



BC Group International Inc.
 9415 Gentry Avenue
 P.O. Box 25125
 St. Louis, MO 63125 USA
 314.638.3800
 Fax 314.638.3200
 www.bcgrouppintl.com

ESU Analyzer Feature Comparison
 Revision 1 - June 1, 2007

	BC Biomedical ESU-2000 Series					
Feature / Instrument	BC Biomedical ESU-2050	BC Biomedical ESU-2300	BC Biomedical ESU-2000A	Fluke Biomedical Model 454A (Discontinued by manufacturer)	Fluke Biomedical QA-ES Metron QA-ES	Fluke Biomedical RF303RS
Information Source(s)	BC Biomedical Formal Product Specification	BC Biomedical Formal Product Specification	BC Biomedical Formal Product Specification	Fluke Biomedical 454A Product Operating Manual (This product no longer listed as being available on manufacturer's website)	Fluke Biomedical QA-ES Product Specification Sheet & information from manufacturer's website	Fluke Biomedical RF303RS Product Specification Sheet and information from manufacturer's website
Uses ESU manufacturer industry-standard current sensing technology	Yes	Yes	N/A	Yes	No	No
ESU waveform measurement methodology	RF current sensing by external wide band current transformer (available separately) Transformer cost: \$ 475	RF current sensing by custom internal custom wide band current transformer	RF Thermocouple Analog Meter	RF current sensing by internal current transformer	Voltage measurement	Voltage measurement
Product Overview	The most accurate, portable and lightweight ESU analyzer on the market. Allows testing in exactly the same way that OEM's test their products. Uses external precision load resistors and external wide band current transformer, purchased separately. This product was developed in a detailed cooperation with the worldwide leading ESU generator manufacturer.	Conventional "mid-range" ESU analyzer with internal loads and a highly competitive set of features. Highest featured mid-range analyzer on the market.	Traditional passive RF measurement device with analog meter supports basic ESU testing, including power (watts), RMS current, QM testing, and RF leakage measurement..	Dynatech Nevada vintage "high-end" conventional ESU analyzer with internal loads. Recently discontinued by Fluke Biomedical and replaced by the Fluke Biomedical QA-ES (re-branded Metron QA-ES)	Conventional "high-end" ESU analyzer with internal loads, originally designed by Metron AS in Trondheim, Norway. Currently offered under the Metron and Fluke Biomedical brands by Fluke Biomedical. Product is still manufactured in Norway.	Conventional "mid-range" ESU analyzer with internal loads. Utilizes simple voltage measurement rather than industry standard RF current measurement or sensing. The companion (same product design) DNI Nevada 402A and Dale Technology 3000 products have since been dropped by Fluke Biomedical.
Tests according to OEM prescribed methods	Yes	No	No	No	No	No
ESU Waveform Measurement Analysis Technology	Patent pending DFA Measurement Technology High speed digital acquisition & analysis	Patent pending DFA Measurement Technology High speed digital acquisition & analysis	Passive RF Thermocouple Analog Meter	Thermal rise based upon ESU waveform energy levels Utilizes a thermal converter	Thermal rise based upon ESU waveform energy levels Utilizes a thermal converter	Thermal rise based upon ESU waveform energy levels Utilizes a thermal converter
Parameters Displayed	Power (watts), Peak voltage, RMS voltage, RMS current, Crest Factor, Test Load	Power (watts), RMS current, Test Load	Power (watts), RMS current	Power (watts), RMS current, Peak to Peak Voltage, Crest Factor, Test Load	Power (watts), RMS current, Peak to Peak voltage, Crest Factor	Power (watts), RMS current, Test Load
Accuracy (RMS Current)	0.5 mV, < 50 mV +/- 1% reading, > 50 mV, up to 2 MHz +/- 3% reading, > 50 mV, 2 to 10 MHz	+/- 2.5% of Reading or +/- 15 ma, whichever is greater	+/- 2% of Full Scale	+/- 5% of Reading (100 - 2000 ma) +/- 5% of reading (30 ma - 100 ma) for Crest Factor < 16	+/- 2 of Reading	+/- 2.5% of Reading or +/- 15 ma, whichever is greater

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Accuracy (RMS Voltage)	Measured directly via current sensing coil: 0.5 mV, < 50 mV +/- 1% reading, > 50 mV, up to 2 MHz +/- 3% reading, > 50 mV, 2 to 10 MHz	N/A	N/A	Not Specified	Peak to Peak Voltage +/- 10%	N/A
Accuracy (Peak Voltage)	Derived from software computation: 0.5 mV, < 50 mV +/- 1% reading, > 50 mV, up to 2 MHz +/- 3% reading, > 50 mV, 2 to 10 MHz	N/A	N/A	+/- 10% of Reading (0 - 10 KV)	Peak to Peak Voltage +/- 10%	N/A
Accuracy (Power - RMS watts)	0.5 mV, < 50 mV +/- 1% reading, > 50 mV, up to 2 MHz +/- 3% reading, > 50 mV, 2 to 10 MHz	+/- 5% of Reading +/- 3 watts, whichever is greater	+/- 2% of Full Scale	+/- 10 of Range	Not Specified	+/-5% of Reading +/- 3 watts, whichever is greater
Accuracy (Load Resistors)	Dependent upon actual load resistors used - Vishay Dale NH-250 precision (1% tolerance) resistors recommended for maximum accuracy on power (watts).	+/- 1% (DC)	+/- 2% (DC)	+/- 3% of selected load (DC)	Not Specified	+/- 4% of selected value measured (DC to 500 KHz) at calibration to 1% across the entire operating temperature range
RF Current Range	20 ma to 7000 ma Max with 0.1:1 external current transformer 2 ma to 700 ma Max with 1:1 external current transformer	30 ma to 2500 ma RMS	0 ma to 1000 ma RMS	30 ma to 2000 ma RMS	20 ma to 2200 ma RMS	30 ma to 2500 ma RMS
RF Power Range	Max of 999.9 watts RMS	1 to 400 watts RMS	0 to 500 watts (RMS)	Not Specified	Not Specified	1 to 400 watts RMS
Crest Factor Range	1.4 to 500	1.4 to 500	N/A	1.4 to 15.9	1.4 to 16	Not Specified
Frequency Bandwidth	10 KHz to 10 MHz	10 KHz to 10 MHz	0 to 10 MHz	30 Hz to 7 MHz	30 Hz to 2.5 MHz (with loads)	1 KHz to 10 MHz
Internal Load Resistors	None - uses external precision load resistors in unlimited combinations, supported by an internal load table menu Vishay Dale NH-250 Precision external load resistors are priced at \$ 75 to \$ 80 per discrete value Load resistor sets are available at a cost savings.	Yes - 15 loads 50 to 750 ohms in 50 ohms increments	Yes 50, 100, 200, 300, 400, 500 ohms	Yes - 50 ohms to 1550 ohms in 50 ohm steps	10 ohms to 2500 ohms in 25 ohm steps 2500 ohms to 5200 ohms in 100 ohm steps	Yes - 15 loads 50 to 750 ohms in 50 ohms increments
Auxiliary (internal) test load for RF leakage test	None - uses external load for this test	Yes 200 ohms +/- 1% (DC) 225 watts rated	Yes 200 ohms 500 ma Max	Yes 50 ohms to 1550 ohms +/- 3% (DC)	Yes 200 ohms 400 watts rated	Yes 200 ohms +/- 4% 225 watts rated

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External Load Resistor(s) Supported	Yes Uses external precision load resistors in unlimited combinations, supported by an internal load table menu	Yes - can be used in external load mode or combined external + internal load mode - user enters value of external load resistor	Yes	Yes - uses proprietary design external load boxes Modules available: 10, 25, 75, 125, 2000 ohms Cost: \$ 402 to \$ 419 each	No	No
Communication Ports	RS232 & USB	RS232 & USB	None	RS232	RS232	RS232
CQM Test	No Performed externally per OEM recommendations	Yes Variable load - 1 to 500 ohms range in 1 ohm increments	Yes 0 to 999 ohms in 1 ohm steps	Yes - Limited Must use optional add-on proprietary test module @ \$ 545 to \$ 797 additional cost	Yes - Limited Using internal loads 10 ohms to 2500 ohms (25 ohm steps)	Yes Load bank - 50 to 75-ohms in 50 ohm steps
RF Leakage Test	Yes - via external current transformer	Yes	Yes	Yes	Yes	Yes
Oscilloscope Output	No	Yes	Yes	Yes	Yes	Yes
Display / Readout	Large graphical display with high intensity backlighting (128 x 64 pixels)	Large graphical display with high intensity backlighting (256 x 64 pixels)	Analog Meter (4.5") with multiple color coded power (watts) scales and 0-1000 ma RMS scale	Vacuum Fluorescent Display 4 lines x 42 characters 32 x 256 pixel matrix	LCD Graphic Display	4-digit Numeric LCD Display with backlighting
Remote Operation	Yes - via BC Biomedical companion PC Utility Software	Yes - via BC Biomedical companion PC Utility Software	No	Yes - via RS232 - no manufacturer supplied software to interface with but there is a structured command language documented in the Operating Manual	Ansur Software test template interface	Yes - via RS232 - no manufacturer supplied software to interface with
Export digitized waveform & graph to Excel	Yes - up to 32,768 discrete data points	No	No	No	No	No
Operating Voltage	83 - 264 VAC, 47-63 Hz	83 - 264 VAC, 47-63 Hz	N/A Passive Device No Power Source Required	120/240 VAC, 50/60 Hz Not auto-sensing User must change orientation of an external fuse block and change fuse based upon desired operating voltage	115/230 VAC, 48 to 66 Hz	83 - 264 VAC, 47-63 Hz
Battery Operation	No	Yes	N/A	No	No	Yes
Internal data storage	Yes Stores up to 32,768 discrete data points for up to three (3) complete ESU waveform sets - data can be displayed on the instrument or downloaded to a PC	No	No	No	Protocol formats and data may be stored, recalled, printed out, or transferred.	No
Flash Programmable / Field Upgradeable	Yes Through use of BC Biomedical Flash Update PC Utility	Yes Through use of BC Biomedical Flash Update PC Utility	N/A Product is not firmware driven - no updates required	No	No	No
First Introduced to market (year)	2007	2007	2000	1993	2002	1997
Manufactured In (Country)	USA	USA	USA	USA	Norway	USA



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Special Features & Capabilities	1) Utilizes patent pending DFA Measurement Technology 2) Export data and waveform to Excel 3) PC Utility Software adds functionality 4) Internal data storage for up to 3 waveform sets 5) Tests according to the way ESU OEM's test in their factories, in their calibration procedures, and with their field service engineers	1) Utilizes patent pending DFA Measurement Technology		1) medTester interface 2) User programmable test sequences 3) Remote operation	1) User programmable test sequences 2) Power load curves 3) ESU footswitch connection	
Physical Size	3.4" H x 9.1" W x 8 D"	6" H x 13.5" W x 12" D	4.125" H x 8.4" W x 9.1" D	18.25" L x 12.5" W x 6" H	15.6" L x 13.5" W x 5.2" H	11.5" L x 13.25" W x 6" H
Weight	< 3 lbs	12.5 lbs	4 lbs	17 lbs	21.6 lbs	14.2 lbs
US List Price	\$4,495	\$3,995	\$2,250	Discontinued	\$4,956	\$3,611