MONDAY BASICS:
TRAINING & COFFEE

LAB BASICS: MICROPIPETTES

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Departament d'Enginyeria Química

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Senior Technician

Research group:

Interfibio

Group member:

repte experimenta

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CRUCIAL LABORATORY TOOL

What is the purpose of a micropipette?

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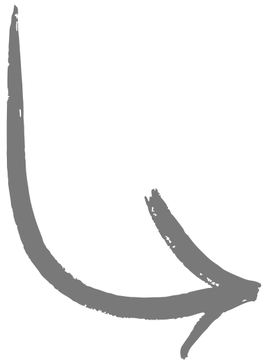
GOOD USE OF MICROPIPETTES



- Conditions
- Verification

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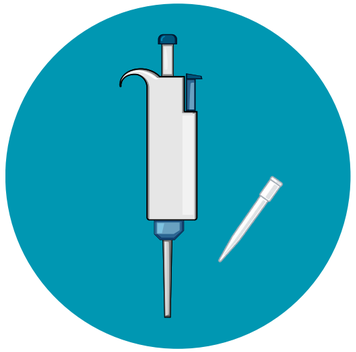
CONDITIONS



Pipette and tips

Technique

Avoid contamination

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VERIFICATION

- Accuracy
- precision

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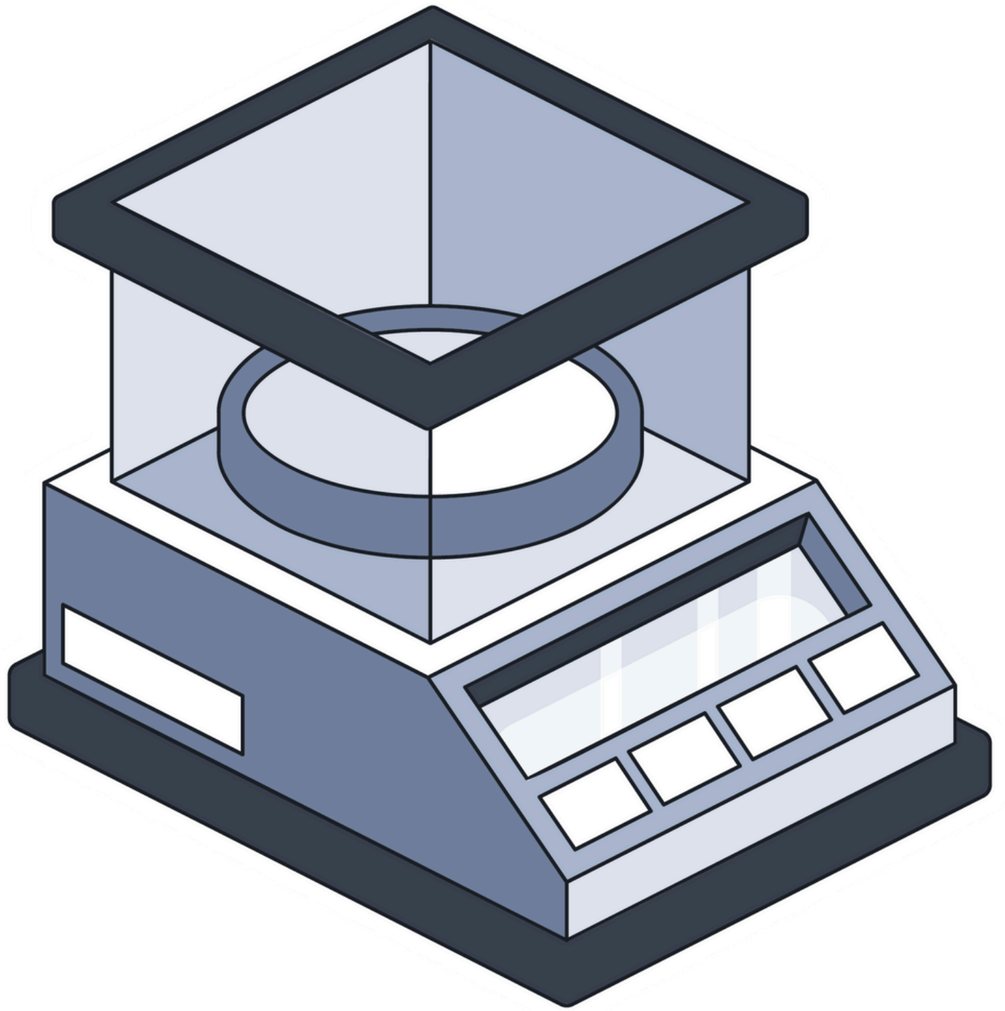
How to verify micropipette?

→ Analytical balance



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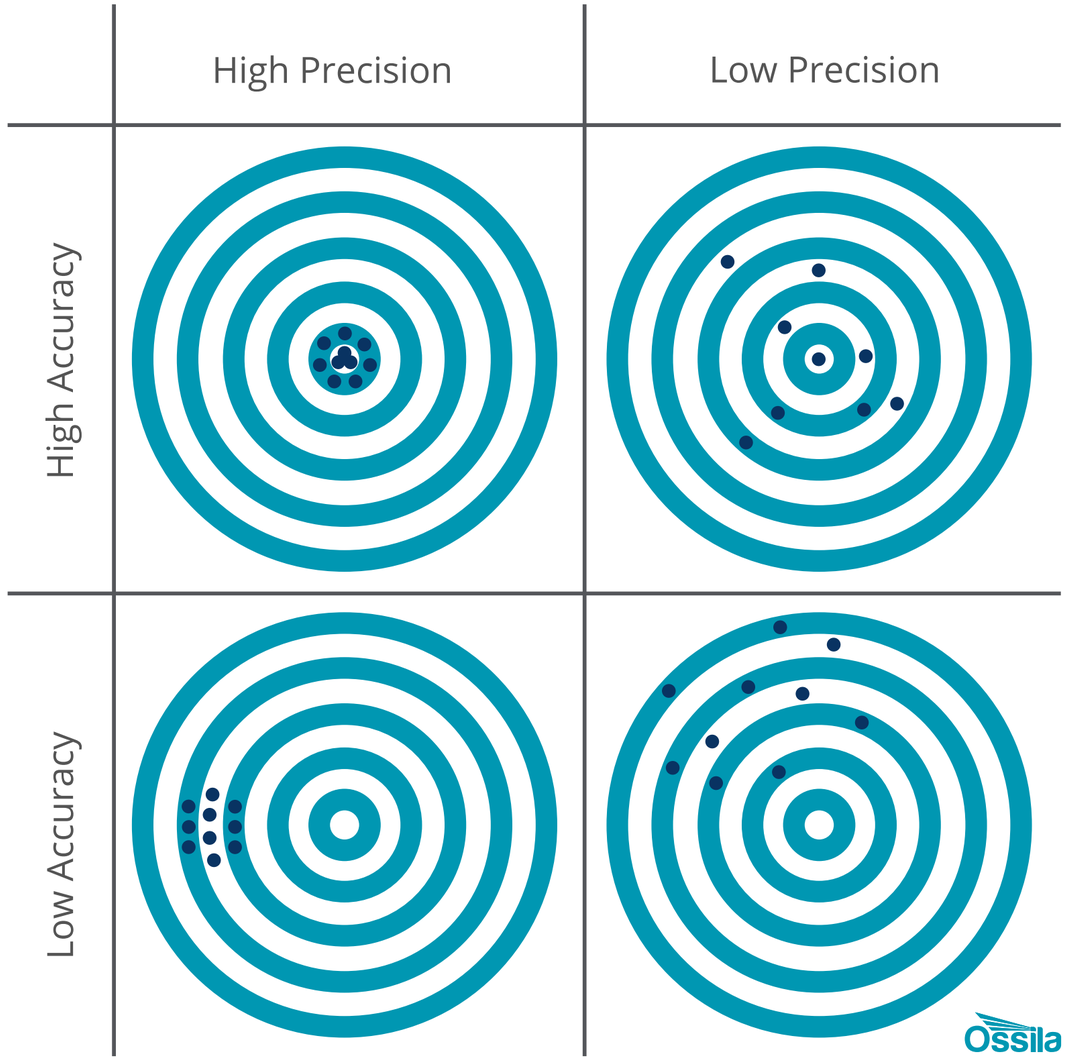
ACCURACY

- Correctness

PRECISION

- Repeatability



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VERIFICATION

CALIBRATION

- Frequency of micropipette use
- Handling and care of micropipette
- Type of liquid dispensed
- Micropipette applications

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GOOD TO KNOW

- Range of verification
- Balance
- Procedure

Experimental work

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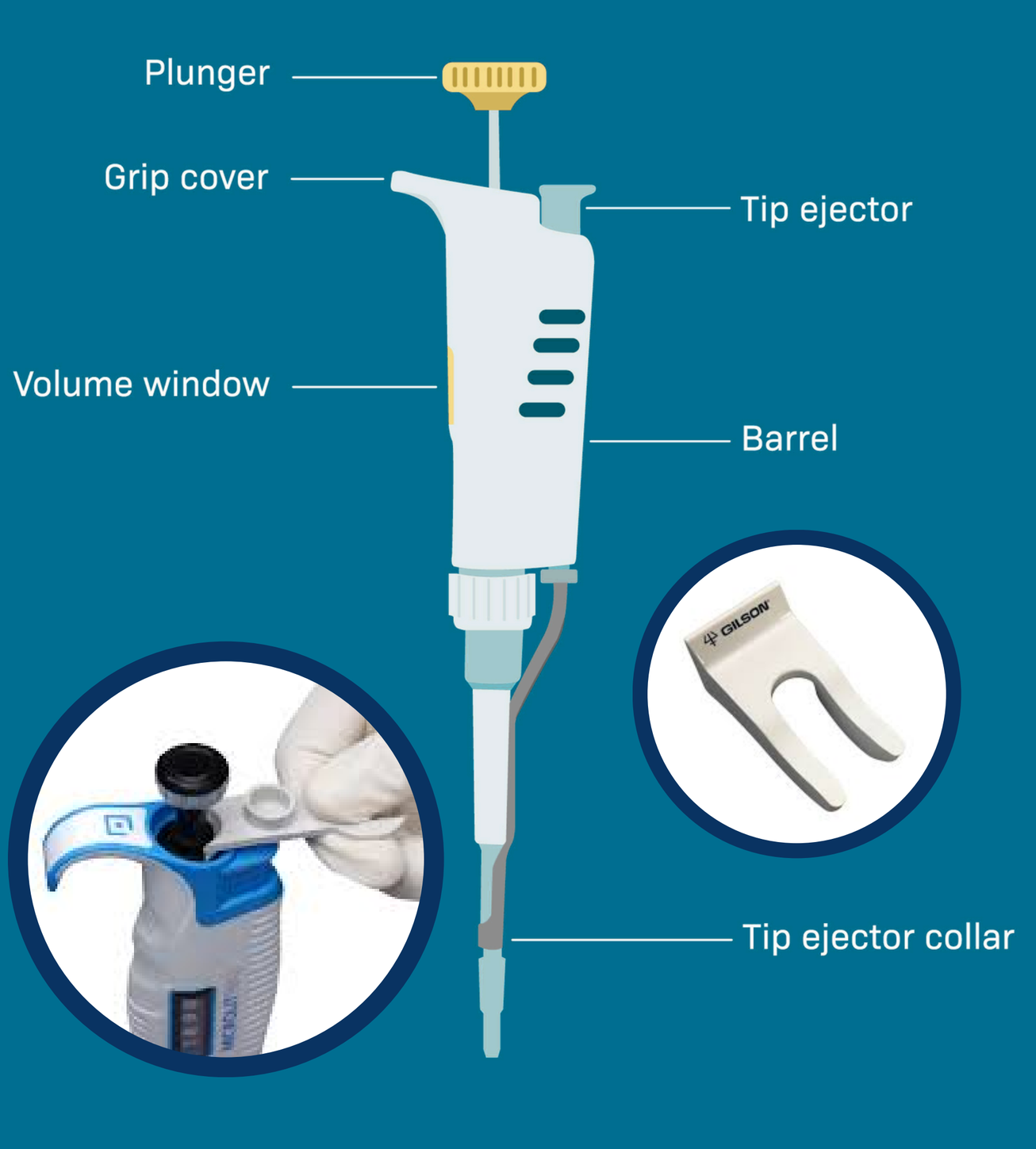
MICROPIPETTES

Micropipettes are provided with a calibration tool and a micropipette stand as an accessory



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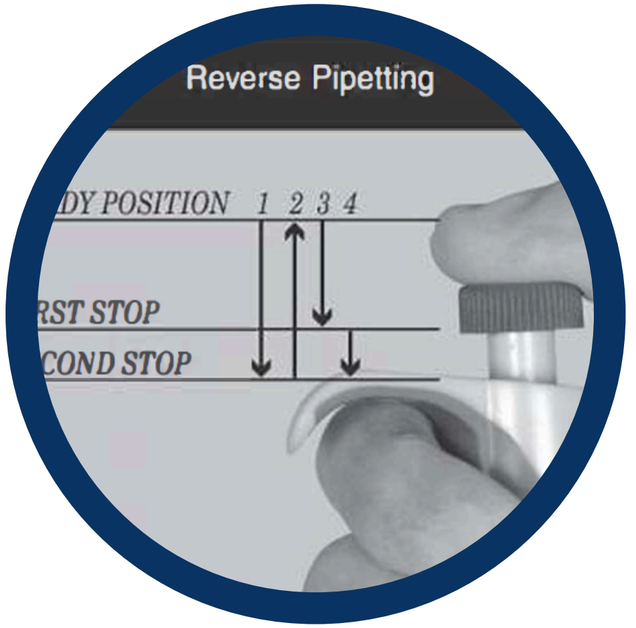
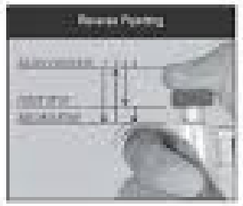
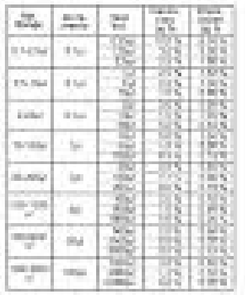
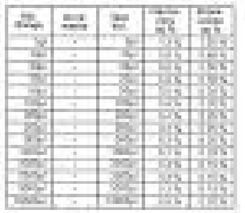
MICROPIPETTES

Manual include accuracy and precision for each volume, calibration and in-house maintenance procedures









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MICROPIPETTES

- 0.1 - 2.5 µl
- 0.5-10 µl
- 2-10 µl
- 10-100 µl
- 20-200 µl
- 100-1000 µl
- 1000-5000 µl
- 2-10 ml

	CRITERIA	
volume (µl)	Accuracy (%)	Precision (%)
0,5	4,0	2,0
1,0	4,0	2,0
2,0	3,5	1,6
5,0	3,0	1,4
10,0	3,0	1,4
50,0	2,5	1,2
100,0	2,0	0,8
200,0	2,0	0,8
500,0	2,0	0,8
1000,0	1,8	0,6
1500,0	1,8	0,6
2000,0	1,6	0,6
3500,0	1,6	0,6
5000,0	1,6	0,6
10000,0	1,2	0,6

According our experimental work

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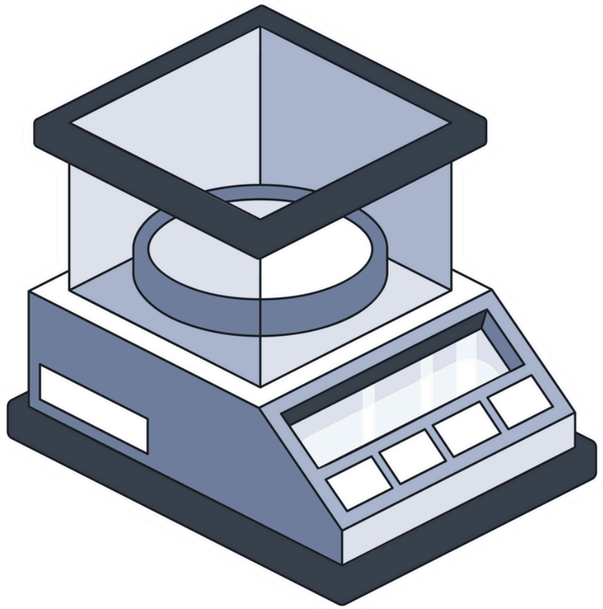
BALANCE



- Mettler AE163

	Acceptance Criteria	
Weight mass (g)	Acceptance Criteria Accuracy-Linearity(g)	Acceptance criteri St. deviation (g)
0.1	0.00010	0.00050
1.0	0.00020	0.00050
50.0	0.00200	0.00100

According our experimental work

- Kern EW

	Acceptance Criteria	
Weight mass (g)	Acceptance Criteria Accuracy-Linearity(g)	Acceptance criteri St. deviation (g)
1.0	0.05	0.02
50.0	0.05	0.02

According our experimental work

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EXAMPLES
Which balance to choose?

- Micropipette P10 0.5-10 µl

Measure of 5 µl

Accuracy 3 % (4.85 µL - 5.15 µL)

Weight (0.00485 g - 0.00515 g)

5 digits in the balance

Verification with balance Merck

Linearity 0.00010 g

- Micropipette 10 mL

Measure of 5000 µL

Accuracy 1.6 % (4920 µL - 5080 µL)

Weight (4.920 g - 5.080 g)

2 digits in the balance

Verification with balance Kern

Linearity 0.05 g

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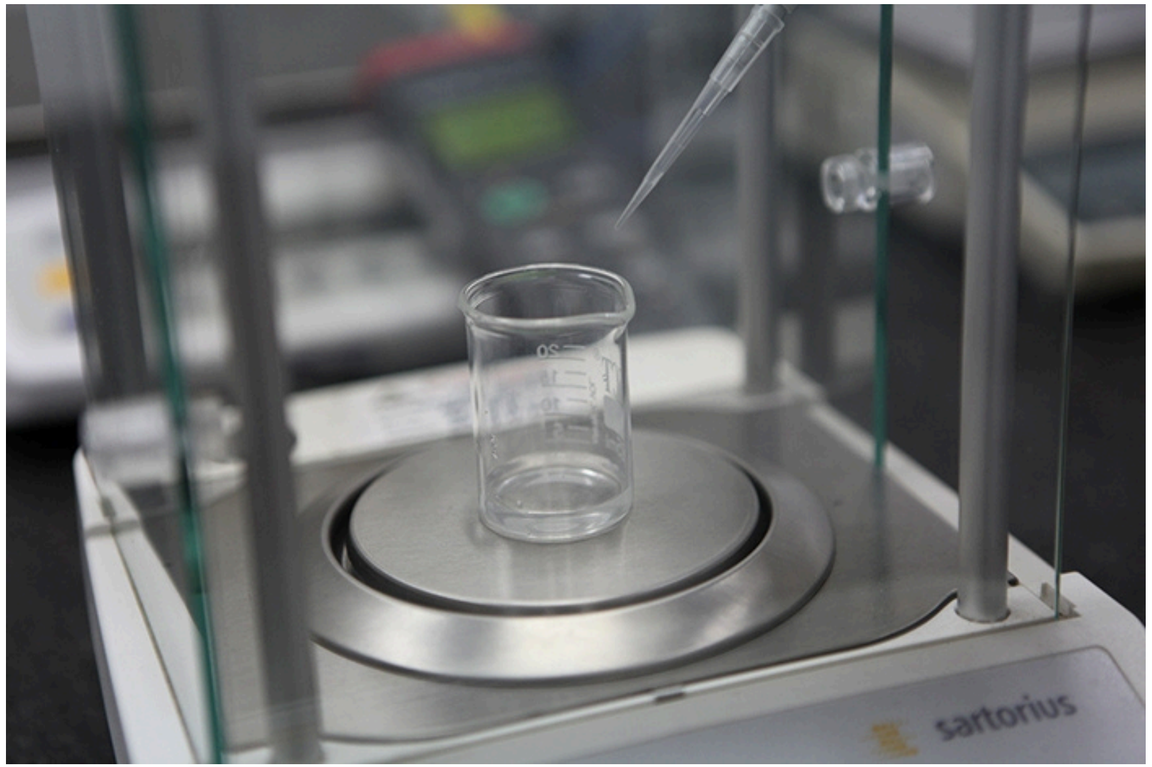
VERIFICATION PROCEDURE

- Verify the balance
- Measure temperature of the water
- Weight several times a defined volume of water



- **Use a container micro-weighing for small volumes (≤10 µL)**

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SMALL VOLUMES

→ **water loss**

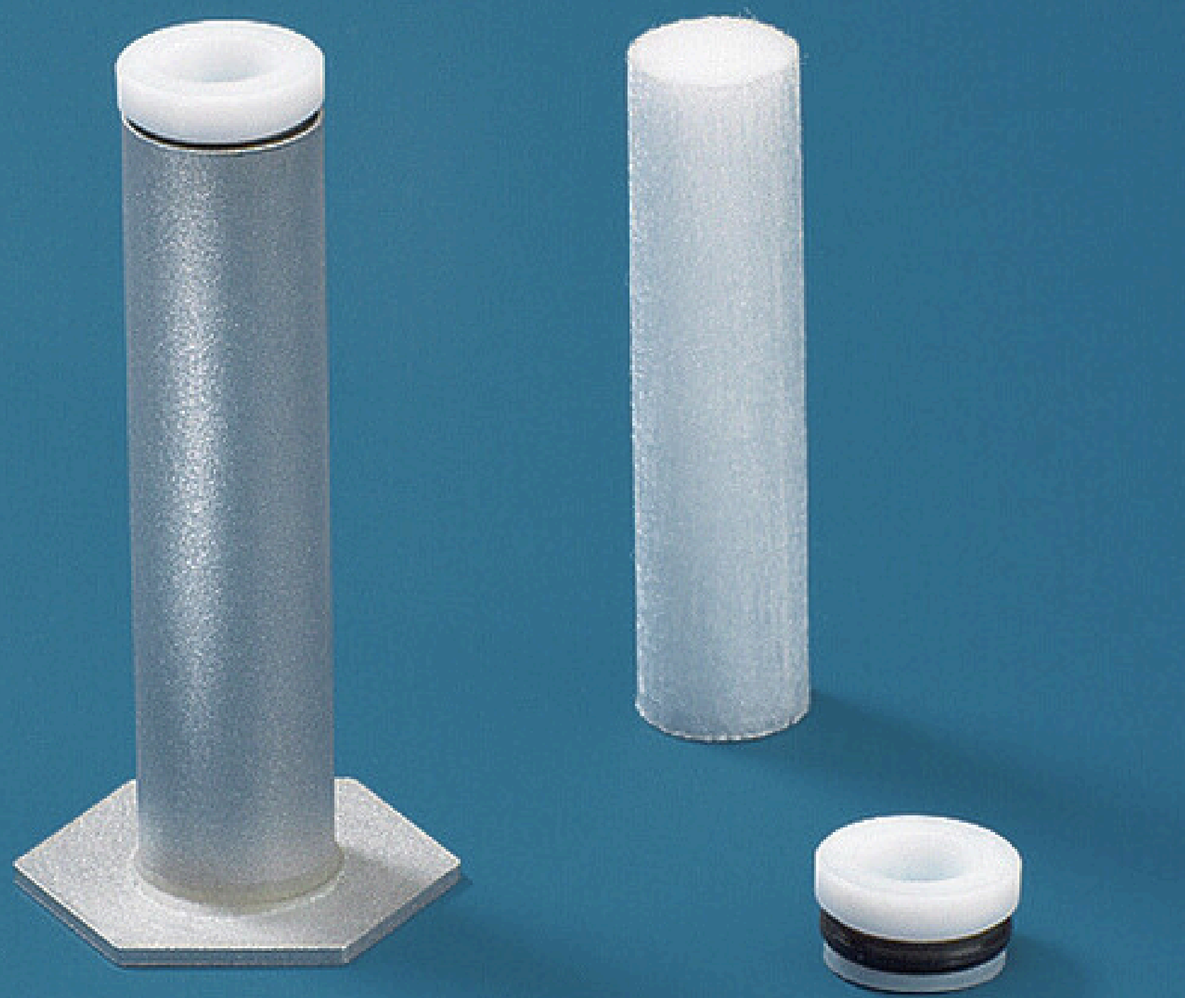
Price

- VWR International Eurolab, S.L.
  ref. BRND708470 42.50 €

- Fisher Scientific, S.L.
  ref. 70323033 45.84 €

Container micro-weighing

BRAND ref. 708470



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TEMPERATURE

- ISO 8655, for volumetric equipment, “Z-Factor” is a temperature-dependent correction factor used to convert measured mass to volume.

CORRECTION FACTOR Z	
T °C	FACTOR Z
10	1,0015
10,5	1,00155
11	1,0016
11,5	1,00165
12	1,0017
12,5	1,00175
13	1,0018
13,5	1,00185
14	1,0019
14,5	1,00195
15	1,002
15,5	1,00205
16	1,0021
16,5	1,0022
17	1,0023
17,5	1,0024
18	1,0025
18,5	1,0026
19	1,0027
19,5	1,0028
20	1,0029

CORRECTION FACTOR Z	
T °C	FACTOR Z
20,5	1,003
21	1,0031
21,5	1,0032
22	1,0033
22,5	1,0034
23	1,0035
23,5	1,00365
24	1,0038
24,5	1,0039
25	1,0040
25,5	1,0041
26	1,0043
26,5	1,00435
27	1,0045
27,5	1,0047
28	1,0048
28,5	1,00485
29	1,0051
29,5	1,00515
30	1,0054

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VERIFICATON REPORT

UNIVERSITAT ROVIRA I VIRGILI Sistema de Gestió de la Qualitat R+D+i	**VERIFICATION INTERNAL REPORT MICROPIPETTES**	2-RG0705-INTERFIBIO Versió: Data:

Equipment:		PNT Equipement:	
Identification n.:		Standard used:	
Brand / Model:		Person for verifcation:	
Temperature (°c)	Z		

			WEIGHT (mg)					ACCURACY				PRECISION				VERIFICATION RESULTS	
	Vol	Teorical volume (µL)	pes 1 (mg)	pes 2 (mg)	pes 3 (mg)	pes 4 (mg)	pes 5 (mg)	Average	Accuracy (%)	Acceptable accuracy criteria (%)	Pass Accuracy (S/N)	Standard Deviation	Precision cv (%)	Acceptable precision criteria (%)	Pass Precision		
Verification date	Superior volume	2						=(PROMEDIO(D12:H12))*D8	=((I12-C12)*100)/C12	3,5	=SI(ABS(J12)<=K12;"PASSA";"NO PASSA")	=DESVEST(D12:H12)	=(M12*100)/I12	1,6	=SI(ABS(N12)<=O12;"PASSA";"NO PASSA")	=SI(ABS(N12)<=O12;"PASSA";"NO PASSA")	=SI(R12="MAL";"MAL";SI(R13="MAL";"MAL";"OK"))
	Inferior volume	0,5						=(PROMEDIO(D13:H13))*D8	=((I13-C13)*100)/C13	4,0	=SI(ABS(J13)<=K13;"PASSA";"NO PASSA")	=DESVEST(D13:H13)	=(M13*100)/I13	2,0	=SI(ABS(N13)<=O13;"PASSA";"NO PASSA")	=SI(ABS(N13)<=O13;"PASSA";"NO PASSA")	

Weights

Accuracy

Precision

Pass or not pass

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EXAMPLE REPORT

- **Kartell, 846710004, 0.5 - 2 µl**

	CRITERIA	
volume (µl)	Accuracy (%)	Precision (%)
2,0	3,5	1,6
5,0	3,0	1,4

CORRECTION FACTOR Z	
T ºC	FACTOR Z
23	1,0035

Equip:	Micropipeta			**PNT Equip:**	PNT 25
Nº Identificació:	846710004			**Patrons utilitzats:**	Aigua desionitzada i balança analítica calibrada
Marca i model:	Kartell			**Nom persona que realitza la verificació:**	Responsable laboratori
Temperatura (ºc)	23	**Z**	1,0035		

			PESADES (mg)					EXACTITUD				PRECISIÓ				RESULTAT VERIFICACIÓ	
Data verificació	Vol	Vol. Teoric (µl)	pes 1 (mg)	pes 2 (mg)	pes 3 (mg)	pes 4 (mg)	pes 5 (mg)	promig	Exactitud (%)	Criteri acceptació Exactitud (%)	Passa exactitud (S/N)	desviació estàndar	Precisió cv (%)	Criteri acceptació Precisió (%)	Passa precisió		
25/4/2025	Vol. Superior	2	2,00	2,01	2,05	2,03	2,02	2,029	1,454	3,5	PASSA	0,0	0,9	1,6	PASSA	OK	OK
	Vol. Inferior	0,5	0,50	0,49	0,49	0,49	0,51	0,498	-0,5	4,0	PASSA	0,0	1,8	2,0	PASSA	OK	

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EXAMPLE REPORT

- **Kartell, 846710004, 0.5- 2 µl**

			PESADES (mg)					EXACTITUD				PRECISIÓ				RESULTAT VERIFICACIÓ	
Data verificació	Vol	Vol. Teoric (µl)	pes 1 (mg)	pes 2 (mg)	pes 3 (mg)	pes 4 (mg)	pes 5 (mg)	promig	Exactitud (%)	Criteri acceptació Exactitud (%)	Passa exactitud (S/N)	desviació estàndar	Precisió cv (%)	Criteri acceptació Precisió (%)	Passa precisió		
25/4/2025	Vol. Superior	2	2,08	2,07	2,07	2,08	2,06	2,079	3,963	3,5	NO PASSA	0,0	0,4	1,6	PASSA	MAL	MAL
	Vol. Inferior	0,5	0,52	0,49	0,49	0,49	0,51	0,502	0,4	4,0	PASSA	0,0	2,8	2,0	NO PASSA	MAL	

CALIBRATION

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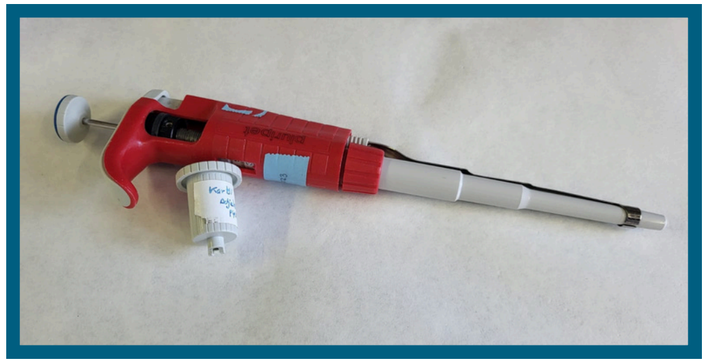
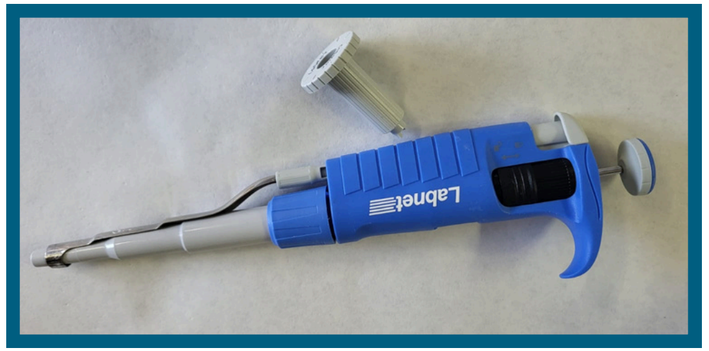
EXAMPLES MICROPIPETTES



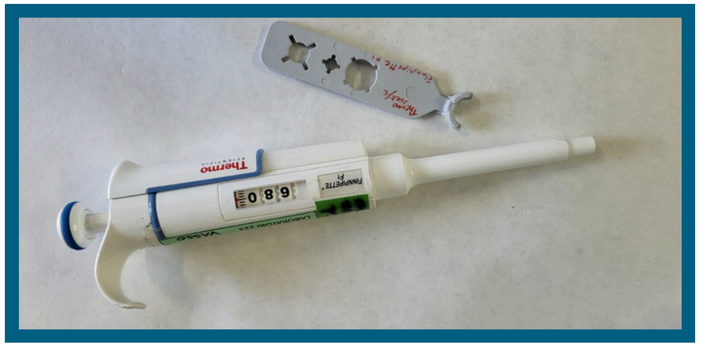
- Kartell

- LLG

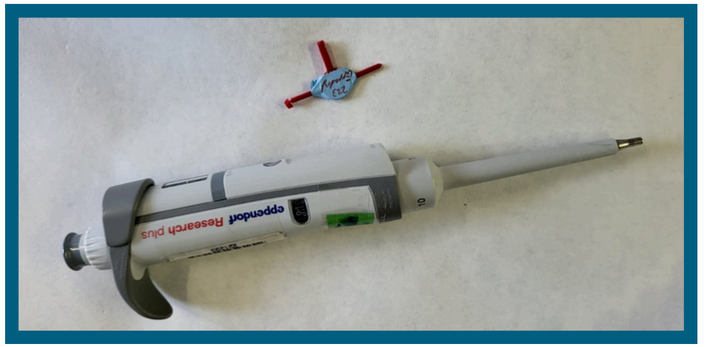
- Brand



- Labnet



- ThermoScientific



- Eppendorf

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Thank you

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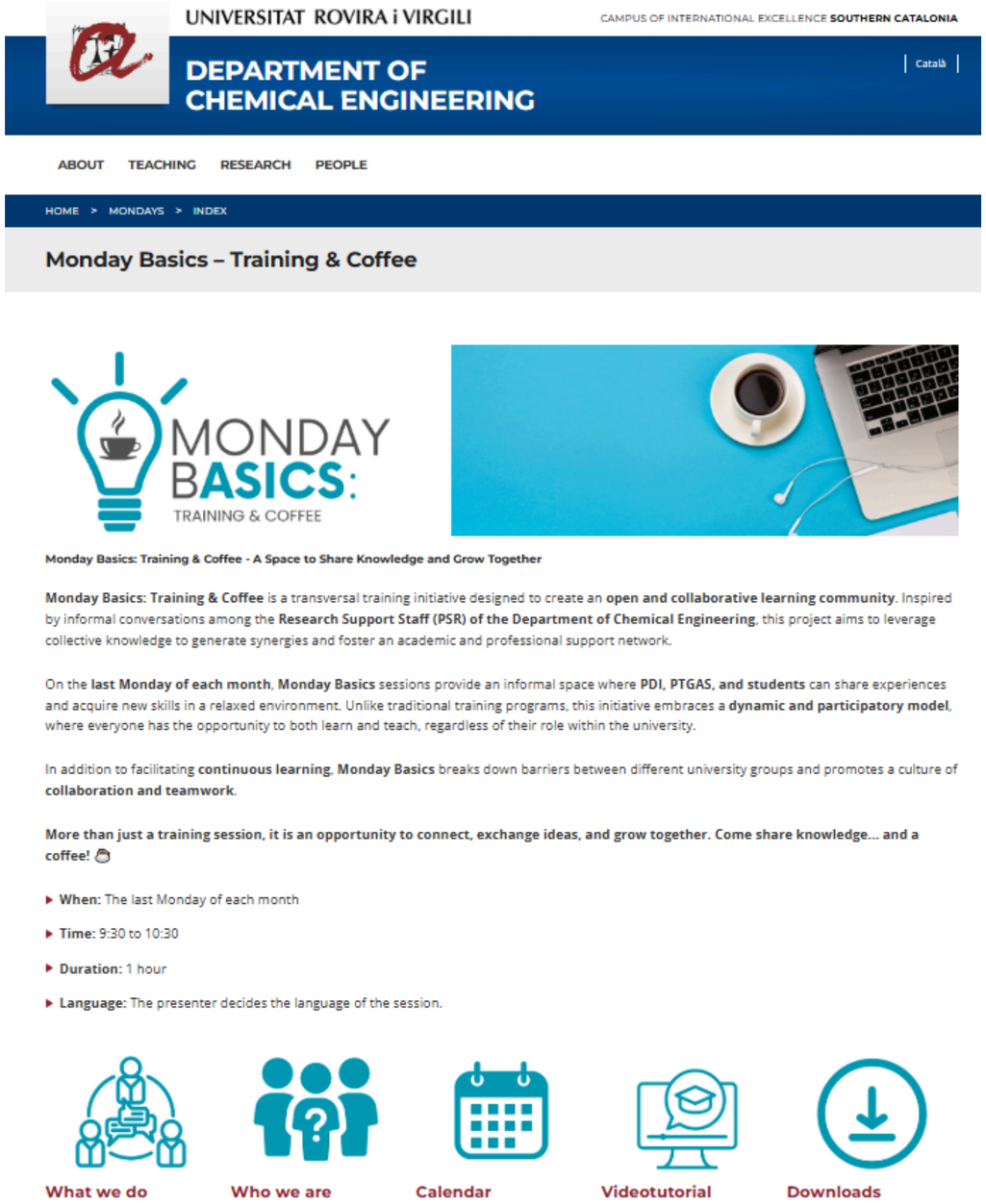

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