FLUKE®
Biomedical

Impulse 6000D/7000DP

Defibrillator/External Pacer Analyzer

Technical Data

The Impulse 6000D Defibrillator Analyzer and Impulse 7000DP Defibrillator/Transcutaneous Pacer Analyzer Test Systems are rugged, portable precision test instruments that ensure proper operation and ultimate performance of critical life-support cardiac-resuscitation equipment.

The Impulse 6000D and Impulse 7000DP test capabilities encompass the spectrum of worldwide-established pulse shapes, showcase breakthrough AED technology compatibility, and outperform in accuracy and standards. Additionally, the Impulse 7000DP incorporates the tests and the extensive range of test loads and measurement algorithms needed to test external transcutaneous pacemakers.

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

Key features

- Impulse 7010 Defibrillator Selectable Load Accessory provides multiple loads of 25 Ω, 50 Ω, 75 Ω, 100 Ω, 125 Ω, 150 Ω, 175 Ω, and 200 Ω to comply with IEC 60601-2-4 standard (optional)
- Lown, Edmark, trapezoidal, biphasic and pulsed-biphasic defibrillation technology compatibility
- AED technology compatibility
- First-class measurement accuracy ± 1 % of reading + 0.1 J
- Intuitive user interface and backlight, easy-to-read display
- Portable, rugged, easy to carry
- Long-lasting, rechargeable battery
- Pacer brand selections
- Pacer input protected against defibrillator output (7000DP only)
- 10 independent ECG outputs that provide 12 lead combinations for standardized clinical signals
- Flexible heart-rate settings (1 BPM step) facilitate rate meter accuracy and alarm testing
- DSP-based measurements enable future firmware and waveforms upgrade
- Unique integrated posts for secure connections
- Two-year extended warranty (no-cost extended warranty available after first-year calibration at any Fluke Biomedical authorized service center)
- Optional Ansur test automation software to standardize testing procedures, capture waveforms and test results, and print and document test results
- Designed, tested, and built to incomparable Fluke quality standards

General specifications

Operating temperature
10 °C to 40 °C (50 °F to 104 °F)

Storage temperature
–20 °C to 60 °C (–4 °F to 140 °F)

Humidity
10 % to 90 % non-condensing

Display
LCD display

Communications
USB device port for computer control

Modes of operation
Manual and remote

Power
Internal rechargeable NiMH battery pack for nine hours (typical) operation after full charge or the battery charger can operate the analyzer and charge the battery simultaneously

Battery charger
100 V to 240 V input, 15 V/1.5 A output. For best performance, the battery charger should be connected to a properly grounded ac receptacle

Enclosure
ABS plastic housing

Dimensions (WxDxH)
32 cm x 24 cm x 13 cm
(13 in x 9.5 in x 5 in)

Weight
3.02 kg (6.6 lb, 0.1 oz)

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

Electromagnetic compatibility standards (EMC)
European EMC: EN61326-1

Defibrillator analyzer technical specifications

Energy output measurement

Compatible defibrillator waveshapes
Lown, Edmark, trapezoidal, dc biphasic, and ac pulsed biphasic

Note: AC pulsed biphasic waveform has not been approved in the United States.

Autoranged measurement
0.1 J to 600 J

Accuracy
0.1 J to 360 J: ± (1 % of reading + 0.1 J)
360 J to 600 J: ± (1 % of reading + 0.1 J), typical

Note: For pulsed biphasic defibrillator, specified accuracy is ± (1.5 % of reading + 0.3 J) on both ranges.

Load resistance
Resistance: 50 Ω
Accuracy: ± 1 %, non-inductive (< 2 µH)

Pulse trigger level
20 V

Pulse width
Range: 1 ms to 50 ms
Accuracy: ± 0.1 ms

Voltage
Range: 20 V to 5000 V
Accuracy: ± (1 % of reading + 2 V)

Current
Range: 0.4 A to 100 A
Accuracy: ± (1 % of reading + 0.1 A)

Tilt (biphasic and pulsed biphasic)
Range: 1 % to 99 %
Accuracy: ± 1 digit

Interphase delay (biphasic and pulsed biphasic)
Range: 0.1 ms to 9.9 ms
Accuracy: ± 0.1 ms

Frequency (pulsed biphasic only)
Range: 2000 Hz to 8000 Hz
Accuracy: ± 1 % of reading

Duty cycle (pulsed biphasic only)
Range: 1 % to 99 %
Accuracy: ± 1 digit

Sample rate
250 kHz (4 µs sample)

Maximum average power
12 W, equivalent to 10 defib pulses of 360 J every 5 minutes

Scope output
Autorange: 2000:1, 400:1, and 80:1 depending on range

Waveform playback
- Output: BNC
- Output impedance: 50 Ω
- Amplitude accuracy: ± 5 %

Charge time measurement
Range: 0.1 s to 100 s
Accuracy: ± 0.05 s, typical

Synchronization test (elective 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
- Resolution: 1 ms
- Accuracy: ± 1 ms

ECG waves
- Normal sinus rhythm (NSR): 10 BPM to 180 BPM in 1 BPM steps
- Atrial fibrillation: Coarse and fine
- Monomorphic ventricular tachycardia: 120 BPM to 240 BPM in 5 BPM steps
- Asystole: Flat line

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 5 BPM steps
Polymorphic ventricular tachycardia: 5 types
Asystole: Flat line

ECG waves

ECG general

Lead configuration: 12-lead simulation; RA, LL, LA, RL, V1-6 with independent outputs
Lead to lead impedance: 1000 Ω (nominal)
Rate accuracy: ± 1 % nominal

ECG amplitudes

Reference lead: Selectable, Lead II (default) or Lead I
Settings: 0.05 mV to 0.45 mV by 0.05 mV steps and 0.5 mV to 5 mV by 0.5 mV steps
Accuracy (all performance waves and normal sinus R waves):
- Lead II.....± 2 %
- All other leads.....± 5 %
- Defib paddles.....± 5 %

Amplitude of ECG signals relative to amplitude setting (in percent)

Lead II reference

Performance waves and R wave detection:

Lead #	Ref. amp.
I	70 %
II	100 %
III	30 %
V1	100 %
V2	100 %
V3	100 %
V4	100 %
V5	100 %
V6	100 %

Normal sinus waves:

Lead #	Ref. amp.
I	70 %
II	100 %
III	30 %
V1	24 %
V2	48 %
V3	100 %
V4	120 %
V5	112 %
V6	80 %

Lead I reference

Performance waves and R wave detection:

Lead #	Ref. amp.
I	100 %
II	150 %
III	50 %
V1	100 %
V2	100 %
V3	100 %
V4	100 %
V5	100 %
V6	100 %

Normal sinus waves:

Lead #	Ref. amp.
I	100 %
II	150 %
III	50 %
V1	24 %
V2	48 %
V3	100 %
V4	120 %
V5	112 %
V6	80 %

ECG normal sinus

Rates: 10 BPM to 360 BPM in 1 BPM steps

ECG high level output (BNC jack)

Amplitude:
- Range: 0.5 V per mV of reference lead setting
- Accuracy ± 5 %

Output impedance: 50 Ω

ECG on defibrillator input load

Same as the Lead II amplitude but limited to ± 4 mV

ECG performance waves

Square wave: 2 Hz and 0.125 Hz
Triangular wave: 2 Hz and 2.5 Hz
Sine waves: 0.05, 0.5, 5, 10, 40, 50, 60, 100, 150, and 200 Hz
Pulse: 30 BPM and 60 BPM, 60 ms pulse width

R-wave detection

Waveform: Haver-triangle
Amplitude: 0.05 mV to 0.45 mV in 0.05 mV steps and 0.5 mV to 5 mV in 0.5 mV steps
Rate: 30, 60, 80, 120, 200, and 250 BPM
Widths: 8, 10, 12 ms, and 20 ms to 200 ms in 10 ms steps
Accuracy: ± (1 % setting + 1 ms)

Noise immunity

Wave: Sine
Line frequency: 50 Hz or 60 Hz (± 0.5 Hz)
Amplitude:
- Range: 0.0 mV to 10 mV in 0.5 mV steps
- Accuracy: ± 5 %

Transvenous pacer pulse simulation

Widths
- Range: 0.1 ms, 0.2 ms, 0.5 ms, 1 ms, and 2 ms
- Accuracy: ± 5 % of setting

Amplitudes:
- Range: 0 (off) and ± 2 mV, ± 4 mV, ± 6 mV, ± 8 mV, ± 10 mV, ± 12 mV, ± 14 mV, ± 16 mV, ± 18 mV, ± 20 mV, ± 50 mV, ± 100 mV, ± 200, ± 500, and ± 700 mV
- Accuracy: ± (10 % setting + 0.2 mV)

Amplitude of transvenous pacer pulse simulation signals relative to amplitude setting (in percent)

Lead II reference

Lead #	Ref. amp.
I	67 %
II	100 %
III	33 %
V1	67 %
V2	67 %
V3	67 %
V4	67 %
V5	67 %
V6	67 %

Lead I reference

Lead #	Ref. amp.
I	100 %
II	150 %
III	50 %
V1	100 %
V2	100 %
V3	100 %
V4	100 %
V5	100 %
V6	100 %

Arrhythmia selections

Pacer interactive (7000DP only)

- Demand: 30 BPM to 360 BPM in 1 BPM steps
- Asynchronous
- Non-capture
- Non-function
- Threshold (interactive pacing simulation only): 10 mA to 250 mA in 10 mA steps

Supraventricular

- Artrial fibrillation course
- Atrial fibrillation fine
- Atrial flutter
- Sinus arrhythmia
- Missed beat
- Atrial tachycardia
- Paroxysmal atrial tachycardia (PAT)
- Nodal rhythm
- Supraventricular tachycardia

Premature

- Atrial PAC
- Nodal PNC
- PVC1 left ventricle
- PVC1 LV early
- PVC1 LV R on T
- PVC2 right ventricle
- PVC2 RV early
- PVC2 RV R on T
- Multifocal PVCs

Ventricular

- PVCs 6/min
- PVCs 12/min
- PVCs 24/min
- Freq multifocal
- Trigeminy
- Bigeminy
- Pair PVCs
- Run 5 PVCs
- Run 11 PVCs
- Monomorphic ventricular tachycardia: 120 BPM to 300 BPM in 5 BPM steps
- Polymorphic ventricular tachycardia: 1 to 5
- Ventricular fibrillation: coarse and fine
- Asystole

Conduction

- 1° Block
- 2° Block Type I
- 2° Block Type II
- 3° Block
- Right bundle branch block RBBB
- Left bundle branch block LBBB

Transvenous Paced with selectable pacer spike amplitudes and widths

- Atrial 80 BPM
- Async 75 BPM
- Demand with frequent sinus beats
- Demand with occasional sinus beats
- AV sequential
- Non-capture
- Non-function

Selections for all waves in group

Atrial pacer pulse

Width: 0.1, 0.2, 0.5, 1, 2 ms
Polarity: + or –
Amplitude: 0 (off), 2 to 20 (by 2), 50, 100, 200, 500, 700 mV

Ventricular pacer pulse

Width: 0.1, 0.2, 0.5, 1, 2 ms
Polarity: + or –
Amplitude: 0 (off), 2 to 20 (by 2), 50, 100, 200, 500, 700 mV

R-wave detection

Rate: 30, 60, 80, 120, 200, 250 BPM
Width: 8, 10, 12, 20 to 200 (by 10) ms
Amplitude: 0.05 to 0.45 (by 0.05), 0.5 to 5 (by 0.5) mV

Transcutaneous pacemaker analyzer technical specifications

(7000DP only)

Test load Selections

Defibrillator input
Fixed load: 50 Ω
Accuracy: ± 1 %, non-inductive (<2 µH)
Power rating: 10 defib pulses of 360 J every 5 minutes

Pacemaker input
Variable load: 50 Ω to 1500 Ω in 50 Ω steps
Accuracy: ± 2 %, non-inductive (< 2 µH)
Power rating: 5 Ω (average), 40 Ω (peak) @ 1000 Ω

Measurements

Manufacturer specific algorithms

- GE Responder (1500 and 1700)
- MDE 300 (Medical Data Electronics)
- Medtronic ERS/Physio Control LIFEPAK
- MRL (Medical Research Laboratory/Welch Allyn)
- Philips/Agilent/HP
- Schiller Medical
- ZOLL Medical

(plus a general purpose Default Algorithm selection)

Current
Range: 4 mA to 250 mA
Accuracy: ± 1 % of reading + 0.02 mA

Pulse rate
Range: 5 PPM to 800 PPM
Accuracy: ± 0.5 % of reading + 0.1 PPM

Pulse width
Range: 1 ms to 100 ms
Accuracy: ± 0.5 % of reading + 0.01 ms

Energy
Range: 1 µJ to 2 J
Accuracy: ± 4 % of reading + 10 µJ

Demand and asynchronous mode test

Input pacer pulse rates
30 PPM to 200 PPM

ECG NSR wave
Rate: 10 BPM to 300 BPM in 1 BPM steps
Amplitude: 1 mV
Underdrive rate: 10 BPM minimum
Overdrive rate: 300 BPM maximum

Sensitivity test

Automatic interactive threshold detection
Compatible pacer rates: 30 PPM to 120 PPM

ECG R wave
Waveforms: Square, triangle, sine
Width: 1 ms to 19 ms (by 1 ms), 20 ms to 95 ms (by 5 ms), 100 ms to 300 ms (by 25 ms)
Accuracy: ± 5 % of setting
Amplitude: 0.05 mV to 0.95 mV (by 0.05 mV), 1 mV to 5 mV (by 0.5 mV)
Accuracy: ± 5 % of setting

Refractory period tests

Paced refractory period
20 ms to 500 ms

Sensed refractory period
15 ms to 500 ms

Accuracy
± 1 ms

Pacer pulse rate
20 PPM to 200 PPM

ECG
Waveform: Triangle wave
Pulse width: 40 ms
Amplitude: 1 mV

Impulse 7010 Defibrillator Selectable Load Accessory

General specifications

Maximum voltage
5000 V

Maximum continuous power
12 W, equivalent to 10 defib pulses of 360 J every 5 minutes

Inductance
< 2 µH, @25 Ω
< 3 µH, @50 Ω
< 4 µH, @75 Ω and 100 Ω
< 5 µH, @125 Ω
< 6 µH, @150 Ω
< 7 µH, @175 Ω
< 8 µH, @200 Ω

Temperature
Operating: 10 °C to 40 °C (50 °F to 104 °F)
Storage: –20 °C to 60 °C (–4 °F to 140 °F)

Humidity
10 % to 90 % non-condensing

Dimensions (WxDxH)
154 mm x 272 mm x 138.7 mm (6.07 in x 10.71 in x 5.46 in)

Weight (net)
1.54 kg (3 lb 6.2 oz)

Safety class
Complies with EN61010-1 2nd Edition, Class II product

Safety and EMC marks
C US N10140

Warranty
Two-year extended warranty (no-cost extended warranty available after first-year calibration at any Fluke Biomedical authorized service center)

Calibration interval
One-year

Electrical specifications (for Load Accessory and Analyzer together)

Load settings
25 Ω, 50 Ω, 75 Ω, 100 Ω, 125 Ω, 150 Ω, 175 Ω, and 200 Ω ± 1 %

Accuracy
Energy (all except pulsed biphasic): 2 % of reading + 0.1 J with 25, 75 Ω though 200 Ω loads, 1 % of reading + 0.1 J with 50 Ω load
Energy (pulsed biphasic): 2.5 % of reading + 0.3 J with 25, 75 Ω though 200 Ω loads, 1.5 % of reading + 0.3 J with 50 Ω load
Voltage: 1 % of reading + 2 V with 25 Ω and 50 Ω loads, 2 % of reading + 2 V with 75 Ω through 200 Ω loads
Current: 2 % of reading + 0.1 A with 25 Ω load, 1 % of reading + 0.1 A with 50 Ω through 200 Ω loads

Ordering information

Models

2811928 Impulse 6000D Defibrillator Analyzer 120 V (US)

3077031 Impulse 6000D Defibrillator Analyzer (Schuko)

3077046 Impulse 6000D Defibrillator Analyzer (UK)

3077054 Impulse 6000D Defibrillator Analyzer (Japan)

3085270 Impulse 6000D Defibrillator Analyzer (Australia)

3085281 Impulse 6000D Defibrillator Analyzer (India)

2811919 Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer 120 V (US)

3077005 Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer (Schuko)

3077010 Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer (UK)

3077022 Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer (Japan)

3085296 Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer (Australia)

3085308 Impulse 7000DP Defibrillator/ Transcutaneous Pacemaker Analyzer (India)

3326874 TA-IMP7KDP Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer with test automation 120 V (US)

3326888 TA-IMP7KDP-01 Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer with test automation (Schuko)

3326895 TA-IMP7KDP-02 Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer with test automation (UK)

3326901 TA-IMP7KDP-03 Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer with test automation (Japan)

3326912 TA-IMP7KDP-04 Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer with test automation (Australia)

3326920 TA-IMP7KDP-05 Impulse 7000DP Defibrillator/Transcutaneous Pacemaker Analyzer with test automation (India)

Standard 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 Plug-In

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

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

3065438 Internal discharge paddle contacts (set of two)

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

3065527 Zoll Medical NTP/PD1400: 4 mm pacer adapters

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

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

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

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

3065423 GE Marquette (RESPONDER1500/1700 Series) (set of two): 4 mm defib/pacer adapters

3158544 Impulse 7010 Defibrillator Selectable Load Accessory

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About Fluke Biomedical

Fluke Biomedical is the world's leading manufacturer of quality biomedical test and simulation products. In addition, Fluke Biomedical provides the latest medical imaging and oncology quality-assurance solutions for regulatory compliance. Highly credentialed and equipped with a NVLAP Lab Code 200566-0 accredited laboratory, Fluke Biomedical also offers the best in quality and customer service for all your equipment calibration needs.

Today, biomedical personnel must meet the increasing regulatory pressures, higher quality standards, and rapid technological growth, while performing their work faster and more efficiently than ever. Fluke Biomedical provides a diverse range of software and hardware tools to meet today's challenges.

Fluke Biomedical Regulatory Commitment

As a medical test device manufacturer, we recognize and follow certain quality standards and certifications when developing our products. We are ISO 9001 certified and our products are:

- CE Certified, where required
- NIST Traceable and Calibrated
- UL, CSA, ETL Certified, where required
- NRC Compliant, where required

Fluke Biomedical.

Better products. More choices. One company.

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