

# Radiation Measuring Equipment

for Radio-Iodine Therapy, PET-centers, Radiopharmacy,  
Nuclear Medicine, Radioimmune Therapy



**NUVIA**  
INSTRUMENTS



# Dose Calibrator

## Dose Calibrator ISOMED 2010

Since approx. 60 years we are on the market, developing and assembling our established MED dose calibrators, which makes us to one of the most experienced manufacturers of these products in Europe.

The result of this experience and the intensive cooperation with our customers is a modern, practical and user-friendly measuring system.

Our PC-based dose calibrators are used for fast and precise activity or volume activity determination of all radiopharmaceuticals used in nuclear medicine.

## Characteristics

- PC-based dose calibrator on Windows 7-basis
- space-saving NetTop PC-system for mounting behind the display
- optionally display with touch-screen function
- well-type ionisation chamber with USB connection
- standard measuring chamber calibrated for more than 30 nuclides (also Y-90, Re-186, Lu-177, I-124 and Ra-223 (Alpharadin)), extendible nuclide library
- calibration factors for different containers, container sizes and content (volume) are taken into account to reduce the total error
- activity calculation for freely definable application times
- integrated quality control for background, responsiveness, linearity, molybdenum-breakthrough and constancy check with user guidance and protocol option
- possibilities to link to radiopharmaceutical management programs or RIS-systems via optional HL7-interface
- system extension by syringe filling system SAM for F-18 possible

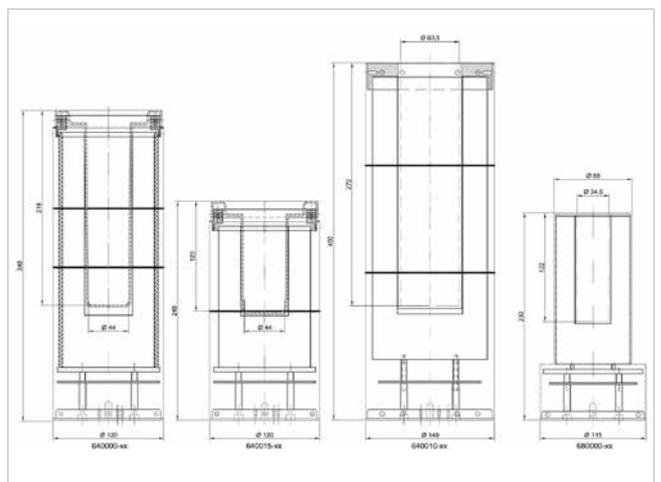
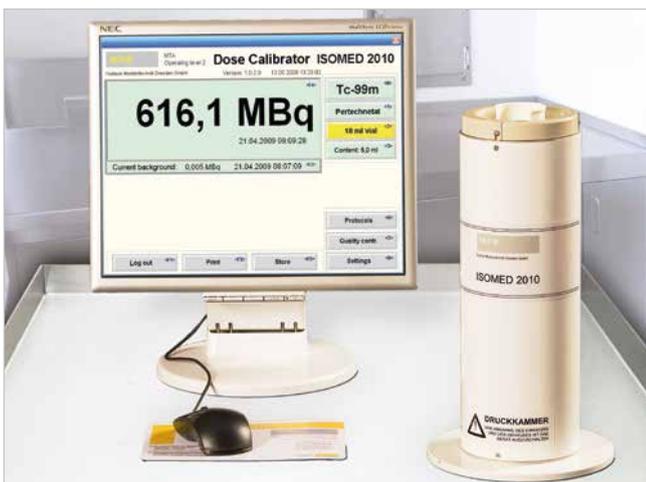


Thanks to its small dimensions, the NetTop PC-system can be mounted behind the display. Both a desktop version (see picture) and a wall version, eventually with VESA arm, are possible. In case of using a display with touch-screen-function, you can work completely without mouse and keyboard. Other PC-systems (for example notebook) are possible.

Apart from the above mentioned complete systems we also offer a basic configuration consisting of a measuring chamber and the ISOMED 2010 software program. The PC-system and the display can be bought by the customer or dealer in that case.

## Measuring chamber types

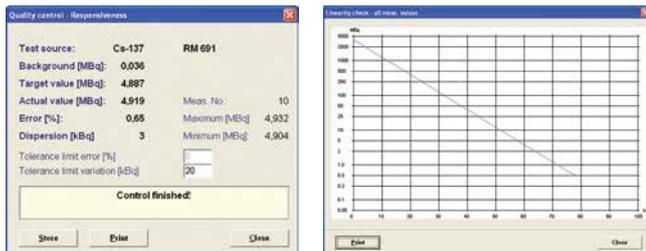
Depending on the field of use, for example regular nuclear medicine or PET-production, we can supply different types of measuring chambers. Even measuring ranges > 1000 GBq are possible. Our measuring chambers are also used as an OEM product by manufacturers of mobile application systems.



## Software

### Integrated quality control

The ISOMED 2010 program contains a menu item for quality control in which some additional quality control features (e.g. responsiveness, linearity, constancy check) required by IEC 61948-4 are already integrated. Each check can be selected and carried out very simply by following the onscreen instructions. The results can be stored and/or printed. The ISOMED 2010 protocols meet the requirements of the medical authorities to provide evidence of the performed quality checks.



### Radiopharmaceutical Management Software RPM 2005

The RPM software is a tool for the entire area of radio chemistry / radio pharmacy and nuclear medicine. The software documents the production process of the radioactive medications in compliance with GMP, including all necessary additives, records the production and documents the application to the patient. The program is designed for the administration of both preparations and ready-to-use radiopharmaceuticals. The measured values are transferred automatically from the dose calibrator ISOMED 2010. An optional HL7 module is available for connection to a RIS system. This module allows you to receive patient data from RIS, supplement and transmit them again to RIS.

The radiopharmaceutical management software RPM is delivered with unlimited customer license. No further or recurring license fees are due!



## Accessories

### Lift system

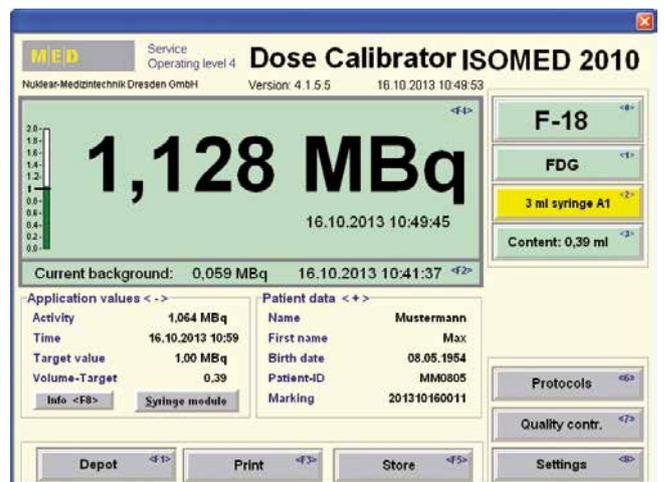
In order to reduce the radiation exposure when working with highly active samples and/or with a measuring chamber that is incorporated in a production cell or a LAF-box, the sample can be transported into the measuring chamber via a lift system. We offer both pneumatic and electric lift systems which are all controlled via the dose calibrator.



### Syringe filling system SAM

An essential factor for radiation exposure which may occur, for example, in the hot laboratory of a PET-CT system, is the process of drawing up the PET activity from the delivered supply container (e.g. 20 ml vial) into the syringe.

If this process is carried out manually, there is a relatively high radiation exposure risk of the lab staff. MED offers an automated, shielded syringe filling system as an accessory to the PC-based dose calibrator.





## Well-Counter ISOMED 2100

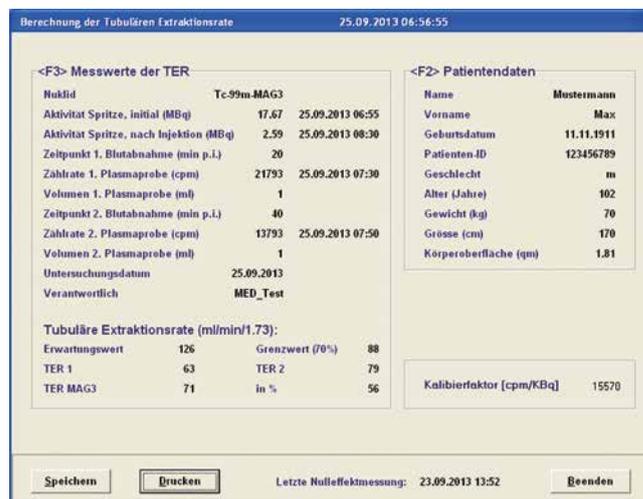
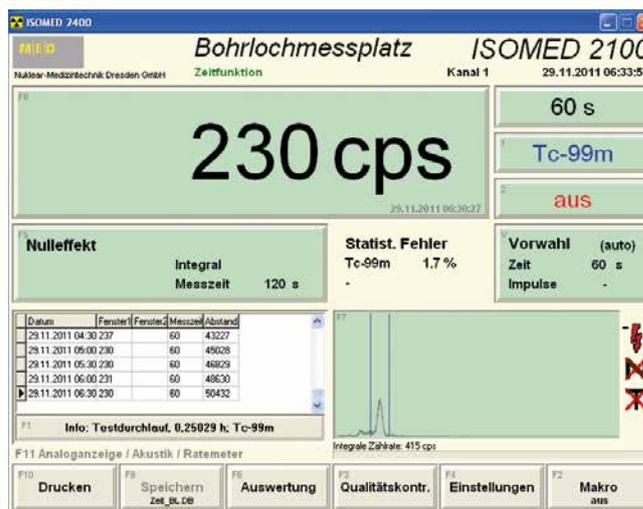
The PC-based **well-counter ISOMED 2100** is a standard measuring system for clinical use. Equipped with a fast MED multi-channel analyser and a high-sensitive NaI-scintillation detector, the digital measuring value and the energy spectrum are displayed online during measurement. An automatic dead time and background correction can be activated. The measuring values can be stored and printed. Measuring value tables can be displayed graphically (as a function of the time) and the energy spectra can be evaluated by means of spectroscopy. A menu to carry out the quality checks according to IEC 61948-1 is integrated in the standard software.

## Additional software

### Clearance program Clear2000

The clearance program **Clear2000**, for calculation of the kidney clearance in case of decreasing plasma level (slope), is based on a procedure of Tauxe et al. This procedure, in which the specific plasma concentration at defined times after application of a renally eliminated substance are empirically assigned to the clearance values of a reference method, means that only a blood sample is required. By normalising the plasma concentration and taking into account the different body dimensions, this method was modified in such way, that also tubulus functions of children and babies can also be quantified.

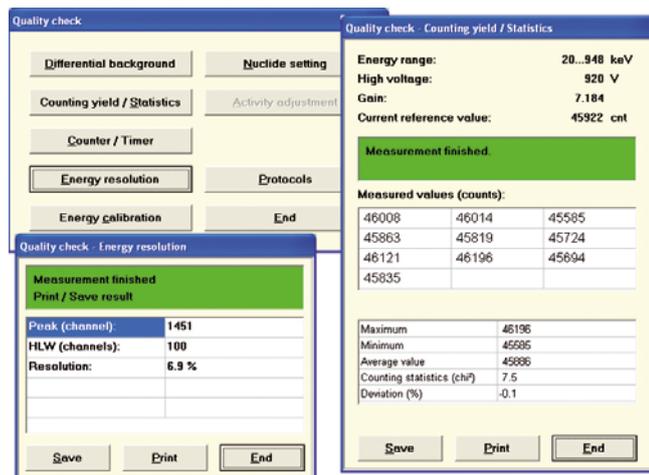
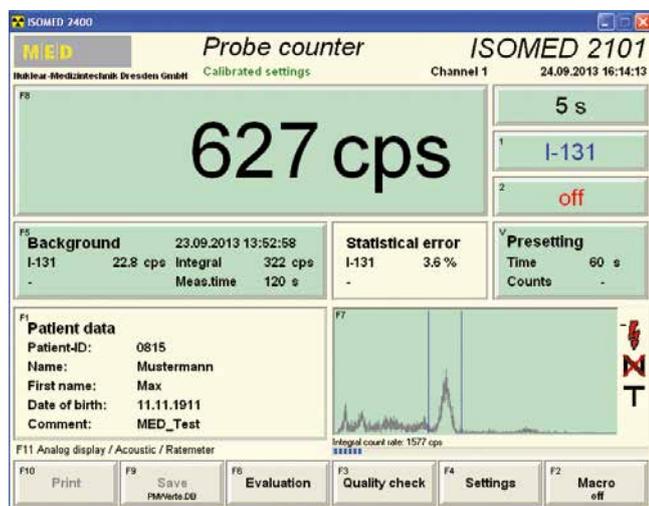
Separate menus allow both the determination of the tubular extraction rate with MAG3 and the determination of the glomerular filtration rate.



## Probe Counter ISOMED 2101

The Probe Counter ISOMED 2101 is a measuring system for general applications in nuclear medicine and research. It is offered separately or as a component of combined counters, together with other components and medical software. Typical fields of application are: medical function checks, ILP-monitoring and spectroscopy evaluations. Preferably NaI-probes are used as detectors.

The measuring system works on PC-basis as a Windows application with a fast MED multi-channel analyser and has an automatic dead time and background correction. The used menu structure guarantees a simple operation. The preset energy calibrations allow a simple and quick setting of nuclide-specific isotope windows. In addition to the digital measuring value display, an analogue display with acoustic function is integrated. Measuring value tables can be displayed graphically and the energy spectra can be evaluated by means of spectroscopy. A special menu is meant to carry out the quality checks according to IEC 61948-1. The current energy spectrum is displayed in a control window and informs the user continuously about the measuring function. All measuring values can be stored and printed. Network integration is possible.

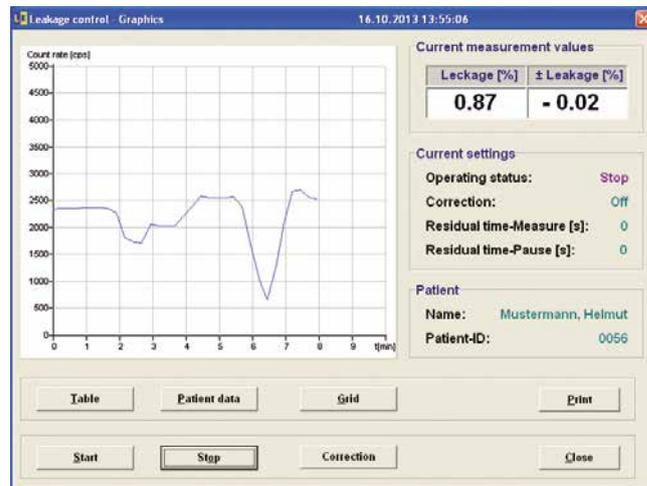


## ILP Counter ISOMED 2166 with software LK 2005

Isolated limb perfusion is a special procedure for the treatment of soft tissue tumors in the extremities. The blood circulation of the limb to be treated is temporarily separated from the systemic circulation. The tumor is treated with a cytostatic agent. To reduce the side-effects of this high-dosed chemotherapy, the transfer (leakage) of the cytostatic agent into the general blood circulation can be minimized. Radionuclides such as Tc-99m are used for this leakage control.

The ILP counter is used to check the activity during operation using one or more detectors in order to report a leakage to the surgical oncologist.

The ILP counter consists of a mobile PC system (notebook) with an MED multi-channel analyser connected via USB interface and a collimated NaI-detector. This mini detector (picture) can be secured directly on the patient's body. During the operation process, the probe measures the count rate cyclically and displays the measured values graphically. This enables you to quickly detect any leakage of the cytostatic agent and to respond accordingly.



On the next pages we will show you the possibilities to adapt the probe counter ISOMED 2101 to your field of use by means of application-specific components and software programs. Combinations of different applications on one counter are also possible.

# Thyroid Counter

## Thyroid Counter ISOMED 2162

The Thyroid Counter ISOMED 2162 is a universal in vivo-counter, especially for diagnostics and therapy of the thyroid. The measuring system consists of a powerful PC-system with integrated MED multi-channel analyser and a stand system accommodating the shielded NaI-scintillation detector. The heart of the measuring system is the user-specific software Upt2000 (See description). Apart from the field of application thyroid, the measuring system can also be used for kinetic function analyses or incorporation monitoring of personnel working in the therapy field.

Many accessories like e.g. collimators, absorbers, thyroid phantoms and test sources complete the thyroid counter.



ISOMED 2162 with a 1-column stand

### Essential characteristics are:

- calibration for I-123, I-131 and Tc-99m under maximum 9 different calibration conditions (distance, absorber, ...) for diagnostics and therapy
- manual input of the thyroid mass or calculation from the scintigraphy and/or sonography data
- uptake determination from background and thyroid activity or from thyroid and whole body activity
- determination of the therapy activity and focal dose also from an uptake
- graphic display of the uptake curve as a function of the time
- calculation of the required period as an in-patient and its earliest possible release. Limit values can be chosen from activity, dose rate and yearly dose.
- post-applications can be taken into account
- possibility for self-measuring of patients. The patient identification takes place by means of a transponder.
- network connection between several thyroid counters. In this way e.g. a transmission between diagnostics and therapy wards is possible.

Our software fulfils the current regulations, standards and directions. The software was created in intensive cooperation with our customers and is based on their experiences.

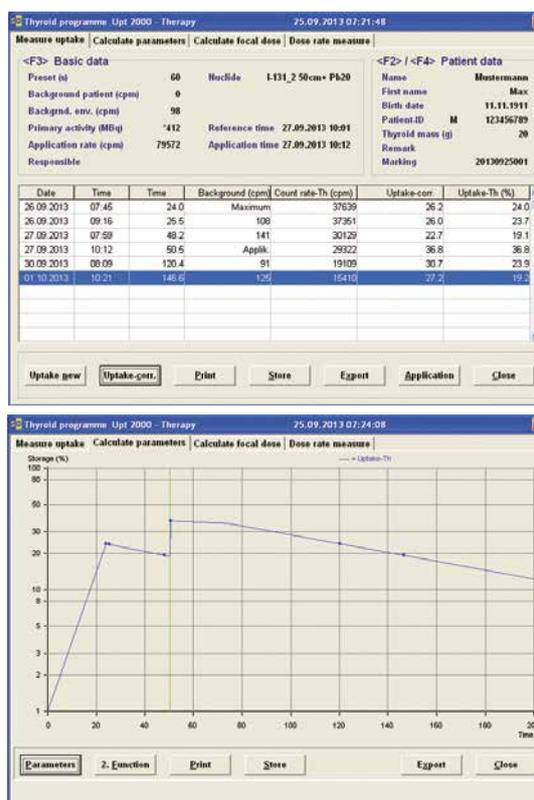
## Thyroid program Upt2000

The thyroid program Upt2000 is used for diagnostics and therapy of the thyroid. From a maximum of 30 uptakes for a patient, the program calculates the parameters effective half-life and maximum storage. With these parameters, the activity for the dose planning of the radiotherapy and/or the effective focal dose during therapy.

Together with the Probe Counter ISOMED 2101, the thyroid program is generally part of the Thyroid Counter ISOMED 2162 or of combined counters, with online processing of the measured count rates. Together with the patient data, the examination results can be stored in a database, printed as a protocol and transmitted to a network.



Table stand with chin support



Thyroid program Upt2000

## Incorporation Counter ISOMED 2163

According to the German Radiation Protection Ordinance and the "Directive for Physical Radiation Protection Control", a frequent incorporation check to calculate the partial body dose of the thyroid has to be performed on all employees of a radioiodine therapy ward. The monitoring interval for I-131 is 2 weeks. Normally, the incorporation measurements are carried out at a licensed, external measuring institute. Due to the distance, is time consuming, a high strain on the employees and also on organising the sequence of work in the hospital. Additionally to the time and organising efforts and the external incorporation monitoring also requires rather high costs.

As an alternative to the external monitoring, a frequent measurement of the partial body dose on own responsibility is possible and has been proved in practice with the incorporation monitor ISOMED 2163.

### The Incorporation Counter ISOMED 2163 consists of:

- PC-based Probe Counter ISOMED 2101 with integrated MED multi-channel analyser
- NaI-scintillation probe 3" x 3" with shielding and collimator
- stand or special chair (picture)
- software Ink2000



## Incorporation program Ink2000

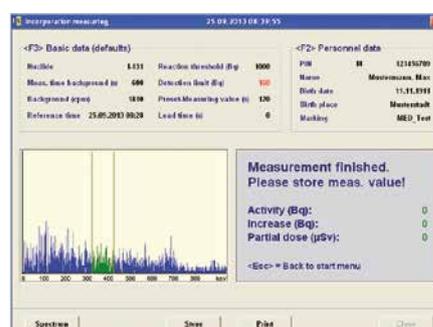
The incorporation program Ink2000 is meant for routine incorporation measurement. The measuring system measures the count rates of the thyroid and calculates the thyroid activity. In addition to the activity, the accumulated dose over a definable time period is calculated too. Measurement and evaluation are possible for I-123, I-125 and I-131. Together with personnel data, the examination results and evaluations can be stored in a database, printed as a protocol and

transmitted via a network. They fulfil the requirements of the governmental institutes. You can choose between two monitoring procedures. In case of the usual procedure up to now, with the typical measuring intervals of 2 weeks (for I-131), the time moment of incorporation is supposed to be in the middle of the interval. The single doses are calculated by means of integration till the end of life. The required detection limit (is calculated and displayed) may not be exceeded in this case. In case of the individual procedure, the incorporation measurements take place in shorter intervals, in general daily. The single doses are calculated by means of integration till the next measurement. The continuous recording of the activity as a function of the time and the small statistic error allow the recognition of 3% of the allowed yearly dose limit value in spite of exceeding the detection limit. The allowed measuring error makes it possible to use smaller shielding and shorter measuring times.

### Essential characteristics are:

- online processing of the measured count rates from Probe Counter ISOMED 2101.
- taking into account the individual thyroid mass and the effective half-life
- taking into account the rest activity of the previous incorporation measurement
- calculation of the partial body dose and effective dose over a definable time period
- graphic display of the activity course during a calendar year and of the current energy spectrum
- listing of the measured thyroid activities and the calculated dose values of all employees over a definable time period
- listing of the performed checks of each employee
- log-on of the person to be measured by means of transponder or chip card
- possibility of obligatory contamination check by means of HFC-monitor before incorporation measurement
- transmission of patient data and examination results via standard network or GDT-interface
- menus for data storage and archiving
- protection for manipulations and wrong operations by several menu levels protected by passwords

The program Ink2000 works on PC-basis as a Windows application. The used menu technique guarantees a simple operation. A combination with the thyroid program Upt2000 using the same hardware is possible.



# Waste Water Counter

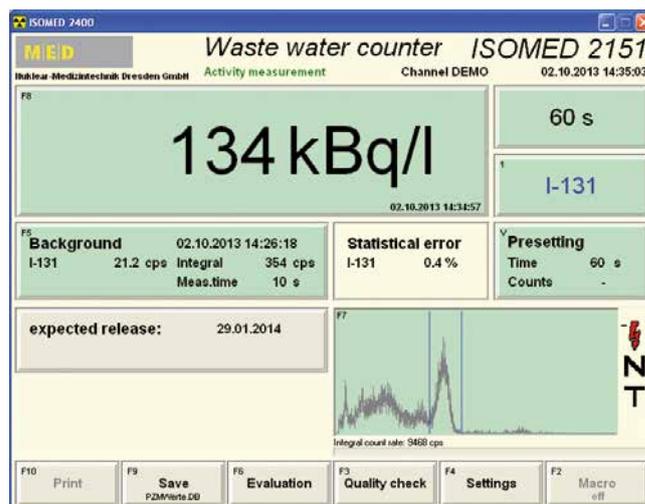
## Waste Water Counter ISOMED 2151

The Waste Water Counter ISOMED 2151 is preferably meant for activity determination of I-131 (other nuclides on request) in single samples from waste water decay containers of nuclear-medical institutes. The samples taken from the waste water containers are put into special measuring containers (1l-Marinelli beaker or Roediger-cartridges). The measuring value is displayed in Bq/l. In this way, the limit value prescribed by official regulations (5 Bq/l for I-131) can be reliably proved. Additionally, the time moment when the specific activity of the waste water container falls below the limit value prescribed by official regulations is calculated and displayed. The measuring values can be assigned to the according waste water containers and can be stored together with the energy spectra. The printed protocol contains not only the measuring value tables, but also the last energy spectrum and the user logo.

The Waste Water Counter works on PC-basis as a Windows application with a fast multi-channel analyser and has an automatic dead time and background correction. The used menu technique guarantees a simple operation. The available energy calibration allows a simple setting of the required nuclide-specific isotope windows. The current energy spectrum is displayed in a control window and informs the user continuously about the measuring function. Network integration is possible.

A 3" x 3" NaI-scintillation probe is used as detector. It is placed in a 50 mm lead shielding. The measuring beaker is inserted from the top.

The Waste Water Counter ISOMED 2151 can also be used as a well counter or as a foodstuff counter.



## Inline-Waste Water Counter ISOMED 2154

The Waste Water Counter ISOMED 2154 is meant for  $\gamma$ -spectrometric inline activity measurement of I-131 (other nuclides on request) from waste water of nuclear-medical institutes, which is stored in decay containers.

The NaI-scintillation probes which are used as a detector are positioned in an inner pipe in the middle of the storage tank. Up to 8 containers can be monitored simultaneously. The system parameters can be set in various ways according to user requirements. For example, you can set individual limit values, measuring times and reference nuclides for each container. The measuring value is digitally displayed in Bq/l. Simultaneously the program calculates when the specific activity of the waste water container falls below the limit value (prescribed by official regulations) and the waste water can be pumped into the public canalisation. The measurements can be controlled as desired manually, automatically or via control signals. Furthermore it is possible to signalise when the activity falls below the limit value by means of a control signal. A graph shows the required decay time for each container till it can be emptied, together with the according date.

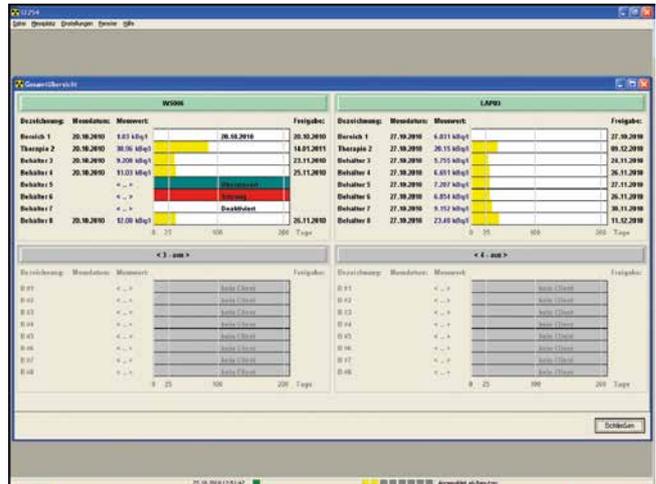
In the automatic mode, the activity of the single containers is automatically measured and stored one by one. Measuring times and measuring distances can be defined individually. The measuring tables assigned to the containers can be displayed as a time diagram. Protocol print and network integration are possible. This makes e.g. the transmission and display of the measuring values in a measuring overview possible. The stored energy spectra can be evaluated by means of spectroscopy.

The Waste Water Counter works on PC-basis as a Windows application with a fast MED multi-channel analyser. A combination of the inline-Waste Water Counter ISOMED 2154 with the single probe Waste Water Counter ISOMED 2151 is possible.

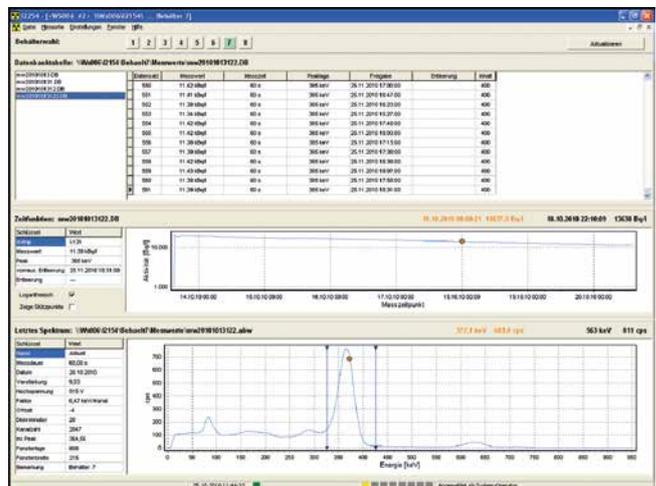


## Display and evaluation program ISOMED 2254

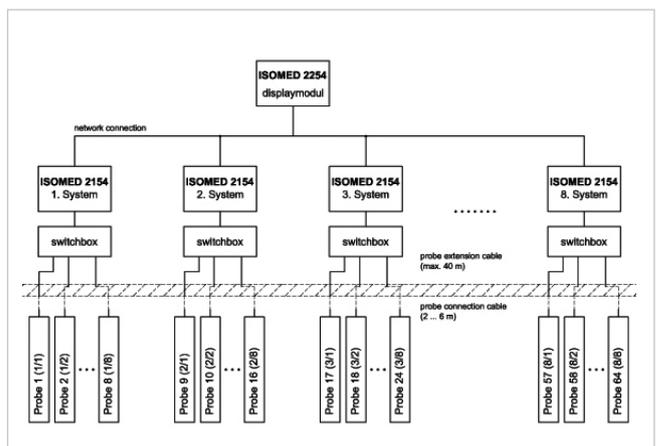
The display and evaluation program ISOMED 2254 makes it possible to combine up to 8 inline-waste water counters ISOMED 2154 in one program. In this way, up to 64 decay containers can be displayed in total. The counters can be displayed individually or simultaneously. By means of the evaluation, the disposal activity and the disposal volume in the public canalisation are calculated.



ISOMED 2254 overall view



ISOMED 2254 single view



Schematic representation of I2154+I2254

## PADOS

### PC-based measuring network for online patient monitoring of radio-iodine therapy wards

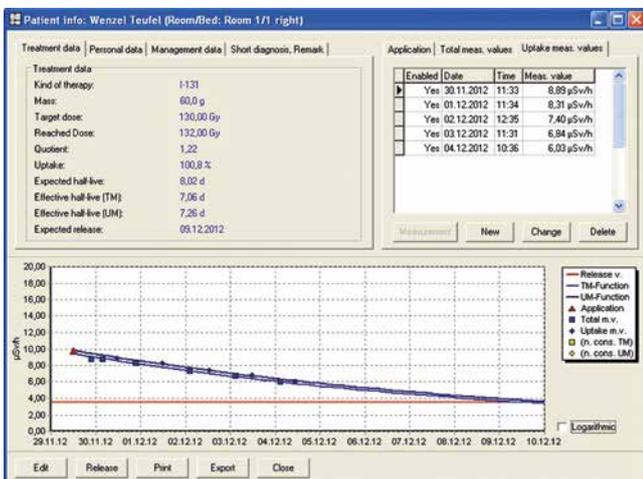
Because of radiation protection regulations it is only allowed to perform the I-131 therapy under stationary conditions. The release of a patient from stationary treatment after application of open radioactive materials and/or sources in the body is only allowed, if the dose rate on the day of release on 2 m distance doesn't exceed 3.5  $\mu\text{Sv/h}$ . This corresponds to a rest activity of approx. 250 MBq.

The PADOS system makes it possible to measure and register the current activity and/or the dose rate of the resting patient periodically. For measurement, a detector collimated for the area is mounted over the bed. A NaI-scintillation probe is used as detector. Via a serial interface (RS-485) the detectors are connected to the central PC-system. The cables are mounted from one detector to the next ... up to the PC-system.

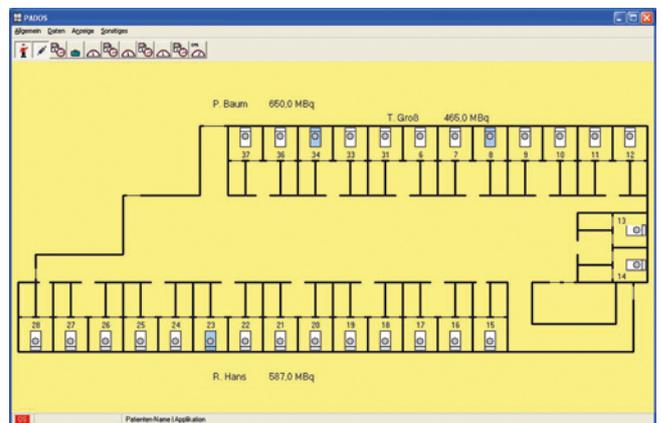
The measurement data are analysed and stored by the PC-system. Only constant measuring intervals are used for monitoring. Based on the periodically registered data, the system software calculates the expected moment of falling below the limit value as date for the patient's release. In this way, an optimized bed planning for the therapy ward is possible. The measuring data of the detectors are transmitted to the central PC-system via the data network and are summarised to a total overview with graphic display of the ward floor plan. Several radiological data can be displayed and printed for each patient. Medical data can e.g. be summarised to a release report, combined with the radiological data.



Detector unit mounted with shielded, collimated NaI-detector at the ceiling above the bed.



Information about patients and measured values



Ward overview

## Release Counter FMS

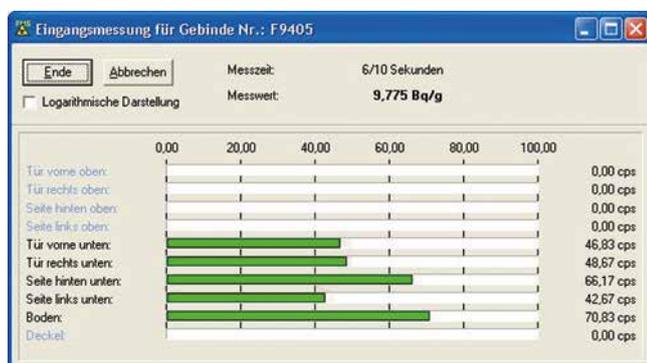
In the German Radiation Protection Ordinance (StrlSchV), the release of radioactive waste is comprehensively regulated. The "unrestricted release" in this case is especially important for the disposal of temporary stored, short-life nuclear medicine radionuclides. This waste can be disposed as normal waste, if they fall below the nuclide-specific release limit value of specific activity listed in the StrlSchV. With the release counter FMS, radioactive waste containers can be measured in a reproducible way and the measuring results can be documented according to the license. Carrying out release measurements significantly reduces the disposal costs which come up.

### Performance features:

- measurement / calculation of specific activity (Bq/g) taking into account nuclide- and container-specific calibration factors
- reproducible activity measurement in 4  $\pi$ -geometry
- compact stainless steel housing with 2 swivel doors for easy loading, movable
- high-sensitive NaI-scintillation detectors (70 x 70 mm) for  $\gamma$ -activity measurements
- as an alternative with large-area, thin-layer plastic scintillation detectors for  $\beta$ -activity measurement
- PC-based measuring system  
industry-PC-system integrated in housing, measuring value display on flat LCD screen
- user-specific software with data management system, simple operation of the measuring system
- protocols of entrance and exit measurements according to the license requirements
- automatic consideration of the waste weight via integrated balance with serial interface. Calculation of specific activity in Bq/g
- calculation of storage time / renewed submission time
- exit measurement after n-half-lives or after calculated falling below the release limit value
- comprehensive data management program with stock accounting, incl. data selection (variable filter functions)
- print of a disposal protocol for documentation and to present to a governmental institute for release to dispose



Our product line contains release counters of several sizes.



# Contamination monitoring

## Hand-Foot-Clothing Contamination Monitors

With more than 20 years of experience and a worldwide clientele, our HFC product line has established itself as the most versatile one on the market. The intensive cooperation with our customers has been transferred into modern, practical and user-friendly instruments. We offer you dedicated solutions to each field of application.

### BaseLine

Our HFC BaseLine models are designed to meet all expectations for a hand-foot-clothing contamination monitor in an easy to use way. Furthermore, our HFC models can be upgraded with a number of options (see below) and individually adapted to meet client requirements. Depending on client requirements and the space available, you can also choose one of the following models from our (standard) product portfolio.

### SlimLine

The HFC SlimLine with the hand detectors integrated into the front panel is ideal for use in confined areas. Transport wheels and a handle allow the system to be easily relocated. Like the BaseLine models, the SlimLine models are available with one or two hand detectors. You can even choose between vertically or horizontally mounted detectors.

### TrendLine

The HFC TrendLine incorporates the latest result of our continuous product development. The trendy, elegant housing, combined with state-of-the-art PC technology as used in all our Windows-based HFC monitors, allows intuitive operation via the large touch screen, provides virtually unlimited networking or data transfer options and allows connection of printers, transponders or card readers.



### CrossLine

The HFC CrossLine is designed for use as a walk through monitor. As usual for all HFC monitors in our range, the output relays can be connected to door controls or other interlocks to ensure everyone is free of contamination before leaving the controlled area.

### EcoLine

The HFC EcoLine is a compact, cost-effective solution if only the hands need to be measured. This version is based on the same technology and electronics as the entire HFC line and can optionally be upgraded by a foot base with two foot detectors.



BaseLine



SlimLine



TrendLine



CrossLine



EcoLine

## Performance features:

- Innovative detector technology based on thin-layer plastic scintillation detectors
  - ✓ No gas-filled or gas-flushed detectors. Low operating and maintenance costs.
  - ✓ Simultaneous, selective  $\alpha$ - and  $\beta/\gamma$ -contamination measurement. No need to change detector.
  - ✓ Measuring system automatically detects and indicates whether  $\alpha$ -radiation is present
- Available with 43 cm system width
- Measuring electronic based on industrial grade PC
- Operator-friendly user interface, large-area color display for display of measurement values
- Nuclide selection menu, user-configurable pre-selection of nuclides possible
- Personal contamination measurement via selection menu, card, barcode or transponder
- Hand probe detachable for clothing measurement, no additional frisker probe required
- Integrated calibration software (auto-calibration) for quality control
- Ergonomic housing design with stainless steel front
- Network-compatible
- Software available for data storage, access control & parameter settings
- Linking of HFC monitors with a central database / access control and parameter setting functions
- Selected nuclides stored with calibration factors according to DIN ISO 7503-1 and A-100 (DIN 44801)
- Detection limits and characteristic limits are calculated for each measured value according to DIN ISO 11929 and stored in relation to the measured values

## Versions

Our HFC monitors are available in various versions. You can select the number and position of the hand detectors, the size of the foot detectors and the operating system. The following table lists the different options per basic model. The combination of the letters shows the version.

Example: Baseline HFT is the Baseline basic model in the version with 2 hand detectors, 2 foot detectors (normal) and Windows operating system.

Basic equipment	2 hand horiz.	4 hand horiz.	4 hand vert.	2 feet normal	4 feet bigfoot	Non-Windows (keypad)	Windows (touch)
Baseline	H	D	V	F	B	K	T
Slimline	H	D	V	F	B	K	T
Trendline	H	D		F	B		T
Crossline			V	F	B	K	T
Ecoline	H						T

## Options

Basic equipment	Transport wheels	Transponder	Admin software	Special card reader barcode
Baseline	✓	✓	✓	✓
Slimline	✓	✓	✓	✓
Trendline	✓	✓	✓	✓
Crossline		✓	✓	✓
Ecoline		✓	✓	✓



## Contamination monitoring

### Portable Contamination Monitor CoMo 170

Our CoMo 170 belongs to the most modern instruments in the field of surface contamination monitors. An essential advantage of the CoMo 170 is the innovative detector technology, which does not use any gas-flow or gas-filled detectors at all. A thin-layer plastic scintillation detector is used. This type of detector is both  $\alpha$ - and  $\beta/\gamma$ -sensitive. In case of mechanical damage of the detector foil, the detector does not have to be repaired by the manufacturer. Time consuming and expensive repairs (usual for xenon detectors) are not necessary anymore. Instead, the repair is simple, cheap and can be performed by the user.

As an alternative, the Contamination Monitor CoMo is also available with additionally integrated Geiger-Müller detector for dose rate measurement (CoMo 170 D). A separate folder can be downloaded from our website.

### System characteristics

- innovative detector technology based on thin-layer plastic scintillation detectors
- appropriate for  $\alpha$ - and  $\beta/\gamma$ -contamination measurements
- $\mu$ -controller-based measuring electronics
- large-area, graphic display, automatic illumination
- calibrated key nuclide file with integrated autocalibration
- nuclide selection menu, person-specific nuclide preselection possible
- very low weight, only approx. 750 g
- integrated measuring value storage (750 data records), software for read-out and processing of measuring data, direct printing of measuring data possible
- can be stationary used in wall station with battery charging and controlling of measuring time
- possibility to connect several external detectors, e.g. for dose rate measurement, automatic identification of the detectors



*CoMo 170 in active wall station*

Stationary use of the CoMo system in active wall station with time-controlled measurement. Start of measurement via light beam. Automatic switch to background measurement. Charging of the CoMo's batteries.



*CoMo 170 in wipe test station*

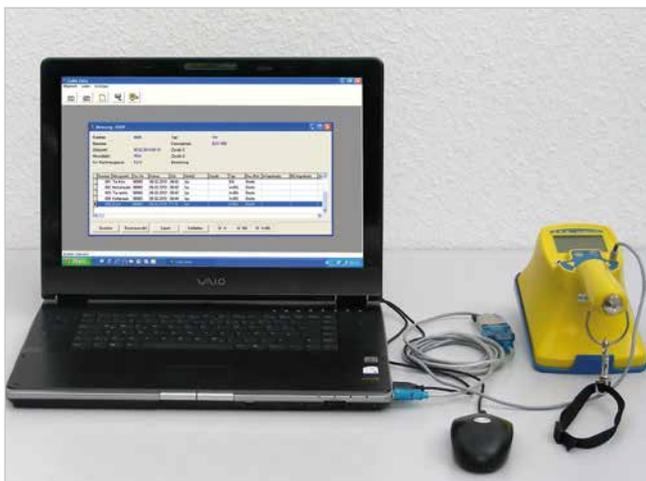
Use of the CoMo system in wipe test station. Separate software level for wipe test measurement. Automatic switch between both measuring modes. Charging of the CoMo's batteries.



*CoMo 170 with external detectors for dose rate or contamination measurement*



*CoMo 170 placed in a floor bogey*



*CoMo 170 data processing software*

By means of the software for data processing, stored measuring values can be read out and assigned to freely definable measuring objects.

A software for uniform parameter setting of several CoMo units is also available.

## ALMO

### ALarm MOnitor – stationary dose rate monitoring system with external detectors

#### Use and function

The ALMO alarm monitors are used to control permanently the dose rate measurement level in the laboratory and in production facilities. The systems consist of a basic device with LCD display and electronics, combined with one or more probes and external alarm units. Depending on the version, it is possible to connect 1, 3 or 6 detectors to the ALMO basic device. The measurement value display of the multi-channel systems ALMO-3 and ALMO-6 is displayed individually for each channel.

The stand-alone ALMO-systems can be linked to a superior PC-system for central monitoring and documentation.



ALMO Einbauversion

#### Fields of application

- workplace and room monitoring, e.g. in hot cells and laboratories
- system monitoring, e.g. in isotope production
- ward and/or patient monitoring in nuclear medicine/radiotherapy, e.g. in radio-iodine therapy or afterloading
- monitoring and selection in sorting boxes for radioactive waste
- exhaust air monitoring
- monitoring of test facilities in nondestructive material testing
- warehouse monitoring, e.g. collection sites for radioactive waste

#### Performance features

- $\mu$ -controller-based measurement electronics
- digital measurement value information on large-area, illuminated LCD
- measurement value display of dose rate in  $n/\mu/mSv/h$  with autoranging function
- externally connectable detectors (GM counter tube, NaI-detectors) with integrated high tension and electronics
- automatic detector identification, calibration data are read out by the measurement electronics, allowing simple replacement of the detector
- 2 freely definable alarm thresholds per probe
- easy-to-operate measurement system with user guidance
- ergonomically shaped housing, desktop or wall version
- cable exit of the wall version upward (to the ceiling) or downward (to the floor)
- various visual/acoustic alarm units can be connected
- serial data interface for measurement data transfer and storage on external PC-system
- software for continuous dose rate measurement, including data storage
- also available with integrated battery back

#### Versions and detectors

The ALMO-system is available in three versions:



ALMO-1 one-channel system,  
1 detector connectable



ALMO-3 multi-channel system,  
up to 3 detectors connectable



ALMO-6 multi-channel system,  
up to 6 detectors connectable

## Special versions

### Afterloading

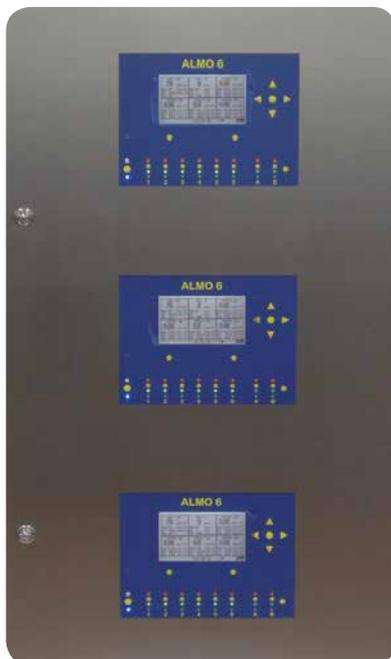
The ALMO-1 system is used by different manufacturers of afterloading systems.

In this case, the main task of the alarm monitor is to indicate if the therapy source is opened or closed. For that purpose the ALMO-1 is mostly combined with GM-probe type 18550. Generally the version with integrated battery backup is used in order to keep the system running in case of a power breakdown. An external LED-lamp with 3 levels (red/yellow/green) and a horn element shows the operating status of the system visually and acoustically: green = closed source, yellow = error, red = open source, red + acoustic alarm = open source and open door.

Additionally to the LED-lamp, some manufacturers use a second LED-lamp or a matrix tableau with alarm signal for the area outside the therapy room (corridor or control room). These units are controlled in a similar way via the ALMO-system. An electronic interlock - if existent - can also be operated via the ALMO-system. Such a function is often used as safety feature, particularly in hot cells.

### ALMO build-in version for clean rooms

Especially for the manufacturers of hot cells and isotope production facilities, we have developed a build-in version for the alarm monitors ALMO-3 and ALMO-6. Instead of the standard housing for desktop or wall mounting, the ALMO is integrated in a metal die-cast case with mounting boreholes. The case is installed behind the hot cell cover or in the door of a switch cabinet. The front panel of the ALMO-system with display, operator keyboard and LEDs is embedded into the intended cut-outs of the covering or the door to form a flat surface with the outside.



This solution has essential advantages particularly with regard to the permanently increasing clean room conditions, because the contamination risks and the extensive cleaning process for housing parts and cabling are omitted.

## Options and accessories

### External alarm units

Alarm units, e.g. the LED-lamp with 3 levels, can be connected to all ALMO-systems to visualize an optical alarm. The LED-lamps are available in different versions (1/2/3 levels, with or without acoustics, flashlight). They can be ordered for wall mounting as well as for desktop or build-up installation. Versions for use in clean rooms are also available on request.



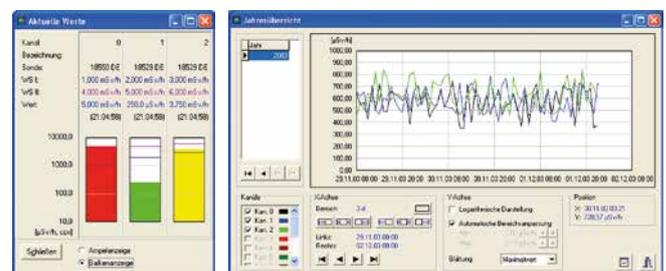
### Additional external display

Depending on the local circumstances it may be necessary to display the measuring value of one or more detectors at the measurement or monitoring place, apart from the central measurement display of the ALMO. The external measurement display offers a high comfort with task-specific parameter setting.



## Software

All measurement data can be displayed graphically by the software for measurement and data storage. Therefore the dose rate measurement values can be displayed in a curve, as a function of time. During the actual monitoring process, the lamp symbols (green/yellow/red) can be shown for a quick interpretation of the measurement values.





Laboratory work bench with lead castle and hatch

## Radiation protection in hot cell

For standard radiation protection equipment of a hot cell we can deliver the following equipments:

### Laboratory work bench

The work bench consists of a stable steel frame construction to carry heavy objects (up to  $850 \text{ kg/m}^2$ ), e.g. lead shielding, Tc-generators, etc.

In accordance with the standards for working with unsealed radioactive materials, the stainless steel table plate is provided with a raised profile edge (8 mm) on all sides. Beside standard dimensions we can also supply work benches with customer-specific dimensions.

### Lead castle

For body protection, a U-formed or completely closed lead castle is built up on the work bench. Protected by the shielding, e.g. radiopharmaceuticals can be prepared and drawn up in this way. The lead shielding consists of lead components covered and protected by a jointless, stainless steel housing. Size and shielding capacity according to field of application. The lead shielding can be expanded by a lead glass window to be mounted.

### Hatch

Syringes with radiopharmaceuticals which were prepared in the hot lab can be passed to the doctor / patient in the application room through the shielded radiation protection hatch. Our radiation protection hatch is a complete stainless steel construction with integrated lead and fireproof material in the door. Dimensions and versions can be adapted to customer-specific requirements.

## Tungsten syringe shieldings

The frequent use of syringe shieldings at the application of radiopharmaceuticals significantly reduces the radiation exposure, especially the partial body dose of the hands, without high costs. We have tungsten shieldings for various syringe types and with different lock systems in our product line (also for PET-applications).

Beside the versions with clip lock, we also have syringe shieldings with screw or bayonet lock and fitted lead glass window as well as plexiglass syringe shieldings for  $\beta$ -emitting nuclides, e.g. for the nuclides of radiosynoviorthesis or radio-immune therapy, in our product line.

## Syringe carrying case

For transport of prepared syringes with radiopharmaceuticals, as desired in several sizes and with several shielding capacities (3 or 6 mm Pb or for PET-applications)

## Shielded container for radioactive waste

Radioactive waste has to be collected separately. For protection of the personnel, the waste collection container has to be shielded. Waste containers are available in various dimensions and shielding thicknesses. We can supply them as pedal bins, with swivelling cover or with divided cover.



*Tungsten syringe shieldings*



*Syringe carrying case*



*Waste container, pedal mechanism*



*Waste container, divided cover, 60 - 80 liter*



*Waste container, round*



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