Application Bulletin 418/1 e

Use of the Polytron PT 1300 D (Metrohm version)

Branch

General analytical chemistry; pharmaceutical industry; food, stimulants, beverages, flavors; fertilizers, base materials, explosives; detergents, surfactants, cosmetics

Keywords

Titration; Karl Fischer titration; volumetric; automation; MATi 11; water content; homogenization; Polytron; sample preparation; 815 Robotic Soliprep; branch 1; branch 4; branch 7; branch 11; branch 12

Summary

This Application Bulletin provides information on the use of the Polytron PT 1300 D homogenizer (Polytron).

Instrument

The Polytron consists of a control and a drive unit. A quick coupling system allows the changing of the dispersing aggregates (figure 7) without further tools.

Three different versions of the Polytron exist. Version 1 (figures 1 and 2) and version 2 (figures 3 and 4) are almost identical. The two control units only vary in the connector for the drive and the RS-232 connector.

The drives are not compatible with the control unit of a different version, even if the connector is the same (e.g. drive of version 3 cannot be used in combination with a control unit version 2).

Figure 1: Polytron version 1 – front view control unit

Figure 2: Polytron version 1 – rear view control unit

Figure 3: Polytron version 2 – front view control unit

Figure 4: Polytron version 2 – rear view control unit

Figure 5: Polytron version 3, control unit (left) and drive (right)

Figure 6: Polytron version 3 – rear view control unit

Aggregates

The aggregates are used to homogenize samples and also to stir the mixture during the titration. Depending on what kind of sample should be homogenized, one of the aggregates shown in figure 7 can be chosen.

Figure 7: Aggregate 6.9012.000 (left) and aggregate 6.9012.010 with protruding knives (right)

Table 1 shows some suggestions for the choice of the aggregate.

Table 1: Recommended aggregate depending on sample type

Aggregate	Samples
6.9012.000	• Viscous samples • Samples smaller than the diameter of the aggregate • Powders and salts that are difficult to dissolve
6.9012.010	• Solid samples • Samples larger than the diameter of the aggregate

Cable connections for RS232-control

Table 2: Accessories needed to connect the Polytron

	900 TC/Ti-Touch	*tiamo*™
Version 1	6.2148.050 6.2134.040	6.2134.040*
Version 2	6.2148.050 6.2134.110	6.2134.110*
Version 3	6.2148.050 6.2134.110	6.2134.110*

*If the computer does not feature an RS-232 connector for the direct connection of the cable, the RS 232/USB Converter (6.2148.050) can be used.

Configuration

900 Touch Control and Ti-Touch

To connect a Polytron to a 900 Touch Control or a Ti-Touch instrument, open the System settings and then the Device manager (figure 8). There a new USB/RS-232 adapter is created. Highlight the USB/RS-232 adapter and press Edit (figure 9). A new window opens and shows the settings of two COM-ports (figure 10). Highlight COM1 and press Edit again and enter the following settings: 2400/8/none/1/none (figure 11).

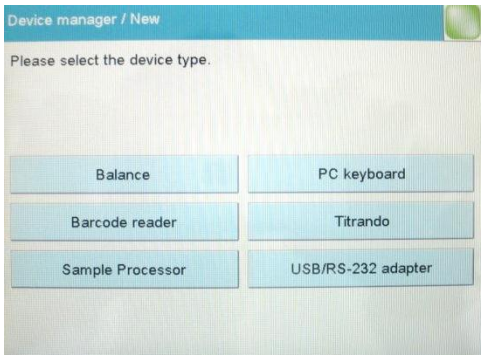

Figure 8: Device manager – create new device

Figure 9: Device manager – overview devices

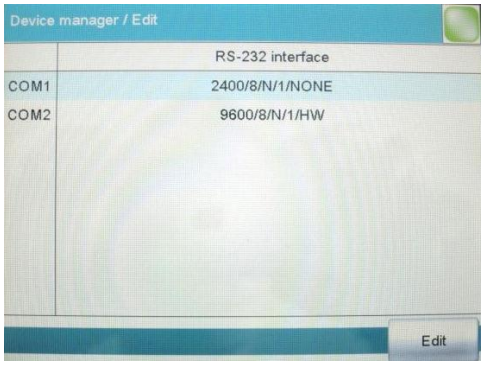

Figure 10: Device manager – COM-ports

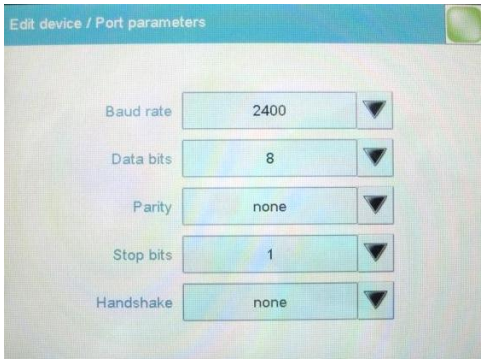

Figure 11: Settings for COM-port 1

tiamo™

If the 6.2148.050 converter is used to connect the Polytron to a ***tiamo***™ system, please make sure the driver of the converter is installed before the software is started. Depending on the connection to the PC, the COM-port can change and does not necessarily need to be COM1 as shown in figure 12.

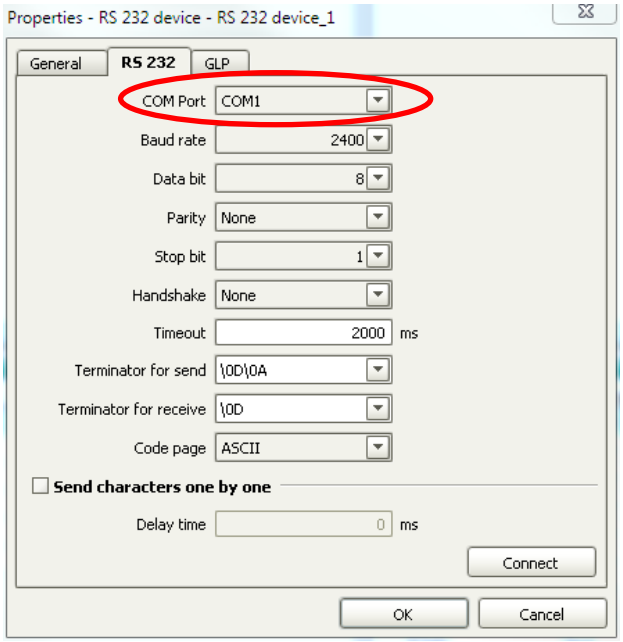

Figure 12: Configuration of the Polytron in ***tiamo***™

Control

The Polytron is controlled via Control RS commands with a 900 Touch Control/Ti-Touch or with Transfer commands in the ***tiamo***™ software (figure 13).

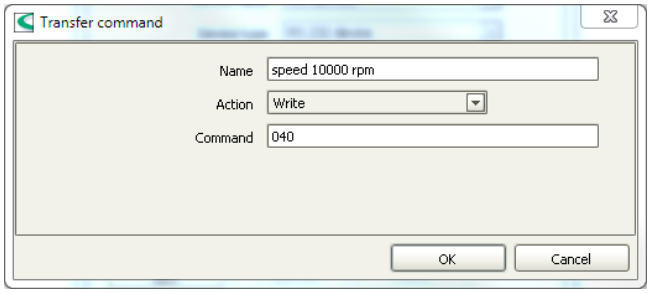

Figure 13: Transfer command in ***tiamo***™ to control the Polytron

To switch the Polytron on or off and to set a speed, choose "Write" as Action and as Command the three digit code (table 3 or 4) which corresponds to the required result.

Table 3: Three digit codes to control Polytron versions 1 and 2

Result	Code
Switch on	254
Switch off	253
Speed of Polytron	252* (answers: 0-250 → speed 5'000-30'000 rpm; 251 → speed > 30'000 rpm; 255 → speed < 5'000 rpm)
7'000 rpm	000
7'100	001
7'200	002
7'300	003
7'400	004
7'500	005
10'000	030
15'000	080
20'000	130
25'000	180

Table 4: Three digit codes to control Polytron version 3

Result	Code
Switch on	254
Switch off	253
Speed of Polytron	252* (answers: 0-140 → speed 2'000-30'000 rpm; 141 → speed < 2'000 rpm; 142 → speed > 30'000 rpm)
2'000 rpm	000
2'200	001
2'400	002
2'600	003
2'800	004
3'000	005
5'000	015
10'000	040
15'000	065
20'000	090
25'000	115
30'000	140
Status of Polytron	143* (answers: 150 → OFF; 151 → ON; 152 → Overload; 153 → Over temperature)
Speed attained	144* (answers: 170 → NO; 171 → YES)

The codes marked with * can be used with the ***tiamo***™ software only (see next page: additional commands).

Additional commands (*tiamo*™ only)

If the current speed or the status of the Polytron has to be read, a Method variable to store the value is needed. A Method variable can be defined in the START command of the Main track of a ***tiamo***™ method. Open the properties of the START command and choose Method variables (figure 14).

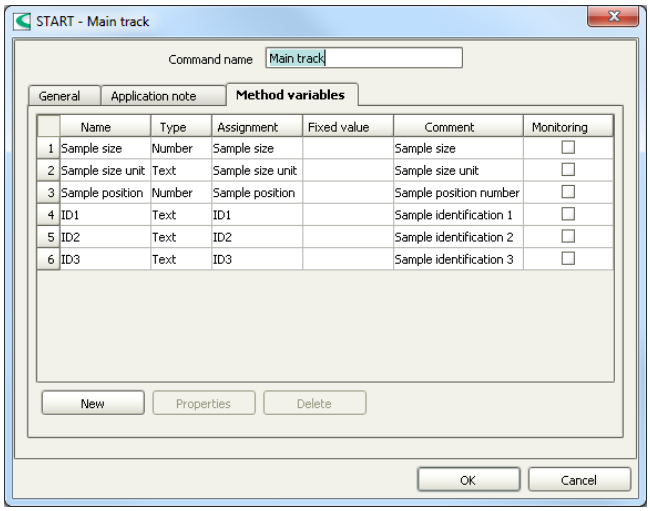

Figure 14: Properties of a START command in the Main track of a ***tiamo***™ method

Enter a Name and define the type of the new Method variable as “Text”. Deactivate the assignment to an ID and activate Fixed value instead. Do not enter a value. Confirm the settings with OK (figure 15).

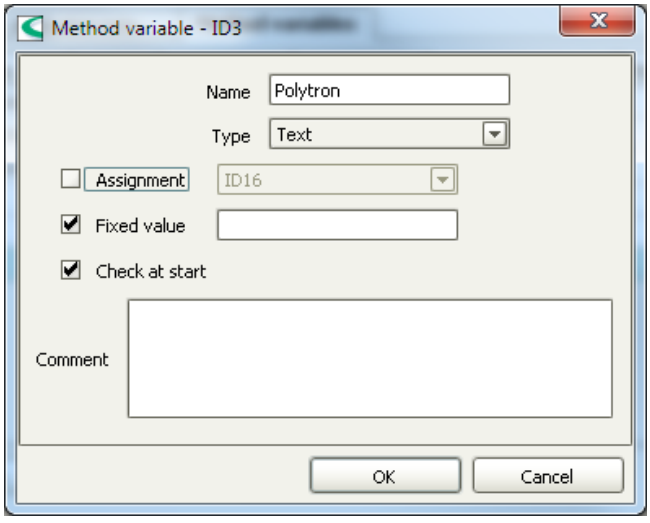

Figure 15: Method variable to store data from a Polytron

To read the status or the current speed of the Polytron a Transfer command (figure 16) is used. Choose “Read” as Action and the corresponding three digit code (table 1 or 2) as Command. Additionally you define the new Method variable as Variable.

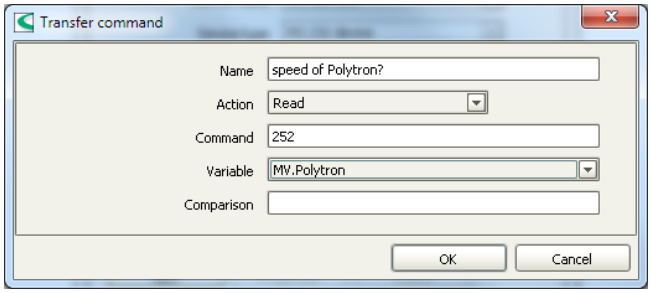

Figure 16: TRANSFER command to read data from a Polytron

Polytron in Karl Fischer Titration (volumetric) stand alone

The Polytron can be used to homogenize samples directly in the titration vessel, which avoids loss or absorption of water by the sample.

To use the Polytron in KF titration, the KF titration vessel lid (6.1414.030) is replaced by the Micro titration vessel lid ECO (6.1414.060). Additionally the parts shown in figure 17 and table 5 are necessary and need to be ordered separately.

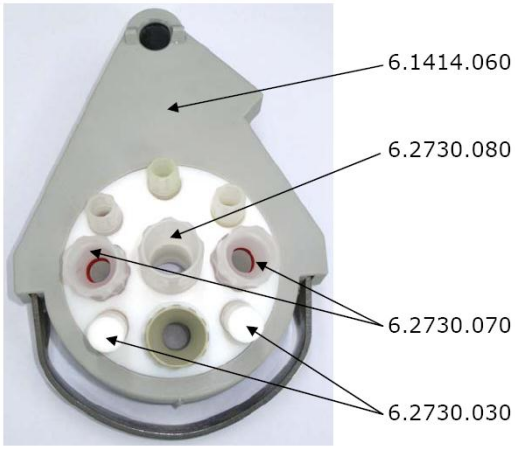

Figure 17: 6.1414.060 for the use with Polytron

Table 5: Additional accessories

Number of items	Ordering number
2	6.2730.030
2	6.2730.070
1	6.2730.080

The Polytron holder 6.2047.110 (figure 18) is available to fix the Polytron at the support rod of the titration system. It includes two spacers which allow the use of both aggregates.

Figure 18: 6.2047.110 holder for Polytron with spacers

Polytron in automation

The homogenization with a Polytron can be automated. Figure 19 to 25 show the available Robotic arms and the Titration heads which can be used in combination with a Polytron. Not all Robotic arms are compatible with all Titration heads. The compatibility can be checked in table 6.

Robotic arms

Figure 19: 6.1462.250 Robotic titration arm with Polytron holder, left swinging (used in combination with 786 Swing Head) and equipped with 1 buret tip for solvent addition and 3 spray nozzles for cleaning

Figure 20: 6.9914.140 Robotic arm with holder for titration head and Polytron, right swinging, Aggregate in the center of the titration beaker (used in combination with a 786 Swing head)

Figure 21: 6.9914.156 Robotic arm with holder for titration head and Polytron, right swinging, Aggregate off-centered (used in combination with a 786 Swing head)

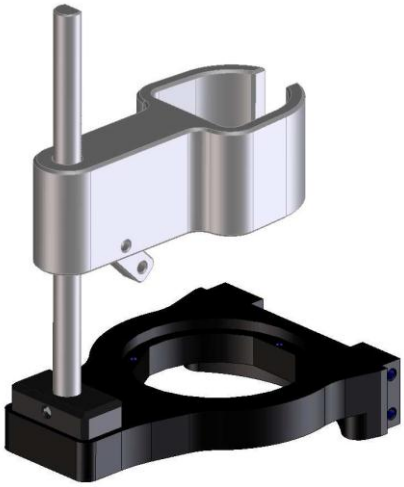

Figure 22: 6.9914.164 Titration head and Polytron holder (used in combination with 814 Robotic USB Sample Processor)

Titration heads

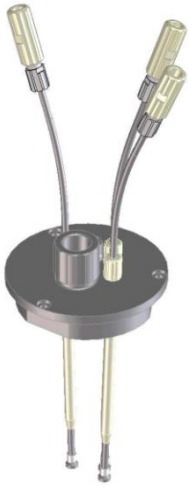

Figure 23: 6.9914.139 (with 3 reinforced buret tips)

Figure 24: 6.9914.141 (with 3 buret tips and 3 spray nozzles for cleaning)

Figure 25: 6.9914.157 (with 3 buret tips, 3 spray nozzles, aspiration tip and 1 x NS14)

Table 6: Possible combinations of special robotic arms with titration heads

	Robotic arms		
Titration heads	6.9914.139	6.9914.141	6.9914.157
6.1462.250	no	no	no
6.9914.140	yes	yes	no
6.9914.156	no	no	yes
6.9914.164	yes	yes	no

Comments

- Only run the Polytron with the connected aggregate immersed in a liquid. Otherwise the Polytron can be damaged. Running the drive without connected aggregate is possible.
- For optimal homogenization it is recommended to vary the speed of the Polytron during the homogenization.
- Depending on the set up the Polytron can automatically be swung between center and wall of the beaker to get a better homogenization
- Once the Polytron is connected to the ***tiamo***™ software, manual control is no longer possible. It is blocked until the Polytron is disconnected in the Configuration window of the ***tiamo***™ software.
- It is recommended to clean the aggregate on a regular base. The tool to disconnect rotor and stator from each other comes with the aggregate.
- Metrohm offers two different aggregate types for the most common applications. Sometimes the samples require the usage of a different aggregate. More information on other aggregate types that can be connected to the Polytron can be found on www.kinematica.com.
- Never close all holes of the aggregate while it is running as it can lead to sample solution being aspirated into the drive unit. Do not lay the drive unit lower than the connected wet aggregate for the same reason.

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Competence Center Titration

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