

# **DARAY<sup>®</sup>**

## **HEALTHCARE PRODUCTS**



# **V202**

## **HANDHELD PULSE OXIMETER**

### **OPERATING MANUAL**

GAB/V202-1-0807



# **DARAY<sup>®</sup>**

## **HEALTHCARE PRODUCTS**

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# 1. Warnings

- Read and understand this manual before using the product.
- The monitor is intended only to assist with patient assessment and it must be used in conjunction with expert clinical diagnosis. It is not intended as a treatment device.
- The monitor is intended for use by only qualified staff who have been trained to use this particular device.
- To ensure patient safety, verify the monitor and its sensor function safely and properly before use.
- SpO2 sensors are precision and delicate instruments - please treat them accordingly!
- Take extra care when using the monitor with electrical surgery equipment.
- **EXPLOSION HAZARD:** Do not use the monitor in the presence of flammable anaesthetics, explosive substances, vapours or liquids.
- Do not pull or lift the monitor by its sensor's cable which may become disconnected allowing the monitor to fall onto the patient or the floor.
- Do not allow the monitor to swing freely when transporting patients, to avoid the risk of it hitting the patient or being damaged.
- Do not use the monitor or its sensor during MRI (magnetic resonance imaging) scanning because induced currents could potentially cause burns. The monitor and MRI equipment may also interfere with each other.
- The monitor and its accessories may be contaminated by bacteria during transporting, use and storage. Use the recommended methods to sterilize and disinfect the monitor or its accessories when the packing material is damaged, or it has not been used for some time.
- Do not perform SpO2 monitoring and NIBP measurements on the same arm simultaneously - obstruction of blood flow during NIBP measurements may adversely affect the SpO2 reading.
- Do not put the sensor on the same extremity as any arterial catheter or venous syringe.
- As with any medical equipment, carefully route sensor cable to avoid patient entanglement or strangulation.
- Separate cables from other electrical surgical equipment as far as practical from the SpO2 sensor.
- If no pulse is found or the reading is unreasonable, first check the patient's condition, and then check the sensor installation and connection with the monitor and the monitor's battery state.
- Do not use the monitor to measure patients whose pulse rate is lower than 30bpm which is outside the equipment's specification.
- Do not allow prolonged and continuous monitoring which may damage the patient, especially small children.
- Do not place the sensor over scar tissue.
- Remove nail varnish, plasters, etc from the finger inserted into the sensor.
- Remove the SpO2 sensor from the patient after monitoring is completed.
- The monitor is not waterproof. Keep its surface dry and clean, and prevent any liquid from entering it.
- Ensure the monitor cannot fall over during use, and that it is not subjected to mechanical vibration or shock.
- Do not permit mobile phones to be used near to the monitor.
- The monitor should be maintained by only personnel approved by the manufacturer.

## 2. INTRODUCTION

The V202 is a non-invasive, handheld pulse oximeter powered by 3 x 1.5V AA alkaline or rechargeable batteries. It is compact, light and simple to use for monitoring adult, paediatric, infant and neonatal patients; it is also suitable for use in some veterinary applications.

The monitor measures and displays arterial oxygen saturation ( $SpO_2$ ), pulse rate (PR), and pulse strength. The monitor measures these parameters via a single sensor, processes the signals and shows the results on clear LED displays. Battery state is also displayed, and the unit shuts down to save battery life if it is not used for 3 minutes.

User-settable audio and visual alarms are featured, and the monitor is operated and controlled by the buttons on its front panel.

This device is supplied with rechargeable batteries and a plug-in charger unit. The rechargeable batteries need to be charged for 16 hours prior to use.

### 2.1 $SpO_2$ MEASUREMENT PRINCIPLES

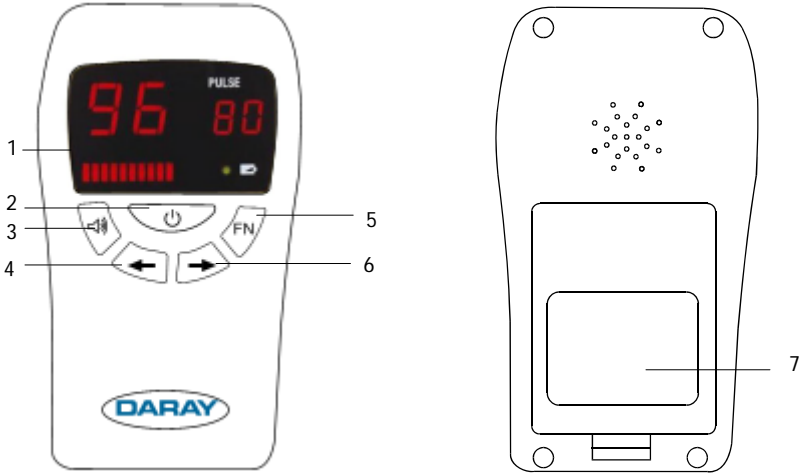
$SpO_2$  measurement determines the oxygen saturation of haemoglobin in the arterial blood. The V202 displays  $SpO_2$  as a %, pulse rate, pulse strength and a plethysmogram wave PLETH.

Arterial oxygen saturation is measured by a technique called pulse oximetry which is a continuous, non-invasive method based on the different spectra absorption of haemoglobin and oxyhaemoglobin. This spectrophotometer principle measures how much light from a red and an infrared LED source on one side of the sensor is transmitted through patient tissue (such as a finger or a toe), to a receiver on the other side.

The source wavelengths are nominally 940nm for the red LED and 660nm for Infrared, whilst the power output of each source is nominally 4mW.

The amount of light transmitted depends on many factors, most of which are constant. However, one of these factors, the blood flow in the arteries, varies with time, because it is pulsating. By measuring the light absorption during a pulsation, it is possible to derive the oxygen saturation of the arterial blood. The sensor detecting the pulsation gives an output from which can be derived the PLETH waveform, pulse rate signal and pulse strength.

## 2.2 CONTROLS AND DISPLAYS



*Front Panel*

*Rear Panel*

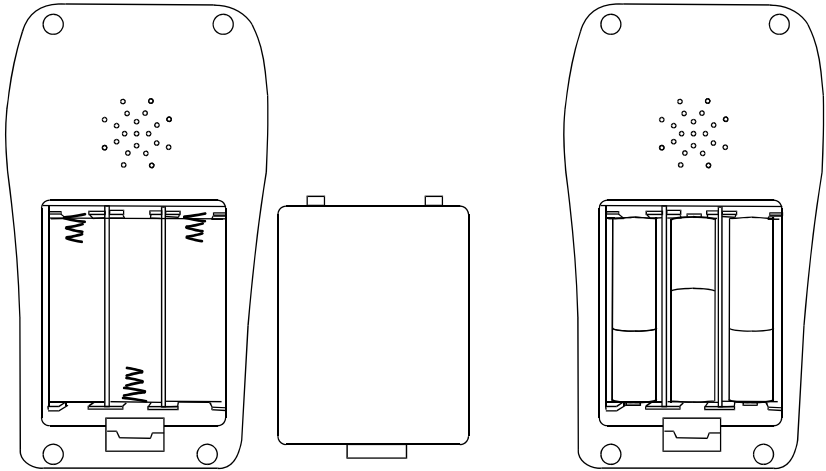
*Top Panel*

| No. | Description           | Remarks  |
|-----|-----------------------|--|
| 1   | LED screen            | See Chapter 4.   |
| 2   | On/Off button         |  |
| 3   | Volume button         | 3 levels: 0 (mute), 1, 2.<br>Disabled during alarm setup.                |
| 4   | Left arrow button     | These button are used to set up alarm limits, as described in chapter 4. |
| 5   | Function key          |  |
| 6   | Right arrow button    |  |
| 7   | Battery compartment   |  |
| 8   | SpO2 sensor connector |  |

### 3. ASSEMBLY

The monitor is powered by 3 AA batteries installed as follows:

- 1 Open and remove the battery compartment lid by pushing the catch upwards.
- 2 Fit the batteries, ensuring they are inserted the correct way round as shown.
- 3 Refit the battery compartment lid by inserting the 2 tongues and clicking down the catch.



#### Caution

- This device is supplied with rechargeable batteries and a plug-in charger unit. The rechargeable batteries need to be charged for 16 hours prior to use.
- Use only AA alkaline batteries or rechargeable batteries. Do not use carbon or poor quality batteries. Remove the batteries if the device is not to be used for some time.
- Weak battery charge may cause inaccurate readings.

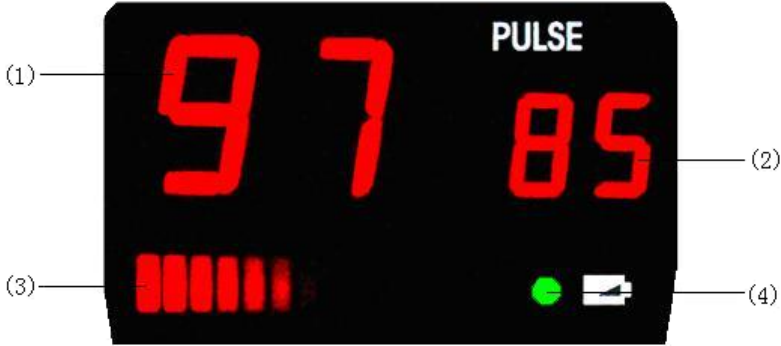
Dispose of flat batteries properly.

Plug the sensor into the socket on the monitor's top panel.

## 4. OPERATION

### 4.1 SpO2 AND PR MONITORING

Press and hold the power button for at least 3 seconds to turn on the monitor. The battery indicator LED should illuminate. To turn the device off, press and hold the power button. There are 2 display screens: the monitoring screen and the alarm set-up screen. The monitoring screen is displayed when the monitor is turned on, and its presentation is described below.



*Monitoring Screen Display*

| No. | Description                         | Remarks   |
|-----|-------------------------------------|---|
| 1   | SpO2 measurement                    | Displays SpO2 as % and is refreshed every second.   |
| 2   | PR measurement                      | Displays PR in BPM and is refreshed every second.   |
| 3   | Pulse strength/<br>Battery capacity | Has 10 bars. Indicates pulse strength when SpO2 being measured. When the SpO2 sensor is not connected or a finger is not placed into the probe, indicates the remaining battery charge. |
| 4   | Battery indicator                   | Green: batteries OK. Red: batteries need changing.  |

Using the volume button, set the required sound level: off, lower level, higher level. This controls the alarms' and the heart-beat's volume.

**Attach the sensor to an appropriate site - see below.**

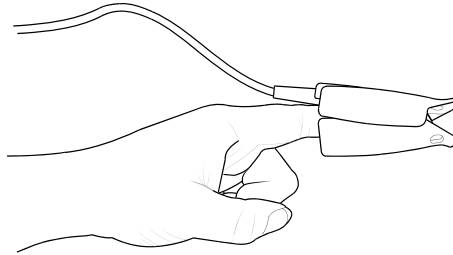
The monitor takes several seconds to compute the sensor's output and register the displays.

If the sensor becomes disconnected, or the finger is not properly inserted into it, the monitor will enter a standby mode. When the sensor is connected and the finger correctly inserted, the monitor will automatically resume its operation mode. Otherwise, the monitor will power down after 3 minutes.

## 4.2 ADVICE ON SENSORS

Sensor selection for SpO<sub>2</sub> measurement depends on the patient's age and body site. For an adult patient, a finger sensor is usually best; for a paediatric patient, a soft-tip sensor is probably most appropriate; whilst for an infant or a neonate, a wrap sensor is easiest. The finger sensor can be also be placed on a toe, and the wrap sensor can be placed on a hand or foot. Other types of SpO<sub>2</sub> sensors are available, eg ear clip, for veterinary use.

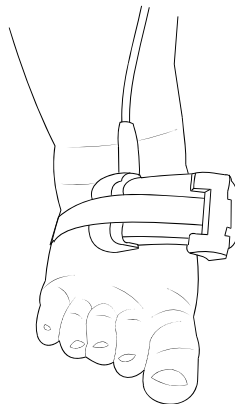
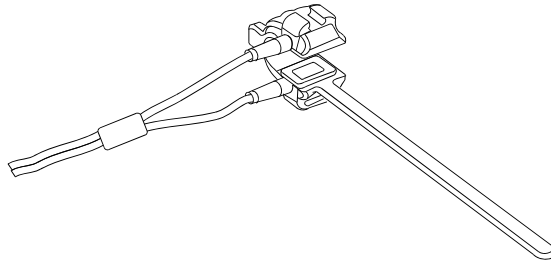
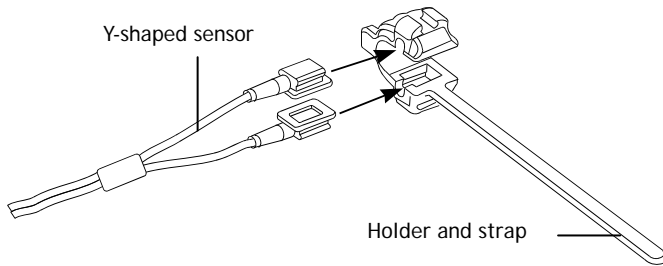
The adult finger SpO<sub>2</sub> sensor is a finger clip consisting of 2 parts. The red and infrared LEDs are located in one half and the photo detector in the other. The icon on the sensor represents the fingernail and the sensor should be placed over the fingertip with the icon lying over the nail.



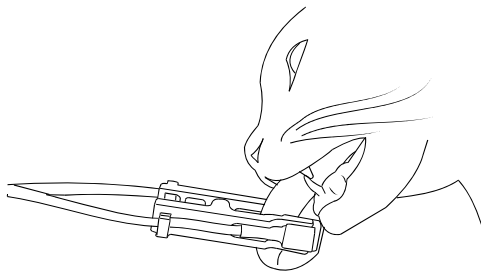
Readings may not be accurate when either the sensor or the patient is moving.

The neonatal wrap sensor consists of a Y-shaped SpO<sub>2</sub> sensor and its holder, as shown below. The Y-shaped sensor has the LEDs in one part and the photo detector in the other. Insert the 2 ends of the Y-shaped sensor respectively into the holder's upper and lower grooves, as shown.

Fit the sensor around the patient's hand or foot and hold it in place using the strap. The sensor must be positioned such that the detector is directly opposite the sources. Do not over tighten the strap and restrict the patient's blood flow.



The animal ear-clip device consists of a Y-shaped sensor and a clip and it may be used on a tongue or ear, as appropriate.



#### **NOTE**

**If the applied issue site is too thin, the measurements may be inaccurate and unstable. Do not use the monitor on animals whose pulse rate is greater than 250BPM which is beyond the specified accurate range of the device.**

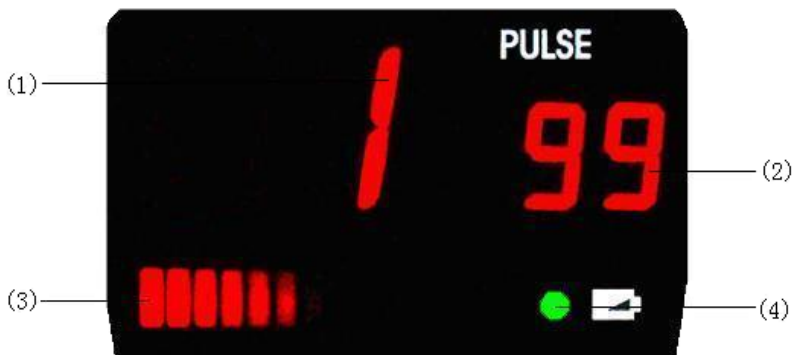
If the accuracy of any measurement does not seem realistic, first check the patient's vital signs using an alternative method. Then check the V202's battery state and that it is correctly connected.

Inaccurate measurements may be caused by:

- Incorrect sensor fitment
- Placement of a sensor on the same extremity with a blood pressure cuff, arterial catheter, or intravascular line
- High-frequency electrical noise, such as may be generated by nearby electrosurgical equipment
- Significant concentrations of dysfunctional haemoglobin, such as carboxyhaemoglobin and methemoglobin
- Intravascular dyes such as indocyanine green or methylene blue
- Exposure to high-intensity illumination, such as surgical lightss (especially ones with a xenon light source), bilirubin lamps, fluorescent lights, infrared heating lamps, or direct sunlight
- Excessive patient motion
- Venous pulsations
- Actual SpO<sub>2</sub> level is too low to register

### 4.3 ALARM SET UP

Select the alarm-set-up screen by pressing FN button once.



| No. | Description                         | Remarks  |
|-----|-------------------------------------|--|
| 1   | Number                              | 1= SpO2 upper limit<br>2= SpO2 lower limit<br>3= PR upper limit<br>4= PR lower limit |
| 2   | Alarm limit value                   | 1. Range: 70:90%<br>2. Range: 70:90%<br>3. Range: 40:250 bpm<br>4. Range: 40:250 bpm |
| 3   | Pulse strength/<br>Battery capacity | Inhibited  |
| 4   | Battery indicator                   |  |

Press FN button to toggle between alarms 1 to 4. Set the alarm limits using the left and right arrow buttons. Press the FN button again to return to the monitoring screen. The monitor will give audio and visual alarms if any parameter measurement falls outside the set limits; the visual alarm flashes the appropriate parameter on the monitoring screen. Ensure the volume level is set as you want it - the volume button functions only when the monitoring screen is selected. The audio pulse beat is silenced when an alarm is triggered.

#### NOTE

Ensure you set sensible alarm levels. For example PR upper alarm limit should not be 20 bpm more than the patient's actual PR.

## 5. MAINTENANCE

### 5.1 Pre-Use Check

Before using the monitor:

- Check the monitor, sensor and sensor cable for any mechanical damage
- Check the battery state, and replace the batteries, if appropriate
- Check the monitor on yourself.
- Do not use the monitor, if you have any doubt over its serviceability.

#### CAUTION

Remove the batteries if the monitor is not to be used for some time.

### 5.2 Periodic Servicing and Recalibration

Ensure before use that the device has been serviced and recalibrated in accordance with your organisation's policies and procedures.

#### WARNING

- Failure to implement a adequate maintenance policy may jeopardise equipment and patient safety.
- Any maintenance which requires opening the monitor housing must be undertaken by trained and authorized personnel only.

### 5.3 Cleaning

#### CAUTION

- Power down the monitor before cleaning.
- Never use strong solvents, such as acetone.
- Dilute the solution in accordance with the manufacturer's recommendations.
- NEVER use abrasives.
- NEVER permit fluids to enter the casing or connectors.
- NEVER submerge the equipment, or pour or spray any cleaning solution onto the equipment.
- Always wipe off all the cleaning solution with a dry cloth and allow the monitor to dry naturally.

The V202 should be regularly cleaned by wiping with a soft, lint-free cloth dipped in diluted sodium hypochlorite and then wiped dry.

The probes and cables may be cleaned with soft cloth, sponge or cotton swap, dipped in ethanol.

### 5.4 Disinfecting

#### CAUTIONS

- Obtain experts' advice before starting disinfecting.
- Always dilute chemicals in accordance with their manufacturer's recommendations and use the lowest effective concentration possible.
- NEVER submerge the equipment, or allow liquid to enter it.
- Always wipe off liquids as quickly as possible using a dry, soft cloth.
- NEVER use ETO and formaldehyde to disinfect.
- NEVER permit high-pressure or high-temperature sterilisation of the monitor or its accessories.

Disinfection may cause damage to the equipment and should be undertaken only when

absolutely necessary. The equipment should be cleaned prior to disinfecting.

Recommended disinfectants are alcohol based (ethanol 70%, isopropanol 70%), and aldehyde based.

The probe cables may be disinfected with hydrogen peroxide (3%) or isopropanol (70%). Active reagents are also effective. Electrical connectors must not be submerged into the above solutions.

## 5.5 Disposal

Disinfect or decontaminate the device appropriately before disposing of it in accordance with your local regulations regarding the disposal of electronic equipment and hospital waste.

## 6. PACKING LIST AND ACCESSORIES

| Standard Packing List                   |      |
|---|------|
| Handheld SpO2 patient monitor main unit | 1 pc |
| Adult finger SpO2 sensor                | 1 pc |
| Operator's manual                       | 1 pc |
| Options                                 |      |
| Paediatric soft tip sensor              |      |
| Neonatal/infant wrap sensor             |      |
| Ear clip sensor                         |      |

### CAUTION

Using other than manufacturer-supplied accessories may cause damage to the device.

## 7. SPECIFICATIONS

|   |  |
|---|--|
| Monitoring parameters                   | SpO <sub>2</sub> , pulse rate (PR), Pulse strength                                 |
| Patient range                           | Adult, paediatric, infant, neonatal, some veterinary                               |
| <b>SpO<sub>2</sub></b>                  |  |
| Range                                   | 35 %-99%   |
| Resolution                              | 1 %  |
| Accuracy                                | ±2 % (70% ~ 99%), unspecified (0% ~ 69%)   |
| <b>PR</b>                               |  |
| Range                                   | 30 bpm ~ 250bpm  |
| Resolution                              | 1bpm   |
| Accuracy                                | ±2bpm  |
| Alarms                                  | Audio and visual, user-settable for SpO <sub>2</sub> and PR upper and lower limits |
| SpO <sub>2</sub> display                | 2-digit and 7-segment red LED nixie tubes  |
| PR display                              | 3-digit and 7-segment red LED nixie tubes  |
| Pulse strength/ Battery-state indicator | 10- segment and bar-graph red LED nixie tube                                       |
| Battery serviceability indicator        | Green and red LEDs   |
| Working voltage                         | D.C. 2.8V~D.C. 5.4V  |
| Battery type                            | 3x 1.5V AA alkaline or rechargeable batteries                                      |
| Run time                                | 7 hours continuous operation with a new battery @25°C                              |
| Auto-power shut down                    | After 3 minutes with no use  |
| Volume control                          | 3 levels: mute, soft and louder  |
| Size                                    | 63 (W) × 120 (H) × 32 (D) mm   |
| Weight                                  | 130g (less sensor and battery)   |
| <b>Environmental</b>                    |  |
| <b>Temperature</b>                      |  |
| Operation                               | 0 °C ~ 45°C  |
| Transportation and storage              | -20°C ~ 60 °C  |
| <b>Humidity</b>                         |  |
| Operation                               | 15% ~95 % (non condensing)   |
| Transportation and storage              | 10% ~95 % (non condensing)   |
| <b>Altitude</b>                         |  |
| Operation                               | 86 kPa ~106 kPa  |
| Transportation and storage              | 50kPa~106 kPa  |

## 8. WARRANTY

### TERMS AND CONDITIONS OF WARRANTY

1. To qualify for this warranty you must register on [www.daray.co.uk](http://www.daray.co.uk) or return to Daray Ltd (Daray) the duly completed warranty-registration form accompanying the product.
2. Daray warrants this product (excluding lamp) against faulty material and workmanship during the period of the warranty. The period of warranty is the period stated on your warranty card and commences on the date of purchase of the product. In the event that the product is not in good working order Daray will provide, during the warranty period, a free repair service within the United Kingdom. The warranty is subject to proof of purchase being provided; therefore, you should retain your original receipt.
  - 2.1 The repair service consists of the provision of spare parts and/or replacement products (at Daray's discretion) which will be provided on an exchange basis and will either be new, equivalent to new or reconditioned. All replaced spare parts and products shall become the property of Daray.
  - 2.2 Daray's only obligation under this warranty is the provision of the service as set out above.
  - 2.3 All products are returned to Daray at the customer's cost and risk. Products to be returned should be adequately packed. For the address to send returns to please visit [www.daray.co.uk](http://www.daray.co.uk)
3. Daray's arrangements for providing service provided under this warranty may include the use of sub-contractors.
4. This warranty does not cover damage or defects in the Product caused by or resulting from:
  - Wilful neglect or negligence by anyone other than Daray;
  - Improper use, storage or handling of the product;
  - Use of non-Daray approved parts (such as replacement lamps) not compatible with the Product;
  - Fire, accident or disaster;
  - Use of non-Daray modifications other than in accordance with Daray's instructions;Attachment of fittings and accessories not approved by Daray;  
Repairs, modifications carried out by service personnel not approved by Daray:
  - Damage caused by chemical corrosion from cleaning agents not approved by Daray.
  - Failure to use or install the product in accordance with the manufacturer's instructions.
5. Nothing in this warranty shall have the effect of restricting or excluding the liability of Daray in respect of:
  - a) Death and personal injury caused by the negligence of Daray, or for fraud;
  - b) Under the *Consumer Protection Act 1987* to a person who has suffered damage caused by a defective product or to a dependant or relative of such a person;
  - c) Direct damage to your property caused by the proven negligence of Daray.
6. This agreement does not give any rights other than those expressly set out above and in particular, Daray will not be responsible for any loss of income, profits or contracts or any direct or indirect consequential loss, damage caused to or suffered by the purchaser as a direct result of this agreement.
7. This warranty is offered (subject to these terms and conditions) in addition to, and does not affect your statutory rights.
8. Daray may disclose your details and other personal information to companies within the Daray group including any subsidiary company or sub contractor of Daray for the purposes of performing our obligations hereunder.
9. You must not resell outside the UK any products supplied by Daray and covered by the *Export of Goods (Control) Order 1992* (or any law that replaces it) without obtaining all necessary licences. You also agree not to sell the product in the UK if you know or think that the person buying the product intends to export it without getting the necessary licences. You agree to impose similar conditions to these on anyone you sell the product to.
10. These conditions shall in all respect be governed and construed in accordance with English law and the exclusive jurisdiction of the English courts.



# DARAY<sup>®</sup> HEALTHCARE PRODUCTS

WARRANTY REGISTRATION  
TO VALIDATE YOUR WARRANTY  
PLEASE COMPLETE IN BLOCK CAPITALS  
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