DEMC 1000 / DEMC 2000

Differential Electrical Mobility Classifier

Figure 1: DEMC 1000

Figure 2: DEMC 2000

The Palas® **Differential Electrical Mobility Classifier – DEMC** is available in two models. The **short classifying column** (model 1000) is ideal for the size range 4 nm to 600 nm. The **long classifying column** (model 2000) is appropriate for the size range 8 nm to 1,200 nm.

The DEMC (as defined in ISO 15900) is a classifier that is able to select aerosol particles according to their electrical mobility and pass them to its exit. A DEMC is historically also known as DMA – differential mobility analyzer.

The Palas® DEMC can universally be connected to CPCs and aerosol electrometers of other manufacturers. Several counters are already supported and if necessary we will add your counter in the software.

In combination with a polydisperse particle source* a DEMC is used to obtain a very narrow (monodisperse) particle size distribution of submicrometer particles of a designated size. Especially for calibration setups accurate sizing and reliable performance of a DEMC is extremely important. Setting the size can be accomplished easily by entering the size (in nm) directly on the touch screen or using arrow buttons to increase or decrease the size.

If the DEMC is used as a component of a scanning mobility particle sizer (SMPS) system, it provides a continuous and fast scan of the particle size distribution of the aerosol. Based on the user settings a scan can be performed in as few as 30 seconds or in as many as 64 size channels per decade.

The user controls the DEMC through a graphical user interface. It offers linear and logarithmic display of measurement values and data management of the integrated datalogger. The evaluation software provides sophisticated data evaluation (extensive statistics and averaging) and export possibilities.

The DEMC is typically operated stand-alone but can be connected to a computer or network by several interfaces (USB, WLAN, LAN, RS-232/485).

** Please consult our other data sheets for available particle generators from Palas®, e.g. DNP 2000, RBG 1000, AGF 2.0*

Particular advantages:

- User can select any size within the specified size range
- DEMC can connect to many counters to form SMPS
- Continuous, fast-scanning operation principle
- Graphical display of measurement values
- Intuitive operation via 7'' touch screen and GUI
- Integrated datalogger
- Low maintenance
- Reliable function
- Reduces your operating costs

Application examples:

- Calibration of condensation particle counters (CPC)
- Highly monodisperse particle source
- System component of a SMPS

Technical parameters:

• Particle size range:	DEMC 1000	dp = 4 nm – 600 nm
	DEMC 2000	dp = 8 nm – 1,200 nm
• Number of size channels:	1 – 64	
• Flow sample air:	0 – 4 l/min	
• Flow sheath air:	0 – 10 l/min	
• Impactor:	Nozzles for 3 different cutoffs	
• Operation terminal:	Touch screen 800 x 480 pixels	
	1.6 GHz Intel Atom™ Processor	
	2 GB Compact Flash	
• Interfaces:	USB, WLAN, LAN, RS-232/485	
• Power supply:	115/230 V; 50/60 Hz	
• Dimensions control unit:	33 x 38 x 24 cm (H x W x D)	
• Dimensions column:	15 x 57 cm (ø at base x H)	
• Weight control unit:	12.9 kg	
• Weight column:	9.3 kg	

Accessories:

- Aerosol Neutralizer Kr-85
- Transportation case

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Palas® is continuously setting standards in aerosol technology with more than 50 patents filed since 1983. Our innovations result in products of superior quality and long durability, which lead to unique technical and economic advantages for our customers.

On this account, Palas® could established itself as a world-wide market leader in aerosol generation, aerosol dilution and aerosol particle measurement.

DEMC 1000 / DEMC 2000
Quality in detail

Function:

Figure 3 shows a schematic of the working principle of the DEMC. Before the aerosol enters the DEMC column it is conditioned. A dryer (e.g. silica gel, Nafion) removes moisture from the particles. A bipolar neutralizer (e.g. Kr 85) is used to ensure a defined charge distribution of the aerosol. An impactor at the inlet of the DEMC is used to remove particles larger than the classifier size range.

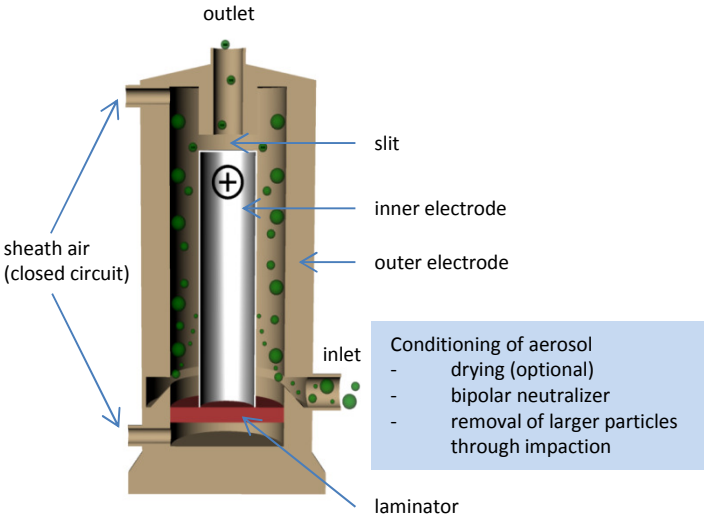

Figure 3: Working principle of the differential electrical mobility classifier (DEMC)

Then the aerosol enters the DEMC column through the inlet. The aerosol flow along the outer electrode is then carefully combined with a sheath air flow. It is important to avoid any turbulence and ensure laminar flow. The surfaces of the electrodes need to be of extremely high quality in regards to smoothness and tolerances.

The sheath air is a dry particle free carrier gas (typically air) that is continuously circulated in a closed loop and of a higher volume than the aerosol. The ratio between sheath air volume to sample air volume defines the transfer function and therefore the resolution of the DEMC.

By applying a voltage, a radial symmetric electrical field between the inner and outer electrode is created. The inner electrode is kept at a positive potential and is outfitted with a small slit at the top end. By balancing the electrical force on each particle with its aerodynamic drag force in the electrical field negatively charged particles are diverted to the positive electrode. Based on their electrical mobility some particles will traverse the slit and be able to exit the DEMC.

These classified particles are in a narrow range of electrical mobility but they can still have different sizes due to the difference in the number of charges that these particles can have.

If the DEMC is used as a component of a scanning mobility particle sizer (SMPS) system, the voltage and therefore the electrical field is continuously changed and at different times particles of different mobility are exiting the DEMC and successively counted by a submicron particle counter such as a condensation particle counter (e.g. Palas® UF-CPC) or aerosol electrometer (e.g. Palas® Charme®).
The well-known and optimized Palas® software combines the data (voltage, particle number, etc.) to produce a particle size distribution as shown in figure 4.

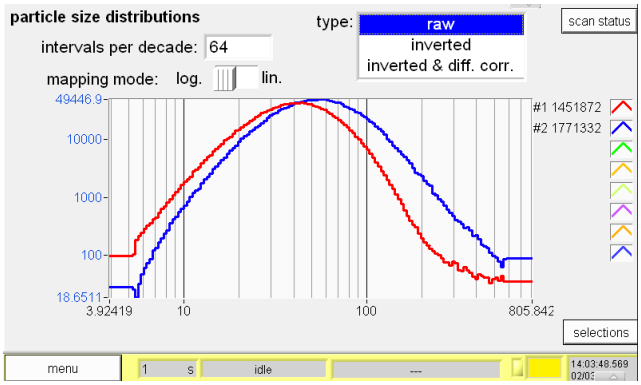

Figure 4: Particle size distributions of an aerosol of the Palas® DNP 3000

User interface and software:

Based on continuous customer feedback the user interface and software is designed for intuitive operation and real-time control and display of measurement data & parameters.

The user interface also provides data management with the integrated data logger, various export capabilities and network support. With the software the measured data can be displayed and evaluated with many options available.

In general the DEMC software and firmware supports the use of submicron particle counters from other manufacturers, an example is shown in figure 5.

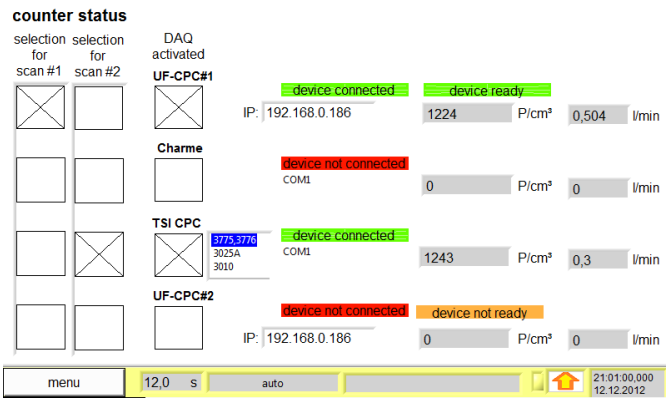

Figure 5: Screenshot of the counter selection screen of the DEMC