Mapa Professional explains...

The protection of electronic devices against ElectroStatic Discharge (ESD[1]) and the use of gloves handling ElectroStatic Discharge Sensitive Device (ESDS[2])

[1/2] Please refer to glossary p.11

A few words to start...

What is an electrostatic phenomena?

If two materials are brought into contact, are rubbed, there is an **exchange of electrostatic charges (static electricity[3]).** When those charges are not dissipated, then they **accumulate and electrostatic discharges can happen.** Primary cause of static electricity is people: walking across the floor or moving an object for instance, can generate static electricity.

What does dissipative means?

A dissipative[4] material has the **ability to not accumulate electrostatic charges. It dissipates charges.**

Note: Antistatic (wrongly designated) is widely used., nevertheless dissipative is the right word.

Why are dissipative gloves needed?

Dissipative gloves are needed to avoid electrostatic discharges.

Electrostatic discharges can happen in two main areas:

- **E**lectrostatic **P**rotected **A**rea (**EPA**[5])

  Electro**S**tatic **D**ischarges (**ESD**) can **damage electronic devices** (issue for the manufacturer) or **weaken electronic device** (issue for the user).

  Main industries: electronics, automotive, consumer products.

- **EX**plosive **AT**mosphere area (ATEX[6] area)

  Electrostatic discharges can **generate risks of explosion**.

  Main industries: chemical, pharmaceutical, farming (grain silo).

Note: Gloves alone do not prevent ElectroStatic Discharges. The worker must wear appropriate dissipative garments and shoes to be permanently connected to the earth.

[3] / [4] / [5] / [6] Please refer to glossary p.11

Electro**S**tatic **D**ischarges **S**ensitive Device **(ESDS), which risk to avoid?**

Electro**S**tatic **D**ischarges **S**ensitive Device, commonly called ESDS, are used in **E**lectrostatic **P**rotected **A**rea (EPA) and have to be protected from electrostatic discharge which could damage it.

ESD, which protection is required?

- **ESD glove: what are the need of the workstation?**

Gloves have to protect the handled object and to prevent electrostatic discharge which could damage it.

- **ATEX glove or ESD glove: which property is needed?**

Working in ATEX area or handling electronic devices, both areas have the same need regarding adapted gloves: gloves must not accumulate charges, they must be dissipative.

Which standard is dealing with electrostatic properties?

Areas	Equipment	Standard Requirement	Pictogram	Test method
EXplosive ATmosphere **(ATEX area)**	Garments	**EN 1149-5** Surface resistance: <2,5.10^{9} Ω at 25% HR[7] Or Half decay time: <4s at 25% HR[7]		**EN 1149-1*** **measured the surface resistivity* *→ Surface resistance = Surface resistivity/19.8* **EN 1149-3**
	Gloves	**EN 16350** Vertical resistance: <10^{8} Ω at 25% HR[7]	 Introduced in EN ISO 21420: 2020	**EN 1149-2**
EPA **(Electrostatic Protected Area)**	Garments	**EN 61340-5-1: 2016** Rp-p* <10^{11}Ω at 12% HR[7] Rgp** < 10^{9}Ω at 12% HR[7] **Rp-p Resistance point to point* ***Rgp: Resistance point-to-groundable point*	Before 2007,  Since 2007, there is no more indication on pictograms to use.	**EN 61340-4-9** (Gloves excluded since 2007)
	Gloves	No standard	No pictogram	No test method

[7] **HR:** Humidity Relative, please refer to glossary p.11

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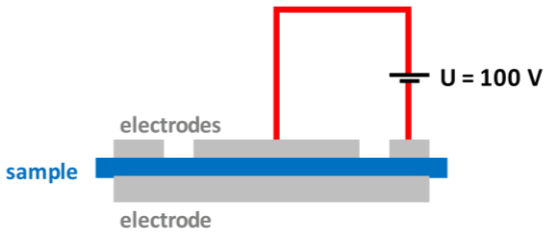
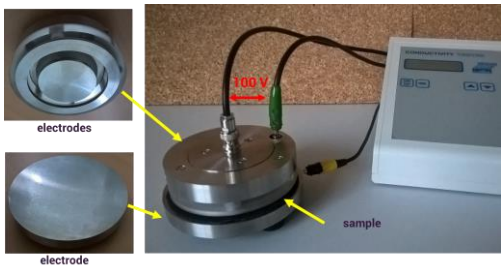
How do we measure electrostatic properties?

- **Test method EN 1149-1**

EN 1149-5
Standard for garments used in ATEX area
Requirement: <2.5 10^9 Ω

The test method EN1149-1 measures the surface resistivity in Ohms (Ω) of the surface of the material between two electrodes placed on its surface, under a voltage of 100 +/- 5 V.



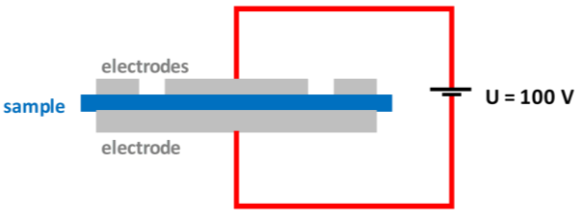


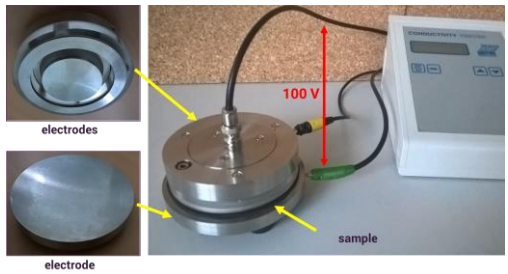
Testing conditions: temperature 23 ± 1 °C / relative humidity 25 ± 5 %
Five tests must be performed, the geometric mean must comply with the limit value.

- **Test method EN 1149-2**

EN 16350
Standard for gloves used in ATEX area
Requirement: <10^8 Ω

The test method EN1149-2 measures the **vertical resistance in Ohms** between **two electrodes placed over the opposite surfaces**, under a voltage of 100 +/- 5 V.





Testing conditions: temperature 23 ± 1 °C / Relative humidity 25 ± 5 %

Five tests must be performed. They all have to pass the limit of vertical resistance.

If the glove passes EN 16350, a pictogram can be affixed as per new EN ISO 21420

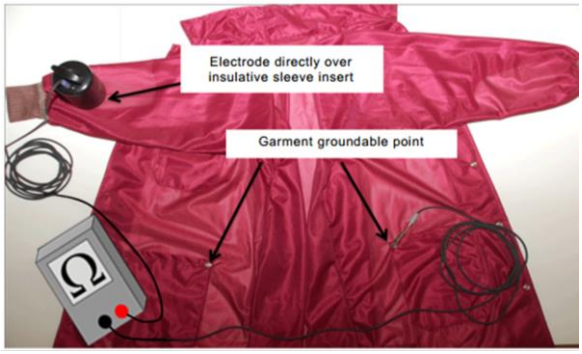
- **Test method EN 61340-4-9**

EN 61340-5-1:2016
Standard for protection of electronic devices against electrostatic discharges

Test methods EN 61340-4-9 for garments are Rp-p and Rgp.

R_{p-p} : Resistance point-to-point
Resistance (Ω) measured from one point to another point of the garment, under a voltage of 100 V. It is a surface resistance.

Garments requirement: Rp-p<10^{11} Ω



Rgp: Resistance point-to-groundable point
Resistance (Ω) measured from one point to the groundable point of the garment, under a voltage of 100 V.

Garments requirement: Rgp < 109Ω

Testing conditions for Rp-p and Rgp: temperature 23 ± 2 °C / HR[7] 12 ± 3 %

Note: For EPA environment, EN 61340-5-1:2016 gives requirement to protect electronic devices against electrostatic discharges for shoes, garments, tools; however gloves are not mentioned. There is ***no established standard today for gloves which handled electronic sensitive device*** *used in Electrostatic Protected Area (EPA).*

[7] HR: Humidity relative, please refer to glossary p.11

What level of electrostatic properties to focus on?

According to **EN 16350**, an **ATEX glove** must have a **vertical resistance below 10^8 Ω at 25% relative humidity**. This standard is very demanding: 25% humidity corresponds to a dry climate, thus severe conditions which are certainly not representative of all situations in the workplace. We can see that most of the gloves used in ATEX area (nitrile/neoprene gloves) do not follow EN 16350, while they do not put the end-user at risk. **EN 16350 does not apply to ESD gloves. Today there is no standard for gloves used to handle electronic device.** Users have sometimes their own test to validate the gloves according to the needs of the workstations.

At MAPA PROFESSIONAL, we refer to EN 16350 (ATEX gloves) to evaluate the dissipative properties of our gloves. This standard being very strict, a glove compliant to EN 16350 **will surely be suitable to handle electronic device**. In the revised EN 420 (EN ISO 21420 to be published end of 2019), a pictogram is introduced for gloves passing EN 16350.

At MAPA PROFESSIONAL, we test our gloves according to EN 1149-1 (requirement for garments in EN 1149-5) and **EN 1149-2 (requirement for gloves in EN 16350).**

Electrostatic properties of our gloves are available on our technical data sheets.

Key points to takeaway

1. ATEX glove or ESD glove: which property is needed?

Working in ATEX area or handling electronic devices, both areas have the same need regarding adapted gloves: **gloves** must not accumulate charges, they **must be dissipative.**

2. Which standard give requirement on electrostatic properties of gloves used to handle electrostatic sensitive devices?

There is **no established standard today for gloves which handled electrostatic sensitive device** used in **E**lectrostatic **P**rotected **A**rea (EPA). The only appropriate standard for gloves is EN 16350 which gives requirement for usage in ATEX environment. **EN 16350 does not apply to ESD gloves.**

3. Which MAPA PROFESSIONAL glove is an "ESD glove"?

There is no established standard today for gloves which handled electrostatic sensitive device.

At MAPA PROFESSIONAL, we refer to EN 16350 (requirement for gloves used in ATEX area) **to evaluate the dissipative properties of our gloves.** This standard being very strict, a glove compliant to EN 16350 **will surely be suitable to handle electrostatic sensitive devices**. In the revised EN 420 (EN ISO 21420 to be published end of 2019), a pictogram is introduced for gloves passing EN 16350.

At MAPA PROFESSIONAL, we test electrostatic properties of **our gloves** according to:

- **EN 1149-1** test method (requirement for garments used in ATEX in EN 1149-5)
- **EN 1149-2** test method (requirement for gloves used in ATEX in EN 16350)

For more information, visit our website www.mapa-pro.net **to discover all MAPA PROFESSIONAL gloves. Please find our electrostatic properties per EN 1149-1 (surface resistance) and EN 1149-2 (vertical resistance) in our technical data sheet. Please refer to STC** (stc.mapaspontex@newellco.com) **if you have any question and let us know your need, your environment and usage to provide you the best MAPA PROFESSIONAL recommendation.**

Glossary

1. ESD: ElectroStatic Discharge
2. ESDS: ElectroStatic Discharge Sensitive Device

   ESDS is an electronic component which could be damaged by ESD.

   Gloves to handle ESD sensitive devices are usually called "ESD gloves".
3. Static electricity

   Accumulation of electric charge on an object or a surface. Primary cause of static electricity is people: walking across the floor, moving an object, can generate static electricity.
4. Dissipative / (Antistatic) is the ability to dissipate charges.

   A dissipative material has the ability to not accumulate electrostatic charges: it dissipates charges. *Note: Antistatic (wrongly called) is widely used., nevertheless dissipative is the right word.*
5. EPA: **E**SD **P**rotected **A**rea where dissipative equipment is needed
6. ATEX: **EX**plosive **AT**mosphere

   An ATEX zone is an area where solvent or dust concentration may create a risk of explosion. Gloves in ATEX area are usually called "ATEX gloves"
7. HR: Humidity Relative
8. Electrical resistance is a fundamental property of a material which quantifies how strongly it resists or conducts electric current. The SI unit of electrical resistance is the ohm (Ω).

   Note: Resistance is dependent on the humidity rate. Higher the humidity rate, lower the resistance (because humidity is conductive).

1 Mega Ohm	1 MΩ	1.10^6 Ω	1.10^6 Ω	1. E+06 Ω	1 000 000 Ω
1 Giga Ohm	1 GΩ	1.10^9 Ω	1.10^9 Ω	1. E+09 Ω	1 000 000 000 Ω
1 Tera Ohm	1 TΩ	1.10^{12} Ω	1.10^12 Ω	1. E+ 12 Ω	1 000 000 000 000 Ω