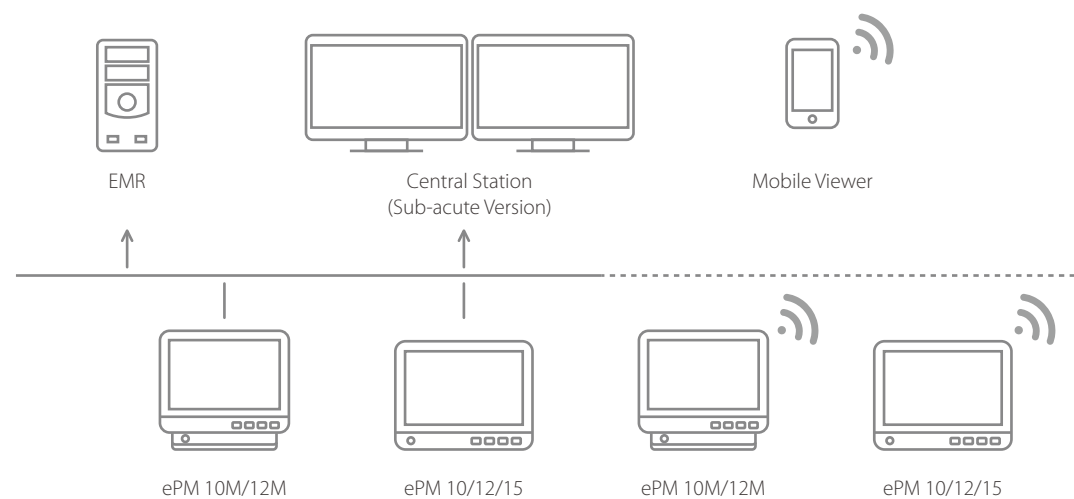# Valuable and Accessible IT Solutions

Mindray ePM devices can connect to the Central Monitoring Station (CMS) and eGateway through both wired and wireless networks, as well as interfacing with third-party electronic medical records (EMR) via HL7 output directly.

The ePM helps enhance clinical work flow and efficiency with it's flexible yet reliable connectivity capabilities.

- The View Other Patient function allows caregivers to see, in real-time, up to 12 other beds on a single ePM screen. This seamless information exchange between bedside monitors can help caregivers view all their patients at once, without the need for CMS.
- With the ePM Caregroups function caregivers can quickly find and review their assigned patients or ward when connected to the CMS.

Data from ePM devices can be easily connected to the CMS and Mobile Viewer, giving clinicians access to their patient data anytime and anywhere in the hospital.

- The CMS Early Warning Scores (EWS) dashboard provides an intuitive display of patient status, with dynamic updates pushed to the Mobile Viewer, alerting caregivers to changes in patient conditions and potential risk of deterioration.

EMR   Central Station (Sub-acute Version)   Mobile Viewer

ePM 10M/12M   ePM 10/12/15   ePM 10M/12M   ePM 10/12/15

ePM 10/12/15
Compact Patient Monitor

The evolution of simplicity

mindray
healthcare within reach

Inspired by the needs of customers, Mindray patient monitors adopt advanced technologies and transform them into accessible innovation. The ePM delivers excellent visual experience, intelligent operation, accurate physiological measurements, smooth workflow and comprehensive connectivity options for demanding hospital settings, such as Emergency Rooms, Recovery Units, Sub-acute Units and General Wards.
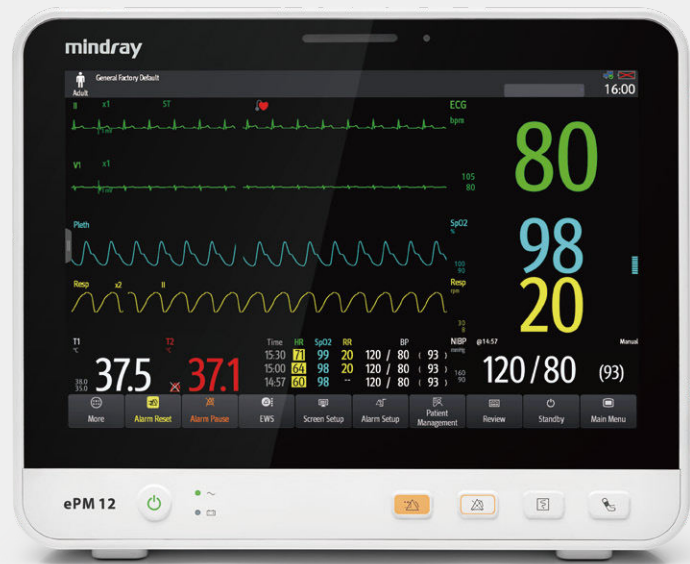
Minimalist Design

Multi-touch capacitive screen
Supports gestures operations

170° Wide viewing angle
Makes display more visible

1280x800 pixel (10.1"/12.1")
1366x768 pixel (15.6")
Provides HD visual experience

Auto brightness
Reduces light interference at night

Fanless design
Reduces the risk of cross-contamination

Durable and robust casing
Validated for cleaning with 49 leading disinfectants

Extensive Data Storage at the Bedside

2400 hrs
Trends @ 10 minutes

48 hrs
Full disclosure waveforms for all parameters

3000 sets
NIBP measurement

2000 sets
Events

400 sets
OxyCRG events

Note: These are the Maximum storage capacity of ePM devices with 16G storage.

Thoughtful Design for Cleaning

- Ergonomic, concealed handle without cleaning blind spot
- Streamlined design makes cleaning easier
- Screen lock for easy cleaning

Flexible Mounting Solutions

- A wide range of mounting solutions designed for various clinical settings
- The release mechanism allows for quick removal from the wall mount or rolling stand for transport

# Accurate, Reliable Parameters

Comprehensive Monitoring

Integrated Platinum^{TM} MPM parameters:
3/5/12-lead ECG, respiration, SpO$_2$*, temperature and NIBP.

- Multi-lead(4) ECG algorithm with ST & QT analysis
- Low perfusion SpO$_2$ algorithm
- Fast, accurate and motion tolerant NIBP algorithm, validated by British Hypertension Society (BHS)

Wide measurement range and anti-interference performance ensures excellent parameter accuracy and reliability.

The ePM also provides advanced parameter options:
2-ch invasive blood pressure, EtCO$_2$ and cardiac output measurement, making it suitable for a wide range of clinical settings.

Legend: Mindray Sys | Mindray Dia | ESH standard

	<±5mmHg	<±10mmHg	<±15mmHg
Mindray Sys	73%	94%	100%
Mindray Dia	79%	95%	98%
ESH standard	61%	76%	91%

Validated NIBP Technology
BHS evaluation results of NIBP accuracy

Mindray provides 3 options of SpO$_2$ measurement, Mindray, Masimo and Nellcor. For further information about the availability of Masimo and Nellcor SpO$_2$, please contact with your local sales representitives.
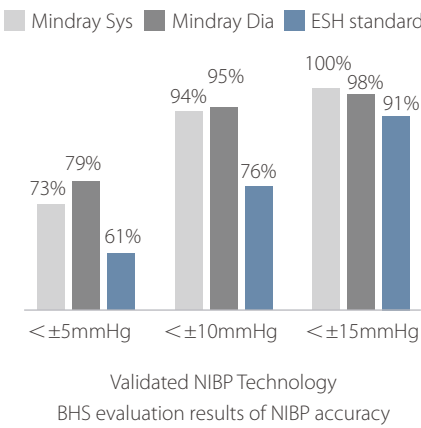
Reduce False Alarms with CrozFusion^{TM}

Innovative multi-parameter alarm analysis can reduce false arrhythmia alarms and promote the accuracy of heart rate and pulse rate, and help to alleviate alarm fatigue.

↑ > 30%
Accuracy of HR & PR

↓ 65%
before
after
False lethal arrhythmia alarm

↓ 50%
before
after
False arrhythmia alarm
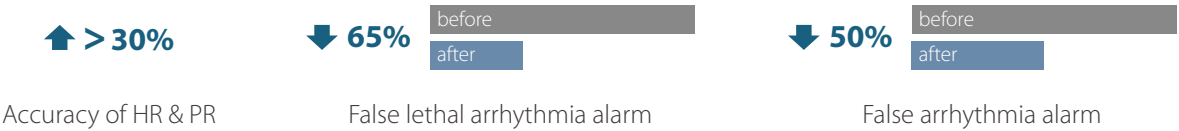
Note: The results are based on an evaluation by Mindray multi-parameter fusion database.

Intelligent Alarm Strategy

- Alarm highlight: Using special fatal alarm sound. Highlight the fatal alarm
- Alarm limits recommendation: Support personaliz threshold settings for different patients based on
- ARR Alarm refractory period: Avoid repeated mea alarm
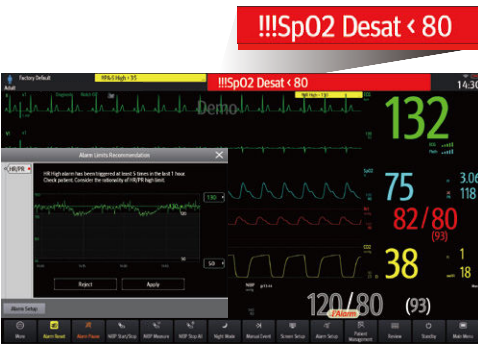
Simplicity at Your Fingertips

Intelligent Operation Experience

- Operate with gestures, just like a tablet PC
- Access to the most common functions in 2 steps or fewer
- Quickly identify disconnected sensors with the innovative AlarmSight technology
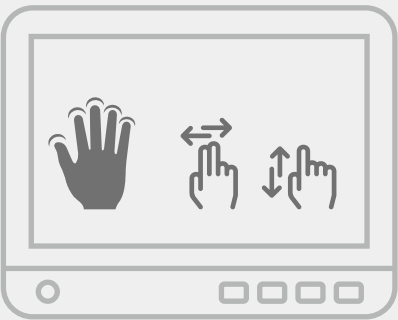
Smooth Workflow

Based on clinical insight, the ePM has optimized workflows to support caregivers at the bedside, swiping the touchscreen to switch between commonly used functions and interfaces, enabling clinical tasks to be completed quickly and accurately.

View from a distance
Intuitive big numerics

View at bedside
Highlights abnormal readings

Ward rounds or nurses hand over
Quickly review the patient status changes

Review and analyze
24hrs waveform review and critical alarms

Early Warning Scoring (EWS)

Mindray ePM monitors provide a point-of-care EWS calculator to help clinicians track and document signs of patient deterioration, aiding faster and more informed patient care decisions.

- Compliant with the National Early Warning Score (NEWS), National Early Warning Score 2 (NEWS2) and Modified Early Warning Score (MEWS) protocols
- Alternatively, create custom protocols to suit your hospital requirements
- Intuitive layout and trends review helps caregivers visualize data quicker
- Automate EWS calculations quickly at the bedside
- Display score escalation instructions on-screen to remind caregivers make rapid care decisions
- Integration to the Electronic Medical Record (EMR) for fast, accurate electronic vitals and early warning scoring documentation
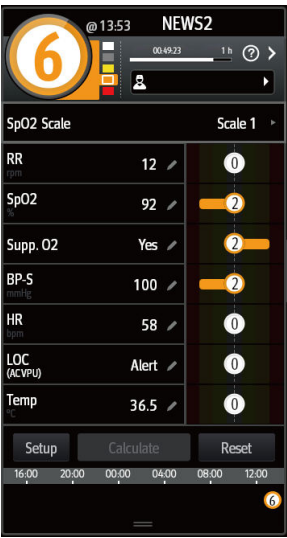
The Early Warning Score tool, as displayed on ePM devices

Clinical Assistive Applications (CAA)

The ePM provides efficient Clinical Assistive Applications (CAA) to help support safe and efficient decision making in mid-acuity and general ward areas.

ST Graphic ™

Glasgow Coma Scale

24 hours ECG summary

Supporting Safety in Neonates

Targeted Goal Screen

- Target parameter dashboard, visualized goal management such as oxygen therapy.
- 24 hours of target parameter statistics helps caregivers to evaluate the treatment effects
- Target parameter trend helps clinicians to identify patient situaiton. Highlighted part is combined with certain bar in the histogram

OxyCRG

- Effectively identify apnea of prematurity as ABD event
- Detailed and complete records of events help caregivers quickly identify the cause

mindray
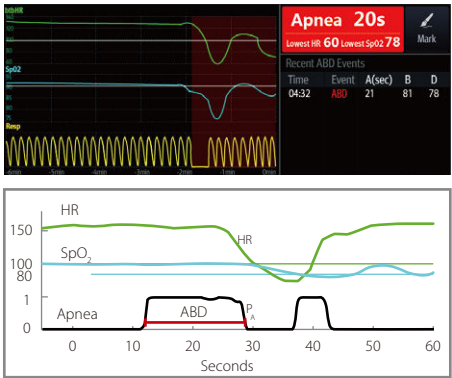
ePM 10/12/15

Patient Monitor

Data Sheet

Physical Specifications

Weight	ePM 10: 3.2 kg
	ePM 12: 3.4 kg
	ePM 15: 4.9 kg
	(Standard configuration,
	excluding recorder, battery and accessories.)
Size	ePM 10: 271 x 226 x 173 mm
	ePM 12: 312 x 258 x 174 mm
	ePM 15: 397 x 293 x 181 mm
Display screen	Capacitive screen, support multi-touch operation.
	ePM 10: 10.1-inch, 1280 x 800 pixels
	ePM 12: 12.1-inch, 1280 x 800 pixels
	ePM 15: 15.6-inch, 1366 x 768 pixels
Display channel	ePM 10: Up to 8 waveform channels
	ePM 12: Up to 10 waveform channels
	ePM 15: Up to 12 waveform channels

ePM 10 main unit complies with the requirements of 6.3.4.3, EN1789

Drop test	0.75m for each of the 6 surfaces (ePM 10)

ECG

Meet standards of IEC 60601-2-27 and IEC 60601-2-25.

Lead set	3-lead: I, II, III
	5-lead: I, II, III, aVR, aVL, aVF, V
	** 6-lead: I, II, III, aVR, aVL, aVF, Va, Vb
	12-lead: I, II, III, aVR, aVL, aVF, V1 to V6

Automatic 3/5/6/12 - lead recognition.

Input signal range	± 10 mV (p-p)
Electrode offset potential tolerance	± 800 mV
Sweep speed	6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Gain	x 0.125, x 0.25, x 0.5, x 1, x 2, x 4, auto
Waveform format	Standard, Cabrera
Bandwidth	Diagnostic mode: 0.05 to 150 Hz
	Monitor mode: 0.5 to 40 Hz
	Surgical mode: 1 to 20 Hz
	ST mode: 0.05 to 40 Hz
CMRR	Diagnostic mode: > 90 dB
	Monitor, Surgical, ST mode: > 105 dB
Pace detection	Amplitude: ± 2 mV to ± 700 mV
	Width: 0.1 to 2 ms
	Rise time: 10 to 100 μs
Defib. protection	Withstand 5000V (360J) defibrillation
Recovery time	<5 s
Multi-lead(4) algorithm	Yes

Provides Glasgow resting 12-lead ECG algorithm, and 12-lead ECG is not available for ePM 10

Heart Rate

HR rang	Adult: 15 to 300 bpm
	Pediatric/Neonate: 15 to 350 bpm
HR accuracy	± 1 bpm or ± 1%, whichever is greater.
HR resolution	1 bpm

Arrhythmia Analysis

Intended use for adult, pediatric and neonate.

Multi-lead, 27 classifications. Asystole, VFib/VTac, Vtac, Vent. Brady, Extreme Tachy, Extreme Brady, Vrhythm, PVCs/min, Pauses/min, Couplet, Bigeminy, Trigeminy, R on T, Run PVCs, PVC, Tachy, Brady, Missed Beats, PNP, PNC, Multif. PVC, Nonsus. Vtac, Pause, Irr. Rhythm., Afib (for adult only), SVT, SVCs/min.

ST Segment Analysis

Intended use for adult, pediatric and neonate.

ST range	- 2.5 to + 2.5 mV
ST accuracy	± 0.02 mV or ± 10%, whichever is greater (- 0.8 to + 0.8 mV)
ST resolution	0.01 mV

QT Analysis

Intended use for adult, pediatric, and neonate.

Parameters	QT, QTc, ΔQTc
QTc formula	Bazett, Fridericia, Framingham, or Hodges
QT/QTc range	200 to 800 ms
QT accuracy	± 30 ms
QT resolution	4 ms
QTc resolution	1 ms
QT-HR range	Adult: 15 to 150 bpm
	Pediatric/Neonate: 15 to 180 bpm

Respiration

Lead	I or II, auto
RR range	0 to 200 rpm
RR accuracy	± 1 rpm (0 to 120 rpm)
	± 2 rpm (121 to 200 rpm)
RR resolution	1 rpm
Sweep speed	3 mm/s, 6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Apnea time	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 s

SpO$_2$

Meet standards of ISO 80601-2-61.

Module	Mindray, Masimo, Nellcor
Range	0 to 100 %
Resolution	1%
Accuracy	
Mindray/Nellcor:	± 2 % (70 to 100%, Adult/Pediatric:)
	± 3 % (70 to 100%, Neonate)
	Unspecified (0 to 69%)
Masimo:	± 2 % (70 to 100%, Adult/Pediatric, non-motion)
	± 3 % (70 to 100%, Neonate, non-motion)
	± 3 % (70 to 100%, motion)
	Unspecified (1 to 69%)
Perfusion index (PI)	Yes, for Mindray/Masimo SpO$_2$
Pitch Tone	Yes
PR Refresh Rate	1 sec

PR

PR range	20 to 300 bpm (from Mindray/Nellcor SpO$_2$)
	25 to 240 bpm (from Masimo SpO$_2$)
	20 to 350 bpm (from IBP)
	30 to 300 bpm (from NIBP)
PR accuracy	± 3 bpm (20 to 300 bpm, from Mindray SpO$_2$)
	± 3 bpm (20 to 250 bpm, from Nellcor SpO$_2$)
	± 3 bpm (non-motion, from Masimo SpO$_2$)
	± 5 bpm (motion, from Masimo SpO$_2$)
	±1 bpm or ±1 %, whichever is greater (from IBP)
	± 3 bpm or ±3 %, whichever is greater (from NIBP)
Refreshing rate	≤ 1 s

Temperature

Meet standard of ISO 80601-2-56.

Technique	Thermal resistance
Channels	2 channels
Temp range	0 to 50 °C (32 to 122 °F)
Temp accuracy	± 0.1 °C or ± 0.2 °F (without probe)
Temp resolution	0.1 °C
Refreshing rate	≤ 1 s

NIBP

Meet standards of ISO 80601-2-30.

Technique	Oscillometry

Operation mode	Manual, Auto, STAT, Sequence
Parameters	Systolic, diastolic, mean
Max measurement time	Adult/Pediatric: 180 s, Neonate: 90 s
Systolic range	Adult: 25 to 290 mmHg
	Pediatric: 25 to 240 mmHg
	Neonate: 25 to 140 mmHg
Diastolic range	Adult: 10 to 250 mmHg
	Pediatric: 10 to 200 mmHg
	Neonate: 10 to 115 mmHg
Mean range	Adult: 15 to 260 mmHg
	Pediatric: 15 to 215 mmHg
	Neonate: 15 to 125 mmHg
NIBP accuracy	Max mean error: ± 5 mmHg
	Max standard deviation: 8 mmHg
NIBP resolution	1 mmHg
Assisting venous puncture	Yes

IBP

Meet standard of IEC 60601-2-34.

Channels	2 channels
Sensitivity	5 μV/V/mmHg
Impedance range	300 to 3000 Ω
IBP range	-50 to 360 mmHg
IBP accuracy	±1 mmHg or ±2 %, whichever is greater
IBP resolution	1 mmHg
PPV range	0 to 50 %
PAWP	Yes
ICP measurement	Yes

Support waveforms overlapping.

C.O.

Technique	Thermodilution
C.O. range	0.1 to 20 L/min
C.O. accuracy	±0.1 L/min or ±5%, whichever is greater
C.O. resolution	0.1 L/min
TB range	23 to 43 ℃
TI range	0 to 27 ℃
TB, TI accuracy	± 0.1 ℃ (without sensor)
TB, TI resolution	0.1 ℃

Artema Sidestream CO_2

Meet standard of ISO 80601-2-55.

CO_2 sample flow rate

    120 ml/min (DRYLINE II ™ watertrap for adult/pediatric)

    90/70 ml/min (DRYLINE II ™ watertrap for neonate)

CO_2 sample flow rate accuracy

	$\pm$ 15 ml/min or ±15 %, whichever is greater.
CO_2 response time	≤ 5.0 s @ 120ml/min (for adult/pediatric)
	≤ 4.5 s @ 90 ml/min (for neonate)
	≤ 5.0 s @ 70 ml/min (for neonate)
Sweep speed	3 mm/s, 6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
CO_2 range	0-150 mmHg
CO_2 accuracy	Full accuracy mode:
	0 - 40 mmHg: ± 2 mmHg
	41 - 76 mmHg: ± 5% of reading
	77 - 150 mmHg: ± 10% of reading
	ISO accuracy mode:
	Add ± 2 mmHg to the full accuracy mode
CO_2 resolution	1 mmHg
awRR range	0 to 150 rpm
awRR accuracy	± 1 rpm (0 to 60 rpm)
	± 2 rpm (61 to 150 rpm)
Apnea time	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 s

Oridion Microstream CO_2

Meet standard of ISO 80601-2-55.

Sample flow rate	50 $^{-7.5}_{+15}$ ml/min
Initialization time	30 s (typical)
Response time	2.9 s (typical)
Sweep speed	3 mm/s, 6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
CO_2 range	0 to 150 mmHg
CO_2 accuracy	±2 mmHg (0 to 38 mmHg)
	±5 % of the reading (0.08 % increased in error for every 1 mmHg if the reading is more than 38 mmHg) (39 to 150 mmHg)
awRR range	0 to 150 rpm
awRR accuracy	±1 rpm (0 to 70 rpm)
	±2 rpm (71 to 120 rpm)
	±3 rpm (121 to 150 rpm)
Apnea time	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 s

Capnostat Mainstream CO_2

Meet standard of ISO 80601-2-55.

Rise time	< 60 ms
Sweep speed	3 mm/s, 6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
CO_2 range	0 to 150 mmHg
CO_2 accuracy	±2 mmHg (0 to 40 mmHg)
	±5 % of the reading (41 to 70 mmHg)
	±8 % of the reading (71 to 100 mmHg)
	±10 % of the reading (101 to 150 mmHg)
awRR range	0 to 150 rpm
awRR accuracy	±1 rpm

Data Review

For 2G storage

Trends data	Up to 120 hours @ 1min
Events	Up to 1000 events, including parameter alarms, arrhythmia events technical alarms, and so on.
NIBP	Up to 1000 sets
Full disclosure	48 hours at Maximum. The specific storage time depends on the waveforms stored and the number of stored waveforms.

For 16G storage

Trends data	Up to 240 hours @ 1min, 2400 hours @ 10 min
Events	Up to 2000 events, including parameter alarms, arrhythmia events technical alarms, and so on.
NIBP	Up to 3000 sets
Full disclosure	48 hours for all parameter waveforms.

For 2G & 16G storage

Interpretation of resting 20 sets of 12-lead ECG results

OxyCRG	400 OxyCRG events
ST review	Up to 120 hours @ 1 min
Minitrend	Yes

Alarms

Audible indicator	Yes, 3 different alarm tones, and prompt tone
Visible indicator	Red/yellow/cyan LED, and alarm message display

Provide AlarmSight infographic alarm indicator.

Alarm limits recommendation   Yes

Alarm highlight: Support the alarm escalation. Using special fatal alarm sound. Highlight and optimize the fatal alarm display on the screen

Special Functions

Clinical Assistive Application (CAA): ST Graphic ™, EWS, GCS, 24h ECG summary, NIBP analysis, AF Summary.

Calculations (Drug, Hemodynamic, Oxygenation, Ventilation, Renal), and Titration table.

Wi-Fi Communications

Protocol	IEEE 802.11a/b/g/n
Modulation mode	DSSS and OFDM
Operating frequency	IEEE 802.11b/g/n (2.4G):
	ETSI/FCC/KC: 2.4 to 2.483 GHz
	MIC: 2.4 to 2.495 GHz
	IEEE 802.11a/n (5G):
	ETSI: 5.15 to 5.35 GHz, 5.47 to 5.725 GHz
	FCC: 5.15 to 5.35 GHz, 5.725 to 5.82 GHz
	MIC: 5.15 to 5.35 GHz
	KC: 5.15 to 5.35 GHz, 5.47 to 5.725 GHz, 5.725 to 5.82 GHz
Channel spacing	5 MHz @ 2.4 GHz, 20 MHz @ 5 GHz
Wireless baud rate	IEEE 802.11a: 6 to 54 Mbps
	IEEE 802.11b: 1 to 11 Mbps
	IEEE 802.11g: 6 to 54 Mbps
	IEEE 802.11n: 6.5 to 72.2 Mbps
Output power	< 20dBm (CE requirement: detection mode- RMS)
	< 30dBm (FCC requirement: detection mode- peak power)
Operating mode	Infrastructure
Data security	WPA-PSK, WPA2-PSK, WPA-Enterprise, WPA2-Enterprise (EAP-FAST. EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, PEAP-TLS, LEAP)
	Encryption: TKIP and AES

Interfacing

Main unit	AC power connector (1)
	VGA port (1)
	Network connector (1), RJ45
	USB 2.0 connector (2)
	Analog output/nurse call/defib. Sync. Port (1)
	Equipotential grounding terminal (1)
	DC-in connector and docking (1) for ePM 10
Barcode scanner	Support 1D and 2D barcode
Remote control	Support
Thermal recorder	3 traces (paper 50 mm width, 20 m length)
Network printer	Support

Power

Line voltage	100 to 240 VAC (±10 %)
Maximum current	2.0A
Frequency	50/60 Hz (±3 Hz)
Battery	Rechargeable lithium-ion battery, 2600mAh/4500mAh
	Rechargeable smart lithium-ion battery 5600mAh
	ePM 10/12/15 ≥ 2 hours run time (2600mAh)
	ePM 10/12/15 ≥ 4 hours run time (4500mAh)
	ePM 10 ≥ 6 hours run time (5600mAh x1)
	ePM 12/15 ≥ 6 hours run time (5600mAh x1)
	ePM 12/15 ≥ 9 hours run time (5600mAh x2)
Recharge time (power off)	2.5 hours to 90%(2600mAh)
	5 hours to 90% (4500mAh)
	5 hours to 90% (5600mAh x1)
	10 hours to 90% (5600mAh x2)

Environmental requirements

Temperature	Operating: 0 to 40 °C
	Storage: -30 to 70 °C (ePM 10)
	Storage: -20 to 60 °C (ePM 12/15)
Humidity	Operating: 15 to 95 % (non condensing)
	Storage: 10 to 95 % (non condensing)
Barometric	Operating: 427.5 to 805.5 mmHg (57 to 107.4 kPa)
	Storage: 120 to 805.5 mmHg (16 to 107.4 kPa)

Some of functions marked with an asterisk may not be available. Please contact your local Mindray sales representative for the most current information.

www.mindray.com

mindray
healthcare within reach

ePM Series

Patient Monitor

Operator's Manual

(Applicable for ePM 10/ePM 10A/ePM 10C/ePM 12/ePM 12A/ePM 12C/ePM 15/ePM 15A/ePM 15C)

CE 0123

Release time: January 2019

Revision: 3.0

9 Monitoring ECG, Arrhythmia, ST and QT

9.1 ECG Introduction

The electrocardiogram (ECG) measures the electrical activity of the heart and displays it on the monitor as waveforms and numerics. ECG monitoring provides 3-, 5-, and 6-lead ECG monitoring, ST-segment analysis, arrhythmia analysis, and QT/QTc measurements. The ePM 12/ePM 12A/ePM 12C/ePM 15/ePM 15A/ePM 15C monitor also provides 12-lead ECG monitoring.

9.2 ECG Safety Information

WARNING

- **This equipment is not intended for direct cardiac application.**
- **Make sure the conductive parts of electrodes and associated connectors, including the neutral electrode, do not contact any other conductive parts including earth.**
- **Use defibrillation-proof ECG cables during defibrillation.**
- **Do not touch the patient or metal devices connected to the patient during defibrillation.**
- **To reduce the hazard of burns during high-frequency surgical procedure, ensure that the monitor's cables and transducers never come into contact with the electrosurgery unit (ESU).**
- **To reduce the hazard of burns during use of high-frequency surgical unit (ESU), the ECG electrodes should not be located between the surgical site and the ESU return electrode.**

CAUTION

- **Only use parts and accessories specified in this manual. Follow the instructions for use and adhere to all warnings and cautions.**
- **Periodically inspect the electrode application site to ensure skin integrity. If the skin quality changes, replace the electrodes or change the application site.**
- **Interference from ungrounded instrument near the patient and electrosurgery interference can induce noise and artifact into the waveforms.**

9.3 ECG Display

The following figures show the ECG waveform and numeric areas. Your display may be configured to look slightly different.
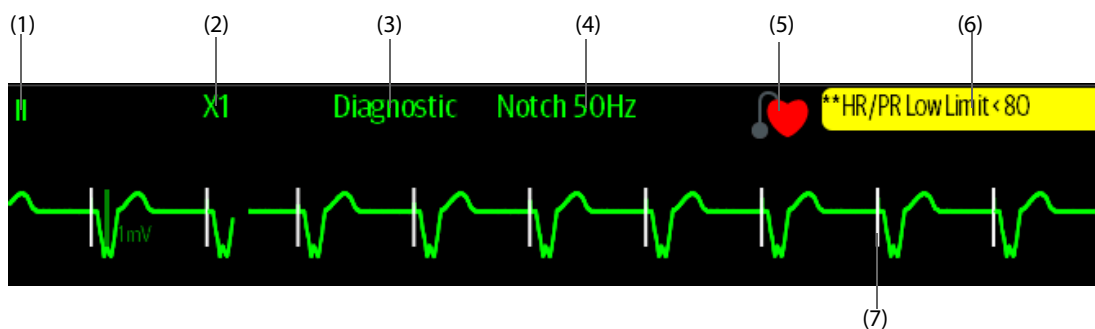
9.4.4.5 10-leadwire Electrode Placement (for ePM 12/ePM 12A/ePM 12C/ePM 15/ePM 15A/ePM 15C)

12-lead ECG uses 10 electrodes, which are placed on the patient's four limbs and chest. The limb electrodes should be placed on the limb extremities and the chest electrodes placed according to the physician's preference. The picture at the right shows the conventional 10-leadwire electrode placement.
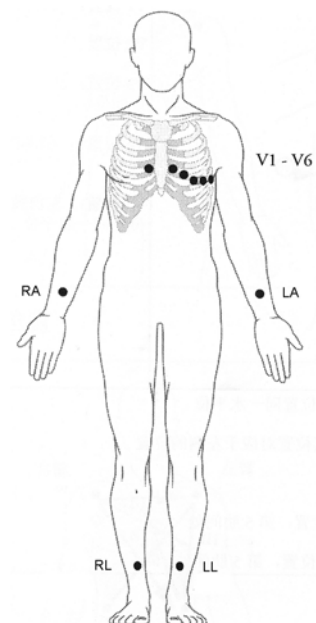
9.4.4.6 Lead Placement for Surgical Patients

The surgical site should be taken into consideration when placing electrodes on a surgical patient. For example, for open-chest surgery, the chest electrodes can be placed on the lateral chest or back. To reduce artifacts and interference from electrosurgical units, you can place the limb electrodes close to the shoulders and lower abdomen and the chest electrodes on the left side of the mid-chest. Do not place the electrodes on the upper arm. Otherwise, the ECG waveform will be very small.

9.4.5 Choosing the ECG Lead Type

To choose ECG lead type, follow this procedure:

1. Select the ECG numeric area or waveform area to enter the **ECG** menu.
2. Select the **Setup** tab.
3. Set **Lead Set** according to the lead type you are going to use. The default lead type is **Auto**. In this case, the monitor automatically detects the lead type.

- **Before defibrillation, the user must ensure both defibrillator and monitor has passed the system test and can be safely used together.**

9.13   ECG Troubleshooting

This section lists the problems that might occur. If you encounter problems when using the monitor or accessories, check the table below before requesting for services. If the problem persists after you have taken corrective actions, contact your service personnel.

Problem	Corrective Actions
Noisy ECG traces	1. Check that electrodes are not detached or dry. Replace with fresh and moist electrodes if necessary. 2. Check that leadwires are not defective. Replace leadwires if necessary. 3. Check that patient cable or leadwires are routed too close to other electrical devices. Move the patient cable or leadwires away from electrical devices.
Excessive electrosurgical Interference	Use ESU-proof ECG cables. For more information, see *28.1 ECG Accessories*.
Muscle Noise	Inadequate skin preparation, tremors, tense subject, and/or poor electrode placement. 1. Perform skin preparation again and re-place the electrodes. For more information, see *9.4.1 Preparing the Patient Skin* and *9.4.2 Applying Electrodes*. 2. Apply fresh, moist electrodes. Avoid muscular areas.
Intermittent Signal	1. Check that cables are properly connected. 2. Check that electrodes are not detached or dry. Perform skin preparation again as described in *9.4.1 Preparing the Patient Skin* and apply fresh and moist electrodes. 3. Check that the patient cable or leadwires are not damaged. Change them if necessary.
Excessive alarms: heart rate, lead fault	1. Check that electrodes are not dry. Perform skin preparation again and re-place the electrodes. For more information, see *9.4.1 Preparing the Patient Skin* and *9.4.2 Applying Electrodes*. 2. Check for excessive patient movement or muscle tremor. Reposition the electrodes. Replace with fresh and moist electrodes if necessary.
Low Amplitude ECG Signal	1. Check that the ECG gain is not set too low. Adjust the gain as required. For more information, see *9.6 Changing ECG Settings*. 2. Perform skin preparation again and re-place the electrodes. For more information, see *9.4.1 Preparing the Patient Skin* and *9.4.2 Applying Electrodes*. 3. Check electrode application sites. Avoid bone or muscular area. 4. Check that electrodes are not dry or used for a prolonged time. Replace with fresh and moist electrodes if necessary.
No ECG Waveform	1. Check that the ECG gain is not set too low. Adjust the gain as required. For more information, see *9.6.4 Changing ECG Wave Settings*. 2. Check that the leadwires and patient cables are properly connected. 3. Change cable and lead wires. 4. Check that the patient cable or leadwires are not damaged. Change them if necessary.
Base Line Wander	1. Check for excessive patient movement or muscle tremor. Secure leadwires and cable. 2. Check that electrodes are not detached or dry and replace with fresh and moist electrodes if necessary. For more information, see *9.4.1 Preparing the Patient Skin* and *9.4.2 Applying Electrodes*. 3. Check for ECG filter setting. Set ECG Filter mode to **Monitor** to reduce baseline wander on the display.

10.4.2 Setting the Baseline Drift Removal

The baseline drift removal (BDR) suppresses most baseline drift interference and also is able to preserve the fidelity of the ST-segment level. BDR is switched on by default. To set the BDR, follow this procedure:

1. On the ECG 12-Lead screen, select the ECG numeric area or waveform area to enter the **ECG** menu.

2. Select the **Setup** tab.

3. Switch on or off **Baseline Drift Removal**. If BDR is switched off, the 0.05 Hz high pass filter is used.

NOTE

- **BDR introduces around 1-second delay. We recommend using BDR except when the delay is unacceptable.**

10.5 Glasgow Resting 12-lead ECG Analysis Algorithm Settings

For the Glasgow algorithm, besides filter mode, BDR, and waveform layout, you can also perform the following operation:

■ Editing patient information

■ Changing tachycardia and bradycardia thresholds.

■ Setting the 12-lead ECG report

10.5.1 Editing Patient Information (For Glasgow Algorithms)

Some patient information may directly affect ECG analysis. Complete and correct patient information is helpful for accurate diagnosis and treatment of the patient. Enter patient information before taking an ECG measurement.

To enter patient information, follow this procedure:

1. On the ECG 12-Lead screen, select **Setup** to enter the **12-Lead Setup** menu.

2. On the **Patient Demographics** page, input or edit patient information.

NOTE

- **Check that patient information is correct before resting 12-lead analysis.**

- **We recommend using pediatric lead placement V4R, V1, V2, V4 - V6 if the patient is under 16 years of age. Please record V4R using the V3 electrode. Also set V3 Electrode to V4R. This is a normal practice for a patient of this age.**

10.5.2 Setting Tachycardia and Bradycardia Thresholds (For Glasgow Algorithms)

To set tachycardia and bradycardia thresholds, follow this procedure:

1. On the ECG 12-Lead screen, select **Setup** to enter the **12-Lead Setup** menu.

2. Select the **Setup** tab.

3. Set **Tachy** and **Brady**.

NOTE

- **The tachycardia threshold only applies to patients whose age exceeds 180 days.**

- **The bradycardia threshold only applies to patients whose age exceeds 2191 days.**
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28 Accessories

The accessories listed in this chapter comply with the requirements of IEC 60601-1-2 when in use with the patient monitor. The accessory material that contacts the patients has undertaken the bio-compatibility test and is verified to be in compliance with ISO 10993-1. For details about the accessories, refer to the instructions for use provided with the accessory.

WARNING

- **Use accessories specified in this chapter. Using other accessories may cause damage to the monitor or not meet the claimed specifications.**
- **Single use accessories are not designed to be reused. Reuse may cause a risk of contamination and affect the measurement accuracy.**

CAUTION

- **The accessories may not meet the performance specifications if stored or used outside the specified temperature and humidity ranges. If accessory performance is degraded due to aging or environmental conditions, contact your service personnel.**
- **Check the accessories and their packages for any sign of damage. Do not use them if any damage is detected.**
- **Use the accessories before the expiry date if their expiry date is indicated.**
- **The disposable accessories shall be disposed of according to hospital's regulations.**

28.1 ECG Accessories

28.1.1 ECG Electrodes

Model	PN	Description	Applicable patient
31499224	0010-10-12304	Electrode Kendall, 10 pcs/package	Adult
2245-50	9000-10-07469	Electrode 3M, 50 pcs/package	Pediatric
1050NPSMKittycat	0681-00-0098-01	NEO Pre-wired Electrode radio Opaque	Neonate
1051NPSMKittycat	0681-00-0098-02	NEO Pre-wired Electrode radio Translucent	Neonate
SF06	040-002711-00	Electrode, 5 pcs/package	Adult
SF07	040-002833-00	Electrode, Intco	Pediatric, neonate
H124SG	900E-10-04880	Electrode, Kendall, 50 pcs/package	Neonate
EMG-SN10-20×20	040-003254-00	NEO Pre-wired Electrode radio Translucent, AHA	Neonate
EMG-SN10-20×20	040-003255-00	NEO Pre-wired Electrode radio Translucent, IEC	Neonate
EMG-SN09-20×28	040-003251-00	NEO Pre-wired Electrode radio Translucent, AHA	Neonate
EMG-SN09-20×28	040-003252-00	NEO Pre-wired Electrode radio Translucent, IEC	Neonate

Accuracy	±0.1 °C or ±0.2 °F (excluding probe error)	
Refreshing rate	≤1 s	
Minimum time for accurate measurement	Body surface: <100 s Body cavity: <80 s	
Recovery time	<15 s (after defibrillation)	
Alarm limit	**Range**	**Step**
TXX High (XX refers to temperature site)	(low limit +1.0) to 50.0 °C (low limit +2.0) to 122.0 °F	0.1 °C 0.1 °F
TXX Low (XX refers to temperature site)	0.1 to (high limit - 1.0) °C 32.2 to (high limit - 2.0) °F	
TD High	0.1 to 50.0 °C 0.2 to 90.0 °F	

A.13.6   NIBP Specifications

Standard	Meet standard of ISO 80601-2-30			
Technique	Oscillometry			
Mode of operation	Manual, Auto, STAT, Sequence			
Auto mode repetition intervals	1, 2, 2.5, 3, 5, 10, 15, 20, 30, 60, 90, 120, 180, 240 or 480 min			
STAT mode cycle time	5 min			
Max measurement time	Adult, pediatric: 180 s Neonate: 90 s			
Heart rate range	30 to 300 bpm			
Measurement ranges (mmHg)		Adult	Pediatric	Neonate
	Systolic:	25 to 290	25 to 240	25 to 140
	Diastolic:	10 to 250	10 to 200	10 to 115
	Mean:	15 to 260	15 to 215	15 to 125
Accuracy	Max mean error: ±5 mmHg Max standard deviation: 8 mmHg			
Resolution	1mmHg			
Initial cuff inflation pressure range (mmHg)	Adult: 80 to 280 Pediatric: 80 to 210 Neonate: 60 to 140			
Default initial cuff inflation pressure (mmHg)	Adult: 160 Pediatric: 140 Neonate: 90			
Software overpressure protection	Adult: 297±3 mmHg Pediatric: 297±3 mmHg Neonate: 147±3 mmHg			
Static pressure measurement range	0 mmHg to 300 mmHg			
Static pressure measurement accuracy	±3 mmHg			
Recovery time	<15 s (after defibrillation)			
PR				
Measurement range	30 to300 bpm			

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Accessories and Consumables

CATALOGUE 2022.07

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Welcome to the Mindray Accessories Catalogue

This catalogue will provide you with the parts and accessories that connect to your Mindray Patient Monitor, Electrocardiograph, Defibrillator. Each Mindray product is the product of a special brand of patient focused, clinician-friendly design. For this reason, you can expect the same service, focus and quality with our parts and accessories.

Finding the Right Part

This catalog has been designed to make finding the right part easy. Chapters are organized by specific parameter categories. Simply locate the type of part you are looking for under the appropriate category.

Note:

This catalog is not an Operating Instructions Manual. This catalog will assist you in identifying the correct parts and accessories to connect to your Mindray product, please refer to the Operating Instructions Manual. Warnings, Precautions and Notes can also be found in the Operating Instructions.
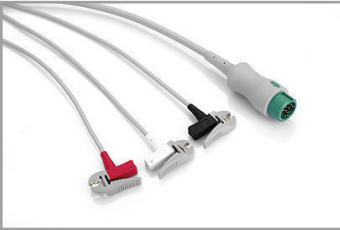
Integrated ECG Cables - AHA

For BeneVision, BeneView, ePM, iPM, uMEC, iMEC series monitors, BeneHeart defibrillator, uMED 20

Picture	Model	Part No.	No. Description	Purchasing Unit
	EA6251B	040-000961-00	ECG cable and wires (integrative): Adu/Ped, 12 Pin 5-Lead, Defib-Proof, AHA, Snap, 3.6 m	Each
	EA6231B	040-000965-00	ECG cable and wires (integrative): Adu/Ped, 12 Pin 3-Lead, Defib-Proof, AHA, Snap, 3.6 m	Each
	EA6251A	040-000960-00	ECG cable and wires (integrative): Adu/Ped, 12 Pin 5-Lead, Defib-Proof, AHA, Clip, 3.6 m	Each
	EA6231A	040-000964-00	ECG cable and wires (integrative): Adu/Ped, 12 Pin 3-Lead, Defib-Proof, AHA, Clip, 3.6 m	Each

Trunk Cables

- Easy to replace leadwires
- Meeting the requirements of EC53
- Outstanding shielding property and anti-interference performance, protecting ECG signal from being interfered
- Excellent defibrillation-proof performance, well protecting the equipment
- ESU-proof, ensuring ECG signals not interfered during operation Flexible and durable cables
- Outstanding cable material, enduring repeated cleaning and disinfection
- Latex free

For BeneVision, BeneView, ePM, iPM, uMEC, iMEC series monitors, BeneHeart defibrillator, uMED 20

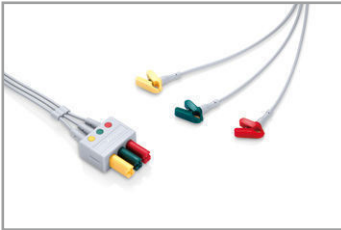| Picture	Model	Part No.	No. Description	Purchasing Unit
	EV6201	0010-30-42719 (009-004728-00)	ECG trunk cable: 3/5-lead, Adu/Ped, 12 Pin, Defib-Proof, AHA/IEC, 3 m	Each
	EV6211	0010-30-42723	ECG trunk cable: 3/5-lead, Adu/Ped, 12 Pin, ESU-Proof, AHA/IEC, 3 m	Each
	EV6202	0010-30-42720	ECG trunk cable: 3-lead, Ped/Neo, 12 Pin, Defib-Proof, AHA/IEC, 3 m	Each

ECG Leadwires – IEC

- Easy to replace trunk cables
- Meeting the requirements of EC53
- Outstanding shielding property and anti-interference performance, protecting ECG signal from being interfered
- Flexible and durable cables
- Outstanding cable material, enduring repeated cleaning and disinfection
- Latex free

Match with 3/5-lead cables (0010-30-42719, 0010-30-42723)

Picture	Model	Part No.	No. Description	Purchasing Unit
	EL6502A	0010-30-42728	5-Lead ECG wires, Clip, Adu, TPU, IEC, 0.6 m/1m	Each
	EL6504A	0010-30-42730	5-Lead ECG wires, Clip, Adu/Ped, TPU, IEC, long, 1m/1.4 m	Each
	EL6502B	0010-30-42736 (009-004730-00)	5-Lead ECG wires, Snap, Adu, TPU, IEC, 1m/1.4 m	Each

Picture	Model	Part No.	No. Description	Purchasing Unit
	EL6308B	0010-30-42733	3-Lead ECG wires, Snap, Adu/Ped, TPU, IEC, 1m	Each
	EL6304A	0010-30-42732	3-Lead ECG wires, Clip, Adu/Ped, TPU, IEC, 1m	Each

Match with 3-lead cables (0010-30-42720, 0010-30-42724)

Picture	Model	Part No.	No. Description	Purchasing Unit
	EL6306A	0010-30-42897	3-Lead ECG wires, Clip, Neo, TPU, IEC, 1m	Each

Electrode

- Latex free
- DEHP free
- Good biocompatibility, avoiding allergic reactions to patient

Picture	Model	Part No.	No. Description	Purchasing Unit
	31499224	0010-10-12304	Adult ECG Electrode (Kendall, Medi Trace 210)	10 pcs/pouch
	H124SG	900E-10-04880	Neonatal ECG Electrode (Kendall, H124SG)	50pcs/pouch
		040-002711-00	Adult ECG electrode (INTCO)	5 pcs/pouch

Picture	Model	Part No.	No. Description	Purchasing Unit
		040-002833-00	Pediatric/Neonatal ECG electrode (INTCO)	30 pcs/pouch

Match with 3-lead Neonatal cables (040-000754-00)

Picture	Model	Part No.	No. Description	Purchasing Unit
	0406062	040-003254-00	Disposable neonatal 3-lead pre-wired electrode, radio translucent, AHA, 60 cm	50 pouch/box (3 pcs/pouch)

SpO$_2$ Accessories

Mindray SpO$_2$ Accessories

Integrated SpO$_2$ Cable

For BeneVision, BeneView, ePM, iPM, uMEC, iMEC, VS series monitors, BeneHeart defibrillator

Picture	Model	Part No.	No. Description	Purchasing Unit
	512FLH	115-012807-00	Integrative reusable SpO$_2$ sensor, Adult, Finger, >30 kg, 3 m	Each
	518BLH	115-020887-00	Integrative reusable SpO$_2$ sensor, Neo, Foot (adult/pediatric, finger), <5 kg, 3 m	Each

Mindray SpO$_2$ Cable

For BeneVision, BeneView, ePM, iPM, uMEC, iMEC, VS series monitors, BeneHeart defibrillator

- Ergonomic design, precise engineering and clinical testing guaranteeing reliable measurement
- Well anti-electromagnetic interference, suitable for complex electrical environment
- Flexible and durable cables
- Outstanding cable jacket, enduring repeated cleaning and disinfection
- Easy to change sensor, meeting clinical requirements for patient use
- Latex free

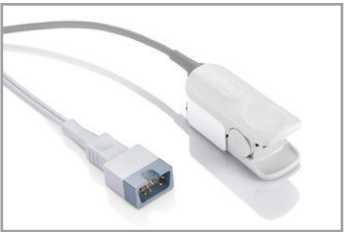| Picture	Model	Part No.	No. Description	Purchasing Unit
	562A	0010-20-42710 (009-004600-00)	Mindray SpO$_2$ extension cable, 7 Pin, 2.5 m	Each
	562B	040-001443-00	Mindray SpO$_2$ extension cable, 7 Pin, 1.2 m	Each

For Telemetry

Picture	Model	Part No.	No. Description	Purchasing Unit
	SAT 10	115-029488-00	Mindray SpO$_2$ module for BeneVision TM80, 6 Pin, 0.5 m	Each

Mindray SpO$_2$ Sensor

Finger-Clip Sensor (Reusable)

- Ergonomic design, precise engineering and clinical testing guaranteeing reliable measurement
- High quality photoelectric element, ensuring precise measurement
- Well anti-electromagnetic interference, suitable for complex electrical environment
- Perfect performance against light interference, can be used in environment of strong light
- ESU-proof, ensuring SpO$_2$ signals not interfered during operation
- Strict electric safety specification, guaranteeing safety for use
- Few pit structure, not easily staining, convenient for cleaning
- Outstanding cable jacket, enduring repeated cleaning and disinfection
- Latex free
- Good biocompatibility, avoiding allergic reactions to patient

Finger-Tip Sensor (Reusable)

- Ergonomic design, precise engineering and clinical testing guaranteeing reliable measurement
- High quality photoelectric element, ensuring precise measurement
- Well anti-electromagnetic interference, suitable for complex electrical environment
- Perfect performance against light interference, can be used in environment of strong light
- ESU-proof, ensuring SpO$_2$ signals not interfered during operation
- Strict electric safety specification, guaranteeing safety for use
- Silicone rubber sheath, not likely to break in case of drop, hardly sensor off
- Few pit structure, not likely staining, convenient for cleaning
- Outstanding cable jacket, enduring repeated cleaning and disinfection
- Latex free
- Good biocompatibility, avoiding allergic reactions to patient

For all Mindray SpO$_2$ Cables and PM-50/60 pulse oximeter

Picture	Model	Part No.	No. Description	Purchasing Unit
	512F	512F-30-28263	Reusable sensor, adult, finger-clip, 1.1 m, >30 kg	Each
	512H	512H-30-79061	Reusable sensor, pediatric, finger-clip, 1.1 m, 10-30 kg	Each

For all Mindray SpO$_2$ Cables and PM-50/60 pulse oximeter

Picture	Model	Part No.	No. Description	Purchasing Unit
	512E	512E-30-90390	Reusable sensor, adult, finger-tip, 1.1 m, >30 kg	Each
	512G	512G-30-90607	Reusable sensor, pediatric, finger-tip, 1.2 m, 10-30 kg	Each

Adapted with the tubing (6200-30-09688, 115-012522-00, 040-002712-00)

| Picture	Model	Part No.	No. Description	Purchasing Unit
	CM1905	040-000688-00	NIBP Cuff Tubing Adapter (Adult tubing to Neonate cuff)	Each

CM1200 Series

- Soft and comfortable. Low hazard to skin even if a long-term use
- Easy to clean. The cuff wrap can not be damped or stained by liquid if duly cleaned
- Pilling-proof. Not deform even if for long-term use
- TPU bladder ensures good air tightness and long life
- Latex free, PVC free
- Good biocompatibility, free from biological hazard to skin

Connected with the tubing 6200-30-09688, 115-012522-00 and 040-002712-00

Picture	Model	Part No.	No. Description	Purchasing Unit
	CM1200	115-002480-00	Reusable cuff, Small Inf, 7-13 cm	Each
	CM1201	0010-30-12157	Reusable cuff, Inf, 10-19 cm, with connector	Each

Picture	Model	Part No.	No. Description	Purchasing Unit
	CM1202	0010-30-12158	Reusable cuff, Child, 18-26 cm, with connector	Each
	CM1203	0010-30-12159	Reusable cuff, Adu, 25-35 cm, with connector	Each
	CM1204	0010-30-12160	Reusable cuff, Large Adu, 33-47 cm, with connector	Each
	CM1205	0010-30-12161	Reusable cuff, Thigh, 46-66 cm, with connector	Each

Temperature Accessories
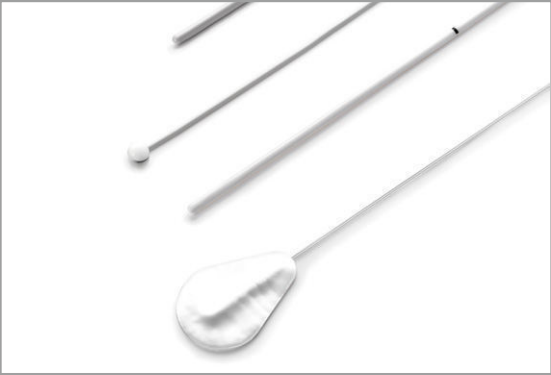
Reusable Temperature Probes

- Available in Rectal/Esophageal and Skin Surface Styles
- Flexible and durable cables
- Outstanding cable material, enduring repeated cleaning and disinfection
- Latex free
- Good biocompatibility, avoiding allergic reactions to patient

For BeneVision, BeneView, ePM, iPM, uMEC, iMEC series monitors, BeneHeart defibrillator

Picture	Model	Part No.	No. Description	Purchasing Unit
	MR401B	0011-30-37392	Reusable Temp Probe, Adu, Esophageal/Rectal, 2 Pin, 3 m	Each
	MR402B	0011-30-37394	Reusable Temp Probe, Ped/Neo, Esophageal/Rectal, 2 Pin, 3 m	Each
	MR403B	0011-30-37393	Reusable Temp Probe, Adu, Skin, 2 Pin, 3.6 m	Each
	MR404B	0011-30-37395	Reusable Temp Probe, Ped/Neo, Skin, 2 Pin, 3.6 m	Each