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1 - Presentation

- **Speaker**
- **Button for data display**
- **Button for parameters display**
- **Red flashing LED for alarm**
- **Large backlit display with 8 digits**
- **Red LED for alarm**
- **Green LED for gamma counting**
- **Blue LED for Hp(0.07) or neutron counting**
- **Functional indicator “blinking”**
- **Measurement or parameter display area**
- **Disable flash, vibrator and speaker indicators**
- **Connected module indicator**
- **Measurement unit**
- **G2 “DMC 2000” compatible protocol**

**Measurement type**

**Alarm type**

**Connected module indicator**

**Measurement unit**

**G2 “DMC 2000” compatible protocol**
2.1 Use and Functionality

The DMC 3000 is the new compact, rugged and reliable dosimeter designed to detect a wide range of X-ray and gamma radiations.

The large-format, backlit, high-contrast 8-digit LCD display provides clear dose and dose rate readings for deep dose equivalent Hp(10).

Additionally, it provides multiple methods to alert the wearer of alarm conditions, including:

- a high decibel speaker
- 1 Flashing LED on the front face
- 3 bright LEDs on the top
- a vibrator.  
  (See Chapter 5 for a complete description of these alarms.)

Only two buttons for easy access to all the DMC 3000's functionality.  
(See Chapter 4 for more information on button use.)

The indication of dose increment is visible with the green LED even when an alarm is given by the two red LEDs.

The blue LED is dedicated to Hp(0.07) or neutron dose detection with future DMC 3000 attachments.
2.2 Compatibility with Mirion Technologies Products

The DMC 3000 features an enhanced "G3" communication protocol to support additional features. It also includes a compatibility mode for previous Mirion Technologies products including Access Control, Turnstiles and Telemetry devices.

The compatible **DMC 2000 protocol "G2"** is indicated on the DMC 3000 by an asterisk in the display's bottom right corner. This guarantees compatibility with the existing Mirion readers (LDM 220, LDM 2000 and LDM 3000) and software (DosiServ, DosiCare and Sentinel).

![Image of the display indicating G3 compatibility](image)

The enhanced communication protocol "G3" requires new readers such as the LDM 320D, LDM 320W or LDM 2000 with upgraded firmware.

*Please contact Mirion Technologies for compatibility diagnostic and information.*

Both G2 and G3 protocols use the same communication medium, with an omnidirectional, low-frequency (125 kHz) transceiver.
2.2.1 Language
The DMC 3000 has the ability to display in French and English.
Language settings can be adjusted using DMCUser software.

2.2.2 Dose Increment Notification
The top green LED gives the rate of dose increment (one flash each 1 µSv) associated with a configurable audible beep (see below).

<table>
<thead>
<tr>
<th>No</th>
<th>No</th>
<th>no audible signal for dose increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>bi</td>
<td>P</td>
<td>1 beep every 100 µSv (10 mrem)</td>
</tr>
<tr>
<td>bi</td>
<td>P</td>
<td>1 beep every 10 µSv (1 mrem)</td>
</tr>
<tr>
<td>bi</td>
<td>P</td>
<td>1 beep every 1 µSv (0.1 mrem)</td>
</tr>
<tr>
<td>bi</td>
<td>P</td>
<td>1 beep every 8 pulses</td>
</tr>
<tr>
<td>bi</td>
<td>P</td>
<td>1 beep every 4 pulses</td>
</tr>
</tbody>
</table>

2.2.3 Remaining Time before Alarm
Displayed as a timer counting down, the time to alarm corresponds to either the time alarm or the time to reach the dose alarm point, whichever is shortest.

The time to reach the dose alarm point is calculated as follows:

\[
\text{time duration before dose alarm} = (\text{dose alarm threshold} - \text{cumulative dose}) / \text{current dose rate}
\]

2.2.4 Add-on Module
An additional module, such as a telemetry device can be attached at the bottom of the DMC 3000 simply by removing the battery cover.

All these add-on modules have their own parameters saved on non-volatile memory and modify the configuration of the DMC 3000 when attached to it.

2.2.5 Rate Alarm Latched
The DMC 3000 allows users to latch the rate alarm. Two options are offered:

- rate alarm latched 10 seconds (See Note)
- rate alarm latched until exit

Note:

This new feature is available and configurable only in G3 protocol.
2.3 Historical Data Function

DMC 3000 series dosimeters have a historical data function which allows the following features:

- Recording and storage of changes greater than 1 μSv (0.1 mrem) in the cumulative Hp(10) dose by intervals of 10 seconds, 1 minute, 10 minutes, 1 hour or 24 hours depending on the dosimeter’s configuration.

- Recording and dating of significant events such as:
  - alarms and warnings
  - acknowledgment of warnings
  - assignment of identifier, task and RWP codes
  - change in operating mode (Pause and Run)
  - dosimeter fault
  - parameter changes

In order to date accurately all the data, the DMC 3000 is equipped with a Real Time Clock to keep the clock time. In satellite mode, this RTC could be set during configuration with a reader during entry.

If the DMC 3000 is in G3 protocol, all the events and dose increments are dated in date format (DD/MM/YYYY and HH:MM:SS) and the time size of recording is doubled (see Note) compared to G2 (DMC 2000 compatible) protocol where the number of histogram’s steps is limited to 3800 (see §6.9 for details).

Note:
*Calculated with an increment of dose every 10 histogram steps.*
2.4 Handling Recommendations

As the DMC 3000 offers the ability to clip it either outside the pocket, (standard or belt clip) or inside (front side clip), users should remember to wear the dosimeter with its back side facing the body. *(See label on the battery cover.)*

---

**Warning:**
*For the DMC 3000 vibrator alarm to be effective, the unit must be in contact with the body for the user to feel it.*

---

As the energy range of the DMC 3000 starts at 15 keV, the detection area of the dosimeter should not be covered with any heavy material, like metal, in order to ensure the most accurate dose measurement.

The DMC 3000 will warn you when the battery needs to be replaced. A completely discharged battery can cause leakage that may damage your DMC 3000. Thus, dead batteries should be removed or replaced promptly.

Only approved batteries or high quality Alkaline batteries should be used with your DMC 3000 (see Chapter 6).

There are no serviceable parts inside your DMC 3000. Thus, tampering with the case will compromise the waterproofing and void the warranty.
3.1 Fast Entry Mode

The DMC 3000 can be started up using a simplified and quick procedure.

Fast entry must be enabled using DMCUser software.

- When fast entry is enabled, the message "ENtER" (1) is displayed. Simply pressing one of the 2 control buttons immediately switches the DMC 3000 dosimeter into Run mode.
- The message "IN" (2) is briefly displayed.
- The dosimeter switches to measurement mode (3).
- The display starts to indicate the dose measurement.

Note:
As soon as the dosimeter switches back to Pause mode, the fast entry mode is disabled.
- To return to fast entry mode set parameters again.
- If the fast entry mode is automatically set, the DMC 3000 will revert to fast entry mode when back in Pause, assuming no alarm.

3.2 Operating Modes

DMC 3000 dosimeter can be used in the following modes:

- **Autonomous mode:**
  Dosimeter’s two buttons can be used to set alarm set points and switch back and forth between Pause and Run.

- **Satellite mode:**
  DMCUser software must be used to configure the DMC 3000.

Note:
DOSIMASS-DM does not have the ability to modify the DMC 3000's parameters.
The **sleep mode** state is a low-power consumption state where the functional indicator ":s:" does not blink. It is an optional factory configuration.

When either button is pressed, or during communication with a reader, the DMC automatically goes into **Pause** with a backlit display and all display segments activate for 2 seconds.

**Note:**
- The first press on any push button only turns on the backlight for 3 seconds.

1. **How to configure in autonomous?**
   See § 4.4

2. **How to switch between Pause and Run modes in autonomous?**
   § 4.1

(1) The configuration of the set point is available in autonomous mode only.
(2) Done manually in autonomous mode or with the use of a reader in satellite mode.
4.1 Run / Pause Flow Diagram

- **Sleep**
- **PAUSE**
  - T.O = 2s
  - Long press >2s

- **RUN**
  - T.O = 2s
- **Exit**
- **Enter**
  - Long until "ENTER" then

- **Switching to Run Mode**
  - Long press >2s
  - T.O = Time Out

- **Switching to Pause Mode**
  - Short until "EXIT"
### Exemple of Data available

<table>
<thead>
<tr>
<th>Data available</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last recorded dose</td>
<td>0.410 mSv</td>
</tr>
<tr>
<td>Last maximum peak rate</td>
<td>0.23 mSv</td>
</tr>
<tr>
<td>Last duration in Run</td>
<td>00:12:40:06</td>
</tr>
<tr>
<td>Current Time (AM/PM or 24H format)</td>
<td>PM09:41:26</td>
</tr>
<tr>
<td>Current Date (MM--DD--YY or DD/MM/YY format)</td>
<td>05--21--07</td>
</tr>
</tbody>
</table>

Data list is configurable with **DMCUser** (choice and order). See § 4.5 for complete list.

### Pause data list

- Or + push button
- T.O= 6 s

### Pause parameters list

- T.O= 6 s
- Or - push button

### Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Display</th>
<th>Parameters</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosimeter number</td>
<td>01900986</td>
<td>Rate warning set point</td>
<td>0.099 mSv</td>
</tr>
<tr>
<td>Wearer’s name</td>
<td>JOHN</td>
<td>Run time warning set point</td>
<td>0.100000</td>
</tr>
<tr>
<td>Wearer ID</td>
<td>DMR 1234</td>
<td>Chirp mode</td>
<td>b1 P 100</td>
</tr>
<tr>
<td>Dose alarm set point</td>
<td>0.950 mSv</td>
<td>Date of next calibration</td>
<td>C1.100113</td>
</tr>
<tr>
<td>Dose warning set point</td>
<td>0.150 mSv</td>
<td>Dosimeter mode</td>
<td>SRL</td>
</tr>
<tr>
<td>Rate alarm set point</td>
<td>0.950 mSv</td>
<td>Software version</td>
<td>E0008E</td>
</tr>
</tbody>
</table>

Parameter list is configurable with **DMCUser** (choice and order). See § 4.5 for complete list.
### Example of Data available

<table>
<thead>
<tr>
<th>Exemple of Data available</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current dose</td>
<td>10 μSv</td>
</tr>
<tr>
<td>Current rate</td>
<td>0 μSv/h</td>
</tr>
<tr>
<td>Remaining time before alarm in Run</td>
<td>0092501</td>
</tr>
<tr>
<td>Date</td>
<td>05-21-07</td>
</tr>
</tbody>
</table>

### Run parameters list

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Display</th>
<th>Parameters</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosimeter number</td>
<td>01900986</td>
<td>Rate warning set point</td>
<td>99 μSv/h</td>
</tr>
<tr>
<td>Wearer's name</td>
<td>JOHN</td>
<td>Run-time warning set point</td>
<td>h0083456</td>
</tr>
<tr>
<td>RWP</td>
<td>RNA1234</td>
<td>Chirp mode</td>
<td>b1p 100</td>
</tr>
<tr>
<td>Date</td>
<td>05-21-07</td>
<td>Operating mode</td>
<td>Sal</td>
</tr>
<tr>
<td>Dose alarm set point</td>
<td>950 μSv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate alarm set point</td>
<td>950 μSv/h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4 Set Point Modifications

Only available in autonomous mode.
The following data and parameter options are available in **Pause** and **Run** mode. They can be selected and ranked by preference, using **dmcUser** software.

### Data

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour (*)</td>
<td>Date (*)</td>
<td>Full life dose (*)</td>
</tr>
<tr>
<td>Full life duration (*)</td>
<td>Total maintenance dose (*)</td>
<td>Total maintenance duration (*)</td>
</tr>
<tr>
<td>Dose (*)</td>
<td>Current rate (*)</td>
<td>Maximum rate (*)</td>
</tr>
<tr>
<td></td>
<td>Duration of integration in Run (*)</td>
<td>Remaining time before alarm in Run (*)</td>
</tr>
</tbody>
</table>

### Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User name</td>
<td>Dosimeter number</td>
</tr>
<tr>
<td>Type of autonomous dose (cumulated or resettable) (*)</td>
<td>Date of next internal calibration</td>
</tr>
<tr>
<td></td>
<td>Dose alarm setpoint (*)</td>
</tr>
<tr>
<td></td>
<td>Rate alarm setpoint (*)</td>
</tr>
<tr>
<td></td>
<td>Duration setpoint (*)</td>
</tr>
<tr>
<td></td>
<td>Remaining time setpoint (*)</td>
</tr>
<tr>
<td></td>
<td>Dose warning setpoint (*)</td>
</tr>
<tr>
<td></td>
<td>Rate warning setpoint (*)</td>
</tr>
<tr>
<td>Beeps at dose change</td>
<td>Autonomous or satellite flag</td>
</tr>
<tr>
<td>Software version</td>
<td>FLASH memory checksum</td>
</tr>
<tr>
<td>Worker identifier</td>
<td>Worker order task code (OT)</td>
</tr>
<tr>
<td>Thermoluminescent film number (TLD)</td>
<td>Radiation Work Permit (RWP)</td>
</tr>
</tbody>
</table>

(*) This item's availability is based on the dosimeter's configuration. For example, if the rate display is not chosen the current rate and maximum rate will not be displayed. In G2 protocol, some data or parameters are not available.
The DMC 3000 dosimeter provides multiple methods to alert the wearer of alarming conditions:

- A loud audible alarm is emitted by the dosimeter speaker
- A message or symbol appears on the backlit, high-contrast LCD display
- Very bright red flashes from the front red flashing LED
- Red flashes from the top red indicator LED
- Vibrations

Note:
- In case of simultaneous alarms, corresponding messages and symbols are displayed based on priority level.

- Speaker, vibrator and red LED can be disabled when configuring the DMC 3000. This function can be factory configured or modified using the DMCUser maintenance software in G3 protocol only.

Look at the pictogram on the top right corner of the display to know which alarm is disabled.
### 5.1 Dose and Rate Alarms or Warnings

- The DMC 3000 has 2 configurable dose alarms from 1 µSv to 10 Sv and 2 configurable rate alarms from 10 µSv/h (*) to 10 Sv/h.

  (*): Please contact Mirion Technologies for a rate set point between 1 µSv/h and 10 µSv/h and see § 9.1.

Dose and rate warnings are acknowledgeable by pressing either push button for longer than 3 seconds.

- The rate alarm and warning occur when the rate exceeds the set point. The rate alarm and warning disappear when the rate decreases to 80% of the set point.

- The pictogram on the display remains visible in Pause mode until the next entry.

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Display</th>
<th>Speaker</th>
<th>Flash LED, Vibrator and Top Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose Alarm</td>
<td><img src="image" alt="Dose Alarm Display" /></td>
<td><strong>3 beeps</strong> every second</td>
<td><strong>FLASH LED</strong> 1 flash every second</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>VIBRATOR</strong> 1 vibration (**) every second</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>TOP LED</strong> 3 red flashes every second</td>
</tr>
<tr>
<td>Dose Warning</td>
<td><img src="image" alt="Dose Warning Display" /></td>
<td><strong>1 flash</strong> every second</td>
<td><strong>FLASH LED</strong> 1 flash every second</td>
</tr>
<tr>
<td>(See note)</td>
<td></td>
<td></td>
<td><strong>VIBRATOR</strong> 1 vibration (**) every second</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>TOP LED</strong> 3 red flashes every second</td>
</tr>
<tr>
<td>Rate Alarm</td>
<td><img src="image" alt="Rate Alarm Display" /></td>
<td><strong>2 long beeps</strong> every second</td>
<td><strong>FLASH LED</strong> 1 flash every second</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>VIBRATOR</strong> 1 vibration (**) every second</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>TOP LED</strong> 3 red flashes every second</td>
</tr>
<tr>
<td>Rate Warning</td>
<td><img src="image" alt="Rate Warning Display" /></td>
<td><strong>1 flash</strong> every second</td>
<td><strong>FLASH LED</strong> 1 flash every second</td>
</tr>
<tr>
<td>(See note)</td>
<td></td>
<td></td>
<td><strong>VIBRATOR</strong> 1 vibration (**) every second</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>TOP LED</strong> 3 red flashes every second</td>
</tr>
</tbody>
</table>

**Note:**
Acknowledge by pressing + or - button longer than 3s.
### 5.2 Time Alarm

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Display</th>
<th>Speaker</th>
<th>Flash LED, Vibrator and Top Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Alarm</td>
<td><img src="image" alt="Time Alarm Display" /></td>
<td>1 short beep every second</td>
<td>FLASH LED 1 flash every 10 seconds, VIBRATOR 1 vibration every 10 seconds, TOP LED 1 red flash every second</td>
</tr>
</tbody>
</table>

#### Flash LED
- 1 flash every 10 minutes

#### VIBRATOR
- 1 vibration every 10 seconds

#### TOP LED
- 1 red flash every second

### 5.3 Low Battery

The DMC 3000 emits a low battery alarm if the battery voltage drops below 1.2 V.

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Display</th>
<th>Speaker</th>
<th>Flash LED, Vibrator and Top Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Battery</td>
<td><img src="image" alt="Low Battery Display" /></td>
<td>3 short beeps every 10 minutes</td>
<td>FLASH LED 1 flash every 10 minutes, NO VIBRATOR, TOP LED 1 red flash every second</td>
</tr>
</tbody>
</table>

#### Flash LED
- 1 flash every 10 minutes

#### Speaker
- 3 short beeps every 10 minutes

#### TOP LED
- 1 red flash every second

xx is the remaining time in Run mode from 9 to 1 hours. Then the DMC goes into power loss for 2 minutes and then turns off.

After 72 hours of low battery in PAUSE mode, the DMC goes into power loss during 2 minutes and then turns off.
### 5.4 Power Loss

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Display</th>
<th>Speaker</th>
<th>Flash LED, Vibrator and Top Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Loss</td>
<td><img src="image" alt="Display" /></td>
<td>3 short beeps every 10 seconds</td>
<td>NO FLASH LED NO VIBRATOR TOP LED 3 red flashes every 2 seconds</td>
</tr>
</tbody>
</table>

### 5.5 Faults

#### 5.5.1 Minor Fault

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Display</th>
<th>Speaker</th>
<th>Flash LED, Vibrator and Top Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Fault</td>
<td><img src="image" alt="Display" /></td>
<td>none</td>
<td>NO FLASH LED NO VIBRATOR TOP LED only 1 red flash</td>
</tr>
</tbody>
</table>

Dosimeter needs a new calibration.
5.5.2 **Major Faults**

The DMC 3000 conducts periodic self tests every 10 minutes in **Run**, **Pause** and **Sleep** modes. Most of the tests are also performed every second in **Run** mode. All the main functions are controlled by the microcontroller and all the data, parameters and configurations integrity are protected by the CRC16.

The calibrations and algorithm parameters are protected by the CRC16 and saved inside a specific and dedicated EEPROM. The different DC voltages on the electronic board are periodically measured and controlled.

If a fault is detected, an alarm is generated and a message is alternately shown with the measure on the display.

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Display</th>
<th>Speaker</th>
<th>Flash LED, Vibrator and Top Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Fault</strong> (Asic, EEPROM, Detection, Data Integrity)</td>
<td>![Display Image]</td>
<td><strong>4 beeps</strong> every second</td>
<td><strong>FLASH LED</strong> 1 flash every second&lt;br&gt;<strong>VIBRATOR</strong> 1 vibration every second&lt;br&gt;<strong>TOP LED</strong> 3 red flashes every second</td>
</tr>
</tbody>
</table>

This faults indicates that the dosimeter is not totally functional. The device must be verified by Mirion technicians.
## 5.5.3 Troubleshooting Guide

The following troubleshooting guide describes the dosimeter’s major fault messages and how to manage them. For safety reasons, the DMC 3000 cannot be set to **Run** mode when a major fault is displayed in **Pause** mode.

<table>
<thead>
<tr>
<th>Major Faults</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPT1 dEF</td>
<td>Physical problem related to the detection circuit and detectors (optical check)</td>
<td>Contact Mirion for verification.</td>
</tr>
<tr>
<td>PLSI dEF</td>
<td>Physical problem related to the detection circuit and detectors (no pulse during the last check period)</td>
<td>See § 5.5.4 Optical test and Impulse test</td>
</tr>
<tr>
<td>AS1 N dEF</td>
<td>Physical problem related to the detection circuit (no communication with the microprocessor)</td>
<td></td>
</tr>
<tr>
<td>E2P dEF</td>
<td>Problems accessing the data saved in memory</td>
<td></td>
</tr>
<tr>
<td>RAN dEF</td>
<td>Problems accessing the data saved in memory</td>
<td></td>
</tr>
<tr>
<td>PROG dEF</td>
<td>Problems accessing the software program saved in memory</td>
<td></td>
</tr>
<tr>
<td>PARA dEF</td>
<td>Problem with the parameters’ data integrity saved in memory</td>
<td></td>
</tr>
<tr>
<td>SHKI dEF</td>
<td>Pulse counting limitation due to an amount of mechanical shocks on the detection circuit</td>
<td>Confirm whether or not this fault occurs with &quot;normal use&quot; (no high mechanical or electromagnetic stress). Contact Mirion for verification.</td>
</tr>
<tr>
<td>BUZZ dEF</td>
<td>Electrical problem related to the speaker circuit</td>
<td>Verify that the speaker cavity is not obstructed and the battery voltage is not too low (low battery fault). Contact Mirion for verification.</td>
</tr>
</tbody>
</table>
### Minor Faults

<table>
<thead>
<tr>
<th>Display</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALI dat</td>
<td>Exceeded date of calibration</td>
<td>Perform a calibration check.</td>
</tr>
<tr>
<td>HIST def</td>
<td>Missing bit/pointer in the histogram</td>
<td>Verify that the battery voltage is sufficient and perform an entry with dmcUser software. If the fault persists, contact Mirion for verification.</td>
</tr>
</tbody>
</table>

### 5.5.4 Optical Test and Impulse Test

The DMC 3000's gamma and X-ray detection capabilities are provided by two detectors. For a complete check of the gamma and X-ray detection capabilities, two complementary tests are performed.

First, a periodic optical test is performed every 10 minutes both in **Pause** and **Run** modes by generating light pulses on both detectors to simulate gamma photons.

If the number of pulses detected is less than expected on one of the two channels, a fault **OPTI def** is displayed, indicating that the detection function is no longer operational.

In addition to the optical test, the background counting is verified. If the duration between two pulses is too long compared to the statistical time calculation, then a fault **PLSI def** is displayed.
6- Battery Replacement

Battery Type:
Alkaline 1.5 V AAA LR03

Screw Type:
Torx N° 8, ISO 14583

Removal
- Remove the belt clip (2). (See §7.1)
  Not necessary with standard or front facing clip.
- Unscrew the two screws (3) with the screwdriver provided with your DMC 3000 (1).
- Rotate and remove the battery cover (4).
- Disengage the AAA battery on the + side first (5).

Replacement
- Engage first the - side of the AAA battery on the compartment (5) by compressing the spring contact and push the battery into its compartment.
- Engage the battery cover bottom side first (6) and rotate.
- Hand tight with the tool provided (1) at 0.25 to 0.35 Nm (2.2 to 3.1 in.Lb).

Take care to not damage the gasket. We recommend to replace the battery cover every five years or if gasket is damage. For proper sealing, equal and proper torque should be applied on both screws.
7- Clip Replacement

7.1 Standard or Belt Clip

- Before removing/installing the clip, make sure that the battery cover is in place.
- Use the screwdriver/clip removal tool provided with your DMC 3000.
- Engage the head of the tool on the top of the clip as shown.
- Lift the clip lug of the clip (1) while sliding down the clip (2).
- Engage the clip on the middle of it location (3).
- Press the clip strongly with the thumbs (4) until the spring is compressed then slide up the clip (5) until locked (click sound).

7.2 Front Facing Clip

- Lift up (6) on both sides and disengage the clip from the attachment guide (7).

Replacement

- Engage the clip on the middle of it location (3). Press the clip strongly with the thumbs (4) until the spring is compressed then slide up the clip (5) until locked (click sound).
8.1 Manual Calibration

- Expose the dosimeter with a gamma source \(^{137}\text{Cs}\) (note) to a minimum dose of 500 µSv, that is the expected dose and read on the dosimeter display the "Read Dose."

- Look up the calibration factor efficiency \(\text{Hp}(10)\) (G2 protocol) or Calibration factor efficiency multiplier \(\text{Hp}(10)\) (G3 protocol) using dmcUser software. This calibration factor is called "\text{K OLD}".

- Determine the new calibration factor "\text{K NEW}" using the following equation:
  \[
  \text{K NEW} = \text{K OLD} \times \frac{\text{Read dose}}{\text{Expected dose}}.
  \]

- Turn off the dosimeter and set the calibration factor to the new value "\text{K NEW}" using dmcUser software.

- Expose the dosimeter with the same source and check that the response of the dosimeter is within the limit.

8.2 Maintenance

Mirion Technologies recommends to perform a complete check at least every year, including:

- Calibration check
- Display, top and flashing LEDs inspection
- Speaker check (turn On your DMC with rate warning set at "0")

Note:

The DMC 3000 is provided with an initial factory calibration traceable to international reference standards. Mirion recommends an annual calibration check; although the re-calibration interval may be determined by the customer based on service environment, frequency of use and requirements defined by local regulations.

The DMC 3000 is equipped with 2 detectors, one for high energy gamma and >50 kev X-ray and a second detector for low energy X-ray down to 15 kev. Calibration with a Gamma source (\(^{137}\text{Cs}\) or \(^{60}\text{Co}\)) or Gamma and low energy X-ray may be considered based on service environment. Mirion Technologies can provide a calibration check at 3 points of energy (16 keV X-rays, \(^{241}\text{Am}\) and \(^{137}\text{Cs}\) and \(^{60}\text{Co}\) on request, in accordance with ISO/IEC 17025.

- In G3 protocol the calibration factor efficiency multiplier \(\text{Hp}(10)\) is set at 1.00 in factory.
- Decreasing in G2 protocol the calibration factor efficiency \(\text{Hp}(10)\) or calibration factor efficiency multiplier \(\text{Hp}(10)\) in G3 protocol will increase the DMC 3000 response.
9.1 Physical Characteristics

- Compliant with IEC 61526 Ed. 3, ANSI 42.20 (*)
  (*) Isotropy at $^{241}$Am and $^{137}$Cs with angle $\pm 75^\circ$

- **Measurement and display:**
  - X-ray and gamma energy range: 15 keV to 7 MeV
  - Energy response better than $\pm 20\%$ from 16 keV to 7 MeV  
    (typically $\pm 10\%$)

- **Accuracy Hp(10):**
  - $\leq \pm 19\%$ (16 keV $\sim 0.7$ mSv/h) including $\pm 9\%$ extended uncertainty $k=2$
  - $\leq \pm 15\%$ ($^{241}$Am $\sim 23$ mSv/h) including $\pm 5\%$ extended uncertainty $k=2$
  - $\leq \pm 10\%$ ($^{137}$Cs $\sim 24$ mSv/h) including $\pm 5\%$ extended uncertainty $k=2$
  - $\leq \pm 17\%$ ($^{60}$Co $\sim 5.5$ mSv/h) including $\pm 7\%$ extended uncertainty $k=2$

- **Display units:** mSv, µSv, or mrem

- **Display dose:** 1 µSv to 10 Sv (0.1 mrem to 1000 rem)

- **Display rate:**
  - 0.01 mSv/h to 10 Sv/h (1 mrem/h to 1000 rem/h)
  - 0.001 mSv/h to 10 Sv/h (0.1 mrem/h to 1000 rem/h)  
    (extended option(**))

- **Measurement range:**
  - 1 µSv to 10 Sv (0.1 mrem to 1000 rem)
  - 0.1 µSv/h to 20 Sv/h (0.01 mrem/h to 2000 rem/h)
  - Saturation indication: above 10 Sv (1000 rem)  
    or 10 Sv/h (1000 rem/h)

- **Dose rate linearity:**
  - $\leq \pm 20\%$ up to 10 Sv/h (1000 rem/h) (Co and X H30 20 keV)
  - $\leq \pm 20\%$ up to 6 Sv/h (600 rem/h)  
    (Pulsed X-rays 20 ms width, 1, 10 & 20 pps)

- **Display units:** mSv, µSv, or mrem

- **Display dose:** 1 µSv to 10 Sv (0.1 mrem to 1000 rem)

- **Display rate:**
  - 0.01 mSv/h to 10 Sv/h (1 mrem/h to 1000 rem/h)
  - 0.001 mSv/h to 10 Sv/h (0.1 mrem/h to 1000 rem/h)  
    (extended option(**))

- **Measurement range:**
  - 1 µSv to 10 Sv (0.1 mrem to 1000 rem)
  - 0.1 µSv/h to 20 Sv/h (0.01 mrem/h to 2000 rem/h)
  - Saturation indication: above 10 Sv (1000 rem)  
    or 10 Sv/h (1000 rem/h)

- **Dose rate linearity:**
  - $\leq \pm 20\%$ up to 10 Sv/h (1000 rem/h) (Co and X H30 20 keV)
  - $\leq \pm 20\%$ up to 6 Sv/h (600 rem/h)  
    (Pulsed X-rays 20 ms width, 1, 10 & 20 pps)
9.2 Electrical Characteristics
- Standard AAA (LR03) 1.5 V Alkaline battery
- 9 calendar month battery life (typical, 8 h per day, 5 days per week in Run mode, without excessive alarms (*))
- 2500 h battery life in continuous run, without excessive alarm (*)
  (*) 0.2% of the time in alarm

9.3 Mechanical Characteristics
- Rugged, high impact polycarbonate-ABS case
- Dimensions: 86 x 56 x 21 mm (3.4 x 2.2 x 0.8 in) without clip
- Weight with alkaline battery and standard clip: < 88 g (3.1 oz)
- Worn with replaceable clips (2 different style back clips or one front-facing clip for DMC worn inside the pocket)

9.4 Environmental Characteristics
- Temperature range: -10°C to 50°C (14°F to 122°F): deviation in response less than ±5%
- Relative humidity: <90% RH at 42°C (108°F)
- Storage: -20°C to 71°C (-4°F to 160°F) without battery
- Shock, vibration and drop resistant (1.5 meter on concrete)
- Waterproof IP67 1m (39 in) during 1 hour
- EMC: complies and exceeds standards by a large margin (Compliant, certificate number 153720)
  - MIL STD 461F RS103 (pulsed electric field): exceeds 200 V/m from 30 kHz to 5 GHz
  - MIL STD 461F RS101 (magnetic field 30 Hz to 100 kHz)

9.5 Factory Calibration and verification
- Approved under ISO/IEC 17025 (COFRAC accreditation Nber 2-1663 ) with three energy references:
  - 16 keV (X);
  - 59.3 keV (²⁴¹Am);
  - 662 keV (¹³⁷Cs);
  - only on request: 1.2 MeV (⁶⁰Co)
9.6 Functional Characteristics

- Indicators:
  - Large-format, backlit, high-contrast LCD display (8 alphanumeric characters + symbols)
  - Indicator lights (red, green and blue LEDs)
  - Flash red alarm LED
  - Vibrator
  - 2 selection buttons for acknowledging warnings, viewing parameters and measurements (data)
  - Alarming speaker with level of 85 dB (A) typical (> 90 dB (C) peak) at 30 cm (11.8 in),
  - frequency < 4800 Hz

- Alarms:
  - Precision: the alarm is triggered when the measured value reaches the corresponding alarm threshold value
  - Dose alarm: two thresholds (alarm and warning). Can be adjusted over the entire display range
  - Dose rate alarm: two thresholds (alarm and warning). Can be adjusted over the entire display range
  - Acknowledgment of warnings is accomplished by pressing and holding either push button for at least 3 seconds.

- Checks:
  - Periodic detector test (every 10 minutes) for both low and high energy detectors
  - Internal data integrity check with CRC16
  - Periodic battery test (every 10 minutes)
  - Component test (integrated circuit, memories)
  - Specific and dedicated EEPROM for calibration and algorithm parameters
### Memory:
- Data storage in EEPROM for more than 10 years
- Historical record of dose increments and events
- RTC for date stamping information
- 3800 history events at programmable intervals of 10 seconds, 60 seconds, 10 minutes, 1 hour or 24 hours
  *(See Note)*

<table>
<thead>
<tr>
<th>Interval</th>
<th>Minimum Value (one increment of dose each interval)</th>
<th>Average Value (one increment of dose each 10 intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 seconds</td>
<td>12 hours</td>
<td>5.5 days</td>
</tr>
<tr>
<td>1 minute</td>
<td>3 days</td>
<td>33 days</td>
</tr>
<tr>
<td>10 minutes</td>
<td>30 days</td>
<td>331 days</td>
</tr>
<tr>
<td>1 hour</td>
<td>180 days</td>
<td>1 985 days</td>
</tr>
<tr>
<td>24 hours</td>
<td>4331 days</td>
<td>47 643 days</td>
</tr>
</tbody>
</table>

*Note:* With G2 protocol.
The storage can be doubled using G3 protocol (calculation based on 1 dose increment every 10 intervals).

### 9.7 Environment

In accordance with European regulation (Directive DEEE 2002-96-CE), dosimeters should not be thrown out with non-sorted waste, but must be selectively collected.

The batteries should not be recharged or thrown in fire.
9.8 Reference point of calibration

Note: Dimensions in millimeters
The DMC 3000 is provided with extension capability at the bottom of the case.

For this purpose, a 26-pin connector allows connection for the following:

- Bidirectional serial communication
- Report alarm signal
- Detection module (Neutron, Hp(0.07), etc.)
- External power (*)

Before connecting any external add-on module, it is necessary to equip your DMC 3000 with a connecting board, reference 153 458 on top of the 26-pin connector.

(*) Before connecting an external power source to your DMC 3000, make sure that the AAA battery is removed. The applied voltage should not exceed 1.6 V, typically remain at 1.5V and should not be lower than 1.3 V.

The typical consumptions are given on the below table:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Sleep</th>
<th>Pause</th>
<th>Run in Background Counting</th>
<th>Run in 120 μSv/h Rate Field</th>
<th>Run in Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean value (µA if no indication)</td>
<td>30 - 40</td>
<td>100 - 120</td>
<td>200 - 220</td>
<td>220 - 260</td>
<td>≈160 mA (**)</td>
</tr>
</tbody>
</table>

(**) vibrator+speaker+top LED+backlit+hands-free at the same time

Note:
Due to current being present on the pins when the DMC 3000 is energized, take care when attaching new modules or adapter board not to short any of the pins. The add-on module must be attached or removed only when the DMC 3000 is in PAUSE.
The items listed below can be ordered from Mirion Technologies.

<table>
<thead>
<tr>
<th>Spare Parts</th>
<th>Mirion Technologies Reference Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaline battery (x10) 1.5V AAA (LR03)</td>
<td>153 634</td>
</tr>
<tr>
<td>Battery cover (with washer and screw)</td>
<td>153 629</td>
</tr>
<tr>
<td>Standard clip (x25)</td>
<td>153 631</td>
</tr>
<tr>
<td>Belt clip (x10)</td>
<td>153 632</td>
</tr>
<tr>
<td>Front facing clip (x10)</td>
<td>153 633</td>
</tr>
<tr>
<td>Set of colored standard clips (x25 in each of the 12 colors (*) = total of 300 clips)</td>
<td>153 650</td>
</tr>
</tbody>
</table>

(*): Available colors are: beige, white, black, red, yellow, purple, orange, brown, pink, grey, green and blue.

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Mirion Technologies Reference Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screwdriver for changing battery/ clip (x10)</td>
<td>153 630</td>
</tr>
<tr>
<td>Connecting board (x10) for add-on module (*)</td>
<td>153 635</td>
</tr>
</tbody>
</table>

(*) = should be attached to your DMC 3000 before connecting any add-on module

<table>
<thead>
<tr>
<th>Racks</th>
<th>Mirion Technologies Reference Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall mounted rack of 40 DMC 3000 (*)</td>
<td>172 609</td>
</tr>
<tr>
<td>Wall mounted rack of 10 DMC 3000 (**)</td>
<td>166 010</td>
</tr>
</tbody>
</table>

(*): compatible with DMC 2000S and GN, can be fixed at the same location as the previous 40 DMC 2000S and GN rack reference 118 938
(***): compatible with DMC 2000S and GN
The dosimeters are delivered either individually or in tray boxed set, with or without additional clips and accessories, contact your Mirion Sales Representative for details.
DECLARATION CE DE CONFORMITÉ

aux exigences de protection des directives 2004/108/CE
"Compatibilité Electromagnétique" et 2006/95/CE "Basse Tension"

Nous déclarons que le produit :
We declare that the following product :

Dosimètre électronique DMC 3000
Numéro de légende: 136959
(nom, type ou modèle, options de constitution, numéros de série ou de lot)

est conforme aux normes génériques ou spécifiques harmonisées suivantes:
is in accordance with the following generic or specific harmonised standards:

EN 61000-6-2 (Edition 2005)
EN 61000-6-4 (Edition 2006)

(Références, dates de validité)

sur la base du dossier: Rapport d'essais
on the basis of the file:
numéro: 153797 – A

Nom et titre du signataire (1):
Name and title of subscriber:
Bruno MOREL
Directeur Général Division HPH

Lieu, date et signature : LAMANON
Place, date, signature: Le 12 avril 2012

Année d'apposition du marquage CE : 2012
Year when CE mark affixed:

(1) Le signataire doit avoir reçu pouvoir pour engager la société

153720 - A