Technical Paper

Lakeland garments, ATEX Directives and regulations: The use of Lakeland garments in ex-zones and explosive atmospheres

In some cases users may need to use Lakeland protective coveralls in EX-zones or explosive atmospheres. There is some confusion over the applicability of the ATEX regulations to PPE and protective clothing. This document seeks to explain the principals behind the regulations, the correct standards to relating to protective clothing for explosive atmospheres and the issues to consider in such applications.

This is an extensive document with detailed analysis of relevant directives and standards and explanations of the technologies and concepts involved. An executive summary is provided below, though we recommend reading of the entire document for a full understanding.

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Executive Summary

1. ***Anti-static properties of all standard disposable garments are achieved using a topical treatment. These treatments have a high degree of uncertainty, rely on absorbing moisture from the atmosphere and so work less well in areas of low relative humidity and are known to rub off or erode over time – yet CE certification requirements (to EN1149) require only one test at the time of certification. There are no requirements or defined systems to confirm that anti-static properties remain on garments after manufacture or storage or during use.***

2. ***Meeting the "anti-static" requirements of EN 1149 means achieving a reduced surface resistivity (or increased surface conductivity) of 2.5 x $10^9\Omega$ at a relative humidity of 25%. This allows any static charge to dissipate and go to earth – but also relies on the garment being grounded in some way, and relies on a humidity of 25% or above.***

3. ***ATEX directives (*Directive 99/92/EC and Directive 94/9/EC) along with associated regulations such as DSEAR and BGR 132 are not relevant to PPE and protective clothing (other than a general requirement to be constructed to avoid incendiary static discharges). In fact in Article 1.4 the ATEX equipment directive SPECIFICALLY EXCLUDES ITS APPLICATION TO PPE AND PROTECTIVE CLOTHING. Thus any claim that a garment is certified or approved to ATEX regulations is incorrect and has no legal basis.**

4. ***The use of protective clothing for use in explosive atmospheres is specifically provided for in the PPE directive 89/686/EEC in clause 2.6. The PPE directive requires clothing claiming to be anti-static is certified to EN 1149-5.***

5. ***Anti-static standard EN 1149-5:2006 (currently a prEN) contains requirements for garment surface resistance (in EN1149-1 : 2.5 x $10^9\Omega$)*** **and for garment design and marking. This standard is a more stringent requirement than any other regulation such as the sometimes used German BGR 132 regulation.**

6. ***Thus approval to EN1149-5 under the PPE directive currently provides the best option for approval of garments*** **for use in explosive atmospheres – though because of uncertainty this is not an absolute confirmation that any garment is suitable in all explosive atmospheres. A statement to this effect is required by EN1149-5.**

7. ***Given the uncertainty in electro-static discharge events, any assessment of garments for use in explosive atmospheres should be conducted by a local, qualified safety engineer with the consideration that other measures may be required.***

8. ***Lakeland Pyrolon garments are intrinsically anti-static and do not require topical anti-static treatments and will maintain anti-static properties through their lifespan so may be an option in some applicastions.***

9. ***In potentially explosive atmospheres consideration of whether flame and heat protection is also required should be considered. Lakeland Pyrolon TPCR offers chemical, anti-static AND flame and heat protection(to EN11612) in one garment.***

1. Introduction: Disposable clothing and anti-static Treatments – how do they work?

According to the protective clothing directive 89/686/EEC clothing intended for use in potentially explosive atmospheres must be constructed so as to minimise the risk of unintended sparks resulting from static charge build up or other factors. To achieve this garments are manufactured to meet the requirements of anti-static standard EN1149, which defines the maximum allowable surface resistance of a fabric in order to minimise the possibility of a static discharge in the form of a spark.

What do we mean by "anti-static?"

The term is used freely by many manufacturers and users without any real explanation or even perhaps understanding of what it means in the context of protective clothing. The fact is few people really understand what "electricity" is and how it works. We just know that it comes out of the light bulb when we switch the light on in the same way water comes out of the tap when we turn the tap on.

The majority of disposable or limited life protective clothing is made using fabric consisting of either polypropylene, polyethylene or a combination of both – man-made polymers (plastics) that untreated have high insulation properties, are NOT conductive and have a strong tendency to build static charges which may then be released through an arc or spark when the fabric comes into close proximity with another surface. We have all been aware of this phenomena when we receive a "bang"or "shock" from a car door handle when an electrical static charge that has built up on our body "jumps" across to the door handle from our finger – because an electrical charge is always trying to get to the ground and we are wearing non-conductive shoes with a rubber or similar sole and it can't… until it finds a route by jumping to the car and to the ground that way. Of course, if this happens to occur in an explosive atmosphere, then the spark may provide sufficient energy to cause an ignition and explosion with possibly disastrous and fatal consequences. *So how, if disposable fabrics are not naturally conductive, are they given anti-static properties to reduce the potential for this hazard?*

In simple terms a topical chemical treatment is applied to the surface of the fabric either through a roller bath or a spraying process during the manufacture of the fabric itself (not during the assembly of the garment). The treatment is basically a weak surfactant (washing-up liquid!) that has a property of absorbing moisture from the surrounding atmosphere, thus creating a fine conductive layer on the fabric surface which allows dissipation of any charge to earth so that it does not build to the point where a sudden discharge spark may occur.

☞ **Almost all standard disposable type fabrics (Lakeland Pyrolon are an exception as they are based on a different technology) are not naturally conductive and are therefor not naturally anti-static. All achieve anti-static properties through the application of this type of topical treatment.**

There are several consequences of anti-static or conductive properties being created in this way:-

1. The level of surface conductivity (which of course is the inverse of surface resistance) – it's degree of anti-static - will depends on several factors over time:-
   a. The amount of the anti-stat treatment
   b. The concentration of the anti-static treatment used
   c. The *consistency* and *control* of the above two factors. The application of such treatments unavoidably has a high uncertainty factor. The requirements of EN 1149-1 and 5 for testing surface resistivity requires only one test at the time of certification to prove the requirements are met (unless garments are certified under Article 11A – see Note 1 – Appendix 3). *Thus a surface resistivity test may have been coinducted once several years ago and there may be little auditing of the consistency and control of the process to prove the correct level of anti-static properties remains during production.*
   d. The longevity and durability of the treatment. The treatment is applied during fabric manufacture. The fabric may be shipped, stored at the garment manufacturers premises, assembled into a garment, shipped (usually from China to the source of local demand, stored with a distributor, stored by the user and eventually used. We can assume that this period is an absolute minimum of 3 to 4 months). Furthermore inevitably the nature of such a topical treatment is that it may rub off during garment manufacture, during use or simply erode over time. It is therefor an unavoidable fact of life that a garment which has been worn for 3 hours may not have the same anti-static properties over the whole of its surface area as when it was taken from the packaging.
   e. The relative humidity in the area in which the garment is used. This is important because the effectiveness depends on absorbing moisture from the surrounding atmosphere – the lower the relative humidity the less effective it will be). It is for this reason that in EN 1149 an unnaturally low RH of 25% is used – to ensure the process works in low humidity as well as a high one. However in drier areas the anti-static properties will be reduced.
   f. The purpose of enhancing the conductivity of the fabric surface is to allow any charge to dissipate and go to earth harmlessly. Thus it is important that not only is the garment fabric anti-static, but that a method or route is provided for this to happen without creating any sparks through "jumping" to other surfaces. Thus the fabric should remain in contact with the wearers skin (at the wrists for example) – provided he is wearing suitably conductive footware. Another option is to use garments with attached feet so the fabric surface is always in contact with the ground. *Unless such grounding is available, the anti-static properties of the garment may be useless*.

2. Any topical chemical treatment is likely to have unintended side effects. Known possible side effects of anti-static treatments are:-
   a. A surfactant also has the unavoidable effect of reducing the surface tension of any liquid it comes into contact with. Since most disposable garment fabrics rely largely on surface tension for their repellency properties (i.e. for Type 6 protection), an over application of an anti-static treatment may result in a lowering of the fabric's repellency properties. Further, there is little in certification and testing processes to confirm that the garment or fabric that is tested for Type 6 repellency is also the fabric or garment that has been treated and tested for anti-static properties*. It is the fact that a manufacturer can relatively easily conduct repellency testing on a fabric without anti-stat treatment and then test the treated fabric for anti-static in order to achieve the two results he needs. There is no proof that any*

specific manufacturer has done this, but the fact is there is little control in the system to ensure that it has not. And if it has it has not necessarily the fact that it has been a deliberate deceit; many manufacturers are likely to be unaware that an anti-static treatment may have this affect.

b. Surfactants as anti-static treatments work by absorbing moisture from the atmosphere. Unfortunately they may also absorb moisture from skin when in contact with it. Skin is a porous menmbrane, and If this happens it can remove the natural oils from the skin – oils that are the skin's defences against infections in the atmosphere. The result can sometimes be reddening and soreness of the skin at wrists and neck, often assumed to be an allergic reaction to the fabric itself. It is not. The reaction is to other contaminants in the air that have "attacked" the skin because of the absence of the natural defensive oils which have been removed by over applied anti-static treatment. Thus over-use (or using an over concentrated level) of an anti-static treatment can also cause problems with the innocuousness of the garment.

In summary:-

1. *Disposable garment fabrics are NOT naturally conductive and must have a topical chemical treatment on the surface to achieve anti-static properties*
2. *This topical treatment relies on absorbing moisture from the atmosphere to increase surface conductivity (or reduce the surface resistivity). Clearly this is less effective in a low humidity area than in a high one*
3. *The nature of applying such treatment necessarily features a relatively high level of uncertainty, and unavoidably its effectiveness may degrade over time for various reasons.*
4. *The controls within CE certification and testing for the consistency of anti-static properties over time are virtually non-existent and the controls to ensure garments are tested correctly are limited and rely on a certain – in fact quite high - level of honesty and knowledge on the part of manufacturers; if anti-static is an important factor – the advice must be only use a trusted and known manufacturer – and consider installing your own QC procedures to ensure levels of anti-static are maintained both through the life of the garment and with ongoing supplies of coveralls*.

2. Directives and regulations for the control of products and equipment intended for use in explosive atmospheres

User and distributors often ask for confirmation or evidence that protective clothing is certified or approved according to ATEX regulations. Some manufactuers have also claimed that their garments are certified or approved according to ATEX regulations or standards. Unfortunately this betrays an essential misunderstanding of these regulations.
There are two EC directives relating to explosive atmospheres:-

a. Directive 99/92/EC (also known as "ATEX 137" or "ATEX Workplace Directive")

This standard defines "Minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres". Requirements of

99/92/EC were put into force in the UK through regulations 7 and 11 of the Dangerous Substances at work Regulations 20002 – known as DSEAR.

Annex II of Article 2.3 of the directive states:-

"Prevention of ignition hazards in accordance with article 3 must also take account of electrostatic discharges, where workers or the working environment act as charge carrier or charge producer. Workers must be provided with appropriate clothing consisting of materials which do not give rise to electrostatic discharges that can ignite explosive atmospheres"

This directive contains no other requirements or mention of protective clothing or PPE in the directive other than this; a general requirement for the provision of clothing that will not give rise to electrostatic discharges.

b. Directive 94/9/EC (also known as " ATEX 95 or "The ATEX Equipment Directive")

This directive concerns the selection of equipment and protective systems for use in potentially explosive atmospheres and it is here that some users expect a provision for certification of PPE and protective clothing.
However this directive applies to electrical and mechanical equipment and protective systems intended for use in potentially explosive atmospheres. It does not apply to protective clothing

In fact this directive *SPECIFICALLY EXCLUDES ITEMS OF PPE FROM BEING CERTIFIED UNDER IT*. Article 1.4 of the directive states:-

1.4. The following are excluded from the scope of this Directive:"

- Personal protective equipment covered by Directive 89/686/EEC"

(See copy of clause - Appendix 1)

There is nothing ambiguous about this. PPE covered by 89/686/EC (including protective clothing) is specifically excluded from inclusion or certification under this directive. The directive contains no standards or test methods for the provision of approval of PPE because PPE is not intended to be part of its remit.

☞ **THUS ANY CLAIM BY A MANUFACTURER TO HAVE PROTECTIVE CLOTHING APPROVED FOR OR CERTIFIED TO ATEX REGULATIONS IS MAKING A FALSE OR MISLEADING CLAIM AND ANY DOCUMENTATION WOULD NOT BE LEGALLY ENFORCIBLE. There are no provisions or testing within the ATEX regulations that relate to protective clothing and no facilities detailed in ATEX that will confirm whether or not protective clothing is suitable for explosive atmospheres.**

3. **DSEAR – Dangerous Substances and Explosive Atmospheres Regulations 2002**

The requirements of Directive 99/92/EC (the "ATEX Workplace Directive") were put into operation in the UK through regulations 7 and 11 of DSEAR. The basic requirement of DSEAR is to require employers to eliminate or control the risks from dangerous substances – including those that may result in an explosive atmosphere.

DSEAR, as according to the EC directive, defines different classes or "zones" of explosive atmospheres as follows:-

For gases, vapours and mists:-

Zone 0	A place in which an explosive atmosphere… is present continuously or for long periods of time
Zone 1	A place in which an explosive atmosphere… is likely to occur in normal operation occasionally
Zone 2	A place in which an explosive atmosphere… is not likely to occur in normal operation but, if it does occur, will persist for a short period only

For dusts:-

Zone 20	A place in which an explosive atmosphere in the form of a cloud of combustible dust… is present continuously or for long periods or frequently
Zone 21	A place in which an explosive atmosphere in the form of a cloud of combustible dust… is likely to occur in normal operation occasionally
Zone 22	A place in which an explosive atmosphere in the form of a cloud of combustible dust… is not likely to occur in normal operation but, if it does occur, will persist for a short time only.

☞ ***NOTE THAT THESE ZONE CLASSIFICATION CONTAIN NO REFERENCE TO THE WHETHER COMBUSTION OR AN EXPLOSION FROM AN ELECTROSTATIC SPARK IS MORE OR LESS LIKELY TO OCCUR BUT PURELY TO THE LIKELIHOOD AND / OR FREQUENCY OF AN EXPLOSIVE ATMOSPHERE BEING PRESENT***

Schedule 3 of DSEAR includes:-

"Criteria for selection of equipment and protective systems"

Clause 2:

- In Zone 0 or 20, Category 1 equipment
- In Zone 1 or 21, Category 1 or 2 equipment
- In zone 2 or 22, Category 1,2 or 3 equipment

However, these categories of equipment relate to the types of equipment intended in the directive and regulations and there is no method of applying these categories to protective clothing. Nor are there any specific tests or requirements for protective clothing other than the general requirement as in the related Directive.

☞ ***There is nothing in ATEX or DSEAR that provides for testing of PPE or protective clothing to confirm or deny that it is or is not suitable for use in explosive atmospheres other than the general requirement for clothing to be designed to avoid electrostatic discharges. This is undoubtedly because the ATEX directives and associated regulations are specifically not intended to apply to protective clothing.***

Conclusion

☞ ***ATEX, DSEAR or any other ATEX-associated regulation is useless for the assessment of PPE and protective clothing for use in explosive zones. The ATEX directivesand related regulations contain no provision for testing or approval of PPE and in fact specifically excludes them. Any claim that an item of PPE is certified under ATEX regulations is meaningless and has no legally enforcible basis.***

4. <u>BGR 132</u>

Some protective clothing manufacturers have used the German regulation BGR 132 as a reference for assessment and approval of protective clothing for use in explosive atmospheres. BGR 132 is (was) the German regulation putting into national German law the requirements of the two ATEX EC directives (in the same way that DSEAR is the UK national regulation applying the Directives in the UK). Statements taken from the regulation such as:-

"Dissipative materials either:

5. *Have a resistivity between 10^4 and 10^9 ohms*
6. *Have a surface resistance of [between] 10^4 to 10^9 ohms at 23^{o}C and 50% Relative Humidity*
7. *Have a surface resistance of [between] 10^4 to 10^{11} ohms at 23^{o}C and 30% Relative Humidity"*

… have been used in order to claim suitability or approval for use in explosive atmospheres.

However, BGR 132 does actually include a specific reference to clothing requirements in Clause 3.5.3. (see Appendix 2 for full german text and English translation). This states that [summarised]:-

8. Normal and protective clothing can become charged but that wearing it in an explosive atmosphere should present no danger provided the person is suitably grounded
9. That with some types of clothing eg "PU-coated" weather clothing, hazardous charges may occur [PE and PP disposable protective clothing - ie most of the clothing on the market - would definitely fall into this category]
10. That in zones 0, 1, 20 and 21 [see ATEX directives} protective clothing or work clothes of any type must not be donned, changed or removed.
11. That in Zone 0 areas only "dissipative" clothing should be used, and that
12. Conductive dissipative clothing and textiles have a maximum surface resistivity of 5 x $10^{10}\Omega$, [though no reference to Relative Humidity is defined), and
13. A reference to EN 1149-1 as the appropriate standard testing and measuring of "dissipative" clothing.

In Short BGR 132 specifically states that in the highest class zone, Zone 0, that only “dissipative” clothing should be used and that the definition of a “dissipative” material is to be found in EN1149-1.

It is also worth noting that:

1) BGR 132 is a redundant regulation issued in 2004, repealed in April 2009 and replaced by TRBS 2153. The newer regulation contains largely the same text regarding clothing in clause 7.3
2) The reference to EN 1149-1 in BGR 132 is now outdated. The latest version of EN 1149-1 from 2006 is purely defining the test method to measure surface resistance of materials for protective clothing and gives no actual garment requirement. The garment requirements for anti-static (or dissipative) clothing are now defined in EN 1149-5: 2006 – of course published AFTER the BGR 132 regulation. (At this stage EN1149-5 remains a draft standard awaiting ratification, but must be used as the basis for assessment because part 1 contains no requirements – there is no other standard to use!). The requirements defined in EN 1149-5 are detailed below and are more stringent than the requirements detailed in BGR 132 / TRBS 2153 and therefore more stringent than the requirements used by some manufacturers to assess suitability for explosive atmospheres detailed above. EN1149-5 also contains garment design and labelling requirements as well as a simple requirement for surface resistance of fabric.

5. Directive 89/686/EC

89/686/EC is the overall directive covering all protective clothing – for protection against chemicals, flame and heat, impact, cut etc. Whilst users are asking for approval of protective clothing under ATEX regulations this directive in fact does include a reference to clothing intended for use in explosive atmospheres:-

Directive 89/686/EC – Clause 2.6:

“2.6. PPE intended for use in explosive atmospheres must be so designed and manufactured that it cannot be the source of an electric, electrostatic or impact-induced spark likely to cause an explosive mixture to ignite”

☞ **The conclusion, combined with the PPE exclusion in ATEX and the requirements of EN 1149-5 (detailed below) is that the requirements of clothing for use in explosive atmospheres is perfectly and adequately covered in the PPE directive and in the associated EN 1149-1 and 5 standards and without reference to the ATEX regulations at all. In fact, as we have seen such protective clothing is specifically EXCLUDED from certification or approval under the ATEX regulations and associated DSEAR or other European legislation such as BGR 132.**

6. prEN 1149-5:2006

prEN 1149 is the standard falling under Directive 89/686/EC for protective clothing and is used to assess garments and garment fabrics for “anti-static” properties; in other words to ensure they will not allow the build-up of a static charge that may result in an electro-static spark causing an ignition in an explosive atmosphere or other hazard. Note that part 5 is the garment requirements whilst

part 1 is purely the surface resistance test method. (ther parts deal with other types of resistance and/or conductivity). The full title of the standard is:-

EN1149-5:2006 *Protective Clothing – electrostatic properties – Part 5: Performance requirements:-*

…and includes the following text:-

Scope: *This European standard specifies requirements for electrostatic dissipative protective clothing, used as part of a total earthed system, to avoid incendiary discharges. The requirements may not be sufficient in oxygen enriched atmospheres.*

And:

4.2.1 Material Requirements

An electrostatic garment shall meet [at least one of] the following requirements:

- *a surface resistance of less than or equal to $2.5x10^9\Omega$, on at least one surface, tested according to EN1149-1*

Note that the test parameters of EN 1149-1 requires the following;-

4.3.3 Conditioning and test parameters

The specimen shall be conditioned for at least 24H prior to testing and shall be tested in the following atmosphere:

Air temperature: *(23+/-1) ^oC*
Relative Humidity: *(25 +/-5) %*

☞ **Note that this EN1149-5 requirement of $2.5x10^9\Omega$ is a <u>more stringent</u> requirement than that stated in some claims related to ATEX and BGR 132 (detailed above) in which the test requirement (relating to the BGR 132 regulation) is stated as being that dissipative materials**

14. ***Have a surface resistance of [between] 10^4 to 10^9 ohms at 23^oC and 50% Relative Humidity***
15. ***Have a surface resistance of [between] 10^4 to 10^{11} ohms at 23^oC and 30% Relative Humidity"***

In other words at a higher relative humidity than that specified in EN1149-1 and 5 (bearing in mind that anti-static treatments perform better at higher relative humidities).

It is also worth recalling that in the BGR 132 regulation itself (again detailed above) the requirement is for a maximum surface resistivity of $5x10^{10}\Omega$ with no specification of relative humidity. (And as we have seen Relative Humidity is a vital component because of the way anti-static treatments work – a high RH means an anti-static treatment will more easily achieve a lower surface resistivity)

Thus EN 1149 is a more stringent requirement than BGR 132.

Anti-Static treatments and Uncertainty

If an electro-static discharge is going to occur, is it possible to predict precisely when and where it will occur?

Evidently it is not. The discharge of an electric spark as the charge jumps from a charged body to a grounded body is affected by many factors in the components bodies and in the surrounding atmosphere to the extent that like predicting the weather the principal of chaos applies and the prediction of the precise result – the precise time or even whether or not a discharge will occur – is all but impossible.

However, the reasons and conditions in which such potentially incendiary sparks occur are well understood. As such – and as is the case with all types of protection - the objective of standards and guidance is to MINIMISE the risk of such events occurring. There is no guarantee – in the same way that there is no guarantee with any other types of protection: it is impossible to be certain for example that when there is a chemical splash that the chemical suit you are wearing will provide all the protection you need – or that if there is a flash fire that the FR garment you are wearing will be sufficient. There is no way to be certain – but you can minimise the risks by selecting the best or most appropriate clothing. So it is with the anti-static properties of protective clothing and the potential for creating and avoiding electrostatic sparks. It is for this reason that EN 1149 requires any garment user instructions states that the garment may not be suitable for use in all explosive atmospheres and that any recommendations should require that an assessment and the final decision is made by a local, knowledgeable and qualified safety engineer who can assess the local circumstances and environment and make a judgement as to whether the standard and selected garment is appropriate in that particular circumstance.

In general terms in the case of disposable fabrics the best way to minimise the risk is as follows:-

1. Ensure the garment meets the requirements of EMN1149-5. This has a lower and more stringent requirement in terms of surface resistance than the other regulations and standards sometimes used (such as BGR 132).
2. Ensure the garment is earthed properly so that a dissipating charge can go to earth properly. This might include measures such as using a garment with attached feet so that the garment fabric is in constant contact with a conductive floor, though it may relate to more than just the garment itself.
3. In constant and highly flammable atmospheres (ie Zones 0 and 20) a qualified safety engineer should consider whether other measured might be required.

7. Pyrolon XT and CRFR

Whilst most standard polypropylene and/or polypropylene disposable garments require a topical surface treatment to achieve anti-static properties and meet the requirements of EN 1149 – treatments with a high level of uncertainty - Lakeland's Pyrolon XT, CRFR and forthcoming Plus2 are constructed using entirely different technology based on viscose. These Pyrolon fabrics are

intrinsically anti-static and require no treatment, generally have lower surface resistivity that standard disposable garments and will maintain these properties throughout their life and use. This cannot be assured with standard disposable. Pyrolon garments also meet the limited flame spread requirements of EN14116 (previously EN533) and so in the event of a fire will not ignite and make the fire worse or increase burn injury.

Thus the use of Pyrolon garments might be another superior option where an explosive atmosphere presents a risk.

8. Requirement for FR protection?

The final consideration is whether, given that the risk of an ignition resulting in a possible flash fire, users should also be wearing suitable flame and heat protection. Clearly there are a variety of types of clothing on the market offering this type of protection. Lakeland disposable product Pyrolon TPCR offers a combination of Type 3 & 4 chemical protection, is intrinsically anti-static as other Pyrolon garments and also offers flame and heat protection to EN11612 so might be considered in extreme cases.

CONCLUSIONS

1. ATEX EC Directives and associated regulations are useless in terms of the assessment or approval of PPE and protective clothing for use in explosive atmospheres. In fact further than this, the ATEX Equipment Directive specifically EXCLUDES PPE from inclusion and so cannot legally be used as an assessment for protective clothing
2. The use of PPE and protective clothing for use in explosive atmospheres is expressly provided for in the PPE directive 89/686/EC in Clause 2.6., and in the associated standard EN1149-5
3. The best standard for assessment of minimising the risk of producing an electrostatic charge form protective clothing is EN1149-5 because:-
    a. It requires the lowest level of maximum surface resistance ($2.5x10^9\Omega$),
    b. It applies to the garment rather than just to a test on the fabric and includes certain garment design requirements
    c. It also includes recommendations on additional information to be provided by the manufacturer including requirements for appropriate grounding of the garment.
4. Any assessment of the suitability of a garment intended for the avoidance of electrostatic sparks should include:-
    a. Confirmation that the garment meets the requirements of EN 1149-5 (NOT JUST EN 1149-1 – THIS IS PURELY A TEST METHOD). ATEX is not relevant to protective clothing and PPE.
    b. Measures to ensure that the requirements of grounding garments are followed in all cases
    c. A risk assessment of the location of use by qualified safety engineer to conclude whether or not a garment meeting EN1149-5 is sufficient

d. In higher risk areas (Zones 0 and 20 for example), the consideration as to whether a system of confirming the surface resistivity of garments on a local basis – (given the intrinsic uncertainty in the application, consistency and testing of surface resistance on these types of fabrics)
e. An assessment of whether other types of protection such as flame and heat protection (to EN11612), given the potential for a flame hazard in the event of an ignition, should be provided.

Appendix 1

Article 4.1 of ATEX Directive 94/9/EC – specifically excludes PPE from being certified under this directive and related standards.

4. The following are excluded from the scope of this Directive:

— medical devices intended for use in a medical environment,

— equipment and protective systems where the explosion hazard results exclusively from the presence of explosive substances or unstable chemical substances,

— equipment intended for use in domestic and non-commercial environments where potentially explosive atmospheres may only rarely be created, solely as a result of the accidental leakage of fuel gas,

— personal protective equipment covered by Directive 89/686/EEC (1),

— seagoing vessels and mobile offshore units together with equipment on board such vessels or units,

Appendix 2

Clause relating to Clothing from German Regulation BGR 132:-

German:-

3.5.3 Kleidung

Arbeitskleidung oder Schutzkleidung, darf in explosionsgefährdeten Bereichen der Zonen 0, 1, 20 sowie in Zone 21 bei Stoffen mit MZE < 3 mJ nicht gewechselt, nicht aus- und nicht angezogen werden.
Handelsübliche Bekleidung sowie Schutzkleidung kann aufgeladen werden. Beim Tragen stellt sie jedoch im Allgemeinen keine Zündgefahr dar, sofern die Person zB durch geeignetes Schuhwerk und geeignete Fußböden geerdet ist. Trotzdem kann es im Einzelfall, zB bei PU-beschichteter Wetterschutzkleidung, zu gefährlichen Aufladungen kommen.
In Bereichen der Zone 0 und in Bereichen, in denen mit einer Sauerstoffanreicherung oder mit dem Auftreten von Stoffen der Explosionsgruppe IIC zu rechnen ist, darf nur ableitfähige Kleidung getragen werden.
Die ableitfähige Eigenschaft der Kleidung darf, zB durch Waschen, nicht beeinträchtigt werden; gegebenenfalls ist die Kleidung wieder neu zu behandeln.

*Ableitfähige Kleidung oder Textilien besitzen einen spezifischen Oberflächenwiderstand < 5 * 10^{10} Ω*

Siehe DIN EN 1149-1.
Die ableitfähige Eigenschaft der Kleidung kann durch spezielle nachträgliche Ausrüstung der Textilien erreicht werden.
Wird die ableitfähige Eigenschaft des Gewebes durch eingearbeitete leitfähige Fäden erreicht, ist sicherzustellen, dass diese Fäden während der Gebrauchsdauer nicht brechen.

English Translation;-

3.5.3 Clothing

Work clothes or protective clothing may, in hazardous zones 0, 1, 20 and Zone 21 for substances with MIE <3 mJ not changed, not out-and not be attracted.
Conventional clothing and protective clothing can be charged [may contain or develop a static charge]. When wearing it, however, generally is no danger of ignition, such as if [provided] the person is grounded by proper footwear and appropriate flooring. However, it may in some cases, eg in the case PU-coated weather protective clothing[or , hazardous charges {may occur].

In Zone 0 areas and in areas where oxygen is a concentration or occurrence of material of the explosion group IIC expected, only dissipative clothing [should be worn].
May [If] the dissipative property of clothing [be affected] for example by washing, are not affected and, where appropriate, the clothes treat [with anti-stic treatment] again.

*Conductive [dissipative] clothing and textiles have a surface resistivity of <5 * 10^{10} Ω*
See EN 1149-1.

The conductive property of the clothes can be achieved by retrofitting the special textiles.

The dissipative properties of the tissue [can be] obtained through incorporated conductive threads, to ensure that these threads do not break during the service life

. Note:

- reference to EN1149-1 as measurement of the conductive or dissipative properties
- Refers to old measure of <5 x 10^{10}Ω - but no mention of relative humidity requirement

Appendix 3 – Notes

1. Certification of PPE can be undertaken under Article 11A or 11B. Article A requires regular spot checking and testing of garments annually to confirm they remain identical and with the same properties to the original garments certified. Article 11B requires garments to be tested to relevant standards only once, but requires the proof of a suitable quality assurance system (such as ISO 9001) and regular (3 yearly) Article 11B factory audits by the notified body to ensure identical products continue to be produced. The majority of manufacturers use Article 11B – the consequence of which is that it is likely – or at least possible – that the anti-static properties of a garment in the market has been tested only once on a fabric or garment sample and that that test occurred several years ago.