PIPETTE SIEROLOGICHE - CLEARLine® CERTIFICATO DI VALIDAZIONE METROLOGICA
SEROLOGICAL PIPETTE - CLEARLine® METROLOGICAL VALIDATION CERTIFICATE

Oggetto: Validazione metrologica di pipette sierologiche (1 mL, 2 mL, 5 mL, 10 mL, 25 mL, 50 mL, 100 mL).	*Subject: Metrological validation of serological pipettes (1 mL, 2 mL, 5 mL, 10 mL, 25 mL, 50 mL, 100 mL).*
Metodo: Metodo di pesata - determinazione della massa di acqua purificata, conversione in volume tramite densità misurata. 10 misurazioni per singola pipetta.	*Method: Weighing method: Determination of the mass of purified water, conversion to volume using measured density. 10 measurements per pipette.*
Riferimento normativo: ISO 7713:1985 - Laboratory glassware — Disposable serological pipettes.	*Reference standard: ISO 7713:1985 - Laboratory glassware — Disposable serological pipettes.*
Data prova: 2025-09-25	*Test date: 2025-09-25*
Condizioni ambientali: T = 21 °C (±2 °C), Umidità 54% (±10%), Pressione atmosferica ≈ 880 hPa.	*Test environment:* *Temperature = 21°C (±2°C),* *Humidity 54% (±10%),* *Atmospheric pressure ≈ 880 hPa.*
Criteri di accettazione: Errore massimo della capacità ≤ ±2% come da ISO; test T per verificare differenze tra componenti con p > 0,05.	*Acceptance criteria: Maximum capacitance error ≤ ±2% as per ISO; t-test for component differences with p > 0.05.*

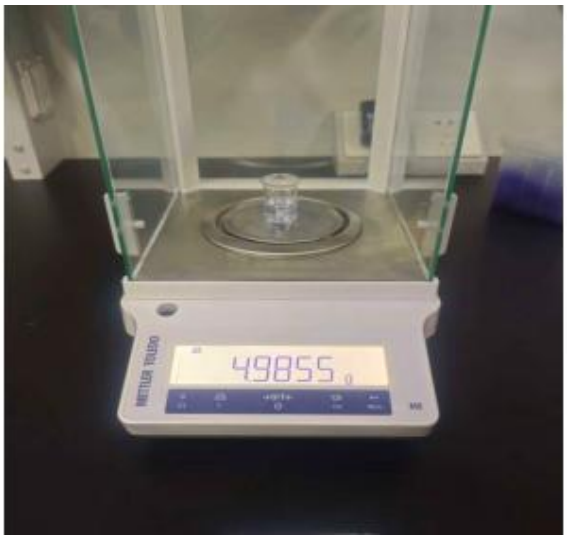
Processo di prova:

1. Prelevare un'unità di volume di acqua purificata mediante pipettaggio preciso e pesarla con una bilancia a sensibilità 1/10.000, per calcolare la densità dell'acqua pura.
2. Selezionare casualmente 10 pipette e contrassegnarle con numeri seriali.
3. Utilizzare una pipetta elettronica per aspirare acqua purificata fino alla tacca corrispondente, trasferirla nel contenitore predisposto, pesare l'acqua nel tubo e registrare il valore.
4. Dopo la pesata, rimuovere l'acqua purificata dalla pipetta, asciugare scuotendo e ripetere l'operazione di riempimento fino alla tacca. Pesare nuovamente l'acqua purificata e ripetere la misurazione per 9 volte, per un totale di 10 misurazioni.
5. Utilizzando la densità dell'acqua purificata calcolata al punto 1, calcolare il volume corrispondente di ciascuna misurazione.
6. Calcolare l'errore di ciascuna misurazione per verificare se rientra nei requisiti dello standard, ed eseguire il T-test per determinare se le differenze sono statisticamente significative.

Testing process:

1. *Take a unit volume of purified water by precise pipetting and weigh the unit volume of purified water*
   on a 1/10,000th scale to calculate the density of pure water.
2. *Randomly select 10 pipettes and mark them with serial numbers.*
3. *Use an electric pipette to draw purified water to the corresponding scale line, transfer it into the prepared container, weigh the weight in the tube and record it.*
4. *Remove the purified water in the pipette after weighing, shake dry, and repeat adding water to the scale, weigh Purified water after adding water to the scale weight, repeat 9 times for a total of 10 times.*
5. *Using the density of purified water calculated in step 1, calculate the volume of purified water each time you add it to the scale.*
6. *Calculate the error of each measurement to determine whether it meets the standard requirements and use T-test to analyze whether the difference is statistically significant.*





Prodotti testati / Tested products

REF	Product Name	Model (Volume)	batch number	quantity
CL100	Serological pipette CLEARLine®	1ml	34624301	10
CL101	Serological pipette CLEARLine®	2ml	22725302	10
CL102	Serological pipette CLEARLine®	5ml	00225205	10
CL103	Serological pipette CLEARLine®	10ml	24625210	10
CL111	Serological pipette CLEARLine®	25ml	35524225	10
CL112	Serological pipette CLEARLine®	50ml	35324350	10
CL113	Serological pipette CLEARLine®	100ml	24725100	10

Apparecchiature di prova ausiliarie / Auxiliary test equipment

Device	Device Model	Serial Number	Remark
electronic	ME104E/02	C120769967	/
electronic	BaronLevo Plus	YZ223AG0000481	/

1 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	0.997	0.330%
2	1.002	-0.169%
3	0.985	1.519%
4	0.989	1.103%
5	0.985	1.466%
6	0.999	0.121%
7	1.004	-0.418%
8	1.000	-0.012%
9	0.995	0.479%
10	0.990	0.987%

Dati grezzi 1 mL / Raw data 1 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	0.985	0.995	1.013	0.997	0.991	0.992	0.992	1.011	0.996	0.995
2	1.002	0.999	0.998	1.002	1.021	1.003	0.996	1.002	0.996	0.997
3	0.983	0.982	0.987	0.989	0.984	0.981	0.982	0.992	0.983	0.985
4	0.991	0.991	0.988	0.995	0.983	0.987	0.998	0.984	0.986	0.986
5	0.988	0.981	0.991	0.984	0.987	0.987	0.984	0.983	0.985	0.983
6	0.998	1.003	1.002	0.999	1.004	0.994	0.994	0.996	1.002	0.996
7	1.015	0.997	1.001	1.011	0.997	1.007	0.999	1.014	0.997	1.004
8	1.001	0.992	1.006	0.996	0.998	1.001	1.001	0.998	1.006	1.002
9	0.992	0.996	0.985	0.991	0.995	1.002	0.998	1.001	0.998	0.994
10	0.986	0.996	0.998	0.986	0.981	0.986	0.992	0.997	0.991	0.988

2 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	2.017	-0.860%
2	2.021	-1.071%
3	2.031	-1.540%
4	2.034	-1.675%
5	2.022	-1.075%
6	1.996	0.225%
7	2.021	-1.070%
8	2.024	-1.190%
9	2.015	-0.725%
10	1.976	1.195%

Dati grezzi 2 mL / Raw data 2 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	2.011	2.014	2.021	2.019	2.025	2.021	2.023	2.024	2.015	1.999
2	2.028	2.026	2.024	2.021	2.027	2.022	2.021	2.008	2.017	2.02
3	2.038	2.029	2.032	2.037	2.035	2.037	2.028	2.026	2.024	2.022
4	2.035	2.036	2.034	2.037	2.027	2.038	2.031	2.032	2.031	2.034
5	2.025	2.019	2.018	2.021	2.018	2.016	2.024	2.021	2.018	2.035
6	2.017	1.979	1.992	1.997	1.995	1.982	1.994	1.992	1.993	2.014
7	2.021	2.011	2.021	2.022	2.023	2.022	2.018	2.023	2.024	2.029
8	2.013	2.025	2.028	2.033	2.025	2.024	2.016	2.031	2.021	2.022
9	2.018	2.014	2.009	2.015	2.017	2.022	2.013	2.017	2.015	2.005
10	1.979	1.981	1.968	1.971	1.969	1.968	1.979	1.983	1.978	1.985

5 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	4.977	0.464%
2	4.990	0.195%
3	4.988	0.248%
4	4.964	0.724%
5	4.982	0.362%
6	4.975	0.492%
7	4.995	0.106%
8	5.008	-0.162%
9	4.978	0.444%
10	4.988	0.238%

Dati grezzi 5 mL / Raw data 5 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	4.967	4.996	4.974	4.967	4.968	4.979	4.986	4.979	4.977	4.975
2	4.968	5.009	4.998	4.986	4.991	4.987	4.965	5.009	4.986	5.004
3	4.967	4.974	4.995	5.005	5.008	4.985	4.979	4.996	4.989	4.978
4	4.956	4.969	4.957	4.948	4.958	4.98	4.978	4.955	4.969	4.968
5	4.979	4.988	4.989	4.985	4.978	4.969	4.989	4.978	4.979	4.985
6	4.985	4.981	4.986	4.978	4.971	4.969	4.972	4.959	4.984	4.969
7	4.999	4.993	4.989	4.991	4.989	5.002	5.005	4.996	4.992	4.991
8	5.02	4.991	5.007	5.011	5.005	4.991	5.014	5.019	5.004	5.019
9	4.985	4.971	4.968	4.967	4.969	4.983	4.989	4.977	4.981	4.988
10	4.969	4.994	4.995	4.989	4.998	4.998	4.985	4.979	4.985	4.989

10 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	10.010	-0.097%
2	9.954	0.459%
3	9.956	0.445%
4	9.953	0.469%
5	9.947	0.526%
6	9.973	0.266%
7	9.969	0.315%
8	9.980	0.205%
9	9.963	0.373%
10	9.955	0.451%

Dati grezzi 10 mL / Raw data 10 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	10.035	10.004	10.005	10.007	10.008	10.002	10.016	10.004	10.007	10.009
2	9.974	9.935	9.947	9.978	9.958	9.956	9.948	9.946	9.957	9.942
3	9.976	9.93	9.956	9.959	9.953	9.946	9.949	9.968	9.967	9.951
4	9.967	9.938	9.958	9.958	9.949	9.966	9.944	9.967	9.948	9.936
5	9.947	9.954	9.949	9.938	9.957	9.943	9.937	9.946	9.957	9.946
6	9.951	9.978	9.967	9.968	9.973	9.986	9.987	9.998	9.963	9.963
7	9.955	9.946	9.981	9.987	9.996	9.977	9.965	9.967	9.948	9.963
8	9.979	9.964	9.983	9.962	9.984	9.996	9.984	9.981	9.993	9.969
9	9.991	9.978	9.955	9.977	9.943	9.978	9.947	9.958	9.946	9.954
10	9.949	9.967	9.971	9.959	9.935	9.942	9.954	9.931	9.955	9.986

25 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	24.972	0.112%
2	24.983	0.068%
3	24.989	0.043%
4	24.981	0.076%
5	25.003	-0.011%
6	24.976	0.096%
7	25.002	-0.010%
8	25.013	-0.050%
9	25.005	-0.019%
10	25.000	0.000%

Dati grezzi 25 mL / Raw data 25 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	24.968	24.966	25.045	24.967	24.976	24.974	24.936	24.989	24.938	24.961
2	24.933	24.959	24.979	25.028	25.005	24.927	25.008	24.954	24.996	25.04
3	24.958	25.02	24.979	25.006	25.017	24.958	24.991	24.972	25.005	24.986
4	25.004	24.977	24.978	24.958	24.983	24.943	25.024	24.977	25.003	24.964
5	25.015	24.987	24.983	25.004	24.995	24.967	25.03	24.975	25.065	25.006
6	24.984	24.955	24.994	24.976	24.991	25.036	24.968	24.946	24.948	24.963
7	24.923	25.035	25.002	25.003	25.015	25.004	25.041	25.007	24.989	25.005
8	25.105	25.026	25.006	24.987	25.015	25.023	24.987	25.092	24.93	24.955
9	24.959	25.029	25.025	25.048	24.969	25.036	25.025	24.964	25.015	24.977
10	25.026	24.987	25.024	25.003	25.018	24.991	24.987	25.016	24.993	24.954

50 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	49.767	0.466%
2	49.931	0.139%
3	49.927	0.146%
4	49.927	0.205%
5	49.852	0.297%
6	50.242	-0.484%
7	50.198	-0.396%
8	49.991	0.018%
9	49.893	0.214%
10	50.137	-0.274%

Dati grezzi 50 mL / Raw data 50 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	49.894	49.925	49.658	49.864	49.846	49.817	49.626	49.727	49.668	49.646
2	49.919	49.898	49.969	49.945	49.942	49.943	49.945	49.891	49.917	49.936
3	49.882	49.925	49.89	49.858	49.939	49.956	50.048	49.885	49.946	49.941
4	49.876	49.979	49.91	49.953	49.859	49.898	49.826	49.895	49.876	49.901
5	49.835	49.809	49.927	49.89	49.907	49.779	49.894	49.855	49.76	49.859
6	50.237	50.279	50.267	50.265	50.226	50.237	50.226	50.257	50.278	50.147
7	50.187	50.168	50.238	50.192	50.193	50.217	50.138	50.284	50.181	50.184
8	49.985	50.059	50.04	49.959	49.985	50.026	49.977	49.946	49.976	49.958
9	49.93	49.847	49.868	49.879	49.88	49.918	49.918	49.97	49.889	49.832
10	50.147	50.14	50.157	50.177	50.167	50.115	50.173	50.097	50.016	50.18

100 mL

Seriale / Serial number	Valore medio (mL) / Average value (mL)	Errore % / Error %
1	99.661	0.339%
2	99.758	0.242%
3	99.699	0.301%
4	99.692	0.308%
5	99.719	0.281%
6	99.701	0.299%
7	99.691	0.309%
8	99.651	0.349%
9	99.647	0.353%
10	99.660	0.340%

Dati grezzi 100 mL / Raw data 100 mL

Seriale	1	2	3	4	5	6	7	8	9	10
1	99.682	99.681	99.665	99.717	99.607	99.799	99.656	99.609	99.515	99.676
2	99.776	99.984	99.737	99.646	99.859	99.994	99.745	99.576	99.619	99.648
3	99.867	99.815	99.726	99.809	99.668	99.757	99.619	99.534	99.615	99.584
4	99.694	99.691	99.766	99.642	99.807	99.637	99.678	99.668	99.646	99.688
5	99.892	99.637	99.837	99.533	99.661	99.745	99.846	99.586	99.758	99.697
6	99.708	99.848	99.804	99.695	99.736	99.615	99.544	99.727	99.629	99.704
7	99.856	99.612	99.635	99.696	99.765	99.627	99.626	99.686	99.84	99.57
8	99.605	99.686	99.653	99.616	99.587	99.602	99.926	99.505	99.767	99.565
9	99.692	99.557	99.645	99.647	99.682	99.595	99.687	99.658	99.656	99.655
10	99.685	99.656	99.587	99.675	99.716	99.657	99.628	99.676	99.635	99.684

Esito: Le pipette esaminate risultano conformi ai requisiti di accuratezza (errore ≤ ±2%). L'analisi statistica (test T) non ha rilevato differenze statisticamente significative (p > 0,05).

Result: *The tested pipettes met the accuracy requirements (error ≤ ±2%). Statistical analysis (T-test) revealed no statistically significant differences (p > 0.05).*

Approved by: Jiang Huihui Date: 2025-09-25

Reviewer: Yang Shu Date: 2025-09-25