

# Manual

---

System Prof. Dr.-Ing. Hans Kleinwächter



## Electro field meter EFM 113B

---

Small stationary static-field meter with high sensitivity to measure static DC-fields and electrostatic charge according the field mill-influenz-principle.

Output: analogue current-signal  $\pm 1\text{mA}$

## Contents

General information of the principle of electrostatics.....	3
What is the result of electrostatic charge .....	3
Description .....	3
Technical Data.....	4
Legend .....	4
Operating instructions.....	5
Measurement method .....	5
Field of application .....	5
Zero adjust .....	5
Calculating the charge .....	5
Pinning.....	6
Optional accessories .....	6
Aluminum-clamp with thread.....	6
Table tripod .....	6
Grounding.....	7
Maintenance .....	7
Warranty.....	7
Warning - Instructions.....	7
Parts of delivery.....	7
Calibration.....	8
Cable assignment .....	8

## General information of the principle of electrostatics

Electrostatic discharging is a today problem on many working places with the use of modern micro-electronics as e.g. Microchips and there sensibility against it.

There is also a very strong danger for industrial branches as e.g. Telecommunication- , Plastics- , and manufactures of explosives.

The loss in manufacturing time as well as high financial damage and the affection of the health of persons may be caused by ESD (electrostatic dischargement).

It is possible that electrical charges of over 10.000 V can build up on human clothes, materials and equipment.

Damage on electronic components may already occur with a charge of less as 100 V and charges of 3.000 V are able to flash and may be the result of explosion in hazardous areas.

## What is the result of electrostatic charge

Trough friction and separation of different materials the so called - Tribo Electricity - ( it stays for the Greek word tribeia which means friction ) will be generated.

The reason is a transfer of electrons between the two materials.

Since the charge of electrons is negative the material depleting electrons has a positive charge, compare the material enhances electrons shows a negative charge.

There are different ways to prevent or divert electrical charges. However to find a useful and effective way, first the source and the charge of the electrostatic field has to be located and polarity and strength measured.

To do so as well as check any chosen steps against electrostatic charge or to control desire charge our Electro-Field meter is recommended.

## Description

The modulator-system with the complete electronic is integrated in a metal tube-housing.

The metal-tube is connected to ground.

The influenz-measure-electrode is in shape of a star. In front of this electrode rotates a ground-connected modulation-vane-wheel with the same shape. These parts are hard-gold-plated to prevent galvanic distortions. An influenz-electrode covers the ring-electrode-system for mechanical protection.

At the back-side there is a balanced-potentiometer to adjust the offset.

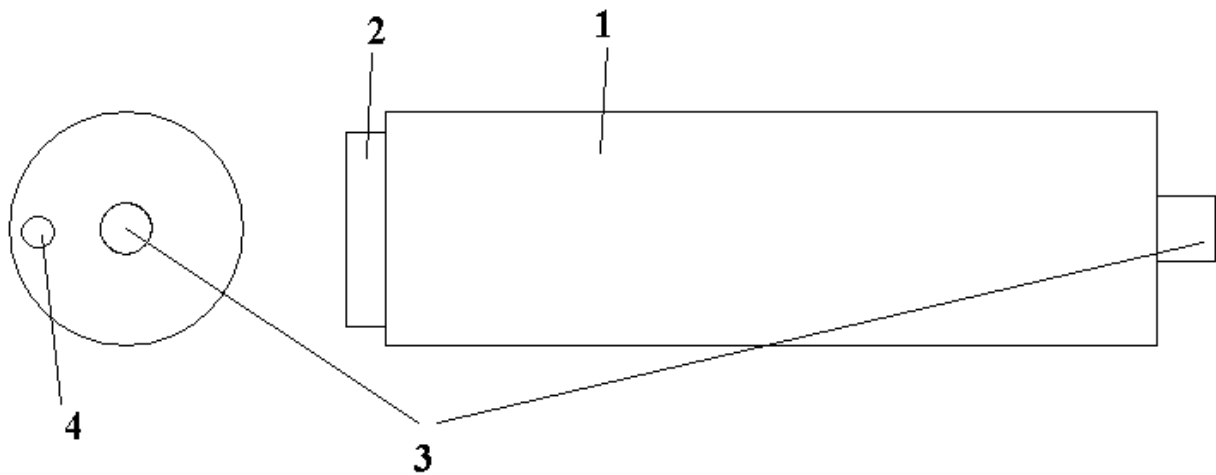
The signal-output to the electronic is an interference resistant  $\pm 1\text{mA}$  current-interface.

The maximal cable-length (0,14qmm) is 50m.

## Technical Data

<b>Dimension (L x B x H):</b>	app. D36mm x 120mm
<b>Weight:</b>	app. 180g
<b>Calibration in a plate capacitor:</b>	200mm x 200mm, Distance 25mm
<b>Ranges:</b>	5kV/m, 20kV/m, 50kV/m und 200kV/m
<b>Tolerance:</b>	< 5%
<b>Power supply:</b>	9-15V DC / ca. 60mA
<b>Operating-time :</b>	By 8 hours a day min. 2 years
<b>Interface:</b>	Analogue $\pm 1\text{mA}$ Current Interface ( $R_i < 2\text{k}\Omega$ )
<b>Warranty:</b>	24 months

## Legend



- 1 nickel-plated housing pipe
- 2 Modulator system
- 3 connector 5 pins
- 4 Zero Adjust

## Operating instructions

### Measurement method

The static-field meter has a parametric amplifier. The electrical field causes an alternated current proportional to the field strength. These current can be measured with a selective amplifier, without taking away energy of the electrical field.

Through using gold-plated influenz-electrodes no galvanic disturbances are induced.

*There is no radioactive material in use !*

---

### Field of application

*Detection* and checking of the electrostatic Field and Charges, and measuring electric and electrostatic charges and extreme highly resistive voltage supplies.

**Before Measure remove the red cap on the modulator system**

### Zero adjust

First put on the red cap on the modulator system. Then select the 5kV/m range.

Adjust zero (0mA) with the potentiometer trough the hole on the back side.

After changing the range adjust zero again.

### Calculating the charge

The measured field-strength (E) is calculated by measurement-range multiplying with the output-current in mA.

To calculate the charge (V) multiply the field strength (E) with the distance (A).

**Example:** Range (R) 50 kV/m output-current (I): 0,4mA

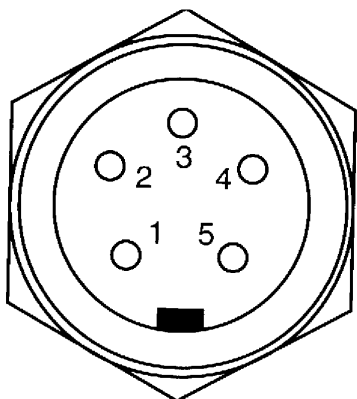
$$E = R \times I = 50\text{kV/m} \times 0,4 = 20\text{kV/m}$$

Object-distance ==> field plate of the static-field meter = 5 cm ( 0,05m)

Charge [V] = field strength [E] \* distance [A] (in meter)

$$U = E \times A = 20.000 \text{ V/m} \times 0,05 \text{ m} = 1000 \text{ V}$$

## Pinning



- Pin 1 = Range select B
- Pin 2 = Power supply + 9-15V DC
- Pin 3 = Ground (GND)
- Pin 4 = Range select A
- Pin 5 = Current output  $\pm 1\text{mA}$

The maximum cable length (0,14 mm<sup>2</sup>) is 50m.

### Range selection

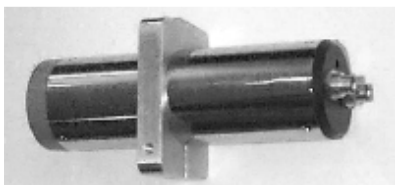
Pin 1(4) open = H

Pin 1(4) connect to ground = L

<i>Pin 1(B)</i>	<i>Pin 4(A)</i>	<i>Range</i>
L	L	5 kV/m
L	H	20 kV/m
H	L	50 kV/m
H	H	200 kV/m

## Optional accessories

### Aluminum-clamp with thread



Aluminum-clamp with thread

To mount the measuring head on each position

### Table tripod



Small table tripod for the aluminum clamp.

## Grounding

The appliance must be grounded to get real measuring results.

You can connect ground by the access line (pin3) or over the optional aluminum clamp

## Maintenance

Don't touch the modulator system !

Time by time the modulator-system needs to be cleaned and a new offset – adjustment with shielded field-plate is necessary. For cleaning use a lint-free cotton cloth.

***Caution ! Absolute avoid a deformation of the modulator.***

---

## Warranty

By normal use conform to this manual we give you a warranty of 24 moth.

By opening the housing you lose the warranty.

## Warning - Instructions

- This measuring - head is not for measuring in explosive-areas !
- The usage in power-installations is not allowed !
- With this unit it is not possible to measure alternated fields  $> 1$  Hz.
- The static-field meter has to be grounded every time.
- The first measurement must be made in a sufficient distance, so that the maximal possible surface-potential is detected in a safe distance.
- Sparkle-discharge to the modulator-system can destroy the electronic and is to avoid absolutely.

## Parts of delivery

- Electro field meter
- shield cap
- access line 3m
- Manual
- Calibration certification

## Calibration

We recommend a new calibration every year.

## Cable assignment

(Standard cable)

<u>Pin</u>	<u>color</u>	<u>Function</u>
1	white	Range select B
2	brown	Power supply + 9-15V DC
3	black	Ground (GND)
4	blue	Range select A
5	grey	Output current $\pm 1\text{mA}$