

## Phosphorus total Trace / Phosphate ortho Trace

! **The actual edition date is given with the procedure or evaluation. See also under „Note“.**

### Principle

Phosphate ions react with molybdate and antimony ions in an acidic solution to form an antimonyl phosphomolybdate complex, which is reduced by ascorbic acid to phosphomolybdenum blue.

### Range of Application

Waste water, drinking water, boiler water, surface water, process control

### Storage Information

The test reagents are stable at +15 to +25°C up to the expiry date given on the package.

### Interferences

The ions listed in the table have been individually checked up to the given concentrations. Cumulative effects and the influence of other ions have not been determined by us. There is no interference from:

<b>2000 mg/l:</b>	SO <sub>4</sub> <sup>2-</sup>
<b>1000 mg/l:</b>	Cl <sup>-</sup>
<b>500 mg/l:</b>	K <sup>+</sup> , Na <sup>+</sup> , Ca <sup>2+</sup>
<b>50 mg/l:</b>	Co <sup>2+</sup> , Fe <sup>2+</sup> , Zn <sup>2+</sup> , Ni <sup>2+</sup> , Cr <sup>3+</sup>
<b>20 mg/l:</b>	NO <sub>3</sub> <sup>-</sup>
<b>10 mg/l:</b>	Sn <sup>2+</sup>
<b>5 mg/l:</b>	CO <sub>3</sub> <sup>2-</sup> , Cu <sup>2+</sup> , Fe <sup>3+</sup> , Hg <sup>2+</sup> , Ag <sup>+</sup>
<b>0.5 mg/l:</b>	Cr <sup>6+</sup> , Pb <sup>2+</sup>

The measurement results must be subjected to plausibility checks (dilute and/or spike the water sample).

### Removal of Interferences

If phosphonic acids are present the time for hydrolysis in the thermostat must be increased to **2 h** at **100°C** in order to prevent low-bias results (see procedure for the determination of total phosphorus).

### pH/Temperature

The pH of the water sample must be between pH 2 and pH 10. The temperature of the water sample and reagents must be between 15 and 25°C.

**Lower and higher temperatures cause low-bias results.**

### NB:

**Important information for the evaluation!**

**Without hydrolysis**, only the (dissolved) **orthophosphate** is measured.

The result of the orthophosphate measurement can be expressed as:

- mg/l PO<sub>4</sub>-P (e.g. for process control)
- mg/l PO<sub>4</sub> (e.g. for analyses of drinking water or boiler water)
- mg/l P<sub>2</sub>O<sub>5</sub> (e.g. for soils analyses)

**With hydrolysis**, all of the phosphorus (Total-P, P<sub>total</sub>) is measured.

The result of the total phosphorus measurement can be expressed as:

- mg/l P<sub>tot</sub> = Display mg/l PO<sub>4</sub>-P** (e.g. for monitoring threshold values in waste water)
- mg/l PO<sub>4</sub> (e.g. for analyses of drinking water or boiler water)
- mg/l P<sub>2</sub>O<sub>5</sub> (e.g. for soils analyses)

### Analytical Quality Assurance

**addista** is an analytical quality assurance system with which you can check the accuracy and precision of your analysis results at any time. Regular checks ensure that your measurement system is functioning properly and is being correctly operated, and reveal sample-specific interferences.

*For trace analysis the standard solution has be diluted by a factor of 5. After dilution the following nominal values are obtained:*

Standard	Range of confidence
0.2 mg/l PO <sub>4</sub> -P	0.18–0.22 mg/l PO <sub>4</sub> -P

### Safety Advice

On grounds of quality and reliability, the analysis should be carried out only with original accessories.

### CADAS 100 (LPG 185 / ≥ LPG 210)

If this test is not already stored in your instrument please ask your manufacturer for programming instructions.

### Note

The introduction of the **DosiCapZip**.

**NB! Change of the procedure.**

Applies to all types of photometer

## Phosphorus total Trace

Edition 04/2004

## Determination of total phosphorus

**Attention!** Procedure for the blank-value see

"Procedure for the determination of orthophosphate"

## 1. Hydrolysis

Carefully remove the foil from the screwed-on **DosiCap Zip**. Unscrew the **DosiCap Zip**. Pipette into the cuvette test

Water sample 3.5 ml

Screw the **DosiCap Zip**, with the fluting at the top, back onto the cuvette and **shake firmly back and forth 2 or 3 times**.Heat in the thermostat at **100°C** for **60 min**. Alternative:In the thermostat **HT 200 S**:heat cuvette **15 min** in **standard program HT**.Allow to cool, then carry out the "**analysis**".

## 2. Analysis

Pipette into the cooled cuvette

Reagent B (LCK 349 B) 0.2 ml

Close the reagent B bottle **immediately** after use.Screw **a grey DosiCap C** (LCK 349 C) onto the cuvette.Invert a few times. After **10 min** invert a few times more and transfer the content to 50 mm semi-micro cuvette, thoroughly clean the outside of the cuvette and evaluate.**Take care that there are no air bubbles!**

Applies to all types of photometer

## Phosphorus ortho Trace

Edition 04/2004

## Determination of orthophosphate

Pipette into the cuvette test

	Sample cuvette	Blank-value cuvette
Water sample	3.5 ml	–
Distilled water	–	3.5 ml
Reagent B (LCK 349 B)	0.2 ml	0.2 ml

Close the reagent B bottle **immediately** after use.Screw **a grey DosiCap C** (LCK 349 C) onto each cuvette. Invert a few times. After **10 min** invert a few times more and transfer the contents to 50 mm semi-micro cuvettes, thoroughly clean the outside of the cuvettes and evaluate.**Take care that there are no air bubbles!**

LP2W 01/1994

 $PO_4\text{-P Trace} \cdot F1 = 0 \cdot F2 = 0.43 \cdot K = 0$  $PO_4\text{ Trace} \cdot F1 = 0 \cdot F2 = 1.3 \cdot K = 0$ 

CADAS 30/30S/50/50S 01/1994

 $PO_4\text{-P Trace} \cdot \lambda: 890\text{ nm} \cdot \text{Pro.: } 1 \cdot F1 = 0 \cdot F2 = 0.296 \cdot K = 0$  $PO_4\text{ Trace} \cdot \lambda: 890\text{ nm} \cdot \text{Pro.: } 1 \cdot F1 = 0 \cdot F2 = 0.903 \cdot K = 0$  $P_2O_5\text{ Trace} \cdot \lambda: 890\text{ nm} \cdot \text{Pro.: } 1 \cdot F1 = 0 \cdot F2 = 0.678 \cdot K = 0$ 

ISIS 6000/9000 01/1994

 $PO_4\text{-P Trace} \cdot \lambda: 695\text{ nm} \cdot \text{Pro.: } 1 \cdot F1 = 0 \cdot F2 = 0.430 \cdot K = 0.018$  $PO_4\text{ Trace} \cdot \lambda: 695\text{ nm} \cdot \text{Pro.: } 1 \cdot F1 = 0 \cdot F2 = 1.319 \cdot K = 0.054$  $P_2O_5\text{ Trace} \cdot \lambda: 695\text{ nm} \cdot \text{Pro.: } 1 \cdot F1 = 0 \cdot F2 = 0.986 \cdot K = 0.041$ 

CADAS 100 / LPG 185 01/1994

 $PO_4\text{-P Trace} \cdot \lambda: 850\text{ nm} \cdot F = 0.35$  $PO_4\text{ Trace} \cdot \lambda: 850\text{ nm} \cdot F = 1.07$ CADAS 100 /  $\geq$  LPG 210 01/1994 $PO_4\text{-P Trace} \cdot \lambda: 850\text{ nm} \cdot F1 = 0.35$  $PO_4\text{ Trace} \cdot \lambda: 850\text{ nm} \cdot F1 = 1.07$

**Phosphorus total Trace**  
**Phosphate ortho Trace**

Edition 01/1994

**Evaluation**

1. Insert filter **800 nm**.
2. Enter factor (see below) and store ↑ .
3. Insert blank-value cuvette (see procedure for orthophosphate) and press "Null" (zero) key.
4. Insert sample cuvette and press "Ergebnis mit Faktor" (result with factor) key.

Parameter	Factor	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	0.43	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	1.3	0.03–1.50 mg/l

**Phosphorus total Trace**  
**Phosphate ortho Trace**

Edition 01/1994

**Evaluation**

1. Insert program filter **800 nm**.
2. Press "Tests" key until display (see below) appears.
3. Control number must be **7** (PO<sub>4</sub>-P) or **4** (PO<sub>4</sub>).
4. Insert blank-value cuvette (see procedure for orthophosphate) and press "Null" (zero) key.
5. Insert sample cuvette and press "Ergebnis" (result) key.

Parameter	Display	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	Test __	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	Test __	0.03–1.50 mg/l

**Phosphorus total Trace**  
**Phosphate ortho Trace**

Edition 01/1994

**Evaluation**

1. Insert filter **800 nm**.
2. Select »Dr. Lange« mode.
3. Select test number (see below).
4. Control number must be **5**.
5. Insert blank-value cuvette (see procedure for orthophosphate) and press blue key.
6. Insert sample cuvette and press green key.

Parameter	Test-No.	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	349	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	349	0.03–1.50 mg/l
Phosphate Pentoxide (P <sub>2</sub> O <sub>5</sub> ) Trace	349	0.02–1.20 mg/l

**Phosphorus total Trace**  
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Edition 01/1994

**Evaluation**

1. Check program control number:  
 \_\_\_ : **38 (CADAS 200)**  
 \_\_\_ : **32 (ISIS 6000/9000)** ⇒ Select »TEST« mode.  
**CADAS 30/50** ⇒ Select »TEST« mode.  
**LASA 100, XION 500** ⇒ Select »Dr. Lange« mode.
2. Select test number (see below).
3. Control number must be:  
**CADAS 30/50, CADAS 200:**  
**6** (PO<sub>4</sub>-P) or **1** (PO<sub>4</sub>) or **1** (P<sub>2</sub>O<sub>5</sub>)  
**ISIS 6000/9000:**  
**6** (PO<sub>4</sub>-P) or **5** (PO<sub>4</sub>) or **9** (P<sub>2</sub>O<sub>5</sub>)  
**LASA 100:**  
**5** (PO<sub>4</sub>-P, PO<sub>4</sub>, P<sub>2</sub>O<sub>5</sub>)  
**XION 500:**  
**6** (PO<sub>4</sub>-P, PO<sub>4</sub>, P<sub>2</sub>O<sub>5</sub>)
4. Insert blank-value cuvette (see procedure for orthophosphate) and press blue key.
5. Insert sample cuvette and press green key.

Parameter	Test-No.	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	349	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	349	0.03–1.50 mg/l
Phosphate Pentoxide (P <sub>2</sub> O <sub>5</sub> ) Trace	349	0.02–1.20 mg/l

**Phosphorus total Trace**  
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Edition 01/1994

**Evaluation**

1. Select »TEST« mode.
2. Select symbol (see below).
3. Check factors and measuring wavelength in memory »Mem« (**LPG 185**) or control number must be **2** (PO<sub>4</sub>-P) or **3** (PO<sub>4</sub>) (**LPG 210**).
4. Insert blank-value cuvette (see procedure for orthophosphate) and press "NULL" (zero) key.
5. Insert sample cuvette and press "MESS" (measure) key.

Parameter	Symbol	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	349 S	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	349 M	0.03–1.50 mg/l

**Phosphorus total Trace**  
**Phosphate ortho Trace**

Edition 01/1994

**Evaluation**

1. Select »TEST« mode.
2. Select test number (see below).
3. Control number must be **6** (PO<sub>4</sub>-P) or **1** (PO<sub>4</sub>) or **1** (P<sub>2</sub>O<sub>5</sub>).
4. Insert blank-value cuvette (see procedure for orthophosphate) and press key below »ZERO«.
5. Insert sample cuvette and press key below »MEAS.«.

Parameter	Test-No.	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	349	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	349	0.03–1.50 mg/l
Phosphate Pentoxide (P <sub>2</sub> O <sub>5</sub> ) Trace	349	0.02–1.20 mg/l

**Phosphorus total Trace**  
**Phosphate ortho Trace**

Edition 05/2006

**Evaluation**

1. Select menu "Stored Programs".
2. Select test number (see below) and touch "Start".
3. Insert blank-value cuvette (see procedure) and touch "Zero".
4. Insert sample cuvette and touch "Read".

Parameter	Test-No.	Measuring range
Phosphate-Phosphorus (PO <sub>4</sub> -P) Trace	349	0.01–0.50 mg/l
Phosphate (PO <sub>4</sub> ) Trace	349	0.03–1.50 mg/l
Phosphate Pentoxide (P <sub>2</sub> O <sub>5</sub> ) Trace	349	0.02–1.20 mg/l