

# Operating Manual

## Corona-Discharge Unit

### CD 2000

**Type A: 2 – 18 m<sup>3</sup>/h**

**Type B: 3 – 36 m<sup>3</sup>/h**



## Content

Important Notes for Operation of Corona Discharge Unit CD 2000! .....	3
1. Check of delivery .....	4
1.1 Checking of accessory equipment supplies .....	4
2. Safety conditions / Intended use .....	5
2.1 General safety conditions .....	5
2.2 Intended use .....	5
2.3 Responsibility of the operator .....	5
3. Short Operating Instructions.....	6
3.1 Connections .....	6
3.2 Switching-on Procedure.....	6
3.3 Switching-off Procedure .....	6
4. Function Principle .....	7
5. Electrical Adjustment of Corona Ionization Chambers.....	8
5.1 Principle: .....	8
5.2 Procedure:.....	8
5.3 Adjusting the external potentiometers with scale:.....	8
6. Malfunctions .....	10
6.1 FAQs .....	10
6.2 General.....	10
7. Maintenance .....	11
8. Technical Data for Standard Equipment.....	12
8.1 Electrical data.....	12
8.2 Mechanical data (standard values).....	12
9. Spare parts list / accessories list .....	13
9.1 The following replacement parts are available: .....	13
10. Transport, packaging and storage.....	14
10.1 Packaging: .....	14
10.2 Storage: .....	14
10.3 Transport: .....	14
11. Disposal of the Discharge Unit CD 2000 .....	15
12. Feedback form.....	16

## **Important Notes for Operation of Corona Discharge Unit CD 2000!**

Start operation of Corona-Discharge Unit only after thoroughly study of operating manual.

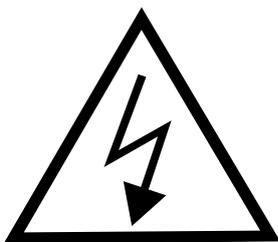
The manufacturer is not liable for damages caused by improper operating, false starting of the unit, misuse or cleaning.

Please take note of the following points:

- The standard equipment may only be operated in dry rooms under atmospheric environmental pressure and at room temperature. The manufacturer will not be liable with regard to the operating guarantee, if operating takes place under different environmental conditions, such as, corrosive or explosive environment, electric or electromagnetic fields, operating within areas of ionizing radiation, within areas conductive to shock or vibration.
- Besides discharging also electric sparks are possible in the discharge chambers. Thus only gas that is definitely not flammable may be used as mixing air and aerosols.
- If any damage at cables, plugs or other parts of the discharge unit is visible do not operate the discharge unit. In order to eliminate the defect please contact the manufacturer.
- The grounding cable of corona-discharge must be connected.
- Use only original spare parts!
- While operation, the corona-discharge-chambers produce ozone. The mixed aerosol should not contaminate the air in the place where people are working.

**Attention:** Aerosols might be dangerous to your health. That's why they ought not to be inhaled. It might also be necessary to wear protective clothes. Please pay attention to the correspondent standards and safety rules.

Explanation of warning signs:



This sign is placed near parts where dangerous high voltage is present.

## **1. Check of delivery**

### **1.1 Checking of accessory equipment supplies**

Please check immediately after unpacking the instrument if it shows any damages due to the transport.

If the instrument is damaged, you may not set it to work. Damages may lead to unsafe operation because of the high voltage in the instrument.

Please check if the supplied accessory equipment of the CD 2000 is complete.

The following parts are attached to the system:

- 1 power cord
  
- 1 operating manual
  
- 1 electrotronical control unit
  
- 1 Discharge unit with a cable with three connectors:
  - Negative Ion
  - Positiv Ion
  - Grounding

## **2. Safety conditions / Intended use**

### **2.1 General safety conditions**

- For safety reasons, under no circumstances may the machine be commissioned if there is visible damage. In this event, please contact Palas® (Tel.: 0721/96 213-0).
- The discharge system CD 2000 has been permanently adjusted by the manufacturer to the mains voltage requested in the order. Please verify, if the mains voltage indicated on the type label corresponds to the mains voltage at the respective place of instalment.

#### **Attention: The manufacturer is not reliable for any damages caused by another voltage supply as stated on the instrument**

- Only use original spare parts! Please contact the manufacturer whenever necessary.

### **2.2 Intended use**

- The discharge system CD 2000 was designed to create a soot similar to diesel soot by graphite electrodes and to disperse this soot into air/ gas stream.
- The manufacturer is not responsible for any damage, which arise due to incorrect operation, cleaning, error in operation or the measurement of aerosols which gas conditions or compound the instrument is not specified for.
- The machine may only be operated in dry rooms, under atmospheric ambient pressure and at room temperature.

Operating under other ambient conditions such as in corrosive or explosive environments, in strong electric or electromagnetic fields, in areas with ionising radiation as well as in areas subject to impact and vibration is not covered by any functional guarantee by the manufacturer

### **2.3 Responsibility of the operator**

- The device was designed and built in consideration of the standards to be adhered to. It therefore represents state-of-the-art technology and allows a high degree of safety in operation.
- Please only operate the dust disperser of the discharge system CD 2000 after reading carefully the manual.
- Trained personal
- Be sure that the machine cannot be used by unauthorized personnel.
- Caution: Depending on the type, aerosols can pose a health hazard. They should therefore not be inhaled. When working with or when around hazardous materials, care must also be taken to wear appropriate protective clothing (respirator mask). Please follow all applicable guidelines and accident prevention regulations.

## **3. Short Operating Instructions**

### **3.1 Connections**

- ☞ Connect mixing air, aerosol inlet and outlet to the discharge chamber
- ☞ Connect grounding cable of HV-power supply to discharge chamber
- ☞ Connect high-tension lead to positive/negative outlet of power supply.  
**Pay attention to polarity!!**
- ☞ Connect power cord to HV-power supply

### **3.2 Switching-on Procedure**

FIRST            Deliver mixing air. Adjust volume flow. On this occasion consider the allowable volume flow range. The mixing air flow must always be bigger than the aerosol flow at the aerosol inlet.

THEN            Switch on the discharge unit.

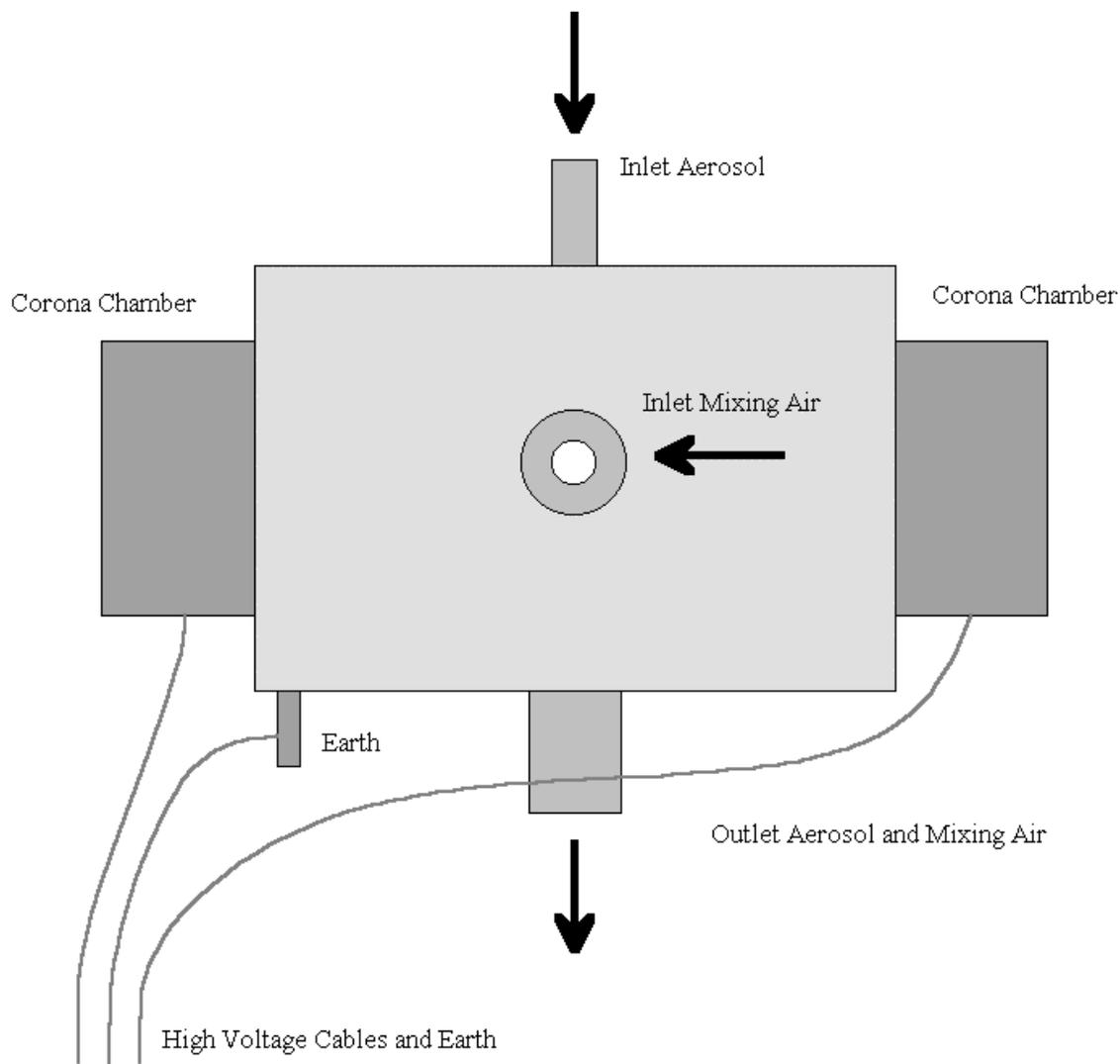
AT LAST        Deliver aerosol.

Thus it is assured that aerosols do not enter the discharge chamber.

### **3.3 Switching-off Procedure**

Follow the switching on procedure in reverse order:  
Aerosol off, discharge off, mixing air off.

## 4. Function Principle



The dust or liquid aerosol is supplied to the inlet. The particles in these aerosols carry some charge and they have to be discharged.

The clean pressurized air is delivered into the mixing air inlet. Mixing air flow is lead through two ionization chambers which are driven by positive/negative high tension. In these chambers the air is enriched with ions by the corona discharge.

The aerosol air flow and the mixing air flow enriched with ions will then be mixed in the mixing chamber just before the outlet. By means of ions in the mixing air, the charge of the particles in the aerosol is neutralized. This takes a certain time which means that the complete discharge procedure takes place mainly in the volume after the outlet of the discharge unit. (For example in the following tubes or in the upper part of a filter holder). An estimate for the needed time for the discharge process is around 0,5 seconds. Good discharge was found in applications assuring a time longer than 0,2 seconds.

## 5. Electrical Adjustment of Corona Ionization Chambers

In order to assure a correct function of the discharge unit, it is important that the electrical working point is adjusted in the right way.

### 5.1 Principle:

The current from the negative and positive high-voltage supplies is set to a value so high that it is completely carried by the corona-discharge. No, or only a few sparks are allowed. This current is set by adjusting the current limiting circuit of the high voltage supplies to the chosen value of maximum current.

The voltage limit is set a little higher than necessary for the maximum current. Due to this, the current will always keep its value, even if conditions such as temperature or state of electrodes are changing.

### 5.2 Procedure:

Positive and negative high-voltage supply and discharge unit are independent of each other and can be separately adjusted.

- 1) Start operating the discharge unit but without aerosol supply. (See First Set-up) Recommendation: Mixing air volume flow should be set to 5 m<sup>3</sup>/h (4 to 10 m<sup>3</sup>/h is useable).  
Connect digital voltmeter to the monitor-output on the back side of the high-voltage supply unit:  
as first to the monitor output for I<sub>mon</sub> of the **positive** high voltage part; after this part is set, then connect the voltmeters to the 'negative' part.  
Setting for voltmeter is: voltage measurement 0 to 10 V.
- 2) The adjusting potentiometers are mounted on the front plate. They have a scale from 0 to 999 and can be set easily and reproducibly by hand.

### 5.3 Adjusting the external potentiometers with scale:

Relation between scales and voltage or current:

voltage (U <sub>pos</sub> /U <sub>neg</sub> ):	1000 scales	correspond to	6000 V
	1 scale	corresponds to	6 V
current (I <sub>pos</sub> /I <sub>neg</sub> ):	1000 scales	correspond to	1000 µA
	1 scale	correspond	1 µA

For example, the standard setting for the current limiting at 20  $\mu\text{A}$  (which means 0.2 V on the monitor output) is now at 20 scales.

### 3) **Adjustment procedure**

- Regulate Adjusting potentiometer for voltage down entirely
- turn current adjusting potentiometer to a high value (200 scales)
- now increase the output voltage by turning the potentiometer for Upos upwards and look for the monitoring value for the current on the digital voltmeter.

For standard setting: As soon as the monitoring value reaches 0.2V (corresponds to 20 $\mu\text{A}$ ), increase the scales of the Upos-potentiometer by 200 scales.

Then turn down the Ipos-potentiometer to 20 scales.

Now the setting for the positive high voltage is adjusted. The digital voltmeter should show now around 0.2V as monitoring value.

When measuring the monitoring value for Umon, the voltage seen there is lower than adjusted with the Upos-potentiometer because the HV-supply now works with current-limiting and therefore decreases the output voltage.

The negative output is adjusted in the same way as the positive output:

- preset potentiometers for Uneg and Ineg
- connect voltmeter
- increase Uneg and look for Ineg: increase Uneg by 250 scales when reaching the 0.2V on voltmeter
- set potentiometer for Ineg to 20 scales.

**Caution!** In order to keep the values given by the EMC-directive, the current should be so low that no sparking takes place. This will be correct as long as the current is kept at 20  $\mu\text{A}$  or less.

## **6. Malfunctions**

If the discharging of the particle is not sufficient then please check if the electrical control unit has electrical power.

If other malfunctions may arise, please contact manufacturer.

Palas GmbH

Greschbachstr. 3b

76229 Karlsruhe, Germany

Telephone: +49 (0)721/96 21 30

E-mail: [support@palas.de](mailto:support@palas.de)

(please indicate the serial number of the instrument within the email)

**A device that obviously does not function perfectly may not be operated further!**

### **6.1 FAQs**

Table with known questions:

(Questions are currently being collected and will be listed in the next revision of this document)

### **6.2 General**

No components may be serviced or replaced in the discharge system CD 2000 without instruction from a Palas® employee. In the event of infringement, the customer loses their warranty claims; in addition Palas® is not liable for the damage arising.

In case of problems with the discharge system CD 2000 please contact Palas® GmbH (Tel.: 0721/96 213-0).

## **7. Maintenance**

During the application of the discharge unit always make sure that mixing air flow will be supplied first then the aerosol flow.

When switching off remove aerosol flow first then mixing air flow. Otherwise the ionization chambers can become contaminated. A high mixing air flow (depending on version, max. 18 or 36 m<sup>3</sup>/h) can clean these chambers .

Dismantling can only be effected by the manufacturer as an exact adjustment of the components is essential when reassembling it.

The function of the unit can be controlled by measuring the corona current at  $I_{Mon}$  while operating. Using the standard settings, there should be shown approx. 0.2 V, which corresponds to approx. 20  $\mu$ A.

## 8. Technical Data for Standard Equipment

### 8.1 Electrical data

mains supply voltage	100 to 250 V AC / 47 to 63 Hz
consumed power	50 W
mains fuse	M 2A / 250 V

#### high-voltage supplies

Positive and negative high voltage is provided by two independent power supplies.

	voltage (max.)	current (max.)
positive	6000 V	1000 $\mu$ A
negative	6000 V	1000 $\mu$ A

#### Monitoring of high voltage

voltage (blue socket):	0 - 6000 V	=	0 - 10 V
current (red socket):	0 - 1000 $\mu$ A	=	0 - 10 V

### 8.2 Mechanical data (standard values)

There are two versions of the mechanical part of the CD-2000 with different mixing air flows:

type A is for air flows from 2 to 18 m<sup>3</sup>/h

type B is for air flows from 3 to 36 m<sup>3</sup>/h

<b>inlet:</b>	aerosol:	volume flow:	0 - 4 m <sup>3</sup> /h	
		connection:	da = 8 mm; di = 6 mm	
	mixing air:	cleaned, dry pressurized air		
			<b>type A, 'small'</b>	<b>type B, 'big'</b>
		volume flow:	2 - 18 m <sup>3</sup> /h	3 - 36 m <sup>3</sup> /h
		hose coupling for hose:	$\varnothing$ i 6 mm $\varnothing$ a 8 mm	$\varnothing$ i 13 mm
<b>outlet:</b>	aerosol and charged mixing air			
		connection:	da = 16 mm	
			di = 12 mm	

## **9. Spare parts list / accessories list**

### **9.1 The following replacement parts are available:**

- Aerosol inlet tube for CD 2000

## **10. Transport, packaging and storage**

### **10.1 Packaging:**

Please keep the original packaging, so that if it should become necessary (for service or maintenance) you can use this packaging to send the unit back to Palas®.

### **10.2 Storage:**

If the unit will not be used for a longer period, the instrument should be cleaned. Then the unit should be stored in a dry location.

### **10.3 Transport:**

When transporting by hand take care about the weight. Please see also technical parameter. For all other types of transport (such as shipping), the unit must first be cleaned and the instrument should be packed safely for transportation. Please use the original transport packaging.

## **11. Disposal of the Discharge Unit CD 2000**

Once the discharge system CD 2000 has reached the end of its lifetime, please contact Palas® (0721-96213-0) for proper disposal.

## 12. Feedback form

In order to continuously improve our Instruction Manual, we request you to fill in this form and to send it back to us. Many thanks for your feedback!

How to contact us:

Address: Greschbachstraße 3 b, 76229 Karlsruhe, Germany

Telephone: +49 (0)721 96213-0 Fax: +49 (0)721 96213-33 E-mail: [mail@palas.de](mailto:mail@palas.de)

This evaluation concerns (Instruction Manual, version): CD 2000, V002022014

Please give us your contact details:

Company: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone number or e-mail: \_\_\_\_\_

Were the instructions clearly formulated and easy to understand?

yes  no

If no, please give details here: \_\_\_\_\_

\_\_\_\_\_

Was information missing for you?

yes  no

If yes, please give details here: \_\_\_\_\_

\_\_\_\_\_

Were you satisfied with the structure of the Instruction Manual? Did you quickly find the information you were looking for?

yes  no

If no, please give details here: \_\_\_\_\_

\_\_\_\_\_

Were you satisfied with the telephone service in the event of technical problems?

yes  no

If no, please give details here: \_\_\_\_\_

\_\_\_\_\_

Here you can tell us what else seems important and helpful for you:

\_\_\_\_\_

\_\_\_\_\_