Antistatic Spiral Fabrics

solution in spirals
Württembergische
Spiralsiebfabrik GmbH

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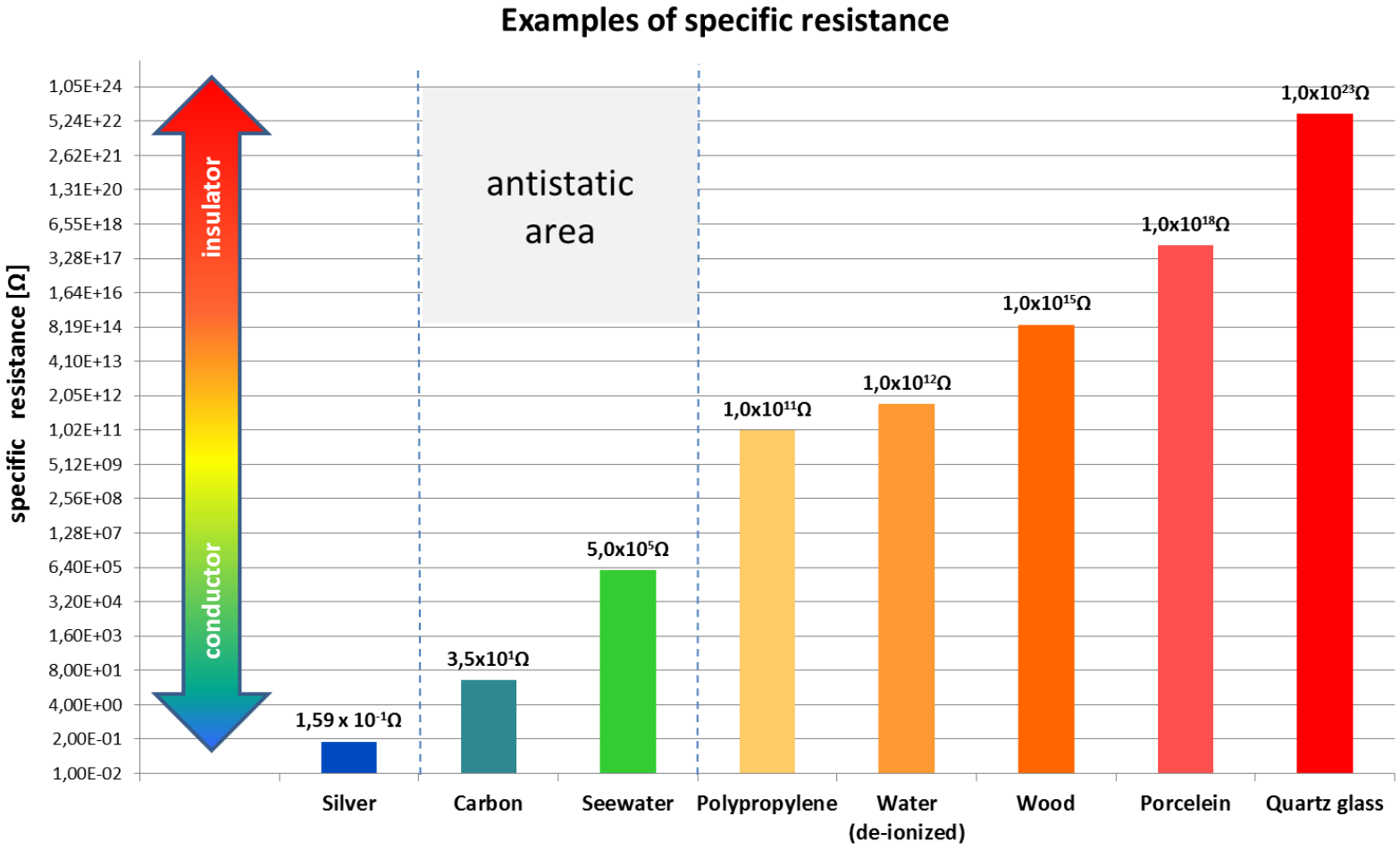
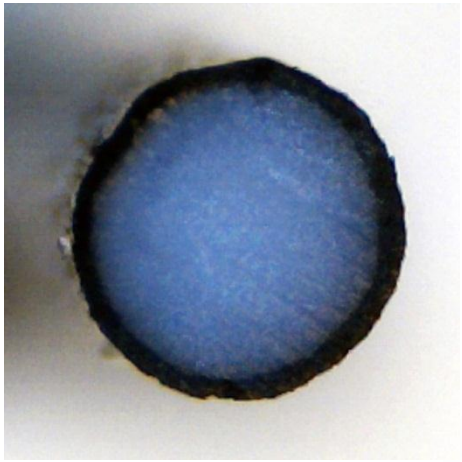


Antistatic Spiral Fabrics

Antistatic spirals are made of bicomponent monofilaments.

“Shell” and “Core” of these monofilaments consist of the same or similar polymer, however the shell polymer is physically modified for electrical conductibility.

The chemical relationship, as well as the production process of the filaments in one process step, guarantees maximum possible adhesion between the two components.



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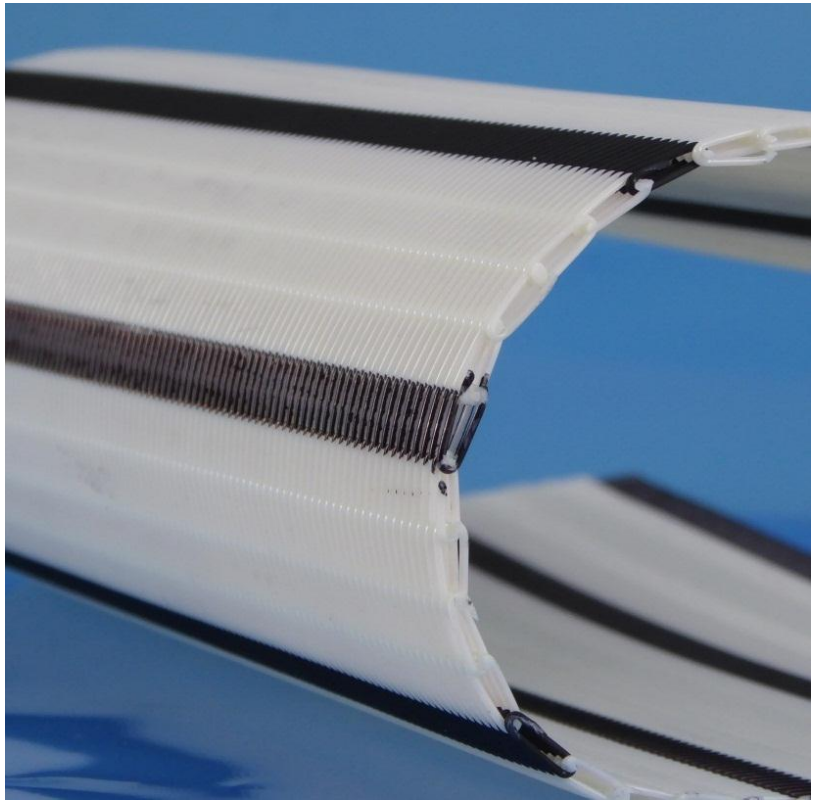
Manufacturing:

Antistatic spiral fabrics are produced with spirals made from an antistatic polymer.

Possible designs either have antistatic spirals alternating with standard spirals, or 100% antistatic spirals only.



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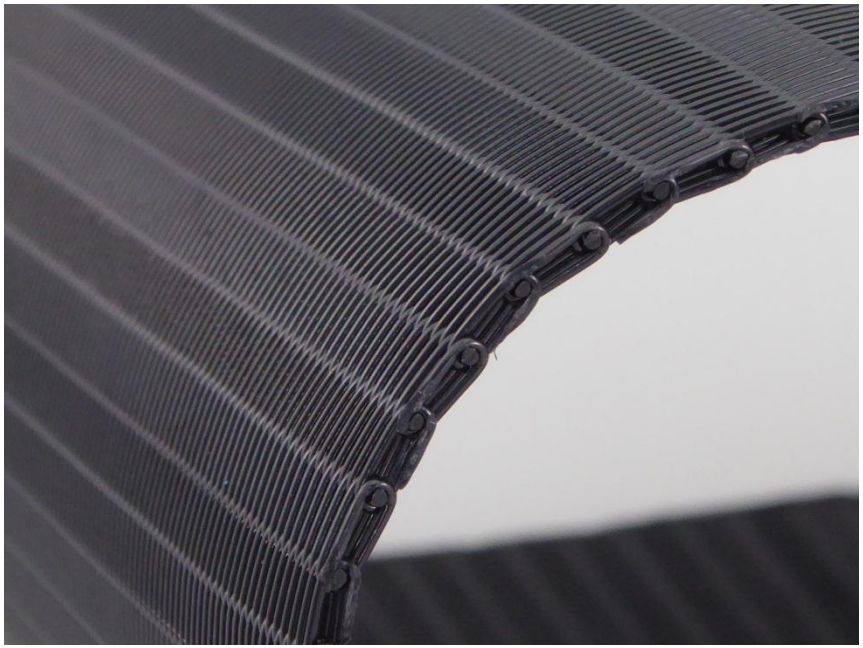
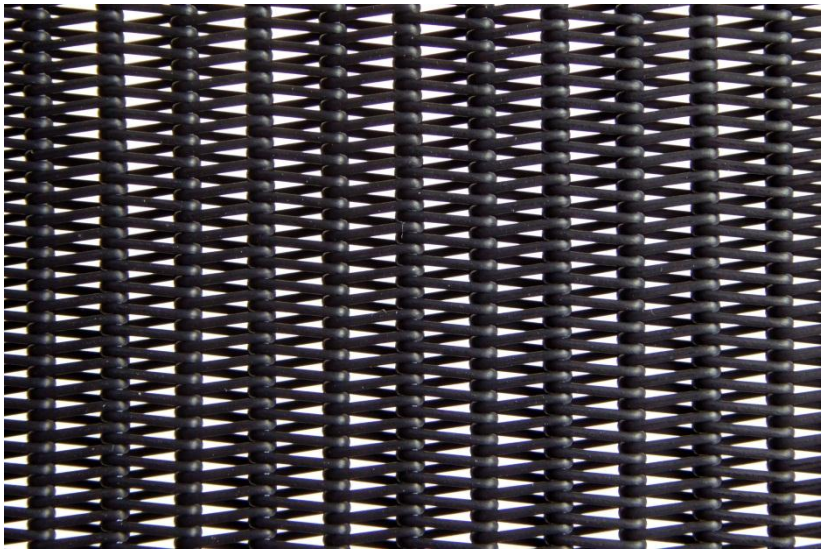
Spiral types made with antistatic spirals:

Spiral fabrics made of 100% antistatic spirals

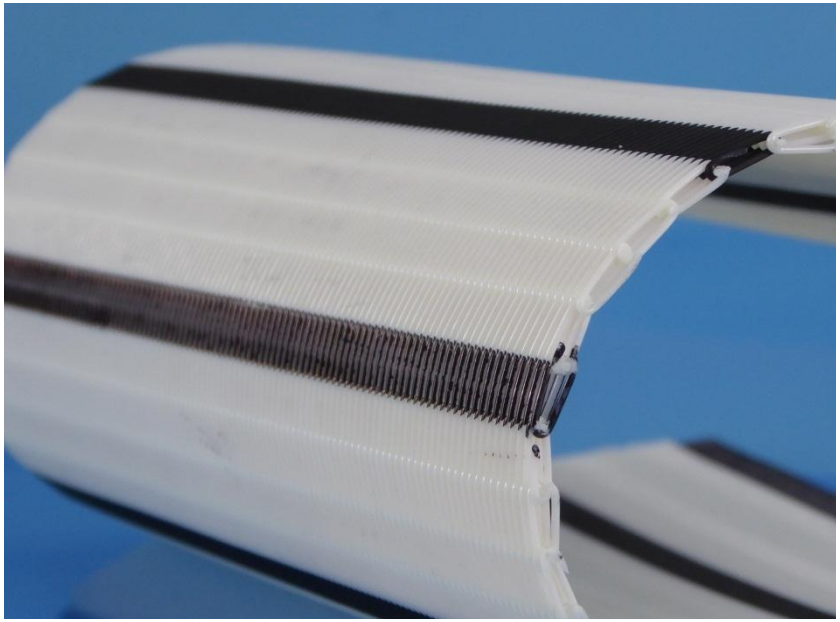


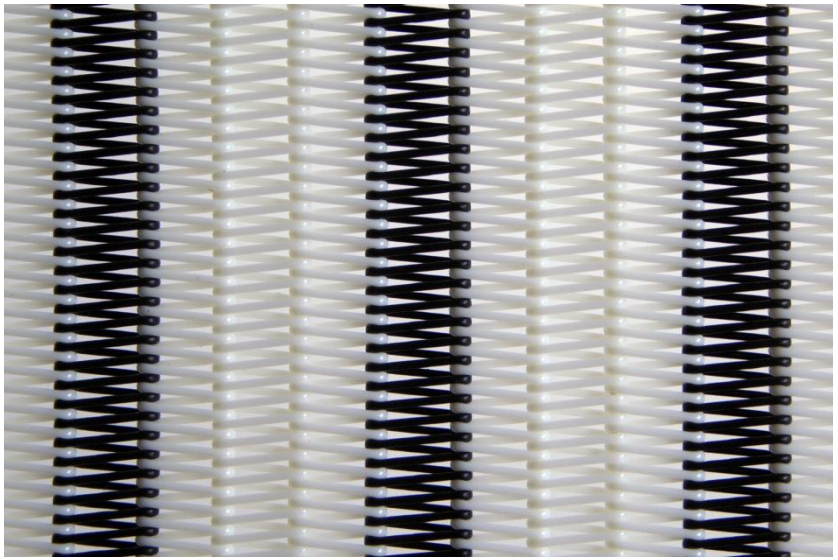


Antistatic Spiral Fabrics

Spiral types made with antistatic spirals:

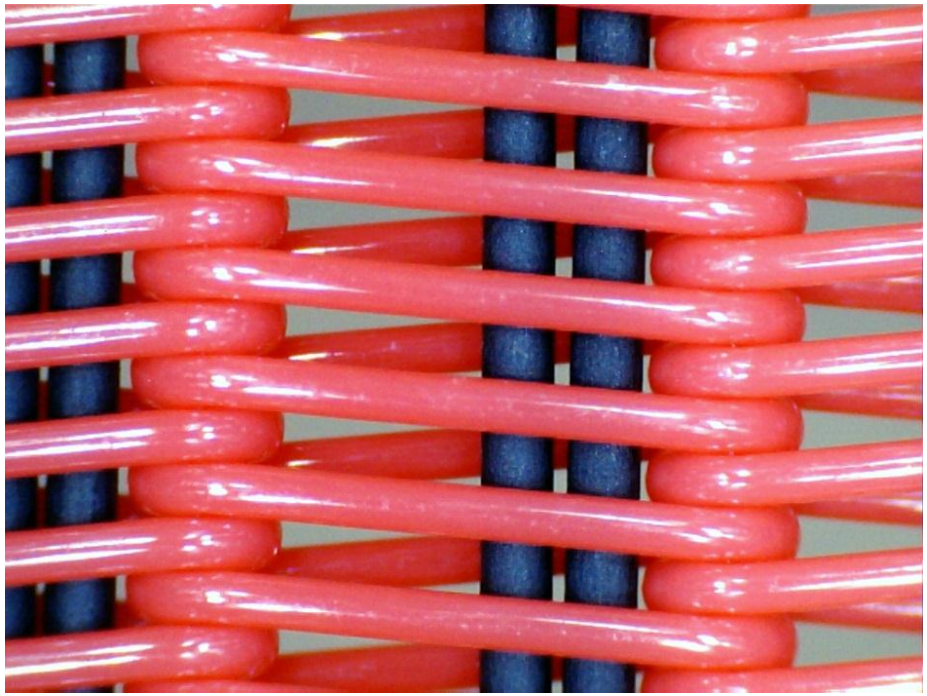
2.) Spiral fabrics produced with antistatic spirals in regular succession …





… depending on design, this can e.g. be every 4th, 5th or 10th spiral

Antistatic Spiral Fabrics



3.) … a further design of an antistatic spiral fabric shows antistatic fillers inside the spiral channel.

These fabrics have an edge reinforcement which also has antistatic properties. The idea behind such construction is the transportation of charges from the fabric through the fillers to the edge dope and from there to the steel roll.

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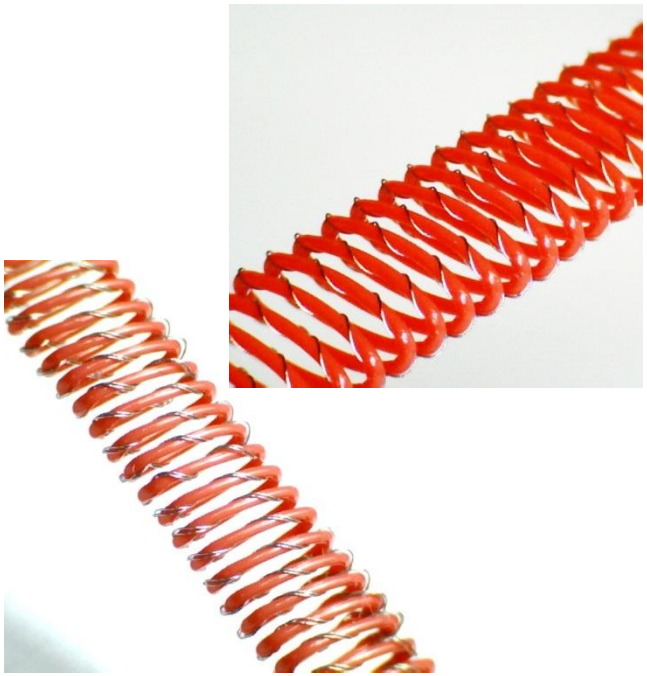
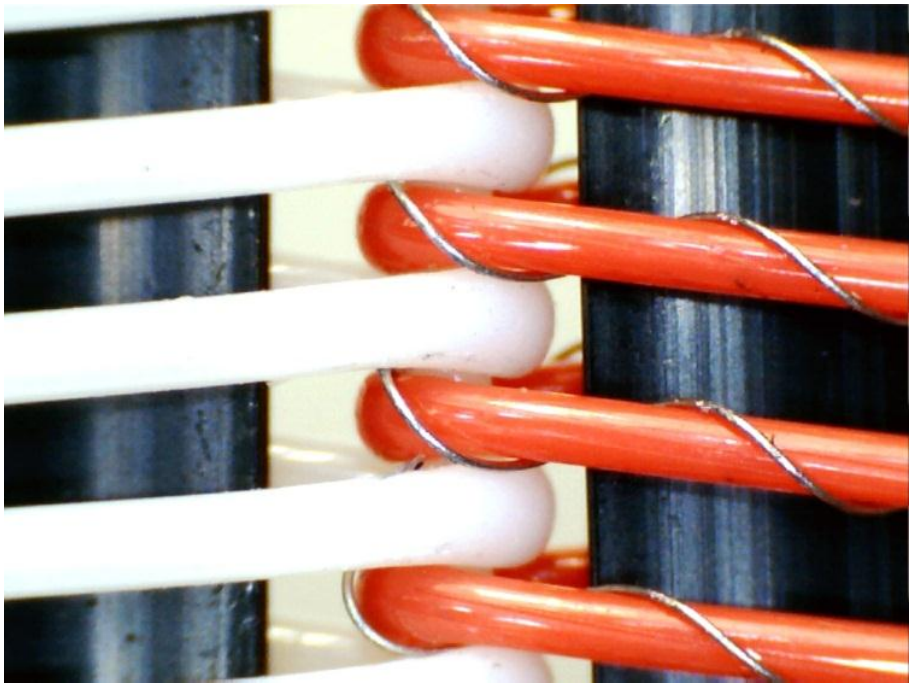
4.) … based on metal-strand twisted spirals:

Single-yarn twisted …



… twin-yarn twisted



… discharging by metal based conductibility

Antistatic Spiral Fabrics

Analyses and certificates were made by the
Institute of Textile Technology and Process Engineering - ITV Denkendorf
accredited to the norm **DIN EN ISO/IEC 17025:2005**

Institute of Textile Technology and Process Engineering Denkendorf
Laboratory for Technical Textiles

Table 1 / 2 of order E-0181-TT-13

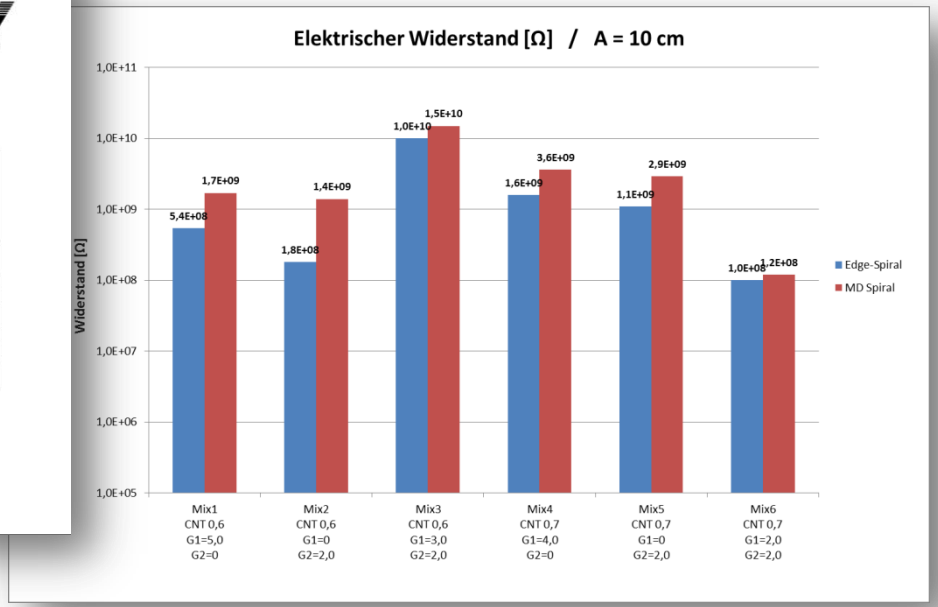
Tabelle 1 von 1

Table 1/2: Electrical resistance of a spiral fabric

Customer: Württembergische Spiralsiebfabrik **Date:** 21.08.2013
Order No.: E-0181-TT-13 **Climatic Condition:** 23 ± 2°C / 25 ± 5 % r.F.

Parameter	Test-conditions	Charac-teristic Values	Unit	Spiral fabric C							
				cross direction with edge contact; edge bonding to spiral		lenght direction along edge bonding[2]		length direction[3]		cross direction without edge contact[4]	
			cm	30	10	30	10	30	10	30	10
Point-to-point-resistance[1] DIN EN 61340-5-1	Distance of electrodes										
	100 V	x_1	Ohm	$1{,}2\ 10^7$	$1{,}2\ 10^6$	$2{,}7\ 10^{10}$	$7{,}5\ 10^9$	$3{,}0\ 10^{10}$	$4{,}9\ 10^9$	$5{,}1\ 10^6$	$2{,}0\ 10^6$
		x_2	Ohm	$4{,}9\ 10^6$	$1{,}0\ 10^6$	$2{,}9\ 10^{10}$	$6{,}4\ 10^9$	$2{,}7\ 10^{10}$	$6{,}5\ 10^9$	$3{,}2\ 10^6$	$6{,}6\ 10^5$
		x_3	Ohm	$4{,}8\ 10^6$	$1{,}3\ 10^6$	$2{,}4\ 10^{10}$	$2{,}3\ 10^9$	$2{,}3\ 10^{10}$	$7{,}4\ 10^9$	$4{,}3\ 10^6$	$1{,}1\ 10^6$
		x_4	Ohm	$5{,}6\ 10^6$	$1{,}3\ 10^6$	$1{,}2\ 10^{10}$	$2{,}5\ 10^9$	$2{,}7\ 10^{10}$	$7{,}9\ 10^9$	$3{,}2\ 10^6$	$9{,}4\ 10^5$
		x_5	Ohm	$8{,}9\ 10^5$	$9{,}9\ 10^5$	$1{,}0\ 10^{10}$	$2{,}4\ 10^9$	$2{,}5\ 10^{10}$	$8{,}1\ 10^9$	$1{,}3\ 10^7$	$1{,}6\ 10^6$
		$\bar{x}$	**Ohm**	**$7{,}2\ 10^6$**	**$1{,}2\ 10^6$**	**$2{,}0\ 10^{10}$**	**$4{,}2\ 10^9$**	**$2{,}6\ 10^{10}$**	**$7{,}0\ 10^9$**	**$5{,}8\ 10^6$**	**$1{,}3\ 10^6$**

[1] point electrode: diamenter: 63 mm; weight: 2,27 kg
[2] both electrodes contact the edge bonding and no spirals
[3] the elctrodes contact different black spirals
[4] the electrodes contact the same spirals



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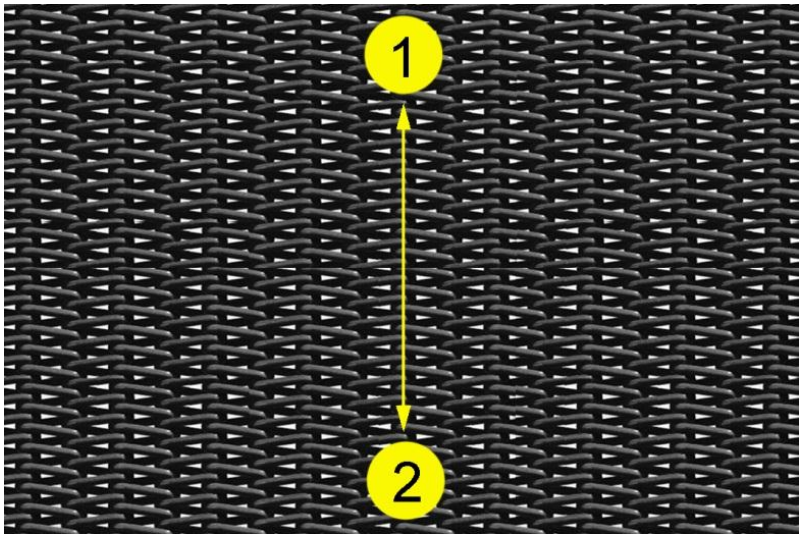
Measurements of spiral fabrics made of 100% antistatic material

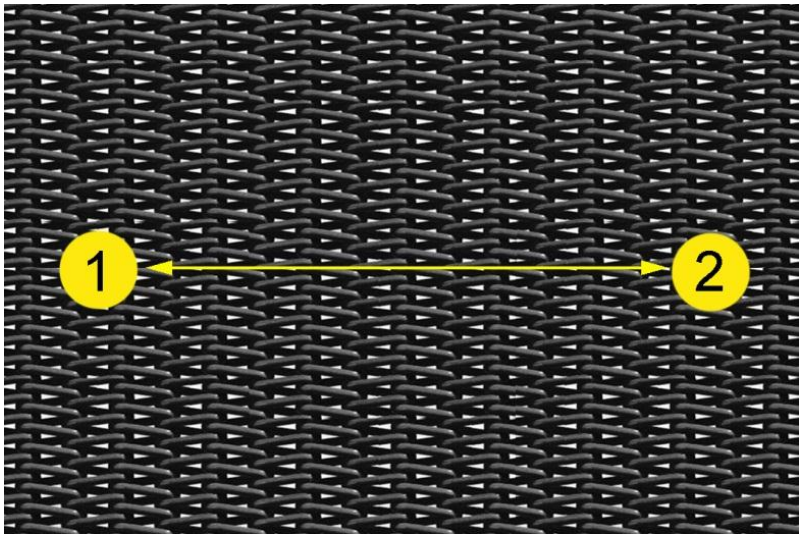
Design 55000 A and 70000 A

Measurements in cross direction (CD)



Electrical resistance [Ω]: 2,0 x 10^5

Measurements in machine direction (MD)



Electrical resistance [Ω]: 8,0 x 10^5

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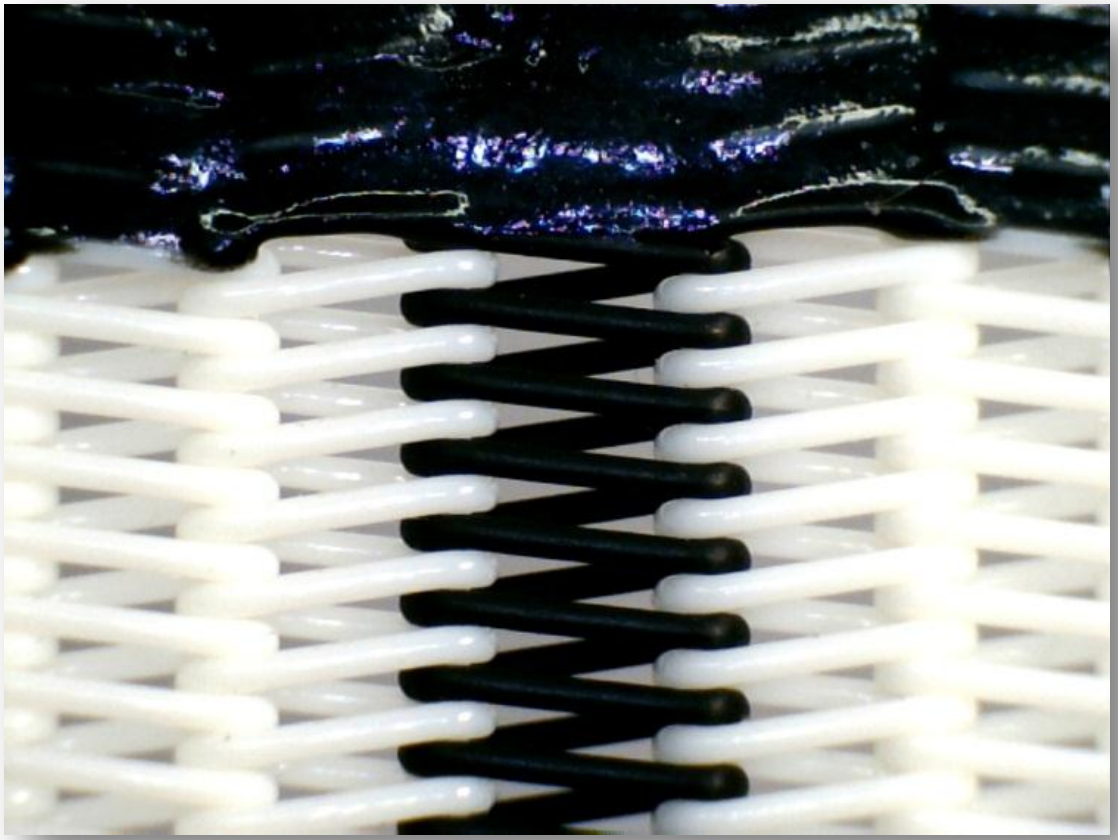
Development of the antistatic WSF edge reinforcement



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WSF – reinforcement for antistatic spiral fabric edges

Components of mixture

- Polyol
- Isocyanate
- Graphite modification
- Carbon nanotubes

of the WSF edge dope for antistatic spiral fabrics are adjusted to achieve an optimal compatibility of

- mechanical properties
- electrical conductibility
- and workability

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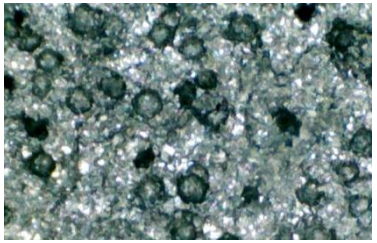
Test series with CNT und graphite modifications in co-operation with the company FutureCarbon

Samples in different mix ratios:

Surface structure:



Confidential information exchange between the co-operation partners

:FutureCarbon
Material Innovations in Composites

Confidential Agreement

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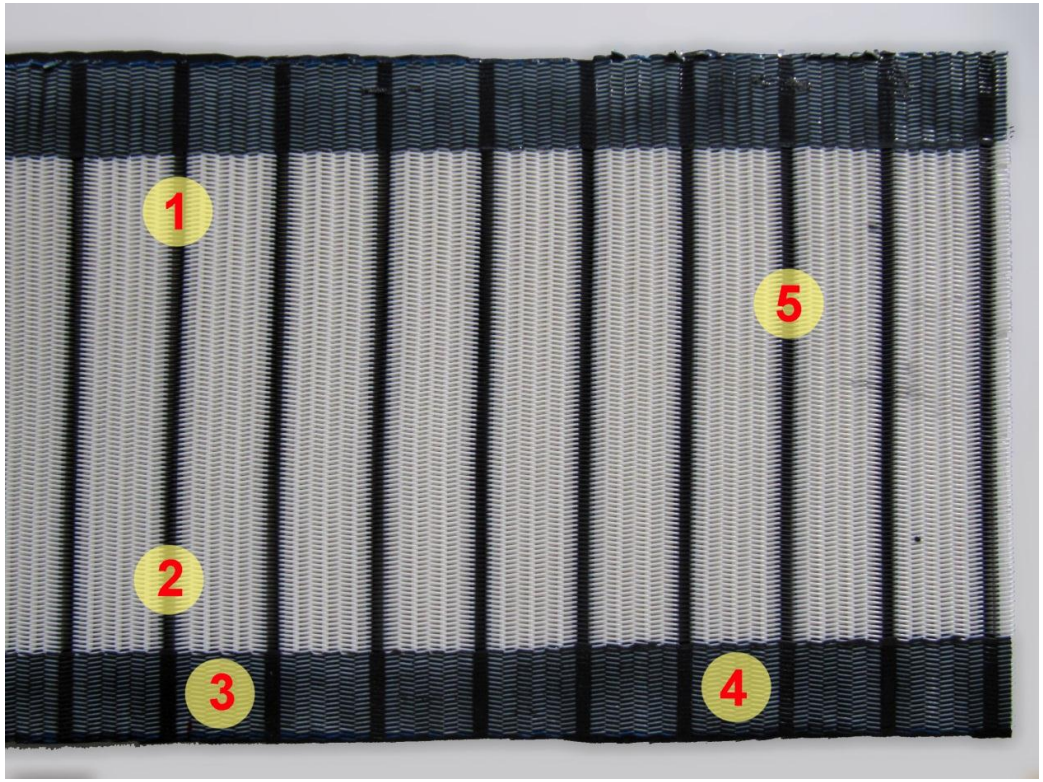
Electrical resistance in a spiral fabric made of alternating regular and antistatic spirals, with antistatic edge reinforcement



Electrical resistance between measuring points

❶→❷ = 1,3 x $10^6\Omega$

❷→❸ = 7,2 x $10^6\Omega$

❸→❹ = 4,2 x $10^6\Omega$

❶→❺ = 7,0 x $10^6\Omega$

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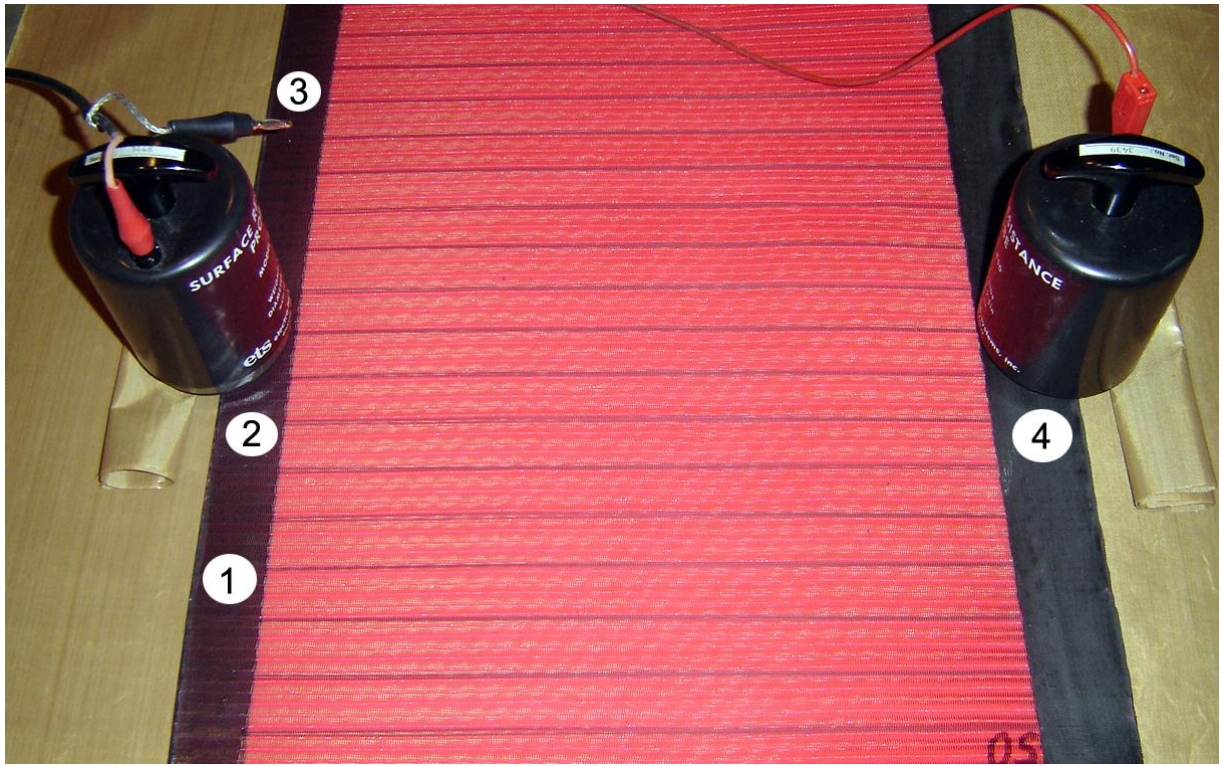
Electrical resistance in spiral fabrics with antistatic filler



Electrical resistance between measuring points:

❶ → ❷ = 4,6 x $10^8\Omega$

❶ → ❸ = 6,7 x $10^8\Omega$

❶ → ❹ = 1,2 x $10^{10}\Omega$

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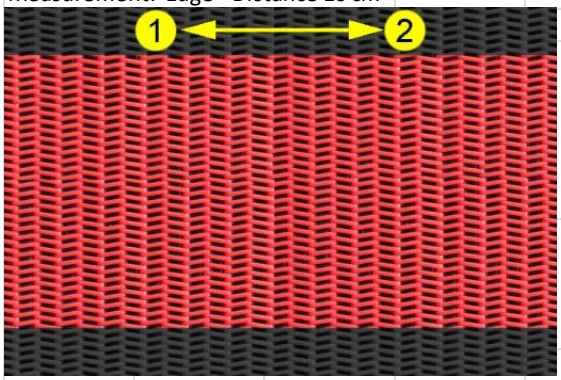
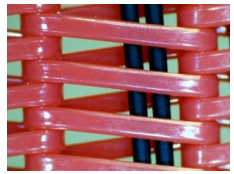
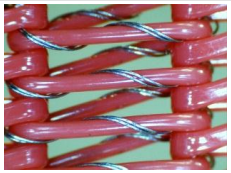
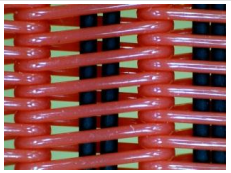
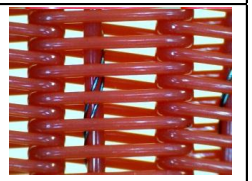
Electrical resistance within the edge (MD)

Measurement: Edge - Distance 10 cm



	ITV 01.12.2016	ITV 04.08.2016	ITV 21.08.2013	ITV 28.11.2016
Type	**55000 A**	**55000 S A-5**	**70000 S7L A-5**	**43800 FSL F2A**
Picture				
electrical resistance [Ω]	2×10^{9}	$1{,}7 \times 10^{8}$	$4{,}2 \times 10^{9}$	$1{,}5 \times 10^{11}$

	ITV 28.11.2016	ITV 28.11.2016	ITV 28.11.2016	ITV 28.11.2016
Type	**43800 FSL F1M**	**43000 FSL M6**	**40700 S F2A**	**40800 S F1M**
Picture				
electrical resistance [Ω]	$1{,}7 \times 10^{10}$	$4{,}4 \times 10^{9}$	$2{,}8 \times 10^{10}$	$3{,}5 \times 10^{9}$

Antistatic Spiral Fabrics

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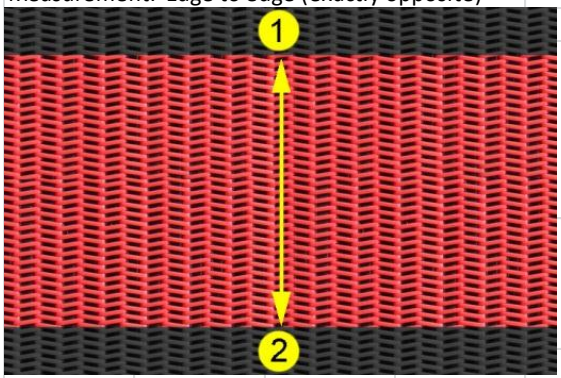
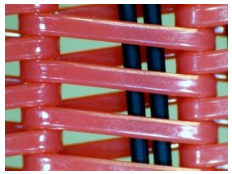
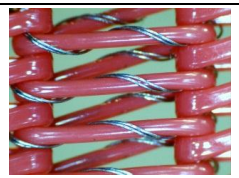
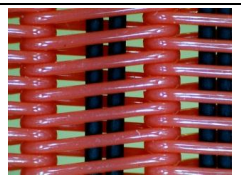
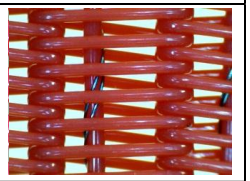
Electrical resistance from edge to edge (CD)

Measurement: Edge to edge (exactly opposite)



	ITV 01.12.2016	ITV 04.08.2016	ITV 21.08.2013	ITV 28.11.2016
Type	**55000 A**	**55000 S A-5**	**43800 FSL F2A**	**43800 FSL F2A**
Picture				
electrical resistance [Ω]	5×10^{9}	$1{,}6 \times 10^{10}$	$4{,}2 \times 10^{9}$	$8{,}5 \times 10^{10}$

	ITV 28.11.2016	ITV 28.11.2016	ITV 28.11.2016	ITV 28.11.2016
Type	**43800 FSL F1M**	**43000 FSL M6**	**40700 S F2A**	**40800 S F1M**
Picture				
electrical resistance [Ω]	$1{,}1 \times 10^{10}$	$2{,}0 \times 10^{3}$ *	$2{,}0 \times 10^{11}$	$3{,}9 \times 10^{8}$

* possible contact of electrodes to metal helix

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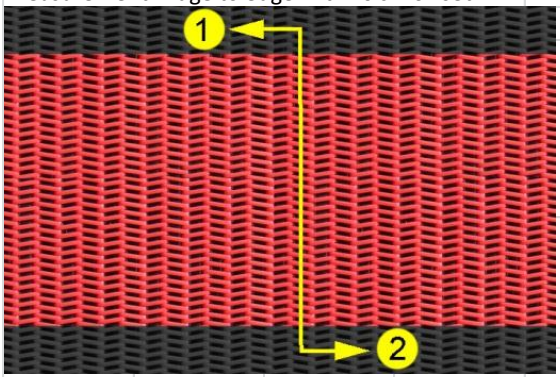
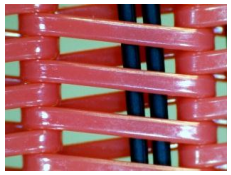
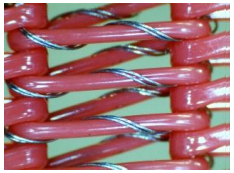
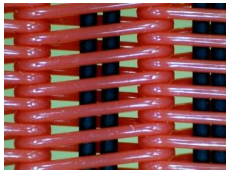
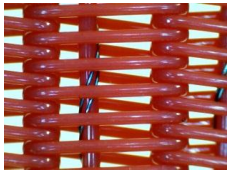
Electrical resistance from edge to edge with additional offset

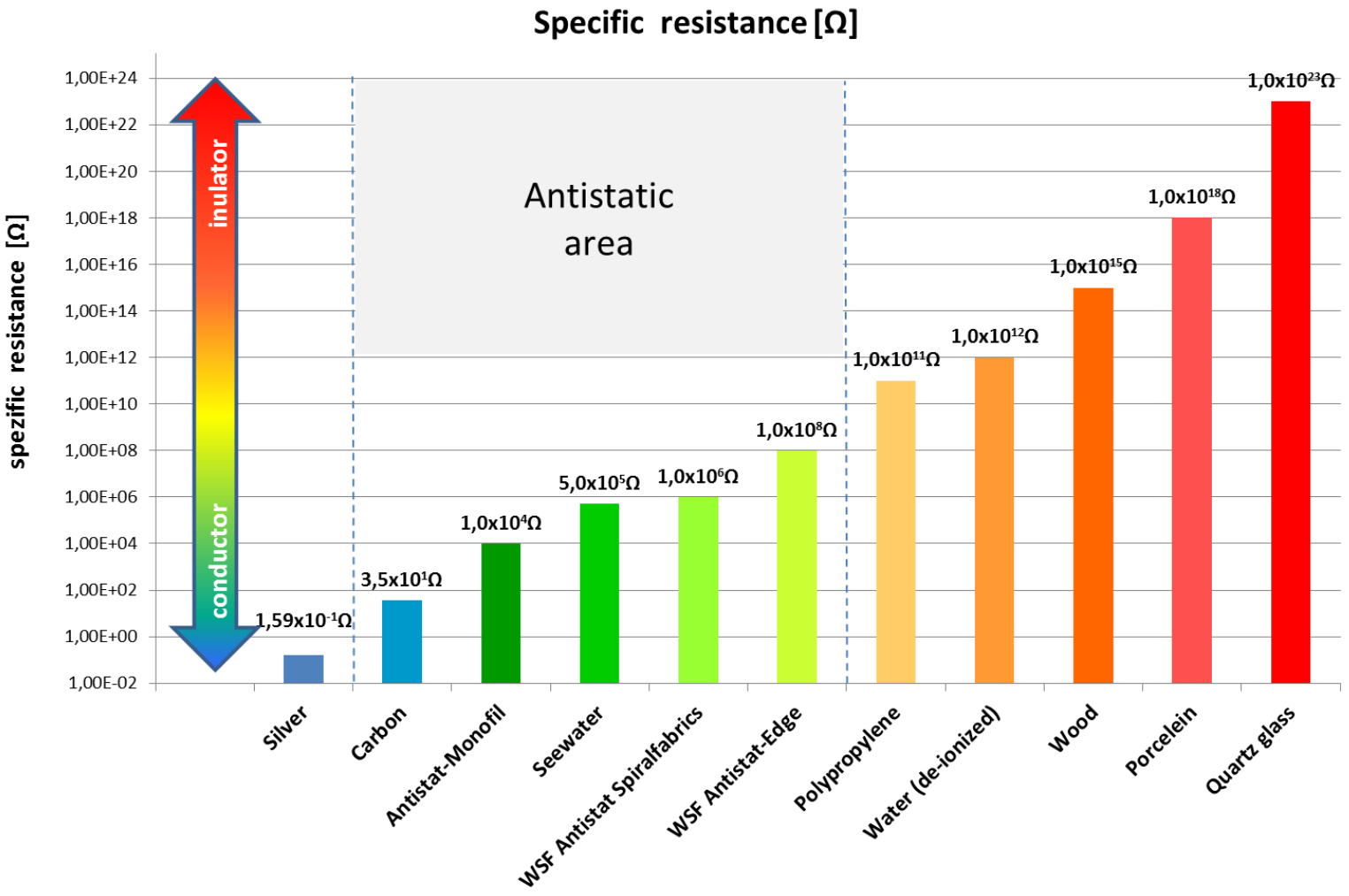
Measurement: Edge to edge with 10 cm offset



	ITV 01.12.2016	ITV 04.08.2016	ITV 21.08.2013	ITV 28.11.2016
Type	**55000 A**	**55000 S A-5**	**43800 FSL F2A**	**43800 FSL F2A**
Picture				
electrical resistance [Ω]	1×10^{10}	kM	$2{,}6 \times 10^{10}$	$1{,}6 \times 10^{10}$

	ITV 28.11.2016	ITV 28.11.2016	ITV 28.11.2016	ITV 28.11.2016
Type	**43800 FSL F1M**	**43000 FSL M6**	**40700 S F2A**	**40800 S F1M**
Picture				
electrical resistance [Ω]	$9{,}5 \times 10^{9}$	$3{,}6 \times 10^{9}$	$1{,}0 \times 10^{11}$	$6{,}9 \times 10^{9}$

Antistatic Spiral Fabrics



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Electrostatic charge

Definition: In a neutral, non-charged body the number of electrons and protons is identical. The body can be positively or negatively charged by transfer of electrons, meaning release or intake of electrons.

The charge can be generated by

- friction
- electrical charge
- electric induction

To imitate an application in the nonwovens industry, a spiral fabric is charged by corona electrode with the intention of analyzing its electrostatic behaviour.

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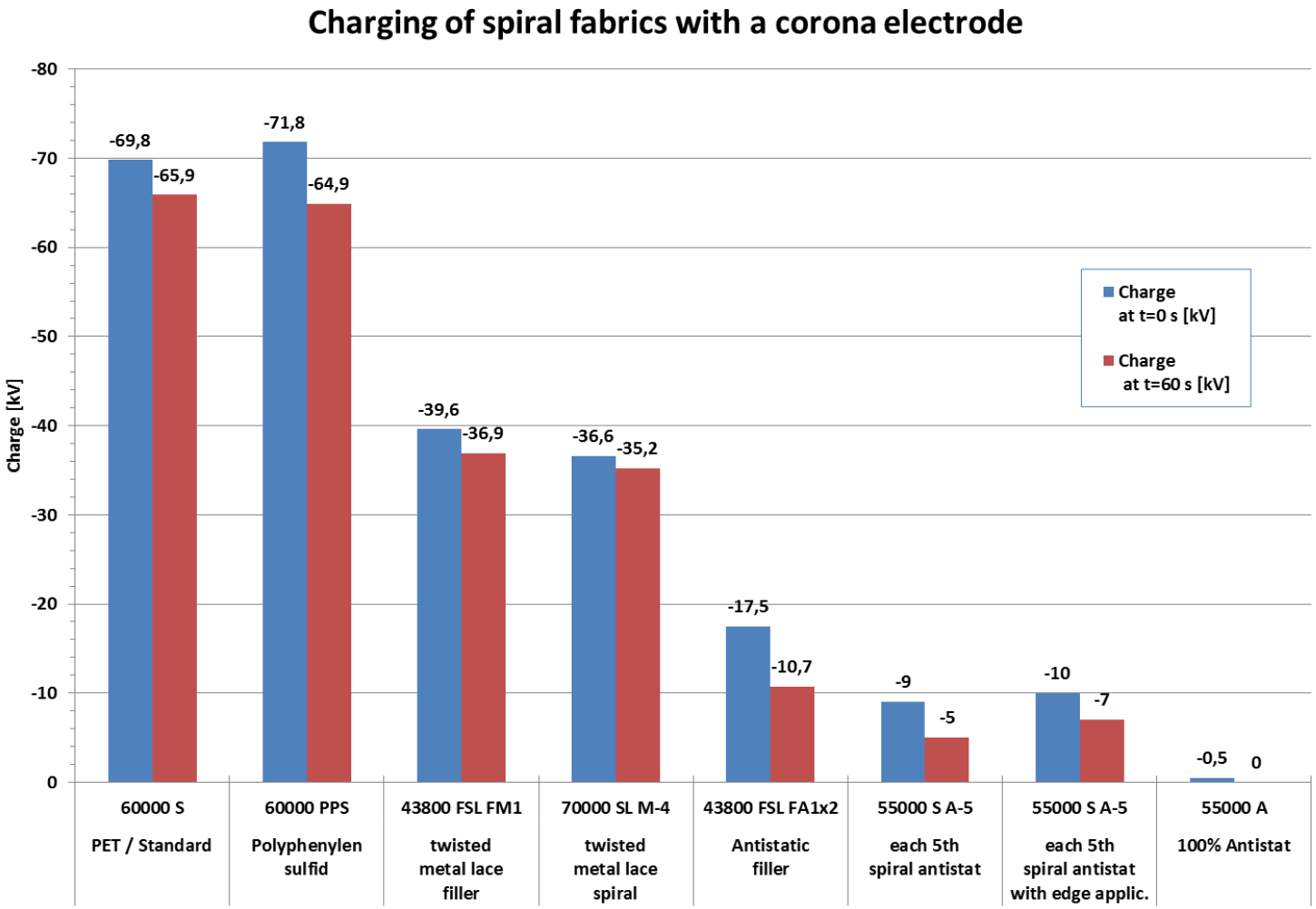

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Electrostatic Charge

Practical comparison of different spiral fabrics

Video 1:	A standard spiral fabric is charged by a corona electrode and tested for electrostatic attraction force towards PP fibers
Video 2:	A partially antistatic spiral fabric is charged by a corona electrode and tested for electrostatic attraction force towards PP fibers
Video 3:	A totally antistatic spiral fabric is charged by a corona electrode and tested for electrostatic attraction force towards PP fibers

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Designs / Extract from the portfolio:

Qualität PET Antistatisch *Spezial Rundspiralen*		Qualität PET Metallummantelt *Spezial Rundspirale*	
Spiralsolution	70000 A	Spiralsolution	70000 S7L M-5
		Spiralsolution	70000 S7L M-10
Spiralsolution	70000 S7 A-5		
Spiralsolution	70000 S7 A-10		
Spiralsolution	70000 S7L A-5		
Spiralsolution	70000 S7L A-10		
Spiralsolution	70250 S7L A-5		
Spiralsolution	70250 S7L A-10		
Spiralsolution	70400 S7L A-5		
Spiralsolution	70400 S7L A-10		
Spiralsolution	70600 S7L A-5		
Spiralsolution	70600 S7L A-10		

Antistatic Spiral Fabrics

… and examples of data sheets:

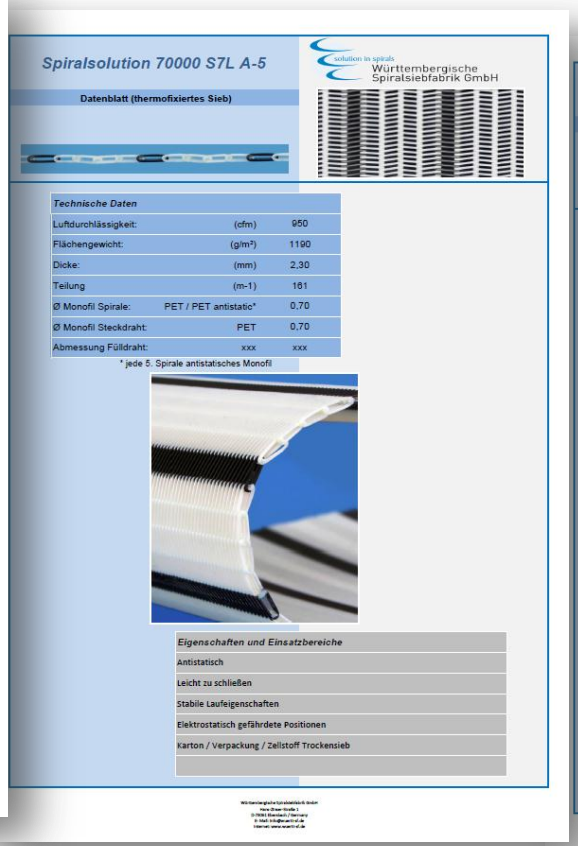
Spiralsolution 70000 A

Datenblatt (thermofixiertes Sieb)

Württembergische Spiralsiebfabrik GmbH

Technische Daten		
Luftdurchlässigkeit:	(cfm)	900
Flächengewicht:	(g/m²)	1310
Dicke:	(mm)	2,30
Teilung	(m-1)	191
Ø Monofil Spirale:	PET antistatic	0,70
Ø Monofil Steckdraht:	PET	0,90
Abmessung Fülldraht:	xxx	xxx

Eigenschaften und Einsatzbereiche
Antistatisch
Leicht zu schließen
Stabile Laufeigenschaften
Elektrostatisch gefährdete Positionen
Karton / Verpackung / Zellstoff Trockensieb



Spiralsolution 70000 S7L A-5

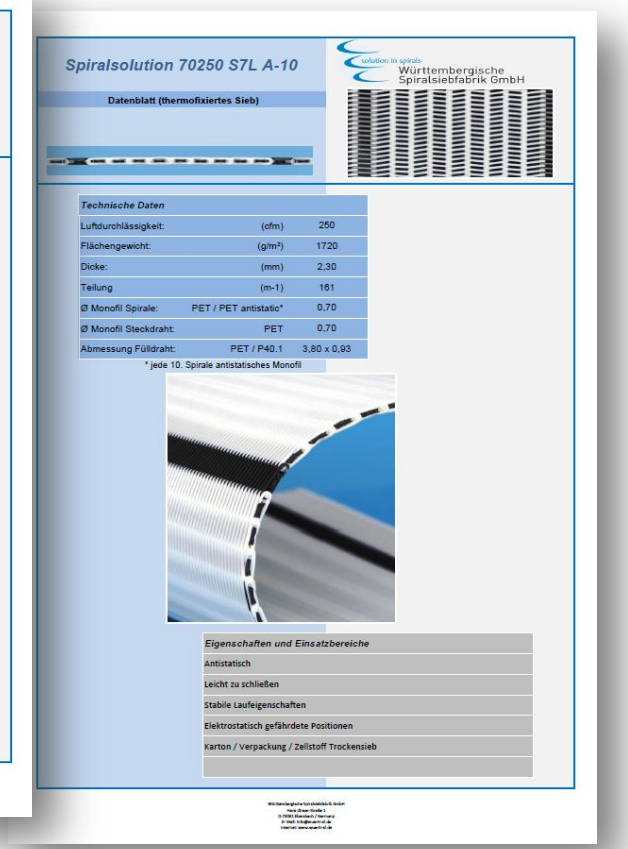
Datenblatt (thermofixiertes Sieb)

Württembergische Spiralsiebfabrik GmbH

Technische Daten		
Luftdurchlässigkeit:	(cfm)	950
Flächengewicht:	(g/m²)	1190
Dicke:	(mm)	2,30
Teilung	(m-1)	161
Ø Monofil Spirale:	PET / PET antistatic*	0,70
Ø Monofil Steckdraht:	PET	0,70
Abmessung Fülldraht:	xxx	xxx

* jede 5. Spirale antistatisches Monofil

Eigenschaften und Einsatzbereiche
Antistatisch
Leicht zu schließen
Stabile Laufeigenschaften
Elektrostatisch gefährdete Positionen
Karton / Verpackung / Zellstoff Trockensieb



Spiralsolution 70250 S7L A-10

Datenblatt (thermofixiertes Sieb)

Württembergische Spiralsiebfabrik GmbH

Technische Daten		
Luftdurchlässigkeit:	(cfm)	250
Flächengewicht:	(g/m²)	1720
Dicke:	(mm)	2,30
Teilung	(m-1)	161
Ø Monofil Spirale:	PET / PET antistatic*	0,70
Ø Monofil Steckdraht:	PET	0,70
Abmessung Fülldraht:	PET / P40.1	3,80 x 0,93

* jede 10. Spirale antistatisches Monofil

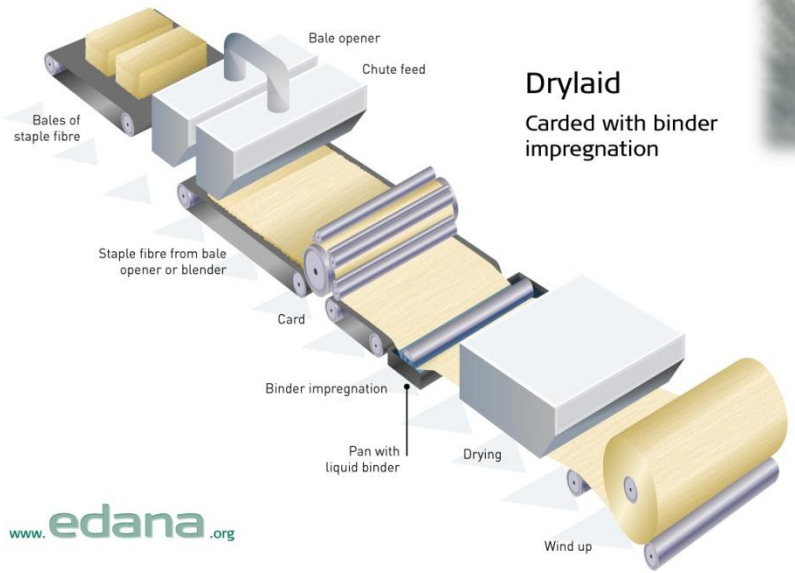
Eigenschaften und Einsatzbereiche
Antistatisch
Leicht zu schließen
Stabile Laufeigenschaften
Elektrostatisch gefährdete Positionen
Karton / Verpackung / Zellstoff Trockensieb

Antistatic Spiral Fabrics

solution in spirals
Württembergische Spiralsiebfabrik GmbH

Possible applications in the nonwovens industry?

Drylaid



Antistatic Spiral Fabrics

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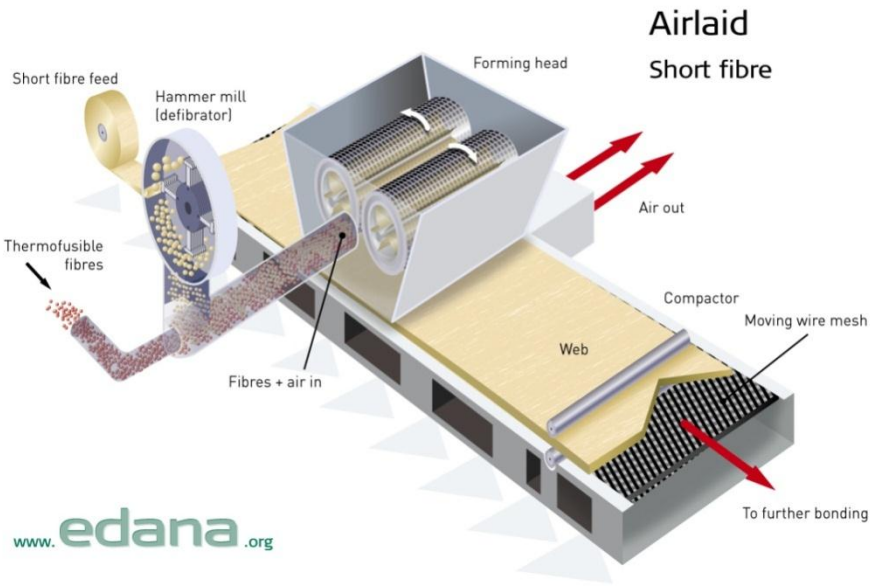
Airlaid



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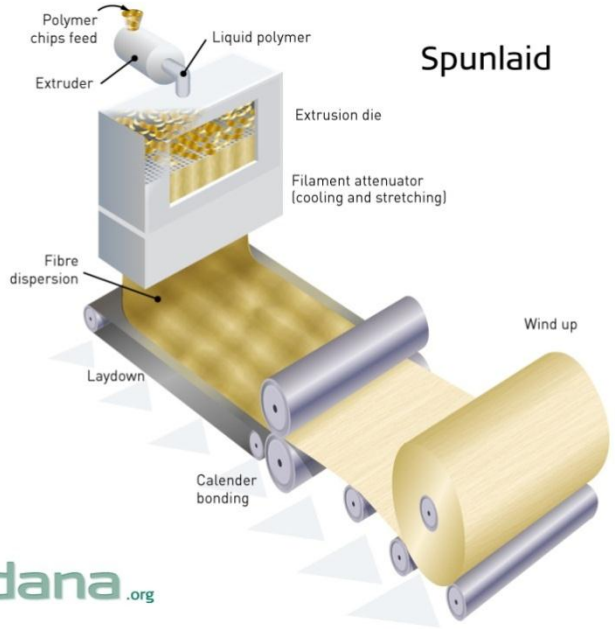
Spunlaid



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Meltblown

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Wood industry

Wood industry / processing in potential flash fire environments

Antistatic Spiral Fabrics

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Reference sources:

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Antistatic Spiral Fabrics

solution in spirals
Württembergische Spiralsiebfabrik GmbH

The WSF-Homepage is work in progress, but we'll gladly visit you personally to introduce our company / product portfolio / capabilities and to discuss your client requirements.

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Thank you for your interest!

Oliver Maier, January 2017