ESD **E**lectro**S**tatic**D**ischarge

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Overview

ESD

ESD stands for electrostatic discharge. A large potential difference causes a spark or disruptive discharge, which produces high electric voltage pulses in electronic devices.

Humans first feel an electrostatic charge from 3000 volts, and in most cases the discharge is harmless, with the moment of shock being the worst part.

When is ESD dangerous?
Sparking can already occur at 10000 volts and can cause explosions if flammable liquids or gases are being handled. Static electricity is produced, for example, when running on a carpeted floor, whereby a person can become charged to approx. 30000 volts in some cases.

The effects of ESD are insidious, meaning that the damage is not immediately visible, and the causer often does not notice it. The consequences can become costly, especially if the assembly is installed in devices for sensitive applications. Sensitive components can be destroyed from just 40 volts.

EPA offers protection against ESD!

EPA = Electrostatic Protected Area

A work area equipped with ESD protective measures where electrostatically sensitive components can be handled without damaging them.

A comprehensive EPA protection area includes the following areas:
- Workstation
- Personal grounding
- Tools
- Markings
- Measurement technology
- Storage/containers
- Flooring

The ESD standard DIN EN 61340-5-1 applies to electronics production facilities.
All products listed here comply with this standard.

Four golden rules for dealing with ESD

1. Always presume that all active components are ESD-sensitive.
2. Only touch electronic components in ESD protection areas (EPA) and then only when you are properly grounded.
3. Store and transport ESD-sensitive components in ESD protective containers.
4. Regularly check the ESD protection system.

Observe the principle *"No charge, no discharge".*

Making as few movements as possible and using ESD-safe equipment reduces the risk of a static charge on people to a minimum.

ESD GLOSSARY

A

Bleeder resistance:
Measurement between an earthing point and the electrodes on a surface.
Antistatic:
The "electrostatic charge reduction property", could be a special type of plastic, for example.
Workstation
The ESD-protected workstation should be ergonomically adaptable. Electrostatic charge is dissipated via the worktop and a earthing cable so that the workstation remains charge-neutral.

D

Dissipative:
Surface resistance of materials between 10^5 and 10^{12} Ω.

E

EPA:
Electrostatic protected area, a work area where electrostatically sensitive components can be handled without damaging them.
Earthing:
Discharge of electric currents into the ground.
Earthing point:
Central point (e.g. on a worktop) that is connected to the building's earthing.
ESD:
The phenomenon of electrostatic discharge.
ESDS:
Electrostatic discharge sensitive devices.

F

Flooring
The flooring should be conductive and comply with the required limit values specified in DIN EN 61340-5-1. When cleaning ESD flooring, use only cleaning agents that do not form layers so that the conductivity values remain within the desired range. If only individual workstations are set up as EPAs, ESP floor mats or tiles can also be earthed.

I

IC:
Integrated circuit, microchip, e.g. microprocessor.
Ionisation:
Removal of charged particles (e.g. electrons) from a material such as air. Ionisation devices can neutralise electrostatic charges by distributing ionised air.
Isolator:
Materials that have a high surface resistance of at least 10^{12} Ω. Static charges remain in a part of these materials for a long time without discharging (plastic, glass, air).

L

Storage/containers
Conductive ESD shelving and containers for transporting and storing components protect endangered components. Assembly trolleys should be fitted with conductive wheels.
Conductivity:
Ability of a material to conduct electrical current, e.g. metals.

M

Markings
Markings on the flooring indicate ESD protection areas. Signs and labels indicating potentially endangered components and assemblies are also important.
Measurement technology
Protective device must be metrologically tested regularly. When entering an EPA, measurements and regular personal inspections must be performed. Work benches, floor mats and earthing connections should be checked monthly and ESD monitoring instruments should be checked annually.
The respective bleeder resistances should have the following values: Worktop: between 7.5 x 10^5 Ω and 10^9 Ω, Flooring: less than 10^9 Ω, Chair/standing aid: less than 10^{10} Ω, Tool: less than 10^{12}Ω.

N

Standards:
IEC 61340-5-1 Protection of electronic devices from electrostatic phenomena - General requirements
IEC 61340-5-2 Protection of electronic devices from electrostatic phenomena - User guide
IEC 61340-4-1 Electrical resistance of floor coverings and installed floors
ANSI/ESD S20.20.-1999 Protection of Electrical and Electronic Parts, Assemblies and Equipment
ANSI/ESD S541-2003 Packaging materials for ESD sensitive items

O

Surface resistance:
Resistance between two points on a surface, measured using a megohmmeter and two electrodes.

P

Personal grounding
People are the main source of electrostatic charges. Shoes and a wrist strap with an earthing cable should be mandatory for employees in electronics production. Wrist strap and shoe testers facilitate the daily inspection of EPA effectiveness. The chair or standing aid should also have ESD protection.

S

Current:
Unit [A] ampere, formula symbol: I, flow of (mostly negative) charge carriers.
Voltage:
Unit [V] volt, formula symbol: U, maintains the electrical current in a closed circuit and is thus the cause for the flow of current.

W

Resistance:
Unit [Ω] Ohm, formula symbol: R, indicates what voltage is required to cause a particular current to flow through an electrical conductor.

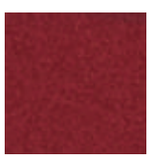
Overview

ESD

To be able to ensure the reliability and quality of current electronic products, it is necessary to observe the most important **HANDLING REGULATIONS** when processing electrostatic discharge sensitive devices (ESDS):

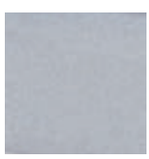
1. ESDS may only be processed at electrostatic protection workstations (EPA)!
2. Ensure a constant "smooth" potential equalisation!
3. Ensure personal grounding via wrist and shoe earthing!
4. Ensure conductive, closed clothing!
5. Avoid electrostatic chargeable materials such as normal PE, PVC, polystyrene , etc.!
6. ESDS must not be exposed to electrostatic fields > 100 V/cm!
7. Only use labelled and defined packaging and transport materials!
8. Employee training!

Standard colours
All ESD products on pages 440-444 have an eco-friendly, conductive powder coating.
Here you can see our 7 standard colours, which may deviate slightly from the standard RAL colours due to the pigmentation.


RAL 3003
Ruby red


RAL 5010
Gentian blue


RAL 5012 Light blue


RAL 7035
Light grey


RAL 7038
Agate grey


RAL 9005
Jet black

ESD guidelines at a glance: DIN EN 61340-5-1

Last updated in July 2017, DIN EN 61340-5-1 is the standard dealing with electrostatic charge in connection with technical devices. Official title of this ESD standard: "Protection of electronic devices from electrostatic phenomena". As part of the international series of standards 61340, which deals with electrostatics in all areas, it is of significance for many industrial companies. Essentially, DIN EN 61340-5-1 contains the requirements that companies must place on their design, concept, creation, setup and maintenance processes for the effective management of electrostatic charges.

The requirements formulated are directly related to electrical parts, components or devices that are manufactured, further processed, packaged, operated or handled in any other way and that can be damaged by electrostatic charges. Adherence to ESD guidelines for companies with sensitive production areas such as clean rooms is of particular importance. Sources of electrostatic charge are also considered in DIN EN 61340-5-1. For example, certain material combinations, gases, impurities or the employees themselves unknowingly produce such charges.

Standard-compliant industrial chairs ensure product safety
In clean rooms compliance with such ESD guidelines should always have top priority. It therefore not only makes sense to orient clean room chairs and industrial chairs to this requirement, but also to prevent the occurrence of electrostatic charges to the greatest extent possible by means of suitable further measures. Companies from the electrical industry should already have a great operational interest in implementing such standards, e.g. DIN EN 61340-5-1, as precisely as possible and striving for their optimal integration into operational workflows.

- Tests personal bleeder resistances for wrist strap and footwear grounding systems to monitor access to electrostatic protection areas (EPAs)
- The test result is signalled visually and audibly. An additional potential-free relay contact makes it possible to control a door opener or turnstile, for example, to control access
- Voltage is supplied by an integrated battery or a plug-in power supply
- Tests wrist strap grounding
- Simultaneous testing of right and left shoe possible thanks to separate measuring circuits
- In combination with entry control systems (e.g. turnstiles), footwear measurements can be performed in hands-free mode without pressing the button
- Test voltage 30, 50 or 100 volts (standard setting)
- The lower limit values can be deactivated
- Can be used as a table-top or wall-mounted device (as a wall-mounted device, the optional wall bracket is required)
- Limit values can be adjusted using a DIP switch

Test station mat
830 x 680 x 13 mm

Footwear testing electrode for separate measuring, left and right shoe
Dimensions: 350 x 500 mm

Magnetic document holder made of IDP-STAT- PVC in DIN A3 format. Can be used for various labelling options.

Personnel Grounding PGT®120

- Scope of delivery: Footwear testing electrode, works calibration certificate, instructions for use (German/English), 9 V battery, 230 V AC plug-in power supply

	Item no.	Type
1	EPGT120	Personnel Grounding Tester PGT®120
	EPGT120.WK	Wall bracket for PGT®120 and PGT®120.COM made of stainless steel (not illustrated)

Personnel Grounding accessories

	Item no.	Type
2	EPGT120.CU.12	Calibration unit for PGT®120 and PGT®120.COM for on-site testing, incl. works calibration certificate for PGTs with 12 dip switches
3	EPGT120.12.S	Test station mat with yellow leading edge

PGTest Station

- Powder coating in the colours depicted
- Test station for the PGT®120
- Dimensions: 590 x 730 x 1700 mm (W x D x H)
- PGT®120 not included in the scope of delivery

Item no.	Type
EPGT120.TEST	PGTest Station for PGT®120 / PGT®120.COM with magnetic document holder made of IDP-STAT-PVC in A3

METRISO® B530 measuring lit

Metriso® B530 – MEASURING KIT

- For measuring point-to-point and bleeder resistances in accordance with DIN EN 61340-4-1 and DIN EN 61340-2-3 (VDE 0300, Part 4-1 / 2-3)
- For measuring the system resistance of human/footwear/flooring systems in accordance with DIN EN 61340-4-5 (VDE 0300, Part 4-5)
- Additional low-ohmic measuring range of 1 Ω - 10 kΩ for testing earthing measures, digital and analogue measurement display, as bar graph or pointer
- Optical signalling of the voltage measuring range with red and green LED
- External voltage detection with red LED
- **Measuring voltage:** DC 10 V, 100 V, 500 V
- **Resistance measuring range:** 1 Ω to 199 GΩ
- **Mode of operation:** Battery operation
- **Electrodes:** 2x model 870: 1x hand electrode – model 45 1x extension set for electrode 870
- **Dimensions:** 225 x 130 x 140 mm (WxDxH)
- **Weight (complete KIT):** 9 kg

ESD

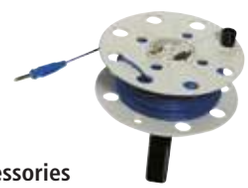
Electrode model 870

Extension set for electrode 870

Measuring and test instrument Metriso® B530

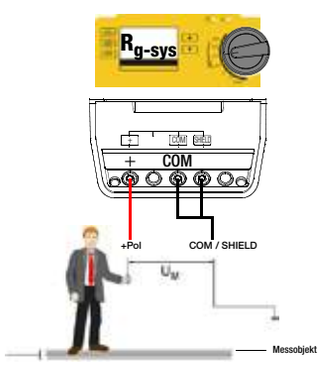
- 2x measuring electrode model 870 according to DIN EN 61340-4-1/2-3
- 1x hand electrode model 45 according to DIN EN 61340-4-5
- 1x extension set for electrode 870
- Conductive carry case

Item no.	Type
EB530.MK	Metriso® B530 complete measuring kit
ES530.G	Metriso® B530 measuring instrument with measuring cables

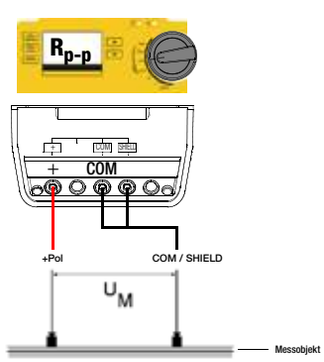


Optional accessories

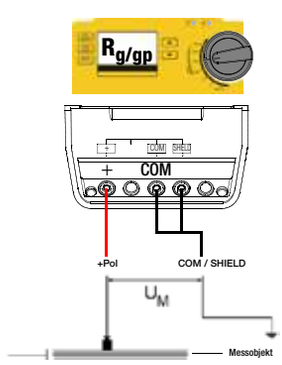
Item no.	Type
E2000.TR50	Cable drum 50 m, with unwinder for ground measurements
E2000.ML	Spare measuring cable set (com/shield + positive cable)



Measurement: $R_{G\ system}$
Personal bleeder resistance (human/shows/flooring) to protective earth



Measurement: R_{P-P}
Point-to-point resistance



Measurement: R_G
Bleeder resistance to protective earth

Handheld meter for testing **conductive surfaces**. Test values displayed on LCD display. Delivery includes conductive carry case, earthing cable, USB cable, works calibration certificate and readout software for stored test data.

- **Measuring range:** 10^3 - 10^{12} ohm
- **Measuring voltage:** Open-circuit voltage 100 V
- **Mode of operation:** Battery operation
- **Display:** LCD display
- **Electrodes:** Bar electrode with conductive rubber

- With data storage and USB interface to PC
- Connection of 2 external electrodes possible

Example application

Surface resistance meter SRM®200

Item no.	Type
ESRM200.K	Handheld meter with case

Veribox

- The Veribox contains resistors for testing high-resistance measuring devices prior to use
- 3 different resistors for testing measuring devices
- Each resistance has a separate plug connection

Item no.
E7100.VB2

ESD standard colours, see page 436

ESD workplaces

C-foot workergo with basic frames - conductive

- ESD conductive worktop, 30 mm

Item no.	Dimensions in mm (WxDxH)
E07.24.15.30	1500 x 750 x 30
E07.24.20/30	2000 x 750 x 30

- C-foot basic frame
- Conductive, powdered

Clamp fixing	Item no.	Dimensions in mm (W x D x H)
 kg 200	EC150KL75G	1500 x 750 x 670 – 1015
	EC200KL75G	2000 x 750 x 670 – 1015

Crank adjustment	Item no.	Dimensions in mm (W x D x H)
 kg 200	EC150KU75G	1500 x 750 x 670 – 1015
	EC200KU75G	2000 x 750 x 670 – 1015

Electric height adjustment, 1 motor	Item no.	Dimensions in mm (WxDxH)
 kg 180	EC150E175G	1500 x 750 x 670 – 1015
	EC200E175G	2000 x 750 x 670 – 1015

Electric height adjustment, 2 motors	Item no.	Dimensions in mm (WxDxH)
 kg 300	EC150E275G	1500 x 750 x 670 – 1015
	EC200E275G	2000 x 750 x 670 – 1015

- ESD conductive worktop, 30 mm

Item no.	Dimensions in mm (WxDxH)
E07.24.15.30	1500 x 750 x 30
E07.24.20/30	2000 x 750 x 30
E03.1590.30	1500 x 900 x 30
E03.2090.30	2000 x 900 x 30

- 4-foot basic frame
- Conductive, powdered

Clamp fixing	Item no.	Dimensions in mm (WxDxH)
 kg 200	E4150KL75G	1500 x 750 x 670 – 1015
	E4200KL75G	2000 x 750 x 670 – 1015
	E4150KL90G	1500 x 900 x 670 – 1015
	E4200KL90G	2000 x 900 x 670 – 1015
Crank adjustment	**Item no.**	**Dimensions in mm (WxDxH)**
 kg 200	E4150KU75G	1500 x 750 x 670 – 1015
	E4200KU75G	2000 x 750 x 670 – 1015
	E4150KU90G	1500 x 900 x 670 – 1015
	E4200KU90G	2000 x 900 x 670 – 1015
Electric height adjustment, 1 motor	**Item no.**	**Dimensions in mm (WxDxH)**
 kg 180	E4150E175G	1500 x 750 x 670 – 1015
	E4200E175G	2000 x 750 x 670 – 1015
	E4150E190G	1500 x 900 x 670 – 1015
	E4200E190G	2000 x 900 x 670 – 1015
Electric height adjustment, 2 motors	**Item no.**	**Dimensions in mm (WxDxH)**
 kg 300	E4150E275G	1500 x 750 x 670 – 1015
	E4200E275G	2000 x 750 x 670 – 1015
	E4150E290G	1500 x 900 x 670 – 1015
	E4200E290G	2000 x 900 x 670 – 1015

ESD workplaces

C-foot table – conductive

1 workergo C-foot
- Worktop, conductive, 1500 x 750 x 30 mm
- Height adjustment by crank
- Energy board with 2x 2 earthed sockets, 1x network socket, 1x compressed air 1/4“
- Load capacity 200 kg

Item no.	Dimensions in mm (WxDxH)
ESDC150KU75G	1500 x 750 x 700 – 1045

2 Parts trolley
- ESD version, 4x steering caster, thereof 2 with locks, Ø 125 mm
- 1x shelf 320 mm, 1x container strip with boxes
- 12x box: 210 x 330 x 200 mm
- 6x box: 150 x 230 x 125 mm

Item no.	Dimensions in mm (WxDxH)
E07.8310.08K	1000 x 800 x 1476

3 Rotary plate with locking mechanism
- With ribbed rubber mat
- With locking mechanism every 45°

Item no.	Dimensions in mm
E07.60.31	Ø 380, conductive
E07.60.32	Ø 500, conductive

workergo C-foot
- Conductive, powdered
- Worktop, conductive, 1500 x 750 x 30 mm
- Height-adjustable

Multi-board setup
- 2x support column
- 1x perforated wall
- 2x shelf 220 mm, 1x shelf 320 mm
- Pivot arm with keyboard platform, pivot arm with shelf
- Overhead frame with equipment rail and lighting 2x 36W

Item no.	Dimensions in mm (WxDxH)	Height adjustment
EC150KL75-05	1500 x 750 x 700 – 1045	Clamp fixing, load capacity 200 kg
EC150KU75-05	1500 x 750 x 700 – 1045	Crank adjustment, load capacity 200 kg
EC150E175-05	1500 x 750 x 700 – 1045	Electric, 1 motor, load capacity 180 kg
EC150E275-05	1500 x 750 x 700 – 1045	Electric, 2 motors, load capacity 300 kg

Supplied without boxes, hooks and decoration

workergo 4-foot
- Conductive, powdered
- Worktop, conductive, 1500 x 750 x 30 mm
- Height-adjustable

Multi-board setup
- 2x support column
- 1x energy bar with 3x earthed sockets and on/off switch
- 2x perforated wall
- 1x shelf, 320 mm
- 1x pivot arm with shelf
- 1x pivot arm with laptop shelf
- Overhead frame with equipment rail and lighting 2x 36W

Item no.	Dimensions in mm (WxDxH)	Height adjustment
E4150KL75-04	1500 x 750 x 700 – 1045	Clamp fixing, load capacity 200 kg
E4150KU75-04	1500 x 750 x 700 – 1045	Crank adjustment, load capacity 200 kg
E4150E175-04	1500 x 750 x 700 – 1045	Electric, 1 motor, load capacity 180 kg
E4150E275-04	1500 x 750 x 700 – 1045	Electric, 2 motors, load capacity 300 kg

workraster
- Conductive, powdered
- Worktop, conductive, 1500 x 750 x 30 mm

Multi-board setup
- 2x support column
- 1x energy board with 4x earthed sockets
- 2x perforated wall
- 1x shelf, 320 mm
- Overhead frame with equipment rail and lighting 2x 36W

Item no.	Dimensions in mm (WxDxH)
E07.899.01	1500 x 800 x 2070

Supplied without boxes, hooks and decoration

ESD workplaces

Basic tables - conductive

workline basic table, 1500 mm
- Conductive, powdered
- Worktop, conductive, 1500 x 750 x 30 mm
- Height-adjustable

Multi-board setup
- 2x support column
- 1x magnetic wall
- 1x perforated wall
- 2x inclinable shelf 320 mm
- Overhead frame with equipment rail and lighting 2x 36W

Item no.	Dimensions in mm (WxDxH)	Height adjustment
E07.75.KLMW	1500 x 750 x 765 – 1135	Clamp fixing, load capacity 200 kg
E07.75.KUMW	1500 x 750 x 765 – 1135	Crank adjustment, load capacity 200 kg
E07.75.KHEMW	1500 x 750 x 765 – 1135	Electric, 1 motor, load capacity 180 kg

workline basic table, 1500 mm
- Conductive, powdered
- Worktop, conductive, 1500 x 750 x 30 mm
- Height-adjustable, tabletop form 765 – 1135 mm

1x superstructure frame
- 1x tripod with 2x earthed sockets and 1x halogen lamp
- 1x pivot arm with shelf
- 1x pivot arm with perforated/slotted wall
- 1x footrest

Item no.	Dimensions in mm (WxDxH)	Height adjustment
E07.75.1KLST	1500 x 750 x 765 – 1135	Clamp fixing, load capacity 200 kg
E07.75.1KUST	1500 x 750 x 765 – 1135	Crank adjustment, load capacity 200 kg
E07.75.1KHEST	1500 x 750 x 765 – 1135	Electric, 1 motor, load capacity 180 kg

Supplied without boxes, hooks, rotary plate and decoration

1

Table cover
- 610 x 1220 mm (WxD)

Item no.
E07.24.03

2

Earthing module
- With 2 m smooth cable
- 4 mm eyelet, without resistance

Item no.
E07.24.21

8

Connection examples for earthing terminal strip on the rear

3

Earthing cable, 1.5 m
- For table/floor coverings, 1 MOhm safety resistor
- 10 mm snap fastener/4 mm eyelet, 3 m

Item no.
E07.24.07

4

Spiral cable
- Highly elastic, 2.4 m long, 2x 1 MOhm safety resistance
- Earthing contact connection: 10 mm snap fastener
- Typical resistance R = 2x 10^6 Ohm

Item no.
E07.24.04

5

Earthing box
- As earth bonding point (EBP) for personal grounding, earthing cable
- 2 m long, connection type: 4 mm eyelet, 1 MOhm safety resistor per connection
- 2x 10 mm snap fastener connection
- 1x 4 mm safety socket

Item no.
E07.24.22

6

Wrist strap
- 3 mm snap fastener

Item no.
E07.24.02

7

Floor mat
- Ecostat® Mega - 3.5 Rubber
- 1220 x 2500 x 3.5 mm (W x D x H)

Item no.
E07.24.08

8

Earthing terminal strip

Item no.
E07.24.09

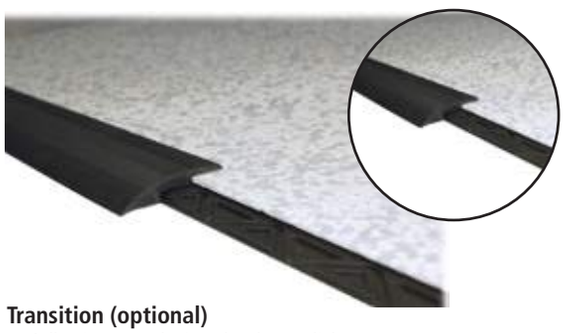
Floor coverings

ECOSTAT® standard floor mats

Flooring material for DIY loose laying

Two-layer composite tile flooring

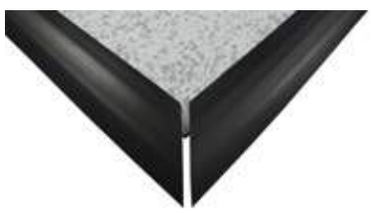
- Volume conductive
- Abrasion-resistant
- Conductive, elastic backing, adapts to the substrate
- Backing with waffle structure for installation on problematic substrates (e.g. residual moisture)
- Suitable for chair castors
- Suitable for forklifts
- Reusable
- Self-laying | **Easy laying thanks to click system**
- Easy handling using woodwork tools
- Can be walked on during laying, therefore very short downtimes
- Colour: Grey
- Typical bleeder resistance $R_{gp} = 10^4 – 10^5$ ohm



Transition (optional)

- Adhesive, easy laying thanks to click system

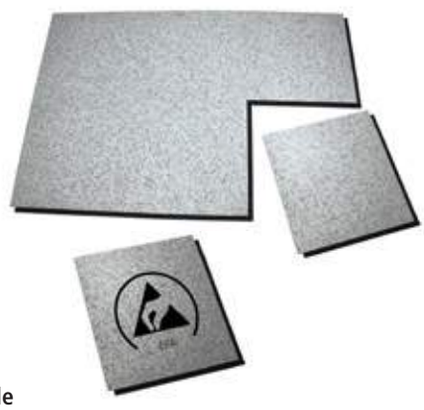
Item no.	Standard dimension in mm	Packaging unit
E1310PF701R	1220 x 65	1



Corner joint (optional)

- Adhesive

Item no.	Standard dimension in mm	Packaging unit
E1310PF701RES	711 x 65	2



Puzzle tile

Item no.	Dimensions in mm (WxDxH)	Packaging unit
E1310.PF.701	469 x 469 x 8.5	12
E1310.PF.ESD	469 x 469 x 8.5 with ESD logo	1

Standard floor mat

- Rounded corners
- 2x 10 mm snap fastener connection
- Max. roll length 10 m

Incl. earthing cable with protective cap, with 10 mm snap fastener, 4 mm eyelet, 1 MOhm safety resistor, 4.5 m long

ECOSTAT® Mega - 3.5 Rubber

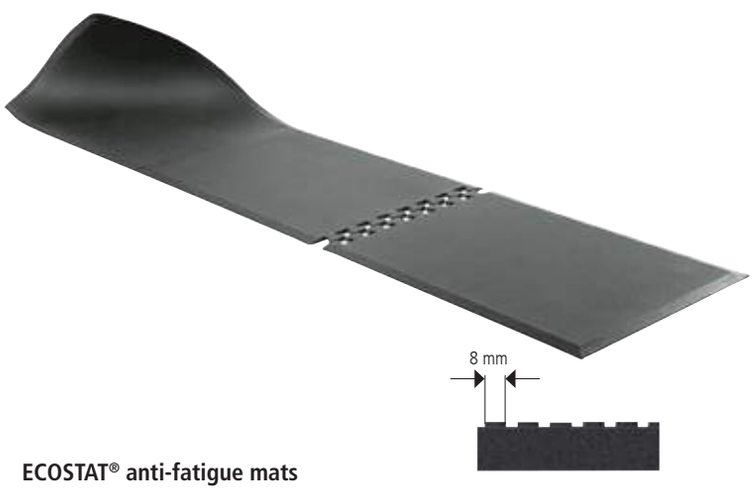
- Adhesive

Item no.	Dimensions in mm (WxDxH)
E1250.681	1220 x 1650 x 3.5
E07.24.08	1220 x 2500 x 3.5

ECOSTAT® PR - 2.0

- Adhesive

Item no.	Dimensions in mm (WxDxH)
E1250.7004.L	1500 x 2000 x 2



ECOSTAT® anti-fatigue mats

- Improved walking, turning and standing properties
- Tread can be quickly extended as desired using puzzle technology
- Customer-specific dimensions also possible lateral and longitudinal directions with puzzle technology
- Smallest configuration: 2 end tiles
- Blister diameter: 8 mm

Item no.	Dimensions in mm (WxDxH)
E06500940VE	End tile: 650 x 940 x 13 incl. 10 mm snap fastener
E06500910VM	Middle tile: 650 x 910 x 13
E307.B1.Z	Custom size on request

ECOSTAT® table mat

- Two-layer composite flooring
- Rugged synthetic rubber
- Resistant to solder and heat
- Abrasion-resistant
- Halogen-free
- Permanently elastic
- Volume conductive
- Material thickness: 2 mm
- Typical bleeder resistance $R_{gp} = 10^6 – 10^7$ ohm
- Includes: 2x 10 mm snap fastener,
  *Rounded corners (radius approx. 43 mm)

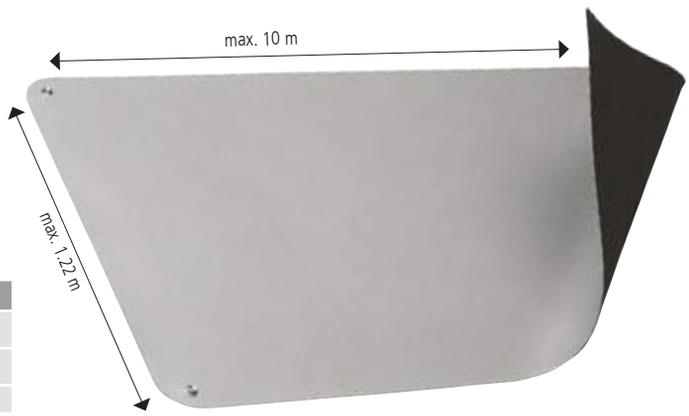


Table cover

Item no.	Colour	Dimensions in mm (WxD)
E07.24.03	Platinum grey	1220 x 610
E1402.663.S*	Platinum grey	900 x 610
E1402.663.R	Platinum grey	Rolls: 1220 x 10000

Table cover

Item no.	Colour	Dimensions in mm (WxD)
E1402.665.L*	Light blue	610 x 1220
E1402.665.S*	Light blue	610 x 900
E1402.665.R	Light blue	Rolls: 1220 x 10000

Table cover

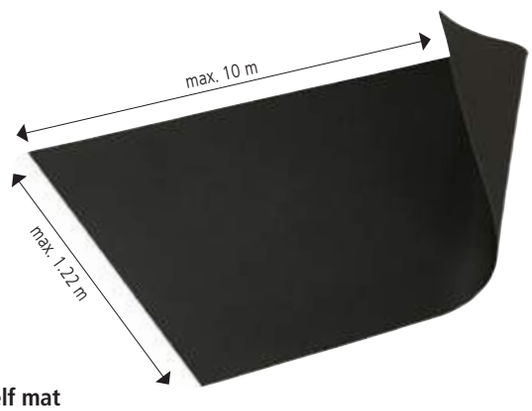
Item no.	Colour	Dimensions in mm (WxD)
E1402.662.L*	Beige	610 x 1220
E1402.662.S*	Beige	610 x 900
E1402.662.R	Beige	Rolls: 1220 x 10000

ECOSTAT® shelf mat

Anti-slip covering

- Anti-slip profile in transverse and longitudinal direction - on both sides
- Permanently dissipative due to carbon
- Covering for transport trolleys and shelves
- Profiled, wear-resistant synthetic rubber
- Material thickness: 2 mm

Item no.	Colour	Dimensions in mm (WxD)
E1453.7300.R	Black	Rolls: 1220 x 10000



Shelf mat

- Two-layer composite flooring
- Rugged synthetic rubber
- Resistant to solder and heat
- Abrasion-resistant
- Halogen-free
- Permanently elastic
- Volume conductive
- Material thickness: 1.5 mm
- Typical bleeder resistance $R_{gp} = 10^6 – 10^7$ ohm

Item no.	Colour	Dimensions in mm (WxD)
E1452.659.R	Black	Rolls: 1220 x 10000

Open fronted storage bins

Open fronted storage bins – conductive

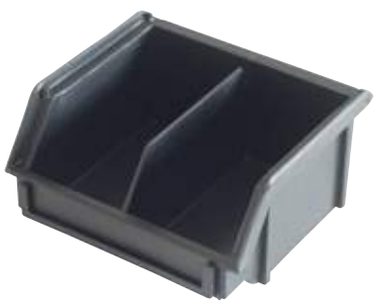
- Carbon-loaded, permanently volume conductive polypropylene
- Improved removal opportunity due to rounded corners
- With ESD labelling
- Typical surface resistance $R_{gp} = 10^4 – 10^5$ ohm

Back

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm	Packaging unit
E5320.FA3Z	200 x 350 x 145	182 x 280 x 127	127	12
E5320.FA4	145 x 235 x 125	127 x 180 x 108	108	25
E5320.FA5	100 x 175 x 75	87 x 129 x 67	67	42

- E5320.2 and E5320.3 include a handle

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm	Packaging unit
E5320.2	300 x 500 x 200	280 x 425 x 183	183	6
E5320.3	200 x 350 x 200	182 x 280 x 185	185	8
E5320.3Z	200 x 350 x 145	182 x 280 x 127	127	12
E5320.4	145 x 235 x 125	127 x 180 x 108	108	27
E5320.5	100 x 175 x 75	87 x 129 x 67	67	40
E5320.6	100 x 95 x 50	87 x 60 x 44	44	50



- With separator

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm	Packaging unit
E5320.6D	100 x 95 x 50	87 x 60 x 44	44	50

IDP-STAT® open fronted storage bins – conductive

- Permanently volume conductive polypropylene
- Made of Inherently Dissipative Polymer (IDP-STAT®)
- Stackable
- With ESD labelling
- Typical surface resistance $R_{gp} = 10^9 – 10^{10}$ ohm

- Red

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm	Packaging unit
E5321.R.4	145 x 235 x 125	127 x 180 x 108	108	27
E5321.R.5	100 x 175 x 75	87 x 129 x 67	67	40
E5321.R.6	100 x 95 x 50	87 x 60 x 44	44	50

- Yellow

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm	Packaging unit
E5321.Y.4	145 x 235 x 125	127 x 180 x 108	108	27
E5321.Y.5	100 x 175 x 75	87 x 129 x 67	67	40
E5321.Y.6	100 x 95 x 50	87 x 60 x 44	44	50

Other sizes and colours on request.

Labels for open fronted storage bins

Item no.	Suitable for open fronted storage bins	Dimensions in mm (WxD)	Packaging unit
E5320.2.ET	5320.2	82 x 42	100
E5320.3.ET	5320.3	79 x 43	100
E5320.3Z.ET	5320.3Z	79 x 30	100
E5320.4.ET	5320.4 / 5321.R.4 / 5321.Y.4	80 x 29	100
E5320.5.ET	5320.5 / 5321.R.5 / 5321.Y.5	79 x 20	100
E5320.6.ET	5320.6 / 5321.R.6 / 5321.Y.6	79 x 13	100
E5320FA2.3ET	5320.FA2 / 5320.FA3	98 x 43	100
E5320FA3Z.ET	5320.FA3Z	101 x 30	100
E5320.FA4.ET	5320.FA4	74 x 23	100
E5320.FA5.ET	5320.FA5	53 x 15	100

Storage and transport containers - conductive

Storage containers - conductive

- Carbon-loaded, permanently volume conductive polypropylene
- Stackable
- Palette modular size
- With ESD labelling
- Closed handle
- Typical surface resistance $R_{gp} = 10^4 – 10^5$ ohm

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm
E5310.05	200 x 300 x 120	170 x 270 x 117	106
E5310.10	300 x 400 x 120	255 x 355 x 115	104
E5310.14	300 x 400 x 170	255 x 355 x 165	152
E5310.20	300 x 400 x 220	255 x 355 x 217	204
E5310.25	300 x 400 x 270	255 x 355 x 265	252
E5310.31	300 x 400 x 320	255 x 355 x 317	304

Item no.	External dimensions in mm (WxDxH)	Internal dimensions in mm (WxDxH)	Usable height/stack in mm
E5310.15	400 x 600 x 75	355 x 555 x 70	56
E5310.24	400 x 600 x 120	355 x 555 x 115	104
E5310.33	400 x 600 x 150	355 x 555 x 145	131
E5310.34	400 x 600 x 170	355 x 555 x 165	152
E5310.42	400 x 600 x 220	355 x 555 x 215	204
E5310.50	400 x 600 x 236	355 x 555 x 231	214
E5310.55	400 x 600 x 280	355 x 555 x 275	261
E5310.70	400 x 600 x 336	355 x 555 x 332	314
E5310.80	400 x 600 x 420	355 x 555 x 415	397

Lid with hooks

Item no.	External dimensions in mm (WxD)
E5310.43	400 x 300 lid, loose
E5310.64	600 x 400 lid, loose

Lid with hooks

Item no.	External dimensions in mm (WxD)
E5310.43.PU	400 x 300 lid, loose, with conductive, soft PU foam
E5310.64.PU	600 x 400 lid, loose, with conductive, soft PU foam

Hinge

Hinged lid

Item no.	External dimensions in mm (WxD)
E5310.32.S	300 x 200 lid, loose
E5310.43.S	400 x 300 lid, loose

IDP-Stat® storage and transport containers - conductive

- Permanently volume conductive polypropylene
- Made of Inherently Dissipative Polymer (IDP-STAT®)
- Stackable
- Palette modular size
- With ESD labelling
- Closed handle
- Typical surface resistance $R_{gp} = 10^9 – 10^{10}$ ohm

- Yellow

Item no.	External dimensions in mm (LxWxH)	Internal dimensions in mm (LxWxH)	Usable height/stack in mm
E5311.Y.10	300 x 400 x 120	255 x 355 x 115	104
E5311.Y.14	300 x 400 x 170	255 x 355 x 165	152
E5311.Y.20	300 x 400 x 220	255 x 355 x 217	204

- Red

E5311.R.10	300 x 400 x 120	255 x 355 x 115	104
E5311.R.14	300 x 400 x 170	255 x 355 x 165	152
E5311.R.20	300 x 400 x 220	255 x 355 x 217	204

- Yellow

Item no.	External dimensions in mm (LxWxH)	Internal dimensions in mm (LxWxH)	Usable height/stack in mm
E5311.Y.24	400 x 600 x 120	355 x 555 x 115	104
E5311.Y.34	400 x 600 x 170	355 x 555 x 165	152
E5311.Y.42	400 x 600 x 220	355 x 555 x 215	204

- Red

E5311.R.24	400 x 600 x 120	355 x 555 x 115	104
E5311.R.34	400 x 600 x 170	355 x 555 x 165	152
E5311.R.42	400 x 600 x 220	355 x 555 x 215	204

Lid with hooks

- Yellow

Item no.	External dimensions in mm (WxD)
E5311.Y.43	400 x 300 lid, loose
E5311.Y.64	600 x 400 lid, loose

Lid with hooks

- Red

Item no.	External dimensions in mm (WxD)
E5311.R.43	400 x 300 lid, loose
E5311.R.64	600 x 400 lid, loose

ESD parts trolley

Multi-trolley combinations from practice – conductive

Multi-trolley
- Equipped with 2x fixed and 2x steering caster with locks, Ø 125 mm
- Bottom shelf
- 8x inclinable shelf 320 mm depth
- Total load capacity 500 kg

Includes
- 6x Euro storage bins 400 x 300 x 170 mm
- 8x open fronted storage bin 200 x 350 x 200 mm
- 16x open fronted storage bin 200 x 350 x 145 mm

Item no.	Dimensions in mm (WxDxH)
ESD07.58.14	990 x 610 x 1450

Multi-trolley
- Equipped with 2x fixed and 2x steering caster with locks, Ø 125 mm
- 4x inclinable shelf 320 mm depth
- 2x perforated panel, 302 mm
- Total load capacity 500 kg

Includes
- 6x Euro storage bins 400 x 300 x 170 mm
- 8x open fronted storage bin 200 x 350 x 145 mm
- Supplied without tools

Item no.	Dimensions in mm (WxDxH)
ESD07.58.16	990 x 610 x 1450

Multi-trolley
- Equipped with 2x fixed and 2x steering caster with locks, Ø 125 mm
- Open fronted storage bins are hung in rails
- Total load capacity 500 kg

Includes
- 32x open fronted storage bin 100 x 170 x 80 mm
- 24x open fronted storage bin 145 x 230 x 125 mm
- 16x open fronted storage bin 200 x 350 x 200 mm

Item no.	Dimensions in mm (WxDxH)
ESD07.58.12	990 x 610 x 1450

Multi-trolley
- Equipped with 2x fixed and 2x steering caster with locks, Ø 125 mm
- 4x inclinable shelf 420 mm depth
- Total load capacity 500 kg

Includes
- 8x Euro storage bins 400 x 600 x 170 mm

Item no.	Dimensions in mm (WxDxH)
ESD07.58.18	990 x 610 x 1450

Individual parts trolleys on request.

Vinyl roller stool

- Dissipative roller stool with height adjustment
- For clean production areas
- 5-star cruciform base made of chrome-plated aluminium with 5 conductive, load-dependent braked, soft castors
- Safety gas spring
- Seat height adjustment from 500 to 640 mm
- Durable and conductive vinyl cover, seat diameter: 340 mm
- With ESD labelling

Item no.	Type
E1700.VH	Black
E1700.KS.13	Hard, conductive chair castors (for carpeted floors)

The INDUSTRIAL PU chair provides excellent, ergonomic sitting comfort. It reliably and safely drains static charges from personnel to the conductive flooring or floor mat.

Standard version

- 5-star cruciform base made of chrome-plated aluminium with 5 conductive, load-dependent braked, soft castors
- Safety gas spring
- Seat height adjustment from 380 to 510 mm
- Synchronous adjustment of seat and backrest
- Seat and backrest made of durable, black conductive PU integral foam
- PU integral foam is easy to clean
- With ESD labelling
- GS tested

Item no.	Type
E1700.PU	Without armrests

Backrest with ESD labelling

PU sit-stand stool

- Dissipative sit-stand stool with height adjustment
- Dissipative and robust construction with anti-skid glides
- Lockable seat height adjustment
- 15° tilting seat
- Dissipative and durable PU integral foam seat
- 16° tilting seat for excellent body contact
- GS tested
- With ESD labelling
- Typical bleeder resistance $R_{gp} = 10^8 – 10^9$ ohm

Item no.	Colour
E1700.S	Black

Backrest with ESD labelling

High model

- Seat height from 540 to 800 mm
- Cruciform base with 5 conductive glides
- Chrome-plated foot ring as climbing aid
- Stepless height adjustment

Item no.	Type
E1710.PU	Without armrests

Optional accessories

Item no.	Type
E1700.KS.13	Hard, conductive chair castors (for carpeted floors)
E1700.XS.PU	Volume conductive PU armrests* incl. mounting plate

Chair

Comfort chair

The COMFORT chair provides an exceptional sitting comfort due to its highly resilient foam contoured seat. It reliably and safely drains static charges from personnel to the conductive flooring or floor mat.

Backrest with ESD labelling

Standard version

- 5-star cruciform base made of chrome-plated aluminium with 5 conductive, load-dependent braked, soft castors
- Safety gas spring
- Seat height adjustment from 400 to 420 mm
- Asynchronous mechanism
- Seat and dynamic back rest individually adjustable
- Hard-wearing and conductive upholstery cover for the seat and backrest in fabric
- Conductive plastic back seat shell with ESD labelling
- GS tested

Item no.	Colour	Type
E1700.ES.B	Blue	Without armrests
E1700.ES.D	Grey	Without armrests

High model

- Seat height from 640 to 760 mm
- Cruciform base with 5 conductive glides, foot ring as climbing aid

Item no.	Colour	Type
E1710.ES.B	Blue	Without armrests
E1710.ES.D	Grey	Without armrests

Optional accessories

Item no.	Type
E1700.KS.13	Hard, conductive chair castors (for carpeted floors)
E1700.XS	Volume conductive PU armrests*

The high-quality COMFORT PLUS chair provides perfect, ergonomic sitting comfort due to its foam contoured seat. It reliably and safely drains static charges from personnel to the conductive flooring or floor mat.

Backrest with ESD labelling

Standard version

- 5-star cruciform base made of polished aluminium with 5 conductive, load-dependent braked, soft castors
- Safety gas spring
- Seat height adjustment from 430 to 540 mm
- Adjustable back height
- Adjustable back height, depth and angle
- Mechanism with synchronous technology ensures active-dynamic sitting
- Seat and dynamic back rest individually adjustable
- High-quality moulded foam pads for perfect sitting comfort
- Hard-wearing and conductive black upholstery cover
- Conductive plastic back seat shell
- With ESD labelling
- GS tested

Item no.	Colour	Type
E1700.ESP.S	Black	Without armrests

High model

- Seat height from 610 to 850 mm
- Cruciform base with 5 conductive glides
- Chrome-plated foot ring as climbing aid
- Stepless height adjustment

Item no.	Colour	Type
E1710.ESP.S	Black	Without armrests

Optional accessories

Item no.	Type
E1700.KS.13	Hard, conductive chair castors (for carpeted floors)
E1700.XS	Volume conductive PU armrests*

ESD standard colours, see page 436