

**Determination of FOS TAC
value in Biogas plants**



Application

Use

The determination of the **volatile organic acids (FOS)** and **total inorganic carbon (TAC)** or buffer monitor the fermentation process in biogas reactors.

Determination of FOS/TAC value is performed as an endpoint titration to two pH endpoint using sulphuric acid. The FOS, TAC and the ratio of FOS/TAC are automatically calculated and displayed.

The FOS TAC method is stored as default method inside the TitroLine® 6000/7000/7750 titrators

Appliances

Titration: TL 6000_M2/50 consists of

- Basic device
- Magnetic stirrer TM 235
- 50 mL exchange unit WA 50, with brown glass bottle for titrant complete
- pH combination electrode A 7780 DIN ID

Electrodes

- see above
- Calibration: DIN buffer pH= 4.00 and pH= 7.00

Application

Reagents

- Titrant: H₂SO₄ 0.05 mol/L
- Titer: Possible with TRIS (Tris (hydroxymethyl)-aminomethan)

Description

Calibration

The pH combination electrode is calibrated in technical buffer pH=4.00 and pH= 7.00 or in DIN buffer pH= 4.01 and pH= 6.87.

Example of the calibration documentation:

Calibration

Buffers used

pH buffer 1:	TEC_4.000
pH buffer 2:	TEC_7.000

Measured values

pH buffer 1:	TEC_4.000	165.6 mV / 23.4 °C
pH buffer 2:	TEC_7.000	-11.2 mV / 23.0 °C

Calibration data

Slope:	99.4 % / -58.8 mV/pH
Zero point:	pH 6.81 / -11.2 mV
Temperature:	23.4 °C (a)
Date and time:	07.03.13 / 15:04

Determination of the exact concentration of the standard solution (option)

The exact concentration of the H₂SO₄ 0.05 mol/L titrant can be determined using a titrimetric standard Tris (hydroxymethyl)-aminomethan. TRIS is dried in a desiccator before the titer determination overnight at room temperature.

The standard method for HCl/H₂SO₄ titrant ("titer HCl) is stored as a default method inside the TitroLine® 6000/7000/7750 titrators. With EDIT/F3 - Default method you can load this method. It is only necessary to change the name of the method and the factor F2 in the calculation formula:

Factor 2 (F2):	1000.0000
Factor 1 (F1):	1.0000

The factor 1 (F1) should be changed to 2.

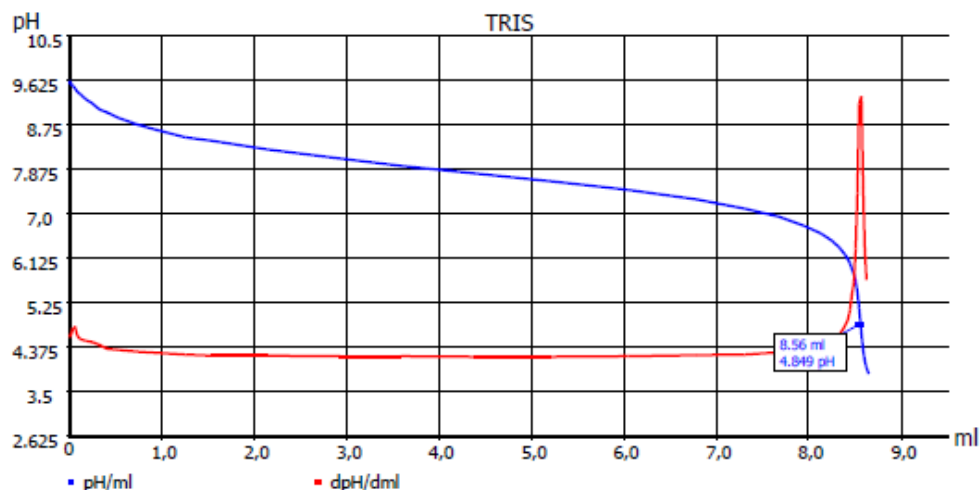
In a 100 or 150 ml, 0.2 to 0.3g TRIS are weighed accurately and dissolved in 60/80 mL of dist. water with stirring. It is titrated with H₂SO₄ 0.05 mol/L.

Application

Documentation example for standard titration of H2SO4/HCl with TRIS

GLP documentation

Titration graph



Method data

Method name:	Titre HCl	Titration duration:	3 m 8 s
End date:	13.09.12	End time:	14:39:30

Titration data

Sample ID:	TRIS	Weight:	0.1038 g
Start pH:	pH 9.590	End pH:	pH 3.864
Start temperature:	25.0 °C (m)	End temperature:	25.0 °C (m)
Zero point:	pH 6.83 / -10.0 mV	Slope:	100.6 % / -59.5 mV/pH
EQ:	8.560 ml / pH 4.849	Titre:	0.1001 mol/l

Calculation formula

Titre: $(W * F2) / ((EQ1 - B) * M * F1) \rightarrow M103$
Mol (M): 121.14000

Weight (W):	man	Factor 2 (F2):	1000.0000
Blank value (B):	0.0000 ml	Factor 1 (F1):	1.0000
Statistics:	Off		

Application

Method for standard titration of H₂SO₄/HCl with TRIS

Method data overall view

Method name:	Titre HCl	Created at:	09/13/12 14:23:02
Method type:	Automatic titration	Last modification:	09/13/12 14:27:56
Measured value:	pH	Damping settings:	None
Titration mode:	Dynamic	Documentation:	GLP

Dynamic:	Steep
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Measuring speed / drift:	Normal:	minimum holding time:	02 s
		maximum holding time:	15 s
		Measuring time:	02 s
		Drift:	20 mV/min

Initial waiting time:	0 s		
Titration direction:	Decrease		
Pretitration:	Off		
End value:	2.500 pH		
EQ:	On (1)		
Slope value:	Steep	Value:	700

Dosing parameter

Dosing speed:	100 %	Filling speed:	30 s
Maximum dosing volume:	50.00 ml		

Unit values

Unit size:	20ml
Unit ID:	10039005
Reagent:	HCl 0.1 mol/L
Batch ID:	no Charge
Concentration [mol/l]:	0.10070
Determined at:	12/05/11 19:18:45
Expire date:	08/18/12
Opened/compounded:	09/10/11
Test according ISO 8655:	05/10/11
Last modification:	09/13/12 14:35:18

Device information

Device:	TitroLine 7000
Serial number:	00012
Software version:	1230

Titre_HCl_13_09_12-14_36_21.pdf

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Application

Titration of the sample

The sample is either centrifugated 20 min or filtrated before use. It is also important that a larger amount of the sample is homogenized before filtration/centrifugation. The sample should be treated always in the same manner.

20 ml of the filtrated sample (or less) are pipetted in a beaker and diluted with water that the pH electrode and titration tip can immerse correctly.

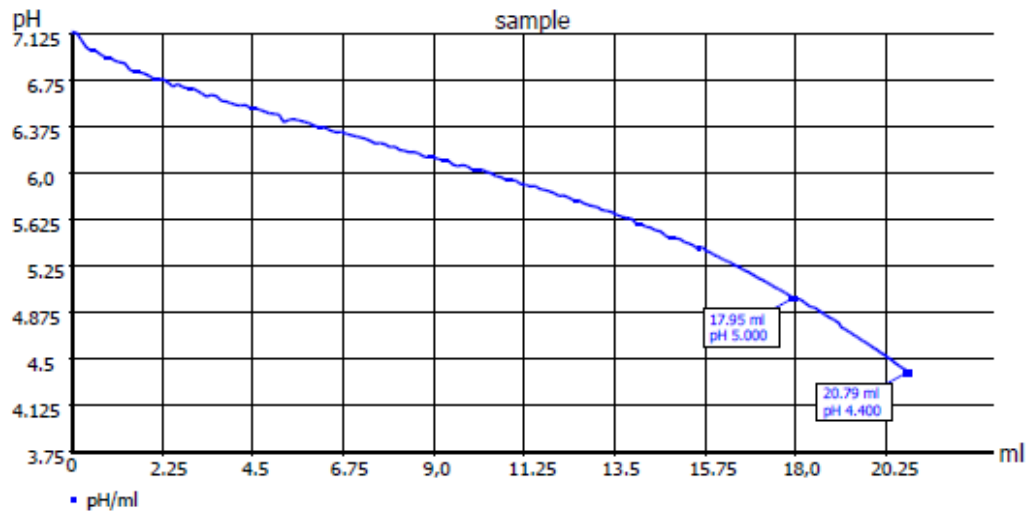
Select the FOS TAC method and start the titration.

Result example:

Application

GLP documentation

Titration graph



Method data

Method name:	FOS TAC	Titration duration:	7 m 9 s
End date:	08.01.13	End time:	17:39:42

Titration data

Start pH:	pH 7.148	Pattern:	20.00000 ml
Start temperature:	25.0 °C (m)	End pH:	pH 4.390
Zero point:	pH 6.88 / -6.7 mV	End temperature:	25.0 °C (m)
EP1:	17.950 ml / pH 5.000	Slope:	97.5 % / -57.7 mV/pH
		TAC:	4487.50
EP2:	20.788 ml / pH 4.400	FOS:	2280.54
		FOS/TAC:	0.51

Calculation formula

TAC:	$(F1/V)*EP1*F2$		
FOS:	$((F1/V)*(EP2-EP1)*F3-F4)*F5$		
FOS/TAC:	$(F6*F7)/(F8*F9)$		
Factor 1 (F1):	20.0000	Pattern (V):	20.0000 ml (f)
Factor 2 (F2):	250.0000	Factor 3 (F3):	1.6600
Factor 4 (F4):	0.1500	Factor 5 (F5):	500.0000
Factor 6 (F6):	2280.54 (FOS)	Factor 7 (F7):	1.0000
Factor 8 (F8):	4487.50 (TAC)	Factor 9 (F9):	1.0000
Statistics:	Off		

Application

Method

The method is available as default method in the TL 6000/7000/TL 7750 titrator and ready to use.

Method data overall view

Method name:	FOS TAC	Created at:	01/08/13 17:30:29
Method type:	Automatic titration	Last modification:	01/08/13 17:32:28
Measured value:	pH	Damping settings:	None
Titration mode:	End pt.	Documentation:	GLP
Linear steps:	0.050 ml		

Measuring speed / drift:	Normal:	minimum holding time:	02 s
		maximum holding time:	15 s
		Measuring time:	02 s
		Drift:	20 mV/min

Initial waiting time:	0 s
Titration direction:	Decrease
Pretitration:	Off

Endpoint 1:	pH 5.000	delta endpoint 1:	pH 0.400
		Endpoint delay 1:	5 s
Endpoint 2:	pH 4.400	delta endpoint 2:	pH 0.400
		Endpoint delay 2:	5 s

Dosing parameter

Dosing speed:	40 %	Filling speed:	30 s
Maximum dosing volume:	50.00 ml		

Unit values

Unit size:	20ml
Unit ID:	10039005
Reagent:	HCl 0.1 mol/L
Batch ID:	no Charge
Concentration [mol/l]:	1.66666
Determined at:	01/07/13 21:41:57
Expire date:	08/18/12
Opened/compounded:	09/10/11
Test according ISO 8655:	05/10/11
Last modification:	01/07/13 13:42:17

Device information

Device:	TitroLine 7000
Serial number:	10003645
Software version:	1301

FOS_TAC_08_01_13-17_32_33.pdf

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Application

Notes

If you have any questions on the application, you can feel free to contact us..

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