VKL 10



The VKL 10 series of dilution systems can reduce the concentration of aerosols by the dilution factor 01:10, also of very highly concentrated aerosols, in a defined and reliable way.

The Palas VKL, 10 dilution systems, are used in vertical operation for the particle size range up to 20 μm for powders and dusts. Dilution factors of up to 1:100,000 are achieved by cascading several VKL systems.

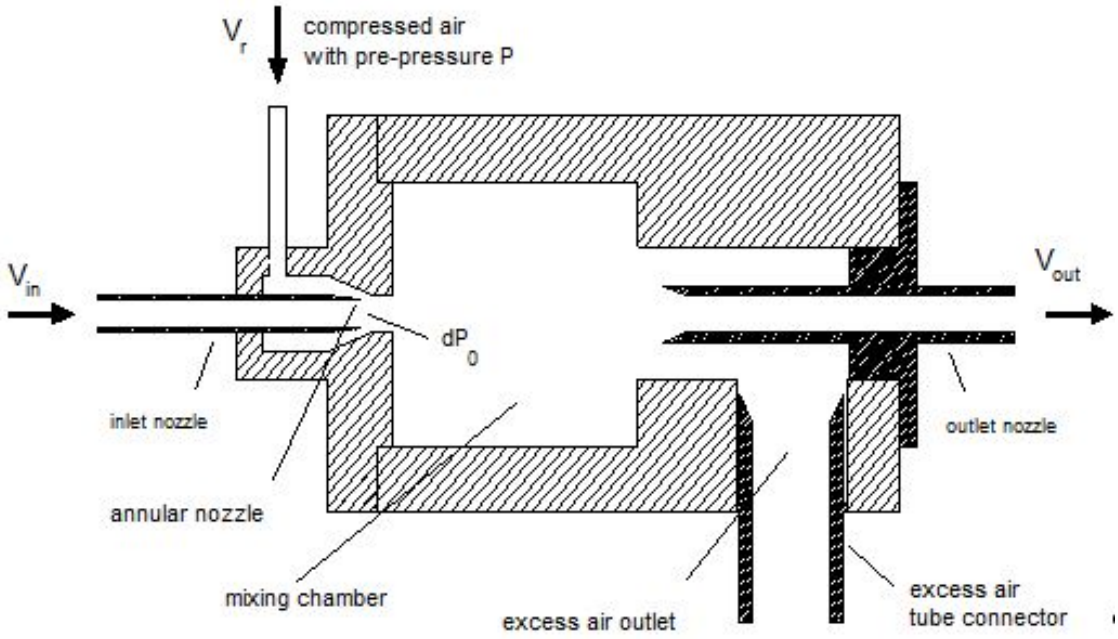
Model Variations



VKL 10 ED
Pressure-resistant version made of stainless steel for dilution at up to 10 bar counter-pressure, and for chemically aggressive aerosols with a dilution factor of 1:10

OPERATION PRINCIPLE

DILUTION SYSTEM WITH A DILUTION FACTOR OF 1:10



Particle-free air with the volume flow V_R circulates through an annular passage around the suction nozzle. Thus, according to Bernoulli, a volume flow V_{An} is generated at the suction nozzle.

The dilution factor V_F is calculated according to the following formula.

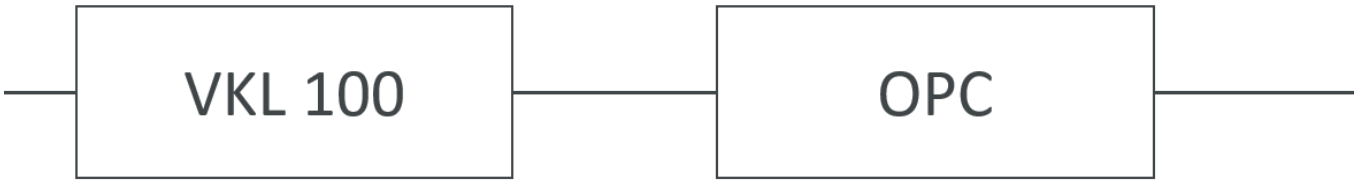
$$V_F = \frac{(\dot{V}_R + \dot{V}_{An})}{\dot{V}_{An}}$$

Simple, functional test on-site

With this simple test setup, the Palas cascaded dilution systems can be checked by anyone:

Firstly a particle measurement is performed with one dilution step. Here it is essential that the aerosol concentration, e.g., lab air, to be measured does not exceed the coincidence limit (maximum detectable aerosol concentration). In the second step, the dilution step to be tested is connected in series (cascaded). To check the dilution

factor of the test step (pos. 2), the total particle count from the measurement in pos. 1 is divided by the total particle count from pos. 2.



Position 1: Lab air



Position 2: Lab air

The VKL 100 measures coincidence-free with the OPC; the VKL 10 is tested.

Particle class in µm	Number Pos. 1
0.2	151648
0.3	71604
0.5	4305
0.7	360
1.0	82
2.0	16
3.0	1
5.0	
Sum	228016
VKL 10 E	10
VKL 10 ED	10
VKL 10 V	10
VKL 27	27
VKL 100	100

Table 2: VKL measurement example 1

Particle class in μm	Number Pos. 2
0.2	15166
0.3	7290
0.5	524
0.7	65
1.0	21
2.0	3
3.0	
5.0	2
Sum	23071
VKL 10 E	10
VKL 10 ED	10
VKL 10 V	10
VKL 27	27
VKL 100	100

Table 4: VKL measurement example 2

Calculation of the dilution factor

$$V_F = \frac{\dot{N}_{GesPos1}}{\dot{N}_{GesPos2}} = 9{,}88$$

Provided the first measurement is not affected by a coincidence error and the dilution system under test is working (not soiled), a dilution factor of almost 10 is determined. If this should not be the case, there was possibly a coincidence in measurement 1. In this case, the aerosol concentration has to be decreased or a further dilution step used. Another possibility would be that the dilution step to be tested is soiled. In this case, the device has to be cleaned and the test repeated.

Type	Dilution factor* V_F	Pressure - resistant up to 10 bar	Chemically resistant	Heatable up to ... °C	dp_{max} in μm	Compressed air 4 - 8 bar	Cascadable	Voltage
DC 100	10, 100				< 5			115 V / 230 V
DC 1000	10, 100, 1000				< 5			115 V / 230 V
DC 10000	10, 100, 1000, 10000				< 5			115 V / 230 V
KHG 10	10		x	150	< 20	x	x	115 V / 230 V
KHG 10 D	10	x	x	150	< 20	x	x	115 V / 230 V
PMPD 100	100		x	200	< 5	x		115 V / 230 V
PMPD 1000	1000		x	200	< 5	x		115 V / 230 V
VDD 10	1 - 10				< 10	x		115 V / 230 V
VKL 10	10				< 20	x	x	
VKL 10 E	10		x		< 20	x	x	
VKL 10 ED	10	x	x		< 20	x	x	
VKL 10 V	10				< 20	x	x	
VKL 27	27				< 10	x	x	
VKL 100	100				< 2	x	x	

Table 6: Characteristics dilution systems

*Other dilution factors on request

Table 1: Technical characteristics of Palas dilution systems

VDI report no. 1973 from 2007 proved metrologically that a reproducible aerosol dilution is possible with the Palas dilution systems down to VF 100,000.

Benefits

- The dilution systems from Palas® are characterized unambiguously. This is documented with a calibration certificate for each device
- The dilution steps deliver a temporally constant, representative dilution with the factors 10 and 100
- The dilution systems can be cascaded with the factors 100, 1,000, 10,000 and 100,000
- Low compressed air consumption, e.g. just 128 l/min with a dilution factor of 10,000 with four VKL 10 systems
- The dilution steps are combinable with all common particle counters
- With a simple test set-up, the users can check these cascaded dilution systems.
- Simple, functional test on-site

DATASHEET

Volume flow (clean air)	18 – 45 l/min
Volume flow (suction flow)	2 – 5 l/min
Isokinetic suction nozzles	0.028–0.06 l/min, 0.23–0.5 l/min, 0.6–1.6 l/min, 2–5 l/min, 28 l/min => 15–37 l/min
Maximum particle size	< 20 µm (for dusts)
Compressed air supply	4 – 8 bar
Dilution factor	1 : 10
Dimensions	100 • 245 • 100 mm (H • W • D)
Weight	Approx. 4 kg
Special features	Cascadable

Applications

- Aerosol measurement technology: diesel exhaust gases, swarfs, coolant aerosols, weld smoke, oil droplets, test aerosols of filters, and inertial separators
- Separation efficiency determination with counting measuring methods, e.g., with dust filters or HEPA/ULPA filters
- Leak test and acceptance measurements of clean rooms, isolators, and safety work benches
- Inhalation toxicology
- Quality control of respirator masks and filter cartridges

Mehr Informationen:
https://www.palas.de/en/product/vkl10