DNP DIGITAL 3000

Particle measurement devices should be calibrated using particles with characteristics — such as shape, size, density, surface condition, and refractive index — similar to those of the actual aerosol to be tested, for example diesel soot.The DNP digital 3000 generates a condensation aerosol from conductive materials such as graphite, copper, silver, and others. The resulting carbon agglomerates resemble diesel soot in terms of particle size distribution. Thanks to its digital control system, the generator offers an expanded adjustment range and even greater consistency in particle size and concentration.

OPERATION PRINCIPLE

GENERATION OF NANO-SCALE TEST AEROSOLS THROUGH CONDENSATION

The DNP digital 3000 aerosol generator generates a jump spark between two graphite electrodes under high voltage. The jump spark rips tiny amounts of graphite from the electrodes at high temperatures. The graphite vaporized by this spark then condenses to form highly tiny particles. The high number concentration can result in the coagulation of these very small particles into agglomerates. The aerosol can be diluted by adding mixed air, enabling the defined adjustment of the agglomerate formation. The generated aerosol distribution is very similar to the distribution of diesel soot particles from a combustion engine. The energy converted in each spark remains constant due to the continual spark over voltage. This continuous energy in each spark guarantees stable particle size distribution (see Fig. 1). A technically sophisticated control of the distance between the electrodes during burn-off ensures very high long-term stability. The mass flow can be quickly and easily adjusted within a wide range using the spark frequency (see Fig. 2).

The digital regulation of the frequency and the continuous regulation of the voltage guarantee a more specific regulation of the distance between the two electrodes. This enables a higher constancy of the particle size distribution and the mass flow. Furthermore, every single spark can be regulated, and the energy of the single spark can be determined in principle. An AK protocol for an Ethernet connection via UDP protocol is part of the delivery.

Due to its easy startup, excellent reproducibility, and high functional reliability, the DNP digital 3000 is exceptionally well suited for calibrating particle measurement devices. Because of the superb reproducibility and easy handling, the DNP digital 3000, combined with the REF 3000 reference exhaust, successfully calibrates the PMP measurement chain in the particle measurement program.

The Particle Measurement Programme (PMP) recommends adjusting the particle size to 30 nm, 50 nm, and 100 nm for calibration of the complete measurement chain. These particle fractions can be classified by means of a DEMC (Differential Electro-Mobility Classifier) based on the particle spectrum provided by the DNP digital 3000. This

enables the transmission behavior of a particle measurement chain and its individual components to be determined quickly, reliably, and reproducibly at temperatures of up to 400 °C.

In addition, the DNP digital 3000 is equipped with mass flow controllers for the regulation of nitrogen and dilution air volume flows. Operation is performed via an integrated touch display, which allows individual adjustment of device parameters and the saving of parameter sets. The REF 3000 reference exhaust can also be controlled separately through the DNP digital 3000.

Carrier gas: Nitrogen or Argon

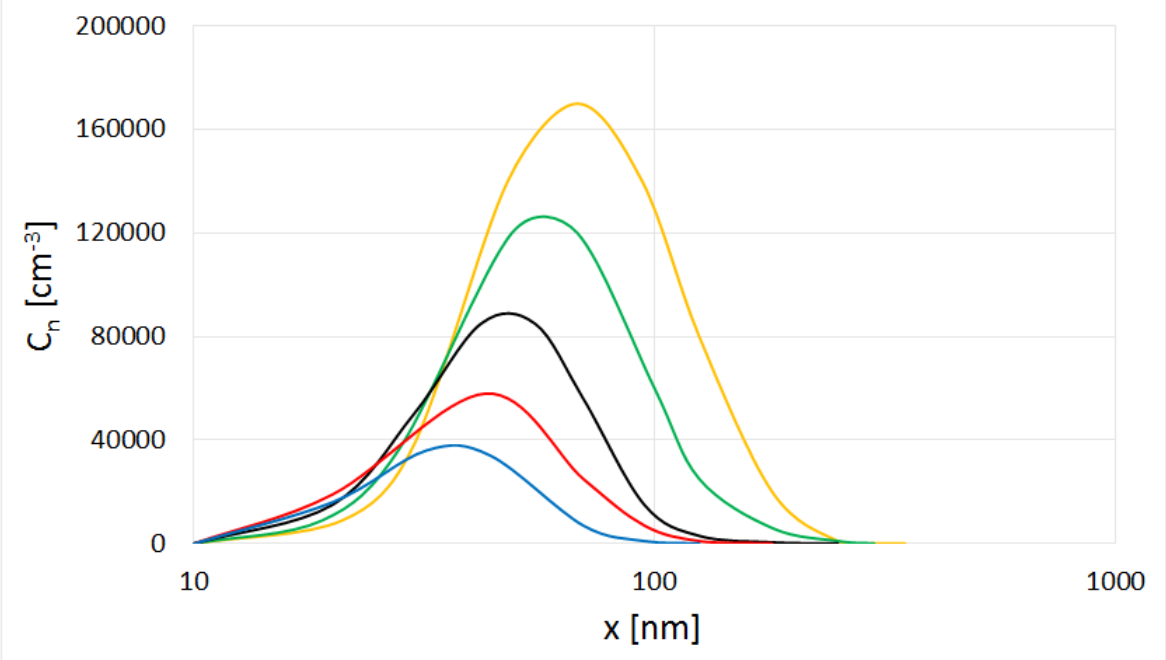

Figure 1: DNP Size Distribution

DNP Größenverteilungen der Partikelagglomerate bei verschiedenen Funkenfrequenzen

Fig. 1: Size distributions of the particle agglomerates at various spark frequencies

Fig. 2: Particle mass flow of the DNP digital 2000 as a function of the spark frequency

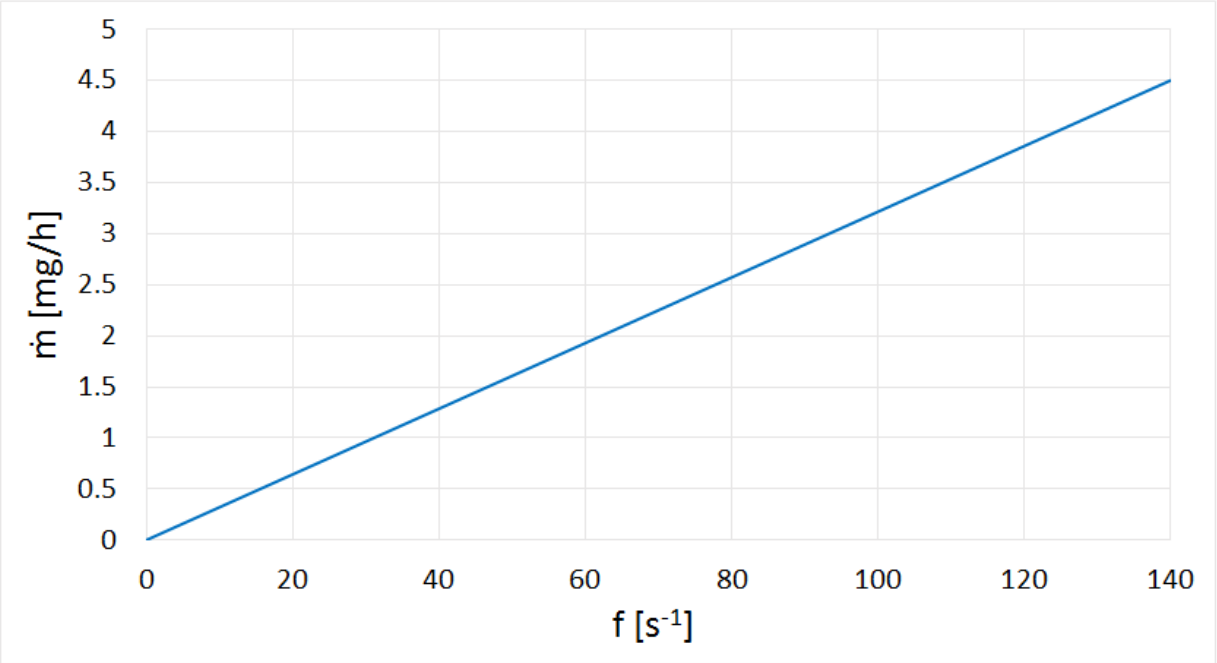

Figure 2: DNP 2000 Mass Flow

DNP 2000: Partikelmassenstrom des DNP digital 3000 als Funktion der Funkenfrequenz

BENEFITS

- Fast adjustable particle size distribution
- Excellent short-term and long-term particle size and concentration constancy
- Particle structure similar to that of diesel soot at graphite electrodes
- Apart from graphite electrodes, copper, silver or other electroconductive electrodes can be used as well
- For PMP-measuring section easy connectable to CVS systems in combination with RAS 3000 (accessories)
- No volatile parts in the aerosol
- Aerosol is temperature-resistant to 400 °C
- Best reproducibility

DATASHEET

Particle size range	0.02 – 0.35 μm
Volume flow	4 – 70 Nl/min
Volume flow (accessories)	0 – 450 l/min (REF 3000)
Volume flow (carrier/dispersion gas)	4 – 20 l/min
Volume flow (dilution gas)	0 – 50 l/min
Mass flow (particles)	0.1 – 25 mg/h (for carbon)
Particle material	Carbon, copper, silver, gold and other metals
Dosing time	Several hours nonstop
Pre-pressure	4 – 8 bar
Carrier/dispersion gas	Nitrogen, argon
Compressed air connection	Quick coupling
Aerosol outlet connection	$Ø_{inside}$ = 6 mm, $Ø_{outside}$ = 8 mm
Particle size range (primary particles)	3 – 10 nm
Dilution gas	Particle-free and dry compressed air
Dimensions	185 • 445 • 380 mm (H • W • D)
Weight	23 kg

APPLICATIONS

- Calibration of PMP measurement chain
- Calibration of particle measurement devices
- Calibration of sampling lines
- Production of nano particles
- Inhalation exploration
- Toxicology
- Material Science

Mehr Informationen:
https://www.palas.de/en/product/dnpdigital3000