

# Titration of FOS/TAC

## Description

The determination of volatile organic acids (FOS) and total inorganic carbon (TAC) is an easy way to monitor the fermentation process in a biogas plant.

The determination of the FOS / TAC value is done as a titration to two end points of pH 5.0 and pH 4.4 with sulfuric acid 0.05 mol/l. As an alternative to sulfuric acid, it is also possible to use hydrochloric acid 0.1 mol/l.

## Instruments

Titration	TL 5000, TL 7000 or higher
Exchangeable head	WA 50
Electrode	A 162 2M DIN ID oder A 7780 NTC30 DIN N
Kabel	---
Stirrer	Magnetic stirrer TM 235 or similar
Lab accessory	Glass beaker 100 ml
	Magnetic stirrer bar 30 mm

## Reagents

1	Sulfuric acid 0.05 mol/l
2	DIN Buffer pH 4.01 or 4.00
3	DIN Buffer pH 6.87 or 7.00
4	Distilled water
All reagents should be of analytical grade or better.	

## Titration procedure

### Reagents

The titer determination of the  $\text{H}_2\text{SO}_4$  0.05 mol/l is done as described in the application report "Titer determination of strong acids".

### Cleaning of the electrode

The electrode is cleaned with distilled water. Suitable for storage is KCl solution 3 mol/l or electrolyte solution L 911.

Because this titration is done as an endpoint titration, the electrode must be calibrated periodically (at least weekly). We recommend a 2-point calibration with the DIN/NIST buffers pH 4.01/6.87 or technical buffers 4.00/7.00.

### Sample preparation

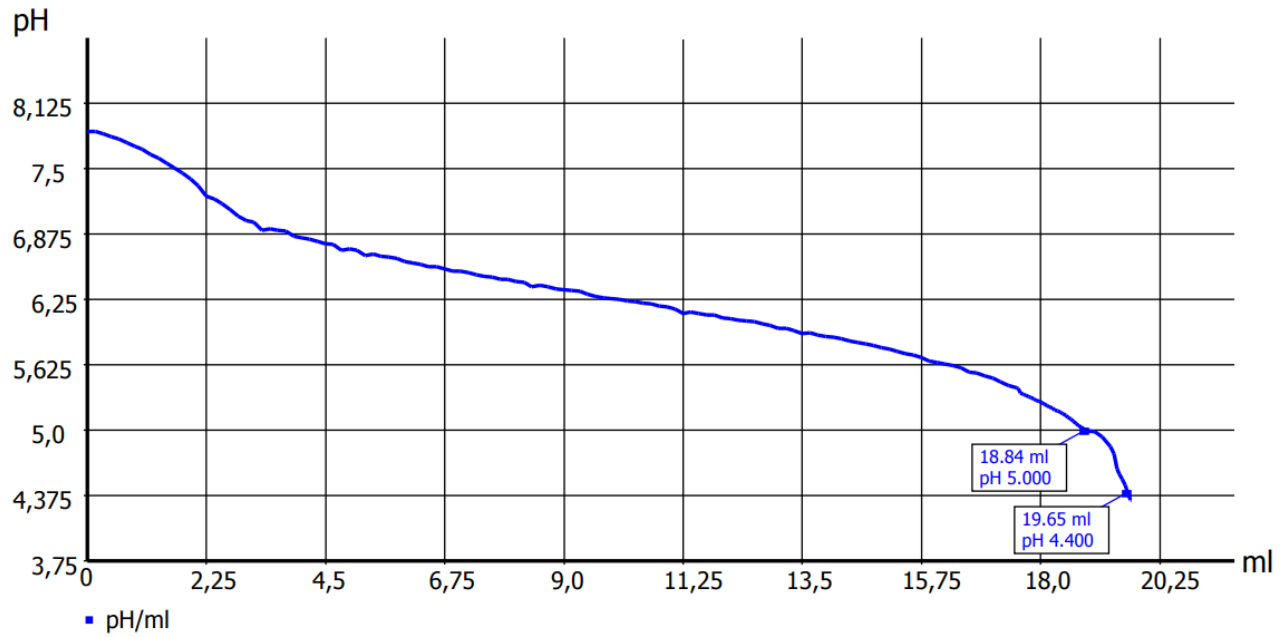
The sample is either centrifuged or filtered through a not too fine sieve. It is important that a larger amount of the sample is already homogenized in advance. The sample must always be treated in the same way to get comparable results.

20 ml of the filtered or centrifuged sample are pipetted into a 100 ml beaker and made up to approx. 50 ml with distilled water and titrated with  $\text{H}_2\text{SO}_4$  0.05 mol/l to two end points pH 5.0 and pH 4.4.

The method FOS-TAC is a default method in the TL 5000 and TL 7XXX potentiometric titrators.

## Titration parameter

### Sample titration



Default method	FOS TAC		
Method type	Automatic titration		
Modus	Endpoint		
Measured value	pH		
Measuring speed / drift	normal	Minimum holding time	2 s
		Maximum holding time	15 s
		Measuring time	2 s
		Drift	20 mV/min
Initial waiting time	0 s		
Step size	0.05 ml		
Dampening	none	Titration direction	decrease
Pretitration	Off	Delay time	0 s
Endpoint 1	5.0 pH	Delta Endpoint	0.4 pH
		Endpoint delay	5 s
Endpoint 2	4.40 pH	Delta Endpoint	0.4 pH
		Endpoint delay	5 s
Max. titration volume	50 ml		
Dosing speed	10%	Filling speed	30 s

Calculation:

Formula 1

$$TAC = \frac{F1}{V} * EP1 * F2$$

Formula 2

$$FOS = \left( \frac{F1}{V} * (EP2 - EP1) * F3 - F4 \right) * F5$$

Formula 3

$$FOS/TAC = \frac{(F6 * F7)}{(F8 * F9)}$$

EP1		Consumption of titrant at first end point
EP2		Consumption of titrant at second end point EP
V	20	Volume of the sample
F1	20	Conversion factor 1
F2	250	Conversion factor 2
F3	1,66	Conversion factor 3
F4	0,15	Conversion factor 4
F5	500	Conversion factor 5
F6	FOS	FOS-value, result from formula 2
F7	1	Conversion factor 7
F8	TAC	TAC-value, result from formula 1
F9	1	Conversion factor 9