



# Defibrillation made simple

Philips 861290 HeartStart XL+ defibrillator monitor

**PHILIPS**  
sense and simplicity

For resuscitation teams and rapid response teams, the Philips HeartStart XL+ defibrillator/monitor is designed with meaningful innovations that help you confidently and effectively respond to patients' needs throughout the hospital environment.

Hospital cardiac emergencies are often stressful and hectic events. You want a defibrillator that is dependable and ready to “grab and go” at a moment’s notice. Building on the clinical history of Philips defibrillation, the HeartStart XL+ will inspire confidence in its ability to respond in critical situations.

The HeartStart XL+ offers advanced and basic life-support in a compact, light-weight and easy-to-use defibrillator/monitor. It offers both Manual and AED defibrillation, synchronized cardioversion, and arrhythmia detection with ECG monitoring through 3- and 5-Lead sets or multifunction electrode pads. Options include SpO<sub>2</sub> and Non-invasive blood pressure (NBP) monitoring and Pacing.

The HeartStart XL+ introduces the Patient Category button. With one simple press of the Patient Category button you can switch from Adult to Infant/Child patient category. The device not only quickly and automatically adjusts the energy for AED defibrillation but it also automatically adjusts all alarm limits.

AED Mode uses the same SMART Analysis algorithm as Philips’ industry-leading AEDs. In AED Mode, with the use of the patient category button, the HeartStart XL+ simplifies the ability to defibrillate different patient types without the need to calculate a dose or special pads to reduce energy. AED Mode coaches you with easy to understand voice prompts and display messages.

In Manual Defibrillation Mode, defibrillation is as easy as 1, 2, 3. The entire process is under your control. After assessing the ECG you decide if defibrillation, cardioversion or pacing is necessary, select an energy, charge and shock. Select cardioversion by simply pressing

the Sync button. When Sync Mode is active, the Sync button lights up and indications appear on the display.

In optional Pacing Mode, you can perform either Demand or Fixed mode transcutaneous pacing with a configurable choice of 20 or 40 msec pulse duration. The device also allows you to use front panel controls to adjust rate and output.

The HeartStart XL+ is highly configurable such that you can configure the energy, number of shocks and CPR time to meet your hospital defibrillation protocol needs.

Viewing and obtaining data from the HeartStart XL+ is easy. You can view patient parameter Trend Reports on the display. The Trend Reports and Event Summaries are also available after an event and are easily retrieved. The results of all daily, weekly and monthly self-tests and Operational Checks are stored in internal memory and available for review.

Data can be copied to a USB Drive for easy transfer to event review data management software.

Since it is part of a larger Philips Healthcare family of products, the HeartStart XL+ can help you simplify inventory management and reduce inventory costs. The device’s supplies and accessories are compatible with other Philips defibrillators while the patient monitoring cables and sensors are the same ones used with Philips patient monitors.

The HeartStart XL+ is ready. Ready to respond. Ready to revive. Ready to review. And ready to meet the needs of your organization.

# Features/Upgrades

## Standard Features

- ST/AR Basic algorithm for arrhythmia detection and ECG analysis
- SMART Analysis algorithm for making shock decisions in AED Mode
- One button push to change from Adult to Infant/Child patient category, including alarm limits in all modes
- ECG monitoring through monitoring electrodes and defibrillation pads
- “Quick Look” ECG monitoring through external paddles
- Synchronized cardioversion with dedicated back-lit button
- Adjustable ECG size and autogain
- Manual and AED operation
- 3-wave color display
- Strip chart printer (50 mm)
- Individual, adjustable volume of QRS beeper, voice prompts and alerts
- Event Summary
- Displayed and printed Trending Reports
- Configuration Mode
- Service Mode
- Operational checks
- Automated self-tests with “Ready For Use” indicator
- Lithium Ion battery with fuel gauge

## Optional Features

- SpO<sub>2</sub> with Fourier Artifact Suppression Technology (FAST)
- Noninvasive Blood Pressure
- Noninvasive Pacing

## Standard Accessories

- Lithium Ion Battery with fuel gauge
- Hands-free multifunction electrode cable
- 3-Lead ECG trunk cable and lead set (snaps)
- 10 monitoring electrodes
- 50mm printer paper
- Defibrillator Test Plug
- Three cable wraps (ECG, pads cable, external paddles)
- Documentation CD containing instructions for use, user training material and application notes
- Quick Reference Cards

## Product Ordering Information

861290	HeartStart XL+ Defibrillator/Monitor
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## Option Ordering Information

A01	SpO <sub>2</sub> Monitoring
A02	SpO <sub>2</sub> and NBP Monitoring
B01	External Pacing
C01	External Paddles with PCI
C02	External Paddles Sterilizable
C03	USB Data Drive
C04	Accessory Storage System
C05	Extra Lithium Ion Battery
C06	Bed Rail/Roll Stand Mounting
C07	5-Lead ECG Lead Set - Snaps
C08	ECG Sync Out Cable
C09	ECG Grabber Lead Set <small>(Select option to receive grabbers instead of snaps.)</small>
LP1	Instructions for Use
LP3	User Training DVD
SM1	Service Manual
W01	One-year on-site warranty
W08	Three-year bench repair and loaner warranty
W23	Two-year bench repair and no loaner warranty
W24	Five-year bench repair and loaner warranty
WA1	Five-year Biomed Alliance

## Upgrades

861395	SpO <sub>2</sub>
861396	NBP
861397	External Pacing
861401	Pads Conversion
861402	External Paddles
861403	Hardware Platform
861404	Software Platform

## Multifunction Electrode Pads

M3501A	Adult/Child Pads, barrel connector
M3504A	Infant Pads, barrel connector
M3713A	HeartStart Adult/Child Plus Pads
M3716A	HeartStart Adult/Child Radiolucent Pads
M3717A	HeartStart Infant Plus Pads
M3718A	HeartStart Adult/Child Radiotransparent/Reduced Skin Irritation Pads
M3719A	HeartStart Infant Radiotransparent/Reduced Skin Irritation Pads
989803166021	HeartStart Adult/Child Preconnect Pads
989803158211	HeartStart Adult (1 set)
989803158221	HeartStart Adult (5 sets)
989803139261	SMART Pads II Adult/Child/Infant (for handoff only)

## Hands-Free Pads Therapy Cables

M3507A	Defibrillator Pads Hands-Free Cable, barrel style (2.2 m/7 ft.)
M3508A	Defibrillator Pads Hands-Free Cable, plug style (2.2 m/7 ft.)
05-10200	Pads Adapter (use with M3507A)

## External Paddles

M3543A	External Paddles
M4745A	Sterilizable External Paddles
M4759A	Paddle Electrode Replacement

## Internal Switched Paddles

M4741A	7.5cm Switched Internal Paddles
M4742A	6.0cm Switched Internal Paddles
M4743A	4.5cm Switched Internal Paddles
M4744A	2.8cm Switched Internal Paddles

## Internal Switchless Paddles

M1741A	7.5cm Switchless Internal Paddles
M1742A	6.0cm Switchless Internal Paddles
M1743A	4.5cm Switchless Internal Paddles
M1744A	2.8cm Switchless Internal Paddles

## 3-Lead ECG Cables

M1500A	3-lead ECG Trunk Cable (AAMI)
M1510A	3-lead ECG Trunk Cable (IEC)
M1605A	3-lead ECG Set with Snaps (AAMI)
M1615A	3-lead ECG Set with Snaps (IEC)
M1669A	3-lead ECG Trunk Cable (AAMI/IEC)
M1671A	3-lead ECG set grabber (AAMI/ICU)
M1672A	3-lead ECG set ICU grabber (IEC)
M1673A	3-lead ECG set with snaps (ICU)
M1674A	3-lead ECG set with snaps (IEC, ICU)
M1675A	3-lead ECG set with grabbers (OR)
M1678A	3-lead ECG set, grabber (IEC, OR)
M3526A	3-wire lead set and plug, snap (AAMI)
M3528A	3-wire lead set and plug, snap (IEC)

## 5-Lead ECG Cables

M1520A	5-lead ECG Trunk Cable (AAMI)
M1530A	5-lead ECG Trunk Cable (IEC)
M1625A	5-lead ECG set with snaps (AAMI)
M1635A	5-lead ECG set with snaps (IEC)
M1644A	5-lead ICU snaps (AAMI)
M1645A	5-lead ICU snaps (IEC)
M1668A	5-lead ECG Trunk Cable (AAMI/IEC)
M1949A	5 plus 5 ECG Trunk Cable (AAMI/IEC)
M1968A	5-lead ICU grabber (AAMI)
M1971A	5-lead ICU grabber (IEC)
M1973A	5-lead OR grabber (AAMI)
M1974A	5-lead OR grabber (IEC)

## 6-Lead ECG Cables

M1667A	6-lead Trunk Cable (AAMI/IEC)
M1680A	6-lead ICU grabber, limb (AAMI)
M1681A	6-lead ICU grabber, limb (IEC)
M1682A	6-lead ICU snap, limb (AAMI)
M1683A	6-lead ICU snap, limb (IEC)
M1684A	6-lead OR grabber, limb (AAMI)
M1685A	6-lead OR grabber, limb (IEC)

## 10-Lead ECG Cables

M1663A	10-lead (5-5) Trunk Cable (AAMI/IEC)
M1665A	10-lead (6-4) Trunk Cable (AAMI/IEC)
M1682A	6-lead ICU snap, limb (AAMI)
M1683A	6-lead ICU snap, limb (IEC)
M3525A	10-lead ECG patient Trunk Cable, 12-pin

### ECG Monitoring Electrodes

M2202A	High-Tack Foam ECG Electrodes — 5 electrodes/pack (60 packs/case)
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### ECG Sync Out Cables

M1783A	12-pin Sync Cable (8 feet)
M5526A	12-pin Sync Cable (25 feet)

### NBP Interconnect Tubing

M1598B	Adult Pressure Interconnect Cable (1.5m)
M1599B	Adult Pressure Interconnect Cable (3m)

### Reusable Blood Pressure Cuffs

40400A	Reusable Cuff Kit, 3 sizes (Pediatric, Adult, Large Adult)
40400B	Reusable Cuff Kit, 5 sizes (Infant, Pediatric, Adult, Large Adult, Thigh)
40401A	Traditional Reusable Cuff — Infant
40401B	Traditional Reusable Cuff — Pediatric
40401C	Traditional Reusable Cuff — Adult
40401D	Traditional Reusable Cuff — Large Adult
40401E	Traditional Reusable Cuff — Thigh
M4552B	Easy Care Reusable Cuff — Infant
M4553B	Easy Care Reusable Cuff — Pediatric
M4554B	Easy Care Reusable Cuff — Small Adult
M4555B	Easy Care Reusable Cuff — Adult
M4556B	Easy Care Reusable Cuff — Adult Long
M4557B	Easy Care Reusable Cuff — Large Adult
M4558B	Easy Care Reusable Cuff — Large Adult X-Long
M4559B	Easy Care Reusable Cuff — Thigh
M1571A	Multi-Patient Comfort Cuffs — Infant
M1572A	Multi-Patient Comfort Cuffs — Pediatric
M1573A	Multi-Patient Comfort Cuffs — Small Adult
M1574A	Multi-Patient Comfort Cuffs — Adult
M1575A	Multi-Patient Comfort Cuffs — Large Adult
M1576A	Multi-Patient Comfort Cuffs — Thigh

### Disposable Blood Pressure Cuffs

M1874A	Disposable Cuff — Infant
M1875A	Disposable Cuff — Pediatric
M1876A	Disposable Cuff — Small Adult
M1877A	Disposable Cuff — Adult
M1878A	Disposable Cuff — Large Adult
M1879A	Disposable Cuff — Thigh
M4572B	Soft Single-Patient Disposable Cuff — Infant
M4573B	Soft Single-Patient Disposable Cuff — Pediatric
M4574B	Soft Single-Patient Disposable Cuff — Small Adult
M4575B	Soft Single-Patient Disposable Cuff — Adult
M4576B	Soft Single-Patient Disposable Cuff — Adult X-Long
M4577B	Soft Single-Patient Disposable Cuff — Large Adult
M4578B	Soft Single-Patient Disposable Cuff — Large Adult X-Long
M4579B	Soft Single-Patient Disposable Cuff — Thigh

SpO <sub>2</sub>	
M1131A	Disposable SpO <sub>2</sub> Sensor — Adult/ Pediatric Finger
M1132A	Disposable SpO <sub>2</sub> Sensor — Pediatric
M1133A	Disposable SpO <sub>2</sub> Sensor — Neonatal/ Adult (for adults only - any finger except thumb)
M1191A	Reusable SpO <sub>2</sub> Sensor — Adult finger
M1191B	Reusable SpO <sub>2</sub> Sensor — Adult finger
M1191AL	Reusable SpO <sub>2</sub> Sensor — Adult finger (3m cable)
M1191BL	Reusable SpO <sub>2</sub> Sensor — Adult finger (3m cable)
M1191T	Reusable SpO <sub>2</sub> Sensor — Adult finger (9-pin connector)
M1192A	Reusable SpO <sub>2</sub> Sensor — Pediatric/Small Adult
M1192T	Reusable SpO <sub>2</sub> Sensor — Pediatric Finger (9-pin connector)
M1194A	Reusable SpO <sub>2</sub> Sensor — Adult/Pediatric ear clip
M1195A	Reusable SpO <sub>2</sub> Sensor — Infant
M1196A	Reusable SpO <sub>2</sub> Sensor — Adult clip
M1196S	Reusable SpO <sub>2</sub> Sensor — Adult clip (2m)
M1196T	Reusable SpO <sub>2</sub> Sensor — Adult clip (9-pin connector)
M1902B	Disposable SpO <sub>2</sub> Sensor — Infant digit (available outside the U.S. only)
M1903B	Disposable SpO <sub>2</sub> Sensor — Pediatric Finger (available outside the U.S. only)
M1904B	Disposable SpO <sub>2</sub> Sensor — Adult Finger (available outside the U.S. only)
M1941A	SpO <sub>2</sub> Extension Cable (2m)
M1943A	Reusable SpO <sub>2</sub> Sensor Adapter Cable (1m) — Use with M1903B/M1904B
M1943AL	Reusable SpO <sub>2</sub> Sensor Adapter Cable

Power	
989803167281	HeartStart XL+ Lithium Ion Battery

Data Management	
989803171261	USB Data Drive

Accessory Pouches	
989803171281	One therapy and one monitoring accessory system
989803171291	Three cable wraps (one each for ECG, hands-free therapy cable, external paddles)

Mounting Solutions	
989803171701	Bed Rail/Roll Stand Hook
PH-0050-60	GCX Roll Stand with basket (orderable through GCX)
PH-0050-03	GCX Flush Wall Mount (orderable through GCX)

Test Loads and Test Plugs	
M1781A	Test Load for use with M3507A Pad Cable
M3725A	Test Load for use with M3508A Pad Cable
989803171271	Defibrillator Test Plug for M3508A Cable

Adapters	
M4740A	For use with internal switchless paddles
05-10200	For M3507A. Changes barrel cable to flat (removable or permanent) for M37xxA pads

Paper	
40457C	50 mm Chemical Thermal Paper, gray grid (10 rolls)
40457D	50 mm Chemical Thermal Paper, gray grid (50 rolls)

# Specifications

Physical Dimensions	
Size:	inches: 11.6W x 9H x 10.9D cm: 29.6W x 23H x 27.9D
Weight:	14.7 lbs/6.6 kg (includes one battery, one new roll of paper, one pads cable). Incremental weight of external standard paddles and paddle tray is less than 3 lbs (1.3 kg).
Standard Operator Position:	Within one meter (3 feet) of the device.

Power Supply	
Rechargeable Lithium Ion battery; AC power using a protectively grounded outlet.	

Alarms	
Alarm Tone and Voice Message Volume Range:	Maximum - 85 dB(A), Minimum - 45 dB(A).

Alarm Tone Volumes	
Imminent Shutdown:	Continuous tone alternating between 1000 and 2100 Hz.
High Priority:	Tone of 960 Hz lasting 0.5 sec repeated every second.
Medium Priority:	Tone of 480 Hz lasting 1 sec repeated every two seconds.
Low Priority:	Tone of 960 Hz lasting 0.25 sec repeated every two seconds.

Alarm Characteristics	
High Priority:	Flashing at 2 Hz with 50% duty cycle (a .25-sec flash twice every second).
Medium Priority:	Flashing at 0.5 Hz with 50% duty cycle (a 1-sec flash every other second).
Low Priority:	Constant on.

Defibrillator	
Waveform:	Biphasic Truncated Exponential. Waveform parameters adjusted as a function of patient impedance.
Shock Delivery:	Via multifunction electrode pads or paddles.
Shock Series:	Configurable energy escalation in a series.
Leads Off sensing and PCI sensing for pads/paddles:	Apply 500nA rms (571Hz); 200uA rms (32KHz).
Charge time:	3 seconds to the recommended adult energy level (150 Joules) with a new fully-charged battery installed.  Less than 5 seconds to the selected energy level (up to 200 Joules) with a new fully charged battery installed.  Less than 15 seconds to the selected energy level while connected to AC power only.  The device powers on in manual defibrillation mode ready to deliver shock in less than 8 seconds plus applicable charge time, assuming an immediate selection of an energy and initiation of a charge, even at 90V AC and after 15 maximum energy discharges.  The device powers on in AED mode ready to deliver shock in less than 17 seconds plus applicable charge time.
Patient Impedance Range:	Minimum: 25 ohm (external defibrillation); 15 ohm (internal defibrillation); Maximum: 250 ohm. Actual functional range may exceed these values.

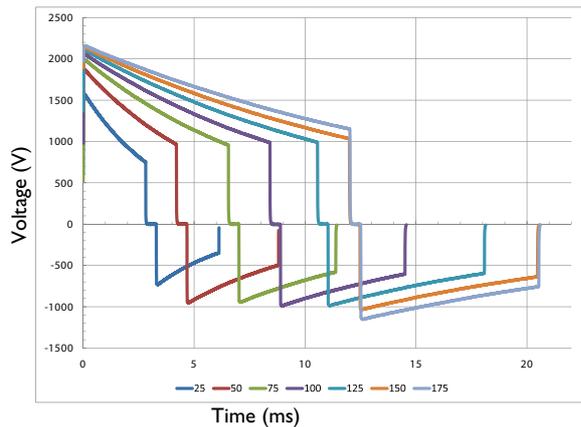
Delivered Energy Accuracy

Nominal Delivered Energy vs. Load Impedance							
Energy	Load Impedance (ohms) ± 2%						
	25	50	75	100	125	150	175
1 J	1.2	1.3	1.3	1.2	1.1	1.0	0.9
2 J	1.7	2.0	2.1	2.0	1.9	1.7	1.6
3 J	2.6	3.0	3.1	3.2	3.2	3.1	2.9
4 J	3.5	4.0	4.2	4.3	4.4	4.5	4.3
5 J	4.3	5.0	5.2	5.4	5.5	5.6	5.4
6 J	5.2	6.0	6.3	6.5	6.6	6.7	6.5
7 J	6.1	7.0	7.3	7.6	7.8	7.8	7.6
8 J	6.9	8.0	8.4	8.6	8.9	8.9	8.7
9 J	7.8	9.0	9.4	9.7	10	10	9.8
10 J	8.7	10	10	11	11	11	11
15 J	13	15	16	16	17	17	16
20 J	17	20	21	22	22	22	22
30 J	26	30	31	32	33	33	33
50 J	43	50	52	54	55	56	54
70 J	61	70	73	76	78	78	76
100 J	87	100	105	108	111	111	108
120 J	104	120	126	130	133	134	130
150 J	130	150	157	162	166	167	163
170 J	147	170	178	184	188	189	184
200 J	173	200	209	216	222	223	217

Delivered Energy accuracy is ±10% or ±1J whichever is greater for all energy settings.

Manual Defibrillation	
Manual Output Energy (Selected):	1-10, 15, 20, 30, 50, 70, 100, 120, 150, 170, 200 Joules; maximum energy limited to 50J with internal paddles.
Controls:	On/Off Therapy knob, Charge, Shock, Sync, ECG Lead Select, Patient Selection, Print, Mark Events, Reports, Alarms, Menu Select, Navigation.
Energy Selection:	Front panel Therapy knob.
Charge Control:	Front panel button; button on external paddles.
Shock Control:	Front panel button; buttons on external or switched internal paddles.
Synchronized Control:	Front panel Sync button.
Synchronized Shock Timing:	Maximum time from R-Wave detected to shock delivered is 25ms, as measured with oscilloscope from peak of input QRS wave to leading edge of defibrillation discharge into a 50 ohm test load.
Indicators:	Text prompts, audio alerts, QRS beeper, battery status, Ready For Use (RFU), External Power, Sync Mode.
Armed Indicators:	Charging/charged tones, flashing shock button on front of panel and on external paddles, energy level indicated on the display.

Smart Biphasic Waveform at 200J into 25-175 Ohms



AED Mode	
AED Energy Profile:	150 Joules for Adult/50 Joules for Infant/Child (factory default) nominal into a 50 ohm test load.
AED Controls:	On/Off, shock.
Text and Voice Prompts:	Extensive text/audible messages guide user through a user-configured protocol.
Indicators:	Monitor display messages and prompts, voice prompts, battery status, RFU, external power.
Armed Indicators:	Charging/charged tones, flashing shock button, energy level indicated on the display.
ECG analysis:	Evaluates patient ECG and signal quality to determine if a shock is appropriate and evaluates connection impedance for proper defibrillation pad contact.
Shockable Rhythms:	SMART Analysis is designed to shock ventricular fibrillation, ventricular flutter and polymorphic ventricular tachycardia. It is designed to avoid delivering a shock for rhythms that are commonly accompanied by a pulse or rhythms that would not benefit from an electrical shock.
Shock Advisory Algorithm Sensitivity:	Meets AAMI DF39 requirements and AHA recommendations; Adult: Ventricular Fibrillation - 90% with lower confidence limit (LCL) of 87 %, Polymorphic Ventricular Tachycardia and Ventricular Flutter - 75% with LCL of 67 %; Infant/Child: Ventricular Fibrillation - 90% with LCL of 87 %.
Shock Advisory Algorithm Specificity:	Meets AAMI DF39 requirements and AHA recommendations; Normal Sinus Rhythm - 99% with LCL of 97%; Asystole - 95% with LCL of 92%; Other non-shockable Rhythms - 95% with LCL of 88%.

ECG and Arrhythmia Monitoring	
Inputs:	Up to 3 ECG waves may be viewed on the display and up to 2 waves printed simultaneously. Lead I, II or III is obtained through the 3-wire ECG cable and separate monitoring electrodes. With a 5-Lead ECG cable, leads aVR, aVL, aVF and V can also be obtained. Pads ECG is obtained through two multifunction electrode pads.
Lead Fault:	Messages and dashed lines appear on the display if an electrode or lead becomes disconnected.
Pad Fault:	Dashed line appears on the display if a pad becomes disconnected.
Heart Rate Display:	Digital readout on the display from 16 to 300 bpm (Adult Patient Category) or 16 to 350 bpm (Infant/Child), with an accuracy of $\pm 10\%$ or $\pm 5$ bpm whichever is greater.
Heart Rate/Arrhythmia Alarms:	HR high/low, Asystole, VFIB/V-TACH, VTACH, Extreme Tachy, Extreme Brady, PVC rate, Pacer Not Capture, Pacer Not Pacing.
Common Mode Rejection:	105 dB for Leads ECG, 96 dB for pads ECG.
ECG Size:	1/4x, 1/2x, 1x, 2x, 4x, auto gain (1x gain is 10mm/mV on the printed strip).
ECG waveforms:	Displayed at a fixed timebase of 25 mm/sec (printer) $\pm 5\%$ , 20 mm/sec (display) $\pm 10\%$ .
ECG Leads Off Sensing:	3- and 5-Lead wires apply a 30nA DC current.
Maximum T-Wave amplitude:	Device rejects up to 80% of R-Wave amplitude for synchronized cardioversion; up to 55% of R-Wave amplitude for demand pacing; up to 34% of R-Wave amplitude for arrhythmia analysis.
Frequency Response:	ECG AC Line Filter - 50 Hz or 60 Hz; ECG for Display - 0.15-40 Hz, 0.05-40 Hz; ECG for Printer - 0.05-150 Hz Diagnostic, 0.15-40 Hz, 0.05-40 Hz.

ECG and Arrhythmia Monitoring	
Heart rate accuracy and response to irregular rhythm:	Meets AAMI standard for ventricular bigeminy (HR = 80 bpm); slow alternating ventricular bigeminy (HR=60 bpm); rapid alternating ventricular bigeminy (HR=120 bpm); bidirectional systoles (HR=90 bpm) as measured after a 20 sec stabilization time.
Heart rate averaging:	For heart rates $\geq 50$ bpm, heart rate is determined by averaging the 12 most recent R-R intervals. Beats N, P, and V are included. When heart rate drops below 50 bpm, the four most recent R-R intervals are used in the average. Note: For ventricular tachycardia alarms, which have a user-definable PVC run length limit, the heart rate is based on the user-selected PVC length up to 9 PVCs maximum.
Pace Pulse Detection Sensitivity:	1 mV for a width of 100 $\mu$ s; 200 $\mu$ V for a 500 $\mu$ s width and 200 $\mu$ V for widths of 500 $\mu$ s to 2 ms.
ECG Analog Output Bandwidth:	0.5 to 70 Hz
ECG Analog Output Gain:	1v output per 1mV input $\pm 10\%$
ECG Analog Output Delay:	Propagation delay time is $< 35$ ms from ECG input to ECG analog output.
Pacemaker Pulse Rejection Capability:	Amplitude from $\pm 2$ mV to $\pm 700$ mV, width from 0.1 ms to 2.0 ms as per ANSI/AAMI EC 13: 2002 4.1.4.1.
Pacer Pulse Detector rejection of Fast ECG signal:	Slew Rate of 1.1 V/s
Heart Rate Response Time:	7 sec (80-120 bpm); 6 sec (80 to 40 bpm)
Time to Alarm for Tachycardia:	4 sec for 206 bpm (1 mV, halved amplitude and double amplitude) and 195 bpm (2 mV, halved amplitude and double amplitude) as measured following a normal 80 bpm rate with upper alarm limit set at 100 and lower alarm limit set at 60 bpm.

ECG and Arrhythmia Monitoring	
Patient Isolation (Defibrillation Proof):	Lead ECG, SpO2, NBP and Internal Paddles: Type CF  Pads/Paddles: Type BF
Other consideration:	The HeartStart XL+ is suitable for use in the presence of electrosurgery. Burn hazard protection is provided via a 1K current-limiting resistor contained in each ECG lead wire. Proper lead placement is important to reduce burn hazards in the event of a defect in the electrosurgical equipment.

Battery	
Type:	Rechargeable, Lithium Ion; See battery label for capacity information.
Dimensions:	23.6mm (H) x 116mm (W) x 146 mm (L); 1 in (H) x 4.5 in (W) x 5.7 in (L)
Weight:	Approximately .68kg (1.5 lbs)
Charge time with device and AC power connected:	With the temperature between 0-35° C (32-95° F), less than 3 hours to 100% capacity; less than 2 hours to 80% capacity.
Charge time with device on and AC power connected	Charge time is less than 10 hours.
Life:	Depends on frequency and duration of use. When properly cared for and used in its intended environment, the useful life is approximately 3 years. Use outside those conditions can significantly reduce battery life.

Battery	
Capacity:	With a new fully charged battery, at 20 °C (68 °F), one of the following: At least 3 hours of monitoring (ECG and SpO <sub>2</sub> monitored continuously and NBP sampled every 15 minutes) followed by 20 full-energy charge/shocks; OR at least two hours of pacing (180ppm at 140mA with 40 msec pulse width) while monitoring (ECG and SpO <sub>2</sub> monitored continuously and NBP sampled every 15 minutes) followed by 20 full-energy charge/shocks; OR at least 175 full-energy charge/shocks.
Battery Indicators:	Battery gauge on battery, capacity indicator on display, power indicators on front of device; flashing RFU indicator, chirp and Low Battery messages on the display for low battery condition. When a low battery message first appears there is still enough energy for at least 10 minutes of monitoring and 6 maximum energy discharges.
Battery Storage:	Storing the battery for extended periods at temperatures above 40° C (104° F) reduces battery capacity and degrades battery life.

Printer	
Continuous ECG Strip:	The Print key starts and stops the strip. The printer can be configured to be run real time or with a 10-second delay. The strip prints the primary ECG lead and a second wave with event annotations and measurements.
Auto Printing:	The printer can be configured to automatically print on Mark Events, Charge, Shock and Alarm.
Reports:	The following can be printed: Event Summary (Long or Short), Vital Signs Trends, Operational Check, Configuration, Status Log, Device Information.
Speed:	25 mm/s with an accuracy of ±5%.
Amplitude Accuracy:	5% for offset voltages of ± 300 mV at 5Hz.
Paper Size:	50 mm (W) x 30 m (L)

Pacing	
Waveform:	Monophasic.
Current Pulse Amplitude:	10 mA to 200 mA if the pulse width is set to 20ms (5 mA increments); accuracy ±10% or ±5 mA whichever is greater. For a 40ms setting, the maximum pacing current is 140mA.
Pulse Duration:	20 or 40 msec with ±10% accuracy.
Rate:	30 ppm to 180 ppm (10 ppm increments); accuracy ±1.5%
Mode:	Demand or Fixed.
Refractory Period:	340 msec (30 to 80ppm); 240 msec (90 to 180 ppm) ±10%.

SpO <sub>2</sub>	
Measurement Range:	0-100%
Resolution:	1%
Update Period:	1-2 sec typical; maximum of ≤ 30 sec
Ambient Light Sensitivity:	Interference from fluorescent light is <2% SpO <sub>2</sub> under the following conditions: 0.3 and 1% perfusion, 50 nA/ mA transmission, 10 to 1000 lx light intensity, 50/60Hz power line frequency ±0.5 Hz line frequency.
Alarm Range:	Low Limit: 50-99% (Adult and Infant/ Child); High Limit: 51-100% (Adult and Infant/Child)
SpO <sub>2</sub> and Pulse High/Low Alarm Signal Generation Delay:	10 seconds
Response Time (90 to 80 %):	Average 18.9 seconds, standard deviation 0.88 seconds
SpO <sub>2</sub> and Pulse Averaging Time:	10 sec
Emitted Light Energy:	≤15 mW
Wavelength Range:	500-1000 nm (Information about wavelength range can be useful to clinicians, especially those performing photodynamic therapy.)

SpO <sub>2</sub>	
Desat Alarm Signal Generation Delay:	20 sec
Pulse Rate Measurement Range:	30-300 bpm
Pulse Rate Resolution:	5 bpm
Pulse Rate Accuracy:	2% or 1 bpm whichever is greater
Pulse Response Time (90 to 120 bpm):	Average 18.0 seconds, standard deviation 0.86 seconds.
Pulse Alarm Range:	Low Limit: 30-295 (Adult and Infant/Child); High Limit: 35-300 (Adult and Infant/Child)
Accuracy with sensors (1 standard deviation 70-100%):	
± 2%:	M1132A, M1133A, M1191A, M1191B, M1191AL, M1191BL, M1192A.
± 3%:	M1131A, M1191T, M1192T, M1194A, M1195A, M1196A, M1196S, M1196T, M1902B, M1903B, M1904B.

NBP	
Systolic Pressure Range:	Adult: 40-260 mmHg/5-35 kPa; Infant/Child: 40-160 mmHg/5-21 kPa
Diastolic Pressure Range:	Adult: 20-200 mmHg/2-27 kPa; Infant/Child: 20-120 mmHg/2-16 kPa
Mean Pressure Range:	Adult: 26-220 mmHg/3-30 kPa; Infant/Child: 26-133 mmHg/3-18 kPa
Systolic Alarm Range High:	Adult: 45-260 mmHg/6-35 kPa; Infant/Child: 45-160 mmHg/6-22 kPa
Systolic Alarm Range Low:	Adult: 40-255 mmHg/5-34 kPa; Infant/Child: 40-155 mmHg/5-21 kPa
Diastolic Alarm Range High:	Adult: 25-200 mmHg/3-27 kPa; Infant/Child: 25-120 mmHg/3-16 kPa
Diastolic Alarm Range Low:	Adult: 20-195 mmHg/2-26 kPa; Infant/Child: 20-115 mmHg/2-15 kPa

NBP	
Mean Alarm Range High:	Adult: 30-220 mmHg/4-30 kPa; Infant/Child: 30-135 mmHg/4-18 kPa
Mean Alarm Range Low:	Adult: 25-215 mmHg/3-29 kPa; Infant/Child: 25-130 mmHg/3-17 kPa
Pulse Rate Range:	30 to 220 bpm
Initial Pressure:	160 mmHg, 21 kPa (adult); 120 mmHg, 16 kPa (Infant/Child);
Maximum Pressure:	300 mmHg; 40 kPa
Overpressure Safety Limits:	300 mmHg; 40 kPa
Cuff Inflation Time:	75 sec maximum
Pressure Transducer Accuracy:	±3 mmHg over the range 1-300 mmHg/.1-40 kPa
Auto Mode Repetition Time:	1, 2.5, 5, 10, 15, 30, 60 or 120 min
Maximum Measurement Time:	120 sec
Interconnect Tube Length:	M1598B Connect tubing 1.5 m (4.92 ft.); M1599B Connect tubing 3.0 m (9.24 ft.)
Recommended Frequency of Pressure Transducer Calibration:	Yearly

Display	
Size:	Approximately 6.5 in (16.5 cm) diagonal viewing area.
Type:	Color TFT LCD
Resolution:	640 x 480 pixels (VGA) with 32 brightness levels per color
Sweep Speed:	20 mm/s nominal (stationary trace; sweeping erase bar) for ECG and SpO <sub>2</sub>
Wave Viewing Time:	5.2 sec

Environmental	
Temperature:	0°C to 45°C (32°F to 113°F) operating; -20°C to 70°C (-4°F to 158°F) storage
Humidity:	Up to 95% relative humidity
Atmospheric Pressure Range:	Operating and Storage - 1014 mbar to 572 mbar (0 to 15,000 ft; 0 to 4,500 m)
Shock - operating:	Half-sine waveform, duration $\leq 11$ ms, acceleration $\geq 15.3$ G, 3 shocks per face
Shock - non-operating	Trapezoidal waveform, acceleration 30G, velocity change 7.42 m/s $\pm 10\%$ 1 shock per face
Water/Solids Ingress Resistance:	Meets Ingress Protection level IP21
EMC:	Complies with the requirements of standard EN 60601-1-2:2002
Safety:	Meets UL 60601-1 (1st edition), EN 60601-2-4:2003, EN 60601-1:1990
Mode of Operation:	Continuous
AC Line Powered:	100-240 VAC, 50 or 60 Hz, 1-0.46A, Class I Equipment
Battery Powered:	Minimum 14.4 V, Rechargeable Lithium Ion
Other considerations:	The HeartStart XL+ is not suitable for use in the presence of concentrated oxygen or a flammable anesthetic mixture with air, oxygen, or nitrous oxide. Hazards arising from software errors were minimized by the product's compliance with the software requirements contained in EN 60601-1-4:1996.

Environmental	
Vibration Operating Random:	Frequency: 10-100, PSD $(m/s^2)^2/Hz$ 1.0 Frequency: 100-200, Slope (dB/octave): -3.0 Frequency: 200-2000, PSD 0.5
Vibration Non-Operating Swept Sine	Frequency: 10-57, Amplitude $\pm .15$ mm; Frequency: 57-150, Amplitude 2g
Vibration Non-Operating Random:	Frequency: 5-500 Hz, PSD: 0.0117 $g^2/Hz$ , Acceleration: $\sim 2.41$ Grms

Patient Data Storage	
Internal Event Summary:	The Internal Event Summary stores up to 8 hours of data per event. The number of events that can be stored is related to the duration of each individual event.

USB Device	
Correct Drive:	Use the USB Drive that accompanied your device. If it is not available, use a USB device that is USB 2.0 compatible and is $\leq 32$ gigabytes.

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