

Installation instruction of TitrIC pro III

The TitrIC pro III system is used for the fully automatic analysis of water samples using direct measurement, titration and ion chromatography. The lids of the air protected sample beakers are discovered with the DISCOVER function of the 815 and the following parameters are determined in a very short time: temperature, conductivity, pH, acid capacity and, in parallel, the concentrations of the individual anions and cations. Further Metrohm instruments can be incorporated in the existing system at any time and used to determine additional parameters.

Analytical sequence

1. The sample is transferred to the 850 Professional IC for anion and cation analysis.
2. The sample is transferred into an external cell via the flow-through cell to determine the conductivity. Afterwards the temperature, pH and acid capacity (p and m values) are determined in the external cell.

The whole procedure is controlled by the MagIC Net software: The user enters the sample position and sample identification into MagIC Net only. All sample liquid handling is done by MagIC Net. MagIC Net Communication such as starting titration analysis, respectively transfer of results to *tiamo*TM is done via RS232.

All data is concluded in a joint report containing all results by MagIC Net.



Fig.: TitrIC pro III system setup

Table of contents:

1.	Delivery package	3
	- delivered with TitrIC pro III package:	3
	-Optional accessories:	3
2.	Installation	4
2.1.	815 Robotic USB Sample Processor XL (2T/2P).....	4
2.2.	Titrande (2.905.0010)	4
2.3.	Conductometer (2.856.0010).....	4
2.4.	850 Professional IC AnCat – MCS (2.850.3030)	5
2.5.	Dosino holder (6.2057.210)	5
3.	Cable connections	5
4.	Tubing connections.....	5
4.1.	External cell\$	5
4.2.	Installation of the 50 mL Dosing Unit	6
4.3.	Overview of all the tubing connections	6
5.	Miscellaneous	7
5.1.	Membrane Pumps of the 815	7
5.2.	Stirrer	7
5.3.	Length of the aspiration tips in the external cell	7
5.4.	Electrodes.....	7
6.	Software	7
6.1.	Installation of the software	7
6.2.	Configuration of MagIC Net	7
6.2.1.	Devices.....	7
6.2.2.	Solution.....	7
6.2.3.	Swing Head configuration.....	8
6.2.4.	Lift positions.....	8
6.2.5.	Needle rinse position	8
6.2.6.	Methods.....	8
6.3.	Configuration of <i>tiamo</i> TM	9
6.3.1.	Devices.....	9
6.3.2.	Solution.....	9
6.3.3.	Electrodes.....	9

6.3.4.	Methods.....	9
6.4.	Setup of RS232 communication between MagIC Net and <i>tiamo</i> TM	9
7.	Complete Analysis with TitrIC.....	10
9.	TitrIC pro – Combo Kit Dilution	11
9.1	Delivery package	11
9.2	Installation	11
9.3	Dosino	11
9.4	Transfer Tubing	11
9.5	External Dilution Vessel.....	11
9.6	Analysis	11
9.	TitrIC pro – Combo Kit Partial Loop.....	13
9.1	Delivery package	13
9.2	Installation	13
9.3	Rinsing station	13
9.4	MiPT Dosino	13
9.5	Analysis	13

1. Delivery package

- delivered with TitrIC pro III package:

No.	Article no.	Article designation
IC		
1	2.850.3030	850 Professional IC AnCat – MCS
2	2.850.9010	IC Conductivity Detector
Sample processor		
1	2.815.0110	815 Robotic USB Sample Processor XL (2T/2P)
2	2.786.0040	Swing Head
1	6.1462.040	Robotic Arm with transfer head for 786 Swing Head, right swinging
1	6.1462.080	Robotic Arm DIS-COVER
1	6.2833.020	Needle holder 1/8 in. With tubing connection M6
1	6.1835.050	PEEK sample aspiration tube (1.58 mm ID)
1	6.2629.000	Screw nut to needle holder IC
Conductometry		
1	2.856.0010	856 Conductivity Module
1	6.0915.100	Five-ring conductivity measuring cell, $c = 0.7 \text{ cm}^{-1}$, with Pt 1000
1	6.2151.000	Cable USB A - mini-DIN 8P (R)
1	6.2763.000	Flow through cell for 60915100
p and m value titration (pH measurement)		
1	2.905.0010	905 Titrande
1	6.0277.300	iAquatrode plus with Pt 1000
1	6.2151.000	Cable USB A – mini-DIN 8P
1	6.2307.230	Buffer solutions pH 4, 7 and 9
1	6.2325.000	Phit kit
Liquid Handling		
2	2.800.0010	800 Dosino
1	6.3032.220	807 Dosing Unit, glass, 20 mL
1	6.3032.250	807 Dosing Unit, glass, 50 mL
1	6.2057.210	Holder Dosino for IC Instruments
1	6.1608.030	Glass bottle GL45 1L (round)
1	6.1808.280	Adapter Dosino Port 4 / M6
1	6.1618.020	Thread adapter S 40 to GL45
2	6.2744.080	Coupling M6-UNF 10/32 (Dosing Unit – IC screw)
1	6.2744.070	Pressure screw made of PEEK, short, 5x
1	6.1808.010	Coupling piece 2 x M6 outer threads
1	6.1808.060	T Connector M6

Connection tubings

1	6.1805.510	Connection tubing FEP, L = 60 cm, 2 x M8 thread
1	6.1805.110	Connection tubing FEP, L = 80 cm, 2 x M6 thread
1	6.1805.030	Connection tubing FEP, L = 150 cm, 2 x M6 thread

External cell

1	2.802.0020	802 Rod Stirrer
1	6.2001.070	Stand support for 804
1	6.1414.060	Titration vessel lid micro ECO
1	6.1415.250	Titration vessel / 50-150 mL
5	6.2730.030	Stopper with nipple and O-ring
1	6.2730.080	Screw nipple M16/NS14
1	6.2730.020	Septum stopper
3	6.2730.060	Screw nipple for electrodes
1	6.1543.170	Aspiration tip M8
1	6.2709.090	Stopper (12 mm)
1	6.1543.210	3-way stopper with antidiffusion valve

Software

1	6.6056.231	Tiamo 2.3 light CD: 1 Licence
1	6.6059.232	MagIC Net 2.3 Professional CD: 1 Licence

RS232 Communication MagIC - Tiamo

1	6.2134.040	Connecting cable RS-232 to IMP-PC (DBp)
2	6.2148.050	USB/RS-232 Converter for 900 Touch Control / Ti-Touch

-Optional accessories:

1	6.2041.xxx	Sample rack made of PVC
1	6.1432.xxx	Sample beaker
1	6.2324.000	Conductivity standard (100 $\mu\text{S/cm}$)
1	6.2301.060	Conductivity standard (12.88 mS)
1	6.2307.230	Buffer solutions 3 x 10 x 30mL of pH 4 / 7 / 9
1	6.2065.000	Stacking frame for 846 Dosing Interface, 856 Conductivity Module, 867 pH Module
1	6.2041.800	Sample rack 100* 75 ml
1	6.2041.810	Sample rack 34* 150 ml
1	6.2041.820	Sample rack 28* 250 ml
1	6.2041.840	Sample rack 59* 120 ml

1	6.1432.210	Sample beaker 75 mL made of glass (for 6.2041.800)
1	6.1432.320	Sample beaker 250 mL made of glass (for 6.2041.820)
1	6.1453.250	Sample beaker 250 mL made of polypropylene (for 6.2041.820)
1	6.1459.300	Sample beaker 120 mL made of polypropylene (250 pieces) (for 6.2041.840)
1	6.1006.510	Metrosep A Supp 5 - 100/4.0
1	6.1006.520	Metrosep A Supp 5 - 150/4.0
1	6.1006.500	Metrosep A Supp 4/5 Guard/4.0
1	6.1030.410	Metrosep A Supp 15 – 100/4.0
	6.1030.420	Metrosep A Supp 15 – 150/4.0
1	6.1030.500	Metrosep A Supp 15 Guard/4.0
1	6.1050.410	Metrosep C 4 – 100/4.0
1	6.1050.420	Metrosep C 4 – 150/4.0
1	6.1050.500	Metrosep C 4 Guard/4.0
1	2.849.1030	849 Level Control for Inline Eluent Preparation

2. Installation

The following is a detailed description of the TitrIC pro III installation.

We strongly recommend that the individual steps are carried out in the order given below!

2.1. 815 Robotic USB Sample Processor XL (2T/2P)

The sample processor is placed at the side at which it is most easily accessible. Please note that the following procedure refers exclusively to the version in which the sample processor is located at the left-hand side of the IC system.

- On the left-hand side of the 815 Robotic USB Sample Processor XL, attach the **stand support** (6.2001.070) for the external titration vessel.
- Mount both Swing Heads (2.786.0040) onto the 815 (see installation instructions).
- **Do not** screw the robotic arm (6.1462.040) nor the robotic arm DIS-COVER (6.1462.080) onto the Swing Head!
- The **Sample Rack** supplied is screwed onto the 815.
- In the vicinity of the 815 the two **canisters** (standard equipment of 815) are placed on the floor: One 10 L canister is used as a waste container, the second one as a reservoir for deionized (DI) water used for rinsing the external cell.
- From the smaller opening of the canisters containing DI water, an M8 PTFE tubing connection of suitable length is led to the connection box made of white plastic of membrane pump 1 / tower 1 and connected.
- From the front opening of the waste canister an M8 PTFE tubing connection of suitable length is led directly to membrane pump 1 / tower 2 (black plastic) and connected.

A more detailed description is given in the instructions for use of the 815 Robotic USB Sample Processor XL.

2.2. Titrande (2.905.0010)

Directly to the right of the 815 Robotic USB Sample Processor, place the Titrande with a bottle of titration solution (0.1 mol/L HCl will be connected to the 20 mL Dosing Unit and 800 Dosino).

2.3. Conductometer (2.856.0010)

The 856 Conductometer is placed directly at the left of the Titrande. For detailed information about the usage check the Instructions of Use of the 856.

Before measurement it is recommended to carry out the calibration of the cell constant in the flow-through cell of this

setup. For further information consult the Installation Instructions of the 856 Conductometer.

2.4. 850 Professional IC AnCat – MCS (2.850.3030)

Place the 850 Professional IC AnCat - MCS (2.850.3030) to the right of the Titrando. The IC instrument can already be installed. Please consult the Instructions for Use for the Professional IC instruments.

2.5. Dosino holder (6.2057.210)

The Dosino holder (6.2057.210) is placed on the left top side of the 850 Professional IC AnCat; the 50 mL (6.3032.250) Dosing Unit is screwed onto this holder at a later stage.

3. Cable connections

First all the power cables are connected to the instruments. Both the instruments and the PC remain switched off.

- ① Controller cable USB (6.2151.000) from 856 Conductometer to USB 1 of the 815 Sample Processor.
- ② USB cable (6.2151.020) from 850 Professional IC to PC, **do not connect!**
- ③ Controller cable USB (6.2151.000) from PC to 815 Controller, **do not connect!**
- ④ Connect the MSB cable from Dosino 800, 50 mL (transfer to external titration cell and to the IC injection valves) to 850 MSB 1
- ⑤ Connect the MSB cable from Dosino 800, 20 mL (0.1 mol/L HCl) to 905 MSB 1
- ⑥ Controller cable USB (6.2151.000) from 905 to USB 2 of the 815 Sample Processor

4. Tubing connections

4.1. External cell\$

The numbers given here (①, ...) and "opening 1", ... refer to the drawing below.

In the next step the external cell is prepared. The following components are inserted in the titration vessel lid (6.1414.060):

The small 6.2730.030 stoppers (with the black rubber ring) are screwed loosely into openings 1, 2, 3, 5 and 7 and fixed in position when the buret tips, etc. are inserted.

A septum stopper (6.2730.020) is put into the opening 6. The 6.2730.080 screw nipple M16/NS14 is screwed into opening 9 and the 6.2730.060 screw nipple M16 into openings 4, 8 and 6.

The titration vessel lid is attached to the stand support (6.2001.070) using opening 10. It is fixed at the required height with the clamping ring and the horizontal brace of the stand support is mounted on the 815 with the socket head screw.

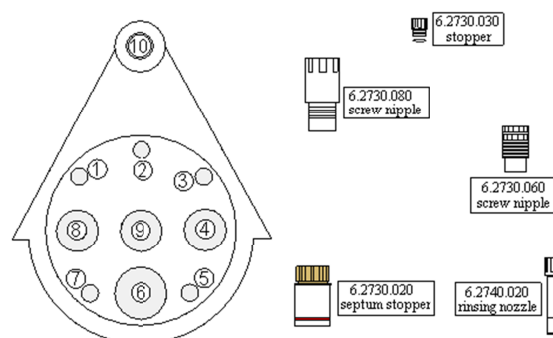


Fig.: Numbers and connections on the titration vessel lid (6.1414.060)

- ① The rinsing nozzle (6.2740.020, supplied with 815) is inserted into opening 1, which is connected via the distributor (6.1808.170) to the membrane pump 1 / tower 1 of the 815 with the FEP-tubing connection (6.1805.060, supplied with 815).
- ② This opening remains empty.
- ③ The rinsing nozzle (6.2740.020, supplied with 815) is inserted into opening 3, which is connected via the distributor (6.1808.170) to the membrane pump 1 / tower 1 of the 815 with the FEP-tubing connection (6.1805.060, supplied with 815).
- ④ This is where the pH electrode is inserted.
- ⑤ The rinsing nozzle (6.2740.020, supplied with 815) is inserted into opening 5, which is connected via the distributor (6.1808.170) to the membrane pump 1 / tower 1 of the 815 with the FEP-tubing connection (6.1805.060, 60 cm, supplied with 815).
- ⑥ The 3-way stopper with antidiffusion valve (6.1543.210) is put into opening 6. Port 1 of the 20 mL Dosing Unit (0.1 mol/L HCl) is connected with the FEP-tubing connection (6.1805.100, 40 cm, supplied with the 807) to the 3-way stopper. Further the port 1 of the 50 mL Dosing Unit is connected with an FEP-tubing connection (6.1805.110, 80 cm) to the 3-way stopper.
- ⑦ The PTFE aspiration tip (6.1543.170, M8) is inserted in opening 7, which is connected via the distributor (6.1808.170) to the membrane pump 2 /

tower 1 of the 815 with the M8-PTFE-tubing connection (6.1805.510, 60 cm).

⑧ This opening is not used. It can be closed with a stopper (6.2709.090)

⑨ After the screw nipple (6.2730.080) has been screwed into opening 9, the 802 Rod Stirrer (2.802.0020) is pushed through it and connected to the tower 1 stirrer connection of the 815 Robotic USB Sample Processor.

4.2. Installation of the 50 mL Dosing Unit

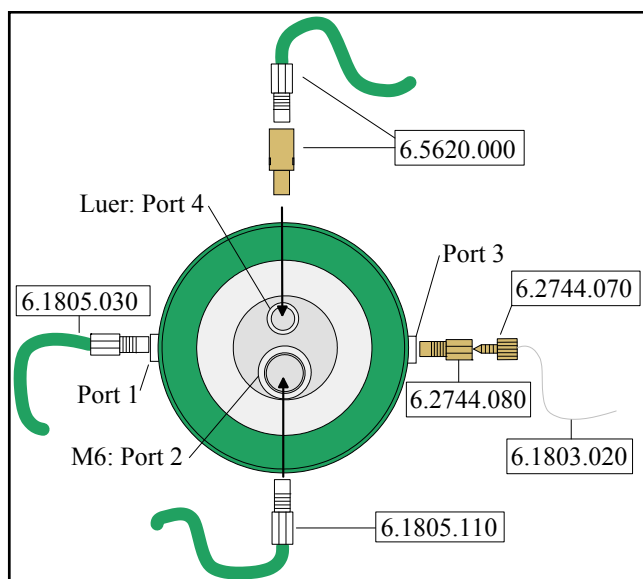


Fig.: Connections on the bottom of the 50 mL Dosing Unit

- **Port 1** is used for transferring the sample to the external titration vessel using FEP-tubing 6.1805.110 (80 cm, supplied by the 815 Sample Processor)
- **Port 2** is used for aspirating the sample via conductivity flow through cell which is connected to the titration arm. The FEP-tubing 6.1805.110 is used here (80 cm, again supplied by the 815 Sample Processor).
- **Port 3** is used by for sample transfer to the IC system. The transition from M6 to the IC screw size (1/16 in.) is achieved with the 6.2744.080 adapter. A PTFE-capillary (0.75 mm ID) is used to aspirate the sample from the T piece at the swing arm through the anion injection valve into the 50 mL Dosino. At the T piece the adapter M6 thread to UNF 10/32 (6.2744.080) is used.
- **Port 4** requires a coupling between Luer and M6 (6.1808.280): This port is used for emptying the Dosing Unit into the waste canister. Herefore the FEP-tubing (6.1805.030) with 150 cm length is used.

- Once the tubing connections have been made, the Dosing Unit is attached to the Dosino holder (6.2057.210) with the thread adapter 6.1618.020.

4.3. Overview of all the tubing connections

- ① The three 60 cm FEP-tubing connections (6.1850.060, supplied with the 815) are used to connect the membrane pump 1 / tower 1 of the 815 and the three rinsing nozzles (6.2740.020, supplied with 815) to the openings 1,3, and 5 of the external cell (see chapter 4.1).
- ② The 60 cm M8-PTFE-tubing connection (6.1805.510) is used to connect the membrane pump 1 / tower 2 of the 815 and the M8-PTFE-aspiration tip (6.1543.170) to the opening 7 of the external cell (see chapter 4.1).
- ③ The Robotic Arm (6.1462.040) is equipped with a PEEK aspiration tube (6.1835.050). The aspiration tube can be mounted using the screw nut (6.2629.000) and the needle holder (1/8 in with tubing connection M6, 6.2833.020). The coupling piece with two outer M6 connections (6.1808.010) is used to connect the needle to the T Connector M6 (6.1808.060).
- ④ The two 80-cm-FEP-tubing connections (6.1850.110) supplied with the 815 are used to connect the T piece (6.1808.060) at the robotic arm with the flow-through cell (6.2763.000) for the conductivity measurement and the flow-through cell with the 50 mL Dosino at Port 2. The third 80-cm-FEP-tubing (6.1850.110) supplied separately is used to connect the 50 mL Dosino Port 1 to the external titration vessel at the left of the 815.
- ⑤ The 40-cm-FEP-tubing connection (6.1805.100, supplied with the Dosing Unit) is used to connect port 1 of the 20 mL Dosing Unit (0.1 mol/L HCl) with the 3-way stopper in the external cell (opening 6 in chapter 4.1)
- ⑥ The 150-cm-FEP-tubing connection (6.1805.030) is used to connect port 4 of the 50 mL Dosing Unit to the 10 L PE waste canister (6.1621.000, supplied with the 815).
- ⑦ Suitable lengths of the 0.97 mm PTFE capillary (6.1803.020, supplied with the 850) are used to connect port 3 of the 50 mL Dosing Unit (using the screws 6.2744.080 and 6.2744.070) and the injection valves of the 850 Professional IC instrument. The injection valves are connected in series and finally connected to the T-piece (6.1808.060) at the robotic arm (using the screws 6.2744.080 and 6.2744.070). In this setup and

methods the following sequential arrangement was implemented: T-piece – anion injection valve – cation injection valve – 50 mL Dosino.

5. Miscellaneous

5.1. Membrane Pumps of the 815

The membrane pump at tower 1 is used to supply the DI water for rinsing of the external vessel; the membrane pump at tower 2 is used to empty the external vessel.

Connect the membrane pump 2/tower 1 to the left connector of the Distributor leading to the M8 aspiration tip for emptying the external vessel. The upper part of the membrane pump 2 is connected to the waste canister.

The upper part of membrane pump at tower 1 is connected to the right connector of the Distributor leading to the three M6 rinsing nozzles to rinse the external vessel. The lower part of the membrane pump is connected to the DI-water canister.

5.2. Stirrer

The 802 Rod Stirrer is inserted through opening 9 of the external cell, and connected to the tower 1 of the 815. The propeller (6.1909.050) is pushed on from below.

5.3. Length of the aspiration tips in the external cell

- Clamp the titration vessel to the titration vessel lid.
- The M8 aspiration tip in opening 7 must reach right to the base of the titration vessel, as this is the only way to ensure that the external cell is cleaned properly.
- The 3-way stopper with antidiffusion valve in opening 6 should reach the middle of the titration vessel.

5.4. Electrodes

- The pH electrode (iAquatrode Plus with Pt 1000; 6.0277.300) is inserted into opening 4. The cable is connected with the 854 iConnect (provided with the 905) to the 905 Titrande at the rear on measuring input 1.
- If the electrode is not used for some time then it should be returned to its holder and kept in the storage solution (6.2323.000).
- The electrode has to be filled up regularly with the electrolyte solution (6.2308.020).
- Conductivity cell (6.0915.100): The measuring cell cable is connected to the opening marked 'Cond. Cell' of the 856 Conductometer. The measuring cell is inserted into the flow-through cell (6.2763.000). The flow-through cell itself is mounted on the rod of the stand support (6.2001.070).

6. Software

6.1. Installation of the software

- **tiamo™ 2.3** – installation (**tiamo™** CD): All the standard directories proposed by the program should be accepted. Please download the patch 1 from the Metrohm.com/com homepage.
- **MagIC Net 2.3** – installation (MagIC Net CD): All the standard directories proposed by the program should be accepted.
- Restart windows and leave MagIC Net and **tiamo™** closed.

6.2. Configuration of MagIC Net

→ The Controller cable (6.2151.000) of the 815 and the USB cable (6.2151.020) of the 850 are now connected to an USB interface on the PC one after the other. Wait a few seconds. The driver installation follows: click on 'automatic installation of the software' for all.

→ Start MagIC Net

6.2.1. Devices

Connected USB devices are automatically recognized when MagIC Net is started. After confirmation of the automatically generated request the devices are stored in the configuration. Keep the proposed device names. The user is automatically requested to save solutions – accept and click on <Yes>.

6.2.2. Solution

The solution to be used must be defined in MagIC Net. Make sure the Dosino of the 50 mL Dosing unit is connected to MSB 1 of the 850. In order to ensure compatibility with the methods provided, the solution must be named as described below.

- At the left click on 'Configuration', under 'Solutions' double-click on the appropriate and enter the following data under 'Solution name' and 'Concentration':

Solutions				
	Solution name ^	Concentration	Cylinder volume	Type
▶ 1	LH Titration Sample	100 %	50	IDU

Fig.: Configuration table for solutions

Now the tubing lengths and ports are defined for each Dosing unit under 'Edit/Properties.../ Dosing unit' as follows:

LH Titration Sample			
	Port	Length	Diameter
Dosing Port Prep/Empty	Dosing Port 1	-	-
Dosing Port 1	Port 1	80.0 cm	2.0 mm
Dosing Port 2	Port 3	150.0 cm	0.7 mm

Fill Port	Port 2	160.0 cm	2.0 mm
Special Port	Port 4	150.0 cm	2.0 mm

Fig.: Configuration table of the 50 mL dosing unit

6.2.3. Swing Head configuration

Under 'Configuration' double-click on '815 Robotic USB Sample Processor XL 1' under 'Devices'. Click on the entry 'Tower 1' and afterwards on 'Tower 2', set the 'Axial distance' to 196.0 mm and in the middle of the window under 'Swing Head' click on 'Configuration' and <Yes> and then enter the following values:

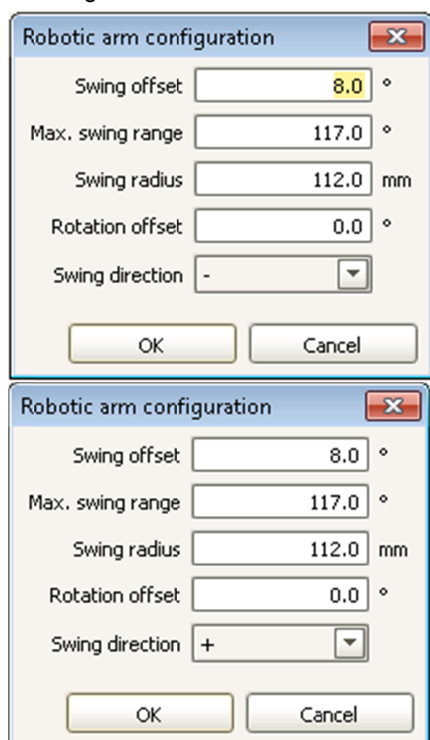


Fig.: Configuration of the Swing Head at tower 1 Configuration of the Swing Head at tower 2

Confirm the entries with <OK>. Then mark '815 Robotic USB Sample Processor XL 1' under 'Devices' and open the properties, go to **Rack** then 'Initialize Rack'. Wait a few seconds. The transfer arm (6.1462.040) is now mounted onto the Swing Head at 'tower 1', the DIS-COVER arm (6.1462.080) onto the Swing Head at tower 2 and is connected to 'Ext. Pump 2' of 'tower 2'.

6.2.4. Lift positions

Go to the 'Manual' operation click on '815 Sample Changer / Tower 1' and use the entries 'Rack position' and 'Lift position' to define suitable values for the following positions (click on <Configure> each time):

- Shift position for changing the rack position (approx. 30 mm)

- Work position for aspirating of the sample (approx. 158 mm)

Please repeat these steps to define the settings for tower 2.

- Shift position for changing the rack position (approx. 30 mm)
- Work position for aspirating of the sample (approx. 120 mm)

6.2.5. Needle rinse position

A special position of the rack is used for rinsing. In the prepared methods, the used position is number 59. On the rack 6.2041.840 this refers to the last position. A sample beaker filled with ultrapure water is placed there. No cap is put on this beaker.

6.2.6. Methods

The following methods (.imet files) are provided for **MagIC Net**:

- **TitriC pro III**: This method is the standard method. Depending on the value of **Value 1** the following will be carried out:
Value 1 = 1 complete analysis including titration and ion chromatography.
Value 1 = 2 only an ion chromatography analysis (e.g. a calibration)
Value 1 = 3 only a titration analysis
- This method is used in combination with the **TitriC pro III** method in **tiamo™**.
- **TitriC pro III_conductivity calibration**: This method is used for calibration of the conductivity sensor. It has to be used in combination with the **tiamo™** method **TitriC pro III_calibration conductivity**.
- **TitriC pro III_titer determination of HCl**: This method is used to determine the titer of the 0.1 mol/L HCl solution used in tiamo. It has to be used in combination with the **tiamo™** method **TitriC pro III_titer determination of HCl**.

Import: Click on **Method** at the left, then select under **File / Method manager... / Edit / Import...** Import the methods related to TitrIC pro III from the MagIC Net CD. You will find the methods in the folder example/TitrIC of the CD.

Note!

Alterations of these methods should only be carried out by a person at the administrator level and who is thoroughly familiar with MagIC Net.

→ Shut down MagIC Net

6.3. Configuration of *tiamo*TM

→ *tiamo*TM 2.3 is started now.

6.3.1. Devices

Connected USB devices are automatically recognized when *tiamo*TM is started. After confirmation of the automatically generated request the devices are stored in the configuration. Keep the proposed device names. The user is automatically requested to save solutions – accept and click on <Yes>.

6.3.2. Solution

The solution to be used must be defined in *tiamo*TM. Make sure the Dosino of the 20 mL Dosing unit is connected to the MSB 1 port of the 905. In order to ensure compatibility with the methods provided, the solution must be named as described below.

- At the left click on 'Configuration', then at the top right under 'Titrants/Solutions' double-click on the appropriate (empty) entries and enter the following under 'Solution name' and 'Concentration':

Titrants/Solutions						
Solution name	Concentration	Cylinder volume	Type	Dosing device	Titer	
HCl	0.1 mol/L	20	IDU	905_1 / D1	1	

Fig.: Configuration table for titrants/solutions

Now the tubing lengths and ports are defined for each Dosing unit under 'Edit/Properties.../ Dosing unit' as follows:

HCl			
	Port	Length	Diameter
Dosing Port	Dosing Port 1	-	-
Prep/Empty			
Dosing Port 1	Port 1	40 cm	2.0 mm
Dosing Port 2	Port 3	0 cm	0.0 mm
Fill Port	Port 2	25 cm	2.0 mm
Special Port	Port 4	0 cm	0.0 mm

Fig.: Configuration table of the 20 mL dosing unit

6.3.3. Electrodes

- pH electrode: Under 'Configuration/Sensors' click on 'iAquatrode Plus', check the information and click on <Ok>.
- Conductivity sensor: Under 'Configuration/Sensors' click on 'Edit/New/other sensor' and enter under 'Sensor name' Conductivity sensor type in the desired sensor information and click on <Ok>.

6.3.4. Methods

The following methods (.mmet files) are provided for *tiamo*TM:

TitrIC pro III: This method is the standard method used. It does the complete titration analysis and sends the results to MagIC Net. It is used in combination with TitrIC pro III method in MagIC Net.

In *tiamo* it is typically used as a single determination in the autorepeat mode. In other words, it is always ready to do a titration as soon MagIC requires it. To set it into autorepeat go to the Run window, right-mouse-click and select 'Properties Run window'. Under Process select 'Autorepeat determination'. Close the window with <Ok>.

TitrIC pro III_pH calibration manual: Here the iAquatrode is taken out of the titration vessel and placed into the buffer solutions. Start this method only from *tiamo*TM!

TitrIC pro III_titer determination of HCl: This method is used for the titer determination. It has to be used in combination with the MagIC Net method TitrIC pro III_titer determination of HCl.

TitrIC pro III_conductivity calibration: This method is used for calibration of the conductivity sensor. It has to be used in combination with the MagIC Net method TitrIC pro III_calibration conductivity.

Import: Click on **Method** at the left, then select under **File / Method manager... / Edit / Import...** Import the methods related to TitrIC pro III also from the MagIC Net CD. You will find the methods in the folder example/TitrIC of the CD.

Note!

Alterations of these methods should only be carried out by a person at the administrator level and who is thoroughly familiar with *tiamo*TM.

→ Shut down IC *tiamo*TM

6.4. Setup of RS232 communication between MagIC Net and *tiamo*TM

The communication, e.g. result transfer between MagIC Net and *tiamo*TM is done via RS232. MagIC Net is the master in this setup. To establish the communication follow the steps below:

Make sure MagIC Net and *tiamo*TM software are closed. If the PC has two built-in RS232 ports you can connect the

RS232 cable (6.2134.040) directly between the two ports. If the PC does not have the built-in RS232 ports please connect two USB/RS232 Converters (6.2148.050) to two USB ports. You can e.g. use the USB hubs of the IC instrument, but it is recommendable to use the USB hubs of your computer, as they are more powerful. Then connect the two converters using the RS232 cable (6.2134.040). In the Device Manager of your Windows operating system check which two RS232 ports you are using.

Open the MagIC Net software. On the left click on 'Configuration', then in the devices window select 'Edit/New/Miscellaneous' and choose the RS 232 device. Keep the proposed Device name and enter a random serial number. Go to the RS232 subsection and choose one of the used RS232 ports. Click on 'Connect' and confirm with <Ok>. Close the window with <Ok>

Repeat the same steps in the *tiamo*TM software and choose the second RS232 port.

7. Complete Analysis with TitrIC

As an example a short description of a complete analysis with TitrIC pro III is described here.

The whole procedure is controlled by the MagIC Net software which is the master software. In *tiamo*TM, the method **TitrIC pro III** is selected as a single determination. Start the determination in an autorepeat mode. To set it into autorepeat go to the Run window, right-mouse-click and select 'Properties Run window'. Under Process select 'Autorepeat determination'. Close the window with <Ok>. Start the determination. Now *tiamo*TM is waiting for the start signal from MagIC Net via RS232.

In the MagIC Net software select the method **TitrIC pro III**. Enter the required sample position, sample identification etc. into MagIC Net. For value 1 choose according to the list below:

- Value 1 = 1 a complete analysis including titration and ion chromatography
- Value 1 = 2 only an ion chromatography analysis (e.g. a calibration)
- Value 1 = 3 only a titration analysis

Start the determination in MagIC Net. All sample liquid handling is done by MagIC Net. At the right moment MagIC Net communicates to *tiamo*TM via RS232 to do the titration analysis. Results are transferred back to MagIC Net and the rinsing steps of the titration equipment by MagIC Net initialized.

All data goes into the MagIC Net database and therefore one report can be generated.

9. TitrIC pro – Combo Kit Dilution

9.1 Delivery package

For the Dilution setup with TitrIC you need the following items:

Number	Article no.	Article designation
IC Dilution		
1	2.800.0010	Dosino
1	2.801.0010	Magnetic Stirrer
1	6.5338.000	TitriC pro equipment for Dilution

9.2 Installation

A short straight forward description of the dilution kit is described here.

9.3 Dosino

Port 4 of the Dosino with the 10 mL Dosing Unit is equipped with the FEP Aspiration tube (6.1829.010, included in the Dosing Unit 10 mL) and mounted directly on the 2 L ultra pure water bottle (6.1608.070).

The Dosino is connected to MSB 1 at the 815 Robotic USB Sample Processor.

9.4 Transfer Tubing

The 10 mL Transfer Tubing with holder (6.1562.130) is mounted on the tower (tower 1). Connect one end of the transfer tubing to port 1 of the 10 mL UPW Dosing Unit. The second end of the transfer tubing is connected to the T-piece at the swing arm. If connected, remove the 0.75mm PTFE capillary and the M6 UNF 10/32 coupling connection which is used by TitrIC pro I standard setup.

9.5 External Dilution Vessel

The External Dilution vessel with all accessories is mounted on the right side of the 815 Robotic USB Sample Processor. The stirrer is connected to the 815 Robotic USB Sample Processor on MSB 2.

Use the 0.75 mm ID PTFE capillary (6.1803.080) and the blue/blue PVC pump tubing (6.1826.020) to connect the dilution vessel via Peristaltic Pump of the MSM to the injection valve of the anions IC. To be able to use the MSM peristaltic Pump the rinse channel has to be removed. Connect the detector outlet with a 2x UNF 10/32 coupling (6.2744.040) to the MSM rinse channel. The rinsing is now done with the detector waste instead of ultra pure water. This gives the possibility to use one of the MSM peristaltic pump channels for pumping the sample to the loops.

The external dilution vessel is mounted onto the sample processor, which is easiest when the rack is temporarily removed. The exact position can be adjusted by directing

the needle into the external dilution vessel with the manual control (in the window manual). The approximate value for the swing head angle is $\sim 117.2^\circ$. The work position is about 125 mm.

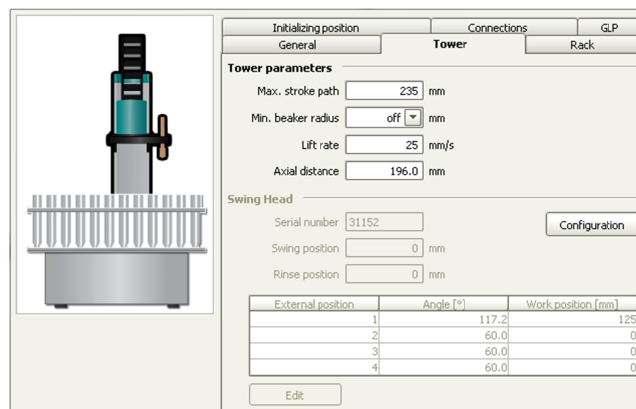


Fig.: Settings for the 815 Robotic USB Sample Processor XL

9.6 Analysis

The following (.imet files) methods are provided for **MagIC Net**:

- **TitriC pro III_dilution**: This method is the standard method. Depending on the value of **Value 1** the following will be carried out:
 - Value 1 = 1 complete analysis including titration and ion chromatography.
 - Value 1 = 2 only an ion chromatography analysis (e.g. a calibration)
 - Value 1 = 3 only a titration analysis
- This method is used in combination with **TitriC pro III** method in **tiamo™**.
- **TitriC pro III_dilution conductivity calibration**: This method is used for calibration of the conductivity sensor. It has to be used in combination with the **tiamo™** method **TitriC pro III_calibration conductivity**.
- **TitriC pro III_dilution titer determination of HCl**: This method is used to determine the titer of the 0.1 mol/L HCl solution used in **tiamo**. It has to be used in combination with the **tiamo™** method **TitriC pro III_titer determination of HCl**.

The following methods (.mmet files) are provided for **tiamo™**:

- **TitriC pro III**: This method is the standard method used. It does the complete titration analysis and sends the results to MagIC Net. It is used in combination with **TitriC pro III_dilution** method in MagIC Net.

In *tiamo*TM it is typically used as a single determination in autorepeat mode. In other words, it is always ready to do a titration as soon MagIC requires it. To set it into autorepeat go to the Run window, right-mouse-click and select **Properties Run window**. Under Process select **Autorepeat determination**. Close the window with <ok>.

- **TitrIC pro III_pH calibration manual:** Here the iAquatrode is taken out of the titration vessel and placed into the buffer solutions. Start this method only from *tiamo*TM!
- **TitrIC pro III_titer determination of HCl:** This method is used for the titer determination. It has to be used in combination with the MagIC Net method **TitrIC pro III_titer determination of HCl**.
- **TitrIC pro III_conductivity calibration:** This method is used for calibration of the conductivity sensor. It has to be used in combination with the MagIC Net method **TitrIC pro III_calibration conductivity**.

Import: Click on **Method** at the left (in MagIC Net and *tiamo*TM), then select under **File / Method manager... / Edit / Import...** Import the methods related to TitrIC pro III with the Dilution kit from the MagIC Net CD. You will find the methods in the folder example/TitrIC of the CD.

Note!

Alterations of these methods should only be carried out by a person at the administrator level and who is thoroughly familiar with *tiamo*TM and MagIC Net

With the TitrIC pro – Combo Kit Dilution following analysis can be carried out using the TitrIC pro III_dilution methods in MagIC respectively *tiamo*TM:

The whole procedure is controlled by the MagIC Net software which is the master software. In *tiamo*TM the method **TitrIC pro III** is selected as a single determination. Start the determination in autorepeat mode. To set it into autorepeat go to the Run window, right-mouse-click and select **Properties Run window**. Under Process select **Autorepeat determination**. Close the window with <ok>. Start the determination. Now *tiamo*TM is waiting for the start signal from MagIC Net via RS232.

In the MagIC Net software select the method **TitrIC pro III_dilution**. Enter the required sample position, sample identification etc. into MagIC Net. For value 1 choose according to the list below:

- Value 1 = 1 complete analysis including titration and ion chromatography.
- Value 1 = 2 only an ion chromatography analysis (e.g. a calibration)
- Value 1 = 3 only a titration analysis

With Value 1 = 1 a complete analysis is carried out. Depending on the entered dilution factor the following will be done:

Dilution Factor = 1:

Depending on the measured conductivity an appropriate dilution factor is automatically applied by MagIC Net. The calculation factor is calculated according to Time Program No. 2. The finally used dilution factor is the integer of the conductivity divided by 250.

Dilution Factor >1:

If a dilution factor is known it can be directly entered into the sample table. It will be diluted accordingly. The conductivity measurement has no influence on the dilution in this case.

E.g. With Value 1 = 2 an ion chromatographic analysis will be carried out with the entered dilution factor. No dilution factor will be calculated as no conductivity measurement will take place.

9. TitrIC pro – Combo Kit Partial Loop

9.1 Delivery package

For the Partial Loop setup with TitrIC pro you need the following items:

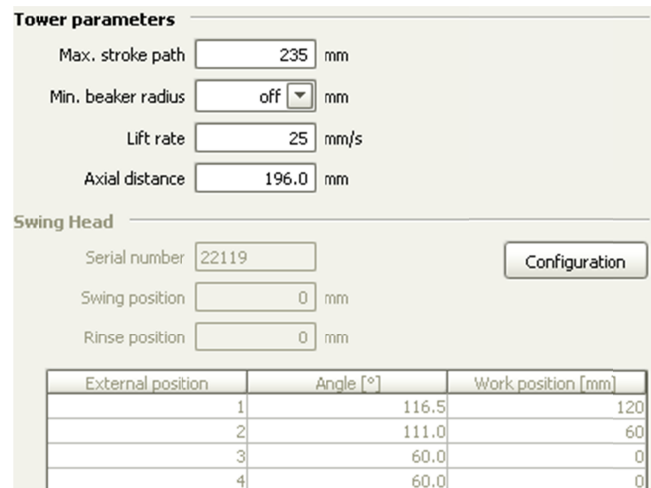
Number	Article no.	Article designation
IC MiPT		
1	2.800.0010	Dosino
1	6.5338.010	TitriC pro equipment for MiPT

9.2 Installation

A short straight forward description of the partial loop kit is described here.

9.3 Rinsing station

For this application, a stopper is used to close the outlet of the inner compartment. The rinsing station is mounted onto the sample processor, which is easiest when the rack is temporarily removed. The exact position can be adjusted by directing the needle into the rinsing station with the manual control (in the window manual). The inner compartment approximately relates to a swing head angle of $\sim 116.5^\circ$, the outer one approximately relates to $\sim 111^\circ$. Define these angles in the settings for the external needle positions 1 and 2. The work positions are 120 mm for the angle 116.5° (external position 1) and 60 for the angle 111° (external position 2). A tube is fixed at the bottom of the rinsing station to drain the waste water.



Tower parameters

Max. stroke path mm

Min. beaker radius mm

Lift rate mm/s

Axial distance mm

Swing Head

Serial number

Swing position mm

Rinse position mm

External position	Angle [°]	Work position [mm]
1	116.5	120
2	111.0	60
3	60.0	0
4	60.0	0

Fig.: Settings for the 815 Robotic USB Sample Processor XL

9.4 MiPT Dosino

The transfer capillary of 2 mL is connected both to the dosino on port 1 as well as on the anion injection valve on the 881. This injection valve is further connected to the T-piece on the needle with a PEEK capillary 0.5 mm i.d.

Port 4 of the Dosino with the 2 mL Dosing Unit is equipped with the FEP Aspiration tube (6.1829.010, included in the

Dosing Unit 2 mL) and mounted directly on the 2 L ultra pure water bottle (6.1608.070).

The Dosino is connected to MSB 2 at the 881 Compact IC pro Anion instrument.

9.5 Analysis

The following (.imet files) methods are provided for **MagIC Net**:

- **TitriC pro III_MiPT**: This method is the standard method. Depending on the value of **Value 1** the following will be carried out:

Value 1 = 1 complete analysis including titration and ion chromatography.

Value 1 = 2 only an ion chromatography analysis (e.g. a calibration)

Value 1 = 3 only a titration analysis

- This method is used in combination with **TitriC pro III** method in **tiamo™**. For calibration the cation standard has to be positioned at the rack position for the anion standard +1. The calibration injection volume entered into the sample table is always 4 μ L.
- **TitriC pro III_MiPT conductivity calibration**: This method is used for calibration of the conductivity sensor. It has to be used in combination with the **tiamo™** method **TitriC pro III_calibration conductivity**.
- **TitriC pro III_MiPT titer determination of HCl**: This method is used to determine the titer of the 0.1 mol/L HCl solution used in **tiamo**. It has to be used in combination with the **tiamo™** method **TitriC pro III_titer determination of HCl**.

The following methods (.mmet files) are provided for **tiamo™**:

- **TitriC pro III**: This method is the standard method used. It does the complete titration analysis and sends the results to MagIC Net. It is used in combination with **TitriC pro III_MiPT** method in MagIC Net.

In **tiamo™** it is typically used as a single determination in autorepeat mode. In other words, it is always ready to do a titration as soon MagIC requires it. To set it into autorepeat go to the Run window, right-mouse-click and select **Properties Run window**. Under Process select **Autorepeat determination**. Close the window with **<ok>**.

- **TitriC pro III_pH calibration manual**: Here the iAquatrode is taken out of the titration vessel and placed into the buffer solutions. Start this method only from **tiamo™**!
- **TitriC pro III_titer determination of HCl**: This method is used for the titer determination. It has to be used in

combination with the MagIC Net method **TitriC pro III_titer determination of HCl**.

- **TitriC pro III_conductivity calibration:** This method is used for calibration of the conductivity sensor. It has to be used in combination with the MagIC Net method **TitriC pro III_calibration conductivity**.

Import: Click on **Method** at the left (in MagIC Net and *tiamoTM*), then select under **File / Method manager... / Edit / Import...** Import the methods related to TitriC pro III with the MiPT kit from the MagIC Net CD. You will find the methods in the folder example/TitriC of the CD.

Note!

Alterations of these methods should only be carried out by a person at the administrator level and who is thoroughly familiar with *tiamoTM* and MagIC Net

With the TitriC pro – Combo Kit Partial Loop setup the following analysis can be carried out using the TitriC pro III_MiPT methods in MagIC respectively *tiamoTM*.

The whole procedure is controlled by the MagIC Net software which is the master software. In *tiamoTM* the method **TitriC pro III** is selected as a single determination. Start the determination in autorepeat mode. To set it into autorepeat go to the Run window, right-mouse-click and select **Properties Run window**. Under Process select **Autorepeat determination**. Close the window with <ok>. Start the determination. Now *tiamoTM* is waiting for the start signal from MagIC Net via RS232.

In the MagIC Net software select the method **TitriC pro III_MiPT**. Enter the required sample position, sample identification etc. into MagIC Net. The Sample volume is used for the anions injection volume. The cation injection volume has to be entered into the value 2.

For value 1 choose according to the list below:

- Value 1 = 1 complete analysis including titration and ion chromatography.
- Value 1 = 2 only an ion chromatography analysis (e.g. a calibration)
- Value 1 = 3 only a titration analysis