Ultra-microbalances and microbalances

Micro Scale Measurement – Laboratory Applications

4Y series microbalances

Extraordinary precision and comfort of operation for small mass measurement performed with the highest accuracy

- 5,7" touch screen
- Interactive menu
- Wireless connection
- Conformity with regulations (GLP, GMP System)
- Database (weighing records, samples, operators, reports)
- Dynamic control sample weight (bargraph)
- Statistics, SQC
- Printouts, reports (PCL standard)
- Multilingual menu
- Interfaces: Ethernet (network applications), USB, RS 232, IN/OUT
- Wide spectrum of use (industry, laboratories, universities, research and development centres)

1   Weighing module

A   Automatically opened draft shield

B   Weighing pan

2   Terminal

C   Information on a selected working mode and on an adoped profile

D   Information on a logged in operator

E   Area for date, time, connection type information, battery state, etc.

F   Measurement indication area

G   Load bargraph

H   Checkweighing function bargraph (thresholds)
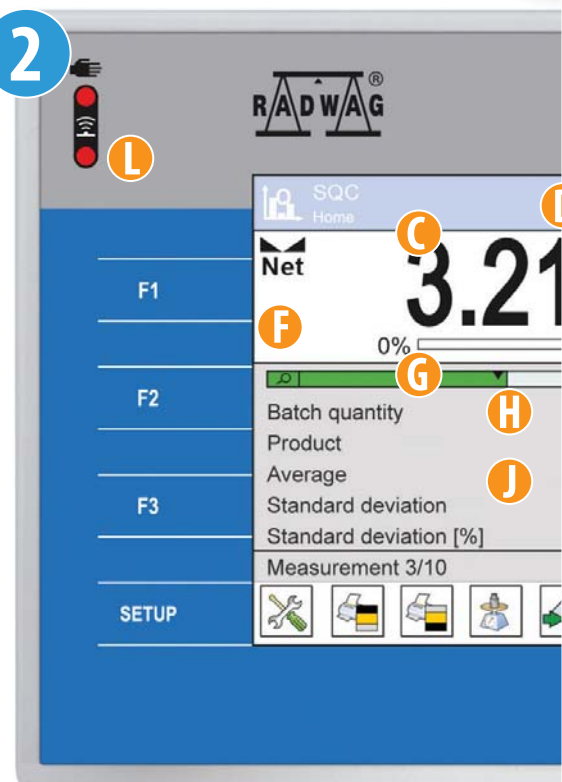
I   Pictograms for ambient conditions monitoring

J   Configurable area for extra information

K   Quick access bar

L   Proximity sensors (optimization of operation)

B

Standard design of UYA 4Y Ultra-microbalance
and MYA 4Y Microbalance

MYA 4Y.P Microbalance for pipettes calibration

MYA 4Y.F Microbalance and Ultra-microbalances UYA 4Y.F
for filters weighing

MYA 4Y.F1 Microbalance for weighing filters
of large-diameter

L

D Admin   **E** 2016.07.28 2:27:45   ● ON / LOAD

5074 g!

100%

I

3/10
2-bromo-2-nitropropane1
3.2152315 g
0,065850 g
1.18 %

K

www.radwag.com

Quality built into the product

Adjustment and an automatic cycle

Accuracy of indication for MYA 4Y microbalances is guaranteed owing to automatic adjustment process. This process takes into account the dynamics of temperature variation and time flow. It is possible to generate a report upon each completed adjustment.
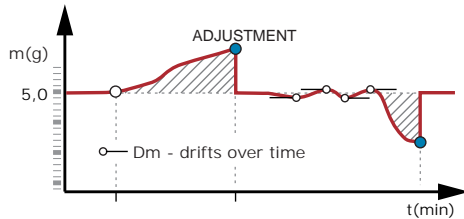
Principle of operation for an automatic adjustment


```
------  Adjustment: Internal  ------
Date                          2016.07.26
Time                            09:12:38
Balance type                      MYA 4Y
Balance ID                        234986
Operator                           Smith
Level status                         Yes
Difference                      0.000000
Temperature                        25 °C
------------------------------------
Signature:
------------------------------------
```


Adjustment history

239	2016.07.26	07:44:28	Triggered by time
240	2016.07.26	08:46:30	Triggered by time
241	2016.07.26	09:12:38	Internal
242	2016.07.26	09:29:07	External
243	2016.07.26	09:53:49	Triggered by temp.
244	2016.07.26	10:14:20	Triggered by temp.

Result of each adjustment is recorded in microbalance memory, it can be previewed

Adjustment history

1	Date	2016.07.26 09:12:38
2	Adjustment mode	Internal
3	Working mode	Weighing
4	Operator	Smith
5	Level status	Yes
6	Nominal mass	4.897654
7	Current mass	4.897653
8	Difference	0.000000
9	Temperature	25°C

Printout or export of a report on adjustment
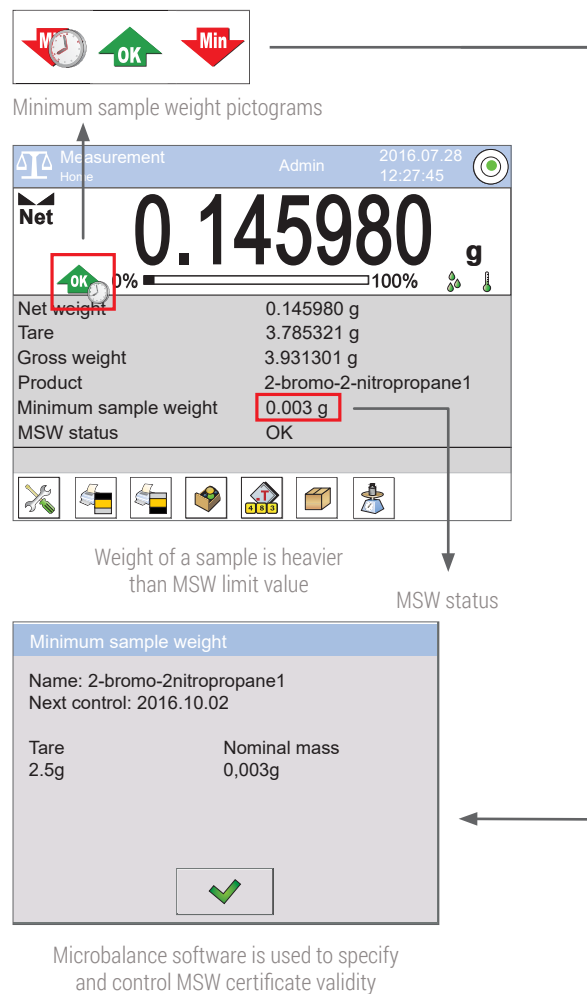
Fast measurement for any sample

System designed to control process of opening the draft shield provides instant access to the weighing pan. Determining weight of a particular sample takes just a few seconds.

1,2 s

stab
($\Delta m/\Delta t$)

time (s)
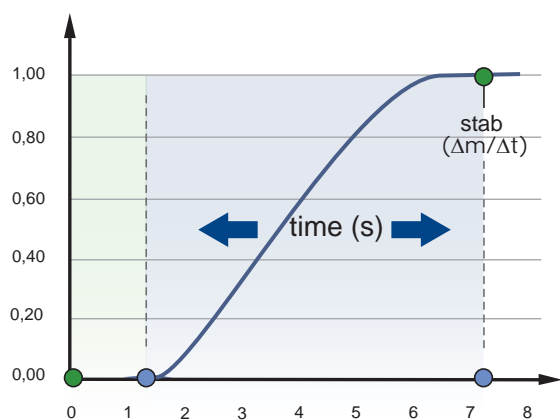
Conformity with USP Conventions

General Chapters, Apparatus for Tests and Assays <41 „BALANCES">
General Information, <1251 „WEIGHING ON AN ANALYTICAL BALANCE">

Applied design solutions provide the best possible micro scale measurement accuracy. MSW-dedicated software features programmable thresholds for low limit of a weighing range wherein variable tare loads can be used.

Minimum sample weight pictograms

Net weight	0.145980 g
Tare	3.785321 g
Gross weight	3.931301 g
Product	2-bromo-2-nitropropane1
Minimum sample weight	0.003 g
MSW status	OK

Weight of a sample is heavier than MSW limit value

MSW status

Minimum sample weight

Name: 2-bromo-2nitropropane1
Next control: 2016.10.02

Tare	Nominal mass
2.5g	0,003g

Microbalance software is used to specify and control MSW certificate validity

Auto-Level an On-line Control of Balance Level

Each sample requires level control for every single weighing performance, only then precise weighing is guaranteed. Any balance deviation from permissible level tolerance is immediately recorded and signalled by means of respective messages and colour scheme. Monitoring and level recording are fully automatic facilities.
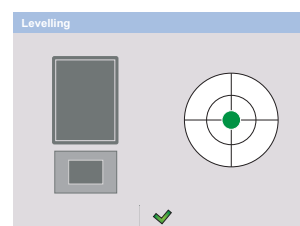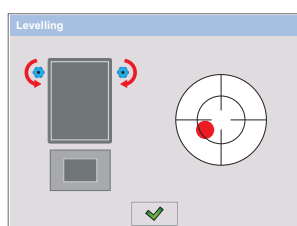
Universal
and specific solutions

Micro and ultra-micro scale measurement

When it comes to standard solutions, RADWAG offers series of microbalances (MYA 4Y) and ultra-microbalances (UYA 4Y) comprising devices varying in terms of max. capacity, readability and weighing pan size. Each balance features glass draft shield comprising automatically opened door.

Using MYA 4Y microbalance for liquid weight measurement

Filters weight measurement differential weighing

Owing to special design of a weighing chamber, precise absorption level may be determined by means of filter weight measurement. F series balances and ultra-microbalances intended to weigh filters comprise specific weighing chamber characterized by airtightness and featuring an open work weighing pan.

Using MYA 4Y.F microbalance for filters weight measurement

Pipettes calibration gravimetric method for control of volume

Dedicated set, installed inside the weighing chamber, allows a microbalance operator to check piston pipettes volume. The procedure is performed in accordance with the respective standard, ISO 8655.

Used evaporation ring limits the effect of particular liquid evaporation, this considerably improves measurement accuracy.

MYA 4Y.P series microbalances provide functionality also when it comes to mass measurement.

shield of an opening for injection

evaporation ring

vessel for liquid

weighing pan

MYA 4Y.P microbalance for pipettes calibration

Automatic cycle optimization
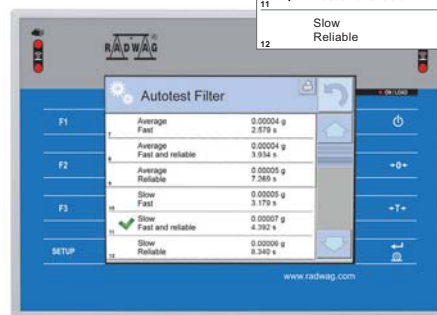
Autotest GLP
automatic control of accuracy

Auto-test function provides the user with possibility of manual confirmation of the performed measurements quality (record, export). Autotest GLP is a perfect solution used in quality management systems (ISO, GMP, GLP, USP, ICH Q10, SOP).

```
- - - - - - - Autotest GLP: Report - - - - - - - -
Balance type                       MYA 4Y
Balance ID                         544121
User                                Admin
Software revision                 L1.4.15 K
Date                             2016.07.30
Time                               13:42:13
- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Number of measurements                 10
Reading unit                    0.000001 g
Internal weight mass          17.673852 g
Filter                               Slow
Value release                     Reliable
Temperature: Start               23.99 °C
Temperature: Stop                23.96 °C
Humidity: Start                      58 %
Humidity: Stop                       58 %
- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Deviation for Max.              0.000004 g
Repeatability                  0.0000017 g
- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Signature
- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

On-line monitoring
of ambient conditions

Mechanisms implemented in a microbalance are used to facilitate automatic monitoring of elementary ambient conditions (temperature, humidity). Specifying limit values and dynamicity of changes for these values, combined with visualization, provide ergonomic and efficient means of operation.
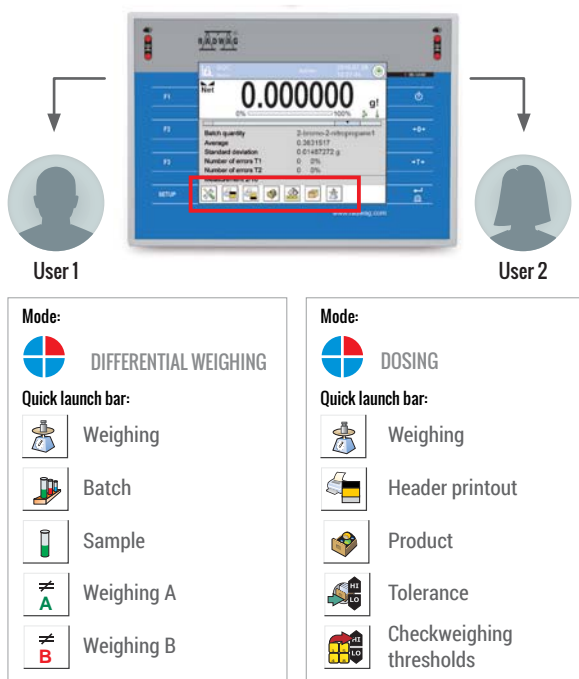

Autotest Filter
automatically performed selection of working parameters

Some weighing operations need accuracy, other require speed. An indispensable help for both features, speed and accuracy, is Autotest FILTER application. The Autotest FILTER is offered by every single Radwag-manufactured laboratory balance.

Autotest Filter operation consists in determining standard deviation value and weighing time needed for all possible combinations of settings for Filter/Value release parameter. Upon Autotest Filter procedure completion, the balance presents its results, allowing the user to select the most optimal options, i.e. such that provide the shortest time of weighing or the best repeatability.

Ambient conditions			
IS T1:	24.26 °C	THB H:	59%
IS T2:	24.26 °C	THB T:	24.26 °C
IS H:	59%	THB P:	994 hPa
ISP:	994 hPa	P:	1.161 kg/m^3
THB T:	23.9 °C		

Ergonomics
and comfort of operation

Customization of balance settings and access level

Unique user profiles with modifiable settings and access permissions provide flexibility of balance customization. Each profile comprises information, pre-set settings and a quick access shortcut dedicated for a particular operation. Number of operators and profiles is not limited.

0.000000 g

User 1   User 2

| Mode: DIFFERENTIAL WEIGHING	Mode: DOSING
Quick launch bar:	**Quick launch bar:**
Weighing	Weighing
Batch	Header printout
Sample	Product
Weighing A	Tolerance
Weighing B	Checkweighing thresholds

Databases As Support for the Weighing Process

Complex databases are a distinctive feature of the 4Y series. The databases size is dynamically shared within 32 GB memory.

4Y balances offer unlimited databases management options, plus they enable record of advanced reports and graphs carried out for series of weighings.

Option of databases import and export enables ease of databases management as well as their copying and archiving.
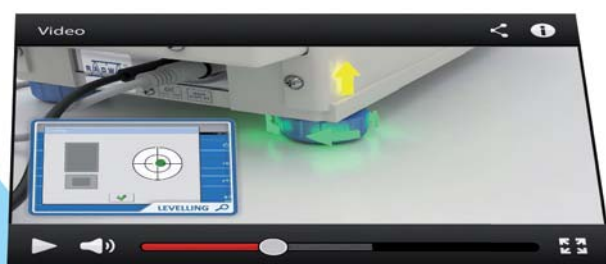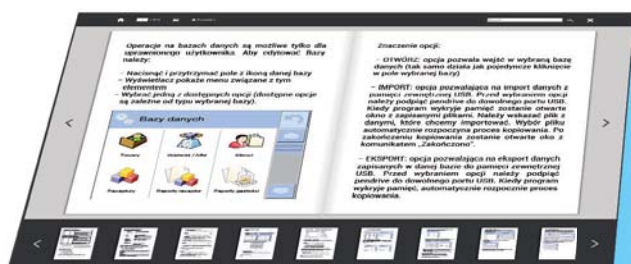
Video-Guidance And an On-screen Manuals

4Y balances feature "Media" module providing you with complex guidance, i.e. direct assistance in operating the device. With easily accessed context help you are fully supported when it comes to operation of particular functions and applications.The help is offered in a form of an on-screen displayed user manual, text and drawing instruction and short video guides.

Programmable proximity sensors

Manual abilities of an operator may be limited by characteristics of a workplace or by a required testing methodology (suit, gloves etc.). Owing to proximity sensors, microbalances and ultra-microbalances may be operated hands-free regardless of the said limitations.

It is possible to assign one of many various operations to a given proximity sensor, e.g. draft shield door opening or closing

RadwagConnect cooperation with portable devices

RadwagConnect software enables communication between any 4Y series balance and a portable user-owned device. The software allows online transfer of various information, recorded by a balance, to any device featuring iOS or Android system.

The communication is established via Wireless Module or Ethernet interface.

Portability balance - terminal wireless communication

Wireless communication provides possibility of placing the terminal in the vicinity of up to 10 meters distant from a balance. Battery-powered terminal allows 8-hour-long, continuous operation. This is especially convenient solution when placing a balance inside fume cupboard or Glove Box type of chamber.

Standard cable connection is an optional solution allowing for balance-terminal communication.

up to 10 m

Data monitoring and safety

Protecting data
user authorization levels

When there is a need for one balance to be operated by several users, the option of customizing access rights for particular functions may turn out to be indispensable. Four access levels ensure many possibilities of supervision over users and provide important data protection (e.g. formulas).

AUTHORIZATION
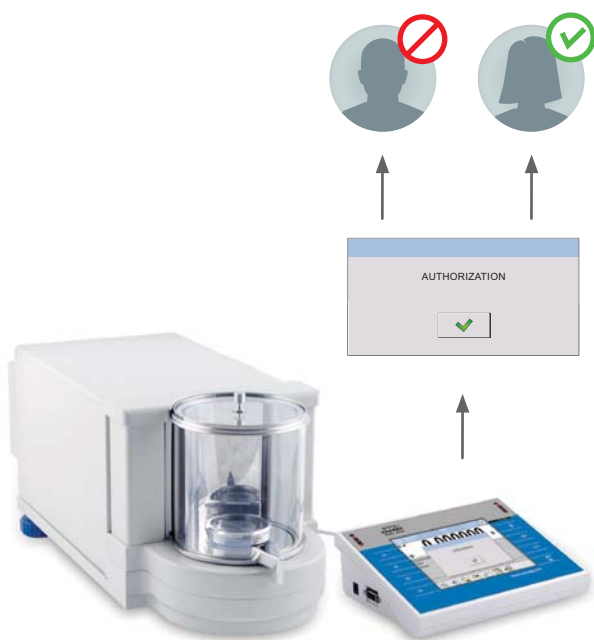
Numerous operations such as defining language of the menu, selecting a desired working mode or personalizing main screen layout may be limited according to the access level, with respective password protection.

Alibi secure
data storage partition

4Y series balances feature secure partition for data storing where all weighment data, reports, ambient conditions measurements are recorded and secured for a specified amount of time. All these can be easily restored in case there was such a need.
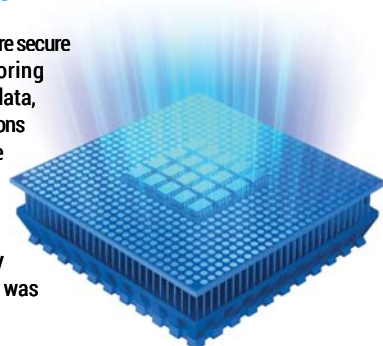
Data archiving
and exchange

The 4Y series offers complex archiving of databases, user profiles and data stored in the memory. All the data can be exported, imported, copied and transferred between balances.

WEIGHING RECORD

Date	Operator
Mass	Customer
Tare	Working mode
Air buoyancy compensation	Warehouse
Product	Packaging

Exemplary information to be found in a weighing record

Access level		Edit record	
1 Anonymous operator	Guest	1 Name	Admin EN
2 Date and time	Administrator	2 Code	
3 Printouts	Administrator	3 Password	********
4 Database		4 Access level	Administrator
		5 Language	English
		6 Default profile	Fast filters

Possibility of associating a given profile with a particular user allows such balance personalization, that upon log in, a given working mode and filters are automatically selected
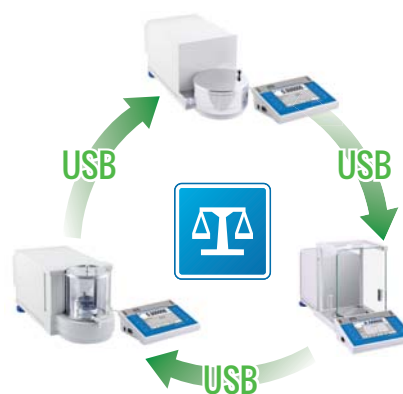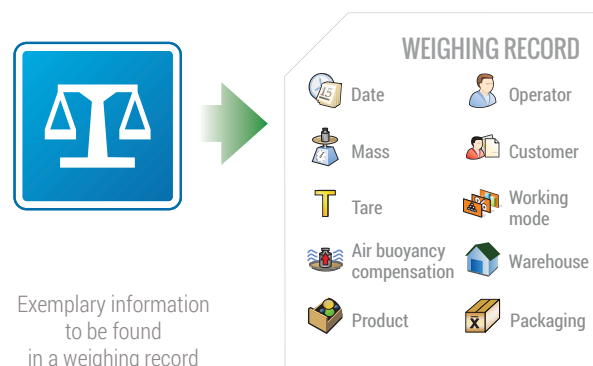
USB USB USB

Exchange of databases between balances via USB port by means of standard storage devices

Reports
and printouts

Reports
reports database

Upon completion of each process, a respective report is generated and recorded in a proper report database. The users have possibility to preview, print, export or archive reports but not only. They can also freely configure them.

```
----------- Weighing -----------
Date                           2016.07.19
Time                             14:48:50
Balance type                      MYA 4Y
Balance ID                        392543
Level status                         Yes
Product                          Calcium
Net weight                   0.1118071 g
Tare                         0.5000000 g
Gross weight                 0.6118071 g
--------------------------------
Signature
--------------------------------
```

Printouts
flexibility of configuration

There are two printout types for 4Y series balances: standard (generated according to a fixed template) and non-standard, customized ones.

Standard printout comprises three sections: header [A], weighment data [B] and footer [C].

Each section can be freely adjusted by a user, it can also be extended with a non-standard printout.

A
B
C

```
----------- Weighing -----------
Date                           2016.07.02
Time                             14:07:43
Balance ID                        419036
Operator                           Admin
Level status                         Yes
Product                          Calcium
Packaging                         Blister

Temperature during measurements:  26.79 °C
Humidity during measurements:        24 %
Pressure during measurements:     994 hPa

Net weight                   0.1118376 g
Tare                         0.5000000 g
Gross weight                 0.6118376 g
Supplementary unit          0.5591880 ct
Minimum sample status                 OK

Net weight                   0.1118071 g
Tare                         0.5000000 g
Gross weight                 0.6118071 g
Supplementary unit          0.5590355 ct
Minimum sample status                 OK

Net weight                   0.1118071 g
Tare                         0.5000000 g
Gross weight                 0.6118071 g
Supplementary unit          0.5590355 ct
Minimum sample status                 OK
--------------------------------
Signature
--------------------------------
```

Charts measurements
visualization and statistics

Selected working modes (Statistics, SQC) apart from generating report offer possibility of creating a chart for a particular completed weighment. The balance allows to generate weighments charts (with mean value calculated) and probability distribution chart out of series of measurements. Each chart can be freely scaled, printed or saved to BMP file.
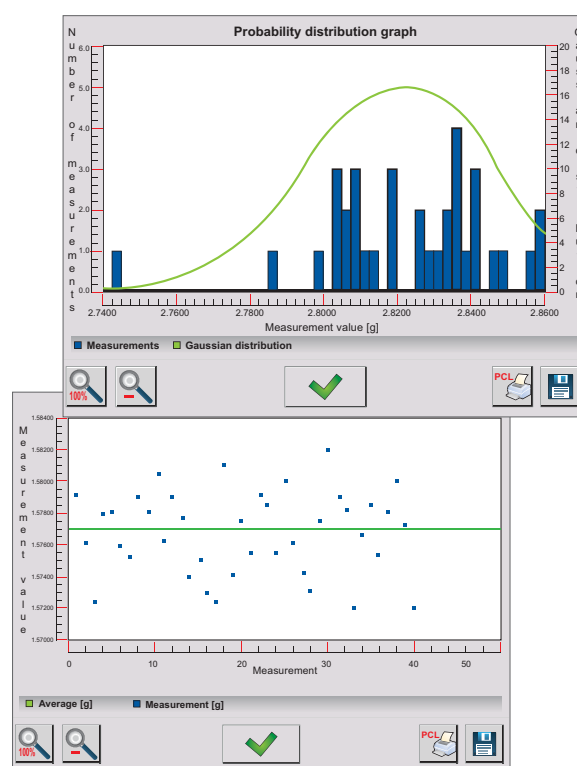
Graph of probability distribution
(Gaussian distribution)

Operating the printouts
import, export and printing

Technology used for 4Y series enables free exchange of printouts and labels (TXT or LB file format) between balances. The balances are compatible with vast range of PCL printers and label printers, wherein connection between printers and balances is established by RS 232, USB, Ethernet.

SQC statistics
on a micro scale

SQC
automatic data analysis

SQC statistics module is an excellent operating mode for complete control over measurement series of a particular sample. The control may be carried out in course of a manufacturing process (warning and critical limits) and during other tests.

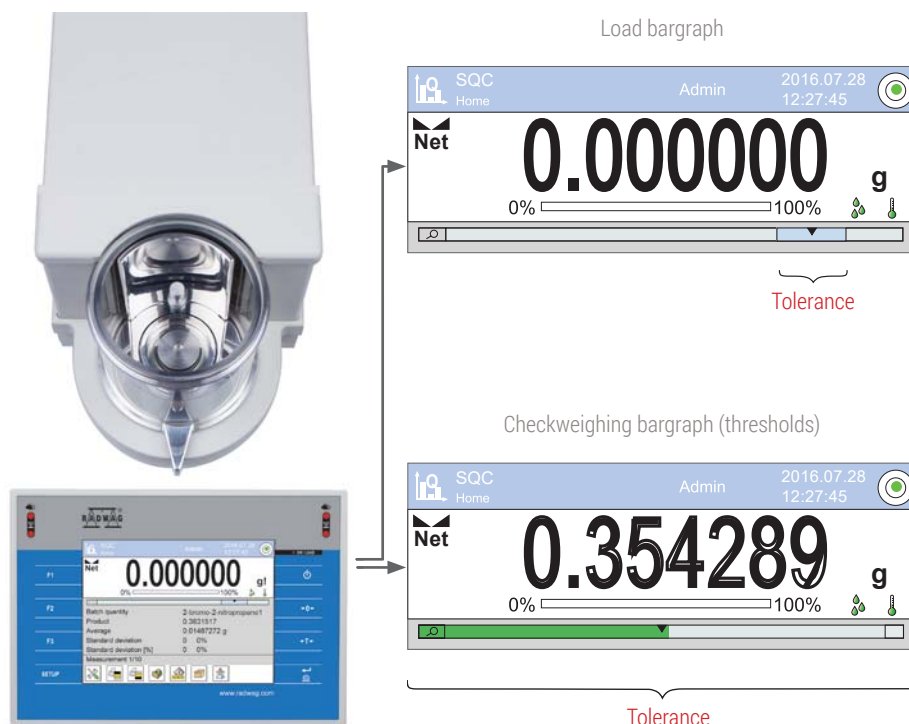## SQC Reports
homogeneous and clear information

SQC Reports is a modern tool for collecting information on carried out measurements, measurement numbers, names, statistic data, information data etc. The collected data is recorded in a database.

Viewer graph
automatic tolerance scaling

Viewer graph facilitates automatic scaling of checkweighing thresholds online, thus providing possibility of comparing current sample weight to a reference value. This tool permits safe and quick sampling wherein optimal accuracy is maintained.

```
-----------    SQC    -----------
User                          Lab
Product                      caps
Start date     2016.07.02 10:10:18
End date       2016.07.02 10:14:41
Batch number                  1\a
Batch quantity                 10
Mominal mass              0.361 g
Limit T2-        0.0361 g    10 %
Limit T1-       0.01805 g     5 %
Limit T1+       0.01805 g     5 %
Limit T2+        0.0361 g    10 %

--------- Measurement 1 ---------
Net                   0.366185 g
--------- Measurement 2 ---------
Net                   0.369271 g
--------- Measurement 3 ---------
Net                   0.385184 g
--------- Measurement 4 ---------
Net                   0.324771 g
--------- Measurement 5 ---------
Net                   0.356942 g
--------- Measurement 6 ---------
Net                   0.368712 g
--------- Measurement 7 ---------
Net                   0.355558 g
--------- Measurement 8 ---------
Net                   0.368694 g
--------- Measurement 9 ---------
Net                   0.368100 g
--------- Measurement 10---------
Net                   0.368100 g

Number of T2- errors      1   10 %
Number of T1- errors      1   10 %
Number of T1+ errors      1   10 %
Number of T2+ errors      0    0 %
Average             0.3631517 g
Standard deviation  0.01487272 g
---------------------------------
Signature
---------------------------------
```

Load bargraph

SQC Home		Admin	2016.07.28 12:27:45

Net **0.000000** g

0% |▭▭▭▭▭▭▭▭| 100%

Tolerance

Checkweighing bargraph (thresholds)

SQC Home		Admin	2016.07.28 12:27:45

Net **0.354289** g

0% |▭▭▭▭▭▭▭▭| 100%

Tolerance

Differential weighing

Analysis of sample weight variation

"Differential Weighing" module facilitates analysis of weight changes of a particular sample subjected to various processes. Two key components are of significant importance for the module operation, these are databases and methods.
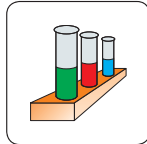
Measurement specification

Ambient conditions prevailing in the course of a particular measurement are recorded automatically. Comparison of respective data registered for various cycles lets the user prove conformity with standard guidelines.

Measuring methods

Diversity of measuring methods requires maximum flexibility of differential weighing function. The said function has to do with measuring methods used for weighing samples, even those that are grouped within one batch.

Conformity with regulations

OIML legal metrological control

Legal metrology requirements concern verification scale interval (e), the lowest value of which is 0,001 g. For declared deviation value of +/- 0,000003 g, resolution of microbalances is 0,000001 g. This allows to affirm that legal requirements are met.

OIML

WELMEC 2.3 software reliability

Program responsible for managing microbalance applications has been designed in a way providing that any reliability and data safety requirements are met (e.g. ALIBI memory). The program is protected against unwanted intrusion. Its structure may be restored when it comes to usage and metrology aspects (RADWAG Quality Management System).

WELMEC 2.3

USP, CFR 21 weight measurement accuracy

Within the scope of which there is data safety, password protected access to the program menu, various user authorization levels, traceability of balance settings modification (Trail System) and weighing system structures. MYA microbalances efficiency is confirmed in course of validation process.

USP CFR 21
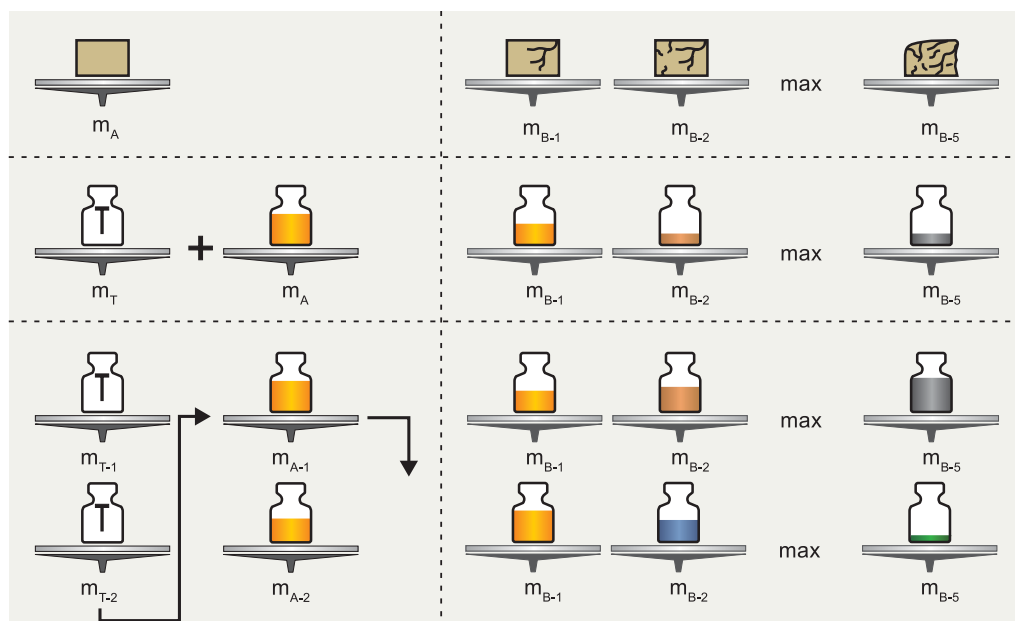
Methods are understood as sequence of steps. Any batches and samples may be selected and measured using any weighing cycle, e.g. mixed system

Data Sheet

	UYA 2.4Y	UYA 2.4Y.F	MYA 0.8/3.4Y	MYA 2.4Y	MYA 5.4Y
OIML accuracy class	I	I	I	I	I
Max capacity [Max]	2.1 g	2.1 g	0.8 g / 3 g	2.1 g	5.1 g
Readability [d]	0.1 µg	0.1 µg	1 µg / 10 µg	1 µg	1 µg
Verification scale interval [e]	1 mg	1 mg	1 mg	1 mg	1 mg
Tare range	-2.1 g	-2.1 g	-3 g	-2.1 g	-5.1 g
Repeatability *	0.4 µg	0.4 µg	1 µg	1 µg	1 µg
Linearity	±1.5 µg	±1.5 µg	±3 µg / ±4 µg	±3 µg	±5 µg
Eccentricity	1.5 µg	1.5 µg	3 µg / 4 µg	3 µg	5 µg
Sensitivity drift	1ppm / °C (temperature range +15 ÷ +35 °C)				
Sensitivity stability	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt
Sensitivity offset	$1.5 \times 10^{-6} \times$ Rt	$1.5 \times 10^{-6} \times$ Rt	$1.5 \times 10^{-6} \times$ Rt	$1.5 \times 10^{-6} \times$ Rt	$1.5 \times 10^{-6} \times$ Rt
Sensitivity temperature drift	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt
Minimum weight	0.08 mg	0.08 mg	0.2 mg	0.2 mg	0.2 mg
Minimum weight USP	0.9 mg	0.8 mg	2 mg	2 mg	2 mg
Stabilization time	10-20 s	10-20 s	5 s	5 s	5 s
Adjustment	automatic (internal)				
Display	colour 5,7" resistive touch screen				
Communication interface	2 × USB. 2 × RS 232. Wireless Module. Ethernet. 4 × IN / 4 × OUT				
Working temperature	+18 ÷ +30 °C	+10 ÷ +30 °C	+10 ÷ +40 °C	+10 ÷ +40 °C	+10 ÷ +40 °C
Atmospheric humidity **	40% ÷ 80%	40% ÷ 80%	40% ÷ 80%	40% ÷ 80%	40% ÷ 80%
Weighing pan size	ø 16 mm	ø 50 mm	ø 16 + 60 mm (for filters)	ø 16 mm	ø 26 mm

PC software

Radwag-designed PC software is a considerable support for microbalances, enhancing the device capability and functionality.

PW Win
Balance and computer cooperation, display of measurements and statistics.

RAD Key
Readout of balance data by means of defined Hot Key.

Database Editor
Databases support for 4Y balances.

E2R Weighing Records
E2R Weighing Records – Recording measurements performed by means of balances cooperating in a network.

MYA 11.4Y	MYA 11/52.4Y	MYA 21.4Y	MYA 21.4Y.P	MYA 5.4Y.F	MYA 5.4Y.F1
I	I	I	I	I	I
11 g	11 g / 52 g	21 g	21 g	5 g	5 g
1 µg	1 µg / 10 µg	1 µg	1 µg	1 µg	1 µg
1 mg	1 mg	1 mg	1 mg	1 mg	1 mg
-11 g	-52 g	-21 g	-21 g	-5 g	-5 g
1.5 µg	1.5 µg	1.5 µg	1.5 µg	1.6 µg	1.6 µg
±6 µg	±10 µg / ±30 µg	±7 µg	±7 µg	±5 µg	±5 µg
6 µg	6 µg / 10 µg	7 µg	7 µg	5 µg	5 µg
1ppm / °C (temperature range +15 ÷ +35 °C)					
1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt	1×10^{-6} / Rok × Rt
$3 \times 10^{-6} \times Rt$	$3 \times 10^{-6} \times Rt$	$4 \times 10^{-6} \times Rt$	$4 \times 10^{-6} \times Rt$	$1.5 \times 10^{-6} \times Rt$	$1.5 \times 10^{-6} \times Rt$
1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt	1×10^{-6} / °C × Rt
0.3 mg	0.3 mg	0.3 mg	0.3 mg	0.32 mg	0.32 mg
3.0 mg	3.0 mg	3.0 mg	3.0 mg	3.2 mg	3.2 mg
5 s	5 s	5 s	5 s	5 s	5 s
automatic (internal)					
colour 5,7" resistive touch screen					
2 × USB. 2 × RS 232. Wireless Module. Ethernet. 4 × IN / 4 × OUT					
+10 ÷ +40 °C	+10 ÷ +40 °C	+10 ÷ +40 °C	+10 ÷ +40 °C	+10 ÷ +40 °C	+10 ÷ +40 °C
40% ÷ 80%	40% ÷ 80%	40% ÷ 80%	40% ÷ 80%	40% ÷ 80%	40% ÷ 80%
ø 26 mm	ø 26 mm / ø 40 mm	ø 26 mm	ø 26 mm	ø 100 mm + ø 26 mm	ø 160 mm + ø 26 mm

Additional equipment

- Anti-vibration weighing tables,
- Thermal and dot matrix printers,
- Printer Cables and PC,
- Additional LCD display,
- Ambient conditions module,
- Barcode scanners,
- Additional adapter for pipettes calibration,
- Pipettes calibration workstation

Complete offer is to be found on www.radwag.com website.

Additional Services

- Calibration of electronic weighing equipment,
- Calibration of mass standards,
- Instalation Qualification PQ/QQ/IQ
- Calibration of piston pipettes.

Complete offer is to be found on www.radwag.com website.

Rt - net weight,
*   repeatability is expressed as a standard deviation from 10 weighing cycles of a particular load,
** non-condensing conditions.

Features:

Touchscreen display

Databases

Portable terminal

Automatic on-line monitoring of level

Proximity sensors

Interfaces: USB, Wireless Module, Ethernet, IN/OUT and RS 232

Profiles

Alibi Memory

Ambient conditions monitoring
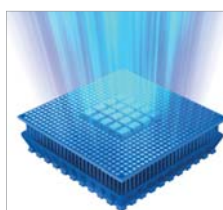
Multimedia

Functions:

Checkweighing

Filling

Percent setup

Infrared sensors

Formulation

Statistics

Pipette calibration

Differential weighing

Statistical Quality Control

GLP procedures

Air density compensation

Ambient conditions monitoring

Autotest (GLP, Filter)