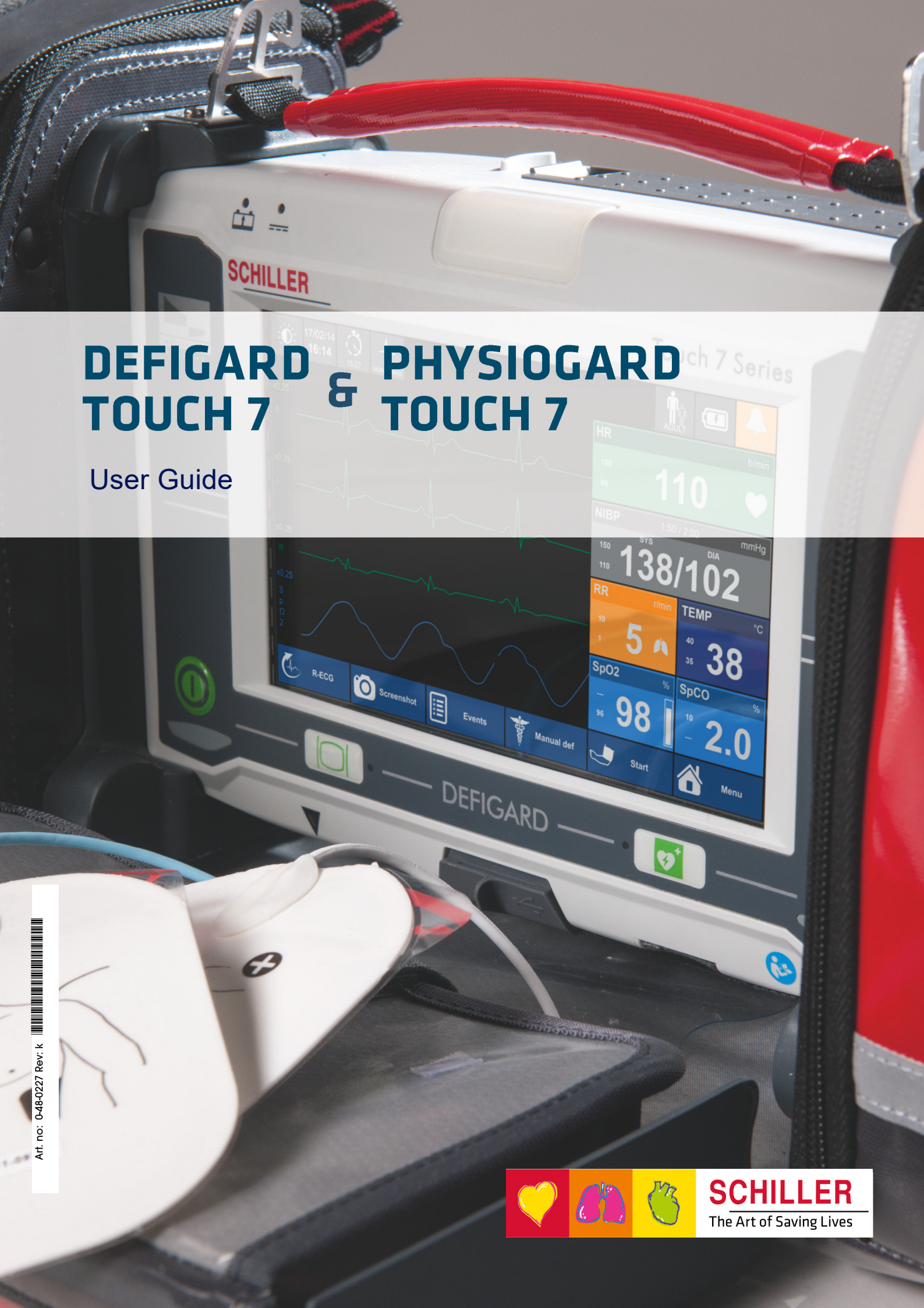

DEFIGARD TOUCH 7 & PHYSIOGARD TOUCH 7

User Guide

Art. no: 0-48-0227 Rev: k

SCHILLER
The Art of Saving Lives

Sales and Service Information

The SCHILLER sales and service centre network is world-wide. For the address of your local distributor, contact your nearest SCHILLER subsidiary.
In case of difficulty, you can find a complete list of all distributors and subsidiaries on our Internet site:
http://www.schiller.ch
Sales information can also be obtained from:
sales@schiller.ch

Manufacturer

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Art. no./revision:	Date	Note
0-48-0227 a	16.12.2014	Version a for testing
0-48-0227 b	3.06.2015	Updated version for validation
0-48-0227 c	1.09.2015	Updated version with minor changes
0-48-0227 d	7.04.2016	Add new feature CO_2 and PHYSIOGARD Touch 7 and other changes.
0-48-0227 e	25.01.2017	Adding correction according to Mantis. Add IBP and Pacemaker.
0-48-0227 f	3.11.2017	Update to Software revision 6
0-48-0227 g	8.02.2018	Adding correction according to Mantis.
0-48-0227 h	29.03.2019	Update to Software version 07
0-48-0227 i	05.05.2021	Update to Software version 08
0-48-0227 j	24.10.2022	Updates for accessories
0-48-0227 k	18.07.2023	Updates for accessories

CE 0459

The DEFIGARD Touch 7 bears the CE-0459 mark (Notified Body GMED), indicating its compliance with the essential requirements of Annex IX of the Medical Device Directive 93/42/EE regarding safety, functionality and labelling. The requirements apply to patients, users and third persons who come into contact with this device within the scope of its intended use. First declaration 26.04.2015.

The PHYSIOGARD Touch 7 bears the CE-0459 mark (Notified Body GMED), indicating its compliance with the essential requirements of Annex IX of the Medical Device Directive 93/42/EE regarding safety, functionality and labelling. The requirements apply to patients, users and third persons who come into contact with this device within the scope of its intended use. First declaration 7.04.2016

Article no.: Rev: k
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Translation: original
SW ≥ 10

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1 Safety Notes

- The **PHYSIOGARD Touch 7** is a monitor.
- The **DEFIGARD Touch 7** is an emergency monitor/defibrillator.

1.1 User Profiles

BLS Qualified medical personnel trained for Basic Life Support (BLS), semi-automatic defibrillation and Cardiopulmonary Resuscitation (CPR) on the **DEFIGARD Touch 7** may use the AED operating mode of the **DEFIGARD Touch 7**.

ACLS Qualified medical personnel trained for Advanced Cardiac Life Support (ACLS), trained on the use of the **DEFIGARD Touch 7** may use the manual defibrillator and AED operating modes of the **DEFIGARD Touch 7**.

Training An initial training of at least 30 minutes is necessary and sufficient to use the device.

1.2 Intended Use

Defibrillator

- ▲ The **DEFIGARD Touch 7** defibrillation function is for treating Ventricular Fibrillation (VT) and pulseless Ventricular Tachycardia (VT).
- ▲ Cardioversion in synchronised mode treats Atrial Fibrillation (AF), atrial flutter, unstable patient with supraventricular tachycardia and some stable VT.
- ▲ The defibrillation function can also be used for synchronised cardioversion of AF or ventricular arrhythmias.

Transcutaneous pacemaker

- ▲ The **DEFIGARD Touch 7** pacemaker function can be used as an alternative to endocardial stimulation for treating bradycardia.
- ▲ The pacemaker pulse is delivered using the same electrode pads (adult or child) used for defibrillation. The user defines the frequency and current of the pacemaker pulses. There are two pacemaker modes as follows:
  - – Fix: The pacemaker pulse is delivered at a fixed frequency and current level defined by the user.
  - – The user defines on-demand, current level and frequency. The unit monitors the ECG signal and generates pacemaker pulses if the pulse rate falls below the defined value.

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Monitoring

- Depending on their configuration, the monitoring function of the **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** delivers the most important parameters ECG, SpO_2, SpCO, SpMet, CO_2, NIBP, IBP and Temperature. It allows continuous patient monitoring from the beginning to the end of an intervention.
- The devices are intended for single-patient use only.
- The devices are designed to meet the specific needs of ground and air rescue services and in-house and inter-hospital transportation.
- The devices can be used with accessories for adults, children and neonates.

ECG

- The ECG is used to diagnose cardiac abnormalities, acute myocardial ischaemia and infarctions in chest pain patients.

NIBP

- The NIBP monitor is intended for use as an aid or adjunct to diagnosis and treatment when measuring an adult, child and neonate patient's blood pressure. NIBP monitoring can be used for male and female patients of all races.
- This NIBP can be used on pregnant patients or patients suffering from pre-eclampsia

IBP

- Invasive blood pressure: systolic, diastolic and mean pressure.

SpO_2, SpCO, SpMet

- The Masimo Rainbow SET Pulse CO sensor is indicated for use with adult and paediatric patients during both no-motion and motion conditions and for patients who are well or poorly perfused.

$EtCO_2$

- The IRMA mainstream sensor is intended to be connected to a patient breathing circuit for the continuous non-invasive monitoring of breath rate and inspired/expired gases during anaesthesia, recovery and respiratory care.
- The ISA gas analyser is intended to be connected to a patient breathing circuit for the continuous non-invasive sidestream monitoring of breath rate and inspired/expired gases during anaesthesia, recovery and respiratory care.
- The IRMA sensor is intended for the adult, paediatric and infant populations.
- The ISA sensor is intended for the adult, paediatric, infant and neonates populations.

1.3 Contraindication for Use

Defibrillation (DEFIGARD Touch 7)

- The defibrillator of the **DEFIGARD Touch 7** must not be used in automated mode (AED) when the person:
  - Is responsive
  - Is breathing normally
  - Has a pulse
- Do not use the device in or near Magnetic Resonance Imaging (MRI) equipment.
- **Danger of explosion.** The device must not be used in areas any danger of explosion exists. There might be a danger of explosion in areas where flammable products (petrol), flammable anaesthetic agents or skin cleaning/ disinfection products are in use or where the ambient air's oxygen concentration is higher than 25%.

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1.4 Known Side Effects

▲ Defibrillating and pacing a patient can cause:
  – Skin irritations or burns
  – Malfunction or damage of implanted pacemaker

➜ Refer to the detailed safety notes in section 5.1 Application guidelines and safety notes.

1.5 Responsibility of the User

▲ The numerical and graphical results and any interpretation given must be examined concerning the overall clinical condition of the patient and the general recorded data quality.

▲ The indications given by this equipment are not a substitute for regular checking of vital functions.

▲ Always ensure that the screen/alarm LED of the device can be seen in case the audible alarms cannot be heard or are turned off (refer to section 4.2.2 Operator's position).

▲ The AED of the **DEFIGARD Touch 7** must only be used if the following symptoms are present:
  – Not responsive
  – Not breathing normally
  – No pulse

▲ Check that the user has read and understood the user guide, especially these safety notes.

▲ Operating a device with a defective casing, cables, or sensors is dangerous to the patient or the user. Therefore:
  – Immediately replace a damaged unit, cables, sensors and connections. Damaged or missing components must be replaced immediately.

▲ The device, including the sensor and accessories, must be serviced regularly. Refer to section 10.1.1 Maintenance interval table.

▲ The **DEFIGARD Touch 7** is an emergency device and must be ready for operation at any time and in all situations. Check that the device is always equipped with a sufficiently charged battery and that a spare battery is at hand.

▲ Properly dispose of the packaging material and check it is out of children's reach.

1.6 Organisational Measures

▲ Before using the device, check that an introduction to the unit functions and safety precautions has been provided and understood.

▲ Always store the user guide at hand near the device. Check that the instructions are always complete, up-to-date and legible.

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1.7 Safety Conscious Operation

- ▲ This user guide, and all safety notes, must be read and observed.
- ▲ Danger of electric shock
  The energy applied to the patient can be conducted through the patient to other persons who may suffer a lethal electric shock. Therefore:
  - – Do not touch the patient, the electrodes or other conducting objects during defibrillation
  - – Do not defibrillate the patient in a puddle of water or on other conductive surfaces
  - – Switch the device off when it is no longer used.
- ▲ This equipment must only be connected to a mains supply with protective earth to avoid the risk of electric shock.
- ▲ For the patient's safety, it must be ensured that neither the electrodes, including the neutral electrode, the patient, nor persons touching the patient, come into contact with conducting objects, even if these are earthed.
- ▲ Immediately report any changes that impair safety (including operating behaviour) to the person responsible.
- ▲ Only connect original SCHILLER accessories to the device.
- ▲ Before switching the device on, check if the unit's casing and electrode connection are undamaged.
- ▲ Only operate the device per the specified technical data.
- ▲ Do not expose the device to large temperature variations over a long period. Major temperature variations can cause condensation of water within and on the device. Dry the unit and defibrillation electrodes, and all connections should condensing occur.
- ▲ In case of strong water/liquid spraying onto the device, check the absence of water/liquid in the battery compartment. Remove the battery, dry water from the compartment and replace the battery.
- ▲ Special caution must always be taken on the intracardiac application of medical equipment. Check that no conducting parts connected to the unit's isolated patient input (patient, plug, electrodes, sensor) come into contact with other, earthed conductive objects, as this might short-out the patient's isolation and remove the protection of the isolated input.
- ▲ Carefully route patient cabling to reduce the possibility of patient entanglement or strangulation.
- ▲ The user must always remain close to the patient during monitoring.
- ▲ Do not place the device where the patient can control the device.
- ▲ Position the device so it cannot fall on the patient or floor.
- ▲ Do not reuse disposable accessories marked with the symbol ⊗ to prevent cross-infection.
- ▲ If unexpected readings are obtained, the operator should check the connections and verify the readings according to section 10.2.5 Functional test and measured values.

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1.8 Operation with other Devices

- Use only accessories and other parts recommended or supplied by SCHILLER. Using other than recommended or supplied parts may result in injury, inaccurate information or damage to the device.
- The patient can be endangered by too high leakage currents (summation of leakage currents) if:
  - Several devices are connected to the patient
  - Other equipment is connected to the **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7**.

  For this reason, devices that are not required should be disconnected from the patient, and only equipment approved by SCHILLER may be connected to the device.
- Accessory equipment connected to the analogue and digital interfaces must be certified according to the respective IEC standards (for example, IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). In addition, all configurations shall comply with the valid version of the system standard IEC/EN 60601-1. Everyone who connects additional equipment to the signal input or output part configures a medical system and is therefore responsible for that the system complies with the requirements of the valid version of the system standard IEC/EN 60601-1. If in doubt, consult the technical service department or your local representative.
- Magnetic and electrical fields of X-ray equipment, tomographs, portable communication devices, HF radios and devices labelled with the  symbol can affect the operation of this device. (refer to section 10.9.3 Preventing electromagnetic interferences). Avoid using such devices or keep a sufficient distance from them.
- Magnets used to configure internal pacemakers may disturb the good functioning of the device, especially its defibrillation module. Therefore, do not place any magnet of any kind inside the bag of the unit.
- The charging of energy and the release of the defibrillation impulse can disturb other devices. Check these devices before their further use.
- Sensors and devices not defibrillation-proof must be disconnected from the patient before a shock is triggered.
- If the patient has a pacemaker implanted, do not position the electrode directly onto the pacemaker. Check the pacemaker after the defibrillation.
- The **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** can be used with high-frequency electrosurgical devices. However, precautions must be observed when such HF equipment is used. To reduce the risk of burns in the case of neutral HF electrode failure, a distance of at least 15 cm must always be kept between the defibrillation and HF surgical electrodes. If in doubt, disconnect the electrodes and sensors from the device while using an HF surgical device. In addition, it may affect the accuracy or availability of the oximeter measurements.

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1.9 Maintenance

- ▲ Danger of electric shock: Do not open the device; there are no serviceable parts inside. Refer servicing to qualified personnel only.
- ▲ No modification of this equipment, including sensors and accessories, is allowed.
- ▲ Before cleaning, switch the unit off and remove the battery.
- ▲ Do not use high-temperature sterilisation processes (such as autoclaving). Do not use E-beam or gamma radiation sterilisation.
- ▲ Do not use solvent or abrasive cleaners on the device or cable assemblies.
- ▲ Do not immerse the device or cable assemblies in liquid.

1.10 Hygiene

- ▲ For cleaning and disinfection, observe the legal requirements applicable.
- ▲ Only use cleaning agents and disinfectants recommended by SCHILLER. Unsuitable agents can damage the device. Clean and disinfect the device per the instructions given in this user manual.

1.11 Networks and Internet

- ▲ Appropriate security measures must be taken to protect stored patient data if the device is part of a LAN, WLAN, HIS or EMR, telephone network, Tx/Rx medium, exposed to the Internet or insecure network.
- ▲ SCHILLER takes no responsibility for the configuration of the Windows operating system.
- ▲ Patient data and network security are the user's sole responsibility.
- ▲ To guarantee the security of the network, SCHILLER recommends the following:
  - – Isolating the **DEFIGARD Touch 7** or **PHYSIOGARD Touch 7** network from other networks
  - – Defining access authorisation for the host system configuration is included. **DEFIGARD Touch 7** or **PHYSIOGARD Touch 7** so that no unauthorised alterations of the system are possible.
  - – Limiting the data transmission between the host and other systems/networks to a minimum

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1.12 Additional Terms

1.12.1 Implied authorisation

Possession or purchase of this device does not convey any express or implied license to use the device with unauthorised sensors or cables which would, alone or in combination with this device, fall within the scope of one or more of the patents relating to this device.

1.12.2 Terms of warranty

Your SCHILLER **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** is warranted against defects in material and manufacture according to the general term of conditions. This guarantee excludes damage caused by accident or as a result of improper handling. The warranty entitles free replacement of the defective part; any liability for subsequent damage is excluded. The warranty is void if unauthorised or unqualified persons attempt to make repairs.

Send the device to your dealer or the manufacturer in case of a defect. The manufacturer can only be held responsible for the safety, reliability, and performance of the apparatus if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorised by him.
- The **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** and the approved attached equipment are used per the manufacturer's instructions.

There are no express or implied warranties which extend beyond the warranties herein above set forth. SCHILLER makes no warranty of merchantability or fitness for a particular purpose to the product or parts thereof.

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1.13 Display Symbols and Indicators

1.13.1 Symbols used in this user guide

The safety level is classified according to ISO 3864-2. The following overview contains the safety symbols and pictorials used in this user guide.

⚠ DANGER	This symbol warns of possible direct danger, which could lead to severe personal injury or death.
⚠ WARNING	This symbol warns of a dangerous situation that could lead to severe personal injury or death.
⚠ CAUTION	This symbol warns of a dangerous situation that could lead to personal injury and/or indicate possible property damage.

For general safety notes, as listed in this section.

For electrical hazards, warnings or precautionary measures when dealing with electricity.

This symbol warns of dangerous situations that could damage property or system failure and provides other important user information.

Reference to other guidelines

Touch-sensitive areas

These symbols designate touch-sensitive areas and interactions that might not be self-evident.

Touch (to open/close menus and perform functions)

Move up or down

Move to the right or left

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1.13.2 Symbols used on the device

BF symbol. The device's signal input is defibrillation protected.

Signal input type CF. Highly isolated port, defibrillation protected. However, it is only defibrillation protected when used with the original SCHILLER accessories.

CE 0459

Notified body of the CE certification (GMED)

Caution. Consult the warning and safety information in the user guide.

- Symbol for the recognition of electrical and electronic equipment.
- The device must be disposed of in a municipally approved collection point or recycling centre when it is no longer required.
- Improper disposal harms the environment and human health due to the presence of dangerous substances in electrical and electronic equipment.

Manufacturer information

Manufacturing date

Reading the user guide is mandatory before using the **DEFIGARD Touch 7/ PHYSIOGARD Touch 7**

Devices with WLAN or cellular network

Attention: Non-ionising electromagnetic radiation environment. The device contains an HF transmitter.

The **DEFIGARD Touch 7/PHYSIOGARD Touch 7** radiates high-frequency electromagnetic energy during telemetric ECG data transfer and can disturb other devices if not installed and operated per the user guide.

However, even in the case of correct installation/operation, there is no guarantee that no interferences can occur.

If the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** causes interferences, these can be prevented by switching off or not sending ECGs.

The user can take the following measures to solve this problem:

- Increase the distance between the disturbed device and the **DEFIGARD Touch 7/ PHYSIOGARD Touch 7**. A minimum distance of 20 cm must be kept between the device and a pacemaker.
- Turn the device to change the antenna's angle of radiation.
- Connect the device to a different mains connector.

For more information, refer to section 10.9.3 Preventing electromagnetic interferences.

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IP55 The device is protected against dust and spraying water from all directions.

Dangerous voltage. Used for electrical dangers during defibrillation.

MD Medical device

1.13.3 Symbols used on the batteries

Common symbols


The unit/component can be recycled.


The Battery must not be disposed of with domestic refuse.


Do not dispose of it in a fire


Do not deform or damage


Do not open or dismantle


Do not short circuit

Expiry date of the primary Li-MnO_2 battery.

Power battery (Li-Ion)


Rechargeable Lithium (Li-Ion) battery


Storage temperature for the power battery:
Unlimited: -10 to +40°C
Limited: -20 to +65°C for 48 hours

Safety primary cell (Li/MnO_2)


Primary Lithium Manganese dioxide (Li-MnO_2) battery, non-rechargeable

Storage temperature for the primary cell (0 to 60°C)

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Read the user guide.

1.13.4 Symbols used on the electrode package

The following only applies to the **DEFIGARD Touch 7**.

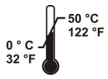
Adults

Children

1. Open the clothes
2. Open the electrode package
3. Peel off the protective foil
4. Place, attach the electrodes.

Disposable items, do not reuse.

Do not bend the packaging.



Storage temperature for the electrodes

Expiration date

Read instructions before use

Use within 1 day after opening

Keep dry

Keep out of direct sunlight

Do not use if the packaging is damaged

The packaging is made of low-density polyethene and can be recycled.

For use by or on the order of a physician or person licensed by state law

2 Components and Operation

The **DEFIGARD Touch 7** is a lightweight mains and battery-powered defibrillator featuring an ECG monitor for SpO_2/SpCO/SpMet, $EtCO_2$, temperature and NIBP measurements. It is designed for clinical use. Defibrillation is possible in non-synchronised or synchronised mode.

In addition, the device can be switched to automated defibrillation (AED operation) by pressing a single button.

The **PHYSIOGARD Touch 7** includes the same features as the **DEFIGARD Touch 7** but without the defibrillation function.

Biocompatibility

The parts and accessories of the product described in this user guide that come in contact with the patient during the intended use fulfil the biocompatibility requirements of the applicable standards. If you have questions, contact SCHILLER.

2.1 Design

Power supply

The **DEFIGARD Touch 7** and **PHYSIOGARD Touch 7** are powered by an integrated rechargeable battery. The capacity of one battery is sufficient for the following:

DEFIGARD Touch 7

- A maximum energy of 190 shocks
- > 6 hours of monitoring

PHYSIOGARD Touch 7

- > 6 hours of monitoring

An external DC supply recharges the battery.

Defibrillator

The **DEFIGARD Touch 7** is a defibrillator featuring biphasic pulsed defibrillation impulse, Multipulse Biowave. The defibrillation is done using disposable adhesive electrodes (pads), which also measure the ECG signal for analysis. Adhesive electrodes for children and adults are available. The device recognises the connected electrodes and selects the defibrillation energy levels accordingly. In the AED mode, the user will be given visual and audible instructions (display/loudspeaker).

Monitoring

According to its configuration, the **DEFIGARD Touch 7** and **PHYSIOGARD Touch 7** monitoring function gives all important parameters, ECG, SpO_2/SpCO/SpMet, $EtCO_2$, RR, NIBP, IBP and Temperature. The parameters are indicated in figures and as waveforms on the large 7” (800 x 480) LCD.

Data storage

All intervention data, resting ECG data, lead II ECG, defibrillator ECG, SpO_2 curves, trends, events and patient data.

Data transmission

- Easy transmission of a 12-lead ECG, trends and screenshots by WLAN or cellular network during an intervention.
- Cellular network, WLAN, Ethernet (via USB adapter) Communication for software and configuration updates and post-intervention data (PDF or Sema format) transmissions.
- USB to Ethernet connector for software updates
- Import/export device configuration via USB

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2.1.1 Standard unit and options

DEFIGARD Touch 7

Standard

- Defibrillator (AED) with 12-lead ECG
- Temp (sensor not included)

Options:

- Manual defibrillation mode
- SpO_2
- Pacemaker
- SpCO
- SpMet
- NIBP
- IBP
- CO_2 mainstream
- CO_2 sidestream
- 12-lead ECG
- Cellular network
- WLAN
- CPR feedback (FreeCPR)
- CPR feedback (ARGUS LifePoint)

PHYSIOGARD Touch 7

Standard

- 12-lead ECG
- SpO_2
- NIBP
- Temp (sensor not included)

Options

- SpCO
- SpMet
- CO_2 mainstream
- CO_2 sidestream
- IBP
- 12-lead ECG
- Cellular network
- WLAN

2.1.2 Additional accessories

- SCHILLER Charging Unit CS-1. External charging and calibrating unit for rechargeable batteries.
- DC/DC or AC/DC ambulance charging bracket. Holds the device securely while recharging the battery inside the device.
- AC/DC desktop charging bracket. Holds the device while recharging the battery inside the device.
- AC/DC Nomad charger

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2.2 Operating Elements

2.2.1 Front panel DEFIGARD Touch 7

Fig. 2.1 Front panel and device controls

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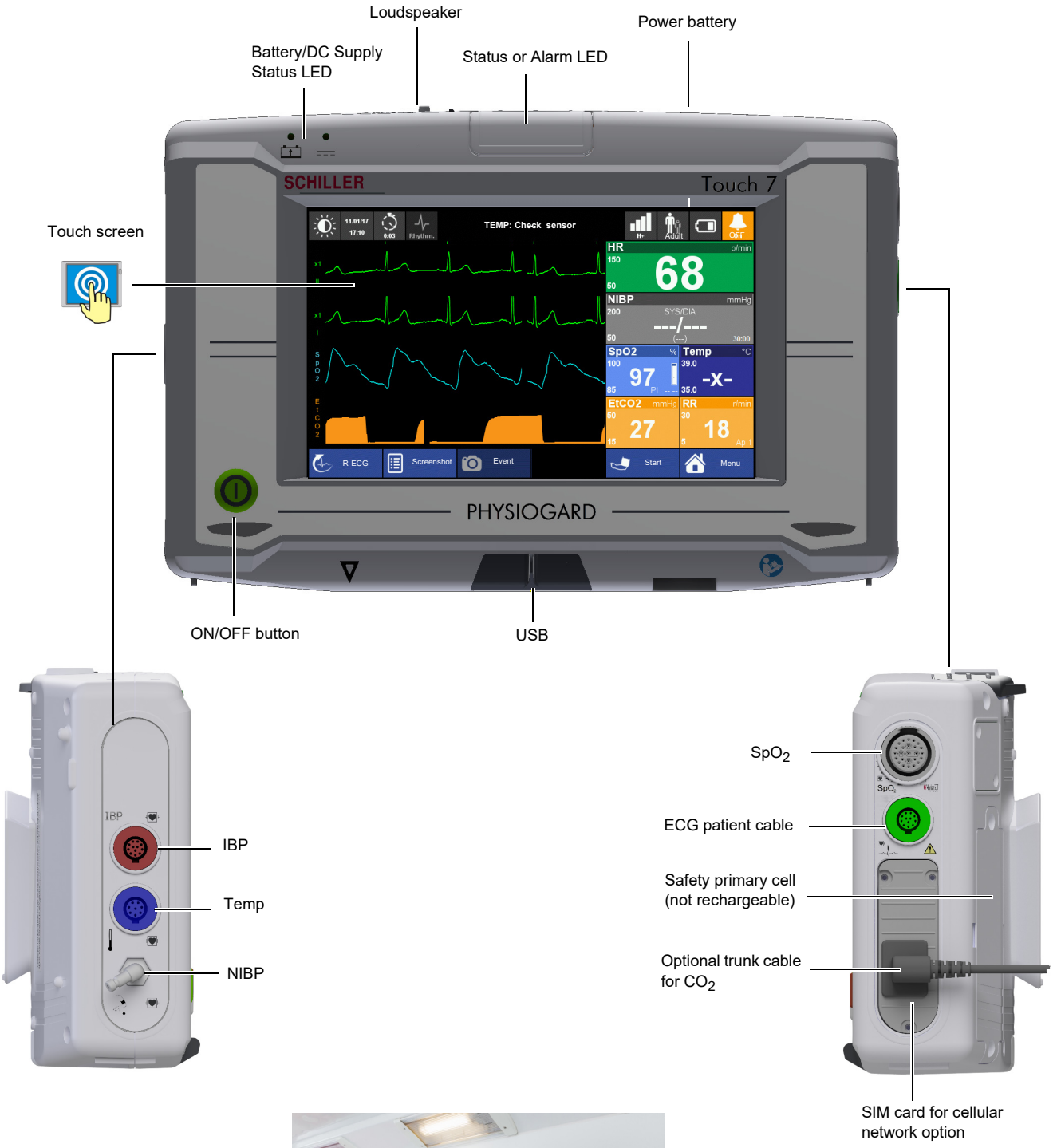
2.2.2 Front panel PHYSIOGARD Touch 7



2.2.3 Back panel PHYSIOGARD Touch 7

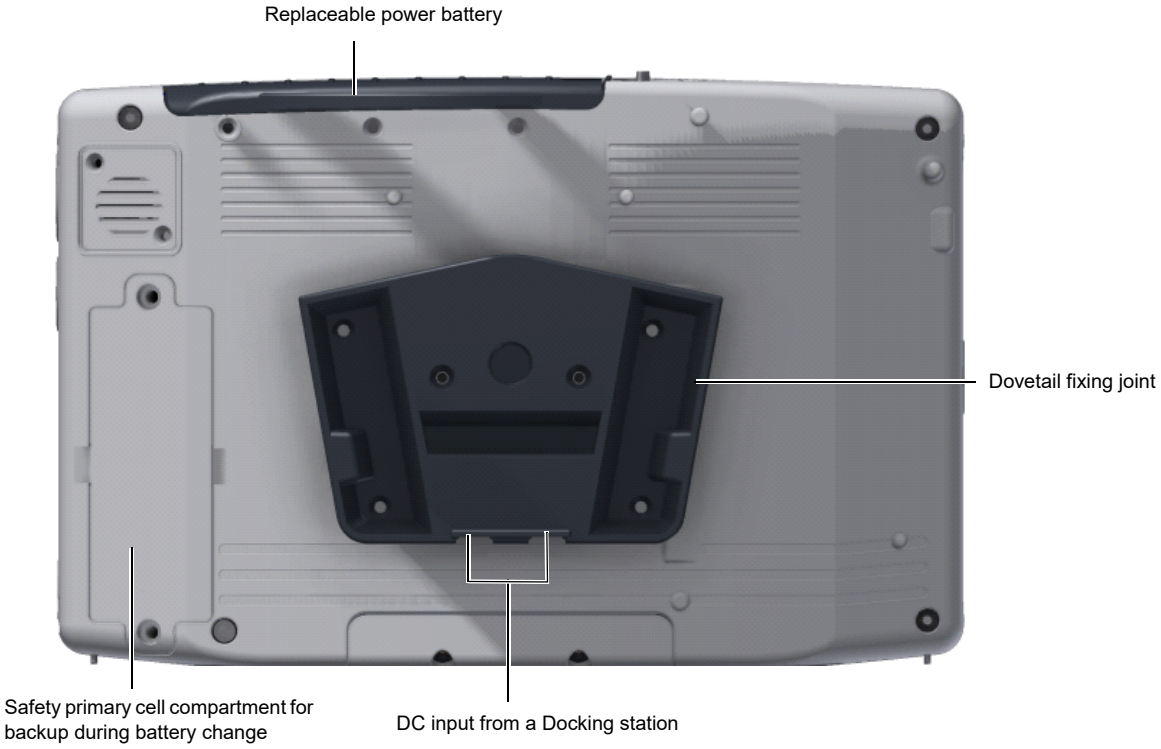


Fig. 2.2 Rear panel and controls

2.2.4 LEDs

The LEDs give the following information:

(5) Flashes while the battery is being recharged
(6) Unit connected to the external power supply.

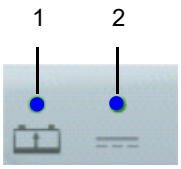


Fig. 2.3 LEDs

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2.2.5 Display

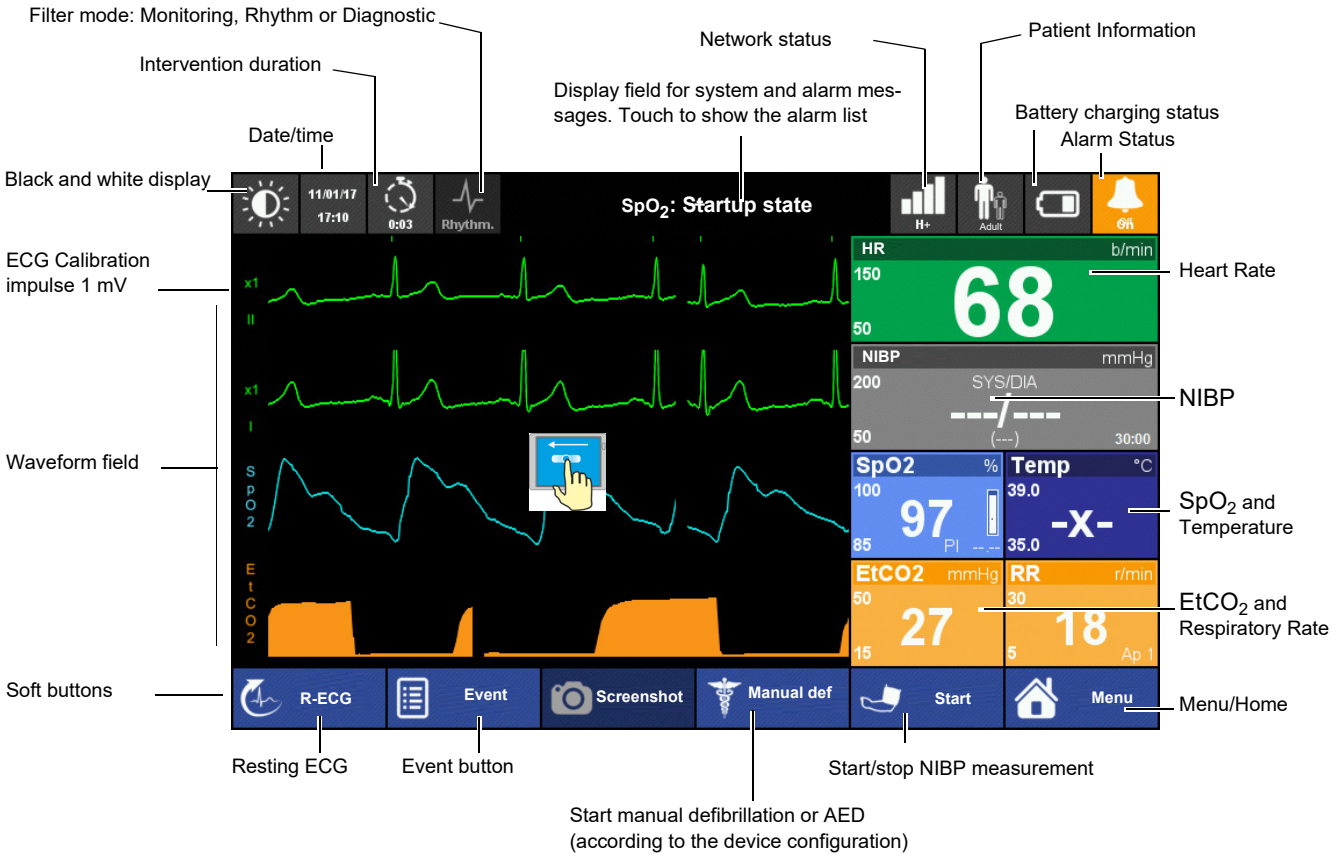

Fig. 2.4 Display elements of the device

The display can vary according to the settings, options, and selected views. The following screen is displayed when swiping from right to left; see above.

To show the ECG curve again, swipe from left to right:

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3 Initial Operation

DANGER

- You must read the safety notes in Chapter 1 Safety Notes before the initial operation.
- Danger of explosion. The device is not designed for use in areas where an explosion hazard may occur. Also, operating the defibrillator in an oxygen-enriched environment or in the presence of flammable substances (gas) or anaesthetics is not permitted. Oxygenation in the vicinity of the defibrillation electrodes must be strictly avoided.
- Danger of electrical shock. The **DEFIGARD Touch 7** is a high-voltage therapy device. Improper use of the device can endanger life. Always follow the instructions given in this user guide.
- During ECG analysis and defibrillation, the user must check that there are no conductive connections between the patient and other persons.
- Avoid defibrillation in very moist or wet surroundings.
- This device must only be connected to a mains supply with protective earth to avoid the risk of electric shock,

3.1 External DC Supply and Battery Operation

3.1.1 External DC supply operation

1. Place the device into the docking station and insert a fully charged battery. Check that LED (2) is On.
2. Press the **ON/OFF** button.
3. Press the **Battery** button (3) to display other battery charging information.
4. Check battery charging LED (1) according to section 3.1.2 Battery operation.

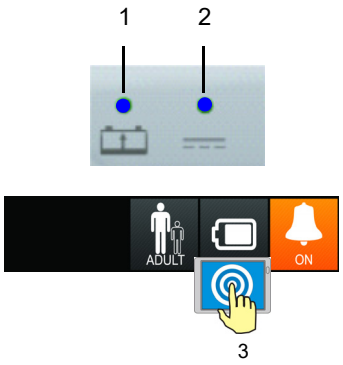

Fig. 3.1 Status LED supply

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3.1.2 Battery operation

Automatic shutdown

The device will automatically shut down after 30 minutes if no activity has been detected (no vital signs measurement or no action from the user) to prevent the device from emptying the battery,

Charging the battery

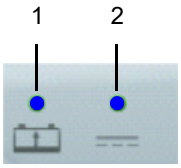

Fig. 3.2 LED battery operation

Important

- The battery power is automatically recharged when the device is connected to the external DC supply via the docking station LED (2). The battery power requires approximately 2 hours to be recharged to 90%.
- The recharging of the battery is indicated by the LED (1) above the battery symbol.
  - LED (1) is continuously on = battery problem
  - LED (1) is blinking = the battery is charging
  - LED (1) is continuously off = the battery is fully charged

If the temperature in the device gets too high, charging is stopped. Charging resumes when the temperature has decreased to an acceptable level.

Fig. 3.3 Battery low indication

Low battery indication

When the battery is below 20%, a red battery symbol with one bar is displayed in the top right corner of the screen.

When the battery is below 10%, a red symbol and a technical alarm are displayed. In addition, a voice prompt provides a reminder to check the battery.

The device shuts-down automatically when the battery is below 5%.

Fig. 3.4 Battery defect indication

Battery status unknown

- When the battery is unknown, a red battery symbol with a question mark is displayed in the top right corner of the screen.

Battery status

Press the **Battery** button. The following information will be displayed:

- Charge level as a percentage
- Estimated autonomy in hours and minutes
- Estimated number of shocks possible with the remaining capacity
- Safety cell voltage level

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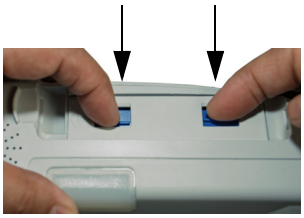
Changing the batteries

- The device does not need to be switched off as monitoring is continued. The device is powered by the primary safety cell for another 30 seconds; then, the device is switched off automatically.
- The battery can only be inserted one way.

1. Open the battery cover.



2. To remove the battery, press the two blue catches to release and remove the battery.

➜ To replace, proceed as follows:
- Slide the battery into the battery compartment with the markings positioned as shown.
- Push home until the battery clicks in place with the blue catches.
- Close the battery cover and check that the cover is clicked in properly.

3.1.3 Operation with an external constant voltage source

- The device can be connected to an external direct-current source via the docking station.
- Operation with an external power source is indicated by the LED  on the device.

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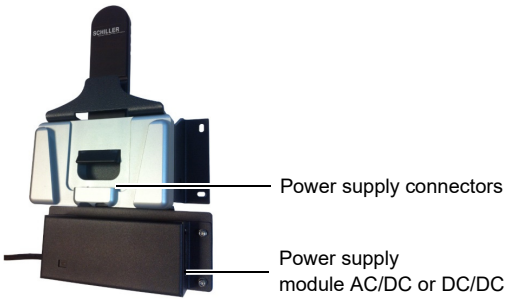
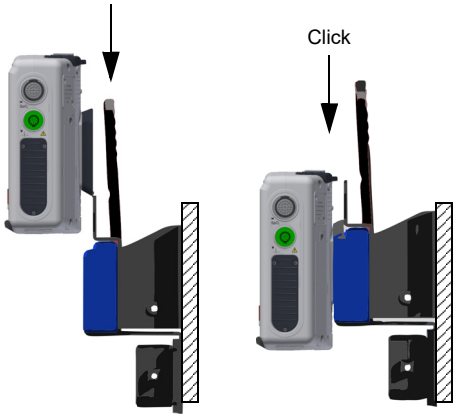
3.1.4 Operation ambulance charging bracket

⚠ CAUTION

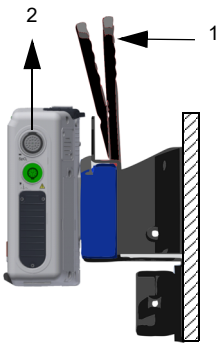
▲ The charging bracket must be secured to a stable wall.





Place the device on the charging bracket

➜ Place the device back on the wall mounting. The device is locked automatically; a click from the locking mechanism will be heard.



Remove the device from the charging bracket

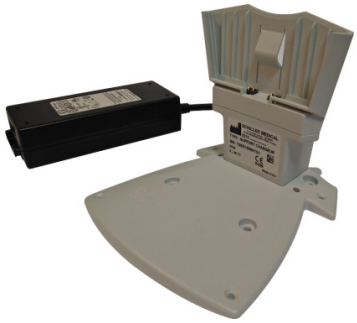
➜ Pull the release lever towards the device (1), then pull the device upwards (2) while keeping the lever in the release position.

3.1.5 Operation of the desktop charging bracket

⚠ CAUTION

▲ The desktop charging bracket must be screwed on a table or VESA fixing system.

▲ The desktop charging bracket is only for indoor use, do not use it in vehicles.



➜ The device can easily be slid onto the desktop charging bracket.

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3.1.6 Operation of the Nomad charging bracket

⚠ CAUTION

- ▲ The Nomad charging bracket must be screwed on a table or VESA fixing system.
- ▲ The Nomad charging bracket is only for indoor use, do not use it in vehicles.

➜ The device can easily be slid onto the Nomad charging bracket.

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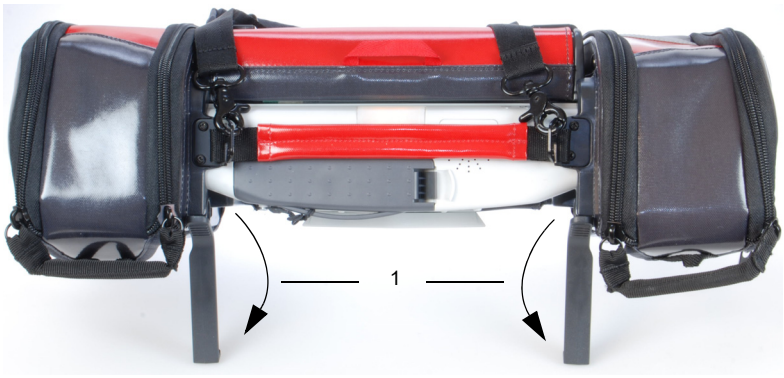
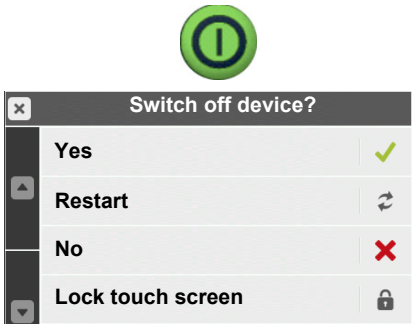
3.1.7 Operation and fixing during intervention

During an intervention, the two positioning bars (1) can be folded outwards to keep the device in an ergonomic/stable position.



The device can be fixed on a rail, such as a bed or a stretcher rail, during transportation.

3.2 Disconnect from the External DC Supply



1. Press the **ON/OFF** button.
2. The **Switch of device?** dialogue is displayed.
3. Select **Yes** or cancel with **No**.
4. Remove the device from the charging station if you do not want to recharge the battery.

The **Restart** function directly exits the Post Intervention or the control panel menu by restarting the device instead of switching it on and off.

Forced shutdown procedure

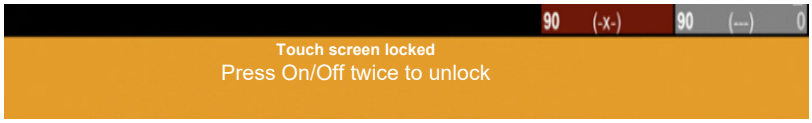
If the device cannot be switched off using the procedure above, press and hold the green **ON/OFF** button until the device switches off.

3.2.1 Lock the touch screen

Lock the Touch screen

In the ON/OFF dialogue, select Lock touch screen.

➜ A locked touch screen message is displayed, complete with instructions on unlocking it.



Unlock the Touch screen

Press the **ON/OFF** button twice. The message, Touch screen unlocked appears.

3.2.2 Internal safety discharge

The **DEFIGARD Touch 7** has an internal safety discharge circuit to discharge the defibrillator's stored energy. The defibrillator displays the message, Internal discharge during the safety discharge. The energy is internally discharged when:

- The shock is not delivered within 20 seconds after charging
- A lower energy value is selected while the defibrillator is charging
- The battery voltage is insufficient
- The device is defective
- The device is turned off

In addition, the residual energy stored in the defibrillator 100 ms after shock release is always discharged internally.

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3.2.3 Interruption of external power supply

If the external DC supply is interrupted, the device automatically switches to battery operation. User settings are maintained.

3.2.4 Ensuring operational readiness

Do not expose the device to direct sunlight or extremely high or low temperatures. The ambient temperature should be in the range of 0 to 50°C. Lower or higher ambient temperatures will have a negative impact on the battery's life.

The device runs a self-test to check the unit and the battery is ready for use. A self-test can be performed at any time. An enhanced periodic test can be performed in a defined interval (standard setting every 5 weeks) and at a defined time (standard setting 12:00)

- Status OK: green blinking LED
- Device failure status: LED OFF.

An audio alarm is activated if the device detects an error during the self-test.

➜ An auto-test can be executed at any time refer to section 10.2.4 Auto-test.

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3.3 Operation

Device menus can be accessed as follows:

- Direct access by pressing on the curve or measurement field
- By clicking on the Menu or any other button
- By clicking on a button (icon)
- By moving a finger up or down, left or right, to scroll or by changing the display.

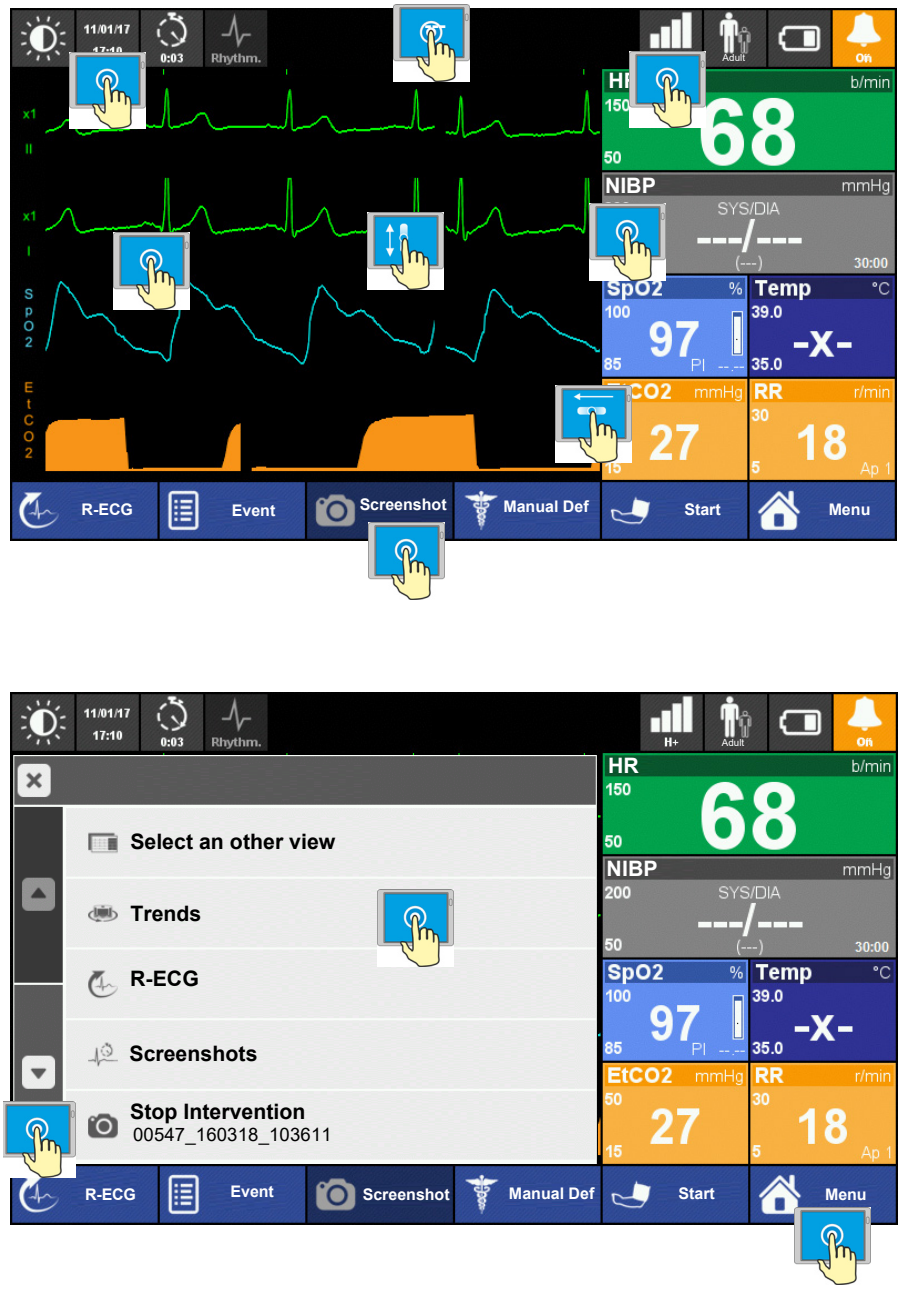

Fig. 3.5 Display with the main menu and the touch-sensitive areas

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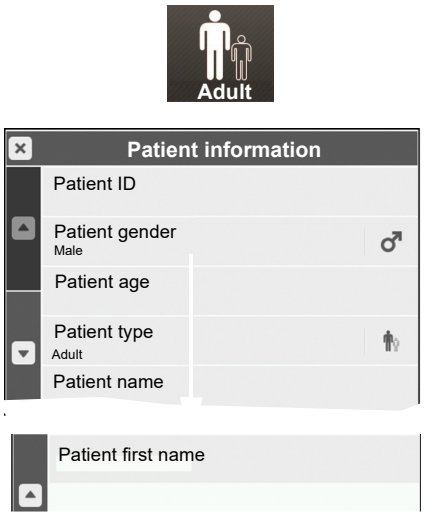
3.4 Patient Information Menu



This menu allows entry to patient details, that is, ID, gender, age, name, first name and patient type.

Gender and age are necessary information for automatic ECG interpretation. If not entered, default values are Male and 50 years.

If no patient details are entered for printouts, undefined will be written for the R-ECG and unknown for all other printouts.

All associated parameters like energy level, initial blood pressure, and alarm limits are automatically adjusted when changing the patient type.

3.5 Printing

The following data can be printed on the Bluetooth printer:

- Recorded Resting ECG (including patient data, patient vitals, interpretation and ECG curves)
- Screenshots (± 5 seconds from the moment of the screenshot that contains all displayed curves, patient data and vital data)
- Intervention report
- Intervention list
- Device information
- Real-time vitals format
- Curves (ECG I, II, II Defi and SpO_2, $EtCO_2$, IBP)
- Trend reports

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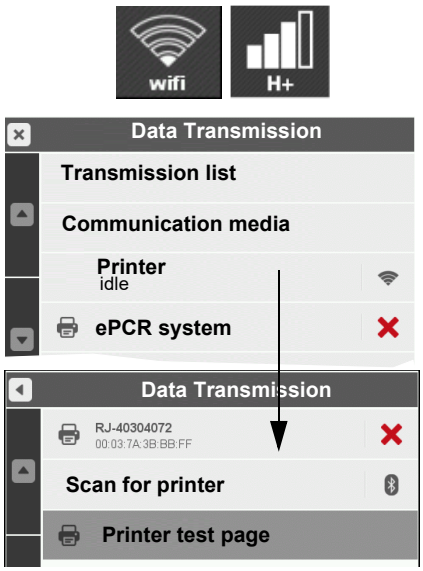
3.5.1 Pairing Bluetooth devices

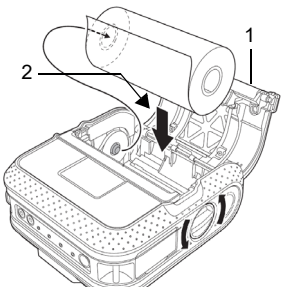


1. Press the **Transmission** button to display the **Data transmission** menu.
2. Select a **Printer** to display the pairing menu.
3. Switch on the Bluetooth printer and check that Bluetooth is activated.
4. Select **Scan for Printer**. When the printer is found, the printer's identification number is displayed, for example, RJ-40304072.
5. Once the printer pairing is complete, the printer status in the Data Transmission menu display a ✓.
6. Select the Printer test page to check the printing function.

In case of communication problems with Bluetooth devices, switch it off and turn back on again. Scan for the Bluetooth device again.

3.5.2 Brother printer overview

Refer to the Brother RJ4030 or RJ-4230b printer user guide for detailed information.



1. Press and hold the **Power** ⏻ button to switch off the printer.
2. Open the cover (1).
3. Insert the RD Roll into compartment (2).
4. Close the cover.
5. Press and hold the **Power** ⏻ button to turn the printer on.
6. Press the **Feed** button to set the paper in the right starting position.

RJ-4030

(1) Power ON/OFF
(2) Paper feed
(3) Power ON/OFF status LED
(4) Status LED printer
(5) Battery status LED (blinks every 4 seconds = battery half, twice every 4 seconds = battery low, once every second = battery must be charged.
(6) Bluetooth Status LED
(7) Bluetooth ON/OFF button

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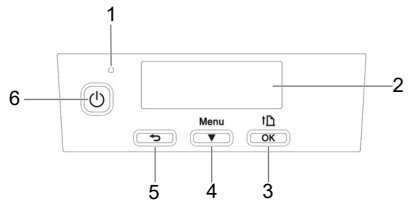
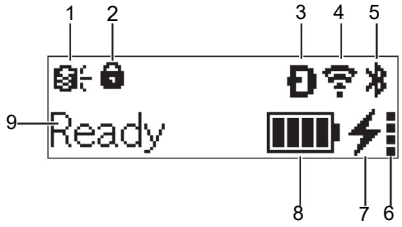
RJ-4230b keypad



(1) LED indicator
(2) LCD
(3) Feed/OK button
(4) Menu/Select button
(5) Back button
(6) Power button

RJ-4230b LCD



(1) Update icon (not used)
(2) Menu lock icon (not used)
(3) Wireless direct icon (not used)
(4) WLAN icon (not used)
(5) Bluetooth button
(6) Battery health level icon
(7) Power supply icon
(8) Battery level icon
(9) Printer status

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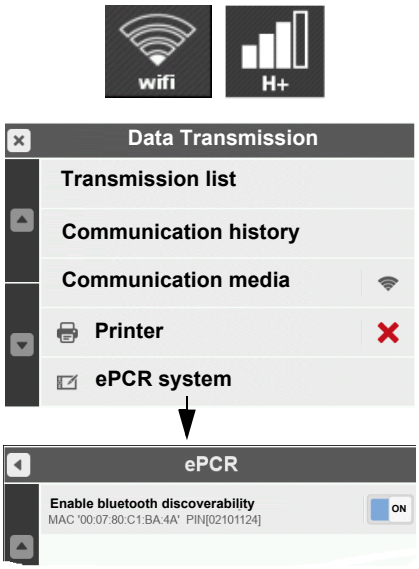
3.6 Connection to an ePCR system

- The following data can be transmitted via Bluetooth to an Electronic Patient Care Record system (ePCR):
  - Patient vital data
  - Patient identification and information
  - RECG in PDF format
  - RECG in RAW data format (SEMA files format)
  - Trends
  - Intervention events
- According to the ePCR settings, this can be a spot measurement, regularly or for a defined period.
- For detailed information, refer to the ePCR manufacturer's user manual.

3.6.1 Pairing Bluetooth devices

- The **DEFIGARD/PHYSIOGARD Touch 7** acts like a slave to the ePCR equipment. Pairing must be initiated on the ePCR equipment.
- Pairing is only completed once, that is when the ePCR equipment is connected for the first time.



1. Press the **Transmission** button to display the Data Transmission menu
2. Select ePCR
3. Activate the Bluetooth discoverability

- Contact your local SCHILLER distributor for a compatible ePCR systems list or interface request.
- In case of communication problems with Bluetooth devices, switch it off and turn it on again. Scan for the Bluetooth device again.

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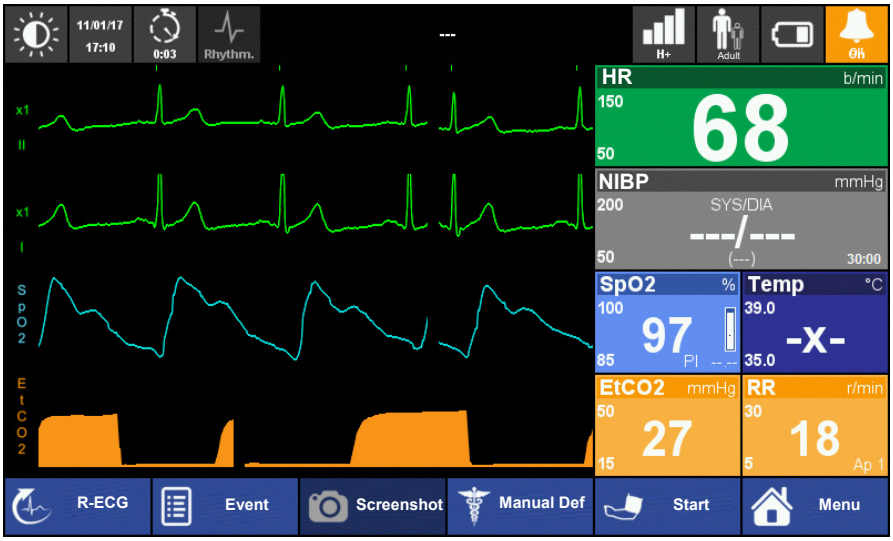
4 Monitoring

For operation and menu access, refer to section 3.3 Operation

4.1 Soft keys, Waveforms and Measurement Fields

The waveform and measurement fields are automatically displayed when the device is switched on (if the options are installed). The device can be operated via the touch screen. The functions of the soft keys vary according to the selected screen.

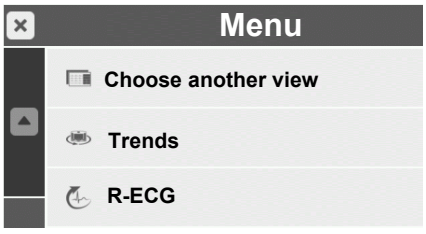


Advanced monitoring view

Settings
The defined menu settings are set to default when the unit is switched off.

4.1.1 View selection

The default view after start-up can be configured.



1. Select **Choose another view** from the menu
2. Choose one of the views:
   - Advanced monitoring
   - Basic monitoring
   - 12-lead ECG
   - Critical care

The display can vary according to the settings and options used. The default views are displayed below:

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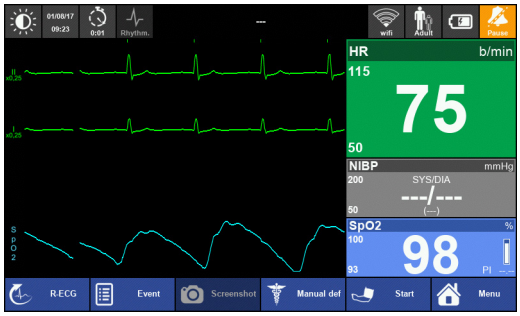
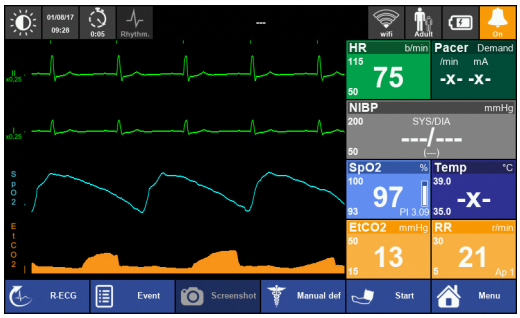
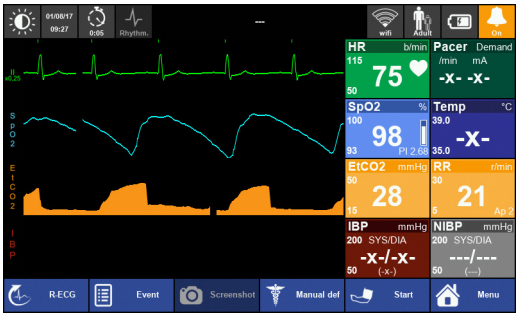


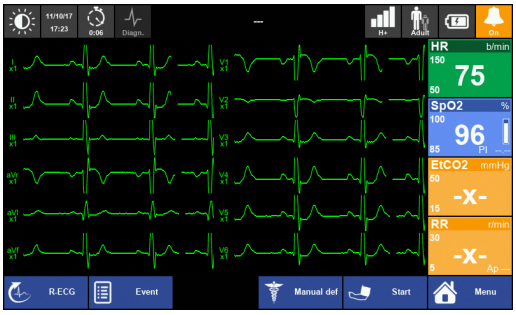
Basic monitoring
With 2 ECG leads a SpO_2 curve and measurements fields displaying HR, NIBP and SpO_2 values.



Advanced monitoring
With 2 ECG leads, SpO_2, $EtCO_2$ curve, and measurements fields displaying heart rate, NIBP SpO_2, $EtCO_2$, RR and Temperature values.



Critical care
With 2 ECG leads, SpO_2, $EtCO_2$, IBP curve, and measurements fields displaying heart rate, SpO_2, Temperature, $EtCO_2$, RR, IBP and NIBP values.



12-lead ECG
With all 12 ECG leads.

The displayed ECG is online and filtered with diagnostic filters so that the curves may be sensitive to motion artefacts. For better ECG quality, it is advised to perform an R-ECG; refer to section 4.5 Diagnostic ECG (R-ECG).

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4.2 Alarm System

⚠ CAUTION

- ▲ In some countries, it is not permitted to disable audio alarms permanently; therefore, this function is configurable.
- ▲ When pausing or switching off the audio alarm, for example, high-priority alarms such as VT/VF and asystole are paused/switched off.
- ▲ Pausing or switching off the audio alarm system is only allowed if the patient is permanently observed.

4.2.1 Alarm priority

Alarm type	Priority	Audible signal	Display
Technical alarm	Low	One beep	• Text display in the alarm status field at the top • Displaying -?- in the parameter field • Orange LED is lit 
Physiological alarm	Medium	3 signals (beep, beep, beep)	• Text display in the alarm status field at the top • Orange flashing parameter field • Orange LED is flashing 
Physiological alarm	High	10 signals (beep beep beep - beep beep beep beep beep - beep beep)	• Text display in the alarm status field at the top • Red flashing parameter field • Red LED is flashing 

4.2.2 Operator's position

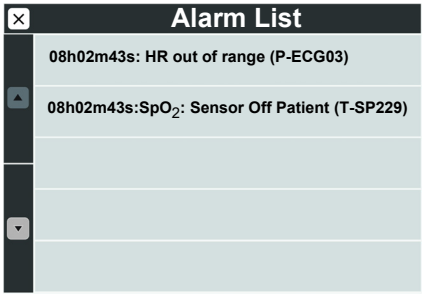
⚠ CAUTION

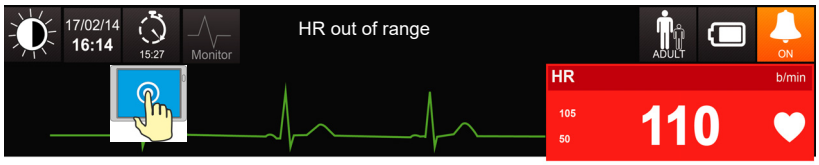
- ▲ Ensure the environmental noise is below the alarm sound volume of 65 dB.

The visual alarm LED is visible at a distance of 4 meters; when flashing, it is visible at a distance of 1 meter.

4.2.3 Alarm list

An alarm list can be displayed anytime by touching the alarm status line.





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4.2.4 Physiological alarms

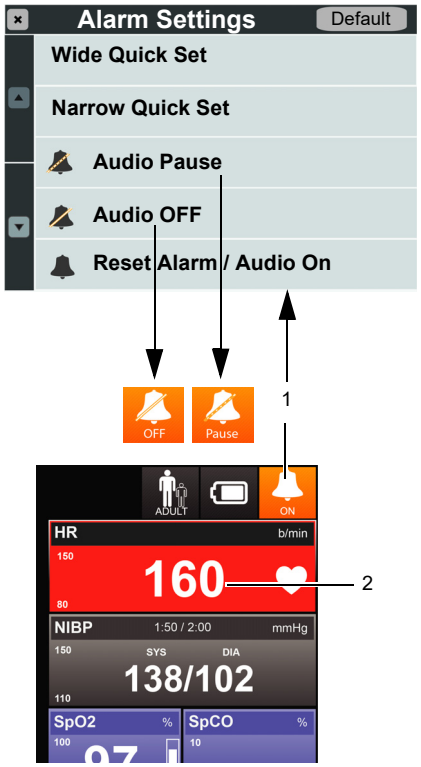

Fig. 4.1 Alarm indicators

When a measurement reading exceeds a threshold, an alarm is triggered after 3 seconds and:

- The device alarm LEDs flash orange (medium) or red (high)
- An interrupted alarm sounds
- The HR measurement value (2) flashes red
- A message is displayed in the alarm field

Pausing an audio alarm 

➜ Pause the audio alarm by pressing button (1) and select **Audio Pause**
  – The measurement reading is flashing red until it returns to the permissible range.
  – The audible alarm is reactivated automatically if the measured value does not return to the permissible range within 2 minutes.

Switching off the audio alarm system 

➜ Press button (1) and select **Audio OFF**
➜ The audible alarm system is switched off permanently until it is reactivated by selecting Reset Alarm/Audio on or Audio Pause.

A reminder signal (buub-buub) is issued every 2 minutes.

Reactivation of the paused or switched-off audio alarm system

➜ Press button (1) and select **Reset Alarm/Audio On**

4.2.5 Technical alarms

When a technical error occurs:

- The orange device alarm LEDs are on
- A message is displayed in the alarm field
- One alarm beep once
- Three dashes --- (2) are displayed if no sensor is connected before switching on (no LED or alarm)
- A question mark -?- (3) is displayed instead of the measurement reading.

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4.3 Operator-defined Alarm Thresholds

⚠ CAUTION

- ▲ Check that the patient's vital parameters are not critical before selecting Wide Quick Set or Narrow Quick Set.
- ▲ Check that the right patient is selected (adult, child or neonate).
- ▲ The defined alarm thresholds are not a substitute for regularly checking vital functions.
- ▲ Setting the Audio OFF is only allowed if the patient is permanently observed.
- ▲ Standard or user-defined alarm limits and quick settings may vary for similar or the same devices. Therefore, always check the set alarm limits for the current patient.
- ▲ Thirty seconds after a mayor battery power interruption, the alarm threshold Wide Quick Set or Narrow Quick Set is set to default.

Access the threshold menu by pressing the **Alarm** icon and selecting Wide Quick Set or Narrow Quick Set.

- The default threshold values are activated by selecting **Default**.
- Selecting **Quick Set**, all values are derived from the current measured values. Refer to section 4.3.1 Table of wide and narrow threshold settings.

→ Check that the patient's vital parameters are not critical before pressing the **Quick Set** button.

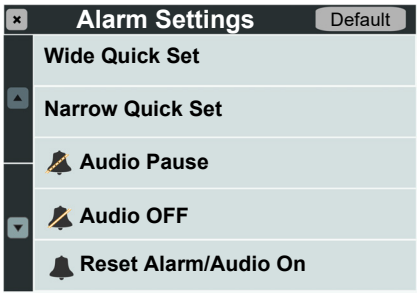

Fig. 4.2 Alarm Setting menu

After switching off the device, the operator-defined Quick Set thresholds will be set to the default values.

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4.3.1 Table of wide and narrow threshold settings

The range values in brackets () are the default values activated when pressing Default in the alarm setting menu refer to Fig. 4.2 Alarm Setting menu. The values before the bracket ECG 0-350 **(50 to 150) bpm** are the low/high system limits.

HR [bpm]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range:		Low	High	Low	High
ECG 0 to 350 **(50 to 120) bpm**	< 60	-20	+35	-10	+25
Pleth 25 to 240 **(50 to 120) bpm**	60-79	-25	+40	-20	+30
	80-104	-30	+40	-30	+30
	≥ 105	-35	+45	-25	+25
Allowed values		[30-150]	[100-240]	[30-150]	[100-240]

RR [rpm]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range: 0 to 60 **(8 to 30) resp/min**		Low	High	Low	High
	< 15	-8	+8	-4	+4
	≥ 15	-15	+15	-8	+8
Allowed values		[5-15]	[10-60]	[5-15]	[10-60]

SpO_2 [%]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range: 50 to 100 **(92 to 100)%**		Low	High	Low	High
	≥ 90	-5	+3	-5	+3
	< 90	-5	+3	-5	+3
Allowed values		[85-100]	[90-100]	[85-100]	[90-100]

SpCO/SpMet [%]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range:		Low	High	Low	High
SpCO 0 to 40 **(0 to 10)%**	-	0%	10%	0%	10%
SpMet **0 to 3%**	-	0%	3%	0%	3%

Temperature [°C]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range: 0 to 46 **(35 to 37.8)°C**		Low	High	Low	High
	-	-3	+3	-1	+1
Allowed value	-	[31-41]	[31-41]	[31-41]	[31-41]

$EtCO_2$ [mmHg]/[%]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range: 5 to 70 mmHg/0.7 to 9.2% **(30 to 45 mmHg/2 to 6.6%)**		Low	High	Low	High
	< 40/5.3	-10/1.3	+15/+2.0	-10/-1.3	+15/+2.0
	≥ 40/5.3	-10/1.3	+15/+2.0	+15/+2.0	+15/+2.0
Allowed values [mmHg]/[%]		[5-60] / [0.7-7.9]	[20-70] / [2.7-9.2]	[5-60] / [0.7-7.9]	[20-70] / [2.7-9.2]

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NIBP SYS [mmHg]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range SYS: 40 to 230 **(90 to 160)** mmHg		Low	High	Low	High
	< 90	-20	+35	-10	+25
	90-114	-20	+35	-10	+25
	115-140	-25	+35	-10	+20
	> 140	-25	+35	-10	+20
Allowed values		[30-245]	[30-245]	[30-245]	[30-245]

NIBP DIA [mmHg]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range DIA: 20 to 130 **(50 to 90)** mmHg		Low	High	Low	High
	< 65	-15	+25	-10	+25
	65-90	-15	+15	-15	+10
	> 90	-15	+15	-15	+10
Allowed values		[12-210]	[12-210]	[12-210]	[12-210]

NIBP MAP [mmHg]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range MAP: 30 to180 mmHg	-	-	-	-	

IBP SYS [mmHg]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range SYS: 40 to 230 **(90 to 160)** mmHg		Low	High	Low	High
	< 90	-20	+35	-10	+25
	90-114	-20	+35	-10	+25
	115-140	-25	+35	-10	+20
	> 140	-25	+35	-10	+20
Allowed values		[30-245]	[30-245]	[30-245]	[30-245]

IBP DIA [mmHg]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range DIA: 20 to 130 **(50 to 90)** mmHg		Low	High	Low	High
	< 65	-15	+25	-10	+25
	65-90	-15	+15	-15	+10
	> 90	-15	+15	-15	+10
Allowed values		[12-210]	[12-210]	[12-210]	[12-210]

IBP MAP [mmHg]	**Pat. value**	**Wide limits**		**Narrow limits**	
Range MAP: 30 to 180 mmHg	-	-	-	-	

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4.3.2 Table of alarm limits

The alarm limits are predefined for each patient type as specified in the following table:

Parameter	Default limit	Adult	Child	Neonate
HR [bpm]	Upper	120	150	170
	Lower	50	80	100
SpO_2 [%]	Upper	100	100	100
	Lower	92	92	90
NIBP SYS [mmHg]	Upper	160	120	90
	Lower	90	70	40
NIBP DIA [mmHg]	Upper	90	70	60
	Lower	50	40	20
NIBP SYS [kPa]	Upper	21.33	16	12
	Lower	12	9.33	5.33
NIBP DIA [kPa]	Upper	12	9.33	8
	Lower	6.66	5.33	2.7
RR [rpm]	Upper	30	30	40
	Lower	8	10	12
$EtCO_2$ [%]	Upper	5.9	5.9	5.9
	Lower	4.0	4.0	4.0
$EtCO_2$ [mmHg]	Upper	45	45	45
	Lower	30	30	30
$EtCO_2$ [kPa]	Upper	6	6	6
	Lower	4	4	4
Temperature [°C]	Upper	37.8	37.8	37.8
	Lower	35	35	35
Temperature [°F]	Upper	100	100	100
	Lower	95	95	95
SpCO [%]	Upper	10	10	10
	Lower	0	0	0
SpMet [%]	Upper	3	3	3
	Lower	0	0	0
IBP SYS [mmHg]	Upper	160	120	90
	Lower	90	70	40
IBP DIA [mmHg]	Upper	90	70	60
	Lower	50	40	20
IBP SYS [kPa]	Upper	21.33	16	12
	Lower	12	9.33	5.33
IBP DIA [kPa]	Upper	12	9.33	8
	Lower	6.66	5.33	2.7

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4.4 ECG and Heart Rate Monitoring

⚠ WARNING

▲ False diagnosis. Only use silver/silver-chloride electrodes if the patient may have to be defibrillated while the ECG is displayed. Other electrodes may create high polarisation voltages, and the ECG trace on the monitor and the recording may simulate cardiac arrest.

▲ Danger of destroying the device during defibrillation. The device is only type CF protected if the original SCHILLER patient cables are used.

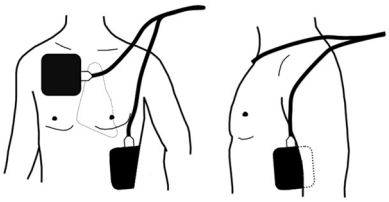
Important

- The guidelines for patient electrode placement are provided as an overview only and not as a substitute for medical expertise.
- If an electrode is faulty or has become detached, a message indicates the faulty electrode.

4.4.1 Quick diagnosis of the ECG using defibrillation electrodes

The following only applies to the **DEFIGARD Touch 7**.

Isoelectric segments are excluded from the corresponding lead arc duration measurements (Q, R, S waves). Isoelectric parts (I-wave) are also excluded in the duration measurement of the respective adjacent waveform. For more detailed information, refer to 2.530036c Statement_of_accurracy 3ed_ETM.

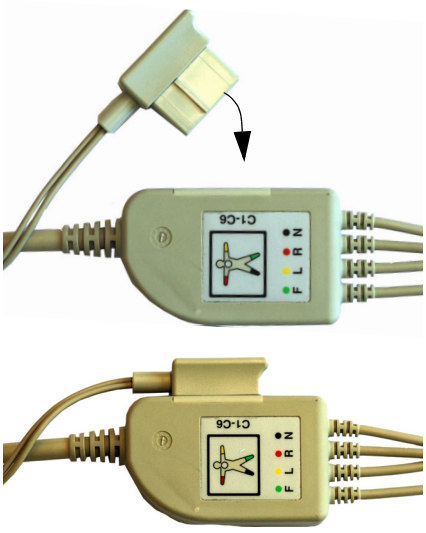


The ECG signal can be recorded from the patient's thorax using the defibrillation electrodes for a quick diagnosis. We recommend acquiring the ECG via ECG electrodes and the patient cable in all other situations.

To apply the electrode pads, refer to section 5.3.1 Applying the adult and paediatric electrodes.

Fig. 4.3 Defibrillation electrodes

4.4.2 Connecting ECG patient cables (4 or 10-wire)



ECG patient cables (4 + 6 wire)

The 4 + 6 wires cable is a two-part cable that provides the standard four monitoring (limb) electrode leads with the option of adding the 6 chest leads to provide a full 12-lead diagnostic ECG without the need to change the cable and remove the limb electrodes.

4-wire patient cable

Refer to the following pages for the electrode placement of the 4-wire cable. Connect the blanking connector to the cable junction.

10-wire patient cable

The electrode placement for the 10-wire cable is the same as for the 10-wire standard cable described on the following pages. The blanking connector must be removed, and the connector for the additional 6 wires must be placed in the socket on the cable junction.

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4.4.3 Connecting a 4-wire ECG patient cable

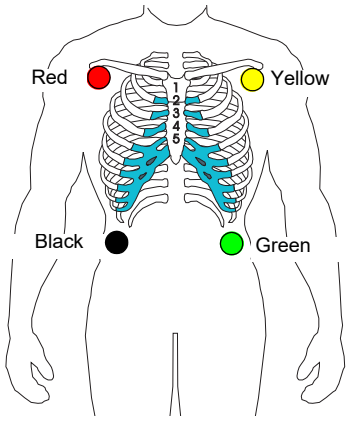

Fig. 4.4 4-wire cable

Important

When a patient cable and the defibrillation electrodes are connected, you can select the heart rate signal source by touching the first curve (standard ECG: II) on display and selecting ECG Defi. The first display curve calculates the heart rate unless the HR source is set to Pleth.

4.4.4 Connecting a 10-wire ECG patient cable

***Note**

The electrode positions shown here are based on the diagnostic ECG. The limb electrodes can be attached to the upper body for patient monitoring.

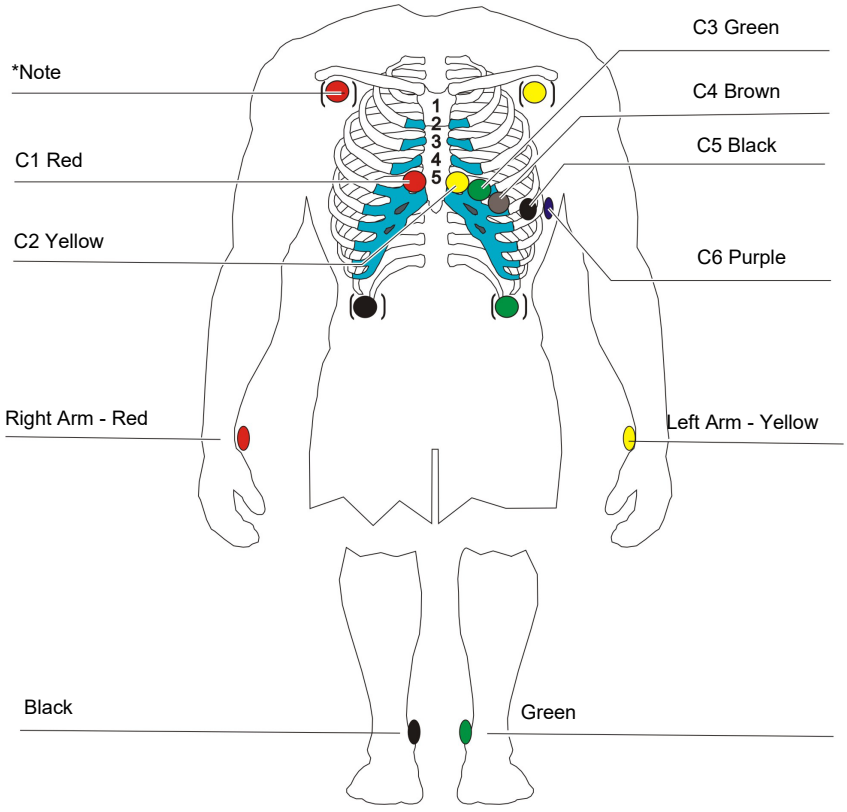

Fig. 4.5 10-wire cable

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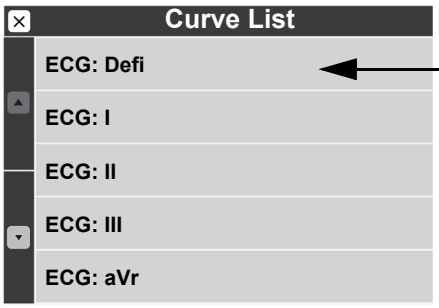
4.4.5 Starting ECG monitoring

1. Apply the electrodes as shown in Fig. 4.4 or Fig. 4.5.
2. Connect the patient cable to the ECG signal input.
3. Define the ECG settings directly via the touch screen curve or measurement field.
4. Open the HR module (ECG menu) and check the settings.

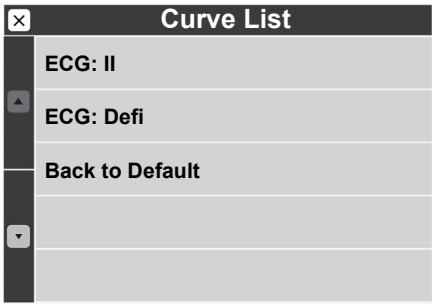
Fig. 4.6 ECG Cable

The sweep speed on the screen is fixed to 25 mm/s.

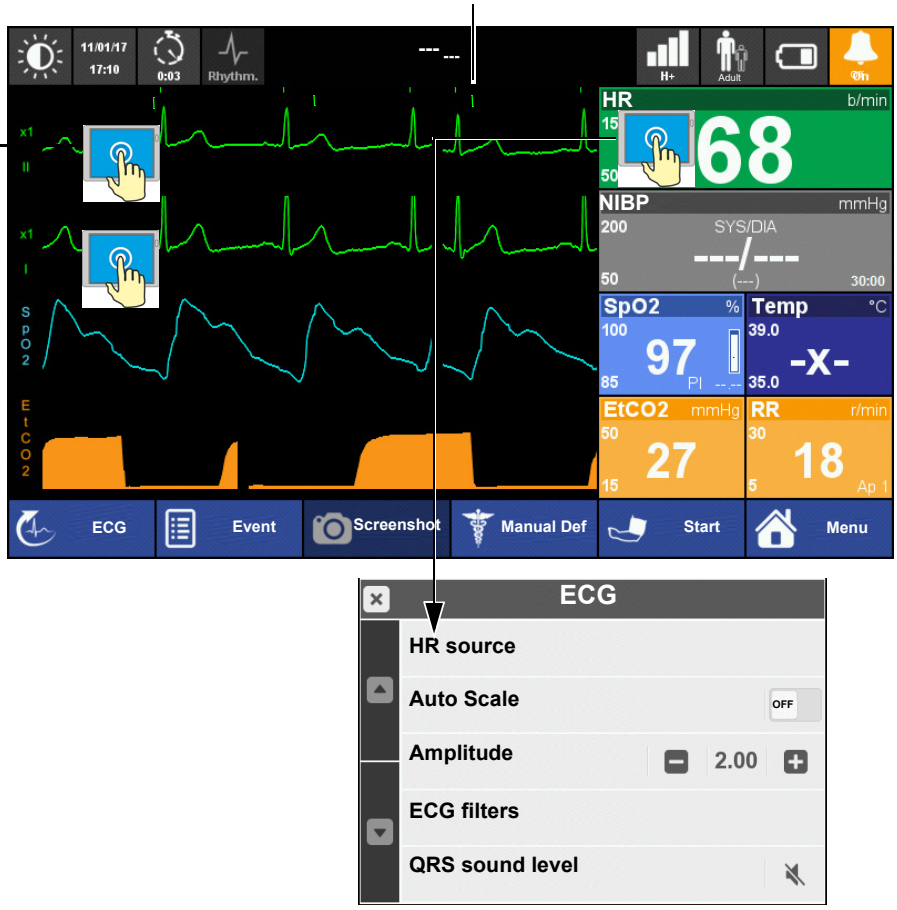
Curve list with a 10-wire cable



Curve list with a 4-wire cable



Green vertical dashes above the top ECG curve and pacemaker pulses with red vertical dashes QRS complexes.



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4.4.6 Monitoring a pacemaker patient

⚠ DANGER

- ▲ **Erroneous HR display**. In monitoring pacemaker patients, the possibility of pacer pulses being counted as QRS complexes cannot be excluded. Therefore, pacemaker patients should always be watched closely. It is recommended to monitor pacemaker patients using the plethysmogram HR source = Pleth in the ECG or SpO_2 menu).
- ▲ This device can reject double pacemaker pulses having amplitudes from ± 2 mV to ± 700 mV (± 70 mV) and pulse widths from 0.1 to 2.0 ms (± 0.3 ms) synchronised with an ECG or without ECG.
- ▲ Patients with a pacemaker must be observed continuously because the heart rate from the pacemaker might still be registered in case of a cardiac arrest or some arrhythmias.
- ▲ Pacemaker signals from different pacemakers vary. In the case of cardiac arrests or some arrhythmias, pacemaker signals might still be measured, especially signals from pacemakers generating high amplitudes (> 20 mV) or overshoot. Pacemaker patients need to be monitored very closely.

When monitoring the heart rate of pacemaker patients, it is important that the device only counts the QRS complexes and rejects the pacer pulses.

Note: Randomly, some pacemaker pulses could be missing from the display. Red vertical dashes above the top ECG curve represent pacemaker impulses.

The device has an electronic pacer pulse suppression algorithm that rejects the pacer pulses, so they are not counted as QRS complexes. Depending on the pacemaker model used and the position of the electrodes, the compensation pulse following every pacer pulse may be considered a QRS complex. In this situation, and when the pacer pulse is ineffective, the displayed heart rate may lead to a misinterpretation. The device will not issue an alarm for bradycardia or asystole. Whether or not the compensation pulse counts as a QRS complex depends on the parameters of the pacer.

The ECG signal amplitude should be greater than 1 mV for pacemaker patients.

If the source of the heart rate is SpO_2, this is indicated by the blue HR (Pleth) measurement field instead of the green HR measurement field.

Fig. 4.7 Indication HR source SpO_2

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4.4.7 Curve list

Menu	Parameter	Description	Value
Curve list	Touch the first curve	Selection of the displayed first curve. The first display curve calculates the Heart rate unless the HR source is set to Pleth.	ECG: I, ECG: II, ECG: III or Defi Default: **ECG II**
	Touch the curves 2,3,4	Selection of the displayed curve	ECG: Defi, ECG: I, ECG: II, ECG: III, aVR, aVL, aVF, SpO_2, Plethysmograph, $EtCO_2$: Respiration, IBP

4.4.8 HR Module (ECG)

The sweep speed on the screen is fixed and set to 25 mm/s.

Menu	Parameter	Description	Value
ECG	HR Source	Source based on which the heart rate should be determined[a].	**Auto**, Defi, ECG I, ECG II, ECG III or Pleth If set to Auto, the device automatically selects the source with the following priorities: ECG II > ECG I > ECG III > DEFI > Pleth.
	Auto Scale	Automatic scale of the ECG amplitude	**OFF**/ON
	ECG Curve amplitude	ECG amplitude setting	0.25/0.5/1/2 cm/mV
	ECG Filter	Filter settings	EMG ON/OFF (electromyogram) BLW ON/OFF (baseline wandering) Refer to ECG amplifier bandpass.
	QRS sound	Volume of the systolic sound	Off/Low/**Medium**/High

a. When the patient has a cardiac pacemaker, the HR source must be set to Pleth (refer to section 4.4.6 Monitoring a pacemaker patient).

4.4.9 ECG Messages

Alarm	Cause	Remedy
Cable not detected	• Electrodes not attached to the patient; come off; bad contact • Electrodes defective; line break • The device is defective	➜ Check the contact between the electrodes and the patient. ➜ Check the ECG cable and electrodes ➜ Have the device repaired
No Patient	• Unable to calculate the heart rate	➜ Check the ECG cable and electrodes
HR out of range	• Heart rate is out of the set alarm limits.	➜ Check the patient ➜ Check the narrow/wide HR alarm limits and adjust them if necessary.
Asystole	• No heart rhythm	➜ Physiological alarm. Check the patient.
VF/VT	• Ventricular fibrillation or Ventricular tachycardia	➜ Physiological alarm. Check the patient.

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4.4.10 Print and PDF formats

The device can generate the following formats according to its configurations:

PDF resting ECG format

- 12 averages + 6-lead, 12.5 mm/s (1 page)
- 1 x 12-lead, 50 mm/s (2 pages)
- 4 x 3-lead + 1 rhythm lead, 25 mm/s (1 page)
- 2 x 6-lead, 25 mm/s (1 page)
- 1 x 12-lead, 25 mm/s (1 page)

Print resting ECG format

- 12 averages + 4*3 leads, 25 mm/s (7 pages)
- 4 x 3-lead + 1 rhythm lead, 25 mm/s (2 pages)
- 4 x 3-lead + 1 rhythm lead, 50 mm/s (3 pages)
- 2 x 6-lead, 25 mm/s (2 pages)

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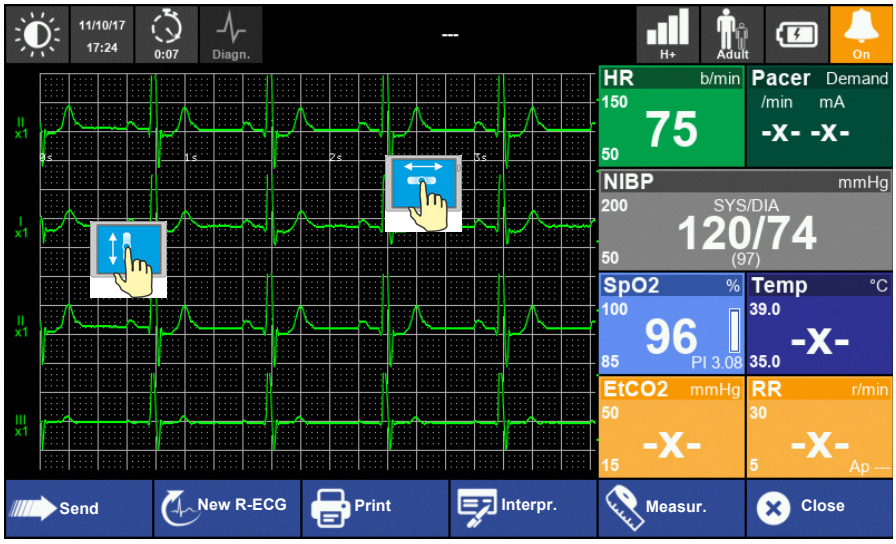
4.5 Diagnostic ECG (R-ECG)

1. Apply the electrodes of the 10-wire ECG cable as shown in Fig. 4.5.
2. Connect the patient cable to the ECG signal input.
3. Depending on the device configuration, press the **R-ECG** or the **ECG** button and:
   – The icon on the top changes from Rhythm to Diagn.
   – The lead placement screen appears, showing leads off with a red circle.
4. Press **Next**
   – The patient information dialogue is displayed for entering patient data if required
   – If no patient data is entered, the device will automatically consider a 50-year-old male patient
5. Press **Next**
   – The ECG acquisition in progress screen appears.
6. Depending on the device's configuration, the signal will be acquired with or without an anteriority of 10 seconds.

After the acquisition, the **Send** and **Print** buttons are active. After about 8 seconds, the **NEW R-ECG** button is displayed so another resting ECG can be recorded.



7. It is now possible to scroll the R-ECG in the X and Y-axis for reviewing.
8. Transmit the ECG with the following options:

➞ Press the **Send** button to transmit the file via the defined transmission path, for example, cellular network, Wi-Fi or Bluetooth to SEMA, e-mail or USB storage.

➞ Press the **Print** button to print the ECG to an external Bluetooth printer.

➞ Press the **Interpr** button to open the interpretation information.

➞ Press the **Measur** button to open the measurement information

- If data transmission fails, the error icon appears in the top right status bar. The failed transmitted data can be re-sent in the main menu R-ECG.
- If you close the R-ECG Window without sending the data, the data can be re-sent via the main menu R-ECG.

For detailed information about the transmission, refer to section 4.7 SpO_2,- SpCO, - SpMet Monitoring (option).

The resting ECG speed displayed on the recording depends on the configured printout or PDF format (refer to section 4.4.10 Print and PDF formats).

- To display all 12-lead ECGs refer to section 4.1.1 View selection.

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4.6 Long ECG Recording

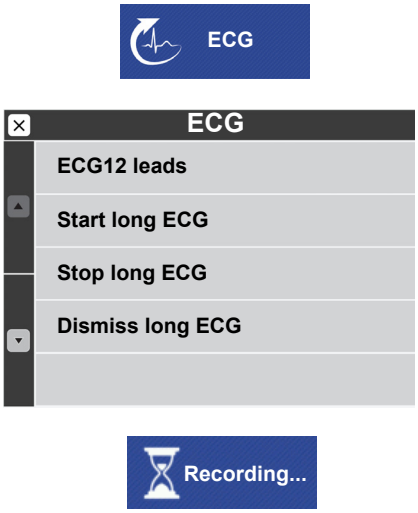
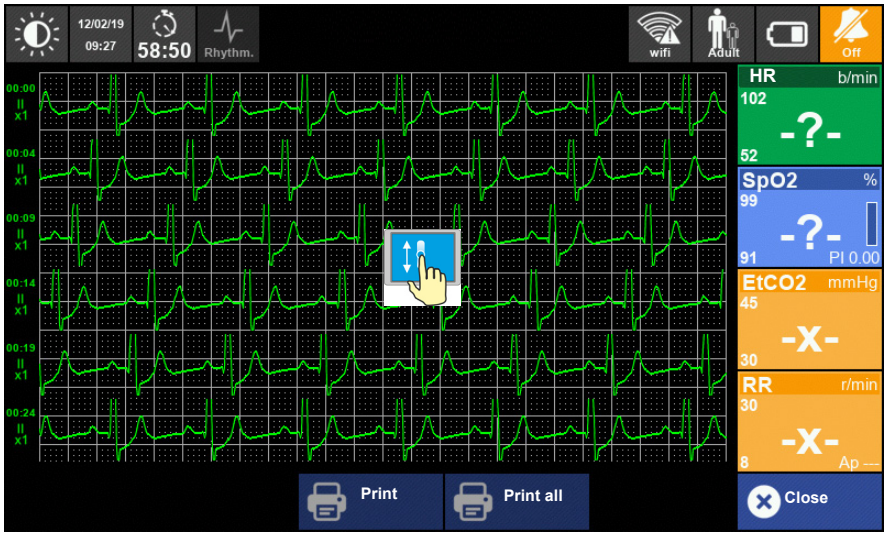


Fig. 4.8 Menu ECG recording type

1. Apply the electrodes of the 4-wire ECG cable as shown in Fig. 4.4.
2. Connect the patient cable to the ECG signal input.
3. Press the **ECG** button. The ECG recording type selection menu appears.
4. Select **Start long ECG**.
5. The acquisition of the ECG lead II will automatically start. While the acquisition is running, the button ECG shows a recording symbol
6. The recording will continue for up to 2 minutes of recording but can be stopped or dismissed by the user at any time; that is, press the **Recording** button and then select either **Stop long ECG** or **Dismiss long ECG**.
7. Once the acquisition is complete, the recording will automatically be displayed. Swiping the touch screen, it is possible to scroll the Long ECG in the Y-axis for reviewing.



8. Press **Print** to print what is displayed on the screen
9. Press **Print all** to print the entire recording.

- The ECG speed is always 25 mm/s.
- The ECG amplitude depends on the selected amplitude while performing the acquisition.

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4.7 SpO_2 - $SpCO$ - SpMet Monitoring (option)

- The pulse oximeter enables the continuous, non-invasive monitoring of functional oxygen saturation of arterial haemoglobin and the pulse rate. The signal received from the patient sensor is used to calculate the patient's functional oxygen saturation and pulse rate.
- The Masimo Rainbow SET technology for SpCO and SpMet measurements is based on the same principles as pulse oximetry. The Masimo Rainbow SET technology uses a multi-wavelength sensor to distinguish between oxygenated blood, deoxygenated blood, blood with carbon monoxide, blood with oxidised haemoglobin and blood plasma. Once the Masimo Rainbow SET technology receives the signal from the sensor, it calculates the patient's functional Oxygen Saturation (SpO_2), fractional concentration of carboxyhaemoglobin (SpCO), fractional concentration of methaemoglobin (SpMet) and pulse rate.
- The display shows the continuous progress of the numeric SpO_2 value, pulse rate, plethysmographic waveform and signal quality.
- The displayed plethysmographic curve is not proportional to the pulse volume.
- The update period of the measurement readings on the display is 0.2 second.
- According to the relevant standards, the temporary alarm suppression must not exceed 2 minutes.
- Equipment used to perform functional tests cannot be used to indicate the accuracy of the SpO_2 module.
- SpO_2, SpCO and SpMet are empirically calibrated in healthy adult volunteers with normal levels of CarboxyHaemoglobin (COHb).
- The peak wavelength and maximum optical power of the light emitted by the pulse oximeter probes have to be considered in certain cases, for example, when performing photodynamic therapy. They are as follows:
  - Range of peak wavelengths: 600 nm to 900 nm
  - Maximum optical power output LNCS sensor: < 15 mW
  - Maximum optical power output Rainbow sensor: < 25 mW
  - Masimo sensors use LEDs that are non-laser with the SpO_2 module.
  - High-intensity extreme lights (such as pulsating strobe lights) directed on the sensor may not allow the pulse co-oximeter to obtain vital sign readings.

⚠ WARNING

- ▲ Only use SpO_2, SpCO and SpMet sensors listed in the order information for the **DEFIGARD Touch 7/PHYSIOGARD Touch 7**. Other oxygen transducers (sensors) may lead to improper performance.
- ▲ The information in this user guide does not overrule any instructions given in the sensor's user guide, which must be consulted for full instructions.
- ▲ Never use the pulse oximeter as the sole means of monitoring a patient or as an apnoea monitor. Always use the pulse oximeter in combination with an ECG trace.
- ▲ Never use a pulse oximeter during MR imaging. Induced current could potentially cause burns, and pulse oximetry may affect the image and accuracy of the measurements.
- ▲ Tissue damage can be caused by the incorrect application or use of a sensor. Inspect the sensor application location as described in the sensor directions to ensure skin integrity and correct positioning and adhesion of the sensor.
- ▲ Do not use damaged patient cables, sensors or sensors with exposed optical components.
- ▲ Change the position of the sensor at least every 4 hours and every 2 hours if the perfusion is low.
- ▲ When patients are undergoing photodynamic therapy, they may be sensitive to light sources. Pulse oximetry may be used only under careful clinical supervision for short periods, minimising interference with photodynamic therapy.

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4.7.1 Inaccurate or incorrect measurement results

⚠ CAUTION

- Inaccurate measurements can be caused by the following:
  - Improper sensor application
  - Low arterial perfusion
  - Motion artefact
  - Elevated levels of bilirubin
  - Intravascular dyes such as indocyanine green or methylene blue
- Inaccurate measurements of SpCO and SpMet can be caused by the following:
  - Abnormal haemoglobin levels
  - Low arterial oxygen saturation levels, including altitude-induced hypoxaemia
- Inaccurate measurements of SpO_2 can be caused by the following:
  - Elevated COHb or MetHb: High levels of COHb or MetHb may occur with a seemingly normal SpO_2. When elevated levels of COHb or MetHb are suspected, a blood sample's laboratory analysis (co-oximetry) should be performed.
  - Externally applied colouring and texture, such as nail polish, acrylic nails, and glitter.
  - Severe anaemia
- Interfering substances: Dyes or any substance containing dyes that change usual blood pigmentation may cause erroneous readings.
- If SpO_2 values indicate hypoxaemia, a laboratory blood sample should be taken to confirm the patient’s condition.

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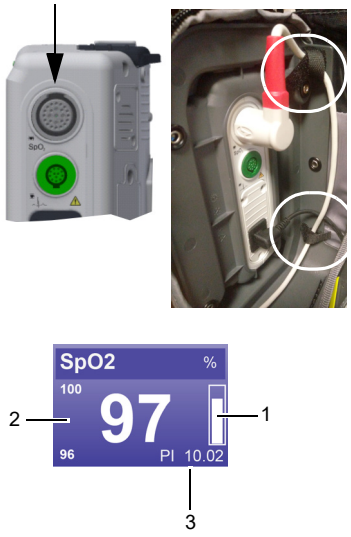
4.7.2 Starting SpO_2 monitoring and test



1. Apply the SpO_2 sensor to the patient. Insert the patient's forefinger into the probe as far as it will go, and check that the fingertip covers the probe window. This is to prevent extraneous light from reaching the photodetector.
2. Connect the SpO_2 sensor to the device and secure the cable with the two velcro fasteners.
3. Check the bar graph for signal quality (1)
4. Check Perfusion Index (PI) level (3)
5. Set the narrow SpO_2 alarm limit, refer to section 4.3 Operator-defined Alarm Thresholds.
6. An alarm is issued when the SpO_2 value exceeds the alarm limit (2).

Set the alarm limit to narrow or wide when the vital data are not critical.

PI (3) with trending capability indicates arterial pulse signal strength and may be used as a diagnostic tool during low perfusion.

PI display ranges from 0.02% (very weak pulse strength) to 20% (very strong pulse strength).

Display -?- or --- instead of the value

➜ --- Sensor not connected to the device

➜ -?- Sensor not attached to the finger

Fig. 4.9 SpO_2 measurement field

4.7.3 SpO_2 Module

Menu	Parameter	Description	Value
SpO_2	HR Source	Source based on which the heart rate should be determined[a].	**Auto**, Defi, ECG I, ECG II, ECG III or Pleth. If set to Auto, the device automatically switches sources with the following priority: ECG II > ECG I > ECG III > DEFI > Pleth.
	Average	Definition of the integration time for the calculation of the displayed average value.	4/6/**8**/10/12/14/16 seconds
	Sensitivity	Select the measurement sensitivity. Select High when the pulse is weak. Adaptive Probe Off Detection (APOD) is optimised for detecting a sensor that has come off, regardless of the signal quality. The setting, High, must not be set as the default setting.	**Normal,** Maximum, APOD If set to maximum and the sensor becomes dislodged from the patient, the potential for false readings may occur due to environmental noise such as light, vibration, and excessive air movement.
	Line Frequency	Set to match regional power line frequency to allow for cancellation of noise introduced by fluorescent lights and other sources.	50 or 60 Hz
	SpO_2 Sound level	Set the pulse tone. The pitch of the pulse tone also indicates if the saturation level is high (high pitch) or low (low pitch).	Off/Low/Medium/High

a. When the patient has a cardiac pacemaker, the HR source must be set to Pleth (refer to section 4.4.6 Monitoring a pacemaker patient).

4.7.4 SpO_2 Error and information messages

Alarm (measurement field)	Code	Cause	Remedy
SpO_2: Low Perfusion Index The same applies for: Low SpCO perfusion Low SpMet perfusion	I.SP214 I.SP206 I.SP209	• Weak pulse • Sensor not properly applied	➜ Check the patient ➜ Check the sensor and reapply it. If this message is displayed repeatedly, the oxygen saturation level must be verified using another method.
SpO_2: Low SpO_2 confidence The same accounts for: Low HR (pleth) Confidence Low SpCO confidence Low SpMet confidence	I.SP203 I.SP211 I.SP205 I.SP208	• Low pulse signal quality measurements are based on poor signal quality. The pulse tone, if activated, is low.	➜ Check the patient ➜ Check the sensor and reapply or replace the sensor ➜ If this message is displayed repeatedly, the oxygen saturation must be verified by another method.
Invalid functional SpO_2 The same accounts for: Invalid HR (pleth) Invalid SpCO Invalid SpMet	I.SP204 I.SP212 I.SP207 I.SP210	• Value is not plausible • SpCO readings may not be provided if there are low arterial saturation or elevated methaemoglobin levels.	➜ Check the patient ➜ Check the sensor and reapply
Pulse Search	T.SP230	• Device is searching for the pulse	➜ Check that the sensor is connected to the patient correctly
Sensor Off patient	T.SP229	• Sensor not connected to the patient or detached from the patient	➜ Check the contact between the sensor and the patient
Check sensor	I.SP231	• SpO_2 sensor failed or disconnected	➜ Check sensor compatibility ➜ Replace the sensor
Board inoperative	T.SP201 T.SP202 T.SP203 T.SP204 T.SP205 T.SP206 T.SP207 T.SP208 T.SP209 T.SP210 T.SP232	• No SpO_2 module installed	➜ Module not installed or is defective
Interference detected	T.SP226	• Interferences detected	➜ Check the sensor on the patient, check the cable connector, and eliminate sources of interference, for example, high-frequency devices or strong light sources. ➜ Check line frequency setting is 50 or 60 Hz
Check cable	T.SP211 T.SP212 T.SP213 T.SP214 T.SP215	• No cable connected • Cable life expired • Incompatible cable • Unrecognised cable • Defective cable	➜ Check/replace the cable

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Alarm (measurement field)	Code	Cause	Remedy
Check sensor	T.SP216 T.SP217 T.SP218 T.SP219 T.SP220 T.SP221 T.SP222 T.SP223 T.SP224 T.SP225 T.SP227	• No sensor connected • Sensor life expired • Incompatible sensor • Unrecognised sensor • Cable and sensor fault • No adhesive sensor connected • Adhesive sensor life expired • Incompatible adhesive sensor • Unrecognised adhesive sensor • Defective adhesive sensor • Defective sensor	➜ Check/replace the sensor ➜ Check cable and sensor fault

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4.8 NIBP Monitoring

- Non-invasive blood pressure is measured by the oscillometric method.
- The module performs single measurements and automatic measurements at selectable intervals.
- The automatic measurements are also suitable for a pregnant or pre-eclamptic patient.
- Check that the cuff is on a level with the heart during blood pressure measurements. If this is not ensured, the hydrostatic pressure of the liquid column in the blood vessels will lead to incorrect results. The cuff is automatically at the correct level when the patient is sitting, standing or supine during measurements.
- Factory default cuff pressure adult = 180 mmHg, children = 150 mmHg, neonates = 50 mmHg
- The initial cuff pressure is configurable. The maximum cuff pressure configuration in neonatal mode is 150 mmHg.

⚠ WARNING

- ▲ It is very important to choose the correct cuff size and to check the patient type setting, adult, child or neonate; this will prevent extensive pressure on the extremity.
- ▲ For neonatal patients, neonatal mode must be selected first. An erroneous mode selection will lead to a higher pressure which can cause a haematoma or an osseous deformation.
- ▲ When neonatal mode is selected, the maximal pressure is lowered, and the time measure is shorter. An erroneous mode selection on neonatal patients would engender inadequate pressure and time measure.
- ▲ In case of long-term monitoring or automatic operation, the connected body areas of the patient and the extremity to which the cuff is attached must be checked regularly for signs of ischaemia, purpura or neuropathy, especially in patients with decreased pain sensitivity (due to medication), or with older patients with decreased blood circulation of the extremities.
- ▲ The cuff must not be attached to a limb that is already used for interventions such as:
  - Infusions
  - SpO_2 measurement (loss of data can occur during cuff inflation)
  - If an arterio-venous shunt is present.
- ▲ Check that the tube is not kinked or compressed to prevent extensive pressure on the extremity and incorrect measurement results.
- ▲ The cuff must always be installed on the right atrium to achieve correct arterial pressure measurement.
- ▲ Keep the cuff and hose as far away as possible from the operated area and the electrosurgical cables to reduce interferences and the danger of burns for the patient. Check that the electrosurgical return conductor (neutral) is well attached to the patient and that good contact is guaranteed.
- ▲ For some patients, petechiae, haemorrhages, or subcutaneous haematomas may occur. When putting on the cuff, all patients must be told that if they experience pain during the recording, they should switch off the equipment and inform the doctor.
- ▲ When an automated measurement interval is defined, bruising or decreased blood circulation can occur in the arm. Only carry out recordings with automated measurement intervals under constant medical supervision.
- ▲ For the patient's health, you must check that the device will not damage the patient's blood circulation in the arm.

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⚠ CAUTION

- As with occasional blood pressure measurements, petechial bleeding can occur in patients with coagulation disorders or having anticoagulant treatment, even with the correct cuff size.
- The cuff can be placed on the opposite arm in patients with a single mastectomy.
- The cuff must not be placed over or near a wound that could cause further injury.
- Check that the tube is not pinched or compressed to prevent incorrect measurement results.
- A cuff applied to a patient in the recumbent or sitting position is normally located at the same level as the heart. If the cuff is located at a level higher than the heart (for example, if the arm of a patient in bed is lifted), this may result in lower-than-actual measurement readings (approximately 7.5 mmHg per 10 cm rise).

i

The measurement may be inaccurate or impossible:

- If a regular arterial pressure pulse is hard or impossible to detect, for example, with cardiac arrhythmias, severe shock, hypothermia or with obesity or an edematous extremity
- With excessive and continuous patient movement, such as shivering or convulsion.

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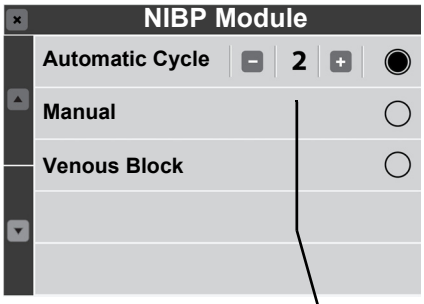
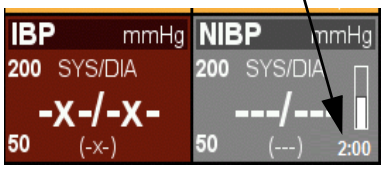
4.8.1 Starting NIBP monitoring





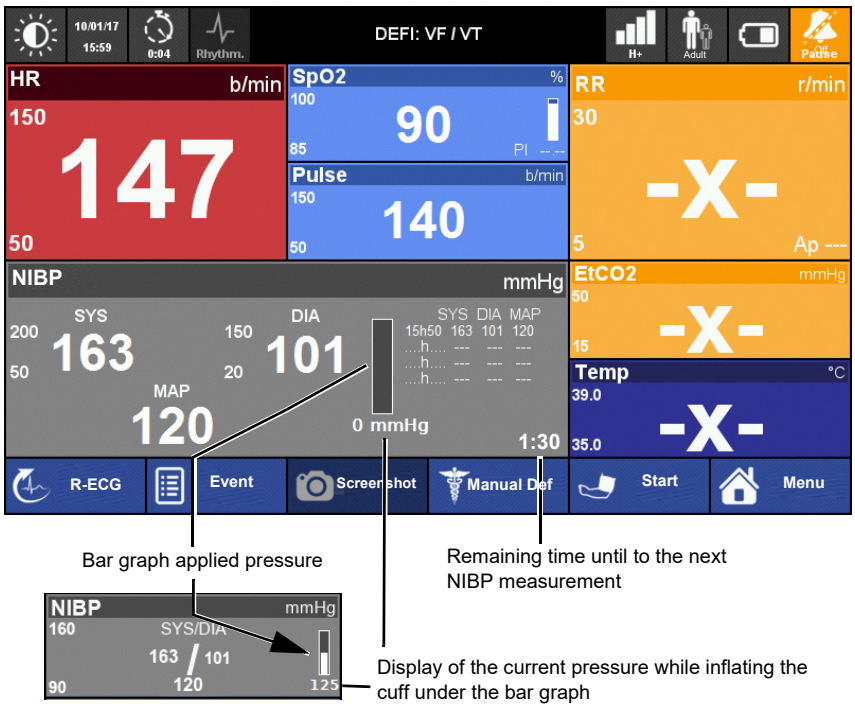
1. Note the cuff size for the respective patient type. Refer to section 13.2 Accessories DEFIGARD/PHYSIOGARD Touch 7.
2. The cuff is attached to the left or right upper arm, about 4 cm above the elbow (on children a little closer).
3. Connect the cuff tubing to the connection sleeve (1) and check it properly locks into place.
4. Define the NIBP settings directly via the Touch screen NIBP measurement field.
   – Patient type, adult, child or neonate (indicated at the top right)
5. Open the NIBP menu and check the settings.
   – The setting of the Automatic cycle time or manual measurement
6. Start the NIBP measurement by pressing the **Start** button.

➜ To disconnect the cuff tube, press the milled shell of the connecting sleeve backwards.

➜ Clean and disinfect the cuff after each use. Refer to sections 10.5 Cleaning and 10.6 Disinfection.

The following settings are available for the cycle time:

Automatic Cycles	2/3/5/10/15/30 minutes
Manual	The measurement is manually initiated by pressing **Manual**.
Venous Block	The venous block is used to apply intravenous access. The pressure is 80 mmHg, and the blockage time is limited to 80 seconds. Stop the blockage at any time by the NIBP Stop.



Bar graph applied pressure

Remaining time until to the next NIBP measurement

Display of the current pressure while inflating the cuff under the bar graph

- When the measurement is started, the increasing cuff pressure is displayed on the bar graph with the current pressure in mmHg under the bar graph.
- The last four measurements are displayed in the window.
- The latest NIBP measurement is always displayed in the NIBP parameter box. Should the value be older than 5 minutes, it will be displayed in yellow.

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4.8.2 NIBP Menu

Menu	Parameter	Description	Value
NIBP	Automatic cycles	Cycle time setting	Automatic cycle of 2/3/5/10/30 minutes
	Manual	The measurement is manually initiated by pressing **Manual**.	Manual = Start

4.8.3 NIBP Information and error messages

NIBP Alarm	Code	Cause	Remedy
Module inoperative	T.NIBP01 T.NIBP02 T.NIBP03 T.NIBP04 T.NIBP05 T.NIBP06 T.NIBP07	• NIBP module failed	➜ Replace the device
Unable to inflate cuff	T.NIBP08	• No pressure can be measured • The device is defective	➜ Check the cuff and connection. ➜ Replace the device
Invalid measurement	T.NIBP09 T.NIBP10 T.NIBP11	• Pressure/pulse below/above limits	➜ Check the cuff and connection for leaks
Unable to measure	T.NIBP12	• No signal/pulse detected at 50 mmHg	➜ Check the patient, cuff and hose
Cuff not present	T.NIBP13	• Pressure in the cuff remains too low, < 10 mmHg during 10 seconds	➜ Check the cuff and connection for leaks
Wrong cuff	T.NIBP14	• Pressure too high because – Too small cuff applied – Tube buckled	➜ Check the cuff and connection.
Artefacts detected	T.NIBP15 T.NIBP16	• Measurement disturbed by external influences	➜ The patient must not move during measurement
Measurement timeout	T.NIBP17	• Measurement time exceeded with no results	➜ Check the cuff and connection. ➜ Check that the cuff is well applied
Inflate timeout	T.NIBP18 T.NIBP19	• Pumping running time exceeded	➜ Check the cuff and connection for leaks.
Pressure out of range	T.NIBP20	• Pressure below/above acceptable range	➜ Check the patient, cuff and hose
No pulse	I.NIBP01	• No pulse detected	➜ Check that the cuff is well applied ➜ Check the patient, cuff and hose

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4.9 IBP Monitoring

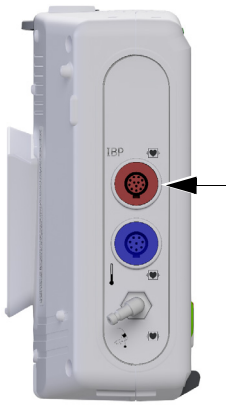
⚠ WARNING

- ▲ Carefully read the manufacturer's instructions before using the invasive blood pressure kit.
- ▲ When applying the kit to the patient, check that no air penetrates the system.
- ▲ The pressure sensor must be installed on the right atrium to achieve correct arterial pressure measurement.
- ▲ If the pressure sensor's position is changed after calibration, this might lead to wrong low or high values.
- ▲ If an invasive catheter for blood pressure measurement is introduced into an arterial vessel, the circulation in the terminal vessels must be checked at regular intervals.
- ▲ Single-use sensors and valves must not be reused.
- ▲ Do not use the IBP kit if the packaging is opened or damaged.
- ▲ For patients' safety, you must check that neither the electrodes, the patient, or persons touching the patient, come into contact with conducting objects, even if these are earthed.
- ▲ Special care must be exercised when the unit is used with high-frequency equipment. To prevent incorrect IBP measurements, only use sensors protected against high-frequency radiation.

- The kit and operating procedure vary according to the manufacturer. Consult the manufacturer's documentation for connection.
- For warm-up time/ready for measurement and displacement for invasive transducers, refer to the documentation of the transducer manufacturer.

4.9.1 Preparing an IBP measurement

The rinse must be contained in a flexible container, and this container must be surrounded by a pressure bag which should exert a pressure of 300 mmHg ± 30 mmHg. The pressure ensures a minimum rinse flow of approximately 6 ml per hour to prevent catheter tip occlusion.



1. Unpack the disposable measuring kit and check all tube connections for tightness.
2. Secure the infusion bag and connect the infusion tube to the bag.
3. Fill up the system with liquid, completely void of air.
4. Hang the measuring kit in the holder and secure the holder.
5. Connect the cable of the transducer to the adaptor cable.
6. Connect the adapter cable to the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** IBP input.

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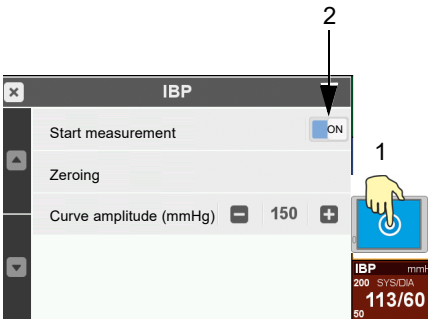
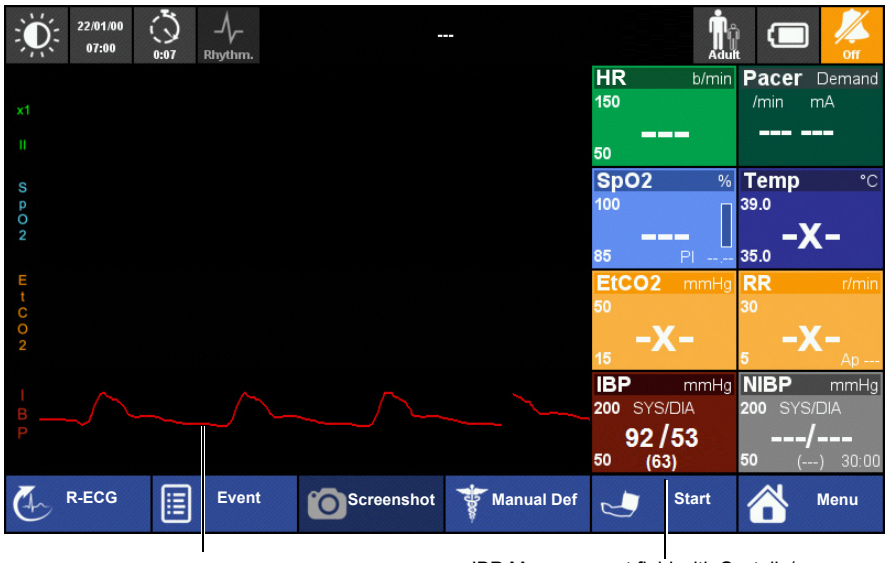
4.9.2 Start IPB measurements



1. Select the **IBP** measurement field (1) to open the IBP menu.
2. Select the **OFF/ON** button (2) to start the measurement.
3. Zeroing the IBP (refer to section 4.9.4 IBP Zeroing)
4. Check the IBP curve on the display to see if the connections have been made correctly and if the IBP value is in the expected range.

IBP Curve display



4.9.3 IBP Menu settings

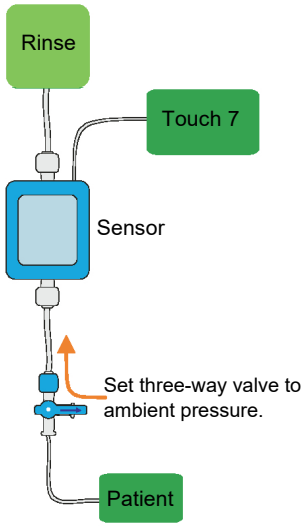
Access the IBP menu via the IBP measurement field as described in section 3.3 Operation.

The default settings are printed in **Bold**.

Menu item	Parameter	Description
IBP Parameter	Start measurement	Starts the IBP measurement
	Zeroing	Zero adjustments of the IBP
	Curve amplitude (mmHg)	Set the range for the IBP measurement: 30, 60, 150, 300 mmHg
	Curve amplitude (kPa)	Set the range for the IBP measurement: 4, 8, 20, 40 kPa

4.9.4 IBP Zeroing

- Zeroing must be carried out before every application.
- To prevent incorrect measurement readings due to the sensor's physical null drift, calibrate the sensor every 24 hours.
- Note if the pressure sensor's position is changed after or during calibration, this might lead to wrong low or high values.



1. As shown in this example, the manufacturer's instruction, open the relevant valve(s) to equalise the system pressure.
2. Select the **IBP** measurement field to display the IBP menu.
3. Select the parameter **Zeroing** to carry out the zeroing.
4. Check that zeroing has been properly performed (indicated by a green mark on the menu)

4.9.5 IBP Alarms and messages

Alarm	Code	Cause	Remedy
No sensor	T_IBP01	• Cable is not connected to the device	→ Check the cable connection to the device.
Catheter is disconnected	T_IBP02	• Catheter is disconnected • Catheter valve is closed	→ Check the catheter → Check the catheter valve
Zero required	T_IBP03	• No zeroing has been done • Zero point sensor too high/low by more than ±30 mmHg or unsteady pressure	→ Check the tube system, sensor and valves. → Perform zeroing.
Zero not possible	I_IBP01	• Try to zeroing during valid patient measurement • Try to zeroing without sensor connected	→ Check the catheter valve is closed during zeroing → → Connect the sensor
IBP SYS LOW/HIGH	P_IBP01	• Systolic pressure higher/lower then the alarm limits	→ Check the patient and alarm limits.
IBP DIA LOW/HIGH	P_IBP01	• Diastolic pressure higher/lower than the alarm limits	→ Check the patient and alarm limits.

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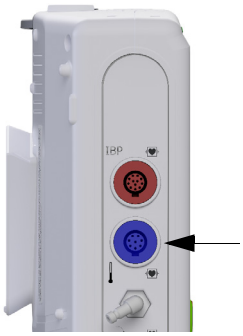
4.10 Temperature Monitoring

- Depending on the sensor type, the sensor can be applied to the ear, skin, or rectum.
- The measurement duration must be at least 2 minutes to achieve a reliable measured value independent of the measuring site.
- The temperature measurement method is Direct mode.

4.10.1 Start temperature monitoring



1. Connect the sensor to the temperature input.
2. Select the **TEMP** measurement field to open the Temp menu.
3. Press the **ON/OFF** button to start the measurement.

4.10.2 Temperature menu settings

Access the temperature menu via the TEMP measurement field as described in 3.3 Operation.

The default settings are printed in **bold**.

Menu item	Parameter	Description
Temperature	Start measurement	ON or **OFF**
	Calibrate	Calibration of the sensor

4.10.3 Temperature alarms

Alarm	Cause	Remedy
Check the sensor	Temperature sensor is not connected to the device	Connect the sensor.
Temperature: Out of range	Temperature is out of set alarm limits.	Check the patient Check the narrow/wide alarm limit and adjust it if necessary.

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4.11 CO_2 Mainstream

4.11.1 IRMA Mainstream gas analyser

- RMA mainstream gas analyser is intended to be connected to a patient breathing circuit for monitoring inspired/expired gases during anaesthesia, recovery and respiratory care.
- Use the connection cable 6-17-0015 with the IRMA sensor 2.100571.

⚠ WARNING

Infant airway adapter

▲ The IRMA gas analyser is intended for use by authorised healthcare professionals only.

▲ Risk of cross infection.
- Disposable airway adapters must not be re-used
- Used disposable airway adapters must be disposed of per local regulations for contaminated and biologically hazardous fluids

▲ Airway Adapters are non-sterile devices. Do not sterilise.

▲ Use only Masimo-manufactured IRMA airway adapters.

▲ Use the correct adapter:
- Do not use the IRMA Paediatric/Adult airway adapter for infants because the adult adapter adds 6 ml dead space to the patient circuit.
- Do not use the IRMA Infant airway adapter for adults because this may cause excessive flow impedance.
- Do not use the airway adapter with metered dose inhalers or nebulised medications as this may affect the light transmission of the airway adapter windows.

▲ The IRMA sensor is not intended as the only means of monitoring a patient.

▲ Never sterilise or immerse the sensor in liquid.

▲ Do not apply tension to the sensor cable.

▲ Do not place the IRMA airway adapter between the endotracheal tube and an elbow, as this may allow patient secretions to block the adapter windows and result in incorrect operation.

Paediatric/Adult airway adapter

▲ Always position the IRMA probe vertically with the LED pointing upwards to keep secretions and moisture from pooling on the windows.

▲ Replace the airway adapter if condensation or rainout (droplets) occurs inside the airway adapter.

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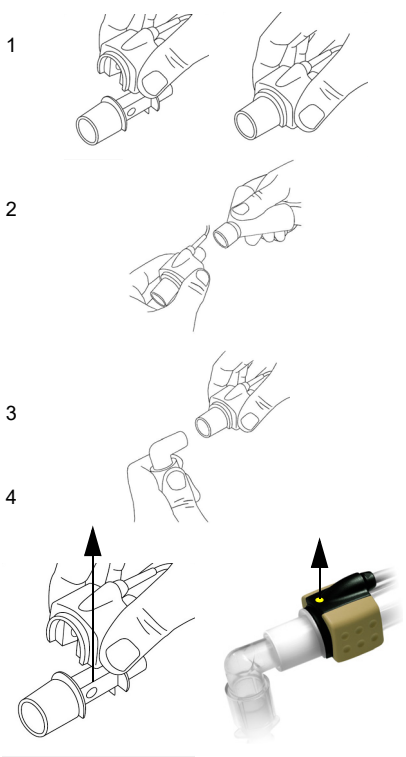
4.11.2 Preparing the IRMA sensor

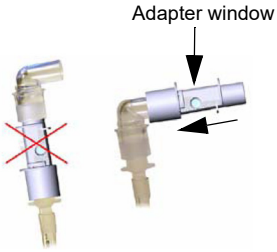


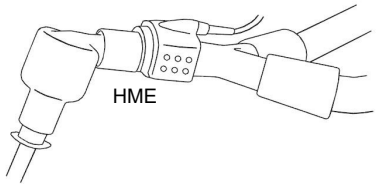
1. Insert the airway adapter.
2. Connect the 15 mm airway adapter end to the ventilator Y-piece.
3. Connect the patient side of the airway adapter to the tube.

Important

4. To keep moisture from pooling on the windows, position the airway adapter with its window vertically (LED pointing upwards).

➜ To prevent the window from soiling from patient secretions or condensing water, position the adapter in a slightly angled position between the endotracheal and the respiration tubes.





➜ Alternatively, connect a Heat Moisture Exchanger (HME) between the patient's endotracheal tube and the IRMA probe. Placing an HME in front of the IRMA probe protects the airway adapter from the secretions and effects of water vapour and eliminates the need to change the adapter. It allows free positioning of the IRMA probe as well. Unless the IRMA probe is protected with an HME, always position the IRMA probe with the LED pointing upwards.

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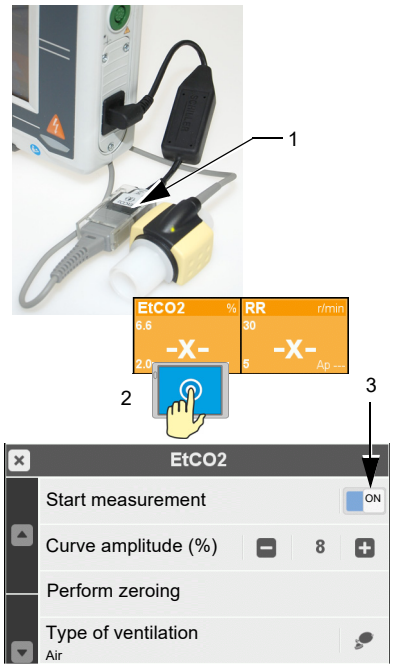
4.11.3 Initial operation of the IRMA sensor

- The sensor requires a warm-up time of around ten seconds to provide fully accurate measurements.
- A correction related to O_2 usage is available in the menu setting $EtCO_2$ > Type of ventilation. If the patient is ventilated with Air and O_2, set the Type of ventilation to Air + O_2; if ventilated only with air, set it to Air.



1. Connect the sensor cable to the main cable (1). Snap the sensor head on top of the airway adapter. Check it clicks into place.
2. A green LED indicates that the sensor is ready for use.
3. Select the **$EtCO_2$** measurement field (2) to open the $EtCO_2$ menu.
4. Select the **OFF/ON** button (3) to start the measurement.
5. Check if the $EtCO_2$ value is zero.
6. If needed, carry out a zeroing (refer to section 4.11.5 Zeroing of the IRMA CO_2 sensor).
7. Connect the narrower end of the airway adapter to the breathing circuit Y-piece.
8. Connect the end of the airway adapter to the patient's endotracheal tube.
9. Check the CO_2 curve on the display to see if the connections have been made correctly and if the CO_2 value is in the expected range. The curve rises during expiration.

4.11.4 Placement of IRMA sensor

⚠ WARNING

▲ The IRMA probe is not intended to be in patient contact.

➜ When connecting the IRMA sensor to an infant patient circuit, it is important to avoid direct contact between the IRMA sensor and the infant's body. Use insulation material between the body and the IRMA sensor to avoid contact.

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4.11.5 Zeroing of the IRMA CO_2 sensor

⚠ WARNING

- ▲ An incorrect zeroing leads to wrong measurement results.
- ▲ Therefore, check that the IRMA adapter is filled with ambient air (21% O_2 and 0% CO_2) during the zeroing.
- ▲ After start-up or changing the adapter, wait at least 10 seconds until the sensor has reached its operating temperature.
- ▲ During zeroing, no breathing air must enter the adapter.

Zeroing intervals for CO_2 IRMA sensor

- When the message, CO_2 calibration is required is displayed
- When an offset in gas readings is discovered (0-offset)

Zeroing procedure

1. Snap a new airway adapter onto the sensor without connecting the airway adapter to the breathing circuit.
2. After start-up or changing the adapter, wait at least 10 seconds until the sensor has reached its operating temperature.
3. In the $EtCO_2$ settings menu, select the menu item, **Perform zeroing.**
4. Carry out the zeroing by pressing the parameter **Perform zeroing** in the $EtCO_2$ settings menu. Check that no exhaled air enters the airway adapter. The green LED on the probe will be blinking for approximately 5 seconds while zeroing is in progress.
5. If the message CO_2 calibration is required is again displayed, perform the zeroing again.
6. If the message CO_2 calibration is required is no longer displayed, the zeroing has been performed.
7. Reconnect the airway adapter with the sensor to the breathing circuit.
8. Check the CO_2 curve on the display to see if the connections are correct, and the CO_2 value is in the expected range. The curve rises during expiration.

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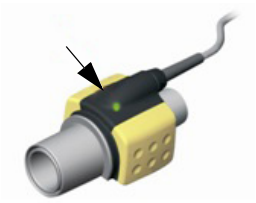
4.11.6 Sensor LED indications



Apart from the indications on the screen, the LED on the sensor gives the following indications:

Steady green:	System OK
Steady red:	Sensor error
Flashing red:	Check the adapter
Flashing green:	Zeroing in progress

4.11.7 Settings $EtCO_2$ menu

Access the $EtCO_2$ menu via the $EtCO_2$ display field as shown in 4.11.3 Initial operation of the IRMA sensor.

The default settings are printed in **bold**.

Menu item	Parameter	Description
$EtCO_2$	Start measurement	ON or **OFF**
	Curve amplitude (%)	**8**, 12 or 15%
	Curve amplitude (mmHg)	50, 75, 100 mmHg
	Curve amplitude (kPa)	7, 10, 14 kPa
	Perform zeroing	Zeroing the sensor to ambient air
	Type of ventilation	Air = patient ventilated only with air Air + O_2 = patient ventilated with Air and O_2

4.11.8 Curve list

Menu	Parameter	Description	Value
Curve list	Touch the first curve	Selection of the displayed first curve. The first display curve calculates the Heart rate unless the HR source is set to Pleth.	ECG: I, ECG: II, ECG: III or Defi Default: **ECG II**
	Touch curves 2,3 and 4	Selection of the displayed curve	ECG: Defi, ECG: I, ECG: II, ECG: III, aVR, aVL, aVF, SpO_2, Plethysmograph, $EtCO_2$: Respiration, IBP

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4.11.9 CO_2 Error messages

Alarm	Code	Cause	Remedy
RR out of range	P.ETCO2 01	• Respiration rate out of set alarm limits.	➜ Check the patient ➜ Check the narrow/wide $EtCO_2$ alarm limit and adjust it if necessary. ➜ Check the ventilation settings
Apnoea	P.ETCO2 02	• Apnoea out of set alarm limits.	➜ Check the patient ➜ Check the narrow/wide alarm limit and adjust it if necessary. ➜ Check the ventilation settings
$EtCO_2$ out of range	P.ETCO2 03	• $EtCO_2$ is out of set alarm limits.	➜ Check the patient ➜ Check the narrow/wide $EtCO_2$ alarm limit and adjust it if necessary. ➜ Check the ventilation settings
CO_2 calibration required	I.ETCO20 1	• an offset in gas readings is discovered	➜ Perform zeroing
Check Sensor	T.ETCO2 01	• No Sensor connected, defective cable	➜ Connect the sensor, check the cable
Zeroing in progress	T.ETCO2 02	• Zeroing process has started	➜ Wait until the zeroing process ends
Replace adapter	T.ETCO2 04	• The Adapter is polluted with patient secretions	➜ Replace the CO_2 adapter if polluted
No adapter	T.ETCO2 05	• No or incorrect CO_2 adapter • Adapter not properly connected	➜ Check if IRMA CO_2 adapter is properly connected
Internal temp out of range	T.ETCO2 14	• Temperature sensor too high/ low	➜ Check the standard operating condition if normal: ➜ Replace the sensor
Ambient pressure out of range	T.ETCO2 15	• Pressure to high/low	➜ Check the standard operating condition if normal: ➜ Replace the sensor
Inaccurate zero reference	T.ETCO2 16	• This alarm is due to zeroing required message from the probe.	➜ Check the standard CO_2 condition if normal: ➜ Perform zeroing
Software error	T.ETCO2 18	• Sensor failure	➜ Check the sensor, replace the sensor
Hardware error	T.ETCO2 19	• Sensor failure	➜ Check the sensor, replace the sensor
Motor speed out of bounds	T.ETCO2 20	• Sensor failure	➜ Check the sensor, replace the sensor
Factory calibration lost	T.ETCO2 21	• Sensor failure	➜ Check the sensor, replace the sensor

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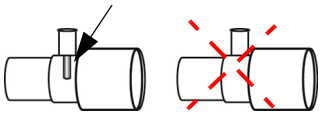
4.12 CO_2 Sidestream

4.12.1 ISA Gas analyser (sidestream measurement)

- ISA sidestream gas analyser is intended to be connected to a patient breathing circuit to monitor inspired/expired gases during anaesthesia, recovery and respiratory care.
- A correction related to O_2 usage is available in the menu setting $EtCO_2$ > Type of ventilation. If the patient is ventilated with Air and O_2, set the Type of ventilation to = Air + O_2; if ventilated only with air, set it to Air.
- Use the connection cable 6-17-0024 with the ISA sensor 2.101176.

⚠ WARNING



- ▲ The ISA sidestream gas analyser is only intended for use by authorised healthcare professionals.
- ▲ Disposable sampling lines must not be reused. Used sampling lines should be disposed of per local regulations for contaminated and biologically hazardous fluids.
- ▲ Only use Masimo´s Nomoline sampling lines.
- ▲ Only use sample lines intended for anaesthetic agents if N_2O or anaesthetic agents are used.
- ▲ Check to select the correct configuration:
  - – Do not use a T- adapter for infants or neonates, as this adds 7 ml of dead space to the patient circuit.
  - – Do not use the NomoLine Airway Adapter Sets adult/paediatric for infants/neonates as the adult/paediatric Airway Adapter adds 6 ml dead space.
  - – Do not use the Nomoline Airway Adapter Set infant/neonate with adult/paediatric patients as they may cause excessive flow resistance (0.7 ml dead space).
- ▲ Use only airway T-adapters with the sampling point in the centre of the adapter; see the images left.
- ▲ Do not use the sampling lines with metered-dose inhalers or nebulised medications, as this may clog the bacteria filter.
- ▲ The ISA sensor is not intended as the only means of monitoring a patient.
- ▲ Excessive positive or negative pressure in the patient circuit (for example, excessive scavenging suction pressure) might lead to incorrect readings.
- ▲ Exhaled gases should be returned to the patient circuit or scavenging system; do not apply negative pressure to the Nomoline (using a syringe) to remove condensed water.
- ▲ Always use a bacteria filter on the evacuation side if sampled gas is intended to be re-breathed.
- ▲ Using high-frequency electrosurgical equipment near the ISA sensor may produce interference and lead to incorrect measurements.
- ▲ Exhaust gases should be returned to the patient circuit or a scavenging system.

⚠ CAUTION

- ▲ The Nomoline sampling line and its interface are non-sterile devices. To avoid damage, do not autoclave any part of the sampling line.
- ▲ Do not apply tension to the sensor cable.
- ▲ Do not operate the device at temperatures outside the specified operating environment.
- ▲ Check that the ISA sensor is properly secured to prevent damage to the sensor.
- ▲ Using a sampling line with an inner diameter of more than 1 mm can change the response and rise time of the CO_2 measurement. When the respiration rate is higher than 130/minute, this might lead to a lower $EtCO_2$ value being displayed.

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- The Nomoline sampling line is designed for single use; do not reuse them.
- The NomoLine Family sampling lines are divided into two application categories:
  - NomoLine Low-Humidity (LH), Single-patient-use sampling lines for short-term applications in LH conditions.
  - NomoLine High-Humidity (HH), Single-patient-use sampling lines for long-term applications in HH conditions.
- The NomoLine sampling lines are designed to collect LH or remove HH condensed water and incorporate a bacteria filter that protects the gas analyser from water intrusion and cross-contamination.

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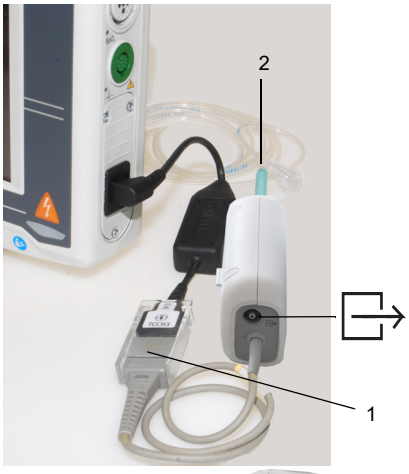
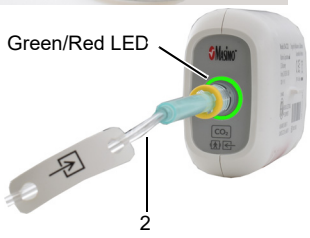
4.12.2 Initial operation of the ISA gas analyser

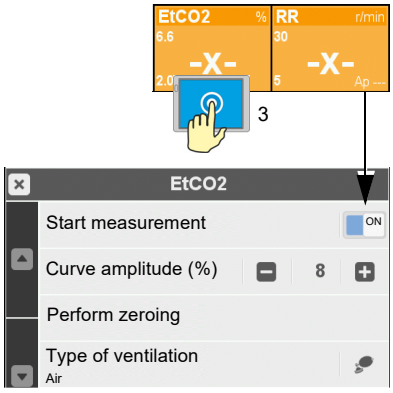
The sensor requires a warm-up time of around 10 seconds.

⚠ CAUTION

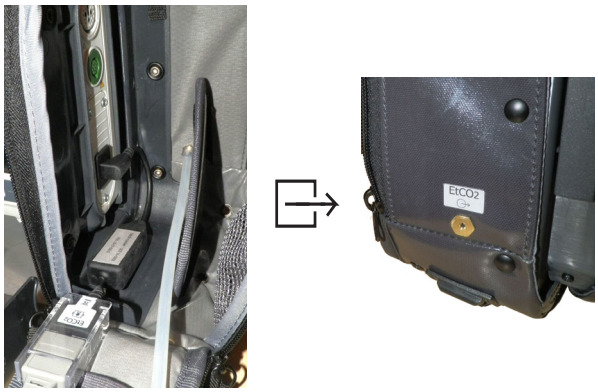
- ▲ Replace the sampling line if the sampling line input connector (2) starts flashing red or the message “Sampling line clogged” is displayed on the device.
- ▲ Connect the gas sample exhaust port ⇨ to the gas exhaust of the bag to prevent the CO_2 enriched gas in the bag influences the zeroing of the ISA gas analyser.







1. Connect the sensor cable (1).
2. Connect the Nomoline sampling line (2) to the ISA gas analyser.
3. A green LED (2) indicates the sensor is ready for use.
4. Select the **$EtCO_2$** measurement field (3) to open the $EtCO_2$ menu.
5. Select the **OFF/ON** button to start the measurement.
6. Breathe briefly into the sampling line and check that the CO_2 curves and values are displayed correctly.
7. Occlude the sampling line with your fingertip and wait for 10 seconds.
8. Check that an occlusion alarm is displayed and that the gas analyser shows a flashing red light.



4.12.3 Sensor LED indications

In addition to the information given on the screen, the sensor LED indicates the following:

Steady green:	System OK
Flashing green:	Zero reference calibration in progress

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Steady red:	Sensor error
Flashing red:	Check/replace the sampling line

4.12.4 Nomoline family sampling line (water trap) replacement

⚠ WARNING

▲ Dispose of the Nomoline family sampling lines per local regulations for biohazardous waste regulations.

➜ NomoLine Family sampling lines should be replaced according to good clinical practice, but latest, after two weeks or when the sampling line gets occluded.
– Occlusion occurs when water secretion has aspired from the respiratory circuit to such an extent that ISA cannot maintain the normal 50 ml/min sample flow. A red flashing gas inlet connector and an alarm message indicate this situation.
➜ Replace the NomoLine and wait until the gas inlet connector switches to green, indicating that the ISA gas analyser is ready for use.

4.12.5 Respiration rate alarms

Alarm	Code	Cause	Remedy
RR is out of range	P.ETCO2 01	• Respiration rate out of set alarm limits.	➜ Check the patient ➜ Check the narrow/wide $EtCO_2$ alarm limit and adjust it if necessary. ➜ Check the ventilation settings
Apnoea	P.ETCO2 02	• Apnoea out of set alarm limits.	➜ Check the patient ➜ Check the narrow/wide $EtCO_2$ alarm limit and adjust it if necessary. ➜ Check the ventilation settings
CO_2 is out of range	P.ETCO2 03	• $ETCO_2$ is out of set alarm limits.	➜ Check the patient ➜ Check the narrow/wide $EtCO_2$ alarm limit and adjust it if necessary. ➜ Check the ventilation settings
CO_2 calibration is required	I.ETCO20 1	• An offset in gas readings is discovered	➜ Perform zeroing
Check the sensor	T.ETCO2 01	• No Sensor connected, defective cable	➜ Connect the sensor, check the cable
Zeroing in progress	T.ETCO2 02	• Zeroing process has started	➜ Wait until zeroing process ends
The sampling line is clogged	T.ETCO2 07	• Indicates sampling line occlusion.	➜ Replace the sampling line
No sampling line	T.ETCO2 08	• Indicates that a sampling line needs to be fitted.	➜ Check if IRMA CO_2 adapter is properly connected
Internal O_2 port failure	T.ETCO2 09	• Sensor failure	➜ If persistent, replace the sensor
Internal temperature is out of range	T.ETCO2 14	• Temperature Sensor to hight/ low	➜ Check the standard operating condition if normal: ➜ Replace the sensor
Ambient pressure is out of range	T.ETCO2 15	• Pressure to high/low	➜ Check the standard operating condition if normal: ➜ Replace the sensor
Inaccurate zero reference	T.ETCO2 16	• This alarm is due to Zeroing required message from the probe.	➜ Check the standard CO_2 condition if normal: ➜ Perform zeroing

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Alarm	Code	Cause	Remedy
Software error	T.ETCO2 18	• Sensor failure	➜ Check the sensor, replace the sensor
Hardware error	T.ETCO2 19	• Sensor failure	➜ Check the sensor, replace the sensor
Motor speed out of bounds	T.ETCO2 20	• Sensor failure	➜ Check the sensor, replace the sensor
Factory calibration lost	T.ETCO2 21	• Sensor failure	➜ Check the sensor, replace the sensor

4.12.6 Settings $EtCO_2$ menu

Access the **$EtCO_2$** menu via the **$EtCO_2$** display field; refer to section 4.12.2 Initial operation of the ISA gas analyser.

The default settings are printed in **bold**.

Menu item	Parameter	Description
	Start measurement	On or **OFF**
	Curve amplitude (%)	**8**, 12 or 15%
	Perform zeroing	Zeroing the sensor to ambient air
	Type of ventilation	Air = patient ventilated only with air Air + O_2 = patient ventilated with Air and O_2

4.12.7 Curve list

Menu	Parameter	Description	Value
Curve list	Touch the first curve	Selection of the displayed first curve. The first displayed curve calculates the Heart rate unless the HR source is set to Pleth.	ECG: I, ECG: II, ECG: III or Defi Default: **ECG II**
	Touch the curves 2,3,4	Selection of the displayed curve	ECG: Defi, ECG: I, ECG: II, ECG: III, aVR, aVL, aVF, SpO_2, Plethysmograph, $EtCO_2$: Respiration, IBP

4.12.8 Zero adjustments of the CO_2 sidestream sensor

⚠ WARNING

- ▲ Incorrect zero adjustment leads to erroneous measurement results.
- ▲ Therefore, check that the calibration is performed in a well-ventilated room. Avoid breathing near the gas analyser before or during the calibration.
- ▲ If the ISA gas analyser is stowed in the transport bag, ensure good ventilation of the bag or check that the gas exhaust is connected before calibration.

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- The ISA sidestream gas analyser performs zeroing automatically by switching the gas sampling from the respiratory circuit to ambient air. Automatic zeroing is performed after startup and 1 to 3 times daily, taking less than 3 seconds.
- During zeroing, if ISA's exhaust gas is returned to the patient circuit, the returned gas level will differ from the gas level at the sampling site.

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Calibration intervals for ISA CO_2 sensor

- When the message CO_2 calibration is required is displayed
- When an offset in gas readings is discovered (0-offset)

Zeroing procedure

1. Select the menu **CO_2** > **$EtCO_2$**, and then the menu item **Perform zeroing.** The green LED on the ISA sensor is blinking, and the **Zeroing process** is displayed on the **DEFIGARD Touch 7/PHYSIOGARD Touch 7**.
2. The calibration is finished when the green LED on the sensor stops blinking.
3. Check the $EtCO_2$ curve in the display to see if the connections have been made correctly and if the $EtCO_2$ value is in the expected range. The curve rises during expiration.

4.13 Registering events

When the **Event** button is pressed, the pre-defined event texts are displayed. Select one of these texts; this text will be recorded in the data report and the time.

Fig. 4.10 Event button

➜ Select **Cancel last** to indicate that an incorrect event was selected. A Cancel Last event and time stamp are stored in the event list.

Data (ECG, automatic and manual events) can be displayed on a PC using the SCHILLER data reviewing software.

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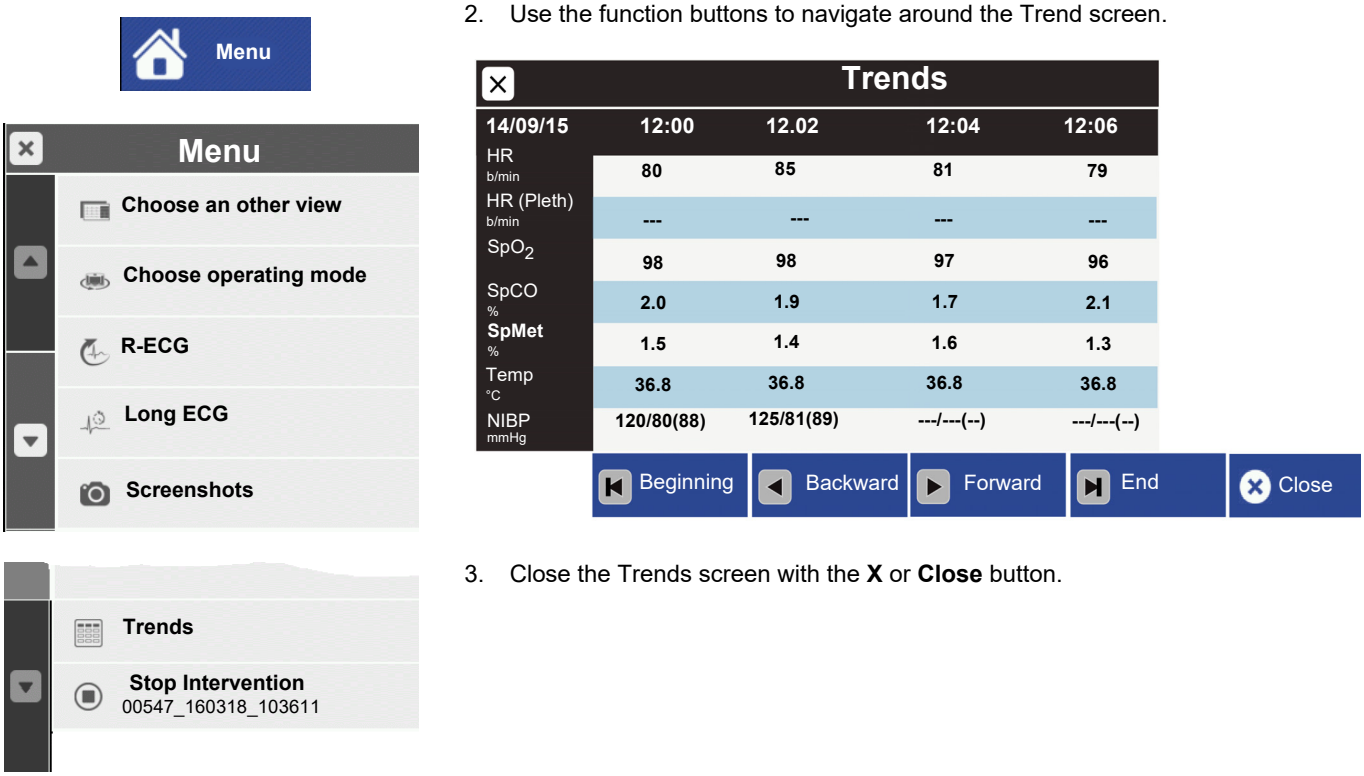
4.14 Trends, R-ECG, Long ECG, Events and Screenshots

All recorded trend data, resting ECGs and screenshots can be viewed during an intervention. The viewed resting ECG can also be transmitted as described in section 4.7 SpO_2,- SpCO, - SpMet Monitoring (option).

4.14.1 View trends

Trends are displayed with a standard interval of 2 minutes. However, each NIBP measurement adds another column independently from the standard interval.

1. Enter the main menu and select **Trends**
2. Use the function buttons to navigate around the Trend screen.



3. Close the Trends screen with the **X** or **Close** button.

Fig. 4.11 Trends screen

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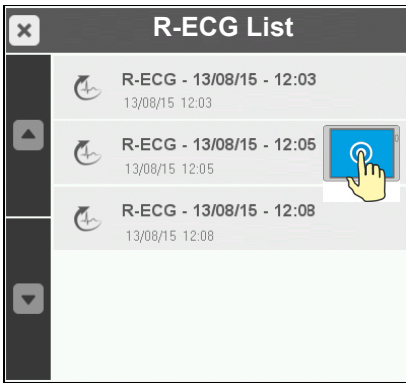
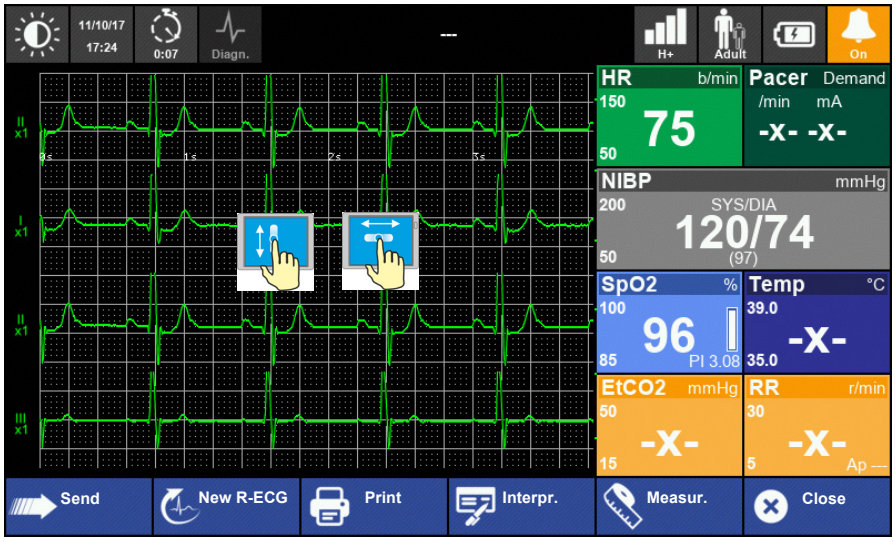
4.14.2 View resting ECG

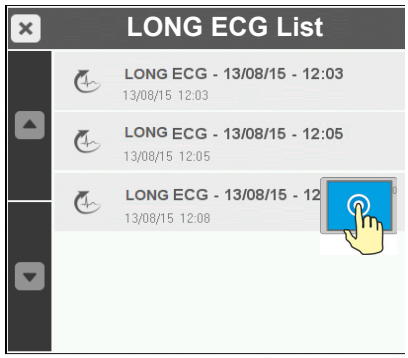


1. Enter the main menu and select **R-ECG.**
2. Select one of the R-ECG records on the R-ECG list
3. The following screen appears.

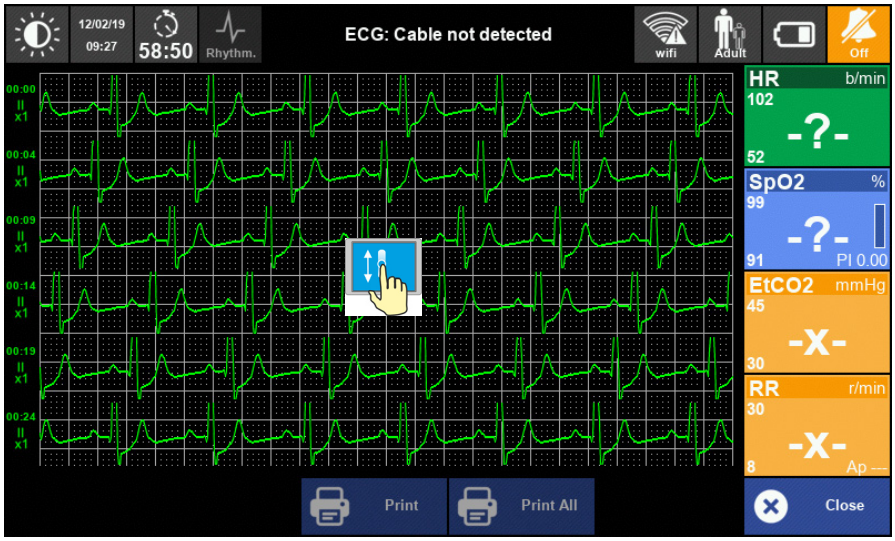


4. To exit the viewing mode, press the **Close** button.
5. To print the resting ECG, select **Print**

4.14.3 View long ECG



1. Enter the main menu and select **Long-ECG**
2. Select one of the **Long ECG records** on the Long ECG list
3. The following screen appears.



4. Exit the viewing mode by pressing the **Close** button.
5. To print the Long ECG, select **Print** or **Print all**

4.14.4 View and print screenshots

The device will automatically capture screenshots in case of:

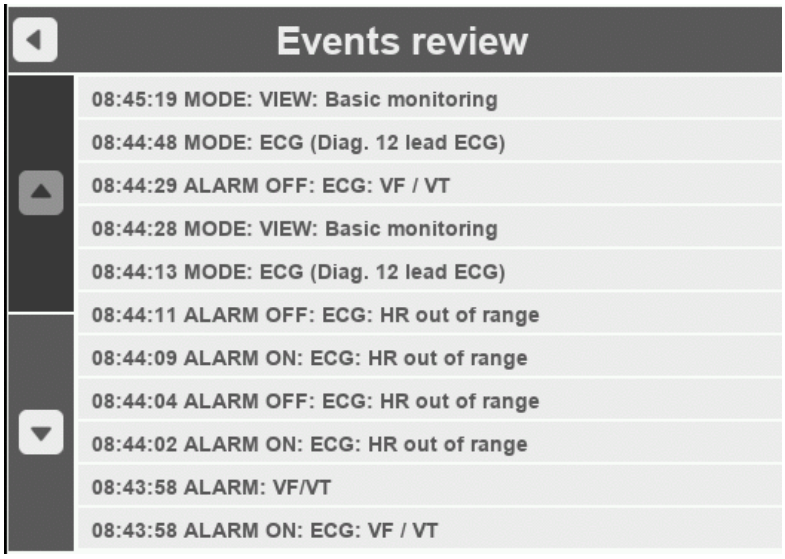
- Shock delivery
- Switch to AED
- Switch to Manual Defibrillator
- Pacer on
- Pacer off
- ECG alarm (VF/VT, Asystole)

1. Enter the main menu and select **Screenshots**
2. Select one of the screenshots on the list.
3. The screenshot appears with a watermark.
4. Exit the viewing mode by pressing the **X** button in the top left corner.

- To print a screenshot, tick the box on the right and click, **Next**.
  Several screenshots can be selected and printed.
- The screenshot is available for printout only when the icon has switched from camera to camera + printer
  - The printout files may take some time to be generated.

4.14.5 View events

1. Enter the main menu and select **Review events**
2. The following screen appears:



3. Exit the viewing mode by pressing the **Back** or the **Menu** button.

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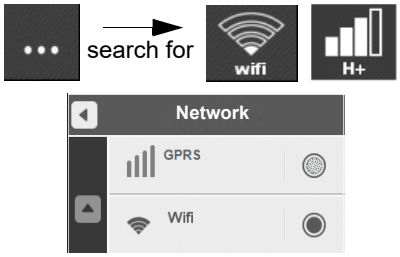
4.15 Transmission

Various data are available for transmission via several communication channels, for example, cellular network, Wi-Fi, USB-Ethernet and USB storage.

4.15.1 Selecting communication media Wi-Fi or GPRS

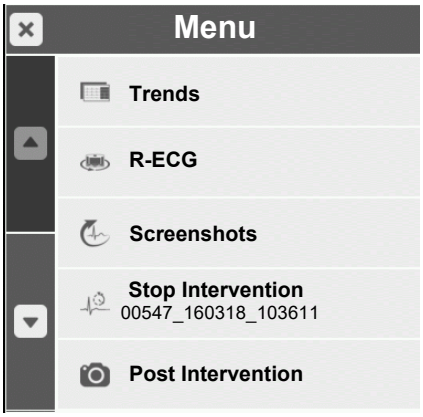


Select the Wi-Fi or GPRS icon from the **Network** menu to change the transmission media. Select Wi-Fi or GPRS; the corresponding icon will be displayed on the top right status bar.

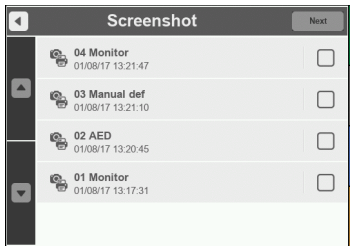
4.15.2 Transmission procedure

Ensure that a transmission line is connected to the device; the configurations in the **Control panel** menu has been made.

Transmitting R-ECG or Screenshots



1. Enter the main menu and select **R-ECG** or **Screenshots**
2. Select one of the R-ECG records.



Transmission in progress

Transmission failed

Transmission successful

No connection to the WLAN or GPRS transmission channel. Transmission to the USB memory sticks only.

3. Press the **Next** button and select the desired transmission channel (cellular network, Wi-Fi, USB/Ethernet or USB storage).
4. The transmission icon on the top right status bar shows the progress of the transmission.
5. Select the transmission icon to open the Transmission list.

If transmission of the data fails, the ECG/Screenshot file can be re-sent via the Menu > ECG or Screenshots

5 Defibrillation

This chapter applies only to the **DEFIGARD Touch 7**.

5.1 Application guidelines and safety notes

Observe the following guidelines to ensure successful and safe defibrillation. Otherwise, the lives of the patient, the user and the bystanders are in danger.

⚠ DANGER

- ▲ The patient must:
  - – Never come into contact with the operator or other persons during defibrillation.
  - – Never come into contact with metal parts, for example, bed or litter, or be positioned on wet ground (rain, accident in swimming pool) to prevent unwanted pathways for the defibrillation current, which may endanger the operator or assistants.
- ▲ Do not allow the defibrillation electrodes to come into contact with other electrodes or metal parts in contact with the patient.
- ▲ The patient's chest must be dry, as moisture causes unwanted pathways for the defibrillation current. For safety, wipe off flammable skin cleansing agents.
- ▲ A real risk of skin burns exists at the site of the electrodes due to high currents. Electrodes must not be placed on or above the sternum, clavicle or mamilla.
- ▲ Immediately before the shock, heart massage CPR and artificial respiration must be stopped, and bystanders must be warned.
- ▲ Defibrillating a patient with an implanted pacemaker is likely to impair the pacemaker's function or cause damage to the pacemaker. For this reason, do not apply the defibrillation electrodes near the pacemaker, have an external pacemaker at hand, and check the implanted pacemaker for proper functioning after the shock.
- ▲ Defibrillation has to be performed with the adapted accessories according to the type of patient.

⚠ CAUTION

- ▲ Equipment damage. Sensors and devices not defibrillation-proof must be disconnected from the patient before a shock is triggered.
- ▲ If the victim is installed on a mattress, the Chest Compression may be cushioned, leading to a loss in CPR quality. Consider moving the victim on a hard surface for optimal CPR quality.

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5.1.1 Additional safety information for AED mode

In addition to the guidelines set out in section 5.1 Application guidelines and safety notes, the following rules must be observed when using an AED, as failure to do so may compromise the success of the defibrillation or endanger the patient's life.

⚠ WARNING

- The user is committed to verifying the AED's prerequisites by checking for lack of consciousness, breathing, and circulatory signs using the ABCD system (BLS algorithm).
- The device must only be used if the following symptoms are found:
  - Non-responsive
  - No respiration
  - No pulse
- If a patient spontaneously regains consciousness during treatment, a defibrillation shock that may have been advised just before must not be delivered.
- The patient must lie as still as possible and must not be touched, as artefacts may otherwise lead to incorrect analysis results to ensure correct analysis of the heart rhythm.
- If the ECG signal changes such that the shock is not recommended, the shock delivery is automatically blocked in the AED mode.
- Using a defibrillator in AED mode in a moving vehicle can interfere with the Shock Advisory System and lead to false decisions related to patient treatment advice. It is advised to stop the vehicle before running any shock advisory analysis.
- Some non-shockable rhythms of patients in cardiac arrest may interrupt the analysis process.
- Using a defibrillator in AED mode on a patient with an implanted pacemaker can interfere with Shock Advisory System and lead to false decisions related to patient treatment advice.
- The agonal respiration phenomenon (GASP) of a patient in cardiac arrest may interrupt the analysis process.

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5.1.2 Defibrillating children and neonates

⚠ WARNING

- ▲ Much less defibrillation energy is needed for children:
  According to the guidelines, a biphasic shock of 2 to 4 joules/kg is recommended for infants and small children with defibrillation.
- ▲ For the defibrillation of children, paediatric pads should be used.
- ▲ If no paediatric pads are available, adult electrodes can be used when patient type Child/Neonate has been selected.
- ▲ You must double-check that the patient type setting and type of electrodes is Child/Neonate. See (1) and (2) below.

⚠ CAUTION

Defibrillation on neonates

- ▲ When using the defibrillator on neonates, follow the local guidelines.
- ▲ Follow the recommended energy setting for infants and small children as described above.
- ▲ The automatic energy setting for neonates is the same as for children.

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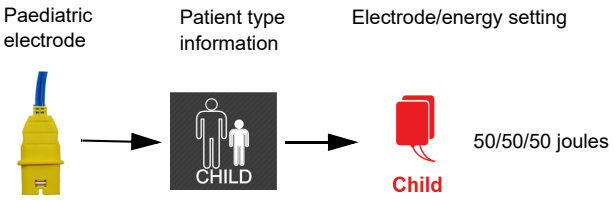
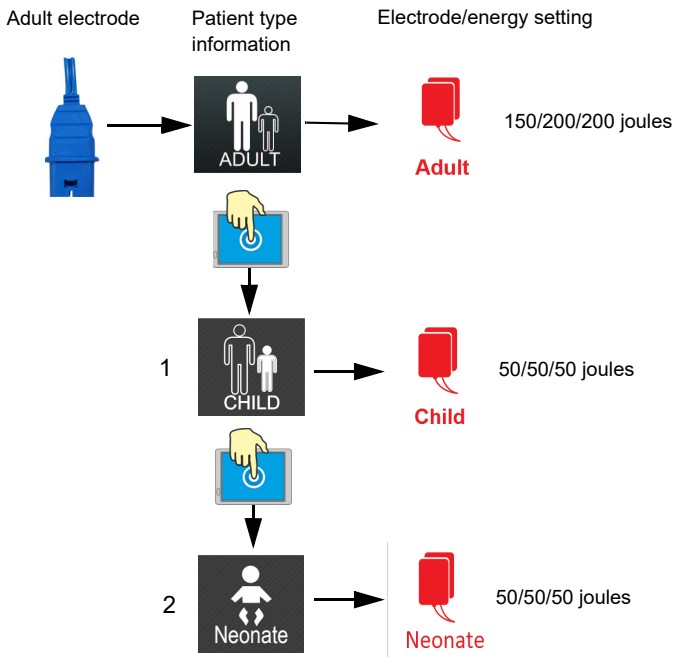
When paediatric pads are used, the patient type setting **Adult** or **Child/Neonate** on the screen does not override the energy setting. The energy setting is always paediatric when paediatric pads are connected to the device.



If no children electrodes are available, adult electrodes can be used. When adult pads are used, the patient type setting **Child/Neonate** on the screen overrules the energy setting Adult to **Child/Neonate**.



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5.2 General Function

- The **DEFIGARD Touch 7** works with biphasic truncated exponential chopped defibrillation waveform impulse. Depending on the factory settings, the device switches automatically from synchronised to non-synchronised defibrillation, or the mode has to be changed manually using the Sync/aSync button.
- When a patient cable is connected, you can select in the ECG menu if the ECG should be displayed via the separate ECG electrodes or the defibrillation electrodes.
- You can select a higher energy value while the defibrillator is charging, and the device will charge to the new level. It is impossible, however, to reduce the charged energy. In this case, the stored energy will be discharged internally, and you must recharge the defibrillator.
- The required energy for successful defibrillation depends on several parameters (body constitution). For emergency medical treatment, AHA/ERC recommend a biphasic impulse. The energy of the 3 first shocks can increase depending on configuration settings.

Shock	Adults	Children
1	150 joules	50 joules
2	200 joules	50 joules
From 3	200 joules	50 joules

5.2.1 QRS and pacing markers description

The different Makers are shown by type in colour over the ECG curve in the respective display mode as follows:

Display mode	QRS marker green	Internal pacer marker white	External pacer marker red
Monitoring			X
AED			X
Sync mode **aSync**			X
Sync mode **Sync**	X		X
Pacer FIX		X	X
Pacer Demand	X	X	X
Monitoring Pacer FIX		X	X
Monitoring Pacer Demand	X	X	X

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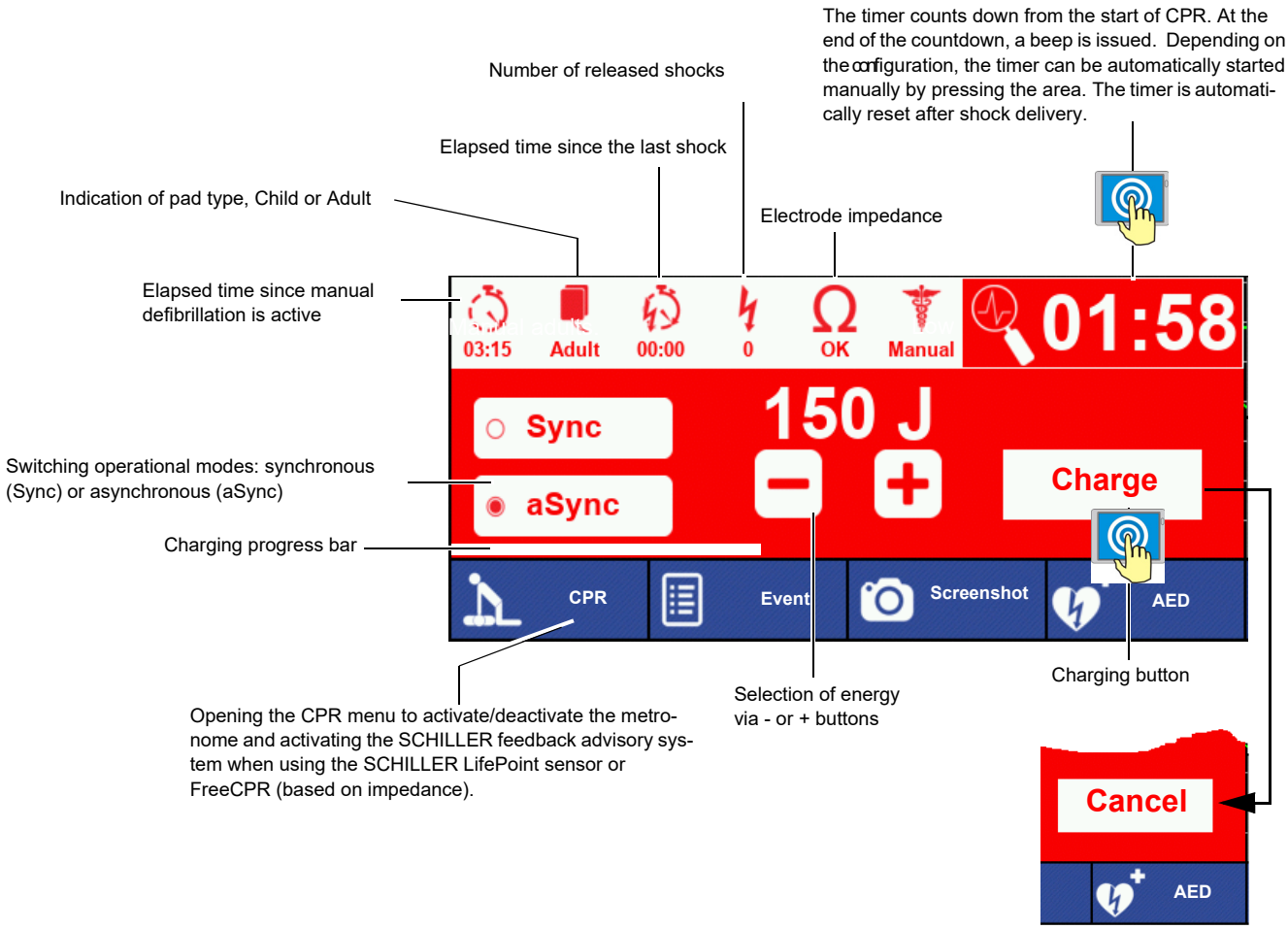
5.2.2 Activating the manual defibrillation mode

Depending on the start-up configuration (performed by the administrator, refer to section 12.6.1 General configuration), the device can start in Monitoring, AED or Manual Defibrillation mode. To activate Manual defibrillation mode when the device does not start in manual defibrillation mode, proceed as follows:

When the device starts in Monitoring or **AED** mode:

➜ Switch to manual mode by pressing the **Manual def** button and confirm with the check box. Alternatively, select the Manual defibrillation mode by pressing the **Menu** button, then choose the operating mode.



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5.2.3 Activating the automated (AED) defibrillation mode

➜ Depending on the start-up configuration (performed by the administrator, refer to section 12.6.1 General configuration), the device can start in Monitoring, AED or Manual Defibrillation mode. To activate the AED mode when the device does not start directly in AED, proceed as follows.

Monitoring and Manual Defibrillation

➜ Switch to AED mode by pressing the **AED** button. Alternatively, select AED mode by pressing the **Menu** button and then select the operating mode.

In the AED operational mode, the alarm system remains active in the same state as in the operational monitoring mode.

The Timer counts down from the start of CPR. Depending on the configuration, the timer can be automatically started manually by pressing the area.

Number of released shocks

Elapsed time since the last shock

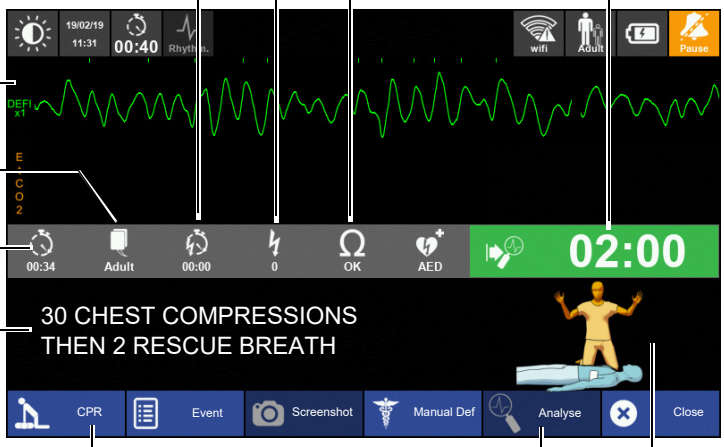
Electrode impedance

ECG curve displayed when the option is activated

Indication of pads type

Elapsed time since AED active

Text instruction

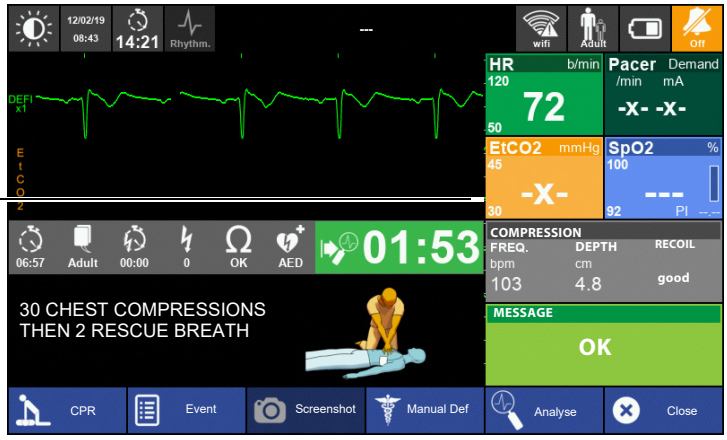


Opening the CPR menu to activate/deactivate the metronome and activating the SCHILLER feedback advisory system when using the SCHILLER LifePoint sensor or FreeCPR (based on impedance).

Action picture

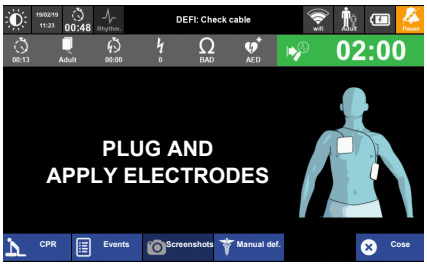
Analyse button

Same AED display as above but with the parameter displayed on the right side of the screen. This view is defined by the administrator configuration.



➜ Switching from the AED mode to Monitoring mode must be confirmed with, Yes, (ticking the box) ✓. This depends on the device's configuration (refer to section 12.6.1 General configuration).

5.2.4 AED Layouts



Depending on user needs, the AED display can be modified:

- Enable/Disable curves display (2 curves, typically DEFI and $EtCO_2$ or SpO_2)
- Enable/Disable the vitals display.

The screen above shows the disabled curve and vital signs. For another example, see the previous page.

5.2.5 Manual defibrillation procedure

1. Select manual defibrillation (refer to section 5.2.2 Activating the manual defibrillation mode).

➜ Confirm switching to manual defibrillation (This depends on the device's configuration, refer to section 12.6.1 General configuration).

2. Select the required energy via the touch screen - or + buttons.
3. Charge the energy using the **Charge** button.
4. Trigger the shock by pressing the **Shock** button on the keyboard or touch screen. The shock button on the touch screen automatically appears 10 seconds after the end of the charge if the shock button on the keyboard has not been triggered efficiently.

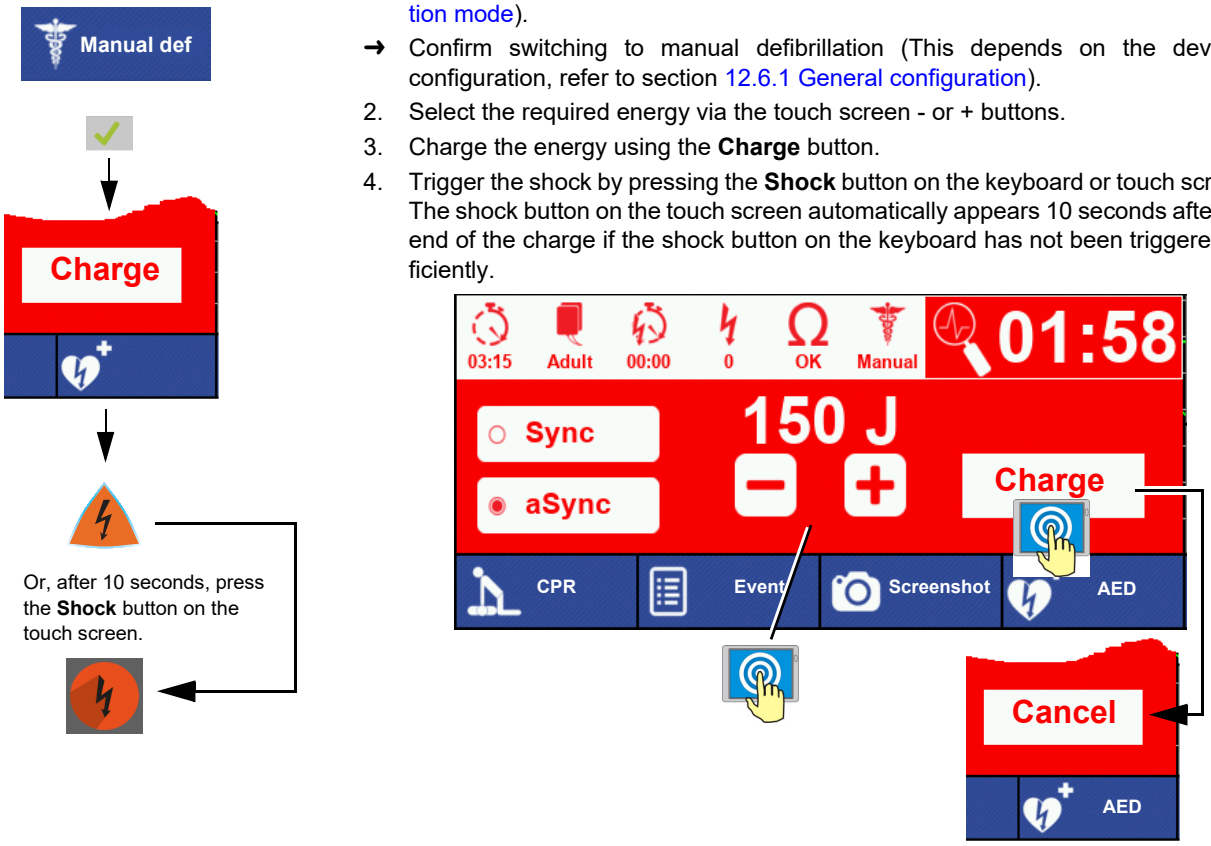


Fig. 5.1 Defibrillator window

➜ To disarm the manual defibrillator while charging or when the shock is ready to be delivered, proceed as follows:

– Press the ⊖ button
– Press the **Cancel** button

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5.3 Manual Defibrillation Using Pads

⚠ DANGER

- ▲ Delivering a shock to a patient with a normal heart rhythm may induce VF. For this reason, read the general rules and safety information in sections 5.1 Application guidelines and safety notes and 5.2 General Function.
- ▲ Electric shock hazard. Turn off the device before exchanging the defibrillation electrodes. Exchanging the electrodes on a charged defibrillator initiates an internal safety discharge.

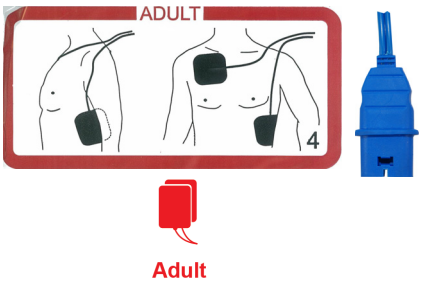
5.3.1 Applying the adult and paediatric electrodes

⚠ CAUTION

- ▲ Only use the pads up to their expiration date. The indicated expiration date only applies if the vacuum pack is intact.
- ▲ The pads are pre-gelled, so there is no need to use an extra contact agent.
- ▲ Do **not** reuse the pads.

Adult electrodes

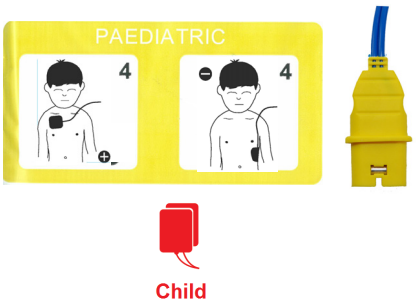
The adult electrodes with the blue connector are used for adults and children from 25 kg.



The adult electrode can be used for children when the patient type is set to Child. Refer to section 5.1.2 Defibrillating children and neonates.

Paediatric electrodes

→ The paediatric electrodes with the yellow connector are used for children under 25 kg. The paediatric electrodes automatically reduce the energy setting (default 50 joules). The default can be set in the device's configuration, refer to section 12.6.3 Defibrillator.



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5.3.2 Applying the electrodes

⚠ WARNING

- ▲ Good contact between the skin and the adhesive electrodes must be ensured. Suntan oil, sand or salt reduce the adhesive quality.
- ▲ The applied pads must have good contact with the patient's skin, and any air bubbles under the pads must be avoided. Therefore, stick one end of the pad to the patient's skin, then smooth it out to the other end.

Adults and children 25 kg or over

Electrode placement is the same for adults and children weighing 25 kg or over (refer to Fig. 5.2 Electrode position for adults and Fig. 5.3 Electrode position for children weighing 25 kg or over).

- ▲ The safety distance between the two electrodes should be approximately 3 cm.

1. Clean and dry the application points for the electrodes (refer to Fig. 5.2 Electrode position for adults and Fig. 5.3 Electrode position for children weighing 25 kg or over). Only clean the skin by vigorously rubbing it with a dry cloth.
2. Apply one electrode above the right pectoral, as illustrated left. Do not apply it on the clavicle (uneven).
3. Apply the other electrode diagonally below the left pectoral, as illustrated in Fig. 5.2 Electrode position for adults and Fig. 5.3 Electrode position for children weighing 25 kg or over.
4. Check that the connections are positioned outside, so the cables do not hinder CPR.

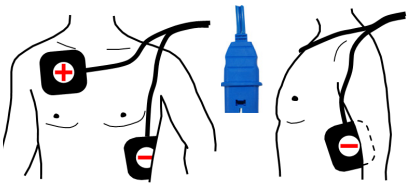

Fig. 5.2 Electrode position for adults

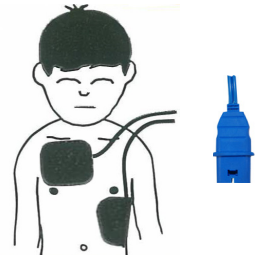

Fig. 5.3 Electrode position for children weighing 25 kg or over

Children weighing under 25 kg

The energy setting is automatically reduced with the paediatric electrodes.

1. Clean and dry the application points for the electrodes (refer to Fig. 5.4 Electrode position for children under 25 kg). Only clean the skin by vigorously rubbing it with a dry cloth.
2. Apply one electrode above the right nipple as illustrated in Fig. 5.4 Electrode position for children under 25 kg
3. Apply the other electrode below the left breast as illustrated in Fig. 5.4 Electrode position for children under 25 kg.

Check that the connections are positioned on the outside so that the cables do not hinder CPR.

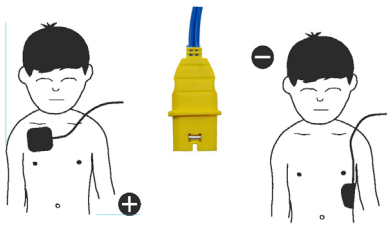

Fig. 5.4 Electrode position for children under 25 kg

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5.3.3 Checking the electrodes

If the resistance between the skin and the electrodes is too high, the message "CONNECT THE ELECTRODES" (AED mode) or Ω BAD (Manual mode) is issued.

Proceed as follows:

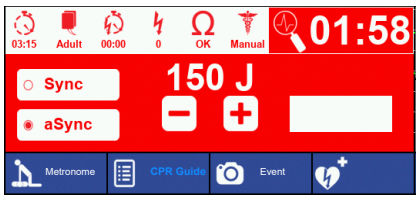
1. Press the electrodes/pads down firmly and check when the message disappears. Carefully press that pad onto the patient's skin once again. If the message does not disappear,
2. Remove both defibrillation electrodes
3. Wipe the rest of the contact agent off with a cloth
4. Shave both application areas to remove the uppermost layer of skin
5. Apply new defibrillation pads to these points.

5.3.4 Manual defibrillation using pads procedure

1. Connect the electrode cable to the pad connector.
2. If the device starts in **Monitoring** or **AED** mode, proceed according to the description in section 5.2.2 Activating the manual defibrillation mode.

⚠ DANGER

- ▲ Danger of electric shock
- ▲ Do not touch the patient during shock delivery.
- ▲ Check that the patient does not touch any conducting objects.



3. Select the required energy via the touch screen - or + buttons.
4. Initiate the energy charging by pressing **Charge**
5. Trigger the shock by pressing the **Shock** button on the keyboard or 10 seconds later with the **Shock** button on the touch screen[a].
6. Finish the therapy (refer to Chapter 7 Finishing the Therapy).

Fig. 5.5 Manual defibrillation

a. The shock button on the touch screen automatically appears 10 seconds after the end of the charge if the shock button on the keyboard has not been triggered efficiently

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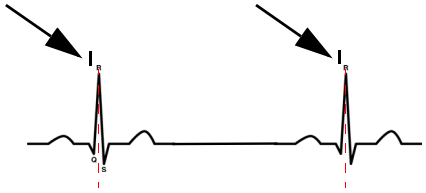
5.4 Synchronised Defibrillation

5.4.1 Warning erroneous triggering

⚠ WARNING



▲ Erroneous triggering, interpretation hazard.
- – Synchronised defibrillation. The ECG electrodes should be positioned as far away from the defibrillation electrodes as possible, for example, on the limbs.
- – Use only silver/silver-chloride electrodes if you acquire the ECG via separate ECG electrodes. These types of electrodes prevent polarisation voltages caused by defibrillation shocks. Polarisation voltages can affect the ECG trace to simulate cardiac arrest on the monitor or in a trace recording.

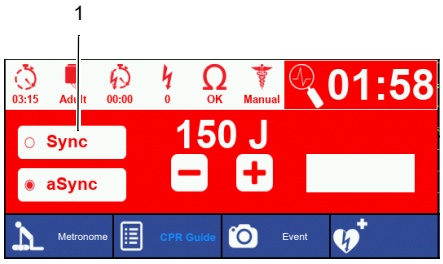
▲ Disturbed ECG trigger signal. Signal noise may disturb the ECG signal and cause artefacts, and must be considered in synchronised mode and demand pacing. For this reason, the following should be observed:
- – Do not touch the device during defibrillation to prevent electrostatic noise
- – Keep the patient cable away from power cords and transformers.

▲ To achieve adequate ECG signal quality for reliable triggering, ensure that
- – The ECG signal is free of artefact
- – There are no major fluctuations in amplitude
- – The displayed trigger pulses are positioned exactly above the R-wave.

5.4.2 Setup switching from synchronised to unsynchronised mode

⚠ WARNING

The synchronised mode (1) is manually activated Sync/aSync. Depending on the factory setup (refer to section 12.6.3 Defibrillator), the synchronised mode stays activated after delivering the shock (Sync after sync shock = True = Sync) or switches back to unsynchronised shock (Sync after sync shock = False = aSync). The current setting must be communicated to the user.



▲ The default setting is Sync after sync shock = false = aSync:

➜ The manually activated synchronised mode will be deactivated after delivering a synchronised shock. Activate synchronised mode again to deliver another synchronised shock.

▲ If the admin setting is Sync after sync shock = true = Sync:

➜ The manually activated synchronised mode is maintained after delivering a synchronised shock. Select aSync again to deliver another unsynchronised shock.

▲ The manually activated synchronised mode will be deactivated automatically if no synchronisation can be performed within 6 seconds.

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5.4.3 Function of the synchronised defibrillation procedure

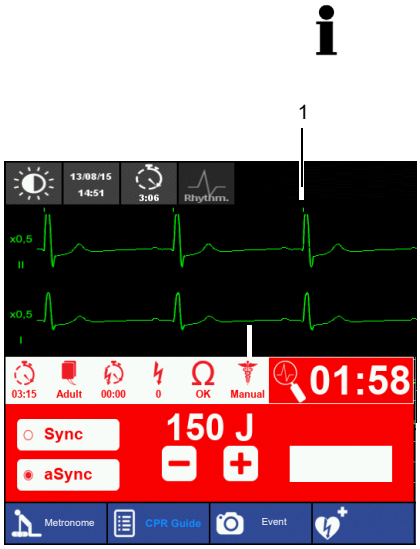
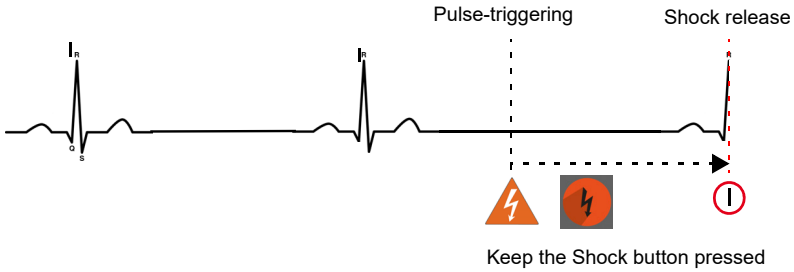


Fig. 5.6 Synchronised defibrillation

The defibrillation shock is delivered synchronised with the heart's action for synchronised defibrillation. The patient's ECG signal must be supplied to the defibrillator as a prerequisite. The user can select his preferred ECG synchronisation source from among ECG I, ECG II, ECG III or DEFI signals. After the physician has triggered the defibrillation shock, the trigger signal for the actual shock delivery will be derived from the subsequent R-wave (maximum 60 ms after the trigger mark (R-wave) on the monitor screen (1).



Without the QRS, the device switches automatically from Sync to aSynch after 6 seconds. If the shock button is pressed, an asynchronous shock will be delivered.

⚠ CAUTION

▲ Be aware that the shock button should remain pressed; the shock will be released with the next trigger signal (QRS) derived from the ECG.

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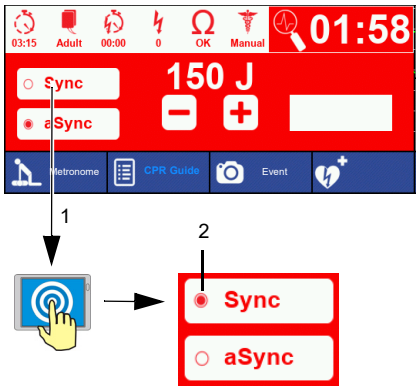
5.4.4 Synchronised defibrillation procedure

1. Connect the electrode cable to the pad connector.
2. If the device starts in **Monitoring** or **AED** mode, proceed according to the description in section 5.2.2 Activating the manual defibrillation mode.



3. Select synchronised defibrillation **Sync** via the touch screen (1).
4. The setting Sync button (2) is activated.
5. Check ECG rhythm:
   – The QRS beep sounds
   – The trigger pulses above the R-wave
6. Select the required energy via the touch screen - or + buttons.
7. Charge the desired energy with the **Charge** button**.**
   As soon the defibrillator is ready to deliver a shock, an audio signal sounds, and the LED below the shock button is on.

➜ You now have 20 seconds to work through points 8 to 10 before the internal safety discharge is activated because of exceeding the time limit.

8. Check the ECG curve, Sync button (2) activated and energy setting**.**

Fig. 5.7 Switching to synchronised defibrillation

DANGER

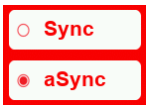
Warning, electric shock

▲ Do not touch the patient during shock delivery.
▲ Check that the patient does not touch any conducting objects.

9. Deliver the shock by pressing the **Shock** button, or 10 seconds later, press the touch screen **Shock** button.[1]

▲ Keep the or button pressed until the shock is delivered.
▲ Be aware that the shock button should remain pressed, and the actual shock will be released with the next trigger signal (QRS) derived from the ECG.

10. After the shock is delivered, monitor the patient and the ECG signal.



▲ If the default setting is Sync after sync shock = false = aSync, the synchronised defibrillation mode is switched back to aSync after delivering the shock.

11. If a second attempt is contemplated, return to step 4.

When an unsynchronised shock is required while in synchronised mode, switch from synchronised to aSync mode and deliver the shock immediately, this is an unsynchronised shock.

1. The shock button on the touch screen automatically appears 10 seconds after the end of the charge if the shock button on the keyboard has not been triggered efficiently

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5.5 Semi-automated Defibrillation

⚠ DANGER

- ▲ Delivering a shock to a patient with a normal heart rhythm may induce VF. For this reason, first, read the general rules and safety information in section 5.1 Application guidelines and safety notes.
- ▲ Electric shock hazard. Turn off the device before exchanging the defibrillation electrodes. Exchanging the electrodes on a charged defibrillator initiates an internal safety discharge.
- ▲ According to AHA/ERC guidelines, even children under 8 may be defibrillated in semi-automated mode.
- ▲ The electrodes should be applied in the common anterior-anterior positions in semi-automated mode. With infants, anterior-posterior placement can be advised to prevent a short circuit between the two defibrillation electrodes.
- ▲ If a patient spontaneously regains consciousness during treatment, a defibrillation shock that may have been advised just before must not be delivered.
- ▲ During HF surgical interventions, ECG analysis is not permitted in the semi-automated mode.

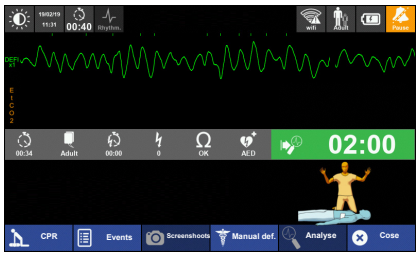
5.5.1 Semi-automated defibrillation (AED) procedure

- In the AED operational mode, the patient is not under monitoring conditions.
- A switched-off device can be started directly in AED mode by pressing the **AED** button.

Depending on the start-up configuration (performed by the administrator), the device can start in Monitoring, AED or Manual Defibrillation mode. Proceed as follows to activate the **AED** mode when the device does not directly start in AED mode:

→ Switch to AED mode by pressing the **AED** button and confirm with the check box.

When the AED mode starts, the verbal and visual instructions for the defibrillation are issued, and the analyses will run automatically when the pads are applied. Closely follow the instructions.



→ Press the **Monitor** button to leave the AED mode.

→ Switching from AED to Monitoring mode must be confirmed with the check box

For qualified physicians only

- The analysis can be repeated during CPR by pressing the **Analyse** button. CPR needs to be interrupted while the analysis is performed.

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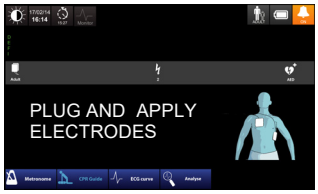
5.5.2 Voice messages in AED mode

⚠ WARNING

▲ The following feature may disturb users, only use it after user feedback.
– The setup **Anteriority Analyse** feature pre-analyses the heart rhythm before the actual analysis. This feature can substantially reduce the analysis duration, but the sequencing of AED instructions might be very fast.

The device's verbal instructions are listed below.

Verbal instructions	Display	Note
Plug and apply electrodes	Illustration for electrode connection 	Technical alarm: Electrodes have not yet been applied. The message disappears when the electrodes are correctly applied and the resistance is 25 to 250 Ohms.
Do not touch the patient, analysing	DO NOT TOUCH THE PATIENT ANALYSIS	
Movement detected - Analysis cancelled, resume CPR	Movement detected, analysis cancelled, resume CPR	Technical alarm: The patient was moved during analysis the device could not run the analysis.
Device recommends a shock		
Shock advised		
Stand clear of the patient, and press the **Shock** button	Stand clear of the patient; and press the **Orange** button to deliver a shock to the patient	
The device does not recommend a shock		
No shock advised	No shock advised	
Immediately resume CPR: 30 chest compressions, then 2 rescue breaths – continue until the patient breathes normally.	30[a] chest compressions, then 2 rescue breaths	

a. When paediatric electrodes are used, CPR is carried out in the ratio of 15:2 if 2 rescuers are on the spot; otherwise, 30:2. A continuous compressions option is also available (that is, no rescue breaths)

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5.5.3 Defibrillation procedure

When the device is switched on, verbal and displayed instructions regarding defibrillation are issued. Always follow the instructions.

Step 1

Switching on and preparing the device

1. Switch on the device by pressing the **Green** or AED buttons directly.
2. Check the state of the patient.
3. Connect the electrode cable to the pad connector.
4. You are prompted to continue the resuscitation and to apply the electrodes.
5. Apply the defibrillation electrodes (refer to section 5.3.1 Applying the adult and paediatric electrodes).
   The message **CONNECT THE ELECTRODES** is switched off when the device measures good electrode resistance. If the message does not switch off, refer to section 5.3.1 Applying the adult and paediatric electrodes.

Fig. 5.8 Switch unit on

Step 2

Analysis

6. The analysis starts automatically when the electrodes are detected.
7. You are prompted not to touch the patient any more.
8. The **Analyse** button can be pressed anytime during CPR to start a new analysis.

If the device detects VF or VT with a heart rate exceeding 150 pulse/minute, follow Step 3 shock delivery; else, continue with Step 4, Performing CPR.

Fig. 5.9 Analysis

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Step 3

Step 3 shock delivery

With enough energy for a shock, the device prompts the user to deliver the shock by pressing button 3.

▲ Danger of electric shock
- Do not touch the patient during shock delivery.
- Check that the patient does not touch any conducting objects.

9. Deliver the shock by pressing the **Shock**  button, or 10 seconds later, press the touch screen **Shock**  button[1].
10. After the shock delivery, Step 4 follows.

The following default energy values are programmed

Shock	Adults	Children
1	150 joules	50 joules
2	200 joules	50 joules
3	200 joules	50 joules

Step 4

Performing CPR

11. Carry out CPR, alternate between 30 chest compressions and 2 breaths[2] for 2 minutes[3]. After 2 minutes, the device begins again with Step 2, Analysis.
12. Finish the therapy (refer to Chapter 7 Finishing the Therapy.

The CPR duration may vary according to country-specific standards (refer to section 9.1.1 Device settings menu, Defibrillator ERC Protocol).

1. The shock button on the touch screen automatically appears 10 seconds after the end of the charge if the shock button on the keyboard has not been triggered efficiently.

2. A continuous compressions option is also available (that is, no rescue breaths)

3. CPR cycle duration can vary depending on the CPR cycle configuration settings.

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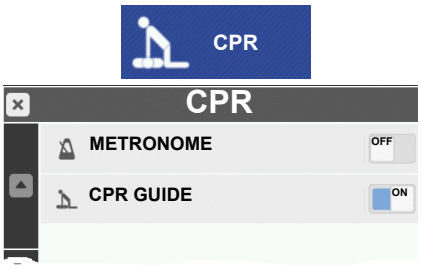
5.6 CPR Guide



The manual and AED defibrillation mode offer three functions for a guided CPR:

CPR Guide with SCHILLER LifePoint sensor

- CPR Guide with FreeCPR based on the impedance measurement by the defibrillation electrodes
- Metronome

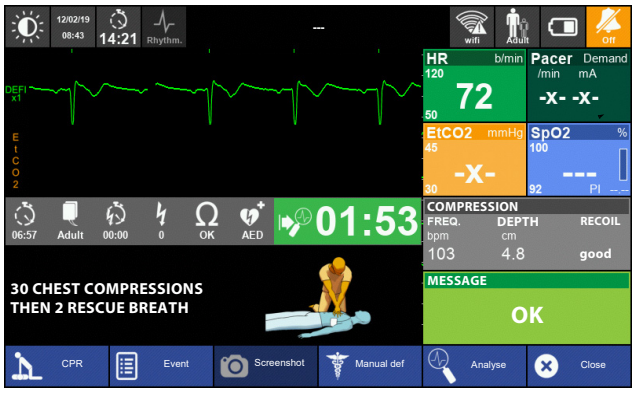
5.6.1 SCHILLER LifePoint

The LifePoint measures the compression depth and rate after each compression.

⚠ CAUTION

▲ The LifePoint is unsuitable for use on children younger than 8 or under 25 kg.

- The range for the depth of compressions is 4.5 to 6.2 cm which is the range for adult patients. No target depth is recommended for paediatric patients < 8 years or < 25 kg.
- We recommend using an adhesive pad so that the sensor remains in position and does not lift off when relieved, which can lead to inaccurate measured values.
- The red side of the sensor must be attached to the adhesive pad.



Measured value from LifePoint sensor

Advice to improve the CPR quality

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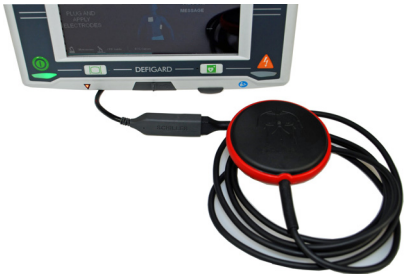
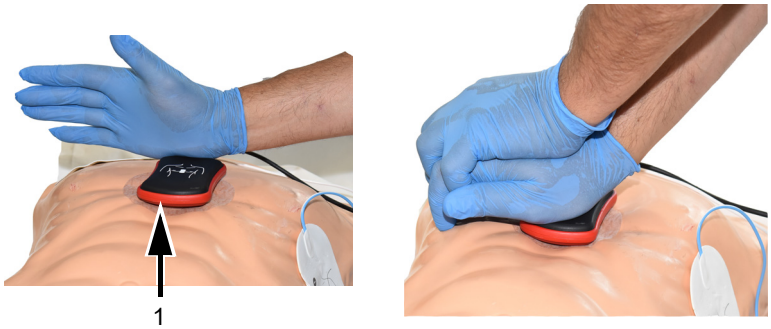


Setup of the Sensor

1. Connect the LifePoint USB cable to the adapter cable.
2. Switch on the device and select **Manual** or **AED** defibrillation.
3. Open the CPR menu and activate the CPR guide.

4. Place the LifePoint on the patient's chest and start CPR.

5. Place the heel of your hand (1) in the middle of the sensor.



6. Start with CPR and monitor the compression quality on the device and follow the instructions given by the device (see the previous page).
7. The displayed measurements on the right side of the screen inform you about your CPR quality.
8. The following limits are set for speed and depth:

Metronome speed [/min]	Press faster	Press slower
100	≤ 90	≥ 120
110	≤ 100	≥ 130
120	≤ 110	≥ 140

Depth [mm]	Press deeper	Press shallower
1 to 127	≤ 45	≥ 62

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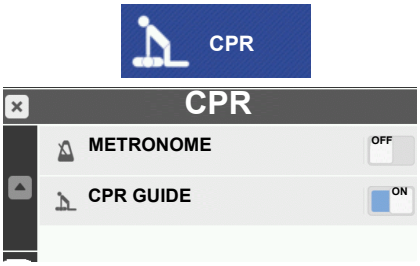
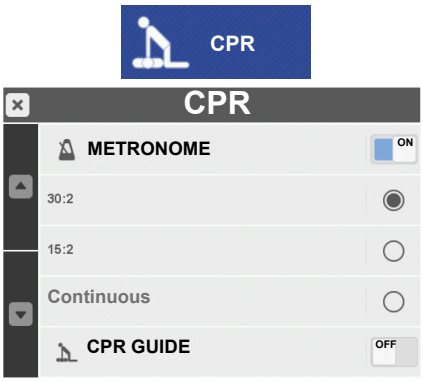
5.6.2 FreeCPR

The FreeCPR measures the compression rate based on the impedance measurement by the defibrillation electrodes.



1. Switch on the device and select manual or AED defibrillation.
2. Apply the defibrillation electrodes.
3. Open the CPR menu and activate the CPR guide.
4. The displayed measurements on the right side of the screen inform you about the CPR quality and frequency.

5.6.3 Metronome settings



1. Open the CPR menu.
2. Activate the metronome.
3. The following settings are available:
   – 30:2
   – 15:2
   – Continuous

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5.7 Defibrillator Technical Messages

Alarm	Code	Cause	Remedy
Defibrillator inoperative	T.ECG11 T.DEFI01 T.DEFI02 T.DEFI03 T.DEFI04 T.DEFI05 T.DEFI06 T.DEFI07 T.DEFI10 T.DEFI13 T.DEFI14 T.DEFI15	• CPU peripheral board defective • Defi board defective	➜ Contact technical service
Incorrect electrodes	T.DEFI08 T.DEFI12	• Internal discharge while releasing shock on impedance higher than 250 Ohms or if the current during the shock is 0 or above 105 A, because of poorly placed electrodes	➜ Check electrodes, if necessary re-apply electrodes
Internal discharge duration too long	T.DEFI09	• A shock not delivered within the specified duration causes an internal discharge.	➜ Do not exceed the time of 20 seconds until releasing the shock ➜ Contact technical service
Internal discharge smaller energy	T.DEFI11	• Internal discharge because of selecting lower energy after the device charged the selected higher energy	➜ Normal safety discharge

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6 Pacemaker

6.1 Pacemaker Function

- The pacemaker is the module for external transcutaneous stimulation of the heart.
- The pacemaker offers two modes of operation, demand and Fixed-rate pacing (FIX). In demand mode, the pacemaker requires an ECG signal for synchronisation.
- The same large adhesive electrodes used for defibrillation are also employed for pacing. They ensure good electrical contact with the skin. These electrodes and a 20 ms square-wave pulse reduce painful muscle contractions provoked by excessive current density.
- Pacer rate, pulse width and current are checked when the device is turned on and during operation; therefore, a functional test of the pacemaker module is un necessary.

6.1.1 Fixed-rate mode (FIX)

In this operating mode, the module delivers pacing impulses with the user-defined current at a user-defined rate. The selected rate remains constant and is not affected by the intrinsic actions of the patient's heart. This mode is mainly used in the case of asystoles.

6.1.2 Demand mode

In demand mode, the pacemaker does not deliver pacing pulses as long as the patient's intrinsic heart rate exceeds the set pacing rate. The pacemaker emits stimulation pulses when the heart rate drops below the pacing rate. This can only be ensured by continued monitoring of the ECG with a 4 or 10-lead patient cable. The pacemaker reads the necessary ECG signal via the pads. If the module cannot reliably identify QRS complexes, it will stimulate the heart permanently in demand mode.

Demand mode is the recommended pacing mode when the patient is at risk of developing bradycardia or even asystole due to a critical event. As the patient's ECG controls the pacemaker function, the unhealthy competition between intrinsic and external stimulation, which could induce VF, is excluded.

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6.2 Safety Notes

⚠ WARNING

▲ **Shock hazard**
Never touch the pads or the patient's body near the pads while the pacemaker is in use.

⚠ CAUTION

▲ **Patient hazards, equipment failure**
Equipment delivering electrical energy to the patient simultaneously as the pacemaker can disturb the pacemaker's function. Particularly HF surgery equipment used on a pacemaker patient may cause interference, preventing the detection of QRS complexes. The pacemaker must be set to Fixed-Rate pacing (FIX) in this situation. Note that leakage currents could be transferred to other electric circuits, interfering with the functioning of devices connected to these circuits.

▲ For safety reasons, the external pacemaker should be disconnected from the patient, and an internal pacemaker should be used.

▲ Accessories, wearing parts and disposables that affect the safe use of the pacemaker and that are to be used in conjunction with the pacemaker must be tested for safety and approved by an authorised test laboratory.

6.3 Guidelines for the Application of External Pacemakers

These guidelines apply to all pacemakers, irrespective of type and manufacturer.

All electrical devices that deliver energy to patients in any form or have an electrically conductive connection to the patient are a potential source of danger.

As the user is responsible for the safe application of the devices, following the instructions in the user manual and the guidelines below is very important.

▲ Pacemakers must only be used under the supervision of trained, qualified and authorised staff.

▲ Observe the user guide for the pacemaker's operation.

▲ The patient must not be left unattended during pacing.

▲ It is assumed that the patient's ECG and plethysmogram are being monitored to assess the effect of pacing.

▲ When positioning the patient, ensure no electrically conductive connections exist between the patient and earthed metal parts (puddles of water, for instance, are capable of conducting the electrical current). Although the pacer current output must be floating, this is an additional safety precaution to ensure that the pacemaker current pulse flows only between the pacemaker electrodes.

▲ Set all values for the pacemaker to position 0, or the lowest value.

▲ Position stationary pacemakers close to the patient.

▲ After each defibrillation, check that the pacemaker is functioning properly.

▲ On neonates, a particular follow-up of the pacing procedure needs to be performed to avoid severe burns. The skin under the paediatric electrodes needs to be checked regularly to detect erythema early on

▲ Conscious patients need to be sedated before pacing to reduce patient discomfort.

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6.3.1 Attaching the pacer pads

- The same adhesive electrodes used for defibrillation are also employed for pacing.
- The electrodes are designed for:
- One hour of pacing using 140 mA/120 minutes (pulse duration 20 ms)
- Eight hours of pacing using 70 mA/60 minutes (pulse duration 20 ms) with inspection of pads every 30 minutes
- Ten minutes of pacing using maximum energy and frequency output (150 mA/210 minutes)

A detailed application of electrodes is given in section 5.3.1 Applying the adult and paediatric electrodes.

Anterior-posterior placement

1. Apply the dorsal electrode + to the left scapular area and the precordial electrode - near the left lower sternal edge.
2. Connect the pads to the device.

If the dorsal electrode cannot be used, apply anterior-anterior placement.

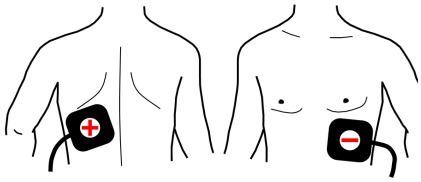

Fig. 6.1 Anterior-posterior placement

Anterior-anterior placement

1. Apply the + electrode on the right side below the clavicle and the - electrode to the left of the axillary line on a level with the 5th intercostal space, so they do not hinder heart massage.
2. Connect the pads to the device.

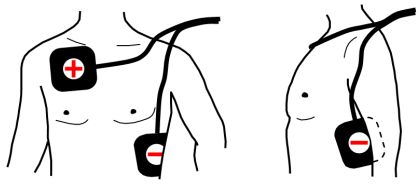

Fig. 6.2 Anterior-anterior placement

6.3.2 Checking the electrodes

If the resistance between the skin and the electrodes is too high, the message

CONNECT THE ELECTRODES Ω_{BAD} is issued

then proceed as follows:

1. Press the electrodes/pads down firmly and check when the message disappears. Carefully press that pad onto the patient's skin once again. If the message does not disappear,
2. Remove both defibrillation electrodes
3. Wipe the rest of the contact agent off with a cloth
4. Shave both application areas to remove the uppermost layer of skin
5. Apply new defibrillation pads to these points.

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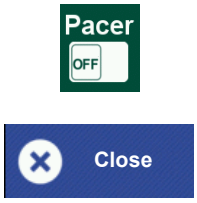
6.4 Start-up of the Pacemaker

⚠ WARNING

▲ **Shock hazard**
Pacing is started immediately when the pacemaker is switched on, and the current is set.



The following conditions must be met to operate the pacemaker:

- The pacemaker (optional) needs to be activated.
- Pads must be connected to the device.
- The current value is set to 10 mA when the pacemaker is switched on,
- The device can be switched from pacing to defibrillation mode at any time, and the pacemaker is stopped by confirming the switchover.
- The device can be switched from pacing to monitoring mode at any time. In this case, the pacemaker screen is displayed as a small measurement field in the top right of the screen.
- The frequency and current settings are reset if the pacemaker function is off and closed by pressing the **Close** button.
- Pressing the **Monitoring** or **Close** button minimises the pacemaker window (pacing is still running).
- Only monitoring advanced and critical care views are available when the pacemaker is started.
- When the pacer is started, and the user tries to switch the device off, there is a confirmation message to switch it off.
- When the pacer is started there is no auto shutdown after 30 minutes of inactivity on the touch screen.

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6.4.1 Pacemaker display

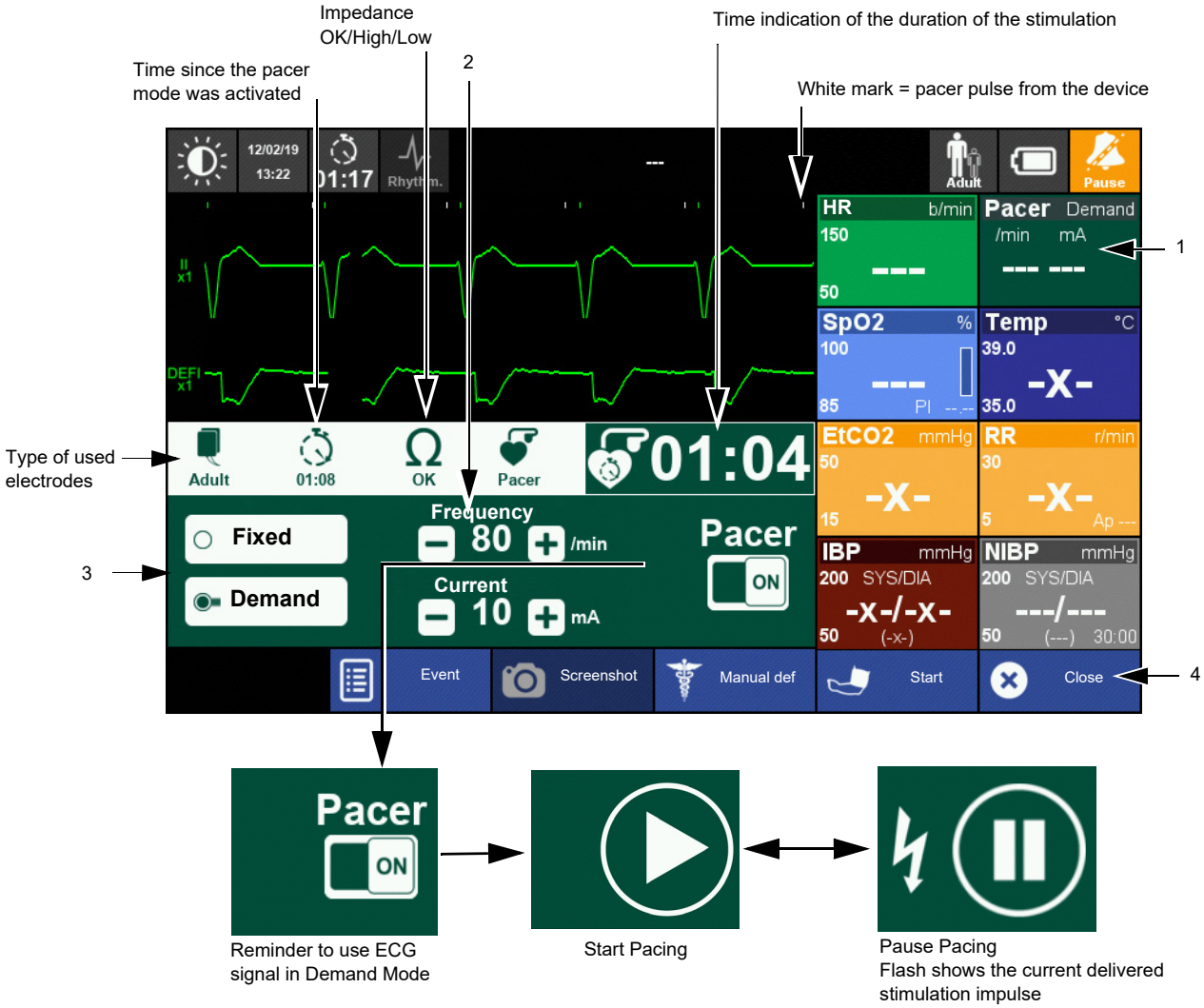
- Select the **Pacer** measurement field at the top right to display the pacemaker function.

The pacemaker's menu with the pacemaker parameter is displayed.

The pacemaker's default mode at switchover is **Demand** mode; **Fixed** mode has to be selected manually.

6.4.2 Selecting pacemaker mode

1. Press the Pacer measurement field (1) **to open the Pacer menu** (2).
2. Press the operational mode button **Fixed** or **Demand** (3)
3. The operational mode is displayed in the pacer measurement field (1)

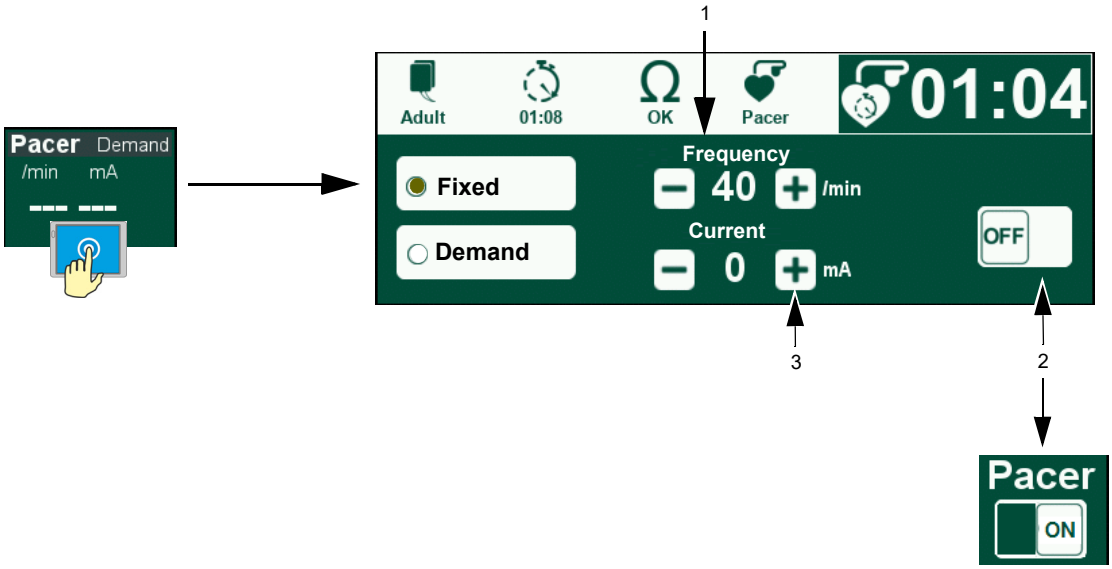


4. When the pacemaker is running, press the **Close** button (4) or switch to monitoring using the Monitoring button.

In this case, the pacemaker values are displayed as a small measurement field (1) at the top right, and the curve field shows all curves again.

6.4.3 Pacemaker settings operational mode fix

1. Attach the pacer pads (refer to section 6.3.1 Attaching the pacer pads).
2. Display the pacemaker and select the operational mode button, **Fixed**
3. Press the **Frequency** - or + buttons (1) to set the impulse frequency.



⚠ WARNING

- ▲ **Shock hazard**
  Pacing is started immediately when the pacemaker is switched on, and the current is set.
- ▲ Never touch the pads or the patient's body near the pads while the pacemaker is in use.

4. **Starting the pacemaker**
   Press the **Pacer OFF/ON** (2) to activate the pacemaker.
5. Press the **Current** - or + buttons (3) mA to set the impulse current until the heart reacts to the stimulation.
6. The pacemaker can be interrupted and restarted by selecting the **Pacer OFF/ON**.
7. Finish the therapy as described in Chapter 7 Finishing the Therapy.

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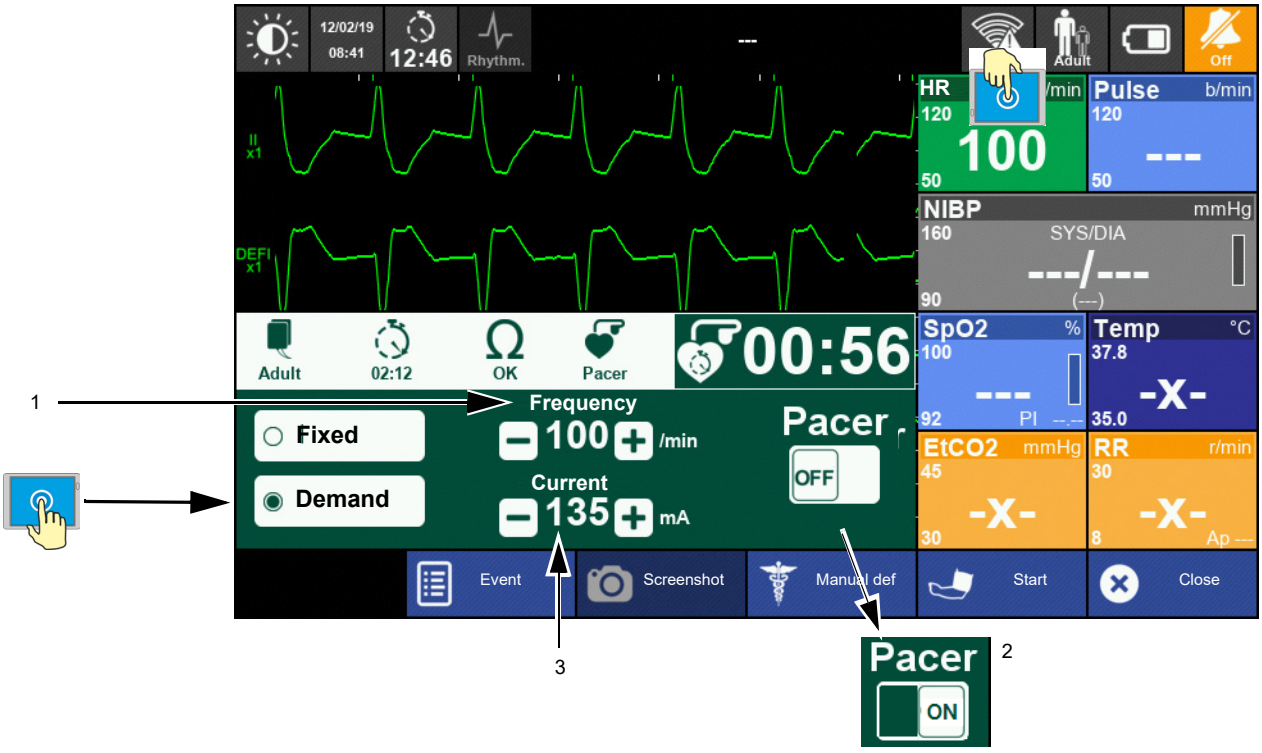
6.4.4 Demand mode

The patient's ECG must be monitored with a 4 or 10-lead ECG cable to determine when a pacemaker pulse is required. The user can select his preferred heart rate source among ECG I, II or III.

1. Attach the pacer pads (refer to section 6.3.1 Attaching the pacer pads).
2. Display the pacemaker and select operational mode, **Demand**.
3. Select the **Frequency** - or + buttons (1) to set the impulse frequency.



⚠ WARNING

▲ **Shock hazard**
Pacing is started immediately when the pacemaker is switched on, and the current is set.

▲ Never touch the pads or the patient's body near the pads while the pacemaker is in use.

4. **Starting the pacemaker**
   Press the **Pacer OFF/ON** (2) to activate the pacemaker.
5. Press the **Current** - or + buttons (3) mA to set the impulse current until the heart reacts to the stimulation.
6. The pacemaker can be interrupted and restarted by selecting the **Pacer OFF/ON**.
7. Finish the therapy as described in Chapter 7 Finishing the Therapy.

6.4.5 Switching from pacemaker to defibrillation

1. Press the **AED** button.
2. Use the same button to confirm, stop the pacemaker and switch to defibrillation mode.

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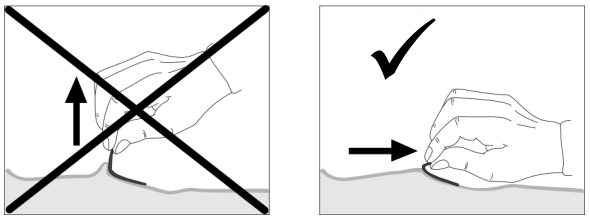
7 Finishing the Therapy

1. Switch the device off after the therapy is finished by pressing the **ON/OFF** button. A No/Yes dialogue is displayed.
2. Confirm switch off.
3. Disconnect the electrode cable.

Adhesive electrodes

– Carefully remove the electrodes from the patient's skin.



– Discard the disposable pads immediately after use to prevent reuse (hospital waste).

– Clean the device, ECG cables and sensors as described in section 10.6.2 Cleaning and disinfecting the device, cable and sensors.

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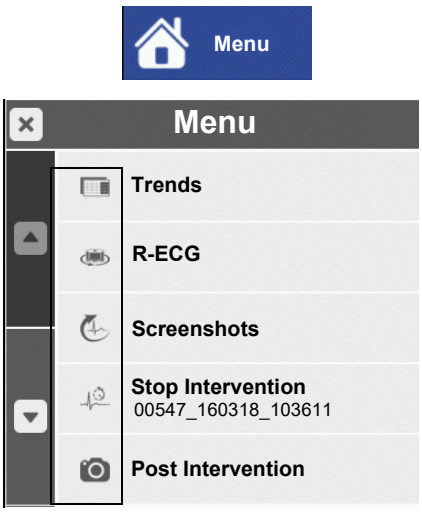
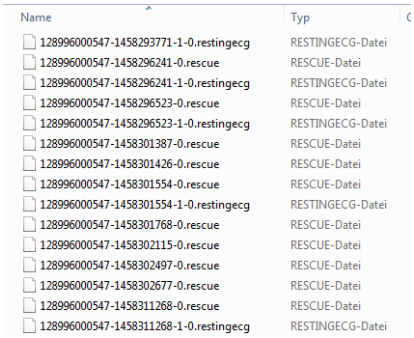
8 Intervention Summary

To document the intervention, the intervention data is saved. The information can be read and displayed with the SCHILLER reviewing software or viewed directly on the device.

- If the memory is full, the oldest data will be overwritten.
- The intervention data is stored as soon the device is switched off, or the intervention has been stopped with the function **Stop Intervention** in the main menu.
- **Stop Intervention** is also used to start a new intervention.
- The data will be stored until the data has been transmitted via the menu Post-Intervention.
- All intervention data (R-ECG, Screenshots and Trends) can be reviewed and transmitted on the device via the **Post Intervention** menu; see below.



Overview of events documented with date and time in the rescue.file:



- Power on
- Start of analysis
- Analysis result
- Defibrillator charging
- Defibrillation shock
- Internal discharge
- Switchover to manual operation
- Electrode alarm
- Battery low alarm
- Activation of a vital signs module
- Deactivation of a vital signs module
- Asystole alarm (manual mode)
- Fibrillation/flutter alarm (manual mode)
- Event button
- ECG curve

The RestingECG.file includes the resting ECG data.

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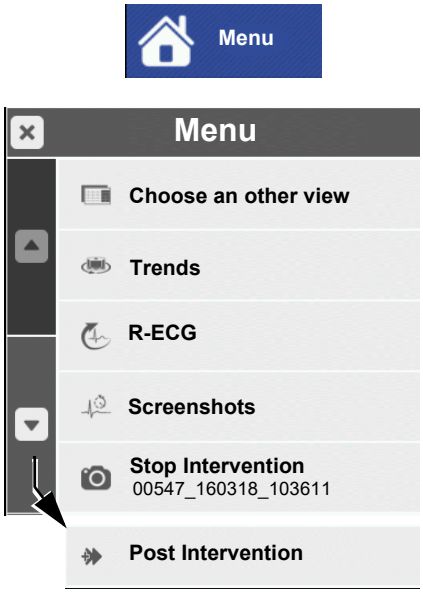
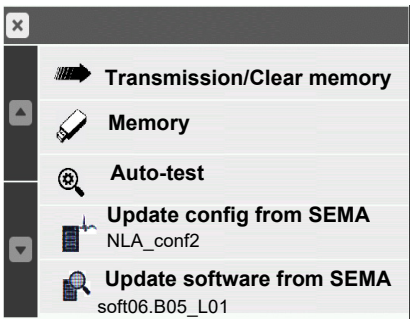
8.1 Post Intervention

Exiting this menu is only possible by switching the device ON/OFF.

8.1.1 Reviewing the intervention file on the device

1. To review the intervention data directly on the device, go to the main menu and select **Post Intervention**.
2. Stop patient monitoring. The **Post Intervention** menu is displayed.
3. Select **Memory** to display the intervention list.
4. Select the desired intervention.
5. For each intervention, you can review, print or send the following data:





Data	Review	Print	Send
R-ECG	X	X	X
Long ECG	X	X	
Screenshot	X	X	X
Trends	X	X	-
Interventions events	X		
Intervention report	-	X	-

For each intervention, it is also possible to printout a full intervention report composed of patient data, a Trend table, the first ECG, auto screenshots (Pacer ON/OFF, shock), and the last ECG.

The intervention report contains the following elements:

- Intervention and patient details
- Trends table (15 columns maximum with adaptive intervals, containing 3 first NIBP measurement and the last NIBP measurement)
- Ten seconds ECG strips (25 maximum) with:
- 1st ECG
- Issued shocks (1st, 2nd, 3rd and last shock)
- Pacemaker ON/OFF
- ECG Alarms (Asystole, VF/VT)
- Intervention events
- Last ECG

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8.1.2 Transmitting the intervention file

1. To review/send the post-intervention data go to the main menu and select **Post Intervention**.
2. Stop the patient monitoring. The **Post Intervention** menu is displayed.
3. Select Transmit/Clear the memory to send all intervention data via Network or direct to a USB memory stick.

8.1.3 Auto-test

After a finalised intervention, an auto-test can be executed to check the device's performance. The auto-test report can be viewed or sent via Network or to a USB memory stick.

8.1.4 Log files

- The device records every action in the log files.
- Each log file data can contain up to 50,000 lines.
- A circular buffer overwrites the oldest log files entries when the limit of 50,000 lines is reached.
- Data is stored on the device in non-volatile memory and is not lost after the power is off

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9 Main Menu

9.1 General Setup

To monitor vital parameters, physiological alarm thresholds are preset in the **DEFIGARD Touch 7/PHYSIOGARD Touch 7**, activated when the device is turned on. The operator-defined thresholds (wide/narrow) can be set in the respective menus. Refer to sections 4.3 Operator-defined Alarm Thresholds, and 4.3 Operator-defined Alarm Thresholds)

1. Press the **Menu** button to display the menu.

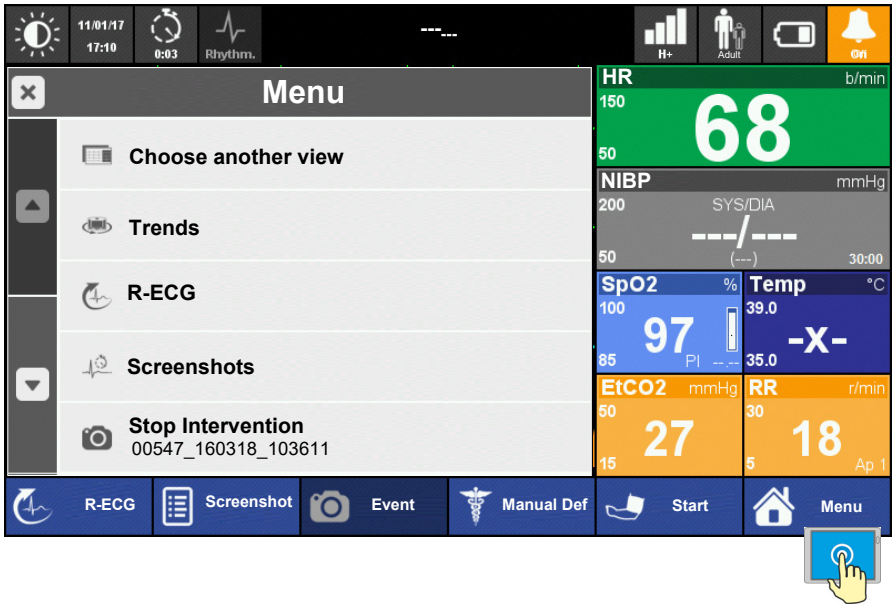

Fig. 9.1 Main menu

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9.1.1 Device settings menu

Access the device settings menu via the Menu button.

Menu	Sub-menu/Parameter	Description	Note
Choose another view	• Advanced monitoring • Basic monitoring • 12-lead ECG • Critical care	Selection of different views according to user's needs	The selection is dependent on the configuration of the device
Choose operating mode	• Manual defibrillation • AED • Pacemaker	Selection of operating mode	The selection depends on the configuration of the device
Trends	• ----	Shows the trend since the start of the intervention	Refer to section 4.14.1 View trends
R-ECG	• Selecting R-ECG	List of the recorded R-ECG since the interventions starts	Refer to section 4.14.2
Screenshots	• Selecting screenshot	List of the screenshots done since the start of the intervention. The screenshot can be displayed, transmitted or printed.	Refer to section 4.14.3
Stop Intervention	• Yes/No	Yes stops recording all data, saves data under the intervention file and resets the Stop-watch on the screen to zero. A new intervention is started.	The stopped intervention can be reviewed/transmitted in the Post-intervention menu. The number under the Stop Intervention parameter shows the Intervention ID with the date and time.
Post Intervention Exiting the Post-Intervention menu only by switching off the device possible.	• Transmission/Clear memory	Transmission/Clears memory of all intervention files.	
	• Memory	Memory of all intervention files since the last clearing. The file can be reviewed via this menu.	Refer to Chapter 8 Intervention Summary
	• Auto-test	Running an auto-test to confirm the functionality after finishing an intervention.	
	• Update configuration from SEMA	Download the configuration from the SCHILLER update server. The line below the parameter shows the current configuration file name.	
	• Update software from SEMA	Download the software from the SCHILLER update server. The line below the parameter shows the current software.	
	• Current version information	Shows the installed software versions and configured options	
Control panel (Password protected) Default password: schiller	• Device Name	Enter the device name	Exiting the Control panel menu only by switching off the device possible.

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Menu	Sub-menu/Parameter	Description	Note
Control panel (Password protected) Default password: schiller	• Import/export configuration • Import from USB • Import configuration from SEMA • Export to USB		Exiting the Control panel menu is only possible by switching the device off.
	• Software update • Update from USB • Search on server • Current version information		Exiting the Control panel menu is only possible by switching the device off.
	• Maintenance • Safety cell replaced • RFID Flasher • RFID Tag info • Export log to USB • Format log file • Format memory • Start auto-test	Once the safety cell has been changed, press this button. Manual start of the auto-test	Exiting the Control panel menu is only possible by switching the device off.
	• Ethernet configuration • DHCP ON/OFF • Radius ON/OFF	If set to OFF: IP address Netmask Gateway DNS1-3 Server If DHCP is set to ON	
	• Check connectivities • • Check SEMA connectivities • Check SUS connectivities	Select one of the desired communication channels, cellular network or Wi-Fi, for checking. ➜ Activates the connectivity check for SEMA ➜ Activates the connectivity check for SUS	
Language	• List of available languages	Select the desired language for current use.	The language setting here is only for current use. Once the device is switched off, it will use the configured default.

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10 Maintenance

10.1 Maintenance Interval

- Note that the unit must be serviced regularly. The test results must be recorded and compared with the values in the accompanying documents.
- According to the Maintenance and Interval Table below, a qualified technician or the user may perform the maintenance work described in this chapter.
- The following table indicates the intervals and responsibilities of the maintenance work required. Local regulations in your country may stipulate additional or different inspection intervals and tests.

10.1.1 Maintenance interval table

Interval	Maintenance	Responsible
Before or after each use, respectively	**Life-saving functions** **Check the following:** • Visual inspection of the device and accessories (refer to section 10.2.1 Visual inspection of the device and accessories) • Switch on the device and check that both batteries are sufficiently charged (refer to section 10.2.2 Battery check). **After every intervention** • Visual inspection of the device and accessories (refer to section 10.2.1). • Battery check (refer to section 10.2.2 Battery check) • Button test (refer to section 10.2.3 Defibrillator key test) • Auto-test in the Post-intervention menu (refer to section 10.2.4 Auto-test)	→ User
Monthly	• Functional test charging capacitor (refer to section 10.2.4 Auto-test)	→ User
Every 12 months	• Measuring and safety checks and inspections according to the instructions in the service handbook • NIBP check • ECG check • SpO_2 check • IBP check • $EtCO_2$ Gas span check • Defibrillator function check (only **DEFIGARD Touch 7**)	→ Service staff authorised by SCHILLER
Lifed item replacement	**The following parts must be checked and replaced if necessary.** • Replace the power battery, refer to section 10.4.1 Replacing the batteries. • Replace the safety cell (see expiring date or when device switches of immediately when replacing power battery) • Replace the internal button cell (every 10 years) • Replace the defibrillation capacitor (if the released energy, joules deviates more than 15% from the intended value) only **DEFIGARD Touch 7**	→ Service staff authorised by SCHILLER

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10.1.2 Service and shelf life

Device The device has a lifetime of 10 years.

Accessories shelf life Power battery (approximately 5 years), safety cell (approximately 7 years), button cell (approximately 10 years) and electrodes (approximately 2 years); see the expiry date on the battery or electrodes pouch. $EtCO_2$ accessories see the expiry date on the packaging.

10.2 Functional Test

A detailed description of the maintenance steps is listed in table 10.8 Inspection and Checklist Tables. Enter the results in the checklist provided.

10.2.1 Visual inspection of the device and accessories

Check the device and accessories for the following:

- ➜ Is there a sufficient number of all required disposables available
- ➜ Is the device housing undamaged
- ➜ Are the electrode connections undamaged
- ➜ Are defibrillator/pacemaker pads available
- ➜ Check the expiration date on the electrode package, battery and safety cell.
- ➜ Check the expiration date invasive blood pressure kit
- ▲ Defective units, damaged cables, and expired accessories must be replaced immediately.

10.2.2 Battery check

- ➜ Connect the unit to the power supply (docking station) and switch it on. The start screen is displayed.
- ➜ The external DC voltage indicator is lit.
  - – When the battery indicator is **flashing,** the battery is being charged. Check the charging status once the indicator goes off.
  - – The battery indicator is off when the battery is fully charged, and the full battery symbol is displayed. The charging process can be reactivated and checked by disconnecting from the external DC supply; indicator is flashing**.**

Battery status

- ➜ Click on the Battery icon and check the following:
  - – Charge level
  - – Estimated autonomy
  - – Estimated numbers of shocks
  - – Safety cell voltage level

10.2.3 Defibrillator key test

1. Switch On the device. If the device starts in AED mode, press the **Manual defibrillation** button.
2. Use the button to set the energy to 2 joules; then use the + button to set the energy to 4 joules.
3. Press the **Charge** button. The device charges, and the **Shock** button is lit.
4. Press the **Shock** button, and a safety discharge is triggered.

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5. Press the **AED** button, verbal instructions are issued, and the pads connector LED starts flashing.

10.2.4 Auto-test

The auto-test can be manually executed at anytime and checks the device's most important function.

1. Switch On the device
2. Select Menu > Post-Intervention > **Auto-test**
3. Start the auto-test.
4. If a message, press the shock button appears, press the **Shock** button to continue and finalise the test.

If a test fails, check the reason by opening the test details in the sub menu, Review/ Send auto-test.

Previous tests are listed in the sub-menu, Review/send previous tests. The tests are performed depending on how the tests have been initiated:

Type of test and intervals	Daily and weekly	After inserting the battery	Every 5 weeks[b]	Manually executed auto-test
Main battery	X	X	X	X
Safety cell	X	X	X	X
Device temperature	X	X	X	X
Defi shock relay	X	X	X	X
Defi IGBT	X	X	X	X
DEFI battery	X	X	X	X
Defi capacitor	-	-	X	X
ECG module	X	X	X	X
RFID module	X	X	X	X
RFID electrodes (if enabled)	X	X	X	X
NIBP module	X	X	X	X
SpO_2 module	X	X	X	X
IBP module	X	X	X	X
Communication module	X	X	X	X
Log file management	-	-	X	X
Shock button	-	-	-	X

a. Automatic executed daily or weekly test depends on the configuration Periodic test frequency refer to section 12.6.1 General configuration).
b. Automatic executed every 5 weeks.

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10.2.5 Functional test and measured values

Heart rate

→ Perform the functional test according to section 4.4.5 Starting ECG monitoring and verify the heart rate with the measured pulse rate of the SpO_2.

SpO_2

→ This test is performed on a volunteer (finger measurement; section 4.7.3 SpO_2 Module).

NIBP

→ This test is performed on a volunteer (arm measurement; section 4.8.1 Starting NIBP monitoring).

Manometer Test

See technical manual 0-48-0245_NT_DGTouch7_ANG

IBP

This test only includes the connection between the sensor, the Touch 7, and the Zeroing function.

1. Connect the sensor to the **DEFIGARD Touch 7** according to section 4.9.1 Preparing an IBP measurement.
2. Perform a zeroing according to section 4.9.4 IBP Zeroing.
3. Zeroing is shown on display.

CO_2 Mainstream

Perform the functional test according to section 4.11.3 Initial operation of the IRMA sensor.

CO_2 Sidestream

Perform the functional test according to section 4.12.2 Initial operation of the ISA gas analyser.

10.2.6 Alarm tests

Alarm volume

Check during the following tests that the alarm sound is higher than 65 dB.

Heart rate

1. Start the ECG monitoring (refer to section 4.4.5 Starting ECG monitoring).
2. Set the alarms with the narrow quick set function (refer to section 4.3 Operator-defined Alarm Thresholds).
3. When the measured value exceeds the alarm thresholds, an alarm is issued.
4. Reset the alarm limits to their original values.

SpO_2

Refer to section 4.7 SpO_2,- $SpCO$, - SpMet Monitoring (option).

NIBP

1. Start the NIBP monitoring (refer to section 4.8.1 Starting NIBP monitoring).
2. Set the NIBP alarm limits below/above the measured values and take a new measurement.
3. When the measured value exceeds the alarm thresholds, an alarm is issued.
4. Reset the alarm limits to their original values.

CO_2

1. Start the CO_2 monitoring according to section 4.11.3 Initial operation of the IRMA sensor, or 4.12.2 Initial operation of the ISA gas analyser.
2. Set the alarms with the narrow quick set function (refer to section 4.3 Operator-defined Alarm Thresholds).
3. When the measured value exceeds the alarm thresholds, an alarm is issued.
4. Reset the alarm limits to their original values.

If the device does not operate as described in this user guide, there is an error that the after-sales service must repair.

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10.3 Update Software

Software updates must only be performed by authorised personnel.

Select **Menu > Control Panel > Software update.**

This function is only used for updating the software. The software can be updated via Wi-Fi (update Server) or USB interface (memory stick).

10.3.1 Update via USB

The USB memory stick must have at least 32 MB of memory.

1. Connect the USB memory stick.
2. Switch On the device, and check that the device is connected to the DC supply or the battery is sufficiently charged. The device must not switch off during the update.
3. Select the parameter **Software update** and start the update by selecting the desired update source. During the update, a progress bar is displayed.
4. When the update is finished, the device switches off.
5. Switch the device on again and enter the **Menu > Control Panel > Software update > Current software version** to verify that the software has been installed.

10.3.2 Update via server

The device initiates by itself regularly or on schedule a connection to the server to check for available updates.

Required accessories Wi-Fi or cellular network connection to the update server.

Update

1. Switch on the device and check that it is connected to the DC supply or that the battery is charged sufficiently. The device must not switch off during the update.
2. Select the parameter **Software update** and start the update by selecting the desired update source. During the update, a progress bar is displayed.
3. When the update is finished, the device switches off.
4. Switch the device on again and enter the **Menu > Control Panel > Software update > Current software version** to verify that the software has been installed.

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10.4 Maintenance Interval of the Batteries

Important

- The battery's performance and life largely depend on how and under what ambient conditions the battery is used.

Power Battery

- The rechargeable power battery is maintenance-free during its normal life.
- The battery must be replaced according:
  - The expired date on the battery, regardless of whether or not the unit has been used
  - Every 3 to 5 years (or after approximately 1000 typical charge/discharge cycles (not full charge/discharge cycles)
- Only store fully charged batteries. If a battery is not used, recharge it every 6 months.

Safety primary cell

- The safety primary cell is maintenance-free during its normal life.
- The safety primary cell must be replaced according to the expiration date on the cell, regardless of whether or not the unit has been used.

10.4.1 Replacing the batteries

⚠ CAUTION

▲ A new **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** replacement power battery must be charged to 100% before the **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** is used on a patient.

Replacing the power battery:

- The power battery needs to be replaced if the operating time in monitoring mode is less than 2 with a fully charged battery (refer to section 10.2.2 Battery check) and if the battery calibration is impossible (refer to section 11.4 Battery Calibration)
- Every 3 to 5 years (or after approximately 1000 typical charge/discharge cycles)

Replacing the safety primary cell:

Check in the menu if the safety cell is OK. (refer to section 10.2.2 Battery check)

10.4.2 Battery disposal

⚠ WARNING

▲ Danger of explosion. The Battery may not be burned or disposed of with domestic refuse.

▲ Danger of acid burns. Do not open or heat the battery.

The battery must be disposed of in municipally approved areas or returned to SCHILLER Medical.

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10.5 Cleaning

Cleaning removes dust, dirt and stains; however, this does not constitute disinfection. Use commercially available detergents intended for clinics, hospitals and practices.

10.5.1 Detergents

Always refer to the manufacturer's information regarding the detergents.

Admissible detergents

- Isopropyl alcohol at 70%
- Neutral detergents
- Soap water
- All products that are suitable for PC PBT plastic

Non-admissible detergents

Never use products containing the following:

- Ethyl alcohol
- Acetone
- Hexane
- Abrasive cleaning powder
- Plastic-dissolving products

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10.6 Disinfection

- Use commercially available disinfectants for clinics, hospitals and practices to disinfect the device.
- Wipe disinfection removes certain bacteria and viruses. Always refer to the manufacturer's information.

10.6.1 Disinfectant

Admissible disinfectants

- Isopropyl alcohol 70%
- Propanol (70 to 80%)
- Ethyl hexanal
- Aldehyde (2 to 4%)
- Ethanol (70 to 80%)
- All products that are suitable for PC PBT plastic

Non-admissible disinfectants

Never use products containing the following:

- Organic solvents
- Ammonia-based detergent
- Abrasive cleaning agents
- 100% alcohol, Virex, Sani-Master
- Sani-Cloth, Ascepti or Clorox wipes
- HB Quat
- Conventional cleaner (for example, Fantastic, Tilex)
- Conductive solution
- Solutions or products containing the following ingredients:
  - Ketone (Acetone)
  - Ammonium chloride
  - Betadine
  - Chlorine, wax or wax compound
  - Sodium salt

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10.6.2 Cleaning and disinfecting the device, cable and sensors

⚠ WARNING

- ▲ Remove the battery and close the cover before cleaning. Refer to section 3.2 Disconnect from the External DC Supply.
- ▲ Do not immerse the unit, cable, or sensors in liquid, and do not sterilise them.
- ▲ Do not apply tension to the sensor cable.
- ▲ Do not use aggressive cleaners.
- ▲ Do not use any phenol-based agents or peroxide compounds for cleaning.
- ▲ Reusable sensors must be treated as biologically dangerous material after usage and sterilised according to the manufacturer's instructions.
- ▲ Observe the manufacturer's notes when cleaning the sensors and cables.

1. Disconnect the device from the mains and remove the plug and sensors.
2. Wipe the equipment, cable and sensors with a dampened cloth and a mild cleaning solution. The manufacturer recommends using 70% alcohol.
3. Dispose of single-use sensors and protective coverings according to the relevant regulations.

Notes on the cleaning and disinfection

NIBP Cuff The manufacturer recommends using 70% alcohol to clean and disinfect the NIBP cuff and tube.

SpO_2 Sensor The manufacturer recommends using 70 % alcohol to clean the cable and sensor. Dry the sensor before reuse.

ECG Cable The cable can be wiped with a mild cleaning agent or with 70 % alcohol.

CO_2 sensors

- The IRMA probe can be cleaned using a cloth moistened with ethanol or isopropyl alcohol (< 70%).
- The ISA sidestream gas analysers and the Nomoline Adapter may be cleaned using a cloth moistened (not wet) with a maximum of 70% ethanol or isopropyl alcohol.
- To prevent cleaning liquids and dust from entering the ISA gas analyser through its sampling gas inlet connector, keep the Nomoline Family sampling line fitted while cleaning the analyser.

Temperature probe The temperature probe can be cleaned easily using well-established procedures in the medical field or can be autoclavable (134°C).

10.7 Device disposal at the End of its Useful Life

When no longer used, this unit must be disposed of in a municipally approved collection point or recycling centre.

If no such collection point or recycling centre is available, you can return the unit to your distributor or the manufacturer for proper disposal. In this way, you contribute to the recycling and other forms of utilisation of old electrical and electronic equipment.

Improper disposal harms the environment and human health due to the presence of dangerous substances in electrical and electronic equipment.

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10.8 Inspection and Checklist Tables

Per the maintenance interval detailed previously, the following checklist must be copied and completed.

Checking life-saving functions

The following tests (sections 10.8.1 to 10.8.3) are recommended before or after each intervention, respectively. Enter the results in the check list. Refer to sections 10.8.1 Monthly to 10.8.3 Life-items replacement every 5 to 10 years

Enter the results in the checklist.

- Complete a visual inspection of the device and accessories. Refer to section 10.2.1 Visual inspection of the device and accessories
- Check the Battery charging status. Refer to section 10.2.2 Battery check
- Complete a Button test. Refer to section 10.2.3 Defibrillator key test
- Complete an Auto-test in the post-intervention menu. Refer to section 10.2.4 Auto-test.

Year	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Jan																															
	Feb																															
	Mar																															
	April																															
	May																															
	June																															
	July																															
	Aug																															
	Sept																															
	Oct																															
	Nov																															
	Dec																															

10.8.1 Monthly

Auto-test will complete a functional test of the charging capacitors using maximum energy. Refer to section 10.2.4 Auto-test.

Month	Date	Periodic test results OK	Periodic test results NOT OK
1		o	o
2		o	o
3		o	o
4		o	o
5		o	o
6		o	o
7		o	o
8		o	o
9		o	o
10		o	o
11		o	o
12		o	o

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10.8.2 Every 12 months

Inspection	Results	Inspection				
Functional safety checks and inspections Confirm the date of the last factory inspections and tests	Return the unit to your nearest authorised service point or your SCHILLER agent for safety and functional checks.	o	o	o	o	o
	Date of inspection: Inspector:					

10.8.3 Life-items replacement every 5 to 10 years

Inspection	Results	Replacement				
Battery						
➜ Replace the battery	• The battery needs to be replaced:					
	– When the operating time is less than 2 hours or after 3 to 5 years. Refer to section 10.4.1 Replacing the batteries	o	o	o	o	o
	– Replace the safety primary cell (see expiry date or when device switches immediately when replacing the power battery)	o	o	o	o	o
	– Replace the internal button primary cell (every 10 years)	o	o	o	o	o
	Date of replacement: Inspector:					
Defibrillation capacitor						
➜ Replace the defibrillation capacitor	• Send the unit to your nearest SCHILLER service centre for capacitor replacement if the defibrillation capacitor deviates more than 15% (joules) from the intended value.	o	o	o	o	o
	Date of replacement: Inspector:					

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10.9 Error Detection

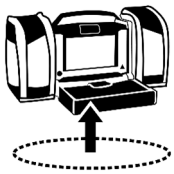
⚠ CAUTION

▲ A reminder is displayed if a technical alarm is still present at shutdown.
▲ If it is impossible to get the device back into operating condition within a reasonable time period, continue CPR.

Forced shutdown procedure
If it is impossible to get the device back into operating condition, complete the following:

→ Press and hold the **Green** button until the device has switched Off. Then switch the device On.

10.9.1 General errors

Error	Cause	Remedy
The screen is not lit when the device is switched on	• The battery is not inserted correctly or is defective • The Battery is empty • The device is defective	→ Insert the battery correctly or replace it → Connect to the power supply (docking station) and charge the battery → Replace the device
The device cannot be switched Off	• Software hangs • The device is defective	→ Keep the **Green** button pressed for at least 10 seconds. → Replace the device
No analysis	• The ECG signal is too weak • ECG signal interference through electromagnetic waves • The patient moved or was touched during the analysis • The device is defective	→ Perform cardiac massage again → Turn off the source of signal interference, for example, radio equipment or cell phone, or move the patient outside the field of interference → Do not move or touch the patient during the analysis → Replace the device
Unable to deliver the shock (**DEFIGARD Touch 7**)	• The battery is too low • Electrode error caused by resuscitation measures • Heart rhythm has changed • The device is defective	→ Change the batteries → Reapply the electrodes → Run a new analysis → Replace the device
It is impossible to deliver a shock (**DEFIGARD Touch 7**)	• The device is not isolated from the patient or the floor	→ The device displays an instruction message and a picture:  → Move the device to isolate it from the patient and the floor.
The battery is not being charged	• The temperature of the device or battery is too high	→ Let the device cool down, charging continues once the temperature has reached an acceptable level.
If the touch screen does not react	• Poor screen tap detection	→ Lock and unlock the screen (refer to section 3.2.1 Lock the touch screen).

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10.9.2 Technical information and error messages

Alarm	Cause	Remedy
CPU BOARD INOPERATIVE	• T.CPU01 • T.CPU02 • T.CPU03 • T.CPU04 • T.CPU05 • T.CPU06 • T.CPU07	➜ Replace the device
BACKUP BATTERY EMPTY	• T.CPU08 • T.CPU09	➜ Replace the device
SAFE BATTERY EMPTY	• T.CPU10 • T.CPU11	➜ Replace the device
LOW POWER BATTERY	• T.CPU12	➜ Replace the device
POWER BATTERY EMPTY	• T.CPU13	➜ Replace the device
POWER BATTERY CHARGE FAILURE	• T.CPU14	➜ Replace the device
ECG INOPERATIVE	• T.ECG01 • T.ECG02 • T.ECG03 • T.ECG04 • T.ECG05 • T.ECG06 • T.ECG07 • T.ECG08 • T.ECG09 • T.ECG10	➜ Replace the device
DEFI INOPERATIVE (**DEFIGARD Touch 7**)	• T.ECG11	➜ Replace the device

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10.9.3 Preventing electromagnetic interferences

Non-ionising electromagnetic radiation

The user can help avoid electromagnetic disturbances by keeping the minimum distance between portable and mobile RF telecommunication devices (transmitters) and the **DEFIGARD Touch 7/PHYSIOGARD Touch 7**. The distance depends on the output performance of the communication device, as indicated below.

HF source Wireless communications devices	Transmitter frequency [MHz]	Testing frequency [MHz]	Maximum power P [W]	Distance d [m]
Various radio services (TETRA 400)	380-390	385	1.8	0.3
- Walkie-talkies (FRS) - Rescue service, police, fire brigade, servicing (GMRS)	430-470	450	2	0.3
LTE band 13/17	704-787	710/745/780	0.2	0.3
- GSM800/900 - LTE band 5 - Radiotelephone (microcellular) CT1+, CT2, CT3	800-960	810/870/930	2	0.3
- GSM1800/1900 - DECT (radiotelephone) - LTE Band 1/3/4/25 - UMTS	1700-1990	1720/1845/1970	2	0.3
- Bluetooth, WLAN 802.11b/g/n - LTE Band 7 - RFID 2450 (active and passive transponders and reading devices)	2400-2570	2450	2	0.3
WLAN 802.11a/n	5100-5800	5240/5500/5785	0.2	0.3

⚠ CAUTION

- ▲ **Portable** HF telecommunication devices must not be used within a radius of 0.3 meters from the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** and its cables.
- ▲ Do not place the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** on top of other electric/electronic devices, that is, maintain a sufficient distance from other devices (this includes the patient cables).

For permanent HF telecommunication devices (for example, radio and TV), the recommended distance can be calculated using the following formula: $d = 1.2 \times \sqrt{P}$ for 150 kHz to 800 MHz and $d = 2.3 \times \sqrt{P}$ for 800 MHz to 2.7 GHz

d = Recommended minimum distance in Meters
P = Transmitting power in Watts

i For more detailed information, refer to section 12.7 Electromagnetic Interferences.

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10.9.3.1 Measures to prevent electromagnetic interferences

Further measures to prevent electromagnetic interferences:

The user can take the following measures to prevent electromagnetic interferences:

- Increase distance to the source of interference.
- Turn the device to change the angle of radiation.
- Connect the device to a different mains connector.
- Only use original accessories (especially patient cables)
- The device should not be used adjacent to or stacked with other equipment.
- Observe the maintenance intervals as detailed in section 10.1.1 Maintenance interval table.

⚠ CAUTION

▲ There is no guarantee that no interference can occur in certain installations. If the **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** causes interferences, these can be prevented by switching off the device.

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11 SCHILLER Charging Unit CS-1

⚠ CAUTION

- ▲ The batteries supplied are rechargeable Lithium-Ion 4.65 Ah batteries. Only use rechargeable batteries supplied by SCHILLER.
- ▲ We recommend that the batteries are replaced every 1000 charge/discharge cycles.

i In battery slot 1, the battery can also be calibrated. The charging unit is optional.

11.1 Battery Charging Options

The following options are available to charge the batteries:

- Batteries can be removed and charged using the optional charging unit SCHILLER CS-1.
- The **DEFIGARD Touch 7/PHYSIOGARD Touch 7** batteries are also charged when the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** is connected to the external power supply.

11.2 Insert the Battery

- Insert the battery in the charger unit and push it home until the battery clicks into place with the blue catches.
- To remove a battery, press the two blue catches to release the battery.

i The charger has double contacts, and a battery can be inserted either way.

(1) Control/indicator panel
(2) Battery slot 1: Only this slot can be used for battery calibration.
(3) Battery slot 2

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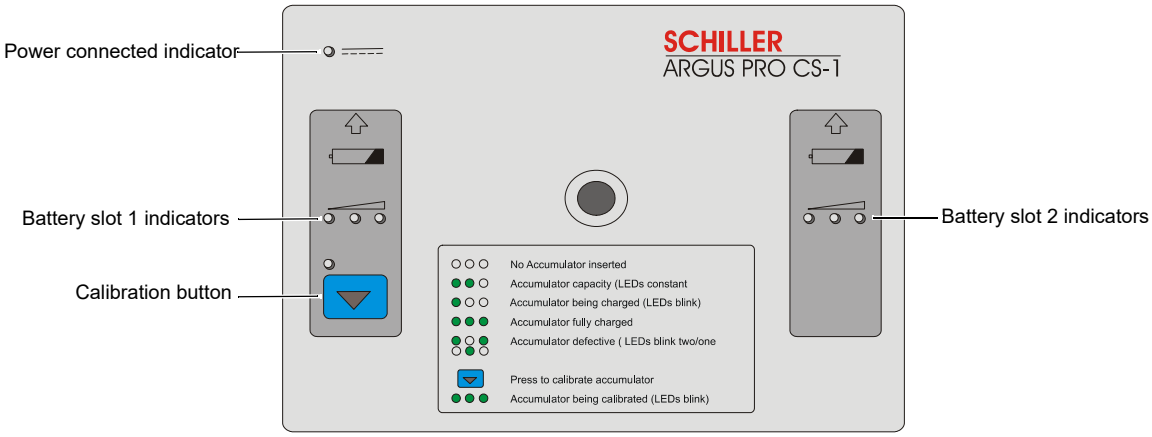
11.3 Control Panel



The LED indicators give the following information:

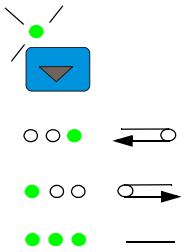
LED	Function
○ ○ ○	**No LEDs lit** - no battery inserted.
● ● ○ —	**Constant display for 5 seconds** - when a battery is first inserted, one, two or three LEDs are lit for 5 seconds. This indicates the battery charge state (1 LED = 1/3 capacity, 2 LEDs = 2/3 capacity and 3 LEDs = 100% capacity).
● ○ ○ →	**LEDs are flashing in sequence (left to right)** - after 5 seconds of a battery being inserted, the charge sequence starts.
● ● ● —	**All LEDs lit** - battery fully charged.
○ ○ ● ←	**LEDs are flashing in sequence (right to left)** - battery is being calibrated (refer to section 11.4 Battery Calibration).
● ○ ● ○ ● ○ — —	**LEDs blink two/one in sequence** - faulty battery.

11.4 Battery Calibration

Every battery has an individual calibration and capacity circuit. The **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** uses this information to display the battery capacity. New batteries are factory calibrated before use and should not need recalibrating during their normal life cycle. If a battery seems to have a low capacity or is near the end of its life, it may need recalibrating.

Calibrate a battery as follows:

1. Place the battery in the left battery slot of the charger.
2. Press the **CAL** button to start the calibration procedure. The stages of calibrating a battery are as follows:
   - The battery is completely discharged[1].
   - The battery is charged and calibrated.



The calibration cycle takes approximately 2.5 to 5 hours to complete the full charge cycle (after full discharge) takes approximately 2.5 hours. During the calibration process:

- The LED above the calibration button lights up.
- To indicate the discharge cycle, the three indicators LEDs blink in sequence - right to left.
- When the discharge cycle is finished, the three indicators LEDs blink in sequence left to right to indicate the charge cycle.
- All LEDs are lit when the calibration is completed, and the LED above the calibration button is extinguished.

The LED flashes above the **CAL** button if the battery cannot calibrate, indicating that the battery cannot be calibrated and should not be used.

The calibration process can be stopped by pressing the **CAL** button again.

1. The power stored in the battery to be calibrated is transferred by ‘dynamic power distribution’ to the battery in the other slot or used for any connected device so that no energy is wasted.

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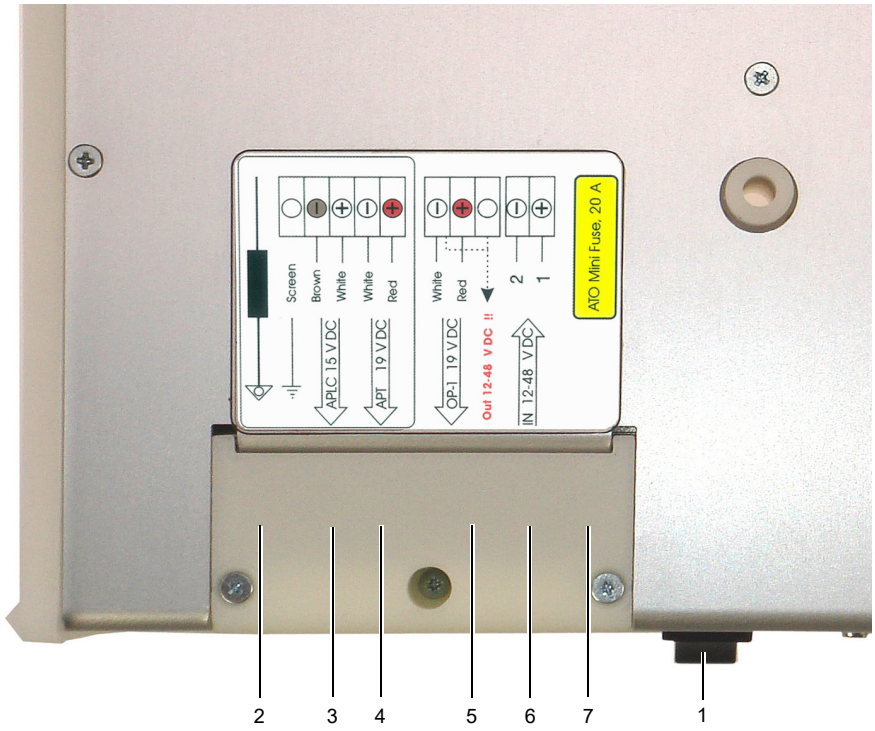
11.5 Input and Output Supplies

The SCHILLER CS-1 Charging Unit has the following input and output power supplies:



(1) ON/OFF switch
(2) Potential equalisation (to common vehicle earth). Yellow/Green Cable.
(3) Power output 15V (do not use)
(4) Spare power output to docking station 8 to 48 VDC 19V (do not use)
(5) Spare power output to docking station 8 to 48 VDC 19V Fixed and 12 to 48V (do not use)
(6) DC IN from vehicle power supply 12 to 48V DC
(7) Fuse 5 x 20 mm, 20 A

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12 Technical Data

Data refer to standard testing conditions.

- Technical data about defibrillation (refer to Chapter 12.2 Defibrillation Waveform) applies only to the **DEFIGARD Touch 7**.

12.1 System Data

Manufacturer	SCHILLER MEDICAL
Device types	**DEFIGARD Touch 7** and **PHYSIOGARD Touch 7**
Dimensions	160 x 250 x 70 mm (h x l x w) without bag
Weight	3.3 kg with battery and bag for **DEFIGARD Touch 7** 2.9 kg with battery and bag for **PHYSIOGARD Touch 7**
Protection case	IP55
Drop test	1 meter according to EN 1789+A2:2014 and 60601-1-12: 2014
Power supply DC/DC	**Ambulance bracket**
Input	10.8 to 17.6 VDC
Output	15 VDC/4.0 A
Power supply AC/DC (desktop charger and ambulance bracket)	Type XP Power Model: AHM85PS15 Medical grade switching power supply, protection class I.
Input	100 to 240 VAC, maximum 1.0 A, 50 to 60 Hz
Output	15 VDC, maximum 5.67 A
Power Battery	
Battery type	Lithium/ion 11.1V, 4.65 Ah, 51.6 Wh
Autonomy	190 shocks with maximum energy or > 6 hours of monitoring
Charging time	100%: 2 hours after a full discharge and with the device switched Off
Safety primary cell	Ensures continued monitoring for approximately 30 seconds when replacing the power battery.
Battery type	Lithium/MnO_2, 6V, 1.4 Ah
Environmental conditions	
For operation	• 0 to 50ºC relative humidity at 15 to 95% (non-condensing) Atmospheric pressure 700 to 1060 hPa • If higher or lower temperatures prevail during use, a limited operation time of up to 1 hour is possible if the device has been stored previously at room temperature. See Environmental Conditions for Transient Operation.

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Environmental conditions
For transient operation

- Operation in normal use for 1 hour under a temperature range of -10 to 50°C
- Operation in normal use for not more than 20 minutes under the following environmental operating conditions:
  - A temperature range of -20 to 50°C (standards requirements)/-26 to 60°C extreme temperature evaluated by a test laboratory
  - A relative humidity range of 15 to 90%, non-condensing, but not requiring a water vapour partial pressure greater than 50 hPa.

Environmental conditions
Before uses

- -10 to 50ºC relative humidity at 0 to 95% (non-condensing)
- Atmospheric pressure 500 to 1060 hPa

Environmental conditions
For transport and storage between uses

- -40 to +5°C without relative humidity control
- -10 to +50°C at a relative humidity of 0 to 90%, non-condensing
- +5 to +35°C at a relative humidity of up to 90%, non-condensing
- > 35 to 70°C at a water vapour pressure of up to 50 hPa
- Atmospheric pressure 500 to 1060 hPa

Time for warming up/cooling down

After removing the device from its protective packaging, do the following:

- Wait 30 minutes
  This is the time required for the **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** to warm or cool from the minimum/maximum storage temperature between uses until the **DEFIGARD Touch 7**/**PHYSIOGARD Touch 7** is ready for its intended use when the ambient temperature is 20°C.

MIL-STD 810G

The device was tested per the:

- MIL-STD 810G Method 501.5 Procedure III
- Tactical standby to Operational (+60°C)
- MIL-STD 810G Method 502.5 Procedure II Operation (-26°C).

Environmental conditions Defibrillation electrodes
Storage
Storage maximum of 10 days

- 0 to 50ºC
- -40 to 75ºC

Display
Type
Dimensions

- High-resolution colour LCD capacitive touch screen, protected by tempered glass
- 7“(154 x 85.92 mm)

Alarm sound level

65 dBA for medium and high priority alarms

Connections

ECG patient cable, SpO_2, NIBP, Temperature, CO_2, IBP

Interfaces

USB

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Memory	24 hours memory (FIFO) Recording of Defi, ECG Lead II, Impedance curves, Events, CPR feedback, patient data, patient vitals and screenshots
Safety standard	IEC/EN 60601-2-4 The device is designed for intensive use
EMC	• IEC/EN 60601-1-2 • IEC/EN 60601-2-4 • CISPR 11 class B The device can be exposed to the following interferences without any impairment: • Static discharges up to 15 kV • Field strength up to 20 V/m in the radio frequency range of (80 to 2700 MHz, 5 Hz/1 kHz modulated) • Magnetic fields of 100 A/m, 50 to 60 Hz
Conformity	CE according to directive 93/42/EEC class IIb
Protection class	Class I according to IEC/EN 60601-1

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12.2 Defibrillation Waveform

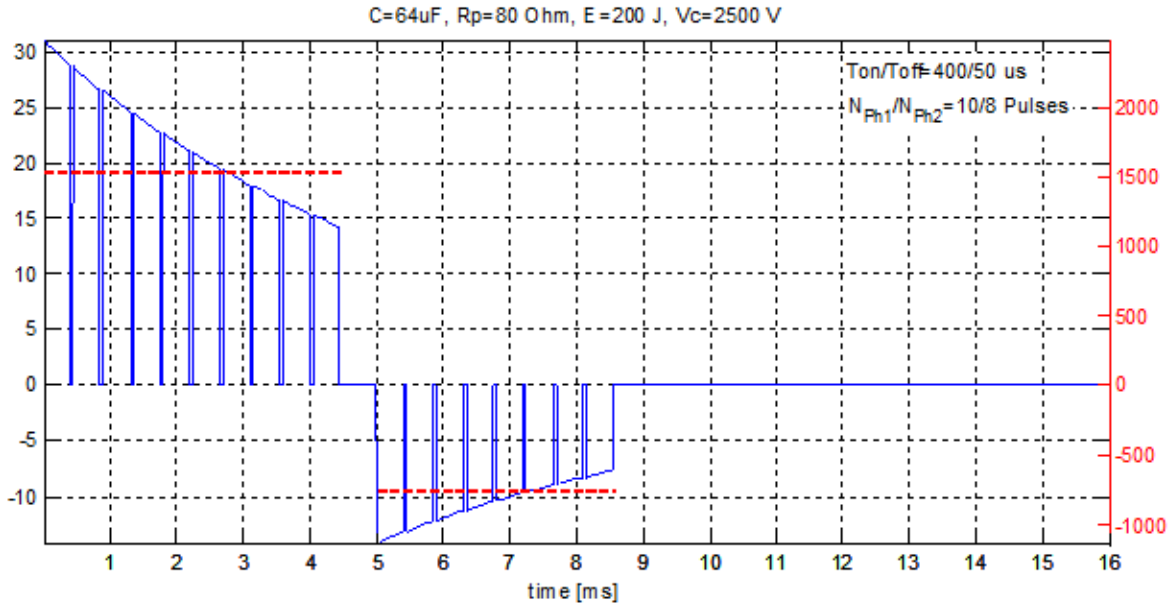
Chapter 12.2 Defibrillation Waveform applies only to the **DEFIGARD Touch 7**.

Form

- Biphasic pulsed defibrillation waveform with fixed optimum physiological phase durations
- Near stabilisation of the emitted energy in function with the patient resistance using pulse-pause modulation depending on the measured patient resistance (duty cycle 80%).

The curve at an impedance of 100 Ω

Printout: Current – left Y-axis (mean current calculated for each cycle)
Condenser voltage – right Y-axis



Overview of the measured impedance values

200 joules released in	25 Ω	40 Ω	50 Ω	60 Ω	75 Ω	80 Ω	100 Ω	125 Ω	150 Ω	175 Ω
First phase										
Maximum current [A]	99.5	62.2	49.8	41.5	33.26	31.1	24.9	19.9	16.6	14.2
Mean current [A]	55.9	38.4	31.1	26.2	21.5	19.2	15.6	12.7	9.7	8.8
Duration [ms]	1.8	2.25	2.7	3.15	3.6	4.5	5.4	6.3	9.45	9.86
Second phase										
Maximum current [A]	36.6	28.5	23.5	20	17.1	14.3	11.8	9.9	6.6	6.5
Mean current [A]	18.6	16.4	14.7	12.6	11.5	9.4	8.2	7.1	4.9	4.9
Duration [ms]	2.25	2.700	2.700	3.150	3.150	3.600	3.600	4.050	4.050	4.050
Total shock duration [ms] including 0.5 ms of pause between the first and second phases.	4.55	5.45	5.9	6.8	7.25	8.6	9.5	10.85	13.55	14.4
The energy delivered [joules]	196	192	189	188	182	187	182	179	184	177

Note. In the case of high patient impedance or some other specific usage cases, the energy delivered to the patient might be lower than expected (for example, If the patient impedance ³ 150 Ohms, the rated energy level is set to 190 joules when 200 joules is selected)

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Standard energy settings	Deviation at 50 Ω ± 3 joules or ± 15% (the higher value is assumed)
AED	
Adult	150/200/200 joules (configurable, refer to section 12.6.3 Defibrillator)
Paediatric	50/50/50 joules (configurable, refer to section 12.6.3 Defibrillator) (automatically selected when the paediatric or adult electrodes are connected)
Manual mode	
Adult	150 joules (configurable, refer to section 12.6.3 Defibrillator)
Paediatric	50 joules (configurable, refer to section 12.6.3 Defibrillator) (default energy settings when starting in manual mode, adjustable any time during intervention)
Charging time for shock	Time used to charge the storage capacitor to the maximum energy of 200 joules in manual mode.
• With a fully charged battery	8 seconds
• With 15 VDC mains voltage after 15 discharges with maximum energy	9 seconds
• From switch-on of the device with pads	19 seconds
Cycle Time Rhythm Analysis – Shock Standby in AED Mode	
• With a fully charged battery	1st shock = 11 seconds maximum.
• With 15 VDC mains voltage after 15 discharges with maximum energy	1st shock = 11 seconds maximum.
• From switch-on of the device to charge at maximum energy	1st shock = 23 seconds
Cycle time shock – shock	< 15 seconds
Operating Modes	• Synchronised with heart action < 60 ms after R-wave • Non-synchronised • AED
Charge control and monitoring	• Automatic shock recommendation of analysis in AED mode • Direct via touch screen • Display of selected energy
Patient resistance	25 to 250 Ω
Indication when ready to shock	LED below  is lit
Shock delivery	Using 

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Safety discharge when:	• The battery voltage is insufficient • The shock is not released within 20 seconds • A lower energy value is selected while the defibrillator is charging • The device is defective • The device is turned off • A non-shockable rhythm is detected
Shock delivery	• Via applied disposable adhesive defibrillation electrodes
Defibrillation electrode connection	Type BF, defibrillation protected > 5 kV
Defibrillation electrodes	Electrode cable, 2 meters long
	Deviating from the compliance statement according to 201.108.1.10 (IEC60601-2-4, 201.1.108.7. and 201.1.108.6), the following features have been measured for the universal electrode:
Adult electrode	• 80 cm^2 active surface Measurements after 60 minutes of pacemaker at the maximum setting, followed by a shock at 200 joules: • Defibrillation recovery 720 mV after 4 seconds and 710 mV after 60 seconds • DC offset voltage 785 mV after 1 minute of stabilisation
Paediatric electrode	• 42 cm^2 active surface

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12.2.1 Shock advisory system

The Shock Advisory System (SAS) in SCHILLER Medical Automated External Defibrillators (AED) was validated with artefacts-free signals:

- ECG signals coming from the PhysioNet databases [1]
- ECG signals coming from Holter recordings on paediatrics who undergo annual examinations in a cardiac unit [3]
- ECG and transthoracic Impedance Cardiogram (ICG) coming from out-of-hospital adult and paediatric cardiac arrest (OHCA) interventions, recorded with
- SCHILLER FredEasy AED [4]

The MIT-BIH Malignant Ventricular Arrhythmia Database (VFDB) is a subset of the general PhysioNet databases recognised as the standard in ECG tests. PhysioNet databases are ECG Holter recordings with full diagnostic bandwidth of 0.05 to 150 Hz, which has been limited to 0.5 to 30 Hz so that the frequency content of the signals is typical of the one found in SCHILLER Medical AED recordings.

All these signals are of appropriate length to allow decisions to be made by the SAS.

In addition, the validation test set database used to establish compliance with AHA requirements [2] and IEC Standard [5] is independent of this used to develop the SAS.
The SAS validation test set contains the following ECG samples without noise (see test sample size in table 1 below):

- Coarse VF (> 200 µV peak-to-peak amplitude)
- Fine VF
- ≥ 100 and ≤ 200 µV peak-to-peak amplitude)
- Shockable VT hi (HR > 150 bpm, rushes that last more than 8 seconds)
- Other VT lo (HR > 40 and < 150 bpm, VT rushes > 3 triplets)
- Asystole (≤ 100 µV peak-to-peak amplitude)
- Normal sinus rhythm (NSR) (P-QRS-T waves visible, HR 40 to 100 bpm)
- Another organised rhythm (includes all rhythms except those in other listed categories)

For each test sample, in the function of the expert rhythm annotation and the SAS decision (shock/no-shock), an interpretation table is built. It shows the true positive (correct classification of a shockable rhythm), true negative (correct classification of a non-shockable rhythm), false positive (non-shockable rhythm incorrectly classified as a shockable rhythm), false negative (shockable rhythm incorrectly classified as non-shockable). Finally, the results of the detector performance are reported in terms of specificity-Sp (TP/(TP + FN)), true predictive value (TP/(TP + FP)), sensitivity-Se (TN/(TN + FP)), false positive rate (FP/(FP + TN)).

Table 1: **DEFIGARD Touch 7** SAS performance by rhythm category meets AHA recommendations [2] and IEC Standards [5] on artefacts-free signals

Rhythms		Test sample size	Performance goal sensitivity	Observed performance
Shockable	Coarse VF	571	> 90%	Meets [1-2]
	VT hi	213	> 75%	Meets [1-2]
	All shockable	784	-	
Non-shockable	NSR	118	> 99%	Meets [1]
	Asystole	634	> 95%	Meets [1]

[1]: The MIT-BIH Malignant Ventricular Arrhythmia Database
http://physionet.org/physiobank/database/vfdb/
[2]: Kerber et al., “Automatic External Defibrillators for Public Access Defibrillation: Recommendations for Specifying and Reporting Arrhythmia Analysis Algorithm Performance, Incorporating New Waveforms and Enhancing Safety”; Circulation, 1997; 95: 1677-1682.
[3]: J.P. Didon, I. Jekova and V. Krasteva, "Evaluation of a shock advisory system with non-shockable paediatric rhythms”, 2010 Computing in Cardiology, Belfast, 2010, pp. 525-528.
[4]: V. Krasteva et al, "Comparison of Paediatric and Adult ECG Rhythm Analysis by Automated External Defibrillators During Out-of-Hospital Cardiac Arrest," 2018 Computing in Cardiology Conference (CinC), Maastricht, Netherlands, 2018, pp. 1-4.
[5]: Standard IEC 2018 60601-2-4, ed 3.1.
[6]: J.P. Didon, V. Krasteva, S. Ménétré, T. Stoyanov, I. Jekova, “Shock advisory system with minimal delay triggering after the end of chest compressions: Accuracy and gained hands-off time”, Resuscitation 82S (2011) S8-S15.
[7]: J.P. Didon, I. Jekova, S. Ménétré, T. Stoyanov, V. Krasteva, “Combination of Algorithms to Decrease Preshock Pause for Automated External Defibrillators”, Circulation 2011; 124: A219, Resuscitation Science Symposium Abstracts, Best Original Resuscitation Science Poster Session.

[8]: J.P. Didon, S. Ménétré, I. Jekova, V. Krasteva, “Method for Minimal Delay Triggering of VF Detection During Cardio Pulmonary Resuscitation”, *Circulation* 2010; 122: A253, Resuscitation Science Symposium Abstracts, Best Original Resuscitation Science Poster Session.

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Rhythms		Test sample size	Performance goal sensitivity	Observed performance
	Other organised rhythms	452	> 95%	Meets [1]
	Total non-shockable	1204	> 95%	Meets [2]
Positive predicted value	-	-	> 90%	-
False predicted value	-	-	> 5%	-

When configured for Analysis with anteriority set On, the SAS uses a combination of algorithms launched in two stages, 6 to 8, to deliver a shock advisory decision at a minimal delay after actual CC stoppage. The SAS configured for Analysis with anteriority set Off starts a chest-compression-free VF detection at an analysis request without trying to optimise hands-off time. The SAS does not analyse both configurations after a shock-advised decision is reached.

12.3 Pacemaker

Operating Modes

- Demand
- Fixed frequency (FIX)

Stimulation pulse

Form	Rectangle mono-phase with constant current source
Pulse duration	20 ms ± 5%
Pulse rate	Configurable in steps of 40, 45, 50, 60, 70 to 240 beats/minute ± 1.5%
Pulse current	Configurable to 0 (pacemaker off) and then from 10 to 200 mA, ± 10% or 5 mA (the higher value is applied)
Refractory period	• 340 ms ≤ 80 b/minute • 240 ms > 80 b/minute
Signal connection	Type BF, defibrillation-protected > 5 kV
Readiness for operation	Immediately

Pacer electrodes
(same as defibrillation electrodes)

Electrode cable, 2 meters long

According to 201.108.1.10 (IEC60601-2- 4, 201.1.108.7. and 201.1.108.6), deviating from the compliance statement. The following features have been measured for the universal electrode:

Adult electrode Duration

80 cm^2 active surface

- For up to 1 hour of pacing, use 140 mA/120 ppM (pulse duration 20 ms)
- For up to 8 hours of pacing using 70 mA/60 ppM (pulse duration 20 ms), an inspection of pads every 30 minutes

Paediatric electrode

42 cm^2 active surface

- For up to 1 hour of pacing, use 70 mA/140 ppM (pulse duration 20 ms). Inspection of pads every 30 minutes

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12.4 Technical Data - Monitoring

12.4.1 ECG

Leads	Simultaneous, synchronous recording of all 9 active electrodes giving 12 leads
Patient cable	4 or 10-lead cable (4 + 6) type CF
Heart rate	
Range	• 15 to 350 beats/minute
Accuracy	• ± 10% or 5 beats/minute, whichever is greater
Lead display	Selection of 1 or 12 leads
Sensitivity	0.25, 0.5, 1, 2 cm/mV programmable
Blockage caused by a defibrillation shock	Maximum 5 seconds
Input impedance	≥ 2.58 MΩ
Current electrode test	< 0.5 µA
Suppression of large T-waves	Maximum amplitude of T-wave according to IEC 60601-2-27 section 201.12.1.101.17: 0.8 mV
HR averaging method	The HR calculation is done using a user-defined number of previous RR intervals (minimum 4, maximum 16). The RR intervals are reset, and the heart rate is set to zero whenever an asystole condition has been detected
Response time HR measurement	Change from 80 to 120 beats per minute: 2.56 seconds Change from 80 to 40 beats per minute: 8 seconds
Reaction to an irregular rhythm	• A1: 80/minute • A2: 60/minute • A3: 120/minute • A4: 90/minute (except for triggers no. 6 and 7, HR < 90/minute) (according to IEC specifications 60601-2-27, 6.8.2.bb)
Duration until the alarm is triggered in the case of tachycardia	B1 and B2: 3 seconds (according to IEC specification 60601-2-27, 6.8.2.bb)
ECG amplifier	
Sampling rate	500 Hz
Pacemaker detection	± 2 mV to ± 700 mV/0.1 until 2.0 ms
QRS detection range	Duration: 70 to 120 ms, amplitude: 0.5 to 5.0 mV
Protection	Fully isolated, defibrillation protected > 5 kV
Mains filter	Distortion-free suppression of superimposed 50 to 60 Hz sinusoidal interferences is achieved by using adaptive digital filtering.
Frequency range	The ECG frequency range depends on the ECG cable, the ECG view and the selected settings (see the table below).

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ECG amplifier bandpass The bandpass depends on the ECG source.

Patient cable	BLW Filter	EMG Filter	Display 	Display 	R-ECG display 
4 and 10-lead	OFF	OFF	0.05 to 42 Hz	-	0.05 to 150 Hz
4 and 10-lead	ON	ON	--	0.6 to 25 Hz	-
4 and 10-lead	ON	OFF	-	0.6 to 42 Hz	-
4 and 10-lead	OFF	ON		0.05 to 25 Hz	-
Defibrillator	-	-	1 to 25 Hz	1 to 25 Hz	-

To pass a distortion test according to IEC 60601-2.25, Clause 201.12.4.107.1, use the 4 or 10-lead patient cable to set the ECG amplifier bandpass to 0.05 to 150 Hz. See the table above.

12.4.2 Features of pacemaker pulse rejection

According to IEC 60601-2-27 Clause 201.12.1.101.13

Single pacemaker pulse	• Duration 2.0 ms, amplitude > 2 mV and an overshoot of < 0.25 mV • Duration 0.1 ms, amplitude > 2 mV and an overshoot of < 0.8 mV
followed by a QRS complex	• Duration 2 ms, amplitude > 4 mV • Duration 0.1 ms, amplitude > 25 mV
Pacemaker pulse followed by an identical pulse within 150 ms	• Duration 2.0 ms, amplitude between 4 mV and 300 mV • Duration 0.1 ms, amplitude between 25 mV and 300 mV
followed by a QRS complex	• Duration 2.0 ms, amplitude between 4 mV and 300 mV • Duration 0.1 ms, amplitude between 25 mV and 700 mV without overshoot • Duration 0.1 ms, amplitude between 25 mV and 300 mV with overshoot
Pacemaker pulse followed by an identical pulse within 250 ms	• Duration 2.0 ms, amplitude between 4 mV and 400 mV • Duration 0.1 ms, amplitude between 25 mV and 400 mV
followed by a QRS complex	• Duration 2.0 ms, amplitude between 4 mV and 300 mV • Duration 0.1 ms, amplitude between 25 mV and 700 mV without overshoot • Duration 0.1 ms, amplitude between 25 mV and 300 mV with overshoot
	Note that the pacemaker signals from different pacemakers vary. In the case of cardiac arrests or some arrhythmias, pacemaker signals might still be measured, especially signals from pacemakers generating high amplitudes (> 20 mV) or overshoot. Pacemaker patients need to be monitored very closely.

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12.4.3 NIBP - Non-invasive blood pressure

Measurement	Automatic or manual
Measuring method	Oscillometric
Connection	Type CF
Measurement range	
Adults(Child)	• Sys 60 to 230 mmHg, dia 40 to 130 mmHg, map 50 to180 mmHg
Neonate	• Sys 40 to 110 mmHg, dia 20 to 60 mmHg, map 30 to 85 mmHg
Accuracy	± 3 mmHg and ± 2 beats/minute
Standards	Complies with ISO 81060-2:2013

12.4.4 IBP - Invasive blood pressure

Measuring range	-150 to 400 mmHg
Accuracy	1 mmHg or ± 1% (whichever is greater)
Sampling rate	500 Hz
Amplifier	Type CF, defibrillation protected > 5 kV
Zeroing	Manual

12.4.5 Temperature

Measuring method	Direct
Sensor	YSI 401, rectal, oesophageal, skin
Amplifier	Type CF, defibrillation protected > 5 kV
Sampling rate	2 Hz
Measurement interval	1 x per second
Measuring range	15 to 45°C
Resolution	0.1°C
Accuracy	± 0.1°C from 25 to 45°C

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12.4.6 SpO_2 Pulse oximetry

Amplifier	Masimo™
Patent	See www.masimo.com/patents.htm for detailed patent information.
Operation	Normal and sensitive
Measuring range	
SpO_2	• 0 to 100%
PP	• 25 to 240 minutes
SpCO	• 0 to 99%
SpMet	• 0 to 99.9%
PI	• 0.02 to 20%
Accuracy[a]	
SpO_2 (no movement)	• 60 to 80% ± 3% adults/children (10 to 50 kg)/infants (3 to 20 kg) • 70 to 100% ± 2 adults/children/infants; ± 3 neonates
SpO_2 (movement)	• 70 to 100% ± 3 adults/children/infants/neonates
SpO_2 (low perfusion)	• 70 to 100% ± 2 adults/children/infants/neonates
PP (no movement)	• 25 to 240/min ± 3 digits adults/children/infants/neonates
PP (movement)	• 25 to 240/min ± 5 digits adults/children/infants/neonates
PP (low perfusion)	• 25 to 240/min ± 3 digits adults/children/infants/neonates
SpCO	• 1 to 40% ± 3 adults/children/infants
SpMet	• 1 to 15% ± 1 adults/children/infants/neonates
Resolution	
SpO_2	• 1%
PP	• 1/min
SpCO	• 1%
SpMet	• 0.1%
Calibration range	70 to 100%
Connection	Type CF
Displayed range	1 to 100%
Blockage caused by a defibrillation shock	Maximum 10 seconds
Skin surface temperature	Less than 41°C in a minimum 35°C environment

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a. SpO_2, SpCO and SpMet accuracy was determined by testing on healthy adult volunteers in the range of 60 to 100% SpO_2, 0 to 40% SpCO, and 0 to 15% SpMet against a laboratory CO-Oximeter. SpO_2 and SpMet accuracy was determined on 16 neonatal NICU patients ranging in age from 7 to 135 days old and weighing between 0.5 to 4.25 kg. Seventy-nine (79) data samples were collected over 70 to 100% SpO_2 and 0.5 to 2.5% MetHb with a resultant accuracy of 2.9% SpO_2 and 0.9%SpMet.

The Masimo sensors have been validated for motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark skin pigmentation in induced hypoxia studies of 70 to 100% SpO_2 against a laboratory CO-oximeter and ECG monitor. This variation equals plus or minus one standard deviation, which encompasses 68% of the population.

The Masimo SET Technology has been validated for low perfusion accuracy in benchtop testing against a Biotek Index 2 simulator and Masimo's simulator with signal strengths greater than 0.02% and transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus one standard deviation, which encompasses 68%of the population.

The Masimo sensors have been validated for pulse rate accuracy of 25 to 240 bpm in benchtop testing against a Biotek Index 2 simulator. This variation equals plus or minus one standard deviation, which encompasses 68% of the population.

The following substances may interfere with pulse CO-Oximetry measurements:

- Elevated levels of Methaemoglobin (MetHb) may lead to inaccurate SpO_2 and SpCO measurements
- Elevated levels of Carboxyhaemoglobin (COHb) may lead to inaccurate SpO_2 measurements.
- Very low arterial Oxygen Saturation (SpO_2) levels may cause inaccurate SpCO and SpMet measurements
- Severe anaemia may cause erroneous SpO_2 readings.
- Dyes, or any substance containing dyes, that change usual blood pigmentation may cause erroneous readings.
- Elevated total bilirubin levels may lead to inaccurate SpO_2, SpMet, and SpCO readings.

12.4.7 $EtCO_2$ Capnography

The IRMA and ISA sensors are equipped with automatic barometric pressure compensation.

The device is an extremely compact infrared mainstream and sidestream gas analyser.

Trademarks	Masimo IRMA™, Masimo ISA™, Nomoline™
Masimo AB patents	IRMA: SE519766; SE519779; SE523461; SE524086 ISA: US 9.861.298; EP 2.065.697
Modules	Masimo IRMA mainstream and Masimo ISA sidestream
Cable length	2.5 meters (IRMA) 0.5 meter (ISA)
Surface temperature IRMA (at an environment temperature of 23°C)	Maximum 39°C
Measuring range	0 to 25%

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Accuracy	The following specifications are valid for a dry gas at 22 ± 5°C and 1013 ± 40 hPa (standard conditions).
In standard conditions	• 0 to 15% (± 0.2 Vol% + 2% of reading) • 15 to 25% (no information on accuracy)
In all conditions	• ± (0.3 kPa + 4% of reading) All conditions' accuracy specifications are valid for all specified ambient conditions (refer to page page138). Deviating from these, influences are specified in the table, Interfering gas and vapour effects and in section, Effects from water vapour partial pressure on gas readings. The technical specifications can be found in the IRMA/ ISA user guide Chapter 2.
Breath detection	Adaptive threshold value, minimum 1 Vol% change in CO_2 concentration
Respiration rate	0 to 150/minute. The respiration rate is displayed after three breaths, and the average value is updated after every breath.
Warm-up time	< 10 seconds
Rise time	IRMA: CO_2 < 90 ms ISA: CO_2 < 500 ms
Total system response time	IRMA: < 2 seconds ISA: < 4 seconds (using a 2 meters long sampling line)
Protection class	IP44 (IRMA) IPX4 (ISA)
Airway adapter IRMA	
Adults/Child adapter	Increases dead space by less than 6 ml Pressure drop less than 0.3 cm H_2O at 30 LPM
Infant/Neonate adapter	Increases dead space by less than 1 ml Pressure drop less than 1.3 cm H_2O at 10 LPM
Airway adapters NomoLine	
Adults/Paediatric adapter	≤ 6 ml dead space
Infant/Neonate adapter	≤ 0.7 ml dead space
Water handling ISA	NomoLine family sampling lines with proprietary water removal tubing
Sampling rate	1 second
Sampling flow rate ISA	50 (± 10) ml/minimum

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12.5 Telecommunication (option)

Frequency range	Six band GSM/GPRS/EDGE: • 850 (824 to 894) MHz • 900 (880 to 960) MHz • 1800 (1710 to 1880) MHz • 1900 (1850 to 1990) MHz • UMTS band-1: 1920 to 2170 MHz • LTE band-7: 2500 to 2690 MHz
Supported SIM cards	3 and 1.8V
Data transmission	LTE FDD Cat 1
Maximum transmitting power	Technology Power (dBm) • 2G LB – 32.5 • 2G HB – 29.5 • 3G/TD-SCDMA – 23.5 • 4G FDD – 22.5 at 1RB
FCC identification **IC**	R17HE910 5131A-HE910
Standards	• FCC/IC, PTCRB, GCF • RCM • JATE/Telec • R&TTE/GCF

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12.6 Device Configuration

12.6.1 General configuration

Parameter	Values	Description
Notch filter	• **None*** • 50 Hz • 60 Hz	This option shall be activated if artefacts are detected on ECG signals when the device is plugged into the mains. The notch filter must be chosen according to the location. • 50 Hz: Europe, Africa, The Middle East (except Saudi Arabia), Asia-Pacific (except Japan, Taiwan and the Philippines), Australia • 60 Hz: The American continent (except Chile, Argentina, Uruguay, Paraguay, Bolivia, and French Guyana)
Boot mode by default	• AED • **Monitoring*** • Manual def	Sets the mode your device shall start in when pressing the **ON/OFF** button
Monitoring display mode	• Monitoring no curve • **Advanced monitoring** • Basic monitoring • 12-lead ECG • Critical care	Sets the desired default view in monitoring. • Monitoring without curve: No curves are displayed by default; only large monitoring values
Default heart rate source	• **Auto*** • Defi • ECG: I • ECG: II • ECG: III • Pleth	Sets the behaviour of the HR parameter box between the following: possibilities: • Auto: The device automatically detects the HR source with predefined priorities level. ECG higher than DEFI higher than SpO_2 (pulse) • Defi: Always force the HR calculation on DEFI • ECG I: Always force the HR calculation on ECG lead I • ECG II: Always force the HR calculation on ECG lead II • ECG III: Always force the HR calculation on ECG lead III • SpO_2: Always force the HR calculation on SpO_2 (pulse)
Audio pause at start	• **2 min*** • Off	When this option is activated, the device remains silent for 2 minutes at the start, even if an alarm occurs.
Periodic test frequency	• **Daily*** • Weekly	The device wakes up by default weekly to perform a self-test. It is possible to set a daily test. Hereafter, the details of the content of the automatic and manual self-test
Time of test	• 12	This parameter specifies when the device will automatically wake-up to perform its self-test. This field must be specified in hours in 24 hours format. Always specify the time in HH and not HH:MM For example, 13 refers to 1 PM, 13:30 is not allowed
Technician password	• 0000	Sets the password that will be asked to enter the Control Panel
Enable printer	• **True*** • False	Activating this option will allow pairing a Bluetooth printer and will make the printer button available
Curve thickness	• **0.5 mm*** • 0.7 mm • 0.9 mm	Sets the thickness of the curves printed on the Bluetooth printer.
Default language	• **English*** German French, Spanish, Italian	Sets of the language in which the device will always start by default. Even if the language is modified during the use on the device, it will start again with the configured default language specified here.

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Parameter	Values	Description
Alarm sound level	• Low • Medium • **High***	Selection of the overall sound level applied to technical and physiological alarms
Audio off allowed	• False • **True***	If this option is activated, the user will have the possibility to shutdown sound alarming
Manual defibrillation mode	• No confirmation • Confirmation needed* • Password protected	Sets the behaviour of the device while entering manual defibrillation mode
Manual defibrillation mode password	• 0000	Password to be entered if entering in manual defibrillation is password protected. The user can modify the password.
Confirmation to leave AED mode	• **True*** • False	If enabled, the device will require a confirmation by the user before allowing to leave AED mode

12.6.2 R-ECG

Parameter	Values	Description
PDF Format	• 1p avg 1 x 6 10 seconds 12.5 mms • 2p 1 x 12 5 seconds 50 mms • **1p 2 x 6 5 seconds 25 mms*** • 1p 4 x 3+1 2 seconds 25 mms • 1p 1 x 12 10 seconds 25 mms	Sets the PDF layout for the resting ECG report. This layout will be used for the PDF sent by e-mail
Encrypt PDF	• True • **False***	PDF encryption If this option is activated, every Resting ECG sent by the device will be password protected with the password specified in the setting PDF password
PDF Password	• SCHILLER	Sets the password to protect the PDF of Resting ECG
R-ECG Low pass filter	• 40 Hz • **150 Hz***	Sets the low pass filter frequency for the resting ECG
Printout format	• 4 x 3 10 seconds 25 mms + avg 7p • **4 x 3 + 1 2.5 seconds 25 mms 2p*** • 4 x 3 + 1 2.5 seconds 50 mms 3p • 2 x 6 5 seconds 25 mms 2p	Sets the layout for the resting ECG printed out on the external thermal printer
ECG Anteriority	• True • **False***	If enabled the device will apply an anteriority of 10 seconds during resting ECG acquisition

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12.6.3 Defibrillator

Parameter	Values	Description
Default energy for adults in manual defibrillation.	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, 50, 70, 90, 120, **150***, 200 joules	Sets the energy which will be displayed by default when entering manual defibrillation mode in adult mode
Default energy for children in manual defibrillation.	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, **50***, 70, 90, joules	Sets the energy which will be displayed by default when entering manual defibrillation mode in child mode
Sync after sync shock	• True (Sync) • **False* (aSync)**	If this option is activated, the device remains in sync mode after a synchronised shock in manual defibrillation (refer to section 5.4.2 Setup switching from synchronised to unsynchronised mode)
Manual mode energy protocol	• True • **False***	If activated, energy is automatically set to the configured energy levels
First shock for adults	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, 50, 70, 90, 120, **150***, 200 joules	Sets the energy which will be delivered for the first shock in AED in adult mode
Second shock for adults	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, 50, 70, 90, 120, 150, **200*** joules	Sets the energy which will be delivered for the second shock in AED in adult mode
Third shock for adults	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, 50, 70, 90, 120, 150, **200*** joules	Sets the energy which will be delivered for the third shock in AED in adult mode
First shock for children	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, **50***, 70, 90, joules	Sets the energy which will be delivered for the first shock in AED in child mode
Second shock for children	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, **50***, 70, 90, joules	Sets the energy which will be delivered for the second shock in AED in child mode
Third shock for children	• 1, 2, 3, 4, 5, 6, 7, 8, 9. 10, 11, 12, 13, 14, 15, 30, **50***, 70, 90, joules	Sets the energy which will be delivered for the third shock in AED in child mode

12.6.4 Digital signal processing

Parameter	Values	Description
Analysis	• **With Anteriority*** • Without Anteriority • Analysis Whilst Compressing	Enables the analysis features (part of the signal analysis is done on the signal before the device mentions the start of the analysis). **Analysis with anteriority*** In AED mode, if motion artefacts do not disturb the signal, the analysis will start in the background 10 seconds before the advice of analysis. This process may result in faster shock delivery. **Analysis without anteriority** Standard AED analysis **Analysis Whilst Compressing** Not yet available; if selected, Analysis with Anteriority will be activated

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Parameter	Values	Description
Analysis button	• False • **True***	Enable/disable the Analysis button in AED mode, allowing you to start an AED analysis manually.
Alarm on Vfib or Vtach detection	• False* • **True***	Enable/Disable the alarming in case of VF/VT detected

12.6.5 AED

Parameter	Values	Description
Display monitoring parameters in AED	• False • **True***	If enabled, the monitoring parameters will be displayed in AED mode
Display curve in AED	• False • **True***	If enabled, ECG lead Defi, $EtCO_2$ and SpO_2 curve are displayed in AED mode
AED voice level	• High • **Medium*** • Low	Sets the level of voice prompts in AED mode

12.6.6 CPR

Parameter	Values	Description
Metronome behaviour adult	• **30:2*** • 15:2 • Continuous Off	The metronome default behaviour in adult mode This behaviour can be changed during intervention on the device
Metronome behaviour child	• 30:2 • **15:2*** • Continuous Off	The metronome default behaviour in child mode This behaviour can be changed during intervention on the device
Metronome rate	• **100 cpm*** • 110 cpm • 120 cpm	Sets the frequency of the metronome
Metronome audio level	• High • **Medium*** • Low	Sets the audio level of the metronome
CPR depth unit	• **cm*** • inch	Sets the unit in which the chest compression depth value will be displayed
CPR cycle duration	• 1 min • **2 min*** • 3 min	Sets the duration of the CPR cycle
CPR during AED	• **No assistance*** • CPR Feedback only • Metronome only • CPR Feedback and Metronome	Sets the type of assistance during CPR in AED mode
CPR during manual defibrillation	• **No assistance*** • CPR Feedback only • Metronome only • CPR Feedback and Metronome	Sets the type of assistance during CPR in manual defibrillation
Launch the manual defibrillation timer at the start	• **False*** • True	

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12.6.7 ECG

Parameter	Values	Description
ECG curve amplitude	• 0.25 mV • 0.5 mV • **1 mV*** • 2 mV • auto	Sets the default amplitude of the ECG curve. When Auto is selected, the displayed amplitude will be automatically adapted depending on the signal amplitude.
ECG 16,7 Hz filter	• **False*** • True	Not used at the moment, has no impact on the unit
Electromyogram (EMG) filter	• **False*** • True	Activate/Deactivate the EMG filter
Baseline wandering (BLW) filter	• False • **True***	Activate/Deactivate the BLW filter
QRS sound level	• Off • **Low*** • Medium • High	Sets the audio level of the QRS sound issued by the ECG
ECG lead-wire	• IEC • AAMI/AHA	Displays ECG lead colours in accordance with IEC or AHA standards

12.6.8 IBP

Parameter	Values	Description
IBP curve amplitude	• **30**, 60, 150, 300 mmHg • 4, 8, 20, 40 kPa • Auto	Sets the default IBP curve amplitude
IBP unit	• **mmHg*** • kPa	Sets the unit in which the IBP values will be displayed and stored

12.6.9 NIBP

Parameter	Values	Description
Deflation rate	• 3, 4, 5, 6, **7**, 8, 9 mmHg/s	Sets the cuff deflation rate
NIBP unit	• **mmHg*** • kpa	Sets the unit in which the NIBP values will be displayed and stored
Automatic cycles at the start	• **False*** • True	Automatic NIBP measurement cycle starts once the first measurement is initiated manually
Automatic cycle duration	• 2, 3, 5, 10,15, 30 min	Sets duration of the automatic pressure measurements cycles
Initial pressure for adults	• 90, 120, 150, **180*,** 210, 240, 270 mmHg	Sets the initial cuff pressure for measurement in adult mode
Initial pressure for children	• 90, 120, **150***, 180, 210, 240, 270 mmHg	Sets the initial cuff pressure for measurement in child mode
Initial pressure for neonate	• **50***, 70, 90 110,130, 150 mmHg	Sets the initial cuff pressure for measurement in neonate mode

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12.6.10 SpO_2

Parameter	Values	Description
SpO_2 Notch filter	• **None***, 50 or 60 Hz	To be activated if artefacts are detected on SpO_2 signals when the device is plugged into the mains. The notch filter must be chosen according to the location.
SpO_2 average	• 4, 6, 8, 10,**12*,**14, 16 seconds	Sets the integration time for the calculation of the displayed average value.
SpO_2 sensitivity	• **Normal*** • Automatic Probe Off Detection	Sets the measurement sensitivity. Adaptive Probe Off Detection is optimised for detecting a sensor that has become detached, regardless of the signal quality.
SpO_2 sound level	• Off • Low • **Medium*** • High	Sets the audio level of the pulse sound
SpO_2 sound level	• Off/Low/Medium/High	Sets the audio level of the pulse sound

12.6.11 Temp

Parameter	Values	Description
Temperature unit	• **Celcius*** • Fahrenheit	Sets the unit in which the temperature value will be displayed and stored

12.6.12 $EtCO_2$

Parameter	Values	Description
Respiration curve amplitude	• **50*,** 75, 100 mmHg • 8, 12,15% • 7, 10, 14 kPa	Sets the respiration curve amplitude to be displayed by default
Type of ventilation	• Air • Air + O_2	Sets the default ventilation type to apply a correction related to O_2 usage.
$EtCO_2$ unit	• Vol% • **mmHg*** • kPa	Sets the unit in which the $EtCO_2$ value will be displayed and stored

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12.6.13 Time and date

Parameter	Values	Description
Date format	• **DD/MM/YY*,** MM/DD/YY YY/MM/DD	Sets the format in which the date will be displayed
Time format	• AM/PM • **24H***	Sets the time format
Time zone	• Europe/Berlin • **Europe/Paris*** • Europe/London • GMT-12...-1 • GTM 0 • GTM 2....+12	Sets the time zone to calculate the correct date and time

12.6.14 Event

Parameter	Values	Description
Event (from 1 to 20)	• Event(1 to 20)	Enter an event name (for example, a medication). This event can be selected on the event list device during the intervention. Once selected, it is stored in the memory and flagged in the intervention report (20 customisable fields) Note: do not use special characters (like / \ < > &…)

12.6.15 E-mail configuration

Parameter	Values	Description
E-mail server	-	Any hostname of the SMTP provider (for example, smtp.myinternetprovider.com)
E-mail address source	-	The e-mail from which the e-mails are going to be sent (example: mymail@myinternetprovider.com)
Server port	-	The port that is used to communicate with the SMTP server (for example, 25, 465, 587)
TLS	• **False*** • True	Enables TLS/SSL encryption for communication with the SMTP Server. This setting must be set according to SMTP Server requirements.
Authentication required	• **False*** • True	Enables the authentication for communication with the SMTP Server. This setting must be set according to SMTP Server requirements
Login	-	The login used for SMTP server authentication
Password	-	The password used for SMTP server authentication

12.6.16 E-mail addresses

Parameter	Values	Description
E-mail address (from 1 to 30)	-	The e-mail address must be correctly entered, for example, user@myinternetprovider.com
Alias (from 1 to 30)	-	This text will be displayed on the device for a better recognition of the recipient. For example, Dr USER

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12.6.17 Transmission

Parameter	Values	Description
Automatic R-ECG transmission	• **False*** • True	If this option is activated, the device will automatically send over the media selected in configuration Transmission media during an intervention to the address specified for SEMA Server There will be no preview of the resting ECG on the device after the acquisition; it will be automatically sent.
Automatic intervention data transmission	• When the device is plugged into the docking station • At device, power off • **Off***	The device is capable of transmitting its memory automatically after an intervention using the media selected in transmission media by automatic wake-up, with the following scenario: • Never (Off) • Ten minutes after the device has been shut down (After the device powers Off) • When an external power supply is detected (When the device is plugged into the docking station) After a successful intervention, data transmission: • The device will also automatically transmit the latest self-test report • The device will synchronise its clock with the server.
Transmission media during an intervention	• **Wi-Fi*** • Cellular network • USB/Ethernet	The selected media will always be selected by default at the manual start of the device. The user can always change this media during the intervention.
Transmission media by an automatic wake-up	• **Wi-Fi*** • Cellular network • USB/Ethernet	The selected media will always be selected by default during the automatic wake-up of the device (automatic intervention data transmission, automatic self-test results transmission)

12.6.18 Ethernet

Parameter	Values	Description
Ethernet ping server	• 8.8.8.8	Sets the IP that will be used to test the device's connectivity over the Ethernet. Usually, it's recommended to use either a common DNS server (for example, 8.8.8.8) or the public SEMA Server IP address

12.6.19 Wi-Fi

- Three different networks can be pre-configured in the device.
- The device can connect itself to a hidden SSID.

Parameter	Values	Description
SSID	-	SSID of the Wi-Fi Network that shall be used for data transmission
Encryption type	• WEP • WPA • **WPA2*** • WPA-EAP • WPA2-EAP • None	Type of encryption from the Wi-Fi Network that shall be used for data transmission
Security key	-	The security key of the Wi-Fi Network that shall be used for data transmission
Wi-Fi Login	-	Login used for EAP authentication

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Parameter	Values	Description
Wi-Fi Password	-	Password used for EAP authentication
Wi-Fi Ping server	-	Sets the IP that will be used to test the device's connectivity over Wi-Fi. Usually, it is recommended to use either a common DNS server (for example, 8.8.8.8) or the public SEMA Server IP address

12.6.20 Cellular network

Parameter	Values	Description
PIN	-	Sets the PIN code to unlock the SIM card It is recommended to either use the same PIN for all devices or to disable PIN on all SIM cards. The device accepts both.
APN Name	-	Sets the APN of the M2M Internet provider For example, orange.m2m.spec or MATOOMA or A1.net
APN Port	-	Sets the APN port (if required by the APN)
APN User	-	Sets the APN user (if required by the APN)
APN Password	-	Sets the APN password (if required by the APN)
APN Extra commands	-	If required by the APN, extra commands can be specified here
Cellular network ping server	8.8.8.8	Sets the IP that will be used to test the device's connectivity over a cellular network. Usually, it's recommended to use either a common DNS server (for example, 8.8.8.8) or the public SEMA Server IP address

12.6.21 SEMA

Parameter	Values	Description
SEMA Server	-	Sets the IP address or the hostname of the SEMA Server Should the device be able to send data to SEMA over the Internet (typically through a cellular network), the public IP address or hostname must be specified and not the private address. For example, 188.165.287.137 (public IP) and not 192.168.200.32 (private IP)
SEMA Server port	8181	Sets the port with which SEMA Server is reachable. This port might be different whether the device tries to connect with or without SSL encryption. For example, by default, 8080 is used for HTTP, and 8181 is used for HTTPS
SEMA SSL encryption	• False • **True***	Sets the SSL encryption. It is recommended to activate this option to secure communication, especially if transmissions are carried over the Internet
SEMA Login	-	Sets the device login to SEMA. To be able to transmit data to SEMA, a login and password must be specified for each device (it can be the same login/password for all devices)
SEMA Password	-	Sets the device password to SEMA. To be able to transmit data to SEMA, a login and password must be specified for each device (it can be the same login/password for all devices)
SEMA Attending name	-	Sets the Technician ID. This field is only necessary if multi-tenancy is used in SEMA to split recordings. Typically, the attending name is a specific login in SEMA Server.

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12.6.22 Schiller Update Server (SUS)

Parameter	Values	Description
SUS Server	-	Sets either the IP address or the hostname of the SUS Server. If the device can update itself over the Internet (typically through a cellular network), the public IP address or hostname must be specified and not the private address. For example, 188.165.287.137 (public IP) and not 192.168.200.32 (private IP)
SUS Server port	8181	Sets the port with which the SUS server is accessible. This port might be different if the device attempts to connect with or without SSL encryption. For example, by default, 8080 is used for HTTP, and 8181 is used for HTTPS
SUS SSL encryption	• False • **True***	Sets the SSL encryption. It is recommended to activate this option to secure communication, especially if transmissions are carried over the Internet
SUS Login	-	Sets the device login to the SUS server. To be able to retrieve data from the SUS server, a login and password must be specified for each device (it can be the same login/password for all devices)
SUS Password	-	Sets the device password to the SUS server. To be able to retrieve data from the SUS server, a login and password must be specified for each device (it can be the same login/password for all devices)

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12.7 Electromagnetic Interferences

The **DEFIGARD Touch 7/PHYSIOGARD Touch 7** is intended to be used in the electromagnetic environments listed in the following tables. The user of the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** must ensure that the device is operated in a good environment.

12.7.1 Electromagnetic emissions

Emission measurement	Compliance with the regulations	Electromagnetic environment explanations
HF Emissions CISPR 11	Group 1	**DEFIGARD Touch 7/PHYSIOGARD Touch 7** only uses HF energy for internal functions. Therefore, HF emissions are very low, and interferences with electronic devices nearby are unlikely.
HF Emissions CISPR 11	Class B	**DEFIGARD Touch 7/PHYSIOGARD Touch 7** is suitable for use in all establishments, including domestic establishments and those directly connected to the public low voltage power supply network that supplies buildings used for domestic purposes.
Harmonics IEC 61000-3-2	Class A	
Voltage fluctuations IEC 61000-3-3	Compliant	

12.7.2 Electromagnetic immunity

Interference testing	IEC 60601 test level	Conformity level	Electromagnetic environment explanations
Electrostatic discharge IEC 61000-4-2	± 8 kV contact ± 15 kV air	IEC 60601-1 conformity	Floors should be made of wood, concrete or ceramic tiles. If the floors are covered with synthetic material, relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	IEC 60601-1 conformity	Mains power quality should be that of a typical commercial and hospital environment.
Surge IEC 61000-4-5	± 1 kV between conductors ± 2 kV conductor earth	IEC 60601-1 conformity	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	> 95% UT; 0,5 cycle At 0°, 45°, 90°, 135°, 180° 225°, 270° and 315° > 95% UT; 1 cycle 30% UT; 25 (50 Hz)/30 (60 Hz) cycles h) Single phase: at 0° 95% UT; 250(50 Hz) 300 (60 Hz) cycle	IEC 60601-1 conformity	Mains power quality should be that of a typical commercial or hospital environment. If the user of the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** is reliant on permanent operation even in the case of a power failure. It is recommended to connect the **DEFIGARD Touch 7/ PHYSIOGARD Touch 7** to an Uninterruptible Power Supply (UPS) or using a battery.
Power frequency (50 to 60 Hz) magnetic field 131	30 A/m	100 A/m	Power frequency magnetic fields should be like a typical commercial and hospital environment.

Note: U_T indicates the AC voltage of the mains before the test level.

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Interference testing	IEC 60601 test level	Conformity level	Electromagnetic environment explanations
			Recommended minimum distances. Portable and mobile HF telecommunication devices must keep the recommended minimum distance (d) from the **DEFIGARD Touch 7/PHYSIOGARD Touch 7** and all its components, including cables; the recommended minimum distance is calculated based on the transmitter's frequency.
Conducted RF IEC 61000-4-6	3 V_{rms} outside ISM band 6 V_{rms} in the ISM and amateur radio band 150 kHz to 80 MHz	$[V_1]$ = 10 V_{rms} $[V_1]$ = 10 V_{rms}	$d = \frac{3.5}{V_1} \times \sqrt{P}$
Radiated HF IEC 61000-4-3	20 V/m 80 MHz to 2.7 GHz	$[E_1]$ = 20 V/m 80 to 2700 MHz	$d = \frac{3.5}{E_1} \times \sqrt{P}$ for 80 to 800 MHz $d = \frac{7}{E_1} \times \sqrt{P}$ for 800 MHz to 2.7 GHz
Proximity fields from RF wireless communications equipment IEC 61000-4-3	Refer to section 12.7.3 Immunity to proximity fields from RF wireless communications equipment	12.7.3 Immunity to proximity fields from RF wireless communications equipment, page 165	The recommended separation distance for this tested frequency is 0.3 meter.
			P is the maximum power in watts, and d is the recommended separation distance in meters. As determined by an electromagnetic site[a] survey, field strengths from fixed transmitters should be less than the compliance[b] levels (V_1 and E_1). Interference may occur in the vicinity of equipment marked with the following symbol.  Non-ionising electromagnetic radiation

Note 1. For 80 to 800 MHz, the higher frequency range applies.
Note 2. These guidelines might not always be applicable. Electromagnetic radiation is influenced by absorption and reflection on structures, objects and people.

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcasts and TV broadcasts, cannot be predicted theoretically with accuracy. An electromagnetic site survey should be considered to access the electromagnetic environment due to fixed RF transmitters. If the measured field strength in the location where the device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures must be necessary, such as re-orienting or relocating the device

b. Over the frequency range of 150 kHz to 80 MHz, field strengths should be less than $[E_1]$ V/m.

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12.7.3 Immunity to proximity fields from RF wireless communications equipment

Test frequency [MHz]	Band[a] [MHz]	Service	Modulation	Maximum power P[W]	Distance d [m]	Immunity level [V/m]
385	380 to 390	Various radio services (TETRA 400)	Pulse modulation[b] 18 Hz	1.8	0.3	27
450	430 to 470	- Walkie-talkies (FRS) - Rescue service, police, fire brigade, servicing (GMRS)	FM[c] ± 5 kHz ± 1 kHz sine	2	0.3	28
710 745 780	704 to 787	LTE band 13/17	Pulse modulation 217 Hz	0.2	0.3	9
810 870 930	800 to 960	- GSM800/900 - LTE band 5 - Radiotelephone (microcellular) CT1+, CT2, CT3	Pulse modulation 18 Hz	2	0.3	28
1720 1845 1970	1700 to 1990	- GSM1800/1900 - DECT (radiotelephone) - LTE Band 1/3/4/25 - UMTS	Pulse modulation 217 Hz	2	0.3	28
2450	2400 to 2570	- Bluetooth, WLAN 802.11b/g/n - LTE Band 7 - RFID 2450 (active and passive transponders and reading devices)	Pulse modulation 217 Hz	2	0.3	28
5240 5500 5785	5100 to 5800	WLAN 802.11a/n	Pulse modulation 217 Hz	0.2	0.3	9

a. For some services, only the uplink frequencies are included.

b. The carrier shall be modulated using a 50% duty cycle square wave signal.

c. As an alternative to FM modulation, 50% pulse modulation at 18 Hz may be used because while it does not represent actual modulation, it would be the worst case.

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13 Appendix

13.1 Accessories and Disposables

⚠ WARNING

▲ Always use SCHILLER replacement parts and disposables or products approved by SCHILLER. Failure to do so may endanger performance and life and invalidate the warranty.

Your local representative stocks all the disposables and accessories for the **DEFIGARD Touch 7**. A full list of all SCHILLER representatives can be found on the SCHILLER website (www.schiller.ch).

13.2 Accessories DEFIGARD/PHYSIOGARD Touch 7

Article No.	Article description
Device	
3.940100	Battery Li-Ion 11.1V, 4.65 Ah, 51.6 Wh (rechargeable)
4-07-0022	Battery Li/MnO_2, 6V, 1,4 Ah
ECG	
0-05-0086	ECG Patient cable 4 leads + 6 leads extension, Press std, IEC, angled
0-05-0087	ECG Patient cable 4 leads + 6 leads extension, Mediclip, IEC, angled
0-05-0088	ECG Patient cable 4 leads + 6 leads extension, Press std, AHA, angled
0-05-0089	ECG Patient cable 4 leads + 6 leads extension, Mediclip, AHA, angled
NIBP	
0-04-0012	Cuff for neonatal soft, 4 cm (Arm circumference 6 to 12 cm)
0-04-0016	Cuff for Child, 8 cm (Arm circumference 11 to 22 cm)
0-04-0014	Cuff for Child, 11 cm (Arm circumference 16 to 28 cm)
0-04-0013	Cuff for Adult, 13 cm (Arm circumference 26 to 33 cm)
0-04-0017	Cuff for Adult, 15 cm (Arm circumference 33 to 41 cm)
0-04-0015	Cuff for Adult, 19 cm (Arm circumference 39 to 55 cm)
0-87-0006	Hose assembly NIBP, 2 meters
SpCO, SpMet, SpO_2	
0-05-0084	RD EMS Patient cable
0-05-0085	RD to M-LNC Adapter cable
0-05-0090	RD Hospital Patient cable
0-13-0063	RD SET DCI, Adult Reusable sensor
0-13-0064	RD SET DCI, Paediatric Reusable sensor
0-13-0065	RD SET DBI, Adult Reusable Soft Boot sensor
0-13-0066	LNCS II Rainbow, Adult Reusable Sensor

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Article No.	Article description
0-13-0067	LNCS II Rainbow, Paediatric Reusable Sensor
Temp	
2.101108	Reusable temperature probe rectal/oesophageal, adult, 2 meters
2.101109	Reusable temperature probe rectal/oesophageal, child, 2 meters
2.101104	Temperature probe skin adult
2.310298	Reuseable connecting cable for the disposable temperature probe
CO_2 IRMA/ISA	
2.100571	IRMA CO_2 sensor
2.101176	ISA sidestream $EtCO_2$ sensor
6-17-0024	Trunk cable IRMA/ISA $EtCO_2$ with adapter plate
IBP	
2.310285	IBP cable assembly Braun
2.310297	IBP cable assembly Baxter
2.310299	IBP cable assembly Transpac IV
2.310308	IBP cable assembly PCB Combitrans
2.310296	IBP cable assembly Ohmeda
2.310246	IBP cable assembly Medex
DEFI	**DEFIGARD Touch 7**
0-21-0040	1 pair disposable adhesive defibrillation electrode pads for adults, 80 cm² pre-connected with RFID
2.155067	1 pair of disposable adhesive defibrillation pads for children, 42 cm²
2.100870	ARGUS LifePoint (CPR feedback sensor)
6-17-0012	Adapter cable for LifePoint CPR feedback sensor
2.100519	Adhesive pad set of 5 pcs
0-05-0064	Pads adapter connector BigSPC-P to connector type SPC-D
General accessories	
0-80-0023	Carrying bag
3.940100	Li-Ion 11.1V, 4.65 Ah, 51.6 Wh (rechargeable)
1-128-5082	Ambulance bracket with AC/DC charging module. The battery is charged in the device via the ambulance bracket.
1-128-5780	Ambulance bracket with DC/DC charging module. The battery is charged in the device via the ambulance bracket.
1-128-5180	Desktop bracket with AC/DC charging module. The battery is charged in the device via a desktop bracket.
1-128-5181	Nomad AC/DC charging module
2.100018	Charging unit CS-1 external battery charger
1-128-5183	Stretcher bracket

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13.3 Literature

European Resuscitation Council (2015) Guidelines 2015 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

American Heart Association (2015) Guidelines 2015 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Cansell A. (2000) Wirksamkeit und Sicherheit neuer Impulskurvenformen bei transthorakaler Defibrillation – Biphasische Impulskurvenformen – Notfall- and Rettungsmedizin, Springer-Verlag 3: 458 – 474.

Clinical experience with a low-energy pulsed biphasic waveform in out-of-hospital cardiac arrest Jean-Philippe Didon, Guy Fontaine, Roger D. White, Irena Jekova, Johann-Jakob Schmid, Albert Cansell; Clinical experience with a low-energy pulsed biphasic waveform in out-of-hospital cardiac arrest, Resuscitation (2008) 76, pp 350—353.

13.4 Glossary

AED Automated External Defibrillator

BLS Basic Life Support (artificial respiration and cardiac massage)
CPR is frequently used synonymously

CPR Cardiopulmonary Resuscitation

VT Ventricular Tachycardia

VF Ventricular Fibrillation

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