

## miniDiSC Application Note #3: Warnings in the Java tool

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This document lists the different warnings that the miniDiSC Java tool can produce, it tells you what they mean, and what you can or should do about it. Please note that these warnings appear even if the error condition only appears during a single data point of the data file.

### **zero offsets are unstable**

This warning appears if the zero offsets of either electrometer in the instrument are larger than 5fA absolute at any point. High zero offsets are usually, but not necessarily a bad sign. If this warning appears, press the zero button in the toolbar and check the zero offsets to see how bad things are.

Unstable zero offsets can be caused by the following:

- (1) large temperature variations (press the temperature button in the toolbar to verify), in particular too high temperatures
- (2) high relative humidity or condensing conditions inside the instrument (you need to verify this with some external RH measurement)
- (3) high signal levels just before the offset measurement (press the glasses button in the toolbar and switch to the display of the stage that has high offsets)
- (4) dirt on the stage insulator or other damage to the instrument. If you can rule out (1) to (3), please contact the instrument manufacturer for further information.

### **Corona voltage high, corona voltage low**

If the corona voltage is above 4.9kV or below 2.8kV this warning will appear. Please refer to application note #1 on instrument warnings to see what this means and what you can do about it.

### **charging current too low**

This warning appears if the charging current (nominally  $10 \pm 1$  nA) is too low. This warning will probably appear in conjunction with a corona voltage high warning, and means that you definitely have to clean the charger's corona wire.

### **there may be dirt on the counterelectrode**

This warning appears when the charging current is nonzero although the charger is turned off. It means that there is dirt or possibly a water film on the insulator of the counterelectrode, leading to a small leak current. You should clean the counterelectrode.

### **the filter (or diffusion) stage current reached its maximal value (overrange)**

At very high particle concentrations (larger than one million particles per  $\text{cm}^3$ ), the miniDiSC electrometer amplifiers might reach their maximal level. These amplifiers can detect currents between 0 and 4096 fA. At higher currents, they remain "stuck" at 4096 fA. In this case, all calculated signals (number, diameter, LDSA) are no longer correct. You can check where this occurred by pressing the filter or diffusion stage button on the toolbar, to quickly see whether this was just a short episode, or whether the entire measurement was bad.

Particle levels which cause the miniDiSC to reach its maximal electrometer currents should be avoided in any case – at such extreme particle levels, you will have to service your instrument very frequently! If you plan on doing measurements at high particle levels, you should use an external dilution system.

### **your instrument requires a service due to excessive dirt in diffusion stage**

The miniDiSC collects particles in both its measurement stages, which eventually become dirty and

clog. The deposition characteristics in the diffusion stage will change with build-up of dirt, and the instrument readings become unreliable. To protect you from using an unreliable instrument, this warning appears when the integrated current deposited on the diffusion stage reaches a certain value – this integrated current is of course a measure of the amount of particles deposited, and we use it to recommend an instrument service. You can continue to use the instrument even if this warning appears, but you have to be aware that only the LDSA reading will then be reliable, whereas particle number and particle diameter are no longer reliable!

**the flow in your instrument is outside tolerance range**

This warning appears if the flow as measured by the internal sensor falls under 0.95 liters/minute. In this case, you should check the flow rate by pressing the flow button in the toolbar. A too low flow can be caused by different things:

- (1) pump failure, easily detected by the absence of any vacuum at the inlet of the miniDiSC, and a flow of about 0.3lpm displayed
- (2) external clogging of a tube when using the tube inlet, or
- (3) clogging of the impactor orifices – in both cases (2) or (3) check whether the flow is normal when you have the miniDiSC running with only the tube inlet fitting. If you notice that the miniDiSC does not reach the nominal flow with the impactor inlet, you should clean the impactor.
- (4) internal clogging of the filter in the filter stage – this should only happen if you also have a warning that your instrument needs servicing.