

Standard protocol

Control and calibration of Socorex micropipette

General parameters

- Always follow the same pre-established control protocol
- Only trained personnel should perform instrument control and calibration
- Instrument should always be cleaned and in perfect working condition
- All temperatures (instrument, room, water) should be stabilised (between 21-25°C)
- Use analytical balance with digit number in relation with the measured volume (5 digits for volumes over 25 µL, 6 digits under 25 µL)
- Use a humidity trap when controlling volumes below 25 µL
- Perform the control measurements without interruption
- Use pipette tips recommended by the manufacturer
- Do not recycle tips after control

Control procedure

1	Place clean reservoir on analytical balance and zero the balance Pre rinse two or three times on nominal (maximum) volume to equal liquid/tip/air cushion temperature.
2	Set instrument to desired volume (always start by minimal volume on adjustable models)
3	Take new pipette tip and rinse twice to pre-wet internal tip surface
4	After aspirating first sample, briefly slide tip along reservoir wall so that no liquid remains on the external tip wall
5	Empty completely the tip on the balance reservoir, sliding tip briefly along reservoir wall so that no liquid remains in the tip
6	Register sample weight after balance stabilisation, then zero the balance
7	Repeat actions 4 to 6 as many times as defined in SOP (i.e. 10 x)
8	Calculate mean weight and transform into volume (multiply by 1/water density at given temperature and atmospheric pressure)
9	Do the necessary statistical evaluation (E for inaccuracy, CV for imprecision)
10	Compare inaccuracy and imprecision with values recommended by the manufacturer or defined in the internal SOP.
If necessary, perform calibration according to manufacturer's instructions (or send the instrument back to the authorized dealer)	
Please note: Set instrument on minimal volume before performing any calibration (modification of the calibration settings) and check resulting value on both min and max volume.	

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Z - FACTOR

Volumes mass of distilled water (µl/mg) in function of water temperature and atmospheric pressure

Temperature °C	Air pressure HPa (mbar)					
	800	853	907	960	1013	1067
15	1.0018	1.0018	1.0019	1.0019	1.0020	1.0020
15.5	1.0018	1.0019	1.0019	1.0020	1.0020	1.0021
16	1.0019	1.0020	1.0020	1.0021	1.0021	1.0022
16.5	1.0020	1.0020	1.0021	1.0022	1.0022	1.0023
17	1.0021	1.0021	1.0022	1.0022	1.0023	1.0023
17.5	1.0022	1.0022	1.0023	1.0023	1.0024	1.0024
18	1.0022	1.0023	1.0024	1.0024	1.0025	1.0025
18.5	1.0023	1.0024	1.0025	1.0025	1.0026	1.0026
19	1.0024	1.0025	1.0025	1.0026	1.0027	1.0027
19.5	1.0025	1.0026	1.0026	1.0027	1.0028	1.0028
20	1.0026	1.0027	1.0027	1.0028	1.0029	1.0029
20.5	1.0027	1.0028	1.0028	1.0029	1.0030	1.0030
21	1.0028	1.0029	1.0030	1.0030	1.0031	1.0031
21.5	1.0030	1.0030	1.0031	1.0031	1.0032	1.0032
22	1.0031	1.0031	1.0032	1.0032	1.0033	1.0033
22.5	1.0032	1.0032	1.0033	1.0033	1.0034	1.0035
23	1.0033	1.0033	1.0034	1.0035	1.0035	1.0036
23.5	1.0034	1.0035	1.0035	1.0036	1.0036	1.0037
24	1.0035	1.0036	1.0036	1.0037	1.0038	1.0038
24.5	1.0037	1.0037	1.0038	1.0038	1.0039	1.0039
25	1.0038	1.0038	1.0039	1.0039	1.0040	1.0041
25.5	1.0039	1.0040	1.0040	1.0041	1.0041	1.0042
26	1.0040	1.0041	1.0042	1.0042	1.0043	1.0043
26.5	1.0042	1.0042	1.0043	1.0043	1.0044	1.0045
27	1.0043	1.0044	1.0044	1.0045	1.0045	1.0046
27.5	1.0044	1.0045	1.0046	1.0046	1.0047	1.0047
28	1.0046	1.0046	1.0047	1.0048	1.0048	1.0049
28.5	1.0047	1.0048	1.0048	1.0049	1.0050	1.0050
29	1.0049	1.0049	1.0050	1.0050	1.0051	1.0052
29.5	1.0050	1.0051	1.0051	1.0052	1.0052	1.0053
30	1.0052	1.0052	1.0053	1.0053	1.0054	1.0055

Test results evaluation

Instrument performance determined by inaccuracy and imprecision.

Inaccuracy

Difference between mean value after instrument's control and nominal value (target volume) often given in % of the nominal value (rel. error %).

$$x = \frac{1}{N} * \sum X_i$$
$$V = x * Z$$
$$E = V - V_0$$
$$E\% = \frac{V - V_0}{V_0} * 100$$

x = Mean value (mg)
N = Number of measurements
X_i = Results of weighing (mg)
V = Mean volume (ul or ml)
Z = Correction factor (density)
E = Error
V₀ = Nominal volume
E% = Inaccuracy (%)

Imprecision

Reproducibility, deviation between repeated measurements obtained to calculate mean value, given as coefficient of variation (CV %).

$$S = Z * \sqrt{\frac{\sum (x - X_i)^2}{N - 1}}$$
$$CV\% = \frac{S}{V} * 100$$

S = Standard deviation
Z = Correction factor (density)
x = Mean value (mg)
X_i = Results of weighing (mg)
N = Number of measurements
CV = Coefficient of variation (%)
V = Mean volume (ul or ml)

Compare test results with recommended instrument performance to determine if new calibration is required.