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 $d=1\mu g$. 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.

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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

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	RP-AV							10				
Radwag	RP-AV	Variable: 1 channel	20	2-20	рI	10	0,1	10				
Radwag	RP-AV	Variable: 1 channel	50	5-50	μl	10	0,5	300				
Radwag	RP-AV	Variable: 1 channel	100	10-100	μl	10	0,5	300				
Radwag	RP-AV	Variable: 1 channel	200	20-200	μ	10	1	300				
Radwag	RP-AV	Variable: 1 channel	1000	100-1000	μ	10	5	1000				
Radwag	RP-AV	Variable: 1 channel	5000	500-5000	μl	10	50	5000				
Radwag	RP-PV	Variable: 1 channel	2,5	0,2-2,5	μl	10	0,01	10				
Radwag	RP-PV	Variable: 1 channel	10	0,5-10	рI	10	0,1	10				
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Radwag	RP-PV	Variable: 1 channel	50	5-50	pl	10	0,5	300				
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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.

easurements			Calib	ration: 09-04-24/000	18					
New calibration	Specification		Weighti	ing	Results/report					
Archive	Select volume for testing									
Archive	Tested Volum	e (µl)	Weight [mg]	Systematic error A [%]	Random error CV [%]					
*	500		498,4548	0,7	0,3					
ass from the balance		5000	4984,5477							
On/Off 🥑										
ASUBS a	Weighing for	selected vo	lume							
g g	Volume [µl]	Canal No.	Measurements No (on canal)	measured Weight [mg]	Calculated volume [µl]					
Get measurement 🧐	5000 µl	1	1	508,5	510,0764					
Tare 🖂	5000 µl	1	2	508,5	510,0764					
	5000 µl	1	3	508,4	509,9761					
(*)	5000 µl 1		4	508,4	509,9761					
ne	5000 µl	1	5	508,4	509,9761					
	5000 µl	1	6	507,9	509,4745					
12,23,355	5000 µl	1	7	507,9	509,4745					
	5000 µl	1	8	508,9	510,4776					
(*)	5000 µl	1	9	508,9	510,4776					
	5000 µl	1	10	508,9	510,4776					

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.

RADWA		TTE CA	Company Department Street Postcode / C Telephone E-mail WWW		Radwag Laborator Bracka 28 26-600 3848800 radwag@ www.radv	Radom radwag.pl vag.pl		
	Document No.	Operator		Ca	libration c	late	CALIBRA	TION RESULT
Current calibration	09-04-24/00001	John Sm	nith	20	09-04-24	11:13:40	DISCA	RD
PIPETTES DATA Manufacturer. Model/symbol:	Radwag RP-AV /	1000		ENVIRONMENT Air temperatute Pressure [hPa]		1 TIONS 21 1013		
Range/increment/tips: Type: Unit:	100-10007 Variable: 1 channel µl	5/ 1		Humidity (%) Z factor (ml/g) Evaporation fact	nr K	50 1,0031 1		
Serial No:	125			Temp. of water [21		
Volume [µl]	Volume [u]] Weight [mg]			Norm, systematic error [%		6] Norm, random error [%]		
100,00		99,6910		2,5			0,7	
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0,00 0,00	0,00 0,0	0,00	0,00	0,00	0,00	0,00	0,00	
Volume [µl]		Weight [mg]		Norm, system	atic error [%]	Norm, ran	dom 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	0,000		0,0000				
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Final report from calibrating pipettes