Flow Solution™ FS 3700 Automated Chemistry Analyzer

Phosphorus – All Forms
USEPA 365.1 by Flow Injection Analysis (FIA)
Cartridge Part Number 330096CT

Scope and Application

This method is used for the determination of orthophosphate in drinking, ground, and surface waters, and domestic and industrial wastes according to **USEPA Method 365.1** (Reference 6), **Standard Method 4500–P G** (Reference 8), and **ISO 15681-1** (Reference 10).

The methods are based on reactions that are specific for the orthophosphate ion. Thus, depending on the prescribed pretreatment of the sample, the various forms of phosphorus that may be determined are defined in **Appendix B**.

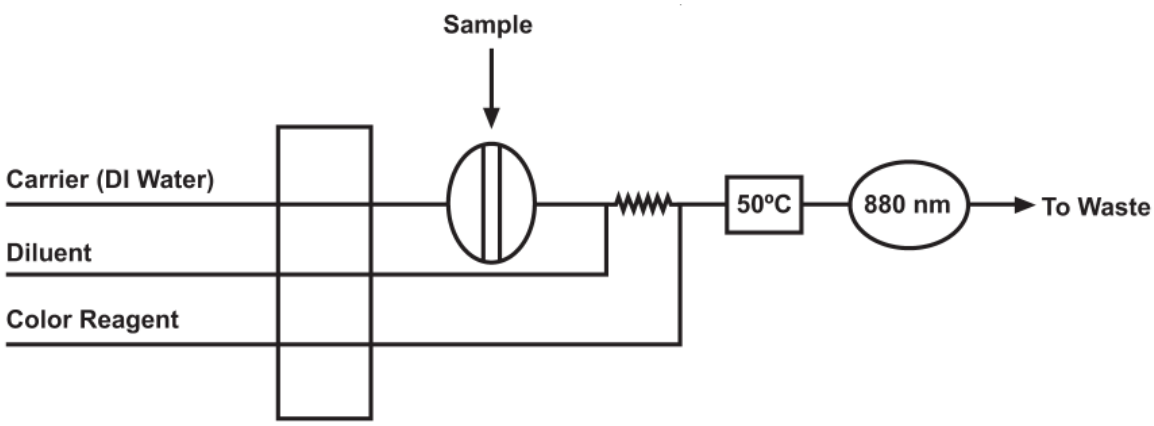
Except for in-depth and detailed studies, the most commonly measured forms are total and dissolved phosphorus and orthophosphate. Hydrolyzable phosphorus is normally found only in sewage-type samples. Insoluble forms of phosphorus are determined by calculation.

Method Performance

Range	0.01–5.0 mg/L P
Rate	60 samples/hour
Precision	~1% RSD
Method Detection Limit (MDL)	0.001 mg/L

The range may be extended to analyze other concentrations by changing the size of the sample loop. The quality of the analysis is assured through reproducible calibration and testing of the Flow Injection Analysis (FIA) system.

A general flow diagram of the Flow Injection Analysis (FIA) system is shown below (see Figure 1 for a detailed flow diagram).



Reagents and Calibrants

Chemical Name	CAS #	Chemical Formula	Part Number
Ammonium molybdate	12054-85-2	$(NH_4)_6Mo_7O_{24} \cdot 4H_2O$	
Antimony potassium tartrate	28300-74-5	$K(SbO)C_4H_4O_6 \cdot ½ H_2O$	
Ascorbic acid	50-81-7	$C_6H_8O_6$	
DOWFAX 2A1	12626-49-2		A000080
Potassium dihydrogen phosphate	7778-77-0	KH_2PO_4	
Sulfuric acid, concentrated	7664-93-9	H_2SO_4	
Water, deionized		H_2O	

Summary of US EPA Method 365.1

US EPA Method 365.1 summarizes the method and interferences as follows below (Reference 6).

Method

- Ammonium molybdate and antimony potassium tartrate react in an acid medium with dilute solutions of phosphorus to form an antimony-phospho-molybdate complex. This complex is reduced to an intensely blue-colored complex by ascorbic acid. The color is proportional to the phosphorus concentration.

- Only orthophosphate forms a blue color in this test. Polyphosphates (and some organic phosphorus compounds) may be converted to the orthophosphate form by manual sulfuric acid hydrolysis. Organic phosphorus compounds may be converted to the orthophosphate form by manual persulfate digestion (Reference 3). The developed color is measured automatically.

- Reduced volume versions of this method that use the same reagents and molar ratios are acceptable provided they meet the quality control and performance requirements stated in the method.

- Limited performance-based method modifications may be acceptable provided they are fully documented and meet or exceed requirements expressed in US EPA Method 356.1 (Reference 6).