






## Packing & Data Protocol for SMPS-measurements

### Equipment Checklist

- **Bubble Flow Meter**
  - Gilibrator-2 (GILAN base & cell module)
  - 0.5m rubber hose
  - 7.5V/0.2A AC charger / adaptor (ARLEC)
  - Carry case
  
- **Scanning Mobility Particle Sizer (5.500)**
  - Vienna type DMA (short inner electrode)
  - Vienna type DMA (short outer electrode)
  - Extension module (short, for pressure sensor)
  - Vienna type DMA (long inner electrode)
  - Vienna type DMA (long outer electrode)
  - Extension module (long, for pressure sensor)
  - Impactor set w/ 0.4 & 0.2mm orifice
  - Impactor-Nozzle-Tool
  - External hose subassembly (yellow / black)
  
- **Condensation Particle Counter**
  - Condensation particle counter (5.400)
  - N-butanol bottle (filled)
  - Condensor N-butanol bottle
  - RS232 cable (data connection to PC)
  - 240V mains cable
  - Conductive tubing
  
- **DustCheck Aerosol Monitor**
  - OPC (1.106)
  - DQ grade filter for zero calibration
  - Sampling hose (0.5 m)
  - AC adaptor
  - Battery adaptor (w/ XLR jack)
  - RS232 cable (data connection to PC)
  - 12V Battery Pack (XLR-jack)
  - Cable for the computer (25pin to RJ-45)
  - Carry case
  
- **Accessories**
  - Bags
  - Cable ties (10 x 30cm long)
  - Chair
  - Compass
  - Double sided tapes
  - Duct tape, or Tesa
  - Earplugs
  - Grease
  - Hats
  - Latex gloves (2 pairs)
  - Paper towels (wipes, Kleenex)
  - Pencils, pens & marker
  - Pillows
  - Posties
  - Slate with data sheets
  - Trolley (foldable)
  - Umbrella
  
- **Computer**
  - Acer (aspire 1400) w/ charged Li-Ion pack
  - Charged** backup Li-Ion-pack
  - Power supply w/ mains leads (19V, 4.7A)
  - Grimm scanning SW (SMPS v.1.34)
  - USB-Mouse
  - Carry case
  
- **Computer**
  - Charged** internal Pb pack
  
- **Computer**
  - Toshiba Tecra 500CDT laptop
  - Toshiba Backup Li-Ion-pACK
  - Charged** backup Li-Ion pack
  - Mains cable
  - DustCheck scanning SW (v.?.??)
  - Dual port serial interface (PCMCIA)
  - External floppy drive
  - Floppy disks
  - Carry case
  
- **Tools**
  - Allen HEX keys (entire set)
  - screwdrivers (5mm ⊕ & ⊖)
  - spanner (small)
  - Stanley knife or scissors
  
- **Electrical**
  - Extension cables (29m / 240V)
  - Power board (multiple outlets)
  - Stopwatch
  - Torch (w/ new batteries)

Packing & Data Protocol for SMPS-measurements

Date:			Location:										Weather:	
SW-version:			Batt-pack status:				<input type="checkbox"/> Li-Ion (PC)		<input type="checkbox"/> Pb (SMPS)		Comments			
Filename	Time 		Neutralizer 		0.35 Impactor 1.09 				Scanmode 					
File-#	Start	End	Yes	No	Mid	Long	Mid	Long	Fast	Norm	Fast	Std	Substance	
	:	:												
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## Checklist for the SMPS & CPC (5.400 & 5.500) – PART 1

### Setup of the external Plumbing (for the DMA and the CPC):

Checklist uses laptop as an external control device (ACER, aspire 1400) and the long DMA (Vienna-type DMA - for small-size scans below 11nm use the short DMA; for conversion from the short to the long DMA and vice versa see PART 2).

**Ticker**

**Task**

**Location**

1. **Remove all protective taps** from both the external hoses as well as from the CPC & DMA (figure 1).

Connect the yellow and the black tubing to the corresponding bosses of the CPC and the DMA (figure 2)  
 SHEATH AIR in/out yellow hose;  
 EXCESS AIR in/out: black hose;

use the **5cm conductive tube** to connect the monodisperse aerosol outlet of the DMA with the aerosol inlet of the CPC (circle in fig.2)  
 Make sure that DMA is positioned in such a way that the **tube is not bended**.

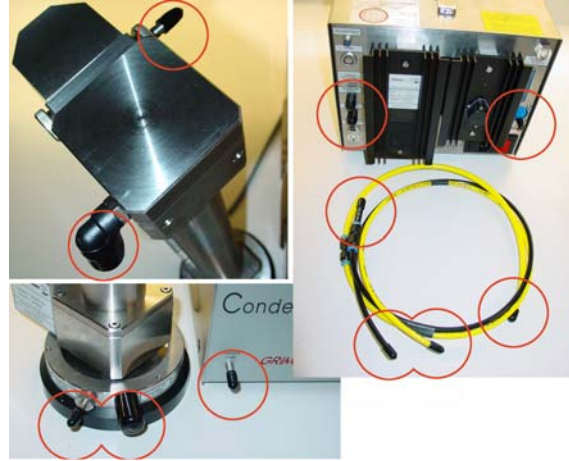


Fig.1: Protective taps

2. **Use conductive tubing** when operating the SMPS with an extended aerosol inlet sample hose (polydisperse-inlet)!

Plug in the **controller cable of the DMA** to the rear of the CPC (rod voltage control).

Optional (laptop used as Data-logger): use **RS232 cable** to connect CPC to the computer's USB port (port setting see below).



Fig.2: External plumbing

Connect the CPC to **230V mains**.

3. **Connect external flasks** to the CPC:

- butyl-alcohol bottle
  - condenser bottle
- Note:** loosen taps of both to enable ventilation (see figure 3).

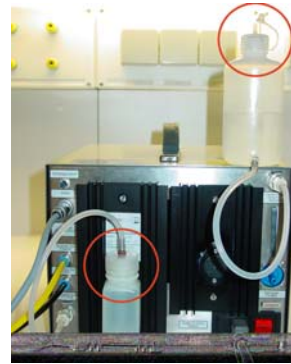


Fig.3: Peripheral accessories

4. Verify that the impactor nozzle of the DMA corresponds to the size of the DMA.

Unscrew impactor nozzle (in some cases it is necessary to use the built-in removal tool to pop-out nozzle from the socket – fig.4).

**Note:** never clean the nozzle with a brush – use ultrasound bath instead!

Unscrew impactor and moderately supply some silicon **grease** to the impactor surface.

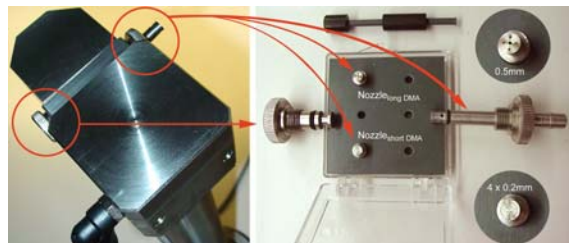


Fig.4: DMA Impactor

## Checklist for the SMPS & CPC (5.400 & 5.500) – PART 1

**Ticker**

**Task**

**Location**

5. Switch on the CPC (red wipe switch at the rear panel – see fig.3); CPC enters into CHARGE MODE (figure 5).

**Note:** make sure the battery charge fuse is not broken (above wipe switch – see fig.3);



Press the ON/OFF key at front panel to boot CPC (display scrolls through step-1 till 5).

Upon request, start “warm-up” by pressing the +key (warm-up of saturator / cool-down of condenser); both Condenser and Saturator-status-LEDs turn red.

**Note:** CPC will only become operational once these parameter-LEDs turn green.



Fig.5: Booting the CPC

6. **At the Computer:** Launch SMPS software on PC; **Note:** stand-alone application using SMPS only (without laptop or PC): once status-LED turn green, press the **standby-key** to run the measurements; scans are performed in the normal scan mode! **Check???** (internal memorycard acts as data-logger);



7. open the Setup toolbox (step 1 in figure 7) and enter the desired parameters:

- slow / normal scan and long / short DMA (step 2 in figure 7);
- Note:** scanning window can be restricted using the min/max scroll-down function;
- if known enter sample density; otherwise set to 1.000 g/cm<sup>3</sup>; (step 3 in figure 7);
- COM-port / Baud rate (step 4 in figure 7);



Fig.7: Parameter-setup of scanning software

8. Start measurement by clicking the:

- new icon (step 1 in figure 8);
  - define FILE name and destination folder;
  - activate the ONLINE icon;
  - name file and choose destination folder and click the START icon (step 2 in figure 8);
- Note:** start will be delayed as prior to each order the instrument will undergo several parameter checks (leak test, zero check, sheath-air activation, etc.);

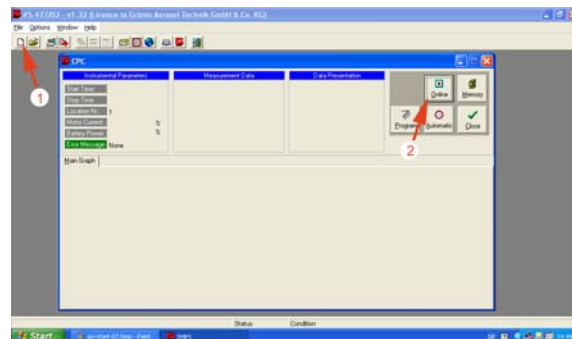


Fig.8: launching scans via the software

9. Choose scan-mode representation (fig.9):

- number particle dist.: [dN/dln(d<sub>p</sub>)];
- surface area distribution: [dS/dln(d<sub>p</sub>)];
- volume distribution: [dV/dln(d<sub>p</sub>)];
- mass distribution: [dM/dln(d<sub>p</sub>)];
- count distribution: [# /cm<sup>3</sup>];

Terminate measurement by clicking the STOP function;

**Note:** Termination of an ongoing scan will cause the program to abort the last scan in progress – the previous scans remain stored onto the file;



Fig.9: choose scan representation mode



# Checklist for the SMPS & CPC (5.400 & 5.500) – PART 1

Ticker

Task

Location

10. Check CPC scan parameters (for each measurement the following parameters are protocolled):



- **Numeric values:** list of numeric entries based on the selected data format (step 1 in figure 10);
- **Instrumental data:** on-line monitoring of battery reserves, air-pump current and critical errors (step 2 in figure 10);

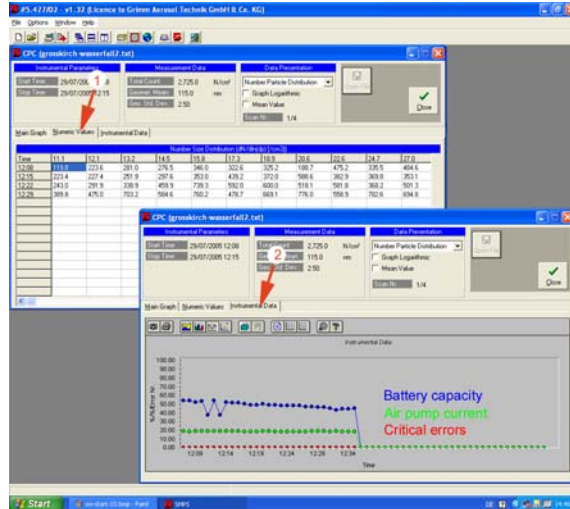


Fig.10: choose scan representation mode

11. Export file (after completion of the measurement click STOP function and convert files from SMPS file format to EXCEL-compatible format):

- Activate EXPORT function (step 1 in figure 11);
- Define mode (step 2 in figure 11);
- Click onto the Export icon (step 3 in figure 11); make sure the 1000-separator is deactivated;
- Chose scan name and assign new name for the exported file (steps 4 & 5 in figure 11);
- Terminate scanning software;

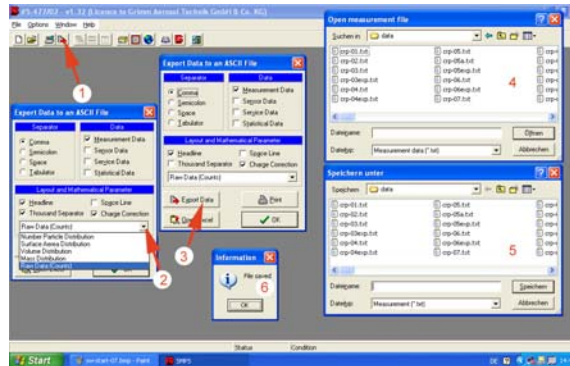


Fig.11: choose scan representation mode

12. Import file into EXCEL:

- Click to DATA;
- Get External Data
- Import Text File ....



Fig.12: import SMPS file into Excel

13. Import file into EXCEL (cont'd):

- Select exported SMPS file (step 1 in figure 13);
- Define Delimiters (step 2 in figure 11);
- Select the rows to be imported (step 3 in figure 11);
- Choose Data format (step 4 in figure 11);
- Define import location (step 5 in figure 11);

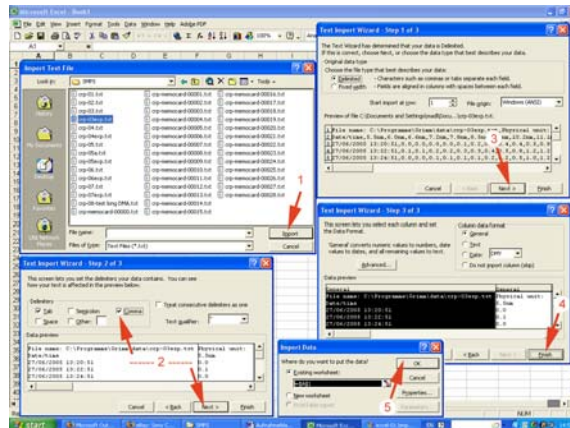


Fig.13: import selected SMPS file

## Checklist for the SMPS & CPC (5.400 & 5.500) – PART 1

### 14. Import file into EXCEL (cont'd):

- Right-click “Column A” of imported file and insert an extra row (step 1 in figure 14);
- Copy-paste content of “Row B” into “Row A” (step 2 in figure 14);
- Right-click “Row A” and set to standard date format (step 3 in figure 14);
- Right-click “Row B” and set to standard time format (step 4 & 5 in figure 14);
- Result should look like step 6 in figure 14;

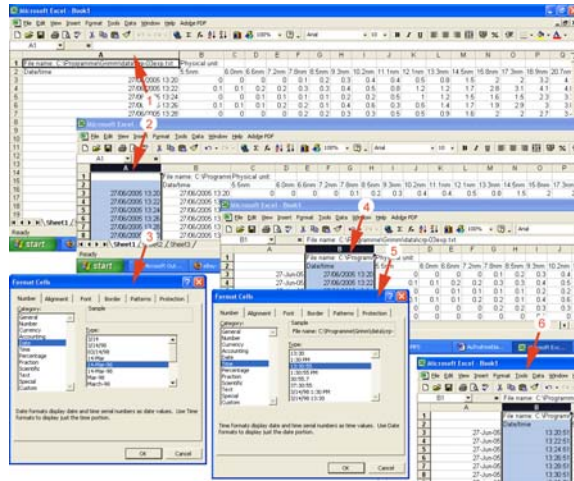


Fig.14: Final touches of the imported SMPS file

15. Proceed with further manipulation within EXCEL or any statistical software package available to generate distribution plots with error bars / standard deviation / histograms / etc.

**Dismounting the Long DMA and assembling the Short DMA:**

Conversion from the long (Vienna-type) DMA to the short DMA should be performed in a clean environment;

**Ticker**

**Task**

**Location**

1. **Prepare all utensils needed** to perform the modification (figure A).  
**Note:** before assembling the DMA **rinse** both the outer and inner electrode **with alcohol**;



Fig.A: Necessary utensils

2. **Unscrew upper assy** (figure B):
- the 4 uppermost screws fixing the outer electrode with the neutraliser / impactor module;
  - the two screws connecting the extension adaptor (for the pressure sensors) with the neutraliser / impactor module;
  - carefully remove lift and remove the neutraliser / impactor module;



Fig.B: Disassembling the DMA

3. **Remove sheath-air fitting** from the socket
- carefully detach adaptor and the two associated O-rings (see figure C);



Fig.C: Neutraliser / impactor module





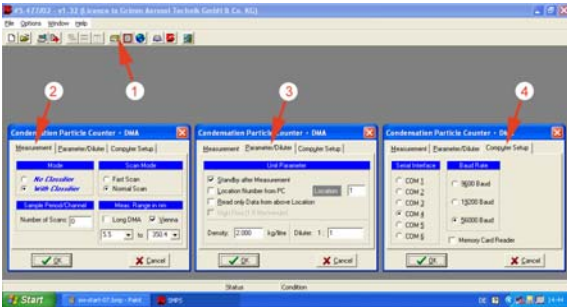
4. **Detach extension adaptor** from the sensor-DC-unit (see figure D);  
**Note:** make sure the brass-fitting does not get loose (if so use shrinking tube to provide for a tight fitting);



Fig.D: Removing the extension adaptor



## Checklist for the SMPS & CPC (5.400 & 5.500) – PART 2

Ticker	Task	Location
5.	<p><b>Unscrew lower assy</b> (figure E):</p> <ul style="list-style-type: none"> <li>the 4 lowermost screws fixing the outer electrode with the basal module;</li> <li>gently slide off the outer electrode from the socket;</li> <li>use glove to unscrew inner electrode</li> </ul> <p><b>Note:</b> grip inner electrode at the basal end to loosen it from the socket – otherwise the adapter fitting separating the electrode from the monodisperse slit fissure;</p>	 <p style="text-align: center;">Fig.E: Removing the outer and inner electrode</p>
6.	<p><b>mount inner electrode</b> onto the basal socket (figure F):</p> <ul style="list-style-type: none"> <li>slip over the short outer electrode;</li> </ul> <p><b>Note:</b> make sure that O-ring is in place and that outer electrode fits tightly onto the basal plate;</p> <ul style="list-style-type: none"> <li>place sheath-air adapter ring with the two O-rings on top of the outer electrode;</li> </ul>	 <p style="text-align: center;">Fig.F: Mounting the short inner electrode</p>
7.	<p><b>Attach sheath-air fitting</b> from the socket:</p> <ul style="list-style-type: none"> <li>Slide on the short extension adaptor for the sensor-DC-unit (see figure G);</li> <li>Carefully slip sheath-air fitting into the predetermined position;</li> </ul> <p><b>Note:</b> make sure the sheath-air adaptor ring and the two O-rings are properly placed – don't exert force, just press gently;</p> <ul style="list-style-type: none"> <li>tighten the 4 uppermost screws fixing the outer electrode as well as those two screws connecting the extension adaptor with the neutraliser / impactor module;</li> </ul>	 <p style="text-align: center;">Fig.G: launching scans via the software</p>
8.	<p><b>Swap impactor nozzle</b> (figure H):</p> <ul style="list-style-type: none"> <li>Unscrew impactor and nozzle holder;</li> </ul> <p><b>Note:</b> if nozzle is left inside, use nozzle tool to push it out;</p> <ul style="list-style-type: none"> <li>Use short sheath-air tubing to attach short DMA to CPC;</li> </ul> <p>Proceed as usual with checklist-1;</p>	 <p style="text-align: center;">Fig.H: Impactor nozzle and external plumbing</p>
9.	<p><b>At the Computer:</b> open the Setup toolbox and enter the desired parameters: (figure I):</p> <ul style="list-style-type: none"> <li>slow / normal scan and long / short DMA (step 1 &amp; 2 in figure I);</li> </ul> <p>Proceed as usual with checklist-1;</p>	 <p style="text-align: center;">Fig.H: Impactor nozzle and external plumbing</p>



## Checklist for the OPC (1.106) - DustCheck

### Setup of OPC:

Checklist uses the OPC together with an externally linked laptop (TOSHIBA-Tegra 500CDT).

#### Ticker

#### Task

#### Location

1. **Power up OPC** (figure 1).

**Insert power-adaptor** and switch power module on (built-in wipe switch of adaptor);



Use the **RS232 cable** to connect OPC with the laptop;

If desired attach **temperature & humidity probe** to the front panel of the OPC;

Attach sampling hose to the polydisperse inlet boss if required;



Fig.1: Peripheral accessories

2. **Switch on the OPC** (press the ON-key at the front panel)!

Skip filter swap by pressing the “-“ key (should a filter change be necessary, open panel at rear of instrument and swap filter membrane - step 3 in fig.2);



Optional (laptop used as Data-logger): use **RS232 cable** to connect CPC to the computer's USB port (port setting see below).

If date and time requires adjustment do so using the +/- keys at the front panel, otherwise wait until calibration of external sensors is complete and instrument starts scanning (step 7 in fig.2).

Press the standby-key to switch the instrument into standby-mouse (step 8 in fig.2);



Fig.2: Booting the OPC

3. **At the Computer:** Launch OPC software on PC;  
**Note:** when using the stand-alone application using OPC (without laptop or PC), press again the standby-key (step 8 in figure 2) and start measurement; recordings are made in 1mins interval and are stored onto the memorycard;

## Checklist for the OPC (1.106) - DustCheck

**Ticker**

**Task**

**Location**

4. **open the Parameter toolbox** (step 1 in fig.4):
  - Dustmonitor (step 2 in fig.4);
  - Define sensor parameters (if applicable - step 3 in fig.4);
  - Define site of measurement (step 4 in fig.4);
  - Define target directory for logged files (step 5 in fig.4);

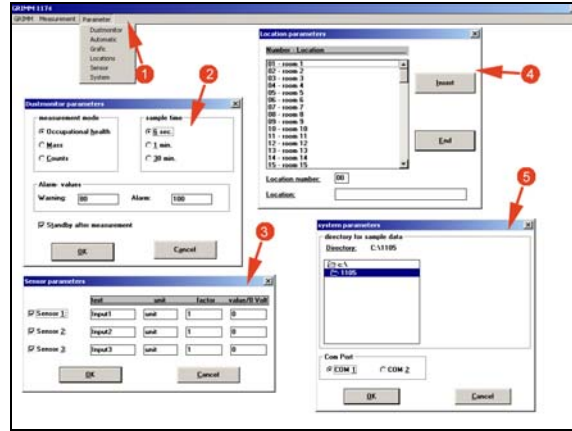


Fig.4: Parameter-setup of the OPC

5. **Start measurement:**
  - Open the MEASUREMENT tab and activate the SATR MEASUREMENT function (step 1 in fig.5);
  - Name file, operator's name and enter additional information if necessary and click the START icon (step 2 in fig.5);
  - Open the measurement tab and activate the Start measurement function (step 1 in fig.5);
 

**Note:** first set of data will be displayed only after a lag-time of several minutes, while subsequent cycles are updated every 60secs;
  - Swap to sensor information by clicking the SENSOR-icon (to swap back to he scanning menu click the RETURN-icon);
  - Terminate measurement by clicking the STOP-icon (step 3 in fig.5);

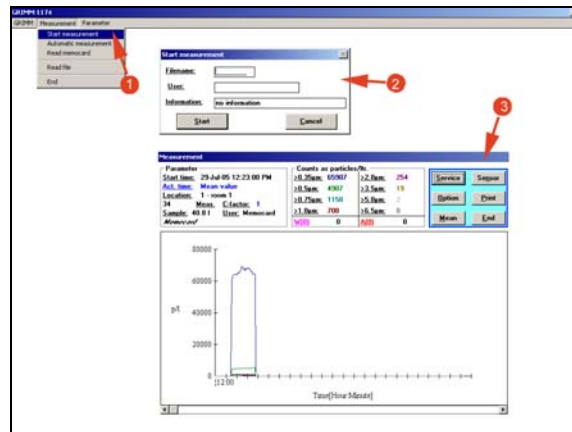


Fig.5: Launch measurement

6. **Exporting the logged data** (memocard)
  - Open the MEASUREMENT tab and activate the READ MEMOCARD function (step 1 in fig.6);
  - ??????/?

Fig.6: Reading data from Memorycard

## Checklist for the OPC (1.106) - DustCheck

**Ticker**

**Task**

**Location**

7. **Data conversion** to XLS format (step 1 in fig.7):
  - Open VisualBasic and click the LOAD-FILE function and activate the tab for existing files (step 1 in fig.7);
  - Load the **GrimmExcel.VBP** application (step 2 in fig.7);
  - Click the PLAY function to launch applet (step 3 in fig.7);

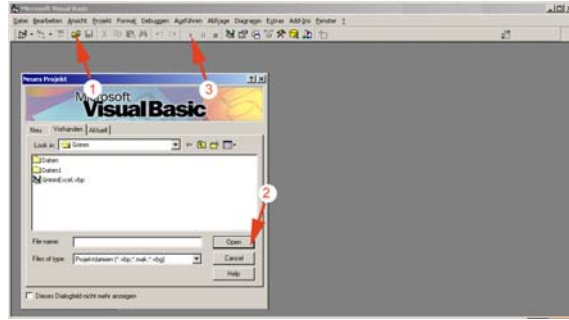


Fig.7: Parameter-setup of the OPC

8. **Data conversion (cont'd)** step 1 in fig.8):
  - To select the file to be converted, click the OPEN FILE icon (step 3 in fig.8);
  - Choose logged file (step 2 in fig.8);
  - Convert file by clicking onto the STORE FILE icon (step 3 in fig.8);

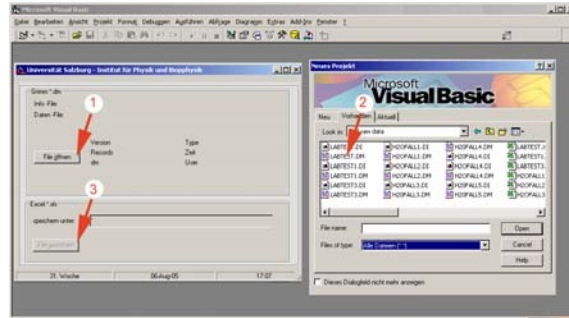


Fig.8: Parameter-setup of the OPC

9. **Import file into EXCEL (cont'd):**
  - Right-click "Column A" of imported file and insert an extra row (step 1 in fig.9);
  - Copy-paste content of "Row B" into "Row A" (step 2 in fig.9);
  - Right-click "Row A" and set to standard date format (step 3 in fig.9);
  - Right-click "Row B" and set to standard time format (step 4 & 5 in fig.9);
  - Result should look like step 6 in fig.9;

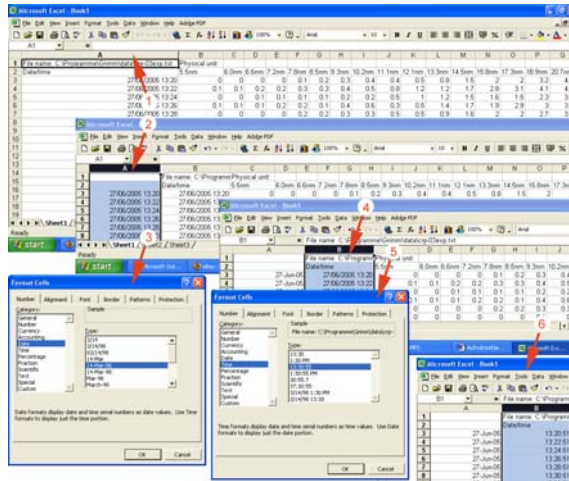


Fig.9: Final touches of the imported SMPS file

10. Proceed with further manipulation within EXCEL or any statistical software package available to generate distribution plots with error bars / standard deviation / histograms / etc.