

**Application**

**Titroline alpha *plus***

**Determination of the  
Permanganate Index (oxidability)  
according to ISO 8467**

**SCHOTT**  
Instruments

## USE

The permanganate index (also referred to as oxidability) is a conventional parameter for the determination of the concentration of organic and oxidable inorganic matters in water. A water sample is mixed with a weight of potassium permanganate solution and heated up. A portion of the permanganate will be reduced by the oxidable matters contained in the sample. The consumption of permanganate is determined by the addition of a surplus of sodium oxalate solution and the subsequent titration using potassium permanganate. The procedure can be used for drinking water as well as swimming and bathing pool water. The lower application limit is 0.5 mg/l.

## APPLIANCES

TitroLine alpha plus TL 20 or 50 plus

TM 135 magnetic stirrer or heatable stirrer TZ 1870 (recommended). Instead of heatable magnetic stirrer a water bath could be used.

Burette tip TZ 1643, glass beaker 150 tall form or any suitable tall glass vessel.

## ELECTRODES

Elektrode: Pt 61 with cable K1A  
Elektrolyte: KCl 3 mol/l, L 300 4

## REAGENTS

Solvent: water  
Titer determination: with Sodium oxalat-Lösung 0.005 mol/l  
Titration agent: Potassium permanganat-Lösung 0.002 mol/l  
Chemicals: Sulphuric acid 7.5 and 2 mol/l

## DESCRIPTION

### Preparation of the potassium permanganate solution

Use a 0.02 mol/l permanganate solution as parent solution. Pipette 100 ml of this parent solution into a 1 l volumetric flask, fill up with water. The permanganate solution should always be stored in a dark bottle.

### Preparation of the sodium oxalate solution

Dry the sodium oxalate ( $\text{Na}_2\text{C}_2\text{O}_4$ ) for 2 h at 120°C, and fill 6.7 g of it up to the volume in a 1 l volumetric flask. Prepare a 1/10 dilution of this solution. The concentration will then be  $c(\text{Na}_2\text{C}_2\text{O}_4) = 0.005 \text{ mol/l}$ . This dilution will remain stable for not more than two weeks.

### Sample preparation

Add 5 ml  $\text{H}_2\text{SO}_4$  7.5 mol/l to 1 L of the water sample right after the sample reached the laboratory.

### Titration procedere

#### Sample titration

Please dilute water samples if the oxidation number is higher than 10 mg/l. Pipette 25.0 ml of the sample into the tall beaker and add 5 ml of the  $\text{H}_2\text{SO}_4$  2 mol/l. Mix it well. Put the beaker in the boiling water bath or on the heatable magnetic stirrer (appr. 110 – 120 °C) for 10 min (+/- 2 min). Add 5 ml of the Potassium permanganat-Lösung 0.002 mol/l. Wait for 10 min (+/- 15 s.). Add 5 ml of the Sodium oxalat-Lösung 0.005 mol/l and wait until the solution is clear. Titrate the hot solution (> 80 °C) with the Potassium permanganat-Lösung 0.002 mol/l to the inflection point.

### Blank titration

Prior to this titration carry out a blank titration using dest. water instead of the water sample. With the titrated sample is carried out a standard titration.

### Standard titration

Add 5.0 ml of the Sodium oxalat-Lösung 0.005 mol/l. Titrate with the Potassium permanganat-Lösung 0.002 mol/l to a turning point.

### **Electrode handling**

As long as the electrode is not being used it should be stored in the appropriate electrolyte solution. For further details, please refer to the electrode's operating instructions.

## NOTES

If you should have any questions concerning application, please contact the Application Department of Schott-Instruments; tel.: **+ 49 6131 66 5062**

## LITERATURE

Also refer to „Deutsche Einheitsverfahren für Wasser-, Abwasser- und Schlammuntersuchung“ (German unified procedures for water, sewage-water and mud examination) DIN 38 409 Part 5 (ISO 8467).

**oxid. no.blank**

1 / 2

method number	5	no smoothing
password	no	sample amount :
sampler	none	no
		statistics :
		no
		no. decimals 3
		no documentation
method link	no	
method	selection mV	
edit std method	one end point	
measuring channel A		
input delay	no / water	
initial meas. value	no	
titration direction	increasing	
sample ID	no	
predosing burette	no	
waiting time [s]	10	
pretitration buret	no	
reaction time [s]	0	
fill dosing unit	fill	
final value	EP1 850.00 mV	
delay[s]:	EP1 10 s	
EP speed	medium	
curve type	EP1 minimal consumption	
	version software	14.07.04/01
	device no.:	00473270
	application user	
	passwd.protected:	no
	documented:	05.04.2005
		08:27:38

**oxid. no. blank**

2 / 2

method number	5
calculation :	
formula	$mL * F1 * F2 / Q$
formula no.	EP 1
value F1	1.0000
value F2	1.0000
value Q	1.0000
identifier	blank value
unit	ml
result:	into global memory 1

version software	14.07.04/01
device no.:	00473270
application user	
passwd.protected:	no
documented:	05.04.2005
	08:28:31

**oxid. no. stand.**

1 / 2

method number	6	no smoothing
password	no	sample amount :
sampler	none	no
		statistics :
		no
		no. decimals 3
		no documentation
method link	no	
method	selection mV	
edit std method	dynamic(EQ)	
measuring channel A		
input delay	no / water	
initial meas. value	no	
sample ID	no	
predosing burette	no	
waiting time [s]	10	
pretitration buret	yes	
pretitration in ml:	1.00	
reaction time [s]	10	
fill dosing unit	fill	
end of titration	mL + EQ	
number end points	EQ 1	
final consumpt. ml	20.00	
end of titration	steep jump	
drift control	medium	
dynamic control	steep jump	

version software 14.07.04/01  
device no.: 00473270  
application user  
passwd.protected: no  
documented: 05.04.2005  
08:42:50

**oxid. no. stand.**

2 / 2

method number        6  
calculation        :  
formula                mL\*F1\*F2/Q  
formula no.            EQ 1  
value F1                1.0000  
value F2                1.0000  
  
value Q                 1.0000  
  
identifier  
unit                    ml  
result:        into global memory    2

version software    14.07.04/01  
device no.:         00473270  
application user  
passwd.protected: no  
documented:        05.04.2005  
                         08:43:38

**oxid. no.**

1 / 2

method number	7	no smoothing
password	no	sample amount :
sampler	none	volume fix 25.00 ml
		statistics :
		no
		no. decimals 2
		no documentation
method link	no	
method	selection mV	
edit std method	dynamic(EQ)	
measuring channel A		
input delay	no / water	
initial meas. value	no	
sample ID	manual	
predosing burette	no	
waiting time [s]	10	
pretitration buret	yes	
pretitration in ml:	0.30	
reaction time [s]	10	
fill dosing unit	fill	
end of titration	mL + EQ	
number end points	EQ 1	
final consumpt. ml	20.00	
end of titration	steep jump	
drift control	medium	
dynamic control	steep jump	

version software 14.07.04/01  
device no.: 00473270  
application user  
passwd.protected: no  
documented: 05.04.2005  
08:41:10



**oxid. no.**

2 / 2

method number	7
calculation	:
formula	$(mL-B)*F1*F2/Q$
formula no.	EQ 1
value F1	400.0000
value F2	1.0000
Q = Global Memory	2
B = Global Memory	1
identifier	
unit	mg/l

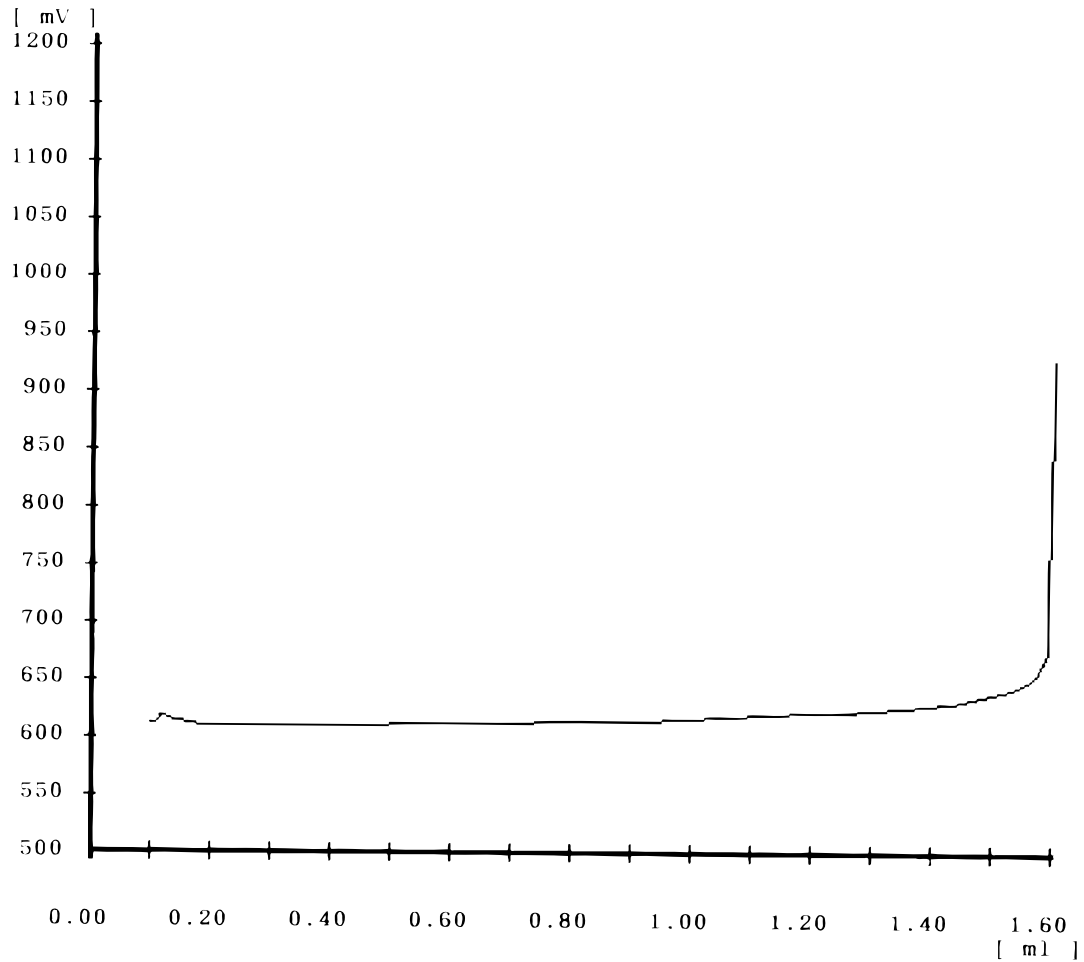
  

version software	14.07.04/01
device no.:	00473270
application user	
passwd.protected:	no
documented:	05.04.2005
	08:41:58

## Curve

Titration Ergebnisse:

EQ 1: 870.258 mV 1.5996 ml  
> INDEX= 24.21 MG/L



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