



## Safety in ESD and ATEX environments

Your trusted compounding partner in innovating new material solutions for the most demanding material needs. Our mission is to improve safety in ESD and ATEX environments.

**PREMIX**

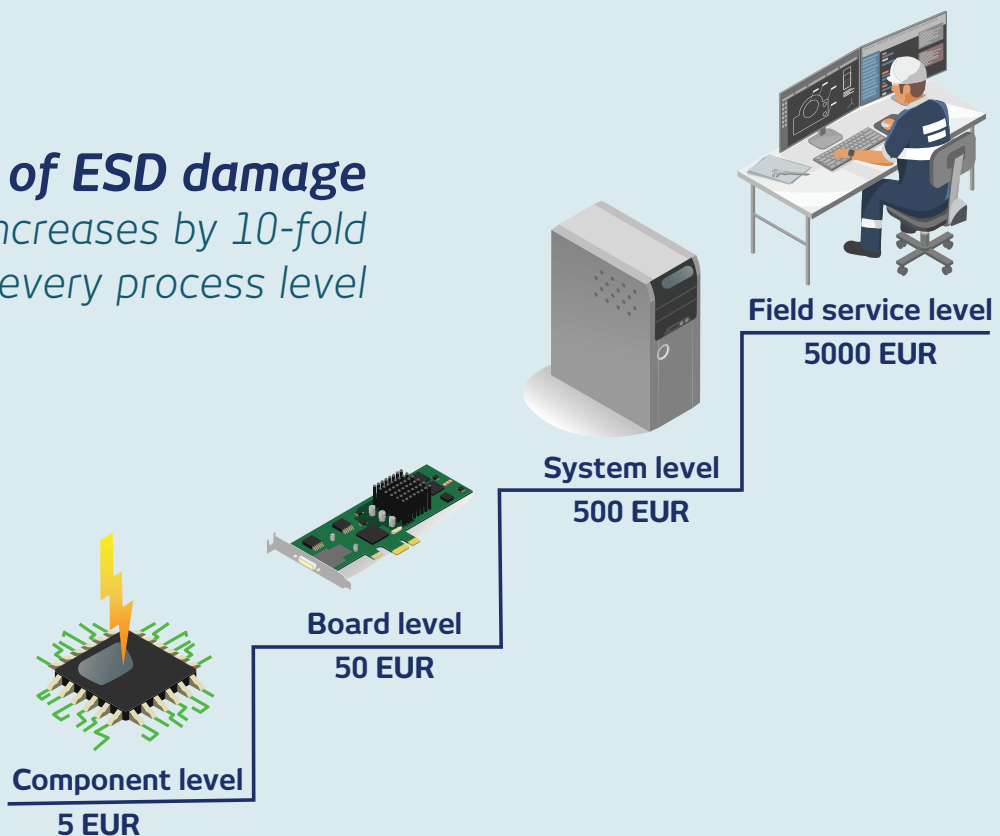


## Protection against uncontrolled electric discharge (ESD)

Uncontrolled electric discharge (ESD) appears when a person or object is charged because of static electricity e.g. from rubber shoe soles on a carpet.

In electronics industry, ESD is a recognized problem, as even very mild electric shocks that a person might not even notice, can cause breakages. Electronics have become smaller over time, and the small parts are even more sensitive to ESD. Fragile electronics can break in manufacturing, transportation, or storage, causing enormous losses. To prevent breakage, components can be packaged in ESD-compatible packaging.

**Cost of ESD damage**  
*increases by 10-fold  
 at every process level*





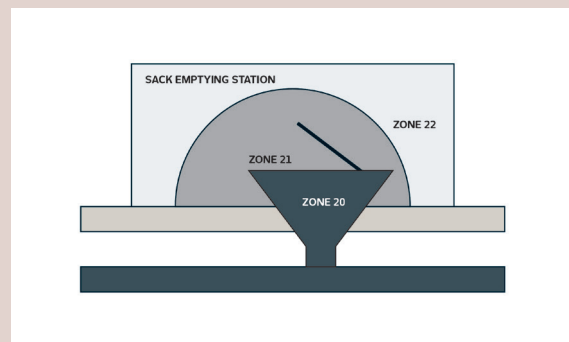
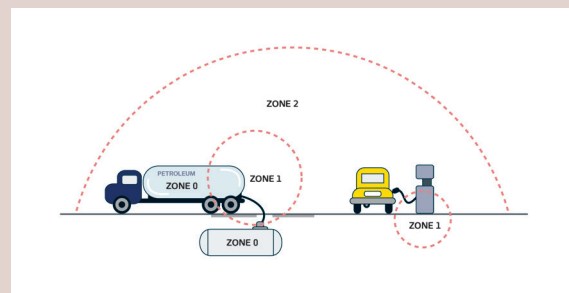
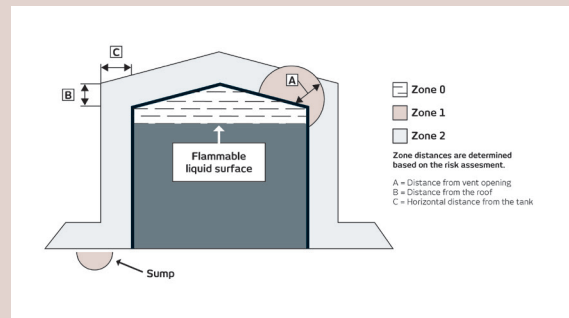
# Protection in explosive environments (EX/ATEX)

In explosive (Ex) environments, electric sparks are especially dangerous. Explosions can occur when these factors combine:

- Dry air
- Explosive substances in the air, such as
  - Oil fumes, gasses
  - Dust from agricultural products, such as flour, sugar, cereals, soybeans, rice, etc.
  - Eliminate the effect of static electricity
- Ignition source (e.g., ESD)

European Union’s ATEX Directive (2014/34/EU) covers equipment and protective systems intended for use in potentially explosive atmospheres. For raw materials, there’s no specific directive, but the materials need to be compatible with the requirements for the whole equipment.

Plastics can be a source of electric discharge if the resistance of the material is over  $10^9$ – $10^{12}$  ohms. Using that kind of plastics in equipment might cause dangerous explosions in ATEX environments.



Atex Zone: a place in which an explosive atmosphere is	Gas	Dust
Continually present	0	20
Likely to occur in normal operation occasionally	1	21
Not likely to occur in normal operation and only for very short durations	2	22

*ATEX zones for gases and dusts*

## Properties of PRE-ELEC® compounds and concentrates (typical values)

Polymer Base	Product name	Applications	Compound	Concentrate	Extrusion	Injection moulding	Volume resistivity (Ωcm)	Surface resistance (Ω)	Melt flow rate (g/10min)	Specific gravity (g/cm <sup>3</sup> )	Flexural modulus (MPa)	Hardness (Sh D)
ABS	PRE-ELEC® ABS 1410	Technical Parts	•			•	350	5E+3	220°C / 10.0 kg: 15	1.10	2,000	76
ABS	PRE-ELEC® ABS 1415	Technical Parts	•		•		300	out of range	220°C / 10.0 kg: 2.5	1.10	1,900	77
EVA	PRE-ELEC® CP 1515	Foams		•	•		250	5E+3	190°C / 5.0 kg: 1.2	1.06	110	47
PA-6	PRE-ELEC® CP 1515	Technical Parts (carbon fiber)	•			•	>5,000	4E+5	275°C / 10.0kg: 46	1.14	6,500	81
PA-6	PRE-ELEC® PA 1408	Technical Parts	•			•	700	2E+3	275°C / 10.0kg: 5.0	1.20	2,000	80
PA-6	PRE-ELEC® PA 1411	Technical Parts		•	◦	•	35 (a)	9E+2 (a)	275°C / 10.0kg: 6.6	1.25	3,200 (a)	84 (a)
PA-6	PRE-ELEC® PA 17970	Technical Parts (glass fiber)	•			•	>5,000	2E+4	275°C / 10.0kg: 13	1.36	6,700	-
PBT	PRE-ELEC® PBT 1455	Technical Parts	•			•	100	3E+3	240°C / 10.0 kg: 14	1.32	2,000	84
PC	PRE-ELEC® PC 1431	Technical Parts	•			•	>5,000	4E+4	240°C / 2.16 kg: 10	1.24	2,500	85
PC/ABS	PRE-ELEC® PC/ABS 1420	Sheets	•		•		150	6E+3	240°C / 21.6 kg: 13	1.12	2,700	78
PE-HD	PRE-ELEC® PE 1250	Sheets, Pipes		•	•	◦	2 (b)	4E+2 (b)	190°C / 21.6 kg: 1.6	1.02	1,100 (b)	65 (b)
PE-LD	PRE-ELEC® PE 1271	Films, FIBC	•		•		70	5E+3	190°C / 5.0 kg: 1.7	1.02	-	56
PE-HD	PRE-ELEC® PE 1291	Sheets, Pipes, Cans & Bins	•		•		50	9E+2	190°C / 21.6 kg: 6.0	1.04	1,200	71
PE-HD	PRE-ELEC® PE 1292	Sheets, Pipes	•		•	◦	70	2E+3	190°C / 21.6 kg: 35	1.03	1,100	66
PE-HD	PRE-ELEC® PE 1296	Sheets, Cans & Bins, Pipes		•	•	◦	1 (c)	3E+2 (c)	190°C / 21.6 kg: 0.6	1.12	1,200 (c)	65 (c)
PE-HD	PRE-ELEC® PE 1312	Cans & Bins	•				100	4E+3	190°C / 21.6 kg: 10	1.03	1,200	67
PE-HD	PRE-ELEC® PE 14708GF	Fuel Systems	•			•	25	5E+2	190°C / 21.6 kg: 17	1.24	4,600	65
PE-HD	PRE-ELEC® PE 16006	Cans & Bins				•		< 1E+7	190°C / 21.6 kg: 2.0	1.02	1,000	-
POE	PRE-ELEC® PE 17693	Flexible Tubes and Profiles		•	•		1.4	4E+2	190°C / 21.6 kg: 11.0	1.06	-	52
PE-LD	PRE-ELEC® PE 17800	Foams		•	•		2	3E+2	190°C / 10.0 kg: 1.0	1.15	-	-
PE-LLD	PRE-ELEC® PE 17840	Films, Filaments, FIBC, Sheets		•	•		0.7	out of range	230°C / 21.6 kg: 4.5	1.20	-	-
PE-LD	PRE-ELEC® PE 18381	Films	•		•		14	9E+2	190°C / 5.0 kg: 0.5	1.05	170	45
POE	PRE-ELEC® PE 18480	Flexible Tubes and Profiles	•		•		8	4E+2	190°C / 10.0 kg: 2.2	1.05	200	47
PE-HD	PRE-ELEC® PE 18594	Sheets, Boxes & Pallets, Cans & Bins		•	•	•	1 (d)	1,2E+6 (d)	190°C / 21.6 kg: 3.1	1.14	1,375 (d)	67 (d)
PE-LLD	PRE-ELEC® PE 18922	Flexible Tubes and Profiles	•		•		30	8E+02	190°C / 5.0 kg: 1.5	1.05	280	50
POE	PRE-ELEC® PE 19400	Flexible Tubes and Profiles		•	•		< 5	< 1E+3	-	1.12	-	55
PP-H	PRE-ELEC® PP 1353	Filaments, FIBC		•	•	◦	180 (h)	1E+3 (h)	230C / 10.0 kg: 9.0	1.11	1,300 (e)	75 (e)
PP-C	PRE-ELEC® PP 1370	Boxes & Pallets	•			•	70	9E+2	230°C / 2.16 kg: 2.0	0.98	1,200	71
PP-C	PRE-ELEC® PP 1375	Boxes & Pallets	•			•	80	4E+3	230°C / 2.16 kg: 20.0	0.98	1,300	65
PP-C	PRE-ELEC® PP 1380	Technical parts	•			•	3	6E+2	230°C / 5.0 kg: 1.5	1.06	1,900	72
PP-C	PRE-ELEC® PP 1392	Boxes & Pallets	•			•	60	2E+3	230°C / 2.16 kg: 7.0	0.98	1,500	72
PP-C	PRE-ELEC® PP 1393	Sheets		•	•	◦	4 (e)	6E+2 (e)	230°C / 5.0 kg: 0.5	1.06	1,500 (f)	71 (f)
PP-C	PRE-ELEC® PP 1397	Sheets	•		•	◦	60	3E+3	230°C / 2.16 kg: 1.2	0.98	1,400	74

• Primary processing method    ◦ Secondary processing method

Polymer Base	Product name	Applications	Compound	Concentrate	Extrusion	Injection moulding	Volume resistivity (Ωcm)	Surface resistance (Ω)	Melt flow rate (g/10min)	Specific gravity (g/cm <sup>3</sup> )	Flexural modulus (MPa)	Hardness (Sh D)
PP-H	PRE-ELEC@ PP 15392	Sheets		•	•	◦	150 (i)	8E+3 (i)	230°C / 10.0 kg: 8	1.11	1,265 (g)	70 (g)
PP-H	PRE-ELEC@ PP 16156	Films	•		•		3	out of range	230°C / 5.0 kg: 15.0	1.03	-	-
PP-H	PRE-ELEC@ PP 18873	Technical Parts (Flame retardant)	•			•	> 5,000	7E+8	230°C / 2.16 kg: 11	1.04	1,100	64
PP-C	PRE-ELEC@ PP 18900	Sheets		•	•	◦	4 (h)	6E+2 (h)	230°C / 5.0 kg: 0.5	1.06	1,500 (h)	71 (h)
PP-C	PRE-ELEC@ PP 18999	Boxes & Pallets		•		◦	15	6E+2	230°C / 10.0 kg: 2.7	1.03	200	51
PP-C	PRE-ELEC@ PP 19136	Boxes, Crates, Technical parts	•			•	> 5,000	7E+6	230°C / 5.0 kg: 34	1.00	1,054	65
PP-C	PRE-ELEC@ PP 19161	Boxes, Crates, Technical parts	•			•	90	4E+3	230°C / 2.16 kg: 3.4	1.02	1,200	65
PP-C	PRE-ELEC@ PP 19279	Sheets, Profiles		•	•	◦	11(f)	5E+2 (f)	230°C / 10.0 kg: 1.6	1.15	1,400(i)	66(i)
PP-C	PRE-ELEC@ PP 19599	Boxes, Crates, Technical parts	•			•	< 200	2E+3	230°C / 5.0 kg: 52	1.01	1,500	-
PP-C	PRE-ELEC@ PP 19625	Sheets		•	•		> 5000 (g)	1E+5 (g)	230°C / 5.0 kg: 7	1.09	-	-
PP-C	PRE-ELEC@ PP 19997	Silicon wafer boxes, Technical parts	•			•	300	5E3	230°C / 2.16 kg: 4	1.01	1700	68
PP-C	PRE-ELEC@ PP 24191	Boxes, Crates, Technical parts	•			•	250	4E3	230°C / 2.16 kg: 8	1.02	1300	62
PS-HI	PRE-ELEC@ PS 1328	Cans & Bins	•			•	60	1E+3	200°C / 5.0 kg: 3.0	1.10	2,200	79
PS-HI	PRE-ELEC@ PS 18014	Technical Parts	•			•	90	4E+3	200°C / 5.0 kg: 6.0	1.00	1,500	73
SBC	PRE-ELEC@ PS 19660	Sheets		•	•		< 100 (k)	1E+3(k)	200°C / 21.6 kg: 0.2	1.10	1,600 (k)	70 (k)
PE-HD	PRE-ELEC@ TP 11270	Fuel Systems	•		•	•	50	2E+3	190°C / 21.6 kg: 15.0	1.03	1,200	70
PP-H	PRE-ELEC@ TP 14815	Profiles, Sheets (Flame retardant)	•		•		110	2E+3	230°C / 10.0 kg: 1.3	1.42	2,000	67
SBC	PRE-ELEC@ TP 15837	Sheets		•	•		100 (j)	8E+2 (j)	200°C / 21.6 kg: 2.3	1.17	1,650 (l)	72 (l)
TPU-Es	PRE-ELEC@ TP 16159	Technical Parts	•			•	9	2E+4	190°C / 10.0 kg: 33.0	1.28	660	62
TPE-S	PRE-ELEC@ TPE 1502	Flexible Tubes and Profiles	•		•		15	9E+2	190°C / 10.0 kg: 4.0	1.08	-	65
TPE-S	PRE-ELEC@ TPE 18416	Flexible Tubes and Profiles	•		•		3,5	4E+2	190°C / 21.6 kg: 9.8	1.20	-	87
TPU-Es	PRE-ELEC@ TPU 1512	Flexible Tubes and Profiles, Sheets, Technical Parts	•		•	◦	10	8E+2	190°C / 10.0 kg: 11.0	1.27	-	87
TPU-Et	PRE-ELEC@ TPU 16619	Flexible Tubes and Profiles	•		•	◦	30	2E+3	190°C / 5.0 kg: 5.0	1.21	-	88
TPU-Et	PRE-ELEC@ TPU 18025	Films, Sheets	•		•		< 10	< 5E+2	190°C / 10.0 kg: 2.0	1.22	-	86
TPU-Es	PRE-ELEC@ TPU 18438	Flexible Tubes and Profiles	•		•		250	2E+3	190°C / 10.0 kg: 9.0	1.27	-	84
TPU-Es	PRE-ELEC@ TPU 18600	Flexible Tubes and Profiles	•		•		41	6E+4	190°C / 10.0 kg: 1.0	1.28	-	87

• Primary processing method ◦ Secondary processing method

More information in  
**Premix Data Center:**  
[www.premixgroup.com/data-center](http://www.premixgroup.com/data-center)

**Contact our sales:**  
[www.premixgroup.com/contact](http://www.premixgroup.com/contact)

#### Notes

(a) dilution 30% PA6  
(b) dilution 50% HDPE MFI 0.25 (190°C / 5 kg)  
(c) dilution 40% HDPE MFI 9 (190°C / 21.6 kg)

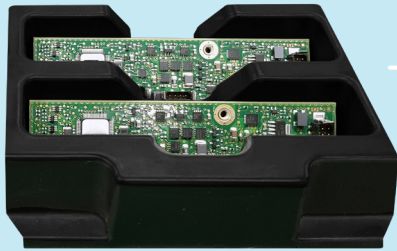
(d) dilution 50% HDPE MFI 9 (190°C / 21.6 kg)  
(e) dilution 30% PP-C MFI 13 ( 230°C / 2.16 kg)  
(f) dilution 30% PP-C MFI 4 ( 230°C / 2.16 kg)  
(g) 50% PP-C, MFI 3.5 (230°C / 2.16 kg)

(h) dilution 50% PP-H MFI 35 (230°C / 2.16 kg)  
(i) dilution 50% PP-C MFI 3.5 (230°C / 2.16 kg)  
(j) dilution 50% HIPS MFI 4 (200°C / 5 kg)

**Surface resistance - how to read:** for example, 2E+6 Ω = 2,000,000 Ω

**Carbon black concentrates** are an excellent way to reduce the raw material costs. In PRE-ELEC® concentrates, the carbon black content has been optimized to the highest possible level. In sustainable and/or cost-driven applications, regrind or recycled plastics can be used for dilution. Besides the economical advantages concentrates also allow the modification of product properties e.g. stiffness or flame retardancy.

# ESD and ATEX applications for PRE-ELEC® materials



## PRE-ELEC® sheet materials

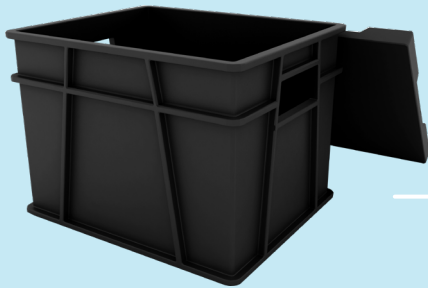
for protecting electric components with ESD packaging

The high material requirements of the transport and packaging industry inspire us to continuously develop new sustainable and functional materials to meet the needs of our customers.

## PRE-ELEC® film materials

for controlling static electricity with conductive films.

The film compounds have high and durable conductivity and excellent dispersion. We have ensured they are compatible with ATEX regulations and are easy to process. They are also recyclable and resist wear and tear very well.



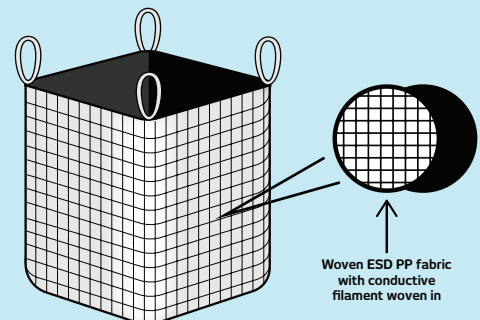
## PRE-ELEC® materials for ESD boxes & pallets

used during assembly and transportation

The conductive thermoplastics can be used to eliminate static charging and reduce the risks of explosions in hazardous environments and damaging expensive equipment.

## PRE-ELEC® FIBC materials

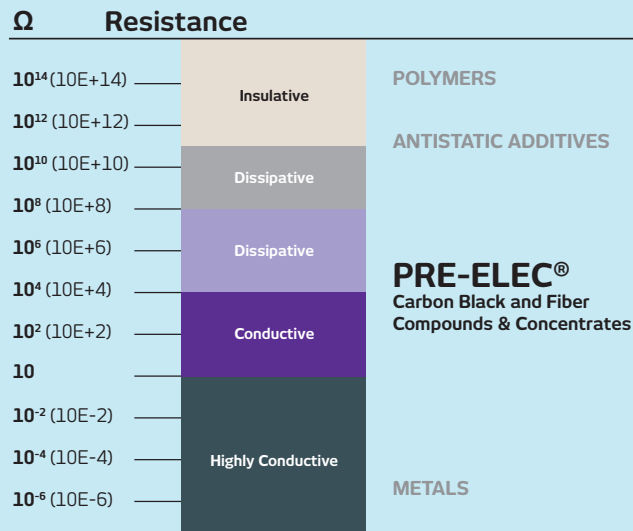
Conductive FIBCs, or FIBC type C bags, are made from non-conductive fabrics interwoven with conducting threads. They can be used to transport flammable powders and in spaces where flammable vapors, gases, or combustible dusts are present. The conductive inner lining increases the safety of these products.



# PRE-ELEC® electrically conductive plastics

Premix’s electrically conductive PRE-ELEC® plastics typically have much lower resistance than typical plastics, and they can be customized to fulfill the customer’s specifications. Compared to metals, plastics are cheaper, lighter, and corrosion-resistant. The plastics can even be made flame-retardant.

Carbon black has established its position as the most widely used electrically conductive filler. Carbon black offers a superior price-performance ratio and stable properties over time. Typically carbon black compounds’ surface resistance range settles between  $10^2 \Omega$  and  $10^5 \Omega$ . Premix’s comprehensive product portfolio covers the conductive plastics spectrum.



*Precision, purity,  
and consistency  
– the cornerstones of  
PRE-ELEC® compounds.*

## Polymer types & processing

	Base polymers	Processing type	Post-processing	Other information
Compounds	PE, PP, PS, ABS, PC, PC/ABS, PA6, PBT, TPU, TPE	<ul style="list-style-type: none"> <li>Extrusion</li> <li>Injection moulding</li> <li>Blow moulding</li> </ul>	<ul style="list-style-type: none"> <li>Foaming</li> <li>Thermoforming</li> </ul>	No dilution
Concentrates	PE-HD, PE-LLD, EVA, PP, PS, PA6	<ul style="list-style-type: none"> <li>Extrusion</li> <li>Injection moulding</li> <li>Blow moulding</li> </ul>	<ul style="list-style-type: none"> <li>Foaming</li> <li>Thermofoaming</li> </ul>	Dilution ratio starting from 70% to 40% depending on SR target



We are ready  
to create a new  
success story  
with you!

#### **BOOST YOUR BUSINESS WITH ELECTRICALLY CONDUCTIVE CONCENTRATES**

Concentrates help reduce raw material costs. In PRE-ELEC® concentrates, the carbon black content has been optimized to the highest possible level. When striving for maximum cost efficiency, recycled plastics or regrind from your own process can be used to dilute the concentrate. One small yet innovative step can lead to significant cost savings.

Besides the economic advantages, concentrates also allow the modification of product properties. To impart stiffness and strength to the finished product, the reinforced plastic can be used for dilution.

#### **ABOUT PREMIX**

With more than 40 years of industry experience, Premix's expertise lies in the formulation and production of functional plastic materials. Premix's materials are more than just traditional plastics – they play an active role in the product or process they are integrated into. Premix was one of the first companies to enter the market for electrically conductive plastics in the early stages, and it is now the world's leading specialist in the area. Today, we are a company that develops future solutions also for antimicrobial materials.

PRE-ELEC® is a registered trademark of Premix Oy.

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and contact our team:

