

Toolbox Talk: How to use a Field Test Kit

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Introduction: What is a Field Test Kit?

This toolbox talk provides a brief overview of how to use a field test kit for industrial water applications. A field test kit enables users with minimal chemistry experience to obtain accurate, affordable onsite test results. These kits are portable and provide instant feedback on water system conditions, facilitating real-time decision-making.

While test kits may differ slightly between suppliers, most follow similar methodologies, outlined in this document.

Health and Safety Compliance

Before using a test kit, familiarize yourself with the safety hazards of all reagents. Refer to their respective safety data sheets (SDS) and complete a COSHH (Control of Substances Hazardous to Health) assessment.

Key Safety Tips:

- **Check expiration dates:** Using expired reagents can lead to inaccurate results and non-compliance during audits.
- **Calibrate equipment:** Periodic calibration is essential for maintaining accuracy. External calibration should occur annually, providing traceability via a calibration certificate.

Prolong Reagent Life:

- Store reagents in the dark, ideally at room temperature.
- Avoid extreme temperatures, which can degrade the chemicals.
- Don't reuse chemicals like pH and conductivity standards to avoid contamination.

Titration Methods

Titration involves adding an indicator reagent to a water sample, followed by the gradual addition of a titrant solution until a colour change signals the endpoint. The titrant volume used correlates to the concentration of the tested parameter.

Example:

In an alkalinity test, a known strength of sulfuric acid is titrated against alkaline species in the water sample. Phenolphthalein and methyl orange are used as indicators to determine 'P' and 'M' alkalinity, respectively.

Common Titration Parameters:

- Hardness (Total/Calcium)
- Chloride
- Alkalinity (M, P & OH)
- Nitrite
- Tannin
- Sulphite

Titration Best Practices:

- Ensure dropper tips are clear of blockages to maintain consistent volumes.
- Add drops steadily while swirling the sample for thorough mixing.
- Fully invert the dropper bottle to release drops and avoid contamination.

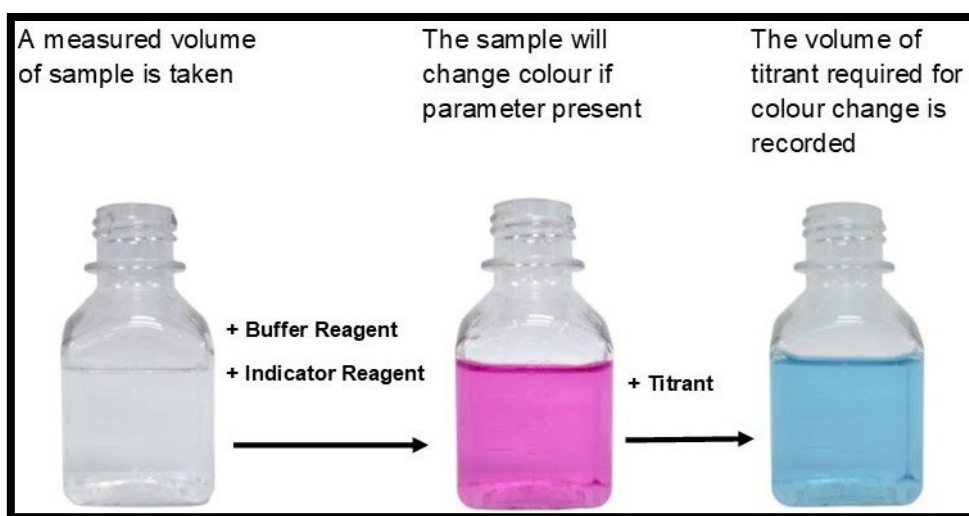


Figure 1. Colour changes of Hardness titration method.

Colorimetric Methods

Colorimetric testing involves adding a fixed volume of reagent to a water sample, forming a coloured complex proportional to the parameter concentration. The intensity of the colour is measured either visually using a comparator or electronically with a photometer.

Comparator vs. Photometer:

- **Comparator:** Involves comparing the sample's colour to a reference disc or card. Results may vary due to lighting or user perception.
- **Photometer:** Measures the absorption of light through the sample, providing more precise and consistent results.

Common Colorimetric Parameters:

- Oxidizing species (Chlorine, Bromine, Ozone)
- Metals (Iron, Copper, Zinc)
- Phosphate, Molybdate, Silica
- Ammonia, DEHA

Best Practices:

- Hold the sample between a light source and your eye for clearer colour observation during both titration and comparator methods.
- For photometer tests, ensure that glassware is clean, as dirt or scratches can interfere with light transmission.

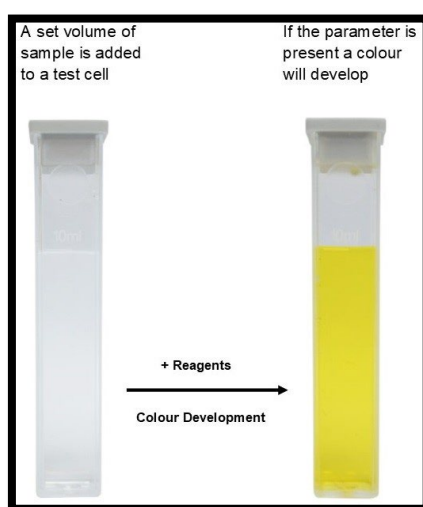


Figure 2. Colour change of High range Phosphate test method.

pH Measurement

There are several ways to measure pH in water, with pH meters being the most common in industrial settings. Handheld meters and professional models with probes offer high accuracy when properly calibrated. Probes deteriorate over time, so regular calibration is necessary.

Other Methods:

- **pH Test Strips:** Litmus paper or multi-band strips offer a quick, rough estimate of pH without needing calibration.
- **Photometric pH:** Some photometers can measure pH using a phenol red solution, though this method is less flexible, covering only pH ranges of 4 to 11.

Best Practices:

- Rinse the probe with sample water before testing.
- Insert both the pH and temperature probes (if available), and swirl to release trapped air bubbles.
- Record the reading once the value stabilizes, allowing time for the probe to adjust to the sample temperature.

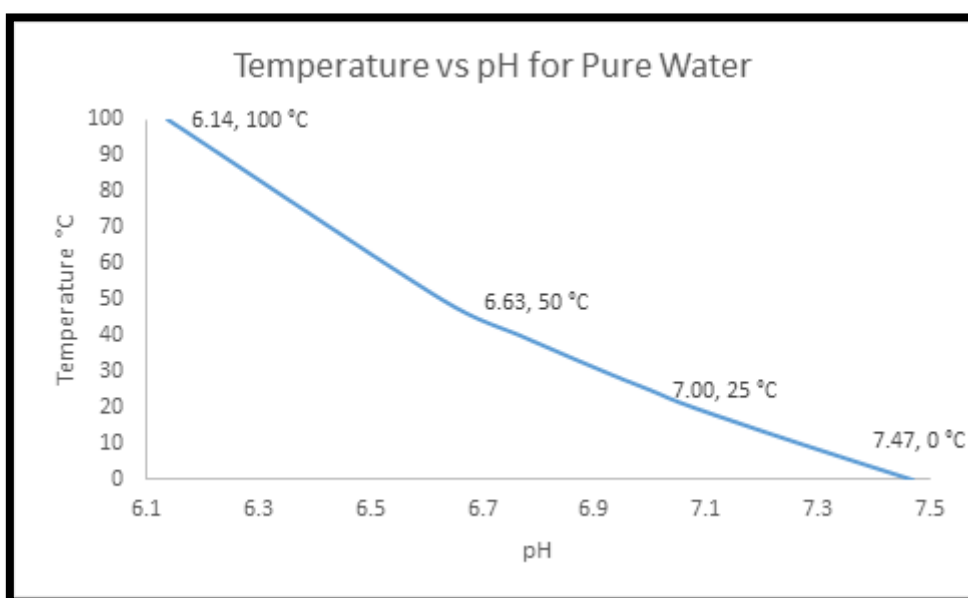


Figure 3. Temperature versus pH on pure water.

Conductivity and TDS Measurement

Conductivity measures a water sample's ability to conduct electricity, typically expressed in micro-Siemens (μS). TDS (Total Dissolved Solids) is derived from conductivity using a TDS factor, usually preset at 0.7 (TDS 442).

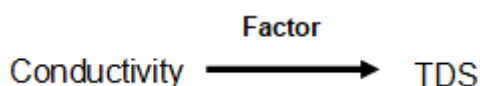


Figure 4. Conductivity to TDS

Conductivity Calibration:

- Calibration standards (84 μS , 1413 μS , 12880 μS) should be used to match the expected conductivity range. Most industrial water applications use 1413 μS as the standard.

Conductivity to TDS factors	Factor
NaCl	0.5
KCl	0.55
640	0.64
4.4.2	0.7

Conversion	
1000 μS	1 mS
1000 ppm	1 ppt

Figure 5. TDS and conversion Factors.

Best Practices:

- Regularly calibrate conductivity meters, using the standard closest to your expected reading.
- Keep the probe clean to ensure accurate measurements.

Summary

Field test kits provide a convenient, effective way to monitor water quality and make timely decisions. These kits typically use titration and colorimetric methods, supported by electronic instruments like pH meters, photometers, and conductivity meters. Regular calibration, proper reagent handling, and adherence to best practices ensure accurate and compliant results.