Meaningful innovations

Philips HeartStart MRx ALS Monitor/Defibrillator for emergency care

PHILIPS

Driving the course

More and more, EMS is driving the course of emergency care by enabling clinical decisions that determine where, when, and how your patients are treated by you in the field and once they reach the hospital. You are leading the way with the adoption of new technologies, such as CPR measurement and feedback tools, advanced monitoring that detects STEMI, and more sophisticated medical treatment in the field such as hypothermia protocols. Your efforts are resulting in earlier recognition of conditions and trends, earlier use of therapeutic interventions, and earlier reporting and care in the receiving hospitals, all of which are revolutionizing patient care.

Periodic Clinical Data Transmission automatically sends vitals and waveforms ahead of the patient's arrival for efficient hand-off and ED triage.

Philips advanced DXL 12-Lead ECG algorithm takes STEMI clinical decision support to a new level with unique capabilities that enable confident decision-making to help speed triage.

# of care

Leading the way with meaningful innovations

Philips is leading the way with meaningful innovations in emergency care that can help you quickly and effectively respond to your patients and influence their course of care as never before. As a worldwide leader in emergency care, we draw on our vast network for real-world input to design solutions that matter most to you.

The Philips HeartStart MRx ALS Monitor/Defibrillator, which includes Q-CPR™ and our advanced DXL 12-Lead ECG algorithm, seamlessly provides industry-leading patient monitoring capabilities, superb diagnostic measurements, robust and reliable STEMI clinical decision support tools, and evidence-based, proven resuscitation therapies in an intuitive, easy-to-use, and rugged design. Our open systems approach to data management, called "Connected Care," helps you streamline information so that it flows from your EMS agency to and throughout the hospital for optimal patient care and operational efficiency.

The HeartStart MRx is tough enough to receive an Airworthiness Release (AWR) from the United States Army after extensive testing for the most rigorous and demanding environments faced by military personnel.
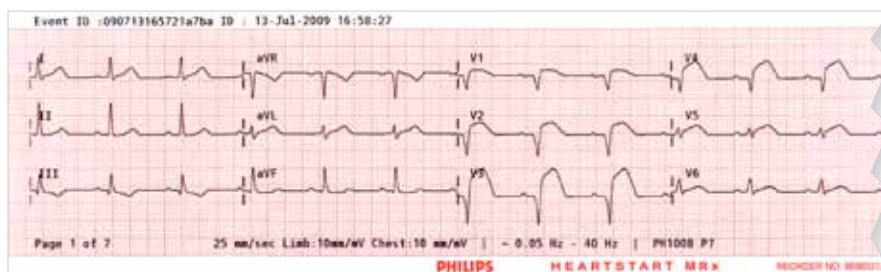

Q-CPR helps improve CPR quality and is supported by more published data than any other CPR quality improvement tool.
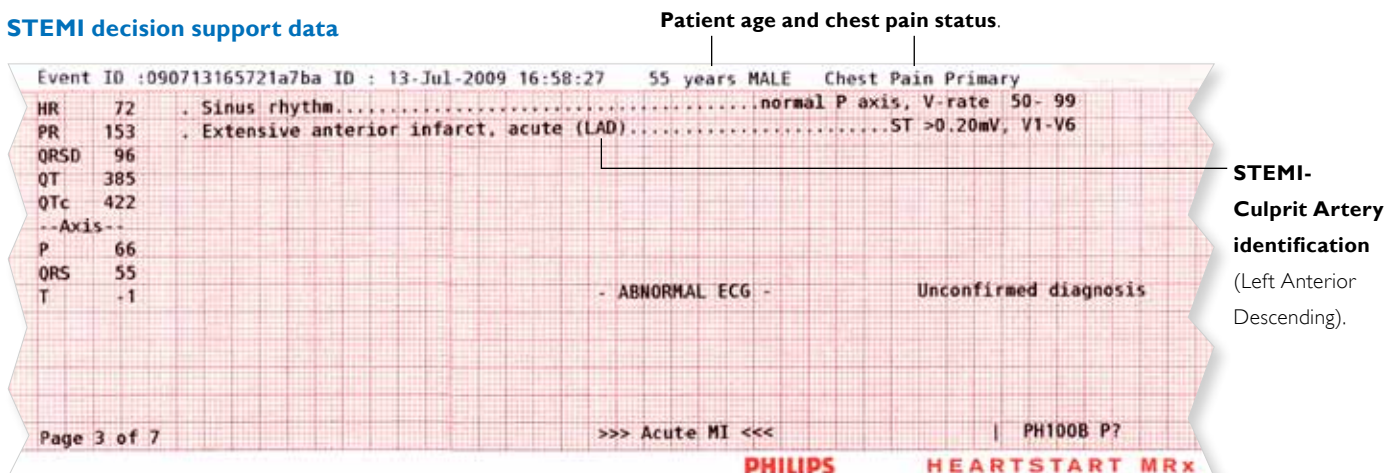
Advanced STEMI clinical decision support tools

Whether you have immediate access to percutaneous coronary intervention (PCI) or are in an area where transport times may necessitate treatment with thrombolytics, Our unique total STEMI solution helps support and speed the entire relay of care starting with the point of discovery when you take the first 12-lead ECG to hand-off at the ED and through the hospital to the Cath Lab and post-procedure care areas.
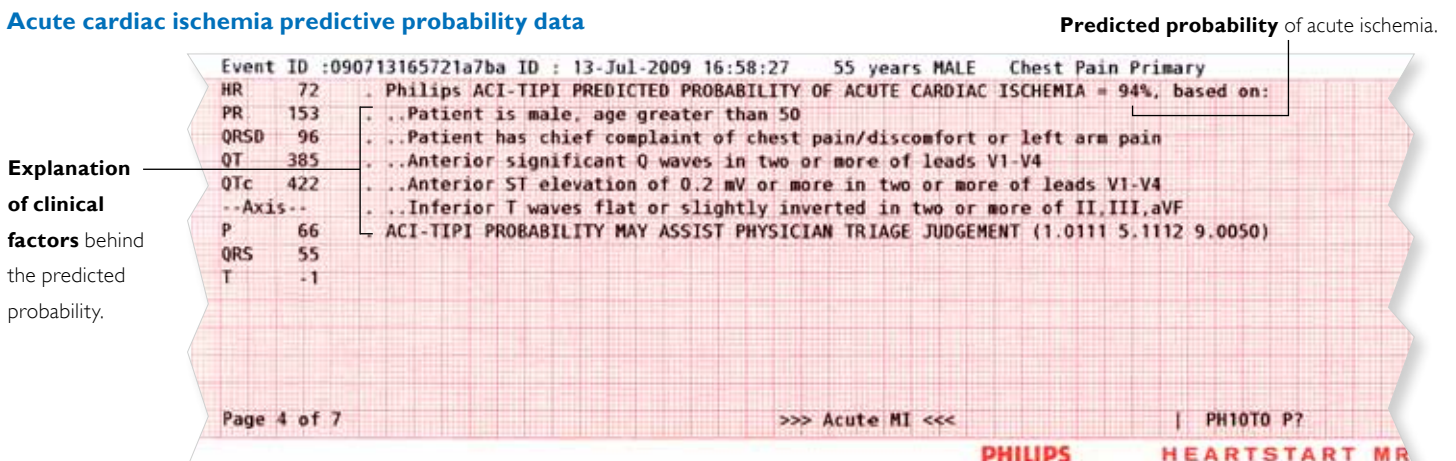
12-lead ECG strip

Patient age and chest pain status.

STEMI decision support data

STEMI-Culprit Artery identification (Left Anterior Descending).

Acute cardiac ischemia predictive probability data

Predicted probability of acute ischemia.

Explanation of clinical factors behind the predicted probability.

> "The decision to activate the Cath Lab can be a challenging one for EMS providers. Tools used in the field that increase your confidence are valuable in terms of providing the best care for the patient and making the best use of the hospital's resources."
>
> *Dr. Mohamud Daya*
> *Associate Professor of Emergency Medicine*
> *Oregon Health & Science University*

Only Philips has the advanced DXL 12-Lead ECG algorithm, which takes STEMI clinical decision support to a new level with unique capabilities that enable confident decision-making to help speed triage.

Key tools:
- Pinpoints the **STEMI-Culprit Artery** most likely responsible for the acute symptoms, which can assist in directing care in the field and treatment in the Cath Lab.
- Generates **Critical Values** for four distinct life-threatening conditions – acute MI, acute ischemia, complete heart block, and very fast heart rate – that require immediate clinical attention.
- Provides enhanced **Gender-Specific Diagnostic Criteria** to improve recognition and interpretation of cardiac symptoms in women.

We also offers predictive instruments designed to help support confident decision-making.
- **Acute Cardiac Ischemia – Time Insensitive Predictive Instrument (ACI-TIPI)** uses the 12-lead ECG to provide a percentage score for predicted probability that the patient is experiencing acute ischemia.
- **Thrombolytic Predictive Instrument (TPI)** uses the 12-lead ECG to predict patient outcome with and without thrombolytic therapy.

The HeartStart MRx is a key element of our total STEMI solution and works with Philips cardiographs, patient monitors, ECG information management systems, and Cath Lab imaging and information solutions to streamline workflow, improve productivity, and raise the quality of your system's STEMI care.

Flexible and fast 12-lead transmission

Time to reperfusion begins when you take the first 12-lead ECG in the field. The HeartStart MRx has flexible, fast, and reliable 12-lead transmission capabilities so you can send data using your choice of technologies to wherever you need it to go – ED, Cath Lab, cardiologist's smart phone – to begin the next level of care.

Industry-leading monitoring capabilities

You face a wide range of emergency care challenges every day. We continue to tailor and enhance our industry-leading, advanced monitoring capabilities so that you can better assess your critical care patients.

"With the growing research supporting the use of cooling following cardiac arrest and with other critical care patients, continuous temperature monitoring is an increasingly important parameter."

Dr. Lance Becker
Professor of Emergency Medicine
Director, Center for Resuscitation Science
University of Pennsylvania

The HeartStart MRx provides a wide range of monitoring capabilities. Key monitoring parameters include:
• Advanced DXL 12-Lead ECG algorithm that shows all 12 leads on screen to ensure a reliable 12-lead is acquired
• ST/AR Basic™ arrhythmia detection for 10 rhythm disturbances and irregularities
• FAST-SpO_2 (Fourier Artifact Suppression Technology)
• Microstream® Capnography ($EtCO_2$)
• Continuous temperature monitoring (core and skin) for post-resuscitation hypothermia protocols
• Invasive blood pressure (2 lines)
• Noninvasive blood pressure
• Vital signs trending
• Audio recording
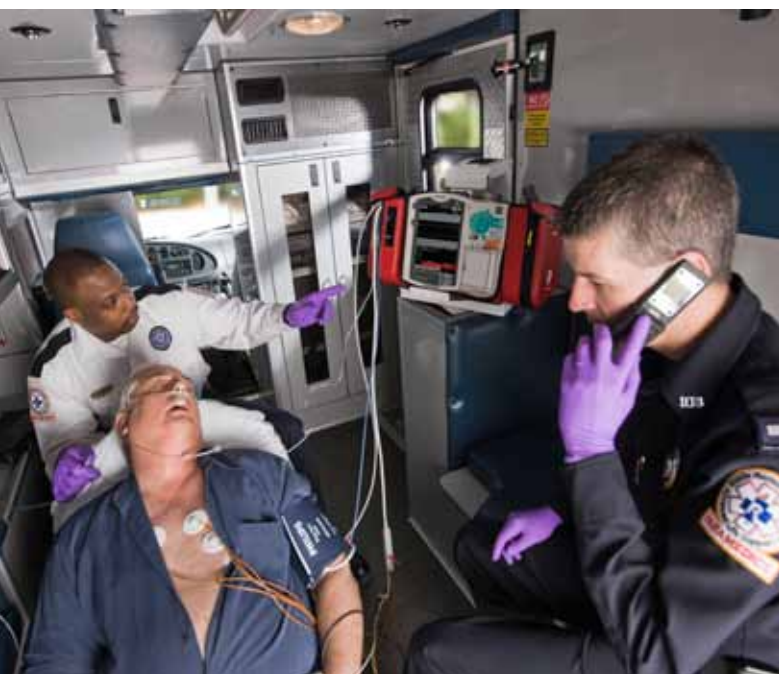
Collaborate with hospital care teams using telemedicine

Periodic clinical data transmission
• Communicate/collaborate on critical care patients: stroke, trauma, respiratory, pediatric, cardiac
• Automatically document critical events and vitals en route so you can focus on your patient
• Help hospital care teams better prepare for arrival

Built tough, ready for action

Rugged and reliable

For whatever you face in a day, the HeartStart MRx is built to be tough and ready for action. The HeartStart MRx is designed to meet stringent test requirements including spraying water, military helicopter vibration, mechanical shock, one-meter drop, electro-magnetic compatibility, and extreme environmental conditions (temperature, humidity, and altitude). In addition, the same MRx model that we ship to all EMS customers has passed an extensive battery of tests, performed by the US military, to achieve aeromedical airworthiness certification. These military-level tests include: baseline performance and durability, electrical safety, vibration, electro-magnetic compatibility, climate, altitude, rapid decompression, explosive atmosphere, acceleration, and in-flight performance evaluations.

Integration and upgrades made easy

Ease of use is the hallmark of all our defibrillators and the HeartStart MRx is no exception. Training your medics to use the HeartStart MRx is straightforward due to its intuitive and easy-to-use design. Once the HeartStart MRx becomes part of your system, it can be easily upgraded in the field so that you receive the benefits of Philips advancements now and into the future without increasing the size of your device.

Defibrillation as easy as 1-2-3

1. Select energy to choose appropriate dosage
2. Charge button charges the defibrillator in <5 seconds
3. Press shock button to deliver therapy

Active ready-for-use visual indicator flashes to signal the device has power and is in good functioning order to monitor and deliver a shock.

Intuitive design with therapy controls and connections on the right, monitoring on the left.

Large color display shows 4 waveforms and numerics, or view all 12 leads at once with the 12-lead acquisition option.

Normal or high-contrast view for easy viewing in bright sunlight conditions.

10 hours of monitoring with two fully charged batteries.

Automated self-tests that run hourly, daily and weekly. Easy-to-run operational checks.

Enhanced resuscitation

Our evidence-based, proven resuscitation therapies are designed to work together to help you give sudden cardiac arrest (SCA) patients the best chance of surviving and returning to active living.

''The shock remains important, but we also need integrated quality CPR, cooling, and good post-arrest care. Resuscitation is about saving a patient's life on the front end and returning the person to an active life on the back end.''
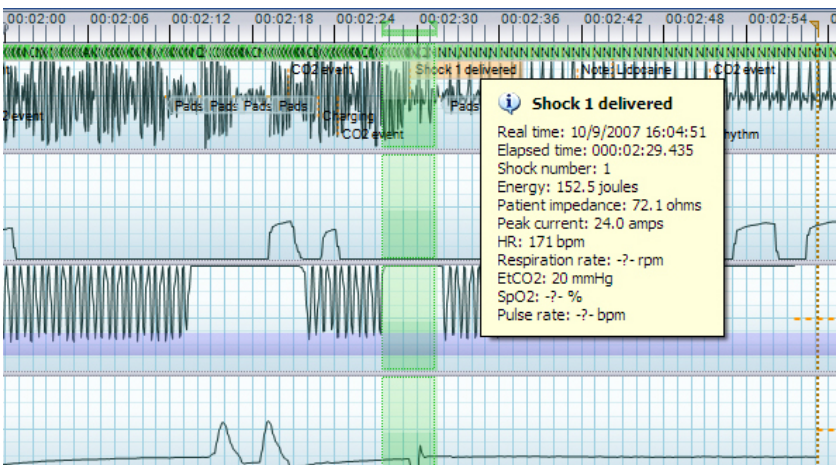
Dr. Lance Becker
Professor of Emergency Medicine
Director, Center for Resuscitation Science
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- **SMART Biphasic** therapy has been rigorously studied and is supported by substantial peer-reviewed, published data. It has been clinically proven to deliver high first shock efficacy for long-downtime SCA patients, as well as to effectively defibrillate across the full spectrum of patients, including those considered "difficult-to-treat." [1-5]
- **Q-CPR** measurement and feedback tool is supported by more published data than any other CPR quality improvement tool. It has been demonstrated to improve CPR and patient outcomes. [6]
- **Quick Shock** enables fast time to shock. Delivering a shock quickly after chest compressions is critical as the benefits of CPR – oxygenated blood delivered to the vital organs – dissipate in seconds. [7,8]
- **Therapeutic Hypothermia** has been shown to improve outcomes when delivered early after an ischemic event. [9,10,11,12,13] The MRx has core temperature monitoring and trending to support cooling protocols. And, Philips offers advanced in-hospital temperature modulation therapy with its InnerCool family of products.

Shock 1 delivered
Real time: 10/9/2007 16:04:51
Elapsed time: 000:02:29.435
Shock number: 1
Energy: 152.5 joules
Patient impedance: 72.1 ohms
Peak current: 24.0 amps
HR: 171 bpm
Respiration rate: -?- rpm
EtCO2: 20 mmHg
SpO2: -?- %
Pulse rate: -?- bpm

HeartStart Event Review Pro captures and stores the entire code for post-event review to help your team reach its full potential for saving more lives. This breakthrough application provides a robust, insightful view of a resuscitation event, along with built-in, easy-to-use navigation to pinpoint areas in a specific patient's code event for learning and improvement.

therapies

Q-CPR: CPR quality improvement tool

The **Philips Q-CPR** measurement and feedback tool is supported by more published research than any other CPR quality improvement tool and is available as a fully integrated option with the HeartStart MRx.

Our next-generation Q-CPR has been enhanced based on new research and input from current customers. It is now available with the new award-winning, digital Q-CPR Meter, which enables you to rapidly adjust performance by displaying dynamic, real-time feedback for each compression, directly on the patient's chest. Voice prompts are also available and can be configured based on your preference.

Reinforce effective CPR

A study used the HeartStart MRx with Q-CPR during actual cardiac arrest events to provide real-time feedback and simultaneously capture performance data. When medical professionals participated in weekly debriefing sessions, improvements were shown in CPR performance, which correlated with an increase in return of spontaneous circulation (ROSC).[6]

As this study demonstrated, continuous CPR training and improvement are the cornerstone of a successful CPR quality improvement program. Philips robust data management program, **HeartStart Event Review Pro**, captures the Q-CPR data and supports system-wide quality improvement.

"Real-time measurement and feedback on CPR performance with follow-up debriefing helps improve CPR quality and could truly make a difference in out-of-hospital arrest outcomes."

Dr. Benjamin S. Abella
Clinical Research Director
Center for Resuscitation Science
University of Pennsylvania
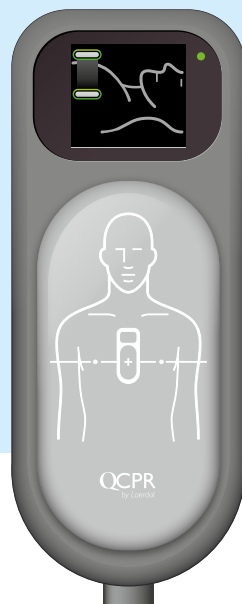
Hitting the mark.
Good compressions.
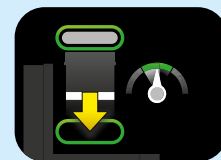
Compress faster.

Compress deeper.

The Q-CPR meter helps ensure that every compression meets depth, rate, and complete release targets to help improve the patient's chance of survival and increase the opportunity for a complete neurological recovery.

Connected Care

Our goal is operational efficiency, enabling you to focus more on patient care and less on moving data during treatment and transport. We do this through our open data management approach called, "Connected Care," which means timely transmission of data, open integration to streamline information flow, and quality debriefing to help you and your medics continuously improve your emergency response services.

With Philips, you have many options to help optimize your operation:
- Whatever your workflow, print, display, fax, email, Bluetooth or Ethernet, we can accommodate it.
- Flexible, fast, and reliable solutions ensure data gets to the next level of care.
- Reliable and trackable automated download and delivery solutions mean no files or data are left behind and reduces medic involvement in administrative tasks so you can focus on more important activities.
- Only the HeartStart MRx moves data at LAN speed, which enables rapid downloads and faster device return-to-service times.
- Automatic time setting ensures the HeartStart MRx is in sync with the system of record from "911 call" to "device on".

"With the MRx, we can now capture all patient data in one place from "device on" through transport. We can query key data points in seconds, which used to take us hours or days and a lot of manual work. With better data, we are in a better position to improve our emergency response services."

Scott Isaacs
Division Chief of EMS
Indianapolis Fire Department

MRx basic functions and optional features

Physical

Dimensions	Without external paddles: 12.4″ (W) x 8.3″ (D) x 11.7″ (H) (313 mm x 210 mm x 295 mm). With external paddles: 13.4″ (W) x 8.3″ (D) x 13.6″ (H) (340 mm x 210 mm x 345 mm).
Weight	13.2 lbs. (6 kg): base unit with 1 battery, pads, and pads cable. Carrying case adds 4.1 lbs. (1.86 kg). Paddle tray and external standard paddles add less than 2.5 lbs. (1.1 kg).

Environmental

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-M90 CSA, EN 60601-2-4

Display

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

Defibrillator

Model	HeartStart MRx (M3535A)
Waveform	Biphasic Truncated Exponential. 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 maximum energy, limited to 50 Joules for internal defibrillation. 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
Quick Shock	Less than 10 seconds from cessation of CPR to shock delivery
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

Strip chart printer

Printer	Standard: 50 mm (paper width) thermal array printer Optional: 75 mm (paper width) thermal array 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, Vital Signs Trending, Operational Check, Configuration, Status Log, and Device Information
Paper Size	1.97″ (50 mm) W by 100 ft. (30 m) L 2.95″ (75 mm) W by 100 ft. (30 m) L

Battery

Type	6.0 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%, 2 hours to 80%
Capacity	At least 5 hours of monitoring with ECG, SpO_2, CO_2, temperature and two invasive pressures monitored continuously, NBP measured every 15 minutes, and 20 200J discharges (with a new, fully charged battery, operating at room temperature, 25° C). At least 3.5 hours of monitoring with ECG, SpO_2, CO_2, temperature and two invasive pressures monitored continuously, NBP measured every 15 minutes, and pacing at 180ppm at 160mA.
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)

Data storage

Internal	12 hours of continuous ECG waveforms and events, maximum capacity of 55 event summaries
Data Card	60 event summary reports or 240 megabytes of patient data

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, Pacer not capture, Pacer not pacing
ECG Size	2.5, 5, 10, 20, 40 mm/mV, autogain

Available options

Noninvasive pacing	SpO_2 pulse oximetry
Noninvasive blood pressure	CO_2 monitoring
Invasive blood pressure (2 lines)	Continuous temperature monitoring
12-lead acquisition	12-lead transmission
Q-CPR measurement and feedback	Audio recording
ACI-TIPI & TPI predictive instruments	Periodic clinical data transmission
Batch/LAN data transfer	

For detailed specifications see the HeartStart MRx product description document. Application notes are also available to describe the advanced features of the HeartStart MRx.

**Philips Healthcare is part of
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How to reach us
www.philips.com/healthcare
healthcare@philips.com
fax: +31 40 27 64 887

Asia
+852 2821 5888

Europe, Middle East, Africa
+49 7031 463 2254

Latin America
+55 11 2125 0744

North America
+1 425 487 7000
800 285 5585 (toll free, US only)

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