

Assessment report

DTI project J107963-1

Extraction Arms series: Ø57 & Ø76 mm



**DANISH
TECHNOLOGICAL
INSTITUTE**



Assessment report

**Extraction Arms series:
ø57 & ø76 mm**

This report covers the technical requirements related to the use of “PermaVent” extraction arms in ATEX areas where there are special requirements to antistatic / non-sparking performance.

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2. Background

An Electrostatic brush discharge from nonmetallic parts can act as a source of ignition when an explosive gas/air mixture is present. Charging of nonmetallic parts can typically occur when the parts are rubbed by dry clothes (e.g., during cleaning) or during operation when e.g., a rapid air flow pass over the nonmetallic surface. To avoid such discharges, it is essential that the nonmetallic parts are designed with a limited surface resistance and furthermore the individual nonmetallic parts must not be isolated from each other. The end-to-end resistance through the full assembly must be limited.

Danish Technological Institute are requested to perform test on the submitted Extraction Arms in accordance with the requirements of the ATEX directive 2014/34/EU with test methods as specified by the electrical standards EN 60079-0:2012 §7.4.2 a) ref. testing to clause 26.13. or IEC 60079-0:2011 clause 7.4.2 a) ref. testing in clause 26.13. ESD requirements according to IEC 61340-5-1: 2016 are fulfilled at the same time.


Identical requirements on how to avoid electrostatically charging can be found in several other standards such as the none-electrical standards EN/ISO 80079-36: 2016 clause 6.7.5 and IEC TS 60079-32-1:2013 clause 13.3.4 ("Explosive Atmospheres - Electrostatic Hazards- guidance")

2.1. The ATEX Guideline:

In relation to the ATEX Directive 2014/34/EU a belonging guideline has been issued called "ATEX 2014/34/EU Guidelines" 3rd Edition May 2020.

This guideline incorporates a so called "*Borderline List - ATEX products*". This list specifies typical products falling within the ATEX Directive and some products falling outside the scope of the ATEX Directive. Extraction arms/conduits are specified to fall outside the scope of the ATEX directive since they got no autonomous function - due to this - extraction arms/pipes cannot be certified as a product in the scope of the directive – nevertheless – antistatic requirements must still be fulfilled to avoid spark ignition of flammable atmospheres.

From the ATEX Guideline:

Products	Scope of 2014/34/EU (El. = Electrical)	Examples of products	Comments
Conduits/pipes: e.g. Fume extraction arms and conduits for electrical installations (except for conduits intended to be used between the flameproof enclosures and the conduit sealing devices)	No		No autonomous function; not essential to safe functioning of ATEX equipment or protective system.

3. Submission of order confirmation and terms

Order Confirmation has been forwarded along with the general conditions for certification & inspection.

4. Products / samples covered by this report



The extraction arms are built as a “module system” and can be assembled in several combinations including different pipe lengths, different number of joints, different mounting methods (wall / table/ roof mount), different types of hoods (dome / flat) and several types of suction nozzles/suction pens.

The used tubes are made of aluminium. Other non-metallic parts such as flexible tubes, knuckles and O-rings are made of electrically conductive, permanently antistatic materials. The different hoods are made of plastic materials painted with a conductive paint.

The PermaVent ESD extraction arms are designed as a special version of the ordinary extraction arms and designed in antistatic version for use in Ex-areas fulfilling ATEX Ex II 1 GD requirements.

PermaVent have delivered all relevant test samples and a complete part list (revision date: 01.01-2022 covering the ESD extraction arm in size $\varnothing 57$ mm and size $\varnothing 76$ mm

The complete list of components/assessors covered by this report are listed in Annex A of this report:

5. Testing program

The purpose of this test is to determine whether the extraction arms can be charged and thereby become an ignition source for explosive atmospheres.

Two types of tests are relevant:

5.1. Test of Surface resistance of the involved plastic materials

The requirement can be accomplished by adding a conductive filler to the plastic material to ensure that the electrical insulation resistance on the surface does not exceed $1\text{ G}\Omega$ at 23°C ($\pm 2^\circ\text{C}$) at 50 % relative humidity ($\pm 5\%$) measured in accordance with EN 60079-0:2018, § 26.13.

Several types of conductive plastic materials and coatings are used for the different parts in the extraction arms.

Datasheets for the used materials/coatings are delivered to Danish Technological Institute. Specifications of the used plastics and coatings are listed in Appendix A to this report.

5.2. Test of Insulation “end to end” resistance of Extraction Arms

The conductivity through the complete extraction arm is in addition relevant to secure that the electrical connection through separate parts, such as the flexible joints, are sufficient.

In accordance with IEC TS 60079-32-1 clause 13.3.4 a maximum value of $1\text{ M}\Omega$ is preferable and values above $100\text{ M}\Omega$ are only acceptable under special circumstances e.g., if strong charging mechanisms are identified. Typical values will most often be between $10\text{ k}\Omega$ and $100\text{ M}\Omega$.

5.3. Treatment

Preparation of test samples before the surface resistance test under item 5.1:

The samples have been cleaned and treated in a climate chamber. According to standard EN/IEC 60079-0:2018, clause 26.13, the specimens shall be treated/ conditioned for at least 24 hours at a temperature of $23^\circ\text{C} \pm 2^\circ\text{C}$ and at a relative humidity, that does not exceed $50\% \pm 5\%$.

The testing is done under the same conditions. The samples were placed in a climate chamber on 3rd January 2022 at 10:30 The test was carried out the 5th of January 2022 at 14:00 a.m.

5.4. Test Procedure

The test is carried out on the same conditions that the samples were treated under, 23 °C ± 2° C, and a relative humidity that does not exceed 50 % ± 5 %.

Two parallel electrodes made of "Silver paint" are painted on the delivered test samples with dimensions as shown in figure 1.

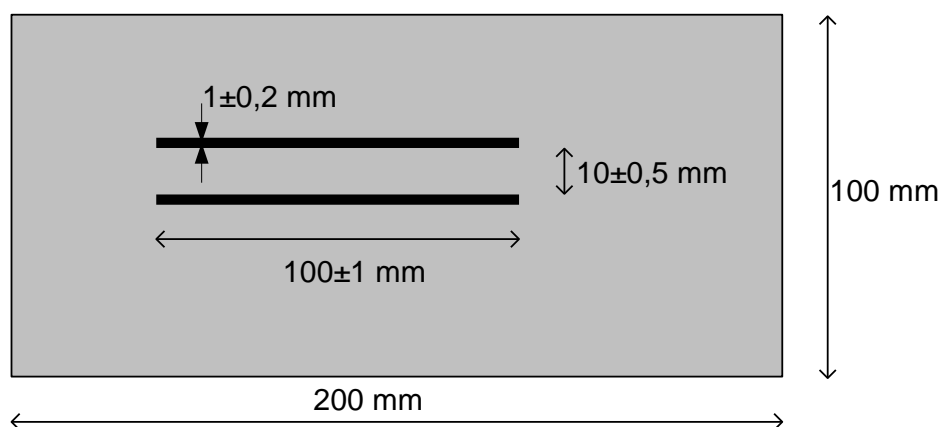


Figure 1: Dimensions for conductive electrodes painted on the samples

A direct voltage of 500 V ± 10 V is applied between the electrodes for 65 seconds +/- 5 seconds. Thereafter the surface resistance is measured.

For resistance below 0,5 K Ω an ordinary ohmmeter can be used

5.5. Measured surface resistance

Sample	Test Voltage [volt]	Surface resistance measured [Ohm]	Demand: ≤ 10 ⁹ (1 GΩ) Pass / failed
1: Plastic material for flexible hoses (black plastic)	500 V	12 Ω	Pass
	100 V	18 Ω	
2: Plastic material for all joints/knuckles (black plastic - all sizes)	500 V	7 Ω	Pass
	100 V	14 Ω	
3: Different kind of hoods / screens coated with "silver paint"	500	577 Ω	Pass
	100 V	575 Ω	



Demand: Surface does not exceed $1\text{G}\Omega$ at 23°C ($\pm 2^\circ\text{C}$) at 50 % relative humidity ($\pm 5\%$, Test time 65 seconds.

5.6. Measured Insulation Resistance of Extraction Arms

The extraction arms are factory mounted with pre-attached earthing/bonding wire which should be properly connected to the installation equalization point.

The resistance in the extraction arms has been measured as the “end-to-end” resistance from the factory mounted earthing wire to the opposite end of the suction arm on the accessories mounted e.g. the hood. The resistance through several combinations of suction arms, hoods and flexible arms has been measured with the results as specified below.

End to end resistance		
Test	System $\varnothing 57\text{ mm}$	System $\varnothing 76\text{ mm}$
1 (multimeter)	420 k Ω	318 k Ω
2 (at 500 V test voltage)	386 k Ω	290 k Ω

Requirement: Values in the range 10 k Ω to 100 M Ω .

Ambient conditions during measurement:

Ambient Temperature $+21,6^\circ\text{C}$, Humidity: 35,8 % RH

6. Picture report



Figure 1: Example of ESD $\varnothing 57\text{ mm}$ version



Figure 2: Example of ESD $\varnothing 76\text{ mm}$ version



Figure 3: Examples – 3 x different hoods



Figure 4: Examples – 3 x different hoods



Figure 5: Example – internal bonding wire between the conductive hood and the aluminum tubing.



Figure 6: Example: end to end resistance $\varnothing 76$




Figure 7: Example: end to end resistance $\varnothing 57$

7. Special Conditions for safe use

In an ESD area or an area where a potential flammable atmosphere may be present (zone classified area), the mounted potential equalizing wire must be connected to the central earthing point for the furniture and tools.

8. Test equipment used

Used test equipment	Equipment no:
Climate controlled test room, (50 ±5) % RH, (23±2) °C	32T 13.60
Conductive Silver Paint: 3863 "Loctite"	NA
NORMA, UNILAP ISO X	270-A-2442
FLUKE Multimeter type 179	130406
Lufft, Thermo / Hygrometer	155106
Measurement of humidity and temperature in test room.	
	

9. Summary / conclusions

The testing of the surface resistance of the extraction systems: ESD ø57 and ø76 mm, shows that the measured surface resistance for all plastic materials and coatings - as listed under section 6.5 of this report – are below the required 1 GΩ.

The measurement of the end- to end insulation resistance of extraction arms including various numbers of hoods / suction pen´s clarifies that there is an appropriate electrical connection between the separate parts to ensure static discharge.

The tested PermaVent extraction systems fulfil the antistatic requirements for use in Ex-ar-eas and are marked accordingly: Ex II 1 GD

Equipment labelled with Category 1 GD can be used in Zone 0, 1 and 2, and in Zone 20, 21 and 22. In its risk assessment, the end user may refer that the suction arms meet the anti-static requirements according to the IEC TS 60079-32-1: "Explosive Atmospheres - Electro-static Hazard Guidance "

NOTE: for correct antistatic function it is a condition that the mounted bonding/earth wire are connected to the central earthing point for the furniture and tools.



10. Filing

The documentation related to this assessment report has been stored under DTI order no 107963

Carried out by:
January 06 - 2022

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11. Annex A

Complete list of components/assessors covered by this report size ESD ø57 and ESD ø76

Punktsugearme type ø57

pen

Varenr. Tekst: Beslag for væg og loftmontage

ESD57049 Base for væg/loft, kan Mont. Direkt i Ø100mm rør L -150mm
ESD57052 Base m/overgang firkantet 100x100mm t/rund Ø100mm L-150mm
Kan monteres direkte i ø100mm rør.

Varenr. Tekst: Beslag til bordmontage.

ESD10490 Bordbeslag monteres i hul i bord L -260mm rør
ESD10491 Bordbeslag monteres på kant af bord er flytbar L- 260mm rør

Varenr. Tekst: Punktsugearme til loft, væg og bordmontage.

Armled sorte. Rækkevidde:
(L = loft/væg montage) – (B = Bordmonteret)

ESD57100-L/B Punktsugearm	380 mm	2 led
ESD57101-L/B Punktsugearm	480 mm	2 led
ESD57102-L/B Punktsugearm	580 mm	2 led
ESD57150-L/B Punktsugearm	750 mm	380x380 mm 3 led
ESD57151-L/B Punktsugearm	950 mm	480x480 mm 3 led
ESD57152-L/B Punktsugearm	1150 mm	580x580 mm 3 led
ESD57153-L/B Punktsugearm	1250 mm	580x680 mm 3 led
ESD57154-L/B Punktsugearm	1350 mm	680x680 mm 3 led
ESD57155-L/B Punktsugearm	1420 mm	750x680 mm 3 led
ESD57156-L/B Punktsugearm	1490 mm	750x750 mm 3 led

Alle arme er med spjæld

Tilbehør.

ESD57299 Kuppel grå malet Ø280mm m/rør L 180 mm
ESD57310 Kuppel grå malet Ø380mm m/rør L 180 mm
ESD57302 Sugetragt konisk grå malet Ø250mm m/rør L 180mm
ESD57303 Sugetragt konisk grå malet Ø250 mm for Ø57 mm m/flex L 300mm
ESD57304 Sugetragt konisk grå malet Ø 250mm m/lige kant m/rør L 180mm
ESD57305 Sugetragt konisk grå malet Ø250 mm m/lige kant m/flexrør L 300 mm
ESD57306 Aluminiumstragt konisk Ø 150m malet med rør L 180mm
ESD57316 Fladskærm grå malet 340x250mm m/rør L 180mm
ESD57317 Sugetragt oval grå malet 140x180mm m/rør L 180mm
ESD57323 Suge tragt oval grå malet 140x180mm med flexslange L-300mm

Tilbehør.

ESD57307 Sugespids L 250mm
ESD57308 Sugespids L 350mm
ESD57309 Sugespids L 150mm med flexrør L 300mm
ESD57319 Sugespids **udkravet** L 250mm grå malet
ESD57320 Sugespids **udkravet** L 350mm grå malet
ESD57318 Sugespids **udkravet** L 150mm grå malet med flexrør L 300mm
ESD57310 Sugespids L 150mm **m/spjæld 1 led** flexrør L 600mm
ESD57311 Sugespids L 150mm **m/spjæld** flexrør L 900mm



Punktsugearme type ø76

Varenr. Tekst: **Beslag for væg og loftmontage.**

ESD76049 Base for væg/loft L-180mm, kan Mont. Direkt i Ø100mm rør
ESD76052 Base m/overg. firkantet 100x100mm til rund Ø100mm L 180mm
Kan monteres direkte i Ø100mm rør.

Varenr. Tekst: **Beslag for bordmontage.**

ESD10492 Bordbeslag monteres i hul i bord L-260mm rør
ESD10493 Bordbeslag monteres på kant af bord er flytbar L-260mm rør

Varenr. Tekst: **Punktsugearme til loft, væg og bordmontage.**

Armled sorte Rækkevidde:
(L = loft/væg montage) – (B = bordmonteret)

ESD76100-L/B Punktsugearm	380 mm	2 led
ESD76101-L/B Punktsugearm	480 mm	2 led
ESD76102-L/B Punktsugearm	580 mm	2 led

ESD76150-L/B Punktsugearm	750 mm	380x380 mm 3 led
ESD76151-L/B Punktsugearm	950 mm	480x480 mm 3 led
ESD76152-L/B Punktsugearm	1150 mm	580x580 mm 3 led
ESD76153-L/B Punktsugearm	1250 mm	580x680 mm 3 led
ESD76154-L/B Punktsugearm	1350 mm	680x680 mm 3 led
ESD76155-L/B Punktsugearm	1420 mm	750x680 mm 3 led
ESD76156-L/B Punktsugearm	1490 mm	750x750 mm 3 led

Alle arme med spjæld

Tilbehør.

ESD76299 Kuppel grå malet Ø280mm m/rør L 180mm
ESD76301 Kuppel grå malet Ø380mm m/rør L 180mm
ESD76302 Sugetragt konisk grå malet Ø 250mm m/rør L 180mm

ESD76304 Sugetragt konisk grå malet Ø 250mm med lige kant m/rør L 180mm
ESD76306 Aluminiumstragt konisk grå malet Ø 150mm m/rør L 180mm
ESD76316 Fladskærm grå malet 340x250 m/rør L 180mm

ESD76307 Sugespids L 250mm
ESD76308 Sugespids L 350mm
ESD76309 Sugespids L 150mm med flexrør L 300mm
ESD76319 Sugespids grå malet **udkravet** L 250mm
ESD76320 Sugespids grå malet **udkravet** L 350mm
ESD76318 Sugespids grå malet **udkravet** L 150mm med flexrør L 300mm