

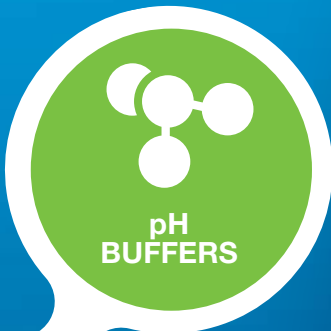
Liquid Solutions

pH, ORP, and Conductivity



Calibration is a key component of every analytical process. And the key to an effective calibration is an absolute trust in the calibration buffers and conductivity standards used to set your measurement.

Hamilton offers a wide range of calibration buffers for pH and ORP as well as conductivity standards, suitable for the use under GMP, GLP, ISO 9001 and EN 45000 regulations. Traceability is ensured through an unbroken chain of comparison to reference material of the highest metrological quality from NIST (National Institute of Standards and Technology, USA) and PTB (Physikalisch Technische Bundesanstalt, Germany).



Hamilton Liquid Solutions



The Importance of pH Buffer Traceability

An important issue for the production of Certified Reference Materials is to ensure traceability through an unbroken chain of comparisons to reference material of the highest metrological quality (Primary Reference Material) from NIST and PTB. Unlike other manufacturers, where only top-down traceability is applied, Hamilton works with circular or closed-loop traceability, providing unique reliability of Hamilton DuraCal buffers.

Top-down Traceability:

At Hamilton, the pH value of DuraCal buffers is determined by comparison against two secondary reference buffer solutions from accredited suppliers of secondary reference materials. The solutions themselves are compared against primary reference solutions from PTB or NIST. The measurement uncertainties of every measurement comparison are known and documented.

Bottom-up Traceability:

To ensure the highest possible accuracy and full reliability of the pH value, a representative number of samples from every single production lot is verified by an external, independent and impartial DAkkS laboratory. The DuraCal samples are compared against secondary reference solutions from DAkkS and these are referenced themselves to primary reference solutions from PTB or NIST. At this stage, the traceability loop is closed. DAkkS provides Hamilton with a calibration certificate for every DuraCal production batch.

Certified Reference Material:

Due to the complete traceability of the measurement procedure and the assignment of uncertainties to the particular testing steps, the buffers pH 4.01, 7.00, 9.21, and 10.01 are classified as "Certified Reference Material" (CRM).

Hamilton pH Buffer Features

- Convenient 250 mL or 500 mL bottle with built-in calibration compartment
- Economical, only about 15 mL of buffer is used per calibration
- Certified pH value from a DAKKS laboratory accredited for pH measurement
- First-class certificate with traceability to international standards
- Certificates available at www.hamiltoncompany.com
- Expiration date on the bottle
- Immune to microbial growth



Simple Handling for Professional Results

Step 1: Open bottle

Step 2: Squeeze to fill calibration compartment.
A valve will close separating the two compartments.

Step 3: Calibrate the sensor

Step 4: Dispose of used buffer

pH Buffers Available

P/N	pH Value	pH Accuracy	Stability*	Certificate	Package
238271	1.09	± 0.02 pH	60	Hamilton	500 mL
238272	1.68	± 0.02 pH	60	Hamilton	500 mL
238273	2.00	± 0.02 pH	60	Hamilton	500 mL
238274	3.06	± 0.02 pH	60	Hamilton	500 mL
238194	4.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	10 L
238217	4.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	500 mL
238317	4.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	250 mL
238332	4.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	5 L
238895	4.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	990 L
238917	4.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	3 x 500 mL
238924	4.01 / 7.00 / 10.01	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	500 mL, each
238922	4.01 / 7.00 / 9.21	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	500 mL, each
238275	5.00	± 0.02 pH	60	Hamilton	500 mL
238276	6.00	± 0.02 pH	60	Hamilton	500 mL
238188	7.00	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	10 L
238218	7.00	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	500 mL
238318	7.00	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	250 mL
238333	7.00	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	5 L
238896	7.00	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	990 L
238918	7.00	± 0.01 pH / ± 0.02 pH	24 / 60	DAkkS	3 x 500 mL
238277	8.00	± 0.02 pH	60	Hamilton	500 mL
238216	9.21	± 0.02 pH	60	DAkkS	10 L
238219	9.21	± 0.02 pH	60	DAkkS	500 mL
238319	9.21	± 0.02 pH	60	DAkkS	250 mL
238897	9.21	± 0.02 pH	60	DAkkS	990 L
238919	9.21	± 0.02 pH	60	DAkkS	3 x 500 mL
238187	10.01	± 0.02 pH	60	DAkkS	10 L
238223	10.01	± 0.02 pH	60	DAkkS	500 mL
238321	10.01	± 0.02 pH	60	DAkkS	250 mL
238898	10.01	± 0.02 pH	60	DAkkS	990 L
238923	10.01	± 0.02 pH	60	DAkkS	3 x 500 mL
238278	11.00	± 0.05 pH	24	Hamilton	500 mL
238279	12.00	± 0.05 pH	24	Hamilton	500 mL

*In months after date of manufacturing.

ORP Buffers Available

P/N	Redox Value mV	Stability*	mV Accuracy	Package
238228	271 mV	24	± 5 mV	500 mL
238227	475 mV	24	± 5 mV	500 mL
238322	475 mV	24	± 5 mV	250 mL

*In months after date of manufacturing.

Conductivity

For measurements in the low-conductivity range, stable and reliable calibration standards are critically important. Since a conductivity standard is not a buffer solution, the lower the value of the conductivity standard, the greater the effect of entry of CO₂ or contamination. Hamilton is the first manufacturer to offer patented conductivity standards of 1.3 and 5 µS/cm with a certified accuracy of ±1% and a lifetime of 1 and 3 years, respectively. The procedure for determining conductivity was developed in collaboration with DFM. Many metrological institutes choose Hamilton standards because of their unprecedented stability and independent verification by PTB. During an interlaboratory test among prestigious European metrological institutes (PTB, DFM, DAkkS) Hamilton standards were used as measurement solutions.

A representative number of bottles from every batch are measured by DFM. Their value is recorded on the calibration certificate and on every bottle. DFM enjoys the highest prestige in Europe in the area of electrolytic conductivity and is equipped with an absolute measurement cell that was developed in collaboration with NIST, and is accredited by the Danish accreditation agency DANAK to a conductivity of 0.9 µS/cm. DFM and NIST have made comparisons of their measurement uncertainty and have confirmed in a series of scientific publications that the measurement accuracy is in each case the same. Because no primary standards exist in the low conductivity range, measurements depend on absolute measurement cells which trace electrical conductivity back to the SI units: meter and volt. Testing of Hamilton standards is thus carried out on the most precise measurement apparatus in the world, and certified accordingly.



Conductivity Standards Available

P/N	Value at 25°C	Package	Stability*
238973	1.3 µS/cm	300 mL glass bottle	12
238926	5 µS/cm	300 mL glass bottle	36
238927	15 µS/cm	300 mL glass bottle	36
238984	84 µS/cm	500 mL Calpack bottle	18
238934	100 µS/cm	300 mL glass bottle	36
238985	147 µS/cm	500 mL Calpack bottle	18
238929	706 µS/cm	300 mL glass bottle	36
238928	1,413 µS/cm	300 mL glass bottle	36
238986	1,413 µS/cm	500 mL Calpack bottle	18
238988	12,880 µS/cm	500 mL Calpack bottle	18
238935	100 mS/cm	300 mL glass bottle	36

**In months after date of manufacturing.*

Features

Remains stable for a minimum of 1 year for 1.3 $\mu\text{S}/\text{cm}$, and up to 3 years for all other values

Certificate with calibration document from DFM (available at www.hamiltoncompany.com)

Expiration date shown on every bottle

Bottles are permitted to stay open for a total of 60 minutes





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