

REAL TIME DOSIMETRY SYSTEM

dosiACTIVE

TECHNICAL DATA

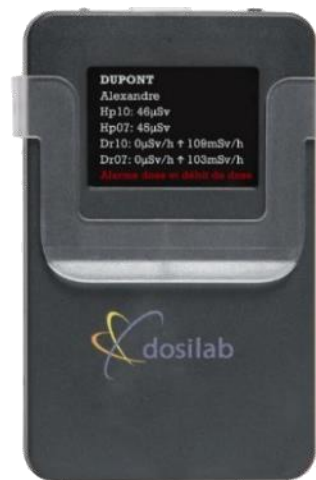
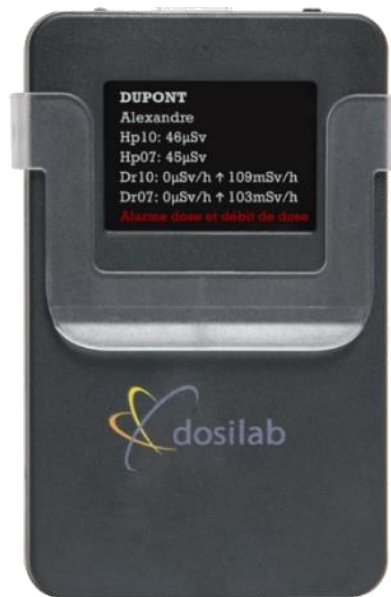


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I – APD: ELECTRONIC DOSIMETER



1.1 OVERVIEW

APD Active Personal Dosimeter Types	EDM-IV EDM-IV-BLE EDM-IV β EDM-IV β -BLE
Manufacturer	Dosilab AG, Köniz, Switzerland

1.2 TYPES

Photon dosimeter	Model ref.: EDM-IV Measures Hp(10) and Hp(0.07) photon radiation. Dose and dose rate values are shown on the dosimeter display.
Photon dosimeter with Bluetooth data transmission	Model ref. : EDM-IV-BLE Same radiation measurement as EDM-IV. With the BLE (Bluetooth Low Energy) module activated, measured results are transmitted in real time to another monitor. The BT signal has a range of up to 150m under optimal conditions.
Photon and Beta Dosimeter	Model ref. : EDM-IVβ Measures Hp(10) and Hp(0.07) photon and beta radiation. Dose and dose rate values are shown on the dosimeter display.

Photon and Beta dosimeter with Bluetooth data transmission	<p>Model ref. : EDM-IVβ-BLE</p> <p>Measures Hp(10) and Hp(0.07) radiation as EDM-IVβ. With the BLE (Bluetooth Low Energy) module activated, measured results are transmitted in real time to another monitor as for the EDM-IV-BLE</p>
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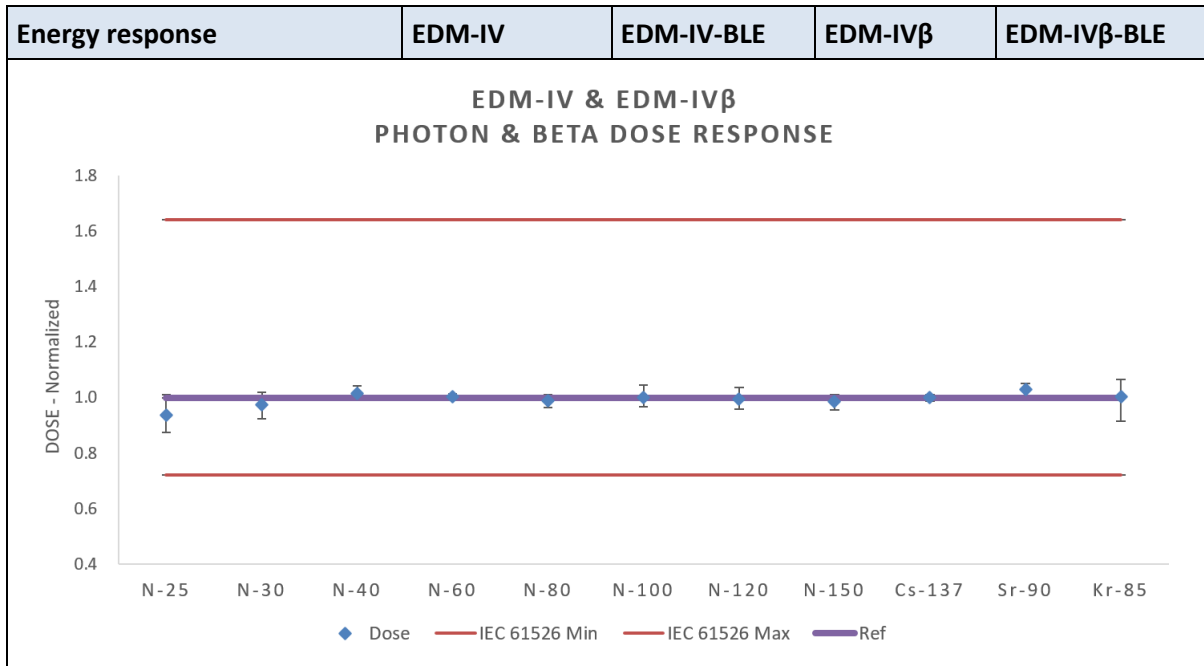
1.3 APD TECHNICAL SPECIFICATIONS

Physical characteristics	EDM-IV	EDM-IV-BLE	EDM-IV β	EDM-IV β -BLE
Dimensions (L x W x H)	92 x 57 x 15 mm			
Weight (grams)	72	72	73	73
Power supply	Rechargeable battery 3.6V, 600mAh Li-Ion			
Autonomy (hours)	36	32	34	30
Battery charge time (hours)	2-4h			
Operating temperature	5°C - 60°C			
Humidity	15% - 85%			
Assign / Sign-off	<p>Assignment of a dosimeter to a user is done via a 6 to 12-digit code on an assignment station. Once assigned, the dosimeter beeps to indicate that it is ready to be removed from the docking station; a green LED on the dosimeter indicates which dosimeter has been assigned. The assigned dosimeter and slot are also highlighted in blue on the station monitor.</p> <p>Once radiation monitoring is no longer required, simply place the dosimeter back in any empty slot; the dosimeter will automatically be signed-off and the dose data transferred to the database.</p> <p>Once all data has been registered in the DB, the dosimeter is reset and recharged in preparation to its next use.</p>			
Shock resistance	Resists drops of max 1.5m onto hard ground			
Waterproofing	IP42			

Display	
Information displayed	The following information is displayed concurrently: <ul style="list-style-type: none"> - Wearer last name - Wearer first name - measured Hp(10) dose - measured Hp(0.07) dose - actual dHp(10) and peak dHp(10) dose rate - actual dHp(0.07) and peak dHp(0.07) dose rate - Dose and/or dose rate alarms
Display	OLED display (no backlighting required). The screen switches-off automatically after a configurable time (5s by default), thus extending the dosimeter's operating time (battery life). To switch on the display, simply press the single button.
Size and resolution	<ul style="list-style-type: none"> - Diagonal: 4.1 cm - Resolution: 160 x 128 (RGB) - 7 lines of text

Buttons	
Button	A single button to switch the display on/off. All other settings are downloaded during the assignment process

Detector and measurements	EDM-IV	EDM-IV-BLE	EDM-IVβ	EDM-IVβ-BLE
Sensor technology	Organic scintillator on photomultiplier (SIPM)			
Radiation quality	Photon	Photon	Photon & Beta	Photon & Beta
Units (autorange)	dose: μSv, mSv, Sv // dose rate: μSv/h, mSv/h, Sv/h			
Dose range	1 μSv - 100 Sv			
Dose rate range	20 μSv/h - 20 Sv/h			
Energy range	15 keV - 2 MeV		γ 15 keV - 2 MeV β 200 keV - 1.2 MeV	
Uncertainty	<10% for doses <10 μSv Cs-137 <5% for doses >10 μSv Cs-137			
Angular response	-10% / +30% up to 60°			
Dead time	<100ns			
Incremental dose registration during wear period	Configurable measurements registration Max 225 dose- / dose rates data points per wear period			



Alarms	
Alarm types	Audible (buzzer) and visual (LED)
Alarm configuration	Doses: 1 μ Sv to 100 Sv Dose rates: 20 μ Sv/h to 20 Sv/h
Alarm sound volume	85 dB
Visual alarm	Different alarm types (shown in red letters): - dose alarm level - dose rate alarm level - dose and dose rate alarm level (both concurrently) - low battery charge level warning A red LED lights-up and the buzzer beeps.
Alarm configuration	Alarm levels are defined by the radiation protection officer for the organization in the dosiCLIENT application. Alarm thresholds are transmitted to the dosimeter during assignment. For wearers with several jobs requiring different alarm levels, the profile suitable for the current task may be chosen when a dosimeter is assigned; the suitable alarm configuration will be transmitted to the dosimeter during the assignment procedure

Fastening options	
Proposed fastening solutions	The dosimeter is equipped with a clamp. Additionally, a badge-type clip or neck cord can be attached to the dosimeter.

1.4 dosiLIVE COMMUNICATION PROTOCOL

Bluetooth communication	
Technology	Bluetooth Low Energy (BLE)
Transmitted data	<ul style="list-style-type: none"> - APD assigned user name - APD assigned user first name - Dosimeter serial number - Measurement data: Hp(10) / Hp(0.07), dHp(10) / dHp(0.07), dHp̂(10) / dHp̂(0.07)

Wi-Fi Communication for long-range data transmission	
Technology	Wi-Fi 2.4GHz
Protocol	MQTT (TCP/IP)
Transmitted data	Partial retransmission of broadcasted BLE data: <ul style="list-style-type: none"> - Dosimeter serial number - Dosimetry data Hp(10) / Hp(0.07), dHp(10) / dHp(0.07), dHp̂(10) / dHp̂(0.07)
System	<ul style="list-style-type: none"> - 1 box transforming the BLE signal from the dosimeters into a wifi signal. - N repeaters to improve wifi range (number of repeaters to be defined according to desired range)

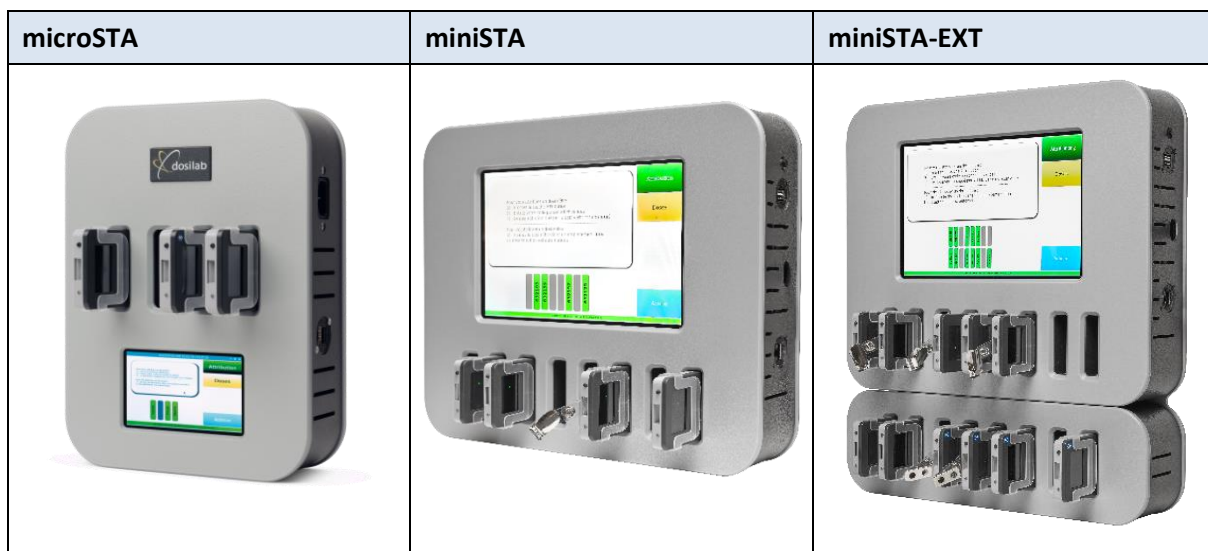
See §4 for details

2 – APD DOCKING STATIONS

2.1 OVERVIEW

APD docking and assignment station types	microSTA	Stand-alone 4-slot assignment station
	miniSTA	Stand-alone 8-slot assignment station
	miniSTA-EXT	Stand-alone 16-slot assignment station
Manufacturer	Dosilab AG, Köniz (Switzerland) Dosilab SAS, Villeurbanne (France)	

2.2 DOCKING STATIONS TECHNICAL SPECIFICATIONS



Type	microSTA	miniSTA	miniSTA-EXT
Main features	Assignment, sign-off and recharging of APD batteries. Query of personal doses over 1 day / 1 month / 1 year		
Capacity	Up-to 4 dosimeters	Up-to 8 dosimeters	Up-to 16 dosimeters
Operating mode	APD docking and assignment station connected to the site's network. Stand-alone mode if the network is down. The dosiACTIVE (virtual) server (dosiSERVER) enables communication between APD assignment station and workstations for administrative management.		
Prerequisites	<ul style="list-style-type: none"> • Suitable location (e.g. hallway, locker room) • 230V power outlet reasonably close to the station • RJ45 network socket reasonably close to LAN connector <ul style="list-style-type: none"> ○ TCP/IP connection to and from dosiSERVER possible via ports 22, 3001, 3306, 5900 		

Physical specifications	microSTA	miniSTA	miniSTA-EXT
Dimensions (L x W x H)	27 x 20 x 7.5 cm	37 x 30.5 x 8.1 cm	37 x 41.8 x 8.1 cm
Weight	1.490 Kg	3.270 Kg	4.420 Kg
Waterproofing	IP20 Wet wipe is allowed for disinfection		
Frame material	Plastic (impact polystyrene)		

Power supply	microSTA	miniSTA	miniSTA-EXT
Supply voltage	Input voltage 230V // Operating voltage 5V		
Power consumption	40 W max	50 W max	60 W max
Micro-break tolerance time	12 ms		
Connection to an UPS (uninterruptible power source)	Connection to an UPS is recommended to prevent the station from being switched off abruptly, i.e. without a shutdown.		
Other technical specifications	230 V power socket RJ45 socket		

Environmental constraints	microSTA	miniSTA	miniSTA-EXT
Temperature range	5°C - 50°C		
Humidity	15% - 85%		

Display	microSTA	miniSTA	miniSTA-EXT
Monito	Color & touch screen		
Size	4.3 inches	10.0 inches	10.0 inches
Features	<ul style="list-style-type: none"> • Dosimeter assignment/sign-off • View of personal dosimetry results • Administrator functions for authorized personnel 		

Computer & Storage system	microSTA	miniSTA	miniSTA-EXT
Computer (embedded)	Linux – Raspberry-Pi		
Internal memory	8GB		
Buffer memory	over 4 weeks in case of connection interruption with server		

2.2 HIGHLIGHTS OF APD ASSIGNMENT STATION

- All stations are compatible with all network configurations, as long as there is a bidirectional TCP/IP connection path to the dosiSERVER
- Choice of station according the required APD allocation quantities
- Multi-site, multi-service configuration
- communication between dosimeters and stations via USB
- WiFi available on miniSTA and microSTA
- Communication between server and station via fixed IP address or DNS name (DHCP protocol)

3 – dosiACTIVE SOFTWARE

3.1 GENERAL

Developer	Dosilab AG, Köniz (Switzerland)
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3.2 CONNECTED SOFTWARE

dosiACTIVE software modules	<ul style="list-style-type: none"> • dosiSERVER • dosiCLIENT • dosiSTATION • dosiLIVE
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dosiSERVER	
Purpose	Manages the communication and coordination of the various assignment stations in one network
Main features	Retrieves and registers doses in the dosiACTIVE database

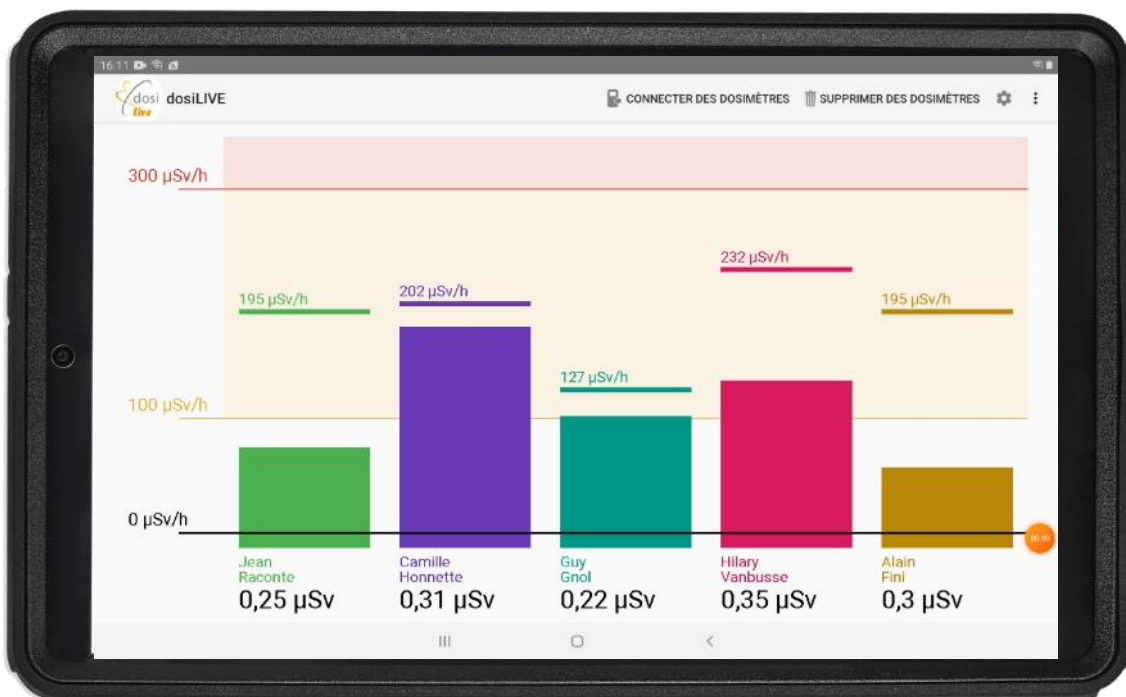
dosiCLIENT	
Purpose	Used for handling the administrative and dose analysis tasks of radioprotection officers and occupational physicians.
Main features	<p>Wearer management</p> <p>Multiple user profile settings assignable to a wearer</p> <p>Dose verification and analysis,</p> <p>Setting trigger levels for dose / dose rate alarm,</p> <p>Generation of dose records and statistics, etc.</p> <p>Messaging system for the radioprotection officer to wearers; the message is automatically shown to the wearer the next time he gets an APD assigned.</p> <p>Settable access rights to dosiCLIENT features for data protection and data security.</p>
Data reporting	Report generation on dose records, dose statistics and administrative data.
Alarms	<p>The configuration of alarms per work profile is done via dosiCLIENT.</p> <p>Alarms are traced and thus always visible in dosiCLIENT to the radioprotection officer and can be (re)consulted at any time.</p>
Password	Mandatory, various access rights available

dosiSTATION	
Description	Dosimeter assignment software on the miniSTA and microSTA docking stations.
Main features	Assignment / sign-off of dosimeters Access to users' personal doses

dosiLIVE	
Description	Dose and dose rates are displayed in real time on a remote tablet
Main features	dosiLIVE displays dose & dose rates measured by EDM-IV-BLE and EDM-IV β -BLE in real time. dosiLIVE runs an Android platform



	Hp10	Hp07	DR Hp10	DR Hp07	Peak Hp10	Peak Hp07
Jean Dupond (654322)	41.0 μ Sv	38.0 μ Sv	0.0 μ Sv/h	0.0 μ Sv/h	321.0 μ Sv/h	312.0 μ Sv/h
Christophe Lemaire (689412)	12.0 μ Sv	11.0 μ Sv	140.0 μ Sv/h	131.0 μ Sv/h	182.0 μ Sv/h	178.0 μ Sv/h
Noël Layé (611235)	0.0 μ Sv	0.0 μ Sv	0.0 μ Sv/h	0.0 μ Sv/h	0.0 μ Sv/h	0.0 μ Sv/h
Marc Jarousseau (622152)	8.0 μ Sv	7.0 μ Sv	0.0 μ Sv/h	0.0 μ Sv/h	41.0 μ Sv/h	38.0 μ Sv/h



3.3 IT SPECIFICATIONS

Installation type (PC or server)	The dosimetry software is based on a client/server architecture.
Database	<p>MySQL or MariaDB: No license required, powerful and fast</p> <ul style="list-style-type: none"> • Indexed database • Small (separate application) • Installed on the dosimetry (virtual) server • Accessed via dosiCLIENT running on Windows 10+ PC. Client chooses the PCs on which dosiCLIENT shall run. • Can be backed up in real time on RAID 1 hard disk • Remote Back-up possible • Customizable access rights
Minimum server requirements	<p>The server shall be supplied by the customer with at least:</p> <ul style="list-style-type: none"> • Virtual server (min 2 vCPUs) or computer / server dedicated to dosimetry activities • Operating system: Windows Server 2016 or Windows Server 2019 with Windows 10 • Memory: min. 2 GB • Disk: 40 GB • Software: MySQL or MariaDB, VNC & Putty (ssh client) for remote maintenance of dosiSTATIONS. <p>The dosiSERVER software must run continuously to ensure communication with the APD docking stations.</p>
Client PC minimal requirements	<ul style="list-style-type: none"> • Runs on Windows 10 or more recent versions. • Connection to the enterprise network • Access to dosiSERVER application and database via server IP address, TCP/IP connection via ports 3010 and 3306 • Access rights management via login and password
IP address of APD assignment stations	A fixed IP address or DNS name for each installed station (microSTA and miniSTA) must be defined by the client's IT department
Back-up	<p>The dosiACTIVE database shall be backed-up by the client's IT department according to the client's IT back-up procedures and philosophy. The dosiACTIVE system has no backup features.</p> <p>Recommendation: daily backups, with the option to adjust the frequency based on the client's configuration, to either a network disk or tape storage solution. Cold backups are preferred, hot backups can be considered during periods of inactivity.</p>

System port	3306, 3001, 3010, 22, 5900 (bi-directional) The client's IT department is required to open and keep open these ports in bidirectional mode prior to installation.
Remote maintenance	Conducted via TeamViewer session (available on our website www.dosilab.ch) or by VPN, RDP, ... according on the client's requirements. Access for diagnostics for all components: stations and APDs. Software updates
Anti-virus, firewall	As per the client's network configuration
Licenses	One license is required per station installed at a client's site. No restriction on the number of dosiCLIENT PC installations.

3.4 Key points of the dosiACTIVE application

- A software simple to use but with comprehensive analysis and reporting capabilities of recorded dose exposures
- Customer feedbacks and needs are taken into account for future releases
- Various levels of access rights to application features and data analysis are settable per user class (radioprotection officer, occupational physician, administrator etc.)

4 – LONG-DISTANCE RELAY SYSTEM FOR DOSIMETERS WITH BLUETOOTH FUNCTIONALITY

4.1 PRODUCTS

EDM-IV-BLE and EDM-IVβ-BLE Dosimeter	
Main features	The BLE dosimeters transmit measured doses in real time via a Bluetooth signal.
Transmission range	150m under ideal situation (free air, i.e. without obstacles)

Tablet / Smartphone	
Main features	The tablet accepts Bluetooth and WiFi signals. The dosiLIVE application enables real-time dose visualization from all (max. 22) dosimeters at the same time on the screen of the remote tablet or smartphone.

RPi relay	
Main features	The Raspberry relay transforms the Bluetooth signal into a WiFi signal, increasing the transmission distance.
Increased range	150 m (without obstacles)
Model	Raspberry Pi Zero W (integrated Bluetooth and WiFi) or similar
Battery	5 V - 3800 mAh
Battery life	14 hours

Wi-Fi repeater (antenna)	
Main features	The Wi-Fi repeater extends Wi-Fi transmission range
Increased range	A repeater increases the transmission distance by 250m (without obstacles). Adding several repeaters makes the transmission distance theoretically unlimited.
Model	TP-Link CPE210 or similar
Power supply	Mains power connection. Rechargeable batteries enable repeaters to operate without power connection.
Battery life	Unlimited on mains and 9 hours with rechargeable batteries