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.

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

- 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
- Range of patient defibrillation loads (IEC 60601-2-4, 25 Ω to 175 Ω, optional)
- Internal pacer brand selections
- Pacer input protected against defibrillator output (7000DP only)
- 10 isolated ECG electrodes that provide 12 combinations for standardized clinical signals
- Flexible heart-rate settings (1 BPM step) facilitate rate meter accuracy and alarm testing
- DSP-based measurements enable future firmware and waveforms upgrade
- Unique integrated posts for secure connections
- Optional Ansur test automation software to standardize testing procedures, capture waveforms and test results, and print and document test result

Pending 510 (k), not yet for sale.
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 (w x d x h)
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
CSA: 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
Compatibility defibrillator waveshapes
Lown, Edmark, trapezoidal, dc bi-phasic, and ac pulsed bi-phasic

Autoranged measurement
0.1 J to 600 J

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

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

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

Variable external load resistance (optional)
25, 75, 100, 125, 150, or 175 W
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: 0.1 J to 360 J;
360 to 600 J: ± 1 % of reading + 2 V

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

Sample rate
250 kHz (4 µs sample interval)

Oscilloscope output
Auto range: 2000:1, 400:1 and 80:1 dependent on range
Waveform playback
• Output: BNC
• Output impedance: 50 Ω
• Delay: 50 ms
Accuracy: ± 5 %

Charge time measurement
Range: 0.1 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): 30 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

Automated defibrillator test
ECG waves
• Normal sinus: 30 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: 5 types
• Asystole
**ECG waves**

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

**ECG amplitudes**
Reference lead: Lead 1
Settings: 0.05 mV to 0.45 mV by 0.05 mV and 0.5 mV to 5 mV by 0.05 mV
Accuracy: ± 2 % of setting, Lead I and 2 Hz square wave
For performance waves and R-wave detection, other leads are proportional to Lead I in percentage per:

- Lead I: 100
- Lead II: 150
- Lead III: 50
- Lead V1 through V6: 100

For normal sinus waves, other leads are proportional to Lead I in percentage per:

- Lead I: 100
- Lead II: 150
- Lead III: 50
- Lead V1: 24
- Lead V2: 48
- Lead V3: 100
- Lead V4: 120
- Lead V5: 112
- Lead V6: 80

**ECG normal sinus**
Rates: 30 BPM to 360 BPM in 1 BPM steps

**ECG high level output (BNC jack)**
Amplitude: 0.2 V/mV of Lead I amplitude
Accuracy: ± 1 %, 2 Hz square wave, 50 Ω output impedance

**ECG on defibrillator input load**
Same as Lead II amplitude

**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
Rate: 30, 60, 80, 120, 200, and 250 BPM
Widths: 8, 10, 12 ms, and 20 to 200 ms in 10 ms steps
Accuracy: ± 1 % setting + 0.2 mV

**Noise immunity**
Wave: Sine
Line frequency: 50 Hz or 60 Hz (± 0.5 Hz)
Amplitude: 0 mV to 10 mV (by 0.5 mV ± 5 %)

**Transvenous pacer pulse simulation**
Widths
- Range: 0.1, 0.2, 0.5, 1, and 2 ms
- Accuracy: ± 5 %
Amplitudes: 0 (off) and ± 2, ± 4, ± 6, ± 8, ± 10, ± 12, ± 14, ± 16, ± 18, ± 20, ± 50, ± 100, ± 200, ± 500, and ± 700 mV
Accuracy: ± 10 % setting + 0.2 mV

**Arrhythmia selections**
Pacer interactive (Impulse 7000DP only)
- Demand: 30 to 360 (in 1 BPM steps) BPM
- Asynchronous
- Non-capture
- Non-function
- Threshold: 10 mA to 250 mA (by 10 mA)

Supraventricular
- AFib coarse
- AFib 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 (by 5 BPM)
- 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 pacemaker**
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 pacemaker**
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

Pending 510 (k), not yet for sale.
Transcutaneous pacemaker analyzer technical specifications (Impulse 7000DP only)

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

Pacemaker input
Variable load: 50 Ω to 1500 Ω by 50 Ω
Accuracy: ± 1 %, non-inductive (< 2 µH)
Power rating: 5 Ω (average), 40 Ω (peak) @ 1000 Ω

Measurements
Manufacturer specific algorithms
• Medtronic/Physio Control
• Philips/Agilent/HP
• ZOLL Medical
• GE Responder (1500 and 1700)
• MRL/Welch Allyn
• Schiller Medical
• MDE300 (Medical Data Electronics)

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 + 0.01 ms

Pulse width
Range: 1 ms to 100 ms
Accuracy: ± 4 % of reading + 10 µJ

Energy
Range: 1 µJ to 2 J
Accuracy: ± 4 % of reading + 0.0 % of setting

Demand and asynchronous mode test
Input pacer pulse rates
30 to 200 PPM

ECG NSR wave
Rate: 10 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 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

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## Ordering Information

### Model

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### Standard accessories
- User manual CD (PN 3028681)
- Getting-started guide (PN 3028662)
- Battery eliminator (country specific)
- Defibrillator paddle contact plates (PN 2795773)

### Optional accessories

- **Ansur Impulse 6000D/7000DP**
  - Plug-in (PN 3091370)
- **Medtronic ERS/Physio-Control**
  - (FAST PATCH) [set of two]: 4 mm defibrillator adapters (PN 3065489)
- **Kimberly Clark/R2 Darox MRL/MDE/NK**
  - 4 mm defibrillator adapters (PN 3065450)
- **Internal discharge paddle contacts**
  - [set of two] (PN 3065438)
- **Medtronic ERS/Physio-Control**
  - (QUIK PACE) [set of two]: 4 mm pacer adapters (PN 3065477)
- **Zoll Medical NTP/PD1400**
  - 4 mm pacer adapters (PN 3065527)
- **Medtronic ERS/Physio-Control**
  - (QUIK COMBO): 4 mm defibrillator/pacer adapters (PN 3065461)
- **Philips/Agilent/HP (CODEMASTER Series-Round)**
  - 4 mm defibrillator/pacer adapters (PN 3065492)
- **Philips/Agilent HEARTSTART FR2/MRX**
  - 4 mm defibrillator/pacer adapters (PN 3065509)
- **Zoll PD-2200 Multi-Function PD-Series, M-Series, M-Series CCT, AED PRO* and AED Plus™ defibrillator/pacer adapters** (PN 3065511)
- **GE Marquette**
  - (RESPONDER1500/1700 Series) [set of two]: 4 mm defibrillator/pacer adapters (PN 3065423)
- **Carrying case** (PN 2814980)

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