



DAMO Activity Meter



USER MANUAL

(rev.03 of the 2026-03-26)



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DAMO Activity Meter





1 GENERAL INSTRUCTIONS

1.1 FIRST INSTALLATION AND STARTUP FOR DAMO DEVICE

The first installation and startup of the DAMO device on customer's site is performed or directly by Murphil srl personnel or by trained personnel of official Murphil srl Distributors.

During this phase the following training areas will be performed:

- Training on how to use the device TO ALL operators that are indicated by the customer for the usage of the device
- Training on specific issues such as QC routines to device administrator and/or medical physics personnel
- Indications on how to manage the device in terms of responsibilities and privileges (the device has two level password protection) and definition of Administrator of the device
- Specific training to the designated administrator of the device about safe use and maintenance.

1.2 BEFORE READING THIS MANUAL

This manual must be used as full reference for DAMO device users once the installation and startup has been completed (see par. 1.1).

1.3 USE OF THE MANUAL

This manual, with the declaration of conformity, shall be considered an integral part of the device supplied by Murphil and thereafter accompany the same until its demolition. If the manual is damaged or lost, it is recommended to ask for a copy to Murphil. A PDF file with the User Manual is present on the PC Desktop. This manual is designed to provide to the operator all the necessary information for proper use and proper maintenance of the equipment. It is intended for qualified personnel with the necessary technical skills to operate the equipment under the best safety conditions. If you will have difficulties in the interpretation of texts, tables or pictures, please contact immediately Murphil,



in order to have all necessary clarification. The precise observation of the instructions contained in the manual operator safety will ensure the correct usage of the equipment itself, as well as its durability. Though this manual has been prepared under the best attention to give the information in a clear and precise way, Murphil cannot in any way be held liable for any error therein. Murphil reserves the right to bring, without prior notice, modifications or corrections to this manual, to improve its understanding or content. The images shown in this manual are for illustration purposes only; they may refer to models similar to the one actually delivered to customer. In this manual we have indicated the most updated instructions that were available at the time of its compilation. No changes may be made to the equipment without the express written permission of Murphil that can be held liable only for the equipment in its original configuration and properly maintained. Murphil disclaims any liability for damages resulting from the equipment used improperly, incorrectly, with negligence or incompetence. We advise you to don't use the equipment to which reference is made in this manual, as long as you will carefully read this manual, even partially. Murphil does not guarantee that the only reading of the present manual constitutes qualification to work with the instrument.

1.4 HOW TO READ THE INSTRUCTIONS

The instructions in this manual are divided into chapters and paragraphs. In addition to the information described by means of words (description of information), the instructions contain symbols, photographs and drawings.

1.5 SYMBOLS

The following symbols identify the parts of the manual on which it is necessary to pay close attention.

 DANGER	The symbol indicates that you must be careful to avoid situations that could cause health damage or death off the staff
 ATTENTION	The symbol indicates that you must be careful to avoid situations that could cause damage to people, environment or to the items



 CAUTION	The symbol indicates that you must be careful to avoid situations that could cause damage to property or to the environment
 INFORMATION	The symbol indicates the particular importance treated by these arguments
	This symbol indicates the presence of dangerous electrical voltage to the user.
	The symbol indicates to carefully read these instructions prior to use

1.6 TARGET OF THE MANUAL AND INTENDED USERS

These instructions contain all the specific information about transport, storage, installation, use and maintenance of the equipment to which this manual refers. As described, the manual is oriented to training and informing the following categories of persons:

- Responsible for the safety of the place where the equipment is used
- Technical personnel of the customer (operators, employees to the operational functioning of the equipment)
- Technical personnel of the customer (operators) responsible for the maintenance of the mechanical, electrical and electronic equipment.

	The employer (or its officer) must ensure that operators read this manual carefully before using any equipment in order to avoid the lack of knowledge of the information in it contained and the possibility of risks to workers' health.
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Keep this manual and use the machine only after all the information will be understood by the technical personnel. The manual must be kept in an accessible place and available to be viewed by operators.



This manual is intended for skilled professionals operating in the field of radiopharmaceutical preparation.

Personnel includes Nuclear Medical Doctors, Nuclear Physicists, radiology and nuclear medicine technicians, hot lab responsible people.

Such personnel is generally divided in these categories:

- Technical personnel skilled for the preparation and dispensing of radiopharmaceuticals
- Medical Physics personnel, generally acting as device administrator, who takes care of instrumentation calibration and QC check over time
- Occasionally also Medical Doctors can use the device just for measuring purpose

1.7 INTENDED USE AND PATIENT POPULATION

DAMO is qualified as a Medical device under MDR, according to the definition of MDR, Article 1.4, Article 2 (1), since it is an instrument intended by the manufacturer to be used for human beings to measure the activity of radiopharmaceuticals used for diagnosis or treatment of disease. The pharmaceutical is measured directly in a syringe or vial prior to administration to patients.

1.8 WARRANTY

Murphil srl applies the warranty object and duration as per conditions laid down in the contract specifications. If the maintenance of the machine is carried out in a non-compliant way with the instructions supplied concerning the after-sales spare parts suggested, without the written permission of the manufacturer, or in any case customers operations will affect the integrity or modify these characteristics, the manufacturer shall be deemed exempt from any liability relating to the safety of the persons or to the malfunction of the machine: any unauthorized modification will result in the end of the warranty. The non-compliance, even partial, of the instructions in the manual of use and maintenance of the item, as well as the use of this equipment by unqualified personnel or unauthorized release the manufacturer from any liability



	The warranty expires if unauthorized people act on the supply, perform modifications or if changes are made that will alter the structural characteristics of the equipment, without the specific permission of the manufacturer. The warranty is void if non-original components are used (sample holders, power supplies, cables kits, molybdenum measurement kits)
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1.9 UNAUTHORIZED MODIFICATION OF THE DEVICE

The device can be serviced only by staff authorized by Murphil srl.

	Unauthorized modification of the device can lead to a relevant electric shock risk for operators.
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1.10 TRANSPORT AND STORAGE SPECIFICATIONS

The device should be shipped and stored in its original package under the following environmental conditions:

Temperature: -25 °C ÷ 55°C

Relative humidity: 0 % ÷ 95 % non-condensing

Pressure: 900 hPa - 1090 hPa

1.11 UNPACKING INSTRUCTIONS SHIPPING CARTON

DAMO and its respective components are carefully packed in one carton.

NOTE: Prior to removing any of the components from the shipping box, visually inspect the box and the inside packing for damage. If any damage is noted, do not unpack the contents. Notify the carrier



immediately so that a claim can be made, if necessary, and contact your Murphil Sales Representative. If there is no visible damage, remove the carton. The carton contains also the DAMO User Manual, all the necessary connection and power wires needed to run the system, and a report of calibration. Severe damage to the unit may result if this carton is dropped. Remove the detector from the carton and carefully place it on the table or where you will set up and use your dose calibrator. Insert into the Detector Well the Well Liner. Save the Packing Material, this material was designed especially for the safe shipment of DAMO Dose Calibrator. You will need them to return any of the DAMO components in the future for updates, calibration or repair.

1.12 CUSTOMER RESPONSIBILITIES

In case the equipment should be installed at the Customer facility, the Customer must ensure that:

- The location where the equipment will be installed has to be in accordance with predispositions provided by Murphil srl; the Customer may establish the connections for the power supply, air supply, air exhaust and any other preparation required for the installation.
- Customer must be sure that the area of the installation is of adequate capacity for the equipment.



The device must not be put into operation if it is delivered with open or damaged packaging



The term "qualified personnel" identifies personnel with technical knowledge in order to: interfere with safety of the equipment, understand instructions in English and possess adequate technical training to enable all the colleagues to understand the instructions and warnings.



The user should report any serious incident that has occurred in relation to the device to the manufacturer and the competent authority of the Member State in which the user is established

1.13 TECHNICAL SUPPORT REQUEST

The technical service after sales Murphil is available for customers and users to provide any clarification regarding the use and maintenance of the equipment; our service will suggest to customers the operations to be executed with specialized personnel or for sending pieces of replacement.

Please, we ask you to always specify:

- *Model of the machine*
- *Order Number*
- *Serial Number*
- *Year of construction*
- *Full details of the customer*
- *Telephone numbers and e-mail*

References Maintenance Service and Support:

Murphil S.r.l.

Via Cosmè Tura 18 – 44121 Ferrara (Italy)

www.murphil.eu - E-mail: info@murphil.eu

1.14 REVISION TABLE

Revision Number: 02

The revisions are outlined in the file "REVISION".

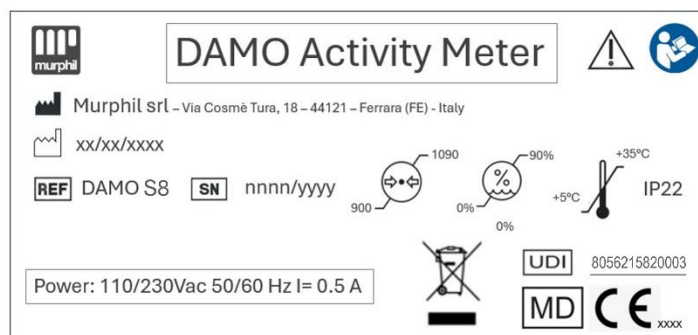
The revision number for each upgrade will increase by one level.



Revision	Description	Revised parts	Date
00	First Edition		2015-01-20
01	Added Cybersecurity description Intended User	Cybersecurity General Instructions	2025-07-07
02	Intended use description Label update with DAMO Model	Intended use and patient population Identification of manufacturer and equipment	2026-02-20
03	Intended use description	Intended use and patient population	2026-03-26

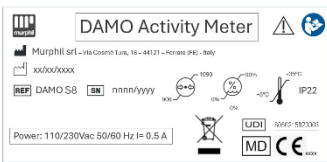
1.15 IDENTIFICATION OF MANUFACTURER AND EQUIPMENT

The identification data of the manufacturer and the equipment are reported on nameplate applied to the item and visible. An example of the nameplate located on our items is reproduced in the figure below.



DAMO 1: DAMO S8 label example



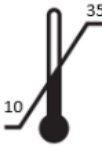
<i>Device Label</i>		Device identification label of DAMO in accordance with (EU) 2017/745.	The label is applied in the lower part of the chamber, near DB9 female serial connector. It identifies the model DAMO S8, S8M or S20	English
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The following table gives an explanation of the used symbols:

Table 1: Symbols

Symbol	Description
	Indicates the manufacturer of the medical device
	Indicates the date on which the device was manufactured
	Indicates the manufacturer's catalog number, which allows the device to be identified



	Indicates the manufacturer's serial number, which allows identification of the specific medical device
	Indicates a medical device that should not be used if the packaging is damaged or is opened and that the user should consult the instructions for use for further information
	Indicates a medical device that must be protected from moisture
	Indicates the temperature limits to which the medical device can be safely exposed
	Indicates the range of atmospheric pressure to which the medical device can be safely exposed
	Indicates the percentage range of relative humidity to which the medical device can be safely exposed
	Indicates the need for the user to consult the instructions for use for important cautionary information such as warnings and precautions that, for a variety of reasons cannot be displayed on the medical device in question
	Indicates a medical device that can be broken or damaged if not handled with care
	Indicates mandatory consultation of the operating instructions/user manual



	Indicates the item is a medical device
	Indicates UDI-DI unique code
	Separate collection of electrical and electronic equipment

1.16 REFERENCE STANDARDS

DAMO devices are compliant with the following standards:

EN 60601-1-2:2015 EN 60601-1-2:2015/A1:2021	Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests
EN 60601-1:2006 EN 60601-1:2006 /A1:2013 EN 60601-1:2006 /A1:2013/AC:2014 EN 60601-1:2006/A12:2014	Medical electrical equipment -- Part 1: General requirements for basic safety and essential performance

The DAMO devices are Class A classified devices (CISPR 11), compliant with the following Immunity reference test methods and Immunity Test levels:

Table 2: Type of test

Type of test	Test Level	Test Method Reference
ESD	15 kV max	EN 61000-4-2:2009
Radiated RF electro-magnetic field	80 ÷ 2700 MHz	EN 61000-4-3:2006



		EN 61000-4-3:2006/A1:2008 EN 61000-4-3:2006/IS1:2009 EN 61000-4-3:2006/A2:2010
Proximity fields from RF wireless communications equipment	28 V/m max	EN 61000-4-3:2006 EN 61000-4-3:2006/A1:2008 EN 61000-4-3:2006/IS1:2009 EN 61000-4-3:2006/A2:2010
Fast transients (EFT / burst)	+/- 2,0 kV max	EN 61000-4-4:2012
Surges	+/- 2,0 kV max	EN 61000-4-5:2014 EN 61000-4-5:2014/A1:2017
Conducted RF common mode	0,15 ÷ 80 MHz	EN 61000-4-6:2014 EN 61000-4-6:2014/AC:2015
Voltage dips and short interruptions	0% of supply rated voltage for 0,5 period 0% of supply rated voltage for 1 period 70% of supply rated voltage for 25 periods 0% of supply rated voltage for 250 periods	EN 61000-4-11:2004 EN 61000-4-11:2004/A1:2017

The above tests were conducted by taking into account the following Essential Performance acceptance criteria:

In standard background conditions, DAMO devices should measure activity below 200kBq (with F-18 calibration factor). Check device in case this value, in the specified background conditions, is overcome.

1.17 IMPORTANT INFORMATION AND WARNINGS



 INFORMATION	The EMISSION characteristics of this device make it suitable for use in industrial and hospital environments (class A of CISPR 11). When used in residential environments (for which CISPR Class B 11 is normally required) this equipment may not offer adequate protection for radio frequency communication services. The user may need to apply disturbance mitigation measures, such as relocation or reorientation of the equipment.
 CAUTION	Use of DAMO device near or resting on other devices should be avoided, as this can lead to incorrect operation. In such cases, it is necessary for the apparatus and other equipment to be monitored to verify their normal operation.
 CAUTION	The use of accessories, transducers, and cables other than those specified or supplied by the manufacturer of this equipment could lead to increased electromagnetic emissions or a decrease in the level of electromagnetic immunity of this equipment, resulting in incorrect operation
 CAUTION	Transportable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used at a distance of not less than 30 cm (12 inches) from any part of the DAMO system, including cables specified by the MANUFACTURER. Failure to do so may result in degradation of the performance of DAMO device.

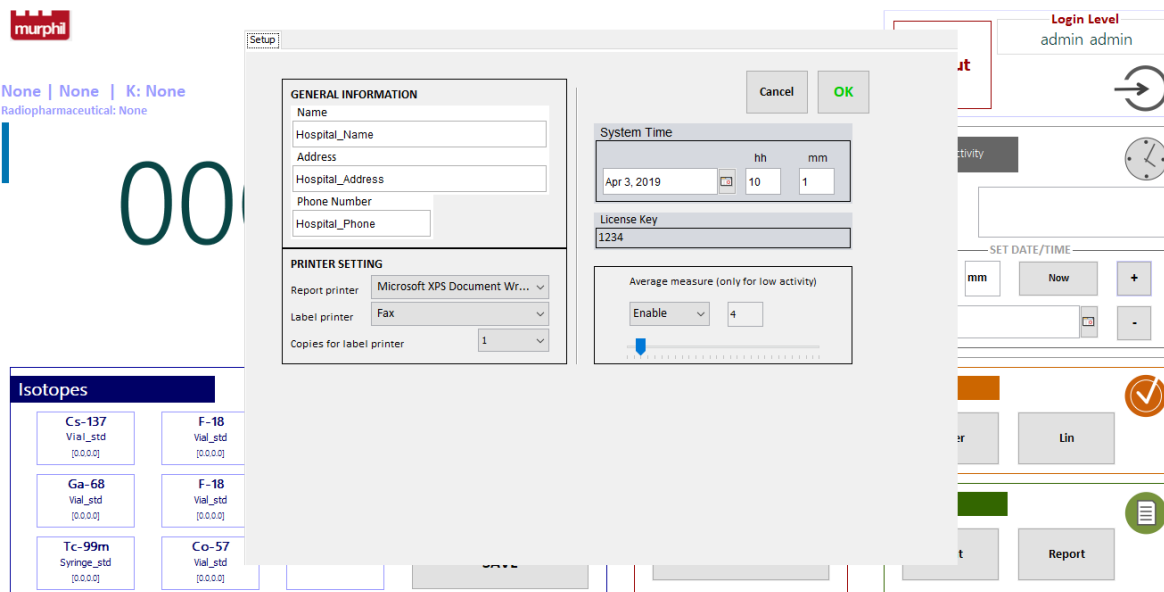


2 GENERAL OVERVIEW OF THE DEVICE

DAMO (refer to DAMO 2: DAMO) is a family of activity dose calibrators, specifically designed to measure most gamma (and beta) emitting isotopes used in Nuclear Medicine and PET Centers. The device comes with a factory set of calibration factors for two standard geometries (Vial and Syringe) but gives operator the possibility to insert (and calibrate) all isotopes/geometries combinations he needs. The customer can customize the software with information (look at DAMO 3: General information)



DAMO 2: DAMO



DAMO 3: General information

The ionization chamber - the device's part sensitive to radiation - is made of aluminum and is optimized for having high efficiency to gamma emitting isotopes. Nevertheless, it is possible to measure also beta-emitting isotopes by means of secondary radiation (X-rays) production. In the latter case, operators are required to possess a good knowledge of effects of geometry and materials in order to obtain accurate calibrations and measurements.

2.1 SOFTWARE LICENCE AGREEMENT

DAMO is provided with a software licence. A recovery copy is also present, to install the software in another PC (if the dedicated PC doesn't work properly).

2.2 IONIZATION CHAMBER

The ionization chamber is the sensitive part to ionizing radiation. The chamber is aluminium made and it is specifically designed for application in activity meter for radiopharmaceuticals.

It is a pressurized well-type chamber that comes in two main configurations, just differing in terms of gas pressure:



- **ARGON 15 BARS:** this configuration has 15 bars ultrapure argon filling. This chamber finds mainly applications for QC laboratories and standard production facilities. The measuring range (with full linearity over the range) is up to 8 Curies (296 GBq) of F-18
- **ARGON 7 BARS:** this configuration has 7 bars ultrapure argon filling. This chamber finds mainly applications for heavy production facilities. The measuring range (with full linearity over the range) is up to 20 Curies (740 GBq) of F-18

By using the same gas but at different pressures, just the absolute efficiency changes while the relative efficiencies ratios between different geometries and isotopes remains unaltered.

2.3 ELECTRONICS

Electronics of DAMO is composed of two boards:

- ELECTROMETER BOARD
- CONNECTIVITY BOARD

ELECTROMETER BOARD

This board is directly coupled to the ionization chamber and it is responsible for:

1. Producing the high voltage polarization for the chamber (500Vdc). This high voltage applied to anode and cathode of the ionization chamber allow to create the ionization current
2. Collecting and quantifying the ionization current via a high accuracy current measuring circuitry.
3. Conversion of the analog signal into a digital value
4. Communication of the value via serial interface

All tasks are performed by an integrated microcontroller.



CONNECTIVITY BOARD

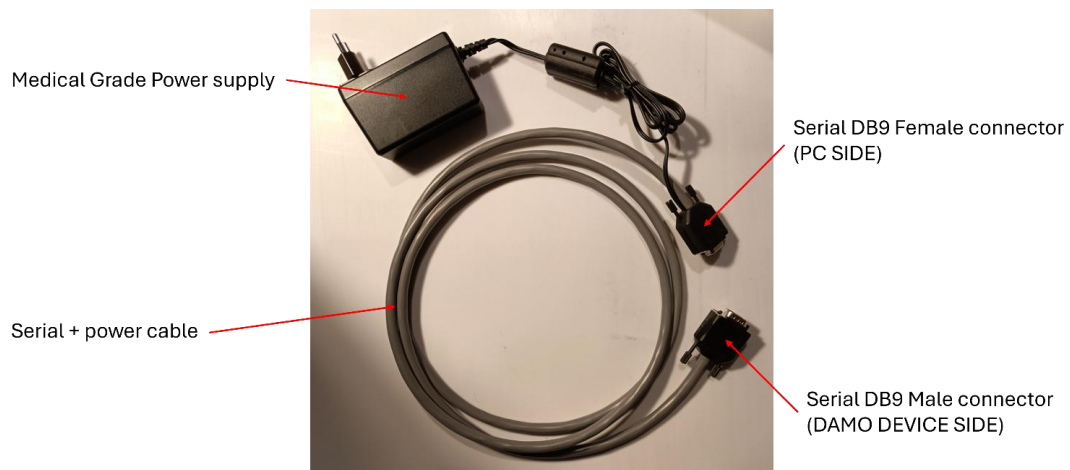
This board provides an additional Medical Grade insulation of both RS232 signals and external power supply. This is to assure insulation of the accessible external connector of the device.

This board only performs insulation of serial signal, so the same RS232 serial modality of the Electrometer board is fully maintained.

In this configuration the HMI software and database resides over an external PC and the DAMO device only perform measurement and communicates with the external PC via a proprietary serial protocol.

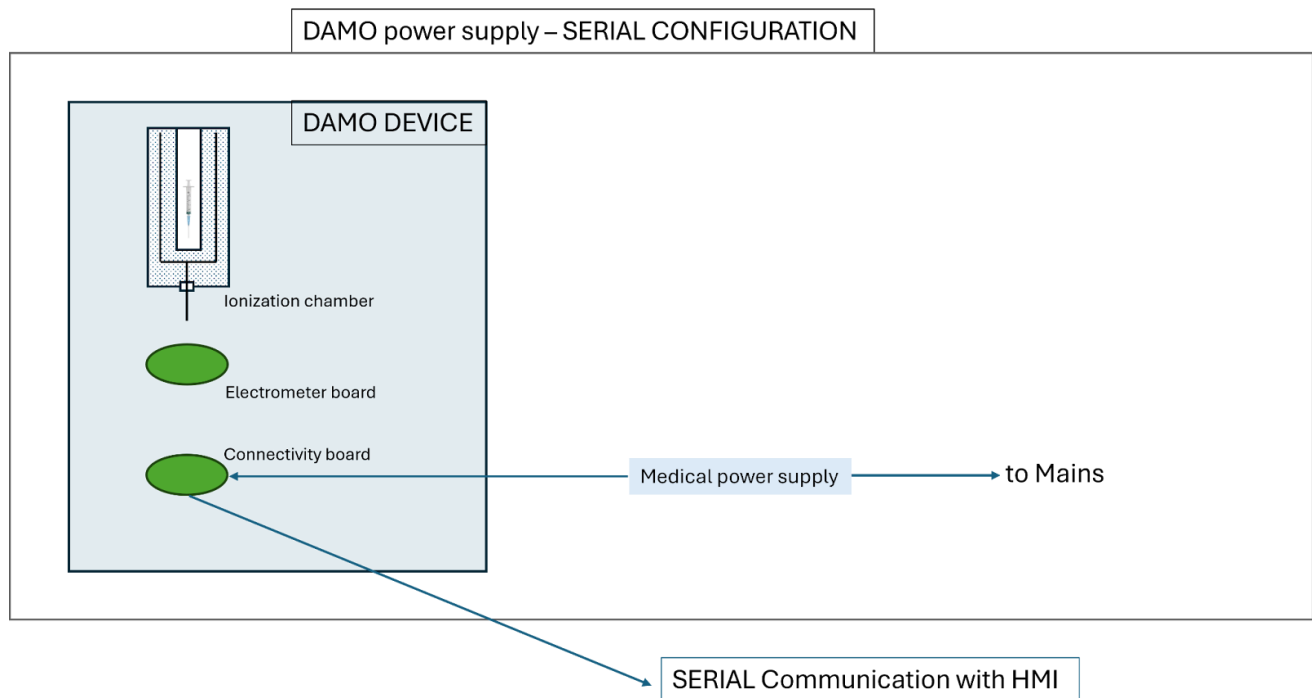
2.4 POWER SUPPLY AND CABLES

The power supply and cables kit is composed of a single cable bringing both signals and power supply. The medical grade power supply is connected to the cable as shown in the picture below:





In serial modality the power supply is done via a medical grade power supply and communication is via three-wire RS232 cable.



DAMO 5: DAMO power supply

To overcome some installation issues, the DAMO_EB board allows to be powered up with PoE injector which allows to cover longer distances (over the 3mt of the standard cable kit with 24Vdc power supply). The system is laboratory tested with the PoE injector (model Microsemi PD-9001GR/AT/AC). This injector is a compatible device and is not included in the standard supply.



3 TECHNICAL SPECIFICATIONS

Table 3: DAMO configurations and models

DAMO Configurations and Models

Model	DAMO S8	DAMO S20	DAMO S8M
Energy Range	25 keV ÷ 4 MeV		DAMO S8M has the same specifications of DAMOS8 but includes the DAMO-Mo99SA (Molybdenum kit) in the supply.
Operating Voltage of electrometer	-500 V		
Filling gas	Ultrapure Argon		
Filling pressure	15 bar	7 bar	
Chamber Internal Dimensions	Well Ø = 70 mm well depth = 265 mm Overall Ø = 115 mm height = 317 mm		
Chamber external dimensions	Ø = 150 mm h = 430 mm	Ø = 150 mm h = 430mm	
Shielding	4 mm Pb		
Chamber weight	14.2 kg		
Power supply	100/240 V, 50/60 Hz via PoE or 24 Vdc adapter Model Mean Well GSM36E24-P1J		
Measurement Range	Auto Ranging Up to 296 GBq (8Ci) of F-18	Auto Ranging; Up to 740 GBq (20Ci) of F-18	
Resolution	0.001 MBq max	0.01 MBq max	
Repeatability over 24 h	Within ±1%		
Electrometer Accuracy	Within ±1%		
Electrometer Linearity over full range	Within ±1%		
Electrometer Response Time	Min 0.2 sec; Max 10 sec		
Electrometer Built-in Diagnostics	Zero Adjustment, High Voltage		



3.1 DETACHABLE PARTS

Detachable parts of DAMO, included in the packaging, are:

- **SAMPLE HOLDER:** this is the plastic holder for the radioactive sources. It is inserted in the well of the ionization chamber (models DAMO S8, DAMO S8M and DAMO S20).
- **MOLYBDENUM KIT:** this is a special holder with shielding, necessary to perform a specific quality check over radiopharmaceuticals (only for DAMO S8M model)
- **Dedicated cable kit for ALL MODELS**

3.2 COMPATIBLE PRODUCTS

The following products are compatible with DAMO device:

PC: any PC with with the following minimal specifications:

- WINDOWS 10/11 pro
- 1xSerial port (or USB port + USB/RS232 converter)
- System memory: 256 GB
- RAM: 8GB
- Screen resolution. 1366x768

LABEL PRINTER: USB thermal printer for labels -> model BROTHER QL800

PoE injector -> model Microsemi PD-9001GR/AT/AC

For the correct codes please refer to chapter 7.

3.3 PACK CONTENT

DAMO S8/S8M and S20 configurations

Before proceeding with installation of the device, it is important to verify the content of the box when unpacking the device. It is also important to check the integrity of all components.

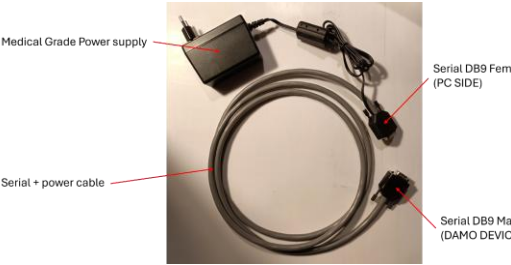
Table 4: DAMO configurations

ITEM	Picture	Description	Model
------	---------	-------------	-------



CHAMBER IC8		1 x Integral Device with integrated electronics Chamber is Argon 15BAR for DAMO S8 and S8M	S8 S8M
CHAMBER IC20		1 x Integral Device with integrated electronics Chamber is Argon 7BAR for DAMO S20	S20
Sample Holder		1 x sample holder with liner	S8 S8M S20



SERIAL POWER SUPPLY AND CABLE KIT		1 x RS232 cable with power supply	S8 S8M S20
Molybdenum kit Included in DAMOS8M This Kit is used for SPECT: it's possible to check the Mo-99 contamination in a Tc-99m solution.		ONLY FOR DAMO S8M	S8M

4 DEVICE INSTALLATION

4.1 PRELIMINARY

Before installation, it is suggested to verify the presence of all components. As a first approach to the device, it is important to get acquainted with the PC and, in particular, with the ports, connectors and indicators placed on it.

4.2 COMPATIBLE PC

On the back panel of the computer are present all the necessary ports for the instrument functioning and the power plug for connecting the power supply.



	DAMO 6: Compatible PC
	DAMO 7: Serial port
	DAMO 8: PC Rear panel

4.3 DAMO – PC AND DEVICE CONNECTIONS

Following is a description the cabling, installation and powering up procedure for the device.



It is recommended to follow the following cabling procedure, in order to avoid damage to instrument and injury to operators



DAMO is connected and powered via the serial+power serial cable kit (which includes the power supply).

Serial connection is present via a female SUB-D connector on the bottom part of the device, as well as the RJ-45 connector provides connection for PoE/Ethernet.

In order to use the serial kit + power supply, it is necessary to connect the female connector of the kit with the DAMO device and the male connector on the back of the PC in the left serial port:

	DAMO 9: Serial cable connection
	DAMO 10: Connection to the PC

4.4 POWER SUPPLY

After connections of the cable kit, connect the Medical Grade POWER SUPPLY to the mains. This will power up DAMO device.



4.5 CONNECTION TO MAINS AND POWER ON

After connecting the power supply to the power supply via the cable, you can switch on the system. Wait for DAMO software starting, so you can use the instrument.

 CAUTION	When receiving the device wait until it is stable with room temperature. Then proceed with first power on.
 CAUTION	 If a compatible PoE injector is used, connect the RJ45 plug to the DAMO PoE port and the other RJ45 plug to the OUT port of the PoE injector 
 DANGER	When the device is powered by the 24Vdc medical power supply (mod. MeanWell GSM36E24-P1J), make sure to have easy access to the injector disconnection point shown below: 

4.6 WARM-UP



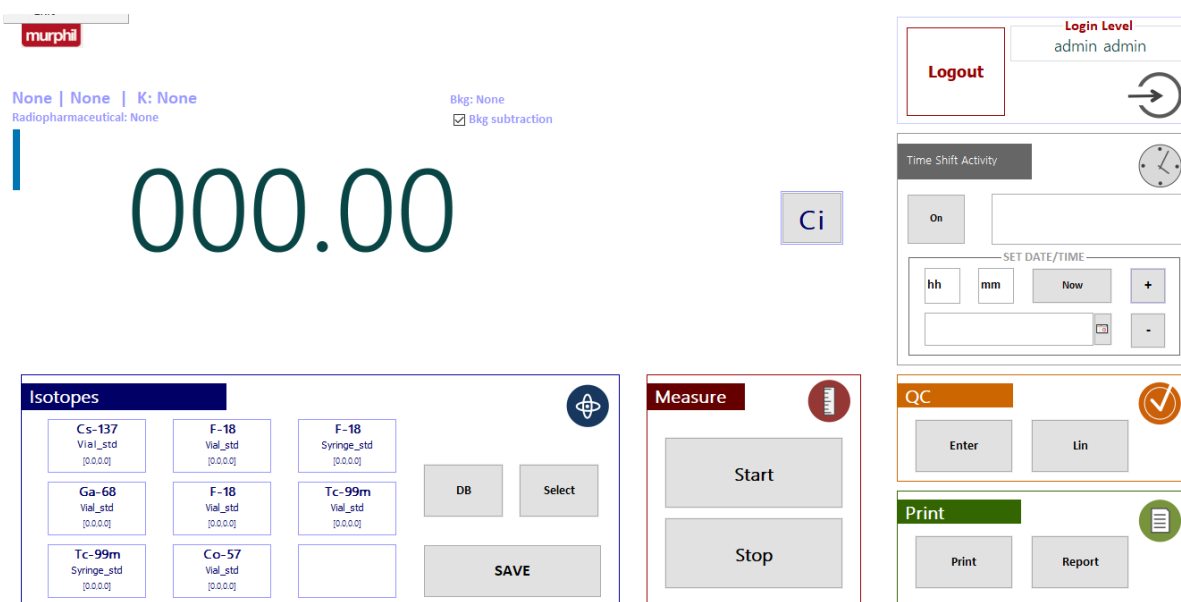
Wait at least one hour after power on before use. This permits the electronics components to stabilize before running radioactive sample measurements.

 CAUTION	The instrument is conceived for continuous use. In case it is not possible to keep it powered on, wait at least one hour after power on before use.
---	--

4.7 DEVICE POWER OFF

 CAUTION	Pay attention to the following power off procedure. Even if the instrument has a software protection in case of accidental power failure, it is necessary to follow a correct power off sequence in order to preserve device lifetime and data integrity.
---	--

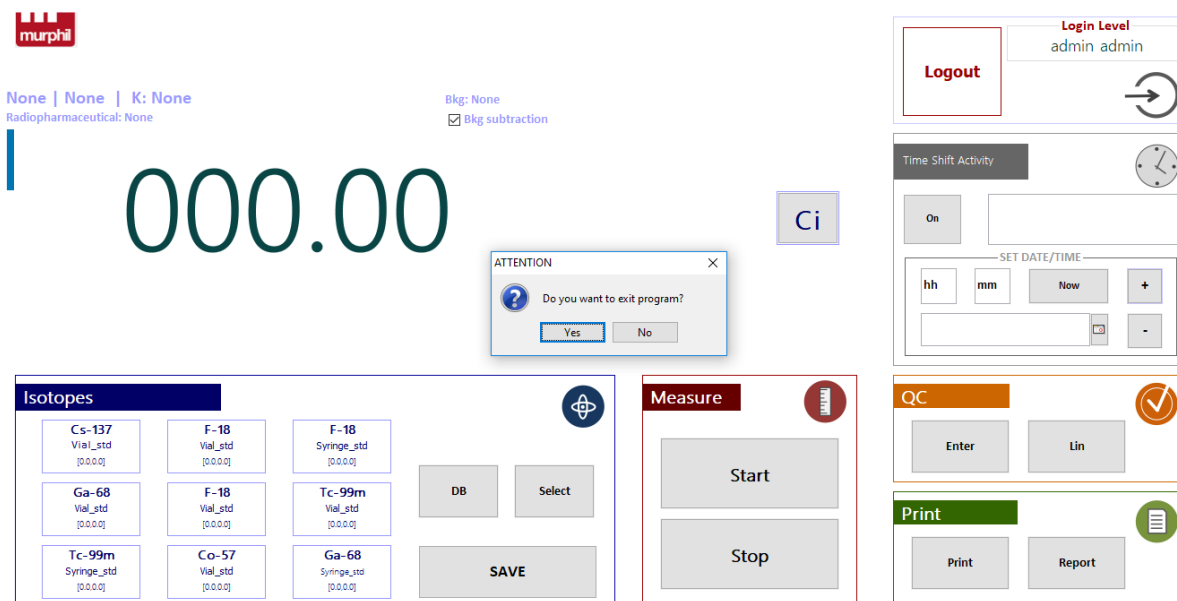
The system must be switched off by executing software shutdown before the power disconnection. From the DAMO software (look at DAMO 11:File menu) select File>>EXIT from the upper menu bar, a dialog window appear, asking if user want to exit from the program; select YES to exit; select NO (only for administrator level privileges DAMO 12:Login as Administrator to exit program) to exit DAMO software without shutting down the system (look at DAMO 13: Exit program window). After this operation, it is possible to follow the standard procedure of Windows shut down: select Start>Turn Off Computer>Turn Off. Once shutdown is completed the device is turned off.



The screenshot displays the DAMO software interface with the following components:

- Top Bar:** Includes the Murphil logo, status indicators (None | None | K: None), and background settings (Bkg: None, Bkg subtraction checked).
- Large Display:** Shows a large numerical value "000.00" and a unit indicator "Ci".
- Isotopes Panel:** A grid of buttons for selecting isotopes: Cs-137, F-18, F-18, Ga-68, F-18, Tc-99m, Tc-99m, and Co-57. It also includes buttons for "DB", "Select", and "SAVE".
- Measure Panel:** Features "Start" and "Stop" buttons.
- QC Panel:** Includes "Enter" and "Lin" buttons.
- Print Panel:** Includes "Print" and "Report" buttons.
- Right Sidebar:** Contains a "Logout" button, a "Login Level" section showing "admin admin", a "Time Shift Activity" section with an "On" button and a clock icon, and a "SET DATE/TIME" section with "hh", "mm", "Now", and "+" buttons.

DAMO 12:Login as Administrator to exit program



DAMO 13: Exit program window

5 WORKING WITH THE SOFTWARE

5.1 GENERAL INSTRUCTIONS

This chapter describes the interface software, in order to get the user familiar with the instrument gradually. For a detailed description please refer to following chapters. The DAMO software starts automatically at PC start up; in case user exit the interface software, it will be possible to restart it by double-clicking on the icon present on the desktop. The next figure shows the home page which appears at startup. On the right side it is shown the control interface for one ionization chamber, while on the left it is shown the case of dual ionization chamber. At first software startup the default operator is “Guest” and can work with the instrument just to perform measurement. All other functions of the device, such as calibration, QC, Database Management, print and report creation are prohibited to level “Guest”.

Management of operators can be done via a dedicated Login page; there are three levels of privileges:

- a. “Guest” level: this level allows just measure function



- b. “User” level: this level allows all operations except Modify and Delete operations of database items.
- c. “Administrator” level: this level allows to execute all operations, including operator’s management (add/delete operators).
- d. “Super-user” level: this level is present just for technical assistance due to Murphil’s personnel.

5.2 HOME PAGE

This paragraph describes functionalities of the home page (look at DAMO 14: DAMO home page).

DAMO 14: DAMO home page

Table 5: Software icons

Symbol	Name	Functions
	Home	Measurement display Selected Isotope, Geometry, Calibration Factor, Radiopharmaceutical Measured background, Background subtraction Current Measurement Unit (Bq or Ci) Current DATE/TIME



	Isotopes	Isotope selection from the DB Geometry selection Access to the shortcuts to the preferred Isotope+Geometry combinations
	Measure	Start measure Stop measure
	Time shift activity	Settings for the measurement of activity at a different time (typical is future time). This functionality is very useful in case the application/injection time is different from preparation time.
	QC	Access to the QC list Calibration menu
	Print	Print labels Print reports
	Login	In a square the current operator is shown. Login button turns to Logout button once access is executed.

DAMO 15: DAMO home page structure

5.3 LOGIN

If operator is recorded in the list of operators of the device, he can execute Login, in order to exploit all functionalities related to his level privileges.

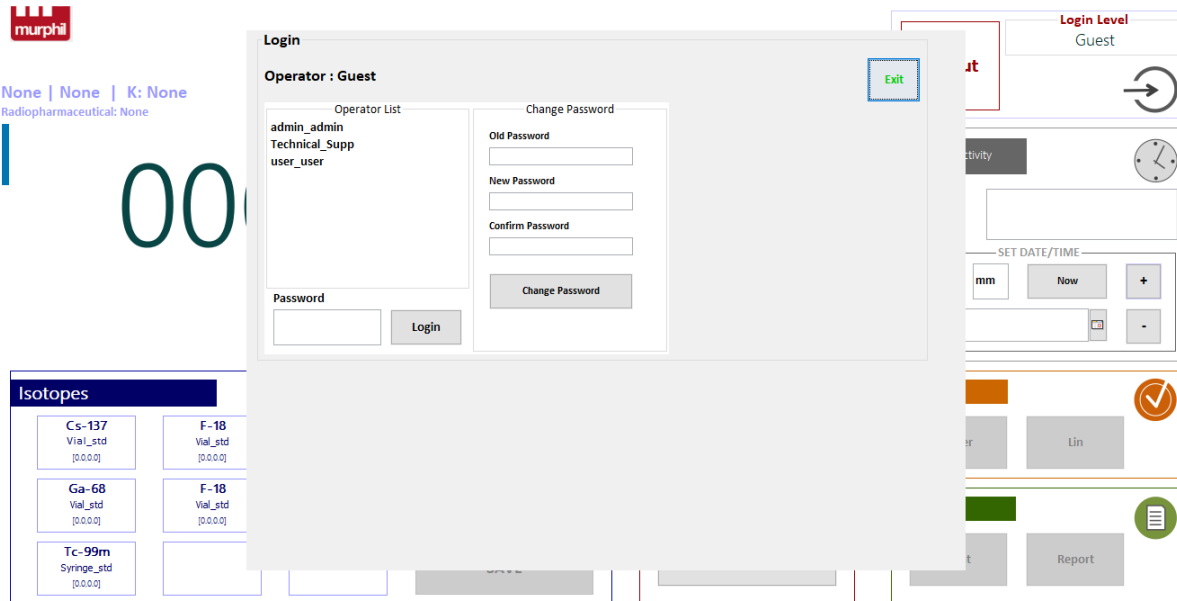
In order to execute this operation, it is necessary to press Login button. A window, like in the figure DAMO 17: Login as Admin), will appear.

Table 6: factory settings

Factory administrator setting is defined as follow:
Default login: admin_admin
Password: admin



Level: Administrator



DAMO 16: Login window



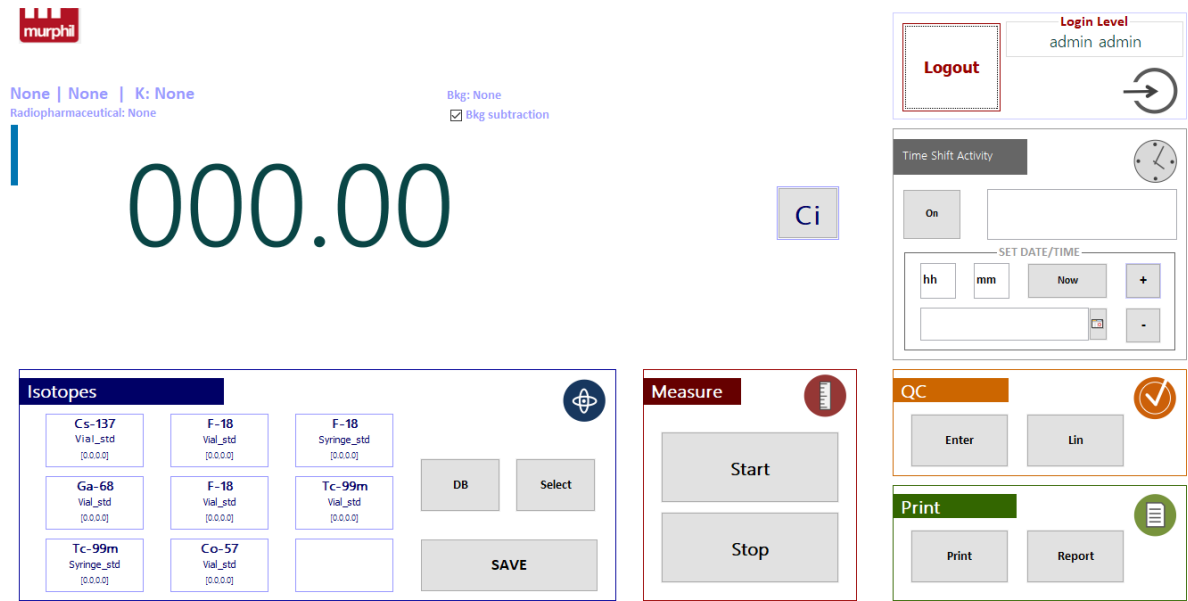
DANGER

At the first login is highly recommended to change the default password of administrator in order to ensure safety to the instrument

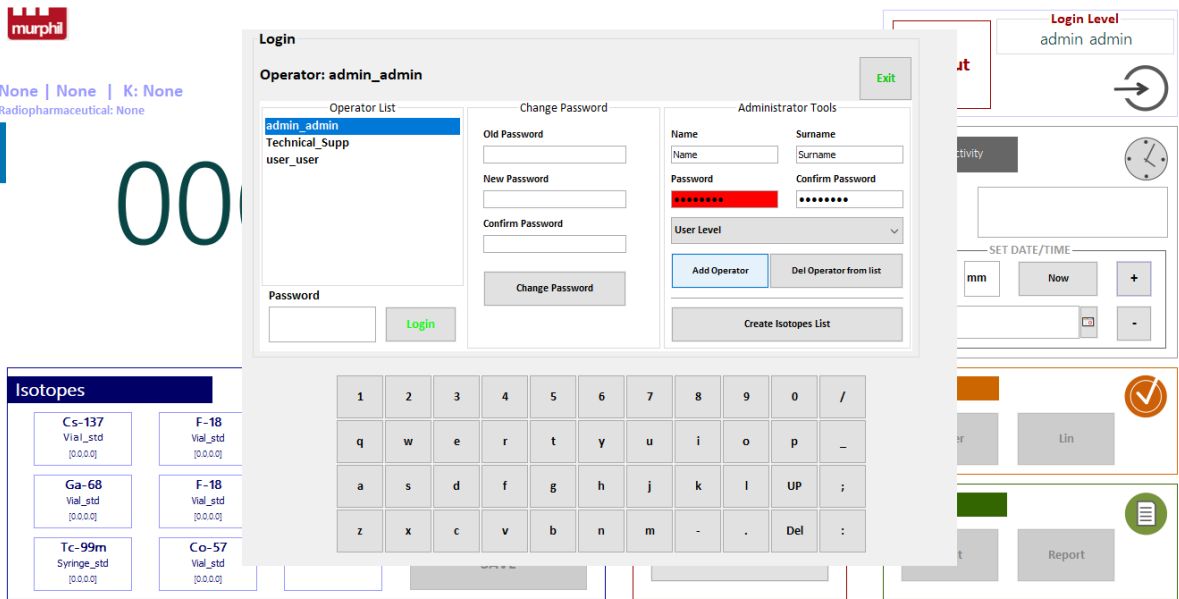
In the section Operator List there is the operator's list. In this introductory chapter the access as "Administrator" will be shown (look at DAMO 17: Login as Admin), because is the most complete in terms of functionalities. "User" can access in the same way but has less privilege. The operator must select the name from the operator's list and press the Password Field: the virtual keyboard will appear in order to write the password. Press Login: if the password is correct, Login button turns green and all the fields on the right will appear. Login as administrator allow you to perform all management operations users, allowing you to add and delete users from the list of operators and define their privileges (look at DAMO 18: Add operator menu, DAMO 19: New operator addition, DAMO 20: New operator correctly added to the operator list). Press EXIT at the top right corner of the login screen to come back to main page.



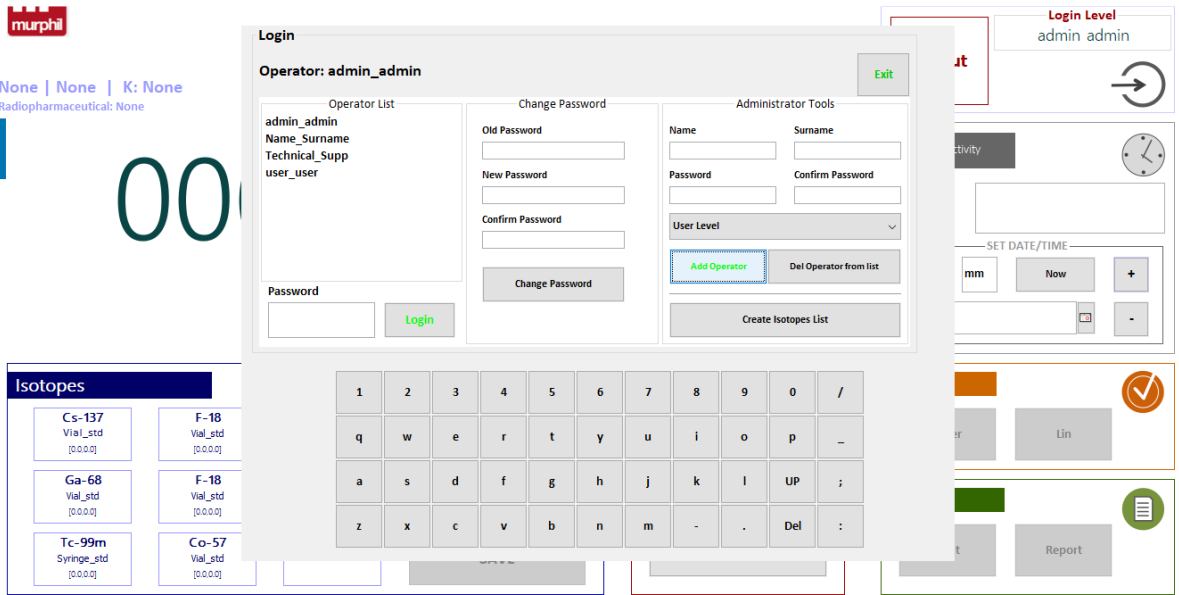
Note: in case of “User” level login, some fields will be disabled.



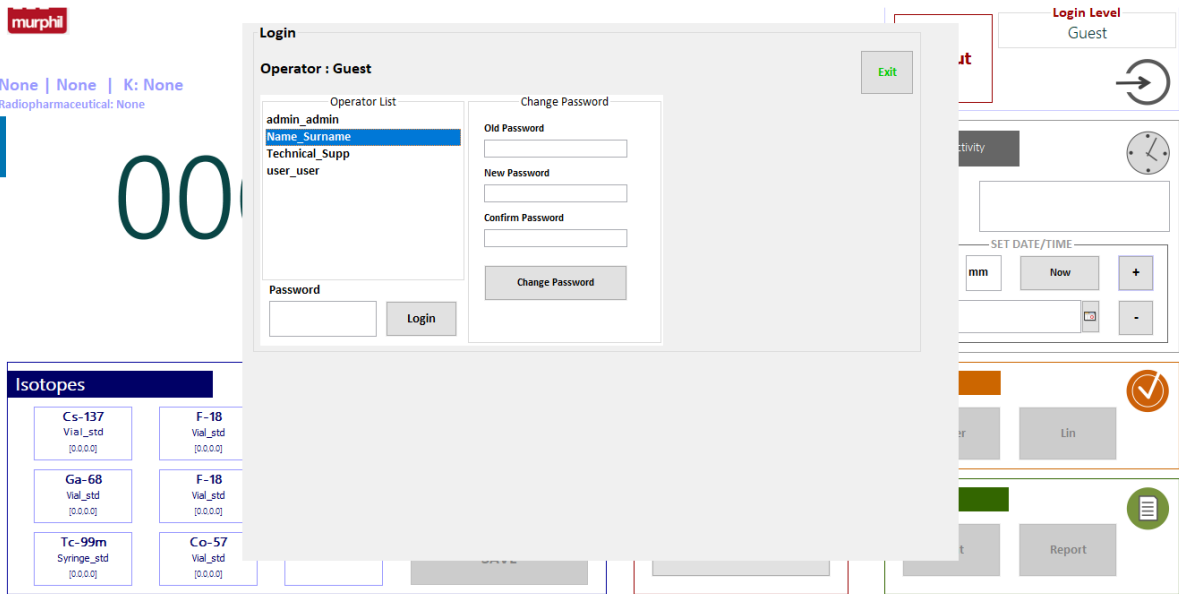
DAMO 17: Login as Admin



DAMO 18: Add operator menu



DAMO 19: New operator addition

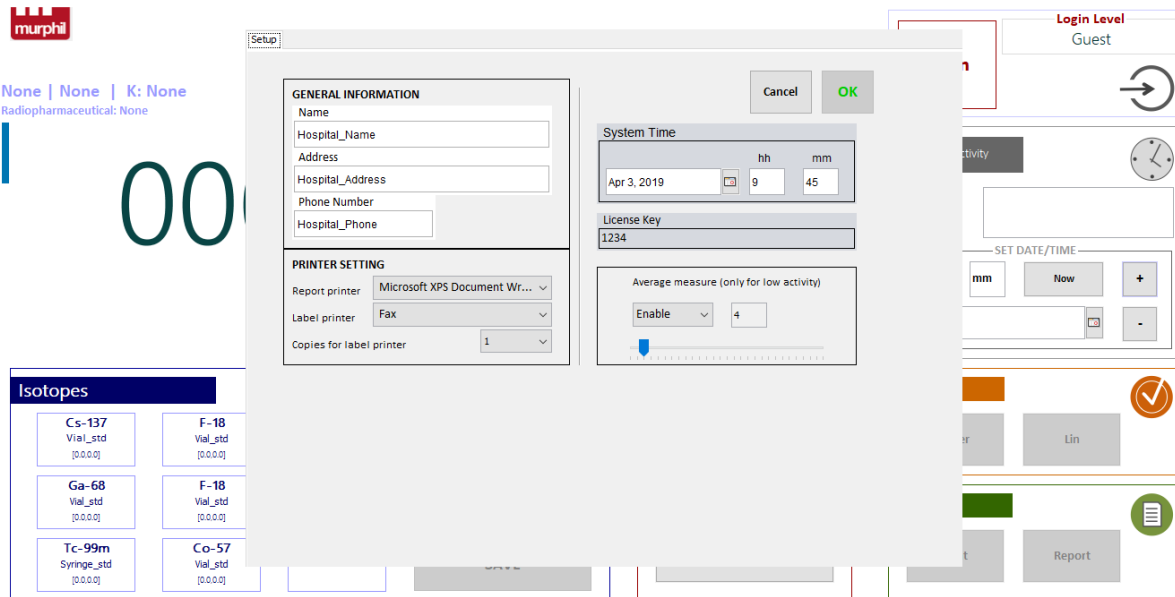


DAMO 20: New operator correctly added to the operator list



5.4 SETUP

After you have logged in with administrator privileges, you can proceed with the software settings from menu File >> Options.



DAMO 21: Setup window

- In the section "GENERAL INFORMATION" we can enter the information that will be printed in the identification labels (no spaces in the fields, to connect more words to use "_").
- In the "PRINTER SETTING" we can select the printer that will be used for reports and labels. With regard to the labels you can also define the number of copies that will be printed.
- In the "System Time" you can change the date and time of the system (for technical reasons, the time is not updated automatically). It is recommended to periodically check the correctness of the date and time of the system.
- In the "License Key" is displayed on the license of the software, it is strongly recommended not to change this code.
- In the "Average Measure" you can enable the average of the measurements at low activity (measurement update every 10 seconds) and define the number of points to be averaged. At low activity of the variability measure is greater and can then be corrected by enabling the average of the measurements. In order to obtain a measure mediated correct (with the average of the measurements



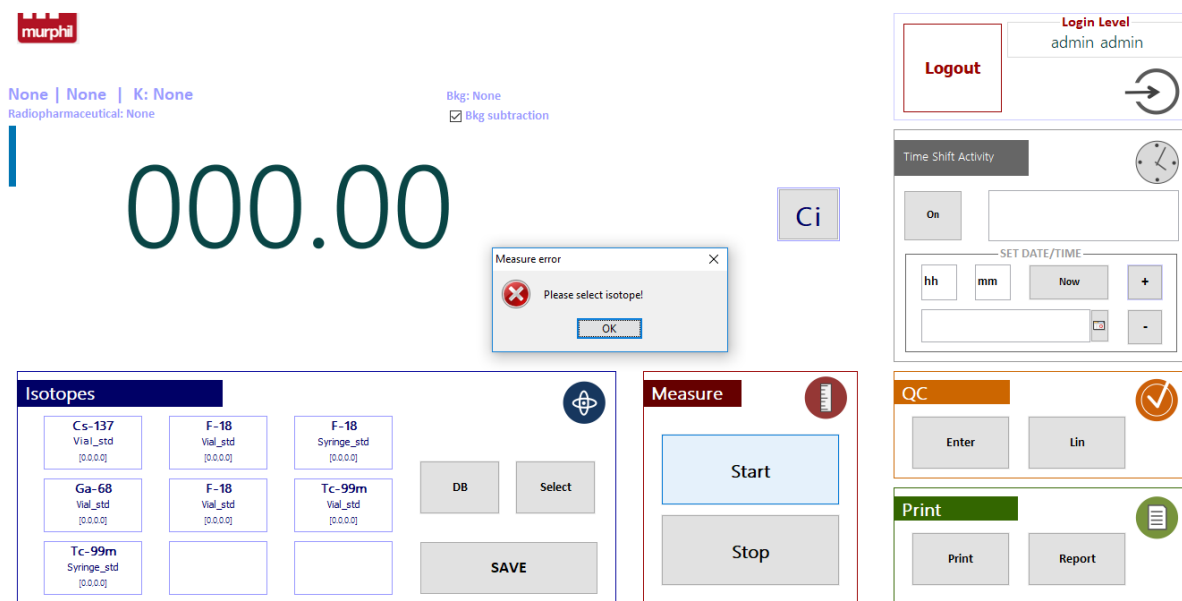
enabled) is desirable to incorporate the radioactive sample in the chamber and subsequently start the measurement.

5.5 ISOTOPES

The isotopes menu is based on database allowing you to create a relational structure between isotopes and geometries. Therefore, we have the possibility of having independent tables, respectively isotopes table, geometries table and finally radiopharmaceuticals table. After defining these tables, we can create the associations we need.

○ ISOTOPE SELECTION

Before performing a measurement, it's necessary to set the isotope and the geometry.



DAMO 22: Select isotope

To select and measure the isotope and related geometry is necessary to press the Select button (look at DAMO 22: Select isotope). At this point it will open a new window containing all the isotopes



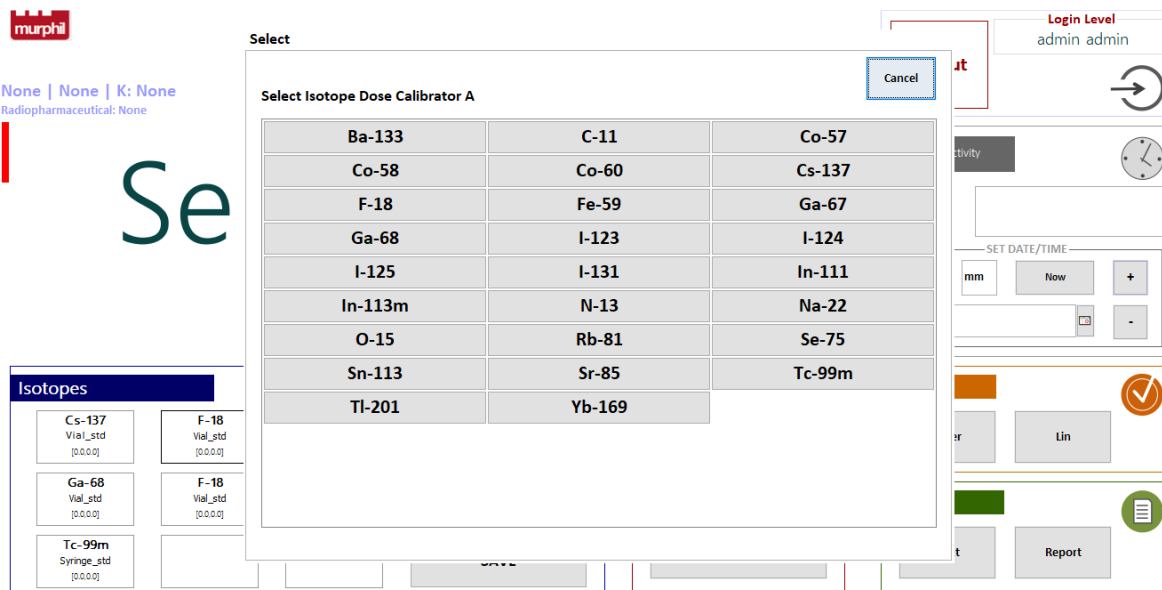
calibrated, subsequently press the requested button until the preset is finished. The selected data will be displayed in the home page (look at DAMO 26: Isotope and geometry correctly selected).

○ SELECT ISOTOPE, GEOMETRY, USE OF THE SHORTCUTS

The screenshot displays the Murphil software interface. At the top left is the Murphil logo. Below it, the text "None | None | K: None" and "Radiopharmaceutical: None" is visible. A large digital display shows "000.00". To the right of the display is a button labeled "Ci". Below the display is a panel titled "Isotopes" containing a grid of buttons for different isotopes: Cs-137, F-18, F-18, Ga-68, F-18, Tc-99m, Tc-99m, and Co-57. Each button also indicates the container type (e.g., Vial_std, Syringe_std) and a status (e.g., [0.0.0.0]). To the right of the grid are buttons for "DB", "Select", and "SAVE". To the right of the "Isotopes" panel is a "Measure" panel with "Start" and "Stop" buttons. Further right is a "QC" panel with "Enter" and "Lin" buttons, and a "Print" panel with "Print" and "Report" buttons. At the top right, there is a "Login Level" section showing "admin admin" and a "Logout" button. Below this is a "Time Shift Activity" section with a clock icon and a "SET DATE/TIME" section with fields for "hh", "mm", "Now", and buttons for "+", "-", and a calendar icon.

DAMO 23: Isotope selection button

Press Select in the Isotopes menu (look at DAMO 23: Isotope selection button); select the Isotope from the Isotopes list DAMO 24: Isotopes list), select the Geometry from the Geometries List (DAMO 25: Geometry selection). The window DAMO 26: Isotope and geometry correctly selected



None | None | K: None
Radiopharmaceutical: None

Se

Isotopes

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	

Select

Select Isotope Dose Calibrator A

Ba-133	C-11	Co-57
Co-58	Co-60	Cs-137
F-18	Fe-59	Ga-67
Ga-68	I-123	I-124
I-125	I-131	In-111
In-113m	N-13	Na-22
O-15	Rb-81	Se-75
Sn-113	Sr-85	Tc-99m
Tl-201	Yb-169	

Cancel

Login Level
admin admin

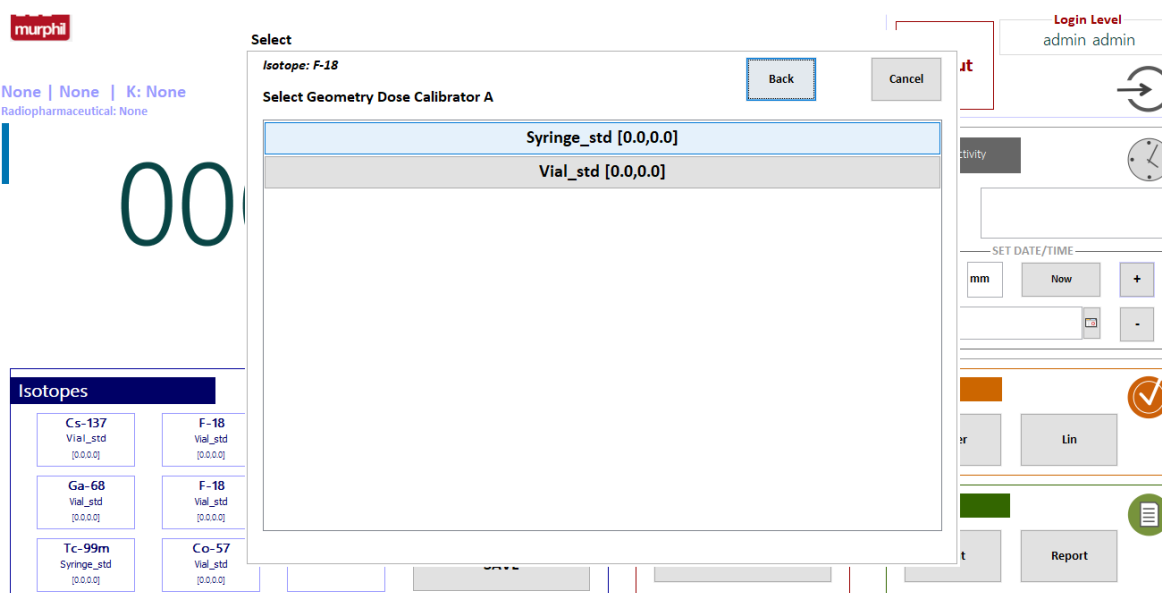
Activity

SET DATE/TIME

mm Now +

Report

DAMO 24: Isotopes list



None | None | K: None
Radiopharmaceutical: None

00

Isotopes

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]

Select

Isotope: F-18

Select Geometry Dose Calibrator A

Syringe_std [0.0,0.0]
Vial_std [0.0,0.0]

Back Cancel

Login Level
admin admin

Activity

SET DATE/TIME

mm Now +

Report

DAMO 25: Geometry selection



Isotopes

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	F-18 Syringe_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	Tc-99m Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]	

DB Select SAVE

Measure

Start Stop

QC

Enter Lin

Print

Print Report

Time Shift Activity

On

SET DATE/TIME

hh mm Now + -

DAMO 26: Isotope and geometry correctly selected

After selecting the isotope and related geometry, we can perform a measurement.

Isotopes

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	F-18 Syringe_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	Tc-99m Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]	

DB Select SAVE

Measure

Start Stop

QC

Enter Lin

Print

Print Report

Time Shift Activity

On

SET DATE/TIME

hh mm Now + -

DAMO 27: Measurement example



In this menu we can also create the shortcuts.

To store the shortcut:

- Make your selection
- Press SAVE button
- In this position will appear the stored selection, every time you press it will be selected the related isotope, geometry and radiopharmaceuticals (optional).

The screenshot displays the DAMO 28 user interface with several panels:

- Top Left:** Displays the selected isotope and geometry: "Ga-68 | Syringe_std [0.0,0.0] | K: 902.404". Below this, it shows "Radiopharmaceutical: None" and "Bkg: 16.117 kBq" with a checked "Bkg subtraction" option.
- Top Right:** Includes a "Logout" button, a "Login Level" indicator showing "admin admin", and a circular arrow icon.
- Center:** A large display shows "Ga-68" in green text, with a small "Ci" unit indicator to its right.
- Bottom Left (Isotopes Panel):** A grid of buttons for selecting isotopes and geometries:

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	F-18 Syringe_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	Tc-99m Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]	

 To the right of the grid are "DB" and "Select" buttons, and a large blue "SAVE" button at the bottom.
- Bottom Center (Measure Panel):** Contains "Start" and "Stop" buttons.
- Bottom Right (QC and Print Panels):**
 - QC Panel:** Includes "Enter" and "Lin" buttons.
 - Print Panel:** Includes "Print" and "Report" buttons.

DAMO 28: Shortcut creation



The screenshot displays the main interface of the DAMO instrument. At the top left, the 'murphil' logo is present. The main display area shows 'Ga-68 | Syringe_std [0.0,0.0] | K: 902.404' and 'Radiopharmaceutical: None'. Below this, a large 'Ga-68' is displayed. To the right, a 'Ci' button is visible. The interface is divided into several sections: 'Isotopes' (a grid of buttons for various isotopes like Cs-137, F-18, Tc-99m, Co-57, and Ga-68, with 'DB' and 'Select' buttons), 'Measure' (with 'Start' and 'Stop' buttons), 'QC' (with 'Enter' and 'Lin' buttons), and 'Print' (with 'Print' and 'Report' buttons). A 'Logout' button is in the top right corner. A 'Time Shift Activity' section with a clock icon and 'SET DATE/TIME' controls is also present.

DAMO 29: New shortcut added

To delete the shortcut:

- Finish the measurement in progress
- Press the stored selection for 5 second
- The selection area will be reset.

 CAUTION	DAMO instruments allow to insert an indefinite number of isotopes and geometry. Nevertheless, the calibration refers all its calibration factors to two standard geometries (Vial and Syringe); these two factory pre-set geometries are so named: 1 Vial_std[0.0,0.0] 2 Syringe_std[0.0,0.0]
--------------------	---

○ DB (DATABASE)

All calibration factors are so referred to these geometries; the meaning of the number inside the square parenthesis is:

- First number = volume (ml)
- Second number = filling volume (ml)



All geometries, such as for example Vial[10.0,5.0] (Vial of 10ml with 5ml filling) must be calibrated by the final user.

The Vial_std[0.0,0.0] and Syringe_std[0.0,0.0], default as standard, doesn't mean ZERO volume and ZERO filling; it is just a way to define a standard and leave operators all volume/filling combination possibilities.

Different geometries, inserted by the user, need an absolute calibration: you have to do the calibration of instrument. If an isotope is not present in the DB, it is necessary to insert the isotope and the related geometries (radiopharmaceutical = facultative field).

Calibration factors are always associated to an isotope/geometry combination. To insert a new isotope, press DB button in the Isotope window on the main page. Will appear the following pages: refer to DAMO 24: Isotopes list). Login as Administrator: all the function are enabled.



None | None | K: None

Radiopharmaceutical: None

Isotopes

Geometries

Radiopharmaceuticals

Login Level
admin admin

ISOTOPE TABLE		
Name	Half Life	Unit
Ba-133	10.51	Years
C-11	20.39	Minutes
Co-57	271.79	Days
Co-58	70.86	Days
Co-60	5.27	Years
Cs-137	30.07	Years
F-18	109.77	Minutes
Fe-59	44.50	Days
Ga-67	3.26	Days
Ga-68	67.70	Minutes
I-123	13.27	Hours
I-124	4.18	Days
I-125	59.41	Days
I-131	8.02	Days
In-111	2.81	Days
In-113m	1.66	Hours
Lu-177	6.65	Days
Mo-99	65.94	Hours
N-13	9.96	Minutes

Dose Calibrator A

Isotope Table Tools

Master isotope

Insert

Modify

Delete

Set master

Isotopes

Cs-137
Vial_std
[0.0.0.0]

F-18
Vial_std
[0.0.0.0]

Ga-68
Vial_std
[0.0.0.0]

F-18
Vial_std
[0.0.0.0]

Tc-99m
Syringe_std
[0.0.0.0]

Co-57
Vial_std
[0.0.0.0]

Dose Calibrator A

Isotope Table Tools

Master isotope

Insert

Modify

Delete

Set master

The screenshot shows the 'Dose Calibrator A' software interface. The main window has a 'GEOMETRY TABLE' with the following data:

Geometry	Volume	Filling	K_absolute	K_relative
sir-lut1	3.0	2.9		
sir-lut2	3.0	2.0		
Syringe_std	0.0	0.0		
Test	0.0	0.0		
Vial_std	0.0	0.0		

To the right of the table is a 'Dose Calibrator A' panel. It contains a 'Geometry Table Tools' section with the following buttons: Insert, Modify, Delete, and Normalize. Above these buttons is an 'Isotope' dropdown menu set to 'None'. The background shows a blurred view of the main application window with tabs for 'Isotopes', 'Geometries', and 'Radiopharmaceuticals'.



The button's function in the DB management page is the following:

- **Insert:** allows to insert a new isotope or geometry. In the table of geometries we can insert a new geometry if the selector Isotope shows None. Selecting an isotope from the Isotope and pressing the Insert button, it will be associated with geometry already in the database (this related geometry needs to be calibrated).
- **Modify:** allows to modify isotope or geometry data.
- **Delete:** allows to delete the corresponding isotope or geometry. Pay attention: if you delete an Isotope or geometry, will be delete all the relative association.
- **Set Master:** allows to define the reference isotope, which is the isotope to which all relative calibration factors are referred. See "Calibration factors" sections for further details.
- **Normalize:** All the calibration factors will be re-calculated referring to the absolute calibration factor (possible also during the calibration).

○ CALIBRATION FACTORS

The instrument manages calibration factors, for each isotope/geometry combination, in this way: in the instrument database there is only one absolute calibration factor, the Master Isotope calibration factor in the Vial_std[0.0,0.0] geometry. All the other Isotopes will be stored referring to the Master Isotope.

As factory set, DAMO comes with Cs-137 Master isotope for the two standard device geometry: Vial_std[0.0,0.0] and Syringe_std[0.0,0.0]

 INFORMATION	Before any calibration, verify that the Master Isotope has been calibrated
--	--

5.6 MEASURE

○ START

To start the measure, it is necessary to select the isotope and the geometry; refer to the following steps:



- Execute Background measurement (see QC menu)
- Press Select from menu Isotopes
- Select Isotope and Geometry
- Once selected, verify on the home page the selection
- Subtract background (by selecting Bkg subtraction in the home page)
- Press Start from menu Measure
- Read activity showed in the home page
- Select Cu (Curie) or Bq (Becquerel) unit with the button in the home page.

○ STOP

To stop measure, press Stop from menu Measure.

5.7 TIME SHIFT ACTIVITY

The software allows to calculate and visualize activity at a different time with respect to current time. To use this function, it is necessary to set date and time for the activity calculation at a different time. It is necessary to proceed in this way:

- Set date. To do this, press the Calendar button in the window DAMO 33: Time shift activity: measurement)
- Set time. Select fields hh:mm:ss and use + and – buttons in Regulation menu to increase/decrease values
- Press On button. The measurement at different time will appear (refer to DAMO 32: Time shift activity: measurement in progress).



F-18 | Syringe_std [0.0,0.0] | K: 890.372
Radiopharmaceutical: None

Bkg: 15.902 kBq
☒ Bkg subtraction

14.65 kBq

Ci

Isotopes

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	F-18 Syringe_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	Tc-99m Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]	Ga-68 Syringe_std [0.0,0.0]

DB Select

SAVE

Measure

Start

Stop

Login Level
Guest

Login

Time Shift Activity

On

SET DATE/TIME

14 48 Now +

05-04-2019 -

QC

Enter Lin

Print

Print Report

DAMO 32: Time shift activity: measurement in progress

F-18 | Syringe_std [0.0,0.0] | K: 890.372
Radiopharmaceutical: None

Bkg: 15.902 kBq
☒ Bkg subtraction

49.17 kBq

Ci

Isotopes

Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	F-18 Syringe_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]	Tc-99m Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]	Ga-68 Syringe_std [0.0,0.0]

DB Select

SAVE

Measure

Start

Stop

Login Level
Guest

Login

Time Shift Activity

On

21.82 kBq

SET DATE/TIME

14 48 Now +

05-04-2019 -

QC

Enter Lin

Print

Print Report

DAMO 33: Time shift activity: measurement



Note1: to speed up operations it is possible to press Now button and all the fields will fill with current date and time. By using Regulation + and – buttons it is possible to choose a different time.

Note2: in order to avoid errors due to previous setting of date and time, the functionality works for 60 sec, after that all fields will unfilled.

5.8 QC (QUALITY CHECK AND CALIBRATION ROUTINES)

All quality check (except linearity) and calibration functions are pooled in the QC page.

QC will appear (refer to DAMO 34: QC window)

Quality check/Calibration

Dose Calibrator A
Operator: admin_admin

QC without source

☐ HV ☐ ZERO ☐ BKG

QC with source (select source)

Calibration (select source)

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi

Isotopes

Cs-137 Vial_std [0.0,0.0] F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0] F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0] Co-57 Vial_std [0.0,0.0]

Report

DAMO 34: QC window

Daily Quality checks are divided in:

- *without test sources*; they can be done without the presence of the operator
- *with test sources*: they have to be done with the presence of a specialized operator

To speed up daily checks, is possible to store the data of the radioactive sources.



At every access to the window QC, the table is updated with residual activity for each source. If the background of the field is green (look at DAMO 34: QC window), it means that the source has still a good activity to perform QC and Calibration; otherwise the field will turn red.

IMPORTANT: when the user receives the instrument has to enter the certified sources of calibration. With New button (on the right of Select Source table) user can enter sources in the database.

Quality checks that can be performed are:

- HV: Measurement (Volt) of high voltage for chamber polarization (min. 450V max.550V)
- ZERO: Measure of the voltage at the output of the amplification circuitry once the input has been disconnected from the chamber. It gives an indication of the state of the electronic board. The results are in mV. Measured value is stored in database and is use for Zero compensation. Accepted values are within $\pm 500\text{mV}$.
- BKG: Measure of environmental background. The result is in Ampere and as an equivalent activity of Cs-137 in Vial_std[0.0,0.0]. Before starting the measurement, make sure that there are no sources or radioactive substances nearby.
- Accuracy: Gives a percentage indication of how the instrument is able to measure a certificate source activity. Instrument accuracy is the difference between the mean value of ten measurement (M) and the residual activity:

$$\text{Accuracy Error \%} = \left| \frac{\text{Residual Activity} - M}{\text{Residual Activity}} \right| * 100$$

Accepted values are $\pm 5\%$, otherwise a recalibration is suggested

- Constancy: Gives a percentage measure of reproducibility over time, meant as the difference between the average of ten measurements (M) and the average of the first ten measures of



constancy stored in the database (MDB), all related to a certified source. Specifically, the following formula is applied:

$$\text{Constancy Error \%} = \left| 1 - \frac{M + \text{Norm.}}{MDb + \text{Norm.}} \right| * 100$$

Where "Norm" is the correction factor for decay. Accepted values are $\pm 5\%$, otherwise a recalibration is suggested

- Mo-99: measurement of Mo-99 breakthrough. The result is the ratio between Mo-99 activity in kBq and Tc-99m activity in MBq.

Quality check/Calibration

Dose Calibrator A
Operator: admin_admin

QC without source

☒ HV
☒ ZERO
☒ BKG

Check

Results

QC with source (select source)

Accuracy Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi

Isotopes

Cs-137 Vial_std [0.0,0.0]
F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]
F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]
Co-57 Vial_std [0.0,0.0]

Login Level
admin admin

Report

DAMO 35: QC selected



File Help

AcMe Activity Meter

05/04/2019 12:51:31

TCP/IP

None | None | K: None
Radiopharmaceutical: None

000

Isotopes

Cs-137 Vial_std [0.0.0.0]	F-18 Vial_std [0.0.0.0]
Ga-68 Vial_std [0.0.0.0]	F-18 Vial_std [0.0.0.0]
Tc-99m Syringe_std [0.0.0.0]	Co-57 Vial_std [0.0.0.0]

Quality check/Calibration

Dose Calibrator A

Operator: admin_admin

QC without source

☒ HV
☒ ZERO
☒ BKG

Check

Results

HV= 500 V ,OK

QC with source (select source)

Accuracy

Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit	
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq	New
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq	
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi	Del

Please wait...

Login Level
admin admin

Activity

SET DATE/TIME

mm Now + -

Lin

Report

DAMO 36: QC in progress

File Help

AcMe Activity Meter

05/04/2019 12:54:29

TCP/IP

None | None | K: None
Radiopharmaceutical: None

0.0

Isotopes

Cs-137 Vial_std [0.0.0.0]	F-18 Vial_std [0.0.0.0]
Ga-68 Vial_std [0.0.0.0]	F-18 Vial_std [0.0.0.0]
Tc-99m Syringe_std [0.0.0.0]	Co-57 Vial_std [0.0.0.0]

Quality check/Calibration

Dose Calibrator A

Operator: admin_admin

QC without source

☒ HV
☒ ZERO
☒ BKG

Check

Results

HV= 500 V ,OK
ZERO= 0.00 mV ,OK
BKG= 131.6E-15 A (eq Cs-137= 19.793 kBq)

QC with source (select source)

Accuracy

Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit	
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq	New
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq	
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi	Del

ATTENTION

Do you want to save background?
BKG= 131.6E-15 A (eq Cs-137= 19.793 kBq)

Yes No

Login Level
admin admin

Activity

SET DATE/TIME

mm Now + -

Lin

Report

DAMO 37: Save background



Quality check/Calibration

Dose Calibrator A
Operator: admin_admin

QC without source

☒ HV
☒ ZERO
☒ BKG

Check

Results
HV= 500 V ,OK
ZERO= 0.00 mV, OK
BKG= 131.6E-15 A (eq Cs-137= 19.793 kBq)

QC with source (select source)

Accuracy Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	30.595	MBq
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	8.992	MBq
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi

New Del

Isotopes

Cs-137 Vial_std [0.0,0.0] F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0] F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0] Co-57 Vial_std [0.0,0.0]

0.0

None | None | K: None
Radiopharmaceutical: None

Login Level
admin admin

Activity

SET DATE/TIME
mm Now + -

Lin

Report

DAMO 38: QC panel after QC measurements

Quality check/Calibration

Dose Calibrator A
Operator: admin_admin

QC without source

☒ HV
☒ ZERO
☒ BKG

Check

Results
HV= 500 V ,OK
ZERO= 0.00 mV, OK
BKG= 131.6E-15 A (eq Cs-137= 19.793 kBq)

QC with source (select source)

Accuracy Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	30.595	MBq
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	8.992	MBq
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi

New Del

Isotopes

Cs-137 Vial_std [0.0,0.0] F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0] F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0] Co-57 Vial_std [0.0,0.0]

Se

None | None | K: None
Radiopharmaceutical: None

ATTENTION
Do you want to save report?
Yes No

Login Level
admin admin

Activity

SET DATE/TIME
mm Now + -

Lin

Report

DAMO 39: Save report



In case a Calibration is necessary (see section Results on the top right of the window) it can be executed by button Calibration (only the Administrator) after you have selected the related source from Select source table.

To execute HV, ZERO e BKG it is enough to select the functions and press Check. Results are displayed in the field results. In case BKG is selected, once measured the software will ask if operator wants to save it. If saved, BKG value will be shown in the main panel and you can subtract it from the measure.

To execute Accuracy, Constancy and Calibration it is necessary to select a certified source from the table.

Example of Accuracy test: look at DAMO 40: Accuracy: select source DAMO 41: Example of accuracy failed test DAMO 42: Accuracy test: save report.

Quality check/Calibration
Dose Calibrator A
Operator: admin_admin

QC without source

☐ HV
☐ ZERO
☐ BKG

Check

Results

QC with source (select source)

Accuracy Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi

New Del

Isotopes

Cs-137 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]
F-18 Vial_std [0.0,0.0]
F-18 Vial_std [0.0,0.0]
Co-57 Vial_std [0.0,0.0]

Login Level
admin admin

SET DATE/TIME
mm Now + -

Report

DAMO 40: Accuracy: select source



Quality check/Calibration

Dose Calibrator A
Operator: admin_admin

QC without source

☐ HV ☐ ZERO ☐ BKG

Check

Results

ACCURACY= 99.968 % ,OUT OF RANGE
Please repeat accuracy or recalibrate!

QC with source (select source)

Accuracy Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit	
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq	New
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq	
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi	Del

Isotopes

Cs-137 Vial_std [0.0,0.0]

F-18 Vial_std [0.0,0.0]

Ga-68 Vial_std [0.0,0.0]

F-18 Vial_std [0.0,0.0]

Tc-99m Syringe_std [0.0,0.0]

Co-57 Vial_std [0.0,0.0]

Report

DAMO 41: Example of accuracy failed test

Quality check/Calibration

Dose Calibrator A
Operator: admin_admin

QC without source

☐ HV ☐ ZERO ☐ BKG

Check

Results

ACCURACY= 99.968 % ,OUT OF RANGE
Please repeat accuracy or recalibrate!

QC with source (select source)

Accuracy Constancy

Mo-99

Calibration (select source)

Calibration

Select source (for QC with source and Calibration)

Isotope	Geometry	Date	Acc. %	Activity	Current activity	Unit	
Cs-137	Vial_std [0.0,0.0]	1988-12-16 12.00.00	1.5	41.409	20.595	MBq	New
Cs-137	Vial_std [0.0,0.0]	2017-08-01 12.00.00	3.0	7.267	6.992	MBq	
Cs-137	Vial_std [0.0,0.0]	1991-01-15 12.00.00	3.0	265.410	138.490	uCi	Del

Isotopes

Cs-137 Vial_std [0.0,0.0]

F-18 Vial_std [0.0,0.0]

Ga-68 Vial_std [0.0,0.0]

F-18 Vial_std [0.0,0.0]

Tc-99m Syringe_std [0.0,0.0]

Co-57 Vial_std [0.0,0.0]

Report

ATTENTION

Do you want to save report?

Yes No

DAMO 42: Accuracy test: save report



If the source is not present, it must be inserted by pressing New. A window will appear for the insertion of the source data. Once the filling is completed and by pressing OK, the software will ask if user wants to save the certificate.

- Store source data in database (Press Yes)
- Save source data temporarily (Press No)

In first case data will be always present in table (unless cancelling with Del button), otherwise in the second case data will be in the table only for the requested operations; exiting this data will be lost.

New Certificate

The execution of accuracy, constancy and calibration commands is described below; for every operation it is necessary to insert the radioactive source in the calibrator that will be used, with the appropriate sample holder. After that is necessary to select the source certificate from the QC sources archive table.

- Accuracy: pressing the Accuracy button the instrument starts to acquire, make the average of 10 measures and compare it with the expected activity shown in the QC source archive table (corrected with the decay). The result is the percentage of deviation from the expected activity.
- Constancy: this daily quality control allows verifying the constancy of the instrument by measuring a source of well-known activity. This measure (average of 10 measures) is corrected with the decay formula and is compared with the average of the first 10 constancy measures of the instrument, obviously relatives to the same source certificate used for this constancy measure.

This quality control shows the integrity over the time of the ionization chamber and of the acquisition electronic.

- Calibration: allow the calculation of the calibration factor (absolute for the master isotope) for the selected source certificate (isotope/geometry combination). This factor will be used for the measure until the next calibration.



Usually the calibration is necessary when accuracy and constancy results are not positives.

It is recommended to wait 30 seconds after the insertion of the sample holder with source before pressing Start.

○ **NORMALIZE**

When the calibration operation is done using the isotope set as master and a standard geometry, software will ask if the operator wants to normalize factors of the isotopes linked at the same geometry; in this case those isotopes' factors will be relatives to the factor of the master isotope just measured. The normalization operation is recommended to avoid errors caused using older factors.

Normalization is necessary:

1. During the first calibration of the instrument.
2. During the installation: the first calibration of the instrument in its final configuration on site.

○ **LINEARITY (LIN)**

Linearity test can be performed in two different modalities (look at DAMO 43: Linearity check window)



DAMO 43: Linearity check window

- Decay Mode
- Sample mode

Before accessing linearity page (see the figure here below), operator must start the Measure selecting Isotope and press Start.

Linearity page can be accessed by pressing button QC.

○ DECAY MODE (DM)

This modality exploits decay of a source. Is therefore necessary to insert a source of activity equal to the maximum that used in the normal routine for the instrument.



DAMO 44: Linearity check: Decay mode

By selecting the decay mode method, operator must decide the final activity and the sampling time interval.

Once started, the acquisition will stop when the final activity has been reached, or when operator stops it via Stop button.

For the purposes of the analysis, program requires at least 10 points acquisition with a minimum time sample of 15 seconds.

○ SAMPLE MODE (SM)

This modality uses samples prepared by the user; operator can decide which is the sample to sample ratio (1/2, 1/5 and 1/10) and prepares samples according to the set ratio. This method is faster but requires high precision in preparing all samples in terms of activity.



DAMO 45: Linearity check: sample mode

Results are displayed on the window.

Linearity files are stored in CSV files in the D:/Linearity folder.

5.9 PRINT (LABELS AND REPORTS)

○ PRINT: LABELS

The instrument gives the possibility to print labels. To access the print page it is necessary to:

1. Start measurement (Press Start)
2. Press Print



The screenshot displays the 'Production label' form in the DAMO 46: Print menu. The form is divided into several sections:

- Production label form:** Contains fields for Isotope (F-18), Geometry (Syringe_std [0.0,0.0]), Conservation (room temperature), Real Filling (ml), Activity (0.0 Bq), Radiopharmaceutical (None), Lot (F-1820190405.1), and Expiration time (Apr 5, 2019, 13:56).
- Application Time Activity:** Includes an On/Off toggle and a date/time selector (Apr 5, 2019, 13:56).
- Dose Calibrator A:** Features buttons for 'Print label and save data' and 'Save data only'.
- Navigation and Status:** Includes a 'Login Level' section (admin admin), a 'Report' button, and a 'Lin' button.
- Isotopes List:** A table on the left lists various isotopes and their associated syringe/vial standards.

Isotopes	
Cs-137 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]
Ga-68 Vial_std [0.0,0.0]	F-18 Vial_std [0.0,0.0]
Tc-99m Syringe_std [0.0,0.0]	Co-57 Vial_std [0.0,0.0]

DAMO 46: Print menu

There are two label typologies:

- Production label
 - Isotope: show the Isotope selected in the main page
 - Geometry: show the geometry selected in the main page
 - Conservation: it is possible to select the preservation status of the radioactive sample
 - Real Filling: show the real filling of the holder
 - Activity: show, in real time, the ionization chamber activity
 - Radiopharmaceutical: it is possible to select the radiopharmaceutical (if present in database) related to the pre-selected Isotope
 - Lot: show the batch number, is automatically filled out, is possible to modify it by the virtual keyboard
 - Expiration time: show the date and time of expiry of the radioactive sample
 - Application Time Activity: if enabled show the sample radioactive activity at a selected data and time
- Patient label
 - Isotope: show the Isotope selected in the main page



- Geometry: show the geometry selected in the main page
- Radiopharmaceutical: it is possible to select the preservation status of the radioactive sample
- Activity: show, in real time, the ionization chamber activity
- First Name – Surname: it is necessary enter patient data
- ID: show an identification code of the syringe and is made by the batch number related with an incremental number
- Birth date – gender: it is possible enter patient birth date and gender
- Real Filling: show the real filling of the holder
- Lot: open a dialogue box in order to select an existing batch or define a new batch
- Application Time Activity: if enabled show the sample radioactive activity at a selected data and time

A window, DAMO 49: Print menu, will appear. Here operator can choose (with the labels on top) to work with the production label or with the patient label.

Data highlighted in bold are mandatory, pressing on any field a virtual keyboard will automatic appear on the bottom. The current measure will be automatically displayed.

Once filled all data operator can choose to:

- Save data only: saves data in permanent database.
- Print Label and save data: same operation as above + label print in the default printer

Press OK to exit window

○ **PRINT: REPORTS**

Operator can access report section by selecting Report button on the main page. From this page, operator can retrieve all executed operations:

- Production label
- Patient label
- Events: this includes all operations performed and saved in the pages QC>> Enter and QC/Calibration>>Lin.



The report window can be divided into three main sections: research, viewing and printing. After selecting the area of interest (label production, label or patient events), we can fill in the search section and then press the "Search" button. At this point the search results appear in the display section.

Now we can print the contents of the table by selecting "Table" and press the "Print" button in the print area. It is also possible to print the detail of a single row by selecting "Row" and press "Print". To view the details you need to press "More" button after selecting the row in the table.

As a factory set printer PDF Creator is installed and PDF files are stored in D:/Report folder.

DAMO 47: Reports

5.10 SOFTWARE INFORMATION

○ USER PROFILES

Function name	Activity Description	Guest	User	Admin
Login	Allows login window access	✓	✓	✓
Password change	Allows change of operators password		✓	✓
Isotope management Select	Allows selection of Isotope, Geometry, Radiopharmaceutical from Database		✓	✓



Isotope Management DB	Allows operator to insert new Isotopes, Geometries, Radiopharmaceuticals in the database		✓	✓
	Allows operator to modify, delete Isotopes, Geometries, Radiopharmaceuticals in the database			✓
	Allows master setting Isotope			✓
Measure Start/Stop	Allows measurement modality, after Isotope, Geometry selection	✓	✓	✓
Ci/Bq	Allows operator to choose the Unit of Measurement	✓	✓	✓
Application Time Activity	Allows activity decay calculation (in a future time and in a previous time)	✓	✓	✓
Background subtraction	Allows background subtraction during the measure modality	✓	✓	✓
QC/Calibration Enter	Allows access to Quality Control routines and calibration function		✓	✓
QC/Calibration Lin	Allows access to Linearity test routines		✓	✓
Add operator	Allows administrator level operators to insert new operators			✓
Del operator	Allows administrator level operators to delete operators			✓
Labels and Reports	Allows patients and production labels printing, reports included		✓	✓
Source certificates	Allows permanent storage in database of calibrations sources certificates		✓	✓
Recall data	Allows recall data from database		✓	✓

5.11 FOLDERS

All executable files and data folders are in “D:” disk drive. Even if many folders are used by the program, operator can retrieve files of interest in two of them (Linearity and Report). All folders are listed below:

- DAMO: main folder of the software
- MySQL Data files: contains all information about database
- Linearity: in this folder all CSV files related to linearity acquisitions are stored.
- Report: in this folder all reports are stored if printed in PDF with PDF Creator (factory set as default printer)
- BackupDB: in this folder (once a week) database backup is automatically stored
- IsoList: this folder is created when pressing “Create Isotope List” button and stores files about Isotope list

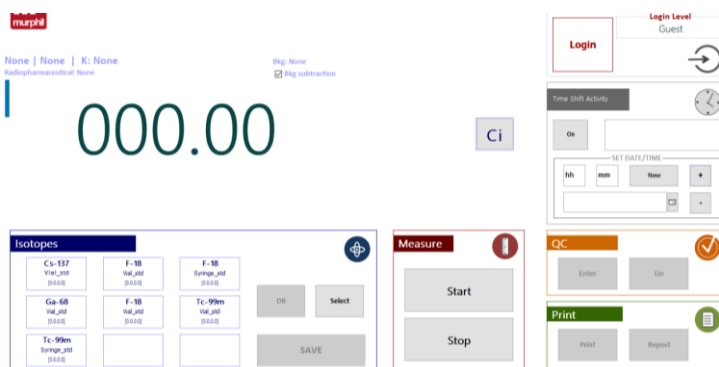
6 SOFTWARE QUICK GUIDE

FILE/OPTIONS

BY SELECTING THE FILE MENU, VIA THE DROP-DOWN LIST YOU CAN ACCESS TO:

-Options

-Exit function: to quit the program “Dose Calibrator”



SETUP

Options menu to enter SETUP data of instrument

Setup: login as Administrator, user can customize Name, Address, phone Number

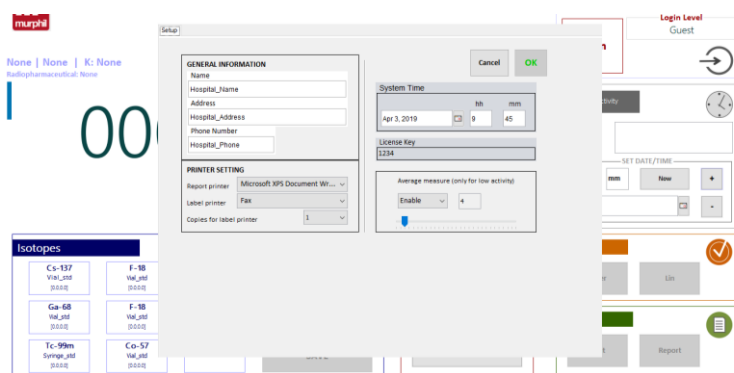
System Time: adjustable by the customer

License key (factory defined)

Select printer dedicated to the report print.

Select printer dedicated to the label print.

You can use the virtual keyboard (empty spaces are not admitted)



HELP

Drop-down list contains About: you can find the Product Name, K Version, Software version and Product version with the Supplier’s homepage.

Click Close to exit from the About window.



LOGIN MENU

Guest level: some features will be disabled

Password: not required. Possible actions:

- Select isotope, geometry, radiopharmaceutical;
- Start Measure
- Stop Measure
- Use Application Time Activity function

Administrator Level: all the features are enabled

Press Logout from main page to exit login

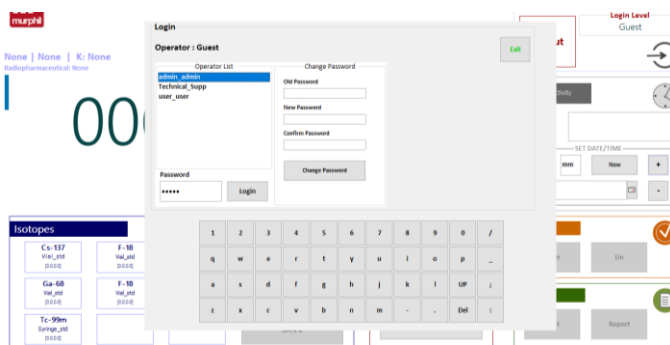
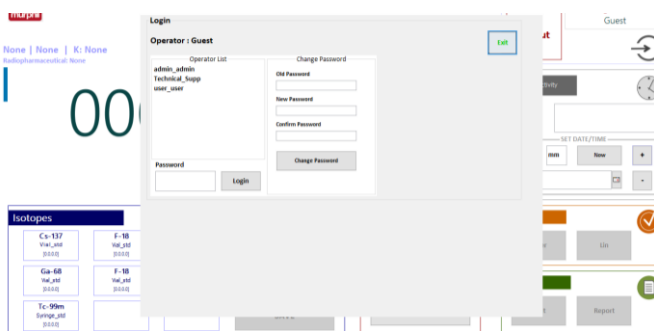
Operators can change password

- Choose the operator from Operator List
- Enter data in section Change Password
- Press Change Password button

LOGIN:

- Select operator from Operator List
- Digit password in the related section
- Press Login button. If the password is wrong repeat the previous step
- press Exit button to exit login

Administrator can add or delete operators. He has access to Create Isotopes List function in order to save all Isotopes, geometries and related calibration factor in D:\IsotList folder.

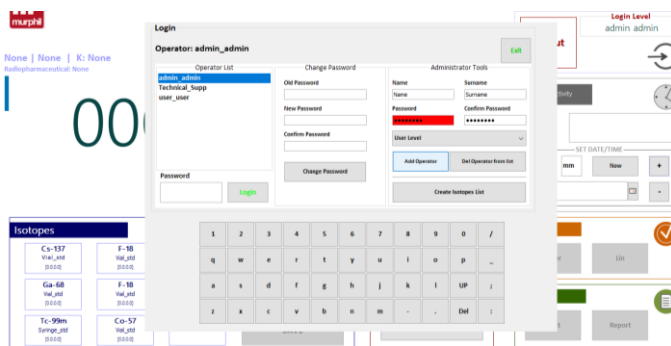


Add Operator:

- Login as Administrator
- Enter data in Administrator Tools section
- Select the operator from the list
- press Add Operator button

Delete operator:

- Login as Administrator
- Press Del Operator from LIST



The screenshot displays the Murphil software interface. At the top left, the Murphil logo is visible. Below it, the text 'None | None | K: None' and 'Radiopharmaceutical: None' are shown. A large '00' is displayed in the center. On the left, there is a table titled 'Isotopes' with columns for Isotope, Val, and Unit. The table contains the following data:

Isotope	Val	Unit
Cs-137	100.0	Bq
F-18	100.0	Bq
Ca-48	100.0	Bq
F-18	100.0	Bq
Tc-99m	100.0	Bq
Co-57	100.0	Bq

In the center, there is a 'Login' dialog box with the following fields:

- Operator: admin_admin
- Old Password: [empty]
- New Password: [empty]
- Confirm Password: [empty]
- Change Password: [button]
- Administrator Tools: [empty]
- Name: [empty]
- Surname: [empty]
- Username: [empty]
- Password: [empty]
- Confirm Password: [empty]
- User Level: [empty]
- Add Operator: [button]
- Del Operator from List: [button]
- Create Isotopes List: [button]

At the bottom, there is a numeric keypad with buttons for digits 1-9, 0, and a decimal point, as well as function keys like 'q', 'w', 'e', 'r', 't', 'y', 'u', 'i', 'o', 'p', 'a', 's', 'd', 'f', 'g', 'h', 'j', 'k', 'l', 'UP', 'DOWN', 'X', 'V', 'B', 'N', 'M', 'Del', and 'I'.

MEASURE/START

To perform a measure:

1. Select Isotope, geometry and radiopharmaceutical using Select button from Isotope management section otherwise press the shortcut button previously stored
2. Check that the data display is the same of your selection
3. Enable or disable the Bkg subtraction
4. Press Start button from Measure Section
5. The measurement is displayed in main panel. It is possible to change the unit measurement from Bq to Ci pressing the relative button.

The screenshot displays the MURPAH web interface. The main display area shows the text "62.77 kBq" in a large green font. Above this, the URL "F-18 | Syringe_std [0.0,0.0] | K: 890.372" and the text "Radiochemical purity: None" are visible. To the right of the main display is a small blue box with the text "Ci". Below the main display is a "Isotopes" section with a table of four isotope buttons: F-18 (Syringe_std), F-18 (Syringe_std), Ga-68 (Syringe_std), and Tc-99m (Syringe_std). To the right of the table are "On" and "Select" buttons. Below the table is a "SAVE" button. To the right of the "Isotopes" section is a "Measure" section with a red "i" icon, a "Start" button, and a "Stop" button. To the right of the "Measure" section is a "Print" section with a green "i" icon, a "Print" button, and a "Report" button. At the top right of the interface is a "Logout" button and a user profile icon. At the bottom right of the interface is a "Time Shift Activity" section with a clock icon, a "On" button, a "Set Date/Time" section with "hh", "mm", and "ss" fields, and a "Print" button.

CONTROL QUALITY/CALIBRATION

Possible actions:

QC without source before using calibrator
(daily)

QC with source (select source) using certified sources

Mo-99 if the option is present

Calibration to do calibration (only Admin level)

Select source: during the QC you can resume the sources certificate previously entered in the database.

[illegible]

QC WITHOUT SOURCE

QC daily check before start radioactive samples measurement

- Select HV, ZERO, BKG
- press Check

QC WITHOUT SOURCE

- HV
- ZERO
- BKG

Results are displayed on the Results window

The operator can save the measured background: if YES: the measured background will be saved; if NO: the software will use the previously saved background

QC WITH SOURCE

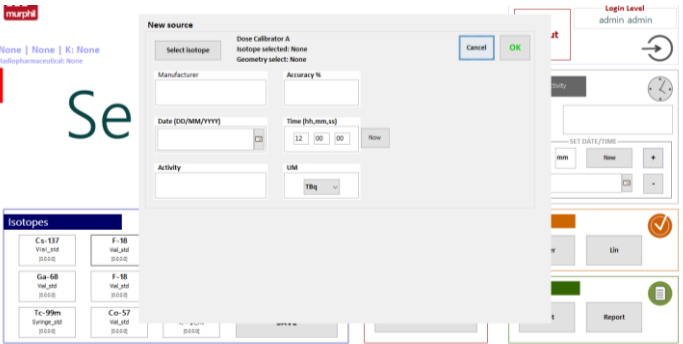
To do the Accuracy and Constancy test, please select a source from the list, put the source in the ionization chamber and press Accuracy or Constancy button

Before testing you can confirm the last acquired background. If you don't want to confirm, remove the source from the chamber and re-start the background measurement. In case the QC results are not in the range $\pm 5\%$, you have to do a new instrument calibration

Press Exit to exit QC window.

The operator can save a report concerning Quality Check performed or not. Confirm with



Yes for report saving. Press No if you don't want any report saving.	
QC - CALIBRATION Press New button on the right, will be open a new window. Proceed as follow: • Press Select Isotope button and select Isotope and geometry to calibrate • Fill all the fields with the source data • Press OK button to confirm • You can save permanently or provisionally the source data of the calibration. Now you can proceed with the calibration: • Select source from the Select source table • Put the source in the ionization chamber • Press Calibration button • You can confirm background subtraction • When the calibration operation is done you can save the new calibration factor • If you have used the master Isotope the software will ask if the operator wants to normalize factors of the isotopes saved in the instrument. • If you want to delete unused data select source, press Del button and confirm delete.	
MO-99 If you have purchased DAMO-S8M for your Dose Calibrator, Mo-99 button will be enabled; you can measure the Mo-99 contamination present in Tc-99m as follow:	Available only for DAMOS8M

- Press Enter button from main panel in section QC/Calibration
- Press Mo 99 button
- It will be open a new window which help you to check the Mo-99 contamination
- Finally, you will see the ratio N between the activity in kBq of Mo-99 and the activity in MBq of Tc-99m
- press Exit button to exit

DB-ISOTOPES

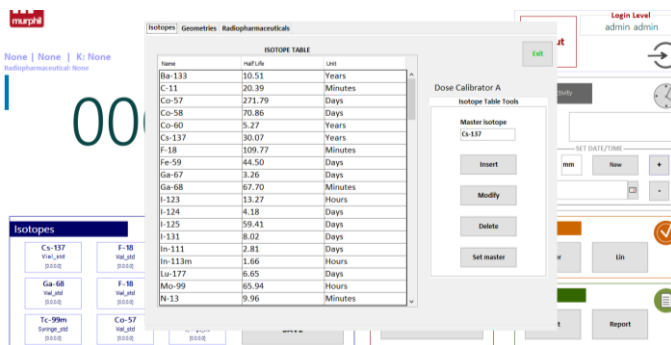
In the Isotope Management Menu, click on DB; three windows will appear: Isotopes, Geometry, Radiopharmaceutical; click on the Isotopes window and explore functions.

In the Isotopes table, possible actions are: Insert new isotope, Modify an existing Isotope, Delete an isotope, Set Master isotope.

To modify an item, select the item and click on Modify.

To delete an item, select the item and click on Delete.

To set an Isotope as a master, select the Isotope from the list and click on Set Master



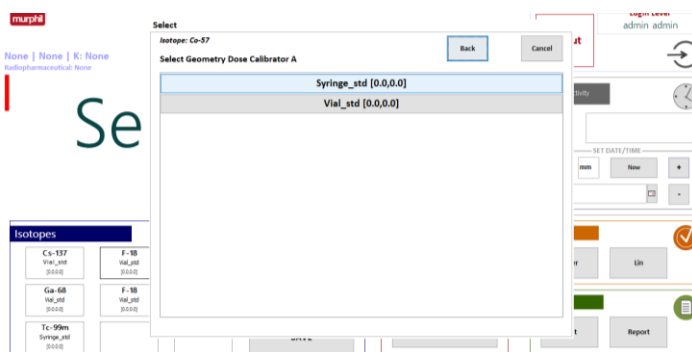
DB-GEOMETRIES

Click on the Geometries window and check.

Possible actions: Insert new Geometry (Isotope selector set to None), Modify an existing Geometry, Delete a Geometry, Normalize to normalize all the calibration factors as for the master Isotope

To modify an item, select the item and click on Modify.

To delete an item, select the item and click on Delete.





From this section you can put together Isotope and geometry as follow:

- Select Isotope from Isotope selector
- Press Insert button
- Select geometry to add
- Confirm using OK button
- Now you can calibrate the geometry

DB-RADIOPHARMACEUTICAL

Click on the Radiopharmaceutical window and check.

Possible actions: Insert new Radiopharmaceutical,

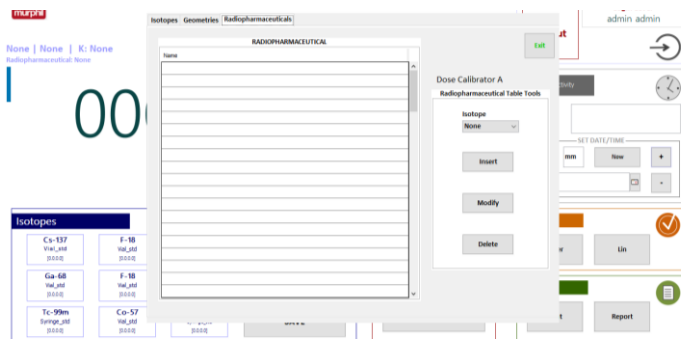
Modify an existing Radiopharmaceutical, Delete a Radiopharmaceutical.

To modify an item, select the item and click on Modify.

To delete an item, select the item and click on Delete.

Insert new Radiopharmaceutical:

- Press Insert button
- Select Isotope that will be add to the Radiopharmaceutical using Isotope selector
- Fill the fields Shelf life (show the Radiopharmaceutical time stability), Name e Note.

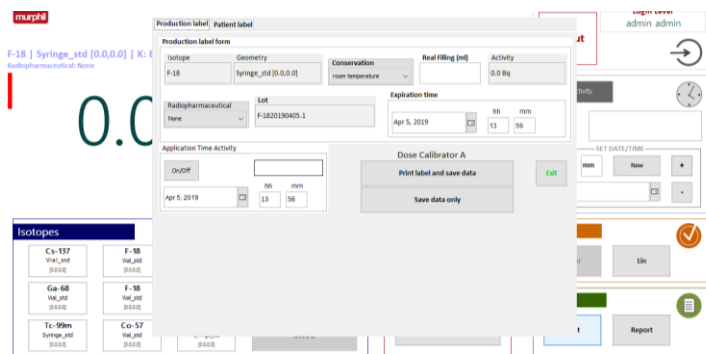


PRODUCTION LABEL CREATION

Fill all the fields (bold fields required); the label could be print and saved, otherwise only saved

If you select a Radiopharmaceutical, the Expiration field will be automatically filled with the Shelf life Radiopharmaceutical data

Press Exit to exit



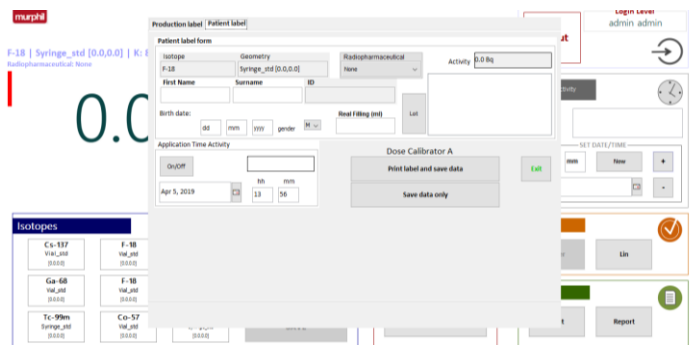
PATIENT LABEL CREATION

Fill all the fields (bold fields required); the label could be print and saved, otherwise only saved

Lot button will open a new window: you can enter information of a new batch or resume a stored batch

Press Insert button and print the label.

Press Exit to exit



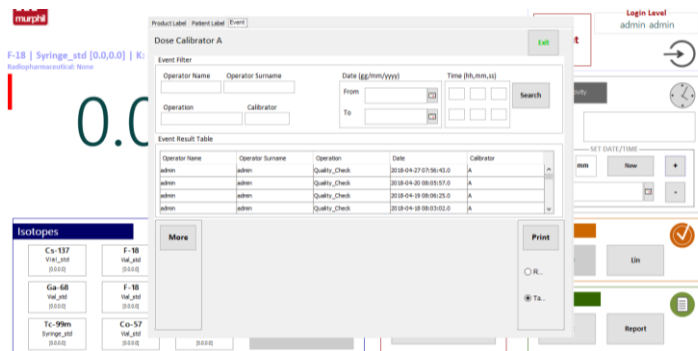
REPORT

Press Report button in the main panel. You can see and print the report that you have saved on the production/patient label database or other similar events.

In each form you can enter and search using Search button.

You can see the results in the table.

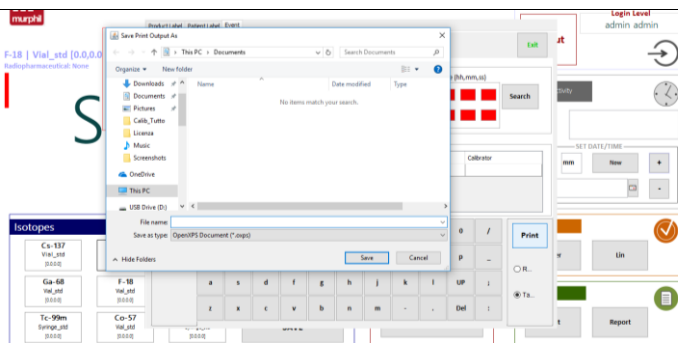
To print or see the details of a row press Print (option Row) or More.



If you need to print all the table content press Print button after selecting Table option

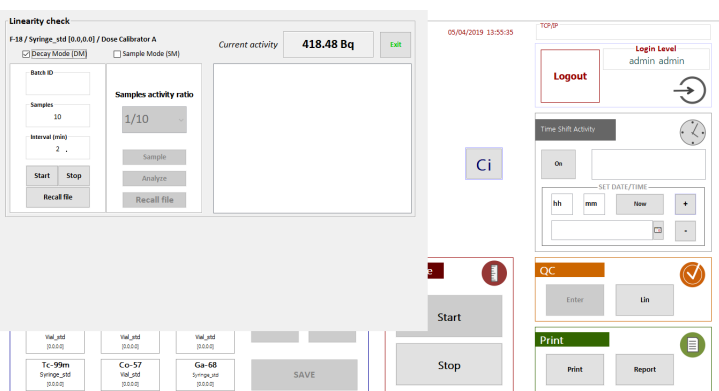
After the print a pdf file will be generated and displayed; the report will be stored in the D:\Report.

Press Exit button to exit



LINEARITY MAIN PANEL

The software shows the actual activity in the upper part of the panel and in the central window the results. Choose between Decay Mode and Sample Mode.

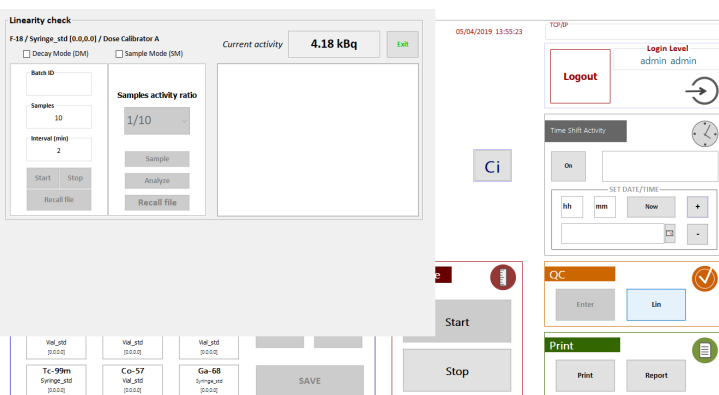


LINEARITY CHECK: DECAY MODE

Select Isotope and Geometry; in the QC/Calibration menu, choose LIN.

Check off the modality Decay Mode (DM); set the final activity, select UM unit by using the drop-down list, set the Sampling Time(s) (not less than 15 sec) for the linearity check test. Press Start to start the acquisition, press Stop to interrupt the acquisition. If the operator will Stop the acquisition before performing 10 Achievement Data, the software will give an error.

The Remaining time is indicated in the central window. Use virtual keyboard to insert parameters. The software shows the actual activity in the upper part of the panel and in the central window the results. It's possible to recall file by clicking on the Recall file button.





LINEARITY CHECK: SAMPLE MODE

Select Isotope and Geometry; in the QC/Calibration menu, choose LIN.

Check off the modality Sample Mode (SM); set the Samples Activity Ratio, for the linearity check test. Press Sample to start the acquisition, analyze at the end of the procedure.

The software shows the actual activity in the upper part of the panel and in the central window the results. It's possible to recall file by clicking on the Recall file button

LINEARITY REPORTS

Folder containing Linearity files DM and SM.

By clicking in the window on the Recall file, select the file from the list and click Open.

7 CODES AND SPART PARTS

CODE	DESCRIPTION	AVAILABLE FOR
895422	COMPATIBLE PC FOR DAMO	DAMOS8
		DAMOS8M
		DAMOS20
895423	COMPATIBLE LABEL PRINTER FOR DAMO	DAMOS8
		DAMOS8M
		DAMOS20
895424	COMPATIBLE POE INJECTOR FOR DAMO	DAMOS8
		DAMOS8M
		DAMOS20



895425	COMPATIBLE CABLE KIT FOR DAMO	DAMOS8
		DAMOS8M
		DAMOS20
8954226	COMPATIBLE SAMPLE HOLDER FOR DAMO	DAMOS8
		DAMOS8M
		DAMOS20
8954227	COMPATIBLE MOLYBDENUM KIT	DAMOS8M

8 CLEANING

The device can be cleaned with isopropyl alcohol. Cleaning of device with isopropyl alcohol does not affect performance and do not deteriorate label.

 CAUTION	Do not spray alcohol directly over the device. Spray alcohol on a proper on a soft cloth or paper then clean the device
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Risk of cross contamination is negligible since the device never gets in contact with the radiopharmaceutical.

The following cleaning precautions should be considered:

- Do not use any sharp object in particular on the touch screen
- Do not use chemical cleansers
- Do not use water
- Use a soft and clean cloth
- Do not use powdered or abrasive solvents on any part of the instrument
- Do not wet the instrument.



9 CYBERSECURITY

The DAMO device is a stand-alone device, with no need to be connected to network for it's functioning. It is provided with a software window always on top that avoids contemporary use of other software.

When supplied with the PC, cybersecurity is assured because all network connections are disabled for the account where the DAMO software application is installed (USER account), automatically starting at PC startup.

In this way the PC is totally isolated and no access from outside is possible. Only the ADMIN account has possibility to give access to the network but this account is only for technical purpose and only MURPHIL personnel can enter this account.

The DAMO device must be operated and managed by an expert administrator. Training of responsible person will focus on awareness that a correct use won't lead to data corruption (-> measurement corruption).

In the case of installation of software on a customer's PC, it is necessary to contact Murphil technical assistance so all necessary OS safety configuration will be set by Murphil technical personnel according to Murphil's cybersecurity police.

 CAUTION	ADMINISTRATOR of the DAMO device must be aware that connection of PC over network can lead to security issues for the DAMO device itself and other entities on the network.
 CAUTION	Any external connection must be authorized by IT service of the facility

10 WEEE DIRECTIVE

CAUTION

Information in accordance with the Directive 2002/96/EC and subsequent amendments



The symbol  on the device confirms that the device:

- has been put on the market after August 13, 2005
- complies with the European Directive on Waste Electrical and Electronic Equipment



- should be disposed of separately

Murphil apply all the procedures necessary to enable the reuse and / or recycling of electrical and electronic equipment, reducing waste to a minimum.

The disposal / abandonment or improper use of illegal waste electrical and electronic equipment can cause damage to the environment and people's health.

The illegal disposal / abandonment of waste electrical and electronic equipment is pursued by the law in accordance with the provisions in force in the territory on which it is illegal disposal/ abandonment.

It is illegal to dispose the waste of electrical and electronic equipment with other waste for separate collection.

The customer must send the waste to designated centres of special waste disposal service or shall deliver it to the dealer in return for the purchase of a similar device.

11 CALIBRATION REPORT

The Calibration report is always present.

12 CE CERTIFICATE

The Certificate is always present.

13 6.6 IFU DOWNLOAD

The latest version of the DAMO Instruction For Use (IFU) is available at <https://www.murphil.eu/measurement-systems/>