Ionplus AG
Lerzenstrasse 12
8953 Dietikon
Switzerland

T +41 43 322 31 60
info@ionplus.ch
www.ionplus.ch

Ionplus

Scientific Instruments
for Radiocarbon Dating and
Accelerator Mass Spectrometry

Dedicated to excellence.

Ionplus

Scientific Instruments for Radiocarbon Dating and Accelerator Mass Spectrometry

Based on more than 30 years of research and experience, Ionplus develops and builds innovative instruments for radiocarbon sample preparation and Accelerator Mass Spectrometry (AMS). Our instruments are highly automated and provide excellent reproducibility and stability that allows our customers to deliver outstanding results in their ^{14}C and AMS applications. Versatility and a user-friendly design are achieved through excellent engineering.

Ionplus stands for high-quality scientific instruments made in Switzerland as well as excellent customer service. We are dedicated to providing our customers all over the world with the best solutions for ^{14}C analysis and cutting-edge AMS technology for a wide range of applications. Ionplus offers virtually the entire range of dedicated AMS laboratory and measurement equipment from one source: AMS instruments, fully automated graphitization systems, gas interface systems, automated carbonate handling systems, pneumatic sample presses, vacuum lines for sealing tubes and a range of accessories for all products.

As of 2021, Ionplus introduces the latest innovation in AMS: our new low-energy AMS system LEA. It runs at just 50 kV accelerator voltage and is the most compact AMS in the world with dimensions of just 2.6 m x 1.8 m (footprint: 4.7 m^2).

APPLICATIONS

THE BEST SOLUTIONS FOR ALL AMS APPLICATIONS.

Find the best solutions for your specific needs in ^{14}C and AMS analysis.

We are there for you – from consulting on application requirements and product combinations to trainings and support in your daily work.

ARCHAEOLOGY High precision

Archeological samples together with samples from paleoclimatology and radiocarbon calibration projects require highest precision, reproducibility and reliability.

BIOMEDICINE High throughput, carbon quantification

Ionplus combines the excellent sensitivity of AMS with the ultrafast and automated ^{14}C analysis required for high-throughput microtracing studies.

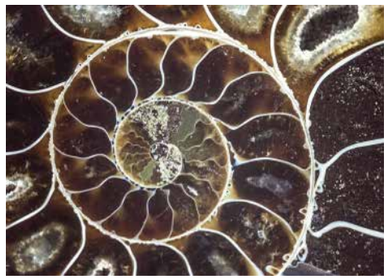
ENVIRONMENTAL SCIENCE Small sample sizes

From carbon cycle studies to biogeochemistry, Ionplus offers the right equipment to deal with challenging sample sizes and sample matrices from a wide variety of research areas.

FORENSICS High precision, simultaneous $\delta^{13}C$ measurements

Forensic applications span a wide variety of sample backgrounds and typically rely on the radiocarbon "bomb peak", which can deliver valuable information, in particular when combined with stable isotope information.

MARINE RESEARCH Handling of carbonates and DIC



From sediments to water samples, from the analysis of single foraminifera to dissolved inorganic carbon, Ionplus offers equipment for fully automated sample treatment, acidification and sampling.

GEOLOGY ^{14}C, ^{10}Be and ^{26}Al measurements

Burial and in-situ exposure dating, glacial erosion studies or the determination of denudation rates are just a few of the many applications accessible with the MILEA/MILEA light system through the measurement of ^{10}Be, ^{14}C and ^{26}Al.

MATERIALS SCIENCE Simultaneous $\delta^{13}C$ measurements

As certification of biofuels and plant-derived materials becomes more important, we offer a fast, reproducible all-in-one solution for simultaneous ^{14}C and $\delta^{13}C$ analysis.

ANTHROPOGENIC NUCLIDES Tracing and monitoring

Tracing and monitoring of anthropogenic I, U and Pu nuclides is a steadily growing field. MILEA offers the highest performance for these applications at lowest energies.

For recommended product combinations for most diverse AMS applications please contact us or visit www.ionplus.ch

PRODUCTS

All Ionplus products can be either used as stand-alone instruments or in combination with each other to streamline processes in your ^{14}C or AMS laboratory. The combination of Ionplus instruments ensures the best control over variability and allows you to obtain precise and reproducible outcomes. Take full advantage of our integrated Lab Management Package LMP by combining Ionplus instruments: virtually all steps of the sample processing can be recorded in a database for convenient and safe logging.

MILEA
Multi-Isotope
Low-Energy AMS
10 - 12

MILEA light
Multi-Isotope
Low-Energy AMS light
13

MICADAS
Mini Carbon
Dating System
14 - 16

LEA
Low Energy AMS
18 - 19

ACS
Accelerator Control
Software
20 - 22

LMP
Lab Management
Package
23

AMC
Automated Magazine
Changer
24

INTERFACES
Versatile Gas
Measurements
25

HTI
High Throughput
Interface
26

GIS
Gas Interface
System
27

AGE 3
Automated Graphitization
Equipment
28

CHS 2
Carbonate
Handling System
29

IRMS
Isotope Ratio Mass
Spectrometer
30

PSP
Pneumatic
Sample Press
31

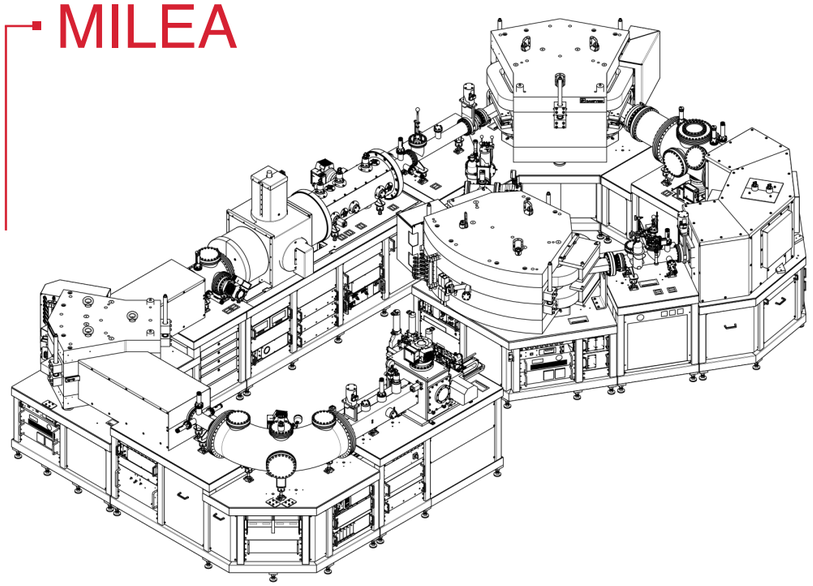
FED
Ferrum Dispenser
32

TSE
Tube Sealing
Equipment
33

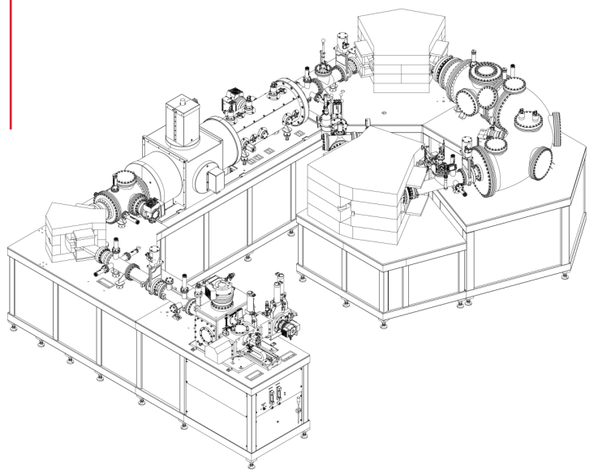
AMS Overview

Comparison of Ionplus AMS Instruments

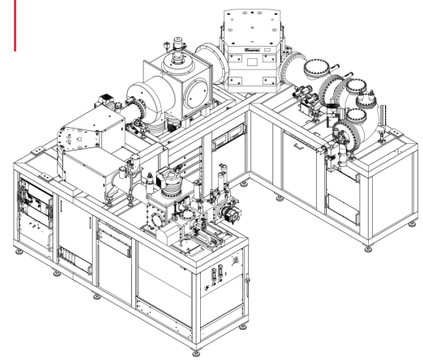
MILEA



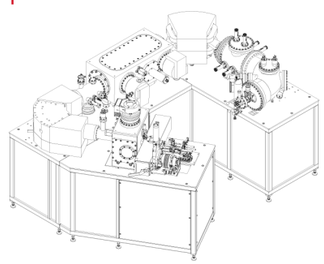
MILEA light



MICADAS



LEA

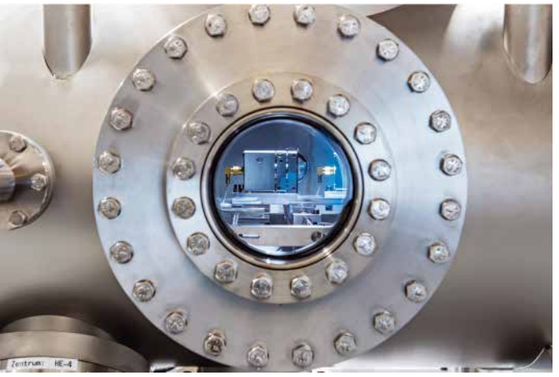


WIRE DRAWING	MILEA	MILEA light	MICADAS	LEA
NOMINAL VOLTAGE	300 kV	300 kV	200 kV	50 kV
ISOTOPES	^{10}Be, ^{14}C, ^{26}Al, ^{41}Ca, ^{129}I U, Pu and other actinides	^{10}Be, ^{14}C, ^{26}Al, ^{41}Ca available as an option	^{14}C	^{14}C
INTENDED USE	Applications of virtually all AMS isotopes with a focus on ^{129}I and actinides	Applications in geology and earth system science	All ^{14}C applications, including ultra-high precision (1 ‰)	All ^{14}C applications above 2 ‰ precision and dedicated gas (biomedical, source apportionment, etc.)
PRECISION ON ^{14}C/^{12}C	2 ‰	2 ‰	2 ‰ (1 ‰ possible)	2 ‰
BLANK ON ^{14}C/^{12}C	<2E-15	<2E-15	<2E-15	ca. 2E-15
DIMENSIONS	3.5 m x 7 m (24.5 m^2)	3.0 m x 4.8 m (14.4 m^2)	3.2 m x 2.6 m (8.3 m^2)	2.6 m x 1.8 m (4.7 m^2)
NOMINAL WEIGHT	15 000 kg	12 000 kg	4 500 kg	3 000 kg
TYPICAL POWER CONSUMPTION	Max. 60 kW (Isotope-dependent)	Max. 60 kW (Isotope-dependent)	<2.5 kW	<2.5 kW
COOLING	Water cooling, 50 kW	Water cooling, 50 kW	Air	Air

MILEA

Multi-Isotope Low-Energy AMS

The world's most innovative multi-isotope AMS system



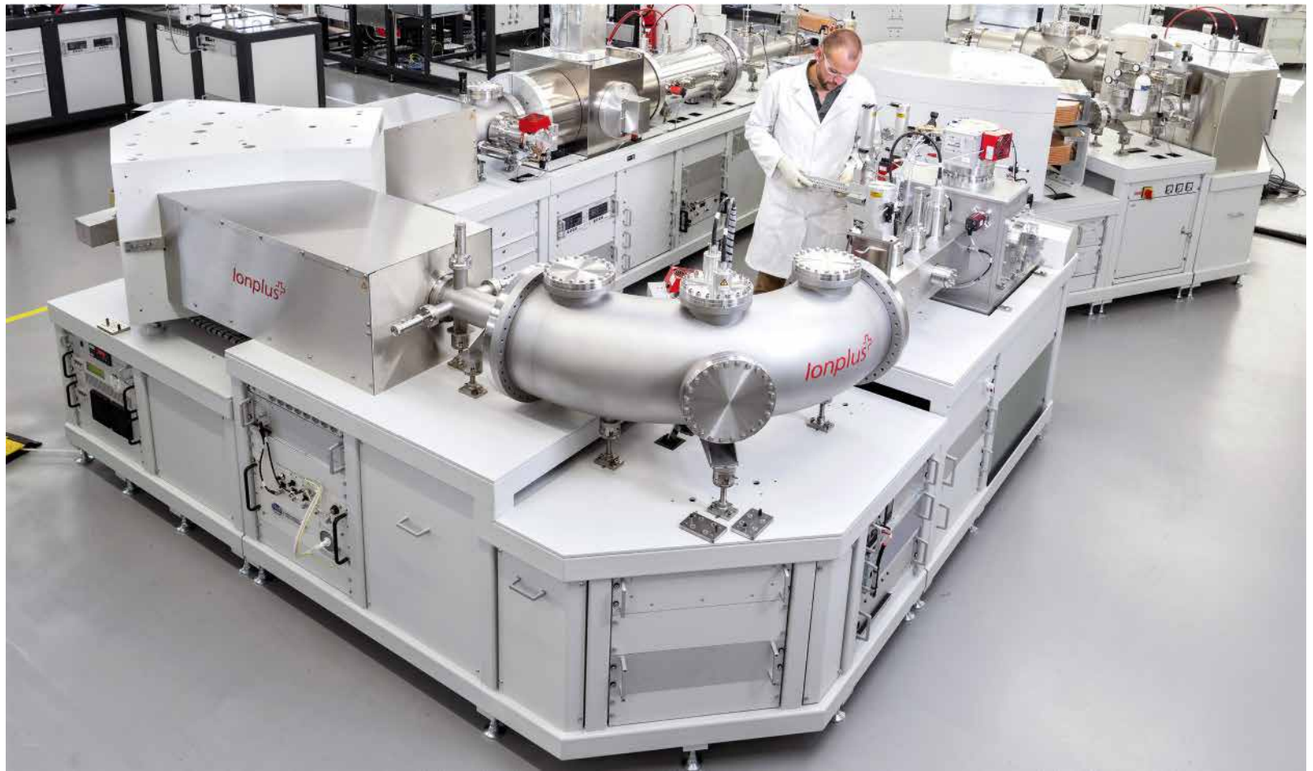
In a collaboration, Ionplus and ETH Zurich have developed a next generation multi-isotope AMS system at low energies: MILEA. Covering ^{10}Be, ^{14}C, ^{26}Al, ^{41}Ca, ^{129}I, U, Pu and other actinides, the new instrument combines the established accelerator and ion source technology of MICADAS with the well-proven concept of the high-energy spectrometer layout of the ETH "TANDY" instrument.

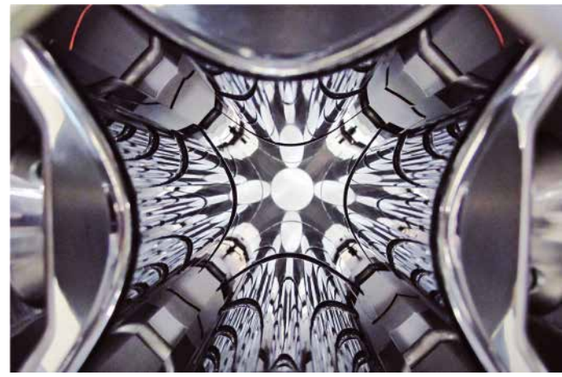
With a footprint of just 3.5 m x 7 m, the space requirements of this new AMS instrument are very low. The accelerator is based on the vacuum insulated MICADAS design, which has been upgraded to support up to 300 kV. The low energy spectrometer of the new instrument comprises an achromatic combination of a 90° electrostatic and magnetic deflector. The layout of the high energy side is inspired by the "TANDY" spectrometer (90° magnetic, 120° electrostatic and 110° magnetic deflector). A quadrupole triplet after the accelerator unit provides similar ion optical conditions for all measured isotopes and facilitates tuning. A new, improved low-noise ΔE-E_{res} gas ionization chamber at the back end of the new multi-isotope AMS system provides outstanding separation and identification of interfering particles.

The MILEA prototype instrument built and tested in 2017 has shown excellent performance in all tested applications, similar to or exceeding the performance of its higher energy predecessor at ETH. In combination with the new Accelerator Control Software ACS, MILEA is currently not only the most compact but also the most user-friendly multi-isotope AMS system in the world.
Contact us to learn more about the exciting possibilities with MILEA.

KEY FEATURES

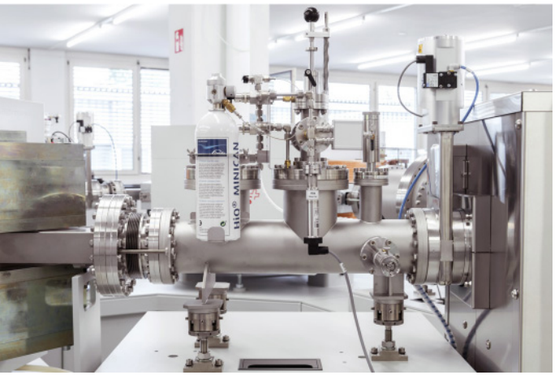
- Isotopes: ^{10}Be, ^{14}C, ^{26}Al, ^{41}Ca, ^{129}I U, Pu and other actinides
- Fast switching between different isotopes
- Optimized ion optics for all isotopes
- Ion source can be equipped with a gas interface for radiocarbon samples
- Fully automated gas measurements with GIS
- Fast magazine changes for continuous measurements without breaking the vacuum or cooling down any part of the ion source
- Low space requirements for a multi-isotope facility through very compact design
- Vacuum insulated accelerator terminal without any moving parts, no SF_6 needed
- Minimal maintenance

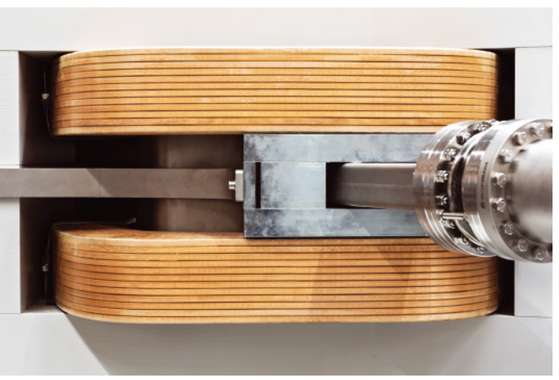


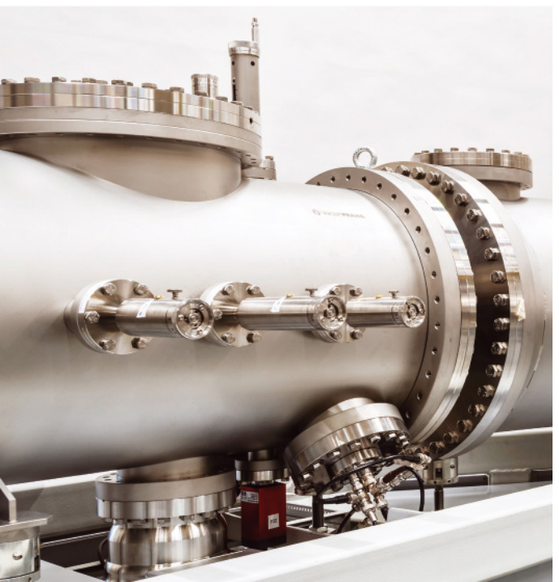


MILEA

Multi-Isotope Low-Energy AMS



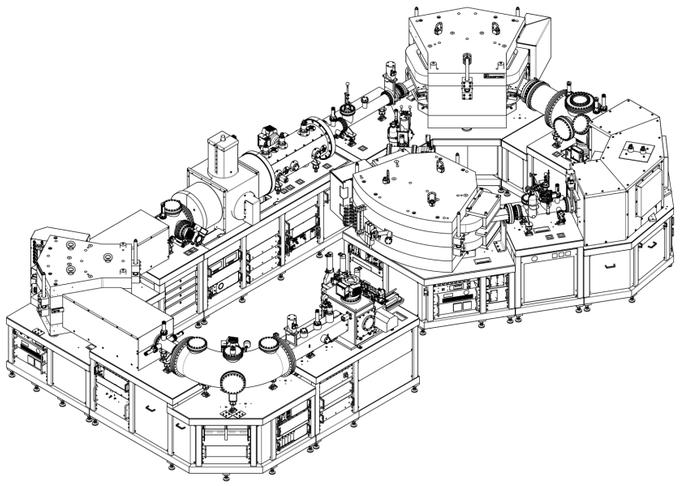




SPECIFICATIONS

- Isotopes: ^{10}Be, ^{14}C, ^{26}Al, ^{41}Ca, ^{129}I, U, Pu and other actinides
- Hybrid cesium negative sputter ion source for solid samples and CO_2 gas
- Random access sample changer with 40 positions
- 300 kV accelerator on a vacuum insulated high voltage platform with a low maintenance solid-state power supply
- Helium stripping
- High mass selectivity, abundance sensitivity of $<5{\cdot}10^{-13}$ for U
- 7 Faraday cups and integrators on the HE side covering the entire range of measured currents (1pA – 300µA)
- High resolution ΔE-E_{res} gas ionization chamber with absorber cell and two parameter data acquisition
- Height of beam line: 1.15 m for simple maintenance
- Dimensions and weight: 3.5 m × 7 m x 2 m, 15’000 kg
- No SF_6 insulation gas needed

Scan the QR code or visit www.ionplus.ch and take a 360° virtual product tour.



MILEA light

Multi-Isotope Low-Energy AMS light

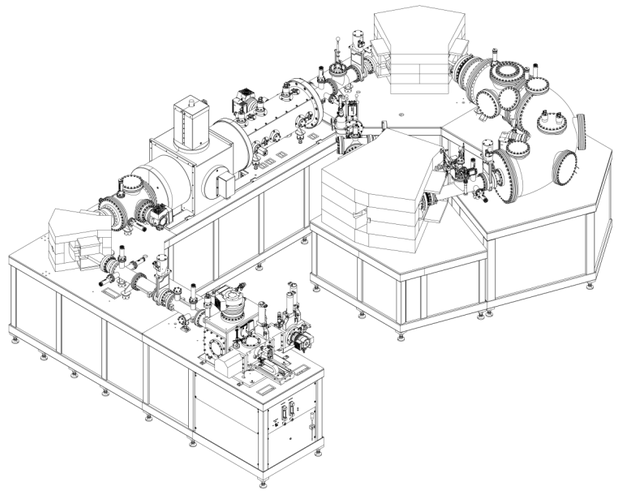
MILEA light is designed for highest performance measurements of ^{10}Be, ^{14}C and ^{26}Al. It is the simpler, smaller and more affordable alternative to MILEA and the perfect instrument for your demanding applications in geology and all radiocarbon research. The compact light version is largely based on the MILEA principles without an ESA on the low-energy side and an optimized high-energy setup with a 90° magnetic, 110° electrostatic and another 110° magnetic deflector.

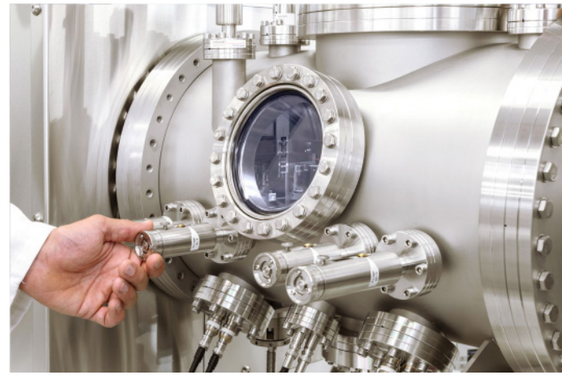
Contact us for more information on our new MILEA light system.

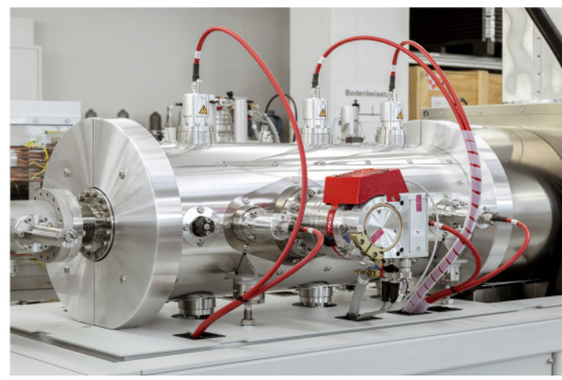
SPECIFICATIONS

Same as MILEA with the following differences:

- Isotopes: ^{10}Be, ^{14}C, ^{26}Al, (^{41}Ca, optional)
- Abundance sensitivity on U: not applicable
- 5 Faraday cups and integrators on the HE side covering the entire range of measured currents (1pA – 300µA)
- Dimensions and weight: 3.0 m x 4.8 m x 2 m, 12’000 kg







KEY FEATURES

- Based on the established MILEA concepts
- Very compact design for a ^{10}Be, ^{14}C, ^{26}Al instrument
- Optimized ion optics for all isotopes
- Ion source can be equipped with a gas interface for radiocarbon samples

MICADAS

Mini Carbon Dating System

The most compact high-performance ^{14}C-AMS system in the world

Highest performance with the world's smallest AMS system: The Mini Carbon Dating System MICADAS is a true precision instrument for your ^{14}C applications.
With its permanent magnet and new design, MICADAS is also the most energy efficient AMS in the world and has the lowest infrastructure requirements.

The first prototype of MICADAS was developed and built by the Laboratory of Ion Beam Physics at ETH Zurich in 2004. Since then, more than 20 instruments have been built and delivered to customers worldwide. MICADAS has demonstrated highest performance and reliability and has become the new standard in ^{14}C-AMS.

With its dimensions of only 3.2 m x 2.6 m x 2 m, MICADAS is the most compact commercially available ^{14}C-AMS system in the world. Its helium stripping offers a very high transmission of up to 47 % and outstanding measurement stability, thus significantly reducing the need for retuning.

The MICADAS hybrid cesium sputter ion source is equipped with a random-access sample changer that holds up to 40 graphite or gas cathodes. Stable ion beam currents of 50 to 150 µA and 10 to 20 µA C^- are readily achieved in routine operation with solid and gas samples, respectively.

The acceleration potential of 200 kV is provided by a solid-state power supply without any moving parts, the terminal is vacuum insulated – no SF_6 or other insulation gases are required. A state of the art gas ionization detector with low noise and virtually no degradation provides the most reliable detection of ^{14}C ions. With this configuration, blanks older than 50'000 radiocarbon years are readily obtained.

In conjunction with the Gas Interface System GIS, MICADAS performs fully automated gas measurements with an auto sampler, an Elemental Analyzer or CO_2 filled glass or quartz tubes. MICADAS is therefore also the most powerful choice for your small samples and high throughput applications.

KEY FEATURES

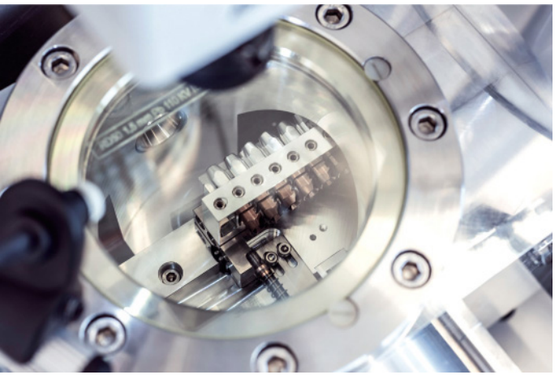
- Simple and fast tuning
- High measurement stability over long time
- Fully automated gas measurements with GIS
- Fast magazine changes for continuous measurements without breaking the vacuum or cooling down any part of the ion source
- Low space requirements through very compact design
- Extremely low power consumption of 2.5 kW
- Fully air-cooled system, no cooling water needed
- Hybrid cesium negative sputter ion source for solid and gas cathodes
- Vacuum insulated accelerator terminal without any moving parts, no SF_6 needed
- Minimal maintenance

MICADAS

Mini Carbon Dating System

VISION

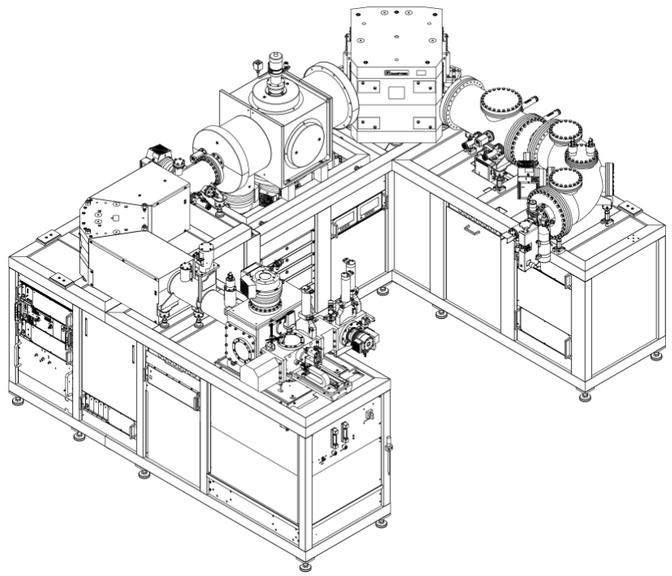
For the future of AMS



SPECIFICATIONS

- Helium stripping (up to 47 % ^{14}C-transmission)
- Negative ion currents of 50 to 150 µA on full-sized graphite samples and 10 to 20 µA on gas samples (10 µg carbon or more)
- 200 kV accelerator on a vacuum insulated high voltage platform with a low maintenance solid-state power supply
- Dating of samples back to more than 50’000 radiocarbon years
- Machine blank up to 68’000 radiocarbon years
- Random access sample changer with 40 positions
- Dimensions and weight: 3.2 m x 2.6 m x 2.2 m, 4’500 kg
- 2.5 kW average power consumption
- No cooling water or SF_6 needed

Scan the QR code or visit www.ionplus.ch and take a 360° virtual product tour.

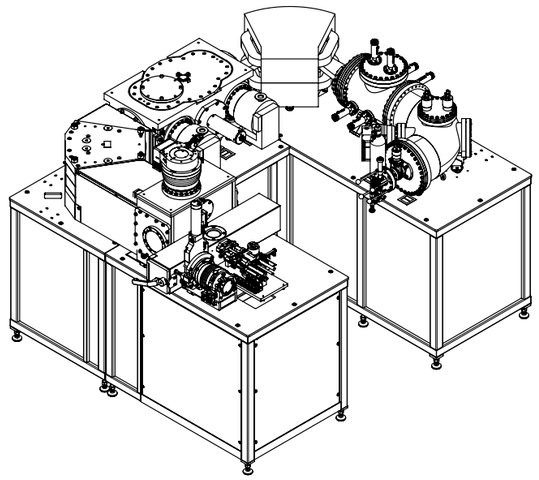


Ionplus is dedicated to manufacturing instruments of excellent quality and best performance to enable the exciting science of our customers. Our ambitious goal is to expand the field of AMS by making our technology accessible to all users through user friendly instruments and a high degree of automation and standardization.

One of the key aspects for us to achieve this goal is to offer complete packages and turnkey solutions to our customers. An AMS lab can only work if all aspects from sample preparation to measurement, data handling and data evaluation are taken care of. In addition to the complete package of hardware and software, Ionplus is offering extensive training sessions and comprehensive factory and site acceptance testing included in the package.

To lower the hurdle for an AMS acquisition even further, we design our systems in the most compact way with great attention given to the lowest possible site requirements and long maintenance intervals, comparable to other traditional mass spectrometers. To round off the Ionplus package, our ACS software allows users to work with all our AMS systems in a state-of-the-art manner.

With our brand new low-energy ^{14}C system LEA, we introduce the next generation AMS system. LEA is the evolution of the well-established concepts of MICADAS. This new system is designed to become the successor of MICADAS and our new back bone for dedicated ^{14}C AMS systems. In order to even better address the needs of our commercially oriented users, we push this technology further still and are currently testing an even more compact setup with a footprint of just 1.8 x 2 m.



LEA

Low Energy AMS

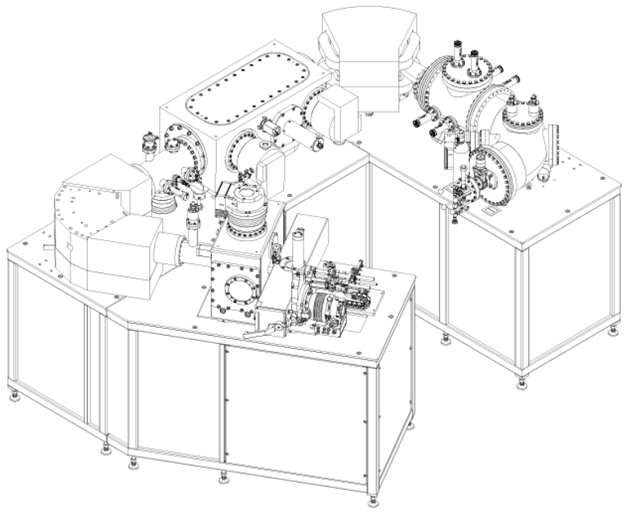
The world's newest, most compact AMS instrument

KEY FEATURES

- Lowest space requirements through very compact design
- Simple and fast tuning
- Controlled by new ACS software for ease of use
- Fully automated gas measurement with GIS
- Fast magazine changes for continuous measurement without breaking the vacuum or cooling down any part of the ion source
- Extremely low power consumption of less than 2.5 kW
- Fully air-cooled system, no cooling water needed
- Hybrid cesium negative sputter ion source for solid and gas cathodes
- Vacuum insulated accelerator terminal without any moving parts, no SF_6 needed
- Minimal maintenance

Based on the concepts of the well-established MICADAS, Ionplus has developed a new AMS system around the patented helium stripping technology with an accelerator voltage of just 50 kV – LEA. LEA's lower accelerator voltage led to a significant reduction in footprint without compromising its performance. With its dimensions of just 2.6 m x 1.8 m and a height of 1.5 m, LEA is less than half the size of MICADAS. And by that the new, most compact ^{14}C-AMS system in the world.

By using much of the same concepts and components found in MICADAS, the new LEA system also offers the same features like: a hybrid Cs sputter ion source for measuring gas and solid samples, random access samples changer with air lock, allowing continuous measurement and the maintenance-free, vacuum insulated tandem accelerator. The helium stripping at low voltages offers an even higher transmission of over 50 % and unparalleled measurement stability.

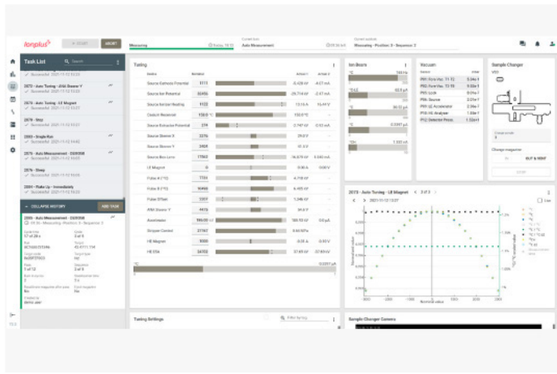


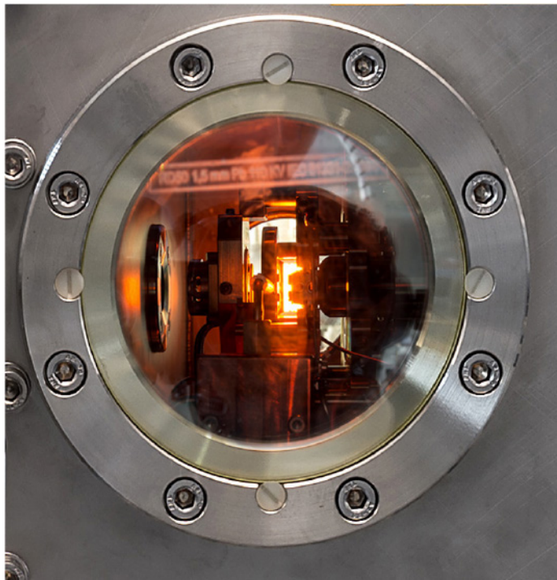
Just like its predecessor MICADAS, LEA is compatible with all other Ionplus products, such as the Gas Interface System GIS to perform fully automated gas measurements or the Lab Management Package for data collection, reduction and evaluation.

Ionplus' new Accelerator Control Software (ACS) allows you to take full advantage of the ease of use of LEA: From fast autotuning and task engine based work flows to new maintenance and diagnostics features – running an AMS instrument has never been easier.

SPECIFICATIONS

- Helium stripping, more than 50 % ^{14}C-transmission
- Negative ion currents of 50 to 150 uA on full-sized graphite samples and 10 to 20 uA on gas samples (10 ug carbon or more)
- 50 kV accelerator on a vacuum insulated high voltage platform with a low-maintenance solid-state power supply
- Precision with a modern reference material: 0.2 % or better for $^{14}C/^{12}C$ and $^{13}C/^{12}C$ ratios
- Dating of samples back to more than 50'000 radiocarbon years
- Random access samples changer with 40 positions
- Dimensions and weight: 2.6 m x 1.8 m x 1.5 m, 3'000 kg
- 2.5 kW average power consumption
- No cooling water or SF_6 needed





ACS

Accelerator Control Software

ACS USER INTERFACE

TUNING CARD

Access all devices relevant to the ion beam. Tune manually or select auto-tuning for the fastest tuning of a device. Save tuning sets and load settings from previous measurements.

CHAT & LOG, NOTIFICATIONS

Get an overview of current and past events. Comment on tasks and notify other users.

USER MANAGEMENT

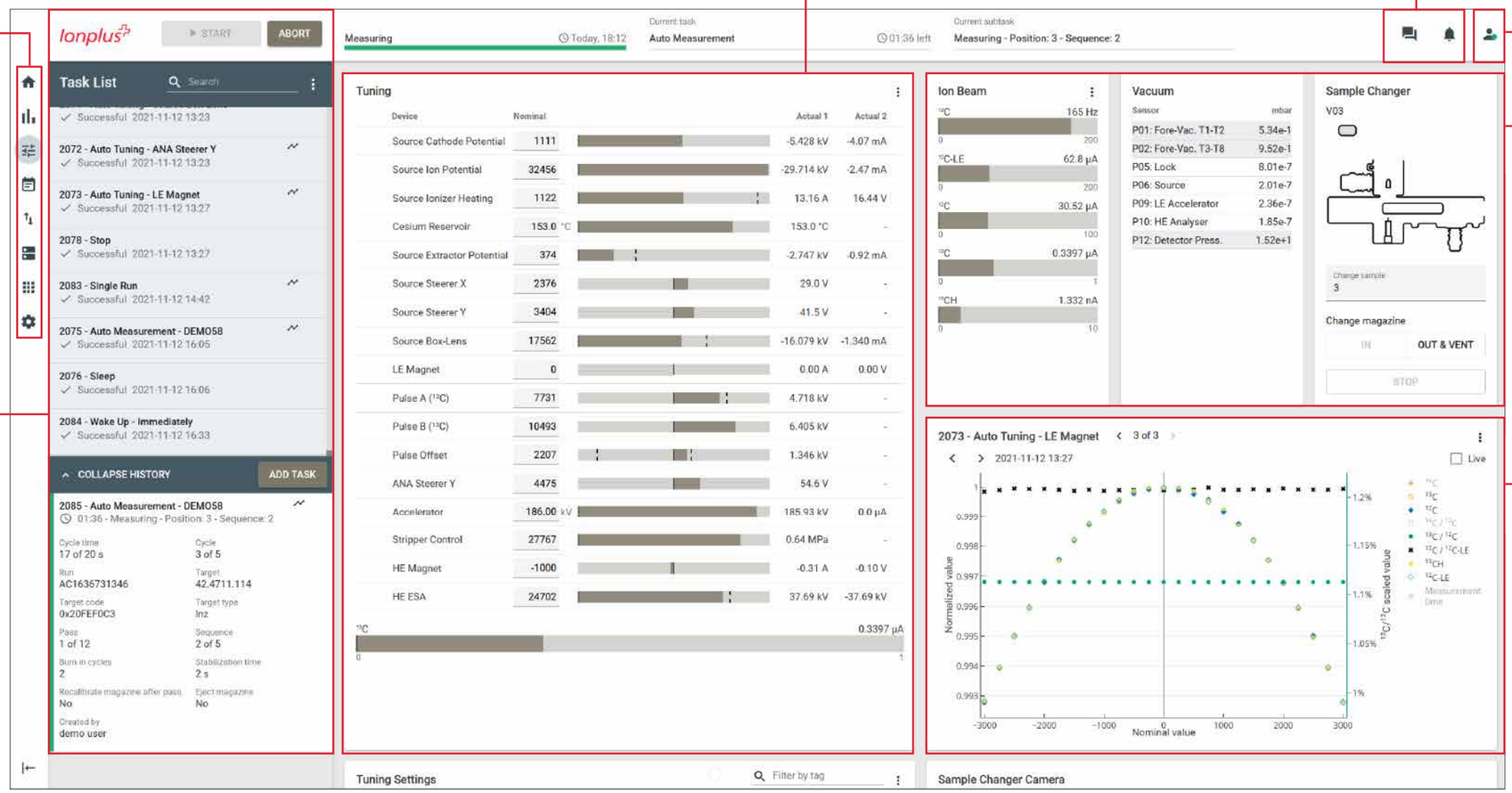
Each user has their own account and only one user at a time is 'in control'.

SELECT YOUR VIEW

Each view contains a number of cards with specific information and controls to help you run your tuning, visualize data, do maintenance or change settings.

TASK LIST

Schedule tasks such as wake up, tuning, measurement and sleep. Let a wizard task guide you through maintenance. A task planner allows you to save your favorite auto-tuning and measurement routines.



STATUS CARDS

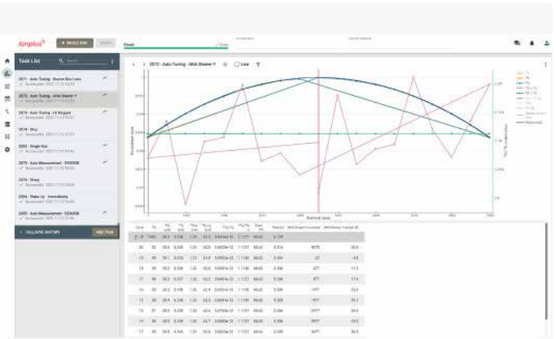
See the most important instrument information such as currents, pressures and device states at a glance.

PLOT CARD

Visualize data and look at tunings. There is also a corresponding view that allows you to look at graphs and tables of all runs.

ACS

Accelerator Control Software



Ionplus' Accelerator Control Software ACS is revolutionizing the operation of AMS systems.

Start any of the Ionplus AMS systems with a scheduled wake-up task, let the instrument tune itself and run batches of samples in the most automated way. Workflows are easily saved to provide the user with the easiest, most reproducible AMS experience. Maintenance work is made easy through maintenance tasks, requiring minimum user interaction to shut down, vent or restart the system while guiding the user through the steps.

ACS runs on the control computers of all our AMS systems and is accessed through a web GUI from any client with a common web browser. The sophisticated user management ensures secure and simple instrument control while logging all user actions and events.

ACS ELEMENTS

- With the new ACS task engine, all Ionplus AMS systems are easily operated through predefined workflows. Running an AMS instrument has never been easier.
- All system parameters are continuously recorded to monitor the system status. Every change to the system and every user interaction is logged to allow the best data quality and security.
- ACS and the Lab Management Package LMP access the same database so that sample information and measurement data are easily traced throughout the entire sample processing chain and measurement.
- Maintenance tasks automate the shut-down and start-up steps and guide the user through the manual steps of the most common maintenance processes.

KEY FEATURES

- Easiest operation of any AMS system
- Highest degree of automation for tuning and measurement
- Intuitive user concept
- Web GUI – Client access through web browser from any device
- Secure logging of users and events
- Logging and monitoring of all readbacks over time
- User chat, built-in lab journal

LMP

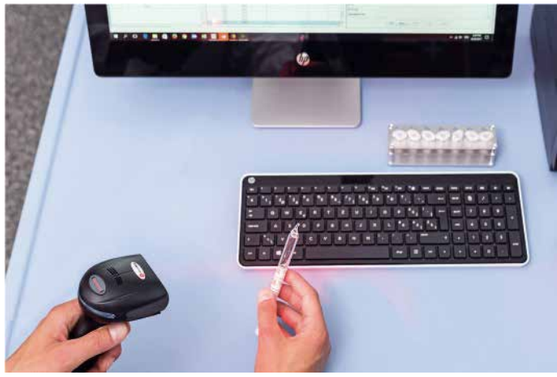
Lab Management Package

Ionplus offers a comprehensive package of hardware and software for the efficient handling of samples, sample preparation information, instrument control, measurements and ^{14}C data reduction. Our Lab Management Package LMP enhances throughput, reliability and quality management of your ^{14}C-AMS laboratory.
Detailed information on every sample is recorded with the user's sample information and measurement data. All this data is safely stored in a database, allowing fast access without the risks associated with file storage.

While the LMP is most useful in conjunction with our AMS instruments, the sample management part of it can be operated with AGE 3 instruments or as standalone system e.g. for the management of customer data, sample information and preparation details or for data reduction. Contact us for a system tailored to your specific needs.

LMP ELEMENTS

- Database and software suite for customer and sample information, lab processing information as well as measurement data
- Label printer and bar-code reader for fast and efficient labeling of samples and logging of sample preparation steps
- LMP and the Accelerator Control Software ACS access the same database so that sample information and measurement data are easily traced throughout the entire sample processing chain and measurement.
- LMP works best with the data reduction tool BATS. BATS is a fast and reliable data reduction tool that allows the user to check and visualize the measurement data in real time and performs calibration of radiocarbon dates.



KEY FEATURES

- Ensures data integrity
- Central data storage and backup
- Lab-wide data sharing e.g. between sample preparation on AGE 3 and ^{14}C measurement on MICADAS
- Convenient user interface for standardized data input

AMC

Automated Magazine Changer

The Automated Magazine Changer AMC was developed to increase sample throughput while further reducing user interaction and idle time for all our AMS systems.
In combination with the standard Ionplus sample changers, AMC enables continuous measurements on all our AMS systems for the first time.

The AMC setup consists of a collaborative robot and a magazine storage platform which allows the fully automated feeding of our AMS systems with up to 10 magazines (40 sample positions each). Single magazines can be placed individually in the storage or the user may swap the entire platform. All measurement and batch related information is stored in the LMP system and available in the ACS software for task planning.

KEY FEATURES

- Fully automated magazine handling of virtually unlimited numbers of samples
- Enables an endless and continuous measurement
- Hot swap of magazines
- Individually programmable safety zone respecting the given environment
- Designed and certified for collaborative and safe operation
- Manual operation possible at any time
- Available as an upgrade to existing Ionplus AMS systems
- Can easy be removed for maintenance work
- Stack of 9 magazines per pallet
- Magazines can be changed individually or complete pallets
- Low maintenance

INTERFACES

Versatile Gas Measurements

GIS and its peripherals (Elemental Analyzer EA, CHS 2, IRMS) make the Ionplus AMS systems the most versatile ^{14}C instruments on the market. A few examples of the coupling and measurement possibilities:

- **Measurement of virtually any volatile organic gas sample in glass ampoules**

  GIS' built-in ampoule cracker not only allows the direct measurement of CO_2 but also enables the measurement of freons, CO and a range of other compounds from sealed glass ampoules with GIS + our AMS systems.

- **Dating of small carbonate samples**

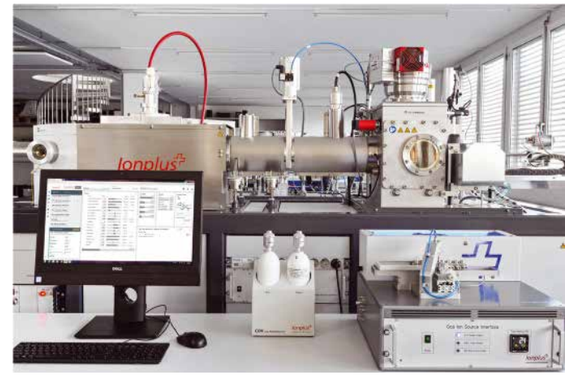
  Combine CHS 2 + GIS + any Ionplus AMS instrument for fully automated sample preparation (leaching, flushing, acidification) and measurement of small carbonate samples.

- **Ultrafast screening of solid/liquid samples (biomedical/materials samples)**

  For the fastest ^{14}C analysis in just 8 minutes per sample, run EA + GIS + an Ionplus AMS instrument in combination. Use the same coupling for more precise measurements by simply increasing the measurement time. To gain precise $\delta^{13}C$ or $\delta^{15}N$ information at the same time, add an IRMS instrument for online sample analysis (EA + IRMS + GIS + any Ionplus AMS system). Use the new HTI (with EA) for the fastest analysis time of discrete samples in under 5 minutes per sample.

- **Coupling to third-party CO_2-producing instruments**

  GIS + any Ionplus AMS system are compatible with any CO_2-producing instrument with just a few adaptations. Ask us about the coupling possibilities for your CO_2-producing device with GIS + any Ionplus AMS system.



HTI

High Throughput Interface

The newly developed HTI is similar to the Gas Interface System (GIS) but sets itself apart with a few distinct features: We have minimized cross-talk between samples, increased sample throughput and streamlined the operation through software. As a result, HTI is the best gas interface for applications such as screening, materials testing (biogenig vs. fossil) and biomedical applications with the need for throughput, traceability and reliability.
The current implementation allows for a streamlined coupling of an Elemental Analyzer (EA) to the HTI, automated tuning on gas and simple operation through Ionplus' ACS software.
Contact us to find the best solution for your application.

SPECIFICATIONS

- CO_2 sample sizes of 20 µg C – 2000 µg C
- Highly standardized and automated coupling with an Elemental Analyzer EA
- Fastest analysis: less than 5 minutes per sample
- Cross-talk: ca. 0.2% @ 100 µg C
- 4 auxiliary gas inlets for reference gases

KEY FEATURES

- Direct measurements of CO_2 conjunction with all Ionplus AMS systems
- For highly standardized applications (biomedical, biogenic carbon measurements)
- Highest throughput of ca. 300 samples per day
- Highest automation in conjunction with our new AMC system
- No moving parts, maintenance-free operation

GIS

Gas Interface System

The Ionplus Gas Interface System GIS is the most versatile gas handling system for ^{14}C-AMS measurements of CO_2. Direct measurements of CO_2 are performed on ultra-small samples of 3 to 100 µg carbon with the GIS + Ionplus AMS coupling. Gas measurements are the ideal solution not only for small samples but also for all lower precision samples in screening and high throughput studies. Sample CO_2 is mixed with helium and the mixture is continuously fed into the ion source of any Ionplus AMS instrument. All functionalities of the instrument are software-controlled and fully automated for gas measurements without user interaction for 8 to 40 samples. Moreover, the coupling of virtually any CO_2-producing device is possible through the integrated zeolite trap.

SPECIFICATIONS

- Handles CO_2 sample sizes between 3 and 100 µg carbon
- Versatile couplings with an Elemental Analyzer EA, a carbonate system CHS 2 and an automated tube cracker (tube dimensions: 4.0 mm O.D., length: 70–80 mm)
- Online stable isotope information is obtained through a GIS + IRMS coupling
- Fully automated measurements for up to 8 sealed tube samples and up to 40 samples with EA or CHS 2
- 60–150 samples can be handled per day
- 4 auxiliary gas inlets for reference gases

KEY FEATURES

- Direct measurements of CO_2 conjunction with all Ionplus AMS systems
- Fully automated sample handling
- Highest versatility through diverse CO_2 sources
- Highest throughput for ^{14}C measurements
- Blank and reference gases are conveniently measured from pre-mixed gas bottles

AGE 3

Automated Graphitization Equipment

The third generation of the Automated Graphitization Equipment AGE 3 is the most compact graphitization system on the market. Used in over 30 laboratories around the world, AGE 3 combines sample combustion and graphite production for AMS in a fast and efficient way. Organics are combusted with an Elemental Analyzer EA, carbonates are hydrolyzed and sampled with the fully automated Carbonate Handling System CHS 2. AGE 3 systems run completely unattended and deliver excellent repeatability due to a high degree of automation. This also shows in the AMS data, where good repeatability translates into higher precision.

SPECIFICATIONS

- Required carbon content for regular samples: 1–2 mg
- Required carbon content for small samples: > 0.2 mg
- Samples of up to 200 mg containing > 3 % carbon can be processed
- Produced graphite: 0.2–1.0 mg carbon on 3–5 mg iron
- Processing blank: < 0.002 $F^{14}C$ (> 50'000 radiocarbon years)
- Cross-talk: < 1 ‰ on 1 mg carbon

KEY FEATURES

- Sample combustion and graphitization combined in one compact system
- Fully automated – no user input required after loading samples
- User-friendly software
- No liquid nitrogen required
- Fast graphitization reaction – 120 minutes
- High throughput – 21 samples per day

CHS 2

Carbonate Handling System

CHS 2 is the second generation of our head-space sampling system for carbonates, DIC and liquid combustion samples. It is designed for efficient flushing, oxidizing/hydrolyzing and sampling from septum-sealed vials. CHS 2 combines a heater block for up to 64 samples, an adapted auto sampler, a water trap and an adjustable flow regulator. The system is fully implemented in both the AGE 3 and GIS software. As a new feature, CHS 2 comes with a completely automated tool change between acid syringes and sampling needles.
An optional water kit for DIC samples of up to 100 ml is also available. With the additional acid containers, an automated leaching, flushing and sampling is now possible without user intervention.

SPECIFICATIONS

- Dimensions: 830 x 390 x 650 mm, 35 kg
- Tray 1: 64 sample vials 4.5/12 ml
- Tray 2: 9 sample vials 100 ml
- Adjustable flow 0–300 ml/min
- Adjustable temperature: room temperature to 100 °C

KEY FEATURES

- Fully automated flushing/acid addition/sampling (including tool changes) with AGE 3/GIS
- Heater block (20–100 °C) for up to 64 Labco Exetainers® or 9 100 ml serum bottles
- Heated acid containers for phosphoric acid, leaching acid and oxidant (20/40 ml borosilicate vials)
- Integrated flow regulator with LCD readout and flow-alarm
- Integrated water trap with increased capacity for water samples

IRMS

*Isotope Ratio Mass Spectrometer**

High-precision $\delta^{13}C$ and $\delta^{15}N$** values are conveniently obtained during graphitization with an AGE 3 instrument or during gas measurements with GIS. A newly implemented Elementar precisION® IRMS instrument is coupled to our AGE 3 or GIS system in order to acquire precise and accurate stable isotope information online. Gain new insight into your samples with this convenient coupling. Applications range from archaeological or forensic samples to materials testing and tracer studies.

* The IRMS instrument is a third-party instrument, interfacing with Ionplus AGE 3 and GIS instruments.

** $\delta^{15}N$ values are obtained in conjunction with an Elemental Analyzer only.

SPECIFICATIONS

- Dimensions: 595 x 460 x 650 mm, 102 kg
- Typical mass range at 3 kV: 1–76 amu
- Typical split: 3 % for IRMS, remainder for AGE 3/GIS
- Mass resolution: > 110 m/Δm @ 10 % valley separation

KEY FEATURES

- Performs $\delta^{13}C$ and $\delta^{15}N$ measurements during graphitization or gas measurements
- Fully automated tuning
- Full functionality for other isotopes such as $\delta^{18}O$, $\delta^{33}S$ and $\delta^{34}S$ in conjunction with different combustion/pyrolysis setups

PSP

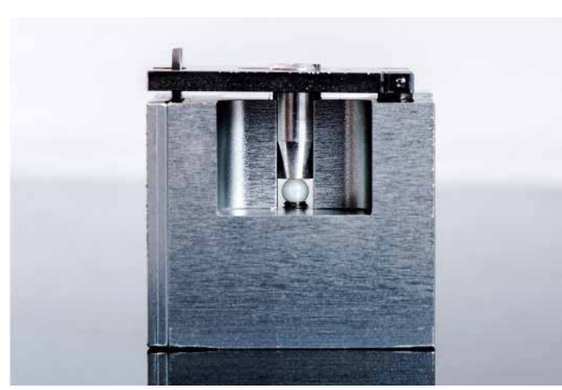
Pneumatic Sample Press

Graphite cathodes are pressed reliably, reproducibly and conveniently with the Pneumatic Sample Press PSP.
By the push of a button, an easy to clean pin presses samples into the back of cathodes. By pressing cathodes from the back, surface contamination is significantly reduced and reproducibility of sample currents is improved due to a well-defined graphite position. Cathode holders for cathodes of all AMS manufacturers are available for PSP.

PSP helps you save time in the preparation of AMS cathodes and plays a key role in making high-precision measurements possible.

SPECIFICATIONS

- Automated pressing by the push of a button
- Adjustable force of 100–800 N for any carbon/catalyst ratio
- Defined pressing time of 1.5 seconds per sample



KEY FEATURES

- Reproducible, reliable and fast pressing of graphite and other materials for AMS cathodes
- Samples are pressed from the back, resulting in low surface contamination and reproducible currents in the AMS measurement
- Cathode holders for Ionplus, NEC and High Voltage cathodes are available

FED

Ferrum Dispenser

The iron dispenser FED dispenses a well-defined and reproducible amount of metal catalyst for AGE 3 systems and other graphitization lines. The fast and easy handling of FED saves time and its reproducibility provides the basis for high-precision ^{14}C measurements. Manually operated and virtually wear-free, FED requires no additional equipment. Repeatability tests indicate that iron masses of typically 4–5 mg* are obtained readily and reliably with a variability of ± 2 %.

*The dispensed mass depends on the mesh size of the iron powder.

SPECIFICATIONS

- Dispenses 4–5 mg of iron powder with a typical variation of ±2 % for a 325 mesh size
- Dosing of iron in ca. 5 seconds per tube
- Accepts any 8 mm O.D. culture tube

KEY FEATURES

- Reproducible dosing of iron or other metallic catalysts for graphitization reactions
- Manually operated
- Maintenance-free

TSE

Tube Sealing Equipment

With its compact design, the Tube Sealing Equipment TSE serves as a simple vacuum line to crack ampoules, split samples into several ampoules or to prepare and seal samples for combustion in quartz tubes. TSE is also a convenient and versatile instrument for ^{14}C preparation laboratories without their own AMS capability. Gas ampoules prepared by TSE can be stored and shipped for later analysis with GIS and vacuum-sealed graphite cathodes can be shipped and stored indefinitely. TSE is manually operated and equipped with two 9 mm Ultra-Torr® ports for sealing of combustion tubes, two 4 mm ports for sealing of quartz and glass tubes and one ½" Ultra-Torr® port with a bellows tube cracker for 9 mm sample tubes. The vacuum line also comprises two calibrated volumes (corresponding to 700 and 2'100 µg carbon as CO_2 at 1 bar), two pressure transducers (0–3'000 mbar) with digital readouts and a Peltier cooler for water removal.

SPECIFICATIONS

- 2 independent pressure transducers
- Calibrated volumes for 700 and 2'100 µg carbon
- Peltier cooler for water removal at -20 °C

KEY FEATURES

- Easy to use vacuum line
- 2 calibrated volumes with pressure readouts
- Peltier cooler for water condensation
- Display of pressures, carbon masses and temperatures

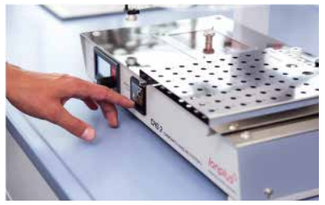
SERVICES

Besides manufacturing high-quality scientific instruments, Ionplus offers also a wide range of services in the field of radiocarbon dating and AMS.

TRAINING

Benefit from our experience and expertise in radiocarbon dating and AMS. In our in-house laboratory, we offer hands-on trainings and courses on:

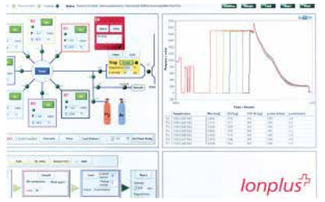
- Operating and maintenance of our instruments
- Sample cleaning and sample preparation for best results
- ^{14}C analysis and data interpretation
- Best practices in ^{14}C analysis

CUSTOM APPLICATIONS AND DEVELOPMENTS

You have a non-standard application or special requests? Or need a custom-built system specific to your analytical questions? Tell us about your unique challenges and we can provide you with custom solutions tailored to your specific needs.





TECHNICAL SUPPORT

Our experienced staff provides prompt assistance and support for any question or technical problem. We are here for you and your questions by e-mail, phone or even through our remote access assistance.

MAINTENANCE PACKAGES

The Ionplus maintenance packages help you avoid costly downtime, reduce repair work and keep your systems up to date and running. Choose the maintenance package that best suits your needs.

SPARE PARTS AND UPGRADES

Our instruments are designed and built to last. We offer upgrades of equipment and spare parts for all our instruments.

Currently available upgrade options for older systems:

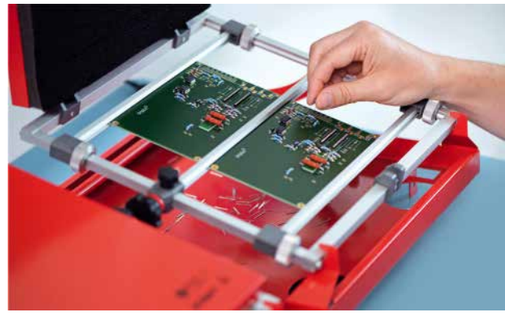
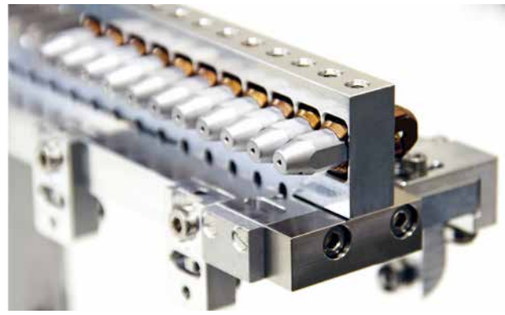
- Helium stripping for MICADAS
- 40 position magazine sample changer for MICADAS
- IT and software upgrades for AGE, GIS and all our AMS systems

Request a quotation for your desired upgrade at info@ionplus.ch.

CONSUMABLES

To keep your research going, we deliver consumables for all our products such as:

- Cathodes for solid and gas samples
- Vials and tubes for AGE 3, CHS 2 and TSE
- Reference and blank gas mixtures for GIS

HEAD QUARTERS

Ionplus

engineering scientific instruments

CONTACT

Ionplus AG
Lerzenstrasse 12
8953 Dietikon
Switzerland
T +41 43 322 31 60
info@ionplus.ch
www.ionplus.ch

SALES NETWORK

Ionplus has an international network of sales representatives with local and market-oriented partner companies. For a trading company in your region, please check www.ionplus.ch or contact us at info@ionplus.ch.