DMC 3000 User's Guide

MIRION TECHNOLOGIES

Health Physics Division

LAURUS SYSTEMS

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Speaker

Red flashing LED for alarm

Button for data display

Button for parameters display

Large backlit display with 8 digits

Red LED for alarm

Green LED for gamma counting

Blue LED for Hp(0.07) or neutron counting

DMC 3000

Measurement or parameter display area

Disable flash, vibrator and speaker indicators

Functional indicator "blinking"

Connected module indicator

Measurement unit

Measurement type

Alarm type

G2 "DMC 2000" compatible protocol

H10   DOSE ALARM

ENLER   μSv/h

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).

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 **DMC*User*** 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).

NO bIP	no audible signal for dose increments
bIP 100	1 beep every 100 μSv (10 mrem)
bIP 10	1 beep every 10 μSv (1 mrem)
bIP 1	1 beep every 1 μSv (0.1 mrem)
bIP 8PLS	1 beep every 8 pulses
bIP 4PLS	1 beep every 4 pulses

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:

time duration before dose alarm = (dose alarm threshold - cumulative dose) / 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 **DMC*User*** 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.
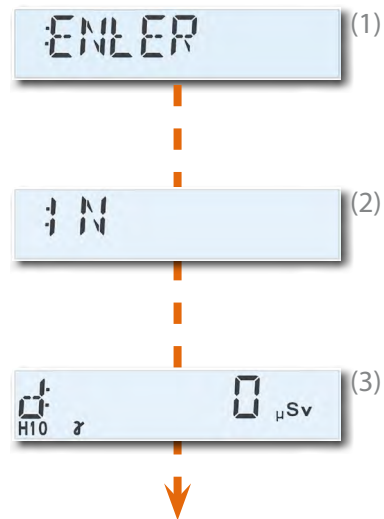
3.2 Operating Modes

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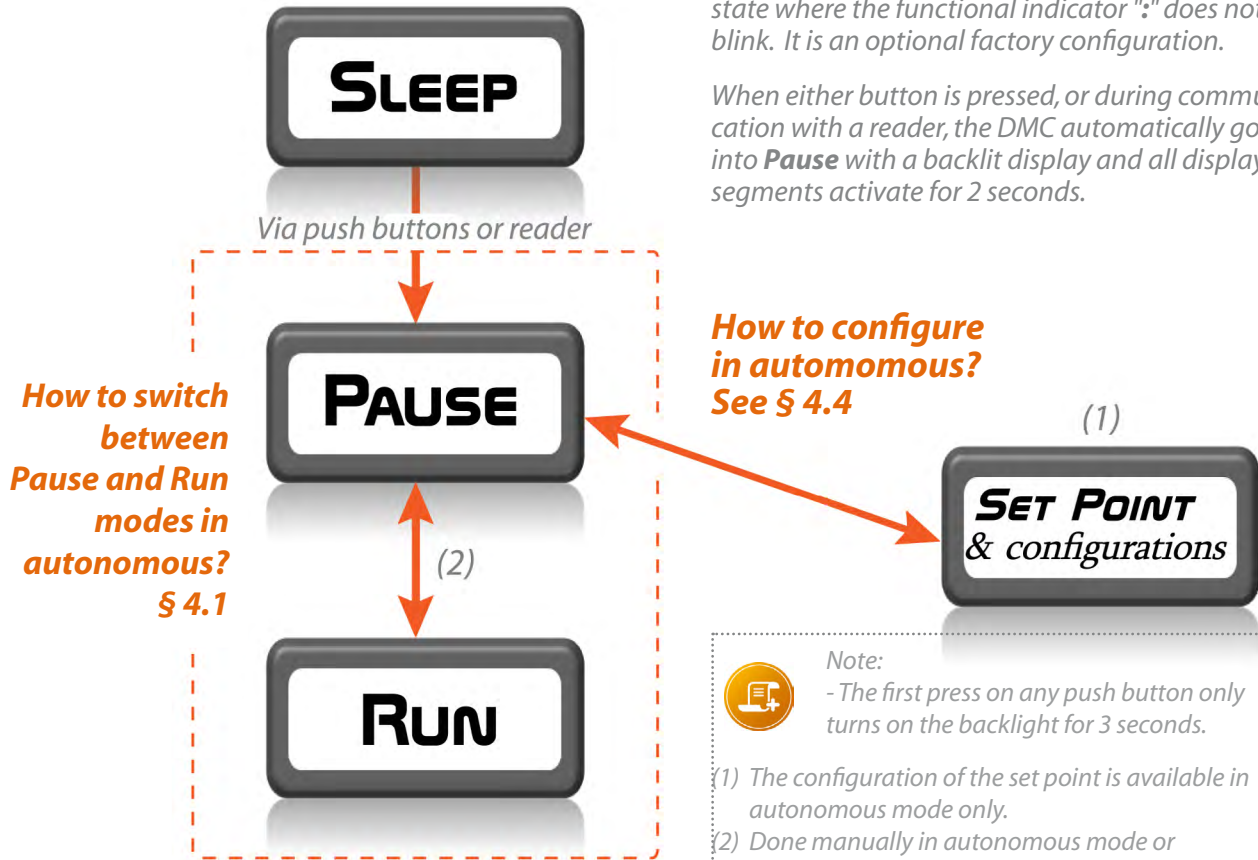
- **Satellite mode**:
  DMC*User* software must be used to configure the DMC 3000.

Note:
DOSIMASS-DM does not have the ability to modify the DMC 3000's parameters.

Sleep

Via push buttons or reader

Pause

Run

(2)

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

The **sleep mode** state is a low-power consumption state where the functional indicator "**:**" 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.
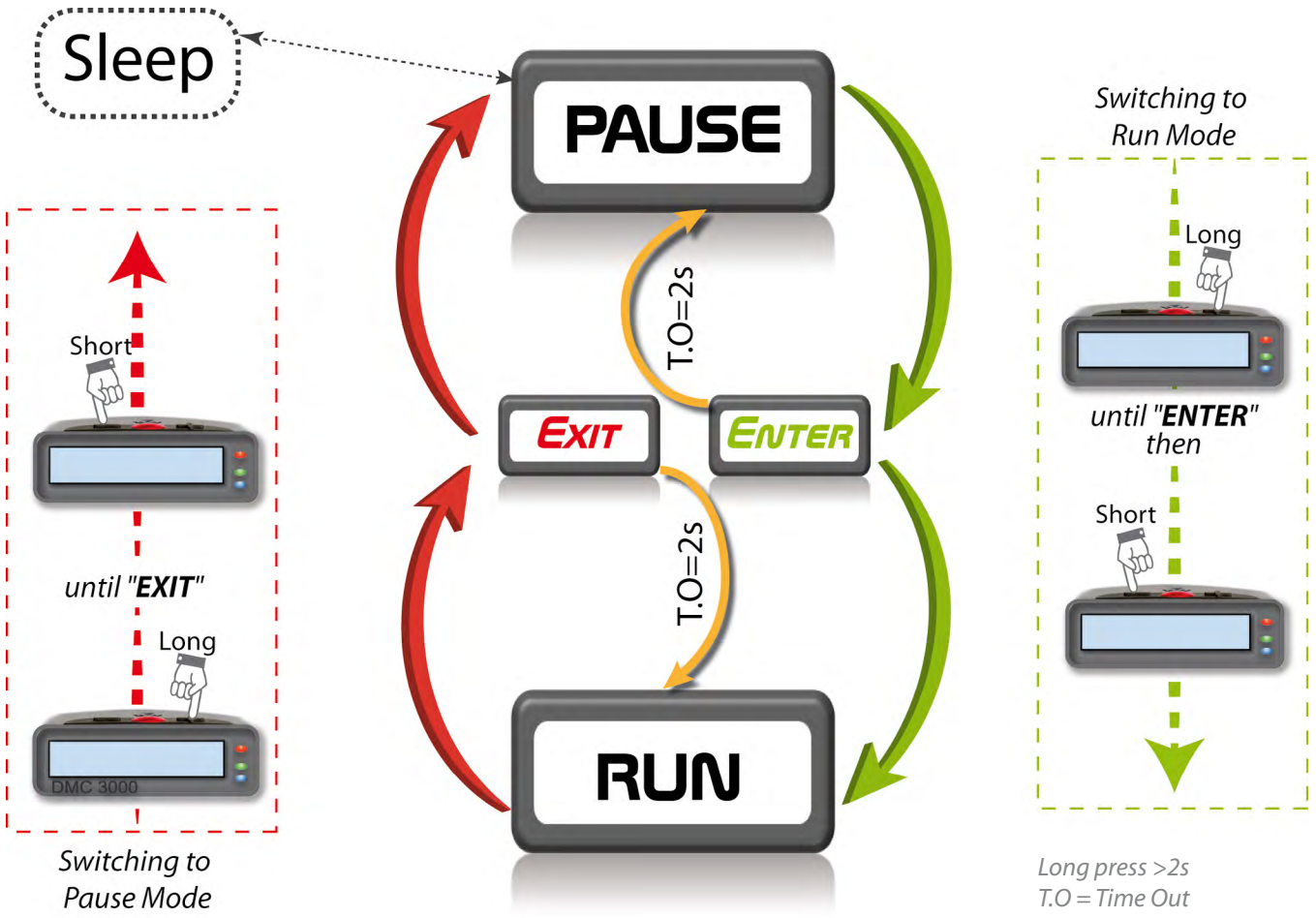
How to configure in automomous? See § 4.4

(1)

Set Point *& configurations*

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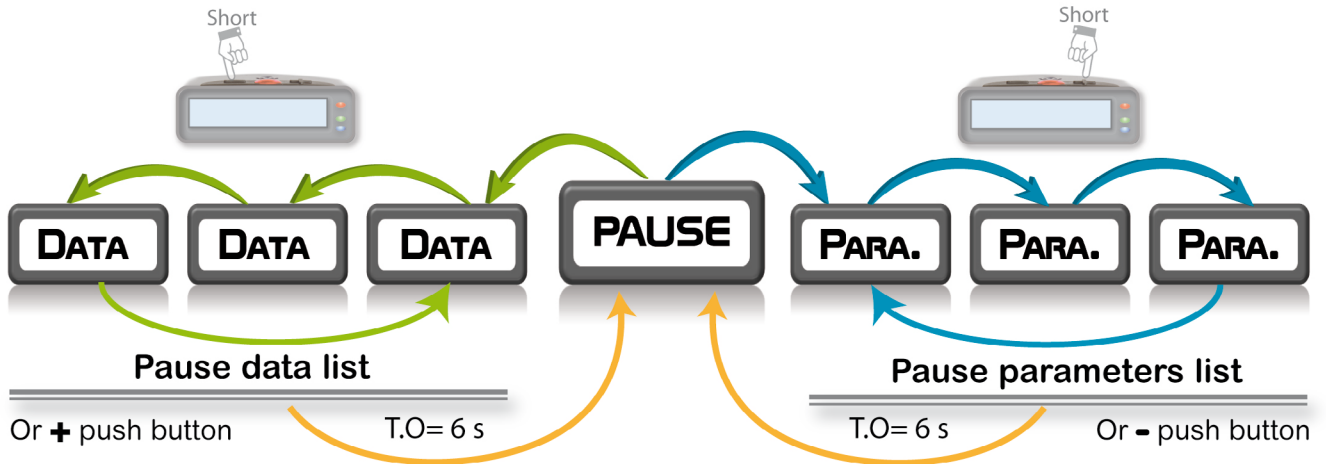*- The first press on any push button only turns on the backlight for 3 seconds.*

(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.

Sleep

PAUSE

EXIT   ENTER

T.O=2s

T.O=2s

RUN

Switching to
Pause Mode

Short

until "EXIT"

Long

DMC 3000

Switching to
Run Mode

Long

until "ENTER"
then

Short

Long press >2s
T.O = Time Out

Short		Short

DATA DATA DATA **PAUSE** PARA. PARA. PARA.

Pause data list

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

Pause parameters list

T.O= 6 s   Or **–** push button

Exemple of Data available	Display
Last recorded dose	d 0.410 mSv
Last maximum peak rate	P. 0.23 mSv/h
Last duration in Run	h00 12:06
Current Time (AM/PM or 24H format)	PM09:12:6
Current Date (MM--DD--YY or DD/MM/YY format)	05-21-07

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

Parameters	Display	Parameters	Display
Dosimeter number	0 1900986	Rate warning set point	P. 0.099 mSv/h
Wearer's name	JOHN	Run time warning set point	h0 100000
Wearer ID	1 dMA 1234	Chirp mode	bi P 100
Dose alarm set point	d 0.950 mSv	Date of next calibration	C1.100113
Dose warning set point	d 0.150 mSv	Dosimeter mode	SAt
Rate alarm set point	P. 0.950 mSv/h	Software version	VER00.8E

Parameter list is configurable with **DMC***User* (choice and order). See § 4.5 for complete list.
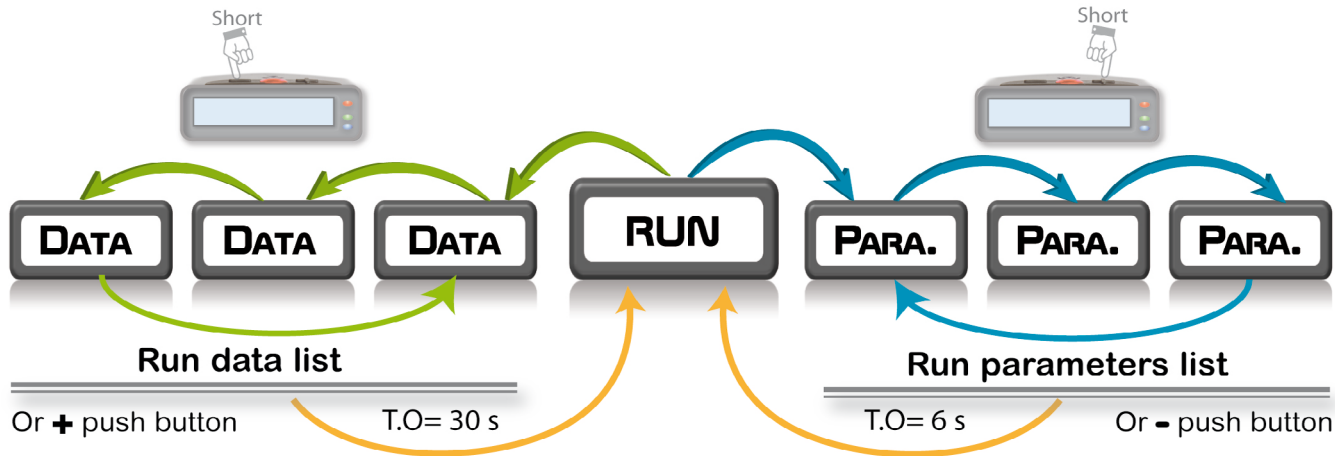
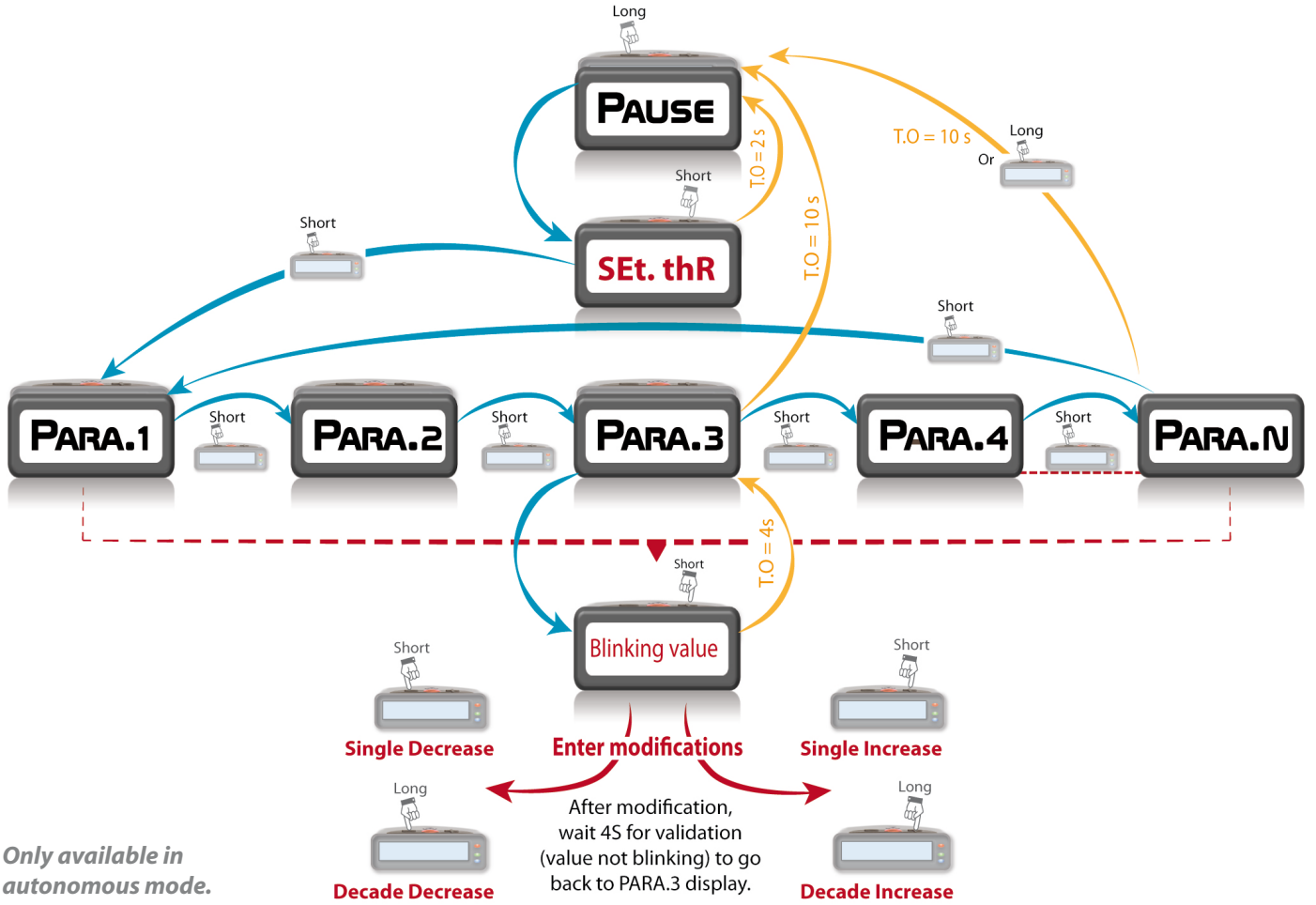| Exemple of Data available	Display
Current dose	d H10 ☢ 10 µSv
Current rate	R. H10 ☢ 0 µSv/h
Remaining time before alarm in Run	t·009250 1
Date	05-21-07

Parameters	Display	Parameters	Display
Dosimeter number	0 1900986	Dose warning set point	d H10 ☢ DOSE 150 µSv
Wearer's name	JOHN	Rate warning set point	R. H10 ☢ RATE 99 µSv/h
RWP	RWNA 1234	Run-time warning set point	h·003456 ALARM ⊙
Date	05-21-07	Chirp mode	bi P 100
Dose alarm set point	d H10 ☢ DOSE ALARM 950 µSv	Operating mode	SAt
Rate alarm set point	R. H10 ☢ RATE ALARM 950 µSv/h		

Long

PAUSE

Short

SEt. thR

T.O = 2 s

T.O = 10 s

T.O = 10 s   Long   Or   Long

Short

Short

PARA.1   Short   PARA.2   Short   PARA.3   Short   PARA.4   Short   PARA.N

T.O = 4s

Short

Blinking value

Short   Short

Single Decrease   Enter modifications   Single Increase

Long   Long

After modification,
wait 4S for validation
(value not blinking) to go
back to PARA.3 display.

Decade Decrease   Decade Increase

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 **DMC*User*** software.

Data
Hour (*)
Date (*)
Full life dose (*)
Full life duration (*)
Total maintenance dose (*)
Total maintenance duration (*)
Dose (*)
Current rate (*)
Maximum rate (*)
Duration of integration in Run (*)
Remaining time before alarm in Run (*)

Parameters
User name
Dosimeter number
Type of autonomous dose (cumulated or resettable) (*)
Date of next internal calibration
Dose alarm setpoint (*)
Rate alarm setpoint (*)
Duration setpoint (*)
Remaining time setpoint (*)
Dose warning setpoint (*)
Rate warning setpoint (*)

Parameters
Beeps at dose change
Autonomous or satellite flag
Software version
FLASH memory checksum
Worker identifier
Worker order task code (OT)
Thermoluminescent film number (TLD)
Radiation Work Permit (RWP)

(*)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.
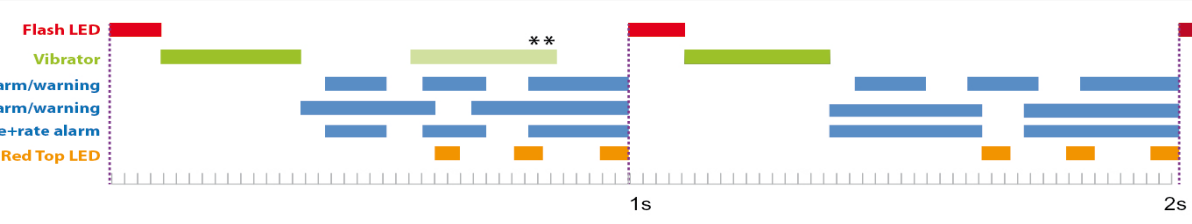
5.1 Dose and Rate Alarms or Warnings

■ 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**.
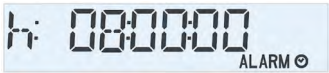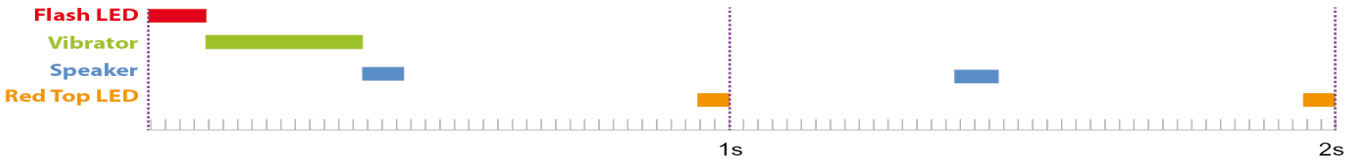*(*) Please contact Mirion Technologies for a rate set point between 1 μSv/h and 10 μSv/h and see § 9.1.*
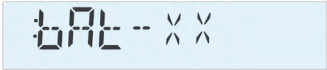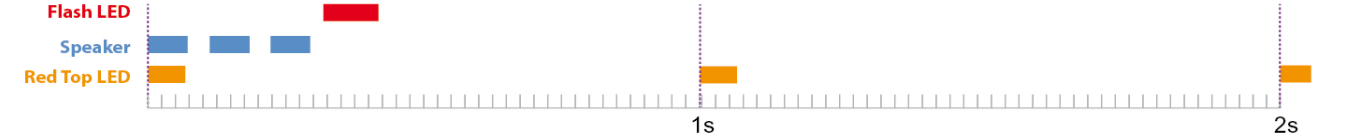**Dose and rate warnings** are acknowledgeable by pressing either push button for longer than 3 seconds.

■ 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.

Alarm Type	Display	Speaker	Flash LED, Vibrator and Top Red LED
Dose Alarm	H10 ☢ DOSE ALARM 117 μSv	**3 beeps** every second	**FLASH LED** 1 flash every second
Dose Warning *(See note)*	H10 ☢ DOSE △ 117 μSv		**VIBRATOR** 1 vibration (**) every second *** An extra vibration is added if the speaker is disabled.*
Rate Alarm	H10 ☢ RATE ALARM 117 μSv	**2 long beeps** every second	**TOP LED** 3 red flashes every second
Rate Warning *(See note)*	H10 ☢ △RATE 117 μSv		Note : *Acknowledge by pressing + or - button longer than 3s.*

Flash LED				
Vibrator		**		
Speaker in dose alarm/warning				
Speaker in rate alarm/warning				
Speaker in dose+rate alarm				
Red Top LED				

1s   2s

5.2 Time Alarm

Alarm Type	Display	Speaker	Flash LED, Vibrator and Top Red LED		
Time Alarm	h: 08:00:00 ALARM ☑	**1 short beep** every second	**FLASH LED**	1 flash every 10 seconds	
			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.*

Alarm Type	Display	Speaker	Flash LED, Vibrator and Top Red LED
Low Battery	**In Run** bAt - xx 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.	**3 short beeps** every **10 minutes**	**FLASH LED** 1 flash every 10 minutes **NO VIBRATOR** **TOP LED** 1 red flash every second
	In Pause LOW bAt 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

Alarm Type	Display	Speaker	Flash LED, Vibrator and Top Red LED
Power Loss	**bAt dEF**	**3 short beeps** every **10 seconds**	**NO FLASH LED** **NO VIBRATOR** **TOP LED** 3 red flashes every 2 seconds

SPEAKER

Red Top LED

1s   2s

5.5 Faults

5.5.1 Minor Fault
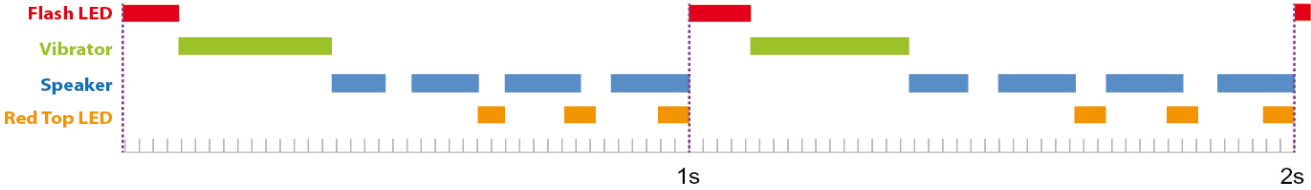
Alarm Type	Display	Speaker	Flash LED, Vibrator and Top Red LED
Minor Fault	**CALI dAt** Dosimeter needs a new calibration.	**none**	**NO FLASH LED** **NO VIBRATOR** **TOP LED** only 1 red flash

Red Top LED

1s   2s

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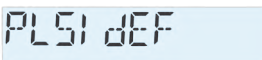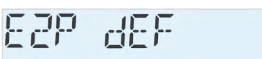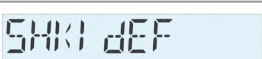
If a fault is detected, an alarm is generated and a message is alternately shown with the measure on the display.

Alarm Type	Display	Speaker	Flash LED, Vibrator and Top Red LED		
Major Fault (Asic, EEPROM, Detection, Data Integrity)	OPtI dEF	**4 beeps** every **second**	**FLASH LED**	1 flash every second	
			VIBRATOR	1 vibration every second	
			TOP LED	3 red flashes every second	

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.

Major Faults		
Display	**Cause**	**Solution**
OPtI dEF	Physical problem related to the detection circuit and detectors (optical check)	**See § 5.5.4 Optical test and Impulse test**
PLSI dEF	Physical problem related to the detection circuit and detectors (no pulse during the last check period)	
ASI N dEF	Physical problem related to the detection circuit (no communication with the microprocessor)	Contact Mirion for verification.
E2P dEF	Problems accessing the data saved in memory	
RAM dEF	Problems accessing the data saved in memory	
PROG dEF	Problems accessing the software program saved in memory	
PARA dEF	Problem with the parameters' data integrity saved in memory	
SHKI dEF	Pulse counting limitation due to an amount of mechanical shocks on the detection circuit	Confirm whether or not this fault occurs with "normal use" (no high mechanical or electromagnetic stress). Contact Mirion for verification.
bUZZ dEF	Electrical problem related to the speaker circuit	Verify that the speaker cavity is not obstructed and the battery voltage is not too low (low battery fault). Contact Mirion for verification.

Minor Faults		
Display	**Cause**	**Solution**
`CALI dAt`	Exceeded date of calibration	Perform a calibration check.
`HI St dEF`	Missing bit/pointer in the histogram	Verify that the battery voltage is sufficient and perform an entry with DMC*User* software. If the fault persists, contact Mirion for verification.

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

(1)

(2)

(3)

(4)

(5)

(6)
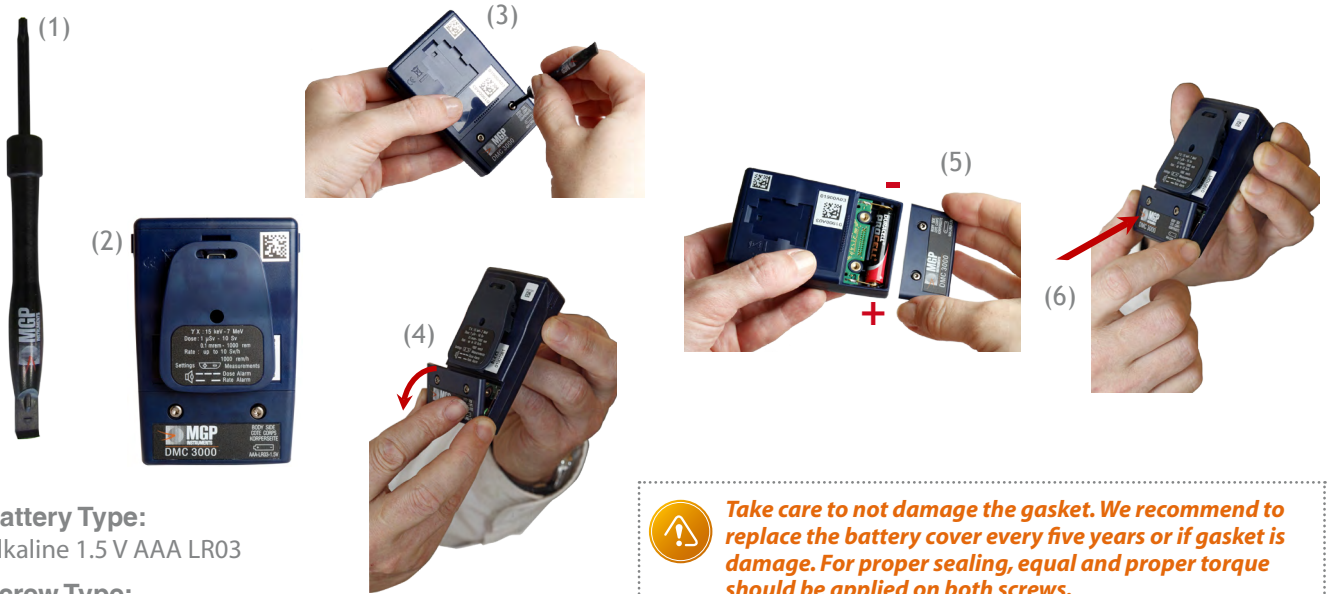
Battery Type:
Alkaline 1.5 V AAA LR03

Screw Type:
Torx N° 8, ISO 14583

⚠️ *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.*

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).

7.1 Standard or Belt Clip

(1)
(2)
(3)
(5)
(4)
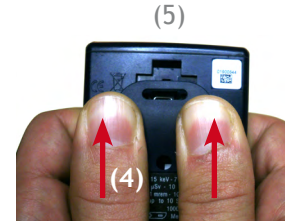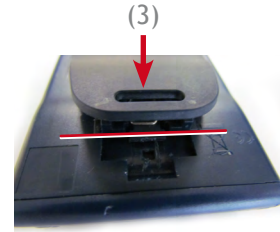
Removal

- 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).

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).

7.2 Front Facing Clip

Removal / Replacement

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

(7)
(6)

8.1 Manual Calibration

- Expose the dosimeter with a gamma source ^{137}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 Hp(10) (G2 protocol) or Calibration factor efficiency multiplier Hp(10)(G3 protocol) using **DMC*User*** software. This calibration factor is called "**K OLD**".
- Determine the new calibration factor "**K NEW**" using the following equation:
  K NEW = **K OLD** x Read dose / Expected dose.
- Turn off the dosimeter and set the calibration factor to the new value "**K NEW**" using **DMC*User*** 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}Cs or ^{60}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}Am and ^{137}Cs) and ^{60}Co on request, in accordance with ISO/IEC 17025.*
>
> *- In G3 protocol the calibration factor efficiency multiplier Hp(10) is set at 1.00 in factory.*
> *- Decreasing in G2 protocol the calibration factor efficiency Hp(10) or calibration factor efficiency multiplier 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* $\pm 75°$
- **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 ~0.7 mSv/h) *including $\pm 9\%$ extended uncertainty k=2*
  - ❑ $\leq \pm 15\%$ (^{241}Am ~23 mSv/h) *including $\pm 5\%$ extended uncertainty k=2*
  - ❑ $\leq \pm 10\%$ (^{137}Cs ~24 mSv/h) *including $\pm 5\%$ extended uncertainty k=2*
  - ❑ $\leq \pm 17\%$ (^{60}Co ~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)
  or 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)

Energy Response of DMC 3000

Dose Rate response of DMC 3000

- Continuous X-ray : H30 19.7keV
- Co60 source Continuous irradiation
- Pulsed X-Ray 10pps 20ms
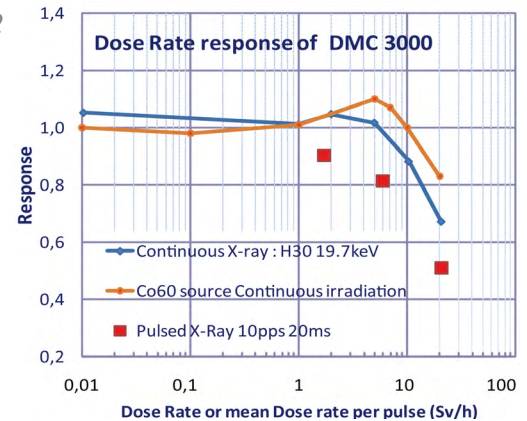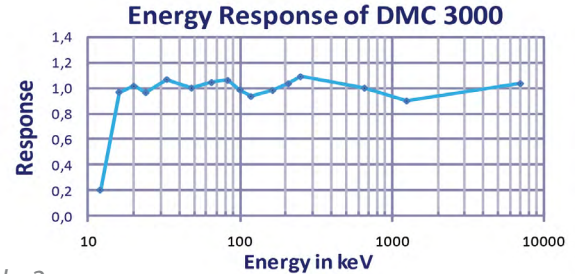
(**) - Mandatory if rate alarms are set below 50 μSv/h
(5 mrem/h) in order to display rate with better accuracy, if
fast response time for rate alarm is not required.
- Recommended for rate alarms settings below
100 μSv/h (10 mrem/h), if fast response time for rate alarm
is not required.

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 (CE 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 (^{241}Am);
  - 662 keV (^{137}Cs);
  - only on request: 1.2 MeV (^{60}Co)

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 (only the warning can be acknowledged)
- ❑ Dose rate alarm: two thresholds (alarm and warning). Can be adjusted over the entire display range (only the warning can be acknowledged)
- ❑ 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*)

| **Total Duration of Record without Overlap with G3 Protocol**		
Interval	**Minimum Value** (one increment of dose each interval)	**Average Value** (one increment of dose each 10 intervals)
10 seconds	12 hours	5.5 days
1 minute	3 days	33 days
10 minutes	30 days	331 days
1 hour	180 days	1 985 days
24 hours	4331 days	47 643 days

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

Reference plan
of calibration

Calibration
reference
point

35,35

29,73

0,95

16,63

15,43
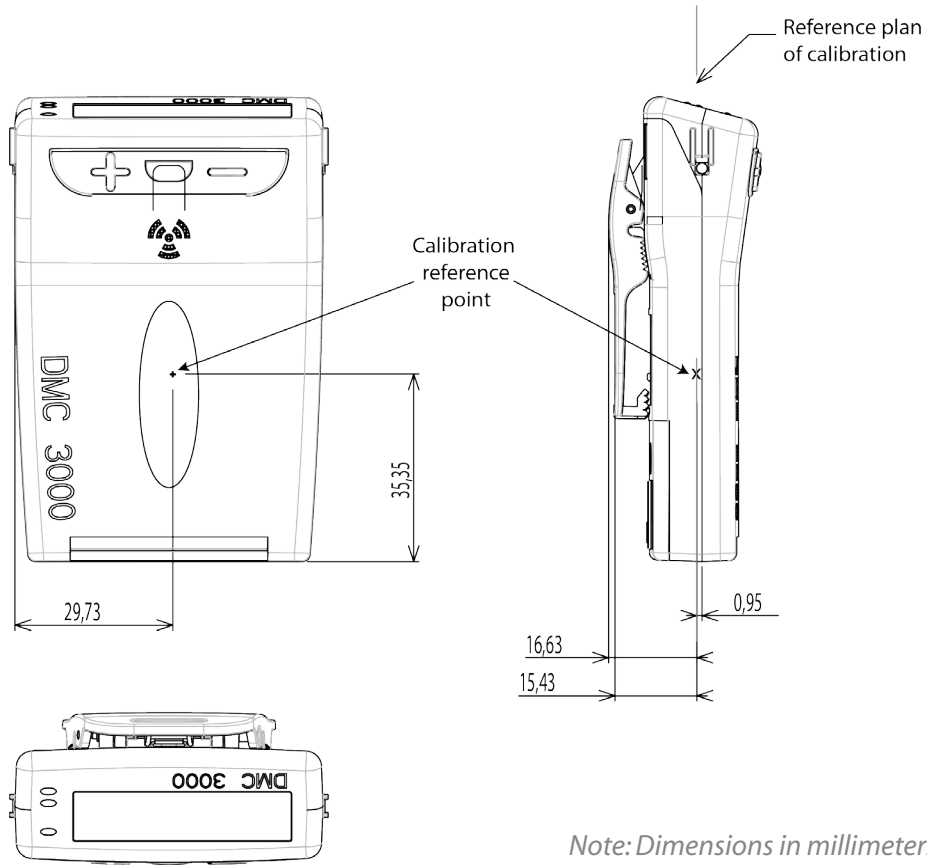
Note: Dimensions in millimeters

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:

| Mode	Sleep	Pause	Run in Background Counting	Run in 120 µSv/h Rate Field	Run in Alarm
mean value (µA if no indication)	30 - 40	100 - 120	200 - 220	220 - 260	≈160 mA (**)

(**) 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.
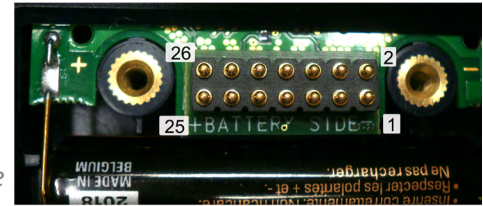
The items listed below can be ordered from MirionTechnologies.

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

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

Accessories	Mirion Technologies Reference Number
Screwdriver for changing battery/ clip (x10)	153 630
Connecting board (x10) for add-on module (*)	153 635

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

| Racks	Mirion Technologies Reference Number
Wall mounted rack of 40 DMC 3000 (*)	172 609
Wall mounted rack of 10 DMC 3000 (**)	166 010

(*) =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.

Individual box
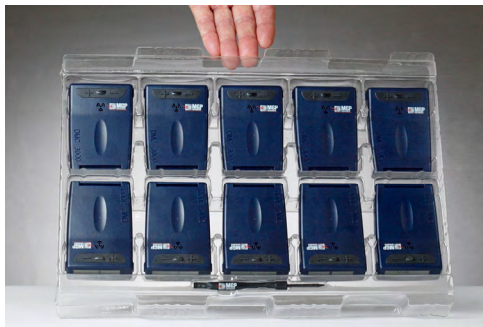
Tray boxed set

Front facing clip   Belt clip   Standard clip

12- CE Certificate

MIRION TECHNOLOGIES

Radiation Monitoring Systems Division
Health Physics Division
Route d'Eyguières— BP n° 1
FR-13113 Lamanon

Tel. +33(0)4 90 59 59 59
Fax +33(0)4 90 59 55 18
www.mirion.com

DECLARATION C€ DE CONFORMITE

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 C€ : 2012
Year when C€ mark affixed:

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

153720   - A

Format 111 911 J

Information

Photos and product representations are for illustration and explanation only.

The publication, translation or reproduction, either partly or wholly, of this document are not allowed without our written consent.

Directive 2002/96/EC of the european parliament and of the council of january 2003 on waste electrical and electronic equipment (WEEE). At the end of the product's useful life, please dispose of it at appropriate collection points provided in your country.

Notes :

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LAURUS SYSTEMS