RADWAG®

radwag.com

NEW Metrology, Testing and Certification Centre

Precision begins with research



STABLE CONDITIONS

PARAMETER CONTROL

ADVANCED TECHNOLOGY

RELIABLE RESULTS

Research – the Foundation of Success

The **RADWAG Metrology, Testing and Certification Centre** is a specialised facility where metrological expertise is combined with measurement practice, research activities and technology development. The Centre comprises the **Measurement Laboratory, Testing Laboratory and Electrical Laboratory**, each performing specific tasks while together providing a comprehensive environment for calibration, testing and evaluation of measurement solutions.

The laboratories' activities include the calibration of balances, mass standards and piston pipettes, metrological testing of balances and weighing systems, determination of moisture and dry matter content, certification, as well as testing of electrical parameters and equipment immunity. This **extensive infrastructure provides knowledge used to develop and continuously improve** RADWAG measurement technologies.

The laboratories exclusively use RADWAG equipment and systems, allowing these technologies to be continuously verified in practice, while experience gained through testing and measurements supports the development of future solutions.

Measurement Laboratory



Tomasz Jędrzejewski
Head of the RADWAG Measurement Laboratory

The Measurement Laboratory operates within the RADWAG Metrology, Testing and Certification Centre. Its activities include **accredited calibration of measuring instruments, measurement services and specialised support in metrology**. The Laboratory operates in the following key areas:

- **Calibration** of balances and weighing systems
- **Calibration** of mass standards, weights and test loads
- **Calibration** of piston pipettes
- **Supervision** of measuring equipment
- **Qualification** of measuring instruments and systems
- **Consulting and cooperation** in metrology and metrological traceability

Research Laboratory



Sławomir Janas, PhD
Head of the RADWAG Research Laboratory

The Testing Laboratory is one of the key areas of the RADWAG Metrology, Testing and Certification Centre. Its activities include **testing, certification, and the development of knowledge and solutions related to mass and moisture measurement**. The Laboratory operates in the following key areas:

- Metrological **testing** of balances and weighing systems
- **Testing** of moisture and dry matter content
- **Certification** of balances and weighing systems
- **Protection and promotion** of metrological knowledge and solutions
- **Publications and cooperation** with scientific and research institutions

Electrical Laboratory



Piotr Ciepłucha
Head of the RADWAG Electrical Laboratory

The Electrical Laboratory, operating within the RADWAG Metrology, Testing and Certification Centre, specialises in **testing the electrical parameters of weighing equipment and its immunity to environmental factors and disturbances**:

- **Testing** of electrical parameters of equipment
- ESD immunity and EMC compatibility **testing**
- **Testing** of immunity to electromagnetic disturbances
- **Assessment and verification** of stability and compliance with requirements
- **Support** for the design and improvement of RADWAG equipment

The history of the RADWAG Measurement Laboratory spans nearly **25 years of continuous development** – from its first measurement stations to the **modern RADWAG Metrology, Testing and Certification Centre**. As the range of services expanded, the team's expertise grew and increasingly advanced technologies were introduced, successive facilities marked **new stages in the Laboratory's development**, providing the space and conditions required for increasingly demanding measurement processes.

Calibration activities date back to 1997, when **RADWAG began manufacturing mass standards** and calibration weights for electronic balances. At the same time, the **first RADWAG mass comparator** was developed. Another important milestone came in 2003, when the company decided to extend its calibration services to external customers and established a dedicated organisational unit – the Measurement Laboratory.

Measurement Laboratory
2003-2012

The first facility of the Measurement Laboratory was located at 28 Bracka Street in Radom and occupied an **area of only approximately 10 m^2**. It soon became clear that the space was insufficient, and **in 2005, construction of a new service and laboratory facility began**.

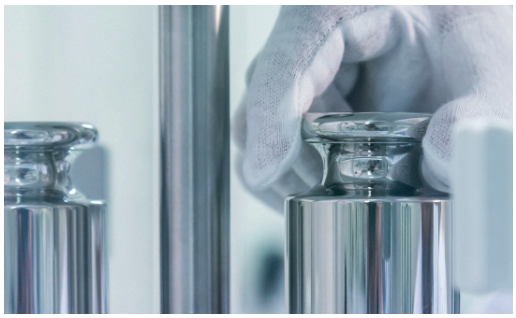
At the same time, work commenced on the first mass comparators. **Positive test results, confirmed by interlaboratory comparison results, made it possible to extend the Laboratory's scope of accreditation in 2006 to include class E2 mass standards**. This also marked the beginning of the global sales of RADWAG mass comparators.

Metrology Centre
2012-2026

Market demands led to the expansion of the laboratory facilities and the construction of the **Metrology Center at 17A Starowiejska Street in Radom**. The new Center enabled the **development of its laboratories, expansion of the scope of measurements, and growth of its training and expert activities.**

On 4 January 2021, the unit was transformed into the Center for Metrology, Research and Certification, expanding its activities to include testing, validation, expert assessments, and training. Since 2012, **scientific and educational activities have also been developed**, including research and participation in conferences and seminars.

In 2026, a new stage of development began with the establishment of a modern facility that significantly expanded the Center's capabilities in specialized testing, measurements, and certification.



PRODUCTION of Mass Standards and Comparators

1997



MEASUREMENT Laboratory

2003



METROLOGY Centre

2012



NEW MEASUREMENT Laboratory

2005



METROLOGY, Testing and Certification Centre

2021



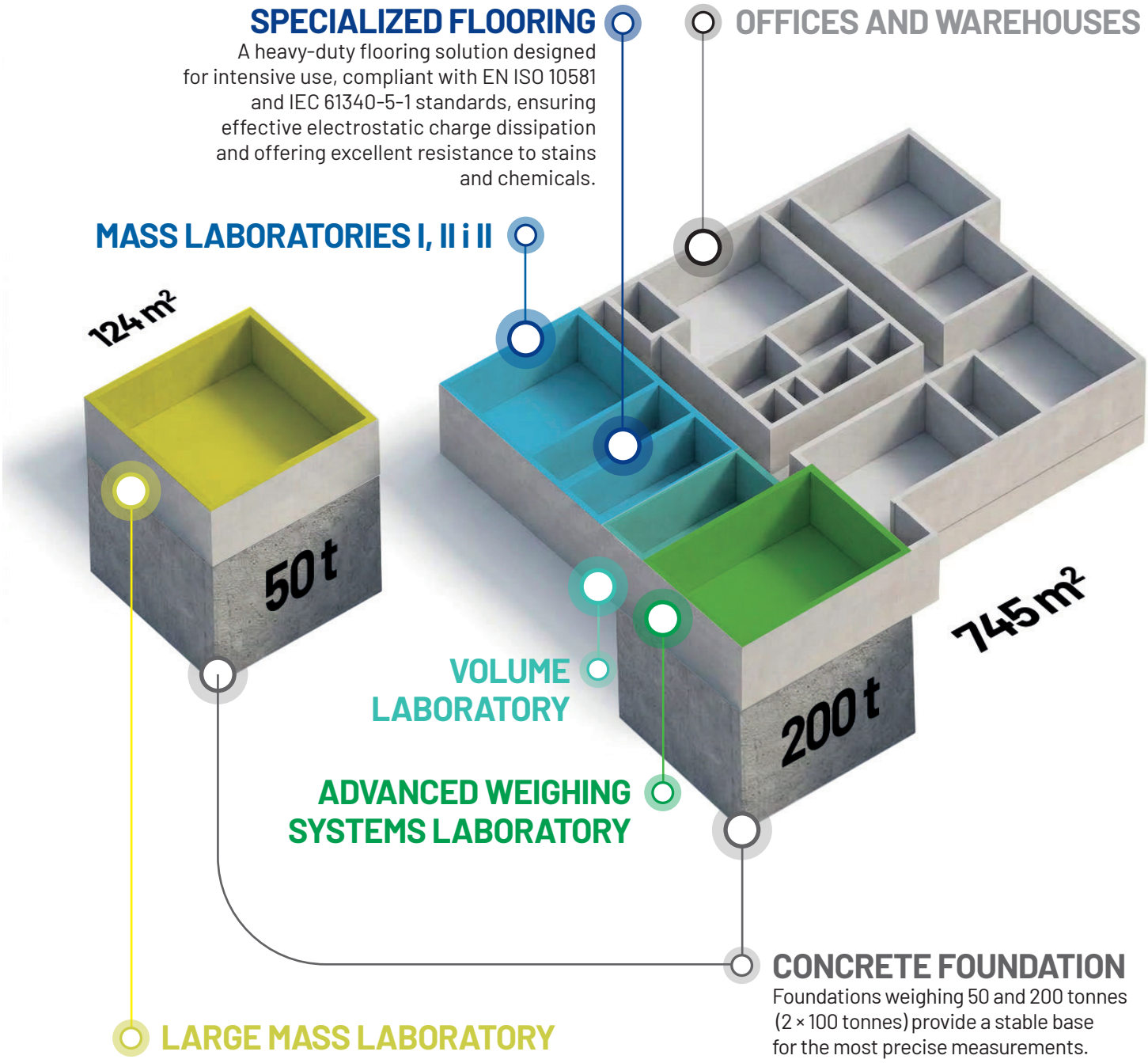
NEW METROLOGY, Testing and Certification Centre

2026



NEW Metrology, Testing and Certification Centre
since 2026

In response to the growing scale of operations and the need to provide even better conditions for the most demanding measurements, a **new Center for Metrology, Research and Certification was established**. The facility was designed from the ground up, creating a specialized environment tailored to precision testing in the field of mass and volume.



Conditions Under Constant Control

Each laboratory room is equipped with sensors that continuously monitor key environmental parameters. **The system records temperature, pressure, humidity, air density, and vibration levels,** enabling continuous monitoring of the conditions in each laboratory.



Air Temperature



Atmospheric Pressure



Air Humidity



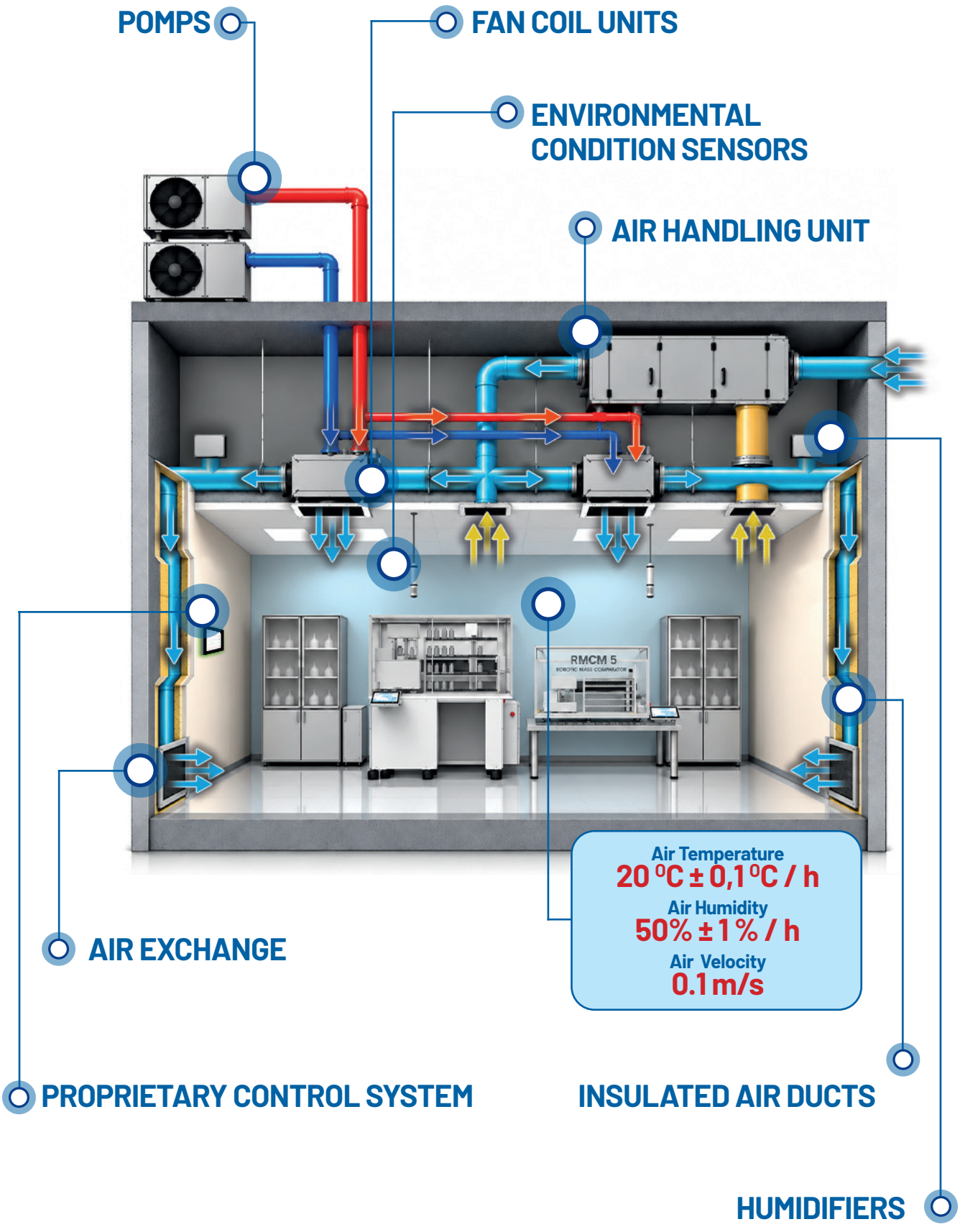
Air Density



Vibration Level



Precise Control of Environmental Conditions



Stable Environment for Precise Measurements

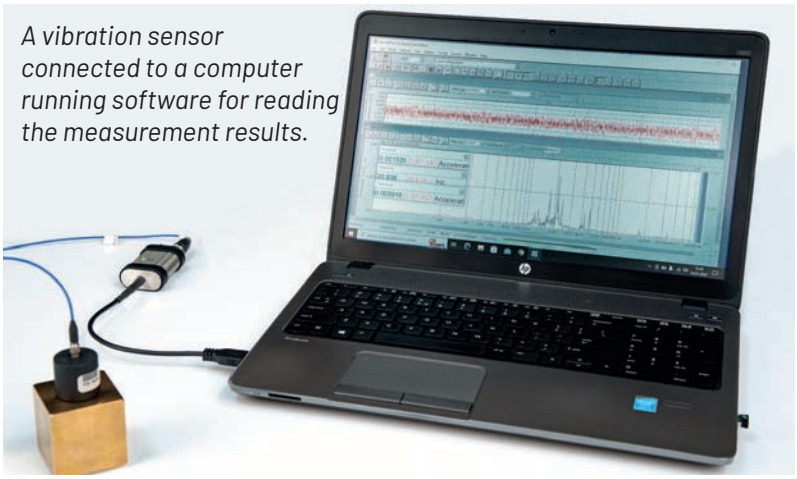
The measurements confirmed that the **new Metrology Center provides exceptionally stable conditions for the most demanding mass measurements**. The level of ground vibrations is significantly lower than in the laboratory located in the urban area of Radom.

Key Findings

- **The vibration level** in the new Center is significantly lower than in the existing RADWAG laboratory.
- **The average RMS value** in the new facility is below the lower limit of the reliable measurement range of the system used – 1 µm/s^2.
- In the new Center, there are practically **no significant low-frequency vibrations**, which are particularly detrimental to measurements requiring the highest levels of accuracy.
- The re**corded vibrations** occur primarily in the 400–500 Hz range, whereas at the urban location their spectrum is considerably broader – from approximately 3 to 500 Hz.
- The distance from heavy urban traffic **reduces the impact of external vibration sources** on the measurements.
- The structural solutions incorporated into the building and its foundations further **enhance the stability** of the measurement stations.
- The obtained results **confirm suitable conditions** for the operation of ultra-microbalances and mass comparators with the highest resolutions.

Stability Designed for Metrology

In the case of the most precise instruments, **ground vibrations can directly affect indication stability, repeatability, and result stabilization time**. Therefore, a low vibration level is not merely a technical parameter of the building, but one of the factors determining the quality of the measurement environment.



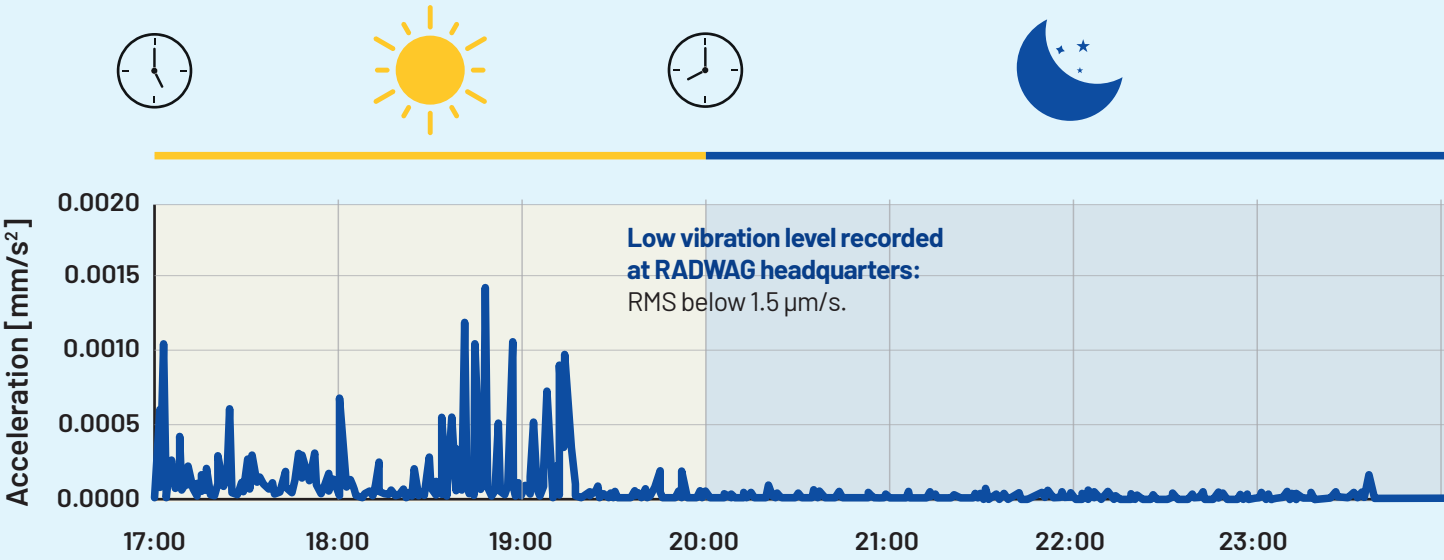
A vibration sensor connected to a computer running software for reading the measurement results.

The test results confirm that the location of the Center and the solutions incorporated at the design stage have created an **environment suitable for mass measurements at the highest levels of accuracy**.

Vibration Testing at RADWAG Headquarters

In the existing Research Laboratory, **the average RMS vibration level only occasionally approached 0.002 mm/s²**. Periodic increases in the recorded values were associated with the ongoing activities of laboratory personnel. Outside these periods, **vibration levels remained lower**.

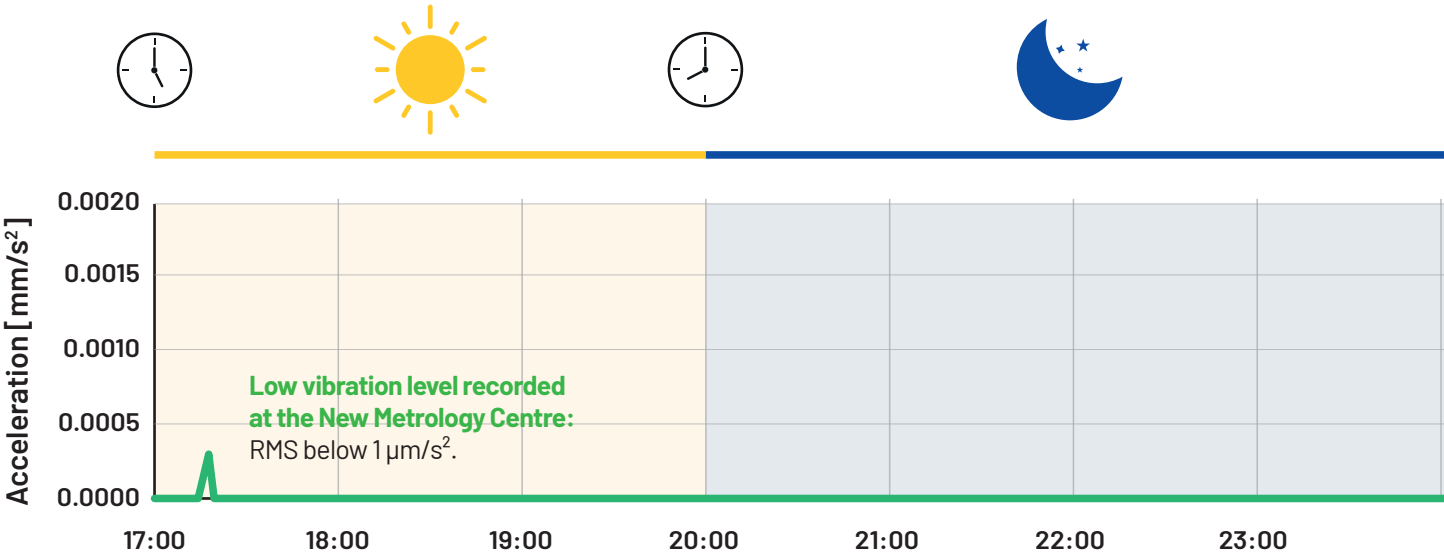
Root mean square (RMS) vibration acceleration



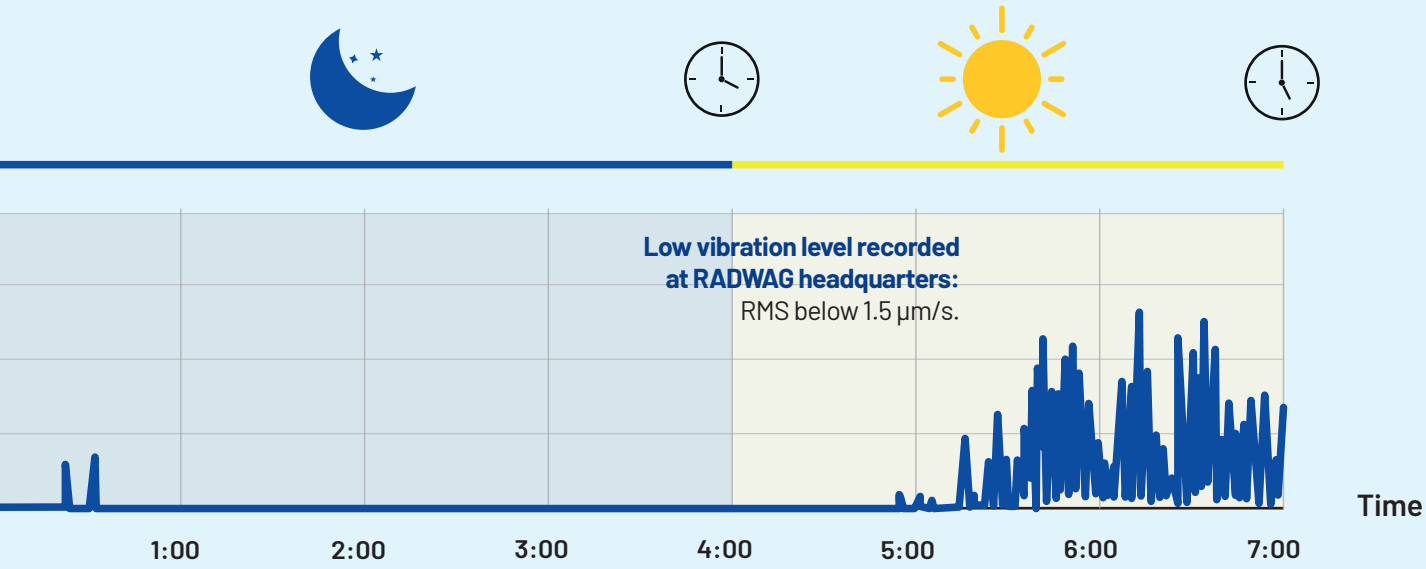
Vibration Testing at New Metrology Centre

The tests confirmed an exceptionally low vibration level in the Metrology Centre facilities. The average **RMS vibration value remained below 0.0005 mm/s²**, which is the lower limit of the reliable measurement range. Nevertheless, lower readings are shown in the graphs for illustrative purposes and to enable comparison between the rooms analysed.

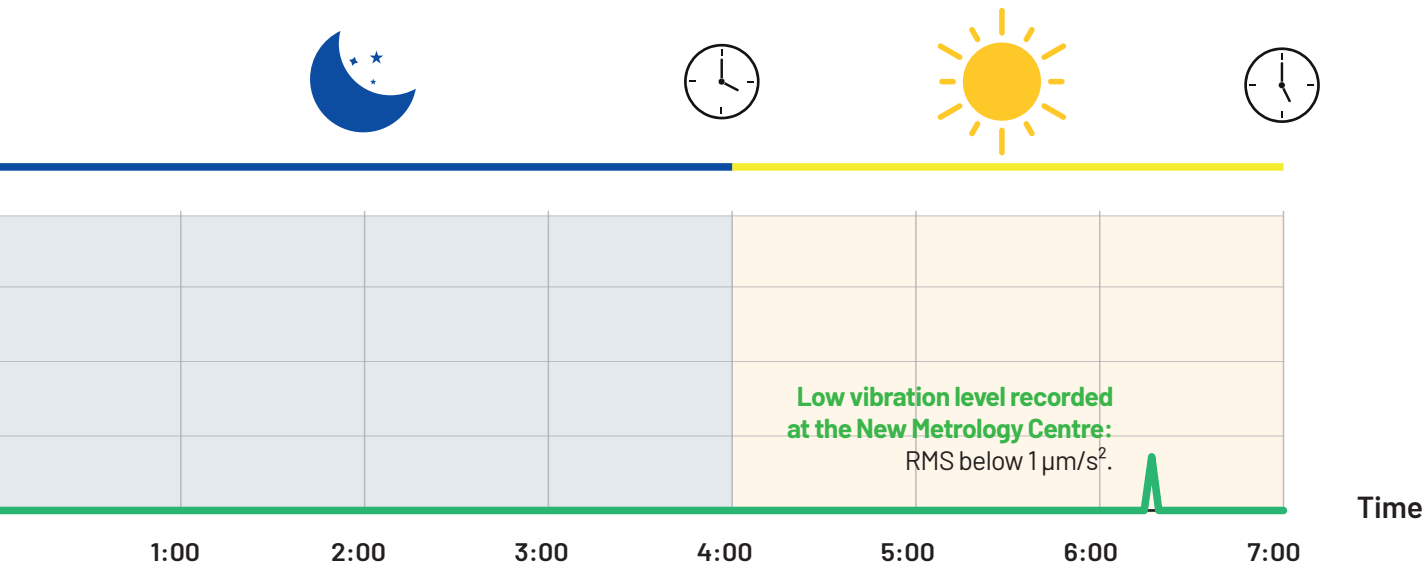
Root mean square (RMS) vibration acceleration



The measurements also revealed **variations in vibration levels depending on the time of day**, which is typical of an urban location. The recorded frequency range was significantly wider than at the new Metrology Centre, extending from **approximately 3 Hz to 500 Hz**. **Throughout the analysed period, the recorded vibration levels remained within the range specified for the operating conditions of measuring instruments.**



Increases in vibration levels were recorded only at the beginning and end of the tests and were associated with the movement of the person operating the measuring equipment. The recorded **vibrations occurred mainly in the 400–500 Hz** frequency range and resulted from the natural resonance of the concrete floor.



Advanced Weighing Systems Laboratory

Mass Comparison in Vacuum and with Nanoscale Accuracy



REQUIRED ENVIRONMENTAL CONDITIONS

TEMPERATURE: 22 C^0 ± 0.1 ^0C / 12 h
HUMIDITY: 40 ÷ 60 %, maximum ± 2 % / 12 h

The Advanced Weighing Systems Laboratory **has been designed for the most demanding mass measurements**, where both instrument performance and stable operating conditions are critical. **It houses RADWAG's most advanced solutions**:

- **the AVK 1000 vacuum mass comparator,** which enables mass comparison under controlled vacuum conditions, reducing the influence of air on measurement results,
- **the NANO.AK-8/500.5Y mass comparator** – a unique RADWAG design with a readability of 10 ng, capable of detecting extremely small changes in mass.

The measuring stations are installed on a specially designed 200-tonne foundation that dampens vibrations and isolates the instruments from external mechanical disturbances.

Mass Laboratory I

Robotic and Automated Mass Comparison Systems



REQUIRED ENVIRONMENTAL CONDITIONS

TEMPERATURE: 21 ÷ 24 ^{0}C ± 0,3 ^{0}C / h, maximum ± 0.5 ^{0}C / 12 h
HUMIDITY: 40 ÷ 60 %, maximum ± 5 % / 4 h

The Robotic and Automated Mass Comparator Laboratory **enables advanced measurements to be performed with minimal operator involvement**. This improves repeatability and allows measurement series lasting several hours to be carried out. The laboratory's key equipment includes:

- **RMC 5Y and RMCM 5Y robotic mass comparators**, which automate the handling and comparison of mass standards in programmed measurement cycles,
- **UMA 5Y automatic mass comparators**, which enable mass standards to be compared automatically in programmed measurement cycles,
- **the AGV 5Y mass comparator**, which enables the density of mass standards to be determined using the hydrostatic weighing method.

Together, these systems provide **comprehensive facilities for the advanced metrological evaluation of mass standards**.

Mass Laboratory II

Manual Mass Comparison Systems



REQUIRED ENVIRONMENTAL CONDITIONS

TEMPERATURE: 21 ÷ 24 ^{0}C ± 1 ^{0}C / h, maximum ± 0.8 ^{0}C / 12 h
HUMIDITY: 40 ÷ 60 %, maximum ± 5 % / 4 h

The Manual Mass Comparison Systems Laboratory is intended for the calibration of mass standards of various nominal values and accuracy classes. The measurement process is carried out **with the direct involvement of qualified personnel**, while the selection of the measuring station depends on the type of standard and the required metrological parameters. The laboratory's equipment includes:

- **AK-4.5Y, XA 5Y.K0, WAY 5Y.K0 and APP 5Y.K0 manual mass comparators**, offering different capacities and specifications, allowing the appropriate instrument to be selected for each specific task,
- **manual measuring stations** for procedures requiring the appropriate preparation of mass standards, monitoring of environmental conditions and operator expertise.

The wide range of comparators ensures **calibration flexibility** and provides an important complement to the Laboratory's automated facilities.

Mass Laboratory III

Specialised Systems for Calibrating Weighing Instruments



REQUIRED ENVIRONMENTAL CONDITIONS

TEMPERATURE: 21 ÷ 24 ^{0}C, maximum ± 0.8 ^{0}C / 4 h
HUMIDITY: 40 ÷ 60 %, maximum ± 5 % / 4 h

The laboratory provides **specialised facilities for the calibration** of both new and in-service **weighing instruments** with various weighing ranges and metrological specifications. The measuring stations **can be configured to adapt the measurement conditions and procedures to the type and characteristics of the instrument under test**, ensuring **appropriate conditions for calibration**.

The laboratory focuses on the evaluation of complete weighing instruments, including verification of their metrological performance under actual operating conditions. The measurements make it possible **to determine the parameters that directly affect** the reliability and accuracy of weighing results and to confirm the metrological performance of the instrument under test.

Volume Laboratory

Calibration of Single- and Multichannel Pipettes



REQUIRED ENVIRONMENTAL CONDITIONS

TEMPERATURE: 21 ÷ 23 ^{0}C, maximum ± 0.5 ^{0}C / h
HUMIDITY: 45 ÷ 80 %, maximum ± 5 % / 4 h

The Volume Laboratory provides **specialised facilities for the calibration of piston-operated pipettes**. The measurements involve determining the actual volume of liquid dispensed based on its mass, taking into account environmental conditions and the properties of the liquid.
The laboratory's equipment includes:

- **XA 5Y.P and AP-12.1.5Y balances**, designed for calibrating single-channel pipettes while reducing the influence of external factors, including liquid evaporation,
- **the AP-12/12.5Y automatic multichannel pipette calibration system**, which enables rapid calibration of 12-channel pipettes by measuring all 12 channels simultaneously.

The combination of measuring stations for single- and multichannel pipettes **enables comprehensive calibration** and reliable evaluation of their metrological performance.

Large Mass Laboratory

Manual Comparison of Large-Nominal-Value Mass Standards



REQUIRED ENVIRONMENTAL CONDITIONS

TEMPERATURE: 19 ÷ 25 ^{0}C ± 1 ^{0}C / h, maximum ± 5 ^{0}C / 12 h
HUMIDITY: 45 ÷ 80 %, maximum ± 10 % / 4 h

The Large Mass Laboratory **has been designed for the calibration of high-nominal-value mass standards**, whose handling requires specialised equipment and infrastructure.
It extends the Laboratory's capabilities to include precise measurements of objects weighing more than two tonnes. The laboratory's main equipment and solutions include:

- **HRP 5Y.K0 mass comparators**, enabling precise comparison of mass standards weighing up to 2,000 kg. They feature a self-centring weighing platform that allows off-centre placement of the standard without affecting the measurement result.

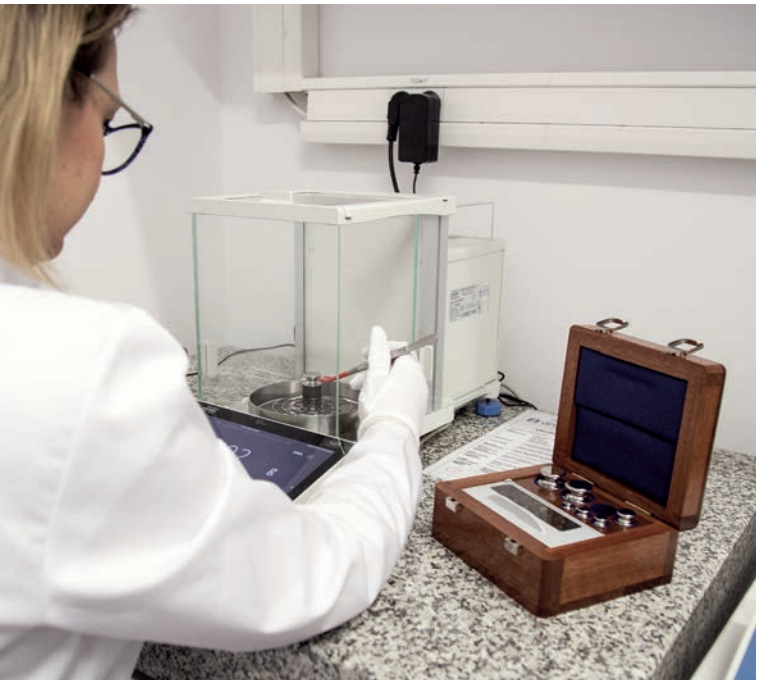
The measuring stations are designed **to accommodate objects of various, including non-standard, shapes** used in industry and weighing systems.

Mass Standard Calibration Activities

Calibration is performed using the comparison method with appropriately selected reference standards. It includes determining the conventional mass value and calibration uncertainty, with the option of assessing conformity with the requirements of OIML R 111.

Mass standards and weights are calibrated in the following accuracy classes and measurement ranges: **E1:** 1 mg – 500 mg, **E2:** 1 mg – 2 kg, **F1**: 1 mg – 20 kg, **F2:** 1 mg – 50 kg, **M1:** 1 mg – 1000 kg, **M2:** 100 mg – 1000 kg oraz **load weights:** 1 mg – 100 kg.





Weighing Instrument Calibration Activities

During calibration, **the most important metrological characteristics** of the instrument are evaluated:

- indication **errors** and repeatability,
- **the effect of off-centre loading**,
- additional parameters, depending on the scope of the order.

The measurement results, together with the determined measurement uncertainty, are presented in the **calibration certificate**.

Vibration Testing Activities

Vibration testing will be conducted at the Metrology Centre using the THB system, which enables precise measurement and analysis of vibrations occurring in the laboratory environment. The measurements will make it possible to assess the stability of operating conditions and the effect of vibrations on the accuracy and reliability of metrological measurements.



Volume Determination Activities

Calibration is performed using the gravimetric method in accordance with the requirements of **PN-EN ISO 8655-2:2022-11**. The following parameters are determined during the process:

- the **actual volume** dispensed by the pipette,
- systematic and random **errors**,
- calibration **uncertainty**.



At the customer's request, conformity with the requirements of **PN-EN ISO 8655** or other agreed criteria may also be assessed.



Magnetism Testing Activities

The Metrology Centre **tests the magnetic properties of mass standards**, including the **measurement of magnetic susceptibility** and **permanent magnetisation**. Measurements are performed using the **SM 5Y.A** automatic susceptometer for mass standards of accuracy class E1 and lower, in accordance with the requirements of **OIML R 111**. The tests enable the **magnetic properties of a mass standard** to be evaluated and its **conformity with the requirements** specified for the relevant accuracy class to be assessed.

A Laboratory Close to You



A team of 30 RADWAG specialists forms the Metrology, Testing and Certification Centre and its eight branches across Poland.

In addition to calibration services, the Laboratory also provides:

- technical **consultations**,
- expert **support**,
- **training**,
- **testing and validation services**.

Digital Support for the Calibration Process

The LabOne system is complemented by RMCS, specialised software that supports calibration using mass comparators and integrates the successive stages of order processing:

- order **acceptance**
- calibration **planning**
- **measurements** using mass comparators
- **processing** of results and issuance of the calibration **certificate**



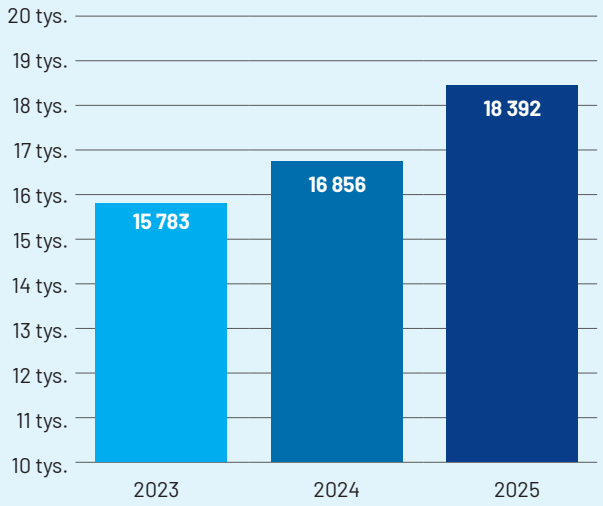
The integration of **RADWAG instruments, automation and the RMCS system** enables **measurement processes to be carried out efficiently while maintaining full control** over every stage.

Experience Measured by Growth

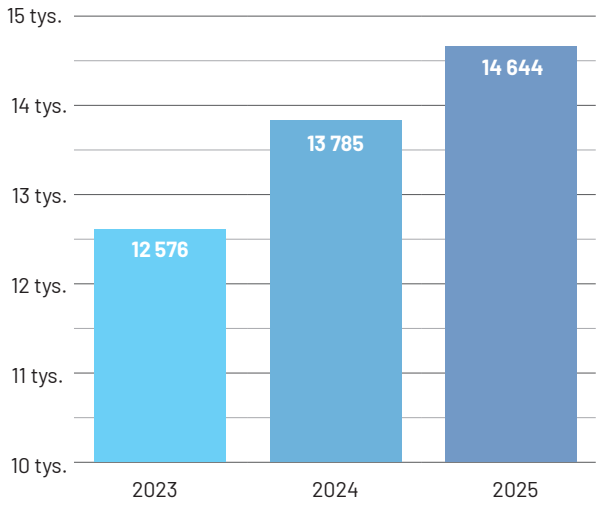
Nearly 22 years of operating within the accredited scope have been marked by the **systematic development of expertise**, infrastructure and measurement process automation. The **expansion of technical facilities and implementation of further RADWAG solutions** have increased the Laboratory's measurement capabilities, broadened its range of services and enabled it to meet growing market requirements.

The scale of these activities is clearly **demonstrated by data from the past three years**. The number of calibration certificates issued increased from 15,783 in 2023 to 18,392 in 2025. Over the same period, the number of calibrated electronic weighing instruments rose from 8,314 to 9,628, pipettes from 770 to 1,305, and mass standards from 12,576 to 14,644.

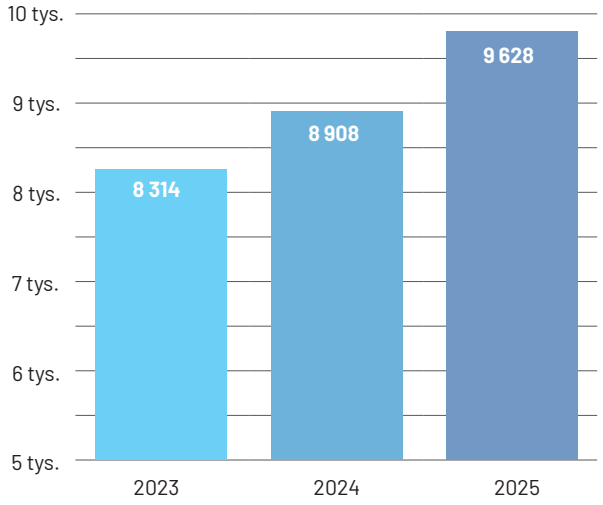
Total Number of Calibration Certificates Issued



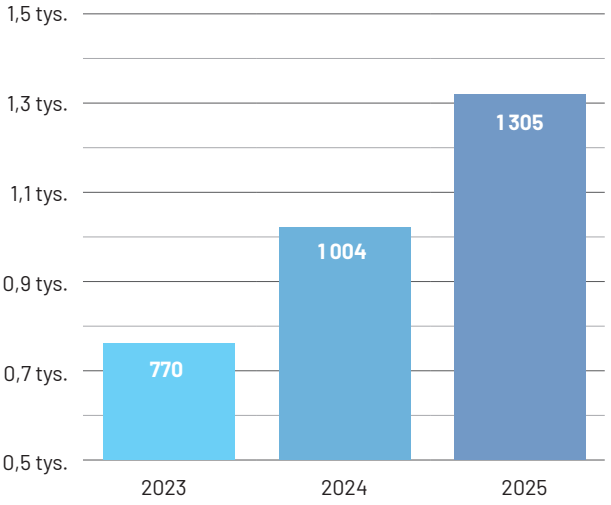
Mass Standards of Various Accuracy Classes Calibrated

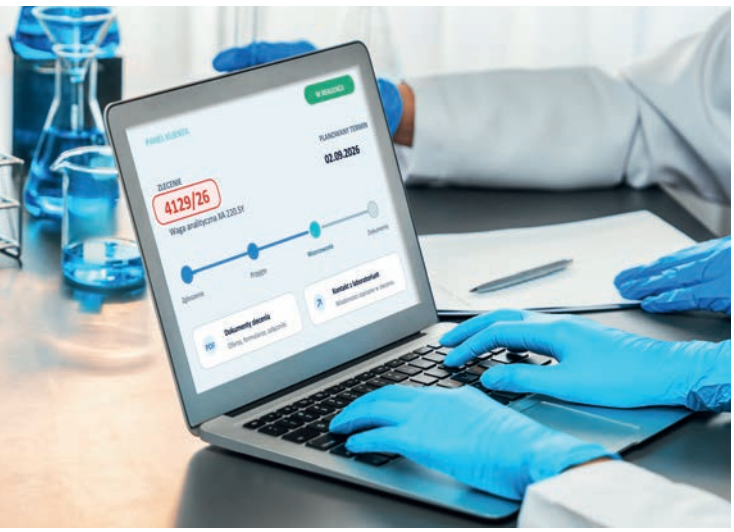


Electronic Weighing Instruments Calibrated



Pipettes Calibrated

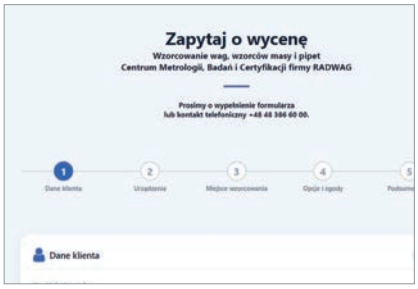


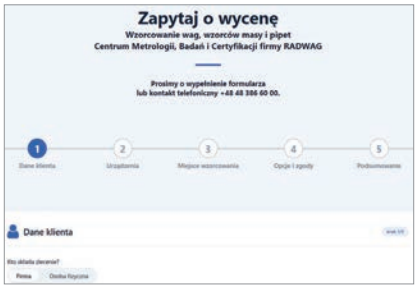


RADWAG LabOne

Software for Comprehensive Laboratory Process Management

Integrated software supporting laboratory operations **at every stage of order fulfilment**. Within a single environment, **it combines customer service, quotations, order planning and execution, measurements, documentation and logistics**.
This ensures that **all information is available in one place** and flows seamlessly between successive stages, without the need to re-enter data.







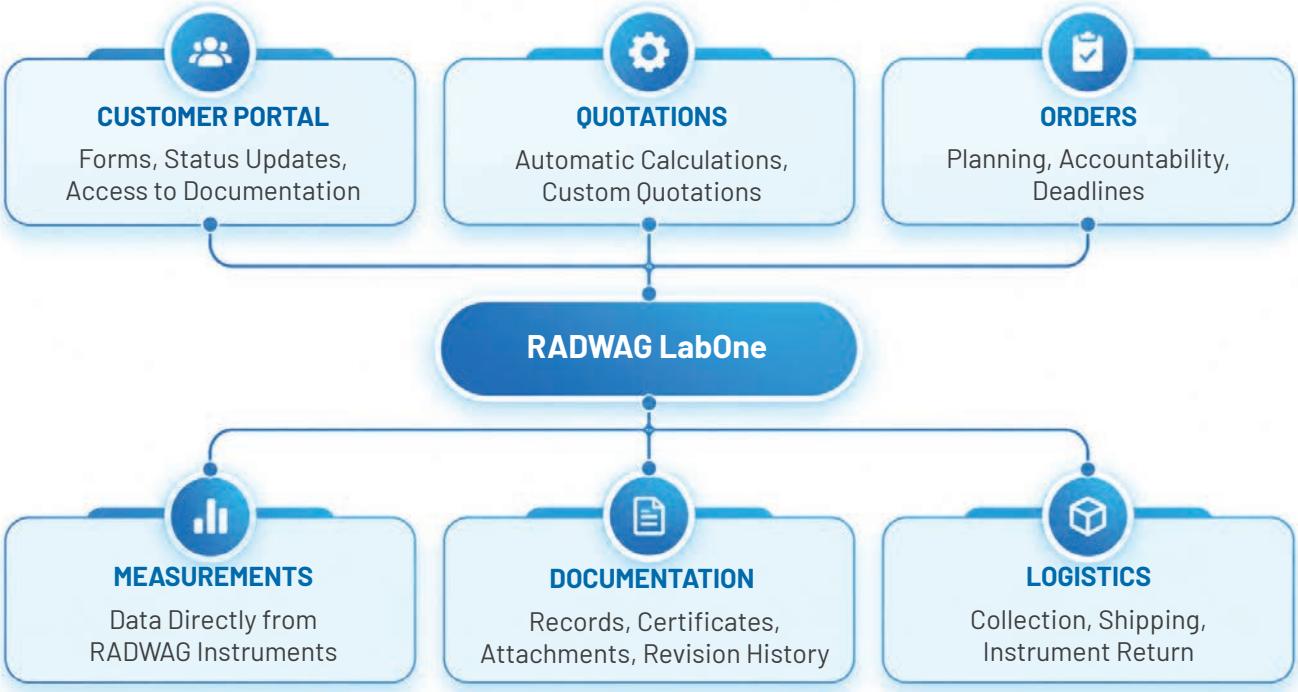
The **system manages the entire process**, from the initial customer enquiry through to the preparation and release of the approved calibration certificate. **It enables the scheduling of deadlines, personnel and equipment, the direct acquisition of measurement data from instruments, verification of results and controlled document workflow**.
Every stage and modification is recorded, providing a complete history of order fulfilment and ensuring full traceability of all activities.

Automated data flow **reduces the risk of errors** and streamlines order processing.
The system also supports process standardisation, ensuring that **work is carried out consistently** throughout the laboratory.

CUSTOMER ENQUIRY
Instrument, Requirements

SCOPE AND QUOTATION
Methods, Measurement Points, Conditions

PLANNING
Schedule, Personnel, Equipment



An **integral part of the solution is the Customer Portal**, which provides access to the current order status, documents and information related to its fulfilment. The laboratory, in turn, receives tools for managing workflows, monitoring individual tasks and maintaining consistent communication with the customer. **A shared information flow increases process transparency and facilitates the efficient organisation of daily operations.**

RADWAG LabOne integrates various calibration areas within a single system, including weighing instruments, mass standards and pipettes. Regardless of the type of procedure being performed, measurement data, calculations and documentation are handled within one structured process. This approach **helps standardise laboratory operations, reduce manual tasks and ensure continuity of information** from order acceptance through to the issuance of final documentation.

CALIBRATION
Measurements, Environmental Conditions

VERIFICATION
Results Review, Calculations

CERTIFICATE
Approval, Release

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