>Leakage range</b>	0 µA to 10,000 µA 0 µA to 20 mA (differential only)	0 µA to 10,000 µA 0 µA to 20 mA (differential only)	0 µA to 10,000 µA 0 µA to 20 mA (differential or 61010 only)	0.0 µA to 1999.9 µA	0 µA to 8000 µA to 16,000 µ (61010 only)
<b>Patient auxiliary leakage lead selections</b>	Any 1 to all	Any 1 to all	Any 1 to all RA-LL-LL-LA RA-LA	-	Any 1-5 to all V1-16 to all
<b>MAP test voltage</b>	100 % of mains	100 % of mains	110 % Or 100 %	-	110 % of mains
<b>Power supply (V ac)</b>	120 or 230	120 or 230	120 or 230	90 to 264	120 or 230
<b>Applied parts connections</b>	5 banana safety jacks, Bj2ECG adapter, 1-to-10 Expander	5 banana safety jacks, Bj2ECG adapter, 1-to-10 Expander	10 insulated posts	-	10 banana safety jacks
<b>Communication options</b>	Wireless and Wired	Wired	Wired	-	Wired
<b>Data entry options</b>	Onboard keypad USB compatible keyboard, Barcode scanner	Onboard keypad	-	-	Onboard keypad PS/2 keyboard Barcode scanner
<b>Printer port</b>	Available via Ansur	Available via Ansur	Available via Ansur	-	Parallel
<b>Dual lead testing</b>	µA/mV, V and Ω	µA/mV, V and Ω	µA/mV, V and Ω	-	µA/mV and V
<b>Connectivity</b>	USB	USB	USB	-	RS-232, parallel printer
<b>Power cord</b>	Removable	Removable	Removable	-	Removable

# ESA615

## Electrical Safety Analyzer

The automated ESA615 Electrical Safety Analyzer brings fast and simple testing to a portable analyzer perfect for use in the field and in facilities. Whether it is simple testing or comprehensive analysis, the ESA615 can do it all. The multifaceted device performs all primary electrical safety tests including line (mains) voltage, ground wire (protective earth) resistance, insulation resistance, device current and lead (patient) leakage tests.



### Key features

- On-board automation with automated test sequences for easy compliance to key global electrical safety standards (ANSI/AAMI ES-1 (NFPA-99), IEC62353 (VDE751), IEC60601-1 2nd and 3rd editions, and AS/NZS 3551)
- Portable, ergonomic design with an integrated handle and tilt stand
- Human-factors-designed user interface for streamlined testing
- ECG waveform tests and dual-lead measurements
- Five applied parts jacks and easy ECG snap connection; optional expander box for up to 12-lead ECG testing
- Easy data entry through barcode, external keyboard or on-board keypad
- Wireless communication plus removable memory card
- Replaceable mains fuses
- Custom language selections include: English, French, German, Spanish, Italian and Portuguese

### Specifications

Voltage	
Range (mains voltage)	90 V ac rms to 132 V ac rms, 180 V ac rms to 264 V ac rms
Range (accessible voltage)	0 V ac rms to 300 V ac rms
Accuracy	± (2 % of reading + 0.2 V)
Voltage tests	Mains and point to point
Earth resistance	
Mode	Two wire
Test current	> 200 mA ac
Range	0 Ω to 2 Ω
Accuracy	± (2 % of reading + 0.015 Ω)
Resistance tests	Earth resistance and point to point
Equipment current	
Mode	AC rms
Range	0 A to 20 A
Accuracy	± 5 % of reading + (2 counts or 0.2 A, whichever is greater)
Duty cycle	15 A to 20 A, 5 min on/5 min off 10 A to 15 A, 7 min on/3 min off 0 A to 10 A continuous
Leakage current	
Modes*	ac + dc (true-rms)
	ac only
	dc only
*Modes are available in all leakage tests with the exception of MAP leakages that are available only in true-rms.	
Patient load selection (input impedance)	AAMI ES1-1993 Fig. 1, IEC 60601: Fig 15
Crest factor	≤ 3
Ranges	0 µA to 199.9 µA 200 µA to 1999 µA 2 mA to 10 mA

### Included accessories

CD-ROM Users Manual (multilingual)  
 MANUAL Getting Started Guide (hard copy, multilingual)  
 Ansur Plug-in CD with demo version  
 Data Transfer Cable  
 USA Accessory Kit: Test Lead Set, TP1 Test Probe Set, AC285 Alligator Clip Set (ESA T/L KIT USA)

### Optional accessories

4316223 50' Test Lead  
 4794643 75' Test Lead  
 4165219 Ansur ESA 615 Plug-in License  
 2392639 Ground Adapter  
 2392639 Ground Adapter

# ESA612

## Electrical Safety Analyzer

Portable, lightweight and designed for operation in tight spaces, the ESA612 Electrical Safety Analyzer offers the functionality of a simulator, multimeter and analyzer in a single test tool. The versatility of the multifaceted ESA612 is further expanded with optional automation software, which speeds and simplifies testing and provides high-end productivity at software-level investment.



### Key features

- Large, easy-to-read display with adjustable contrast
- Human-factors-designed user interface
- Tilt stand design for stand-up testing in field environments
- Five applied parts jacks and easy ECG snap connection with optional expander box
- ECG waveform tests and dual-lead measurements
- Replaceable mains fuses
- Internal memory for 100 test records
- USB connection for use with Ansur and Data Viewer software (for memory download to PC)
- Built-in handle

### Specifications

Voltage	
Range (mains voltage)	90 V ac to 132 V ac rms, 180 V ac to 264 V ac rms
Range (accessible voltage)	0 V ac to 300 V ac rms
Accuracy	± (2 % of reading + 0.2 V)
Voltage tests	Mains and point-to-point
Earth resistance	
Mode	Two terminal
Test current	> 200 mA ac
Range	0 Ω to 2 Ω
Accuracy	± (2 % of reading + 0.015 Ω)
Resistance tests	Earth resistance and point-to-point
Equipment current	
Mode	AC rms
Range	0 A to 20 A
Accuracy	± 5 % of reading + (2 counts or 0.2 A, whichever is greater)
Duty cycle	15 A to 20 A, 5 min on/5 min off 10 A to 15 A, 7 min on/3 min off 0 A to 10 A continuous
Leakage current	
Modes*	ac + dc (true-rms) ac only dc only
*Modes are available in all leakage tests with the exception of MAP leakages that are available only in true-rms	
Crest factor	≤ 3
Ranges	0 µA to 199.9 µA 200 µA to 1999 µA 2 mA to 10 mA

### Included accessories

CD-ROM Users Manual (multilingual)  
Manual Getting-Started Guide (hard copy, multilingual)  
Cable Assembly Data Transfer Cable  
ESA612 Accessory Kit (country specific)  
Null Post Adapter  
5-to-5 Banana Jack to ECG (BJ2ECG) Adapter  
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

### 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  
4316223 50' Test Lead  
4794643 75' Test Lead



# ESA620

## Electrical Safety Analyzer



The multifaceted ESA620 Electrical Safety Analyzer performs all primary safety tests including mains voltage, protective earth resistance, insulation resistance, device current, earth, chassis, and patient leakages as well as several additional leakage tests to comply with standards of choice.

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 the 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.

### Specifications

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	0 Ω to 2 Ω
Accuracy	± (2 % of reading 0.015 Ω)
Equipment current	
Mode	ac rms
Range	0 A to 20 A
Accuracy	± 5 % of reading ± (2 counts or 0.2 A, whichever is greater)
Leakage current	
Patient load selection (input impedance)	AAMI ES1-1993 Fig 1 IEC 60601: Fig 15 IEC 61010: Fig A-1
Crest factor	≤ 3
Ranges	0 μA to 199.9 μA 200 μA to 1999 μA 2.0 μA to 10.0 mA
Frequency response	DC to 1 kHz 1 kHz to 100 kHz 100 kHz to 1 MHz
Accuracy	± (1 % of reading + 1 μA or 1 LSD, whichever is greater) ± (2 % of reading + 1 μA or 1 LSD, whichever is greater) ± (5 % of reading + 1 μA or 1 LSD, whichever is greater)

### Key features

- Superior compliance with multiple standards: IEC60601-1(partial), IEC62353, VDE 751, ANSI/AAMI ES1:1993, NFPA-99, AN/NZS 3551, IEC61010
- 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 parts (lead isolation) test
- DSP filter technology
- 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
- Two or (optional) four-wire ground wire resistance
- Optional Ansur plug-in software
- USB connection
- CE, C-TICK and CSA for USA and Canada
- RoHS compliance

### Included accessories

CD-ROM Users Manual  
Manual Multilingual Getting Started Guide  
ESA620 Accessory Kit (country specific)  
Soft Case Carry case Detachable Power Cord (country specific)

### ESA620 with test automation

Comes with all of the above plus:  
ANSUR ESA620 Ansur Test-Automation Software ESA620 plug-in  
Cable Assembly Data Transfer Cable

### Optional accessories

2392639 Ground Adapter  
4316223 50' Test Lead  
4794643 75' Test Lead

# ESA609

## Electrical Safety Analyzer



The ESA609 Electrical Safety Analyzer is a rugged, portable and easy-to-use analyzer designed for general electrical safety testing. Engineered for on-the-go technicians, the ESA609 requires no training to use and has a protective, rubberized case. Its functional strap and featherweight design make it one of the most portable electrical safety analyzers in its class. Heavy-duty switches allow users to effortlessly change polarity and configuration of the neutral connection between open and closed, while push-button operation ensures fast transition between tests for complete basic testing. The ESA609 integrates all functions needed to test medical devices when patient lead testing is not required, including: line (mains) voltage, ground wire (protective earth) resistance, equipment current, leakage current and point-to-point tests. Versatile to global electrical safety standards of choice, the ESA609 tests to ANSI/AAMI ES1, NFPA-99, and parts of IEC62353 and IEC60601-1.

### Specifications

Mains voltage measurement	
Range	90.0 V to 264.0 V ac rms
Accuracy	± (2 % of reading + 0.2 V)
Earth resistance	
Modes	Two wire
Test current	> 200 mA dc
Range	0.000 Ω to 20.000 Ω
Accuracy	± (1 % of reading + 0.010 Ω)
Resistance tests	Earth resistance and point to point
Equipment current	
Mode	ac rms
Range	0.0 A to 20.0 A
Accuracy	± 5 % of reading + (2 counts or 0.2 A, whichever is greater)
Duty cycle	15 A to 20 A, 5 min. on/5 min. off 10 A to 15 A, 7 min. on/3 min. off 0 A to 10 A, continuous
Leakage current	
Modes	True-rms
Patient load selection	AAMI ES1-1993 Fig. 1 IEC 60601: Fig. 15
Crest factor	Less than or equal to 3
Ranges	0.0 μA to 1999.9 μA accuracy
DC to 1 kHz	± 1 % of reading + (1 μA, whichever is greater)
1 kHz to 100 kHz	± 2.5 % of reading + (1 μA, whichever is greater)
100 kHz to 1 MHz	± 5 % of reading + (1 μA, whichever is greater)
Leakage tests	Ground wire (earth) Chassis (enclosure) Direct equipment Point to point

### Key features

- Standards compliance include: ANSI/AAMI ES1, NFPA-99, and parts of IEC62353 and IEC60601-1
- Test current consumption up to 20 A for a diverse set of medical devices
- All parameters needed for basic electrical safety testing: line (mains) voltage, ground wire (or protective earth) resistance, equipment current, ground wire (earth) leakage, chassis (enclosure) leakage, direct equipment leakage, and point to point leakage and resistance
- Global use: the ESA609 will operate at 120 V and 230 V
- Rugged: Rubberized case and Ingress Protection rating of IP30 help prevent damage when dropped
- User-friendly: Quick push-button operation for rapid testing
- Portable: Featherweight (1.5 lb) design, functional strap, and tilt stand make it easy for transportation and operation on-the-go (onsite or offsite)
- Rigorously tested for safety and reliability, with CE, CSA and Australia RCM in addition to Fluke quality

### Included accessories

4370089 Operator's manual (Multilingual CD-ROM)  
4370092 Safety sheet  
3111008 USA/AUS/ISR Accessory Kit: test lead set, TP1 test probe set, AC285 alligator clip set (ESA T/L kit, USA)  
2248650 Carrying case  
2242165 Ground Adapter  
Line cord Country-specific power cord  
3111024 EUR Accessory Kit: test lead set, TP74 test probe set, AC285 alligator clip set (ESA T/L kit, EUR)

### Optional accessories

2195732 15 A to 20 A adapter

# Gas flow analyzers

## Comparison guide



VT900

VT650

Features and functions	VT650	VT900
Oxygen accuracy	2 %	1 %
Single flow full range channel ( $\pm 300$ lpm)	(1.7 % or 0.04 lpm)	(1.7 % or 0.04 lpm)
Airway temperature/humidity/oxygen measurement	•	•
Ultra-low flow channel ( $\pm 750$ mL/min) accuracy	(1.7 % or 0.04 lpm)	•
Ultra-low pressure range (0-10 mbar) accuracy	(1 % or 0.01 mbar)	
Real-time measurements and graphical display	•	•
Test profile customization	•	•
External trigger input		•
Onboard memory and automatic test resport creation	•	•
Global user interface	•	•
7 in (17.8 cm) color screen	•	•
High pressure (-0.8 to 10 bar)	$\pm 1\%$ or $\pm 0.007$ bar	$\pm 1\%$ or $\pm 0.007$ bar
Low pressure ( $\pm 160$ mbar)	$\pm 0.5\%$ or $\pm 0.1$ mbar	$\pm 0.5\%$ or $\pm 0.1$ mbar
Battery life	8 hours	8 hours

## VT650

### Gas Flow Analyzer

Designed for accuracy and portability, the VT650 Gas Flow Analyzer is a high quality, all-in-one, basic needs gas flow analyzer that also ventilators.

The VT650 Gas Flow Analyzer offers high accuracy and reliability for gas flow and respiratory medical equipment, including neonatal, mechanical and high-frequency ventilators. The single, full range  $\pm 300$  lpm air flow channel offers built-in oxygen, temperature and humidity measurements to streamline your testing procedure. Designed and tested to world renown Molbloc-L calibration specifications ensures traceability to global regulatory standards with measurements you can rely on.



#### Key features

- More uptime with increased oxygen sensor accuracy and life
- Avoid confusion and ensure accuracy with one-channel full range air flow functionality
- Streamline your testing procedure reduce errors and quicken your test time with the ability to create customized test profiles
- Reduce testing time with built-in line sensors which automatically test humidity temperature and oxygen while compensating for atmospheric pressure and environmental conditions
- Easily transport and store the lightweight (3.64 lb/1.6 kg) all-in-one device—no extra modules for different tests
- Quickly access menu options interpret results and see measurements at a distance up to 6' (1.8 m) with the large easy-to-read 7 (17.8 cm) color touch screen
- Operate on-the-go all day with 8 hours of battery life
- The on-board memory allows you to record and save data
- Have confidence that your measurements comply to global regulatory standards and adhere to SI units of measurement with the Molbloc-L calibration system.
- Operate on-the-go, all day with 8 hours of battery life
- More control over your testing by selecting your own trigger point with the external trigger input
- The ability to ensure patient safety with ultra-low flow and ultra-low pressure anesthesia and flow meter testing

## VT900

### Gas Flow Analyzer

The VT900 Gas Flow Analyzer provides the highest accuracy for testing gas flow and respiratory medical equipment. It's accurate, easy-to-use, reliable and portable.

Designed to accurately and reliably test all types of gas flow equipment especially those requiring high accuracy in ultra-low flow and ultra-low pressure measurements, this compact and lightweight analyzer is extremely portable, and also saves space on your benchtop.



The VT900 features an external trigger input and special ultra-low flow and ultra-low pressure ports. These ultra-low flow and ultra-low pressure ports allow the highest accuracy for devices requiring crucial low volume and pressure testing such as anesthesia machines and flow meters. Designed and tested to world renown Molbloc-L calibration specifications ensures traceability to global regulatory standards with reliable measurements you can count on.

#### Optional accessories

2387318 ACCU LUNG Test Lung  
4281291 ACCU LUNG II Test Lung  
4969657 Vesa Mounting System/  
Test Arm



# Impulse 7000DP

Defibrillator Tester/External Pacemaker Analyzer



The Impulse 7000DP is a combination Defibrillator/Transcutaneous Pacemaker Analyzer that is portable, rugged, and easy-to-carry. It measures any defibrillator energy waveform, properly tests all defibrillator and AED devices (including Shock Advisory), ensures proper loads used for pacer testing, and delivers superior performance with accuracy measurements  $\pm 1\%$  of reading  $+ .01\text{ J}$ .



## Impulse 7010 Selectable Load Accessory

The 7010 Selectable Load Box replicates selectable impedance values and simulates user-selectable impedances as high as 200 ohms accurately, ensuring IEC 60601-2-4 compliance. The 7010 Load Box and Impulse 7000DP work together as a system to replicate all possible human variations and ensure patient safety.

## Specifications

### Defibrillator Analyzer

Safety standards	CE: IEC/EN61010-1 2nd Edition; Pollution degree 2, CAN/CSA-C22.2 No 61010-1; UL61010-1, C-Tick: Australian EMC
Autoranged measurement	0.1 J to 600 J
Accuracy	0.1 J to 360 J: $\pm 1\%$ of reading $+0.1\text{ J}$ 360 J to 600 J: $\pm 1\%$ of reading $+0.1\text{ J}$ , typical Note: For pulsed bi-phasic defibrillator, specified accuracy is $\pm (1.5\% \text{ of reading} + 0.3\text{ J})$ on both ranges
Load resistance	Resistance: 50 $\Omega$
Accuracy	1%, non-inductive ( $< 2\text{ }\mu\text{H}$ )
Charge time measurement	Range: 0.1 s to 100 s Accuracy: $\pm 0.05\text{ s}$ , typical
Synchronization test (cardioversion)	Delay time measurement • Timing window: ECG R-wave peak to the defib pulse peak • Range: -120 ms to 380 ms; measures timing from 120 ms prior to the R-wave peak to up to 380 ms following the R-wave peak Automated defibrillator test ECG waves • Normal sinus: 10 BPM to 300 BPM in 1 BPM steps • Ventricular fibrillation: Coarse and fine • Monomorphic ventricular tachycardia: 120 BPM to 300 BPM in 1 BPM steps • Polymorphic ventricular tachycardia: Five types • Asystole

### Key features

- IEC 60601-2-4 compliance
- Lown, Edmark, trapezoidal, biphasic and pulsed-biphasic defibrillation technology compatibility
- AED compatibility
- 12-lead ECG simulation
- Ability to test external transcutaneous pacemakers (Impulse 7000 DP only)
- Internal pacer brand selections
- Flexible heart-rate settings (1 BPM step)
- DSP-based measurements for firmware and waveform upgrade
- Waveform capture, store and replay
- First-in-class accuracy  $\pm 1\%$  of reading  $+ 0.1\text{ J}$
- Long lasting, rechargeable battery

### Included accessories

1626219 USB Computer Communication Cable  
3028681 User Manual CD  
3028662 Getting-Started Guide  
Battery Eliminator Country specific  
2814980 Carrying Case  
3156262 Defib Paddle Contact Plates

### Optional accessories

3091370 Ansur Impulse 6000D/7000DP  
Impulse 7010 Defibrillator Selectable Load Accessory provides multiple loads of 25  $\Omega$ , 50  $\Omega$ , 75  $\Omega$ , 100  $\Omega$ , 125  $\Omega$ , 150  $\Omega$ , 175  $\Omega$ , and 200  $\Omega$  to comply with IEC 60601-2-4 standard\*

\*Compatible only with Impulse 7000DP

## Impulse 6000D

### Defibrillator Analyzer





#### Key features

- Portable, rugged, easy to carry
- Intuitive user interface and backlight, easy-to-read display
- 10 independent ECG outputs that provide 12 lead combinations for standardized clinical signals
- Unique integrated posts for secure connections
- Optional Ansur test automation software to standardize testing procedures, capture waveforms and test results, and print and document test results
- Two-year extended warranty (no-cost extended warranty available after first-year calibration at any Fluke Biomedical authorized service center)

If you don't require a pacemaker analyzer, the Impulse 6000D is your device. It is the quintessential defibrillator analyzer featuring the exact functionality of the 7000DP, but without pacemaker testing. It will deliver any energy or waveform (monophasic, biphasic, pulsed-biphasic) while properly testing all defibrillator and AED devices including Shock Advisory.

## Defibrillator analyzer

### Comparison guide

		
Functions	Impulse 7000DP	Impulse 6000D
Accuracy (Energy measurement)	± 1 %	± 1 %
Default patient test load	50 Ω	50 Ω
External pacer tests	•	
Mono-, bi- and pulsed bi-phasic energy measurement	•	•
Non-inductive resistor	• (<2 μH)	• (<2 μH)
Protection of pacer input against accidental defibrillation	•	No; Unable to test pacers
Test variable patient loads	• (with 7010 Load Box)	
Selectable measurement algorithms, test loads for external transcutaneous pacemakers	•	
Capable of testing ECG	• (10-lead)	• (10-lead)
Ansur automatic testing compatibility	•	•

#### Included accessories

1626219 USB Computer Communication Cable  
 3028681 User Manual CD  
 3028662 Getting-Started Guide  
 Battery Eliminator Country specific  
 2814980 Carrying Case  
 3156262 Defib Paddle Contact Plates

#### Optional accessories

3091370 Ansur Impulse 6000D/7000DP

# Infusion device analyzers

## Comparison guide



Features	IDA-1S	IDA-5 4Ch
Number of channels	1	Up to 4
Volume of measurement	0.06–999 ml	0–9999 ml
Dual flow measurement		•
Onboard graphic of pressure and flow		•
Flow rate change	0.5 to 1000 ml/hr	0.05–1500 ml/hr
Battery powered	Yes	No
Weight	2.7 lbs	11 lbs



### HydroGraph™ Graphics Software

Use the moving-color visual advantage of HydroGraph to trouble-shoot up to four infusion pumps at once. Data is taken directly from the transducer and transmitted to HydroGraph. 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.

# IDA-1S

## Infusion Device Analyzer

A unique mix of speed and technical precision, the IDA-1S is the ideal analyzer for quick reliable one-channel measurements while on-the-go.

It's a portable, battery-operated instrument that allows for speedy verification of infusion device performance.

The IDA-1S measures the flow rate and volume delivered, and the pressure generated in occlusions or blockages of the fluid line. The IDA-1S is based on sophisticated measurement technology trusted by biomedical professionals around the world.

It is easy to set up and requires little or no training to use. The IDA-1S can be used to test a wide variety of infusion pumps and an auto-start feature simplifies syringe pump testing and other tests that have long startup times.



### Key features

- Integrated carrying handle and lightweight (2.7 lb) for easy portability
- Battery powered with up to 10 hours of continuous operation for on-the-go operation
- LCD touch screen for ease of use
- Average and instantaneous flow measurement
- Occlusion pressure measurements to 45 psi
- Maximize accuracy with Autostart mode enabling unit to begin testing only when fluid is detected
- Compatible with a wide variety of infusion pumps
- Based on technology that is proven and trusted worldwide
- On-board memory allows test results storage instantly
- Hydrograph graphical software to control unit, display results and print results via PC
- Global sales, service and support

### Specifications

Flow rate measurement	
Range	0.5 ml/h to 1000 ml/h
Accuracy	1 % of reading $\pm$ 1 LSD for flows of 16 ml/h to 200 ml/h for volumes over 20 ml; otherwise 2 % of reading $\pm$ 1 LSD for volumes over 10 ml under laboratory conditions
Max test duration	10 hours on battery
Volume measurement	
Range	0.06 ml to 999 ml
Accuracy	1 % of reading $\pm$ 1 LSD for flow rates of 16 ml/h to 200 ml/h for volumes over 20 ml; otherwise 2 % of reading $\pm$ 1 LSD for volumes over 10 ml under laboratory conditions
Max test duration	10 hours on battery
Pressure measurement	
Range	0 psi to 45 psi and equivalent in mmHg, Bar and kPa
Accuracy	1 % of full scale $\pm$ 1 LSD under laboratory conditions
Max test duration	10 hours on battery

### Included accessories

- 4418071 Hydrograph Software and Users Manual
- 4497350 20 ml syringe
- 4480978 3-way Luerlock
- 4478942 Drain tube (1 m)
- 4541948 Micro-90 solution (225 ml)
- 1740487 USB data transfer cable
- 2461300 Country-specific adapters
- 4329971 Power Supply
- 4481150 NiMH replacement battery



# IDA-5

## Infusion Device Analyzer

Representing 20 years of experience in infusion pump testing, the IDA-5 Infusion Device Analyzer can digitally verify a pump is administering flow, volume and boluses accurately, and the pump is alarming upon occlusion as expected. The IDA-5 has built-in automation allowing users to create custom test templates for quick, standardized testing with minimal user intervention. This automation bundle includes Ansur software for comprehensive testing.



### Key features

- Tests up to four infusion pumps at the same time
- Customizable test templates for quick and standardized testing
- On-board and PC-based automation to fully test to IEC60601-2-24 testing requirements for quick standardized testing
- Compatible with virtually any type of infusion device
- Real time snap shots of flow and pressure for immediate issue recognition
- Instantaneous and average flow measurement of up to 1500 ml/hr
- Occlusion pressure measurements to 45 psi
- Single-flow, dual-flow (piggy-back) and PCA testing
- Auto-start mode enables unit to begin testing only when fluid is detected to maximize accuracy
- Ability to automatically end flow measurement based on user-defined time, volume or both
- Convenient and easy data entry with plug-n-play, USB compatible, keyboard or barcode scanner
- Built-in memory to save test results for printing or downloading to computer

### Specifications

Flow rate measurement	
Range	0.1 ml/h to 1500 ml/h (2600 ml/h is shown)
Accuracy	1 % of reading $\pm$ 1 LSD for flows of 16 to 200 ml/h for volumes over 20 ml; otherwise 2 % of reading $\pm$ 1 LSD for volumes over 10 ml under laboratory conditions.
Volume measurement	
Range	0.06 ml to 9999 ml
PCA bolus/dual flow measurement	
Minimum bolus volume	0.5 ml
Resolution	60 ul increments
Pressure measurement	
Range	0 psi to 45 psi and equivalents in mmHg and kPa
Accuracy	1 % of full scale $\pm$ 1 LSD under laboratory conditions

### Included accessories

4418071 Hydrograph Software and User Manual  
 4354014 20 ml syringe  
 4354038 3-way Luerlock  
 4354429 5-ft Plastic Drain Line  
 4354452 USB A-B Cable 2M

### Optional accessories

4354490 Optional Miniature Keyboard  
 4354503 Ansur Test Software, IDA-5 Plug-In License  
 4354532 One Channel Upgrade Option

# QA-ES III

## Electrosurgical Analyzer

FLUKE®



### Key features

- Test ESU functions with precise power, current, frequency, crest factor, and load resistance ranges
- Connect wirelessly via Bluetooth for easy record retrieval without interference or limitation by cables and wires\*
- All hardware and software necessary to complete preventive maintenance and troubleshooting is built in to the unit
- User-friendly interface: large buttons and LCD screen guide the user through test sequences
- Memory storage of up to 5,000 test records
- Complies to global standards, including ANSI/ AAMI and IEC

### Specifications

#### Modes of operation

Continuous operation	Continuous measurement of power, current, peak-to-peak voltage (closed load only), and crest factor
Single operation	Single measurement after the set delay time of the ESU output of power, current, peak-to-peak voltage (closed load only), and crest factor
Power distribution	Tests impedance-sensing circuitry in "power guarantee functions in new-generation ESU. Applicable parameters—power, current, peak-to-peak voltage (closed load only) and crest factor—can easily be observed during the automatic, sequential output energy measurements.
RF leakage current	Provides connections and load configurations to measure HF leakage from both grounded and isolated equipment
CQM	Test the "return electrode control quality monitoring" using the QA-ES internal loads

#### Generator output

Load resistance	Variable: 0 $\Omega$ , 10 $\Omega$ , 20 $\Omega$ , 25 $\Omega$ to 2500 $\Omega$ (by 25 $\Omega$ ), 2500 $\Omega$ to 5200 $\Omega$ (by 100 $\Omega$ ); DC Accuracy: $\pm 2.5\%$
Power (0 W to 9.9 W $\pm 5\%$ + 1W), 10 W to 500 W $\pm 5\%$	At 25% duty cycle (10 seconds on, 30 seconds off): 10 $\Omega$ : 300 W, 20 $\Omega$ to 2900 $\Omega$ : 400 W, 3000 $\Omega$ to 5200 $\Omega$ : 200 W At 10% duty cycle (5 seconds on, 45 seconds off): 10 $\Omega$ : 300 W, 20 $\Omega$ to 2400 $\Omega$ : 500 W, 2425 $\Omega$ to 2900 $\Omega$ : 400 W, 3000 $\Omega$ to 5200 $\Omega$ : 200 W
Current	RMS: 0 mA to 5,500 mA; Accuracy: $\pm (2.5\%$ of reading + 1 mA)
Voltage	Peak: 10 kV peak to peak; Accuracy: $\pm (10\%$ of reading + 50 V); Crest factor: 1.4 to 16.0 defined as the ratio of peak voltage to rms voltage (Vpk/Vrms), using the larger of the 2 peaks (positive or negative)
Vessel sealing measurement	Loop current, rms: 0 mA to 5500 mA; Accuracy: $\pm (2.5\%$ of reading + 1mA)
HF leakage current	Fixed load: 200 $\Omega$ V; V accuracy: $\pm 2.5\%$ Power rating: 400 W; Additional fixed load: 200 $\Omega$ ; Current, RMS: 0 mA to 5500 mA; Accuracy: $\pm (2.5\%$ of reading + 1 mA)
CQM test (contact quality monitor)	Resistances: 0 $\Omega$ to 475 $\Omega$ (by 1 $\Omega$ ); Accuracy: 0 $\Omega$ to 10 $\Omega$ $\pm 0.5 \Omega$ , 11 $\Omega$ and above $\pm 5\%$ ; Power rating: 0.5 W; Auto time interval: 1 to 5 seconds
Oscilloscope output	1 V per ampere of input current, typical
Footswitch simulations	Cut and coag
Communications	USB device port: Micro B connector, full speed; Wireless port: 802.15, Speed: 115,200 baud
Memory	Test records: 5,000; Non-volatile: retained through power cycling

#### General information

Display	Monochrome 240 pixels x 64 pixels, 8 lines x 40 characters, white LED backlight
Power	100 V ac, 115 V ac, 230 V ac, 50 Hz / 60 Hz, universal input, 100 V/115 V: 20 VA, 230 V: 30 VA
Dimensions (LxWxH)	14.5 cm x 35 cm x 47 cm (5.75 in x 13.75 in x 18.5 in)
Weight	7.5 kg (16.5 lbs)

\*Wireless capabilities not available in all countries. Ask your sales representative for more details.

### Optional accessories

4635248 International dispersive lead (1/4 inch phono plug)  
1909216 Test probe set—0.080 brass tip  
4704312 Ansur Plug-in

# INCUII™

## Incubator/Radiant Warmer Analyzer

Portable and intuitive-to-use, the INCUII Wireless\* Incubator/Radiant Warmer Analyzer simplifies testing and verifying the performance of baby incubators, transport incubators, and radiant warmers. Compliant with global IEC standards (IEC 60601-2-19, IEC 60601-2-20 and IEC 60601-2-21), the INCUII simultaneously measures temperature in six independent points, sound, humidity, and airflow.

\* Wireless capabilities not available in all countries. Ask your distributor for more details.



### Key features

- Displays pass/fail indicators and real-time test results on a large LCD screen
- Portable and compact design, weighs less than 3 lbs (1.4 kg), or 9 lbs (3.9 kg) including radiant warmer pucks
- Creates personalized test sequences for automatic test completion in compliance with standards
- General Test enables flexibility in testing procedures and simplifies troubleshooting
- Simplifies test set-up with color-coded temperature probes that match color of input ports
- Wireless\* functionality supports fast and convenient downloading of test results and data
- Able to choose from 10 different language interfaces

### Optional Accessories

4721175 Skin Temperature Heater Assembly

### Specifications

Measurement and test	
Air conduction peripheral temperature sensors for incubator (T1-T5)	5 sensors; Range: 0 °C to 50 °C; Accuracy: $\pm 0.05$ °C; Display resolution: 0.01 °C
Air convection temperature sensors for radiant warmers, sensors in pucks (black discs)	5 pucks; Range: 0 °C to 50 °C; Accuracy: $\pm 0.2$ °C; Display resolution: 0.01 °C
Relative humidity	Range: 0 % to 100 %; Accuracy: $\pm 3$ % RH (0 % to 100 %, non-condensing); Display Resolution: 0.1 % RH
Airflow	Range: 0.2 m/sec to 2.0 m/sec at 35 °C, 50 % RH; Accuracy: $\pm 0.1$ m/sec; Display Resolution: 0.01 m/sec
Sound pressure	30 dB(A) to 100 dB(A); Accuracy: $\pm 5$ dB(A); Display resolution: 0.1 dB(A); IEC-61672-1 Class 2 from 31.5Hz to 8kHz
Surface temperature	Range: 5 °C to 60 °C; Accuracy: $\pm 0.5$ °C; Display Resolution: 0.05 °C
Skin temperature probe with reference thermometer	Range: 0 °C to 50 °C; Accuracy: $\pm 0.05$ °C; Display Resolution: 0.01 °C
Environmental	
Operating temperature	10 °C to 40 °C
Storage temperature	-20 °C to 60 °C
Humidity	10 % to 90 % non-condensing
Altitude	2000 m
Ingress protection rating	IP -20
General Information	
Display	LCD Color Display, 480 pixels x 272 pixels, 4." (10.9 cm), white LED backlight
Power adapter—universal voltage	Input: 100 V to 240 V with adaptors 50 Hz/60 Hz; Output: 15V dc, 1.3 A maximum
Rechargeable lithium-ion battery, internal	7.4 V, 7800 Ah, 58 Wh; 24 hour battery life with 30 second sample rate
Dimensions (LxWxH)	23 cm x 21 cm x 6 cm (9.0 in x 8.5 in x 2.5 in)
Total weight	3.9 kg (8.5 lb)

\*Wireless not available in all countries. Please talk to your local Fluke representative for information about wireless availability in your country.

# Neonatal test equipment

NICU test solutions

## DALE40

### Phototherapy Radiometer

The DALE40 measures light radiation in medical devices used to treat hyperbilirubinemia in newborns. It can accurately capture measurement across the blue color spectrum from 400-480 nanometers.



#### Key features

##### DALE40 Phototherapy Radiometer

- Intuitive to use with LCD screen
- Accurate to  $\pm 5\%$  of full spectral range of 429-472 nanometers
- Measurement range of 0-1999  $\mu\text{W}/\text{cm}^2$  with 1  $\mu\text{W}/\text{cm}^2$
- Probe lens matches the cosine receiving function of human skin
- Portable, weighing less than 9 ounces with a 9 V battery
- Verifies output power and provides continuous measurement of irradiation
- Saves costs by eliminating premature replacement of lamps



## Max O2 PLUS AE

### Oxygen Analyzer

The Max O2 PLUS AE Oxygen Analyzer measures the oxygen concentration in infant incubators, ventilators, anesthesia systems, or oxygen tanks. Portable and straightforward to use, it can capture measurements from 0 % to 100 % with  $\pm 3\%$  accuracy (actual oxygen level overfull operating range).

##### Max O2 PLUS AE Oxygen Analyzer

- One-touch calibration with reminder
- Long battery life, approximately 5,000 hours
- Impact resistant and drip-proof
- External Max-25OE Oxygen Sensor

## PS320

### Fetal Simulator

At week 5, a fetus' heart starts beating, increasing to 155 to 195 beats per minute prior to birth. The strength and number of beats can be measured by a fetal electronic monitor is used to determine whether a fetus is in distress.

The PS320 Fetal Simulator mimics fetal and maternal heartbeats (ECG), along with uterine activity during labor to accurately test and troubleshoot fetal electronic monitors.



##### PS320 Fetal Simulator

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



# Digital pressure meters

## DPM2Plus

### Universal Pressure Meter

The DPM2Plus Universal Pressure Meter is designed to measure the positive and negative pressures of medical devices in either liquid or gaseous form to assist in repair and quality control.

## DPM1B

### Pneumatic Transducer Tester

The DPM1B Pneumatic Transducer Tester is designed to measure the positive and negative pressures of medical devices in either liquid or gaseous form, and to generate pressure within the  $\pm 300$  mmHg range to assist in repair and quality control.

## DPM4

### Parameter Tester—Model 1 and 2

DPM4 Parameter Tester is a highly accurate meter for testing a wide range of medical devices. Key features include its lightweight, compact size and battery operation. DPM4 is ideal for the testing done as part of preventive maintenance or repair processes whenever measurement of pressure, flow, or relative humidity is required.



### Key features

#### DPM2Plus

- Low-priced pressure meter
- Great for all medical pressure device testing
- Optional cable for viewing pressure waveform on an oscilloscope (0.1 V/psi on all ranges except 100 psi, which is 0.01 V/psi)
- Voltage output accuracy: 5 % of range
- Can be used with optional DALE22 Parabolic Flow Adapter Set

#### DPM1B

- Low-priced pressure-generator
- Great for all pressure transducers, not just IBP

#### DPM4

- Mid-priced pressure and temperature tester
- Great for all medical device testing where low-pressure, temperature and low-flow measurements are required
- RS232 for computer control

	DPM1B	DPM2 Plus	DPM4 Model 1	DPM4 Model 2
Pressure generator (positive pressure and vacuum)	•			
Pressure measurement $\pm 300$ mmHg	•	•	•	•
5 Selectable pressure ranges standard		•		
2 Optional pressure ranges (select at time of purchase) G range: -700 to +5000 mmHg H range: 380 to 900 mmHg			•	•
Temperature measurement (-200 to 750 degrees C range)			•	•
Gas flow measurement ( $\pm 750$ ml range)				•
Gas flow measurement (requires DALE22 Parabolic Flow Adapter set) 10 to 250 l/min (interpretive chart) 10 to 75 l/min (interpretive chart) 5 % of reading accuracy		•		

# 190M

## Medical ScopeMeter® Portable Oscilloscope

Taking the guesswork out of troubleshooting

The 190M Medical ScopeMeter Portable Oscilloscope is a high-performance test tool built upon the legacy of Fluke and Fluke Biomedical oscilloscopes in partnership with real customers like you. The 190M is available with choice of two or four channels and offers an unprecedented level of performance, ruggedness and portability.

With the combined power of a high-performance oscilloscope, meter and paperless recorder in an easy-to-use test tool, the 190M is the one test tool you can rely on to tackle just about any troubleshooting task in the field. To minimize downtime and repair costs, you need to get to the root cause of problems as quickly as possible. The 190M offers a number of unique features to help you quickly set up the 'scope and diagnose difficult problems like intermittent events, signal fluctuations or drift. Extend your arsenal of troubleshooting capabilities with the new Fluke Biomedical 190M Medical ScopeMeter Portable Oscilloscope, designed to meet the demands of field service professionals.



### Key features

- Two or four electrically-isolated inputs
- Fast sampling rate, up to 2.5 GS/s on two channels simultaneously with up to 400 ps resolution
- Deep memory: 10,000 samples per channel waveform capture so you can zoom in on the details
- Dedicated 5,000 count digital multimeter in two-channel model
- Quad meter measurements via scope BNC inputs in four channel model
- Connect-and-View™ trigger for intelligent, automatic triggering on fast, slow and even complex signals
- Frequency spectrum using FFT-analysis
- High-resolution, non-interlaced video
- Smart averaging
- ScopeRecord™ roll mode gives 30,000 points per input channel and capture waveform sample data for up to 48 hours
- TrendPlot™ trend measurement readings for up to 22 days
- Advanced automatic measurements, power (Vpwm, VA, W, PF) and time (mAs, V/s, w/s)
- Two USB ports make it easy to transfer data to a PC and store unlimited waveforms, screen captures and instrument setups on USB memory devices
- New high-performance Li-ion battery technology delivers the longest battery life on the market
- Charge spare battery door for quick swaps in the field
- Security slot locks down oscilloscope with Kensington lock while unattended
- Environmentally tested to meet IP-51 and withstand a 3 g vibration or 30 g shock

### Included accessories

VPS410-R Voltage probe set, 10:1, 300 MHz, one set red  
 VPS410-G Voltage probe set, 10:1, 300 MHz, one set gray  
 VPS410-B Voltage probe set, 10:1, 300 MHz, one set blue  
 VPS410-V Voltage probe set, 10:1, 300 MHz, one set green  
 EBC290 External battery charger for BP290 and BP291  
 SW90W FlukeView Software for Windows (full version)  
 C290 Hard shell protective carrying case for 190 Series II  
 BP291 Li-Ion battery pack, 4800 mAh  
 MA190 Medical Accessory Kit

### Optional accessories

VPS410-R Voltage probe set, 10:1, 300 MHz, one set red  
 VPS410-B Voltage probe set, 10:1, 300 MHz, one set blue  
 TL175 TwistGuard™ safety-designed test leads set (1 red, 1 black)  
 EBC290 External battery charger for BP290 and BP291  
 SW90W FlukeView Software for Windows (full version)  
 C290 Hard shell protective carrying case for 190 Series II  
 BP290 Li-Ion battery pack, 2400 mAh  
 MA190 Medical Accessory Kit



# ASM-990

## Advanced Survey Meter

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

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



### Key features

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

### Specifications

#### ASM-990 and ASM-992

Operating modes	Rate
	Integrate
	Scaler (dual option): "Based On Measurement" or "Based On Time"
	Timed Peak Hold
	Data Logging
Operating rate ranges (dependent on selected probe)	$\mu$ R/hr, mR/hr, R/hr, $\mu$ rem/hr, mrem/hr, rem/hr, $\mu$ Sv/hr, mSv/hr, Sv/hr, CPM, CPS, DPM 99mTc, DPS131I, Bq 125I, kBq 123I, MBq 201Tl, $\mu$ Ci 67Ga, mCi18F, Ci 57Co
	$\mu$ R, mR, R, $\mu$ rem, mrem, rem, $\mu$ Sv, mSv, Sv, C (counts), kC, MC, D (distinctions), kD 99mTc, MC 131I
	Complementary units in the integrate mode with the integrated time value in seconds
Accuracy (dependent on selected probe)	Within 10 % of reading between 10% to 100% of full scale indication on any range, exclusive of typical energy dependence.
Detector	Accepts GM detectors and scintillation probes operating at high voltages between 500 V and 1300 V
Temperature range	-10 °C to 50 °C (14 °F to 122 °F)
Relative humidity	0 % to 95 %, non-condensing

### Optional accessories

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

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

# 451B

## Ion Chamber Survey Meter with Beta Slide



### Key features

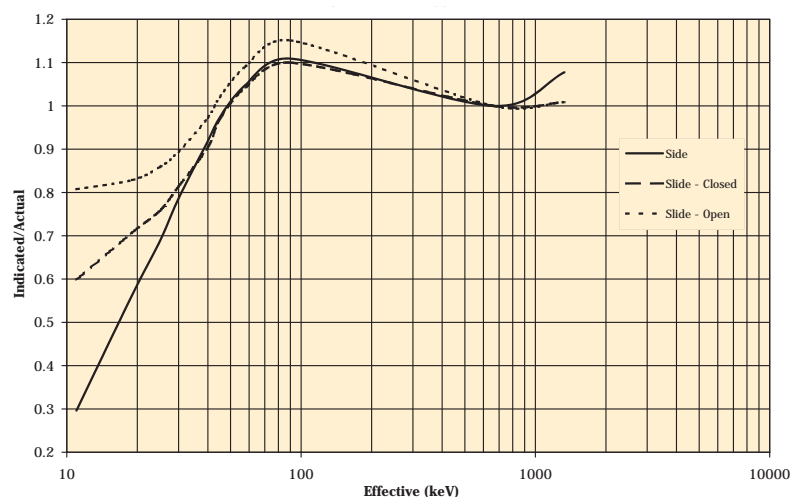
- High sensitivity measurement of rate and dose simultaneously with the capability to record peak rate
- Auto-ranging and auto-zeroing
- RS-232 communications interface with optional Windows-based Excel add-in for data logging
- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod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

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

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

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

### Typical energy dependence



# 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 $\mu$ Sv/h	
	0 to 50 mR/h or 0 to 500 $\mu$ Sv/h	
	0 to 500 mR/h or 0 to 5 mSv/h	
	0 to 5 R/h or 0 to 50 mSv/h	
	0 to 50 R/h or 0 to 500 mSv/h	
Accuracy	Within 10 % of reading between 10 % and 100 % of full scale indication on any range, exclusive of energy response. Calibration source is <sup>137</sup> Cs	
Detector		
Chamber	349 cc volume air ionization	
Chamber wall	246 mg/cm <sup>2</sup> thick phenolic	
Chamber window	6.6 mg/cm <sup>2</sup> mylar, protected by steel mesh, 46 cm <sup>2</sup> detection area	
Beta slide	440 mg/cm <sup>2</sup>	
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 auto-backlight	
Response time	Range	Response
	0 to 5 mR/h (0 to 50 $\mu$ Sv/h)	8 s
	0 to 50 mR/h (0 to 500 $\mu$ Sv/h)	2.5 s
	0 to 500 mR/h (0 to 5 mSv/h)	2 s
	0 to 5 R/h (0 to 50 mSv/h)	2 s
	0 to 50 R/h (0 to 500 mSv/h)	2 s
Display LCD analog/digital with backlight		
Analog	100 element bar graph 6.4 cm long. Bar graph is divided into 5 major segments, each labeled with the appropriate value for the range of the instrument	
Digital	2.5 digit display is followed by a significant zero digit depending on the operating range of the instrument. The units of measurement are indicated on the display at all times. Digits are 6.4 mm (0.25 in) high. Low battery and freeze indicators are also provided on the display	
Modes		
Integrate mode	Operates continuously 30 seconds after the instrument has been turned on. Integration is performed even if the instrument is displaying in mR/h or R/h	
Freeze mode	Will place a tick mark on the bar graph display to hold on the peak displayed value. The unit will continue to read and display current radiation values	
Environmental		
Power requirements	Two 9 V alkaline, 200 hours operation	
Warm-up time	One minute	
Temperature range	-20 °C to 70 °C (-4 °F to 158 °F)	
Relative humidity	0 % to 100 %, at 60 °C	
Geotropism	Less than 1 %	
Dimensions (WxDxH)	10 cm x 20 cm x 15 cm (4 in x 8 in x 6 in)	
Weight	1.11 kg (2.5 lb)	

### Optional accessories

451EXL 451 Assistant for Excel, includes RS-232 interface cable  
 190HPS Single Unit Carrying Case  
 450UCS Check Source, 238Uranium, 0.064  $\mu$ Ci, impregnated 2 x 2 in yellow card  
 62-103 Check Source, 137Cs, 10  $\mu$ Ci. 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.



# 451P

## Pressurized $\mu$ R Ion Chamber Survey Meter

The auto-ranging 451P features a pressurized ion chamber, providing enhanced sensitivity ( $\mu$ R 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

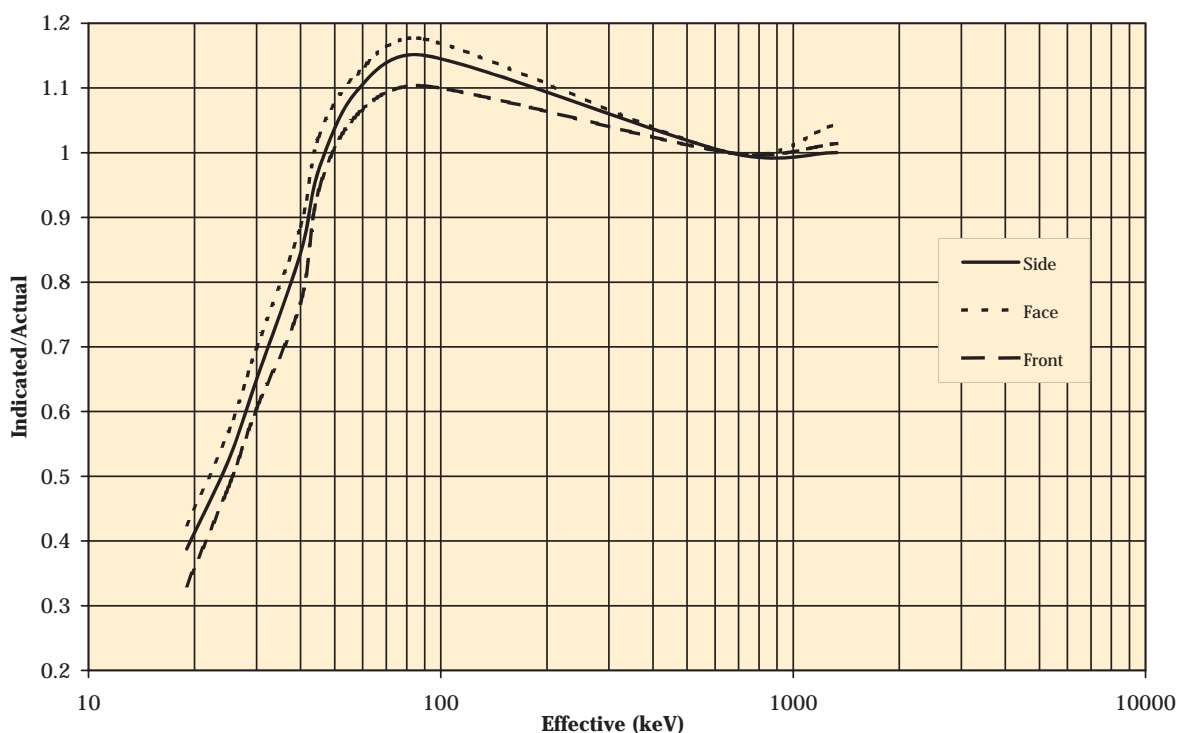
from leakage, scatter beams and pinholes. Additionally, the low-noise chamber bias supply provides for fast background settling time.

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

<sup>16</sup>Nitrogen gamma rays are 110 % to 120 % of indicated readings as determined at the University of Lowell.



## Specifications

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

## Key features

- High sensitivity  $\mu$ R measurements of rate and dose simultaneously with the capability to record peak rate
- Ergonomic, anti-fatigue handle with replaceable grip, wrist strap and tripod mount
- 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 that can be easily decontaminated (Nuclear power plant specific unit)

## Optional accessories

451EXL 451 Assistant for Excel, includes RS-232 interface cable  
 190HPS Single Unit Carrying Case  
 62-103 Check Source,  $^{137}\text{Cs}$ , 10  $\mu$ Ci. 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.



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 so 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 by using ready-to-use and customizable test templates. The 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.



### Key features

- Allows for creation and management of custom electronic test protocols to eliminate dependence on service manuals
- Guides users through stepwise testing process to ensure standardized testing
- Generates test report (PDF or MTR) per requirements with needed level of data to ensure compliance
- Enables the use of personalized pictures, illustrations and graphs to facilitate proper testing with ease
- Automatically assesses pass/fail against test limits specified by global standards or organizations
- 21CFR Part 11 compliant. Users can create their own signature and sign templates and results. (This feature can be disabled)
- Authorization levels can be assigned to manage level of access to software. Levels include User, Author and Administrator (This feature can be disabled)
- Reduces test time per medical device, tests multiple devices simultaneously, and performs multiple PM tests in a single procedure
- Offers easy data traceability with electronic archival and printing of detailed records
- Data extraction offers trending, analysis and reporting capability

### Specifications

PC hardware requirements	• Intel® Pentium® 4 2.0 GHz FSB at 400 MHz or faster processor
	• 512 MB of RAM Microsoft® operating system: Windows® 2000, Windows XP, Windows Vista, Windows 7, Windows 8 or Windows 10
	• 50 MB of available hard drive for software
	• Hard drive space (from 100 k to several megabytes) for result and template files
	• New framework version 3.5 or newer
PC software requirements—with electronic signature	• This software is required on the central PC (for a network configuration) or each PC (for a nonnetworked configuration):
	• Microsoft SQL® Server 2012
	• Express Ansus Executive Server
Other requirements	• License key for each Fluke Biomedical simulator/ analyzer plug-in
	• One or more Ansus-compatible Fluke Biomedical simulators or analyzers

“We used Ansus 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

# 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.

CarePlans are only available in the United States.



Choose the best plan for you	Gold	Silver
First-on-bench priority service	●	●
Discounts on additional service requests	●	●
Turn-around time for repair	7 days	10 days
Turn-around time for calibration	3 days	3 days
Operational upgrades	●	●
Accredited calibration to manufacturer's specifications	●	●
Coverage options for up to 3 years	●	●
One-year extended warranty beyond your original factory warranty. No-cost repair service	●	
No cost repair service	●	●
No cost calibration	●	●
Coverage options for up to 3 years	●	●





## Global service and calibration

World-class facilities. 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 CarePlan 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.

**CarePlan options:** Fluke Biomedical's CarePlan 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, expedited return shipping and more.

### Calibrate the following

- 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 Corporation,  
Building 3  
2 Science Road  
Glenwood, Illinois 60425

Tel: 1-440-248-9300; option 4 for calibration and repair

Toll free: 1-800-850-4608

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

### 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



# Ordering information

## Defibrillators

### 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

## Electrosurgery analyzers



### QA-ES Series III Electrosurgery Analyzers

QA-ES MK III  
 QA-ES MK III – 01 United Kingdom  
 QA-ES MK III – 02 United Kingdom  
 QA-ES MK III – 03 Japan  
 QA-ES MK III – 04 Australia  
 QA-ES MK III – 05 Brazil

### QA-ES Series III Electrosurgery Analyzers with test automation

TA-QA-ES MK III United States  
 TA-QA-ES MK III Schuko  
 TA-QA-ES MK III United Kingdom  
 TA-QA-ES MK III Japan  
 TA-QA-ES MK III Australia  
 TA-QA-ES MK III Brazil

Non-wireless version are available with and without test automation.

## Digital pressure meters

DPM4 - 1H  
 DPM4 - 1G  
 DPM4 - 2H  
 DPM4 - 2G  
 DPM2Plus  
 DPM1B

### SigmaPace 1000 External Pacemaker Analyzer

SigmaPace 1000 United States 120 V  
 SigmaPace 1000 Japan  
 SigmaPace 1000 Schuko  
 SigmaPace 1000 United Kingdom

## Infusion pump analyzers



### IDA-5 One-Channel Infusion Device Analyzer

IDA-5/1 US120V United States, 120 V  
 IDA-5/1 AUS250V Australia, 250 V

IDA-5/1 DEN250V Denmark 250 V  
 IDA-5/1 SHK250V Shuko, 250 V  
 IDA-5/1 ISR250V Israel, 250 V  
 IDA-5/1 ITAL250V Italy, 250 V  
 IDA-5/1 IND250V India, 250 V  
 IDA-5/1 SWZ250V Switzerland, 250 V  
 IDA-5/1 UK250V, United Kingdom, 250 V  
 IDA-5/1 BRAZ230V, Brazil, 230 V

### IDA-5 Two-Channel Infusion Device Analyzer

IDA-5/2 US120V, United States, 120 V  
 IDA-5/2 AUS250V, Australia, 250 V  
 IDA-5/2 DEN250V, Denmark, 250 V  
 IDA-5/2 SHK250V, Shuko, 250 V  
 IDA-5/2 ISR250V, Israel, 250 V  
 IDA-5/2 ITAL250V, Italy, 250 V  
 IDA-5/2 IND250V, India, 250 V  
 IDA-5/2 SWZ250V, Switzerland, 250 V  
 IDA-5/2 UK250V, United Kingdom, 250 V  
 IDA-5/2 BRAZ230V, Brazil, 230 V

### IDA-5 Four-Channel Infusion Device Analyzer

IDA-5/4 US120V, US, 120 V  
 IDA-5/4 AUS250V, Australia, 250 V  
 IDA-5/4 DEN250V, Denmark, 250 V  
 IDA-5/4 SHK250V, Shuko, 250 V  
 IDA-5/4 ISR250V, Israel, 250 V  
 IDA-5/4 ITAL250V, Italy, 250 V  
 IDA-5/4 IND250V, India, 250 V  
 IDA-5/4 SWZ250V, Switzerland, 250 V  
 IDA-5/4 UK250V, United Kingdom, 250 V  
 IDA-5/4 BRAZ230V, Brazil, 230 V

### IDA-1S One-Channel Infusion Device Analyzer

IDA-1S One-Channel Infusion Device Analyzer

## Electrical safety analyzers

### ESA609 Electrical Safety Analyzer

ESA609-US Electrical Safety Analyzer, United States  
 ESA609-02-EUR Electrical Safety Analyzer, Europe  
 ESA609-01-FR Electrical Safety Analyzer France  
 ESA609-06-UK Electrical Safety Analyzer, United Kingdom  
 ESA609-05-AUS Electrical Safety Analyzer, Australia  
 ESA609-07-SWISS Electrical Safety Analyzer, Switzerland  
 ESA609-03-ISR Electrical Safety Analyzer, Israel  
 ESA609-11-BRAZIL Electrical Safety Analyzer, Brazil 230 V  
 ESA609-12-INDIA Electrical Safety Analyzer, India  
 ESA609-09-Japan Electrical Safety Analyzer, Japan  
 ESA609-08-THAI Electrical Safety Analyzer, Thailand 230 V  
 ESA609-US W/ADAPT, ESA609-US W/ADAPT, Electrical Safety Analyzers, United States

### ESA612 Electrical Safety Analyzer

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

#### **ESA615 Electrical Safety Analyzer**

ESA615-US United States, 115 V  
ESA620-02-EUR Europe, 230 V  
ESA615-01-FR France/Belgium, 230 V  
ESA615-03-ISR Israel, 230 V  
ESA615-05-AUS Australia, 230 V  
ESA615-06-UK United Kingdom, 230 V  
ESA615-07-SWISS Switzerland, 230 V  
ESA615-08-THAI Thailand, 230 V  
ESA615-11-BRAZ Brazil, 230 V  
ESA615-09-JAPAN Japan, 100 V  
ESA615-12-INDIA India, 250 V  
ESA615-10-NA220V North America, 220V  
TA-ESA615-USA ESA615 United States 115 V w/  
Test Automation  
TA-ESA615-EUR ESA615 Europe, 230 V w/Test  
Automation  
TA-ESA615-FR ESA615 France/Belgium 230V w/  
Test Automation  
TA-ESA615-ISR ESA615 Israel 230 V  
w/Test Automation  
TA-ESA615-AUS ESA615 Australia 230 V w/Test  
Automation  
TA-ESA615-SWISS ESA615 Switzerland 230V w/  
Test Automation  
TA-ESA615-UK ESA615 United Kingdom 230V w/  
Test Automation  
TA-ESA615-THAI ESA615 Thailand 230 V  
w/Test Automation  
TA-ESA615-BRAZ ESA615 Brazil 230 V  
w/Test Automation  
TA-ESA615-JAPAN ESA615 Japan 100 V w/Test  
Automation  
TA-ESA615-12-INDIA ESA615 India 230V w/Test  
Automation  
TA-ESA615-NA220V ESA615 North America  
220 V w/Test Automation

#### **ESA620 Electrical Safety Analyzer**

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,  
230 V w/Test Automation  
TA-ESA620-FR ESA620 France 230 V  
w/Test Automation  
TA-ESA620-ISR ESA620 Israel 230 V  
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

## **Vital signs simulators**

ProSim 8 Vital Signs Simulators  
ProSim 8  
ProSim SPOT ProSim SpO<sub>2</sub> Test Module  
ProSim RAINBOW ProSim Rainbow Sensor  
ProSim 4 Vital Signs Simulators  
ProSim 4  
ProSim 3 Vital Signs Simulators  
ProSim 3  
ProSim 2 Vital Signs Simulators  
ProSim 2

#### **SPOT Light**

SPOT Light SpO<sub>2</sub> Tester



## **Gas flow analyzers**

VT650 Gas Flow Analyzer  
VT900 Gas Flow Analyzer  
VT650/ACCU LUNG II  
VT900/ACCU LUNG II

## **Neonatal test equipment**

#### **Incubator/radiant warmer analyzers**

INCU II-BT Incubator Analyzer, Wireless  
INCU II-NO BT Incubator Analyzer,  
Non-Wireless

DALE40 Phototherapy Radiometer  
PS320 Fetal Simulator  
MAXO2+AE Oxygen Analyzer



#### **ScopeMeter® Medical Oscilloscopes**

190M-2 Medical ScopeMeter Portable  
Oscilloscope  
190M-4 Medical ScopeMeter Portable  
Oscilloscope

## **Radiation safety**



#### **990 Advanced Survey Meter**

451B Ion Chamber Survey Meter with Beta Slide  
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**

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



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