β-Radiochromatography
γ-Radiochromatography
Positron-Emission-Tomography
Radiation Protection
Bio-Imaging
Technology Transfer
installation and training for raytest instruments
We are looking forward

raytest was founded on 23. September 1980 in Straubenhardt, Germany.

The idea behind the foundation was to create a "new instrument generation" for radioactivity detection in all chromatography applications:

combination of a suitable radioactivity detector with a personal computer by a dedicated "counting interface" and development of a sophisticated program for individual applications.

The radioactivity detector was consequently optimised for the intended application and at the same time simplified for operation by a personal computer.

The always required capacity of counting the radioactive radiation events over time, distance, flow, angle etc. was programmed on a personal computer.

The running measurement progress was displayed "live" on the screen of the PC and no peak went off scale, which made evaluation impossible and required the repetition of the measurement.

All parameters for the "live-display" can automatically or manually be changed during the run and the optimized display of the running measurement can be obtained "on the flight".

Even some evaluation procedures – like peak integrations – could be performed during the running experiment and first results could be obtained immediately.

After the running measurement, extensive evaluation processes could be executed manually or even automatically.

The most important "basic principle" was that all measured data were stored as raw data without any modification or treatment.

raytest anticipated the later definition of principles of GLP/GMP and CFR 21 part 11.
Carsten Dietzel Dipl.-Wi.-Ing. MBA
General Manager Commerce
Carsten went through an apprenticeship of information electronics and graduated as Dipl.-Ing. in Commercial Engineering in Munich and MBA in Berlin. Carsten is General Manager Commerce since 2006.

Oliver Dietzel Dipl.-Ing.
General Manager Technology
Oliver went through an apprenticeship of mechanics and graduated as Dipl.Ing. for production technology in Weingarten. Oliver is General Manager Technology since 2006.

Gerhard Petz
VP Nuclear Instruments
Gerhard joined raytest in 1987 and because of his extraordinary performance he was promoted from technical support, through marketing and sales to director of the nuclear instruments division and Vice President.

Günter und Erika Dietzel
Founder Family
Günter graduated 1964 as Dipl.-Ing for nuclear process technology at the University of Essen. After 16 years in development, application, marketing, sales and support, he founded raytest in 1980 and his wife Erika ran the office since that time.
Radioactive nuclides and applications

for more than 29 years raytest is specialised on radioactivity detection in all applications of chromatography.

C-14 detection in HPLC, TLC, GC and CE was the largest demand in pharmaceutical R&D.
The most powerful requirement is now the C-14 detection in-line with the mass spectrometer.

H-3 detection was applied less frequently for preliminary, fast investigations.

P-33, P-32, S-35 and Cl-36 were applied even less, sometimes in agrochemical R&D.

Tc-99m labelled compounds were applied in Nuclear Medicine in in-vivo-diagnostic.
I-125 was used for labelling of Radio-Immuno-Assays in in-vitro-diagnostic.
I-131 was the preferred nuclide in Nuclear Medicine therapy.

All labelling and preparation of all different radioactive compounds require radio-chromatography application and raytest developed – on demand of its customers – the largest range of suitable radioactivity detectors for many methods and all nuclides.
Development

raytest has its own team of experienced physicists, biologists, engineers and technicians for its own development of new products. The raytest development team is very much customer oriented and the successful test and application of new instruments by the customer is a long tradition at raytest.

Production

raytest is manufacturing its products in house. raytest instruments are not “mass production units” but manufactured, assembled and tested by hand individually one-by-one. Scientific instruments for radioactivity detection require very special craftsmanship and a personnel with many years of experience.

Quality

raytest products are manufactured to the highest standards of German products and under the regulation and inspection of ISO 9001:2000 of TÜV CERT. The product life time is not limited to 10 years, but made for the time required.
Positron-Emission-Tomography

PET is a quite new diagnostic method in nuclear medicine. During the development of the PET application, raytest has been involved in many different projects and collected many detailed experiences in PET technology since 1993.

The synthesis of new PET compounds required many chemical and instrumental steps for realisation of new synthesis procedures.

The quality control of new PET compounds is well documented in particular regulations.

The radiation protection during production, transport and application of radioactive pharmaceutical compounds is legally required for operators, patients and environment.

raytest offers solutions through all the requirements from the synthesis to the application.
raytest has its own team for radiochemical developments. The synthesis unit SynChrom R&D is designed for adaptation to various synthesis protocols. The individual synthesis process is completely, automatically controlled by the raytest program GINA*. The SynChrom automatic synthesis unit can be supplied for an individual compound or for the general synthesis procedure, which can be changed from one process to another.

**Synthesis Installation/Training**

raytest has its own team of radiochemists for installation and training on site. The supply of a PET synthesis can contain the automatic synthesis unit, the individual synthesis control program, the required consumables and chemicals as well as the installation and training of a PET synthesis on-site.

**PET quality control**

Every individual synthesis process requires its particular quality control procedure. raytest offers a team of technical and radiochemical specialists, who can install the required quality control instrumentation and methods as well as train an qualified customers for the particular process.
Radiation Protection

Dealing with radioactive material in general requires not only the know-how on the application of radioactivity, but the know-how on the legal regulations of radiation protection as well as the application of protection facilities, instrumentation and documentation.

Radiation protection equipment cannot be considered as "productive investment" but as the legally required condition for the protection of operators, patients and environment.

Therefore every use of radioactive material – in particular open radioactivity – requires a reasonable minimum of radiation protection facilities, instrumentation and documentation to avoid any exposure, determine every exposure and keep every exposure to radioactive radiation as low as possible at least within the limits of the radiation protection law.

Without the legally required radiation protection know-how, facilities, instruments and documentation the application of radioactive material is not permitted.
**Electronics**

The electronic design, the components and the firmware is produced in house on the basis of the latest technology. raytest is using modern computerized development tools in order to enable the latest technology level for electronic development. raytest products are redesigned on a regular basis in order to improve quality and the life time of fault-free operation. Every raytest product is tested and documented individually. raytest can repair, reproduce or exchange all its products even after more than 10 years.

**Mechanics**

The mechanical design of raytest products is performed in house. Computerized mechanical development tools are used. Many mechanical details of scientific instruments and equipment are determined by its application. Therefore, a close cooperation of mechanical, electronical and program development is essential.

**Programs**

The “philosophy” of raytest is to combine “suitable radioactivity detectors” with “personal computers” and to develop individual operation programs for each different application. Programs are combined in resident programs in the detector and application programs in the connected PC. raytest has developed a modular program system, which enables to use individual firmware in the detector and individual software in the PC for particular applications.
Radioluminography is a relatively new radiation detection method applied in many procedures of radioactivity detection. The single ionising radiation particle – in principle any alpha-, beta-, gamma-, X-ray etc radiation – can elevate an electron of the crystal BaF:E2 to a more energetic position. The elevated electron can reside there until a photon from a laser beam pushes the electron out of its trap, falls back to ground energy and emits a particular photon, which is detected. Radioluminography is based on a fluorescence measurement. Scanners developed for radioluminography were relatively easy to modify for more fluorescence applications.

In bio-imaging a lot of different applications for fluorescence were invented. Various fluorescence dyes were used in modern biological research, from Gel documentation to array evaluation with even multiple wavelengths applications.

At the same time cooled CCD cameras became available for the measurement of chemiluminescence – a single photon emission/detection process – as well as fluorescence.

All these methods – chemiluminescence, fluorescence etc. – had one strong advantage in common: these methods are not using any open radioactivity.

raytest developed the European market for various applications of radioluminography, fluorescence and chemiluminescence and installed more than 1000 units in Europe.

Recently raytest has introduced its own most professional cooled CCD cameras, based on 17 years experience with chemiluminescence and fluorescence application.
Applications

Successful introduction of new applications, instruments and methods require an application laboratory in house. New combinations of instruments, methods and programs need to be tested at raytest. Samples of potential customers have to be evaluated. The highest success rate of sales is based on the competitive product, the detailed knowledge of the application and the accumulated know-how of the operator at the demonstration.

Technical Support

Many scientific instruments are purchased once in the research project. Most scientific instruments are relatively expensive, because the number produced can never be as large as for commercial, technical or private markets. Furthermore scientific instruments have to use the available technology as soon as possible. Therefore, technical support of scientific instruments is utmost important. The product, which never fails is the best! But the product, which cannot be repaired anymore is the worst. raytest offers worldwide technical support, which guarantees that the product never fails or the user can always work.
β-Radiochromatography
nuclear instruments

Index

HPLC-detectors
- RAMONA* 1 1/8” analog output
- RAMONA* 1 1/8” digital output to PC
- RAMONA* 2” analog output
- RAMONA* 2” digital output to PC
- RAMONA* HPLC-LS pump
- MIRA* analog output
- MIRA* digital output to PC
- RAMONA* quattro analog output
- RAMONA* quattro digital output to PC

GC-detectors
- RAGA* analog output
- RAGA* digital output to PC

HPLC/GC-program
- GINA*

TLC-detectors
- MARITA* 1 trace TLC scanner
- RITA* 80 traces TLC scanner
Applications

- β: radioactivity HPLC
  - internal solid scintillators
  - external solid scintillators
  - liquid scintillator admixture

- γ: radioactivity HPLC
  - external solid scintillators

Features

- all wet parts: stainless steel, quartz glass, PTFE
- shielding: stainless steel, low activity lead
- photomultiplier: 2 x 1 1/8" in diameter
- fast coincidence: automatic change solid/liquid scintillator
- pulse summation: high spectrum resolution
- low background: by graded shielding
- high efficiency: by selected photocathodes
- operation: internal μ-processor control
- keyboard entry of counting parameters
- display of all parameters and results on LCD
- 0 – 1V analog output for most HPLC brands

General description

RAMONA* 1 1/8" analog output is a new radioactivity-HPLC-flow detector in the long tradition of more than 2000 units installed since 1983.

Photomultipliers with a 1 1/8" diameter photocathode have been selected for high sensitivity and in particular for very low background. Environmental and cost considerations have promoted internal solid scintillators. Internal solid scintillators of suitable material and particle size are offering the same efficiency for C-14 as liquid scintillator admixtures. Various internal solid scintillator materials and particle grades have been recommended for low energy β⁻ applications.

Potential contaminations of solid scintillators have been analysed and avoided. Various external scintillators are recommended for high energy β⁺ or gamma applications. raytest invented and introduced the identification of every cell with various internal or external scintillators, particle size, cell volume etc for GLP-applications.

By reading the cell-chip the fast coincidence time is automatically adapted to the scintillator material. Pulse summation is applied for high spectral resolution. 2 identical, simultaneous counting channels are available. Each channel has individual lower and upper discriminators for various applications and calibrations. The integrated micro processor counts single events in each channel and converts the number of counts per time interval to the analog output signals of 0-1V. That fits easily the auxiliary inputs of many HPLC-systems of most brands.

Ordering information

- 01002032 RAMONA* 1 1/8" β⁺HPLC-flow-detector
  - select flow cell for your application from list
- 01040020 waste control box
- S1046C14 RAMONA* C-14 standard
- 01240074 installation and 1 day training

www.raytest.com
RAMONA®
1 1/8” analog output
radioactivity HPLC-flow-monitor

Technical data

<table>
<thead>
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<th></th>
<th>solid scint</th>
<th>liquid scint</th>
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<tr>
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<td>H-3</td>
<td>5 - 8%</td>
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<td>C-14</td>
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internal solid scintillator flow cells

011nnnnn  internal glass scintillator flow cell
...nn particle size 30 – 250 μm
..nnn volume 50 – 370 μl

012nnnnn  internal CaF scintillator flow cell
nn... particle size 40 – 250 μm
..nnn volume 50 – 370 μl

013nnnnn  internal US glass scintillator flow cell
nn... particle size 30 – 250 μm
..nnn volume 50 – 370 μl

internal solid scintillator flow cell for SFC high pressure applications

01049250  up to 500 bar, 110 μl, glass scintillator

external solid scintillator flow cells

01046nnn  external plastic scintillator flow cell
nnn volume

01048nnn  external BGO scintillator flow cell
nnn volume

liquid scintillation admixture flow cell

01045nnn  liquid scintillator admixture
nnn volume (200, 800 μl)

liquid scintillator admixture pump see separate page
**Applications**

- **β**
  - radioactivity HPLC
  - internal solid scintillators
  - external solid scintillators
  - liquid scintillator admixture

- **γ**
  - radioactivity HPLC
  - external solid scintillators

**Features**

- All wet parts: stainless steel, quartz glass, PTFE
- Shielding: stainless steel, low activity lead
- Photomultiplier: 2 x 1 1/8”
- Fast coincidence: automatic change solid/liquid scintillator
- Pulse summation: high spectrum resolution
- Low background: by graded shielding
- High efficiency: by selected photocathodes
- Operation: by internal μ-processor control
- Parameter entry by PC
- Digital recording by PC
- Limit-of-detection calculation, display, print insertion in all WINDOWS-PC’s

**General description**

RAMONA* 1 1/8” digital output is a new radioactivity-HPLC-flow detector in the long tradition of more than 2000 units installed since 1983. Photomultipliers with a 1 1/8” diameter photocathode have been selected for high sensitivity and in particular for very low background. Environmental and cost considerations have promoted internal solid scintillators. Internal solid scintillators of suitable material and particle size are offering the same efficiency for C-14 as liquid scintillator admixtures. Various internal solid scintillator materials and particle grades have been recommended for low energy β^-applications. Potential contaminations of solid scintillators have been analysed and avoided. Various external scintillators are recommended for high energy β^-applications.

Raytest invented and introduced the identification of every cell with various internal or external scintillators, particle size, cell volume etc for GLP-applications. By reading the cell-chip the fast coincidence time is automatically adapted to the scintillator material. Pulse summation is applied for high spectral resolution. 2 identical, simultaneous counting channels are available. Each channel has individual lower and upper discriminators for various applications and calibrations. The integrated micro processor counts single events in each channel. The number of counts per interval time is transferred to a PC operating raytest’s GINA* program. No range can be overridden. Integration of ROI’s and peaks is digital. Statistical accuracy and limit of detection are calculated, displayed and documented.

**Ordering information**

01002035 **RAMONA** 1 1/8” + **GINA**

- β^-HPLC-flow-detector
- Select flow cell for your application from list

01040020 waste control box

01046C14 **RAMONA** C-14 standard

01240074 installation and 1 day training
**Technical data**

<table>
<thead>
<tr>
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<th>solid scint</th>
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**internal solid scintillator flow cells**

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nn... particle size 30 – 250 μm
..nnn volume 50 – 370 μl

012nnnn internal CaF scintillator flow cell
nn... particle size 40 – 250 μm
..nnn volume 50 – 370 μl

013nnnn internal US glass scintillator flow cell
nn... particle size 30 – 250 μm
..nnn volume 50 – 370 μl

**internal solid scintillator flow cell for SFC high pressure applications**

01049250 up to 500 bar, 110 μl, glass scintillator

**external solid scintillator flow cells**

01047nnn external plastic scintillator flow cell
100, 300, 600 ml volume

01048nnn external BGO scintillator flow cell
100, 300, 600 μl volume

**liquid scintillation admixture flow cell**

01045nnn liquid scintillator admixture
nnn volume (200, 600 μl)

liquid scintillator admixture pump see separate page
Applications

- radioactivity HPLC
- internal solid scintillators
- external scintillators
- liquid scintillator admixture

γ radioactivity HPLC
- external solid scintillators

General description

RAMONA* 2” analog output is a new radioactivity-HPLC-flow detector in the long tradition of more than 2000 units installed since 1983. Photomultipliers with a 2” diameter photocathode have been selected for highest sensitivity and for very low background.

Liquid scintillation admixture is the most sensitive detection method for very low energy beta minus nuclides such as H-3. Alternative internal solid scintillators of suitable material and particle size are offering the same efficiency for C-14 as liquid scintillator admixtures. Various internal solid scintillator materials and particle grades have been recommended for low energy β- applications. Potential contaminations of solid scintillators have been analysed and avoided. Various external scintillators are recommended for high energy β- or gamma applications.

Raytest invented the identification of every flow cell with various internal or external scintillators, particle size, cell volume etc for GLP-applications. By reading the cell-chip the fast coincidence time is automatically adapted to the scintillator material. Puls summation is applied for high spectral resolution. 2 identical, simultaneous counting channels are available. Each channel has individual lower and upper discriminators for various applications and calibrations. The integrated micro processor counts single events in each channel. The information of detected counts per interval time is converted by the internal ratemeter to an analog voltage of 0 – 1 V. To most brands of HPLC an auxiliary detector can be connected by 0 – 1V. All parameters like range, interval time, background subtraction, cell volume etc are entered by keyboard and displayed on a 4 line 20 character LCD.

Features

- all wet parts: stainless steel, quartz glass, PTFE
- shielding: stainless steel, low activity lead
- photomultiplier: 2 x 2”
- fast coincidence: automatic change solid/liquid scintillator
- pulse summation: high spectrum resolution
- low background: by graded shielding
- high efficiency: by selected photocathodes
- operation: internal μ-processor control

Keyboard entry of counting parameters display of all parameters and results on LCD 0-1V analog output for most HPLC brands

Ordering information

01002026 RAMONA* 2” stand alone β-HPLC-flow-detector
01040020 waste control box
01046C14 RAMONA* C-14 standard
01240074 installation and 1 day training
HPLC-System with radioactivity flow detector and liquid scintillator admixture

Liquid scintillation admixture flow cell

β-Radiochromatography

**Technical data**

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<thead>
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**internal solid scintillator flow cells**

S11nnnnn internal glass scintillator flow cell
...nn particle size 30 – 250 μm
...nnn volume 50 – 370 μl

012nnnnn internal CaF scintillator flow cell
nn... particle size 40 – 250 μm
...nnn volume 50 – 370 μl

013nnnnn internal US glass scintillator flow cell
nn... particle size 30 – 250 μm
...nnn volume 50 – 370 μl

S11μ2805 internal glass scintillator flow cell
28 grade 10-20μm particle size
05 volume 5 μl

**external solid scintillator flow cells**

01048nnn external BGO scintillator flow cell
100, 300, 600 μl volume

S1049nnn external BGO scintillator flow cell
for gamma coincidence
100, 300, 600 μl volume

**liquid scintillation admixture flow cell**

S1045nnn liquid scintillator admixture
200 μl volume
600 μl volume
1300 μl volume
2500 μl volume

liquid scintillator admixture pump see separate page
Applications

\( \beta \) radioactivity HPLC
internal solid scintillators
external scintillators
liquid scintillator admixture

\( \gamma \) radioactivity HPLC
external solid scintillators

General description

RAMONA* 2" analog output is a new radioactivity-HPLC-flow detector in the long tradition of more than 2000 units installed since 1983. Photomultipliers with a 2" diameter photocathode have been selected for highest sensitivity and for very low background. Liquid scintillation admixture is the most sensitive detection method for very low energy beta minus nuclides such as H-3.
Alternative internal solid scintillators of suitable material and particle size are offering the same efficiency for C-14 as liquid scintillator admixtures. Various internal solid scintillator materials and particle grades have been recommended for low energy \( \beta \) applications. Potential contaminations of solid scintillators have been analysed and avoided. Various external scintillators are recommended for high energy \( \beta \) applications. raytest invented the identification of every flow cell with various internal or external scintillators, particle size, cell volume etc for GLP-applications. By reading the cell-chip the fast coincidence time is automatically adapted to the scintillator material. Pulse summation is applied for high spectral resolution. 2 identical, simultaneous counting channels are available. Each channel has individual lower and upper discriminators for various applications and calibrations. The integrated micro processor counts single events in each channel.
The number of counts per interval time is transferred to a PC operating raytest’s GINA* program. No range can be overridden.
Integration of ROI’s and peaks is digital. Statistical accuracy and limit of detection are calculated, displayed and documented.

Features

all wet parts: stainless steel, quartz glass, PTFE
shielding: stainless steel, low activity lead
photomultiplier: 2 x 2"
fast coincidence: automatic change solid/liquid scintillator
pulse summation: high spectrum resolution
low background: by graded shielding
high efficiency: by selected photocathodes
operation: internal \( \mu \)-processor control
parameter entry by PC
digital recording by PC
limit-of-detection calculation, display, print
insertion in all WINDOWS-PC’s

Ordering information

01002025 RAMONA* 2" + GINA*
\( \beta \)-HPLC-flow-detector
select flow cell for your application from list
01040020 waste control box
01046C14 RAMONA* C-14 standard
01240074 installation and 1 day training

www.raytest.com
**Technical data**

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</table>

**internal solid scintillator flow cells**

- S11nnnnn internal glass scintillator flow cell
  - particle size: 30 – 250 μm
  - volume: 50 – 370 μl

- O12nnnnn internal CaF scintillator flow cell
  - particle size: 40 – 250 μm
  - volume: 50 – 370 μl

- O13nnnnn internal US glass scintillator flow cell
  - particle size: 30 – 250 μm
  - volume: 50 – 370 μl

- S11μ2805 internal glass scintillator flow cell
  - particle size: 10-20μm
  - grade: 28
  - volume: 5 μl

**external solid scintillator flow cells**

- O1048nnn external BGO scintillator flow cell
  - volume: 100, 300, 600 μl

- S1049nnn external BGO scintillator flow cell for gamma coincidence
  - volume: 100, 300, 600 μl

**liquid scintillation admixture flow cell**

- S1045nnn liquid scintillator admixture
  - volume: 200, 600, 1300, 2500 μl

liquid scintillator admixture pump see separate page

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www.raytest.com

β-Radiochromatography
**Applications**

- β- radioactivity HPLC
- liquid scintillator admixture
- all H-3-applications
- other low energy beta applications, which create memory effect on the surface of internal solid scintillators

**General description**

**RAMONA** HPLC-LS pump is used for continuous admixture of liquid scintillator to the radioactive labelled eluate of a HPLC system.

**Features**

- maximum pressure 1000 PSI
- intensified mixing by a suitable stainless steel mixer
- manual and remote control
- standard and micro-flow rates

** Ordering information**

<table>
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<th>Code</th>
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<td>RAMONA* HPLC-LS admixture pump</td>
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<td>04200001</td>
<td>MIRA* μ-HPLC-LS admixture pump</td>
<td>200-2000μl/min</td>
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*RAYCHEMA - Radiochromatography*
### Technical data

<table>
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<th>Feature</th>
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<tr>
<td><strong>power</strong></td>
<td>110 – 230 V</td>
</tr>
<tr>
<td></td>
<td>50 – 60 Hz</td>
</tr>
</tbody>
</table>
MIRA* analog output
μ-HPLC radioactivity flow detector

Applications
β* radioactivity μ-HPLC
liquid scintillator admixture
internal solid scintillator
external solid scintillator
developed for μ-flow rates
ultra high sensitivity

General description
In μ-HPLC-applications the eluate flow rate is very small. That requires very small flow cells with almost no dead volume. Conventional radioactivity flow detectors have been modified for small dead volume and small cell volumes. Consequently the radioactivity counted in the flow cell is very small and often impossible to detect in the background. Therefore, MIRA* has been developed using quite small photomultipliers with very low noise. The small photomultipliers are arranged in coincidence in order to obtain the best possible sensitivity. 4 coincidence detectors are arranged after another. The very small radioactive fraction is passing one detector after the other. Every coincidence flow detector is counting separately over the optimal interval time. 4 separate radio-chromatograms are digitally recorded and can be displayed on PC. The flow time from one flow cell to the following one is automatically determined. When the delay of the 4 consequent flow detectors is digitally compensated, the 4 radio-chromatograms can be added up. By that the sensitivity is dramatically improved and fractions which are not detectable in a single coincidence flow detector can be obtained surprisingly by MIRA*.

MIRA* with 4 inline coincidence flow detectors is available for conventional HPLC systems with 0.1V input. In PC-controlled HPLC systems the sensitivity gain can be monitored live and is even more surprising.

MIRA* can be supplied with internal solid scintillators as well as with liquid scintillator admixture.

Features
4 flow detectors in 1
μ-volume flow cells
new dimension of sensitivity
for conventional 0 – 1V analog recording as well as
for digital PC-controlled HPLC-Systems

Ordering information
04000001 MIRA* HPLC flow detector analog 0 – 1V output
04000011 liquid scintillator flow cell
04000010 internal solid scintillator flow cell US glass

Features
4 flow detectors in 1
μ-volume flow cells
new dimension of sensitivity
for conventional 0 – 1V analog recording as well as
for digital PC-controlled HPLC-Systems

Ordering information
04000001 MIRA* HPLC flow detector analog 0 – 1V output
04000011 liquid scintillator flow cell
04000010 internal solid scintillator flow cell US glass

MIRA* can be supplied with internal solid scintillators as well as with liquid scintillator admixture.

www.raytest.com
Technical data

photomultiplier: 4 x 2 = 8
photocathode: 20 mm diameter
shielding: tungsten, stainless steel, lead
energy channel: 1 integral channel
coincidence: automatic

flow cell volumes
internal solid scintillator 4 x (6, 25, 50) μl
liquid scintillator admixture 4 x (40-100) μl

0 - 1 V analog version

LCD: 4 lines, 80 character
keyboard: touch sensitive
range: selectable
interval time: selectable
background: subtractable
dimension detector: 200 x 200 x 300 mm
electronics: 250 x 300 x 300 mm
power: 110 – 230 V
           50 – 60 Hz
**General description**

In μ-HPLC-applications the eluate flow rate is very small. That requires very small flow cells with almost no dead volume.

Conventional radioactivity flow detectors have been modified for small dead volume and small cell volumes. Consequently the radioactivity counted in the flow cell is very small and often impossible to detect in the background.

Therefore, **MIRA** has been developed using quite small photomultipliers with very low noise.

The small photomultipliers are arranged in coincidence in order to obtain the best possible sensitivity. 4 coincidence detectors are arranged after another. The very small radioactive fraction is passing one detector after the other.

Every coincidence flow detector is counting separately over the optimal interval time. 4 separate radio-chromatograms are digitally recorded and can be displayed on PC.

The flow time from one flow cell to the following one is automatically determined. When the delay of the 4 consequent flow detectors is digitally compensated, the 4 radio-chromatograms can be added up.

By that the sensitivity is dramatically improved and fractions which are not detectable in a single coincidence flow detector can be obtained surprisingly by **MIRA**.

In PC-controlled HPLC systems the sensitivity gain can be monitored life and is even more surprising.

**MIRA** can be supplied with internal solid scintillators as well as with liquid scintillator admixture.

**Features**

- 4 flow detectors in 1
- μ-volume flow cells
- new dimension of sensitivity
- for conventional 0 – 1 V analog recording as well as for digital PC-controlled HPLC-Systems

**Ordering information**

- **04000002** MIRA HPLC flow detector digital output to PCI
- **04000011** liquid scintillator flow cell
- **04000010** internal solid scintillator flow cell

**Applications**

- β\(^+\) radioactivity μ-HPLC
- liquid scintillator admixture
- internal solid scintillator
- external solid scintillator

developed for μ-flow rates

ultra high sensitivity
Technical data

- **photomultiplier:** 4 x 2 = 8
- **photocathode:** 20 mm diameter
- **shielding:** tungsten, stainless steel, lead
- **energy channel:** 1 integral channel
- **coincidence:** automatic

**Flow cell volumes**
- Internal solid scintillator: 4 x (6, 25, 50) μl
- Liquid scintillator admixture: 4 x (40-100) μl

**PC-measurement:**
- Parameter selection and entry
- Live measurement
- 4 single chromatogram lines
- 1 summed chromatogram line
- Peak integration
- Background subtraction

**Dimension detector:** 200 x 200 x 300 mm
**Electronics:** 250 x 300 x 300 mm

**Power:**
- 110 – 230 V
- 50 – 60 Hz
Applications

- radioactivity HPLC
- ultra high sensitivity
- ultra high resolution
flow rate 100-1000 μl/min
metabolism R&D
Pharmacokinetic
- radiochemical purity

in case other detectors are not sensitive enough

General description

RAMONA* quattro contains 4 beta-radioactivity-coincidence-flow-detectors in 1 instrument. RAMONA* quattro is using 4 pairs of 2 x 1 1/8” photomultipliers in coincidence in order to arrange 4 flow cells, one after the other. 4 coincidence-detectors are measuring the beta-radioactivity in HPLC-flow individually.

The internal micro-prozessor counts 4 individual traces of HPLC-flow detectors. Each trace is the same chromatogram but slightly delayed. The individual fraction is flowing from the first to the second, third and fourth coincidence detector and is recorded individually. The flow time from the first to the second, third and fourth detector is determined individually and automatically. The individual flow delay from the first to the second, third and fourth detector to the recording program is subtracted from the individual traces digitally and automatically, in order to obtain 4 simultaneous chromatograms. After that, 4 individual, synchronous chromatograms are added up in the sum chromatogram. RAMONA* quattro analog determines the delay and addition of 4 traces automatically by a calibration run. This procedure improves the sensitivity of the radioactivity-flow-detector-system effectively. While the peaks are growing linearly by 4, background is adding up to 2 = sq of 4 only.

Features

4 x 2 photomultiplier 1 1/8”
eluate flow rate 100-1000 μl/min
solid scintillator flow cells
liquid scintillator flow cells
0-1 V analog data output
for all HPLC brands with analog detector signal input

Ordering information

01003000 RAMONA* quattro analog
4 flow detectors in 1 stand alone version
digital display and keyboard analog output 2,5V

010040nn solid scintillator flow cell

010050nn liquid scintillator admixture cell
600 μl volume

www.raytest.com
**Technical data**

- **internal solid scintillator flow cells**

- **digital display:** 4 x 20 character LCD

- **keyboard:** numerical

- **parameter entry:** guided dialog

- **all wet parts:** stainless steel, quartz glass, PTFE

- **shielding:** stainless steel, low activity lead

- **photomultiplier:** 8 x 1 1/8"

- **fast coincidence:** automatic change liquid scintillator to solid scintillator

- **flow cell:** internal solid scintillator

  - 4 x 40 μl
  - 4 x 100 μl

- **liquid scintillator admixture**

  - 4 x 600 μl

- **delay calibration of 4 detectors:** automatically

- **radioactivity signal output:** 0-2.5 V

- **resolution:** 16 bit

- **ratemeter range:** selectable

- **smoothing:** selectable

- **dimensions:**
  - width: 470 mm
  - height: 162 mm
  - depth: 430 mm
  - weight: 30 kg
Applications

- radioactivity HPLC
  - ultra high sensitivity
  - ultra high resolution
  - flow rate 100-1000 μl/min
  - metabolism R&D
  - pharmacokinetic
  - radiochemical purity

in case other detectors are not sensitive enough

General description

RAMONA* quattro contains 4 beta-radioactivity-coincidence-flow-detectors in 1 instrument. RAMONA* quattro is using 4 pairs of 2 x 1 1/8” photomultipliers in coincidence in order to arrange 4 flow cells, one after the other. 4 coincidence-detectors are measuring the beta-radioactivity in HPLC-flow individually.

The recording PC can display 4 individual traces of HPLC-flow detectors on the screen. Each trace shows the same chromatogram slightly delayed. The individual fraction is flowing from the first to the second, third and fourth coincidence detector and is recorded individually. The flow time from the first to the second, third and fourth detector can be determined individually. Entering the individual flow delay from the first to the second, third and fourth detector to the recording program, 4 simultaneous chromatograms can be obtained and each trace delay can be adjusted individually. After that, 4 individual chromatograms can be added up and in trace 5 the sum of the 4 individual chromatograms is displayed. The display of the 4 single traces can be suppressed and only the sum shown. Peak integration can be performed during measurement and live display. This procedure improves the sensitivity of the radioactivity-flow-detector-system effectively. While the peaks are growing linearly by 4, the background is adding up to $2 = \text{sqr of } 4$ only.

Features

- 4 x 2 photomultiplier 1 1/8”
- eluate flow rate 100-1000 μl/min
- solid scintillator flow cells
- liquid scintillator flow cells
- digital recording by GINA*
- calculation “limit of detection”

Ordering information

01003010 RAMONA* quattro digital 4 flow detectors in 1 digital recording program limit-of-detection determination

010040nn solid scintillator flow cell 40, 100 μl volume

010050nn liquid scintillator admixture cell 600 μl volume

www.raytest.com
**Technical data**

- **all wet parts:** stainless steel, quartz glass, PTFE
- **shielding:** stainless steel, low activity lead
- **photomultiplier:** 8 x 1 1/8"
- **fast coincidence:** automatic change from liquid scintillator to solid scintillator
- **flow cell:**
  - internal solid scintillator
  - 4 x 40 μl
  - 4 x 100 μl
  - liquid scintillator admixture
  - 4 x 600 μl
- **control by:** external PC
- **control program:** GINA*
- **display:** live on PC screen
- **Y-scale:** selectable during run, no loss of date by overriding range
- **X-scale:** individually selectable during run, no loss of date
- **smoothing:** individually, during run
- **delay calibration of:** individually, displayed on screen
- **summation of traces:** automatically
- **display of sum trace:** individually
- **peak integration:** live
- **dimensions:** width 470 mm, height 162 mm, depth 430 mm, weight 30 kg

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Applications

- radioactivity in GC
- proportional gas flow counter
- nuclides H-3, C-14
- external standardisation
- ultra high sensitivity

General description

Gas chromatography fractions labelled with H-3 and C-14 can only be detected in internal gas mixtures of the GC eluate with the counting gas by a proportional gas flow through counter.

Modern capillary GC’s have quite a small eluate flow. The mixture of the radioactive sample vapour with the counting gas is quite difficult. Therefore, the vapour of the GC eluate has to be converted to a reproducible gas form in order to obtain stable chromatograms.

Raytest RAGA* offers 2 modes:
- Formation of CH₄ under Hydrogen flow at high temperature and presence of a Platinum catalyst.
- Alternatively, the formation of CO₂ can be performed at high temperature over CuO₂. This method is only suitable for measurements of C-14 because the H-3 would be absorbed by the drying agent before it can be counted.

The condition of operation and reproducible results is indicated very sensitive by recording a plateau at the operation conditions.

Therefore, raytest is automatically running a plateau at the selected operation condition with an external gamma source of Cs-137, which produces sufficient Compton electrons and indicates the present operation conditions.

The single radiation events are digitally counted in a selected interval time. The digital result is converted into an analog output signal 0-1 V using a ratemeter. The ratemeter range, interval time, background subtraction, smoothing etc is displayed on a 4 line, 20 character LCD and selected, entered manually by a keyboard.

Auxiliary inputs of most GC-control and recording systems enable the input of 0-1V signal. Radioactivity can be recorded simultaneously with FID, TCD etc.

Features

- automatic plateau run
- automatic gas mass flow control
- very high sensitivity.
- for conventional 0 – 1 V analog recording

Ordering information

- **11023200** RAGA* analog output beta-GC detector
- **11202700** RAGA* conversion reactor
- **11203000** RAGA* thermal insulation
- **11202720** RAGA* mounting device for conversion reactor
- **97030006** RAGA* test source Cs-137, 333 kBq
- **01240074** installation and 1 day training

www.raytest.com
Technical data

Detector
- Proportional gas flow through counter
- Volume: 10 ml
- Sensitivity: H-3 - 50 Bq
- C-14 - 3 Bq
- Peak degradation: < 3%
- Analog input: 4 (only with GINA*)
- Analog output: 1 (0-1 V, 21 bit res.)
- Dimension (wxhxd): 16 x 54 x 42 cm
- Weight: 21 kg
- Power supply: 95-240 V, 50 Hz, 300 W

Reactor
- Length: 170 mm
- Diameter: 44 mm
- Tube inner diameter: 3 mm
- Tube outer diameter: 6 mm
- Heating voltage: 42 V, 150 W
- Temperature: 600 - 900°C
- Thermo element: NiCr/Ni

GC type Agilent 6850/90
- Splitter: to be supplied with GC
- Column: packed or capillary

Required Gases
- Methane (counting tube)
- Helium (for process) or Hydrogen (for reduction process)

GINA* Chromatography data system

β-Radiochromatography

RAGA*
- Analog output
- Radioactivity flow detector in GC
**General description**

Gas chromatography fractions labelled with H-3 and C-14 can only be detected in internal gas mixtures of the GC-eluate with the counting gas by a proportional gas flow through counter. Modern capillary GC’s have quite a small eluate flow. The mixture of the radioactive sample vapour with the counting gas is quite difficult. Therefore, the vapour of the GC eluate has to be converted to a reproducible gas form in order to obtain table chromatograms.

Raytest RAGA* offers 2 modes: formation of CH4 under Hydrogen flow at high temperature and presence of a Platinum catalyst. This procedure is suitable for both H-3 as well as C-14. Alternatively, the formation of CO2 can be performed at high temperature over CuO2. This method is only suitable for measurements of C-14 because the H-3 would be absorbed by the drying agent before it can be counted. The condition of operation and reproducible results is indicated very sensitive by recording a plateau at the operation conditions.

Therefore, raytest is automatically running a plateau at the selected operation condition with an external gamma source of Cs-137, which produces sufficient Compton electrons and indicates the present operation conditions.

The total GC and the radioactivity GC-detector is controlled by GINA* program. The single radiation events are digitally counted in a selected interval time. The digital results are transferred to PC. The digital radioactivity and the analog FID/ TCD or other GC-detector are simultaneously recorded and displayed.

Peak integration, background subtraction etc can be performed manually or automatically. Limit of radioactivity determination is calculated, displayed and printed for every peak.

**Features**

- automatic plateau run
- automatic gas mass flow control
- very high sensitivity.
- digital control of GC
- digital recording of radioactivity detection
- analog recording of FID, TCD etc
- Agilent GC

**Ordering information**

- 11023210 RAGA* digital output to PC beta-GC detector incl. GINA* program
- 11202700 RAGA* conversion reactor
- 11203000 RAGA* thermal insulation
- 11202720 RAGA* mounting device for conversion reactor
- 97030006 RAGA* test source Cs-137, 333 kBq
- 01240074 installation and 1 day training

**Applications**

- radioactivity in GC
- proportional gas flow counter
- nuclides H-3, C-14
- external standardisation
- ultra high sensitivity
Technical data

Detector

Proportional gas flow through counter

volume: 10 ml
sensitivity: H-3 - 50 Bq
C-14 - 3 Bq
peak degradation: < 3%
analog input: 4 (only with GINA*)
analog output: 1 (0-1 V, 21 bit res.)
dimension (wxhxd): 16 x 54 x 42 cm
weight: 21 kg
power supply: 95-240 V,
50 Hz, 300 W

Required Gases

Methane (counting tube)
Helium (for process) or
Hydrogen (for reduction process)

Integrated System Control

RAGA* in combination with the
GINA* Chromatography data system
offers total system control of the GC
system (Agilent 6850). This provides
best usability since only one software
system manages all method and
meta data. The combination of Agi-
ilent GC and raytest RAGA* operated
by GINA* software is fully compliant
with all regulations about GLP.
GINA* is a general interface and analysis program for all radioactivity chromatography applications in HPLC, TLC, GC and CE. GINA* is recording simultaneously in 1–8 channels. The interval time – the time period for measurement of a single chromatogram data point – can be programmed from 0.010 s to hours. The total runtime of a chromatogram can be a few seconds up to many days. The number of radioactive events per interval time is not limited. Overriding a selected range can never happen. The record of a radioactivity distribution over time, distance, angle etc can never overflow. The recording of radioactivity is originally digital. The recording of other detector outputs can be analog. The resolution of analog signals is 24 bit. GINA controls completely all Agilent (and others) HPLC and GC equipment like: Autosamplers, HPLC-pumps, Column heaters, Column switches, all types of detectors, fraction collectors etc. Furthermore, GINA* can control 2/2 or 3/2 valves, injectors, heaters/coolers, liquid phase detectors, and many other functions. GINA* is the most sophisticated and flexible program for every radioactivity detection and control of any process. GINA* is used frequently for very complex process control like PET synthesis control and measurement. Hundreds of GINA* programs are in daily use with extremely high requirements of reliability. GINA* is compliant with most international regulations of original data handling, reproducibility and validity.

Applications

β−,γ,β+ radioactivity chromatography measurement, evaluation and control for HPLC and GC 1–8 simultaneous channels

General description

GINA* is a general interface and analysis program for all radioactivity chromatography applications in HPLC, TLC, GC and CE. GINA* is recording simultaneously in 1–8 channels.

Features

digital recording of radioactivity
analog recording of other detectors
no range limitations
digital control of chromatography equipment
peak integration, background subtraction etc.
limit-of-detection calculation

Ordering information

01240001 2 channel measurement, basic program
01240002 extension by 2 channels (up to 8)
01240005 quench correction
01240006 decay correction
01240007 3-dimensional display
01240008 int/external standardisation
01240010 autosampler control
01240017 full automatic evaluation
01240020 HPLC pump control
01240021 isocratic HPLC pump control
01240030 UV, RI, HPLC pump control etc detector control
01240035 DAD spectrum acquisition + evaluation
01240040 fraction collector control
01240070 1 day training
01240079 MUCHA* spectrum control
01240095 CFR 21 part 11
01240111 GINA* data acqui.server
**Technical data**

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<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval time</td>
<td>0.01 s - no limit</td>
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<td>Run time</td>
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<td>Analog data conversion</td>
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<td>Analog input</td>
<td>0 – 1 V</td>
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<tr>
<td>Counting capacity</td>
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<td>Scaling</td>
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<td>Simultaneous channels</td>
<td>8 extension on request</td>
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<tr>
<td>Evaluation</td>
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<td></td>
<td>Peak integration</td>
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<td>Background subtract</td>
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<td>Flow correction</td>
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<td>Efficiency correction</td>
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<td>Number of control inputs</td>
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<td>Fraction collector control</td>
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<td>Detector control</td>
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</table>

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### General description

**MARITA** – the single trace radioactivity thin-layer-chromatography detector – is using a linear analyser detector, which is sensitive over the entire chromatogram trace from the start to the front. The entrance window can be open for H-3-applications or closed for C-14 or any other beta\(^-\) or beta\(^+\) radiation emitting nuclide.

Beta\(^+\)(PET) emitting nuclides can be detected very efficiently. Many gamma radiation emitting nuclides are emitting beta\(^-\) radiation as well. The pure gamma emitting nuclides can be detected as well, because they produce some Compton electrons. **MARITA** has 2 simultaneous sensing electrodes: the delayline determines the location of the counted event, the pulse height of the counting wire is used for the electronic collimation. Thus high energy beta radiation can be detected with high resolution using a narrow collimator window.

**MARITA** can measure a single trace at once. The **MARITA** detector is elevated after the end of the measurement and a new chromatogram plate can be placed for the following measurement.

Counting gas is a non-inflammable mixture of 90% Argon and 10% Methane, which is traded as P10 gas. The gas consumption is very low.

1 TLC plate of 50 x 200 up to 200 x 200 mm can be placed on **MARITA**.

### Features

- Open window detection for H-3
- Antistatic protection grid for open window operation
- Closed window detection for C-14, F-18, C-11 etc.
- Very high sensitivity
- Live-display of measurement
- Peak integration, background subtraction
- Manual or automatic
- Limit of detection calculation

### Ordering Information

- **02200001** **MARITA**\(^-\) \((\beta^+)^TLC\) analyser for single traces
- **02000105** **MARITA** homogeneity + resolution standard
  - C-14 source 22.14 MBq
  - 200 x 10 mm with holder
- **02110010** **MARITA** IQ/OQ C-14 standard for check of homogeneity + resolution
  - 18 spots homogeneity test
  - 4 spots sensitivity test
  - 1-3-mm resolution test
  - Counting gas and valve are expected on-site
Technical data

detector: gas flow proportional counter

counting gas: P10
90% Argon, 10% Methane

gas consumption: 1 l/min

detection area: 200 mm long, 20 mm wide

detection window: open or closed, 0.9 mg/cm²

diaphragm: 3 – 20 mm wide magnetic attached

resolution:
- H-3 < 1 mm
- C-14 < 2 mm

sensitivity:
- H-3 16 Bq in 10 min
- C-14 1.6 Bq in 10 min

background: 1.3 cps/200 mm

energy discrimination: electronic collimator

traces: 1

display: live single chromatogram

evaluation:
- manual or automatic
- peak integration
- background subtraction
- limit of detection

dimension (w x h x d): 235 x 135 x 500 mm

weight: 9 kg

power supply: 110-230 V, 20 VA

operating conditions: 10-40°C max 70% r.H.
Applications

radioactivity detector for Thin-Layer-Chromatography

\( \beta^- \) nuclides H-3, C-14 etc.

(\( \beta^+ \)) nuclides F-18, C-11 etc.

external standardisation

ultra high sensitivity

General description

**RITA** – the radioactivity thin-layer-chromatography detector – is using a linear analyser detector, which is sensitive over the entire chromatogram trace from the start to the front. The entrance window can be open for H-3-applications or closed for C-14 or any other beta^- or beta^+ radiation emitting nuclides. Many gamma radiation emitting nuclides are emitting beta radiation as well. The pure gamma emitting nuclides can be detected as well, because they produce some Compton electrons.

**RITA** has 2 simultaneous sensing electrodes: the delay line determines the location of the counted event, the pulse height of the counting wire is used for the electronic collimation. Thus high energy beta radiation can be detected with high resolution using a narrow collimator window.

**RITA** can measure many single traces one after the other. The **RITA** detector is elevated after the end of the measurement and moved automatically to the next trace position. Multi traces can be displayed in 3-dimensional presentation or a 2-dimensional distribution over the entire 200 x 200 mm TLC plate can be calculated and presented.

Counting gas is a non-inflammable mixture of 90% Argon and 10% Methane, which is traded as P10 gas. The gas consumption is very low.

2 TLC plates of 200 x 200 mm each can be placed in **RITA** at the same time.

A metal/glass cover closes **RITA** completely and protects the environment as well as **RITA** itself from electronic frequency emissions (CE).

Features

open window detection for H-3

antistatic protection grid for open window operation

closed window detection for C-14, F-18, C-11 etc.

very high sensitivity

live display of measurement

peak integration, background subtraction

manual or automatic

limit of detection calculation

Ordering information

02110001 **RITA** **B-TLC analyser for single and multiple traces**

2 and 3 dimensional presentation

02000105 **RITA** homogeneity + resolution standard

C-14 source 22.14 MBq

200 x 10 mm with holder

02110010 **RITA** IQ/OQ C-14 standard for check of homogeneity + resolution

18 spots homogeneity test

4 spots sensitivity test

1-3-mm resolution test

counting gas and valve are expected on-site

www.raytest.com
Technical data

detector: gas flow proportional counter

counting gas: P10
90% Argon,
10% Methane

gas consumption: 1 l/min

detection area:
- single step 200 mm long,
  20 mm wide
- multiple step 200 mm x 200 mm

detection window: open or closed, 0.9 mg/cm²

diaphragm: 3 - 20 mm wide magnetic attached

resolution:
- H-3 < 1 mm
- C-14 < 2 mm

sensitivity:
- H-3 16 Bq in 10 min
- C-14 1.6 Bq in 10 min

background: 1.3 cps/200 mm

energy discrimination: electronic collimator

traces: 1-80

display:
- live
- single chromatogram

evaluation:
- manual or automatic
- peak integration
- background subtraction
- limit of detection

dimension (w x h x d): 700 x 320 x 560 mm

weight: 45 kg

power supply: 110-230 V, 20 VA

operating conditions: 10-40°C max 70% r.H.
γ-Radiochromatography
nuclear instruments
Index

HPLC-detectors

TLC-detectors

- GABI* analog output
- GABI* digital output to PC

- miniGITA*, 1 trace scanner
- GITA*, 80 traces scanner
General description

GABI* is the latest technology μ-processor controlled gamma spectrometer with built in digital ratemeter.
GABI* is assembled by modules of 19” format, which make modification and service support very fast and easy.
GABI* stand alone unit offers a keyboard and liquid crystal display for parameter dialog, entry and result presentation.

GABI* has high voltage unit for manual or automatic selection of the required detector operation. Inserting a suitable calibration source and running the automatic calibration program, GABI* is setting all parameters to a calibrated energy scale. Recalibration for compensation of any drift is quite easy, fast and full automatic.

GABI* has 2 simultaneous counting channels with each 2 individually selectable energy thresholds each for setting an individual counting window for a particular nuclide. GABI* is counting the radiation events in an energy channel per selected interval time.

The information of counts per time is transferred to a ratemeter, which converts the digital format to an analog output format of 0 – 1V. Individual parameters of the ratemeter can be selected and entered by LCD and keyboard. The output signal 0 – 1V of Gabi can be easily adapted to the required chromatography conditions. GABI has an extremely high dynamic range from 0 – 500.000 c/s.

Features

automatic energy calibration
2 simultaneous counting channels
free threshold settings
extremely high dynamic range 0 – 500.000 c/s
LCD 4 lines, 20 characters each
keyboard: 16 touch sensitive keys
output: 0 – 1V

Ordering information

01050100 GABI* γ-HPLC-flow-detector with keyboard and display analog output 0-1V
01052001 GABI* scintillation probe 1x1” pinhole, 12 x 20mm
01052015 GABI* 30 mm lead shielding
01052002 GABI* flow cell 1x1” pinhole
01058004 γ-reference source, Cs-137 for 1x1”
01059025 GABI* scintillation probe 2x2” pinhole, 16 x 30mm
01059024 GABI* 50 mm lead shielding
01059023 GABI* flow cell for 2x2” pinhole
01059026 GABI* scintillation probe 3x3” pinhole, 16 x 40mm
01059028 GABI* 50 mm lead shielding
01059027 GABI* flow cell 3x3” pinhole
01058004 γ-reference source, Cs-137 for 2x2, 3x3”
01240074 installation and 1 day training
**Technical data**

- **energy range:** 10 – 2000 keV
- **high voltage range:** 500 – 2000 V
- **count rate:** 0 – 500,000 c/s
- **data input:** 7 analog input channels, -0.5 - + 4.5V, resolution 21 bit
- **data output:** RS232C, 2 analog outputs 0-1V, resolution 20 bit

**Scintillation probes**

- **1x1” NaI(Tl) size:**
  - pin hole size: 12 mm diameter
  - 20 mm deep
  - energy range: 10 – 150 keV
  - typical nuclide: I-125, Tc-99m
  - shielding: 30 mm lead

- **2x2” NaI(Tl) size:**
  - pin hole size: 16 mm diameter
  - 30 mm deep, 50 mm lead shield
  - energy range: 60 – 600 keV
  - typical nuclide: Tc-99m, I-131, F-18
  - shielding: 50 mm lead

- **3x3” NaI(Tl) size:**
  - pin hole size: 16 mm diameter
  - 40 mm deep, 50 mm lead shield
  - energy range: 60 – 2000 keV
  - typical nuclide: Fe-59
  - shielding: 50 mm lead
Applications

<table>
<thead>
<tr>
<th>Energy Range</th>
<th>Detector Size</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>10 – 150 keV</td>
<td>1x1&quot; NaI(Tl)</td>
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<tr>
<td>60 – 600 keV</td>
<td>2x2&quot; NaI(Tl)</td>
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</tr>
<tr>
<td>60 – 1300 keV</td>
<td>3x3&quot; NaI(Tl)</td>
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</table>

General description

**GABI** is the latest technology μ-processor controlled gamma spectrometer.

**GABI** is assembled by modules of 19" format, which make modification and service support very fast and easy.

**GABI** has high voltage unit for manual or automatic selection of the required detector operation.

Inserting a suitable calibration source and running the automatic calibration program, **GABI** is setting all parameters to the calibrated energy scale. Recalibration for compensation of any drift is quite easy, fast and fully automatic.

**GABI** has 2 simultaneous counting channels with 2 individually selectable energy thresholds each for setting an individual counting window for a particular nuclide.

**GABI** is counting the radiation events in an energy channel per selected interval time.

The information of counts per time is transferred to **GINA** program. The chromatogram is displayed live on screen. No overriding of ranges can happen. Peak integration, background subtraction, flow correction, absolute activity calculation etc can be performed manually or automatically.

Limit-of-detection is determined for every ROI, displayed and printed.

**GINA** program can control all modules of Agilent HPLC. All data and parameters are stored under one identity code.

**GINA** can be installed as well in background of the original HPLC-operation program and the user can use the operation program of the HPLC supplier as well as the advantages of **GINA**.

Features

- Automatic energy calibration
- 2 simultaneous counting channels
- Free threshold settings
- Extremely high dynamic range 0 – 500.000 c/s
- Digital communication to PC
- Including **GINA** program
- Live record on PC screen
- No range overriding
- Peak integration, manual or automatic
- Limit-of-detection calculation
- Statistical accuracy for every integral

Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>01050200</td>
<td>GABI* HPLC-flow-detector with <strong>GINA</strong> program</td>
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<tr>
<td>01052001</td>
<td><strong>GABI</strong> scintillation probe 1x1&quot; pinhole, 12 x 20mm</td>
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<tr>
<td>01052015</td>
<td><strong>GABI</strong> 30 mm lead shielding</td>
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<tr>
<td>01052002</td>
<td><strong>GABI</strong> flow cell 1x1&quot; pinhole</td>
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<tr>
<td>01058004</td>
<td><strong>GINA</strong> reference source, Cs-137 for 1x1&quot;</td>
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<tr>
<td>01059025</td>
<td><strong>GABI</strong> scintillation probe 2x2&quot; pinhole, 16 x 30mm</td>
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<tr>
<td>01059024</td>
<td><strong>GABI</strong> 50 mm lead shielding</td>
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<td>01059023</td>
<td><strong>GABI</strong> flow cell for 2x2&quot; pinhole</td>
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<td><strong>GABI</strong> scintillation probe 3x3&quot; pinhole, 16 x 40mm</td>
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<td><strong>GABI</strong> flow cell 3x3&quot; pinhole</td>
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<td>01058004</td>
<td><strong>GINA</strong> reference source, Cs-137 for 2x2, 3x3&quot;</td>
</tr>
<tr>
<td>01240074</td>
<td>Installation and 1 day training</td>
</tr>
</tbody>
</table>

*www.raytest.com*
Technical data

- energy range: 10 – 2000 keV
- high voltage range: 500 – 2000 V
- count rate: 0 – 500,000 c/s
- data input: 7 analog input channels, -0.5 - + 4.5V, resolution 21 bit
- data output: RS232C, 2 analog outputs 0-1V, resolution 20 bit

Scintillation probes

- NaI(Tl) size: 1x1"
  - pin hole size: 12 mm diameter, 20 mm deep
  - energy range: 10 – 150 keV
  - typical nuclide: I-125
  - shielding: 30 mm lead

- NaI(Tl) size: 2x2"
  - pin hole size: 16 mm diameter, 30 mm deep
  - energy range: 60 -600 keV
  - typical nuclide: Tc-99m, I-131, F-18
  - shielding: 50 mm lead

- NaI(Tl) size: 3x3"
  - pin hole size: 16 mm diameter, 40 mm deep
  - energy range: 60 – 2000 keV
  - typical nuclide: Fe-59
  - shielding: 50 mm lead
**General description**

miniGITA* is a scanning device, which moves a radioactivity detector along 1 trace from start to front. The repeated, fast, continuous detection from start to front and back compensates automatically the radioactive decay of the compound over the scan length.

For γ-nuclides, miniGITA* is using a scintillation probe with a BGO crystal. Due to its density, BGO has quite high stopping power for radiation and a reasonable energy resolution. BGO is mechanically quite stable and non hydroscopic. Relative small size and special shape enable a sophisticated design of the scintillation probe.

There are 5 mechanical collimators designed for the energy ranges of 0-60, 60-150, 150-250, 250-450, > 450 in keV. Depending on the radiation energy of the radioactive compound, the suitable collimator is inserted into the detector. Simple tools help to keep the distance exactly the same between the sample surface and detector entry window.

miniGITA* offers a calibration and sensitivity check. Inserting a suitable reference standard and running the calibration program will result in an energy spectrum scan and calibration.

After one scan the TLC-plate can be moved manually to the following trace and the next TLC can be examined.

The chromatogram is displayed live on the screen of the connected PC. Peak integration and evaluation can be performed manually or automatically.

The measurement and data handing is digital (single event counting) and limit of detection can be determined for every small peak.

**Features**

- 1 trace scan 25 x 200 mm
- automatic energy calibration
- extremely high counting rate
- dead time correction
- automatic decay correction
- live display on screen
- peak integration, TLC evaluation
- limit-of detection calculation

**Ordering information**

- 02900012 miniGITA* γ-TLC-scanner all programs included
- 02900004 miniGITA* collimator 0-60 keV
- 02900005 miniGITA* collimator 60-150 keV
- 02900006 miniGITA* collimator 150-250 keV
- 02900007 miniGITA* collimator 250-450 keV
- 02900008 miniGITA* collimator > 450 keV
- 02900011 γ-reference source with holder
- 01240074 installation and 1 day training

complete installation requires PC and WINDOWS
### Technical data

- **Scan area:** 25 x 200 mm  
- **Scan speed:** selectable  
- **Traces:** 1  
- **Detector:** scintillation probe  
- **Nuclides:** gamma  
- **Energy:** 20 – 2000 keV  
- **Activity:** 10 Bq – 100 MBq  
- **Decay:** corrected  
- **Maximum countrate:** 200,000 cps

### Collimators

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<tr>
<th>Energy Range</th>
<th>Material</th>
<th>Typical Nuclide</th>
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</thead>
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<td>0-60 keV</td>
<td>stainless steel</td>
<td>I-125</td>
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<tr>
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<tr>
<td>60 – 150 keV</td>
<td>tungsten</td>
<td>Tc-99m</td>
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<tr>
<td></td>
<td></td>
<td>5 mm high</td>
</tr>
<tr>
<td>150 – 250 keV</td>
<td>tungsten</td>
<td>In-111</td>
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<tr>
<td></td>
<td></td>
<td>10 mm high</td>
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<tr>
<td>250 – 450 keV</td>
<td>tungsten</td>
<td>I-131</td>
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<tr>
<td></td>
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<td>15 mm high</td>
</tr>
<tr>
<td>&gt; 450 keV</td>
<td>tungsten</td>
<td>F-18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 mm high</td>
</tr>
</tbody>
</table>

- I-123 bkg 0.7 cps (20-100 keV)  
- Sensitivity 20 Bq in 10 min  
- Resolution 2.3 mm depending on collimator

---

**raytest Isotopenmessgeräte GmbH**  
Benzstrasse 4  
75334 Straubenhardt · Germany  
Phone +49 7082 9255-0 · Fax +49 7082 9255-4444  
[www.raytest.com](http://www.raytest.com)
**Applications**

γ  radioactivity TLC
radiochemical purity
multiple trace TLC
2 plates 200 x 200 mm
multiple nuclides

**General description**

GITA* is a scanning device, which moves the radioactivity detector along 1 trace from start to front and goes to the next pre-programmed trace position and scans that trace with individual nuclide settings.

For γ-nuclides, GITA* is using a scintillation probe with a BGO crystal. Due to its density, BGO has a quite high stopping power for radiation and a reasonable energy resolution. BGO is mechanically quite stable and non-hydroscopic. Relative small size and special shape enable a sophisticated design of the scintillation probe.

There are 5 mechanical collimators designed for the energy ranges of 0-60, 60-150, 150-250, 250-450, >450 keV. Depending on the radiation energy of the radioactive compound, the suitable collimator is inserted into the detector. Simple tools help to keep the distance exactly the same between the sample surface and detector entry window.

GITA* offers a calibration and sensitivity check by a reference source.

After all traces of 1 TLC plate 200 x 200 mm are ready, the second TLC plate 200 x 200 mm can be scanned.

A single chromatogram can be displayed live on the screen of the connected PC. Multiple traces can be displayed 3-dimensional.

Peak integration and evaluation can be performed manually or automatically. The measurement and data handling is digital (single event counting) and limit of detection can be determined for every small peak.

**Features**

- 80 trace scans on 2 TLC plates 200 x 200 mm
- automatic energy calibration
- extremely high counting rate
- dead time correction
- automatic decay correction
- live display on screen
- peak integration,
- TLC evaluation
- limit-of detection calculation

**Ordering information**

- 07000010 GITA* multiple-γ-TLC-scanner all programs included
- 02900004 GITA* collimator 0-60 keV
- 02900005 GITA* collimator 60-150 keV
- 02900006 GITA* collimator 150-250 keV
- 02900007 GITA* collimator 250-450 keV
- 02900008 GITA* collimator 450 – keV
- 02900011 γ-reference source with holder
- 01240074 installation and 1 day training

Complete installation requires PC and WINDOWS

www.raytest.com
Technical data

Scan area: 400 x 200 mm
Scan speed: selectable
Traces: 80
Detector: scintillation probe
Nuclides: gamma
Energy: 20 – 2000 keV
Activity: 10 Bq – 100 MBq
Decay: corrected
Maximum countrate: 200,000 cps

Collimators 3 x 25 mm open

0-60 keV stainless steel,
typical nuclide I-125
3 mm high

60 – 150 keV tungsten,
typical nuclide Tc-99m
5 mm high

150 – 250 keV tungsten,
typical nuclide In-111
10 mm high

250 – 450 keV tungsten,
typical nuclide I-131
15 mm high

> 450 keV tungsten,
typical nuclide F-18
20 mm high

I-123 bkg 0.7 cps (20-100 keV)
sensitivity 20 Bq in 10 min
resolution 2-3 mm depending on collimator

scintillation probe F-18 linearity on TLC

scintillation probe F-18 linearity result table
Positron-Emission-Tomography

nuclear instruments

ClearPET™

raytest
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- PETra* analog output
- PETra* digital output to PC

TLC-detector
- PET-miniGITA*
- 1 trace TLC scanner

Synthesis
- SynChrom FDG
- SynChrom R&D
- SynChrom FLT
- SynChrom FET
- SynChrom FEC
- Synchrom F2
- Synchrom F-Dopa
- SynChrom Ga68
- SynChrom multi process interface

Quality Control
- total activity · ISABEL 1010, ISABEL 2000
- total weight · PET-balance
- pH-meter · PET-pH
- Osmometery · PET-osmo
- Endotoxicity · PET-endotox
- Sterility · PET-steril

BARES
- batch recording program

ClearPET
- small animal PET scanner

TomoScope
- small animal CT scanner
Applications

\( \gamma \)  
radioactivity GC  
radiochemical purity of  
\([0\text{-}15] \text{H}_2\text{O} \)  
20 – 2000 keV, 2x2” NaI(Tl)

Features

automatic energy calibration  
2 simultaneous counting channels  
free threshold settings  
extremely high dynamic range 0 – 500,000 c/s  
LCD 4 lines, 20 characters each  
keyboard: 16 touch sensitive keys  
output: 0 – 1V  
heated GC capillary tube between oven and detector  
special coiled capillary flow cell with temperature shield  
see application report

Ordering information

11050100 PETra* γ-HPLC-flow-detector  
with keyboard and display  
analog output 0-1V

11053000 PETra* γ-GC-scintillation probe  
2x2” full crystal

11053010 PETra* 50 mm lead shielding

11050024 PETra* γ-GC-flow cell

11203100 PETra* γ-GC-accompanied heating  
for GC capillary

97030006 PETra* γ-reference source, Cs-137, 333kBq, 9 μCi

01240074 installation and 1 day training

29000001 BARES batch QC recording program and reporting system

29000002 BARES extension further data source

PETra* analog output  
Radioactivity-GC-flow-monitor
Technical data

- Energy range: 10 – 2000 keV
- High voltage range: 500 – 2000 V
- Count rate: 0 – 500,000 c/s
- Data input: 7 analog input channels, -0.5 - + 4.5V, resolution 21 bit
- Data output: RS232C, 2 analog outputs 0-1V, resolution 20 bit

Scintillation probes

- NaI(Tl) size: 2x2”, full crystal
- Energy range: 60 - 600 keV
- Typical nuclide: 15O
- Shielding: 50 mm lead on a 3 foot
- Flow cell: Capillary tube coiled for required volume, temperature shield for protection of scintillation crystal
- Temperature setting: up to 150 degree C

accompanying heating between GC and scintillation probe in order to avoid condensation in capillary tube
PETra* digital output to PC
Radioactivity-GC flow-monitor

Applications

\[ \gamma \] radioactivity GC
radiochemical purity of
\([0-15] \text{H}_2\text{O}\)
20 – 2000 keV, 2x2” NaI(Tl)

Features

automatic energy calibration
2 simultaneous counting channels
free threshold settings
extremely high dynamic range 0 – 500,000 c/s
GINA* acquisition + control program
PC, screen and keyboard
heated GC capillary tube between oven and detector
special coiled capillary flow cell with temperature shield
see application report

General description

PETra* is consisting of GABI*, the radioactivity flow detector, an accompanied heating for GC capillary tube between GC oven and scintillation detector and a 2x2” full crystal scintillation probe with a special PETra* flow cell. GABI* is the latest technology µ-processor controlled gamma spectrometer with built in digital ratemeter. GABI* is assembled by modules of 19” format, which make modification and service support very fast and easy. GABI* has high voltage unit for manual or automatic selection of the required detector operation. Inserting a suitable calibration source and running the automatic calibration program, GABI* is setting all parameters to an calibrated energy scale. Recalibration for compensation of any drift is quite easy, fast and full automatic. GABI* has 2 simultaneous counting channels with 2 individually selectable energy thresholds each for setting an individual counting window for a particular nuclide. GABI* is counting the radiation events in an energy channel per selected interval time. GABI* has an extremely high dynamic range from 0 – 500,000 c/s. The information of counts per time is transferred to a PC running GINA* program. The chromatogram is displayed live on screen. No overriding of ranges can happen. Peak integration, background subtraction, flow correction, absolute activity calculation etc can be performed manually or automatically. Limit-of-detection is determined for every ROI, displayed and printed. GINA* can measure and control Agilent GC 6850. All data and parameter are stored under one sample ID. The accompanied heating for GC capillary tube ensures that there is no condensation between GC oven and detector. The special flow cell ensures that the sensitivity is high and the temperature of the scintillator is low.

Ordering information

11050200 PETra* γ-HPLC-flow-detector with GINA* program
11053000 PETra* γ-GC-scintillation probe 2x2” full crystal
11053010 PETra* γ-GC-flow cell
11050024 PETra* γ-GC-accompanied heating for GC capillary
11203100 PETra* γ-GC-accompanied heating for GC capillary
01240038 GINA* control extension Agilent GC
97030006 PETra* γ-reference source, Cs-137, 333kBq, 9 μCi
01240074 installation and 1 day training
29000001 BARES batch QC recording program and reporting system
29000002 BARES extension further data source
**Technical data**

- **energy range**: 10 – 2000 keV
- **high voltage range**: 500 – 2000 V
- **count rate**: 0 – 500,000 c/s
- **data input**: 7 analog input channels, -0.5 - + 4.5V, resolution 21 bit
- **data output**: RS232C, 2 analog outputs 0-1V, resolution 20 bit

**Scintillation probes**

- **NaI(Tl) size**: 2x2”, full crystal
- **energy range**: 60 - 600 keV
- **typical nuclide**: 15O
- **shielding**: 50 mm lead on a 3 foot
- **flow cell**: capillary tube coiled for required volume, temperature shield for protection of scintillation crystal
- **temperature setting**: up to 150 degree C

GINA Agilent GC 6850 full control

accompanied heating between GC and scintillation probe in order to avoid condensation in capillary tube
PET-miniGITA* is a scanning device, which moves a radioactivity detector along 1 trace from start to front. The repeated, fast, continuous detection from start to front and back compensates automatically the radioactive decay of the compound over the scan length.

For PET-nuclides, emitting high energy positrons, PET-miniGITA* is using a Geiger-Mueller counting tube. The end window counting tube is modified for very high counting speed.

For suitable resolution of radioactive fractions along the thin-layer-chromatogram a collimator made of stainless steel is used.

PET-miniGITA* a calibration and sensitivity check. Inserting a suitable β-reference standard.

After one scan the TLC-plate can be moved manually to the following trace and the next TLC can be examined.

The chromatogram is displayed live on the screen of the connected PC.

Peak integration and evaluation can be performed manually or automatically.

The measurement and data handing is digital (single event counting) and Limit-of-Detection can be determined for every small peak.

Limit-of-Detection is automatically calculated, displayed and printed.

**Applications**

- β⁺ radioactivity TLC
- radiochemical purity
- single trace TLC 25 x 200 mm
decay corrected

**Features**

- 1 trace scan 25 x 200 mm
- high counting rate
- dead time correction
- automatic decay correction
- live display on screen
- peak integration
- TLC evaluation
- Limit-of-Detection calculation

**Ordering information**

- 02900015 PET-miniGITA* TLC-scanner all programs included
- 02900018 β-reference source with holder
- 01240074 installation and 1 day training
- 29000001 BARES batch QC recording program and reporting system
- 29000002 BARES extension further data source
**Technical data**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tr>
<td><strong>scan area:</strong></td>
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<td>1</td>
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<td>Geiger-Mueller probe</td>
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<td><strong>nuclides:</strong></td>
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<td>10 Bq – 100 MBq</td>
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<td><strong>background 18F:</strong></td>
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<td><strong>sensitivity 18F:</strong></td>
<td>10 Bq in 10 min.</td>
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<td><strong>connections:</strong></td>
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</tbody>
</table>
Applications

PET synthesis of: \[^{18}\text{F}\]-FDG

General description

The SynChrom FDG system has been developed & designed to produce \[^{18}\text{F}\]-FDG based on nucleophilic substitution. The system is based on the raytest SynChrom R&D system without the hardware which is not required for the FDG synthesis process. raytest is supplying the entire process documentation as well as the responsibility for the successful FDG production on this device.

The SynChrom FDG unit is equipped with one of the unique raytest transparent reactor systems. The entire process is visible.

The 500W electrical air heater system & the compressed air cooling enables ultra fast temperature changes in the synthesis reagent solvent. The system monitors the real solvent temperature. Temperature range 20°C - +180°C. SynChrom FDG is equipped with very fast, low hold up volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves.

All solvents are transported directly into the reaction vessel without any solvent cross contamination.

The built-in pressure sensor continuously displays the actual system (reactor) pressure. This pressure sensor is also used for automatic gas leakage test after the synthesis unit cleaning procedure. During the process this sensor also observes the process for unexpected “accidents” with selectable warning and shutdown levels.

The reactor system is also equipped with a magnetic stirrer mixing system & a tube lifting system.

The unit contains a built-in lead shielding housing for the F-trap as well as a shielded target water collecting vial with radiation detectors for observation, analysis and reporting. (both can be used also without a self owned cyclotron).

The target activity delivery can be done directly to the F-trap or via the target vial.

Features

- very compact
- 1 transparent reactor systems
- fully visible process
- ultra fast reactor heating / cooling
- magnetic stirrer mixing system
- tube lifting system
- cartridge product purification
- built-in vacuum pump
- built-in pressure control
- on-line process control
- interactive process diagram
- fully automatic operation
- reported manual intervention
- online/offline process development interface
- GLP/GMP/21 CFR part 11 compliant
- highest reliability
- highest yield (>55%)
- acid or base hydrolysis possible

Ordering information

require example quotation
#2008-30325

www.raytest.com
**Continued description**

Close to the reactor further shielded radiation detectors are installed to monitor the actual process activity. Target or QMA + product radiation detectors are used for automatic calculation of the yield. (EOB / EOS / EOP, uncorrected and/or corrected) The system contains a 0-18 water recovery vial and on request a second water recovery vial (for flushing target). The built-in double membrane high performance, solvent resistant vacuum pump (40mbar) allows ultra fast drying of the solvent. The product will be purified by single use cartridges. All detectors are designed for a dynamic range from 10 mCi to 5 Ci at minimum crosstalk. The entire unit is tested up to 5 Ci. The unit is controlled by GINA* SynChrom software with an almost unlimited flexibility for process optimization.

**Technical data**

- **number of valves:** 15
- **liquid nitrogen cooling Dewar:** 1 l
- **solvent container:** 6
- **product vessel:** 25 ml
- **magnetic stirrer:** 2
- **radioactivity detectors:** 4 GM tubes
- **gas pressure sensor:** 1
- **reactor systems:** 1
- **reactor cooling method:** glass or Sigradur 18ml compressed air
- **shielded cartridge trap positions:** 2
- **vacuum pump:** 40 mbar, solvent resistant
- **overall dimension:** 380mm width, 520mm width incl. cold trap, 490 mm depth, 500 mm height
- **weight:** 36 kg
- **power:** 115 – 230 V, 200 W
- **humidity:** max 70% relative
- **temperature:** 10 – 40 degree C

**Technical diagram**

![SynChrom F-18 FDG flow diagram](image)

![SynChrom F-18 FDG acid](image)

![Solvent container & connection](image)

**Position-Emission-Tomography**

raytest Isotopenmessgeräte GmbH
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**Applications**

PET synthesis of:
- FEC, FLT, FET, FDDNP,
- F-Misodiazol, FTHA,
- F-Altanserin, F-BMS
- FDG (Dual), FFAU,
- F-diprenorphen,
- F-benperidol, FESP,
- F-m-piperone, FEAU,
- F-estradiol, FMZ,
- F-Paclitaxel, FHBG,
- F-Octreotide

others

**General description**

The **SynChrom R&D** system has been developed & designed to afford the transfer of the radio chemist’s idea of a chemical synthesis process from an “on hand”, published or known process to a fully automatic synthesis system. Also the entire chemical process development can be done on this unit. Almost all synthesis processes can be applied.

With the optional reactor pre-cooling device even electrophilic substitution processes can be adapted.

The **SynChrom R&D** unit is equipped with one or two unique raytest transparent reactor systems. The entire process is visible.

The 500W electrical air heater system & the compressed air cooling enables ultra fast temperature changes in the synthesis reagent solvent. The system monitors the real solvent temperature. Temperature range 20°C /±180°C.

**SynChrom R&D** is equipped with very fast, low dead volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves. All solvents are transported directly into the reaction vessel without any solvent cross contamination.

The built-in pressure sensor continuously displays the actual system (reactor) pressure. This pressure sensor is also used for automatic gas leakage test after the synthesis unit cleaning procedure. During the process this sensor also observes the process for unexpected “accidents” with selectable warning and shutdown levels.

The reactor system is also equipped with a magnetic stirrer mixing system & a tube lifting system.

The unit contains a built-in lead shielded housing for the F-trap as well as a shielded target water collecting vial with radiation detectors for observation, analysis and reporting. (both can be used also without an on site cyclotron).

The target delivery can be done directly to the F-trap or via the target vial.

**Features**

- very compact
- 1 or 2 reactor systems
- transparent reactor systems
- fully visible process
- ultra fast reactor heating / cooling
- magnetic stirrer mixing system
- tube lifting system
- built-in HPLC purification system
- built-in vacuum pump
- built-in pressure control
- on-line process control
- interactive process diagram
- full automatic operation
- reported manual intervention
- online/offline process development interface
- GLP/GMP/21 CFR part 11 compliant
- highest reliability

**Ordering information**

- require example quotation
- #2008-30234
Continued description

Close to the reactors further shielded radiation detectors are installed to monitor the actual process activity. Target or QMA + product radiation detectors are used for automatically calculation of the yield (EOB / EOS / EOP, uncorrected and/or corrected). The system contains a 0.18 water recovery vial and on request a second water recovery vial. (for flushing target). The built-in double membrane high performance, solvent resistant vacuum pump (40mbar) allows ultra fast drying of the solvent.

For purifications of the product the system contains a built-in semipreparative HPLC system. The automatic injector with a sample loop for the entire reaction vessel volume is controlled by the IR liquid detector for automatic detection of the injection time (reactor empty).

In front of the HPLC column there is a further lead shielded housing for a cartridge trap (DMSO trap). The built-in radioactivity flow through detector detects the main peak and the built-in fraction collector automatically collects it. All detectors are designed for a dynamic range from 10 mCi to 2 Ci at minimum crosstalk.

The entire unit is tested up to 5 Ci.

A lead shielded cartridge trap housing is installed behind the HPLC product separation and fractioning to allow organic solvent trapping.

The unit is controlled by GINA* SynChrom software with an almost unlimited flexibility for process optimization.

Technical data

- number of valves: 25
- liquid nitrogen cooling Dewar: 1 l
- HPLC pump: 10 ml/min, isocr. 400 bar
- UV detector: 254 nm
- autom. injector loop: 3–5 ml
- liquid sensor: IR
- solvent container: 11
- product vessel: 20 ml
- magnetic stirrer: 3 or 4
- radioactivity detectors: 7 GM tubes
- gas pressure sensor: 1
- reactor systems: 1 or 2
- reactor cooling method: compressed air or pre-cooled nitrogen
- shielded cartridge trap positions: 3
- vacuum pump: 40 mbar, solvent res.
- overall dimension: 520 mm wide
  490 mm deep
  500 mm high
- weight: 36 kg
- power: 115 or 230 V / 200W
- humidity: max. 70% relative
- temperature: 10 – 40 degree C
**General description**

The **SynChrom FLT** system has been developed & designed to produce [F-18]FLT based on nucleophilic substitution. The system is based on the raytest **SynChrom R&D** system without the hardware which is not required for the FLT synthesis process. Raytest is supplying the entire process documentation as well as the responsibility for the successful FLT production on this device.

The **SynChrom FLT** unit is equipped with one of the unique raytest transparent reactor systems. The entire process is visible. The 500W electrical air heater system & the compressed air cooling enables ultra fast temperature changes in the synthesis reagent solvent. The system monitors the real solvent temperature. Temperature range 20°C - +180°C. **SynChrom FLT** is equipped with very fast, low hold up volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves. All solvents are transported directly into the reaction vessel without any solvent cross contamination.

The built-in pressure sensor continuously displays the actual system (reactor) pressure. This pressure sensor is also used for automatic gas leakage test after the synthesis unit cleaning procedure. During the process this sensor also observes the process for unexpected “accidents” with selectable warning and shutdown levels. The reactor system is also equipped with a magnetic stirrer mixing system & a tube lifting system.

The unit contains a built-in lead shielding housing for the F-trap as well as a shielded target water collecting vial with radiation detectors for observation, analysis and reporting. (both can be used also without a self owned cyclotron). The target delivery can be done directly to the F-trap or via the target vial.

**Features**

- very compact
- 1 transparent reactor systems
- fully visible process
- ultra fast reactor heating / cooling
- magnetic stirrer mixing system
- tube lifting system
- built-in HPLC purification system
- built-in vacuum pump
- built-in pressure control
- on-line process control
- interactive process diagram
- fully automatic operation
- reported manual intervention
- online/offline process development interface
- GLP/GMP/21 CFR part 11 compliant
- highest reliability
- highest yield

**Ordering information**

require example quotation

#2008-30184
**General description**

Close to the reactor a further shielded radiation detector is installed to monitor the actual process activity. Target or QMA + product radiation detectors are used for automatic calculation of the yield. 

(EOB / EOS / EOP, uncorrected and/or corrected) 

The system contains a 0-18 water recovery vial and on request a second water recovery vial (for flushing target). 

The built-in double membrane high performance, solvent resistant vacuum pump (40mbar) allows ultra fast drying of the solvent. 

For purifications of the product the system contains a built-in semi-preparative HPLC system. 

The automatic injector with a sample loop for the entire reaction vessel volume is controlled by the IR liquid detector for automatic detection of the injection time (reactor empty). 

The built-in radioactivity flow through detector detects the main peak and the built-in fraction collector automatically collects it. All detectors are designed for a dynamic range from 1.0 mCi to 2 Ci at minimum crosstalk. 

The entire unit is tested up to 5 Ci. 

The unit is controlled by GINA* SynChrom software with an almost unlimited flexibility for process optimization.

---

**Technical data**

- **number of valves**: 25
- **liquid nitrogen cooling Dewar**: 1l
- **HPLC pump**: 10ml/min, isocr. 400bar
- **UV detector**: 254 nm
- **autom. injector loop**: 3–5 ml
- **liquid sensor**: IR
- **solvent container**: 11
- **product vessel**: 20 ml
- **magnetic stirrer**: 3 or 4
- **radioactivity detectors**: 5 GM tubes
- **gas pressure sensor**: 1
- **reactor systems**: 1 
glass or Sigradur18ml 
compressed air
- **shielded cartridge trap positions**: 1
- **vacuum pump**: 40 mbar 
solvent resistant
- **overall dimension**: 520 mm wide 
490 mm deep 
500 mm high
- **weight**: 36 kg
- **power**: 115 – 230 V 
200 W
- **humidity**: max 70% relative
- **temperature**: 10 – 40 degree C

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**General description**

The **SynChrom FET** system has been developed & designed to produce [F-18]FET based on nucleophilic substitution. The system is based on the raytest **SynChrom R&D** system without the hardware which is not required for the FET synthesis process.

Raytest is supplying the entire process documentation as well as the responsibility for the successful FET production on this device.

The **SynChrom FET** unit is equipped with two of the unique raytest transparent reactor systems. The entire process is visible.

The 500W electrical air heater systems & the compressed air cooling enables ultra fast temperature changes in the synthesis reagent solvent.

The system monitors the real solvent temperature. Temperature range 20°C - +180°C.

**SynChrom FET** is equipped with very fast, low hold up volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves.

All solvents are transported directly into the reaction vessel without any solvent cross contamination.

The built-in pressure sensor continuously displays the actual system (reactor) pressure. This pressure sensor is also used for automatic gas leakage test after the synthesis unit cleaning procedure. During the process this sensor also observes the process for unexpected “accidents” with selectable warning and shutdown levels.

The reactor systems are also equipped with a magnetic stirrer mixing system & a tube lifting system.

The unit contains a built-in position for the F-trap as well as a position for the target water collecting vial with radiation detectors for observation, analysis and reporting. (both can be used also without a direct attached cyclotron).

The target delivery can be done directly to the F-trap or via the target vial.

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**Features**

- very compact
- 2 transparent reactor systems
- fully visible process
- ultra fast reactor heating / cooling
- magnetic stirrer mixing system
- tube lifting system
- cartridge purification
- built-in vacuum pump
- built-in pressure control
- on-line process control
- interactive process diagram
- fully automatic operation
- reported manual intervention
- online/offline process development interface
- GLP/GMP/21 CFR part 11 compliant
- highest reliability
- highest yield

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**Applications**

PET synthesis of: [F-18]FET

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**Ordering information**

require example quotation

#2008-30185

www.raytest.com
**Continued description**

Close to the reactors two further shielded radiation detectors are installed to monitor the actual process activity. Target (or QMA + product radiation detectors are used for automatic calculation of the yield. (EOB / EOS / EOP, uncorrected and/or corrected) The system contains a 0-18 water recovery vial and on request a second water recovery vial (for flushing target).

The built-in double membrane high performance, solvent resistant vacuum pump (40mbar) allows ultra fast drying of the solvent.

For purifications of the product, the system contains a radiation detector observed cartridge position. No semi-preparative HPLC system is required. All detectors are designed for a dynamic range from 10 mCi to 2 Ci at minimum crosstalk.

The entire unit is tested up to 5 Ci. The unit is controlled by GINA* SynChrom software with an almost unlimited flexibility for process optimization.

The system (hard as well as software) is GLP/GMP/21 CFR part 11 compliant.

---

**Technical data**

- **number of valves:** 25
- **liquid nitrogen cooling Dewar:** 1 l
- **solvent container:** 11 l
- **product vessel:** 20 ml
- **magnetic stirrer:** 3
- **radioactivity detectors:** 7 GM tubes
- **gas pressure sensor:** 1
- **reactor systems:** 2
  - glass or Sigradur 18ml
- **reactor cooling method:** compressed air
- **cartridge trap positions:** 3
- **vacuum pump:** 40 mbar, solvent res.
- **overall dimension:**
  - 520 mm wide
  - 490 mm depth
  - 500 mm high
- **weight:** 36 kg
- **power:** 115 or 230 V / 200 W
- **humidity:** max 70% relative
- **temperature:** 10 – 40 degree C
The SynChrom FEC system has been developed & designed to produce [F-18]FLT based on nucleophilic substitution. The system is based on the raytest SynChrom R&D system without the hardware which is not required for the FEC synthesis process. Raytest is supplying the entire process documentation as well as the responsibility for the successful FEC production on this device.

The SynChrom FEC unit is equipped with two of the unique raytest transparent reactor systems. The entire process is visible.

The 500W electrical air heater system & the compressed air cooling enables ultra fast temperature changes in the synthesis reagent solvent. The system monitors the real solvent temperature. Temperature range 20°C : +180°C.

SynChrom FEC is equipped with very fast, low hold up volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves. All solvents are transported directly into the reaction vessel without any solvent cross contamination.

The built-in pressure sensor continuously displays the actual system (reactor) pressure. This pressure sensor is also used for automatic gas leakage test after the synthesis unit cleaning procedure. During the process this sensor also observes the process for unexpected “accidents” with selectable warning and shutdown levels.

The reactor systems are also equipped with magnetic stirrer mixing systems & tube lifting systems.

The unit contains a built-in lead shielding housing for the F-trap as well as a shielded target water collecting vial with radiation detectors for observation, analysis and reporting (both can be used also without a self owned cyclotron).

The target delivery can be done directly to the F-trap or via the target vial.

www.raytest.com
Technical data

- Number of valves: 25
- Liquid nitrogen cooling Dewar: 1 l
- Solvent container: 11
- Product vessel: 25 ml
- Magnetic stirrer: 3
- Radioactivity detectors: 5 GM tubes
- Gas pressure sensor: 1
- Reactor systems: 2
- Reactor cooling method: Compressed air
- Cartridge trap positions: 3
- Vacuum pump: 40 mbar, solvent res.

- Overall dimension: 520 mm wide, 490 mm deep, 500 mm high
- Weight: 36 kg
- Power: 115 or 230 V / 200 W
- Humidity: Max 70% relative
- Temperature: 10 – 40 degree C

Continued description

Close to the reactors further shielded radiation detectors are installed to monitor the actual process activity. Target or QMA + product radiation detectors are used for automatic calculation of the yield. (EOB / EOS / EOP, uncorrected and/or corrected) The system contains a 0-18 water recovery vial and on request a second water recovery vial (for flushing target).
The built-in double membrane high performance, solvent resistant vacuum pump (40 mbar) allows ultra fast drying of the solvent. For purifications of the product the system is equipped with a cartridge purification. All detectors are designed for a dynamic range from 10 mCi to 5 Ci at minimum crosstalk. The system will be delivered with the raytest FEC 2 step process with cartridge purification. Entire chemical process description available on request.
The unit is controlled by GINA* SynChrom software with an almost unlimited flexibility for process optimization.

Example run FEC

SynChrom FEC flow diagram
**SynChrom F2**

PET-automatic-synthesis-unit for electrophilic substitution

**Applications**

PET synthesis of:
- F-DOPA
- F-Tyrosine
- F-Uracile

**General description**

*SynChrom F2* is a fully automatic PET-synthesis unit for electrophilic substitution processes.

The system contains the unique raytest transparent reactor system. The entire process is visible.

The first synthesis step requires a very low temperature. *SynChrom F2* has a nitrogen gas cooled (liquid nitrogen pre cooled) reactor and a 500W electrical air heater. This enables ultra fast temperature changes in the synthesis reagent solvent.

The system monitors the real solvent temperature. Temperature range –40°C - +180°C.

*SynChrom F2* is equipped with very fast, low hold up volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves.

All solvents are transported directly into the reactor vessel, without any solvent cross contamination.

The built-in pressure sensor displays the actual system (reactor) pressure. This pressure sensor is also used for pressure / vacuum tightness test after the synthesis unit cleaning procedure. During the process this sensor also observes for unexpected events with settable warnings and shutdown levels.

The 18ml reactor is equipped with a magnetic stirrer solvent mixing system and a tube lifting system.

The reactor is equipped with a lead shielded radiation detector to monitor the actual delivered activity and to automatically calculate the yield. (EOB / EOS).

**Features**

- very compact
- 1 transparent reactor system
- on-line process display
- interactive process diagram
- fully automatic
- manual intervention
- GLP/GMP/21 CFR part 11 compliant
- highest reliability
- highest yield

**Ordering information**

require example quotation

#2008-30232
**Continued description**

For purification of the product the unit contains a built-in semi-preparative HPLC system consisting of a 10 ml isocratic pump, 254 nm UV detector, automatic injector with a sample loop for the entire reaction vessel volume and a liquid detector for automatic detection of the injection time (reactor empty).

Dependent on the process, the required HPLC separation column is included.

Other columns are available on request.

The built-in radioactivity flow sensor detects the main peak and the built-in fraction collector automatically collects it.

All detectors are designed for a dynamic range from 10 mCi up to 2 Ci at minimum crosstalk. The entire unit is tested up to 2 Ci.

F2 target is required.

---

**Technical data**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of valves:</td>
<td>14</td>
</tr>
<tr>
<td>liquid nitrogen Dewar:</td>
<td>1 l</td>
</tr>
<tr>
<td>reaction vessel:</td>
<td>18 ml Sigradur or Duran</td>
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<tr>
<td>reactor temp. range:</td>
<td>-40°C  -  +180°C</td>
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<tr>
<td>HPLC pump:</td>
<td>10 ml/min, 400 bar</td>
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<tr>
<td>UV-detector:</td>
<td>254 nm</td>
</tr>
<tr>
<td>autom. injector loop:</td>
<td>5 ml</td>
</tr>
<tr>
<td>liquid sensor:</td>
<td>IR</td>
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<tr>
<td>F2-flow:</td>
<td>mass flow detector / regulator (optional)</td>
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<tr>
<td>solvent container:</td>
<td>1x20 ml 3 x 8 ml</td>
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<tr>
<td>product vessel:</td>
<td>20 ml (illuminated)</td>
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<tr>
<td>radioactivity detectors:</td>
<td>3 x GM (lead shielded)</td>
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<tr>
<td>pressure sensor:</td>
<td>1</td>
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<tr>
<td>vacuum pump:</td>
<td>40 mbar / solvent resistant</td>
</tr>
<tr>
<td>overall dimension:</td>
<td>520 mm wide 490 mm deep 500 mm high</td>
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<td>power:</td>
<td>115 – 230 V / 200 W</td>
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<td>environment humidity:</td>
<td>max 70% relative</td>
</tr>
<tr>
<td>environment temp.:</td>
<td>10 – 40 degree C</td>
</tr>
</tbody>
</table>
**Applications**

PET synthesis of: F-Dopa

**General description**

**SynChrom F-Dopa** is a fully automatic PET-synthesis unit for FDopa production via electrophilic substitution processes.

The **SynChrom F-Dopa** unit is based on the raytest **SynChrom F2** system. Different to that system raytest delivers together with the **SynChrom F-Dopa** the entire chemical process description. raytest guarantees the successful F-Dopa production. SOP, solvent description & comprehensive documentation is available. The system contains the unique raytest transparent reactor system. The entire process is visible.

The first synthesis step requires a very low temperature. **SynChrom F-Dopa** has a nitrogen gas cooled (liquid nitrogen pre cooled) reactor and a 500W electrical air heater. This enables ultra fast temperature changes in the synthesis reagent solvent. The system monitors the real solvent temperature. Temperature range –40°C : +180°C. **SynChrom F-Dopa** is equipped with very fast, low hold up volume, solvent resistant and pressure tight (4 bars) magnetic flipper valves.

All solvents are transported directly into the reactor vessel, without any solvent cross contamination. The built-in pressure sensor displays the actual system (reactor) pressure. This pressure sensor is also used for pressure / vacuum tightness test after the synthesis unit cleaning procedure. During the process this sensor also observes for unexpected events with settable warnings and shutdown levels.

The 18ml reactor is equipped with a magnetic stirrer solvent mixing system and a tube lifting system.

The reactor is equipped with a lead shielded radiation detector to monitor the actual delivered activity and to automatically calculate the yield (EOB / EOS).

**Features**

- very compact
- on-line process display
- interactive process diagram
- fully automatic
- manual intervention
- GLP/GMP/21 CFR part 11 compliant
- highest reliability
- highest yield

**Ordering information**

require example quotation #2008-30233
## General description

For purification of the product the unit contains a built-in semi-preparative HPLC system consisting of a 10 ml/min isocratic pump, 254 nm UV detector, automatic injector with a sample loop for the entire reaction vessel volume and a liquid detector for automatic detection of the injection time (reactor empty).

The required HPLC separation column is included on request.

The built-in radioactivity flow sensor detects the main peak and the built-in fraction collector automatically collects it.

All detectors are designed for a dynamic range from 10 mCi up to 2 Ci at minimum crosstalk. The entire unit is tested up to 2 Ci.

F2 target is required.

## Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of valves</td>
<td>14</td>
</tr>
<tr>
<td>liquid nitrogen Dewar</td>
<td>1l</td>
</tr>
<tr>
<td>reaction vessel</td>
<td>18ml Sigradur or Duran</td>
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<tr>
<td>reactor temp. range</td>
<td>-40°C - +180°C</td>
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<tr>
<td>HPLC pump</td>
<td>10 ml/min, 400 bar</td>
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<tr>
<td>UV-detector</td>
<td>254 nm</td>
</tr>
<tr>
<td>autom. injector loop</td>
<td>5 ml</td>
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<tr>
<td>liquid sensor</td>
<td>IR</td>
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<tr>
<td>F2-flow</td>
<td>mass flow detector / regulator (optional)</td>
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<tr>
<td>solvent container</td>
<td>1x20 ml 3 x 8 ml</td>
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<tr>
<td>product vessel</td>
<td>20 ml (illuminated)</td>
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<tr>
<td>radioactivity detectors</td>
<td>3 x GM (lead shielded)</td>
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<tr>
<td>pressure sensor</td>
<td>1</td>
</tr>
<tr>
<td>vacuum pump</td>
<td>40 mbar / solvent resistant</td>
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<tr>
<td>overall dimension</td>
<td>520 mm wide 490 mm deep 500 mm high</td>
</tr>
<tr>
<td>power</td>
<td>115 – 230 V / 200 W</td>
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<tr>
<td>environment humidity</td>
<td>max 70% relative</td>
</tr>
<tr>
<td>environment temp.</td>
<td>10 – 40 degree C</td>
</tr>
</tbody>
</table>
Applications

PET synthesis of: Ga-68-DOTATOC

General description

**SynChrom Ga68** is using an automatic process unit for labelling with activity eluted from the generator of Ge-68/Ga-68.

The **SynChrom Ga68** unit is equipped with an electrical heater for a reaction temperature between +20 and +180 degree Celsius.

The unit is equipped with very fast, low dead volume, solvent resistant and pressure tight (4 bar) magnetic flipper valves.

All solvents are transported directly into the reaction vessel without any solvent crosscontamination.

The built-in pressure sensor continuously displays the actual system (reactor) pressure. This pressure sensor is also used for automatic gas leakage test after the synthesis unit cleaning procedure. During the process this sensor also observes the process for unexpected “accidents” with selectable warning and shutdown levels.

The reactor is equipped with a special reactor solvent mixing system without magnetic stirrer and replaces the tube lifting system.

The built-in double membrane, high performance, solvent resistant vaccuum pump (40 mbar) allows fast drying of the solvent.

Features

- on-line process display
- interactive process control
- fully automatic
- manual intervention
- very compact

Ordering information

- **30000040** SynChrom Ga68 automatic labelling unit
- **30000003** SynChrom Installation and training 5 days on site

www.raytest.com
Continued Description

Shielded cartridge position (e.g. Ga-68 trap, C-18). All components and material are solvent resistant. Product vessel with magnetic stirrer and radioactivity detector.

Real time display and recording of all measurement values of the process control.

Automatic calculation of trapping efficiency and yield.

Technical data

- number of valves: 12
- liquid nitrogen cooling Dewar: 1 l
- liquid sensor: IR
- solvent container: 5 ml
- product vessel: 20 ml
- product mixing: magnetic stirrer
- radioactivity sensors: 5
- reactor pressure sensor: 1
- vacuum pump: 40 mbar solvent resistant
- overall dimension: 520 mm wide, 490 mm deep, 500 mm high
- weight: 36 kg
- power: 115 – 230 V, 200 W
- humidity: max 70% relative
- temperature: 10 – 40 degree C
- required gases: compressed air, 10 bar, He, 2 bar
SynChrom MPI
PET-automatic-synthesis-control-unit

Applications
PET synthesis control unit
for own synthesis unit
nuclear interface units

General description

SynChrom Multi Purpose Interface is the “appetizer” for R&D scientist not willing to move from their self-developed synthesis unit or an “old” Nuclear Interface synthesis unit to a modern commercially available synthesis unit, because of the fear to lose flexibility and usual control.

The SynChrom MPI allows to link almost all synthesis units to the GINA* SynChrom software.

The interface unit contains a large number of valve outputs for all kinds of valves.

All these outputs can be configured with high flexibility.

Reactor heating control and temperature record input are included as well.

Within 2 days each individual synthesis unit can be configured and automated by the SynChrom MPI unit.

Features

on-line process display
interactive process control
fully automatic
manual intervention
very compact

Ordering information

30000085 SynChrom MPI
automatic synthesis control unit

30000003 SynChrom
Installation and training
5 days on site
### Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>relays for valve control</td>
<td>8</td>
</tr>
<tr>
<td>pump control output</td>
<td>A, B, C</td>
</tr>
<tr>
<td>autom. injector loop</td>
<td>3 ml</td>
</tr>
<tr>
<td>liquid sensor</td>
<td>IR</td>
</tr>
<tr>
<td>solvent container</td>
<td>6</td>
</tr>
<tr>
<td>product vessel</td>
<td>20 ml</td>
</tr>
<tr>
<td>product mixing</td>
<td>magnetic stirrer</td>
</tr>
<tr>
<td>radioactivity sensors</td>
<td>5</td>
</tr>
<tr>
<td>reactor pressure sensor</td>
<td>1</td>
</tr>
<tr>
<td>vacuum pump</td>
<td>40 mbar, solvent resistant</td>
</tr>
<tr>
<td>overall dimension</td>
<td>520 mm wide, 490 mm deep, 500 mm high</td>
</tr>
<tr>
<td>weight</td>
<td>36 kg</td>
</tr>
<tr>
<td>power</td>
<td>115 – 230 V, 200 W</td>
</tr>
<tr>
<td>humidity</td>
<td>max 70% relative</td>
</tr>
<tr>
<td>temperature</td>
<td>10 – 40 degree C</td>
</tr>
<tr>
<td>required gases</td>
<td>compressed air, 10 bar, He, 2 bar</td>
</tr>
</tbody>
</table>
Applications

- total activity meter
- nuclear medicine
- radiopharmaceutical QC
- PET quality control

General description

The well-type ionisation chamber is designed for all potential applications in nuclear medicine and radiopharmaceutical production.

The sensitive electronics is integrated in the foot of the upright-standing chamber.

The accuracy over a very large range of activity is very high. The long term stability is due to the sealing technology of the chamber excellent.

Tools for samples and various positioning are supplied.

The measurement geometry is almost 4π.

Background is automatically measured and compensated.

Absolute activity is automatically calculated for more than 30 nuclides.

Features

- high energy range
- more than 30 nuclides
- very high accuracy
- long term stability
- PC-version

Benefits

Minimization of components, integration of all components into the flat housing, requiring only little set up space.

State-of-the-art, powerful computer technology according to the industry standard (PC104).

Menu-guided Windows-based software.

Integration into network and combination with database system possible for radiopharmaceutical balancing and measurement.

Integrated quality control according to EN/DIN standard with protocol printout and data monitoring.

Software includes program for radiopharmaceutical identity checks, e.g. during production of PET nuclides.

User specific result display through adjustable user interface.

Ordering information

07161025 activimeter 1010
dose calibrator
PD version

07161022 activimeter
calibration source,
Cs-137, 3.7 MBq

alternative:
07161023 shielding 16 mm wall
alternative
07161024 shielding 50 mm wall

29000001 BARES
batch QC recording program and reporting system

29000002 BARES extension
further data source
## Technical data

**measuring range:**
- \( ^{99m} \text{Tc} \): 40 kBq – 50 GBq at 200 GBq; 7% add. error
- \( ^{18} \text{F} \): 60 kBq – 70 GBq at 300 GBq; 7% add. error

**range setting:** automatically or alternatively fixed for PET filling.

**energy range:** 25 keV – 3 MeV gamma

**measurement time:**
- incl. range change: 2 – 15 s
- no range change: 1-3 s

**basic error:** < 5%

**linearity error:** < 2%

**result display:** 4 digits including unit, nuclide, chemical compound

**stored isotope table:**
- C-11, N-13, O-15, F-18
- P-32, Cr-51, Mn-54, Co-57, Co-58, Fe-59, Cr-51, Mn-54, Co-57, Co-58, Fe-59
- Sr-89, Y-90, Mo-99, Tc-99m, In-111, In-113, I-123, I-125, I-131, Xe-133, Cs-137, Ba-140
- Sm-153, Er-169, Yb-169 Re-186, Re-188, Hg-197
- Tl-201, Ra-224

**containers:**
- **injector syringe:** 1, 2, 3, 5, 10, 20 ml
- **bottles:** 5, 10, (P6) 15, 20 ml
- **ampoules:** 5 ml
- **contents:** 0.1 – 99.9 ml
- **measurement cham.:** 125/184 mm diameter chute diameter 47 mm

**height:** 387 mm
- chute depth 205 mm

**shielding:** 4 mm basic Pb shielding
- additional: 16 or 50 mm Pb shielding

---

**Description**

Container (syringe size, ampoule, bottle, capsule) and contents are taken into account.

Measurement of the activity of all nuclides common in PET; measuring range up to 300 GBq, rapid determination of the bottled activity (\( T = 1.5 \text{s} \)).

Background measurement and compensation

Calculation of measured value for freely selectable application times

Allocation of measured value to patient possible.

Network connection with patient database

Reliable chute ionisation chamber in various design

High measurement accuracy, low position dependency of sample

Connection of several measurement chambers to one central electronics (multi-chamber-concept)

Upgrade of measurement electronics with additional I/O ports e.g. to control syringe filling machines.

Combimable with:
- laser scanner for reading barcodes
- transponder readers for control of access right
- network systems

Expandable by user-specific software e.g.
- depot management
- nuclide management
- balancing

Certified in accordance with Medical Product Act CE 0123
**Applications**

- total activity meter
- nuclear medicine
- radiopharmaceutical QC
- PET quality control

**General description**

The well-type ionisation chamber is designed for all potential applications in nuclear medicine and radiopharmaceutical production. The sensitive electronics is integrated into the foot of the upright-standing chamber. The accuracy over a very large range of activity is very high. The long-term stability is excellent, due to the sealing technology of the chamber. Tools for samples and various positioning are supplied. The measurement geometry is almost 4π. Background is automatically measured and compensated. Absolute activity is automatically calculated for more than 30 nuclides.

**Features**

- high energy range
- more than 30 nuclides
- very high accuracy
- long-term stability
- large area display
- touch sensitive screen

**Benefits**

Minimization of components, integration of all components into the flat housing, requiring only little set up space. State-of-the-art, powerful computer technology according to the industry standard (PC104). Flat LC-display 12.1” TFT with touchscreen operation, clearly structured presentation of measurement results and parameters. Menu-guided Windows-based software. Integration into network and combination with database system possible for radiopharmaceutical balancing and measurement. Integrated quality control according to EN/DIN standard with protocol printout and data monitoring. Software includes program for radiopharmaceutical identity checks, e.g. during production of PET nuclides. User specific result display through adjustable user interface.

**Ordering information**

- 07161021 activimeter 2000 dose calibrator large are a screen
- 07161022 activimeter calibration source, Cs-137, 3.7 MBq alternative:
  - 07161023 shielding 16 mm wall
  - 07161024 shielding 50 mm wall

- 29000001 BARES batch QC recording program and reporting system
- 29000002 BARES extension further data source

**Ordering information**

- www.raytest.com
Continued benefits

Container (syringe size, ampoule, bottle, capsule) and contents are taken into account. (important especially with β-sources)

Measurement of the activity of all nuclides common in PET; measuring range up to 300 GBq, rapid determination of the bottled activity (T= 1-1,5s)

Background measurement and compensation

Calculation of measured value for freely selectable application times

Allocation of measured value to patient possible

Network connection with patient database

Reliable chute ionisation chamber in various design

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Connection of several measurement chambers to one central electronics (multi-chamber-concept)

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- depot management
- nuclide management
- balancing

Certified in accordance with Medical Product Act CE 0123

Technical data

measuring range:
- Tc-99m
  40 kBq – 50 GBq
  at 200 GBq 7% add. error
- F-18
  60 kBq – 70 GBq
  at 300 GBq 7% add. error

range setting: automatically
alternative fixed for PET filling

energy range:
25 keV – 3 MeV gamma

measurement time:
incl. range change: 2 – 15 s
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result display: 4 digits including unit, nuclide, chemical compound

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Co-60, Ga-67, Se-75
Sr-89, Y-90, Mo-99,
Tc-99m, In-111, In-113,
I-123, I-125, I-131,
Xe-133, Cs-137, Ba-140
Sm-153, Er-169, Yb-169
Re-186, Re-188, Hg-197
Tl-201, Ra 224

containers:
- injector syringe: 1, 2, 3, 5, 10, 20 ml
- bottles: 5, 10, (P6) 15, 20 ml
- ampoules: 5 ml
- contents: 0.1- 99.9 ml

measurement cham.:
diameter 125/184 mm
chute diameter 47 mm

height: 387 mm
chute depth 205 mm

shielding: 4 mm basic Pb shielding
additional: 16 or 50 mm Pb shielding
Applications

weight preparation of precursors for synthesis of radio-pharmaceutical solution

General description

Analytical balance for determination of accurate weight for preparation of precursors for the synthesis of PET compounds.

The analytical balance has a large display for easy reading of the determined weight.

Multiple weight units including a user defined custom unit for use in unique weighing applications.

The pan is made of stainless steel and is easy to clean.

Frameless draft screen is available as an option.

QuadraStance incorporates for adjusting feet to provide superior footprint stability on any surface.

The balance has a front level indicator for fast check before any use.

The balance can be operated by AC and/or battery. An automatic shut off feature helps to conserve battery life.

Features

high precision

easy to operate

weighing, percent weighing

tara subtraction

LAN connection to central batch recording system

BARES

Ordering information

28000022 analytical balance
range 210g
readability 1mg

29000001 BARES batch QC recording program and reporting system

29000002 BARES extension further data source
Technical data

- **capacity:** 210 g
- **readability:** 0.1 mg
- **repeatability (Std.Dev.):** 0.1 mg
- **linearity:** +/-0.2 mg
- **stabilisation time:** 3 s
- **operating temperature range:** 10 – 30°C
- **draft type:** square
- **height over pan:** 220 mm
- **calibration:** digital with external weight
- **display:** LCD
- **display size:** 100x25 mm
- **pan diameter:** 90 mm
- **dimension:** 220 mm
  305 mm
  300 mm
- **weight:** 4 kg
Applications

pH measurement for radio-pharmaceutical solution

Features

- small volume pH-meter-probe
- automatic instrument full check
- protocol for QM-documentation according to ISO 9000 and GLP
- EMV according to NAMUR
- RS 232 C interface for central recording on BARES

General description

**Fullcheck**
automatically checks the device functions during power on. Also during operation a complete instrument check can be carried out at a single key stroke. Here also display and keypad are checked besides the electrical characteristics.

**Sensoface**
checks the electrode and provides information on the electrode condition. The zero, slope, response time and glass impedance of the electrode as well as the calibration interval are evaluated.

**Calimatic**
automatically recognizes the right buffer. It allows calibration at the stroke of a key, providing ease of use and above all safety.

**Trueline**
delivers a calibrated analog recorder signal, of course electrically isolated. This provides you with a true pH signal, calibrated for the electrode and without disturbing quantizing levels, permitting undisturbed recording of pH curves.

Ordering information

- 02420112 Laboratory pH-meter 765
- 02420113 micro electrode, pH 0-14
- 02420114 electrode holder
- 02420115 connection cable DIN/S7
- 02420116 temperature sensor
- 02420117 calibration buffer
- 29000001 BARES batch QC recording program and reporting system
- 29000002 BARES extension further data source

www.raytest.com
Positron-Emission-Tomography

specifications of laboratory pH-meter

equipment: meter with power cord, separate electrode
ranges: pH: -2.00 ... +16 , mV -19999 ... +19999, dC -50.0 ... +150.0
display: alphanumeric 2 x 4 digits, 14 segment LED, 13 mm high characters
measurement symbols pH, dC/man,
3 Sensoface status indicators inform about condition of electrode, equipment
measuring cycle: approx. 1/sec
accuracy: pH: > 0,01 , mV: < 0,1% +/- 0,3 mV, dC: < 0,3 K
input: DIN 19262
input resistance: > 1 x 10^12 Ohm
input current(20dC): > 1 x 10^12 A
temperature coeff.: < 0,1 count/K
electrode standard: Calimatic, automatic calibration and buffer recognition for buffer sets
permitted calibration ranges: Zero: pH 6 ... 8 , slope 47 ... 61 mV/pH (25°C)
electrode monitoring: Sensoface , evaluates zero, slope, response time and glass impedance
of electrode as well as the calibration interval,
electrode condition displayed as good, average , poor ( can be disabled )
Cal timer: monitors the calibration interval
fullcheck: tests complete measurement electronics incl. analog output, segment, keypad
test in diagnostic mode, automatic short check at power on
records: parameter setting, calibration, diagnostics, QM documentation to ISO 9000
and GLP, retrieval in diagnostics mode or via interface
displaymatic: digit suppression according to signal change, can be disabled
temperature comp.: Pt 100 / Pt 1000, automatic selection, manual. -50 - +150 °C
dead stop current: - 10 μA
recorder output: galvanically isolated, mV: 1 mV/mV, pH: 100mV/pH, dC: 10mV/dC
interface: RS 232 without control lines, galvanically isolated, for printer or PC
software: control of model 765 pH meter is integrated in the automation software for
lab meters "labworldsoft" for display and control of device functions for
version 4.0 or higher
printer control: for standard printer with serial port, printing at keystroke, via print interval time
0.1 ... 999.9 min or external floating contact
clock: real time clock with date, self-contained
calibration storage: automatic storage of calibration data, self contained
data retention: parameters, statistics, factor settings: > 10 years (EEPROM)
clock: reserve power > 1 year (battery backed)
electrode statistics: storage of zero and slope of first calibration as well as
data of the last 3 calibrations with time and date stamp, self contained
output via interface to printer or PC
protection: against electrical shock, protective separation as defined in DIN 57100
VDE 0100 part 410 and DIN VDE 0106 part 101
power supply against all other inputs in accordance with the NAMUR
recommendation "extra low voltage circuits with protective separations"
EMC directive: 89/336/EEC
standards: EN 61326, VDE 0843 part 20: 2002-3
ambient temperature: 0 ... 45 dC
storage: -20 ... + 70 dC
power supply: 230V – 15% + 10 %, 48 – 62 Hz, < 10 VA
protection class: II
dimension: 244 x 95 x 255 mm
weight: 2 kg
General description

The osmolality describes the concentration of osmotic effective particles in solutions, independent from type, composition or electrical charge. The osmolality refers to the mass of the solution, that means to 1 kg pure water.

Operation

150 μl of an aqueous solution are super cooled below the melting point.

Then the stirring needle (vibrator) automatically initiates crystallization.

The crystallization warmth causes a temperature rise up to the melting point (below 0°C).

The temperature difference to 0°C measured is proportional to the number of free particles in the solution.

The measurement value in mOsmol is shown in the display and registered by the central batch recording system BARES.

Applications in PET

mOsmol measurement of osmolarity in radiopharmaceutical solution

Features

- simple handling
- 2-4 point calibration
- short measurement time 2-3 min
- fully automatic measurement
- automatic storing of measured values
- air cooling
- cooling process thermistor controlled
- cooling chamber will not freeze
- LAN connection to central batch recording system BARES

Ordering information

- 02420059 Semi-Micro Osmometer
- 02420068 Osmometer cleaning solution
- 02420069 NaCl calibration solution 10 pieces/pack
- 02420070 adapter
- 02420071 measurement vial 1000 pieces/pack
- 02420100 printer for osmometer
- 29000001 BARES batch QC recording program and reporting system
- 29000002 BARES extension further data source

www.raytest.com
Technical data

measurement accuracy: error < 1%

measurement precision: RDS < 1%

 calibration: 2 calibration points required up to 4 calibration points accepted

sample volume: 150 μl

measurement time: 2 minutes

guaranteed range: 0–2000 mOsmol

possible range: 0–3500 mOsmol

output: RS 232 C to printer or to PC ( Bares )

power supply: 90 – 260 V 47 – 63 Hz 70 VA

dimension: 160x182x340mm

weight: 5 kg
Applications

dermatose determination of the produced radio-pharmaceutical solution

Features

General description

test technology

The PTS uses LAL kinetics chromogenic methodology that measures a color intensity that is directly related to the endotoxin concentration in the sample. Each cartridge contains precise amount of LAL reagent, chromogenic substrate and control standard of endotoxin (CSE). The cartridges are manufactured according to rapid quality control procedures promoting test accuracy, consistency and product stability.

test procedure

To perform the test, the user simply pipettes 25μl of a sample into each of the four sample reservoirs of the cartridge. The reader draws and mixes the sample with the LAL reagent in two channels (sample channels) and with the LAL reagent and positive product control in the other two channels (spike channels). The sample is incubated and then combined with the chromogenic substrate. After mixing, the optical density of the wells is measured and analysed against an internally-archived standard curve. By design, the PTS cartridge automatically performs a duplicate sample/ duplicate positive product control LAL test, thereby satisfying the harmonized USP Bacterial Endotoxin Test (BET) and the FDA guideline for LAL testing.

Ordering information

33100005 Endosafe PTS LAL test system
33100000 PTS cartridges 0.05 ml
33100001 LAL water < 0.005 EU/ml
33100002 16 x 90 mm borosicate tubes
33100003 yellow pipettes tips 5-200 μl
33100004 blue pipettes tips 100-1000 μl
33100007 PTS Epson dot matrix printer
33100008 warranty extension
33100009 kit for IQ, QQ, PQ qualification

29000001 BARES batch QC recording program and reporting system

29000002 BARES extension further data source

www.raytest.com
**FDA-licensed LAL Assay**

The PTS was approved by the FDA as an alternative to traditional LAL testing methods for in process and final product release testing of biomedical products. The PTS can be used in QC laboratory to effectively troubleshoot problematic products and get a quick read on STAT samples and raw materials that require immediate analysis. The PTS was described to be compliant with global pharmacological methods and meets the BET criteria for photometric techniques. Validation of the PTS can be accomplished by performing inhibition/enhancement on three batches of product.

**Data Analysis**

With the PTS, data reporting is simple. At the conclusion of the test, the endotoxine measurement and assay acceptance criteria are displayed on screen. The instrument is used to detect endotoxine levels 0.01-10 EU/ml. Internally, the PTS reader measures the reaction time in each channel. An archived standard curve specific for each batch of cartridges is constructed using the log of the reaction time vs. the log of the endotoxine standard concentration. The sample and spike values are calculated by interpolation off the standard curve using the reaction times.

**Training**

Training of the new users is fast and easy and results are obtained quickly – preventing costly delays in research or production.

The Endosafe-PTS provides significant advantages over traditional LAL test methods while relying on validated and proven LAL technology.

**PTS Instrument**

The PTS instrument is a lightweight, incubating spectrophotometer that has many features including:

- rechargeable power block
- easy-to-read display screen
- keypad operation
- storage of 100 test results
- data transferability to Bares
- trending software applications
- printable results
- protective case with cover

**Annual Calibration Certification**

The factory calibration certified at the time of manufacture is valid for one year.

The supplier offers an annual recalibration certification service.

To request this service, the client must notify the supplier 60 days prior to the end of the calibration period to arrange recertification.

**Extended Warranty**

The factory offers an extended warranty option for the Endosafe PTS reader for an additional fee.

The extended warranty is valid for four years after the initial one-year warranty period.

It must be purchased within the first year of the date of purchase of the PTS.
### General description

Sterility testing is one of the most crucial steps in pharmaceutical product release. False positives, false negatives, equipment failure and human error can cost you time, money and ultimately your product.

The Steritest Equinox transfer pump is a software controlled peristaltic pump used for the safe, uniform transfer of drug samples from various packaging formats through the Steritest sterility testing devices. The Steritest Equinox pump and Steritest devices deliver unmatched sterility testing consistency and reliability.

**The Next Generation Intelligent Pump**

From a computer, standard operating procedures (SOPs) can be developed and then loaded onto the Steritest Equinox pump.

In automated mode, an analyst simply selects the appropriate SOP for the sample to test from the Steritest Equinox control panel. The Steritest Equinox pump will walk the analyst through each step, acting as a training guide, thereby supporting good manufacturing practices. The various steps in the procedure, corresponding pump speed and related information are displayed on the control panel, improving repeatability and reliability.

Analysts can select either manual or automated mode. In manual mode, the Steritest Equinox pump will prompt the analyst to enter data at each step of the procedure.

### Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>02420210</td>
<td>Steritest™ Equinox Pump for Isolators includes software, bottle holder, canister holder, and power supply unit</td>
</tr>
<tr>
<td>02420211</td>
<td>Pressure control kit for Steritest™ Equinox pump</td>
</tr>
<tr>
<td>02420212</td>
<td>Steritest™ Equinox footswitch</td>
</tr>
<tr>
<td>02420213</td>
<td>Pre-filled syringes, 10 units</td>
</tr>
<tr>
<td>02420214</td>
<td>Liquid vials</td>
</tr>
<tr>
<td>02420215</td>
<td>Soybean Casein Digest Broth</td>
</tr>
<tr>
<td>02420216</td>
<td>Clear Fluid Thioglycollate</td>
</tr>
<tr>
<td>02420217</td>
<td>Fluid Air in bottle with screw cap</td>
</tr>
<tr>
<td>29000001</td>
<td>BARES batch QC recording program and reporting system</td>
</tr>
<tr>
<td>29000002</td>
<td>BARES extension further data source</td>
</tr>
</tbody>
</table>

www.raytest.com
## Technical data

|-------------------------|-------------------------------------------------------------------------------------------------|
| Operating Conditions:   | Ambient temperature: 15 – 40°C  
Relative humidity: < 90%  
Altitude: < 3000 m (9842 ft) |
| Electrical Requirements:| 115 – 230 VAC |
| Input to Pump from DC Power Supply: | 24 VDC, 150 W |
| Sterilization: | Pump head cover, roller knob, bottle holder and drain tray may be autoclaved for 30 minutes at 121°C or 10 minutes at 134°C. |
| Canister Style: | Compatible with Steritest, Sterisolutest®, Steridilutor® and Steritest EZ canisters |
| Dimensions: | Pump: 35 cm (14 in.) width  
32.2 cm (13 in.) depth  
25 cm (10 in.) height  
Pump with bottle holder, canister holder, power supply unit: 59 cm (23 in.) width  
35 cm (14 in.) depth  
53.2 cm (21 in.) height |
| Weight: | Pump: 18.5 kg (41 lb)  
Pump with bottle holder, canister holder, power supply unit: 22 kg (48.5 lb) |
| Materials of Construction: | Frame, pump head, pump head cover, and bottle holder: 316L stainless steel  
Keypad and screen window: Polyester  
Drain tray: Polyacetal  
Drain tray tubing: Silicone |

## General description

### Proven Technology
For over 28 years, Steritest has been the industry standard for sterility testing of sterile pharmaceuticals. The development of the Steritest Equinox pump is the result of years of customer collaboration and communication as well as testing experience. The innovative hardware design and control software offers an easy to use, intelligent system for optimizing productivity and performance.

### Fast and Reliable Sterility Testing Transfer System
Designed for use with Steritest/Steritest EZ devices, the automatic pump head makes it easy to load and unload Steritest unit tubing without the risk of damaging the isolator gloves. The pump is also equipped with a precision "stop control" for low volume sampling. A built-in timer enables analysts to pre-set the time required for the transfer of product into both canisters. This is critical for product exposed to the environment such as glass ampoules where there is a risk of introducing non-sterile air into the canisters and generating false positives.

A pressure control system constantly monitors the pressure inside both Steritest canisters ensuring that the system is running within acceptable pressure limits at all times. An alarm informs the operator of any pressure increase above specifications. An external foot switch operates the pump in either "continuous" or "two-way" operation mode.

### Ergonomic Design
Ergonomically designed for easy operation and cleanability, the Steritest Equinox pump fits in both glove and half-suit isolators. Its profile ensures perfect decontamination inside isolators, eliminating the risk of false positives. Its unique design makes it easy to connect and disconnect from an isolator work table during maintenance. The drain tray as well as the polished 316L stainless steel surfaces of the pump, pump head and bottle holder are easily cleaned using most standard decontamination agents.
Applications

- central data recording of all production data
- all quality control data
- for every production batch

General description

International – and consequently almost all national – authorities require complete documentation of radio-pharmaceutical production.

Complete documentation covers:
- raw materials
- production process
- quality control
- aseptic processing

For the synthesis process, raytest has developed full data transfer via LAN and a software that stores and displays every single step of the synthesis production process and its intermediate and final results and graphics:
- arriving target activity
- synthesis process steps over time
- intermediate results
- final product activity

For the quality control, raytest has developed a solution for full data transfer via LAN and a software with raw data transfer from all analytical instruments and other measurements required by the authorities:
- radio HPLC, conventional HPLC
- radio TLC, conventional TLC
- radio GC, conventional GC
- osmometry
- endotoxinity
- sterility
- pH
- weight
- activity

All data – even raw data of all chromatograms – are stored and can be retrieved and evaluated by the software, which has been used to generate the results. The software and its data structure is open for data from used raw materials and the applied aseptic processing from separate database systems.

**BARES** software produces batch report, single page containing all required data for production and quality control.

Features

- central recording
- display
- storage
- documentation
- requirements of local
- national
- international regulations

Ordering information

- **29000001** BARES: batch QC recording program and reporting system
- **29000002** BARES: extension further data source

[www.raytest.com](http://www.raytest.com)
# RPL quality control lab Batch Report

**Charge**  FDG012214  **27.02.2003 14:55:00**

<table>
<thead>
<tr>
<th>Cyclotron batch ID</th>
<th>20030224. +. 0000000056</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process type</td>
<td>(1) 18F-F- (HY)</td>
</tr>
<tr>
<td>Irradiation Start - EOB</td>
<td>13:47:12 - 14:47:16</td>
</tr>
<tr>
<td>Beam current, µA</td>
<td>38.00</td>
</tr>
<tr>
<td>Beam charge, µAh</td>
<td>38.00</td>
</tr>
<tr>
<td>Activity, MBq</td>
<td>83320.00</td>
</tr>
<tr>
<td>SynChrom batch ID</td>
<td>FDG012214</td>
</tr>
<tr>
<td>Preparation</td>
<td></td>
</tr>
<tr>
<td>2.3 mg potassium carbonate in 0.5 mL water</td>
<td>01234</td>
</tr>
<tr>
<td>22 mg cryptofx in 1 mL acetonitrile</td>
<td>12345</td>
</tr>
<tr>
<td>20 mg triflate in 1 mL acetonitrile</td>
<td>221551</td>
</tr>
<tr>
<td>1 mL NaOH (2M)</td>
<td>43212123</td>
</tr>
<tr>
<td>1 mL buffer</td>
<td>1231231</td>
</tr>
<tr>
<td>Synthesis process</td>
<td>fdg1</td>
</tr>
<tr>
<td>Start of synthesis</td>
<td>10.03.2003</td>
</tr>
<tr>
<td>Activity at start of synthesis (estim), MBq</td>
<td>11312.00</td>
</tr>
<tr>
<td>Quality control</td>
<td></td>
</tr>
<tr>
<td>Residual solvents</td>
<td>18F - desoxyglucose</td>
</tr>
<tr>
<td>GC Method</td>
<td></td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>&lt;0.05 mg/mL</td>
</tr>
<tr>
<td>Ethanol</td>
<td>&lt;0.30 mg/mL</td>
</tr>
<tr>
<td>Kryptofix</td>
<td>&lt;0.02 mg/mL</td>
</tr>
<tr>
<td>Glucose, mg/mL</td>
<td>12</td>
</tr>
<tr>
<td>Properties</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>5.5 - 7.8</td>
</tr>
<tr>
<td>Osmolarity</td>
<td>270 - 330 mO/kg</td>
</tr>
<tr>
<td>Bacterial endotoxines</td>
<td>negative</td>
</tr>
<tr>
<td>Total activity, MBq</td>
<td>7.03</td>
</tr>
<tr>
<td>Total Weight, g</td>
<td>33.00</td>
</tr>
<tr>
<td>Radioconcentr., MBq/mL</td>
<td>55000</td>
</tr>
<tr>
<td>Product distribution</td>
<td></td>
</tr>
<tr>
<td>Vial 1, MBq at</td>
<td>0.00</td>
</tr>
<tr>
<td>Vial 2, MBq at</td>
<td>0.41</td>
</tr>
<tr>
<td>Vial 3, MBq at</td>
<td>0.00</td>
</tr>
<tr>
<td>Vial 4, MBq at</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Some values missing; some values do not complain
Values out of bounds: 18FDG Purity, 18F Other Contr., 18Fluoride, Kryptofix, Osmolarity, Acelo ...

Sign
Signed by **rg** at **01.07.2003 13:23:01**
ClearPET™
A high Performance Small Animal PET System

Applications

PET small animal
mouse, rat
rabbit, minipig
primate

General description

ClearPET is a small animal PET scanner designed for scientific research and development work on new PET compounds tested in small animals like mice and rats.

The gantry diameter is extendable for applications on rabbits, minipigs and primates. The gantry can rotate by 360 degree with selectable speed.

Measurement data are accumulated during rotation. The gantry can be equipped with 12, 16 or 20 cassettes. Each cassette contains 4 photomultiplier with 64 photocathodes each, the individual high voltage and event collecting front end electronics with a patented “free running ADC” programmed for an FPGA. All measurement parameters are software selectable.

ClearPET is using the patented dual scintillator phoswich technology for higher resolution in the centre and in particular outside the centre by DOI (depth of interaction). Scintillators are LYSO and LuYAP well known for the highest sensitivity and resolution.

ClearPET is using the accumulated raw data for evaluation under various parameters without new measurement. All correcting programs for absorbance, scattering, volume calibration, NEC etc are integrated.

ClearPET can be partially equipped and grow with the scientific demand and available budget.

Features

partial ring configuration
extendable gantry diameter
resolution 1.1 mm
sensitivity ~5%
multi modality with CT, MRI etc

Ordering information

25000111 ClearPET, basic unit with 12 cassettes with 4 photomultiplier each with 2 x 64 crystals each 3 PCs for data acquisition 1 PC for master control 1 PC for reconstruction
2500020 ClearPET, extension by with 4 cassettes with 4 photomultiplier with 8 x 8 x 2 crystals (LYSO, LuYAP) 1 computers, program etc.
25000050 ClearPET installation and training

www.raytest.com
Technical Data

**Gantry:**
- Crystal: LYSO & LuYAP in double layer
- Crystal size: (2x2x10) + (2x2x10) mm³
- # Crystal: 10240
- # Pixel: 5120
- Detector: 80 x Hamamatsu R7600M64
- Detector Ø: 135 - 225 mm
- Animal Port: 125 - 200 mm
- Axial Length: 110 mm

**Performance:**
- Timing resolution: 5.7 ns (FWHM)
- Coincidence time: adjustable per software
- Field of View Ø: adjustable 0 - 160 mm
- Energy resolution: < 30% LYSO & LuYAP
- Sensitivity: ~5%
- Spatial resolution: 1.1 mm at center, ≤ 2 mm, 30 mm off from center
- Modular System: 12, 16, 20 cassettes of gantry

A high Performance Small Animal PET System

raytest Isotopenmessgeräte GmbH
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75334 Straubenhardt · Germany
Phone +49 7082 9255-0 · Fax +49 7082 9255-4444
www.raytest.com
Applications in CT

CT  small animal In-Vivo Imaging
  mouse, rat

General description

Small Animal In-Vivo Imaging for
Non-Invasive Pre-Clinical Applications
TomoScope® 30s Series Micro-CT Scanners

TomoScope 30s, 30s+ and 30s Duo offers the series of micro-CT scanners dedicated for small animal imaging. The product range balances between short scan times, good low-contrast and high spatial resolution.

TomoScope scanners are stand-alone systems. They are based on the rotating gantry principle as known from clinical scanners for human use. All models are fully shielded, lightweight desktop scanners, which can be operated in any laboratory environment.

To allow for continuous rotation, a slip ring connects the stationary part of the gantry with the detectors and tubes allowing sophisticated scan protocols. Radiation dose and signal-to-noise-ratio in the images can be optimized by employing pre-filtering of the beam. The motorized animal table is prepared to support online monitoring of the animal life support sensors. The TomoScope 30s Duo scanner is capable of running both tubes at different voltages. Thereby, data of one and the same object are acquired simultaneously at two energy levels.

Special reconstruction algorithms offer materials-selective dual-energy images and therefore allow investigation of new contrast mechanisms. Tomographic reconstruction is based on the cone beam Feldkamp algorithm optimized for speed and includes all necessary corrections. The software runs under Windows XP and Vista.

Features

| object diameter: 65mm ø |
| single scan length: max. 37mm |
| max. examination length: 150mm |
| resolution >80 μm |

Ordering information

| 25200000 | TomoScope 30s |
| table top μ CT scanner with rotating gantry |
| hot panel detector |
| single Xray source |
| reconstruction workstation |
| reconstruction software |
| image view software |

| 25200001 | TomoScope 30s+ |
| 25200002 | TomoScope 30s Duo |
Technical data

Principle

- Desktop micro-CT cone-beam scanner
- Rotating gantry with stationary object
- One or two source-detector systems

Field of measurement

- Diameter: 65 mm
- Length: 37 mm
- Max. object length: 150 mm

Scan

- 30s Duo: 1 s to 90 s effective scan time
- 30s/30s+: 2 s to 180 s effective scan time
- Acquisition PC, client-server concept
- Circle, sequence and spiral acquisition
- Localizer image

Reconstruction

- High speed cone-beam reconstruction < 2 min
  (512³ voxels from 720 projections of 1024² pixels, for circle and sequence scans)
- Floating point precision
- Arbitrary matrix and voxel size (typ. 40 μm and 512³ or 1024³)
- Various reconstruction filters
- Cupping correction
- HU-normalization
- Reconstruction PC, client-server concept

Other characteristics

- Integrated radiation shielding
- Dimensions: 75 cm x 88 cm x 112 cm
- Std. electrical outlet (110/230 VAC, 10 A)
- Weight: 220-250 kg

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www.raytest.com
Index

Dose/Doserate, portable
- DoseGUARD: personal doserate meter
- Radiometer: multipurpose dose/doserate meter

Contamination
- INSPECTOR: α, β, γ hand-held-radiation detector
- CORA: portable contamination monitor
- HANNA: hand-foot-cloth-monitor
- MALISA*: β-liquid scintillation counter
- MUCHA*: γ-multi channel analyser

Dose/Doserate, installed
- RENA*: doserate meter
- RENA*: waste water monitor
- RENA*: air monitor

MARA
- central radiation protection data recording, display, management
### Applications

- dose / doserate meter
- personal dose
- doserate measurement
- dose/doserate

### General description

According to the German Radiation Protection Ordinance (StrlSchV §§ 40, 41), the body dose of persons has to be determined. Upon request, the person to be monitored has to be provided with a dosimeter to be able to measure the personal dose at any time. For pregnant women, the radiation exposure at work has to be determined every week.

Nowadays, for dose monitoring, modern powerful electronic dosimeters with easy to read LCD-display and definable dose and dose rate alarm thresholds are available.

### Features

- pocket operation
- universal function
- ratemeter
- digital display

### Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12000394</td>
<td>DoseGUARD S 10</td>
</tr>
<tr>
<td></td>
<td>Electronic Dosimeter</td>
</tr>
</tbody>
</table>

[www.raytest.com](http://www.raytest.com)
System characteristics:

- Personal dosimeter appropriate for calibration and capable of measuring the personal depth dose Hp(10) according to the new German Radiation Protection Ordinance (StrlSchV)
- Qualification approval by the German Institute of Weights and Measures (PTB)
- Digital display of dose and dose rate
- X-ray and gamma radiation 50 keV - 3 MeV
- Silicon diode with energy compensation filter as detector
- Alarm values for dose and dose rate definable, incl. acoustic and optical alarm
- Continuous self-check function
- Very small dimensions, very low weight (80g)
- Battery operated
- Improved shielding against electromagnetic radiation

Accessories:

- Radioactive control device with Cs-137-test source (3.7 MBq) for radiological check and semi-annual control of the calibrated dosimeter for prolongation of the calibration dosimeter validity.
- Rack for storage of the dosimeters
  15 storage positions

Dosimetry software DOSMO

Electronic dosimeter like the DoseGUARD S 10 can be used self-sufficiently as an independent single dosimeter.

For larger groups of people, the electronic dosimeter can be read out automatically in connection with a PC-based dosimetry reading system and the evaluation software DOSMO. All dosimetry tasks defined in the German Radiation Protection Ordinance (StrlSchV) are fulfilled by this system.

Via an interface, the dosimeter reading system reads the dose value stored in the dosimeter. The personal dose values are registered and used to calculate the week dose, month dose and year dose. Limit values can be monitored safely in this way. Further functions, e.g. period monitoring, annual protocols, monitoring of the access rights complete the performance spectrum. Our dosimetry system can be used as a single place system or connected to several reading systems as a network version.

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www.raytest.com
Applications

measurement and definition of
- surveillance area
- control area
- transport containers

General description

The RADIAMETER is using a single proportional counting tube for the total range.

Other types using 2 GM tubes show hysteresis effects and discontinuities by overlapping.

The housing is water tight made of a robust plastic with a metal layer inside for good electromagnetic shielding.

Special silent blocks are protecting the detector and electronics from mechanical shocks.

The battery compartment is sealed for leakage.

The RADIAMETER can be calibrated for various functions.

The RADIAMETER is a professional highest quality multi purpose instrument.

Features

multi purpose, wide range
proportional detector inside
various detectors connectable
scintillation probe
α, β, contamination probe
neutron doserate probe

Ordering information

12000061 RADIAMETER
12000063 calibration free
12000359 neutron probe

www.raytest.com
Technical data

measured value: photon doserate
range doserate: 0,1 μ Sv/h – 0,99 Sv/h
deviation dose max: 0–10 Sv < 5% (Cs137)
energy range: 36 KeV – 1,3 KeV
angle to axis: 75° – +75° ±20%
alarm threshold: selectable in dose and doserate
acoustic signal: 80 dB (A) in 30cm distance
environment temp.: -30 – +50°C
storage temperature: -40 – +70°C
serial I/O: RS232, infrared
electromagnetic sensitivity: 10V/m (200kHz – 1Ghz)
IEC 801-3
interference emission: EM 55011 class B
ESD: 8kV
IEC 801-2
batteries: 2 standard cells 1,5V (B6-2:IEC RG6)
2 lithium cells 1,5 V
operation time: > 250h
600h with lithium cells
housing protection: IP67
size: 195 x 73 x 42 mm
weight: 420 g
**General description**

INSPECTOR is a simple, universal, hand-held radioactivity detector, sensitive for alpha, beta, gamma and x-ray radiation.

INSPECTOR has a large end-window Geiger-Mueller counting tube with a window diameter of 45 mm.

INSPECTOR has an optical and acoustical event indicator.

INSPECTOR can be used as ratemeter or scaler/timer for momentary or long term measurements.

INSPECTOR can display activity in:
- total counts (accumulated in time)
- counts per second
- counts per minute

INSPECTOR can display doserate in:
- mR/h
- μS/h

**Features**

- one hand operation
- universal function
- ratemeter and scaler/timer
- digital display
- large area end-window GM-tube

**Ordering information**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>12000301</td>
<td>INSPECTOR</td>
</tr>
</tbody>
</table>

Radiation alert

www.raytest.com
**Technical data**

- **detector:** Geiger-Mueller
- **window:** 45 mm diameter, 2 mg/cm², mica
- **display:** 4 digit LCD
- **timer:** 1-10 min, in 1 min step
  - 10 - 60 min, 10 min step
  - 1 – 24 h, step 1 h
- **counter:** 1 – 9 999 000 counts
- **ratemeter range:**
  - 0 – 300 000 c/m
  - 0 – 5 000 c/s
- **update:** 3s
- **doserate:** 1 μR/h – 100 mR/h
  - 0.01 mSv/h–1000 mSv/h
- **accuracy:**
  - (+/-15% from 0-50mR/h)
  - (+/-20% from 50-100mR/h)
  - (+/-15% from 0–130000c/m)
  - (+/-20%, 130000-300000)
- **anti saturation:** holds full scale in radiation field of 100 times full scale
- **output:** CMOS or TTL
  - counts to PC or data logger
- **temperature:** -10 - +50°C
- **power:** alkaline battery, 9V
- **dimensions:** 150 x 80 x 30 mm
- **weight:** 272 g

---

**Specifications for several nuclides**

<table>
<thead>
<tr>
<th>Isootope</th>
<th>emax in keV</th>
<th>efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-14</td>
<td>156</td>
<td>30%</td>
</tr>
<tr>
<td>Pm-147</td>
<td>225</td>
<td>40%</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>294</td>
<td>60%</td>
</tr>
<tr>
<td>Cl-36</td>
<td>1142</td>
<td>65%</td>
</tr>
<tr>
<td>Sr-90</td>
<td>2282</td>
<td>90%</td>
</tr>
<tr>
<td>Am-241</td>
<td>5400</td>
<td>50%</td>
</tr>
</tbody>
</table>

**alpha, beta, gamma hand-held radiation detector**
Applications

\( \alpha, \beta, \gamma \) surface contamination
bench, floor, wall, door
hand, foot, shoe, cloth

General description

CORA is using 2 scintillator materials.

For detection of alpha-radiation ZnS is used.

For detection of beta and gamma radiation a plastic scintillator foil is used.

The large area detector window is permeable for low energy

- alpha radiation like U-238
- beta radiation like C-14

The thin window can be replaced easily by the user and measurements can be continued without much delay.

The light flashes generated by the alpha or beta/gamma radiation can be separated by pulse analysis.

The detected events are counted over time and displayed digitally in c/s, Bq or Bq/cm².

Nuclide specific sensitivity is calculated and alarm values are preprogrammed.

Measurement results can be stored and transferred by RS 232 C.

Features

- alpha-, beta- and gamma-sensitivity
- one detector, large area 170 cm²
- selective alpha or beta/gamma detection
- scintillation probe
- no counting gas

Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12000320</td>
<td>CORA alpha-, beta-, gamma-contamination and radiation monitor</td>
</tr>
<tr>
<td>12000312</td>
<td>beta reference standard C-14, Ø 50mm, 1kBq</td>
</tr>
<tr>
<td>12000313</td>
<td>beta reference standard Cs-137, 100 cm², 1kBq</td>
</tr>
<tr>
<td>12000321</td>
<td>CORA wall holder</td>
</tr>
<tr>
<td>12000323</td>
<td>CORA battery charger</td>
</tr>
<tr>
<td>12000233</td>
<td>CORA floor control device</td>
</tr>
</tbody>
</table>

www.raytest.com
**Efficiency for various nuclides**

<table>
<thead>
<tr>
<th>Nuclide</th>
<th>Efficiency</th>
<th>Nuclide</th>
<th>Efficiency</th>
<th>Nuclide</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-14</td>
<td>14%</td>
<td>F-18</td>
<td>18%</td>
<td>P-32</td>
<td>25%</td>
</tr>
<tr>
<td>P-32</td>
<td>25%</td>
<td>S-35</td>
<td>12%</td>
<td>Cl-36</td>
<td>42%</td>
</tr>
<tr>
<td>Cl-36</td>
<td>42%</td>
<td>K-40</td>
<td>30%</td>
<td>Co-57</td>
<td>7%</td>
</tr>
<tr>
<td>Co-57</td>
<td>7%</td>
<td>Co-60</td>
<td>27%</td>
<td>Sr-89</td>
<td>27%</td>
</tr>
<tr>
<td>Sr-89</td>
<td>27%</td>
<td>Sr-90/Y-90</td>
<td>42%</td>
<td>Tc-99m</td>
<td>3%</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>3%</td>
<td>In-111</td>
<td>8%</td>
<td>I-123</td>
<td>7%</td>
</tr>
<tr>
<td>I-123</td>
<td>7%</td>
<td>I-125</td>
<td>12%</td>
<td>I-131</td>
<td>21%</td>
</tr>
<tr>
<td>I-131</td>
<td>21%</td>
<td>Cs-137</td>
<td>35%</td>
<td>Au-198</td>
<td>23%</td>
</tr>
<tr>
<td>Au-198</td>
<td>23%</td>
<td>Tl-204</td>
<td>43%</td>
<td>Am-241α</td>
<td>22%</td>
</tr>
<tr>
<td>Am-241α</td>
<td>22%</td>
<td>Pu-238α</td>
<td>12%</td>
<td>U-238α</td>
<td>26%</td>
</tr>
</tbody>
</table>

**Technical data**

- **detector type:** thin layer plastic scintillator with ZnS coating
- **detector size:** 170 cm²
- **background:**
  - alpha: 0.1 c/s
  - beta: 15-25 c/s
- **background subtr.:** adjustable background measurement time
- **measurement electr.:** μ-controller supported electronics
- **keyboard:** foil keyboard
  - 5 function keys
- **alarm:** separately adjustable for each nuclide
  - acoustic alarm
- **result display:** 25 nuclides
  - preset calibration factors
  - user specific nuclides may be added
  - integrated autocalibration
- **measurement time:** continuous, for stationary application
  - adjustable in s
- **display:** large-area graphical
  - LCD display 128 x 64 pixel with illumination
  - duration of illumination adjustable
- **power supply:**
  - 2 batteries, AA Mignon or rechargeable batteries can be charged by charge unit
  - in stationary mode via wall station with inductive charge conservation
- **temperature range:** -10 - +40°C
  - no condensation
- **dimension:** 280 x 125 x 135 mm
- **weight:** 750 gr.
- **interface:** RS 232 C

*Efficiency for various nuclides*

- C-14 14% F-18 18%
- P-32 25% S-35 12%
- Cl-36 42% K-40 30%
- Co-57 7% Co-60 27%
- Sr-89 27% Sr-90/Y-90 42%
- Tc-99m 3% In-111 8%
- I-123 7% I-125 12%
- I-131 21% Cs-137 35%
- Au-198 23% Tl-204 43%
- Am-241α 22% Pu-238α 12%
- U-238α 26%
Applications

α, β, γ  control area for radioactive laboratory

control area for radiopharmaceutical laboratory

control area for PET synthesis & quality control laboratory

General description

HANNA is using 2 scintillator materials.

For detection of alpha-radiation ZnS is used.

For detection of beta and gamma radiation a plastic scintillator foil is used.

The large area detector window is permeable for low energy

- alpha radiation like Am-241
- beta radiation like C-14

The thin window can be replaced easily by the user and measurements can be continued without much delay.

The light flashes generated by the alpha or beta/gamma radiation can be separated by pulse analysis.

The detected events are counted over time and displayed digitally in c/s, Bq or Bq/cm².

Nuclide specific sensitivity is calculated and alarm values are preprogrammed.

Measurement results can be stored and transferred by RS 232 C.

Features

alpha-, beta- and gamma-sensitivity

2 hand detectors, 2 foot detectors

1 body detector (right hand probe detachable)

selective alpha or beta/gamma detection

scintillation probe

no counting gas

nuclide specific display + alarm

Ordering information

12000330  HANNA  alpha-, beta-, gamma-hand, foot, cloth-monitor

12000313  beta reference standard Cs-137, 100 cm², 1kBq
Efficiency for various nuclides

<table>
<thead>
<tr>
<th>Nuclide</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-14</td>
<td>8%</td>
</tr>
<tr>
<td>Cl-36</td>
<td>40%</td>
</tr>
<tr>
<td>Co-60</td>
<td>23%</td>
</tr>
<tr>
<td>Sr-90/Y-90</td>
<td>49%</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>5%</td>
</tr>
<tr>
<td>I-125</td>
<td>13%</td>
</tr>
<tr>
<td>I-131</td>
<td>23%</td>
</tr>
<tr>
<td>Am-241</td>
<td>25%</td>
</tr>
</tbody>
</table>

Technical data

detector type: thin layer plastic scintillator with ZnS coating

detector size: hand: 375 cm², (15x25cm) foot: 450 cm², (15x30cm)

background subtr.: adjustable background measurement time

measurement electr.: integrated PC 104

keyboard: silicon keyboard

alarm: separately adjustable for each detector

result display: selectable in c/s or nuclide related in Bq/cm²

measurement time: adjustable in s

display: large-area graphical colour LC display, 10,4"

power supply: 230V, 50Hz

dimension: 1160 x 830 x 700 mm

weight: 45kg

interface: RS 232 C parallel printer interface external keyboard floppy disk drive 3,5" network connection RJ45
Applications

- $\alpha$, $\beta$, $\gamma$

  - Radioactivity detection in liquid scintillator for contamination measurement of food, water, soil, etc.
  - Biological or medical filters, wipe tissue, waste analysis.

General description

MALISA* has a simple sample draw, which can be opened and closed easily. Extracting the sample draw, the measurement is automatically terminated.

MALISA* is designed to accept standard liquid scintillation vials of 20 ml volume. A simple insert can be added to adapt to mini vials of 7 ml volume.

Low activity lead and stainless steel is provided to reduce background count rate to a minimum.

MALISA* is equipped with dead time correction and enables very high count rates up to 200,000 c/s.

Linear pulse summation is improving the spectral resolution for precise separation of different energy spectra of various alpha, beta and gamma radiation emitting nuclides.

1 or 2 counting channels can be selected with individual lower and upper discriminators. In case 2 channels are used, spill-over correction is provided.

Quench corrections can be applied using various configurations of counting channels.

A spectrum scan can be performed in order to determine the spectrum position and shape under quench conditions.

Absolute activity can be calculated by entering background and efficiency values.

Liquid-Crystal Display is guiding through the parameter selection and provides visual measurement results.

Features

- Sensitivity: H-3 2 Bq, C-14 1 Bq
- 2 separate counting channels
- 4 pi geometry
- No self absorption
- Quench correction
- Calibration to Bq
- Data output: LCD, thermal printer, PC

Ordering information

- 04203200 MALISA* manual liquid scintillation counter
- 03479910 H-3, C-14, BKG 20 ml standards
- 03200004 liquid scintillator Gold*
- 03479960 20 ml plastic vials
- 03479962 7 ml plastic vials
- 04203104 plastic vial holder
- 03479950 20 ml glass vials
- 03479954 7 ml glass vials

www.raytest.com
## Technical data

<table>
<thead>
<tr>
<th>Loading:</th>
<th>Sample draw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size:</td>
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<td>7 ml</td>
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<tr>
<td>Photomultiplier:</td>
<td>2 x 2&quot; size</td>
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<tr>
<td>Coincidence:</td>
<td>Fast</td>
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<tr>
<td>Pulse summation:</td>
<td>Automatic</td>
</tr>
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<td>Shielding:</td>
<td>12 mm stainless steel</td>
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<tr>
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<td>20 mm lead</td>
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<td>Shielding low level:</td>
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<tr>
<td></td>
<td>50 mm lead</td>
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<tr>
<td>Counting channel:</td>
<td>1 or 2</td>
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<tr>
<td>Preset count:</td>
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<tr>
<td>Preset time:</td>
<td>..h ..m ..s</td>
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<tr>
<td>Discriminator level:</td>
<td>A: 0 – 999</td>
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<tr>
<td></td>
<td>B: 0 – 999</td>
</tr>
<tr>
<td>Efficiency:</td>
<td>H-3: 65%</td>
</tr>
<tr>
<td></td>
<td>C-14: 95%</td>
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<tr>
<td>Calibration:</td>
<td>Spectrum scan</td>
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<tr>
<td></td>
<td>Internal standard channel ratio</td>
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<tr>
<td>Print out:</td>
<td>RS 232 C</td>
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<tr>
<td></td>
<td>All parameters</td>
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<td></td>
<td>All data</td>
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<td>Dimension:</td>
<td>470 mm wide</td>
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<td>370 mm deep</td>
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<td>Weight:</td>
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<tr>
<td>Power:</td>
<td>100-230V</td>
</tr>
<tr>
<td></td>
<td>50-60Hz</td>
</tr>
</tbody>
</table>
General description

The gamma radiation measuring system is designed for applications in nuclide laboratories for the determination of radio nuclide purity, for analysis of environmental samples or for determination of very low activities in food, water and waste samples.

Various scintillation probes of different sizes in suitable lead shieldings are available for the Marinelli beaker covering the total crystal volume or for a reaction tube samples in a central pin hole position.

The operation of the multi-channel-analyser is simple and self explaining. The user is guided through a dialog on the screen. The parameter selection and operation are performed by touching a soft key on the screen.

Every screen offers all operational functions as needed for the analysis to be performed.

Display of the measured spectrum is live.

Automatic energy calibration is obtained by using a suitable Cs-137 calibration source.

Selected energy regions are highlighted.

Selected nuclides are named with activity unit. Background spectra can be accumulated and automatically subtracted for the selected measurement time at selected regions.

In order to offer a suitable spectrum display, a low, medium and high energy range can be selected.

At the end of any measurement the spectrum can be printed or transferred for further analysis or storage to a PC.

Features

touch sensitive screen
easy operation
life spectrum display
selectable nuclide ROI’s
calibration to Bq

Ordering information

12000302 MUCHA* multi channel analyser
09400518 MUCHA* 2x2″NaI(Tl) pinhole, 16 x 30 mm
09400535 MUCHA* lead shielding, 50 mm
09400508 MUCHA* top load pinhole cell
09400516 MUCHA* 3x3″NaI(Tl) pinhole, 16 x 40 mm
09400534 MUCHA* lead shielding, 50 mm
09400508 MUCHA* top load pinhole cell
97010007 MUCHA* 3x3″NaI(Tl) full crystal
09400540 Marinelli lead shielding, 28 mm
09400541 Marinelli beaker, 11
Determin. of Radionuclidic Nuclide Purity according to Eur. Pharmacopoeia 07/2008

A) Test A for radionuclide purity (see Tests)
B) Determine the approximate half life by no fewer than 3 measurements of the activity in a sample in the same geometrical conditions within a suitable period of time (for example 30 min)
Result: 105 – 115 min
C) Examine the chromatograms obtained for test A for radiochemical purity (see test)

RADIONUCLIDIC PURITY
The preparation may be released for use before completion of test B.
A) Gamma-ray spectrometry
Results: the only gamma photons have an energy of 0,511 MeV and, depending on the measurement geometry, a sum peak of 1,022 MeV may be observed
B) Gamma-ray spectrometry
Determine the amount of fluorine-18 and radionuclides with a half life longer than 2 h. For the detection and quantification of impurities, retain the preparation to be examined for at least 24 h to allow the fluorine-18 to decay to a level that permits the detection of impurities.
Results: the total radioactivity due to radionuclidic impurities is not more than 0,1 per cent.

Technical data

- range: 1024 channels
- conversion time: 7 μs, average
- signal input: positive
- signal range: 0-8 V
- offset: adjustable
- lower discriminator: adjustable
- energy ranges: 0 – 256, 1024, 2048 keV
- high voltage: 0 – 1300 V, max 1.5 W
- preamplifier: automatic
- amplifier: automatic
- display: 320 x 240 px, touch sensitive LED backlight with automatic shut down
- power: 90 – 260 VAC, 50 – 60 Hz
- temperature: 5 – 40°C

By using of MUCHA with 3x3”NaI(Tl) with pinhole 16 x 40 mm and 100 mm lead shielding:

1) take 20 μl of ready solution from the synthesis
2) take 10μl of that and dilute it to about 500.000 Bq.
3) take a sample and check by measurement in an activity meter in order to assure the total activity inserted in MUCHA is not more than 50 000c/s.
4) Take of that sample a spectrum and measure the total countrate of the peak at 511 keV for 1 min.
Result A: The spectrum shows only one peak at 511 keV (and depending on the geometrical condition a second, smaller sum peak at 1022 keV)
5) wait 10 min and repeat the measurement of the same sample in the same geometry again for 1 min.
6) repeat the measurement at least 3 times, take the count rate of each peak and calculate the decay time.
Result B: in case the computed decay time is indicating about 2 min: there may be O-15
about 10 min: there may be N-13
about 20 min: there may be C-11 contaminations in the sample.
In case the computed decay time is inbetween 105–115 min, the decay of 18F is calculated and there may be no contamination.
7) For each produced radiopharmaceutical compound a time period for human application is defined. Take a spectrum of the sample at the last applicable time and determine the countrate in the peak of 511 keV.
This is the 100%-reference sample. Result C.
8) Wait 24 hours and take a spectrum of the same sample in the same geometry once more with the same measurement time.
Result D.
9) Integrate the recognizable peaks of Result D and
10) set the sum of all counts of Result D in relation to Result C.
Result E: The sum of all peak counts (potential contaminations) measured after 24 hours has to be smaller than 0,1% of the peak counts measured at the end of the application time period.
11) Scintillation probes with a 3x3"NaI(Tl) crystal have continuous efficiency values of 35 to 95% between 0,1 and 10 MeV as documented in literature. This means that in case a spectrum is shown for certain energies (like 511 & 1022keV) other spectrum parts would be displayed in case they would be present.
ALMO is an installed gamma dose rate alarm monitor. 1 or 3 or 6 gamma detectors can be operating simultaneously. Various detectors with different energy and intensity ranges can be connected.

ALMO is using a micro processor controlled electronic. The measured values are presented on a large, illuminated liquid crystal display. The units of displayed value can be selected in units of n/µ/mSv/h.

The ranging is changing automatically. The external detectors can be Geiger-Müller or NaI(Tl) type probes with integrated High Voltage Supply. The detector type is automatically acknowledged. The calibration for every detector is automatically set. 2 separate alarm levels can be programmed individually. Easy operatable measurement menu with user guidance.

Serial data interface for external monitoring/alarming. Available with integrated emergency power supply (akkupack).

Ergonomical housing for wall or table top mounting. Separate optical and acoustical alarm units connectable.

### Applications

- installed γ-doserate
- installed γ-alarm
- installed door lock
- central data presentation
- central alarm signal

### General description

**ALMO** is an installed gamma dose rate alarm monitor. 1 or 3 or 6 gamma detectors can be operating simultaneously. Various detectors with different energy and intensity ranges can be connected.

**ALMO** is using a micro processor controlled electronic. The measured values are presented on a large, illuminated liquid crystal display. The units of displayed value can be selected in units of n/µ/mSv/h.

The ranging is changing automatically. The external detectors can be Geiger-Müller or NaI(Tl) type probes with integrated High Voltage Supply. The detector type is automatically acknowledged. The calibration for every detector is automatically set. 2 separate alarm levels can be programmed individually. Easy operatable measurement menu with user guidance.

Serial data interface for external monitoring/alarming. Available with integrated emergency power supply (akkupack).

Ergonomical housing for wall or table top mounting. Separate optical and acoustical alarm units connectable.

### Features

- 1-6 detectors simultaneous operation
- GM-probe 18545C: 0.04–1.3 MeV, 0.15–200µSv/h
- GM-probe 18550C: 0.04–1.3 MeV, 1µ–20 mSv/h
- GM-probe 18509C: 0.055–1.3 MeV, 10µ–1 Sv/h
- GM-probe 18529C: 0.07–3 MeV, 100µ–10Sv/h
- NaI-probe 25B38: 0.025–1.3 MeV, 40n–200µSv/h

1-6 display fields
- selectable display parameters
- programable display format
- low and high dose rate probes
- external alarm unit
- visual and acoustical alarm signal

independent operation or system integration

### Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07161999</td>
<td><strong>ALMO 1</strong> for 1 probe</td>
</tr>
<tr>
<td>07162000</td>
<td><strong>ALMO 3</strong> for 3 probes</td>
</tr>
<tr>
<td>07162001</td>
<td><strong>ALMO 6</strong> for 6 probes</td>
</tr>
<tr>
<td>07162005</td>
<td>GM 0.04–1.3MeV, 150n–200µSv/h</td>
</tr>
<tr>
<td>07162002</td>
<td>GM 0.04–1.3MeV, 1µ–20mSv/h</td>
</tr>
<tr>
<td>07162003</td>
<td>GM 0.055–1.3MeV, 10µ–1Sv/h</td>
</tr>
<tr>
<td>07162004</td>
<td>GM 0.07–3MeV, 10µ–10Sv/h</td>
</tr>
<tr>
<td>07162010</td>
<td>NaI, 0.025–1.3MeV, 40n–200µSv/h</td>
</tr>
<tr>
<td>07162035</td>
<td>additional digital display/alarm</td>
</tr>
</tbody>
</table>

www.raytest.com
**Technical data**

<table>
<thead>
<tr>
<th>ALMO 1</th>
<th>ALMO 3</th>
<th>ALMO 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>electronic:</strong></td>
<td>µ-procesor control</td>
<td>same as Almo 1 but for 3 detectors</td>
</tr>
<tr>
<td></td>
<td>for 1 detector</td>
<td></td>
</tr>
<tr>
<td><strong>display:</strong></td>
<td>liquid crystal</td>
<td></td>
</tr>
<tr>
<td><strong>keyboard:</strong></td>
<td>foil-type</td>
<td></td>
</tr>
<tr>
<td><strong>temparatur:</strong></td>
<td>0–+50 degree C</td>
<td></td>
</tr>
<tr>
<td><strong>humidity:</strong></td>
<td>0 – 95%</td>
<td></td>
</tr>
<tr>
<td><strong>I/O:</strong></td>
<td>3 outputs 24V/0,5A or potentail free</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 stage optical alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>acoustical alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>door interlock</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RS 232, 422, 485, USB</td>
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</tr>
<tr>
<td><strong>dimension:</strong></td>
<td>200 x 150 x 75 mm</td>
<td>280 x 300 x 120 mm</td>
</tr>
<tr>
<td><strong>weight:</strong></td>
<td>0,7 kg</td>
<td>2,2 kg</td>
</tr>
<tr>
<td><strong>power:</strong></td>
<td>100–240V,47–63 Hz,15W</td>
<td>60W</td>
</tr>
</tbody>
</table>

**ALMO PC software**

for surveillance and recording system
ALMO can be used for an installed gamma radioactivity monitor for waste water control.
1 scintillation detector is measuring the effluent waste water activity.
As soon as the radioactivity level is higher than the legally permitted level, a electromagnetic valve is closing the drainage. The waste water is accumulated in the waste water container.
The waste water container volume has to be designed large enough for the required accumulation.
Meanwhile the radioactivity, mainly nuclear medical nuclides of short half life time, will decay.
As soon as the stored radioactivity is decayed below the legally permitted level, the storage valve is opened automatically and the waste water is released to the public drain.
The energy range of the scintillation detector is selected to cover the complete energy range of all nuclides used. The radioactivity is counted over a sliding time.
Small radioactivity concentration require a longer counting time; high radioactivity concentrations a small time.

ALMO is using a micro processor controlled electronic. The measured values are presented on a large, illuminated liquid crystal display. The units of displayed value can be selected in units of Bq/l or Bq/m³.
The ranging is changing automatically. 2 separate alarm levels can be programmed individually. Easy operatable measurement menu with user guidance. Serial data interface for external monitoring/alarming. Available with integrated emergency power supply (akku-pack). Ergonomical housing for wall or table top mounting. Separate optical and acoustical alarm units connectable.

### Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07161999</td>
<td>ALMO 1 for 1 probe</td>
</tr>
<tr>
<td>12000362</td>
<td>NaI(Tl) 2x2“, 0.025–1,3MeV</td>
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<tr>
<td>12000400</td>
<td>waste water container with automatic storage/release valve</td>
</tr>
<tr>
<td>07162033</td>
<td>Almo, additional display/alarm connection to central data recording</td>
</tr>
</tbody>
</table>

### Applications

- γ radio-pharmacy-lab
- PET synthesis lab
- PET-quality-control-lab
- nuclear-medicine-lab

### General description

- scintillation detector 2x2“ full crystal
- waste water container
- effluent valve for storage/release
- intermediary storage during high activity
- automatic release after decay
- calibratable to legally free activity level
- data transfer to central data recording

### Features

- scintillation detector 2x2“ full crystal
- waste water container
- effluent valve for storage/release
- intermediary storage during high activity
- automatic release after decay
- calibratable to legally free activity level
- data transfer to central data recording
Technical data

ALMO 1
electronic: µ-procesor control for 1 detector
display: liquid crystal
keyboard: foil-type
temparatur: 0 – +50 degree C
humidity: 0 – 95%
I/O: 3 outputs 24V/0,5A or potential free
3 stage optical alarm
acoustical alarm
door interlock
RS 232, 422, 485, USB

dimension: 200 x 150 x 75 mm
weight: 0,7 kg
power: 100–240V, 47–63 Hz, 15W

ALMO PC software
for surveillance and recording system
**Applications**

- $\gamma$ radio-pharmacy-lab
- PET synthesis lab
- PET-quality-control-lab
- nuclear-medicine-lab
- central alarm signal

**General description**

ALMO 1 can be used for an installed gamma radioactivity monitor for air contamination control.

A scintillation detector sensitive to gamma radiation is mounted by a plastic tube in the middle of a cross section of the ventilation channel close to the exit over the roof. The scintillation probe is measuring continuously the effluent radioactivity of the ventilated air. The radioactivity countrate is transferred from the probe at the roof to the monitor in the control room in the basement. Close to the scintillation probe there is an air-flow-speed-meter, measuring in a given cross section of the ventilation channel the air-ventilation-volume per time. The scintillation probe enables an extraordinary high dynamic range from the background countrate to the extremely high countrate of an accidental emission. The background countrate can be reduced by a suitable lead shielding arrangement. The activity rate overriding preprogramed levels can activate an optical and/or accoustical alarm.

An optional recording and integration program can be installed on a PC.

The integration of the radioactivity emission rate over time results in total radioactivity emission in Bq. The time span of the integration can be selected from $t_1-t_2$ for hours, days, weeks, months and a year.

**Features**

- scintillation detector 3x3" full crystal
- air flow speed meter
- radioactivity Bq/m3
- optional integrated total radioactivity in Bq

**Ordering information**

- 07161999 ALMO 1 for 1 probe
- 12000363 NaI(Tl) 3x3", 0.025-1,3MeV
- 12000361 air contamination flow cell
- 12000371 air-mass-flow measurement system
- 12000374 shielding for air flow cell
- option central data recording and integration

www.raytest.com
Technical data

ALMO 1

Electronic: µ-procesor control for 1 detector

Display: liquid crystal

Keyboard: foil-type

Temperatur: 0–+50 degree C

Humidity: 0 – 95%

I/O: 3 outputs 24V/0,5A or potential free

3 stage optical alarm

Acoustical alarm

Door interlock RS 232, 422, 485, USB

Dimension: 200 x 150 x 75 mm

Weight: 0,7 kg

Power: 100–240V, 47–63 Hz, 15W

ALMO PC software

For surveillance and recording system
Applications

- installed doserate
- installed alarm
- installed door lock
- central data presentation
- central alarm signal

General description

Management of Radiation protection measurements, storage and evaluations.
The production of radioactive labelled compounds or sources for medical diagnostic, therapy biological analysis of metabolism, kinetics technical irradiation and activation requires the detection of all relevant irradiation of humans, animals, environment, facilities exposed to high activity radiation sources, cyclotrons and accelerators.

According to the national legislation – often based on international, legal regulations – the possession, storage, operation, use and maintenance of high activity radiation sources require in every country suitable detectors operating in calibrated conditions base on validated procedures in continuous mode during the usage well documented and retrievable for re-evaluation at any time for 30 years.

raytest offers the MARA system for simultaneous measurement of an unlimited number of detectors suitable for determination of installed dose rate personal gamma dose rate hand, foot, cloth contamination surface contamination air contamination water contamination

Features

- bright display readable from distance
- single or dual probe operation
- low dose and high dose system
- 2 individual serial interfaces
- memory of 1000 measurements
- ratemeter or timer/counter
- network integration

Ordering information

12000369 MARA management system for radiation protection data

12000370 MARA extension per channel

www.raytest.com
**MARA-System**

raytest offers **MARA-system** for display of all relevant radiation protection values in:

- live mode in a floor plan individual actual radiation levels and alarms and display of many records over time.

raytest offers **MARA-system** for:

- individual security
- immediate reaction
- documented redressment and inspection at any time later

**Technical data**

- communication: LAN
- data base: SQL
- display: floor plan, all actual values, all actual alarms, list of events
- evaluation: actual time, previous time, previous: day, week, month, year
- calibration: optional service of raytest using calibrated standard requires individual quote performance in cooperation with local authorities

Simultaneous display of many detectors, alarms
Index

Chemiluminescence/Fluorescence

STELLA 2000
high sensitive modular imaging system

STELLA 3200
ultra high sensitive modular imaging system

STELLA 8300
ultra high sensitive modular imaging system
- white light transilluminator
- UV-light transilluminator
- variable wavelength transilluminator

AIDA
advanced image data analysis program
- densitometry, fragment length
- array evaluation
- colony counting
- whole-body-radioluminography
- thin layer chromatography

Imaging plate scanner
CR 35 Bio
HD-CR 35 Bio

IPshiebox - shielding box for radioluminography

ImageStream X
imaging flow cytometer

Image plate standards
IPsen - imaging plate sensitivity test
IPcal - imaging plate calibration test
IPust - imaging plate uniformity test
Applications

Bio/Chemiluminescence
Fluorescence, UV to near IR
Multichannel fluorescence
Western Blots
Gel Documentation
Proteomics
GLP/GMP

General description

The STELLA family of imaging systems is based on a modular concept with different high performance modules: several cooled high performance CCD-cameras combined with lens optimized for different applications and a variety of modules for illumination ranging from UV to near IR. This guarantees an optimal price-performance ratio for any given application plus the ability to upgrade the system later for additional future applications.

STELLA 2000 uses a high performance, cooled, full-frame CCD camera with microlenses for optimal quantum efficiency. 4.0 Megapixel resolution, state-of-the-art CCD architecture and four stage Peltier cooling (abs. -20°C) guarantee high sensitivity and high resolution for chemiluminescent western blots and many other applications.

Adding raytest AIDA software for data analysis leads to a high performance chemiluminescence and fluorescence imaging system at affordable price. Optional software modules for GLP/GMP and 21 CFR part 11 allow the operation of STELLA in regulated environment.

Features

modular / upgradable imaging system
manual focus and aperture
white-light table for protein gels or film digitalisation
UV-table for gel documentation
variable illumination unit, visible to near IR
manual 2 position filter changer
AIDA software with many modules incl. GMP/GLP

Ordering information

14800014 STELLA 2000 with bright light performance lens
14800050 Computer controlled Focus and Aperture
14800100 white light table for STELLA
14800200 UV-table 312 nm, 250 x 230 mm
14800300 variable transilluminator
14800400 7 position filter wheel
14800401 manual filter changer
14800410 emission filter Em535/40
14800411 emission filter Em605/20
14800412 emission filter Em700/35
14800450 excitation filter Ex470/40x
14800451 excitation filter HQ540/20x
14800452 excitation filter HQ630/20x
14800600 EPI blue illuminator (Cy2)
14800610 EPI green illuminator (Cy3)
14800620 EPI red illuminator (Cy5)

www.raytest.com
### Technical data

<table>
<thead>
<tr>
<th>Sensor</th>
<th>cooled full-frame CCD with on-chip microlenses, low dark current, 100 % fill factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pixels</td>
<td>2048 x 2048 / 4.0 Mpixel</td>
</tr>
<tr>
<td>Pixel size</td>
<td>5.4 x 5.4 μm (unbinned), 10.8 x 10.8 μm (@ 1MP)</td>
</tr>
<tr>
<td>Cooling</td>
<td>4 stage Peltier cooling (-20°C)</td>
</tr>
<tr>
<td>Digitalisation</td>
<td>16 bit</td>
</tr>
<tr>
<td>Binning</td>
<td>2x2, 3x3, 4x4, ..., 16x16</td>
</tr>
<tr>
<td>Peak quantum efficiency</td>
<td>62%</td>
</tr>
<tr>
<td>Interface</td>
<td>USB 2.0 high-speed</td>
</tr>
<tr>
<td>Field of view</td>
<td>max. 12.5 x 12.5 cm</td>
</tr>
<tr>
<td>Excitation sources</td>
<td>UV table (312 nm), white-light table, variable transilluminator with 7 position filter wheel</td>
</tr>
<tr>
<td>Emission filters</td>
<td>manual 2 position filter changer, E72 filters for a variety of different applications</td>
</tr>
<tr>
<td>Control software</td>
<td>easy to operate, method-based (optimized methods included)</td>
</tr>
<tr>
<td>Data analysis</td>
<td>AIDA (network or standalone) state-of-the-art data analysis optimized modules for TLC analysis gels and blots multilabelling whole-body autoradiography GLP/GMP, 21 CFR part 11</td>
</tr>
</tbody>
</table>

---

**Bio-Imaging**

**STELLA 2000**

high sensitive modular imaging system
Applications

Bio/Chemiluminescence
Fluorescence, UV to near IR
Multi-Fluorescence
Western Blots
Gel Documentation
Proteomics
GLP/GMP

General description

The STELLA family of imaging systems is based on a modular concept with different high performance modules: several cooled high performance CCD-cameras combined with lens optimized for different applications and a variety of modules for illumination ranging from UV to near IR. This guarantees an optimal price-performance ratio for any given application plus the ability to upgrade the system later for additional future applications.

STELLA 3200 uses a high performance, cooled, full-frame CCD camera with microlenses for optimal quantum efficiency. 3.2 Megapixel resolution, state-of-the-art CCD architecture and four stage Peltier cooling (abs. -35°C) guarantee ultra high sensitivity and high resolution for chemiluminescent western blots and many other applications.

Adding raytest AIDA software for data analysis leads to a high performance chemiluminescence and fluorescence imaging system at affordable price. Optional software modules for GLP/GMP and 21 CFR part 11 allow the operation of STELLA in regulated environment.

Features

modular / upgradable imaging system
motorized focus and aperture
white-light table for protein gels or film digitalisation
UV-table for gel documentation
variable illumination unit, visible to near IR
motorized 7 position filter wheel for fluorescence
AIDA software with many modules incl. GMP/GLP

Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Notes</th>
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<tbody>
<tr>
<td>14800011</td>
<td>STELLA 3200 without lens</td>
<td></td>
</tr>
<tr>
<td>14800015</td>
<td>bright light performance lens</td>
<td></td>
</tr>
<tr>
<td>14800017</td>
<td>bright light, wide angle lens</td>
<td></td>
</tr>
<tr>
<td>14800100</td>
<td>white light table for STELLA</td>
<td></td>
</tr>
<tr>
<td>14800200</td>
<td>UV-table 312 nm, 250 x 230 mm</td>
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<tr>
<td>14800300</td>
<td>variable transilluminator</td>
<td></td>
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<tr>
<td>14800400</td>
<td>7 position filter wheel</td>
<td></td>
</tr>
<tr>
<td>14800401</td>
<td>manual filter changer</td>
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</tr>
<tr>
<td>14800410</td>
<td>emission filter Em535/40</td>
<td></td>
</tr>
<tr>
<td>14800411</td>
<td>emission filter Em605/20</td>
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<tr>
<td>14800412</td>
<td>emission filter Em700/35</td>
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<tr>
<td>14800450</td>
<td>excitation filter Ex470/40x</td>
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<tr>
<td>14800451</td>
<td>excitation filter HQ540/20x</td>
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<tr>
<td>14800452</td>
<td>excitation filter HQ630/20x</td>
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<tr>
<td>14800600</td>
<td>EPI blue illuminator (Cy2)</td>
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<tr>
<td>14800610</td>
<td>EPI green illuminator (Cy3)</td>
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</tr>
<tr>
<td>14800620</td>
<td>EPI red illuminator (Cy5)</td>
<td></td>
</tr>
</tbody>
</table>
**Technical data**

**sensor:**
- cooled full-frame CCD
- with on-chip microlenses
- low dark current
- 100 % fill factor

**number of pixels:**
2184 x 1472 / 3.2 Mpixel

**pixel size:**
- 6.8 x 6.8 μm (unbinned)
- 13.6 x 13.6 μm (@ 1MP)

**cooling:**
4 stage Peltier cooling (-35°C)

**digitalisation:**
16 bit

**binning:**
2x2, 3x3, 4x4, ..., 16x16

**peak quantum efficiency:** 90%

**interface:**
Ethernet

**field of view:**
- max. 11.5 x 17.5 cm
- (optional wide angle lens: FOV max. 15 x 23 cm)

**excitation sources:**
- UV table (312 nm)
- white-light table
- variable transilluminator
- with 7 position filter wheel

**emission filters:**
7 position filter wheel
E72 filters for a variety of different applications

**control software:**
easy to operate
method-based
(optimized methods included)

**data analysis:**
AIDA (network or standalone)
state-of-the-art data analysis
optimized modules for TLC analysis
gels and blots
multilabelling
whole-body-autoradiography
GLP/GMP, 21 CFR part 11

**UV-light table**

**white light table**

**excitation and emission filters**

**mechanical integration of high-performance lenses**

**Chemiluminescence**

**2D Gel**
The STELLA family of imaging systems is based on a modular concept with different high performance modules: several cooled high performance CCD-cameras combined with lens optimized for different applications and a variety of modules for illumination ranging from UV to near IR. This guarantees an optimal price-performance ratio for any given application plus the ability to upgrade the system later for additional future applications.

STELLA 8300 uses a high performance, cooled, full-frame CCD camera with microlenses for optimal quantum efficiency. 8.3 Megapixel resolution, state-of-the-art CCD architecture and four stage Peltier cooling (abs. -20°C) guarantee high sensitivity and very high resolution for proteomics, chemiluminescent western blots and many other applications.

Adding raytest AIDA software for data analysis leads to a high performance chemiluminescence and fluorescence imaging system at affordable price. Optional software modules for GLP/GMP and 21 CFR part 11 allow the operation of STELLA in regulated environment.
STEELA 8300
high sensitive imaging system with very high resolution

Technical data

sensor: cooled full-frame CCD
with on-chip microlenses
low dark current
100 % fill factor

number of pixels: 3326 x 2504 / 8.3 Mpixel

pixel size: 5.4 x 5.4 μm (unbinned)
10.8 x 10.8 μm (@ 2MP)

cooling: 4 stage Peltier cooling (-20°C)

digitalisation: 16 bit

binning: 2x2, 3x3, 4x4, ..., 16x16

peak quantum efficiency: 62%

interface: USB 2.0 high-speed

field of view: max. 21 x 27 cm

excitation sources: UV table (312 nm)
white-light table
variable transilluminator
with 7 position filter wheel

emission filters: 7 position filter wheel
E72 filters for a variety of different applications

control software: easy to operate
method-based
(optimized methods included)

data analysis: AIDA (network or standalone)
state-of-the-art data analysis
optimized modules for
gels and blots
multilabelling
whole-body-autoradiography

Chemiluminescence
2D Gel

STEELA on variable transilluminator
Applications

- contrast optimizing
- image printing
- 1-dimensional densitometry (profile analysis)
- fragment length determination
- molecular weight determination
- 2-dimensional densitometry (region of interest analysis)

General description

**AIDA** is designed for the fast and reliable acquisition of quantitative and qualitative data of all kinds of biological samples.

**AIDA** can be run under most service packs of Windows 2000, under Windows XP Professional SP 1 and 2 and under Windows Vista.

**Easy and flexible**
The modular structure of **AIDA** allows to perfectly match individual application demands with optimal software modules. This results in enhanced usability as the software is restricted to just the required features. At any time **AIDA** can be upgraded to changing application demands.

**Versatile**
With **AIDA** it is possible to analyze and save or convert most of the existing image file formats such as TIFF (16 or 8 bit) BMP or JPEG and special file formats from Fuji scanners and cameras and Gel file format.

**Independent**
The origin of the digital data may come from a CCD camera, a flat bed scanner, a fluorescence scanner for micro of macro application and/or an imaging plate scanner.

Reliable background correction
**AIDA** allows to adapt the background correction to the individual requirements of a large variety of samples.

Features

- easy operation
- fast, accurate results
- intuitive menus
- high flexibility
- professional performance
- full documentation
- standalone or network version
- upgrade with GLP/GMP/21 CFR 11 module possible

Ordering information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15000001</td>
<td><strong>AIDA</strong> bio-package, 1D, 2D, FL</td>
</tr>
<tr>
<td>15000002</td>
<td><strong>AIDA</strong> basic software</td>
</tr>
<tr>
<td>15000003</td>
<td><strong>AIDA</strong> 1D module quantification</td>
</tr>
<tr>
<td>15000004</td>
<td><strong>AIDA</strong> 2D module quantification</td>
</tr>
<tr>
<td>15000005</td>
<td><strong>AIDA</strong> fragment length determination</td>
</tr>
<tr>
<td>15000067</td>
<td><strong>AIDA</strong> bio-package GLP</td>
</tr>
</tbody>
</table>

[www.raytest.com](http://www.raytest.com)
AIDA 1D Densitometry – fast and precise quantification with automatic lane, baseline and peak determination or with manual functions for special requirements. The quantitation result table is user configurable.

Technical data

evaluation:
- Manual or automated
- 1D (profile analysis)
- 2D (region of interest)

background correction:
- based on profiles
- based on background region
- local background
- integration limits

input data from:
- most CCD cameras
- most flatbed scanners
- Fuji BAS/FLA scanners
- GE STORM/TYPHOON
- CR 35 Bio
- HD-CR 35 Bio

output file type:
- 16 bit TIFF
- 8 bit TIFF
- JPG
- BMP
- Fuji or GE file format

fragment length determination:
- RF value
- molecular weight
- fragment length
- pl value

quantity calibration:
- linear regression
- linear interpolation
- logarithmic regression
- logarithmic weighted regression
- X vs. log Y regression
- Y vs. log X regression

running under:
- Windows 2000 Pro (most service packs)
- Windows XP Pro
- Windows Vista
# Applications
- contrast optimizing
- image printing
- import of GAL files
- normalization
- alignment
- array compare module

## General description
*AIDA* is designed for the fast and reliable acquisition of quantitative and qualitative data of all kinds of biological samples.

*AIDA* can be run under most service packs of Windows 2000, under Windows XP Professional SP 1 and 2 and under Windows Vista.

### Easy and flexible
The modular structure of *AIDA* allows to perfectly match individual application demands with optimal software modules. This results in enhanced usability as the software is restricted to just the required features. At any time *AIDA* can be upgraded to changing application demands.

### Versatile
Import of GAL files or manual creation of the template.

### Powerful
*AIDA* allows normalization and up to 9 different correction functions.

## Features
- easy operation
- fast, accurate results
- intuitive menus
- high flexibility
- professional performance
- full documentation
- array compare module
- standalone or network version
- upgrade with GLP/GMP/21 CFR 11

## Ordering information
- 15000002 *AIDA* basic software
- 15000050 *AIDA*-array easy
- 15000051 *AIDA*-array matrix easy
- 15000052 *AIDA*-array compare
- 15000053 *AIDA*-array matrix professional
- 15000070 *AIDA* microarray
AIDA-array
automatic imaging data analysis program, array evaluation

Technical data

templates:
- Manually created
- GAL file import

normalization:
- reference dots
- data range (lowest or highest dots)
- arithmetic or geometric mean
- variance stabilization

background correction:
- 9 different correction functions
- optimal background for most arrays

output file type:
- 16 bit TIFF
- 8 bit TIFF
- JPG
- BMP
- Fuji or GE file format

array compare:
- compare a master array to client arrays

running under:
- Windows 2000 Pro (most service packs)
- Windows XP Pro
- Windows Vista

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Benzstrasse 4
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Phone +49 7082 9255-0 · Fax +49 7082 9255-4444
www.raytest.com
AIDA-colony
automatic imaging data analysis program, colony counting

<table>
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<tr>
<th>Applications</th>
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</thead>
<tbody>
<tr>
<td>contrast optimizing</td>
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<tr>
<td>image printing</td>
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<tr>
<td>colony counting</td>
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<tr>
<td>variable search areas</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>General description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIDA</strong> is designed for the fast and reliable acquisition of quantitative and qualitative data of all kinds of biological samples.</td>
</tr>
<tr>
<td><strong>AIDA</strong> can be run under most service packs of Windows 2000, under Windows XP Professional SP 1 and 2 and under Windows Vista.</td>
</tr>
<tr>
<td><strong>Easy and flexible</strong></td>
</tr>
<tr>
<td>The modular structure of <strong>AIDA</strong> allows to perfectly match individual application demands with optimal software modules. This results in enhanced usability as the software is restricted to just the required features. At any time <strong>AIDA</strong> can be upgraded to changing application demands.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>easy operation</td>
</tr>
<tr>
<td>fast, accurate results</td>
</tr>
<tr>
<td>intuitive menus</td>
</tr>
<tr>
<td>high flexibility</td>
</tr>
<tr>
<td>professional performance</td>
</tr>
<tr>
<td>full documentation</td>
</tr>
<tr>
<td>standalone or network version</td>
</tr>
<tr>
<td>upgrade with GLP/GMP/21 CFR 11 module possible</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Ordering information</th>
</tr>
</thead>
<tbody>
<tr>
<td>15000002 <strong>AIDA</strong> basic software</td>
</tr>
<tr>
<td>15000080 <strong>AIDA</strong>-colony counting module</td>
</tr>
</tbody>
</table>

www.raytest.com
Colony detection
Two ways of parameter setting:
- automatic setting by choosing one or more typical colonies
- manual setting of detection parameters

Variable search areas
For examples circles for Petri dishes or rectangles for microtiter plates

Intersections of search areas
Flexible definition of intersections is possible

Result table
User adaptable result table with numerous information

Spot editing
- manual spot editing functions
- separation of double spots
- creation of undetected spots or
- erasure of false spots

Technical data
running under:
- Windows 2000 Pro
  (most service packs)
- Windows XP Pro
- Windows Vista
AIDA-QWBR
automatic imaging data analysis program, quantitative whole body radioluminography

Applications

whole body radioluminography
contrast optimizing
image printing
overlay and alignment of
white light and radioactive image

General description

AIDA is designed for the fast and reliable acquisition of quantitative and qualitative data of all kinds of biological samples.

AIDA can be run under most service packs of Windows 2000, under Windows XP Professional SP 1 and 2 and under Windows Vista.

Easy and flexible
The modular structure of AIDA allows to perfectly match individual application demands with optimal software modules. This results in enhanced usability as the software is restricted to just the required features. At any time AIDA can be upgraded to changing application demands.

Versatile and flexible
Images from different sources and/or in different file formats can be overlaid and aligned.

Features

easy operation
fast, accurate results
overlay and alignment
professional performance
full documentation
standalone or network version
upgrade with GLP/GMP/21 CFR 11 module possible

Ordering information

15000002 AIDA basic software
15000078 AIDA quantitative whole body autoradiography

www.raytest.com
Technical data

region determination:
- regions of different shapes
- automatic region finder ("magic wall")
- manual possibilities
- auto contour

region calibration:
- linear regression
- linear interpolation
- logarithmic regression
- logarithmic weighted regression
- X vs. log Y regression
- Y vs. log X regression

image alignment:
The visible and the radioactive image can vary in
- size
- position
- resolution
The alignment is done
- using three marker points
- without changing the raw data

input data from:
- CR 35 BIO
- HD-CR 35 BIO
- Fuji BAS/FLA scanners
- GE STORM/TYPHOON
- JPG e.g. from camera-based system

running under:
- Windows 2000 Pro (most service packs)
- Windows XP Pro
- Windows Vista

whole body autoradiography
AIDA-TLC
automatic imaging data analysis program, thin layer chromatography

Applications

- contrast optimizing
- image printing
- 1-dimensional thin layer chromatography
- RF determination
- 2-dimensional thin layer chromatography

General description

AIDA is designed for the fast and reliable acquisition of quantitative and qualitative data of all kinds of biological samples.

AIDA can be run under most service packs of Windows 2000, under Windows XP Professional SP 1 and 2 and under Windows Vista.

Easy and flexible

The modular structure of AIDA allows to perfectly match individual application demands with optimal software modules. This results in enhanced usability as the software is restricted to just the required features. At any time AIDA can be upgraded to changing application demands.

Versatile

With AIDA it is possible to analyze and save or convert most of the existing image file formats such as TIFF (16 or 8 bit) BMP or JPEG and special file formats from Fuji scanners and cameras and Gel file format.

Independent

The origin of the digital data may come from a CCD camera, a flat bed scanner, a fluorescence scanner for micro of macro application and/or an imaging plate scanner.

Reliable background correction

AIDA allows to adapt the background correction to the customers requirements.

Features

easy operation
fast, accurate results
intuitive menus
high flexibility
professional performance
full documentation
standalone or network version
upgrade with GLP/GMP/21 CFR 11 module possible

Ordering information

<table>
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<tr>
<th>Code</th>
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<td>15000064</td>
<td>AIDA 1D TLC module</td>
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<td>15000063</td>
<td>AIDA 2D TLC module</td>
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<td>15000222</td>
<td>AIDA 1D+2D TLC modules</td>
</tr>
<tr>
<td>15000002</td>
<td>AIDA basis software</td>
</tr>
</tbody>
</table>

www.raytest.com
Technische Daten

Evaluierung:
- 1D Analyse
- 2D Analyse

Hintergrundkorrektur:
- basiert auf Profilen
- basiert auf Hintergrundgebiet
- lokaler Hintergrund
- Integrationslimits

Eingabe:
- meisten CAMs
- meisten Flachbettscanner
- Fuji BAS/FLA Scanner
- GE STORM/TYPHOON
- CR 35 Bio
- HD-CR 35 Bio

Ausgabedateiformate:
- 16-Bit-TIFF
- 8-Bit-TIFF
- JPG
- BMP
- Fuji oder GE-Dateiformate

Betriebssystem:
- Windows 2000 Pro (meistens Service Packs)
- Windows XP Pro
- Windows Vista
CR 35 Bio

high-speed image plate scanner

Applications

- PhosphorImager
- Digital radiography
- Image plate scanning
- Storage phosphor screens
- Whole body radioluminography

General description

CR 35 Bio is a compact high-speed scanner for all flexible types of image plates / storage phosphor screens up to the size of 35 x 43 cm. In combination with the corresponding imaging plate it can be used for a variety of different nuclides, such as H-3, C-11, C-14, F-18, P-32, P-33, S-35, Fe-59, Ga-68, Tc-99m, In-111, I-125, I-131, Cs-137, etc.

An integrated erasing unit allows to read and erase the imaging plate in one step.

Its novel design allows compact size and high speed scanning. The laser is focused to 30 μm allowing pixels sizes from 30 to 200 μm without pixel interpolation.

Features

- red LED laser 635 nm
- easy to use
- high scanning speed
- 16 bit dynamic range
- integrated erasing unit

Ordering information

- 22200002  CR 35 Bio
- 22200012  CR-Reader software
- 22200015  CR 35 Dark Cabinet
- 08000206  external eraser IP’s up to 35 x 43 cm

www.raytest.com
Technical data

laser: red LED laser 635 nm focused to 30 μm

pixel size: 30 μm, 50 μm, 100 μm, 200 μm

size: 39 x 38 x 52 cm

weight: 21 kg

max. size for screens: 35 cm width, length up to 43 cm or longer

interface: USB 2.0 high-speed

operating noise: < 49db(A)

optional eraser: for high-throughput and/or highly radioactive samples

data analysis: AIDA (network or standalone) state-of-the-art data analysis optimized modules for TLC analysis gels and blots whole-body autoradiography GLP/GMP, 21 CFR part 11
Applications

- PhosphorImager
- Digital radiography
- Image plate scanning
- Storage phosphor screens
- Whole body radioluminography

General description

HD-CR 35 Bio is a compact high-speed scanner for all flexible types of image plates / storage phosphor screens up to the size of 35 x 43 cm. In combination with the corresponding imaging plate it can be used for a variety of different nuclides, such as H-3, C-11, C-14, F-18, P-32, P-33, S-35, Fe-59, Ga-68, Tc-99m, In-111, I-125, I-131, Cs-137, etc.

An integrated erasing unit allows to read and erase the imaging plate in one step.

Its novel design allows compact size and high speed scanning. The laser is focused to 12.5 μm allowing pixels sizes from 12.5 to 200 μm without pixel interpolation.

The HD-CR 35 Bio scanner is the first imaging system for radioluminography certified by BAM, Berlin for the tests according to DIN EN 14784, class B.

Features

- red LED laser 635 nm
- easy to use
- high scanning speed
- 16 bit dynamic range
- integrated erasing unit

Ordering information

- 22200001 HD-CR 35 Bio
- 22200012 CR-Reader software
- 22200015 CR 35 Dark Cabinet
- 08000206 external eraser IP’s up to 35 x 43 cm

www.raytest.com
**Technical data**

- **laser:** red LED laser 635 nm focused to 12.5 μm
- **pixel size:** 12.5 μm, 25 μm, 50 μm, 100 μm, 200 μm
- **size:** 39 x 38 x 52 cm
- **weight:** 21 kg
- **max. size for screens:** 35 cm width length up to 43 cm or longer
- **interface:** USB 2.0 high-speed
- **operating noise:** < 49db(A)
- **optional eraser:** for high-throughput and/or highly radioactive samples
- **data analysis:** AIDA (network or standalone) state-of-the-art data analysis optimized modules for TLC analysis gels and blots whole-body autoradiography GLP/GMP, 21 CFR part 11
Applications

β low activity sample exposure for radio-luminography

General description

At very low activity expositions to imaging plates, the background radiation will generate a signal, which may be as strong as the signal from the sample itself.

Therefore the sample cannot be differentiated from the background radiation.

The background radiation must be reduced.

That is the purpose of the shielding box.

The “external” radiation from construction material, building, nature and cosmos has to be reduced by an effective shielding material, which encloses the sample as well as the sensor (imaging plate).

The internal design material is electrolytic molten pure copper, which contains almost no radioactive contamination.

Especially selected “old”, very low activity lead is used for the shielding box.

The outside housing is made from 3 mm steel, selected for low activity.

The foot design suitable for fork lift transportation.

Features

improvement of detectability
up to a factor of 10
all image plate sizes
refrigerated version

Ordering information

08000165 shielding box for 16 imaging plates 23 x 40 cm
08000173 shielding box for 16 imaging plates 46 x 49 cm
08000182 shielding box refrigerated 16 imaging plates 46 x 49 cm

www.raytest.com
# Technical Data

<table>
<thead>
<tr>
<th>Article Number</th>
<th>Shielding Box for</th>
<th>Wall Composition</th>
<th>Inner Dimension</th>
<th>Outer Dimension</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>08000165</td>
<td>16 IP’s 23 x 40 cm</td>
<td>5 mm pure copper</td>
<td>262 x 262 x 433 mm</td>
<td>572 x 379 x 479 mm</td>
<td>550 kg</td>
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<tr>
<td></td>
<td></td>
<td>50 mm low activity lead</td>
<td>3 mm selected steel</td>
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<tr>
<td>08000173</td>
<td>16 IP’s 460 x 490 mm</td>
<td>5 mm pure copper</td>
<td>262 x 492 x 460 mm</td>
<td>375 x 573 x 707 mm</td>
<td>820 kg</td>
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<td>16 IP’s 400 x 430 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 IP’s 230 x 400 mm</td>
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</tr>
</tbody>
</table>

**Shielding Box for Low Activity Exposure of Imaging Plates**

- Refrigeratable but without cooling unit
- 16 IP’s 460 x 490 mm
- 16 IP’s 400 x 430 mm
- 32 IP’s 230 x 400 mm

- Wall composition:
  - 5 mm pure copper
  - 10 mm styropor
  - 50 mm low activity lead
  - 3 mm selected steel

- Inner dimension: 262 x 492 x 460 mm
- Outer dimension: 395 x 617 x 727 mm
- Weight: 890 kg
Applications
Morphology/Shape Change
Internalization
Cell Signalling
Co-localization
Apoptosis
Cell Death and Autophagy
Phenotyping
Cell Cycle and Mitosis
Cell-Cell Interactions
DNA Damage and Repair
Stem Cell Differentiation

General description
The ImageStreamX is a high performance imaging flow cytometer. It combines the speed, sensitivity, and phenotyping abilities of flow cytometry with the detailed imagery and functional insight of microscopy.

The cells are analyzed in flow as on any standard flow cytometer. The ImageStreamX quantifies both the intensity and the location of fluorescent probes and can image more than 50,000 cells per minute, allowing to analyze rare subpopulations and highly heterogeneous samples with statistically robust and objective results.

The ImageStreamX allows to
- image cells directly in suspension with the resolution of a 60X microscope and the fluorescence sensitivity of the best flow cytometers,
- perform phenotypic and functional studies at the same time using up to 12 images per cell,
- analyze highly heterogeneous samples and rare cell sub-populations at speeds of up to 1,000 cells per second,
- quantitate virtually anything visible using the IDEAS software package’s numerous pre-defined fluorescence and morphologic parameters.

The modular design of the ImageStreamX system yields experimental flexibility through a broad range of field-installable options.

Features
High speed cell imaging (up to 1,000 cell/sec)
High sensitivity
Up to 5 lasers / up to 12 imaging channels
Many modular Options
IDEAS software for fast and efficient data analysis

Ordering information
38100000 ImageStreamX (blue laser 488 nm / 100 mW, 6 channels, 40X objective)
38100001 violet laser (405 nm, 100 mW)
38100002 red laser (658 nm, 120 mW)
38100003 high power blue laser (488 nm/500 mW)
38100004 green laser (561 nm, 200 mW)
38100005 yellow laser (592 nm, 300 mW)
38100201 Extended depth of field option, EDF™
38100202 MultiMag option, 20X/40X/60X objectives
38100203 upgrade to 12 imaging channels
38100204 Full color brightfield upgrade
38100205 Autosampler option
38100301 IDEAS software (1 seat)
38100302 IDEAS software (lab licence)
38100401 Speed beads kit
38100601 Data analysis workstation

www.raytest.com
**Technical data**

Up to 5 excitation lasers (405 / 488 / 561 / 594 / 658 nm)

785 nm darkfield laser

Up to 12 imaging channels

- **detection limit:** < 50 MESF
- **magnification:**
  - 40X (0.75 NA) standard
  - 60X (0.9 NA) with MultiMag option
  - 20X (0.5 NA) with MultiMag option
- **pixel size:**
  - 0.5 x 0.5 microns at 40X
  - 0.3 x 0.3 microns at 60X
  - 1.0 x 1.0 microns at 20X
- **field of view:**
  - 60 x 128 microns at 40X
  - 40 x 76 microns at 60X
  - 120 x 256 microns at 20X
- **imaging rate:**
  - 1,000 cells per second at 40X
  - 600 cells per second at 60X
  - 2,000 cells per second at 20X
- **images per cell:**
  - 6 images per cell standard (brightfield, darkfield, fluorescence)
  - 12 images per cell optional
- **throughput:**
  - 1 sample per minute, nominal
- **sample volume:**
  - 50 microliters
- **autosamper:**
  - Optional upgrade for multiwell plates

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Phone +49 7082 9255-0 · Fax +49 7082 9255-4444
www.raytest.com
test source and program for imaging plate sensitivity and resolution

**Applications**

- β quantitative evaluation of
  - 1D-TLC
  - multiple 1D-TLC
  - 2D-TLC
  - whole-body radioluminography

**General description**

Imaging plate scanners have to be checked out for sensitivity changes over time in particular after laser or other components replacement.

The imaging plate sensitivity source is supplied in an imaging plate exposition cassette made of metal plate sheet.

The cassette wall is shielding the low energy C-14 beta radiation completely and radiation cannot escape.

For resolution test a suitable stainless steel foil is placed partially over the C-14-sensitivity test source.

The resolution test program is performed and the MTF is calculated and printed.

**Features**

- shading test is required after every repair of any scanner
- shading test with C-14 source
- very high accuracy standard
- long life of standards, C-14
- low energy radiation of standard
- resolution test with MTF

**Ordering information**

- **08000010** C-14-polymer source sensitivity test after every repair 22 kBq, C-14
- **15000012** resolution test after every repair

www.raytest.com
### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>nuclide:</td>
<td>C-14</td>
</tr>
<tr>
<td>half-life time:</td>
<td>5600 years</td>
</tr>
<tr>
<td>dimension source:</td>
<td>25 mm diameter</td>
</tr>
<tr>
<td>thickness source:</td>
<td>saturation</td>
</tr>
<tr>
<td>material:</td>
<td>polymer foil</td>
</tr>
<tr>
<td>activity:</td>
<td>22 kBq</td>
</tr>
<tr>
<td>surface uniformity:</td>
<td>&gt;1%</td>
</tr>
</tbody>
</table>
### General Description

C-14 standards for testing the detection limit. 13 standards have total activities from 0.068 Bq to 19.5 kBq.

**Regulatory Requirements:**
At installations and during the ongoing use of analytical instruments in a regulated environment it is required to measure the instrument’s performance. To meet these requirements for scanner and imaging plates, raytest has developed tools, consisting of software and radioactive sources:
- Limit of detection
- Uniformity and resolution

**Determination of Limit of Detection:**
Exposure of a plate with a series of radioactive standards to an imaging plate for a defined time.

- Scan of the imaging plate.
- Automated region search for the standards.
- Determination of the background.
- Generation of the standard curve region area versus activity.
- Calculation of the lower detection limit.
- Printout of the results for performance documentation.

### Features

- Linear range 1:1 Mio
- Comparing sample/standard
- Very high accuracy standards
- Long life of standards, C-14
- Low energy radiation of standard
- Uniformity better +/- 1%

### Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>08000059</td>
<td>C-14-polymer standard array total activity range</td>
</tr>
<tr>
<td></td>
<td>13 sources, 0.068 Bq to 19.5 kBq</td>
</tr>
<tr>
<td>08000060</td>
<td>C-14-polymer standard array high activity range</td>
</tr>
<tr>
<td></td>
<td>6 sources, 65.8 Bq to 19.5 kBq</td>
</tr>
<tr>
<td>08000061</td>
<td>C-14-polymer standard array low activity range</td>
</tr>
<tr>
<td></td>
<td>6 sources, 0.068 Bq to 20.2 Bq</td>
</tr>
<tr>
<td>15000261</td>
<td>Limit of detection software</td>
</tr>
</tbody>
</table>

[www.raytest.com](http://www.raytest.com)
**Technical data**

- **nuclide:** C-14
- **half-life time:** 5600 years
- **dimension 1 source:** 10 x 10 mm
- **thickness of source:** saturation
- **material:** polymer foil

**activities:**

- blue: 19.5 kBq
- light blue: 7 kBq
- yellow: 1.8 kBq
- light yellow: 691 Bq
- purple: 222.5 Bq
- light purple: 65.8 Bq
- orange: 20.2 Bq
- brown: 7 Bq
- green: 2 Bq
- light green: 0.68 Bq
- red: 0.16 Bq
- grey: 0.068 Bq
- colorless: bkg

**surface uniformity:** > 1%
Applications

\[ \beta \] quantitative evaluation of

1D-TLC

multiple 1D-TLC

2D-TLC

whole-body radioluminography

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General description

Regulatory requirements:
At installations and during the ongoing use of analytical instruments in a regulated environment it is required to measure the instrument’s performance. To meet these requirements for scanner and imaging plates, raytest has developed tools, consisting of software and radioactive sources:

- limit of detection
- uniformity and resolution

Determination of system uniformity:
for scanner and imaging plate.
Exposure of the uniformity standard test source with equally distributed radioactivity to an imaging plate for a defined time.
Scan of the imaging plate.
Automated generation of numbered regions of interest.
Determination of the background.
Automated marking of the area with the lowest activity in green and the highest activity in red.
Display of image and marked areas together with experiment parameters.
Automated calculation of the maximum deviation.
Printout of the result for performance documentation.

Uniformity test source technical data:
C-14 standard with total activity of 13 – 16 MBq for testing uniformity of all radioluminography scanners and imaging plates. Each scanner needs new uniformity adjustment, this standard must be used. Available size:

- 200 x 250 mm
- 200 x 400 mm
- 230 x 250 mm
- 230 x 400 mm

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Features

- linear range 1 : 1 Mio
- comparing sample/standard
- very high accuracy standards
- long life of standards, C-14
- low energy radiation of standard
- uniformity better +/- 1%

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Ordering information

08000193 C-14-polymer uniformity test source
  type II 2025

08000194 C-14-polymer uniformity test source
  type II 2325

08000195 C-14-polymer uniformity test source
  type II 2040

08000196 C-14-polymer uniformity test source
  type II 2340

15000011 system uniformity test software

www.raytest.com
## Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclide</td>
<td>C-14</td>
</tr>
<tr>
<td>Half-life time</td>
<td>5600 years</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td>20 x 25 cm</td>
<td></td>
</tr>
<tr>
<td>23 x 25 cm</td>
<td></td>
</tr>
<tr>
<td>20 x 40 cm</td>
<td></td>
</tr>
<tr>
<td>23 x 40 cm</td>
<td></td>
</tr>
<tr>
<td>Thickness source</td>
<td>saturation</td>
</tr>
<tr>
<td>Material</td>
<td>polymer foil</td>
</tr>
<tr>
<td>Activity</td>
<td>13 - 16 MBq</td>
</tr>
<tr>
<td>Uniformity of radioactivity distribution</td>
<td>&gt;1%</td>
</tr>
</tbody>
</table>
Index

Training and Applications

technical support,
system analysis

ANITA

TESSA
Successful applications of scientific instruments require not only an excellent quality of instrument and documentation, but a dedicated know-how about the methods and regulations. On the international level academic education often does increasingly lacks to supply detailed knowledge and training as mandatory for the particular applications.

Therefore raytest has founded ANITA: the Academy of Nuclear Instruments Training and Applications, in order to supply, improve or refresh the detailed knowledge about the methods, materials and regulations within legal requirements of quality insurance.

raytest has engaged in ANITA a group of experts, who all have accumulated extensive experience in various applications and offer that for methodical training.

The training can offer basic information about nuclear chemistry and radiopharmacy, physics and and statistics, radioactive detection and instrumentation etc.

The training deals with radiochemical as well as radionuclide purity determinations as applied in routine syntheses.

The training includes required non-radioactive and radioactive quality control methods.

The training addresses important issues such as radiation protection requirements, instrumentation and methods.

The training present an overview about legal and organizational requirements for the operation of a nuclide laboratory.

The training is performed by lecturing as well as „hands-on“ training on instruments. The successful participation is formally confirmed by a raytest certificate.

99200001 application training on basics of Radiation Physics, Statistics, Detectors & Technologies, Synthesis, Labelling, Chemical & Nuclide Purity, Osmolarity, Pyrogenity, Weight, pH etc., Batch Documentation, Radiation Protection Course of 5 days x 8 hours Documents of presentations incl. hotel & meals

www.raytest.com
Radio-TLC
The thin-layer-chromatography has the advantage of relative simple methods, easy to perform and relatively low instrumentation cost. The separation performance is often quite limited, but still suitable for many applications.

Radio-GC
In case the sample mixture is highly volatile, GC is still the method of choice. Special gas flow detectors are required.

gamma-Spectrometry
is required for the determination of the nuclide purity of the injectable solution. Many users are thinking, that a quite expensive HP-Ge-gamma-spectrometer is required. raytest demonstrates, that a 1024 channel analyzer with a 3x3" NaI(Tl) pin hole crystal is more sensitive, has sufficient resolution and is much lower in price. All requirements of the latest EU-Pharmacopoeia are fulfilled.

Batch Documentation
All data of the required quality control have to be recorded and stored for a long time. That can be performed conventionally by hand in laboratory diaries or other forms. Computers can read by LAN all relevant data and store them for many years under defined identification codes.

Radiation Protection
With production of radiopharmaceuticals potentially many exposures to radioactive radiation are feasible. Therefore radiation protection facilities, installations, monitoring and documentation is legally required. Radiation protection is not directly productive but indispensable for personal, patients, test-animals and environment.

Radioactivity Contamination on hands, feet, cloths; tables, walls, floors, air and water as well as all Radioactive Radiation Exposures have to be permanently monitored and recorded and every violations of the legally required limits of operation have to be reported and explained. In case the continued operation of the radioactivity production, synthesis, dispensing and quality control is not operating within the limits of the operation permission, the operator will face fines and/or timely or permanent withdrawal of operation permission. In that sense, radiation protection is an productive investment and indispensable condition for every radiopharmacy production.

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www.raytest.com

ANITA, raytest headquarter, Germany
Scientific instruments require technical training, product training, regular maintenance, competent repair, and equipment for exchange.

**General description**

Scientific instruments are sometimes more complicated than conventional instruments.

Nuclear instruments are not as often used in academic education, training, and courses.

Bio-imaging instruments become more and more well known, but the technical development is progressing so rapidly that potential users are in need of training.

Therefore, the regulatory authorities require a certain level of know-how and experience in selecting, using, and working with scientific instruments to protect people, animals, and the environment.

**Technical training**

Raytest's technical service and support team is trained to provide technical support in house as well as on site. The training language is usually German or English.

All Raytest partners in various countries supply technical support on site often in the local language of the country.

**Features**

- IQ installation qualification
- OQ operation qualification
- Training of additional personnel
- Training at change of personnel

**Ordering information**

- **99100001** working hour in factory
- **99100002** working hour on site
- **99100003** travelling hour
- **99100004** travelling km by company car
- **01240070** training for 1 day
- **01240073** IQ installation qualification, 1st unit
- **01240132** IQ installation qualification, nth unit
- **01240075** OQ operation qualification, 1st unit
- **01240018** OQ operation qualification, nth unit
- **01240112** IQ installation qualification, docu
- **01240114** OQ operation qualification, docu

**Cost**

The technical support is invoiced per working hour in factory, on site or travelling time.

- For travelling in Germany/Europe by business car, the mileage from the next Raytest support centre is charged.
- For travelling by train the train ticket is invoiced.
- For travelling by plane the flight ticket is invoiced.

www.raytest.com
**Warranty**

The warranty period is 12 months after delivery, ex factory.

Warranty extensions for additional 12 months can be acquired and purchased.

All-inclusive contracts can be quoted on request.

**Support Time**

Usually raytest products are supported for at least 10 years. The quality of raytest products is so good, that quite often the service life is much longer than 10 years.

In general there is no limitation at raytest for the support on any raytest instrument or program.

Since the foundation of the company, there has never been any raytest instrument that could not or has not been repaired.

**Spare Parts**

raytest will keep original spare parts in stock for at least 10 years after installation. Spare parts can be purchased as quoted. Delivery time is ex stock, from subcontractors or as fast as possible.

**Documentation**

raytest keeps records of every instrument ever delivered. Even after many years, the original technical specification and conditions of any raytest product can be traced back to the time of production and final testing.

Based on the detailed documentation a reproduction or replacement can be purchased any time.

**Technical data**

For all raytest instruments, raytest offers a first aid and professional technical training.

raytest employs technical specialists, who are ready to train a user in our factory or even on site. The training is charged by time and travelling cost.

**Up grades**

raytest's specialist can be called in for repeated or upgrading training on every application.

**Warranty**

The warranty period is 12 months after delivery, ex factory.

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