New generation of microbalances
functionality and precision

The weighing technique of high resolute Ions requires continual improvement of repeatability and stability within the operation temperature range. Nowadays more and more attention is turned to ergonomics of applied solutions - productivity and effectiveness of work.

In the end of 2008 year RADWAG marketed a new version of microbalances of MXA series – with maximum capacity Max 21g and readability d=1µg. The compact, hermetic enclosure of the mechanical part protects the system against accidental mechanical shock
s. The weighing chamber is made of antistatic glass ensuring access the left and right side as well as from above to the weight pan. The new thing in this solution constitutes two proximity detectors that help to automatically control some activities. By default each detector controls opening and closing the weighing chamber from one side. This solution is required while during weighing manual opening of the chamber is impossible. Every detector can be set to operate in different ways:

- Left side,
- Right side,
- tarring,
- printout,
- non-active.

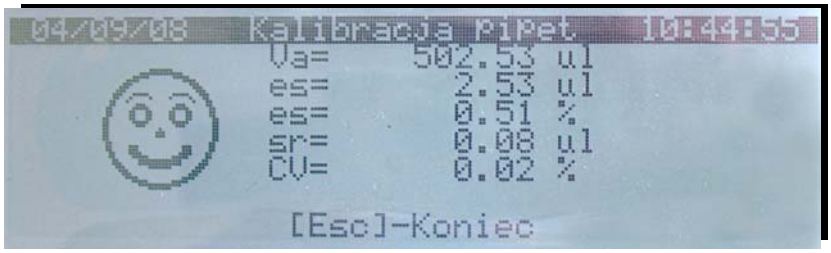
The presented solution assures flexibility in building ones own laboratory weighing stands according individual needs e.g. the right detector for opening and closing the right side, the left for tarring.

The stand for calibrating pipettes

Apart from automatic control via proximity detectors microbalances have functionalities connected with graphic displays such as: backlight, brightness setting, contrast setting, screen saver, password protection. Owning to that readability of the display is assured even in poorly lit compartments and unauthorized access to devices practically impossible.
The menu structure on the graphic display is easy to read and intuitive. The set of 12 keys and accessible in the menu language versions: Polish, English, Italia, Spanish, French, German cause that the microbalance can be perceived as an ergonomic and precise measurement instrument on the European mark et.

It is advisable to connect a PC keyboard to the PS interface to speed up operation. Balance software includes different procedures accessible from the menu: counting pieces, weighing in tolerance, filling, percents, standard deviation, recipes, statistics and pipette calibration.

The pipette calibration procedure comprises possibility of calibrating pipettes with constant and adjustable volume. There are errors of accuracy and repeatability of volume for Max, Min and ½ Max estimated for pipettes with adjustable volume. Depending on the way work is organized, pipette calibration can be performed with procedures in the balance or using a computer program. The first solution is much simpler and can result in printing a calibration report. The range of checked volume and number of samples is freely declarable.



Balance display – final result of calibration procedure

*** Check pipette calibration ***

Temp. : 22.5 °C
Presure : 1013 hPa
Humidity: 50 %

Results Vmin:
1 100.45 ul
2 100.55 ul
3 100.55 ul
4 100.65 ul
5 100.55 ul

Vmin= 100.00 ul
Va= 100.55 ul
es= 0.55 ul
es= 0.55 %
sr= 0.07 ul
CV= 0.07 %

Results Vmax:
1 1004.90 ul
2 1004.80 ul
3 1004.60 ul
4 1004.80 ul
5 1004.80 ul

Vmax= 1000.00 ul
Va= 1004.78 ul
es= 4.78 ul
es= 0.48 %
sr= 0.11 ul
CV= 0.01 %

Results V1/2:
1 502.65 ul
2 502.55 ul
3 502.45 ul
4 502.45 ul
5 502.55 ul

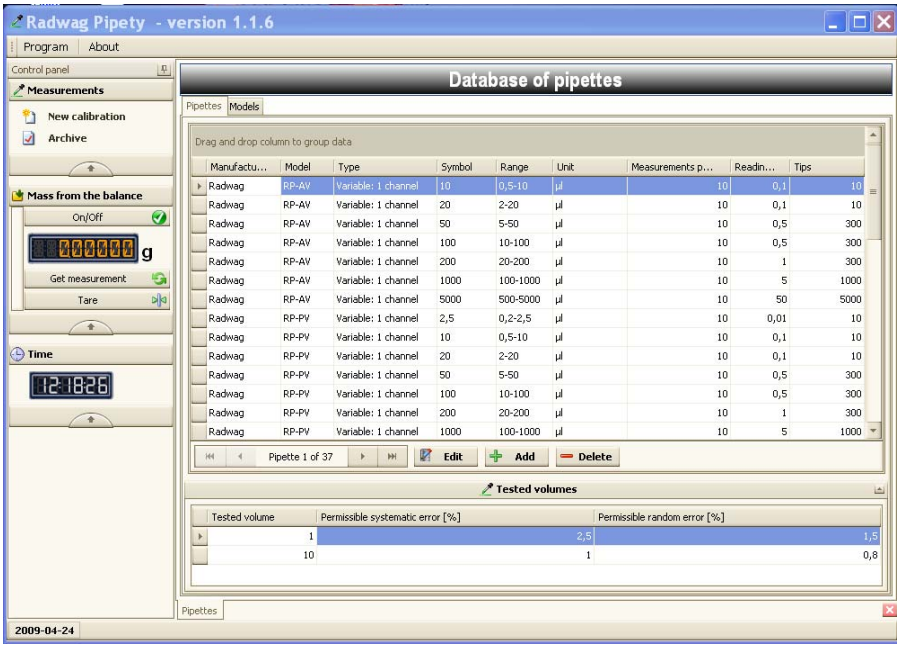
V1/2= 500.00 ul
Va= 502.53 ul
es= 2.53 ul
es= 0.51 %
sr= 0.08 ul
CV= 0.02 %

Name .....

Report from a balance after the pipette calibration procedure

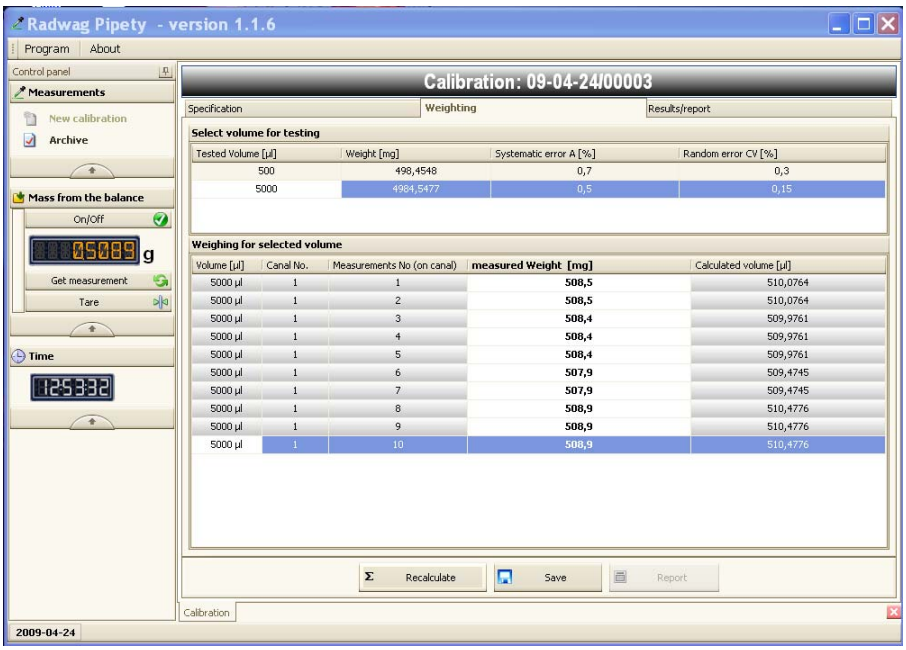
Using the PC software all the necessary calculations are performed by a computer and the scale constitutes only a precise measurement instrument. Communication between a computer and a balance is performed via RS 232. Computer software comprises databases that can include:

- company data
- operators
- inventory of applicable balances
- inventory of pipettes



Selecting a pipette from the database

After completing calibration of a pipette the transfer of results should be performed using command recalculate. It will result in calculating volume considering initial conditions and coefficient Z that depends on air temperature and atmospheric pressure. Numerical values are given in a table from the PN-EN ISO 8655-6:2003 standard.



A pipette calibration – cumulative sheet

The final results are saved in the database and can be printed out any time. A user, after choosing from the menu Results/Report, can see a cumulative sheet as a report from the performed procedure that can be printed out. Cooperation computers with balances is not only practical but also useful from the reason of widely applied quality systems. All pipettes are checked as far as accuracy and repeatability of dosing is concerned according to the standard PN-EN ISO 8655-2:2003. All the calculations are performed according to the standard PN-EN ISO 8655-6:2003 requirements, using the gravimetric method.

RADWAG®

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PIPETTE CALIBRATION REPORT

	Document No.	Operator	Calibration date	CALIBRATION RESULT
Current calibration	**09-04-24/00001**	**John Smith**	**2009-04-24 11:13:40**	**DISCARD**

PIPETTES DATA

Manufacturer:	Radwag		
Model/symbol:	RP-AV /	1000	
Range/increment/tips:	100-1000 /	5 /	1000
Type:	Variable: 1 channel		
Unit:	µl		
Serial No:	**125**		

ENVIRONMENTAL CONDITIONS

Air temperatute [°C]	21
Pressure [hPa]	1013
Humidity [%]	50
Z factor [ml/g]	1,0031
Evaporation factor K	1
Temp. of water [°C]	21

AVERAGE RESULTS

Volume [µl]	Weight [mg]	Norm, systematic error [%]	Norm, random error [%]
100,00	99,6910	2,5	0,7

Canal No / Weighings	Averange volume [µl]	Syst. err. [%]	Rand. err. [%]	Result A	Result CV
Canal 1	0,0000	0,0000	0,0000	☐	☐
0,00 0,00	0,00 0,00	0,00 0,00	0,00 0,00	0,00 0,00	

Volume [µl]	Weight [mg]	Norm, systematic error [%]	Norm, random error [%]
1000,00	996,9095	0,6	0,2

Canal No / Weighings	Averange volume [µl]	Syst. err. [%]	Rand. err. [%]	Result A	Result CV
Canal 1	0,0000	0,0000	0,0000	☐	☐
0,00 0,00	0,00 0,00	0,00 0,00	0,00 0,00	0,00 0,00	

SUMMARY

Calibration

Basis for calibration:	Ex
Measurements per canal	10
Mass unit	mg
Next calibration:	2009-05-24 11:13:40

Balance

Name/model:	MXA 30
Unit:	g

Thermo-higro-barometer

Manufacturer:	-
Name/type:	-
Serial No:	-

Comments: Calibration date:2009-04-24 11:13:40

Operator: John Smith

Operator signature

Final report from calibrating pipettes