

PHILIPS

HEARTSTART MRx



**HEARTSTART MRx
MONITOR/DEFIBRILLATOR**

MORE OF WHAT
YOU WANT, LESS OF
WHAT YOU DON'T



HeartStart MRx unites Philips' industry-leading monitoring technologies with superior diagnostic measurements and our patented resuscitation waveform in a single, elegantly designed, and lightweight device.

MONITORING CAPABILITIES

- ▶ Monitoring through defibrillation pads
- ▶ 3- and 5-Lead ECG monitoring through electrodes
- ▶ ST/AR Basic™ arrhythmia detection
- ▶ FAST-SpO₂ (Fourier Artifact Suppression Technology), optional
- ▶ Noninvasive Blood Pressure (NBP), optional
- ▶ Microstream® Capnography (etCO₂), optional
- ▶ 12-Lead ECG, optional

THERAPIES

- ▶ SMART Biphasic waveform
- ▶ Manual mode with shock delivery through defibrillation pads or paddles
- ▶ AED mode
- ▶ Synchronized cardioversion
- ▶ Noninvasive pacing, optional

FEATURES

- ▶ Adjustable ECG size and autogain
- ▶ 8.4 inch (diag.), 4-wave color display, largest in its class
- ▶ Data collection and event summary
- ▶ Strip chart recorder
- ▶ Automated self-tests
- ▶ Operational checks
- ▶ Individual, adjustable volume of QRS beeper, voice prompts, and alerts
- ▶ Long-life lithium ion battery (2 bays) with capacity gauge
- ▶ AC power module
- ▶ "Ready-for-Use" indicator
- ▶ Configuration mode
- ▶ Diagnostic mode
- ▶ Quick Reference Cards
- ▶ Bed rail hook

Optimized for a variety of uses – AED, crash cart defibrillator, critical care transport monitor and cardiograph – and environments, it's remarkably easy to operate:

- ▶ Thoughtfully organized controls and ports clearly separate functions, monitoring from therapeutic and lifesaving.
- ▶ Monitoring starts once a patient cable is connected to the device.
- ▶ Monitoring and therapy data are clearly and logically arranged on-screen.
- ▶ Large numeric measurements, waveforms, and alarm indicators enable the user to quickly locate information.
- ▶ The appearance of measurements and waveforms can be customized, and the screen organized to the user's preferences.
- ▶ On-screen menus simplify navigation for configuring data, setting and responding to alarms, and accessing additional functionality.



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Superior Diagnostic Measurements



A typical monitoring view shows some basic patient information, the date, time and battery status. Next are the numerics and waveforms – in this example, heart rate, non-invasive blood pressure and two ECG waves. The bottom half of the screen shows additional monitoring parameters, SpO₂ and CO₂ numerics followed by their waveforms, and soft keys for customizing the display, setting and responding to alarms, and scrolling through screens to view additional monitoring data.

HeartStart MRx features many of the same measurement algorithms and alarms found in our industry-leading patient monitors and cardiographs. So transitioning a patient from HeartStart MRx to a Philips, Hewlett-Packard, or Agilent bedside monitor or cardiograph couldn't be easier. And the ECG cables, NBP cuffs, SpO₂ sensors, and CO₂ filter lines used on HeartStart MRx are interchangeable with those other devices.

Arrhythmia Monitoring

HeartStart MRx employs Philips' ST/AR Basic arrhythmia algorithm to analyze ECGs for heart rate, while continuously monitoring for ventricular arrhythmias and generating visible and audible alarms as needed. ST/AR detects 10 rhythm disturbances, including 5 life-threatening arrhythmias: asystole, ventricular fibrillation, ventricular tachycardia, extreme bradycardia, and extreme tachycardia.

SpO₂ with Fourier Artifact Suppression Technology (FAST-SpO₂)

With its low-noise hardware and patented digital processing, FAST-SpO₂ produces few false readings, drop-outs and false alarms in the presence of motion and other interferences. The algorithm uses numerous technical and physiological criteria, as well as quality indicators, and applies rule-based analysis and scoring to generate the Fourier spectrum. The FAST-SpO₂ algorithm even measures reliably in the presence of low peripheral perfusion. FAST-SpO₂ has been featured in Philips' monitors since 1999.

Noninvasive Blood Pressure (NBP)

HeartStart MRx is equipped with the ADVANTAGE® oscillometric noninvasive blood pressure system from SunTech Medical Instruments. Developed for transport applications, this motion-tolerant system accurately and reliably measures systolic and diastolic pressure and calculates mean arterial pressure in any environment.

Microstream® Capnography (etCO₂)

With Microstream® CO₂ measuring technology from Oridion Medical, there is no zeroing, no heating and no sensor to interfere with the patient's airway. And the Microstream system monitors etCO₂ on both intubated and nonintubated patients. On nonintubated patients, respiration samples are collected through a nasal cannula. Since this method requires a

low sample volume, it also works reliably with pediatric patients. Microstream's FilterLine® airway adapter and sample line inhibit the build-up of condensed water and secretions from the patient (i.e., no water trap), allowing the instrument to collect CO₂ samples in any orientation without clogging.

Philips 12-Lead ECG

The 12-lead algorithm in HeartStart MRx, which is also used in Philips PageWriter Touch cardiograph and IntelliVue bedside monitors, delivers both ECG data and interpretation. And, for patients with symptoms of ST-segment elevation acute myocardial infarction (STEMI), the algorithm detects and stratifies early acute coronary syndromes.

Philips 12-Lead Algorithm features a sophisticated pacemaker pulse detector and paced rhythm classifier. The algorithm is designed to understand a variety of atrial, ventricular, and A-V sequential pacing modes and to recognize asynchronous pacing typically seen with a magnet in place. In addition to automated detection capabilities, the algorithm provides user-selected configuration of 'pacemaker patient' or 'non-pacemaker patient' for more accurate analysis.

With patients under the age of 16, the algorithm employs its Pediatric Criteria Program, which recognizes 12 distinct age groups to ensure that the most age-relevant interpretation criteria are applied for analyzing ECG data.

Clinically Proven Therapies

SMART Biphasic Technology

Philips' patented low-energy SMART Biphasic (truncated exponential) waveform is proven effective in emergency resuscitation and for minimizing post-defibrillation heart dysfunction. Its impedance compensation algorithm measures chest impedance and delivers a low-energy shock based on the patient's unique physical requirements.

No other external defibrillation waveform is supported by more peer-reviewed clinical data.

AED Mode

AED mode enables the first caregiver on-scene to deliver a lifesaving shock within seconds of arrival. Clear, concise voice and text prompts guide the user through the process.

Manual Defibrillation

When switching to manual mode, the user selects defibrillation energy (1) with the therapy knob. With the press of a button (2), MRx charges. HeartStart MRx charges to its highest energy level, 200 Joules, in less than 5 seconds. Then, pressing the shock button (3), MRx delivers defibrillation therapy.

HeartStart MRx defibrillates with either paddles or pads. If paddles are preferred, MRx can be equipped with a set of external paddles.



Pediatric and adult paddle electrodes with Philips' patented Patient Contact Indicator (PCI).

These anterior/anterior paddles (water resistant available) are for adult and pediatric use and convert from adult to pediatric by removing the outer contacts. Sensors in the external paddles' electrodes assess paddle-to-patient contact and display their readings in the Patient Contact Indicator (PCI) located on the sternum paddle's handle.

For open-heart and other intrathoracic procedures, HeartStart MRx can be used with our line of internal defibrillation paddles, which come in a range of sizes.

HeartStart Defibrillator Pads

Optimized for Philips defibrillators, HeartStart Multifunction Defibrillator Pads come in adult and pediatric sizes and specialty choices to fit the needs of a variety of departments, caregivers, patients and treatments – from emergency use to ECG monitoring and radiological procedures. When connected to MRx, they can provide ECG monitoring, synchronized cardioversion, and noninvasive pacing, in addition to external defibrillation.

Synchronized Cardioversion

Philips' SMART Biphasic waveform has undergone clinical testing, and peer-reviewed evidence supports its effectiveness in cardioverting atrial fibrillation. Synchronized cardioversion is activated by selecting an energy setting, then pressing the "sync" key just above the therapy knob. In *sync mode*,

R-wave markers are shown on-screen above (or on) each detected R-wave.

Noninvasive Pacing

HeartStart MRx paces with a monophasic truncated exponential waveform. The pacer's 40 msec pulse width is constant, while rate and output (mA) are adjustable. MRx offers both user selectable demand- and fixed-mode.



A flashing hourglass in the "ready-for-use" indicator window signals that HeartStart MRx has ample battery power to monitor and deliver a shock. If battery power is low, ECG capability is compromised, or MRx detects that it cannot pace or shock, a red "X" replaces the hourglass and the device audibly chirps until the situation is corrected.

HeartStart MRx inherits its uncomplicated 1-2-3 operation from our popular CodeMaster defibrillators. Defibrillation therapies are activated, using the therapy knob on the front right side of MRx.

In *code view*, a single ECG wave is shown in the top half of the display, the incident timer is prominent and all alarms are paused.



Feature-packed and still lightweight

For all its monitoring capabilities, therapies, and features, HeartStart MRx is surprisingly lightweight, 13.2 pounds. Measuring 12.4 x 7.7 x 11.7 inches, it's easy to carry and fits neatly on a standard stretcher.

Data collection, management and reporting

HeartStart MRx captures as many as 8 hours of continuous ECG waveforms and events (including drug and therapy markers), plus 50 12-lead ECG reports in its internal memory or on an optional, removable CompactFlash® data card. This information can be printed as an Event Summary Report on the device's strip chart printer and later transferred to a PC running HeartStart Event Review Pro data management software, where data can be compiled, edited, shared and archived for quality control and reporting – from single-patient reports to system-wide, statistical reports used for data trending.

So that patient data can be transferred and compiled easily, HeartStart MRx can accept a data card from Heartstream and HeartStart FR2-series AEDs. Upon hand-off, the data card can be removed from the FR2 defibrillator and

inserted in the MRx. And when transferring the patient to another department, the data card can again be removed and inserted in the receiving HeartStart defibrillator, whether it's the FR2 or another MRx.

Battery power

Two rechargeable, lithium ion batteries, when new and fully charged, provide 10 hours of monitoring, more than any other monitor/defibrillator. Depleted batteries can be charged to full capacity in just 3 hours. No conditioning is required. Capacity gauges on the monitor's screen and on each battery pack show the remaining charge.

Self-tests and operational checks

The HeartStart MRx incorporates both automated self-tests (hourly, daily and weekly) and easy-to-run routine operational checks. By automatically storing results in internal memory, MRx will help keep records up to date, simplifying JCAHO compliance. Records can be viewed on-screen and printed with the strip chart printer.

Strip chart printer

The integrated 50 mm strip chart printer prints the primary ECG lead with event annotations and measurements in real-time or with a 10-second delay. It can be configured to print marked events, charge, shock and alarms. And, it can also print event summaries, including ECG rhythm strips, 12-Lead ECGs reports, operational checks, configuration, status logs, and device information.

Carrying Case

An optional carrying case, constructed of durable, semi-rigid foam covered in polyester, improves device portability, contains and segments accessories for better organization, and adds a layer of protection to HeartStart MRx. Modular pouches snap on and can be easily removed for thorough cleaning.

Quick Reference

A set of reference cards highlights the device's key functionality and operation. Laminated to resist wear and stains, the card set can be tethered to HeartStart MRx, stored in its carrying case, or kept in the drawer of its crash cart.

Training materials

A 90-minute, self-paced web-based training program familiarizes the user with the features and operation of HeartStart MRx. Students explore components and accessories, run simulations of hands-on procedures, and test their understanding of the material. Continuing education credit is available for completing the program. Philips also provides an optional video-based training program.



With diagnostic measurements, lifesaving defibrillation therapy and numerous innovations, HeartStart MRx has more of what you want for thorough care and positive patient outcomes.

Specifications

Physical

Dimensions	Without external paddles: 12.4 in. (W) x 7.7 in. (D) x 11.7 in. (H) (313 mm x 195 mm x 295 mm) With external paddles: 12.4 in. (W) x 7.7 in. (D) x 13.4 in. (H) (313 mm x 195 mm x 340 mm)
Weight	13.2 lbs. (6 kg): base unit with 1 battery, pads and pads cable. Paddle tray and external standard paddles add less than 2.5 lbs. (1.1 kg).

Environmental and Physical Requirements

Water Resistance	Meets IEC 60601-2-4
Solids Resistance	IP2X
Temperature	Operating: 32° - 113° F (0° - 45° C) Storage: -4° - 158° F (-20° - 70° C)
Humidity	Operating: 0% to 95% relative
Safety	Meets EN 60601-1, UL 2601-1, CSA C22.2 No. 601-1

Display

Dimensions	8.4" diagonal (128 mm x 171 mm)
Type	TFT color LCD
Resolution	480 x 640 pixels (VGA)
Wave Viewing Time	5 seconds (ECG)

Defibrillator

Defibrillator Model	HeartStart MRx (M3535A)
Waveform	Truncated Exponential Biphasic. Waveform parameters adjusted as a function of patient impedance.
Output Energy	Manual (selected): 1-10, 15, 20, 30, 50, 70, 100, 120, 150, 170, 200 Joules into a 50 Ohm load. 1-10, 15, 20, 30, 50 Joules through internal defibrillation paddles. AED Mode (single energy output): 150 Joules into a 50 ohm load.
Charge Time	Less than 5 seconds to 200 Joules with a new, fully charged lithium ion battery at 25° C
Shock Delivery	Via multifunction defib electrode pads or paddles
Shock-to-Shock Cycle Time	Typically less than 20 seconds
Patient Impedance Range	Minimum: 15 Ohm (internal defibrillation); 25 Ohm (external defibrillation) Maximum: 180 Ohm
AED Mode	Shock advisory sensitivity and specificity meet AAMI DF-39 guidelines

Noninvasive Pacing

Waveform	Monophasic Truncated Exponential
Current Pulse Amplitude	10 mA to 160 mA (5 mA resolution); accuracy 10 mA to 50 mA ± 5 mA, 50 mA - 160 mA ± 10%
Pulse Width	40 ms with ± 10% accuracy
Rate	30 ppm to 180 ppm (10 ppm increments); accuracy ± 1.5%
Modes	Demand or Fixed Rate
Refractory Period	340 msec (30 to 80 ppm); 240 msec (90 to 180 ppm)

Data Storage

Internal	8 hours of continuous ECG waveforms and events, plus 50 12-lead ECG reports
Data Card	8 hours of continuous ECG waveforms and events, plus 50 12-lead ECG reports, on a Compact Flash Memory Card

Battery

Type	6.3 Ah, 14.8 V, rechargeable lithium ion
Dimensions	6.5" (H) x 3.8" (W) x 1.6" (D) (165 mm x 95 mm x 42 mm)
Weight	1.6 lb. (0.73 kg)
Charge Time	Approximately 3 hours to 100%, 90 minutes to 80%
Capacity	At least 5 hours of continuous 12-lead ECG, SpO ₂ , and CO ₂ monitoring, with NBP every 15 minutes on a new, fully charged battery At least 3.5 hours of continuous 12-lead ECG, SpO ₂ , and CO ₂ monitoring, with NBP every 15 minutes and pacing at 180 ppm at 160 mA on a new, fully charged battery
Battery Indicators	Battery gauge on battery, capacity indicator on display; flashing RFU indicator, chirp, and 'Low Battery' message appears on display for low battery condition, when 10 minutes of monitoring time and 6 maximum energy discharges remain (with a new battery at room temperature, 25° C)

ECG and Arrhythmia Monitoring

Input	Up to 4 ECG waves displayed and up to 2 ECG waves print simultaneously Lead I, II, or III obtained through 3-lead ECG cable and separate monitoring electrodes. With 5-lead cable, obtain leads aVR, aVL, aVF, or V. Pads ECG obtained through 2 multifunction defibrillation electrode pads.
Lead Fault	'Lead Off' message and dashed line displayed, if an electrode or lead wire becomes disconnected
Pads Fault	Dashed line displayed if a pad becomes disconnected.
Heart Rate Display	Digital readout on display 15 to 300 bpm, accuracy ±10%
Heart Rate/Arrhythmia Alarms	HR, Asystole, VFIB/VTACH, VTACH, extreme tachycardia, extreme bradycardia, PVC rate
ECG Size	2.5, 5, 10, 20, 40 mm/mV, autogain

SpO₂ Pulse Oximetry

Range	0 to 100%
Resolution	1%
Alarm Range	Low Limit: 50 to 99% (Adult/Pediatric) High Limit: 51 to 100% (Adult/Pediatric)
Alarm Delay	10 seconds

Noninvasive Blood Pressure

Pressure Range	Systolic: 40 to 260 mmHg Diastolic: 20 to 200 mmHg
Initial Pressure	Adult: 160 mmHg Pediatric: 120 mmHg
Maximum Pressure	280 mmHg
Alarm Range	Systolic high limit: 30 - 270 (Adult), 35 - 180 (Pediatric) Systolic low limit: 30 - 265 (Adult), 30 - 175 (Pediatric) Diastolic high limit: 18 - 240 (Adult), 18 - 150 (Pediatric) Diastolic low limit: 10 - 240 (Adult), 10 - 145 (Pediatric)

End-Tidal CO₂

Range	0 to 99 mmHg
Resolution	1 mmHg (0.1 kPa)
Sample Size	50 ml per minute
Alarm Range	Low Limit: 10 to 95 mmHg (Adult/Pediatric) High Limit: 20 to 100 mmHg (Adult/Pediatric)

12-Lead ECG

Input	12-Lead cable: leads I, II, III, aVR, aVL, aVF, V/C1-V/C6
Display View	All 12-lead ECG waves display simultaneously
Strip Record	All 12-leads print on the strip chart printer in 3x4 format

Strip Chart Printer

Continuous ECG Strip	Prints primary ECG lead with event annotations and measurements in real-time or with 10-second delay
Auto Printing	Printer can be configured to print marked events, charge, shock and alarms
Reports	Event Summary, 12-Lead, Operational Check, Configuration, Status Log, and Device Information
Paper Size	50 mm (1.97 in.) W by 30 m (100 ft.) L

Built to Perform and Backed by Philips

Our dedication to excellence in design, manufacturing and customer support makes us a trusted supplier of patient monitors and defibrillators, serving the healthcare community for more than 35 years. HeartStart MRx is part of our cardiac resuscitation family of products, which includes ALS defibrillator/monitors and automated external defibrillators used in private and public environments. Each is tailored to the needs and skills of a particular type of user, extending the reach of care from the home to the hospital.

Warranties, services, and support

So that our HeartStart MRx customers continue delivering reliable and effective patient care, we provide a variety of warranty offerings.

Philips backs HeartStart MRx with a 5-year repair and return warranty and offers a variety of optional programs, helping to ensure that our customers receive the service and technical expertise they need and expect. If on-site repair is preferred, the standard 5-year warranty can be substituted with our 1-year On-site Service program, which can be extended by one, two, or four years at the time of purchase (for a maximum of five years coverage from date of purchase).

Qualified U.S. customers may select our 5-year Biomedical Warranty, in place of the standard warranty program. The Biomedical Warranty program is a cooperative relationship between Philips and your in-house biomedical engineering staff for servicing the HeartStart MRx. Philips provides replacement parts and technical assistance, while the in-house biomedical engineer repairs and maintains the device.

Philips Medical Supplies

Philips is committed to producing and supporting the finest quality medical equipment and supplies. Our supplies are thoughtfully designed, tested and manufactured to deliver reliable and accurate results from your HeartStart MRx. For a complete list of supplies, please visit <http://shop.medical.philips.com>.

PHILIPS MEDICAL SYSTEMS IS PART OF ROYAL PHILIPS ELECTRONICS

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