



**TECH BRIEF**

# ASTM Color Scale

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# What is the ASTM color scale?

The ASTM color scale, established by the American Society for Testing and Materials (ASTM), is a standardized system used to determine the color of petroleum products and other related liquids. Measurements using this scale are used for quality control in final products and in processing control functions such as product identification and blending.

## Introduction

The ASTM color scale typically ranges from 0.5 to 8.0, with each number representing a specific color intensity. Lower numbers (e.g., 0.5) correspond to a lighter, pale-yellow color, while higher numbers (e.g., 8.0) indicate darker, more intense red-black colors. In a laboratory environment, samples are filtered to remove any suspended particulate and then compared to standard liquids or glass filters corresponding to various incremental values (typically increments of 0.5) using a colorimeter or spectrophotometer. Modern electronic laboratory colorimeters are calibrated to provide an ASTM color score directly.



**Typical Colors through the ASTM Color Scale**

For colors lighter than ASTM 0.5, the Saybolt color scale is typically used. 0.5 ASTM is approx. equal to Saybolt -16.

ASTM color is described in the ASTM D 1500 standard

## HOW IT WORKS

Traditionally, sample color measurements are made using an ASTM color comparator. In a comparator, a glass tube filled with a sample is visually compared against standard color discs of known color value under controlled lighting conditions. The color value assigned to the sample is taken from the standard color disc that most closely matches the color of the sample. Note that this method relies on human vision and results are therefore subjective, but it is widely used due to its simplicity and cost-effectiveness.

Modern offline methods use spectrophotometers. The sample is placed in a cuvette or sample holder, and the spectrophotometer measures the intensity of light transmitted or absorbed by the sample at specific wavelengths. The ASTM color value is then calculated based on the measured data.

Spectrophotometers provide a more precise and reproducible measurement than the [subjective] visual comparator method, plus have much better specificity and resolution as they are not constrained by the discrete values of a standard color disc set (typically every 0.5 from 0.5 to 8 ASTM).

With electronic colorimeters, it is also possible to measure ASTM color online in processing plants. Online ASTM color measurement provides real-time data that allows for immediate adjustment in production processes to improve manufacturing efficiency. Such continuous monitoring provides real time feedback that products are meeting the required quality and eliminates the risk of rework caused by a deviation that could occur between offline tests.

Cuvette Port on a Kemtrak Flanged Flow Cell



Calibration of inline ASTM colorimeters is a simple task. Using a calibration port that accepts standard (10mm OPL) laboratory cuvettes, standard solutions of various color depths can be inserted into the measurement path of the instrument and used to validate and/or calibrate the instrument without the need to remove it from line. This fast, convenient method greatly reduces the task and complexity of checking colorimeters while dramatically increasing the safety of personnel carrying out the task.

Online measurement eliminates the need for manual sampling and handling, reducing the potential for human error and can enhance safety by minimizing exposure to hazardous substances. Overall, online ASTM color measurement offers a safer, more accurate and more efficient approach to maintaining the quality of intermediates and products.

## APPLICATION

The ASTM color scale is used extensively in the petroleum industry to assess the color of feedstocks and refined products, it has also found uses in other industries where it helps in identifying contaminants, ensuring product consistency, and verifying that products meet regulatory and industry standards.

- **Petrochemical Industry:** In the petrochemical industry, ASTM D 1500 color measurement is crucial for assessing the color of fuels, lubricating oils, heating oils, and other hydrocarbons. For instance, gasoline, diesel, and jet fuel must meet specific color standards to demonstrate that they are free from impurities that could affect performance or safety.

The ASTM D 1500 color scale is widely used for product identification and interface detection in pipelines, and for product contamination monitoring.

- **Food and Beverage Industry:** In food and beverage production, ASTM color measurement is used to monitor the appearance of products such as edible oils, syrups, and beverages. The color of these products is a critical quality attribute that affects consumer perception and acceptance. For example, edible oils must be free from color impurities that could indicate oxidation or contamination. Similarly, beverage manufacturers use ASTM color measurement to ensure consistency in product appearance, vital for brand identity and customer satisfaction.

- **Chemical Industry:** ASTM color measurement is employed to evaluate the color of chemical solutions, solvents, and intermediates. Color measurement provides an insight into the purity and concentration of various chemicals, and therefore their suitability for different applications. Consistent color measurement greatly assists in quality control during production and ensures that final products meet the required specifications for industrial or consumer use.



**Kemtrak DCP007 online colorimeter system complete with measurement cell.**

The standardization provided by the ASTM color scale allows for uniformity and comparability across different laboratories and production facilities. This consistency is essential for maintaining quality control and ensuring that products meet the required specifications of quality and purity globally.

# Learn More

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