Confidential Report

Our Ref: E-017052/A

ilac-MRA

UKAS TESTING

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Notified Body
for PPE Directive,
Construction Products Regulation
& Marine Equipment Directive
I.D. No. 0338

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Manchester, M17 1EH, UK.
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Email: info@bttg.co.uk
Website: www.bttg.co.uk

Date: 21st January 2021

Our Ref: E-017052/A
Your Ref: --

Client: American Safety Power Tool (Pvt)
Plot No. 1&2, 12&13 E-IV Phase-II
Karachi Export Processing Zone
Karachi
Pakistan

Job Title: Tests on nonwoven coverall

Client's Order No: --

Date of Receipt: 13th October 2020
Date of Test Start: 23rd November 2020

Description of Sample(s): A coverall, made from a white-coloured coated nonwoven fabric, identified as follows, was received for testing:

MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Work Requested: We were asked to make the following tests as specified in EN ISO 13688: 2013 "Protective Clothing – General Requirements":

pH Value ISO 3071
Determination of the Presence of Aromatic Amines EN 14362-1*

*Not UKAS accredited

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American Safety Power Tool (Pvt)

Sample was identified as follows:

MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Laboratory Work

Where appropriate, the tests were made in Standard Atmosphere (65 ± 4 % relative humidity at 20 ± 2 °C) the sample having been freely and continuously exposed to that atmosphere for at least 24 hours prior to testing. Specimens have been taken from the sample as described in the specified standards.

EN ISO 13688: 2013 (Clause 4.2.c) pH Value ISO 3071: 2020

The pH value was measured according to ISO 3071: 2020 in accordance with EN ISO 13688: 2013. 1 gram of sample is extracted in 0.1mol/l potassium chloride (pH 5.86 at 21.4°C), under gentle agitation, for 2 hours. The pH of the extract is measured. The test is performed in triplicate and an average value reported.

EN ISO 13688: 2013 states that the pH Value for protective clothing material shall be greater than 3.5 and less than 9.5.

EN ISO 13688: 2013 (Clause 4.2.d) Azo Colorants EN 14362-1: 2017

The sample was tested according to EN 14362-1: 2017 in accordance with EN ISO 13688: 2013. To test for the presence of azo colorants which may be reduced to release banned aromatic amines, a 1.00 g test specimen was subjected to the test procedure described in the standard, to produce a test solution.

The test solution was analysed by GC/MS and amines detected were quantified by reference to an internal standard method, as described in the standard. If aniline was detected in amounts ≥10 mg/kg then EN 14362-3: 2017 was additionally applied to test for 4-aminoazobenzene.

EN ISO 13688: 2013 states; “Azo colorants which release carcinogenic amines listed in EN 14362-1 shall not be detectable by the method in these standards.”

The results for all tests are given in the tables on the following page.

Reported by: ..... D. Southworth ..... Miss D Southworth, Senior Laboratory Technician

Countersigned by: ..... Alex Newton ..... Mr A Newton, Senior Customer Service Officer

Note: This report relates only to the samples submitted and as described in the report.
Enquiries concerning this report should be addressed to Customer Services.

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American Safety Power Tool (Pvt)

RESULTS

Sample Ref: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

pH Value

Result	Pass/Fail
8.0	Pass

Azo Colorants

There was no evidence of any of the following primary aromatic amines in the sample provided:

4-Aminobiphenyl	4,4'-Thiodianiline
Benzidine	4-Chloro-o-toluidine
2-Naphthylamine	o-Aminoazotoluene
5-nitro-o-toluidine	4-Chloroaniline
2,4-Diaminoanisole	4,4'-Diaminodiphenylmethane
3,3'-Dichlorobenzidine	3,3'-Dimethylbenzidine
3,3'-Dimethoxybenzidine	p-Cresidine
4,4'-Methylene-bis-(2-chloroaniline)	4,4'-Oxydianiline
o-Toluidine	2,4-Toluylendiamine
2,4,5-Trimethylaniline	o-Anisidine (2-Methoxyaniline)
4-Aminoazobenzene	4,4'-methylenedi-o-toluidine

Result	Pass/Fail
Primary aromatic amines listed above not detected	Pass

Uncertainty of measurement has not been taken into account when presenting the test result. The relevant uncertainty value is included as an annex which forms an integral part of the report.

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American Safety Power Tool (Pvt)

Annex

Summary of Uncertainty Budgets

pH Value	± 0.06 pH units
Azo Colorants	The estimated uncertainty of measurement based on interlaboratory trials ranges from 25.8% to 57.8% depending on compound and sample type

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Date: 21st January 2021

Our Ref: E-017052/B
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Client: American Safety Power Tool (Pvt)
Plot No. 1&2, 12&13 E-IV Phase-II
Karachi Export Processing Zone
Karachi
Pakistan

Job Title: Tests on nonwoven coverall

Client's Order No: --

Date of Receipt: 13th October 2020
Date of Test Start: 14th January 2021

Description of Sample(s): A coverall, made from a white-coloured coated nonwoven fabric, identified as follows, was received for testing:

MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Work Requested: We were asked to make the following tests as specified in EN 14325: 2004, "Protective clothing against chemicals – Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages", and as required by EN 13034: 2005 + A1: 2009, "Protective clothing against liquid chemicals – Performance requirements for chemical protective clothing offering limited protective performance against liquid chemicals (Type 6 and Type PB [6] equipment)".:

Trapezoidal tear resistance EN ISO 9073-4
Puncture resistance EN 863
Repellency to liquids EN 368
Resistance to penetration by liquids EN 368
Seam strength EN ISO 13935-2

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Date: 21st January 2021

Our Ref: E-017052/B
Your Ref: --

American Safety Power Tool (Pvt)

Sample was identified as follows:

MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Laboratory Work
Where appropriate, the tests were made in Standard Atmosphere (65 ± 4% relative humidity at 20 ± 2°C) the sample having been freely and continuously exposed to that atmosphere for at least 24 hours prior to testing. Specimens have been taken from the sample as described in the specified standards, except where indicated otherwise.

NOTE – The tests were made as specified in EN 14325: 2004, "Protective clothing against chemicals", except the pre-conditioning (5 cycles of cleaning as specified in Clause 4.2 & 5.2) was not conducted.

Trapezoidal tear resistance
Trapezoidal tear resistance was measured in accordance with EN ISO 9073-4: 1997.

Five specimens were prepared in each direction as described in the standard. A force was applied, to steadily extend a cut in the test specimen. The mean maximum tear resistance is given in Newtons.

The performance of the material was classified using the mean result according to the performance levels given in Table 4.

Puncture resistance
Puncture resistance was measured in accordance with EN 863: 1995.

Four specimens were tested with the outer face of the fabric to the probe. The maximum force required to push the spike through the specimen is recorded as puncture resistance.

The mean value is rounded to the nearest whole number, as required by the standard.

The performance of the material was classified using the mean result according to the performance levels given in Table 7.

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American Safety Power Tool (Pvt)

Repellency to liquids and resistance to penetration by liquids

The tests were made in accordance with EN ISO 6530: 2005 (supersedes EN 368: 1992 which is withdrawn) against the following chemicals. The chemical was applied to the outer face.

Delivery rate: 10ml in 10±1s

Chemical 1: 30% H_2SO_4 (boiling point 100°C), delivery temperature: 20°C, delivery rH 41%
Chemical 2: 10% NaOH (boiling point 100°C), delivery temperature:21°C, delivery rH 36%
Chemical 3: o-Xylene (boiling point 143-145°C), delivery temperature: 21°C, delivery rH 41%
Chemical 4: Butan-1-ol (boiling point 117°C), delivery temperature: 21°C, delivery rH 37%

The sample was classified according to the performance levels given in Table 10 and Table 11 using the lowest single value.

Seam strength

Seam strength was measured in accordance with EN ISO 13935-2: 1999.

Three specimens of each seam type were prepared as described in the standard. The tests were made on a Testometric M500 C.R.E. machine fitted with 25 mm grab jaws, set 100mm apart and operating at a constant rate of extension of 50 mm per minute. No pretension was used.

The mean result is reported as required by the standard.

The performance of the material was assessed using the lowest mean (i.e. the weakest seam type) result according to the performance levels given in Table 13.

Seam strength was carried out to EN 13935-2: 1999 as modified by EN 14325: 2004 in that three specimens were tested (instead of 5 as required by 13935), and the method of seam failure is not reported.

The results of all tests are given in the tables on the following pages.

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American Safety Power Tool (Pvt)

RESULTS

Sample Ref: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

TRAPEZOIDAL TEAR RESISTANCE (N)	
Class	Tear Resistance
6	> 150
5	> 100
4	> 60
3	> 40
2	> 20
1	> 10

Specimen Number	Tear through MD	Tear through XD	Class
1	66.40	29.42	2
2	79.69	29.69	
3	69.72	37.73	
4	75.92	34.77	
5	68.49	27.59	
Mean	72.04	31.84	

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American Safety Power Tool (Pvt)

RESULTS

Sample Ref: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

PUNCTURE RESISTANCE (N)		
Class	Puncture Resistance	
6	> 250	
5	> 150	
4	> 100	
3	> 50	
2	> 10	
1	> 5	
Specimen Number		Class
1	11.09	2
2	9.39	
3	10.46	
4	12.08	
Mean	11	

*****Note - The test exhibited a 'multiple peak' effect, the first being penetration of the spike. As the test progresses there are further peaks that rise to a maximum level at the point where the 4.5mm diameter of the spike penetrates the specimen. We have reported the maximum peak.

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Date: 21st January 2021

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American Safety Power Tool (Pvt)

RESULTS

Sample Ref: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

REPELLENCY TO LIQUIDS & RESISTANCE TO PENETRATION BY LIQUIDS 30% Sulphuric Acid (H_2SO_4)						
Specimen	1↑	2↑	3↑	4→	5→	6→
Repellency, %	97.9	97.2	97.4	94.0	97.0	97.5
Penetration, %	0.0	0.0	0.0	0.0	0.0	0.0

REPELLENCY TO LIQUIDS & RESISTANCE TO PENETRATION BY LIQUIDS 10% Sodium Hydroxide (NaOH)						
Specimen	1↑	2↑	3↑	4→	5→	6→
Repellency, %	97.1	97.5	96.8	97.1	97.4	97.9
Penetration, %	0.0	0.0	0.0	0.0	0.0	0.0

REPELLENCY TO LIQUIDS & RESISTANCE TO PENETRATION BY LIQUIDS o-Xylene						
Specimen	1↑	2↑	3↑	4→	5→	6→
Repellency, %	94.8	94.7	95.5	94.6	92.9	94.0
Penetration, %	0.0	0.0	0.0	0.0	0.0	0.0

REPELLENCY TO LIQUIDS & RESISTANCE TO PENETRATION BY LIQUIDS Butan-1-ol						
Specimen	1↑	2↑	3↑	4→	5→	6→
Repellency, %	85.4	86.3	86.7	86.4	84.1	84.1
Penetration, %	0.0	0.0	0.0	0.0	0.0	0.0

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Date: 21st January 2021

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American Safety Power Tool (Pvt)

RESULTS

Sample Ref: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

REPELLENCY TO LIQUIDS & RESISTANCE TO PENETRATION BY LIQUIDS				
Class	Repellency index (%)	Penetration Index (%)		
3	> 95	< 1		
2	> 90	< 5		
1	> 80	< 10		
Chemical	Results (lowest values)	Results (poorest values)	Class Repellency	Class Penetration
30% Sulphuric Acid (H_2SO_4)	94.0	0.0	2	3
10% Sodium Hydroxide (NaOH)	96.8	0.0	3	3
o-Xylene	92.9	0.0	2	3
Butan-1-ol	84.1	0.0	2	3

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Date: 21st January 2021

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Your Ref: --

American Safety Power Tool (Pvt)

RESULTS

Sample Ref: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

SEAM STRENGTH (N)		
Class	Seam Strength	
6	> 500	
5	> 300	
4	> 125	
3	> 75	
2	> 50	
1	> 30	
Seam Type		Class
MD, taped seam	140	2
XD, taped seam	57	

In accordance with BS EN 13034: 2005 + A1: 2009 for the tear, puncture and seam strength requirements, at least performance level 1 shall be obtained.

For liquid repellency performance level 3 shall be obtained for at least one of the chemicals referred to in EN 14325: 2005, clause 4. For resistance to penetration by liquids a performance level of at least 2 shall be obtained for at least one of the chemicals referred to in EN 14325: 2005, clause 4.

Uncertainty of measurement has not been taken into account when presenting the test result. The relevant uncertainty value is included as an annex which forms an integral part of the report.

Reported by: ..... Miss D Southworth, Senior Laboratory Technician

Countersigned by: ..... Mr A Newton, Senior Customer Service Officer

Note: This report relates only to the samples submitted and as described in the report.
Enquiries concerning this report should be addressed to Customer Services.

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American Safety Power Tool (Pvt)

Annex

Summary of Uncertainty Budgets

Tear Strength	± 2.6 % for PP/PES/Nomex
	± 4.1 % for 100% Wool
	± 5.2 % for 100% Cotton
Seam Strength	± 1.7 % for PP/PES/Nomex
	± 3.5 % for 100% Wool
	± 4.8 % for 100% Cotton
Puncture Resistance	± 8.1 %
Repellency to liquids / Resistance to penetration by liquids	± 1.1 %

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Confidential Report

Our Ref: E-017052/C

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Date: 21st January 2021

Our Ref: E-017052/C
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Client: American Safety Power Tool (Pvt)
Plot No. 1&2, 12&13 E-IV Phase-II
Karachi Export Processing Zone
Karachi
Pakistan

Job Title: Tests on nonwoven coverall

Client's Order No: --

Date of Receipt: 13th October 2020
Date of Test Start: 15th January 2021

Description of Sample(s): A coverall, made from a white-coloured coated nonwoven fabric, identified as follows, was received for testing:

MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Work Requested: We were asked to make the following test as specified in EN 14325: 2004, "Protective clothing against chemicals – Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages", and as required by EN 13034: 2005 + A1: 2009, "Protective clothing against liquid chemicals – Performance requirements for chemical protective clothing offering limited protective performance against liquid chemicals (Type 6 and Type PB [6] equipment)":

Determination of resistance to penetration by a spray of liquid ISO 17491-4: 2008, Method A*

*sub-contracted test, UKAS accredited

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Date: 21st January 2021

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American Safety Power Tool (Pvt)

Sample was identified as follows:

MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Laboratory Work
Where appropriate, the tests were made in Standard Atmosphere (65 ± 4 % relative humidity at 20 ± 2°C) the sample having been freely and continuously exposed to that atmosphere for at least 24 hours prior to testing. Specimens have been taken from the sample as described in the specified standards, except where indicated otherwise.

NOTE – The tests were made as specified in EN 14325: 2004, "Protective clothing against chemicals", except the pre-conditioning (5 cycles of cleaning as specified in Clause 4.2 & 5.2) was not conducted.

Resistance to penetration by liquids in the form of a light spray (mist test)
The tests were made following the EN ISO 17491-4: 2008, method A (low-level spray) procedure.

Prior to testing, three repetitions of a sequence of seven movements as described in Clause 5.2 of BS EN 13034, were carried out by a test subject.

An aqueous spray, containing a fluorescent or visible dye tracer, is directed under controlled conditions at the chemical protective clothing worn by a human test subject. Inspection of the inside surface of the clothing and the outside surface of the "Sontara" absorbent overall worn under the test garment allows any points of inward leakage to be identified.

The device is a white material one piece hooded coverall with blue external taped seams. The device incorporates elasticated cuffs, ankles, waist and hood. There is a single action zip at the front of the suit, running from crotch to neck, covered during use by a flap, sealed to the suit by integral double sided tape.

Note: The coverall was tested with 50mm PVC insulating tape onto chemical resistant gloves, wellington boots and a Scott 'ProMask' full facemask.

The standard calls for testing to be carried out using three suits. In response to the question "does the suit fit", the test subject answered "yes".

The results of all tests are given in the table on the following page.

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Date: 21st January 2021

Our Ref: E-017052/C
Your Ref: --

American Safety Power Tool (Pvt)

Results

Sample: MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White

Resistance to penetration by liquids in the form of a light spray EN ISO 17491-4

Test Liquid: Aqueous solution with water-soluble dye, with surface tension ranging from 50.2 to 50.9 $Nm^{-1} \times 10^{-3}$ before testing and 51.1 to 51.4 $Nm^{-1} \times 10^{-3}$ after testing
Temperature: Ranged from 19.8 to 19.9°C
Size: N/A
Height of wearer: 182cm
Chest of wearer: 98cm

PENETRATION BY SPRAY			
	(1) Calibration stain (cm^2)	(2) Total leakage stain (cm^2)	Ratio of (2) to (1)
Test 1	3.88	0	-
Test 2	3.88	0	-
Test 3	3.88	0	-

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Conclusions:

BS EN 13034: 2005 for type 6 clothing states that:

"All suits shall pass the test, i.e the total stain area on any one undergarment of each suit shall be less than or equal to three times the total calibrated stain area".

For this suit type, no leakage was observed on the dosimeter suits for any of the three suits tested.

The sample identified as "MP-1211 Chemical Protective Suit Non Woven Polypropylene 60gsm White" complies with the requirements of BS EN 13034:2005 for type 6 clothing when tested as specified in this report.

Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Uncertainty of measurement has not been taken into account when presenting the test result. The relevant uncertainty value is included as an annex which forms an integral part of the report.

Reported by: ..... Miss D Southworth, Senior Laboratory Technician

Countersigned by: ..... Mr A Newton, Senior Customer Service Officer

Note: This report relates only to the samples submitted and as described in the report.
Enquiries concerning this report should be addressed to Customer Services.

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Annex A

Summary of Uncertainty Budgets

ISO 17491-4: Determination of resistance to penetration by a spray of liquid (spray test)

Aspect in Standard	Measurand	Parameter / Range	Details of measurement uncertainty considered and significance
Liquid for application in the form of a spray	Water temperature	20 ± 2 °C	Temperature influences the surface tension and therefore potentially the surface adsoption of the spray solution on the test suit. Hence, calibration and subsequent testing requires conformance to the acceptable temperature and tolerance stated. The measurement uncertainty associated with the thermometer calibration is ± 0.13 °C. This uncertainty is not considered significant in the context of the measurand value and its acceptable tolerance range.
	Surface tension	Method A: 52 ± 7.5 mN/m Method B: 30 ± 5 mN/m	Surface tension may influence surface adsoption of the spray solution on the test suit. Hence, calibration and subsequent testing requires conformance to the acceptable surface tension and tolerance stated. No measurement uncertainty is provided with external calibration of the device. Hence, an estimate of the measurement uncertainty stated as the average of standard deviations over the annual calibration test results is ± 0.23 mN/m. This level of uncertainty is not considered significant in the context of the measurand values and their acceptable tolerance ranges as an acceptance criterion of < ± 5% variation from the two reference surface tensions (water and methanol) is also adopted.
Apparatus & Test Subjects	Absorbent overall (dosimeter suit)	Absorption spots (stains) should vary less than 10% in surface area from the mean value for a given volume of liquid.	The surface area of absorption spots (determined from 10 measurements) varies from 92.1% to 110.8% of the mean.
	Calibration Stain	Stain area on the dosimeter suit fabric is >1 cm^2.	The range of the calibration stain areas (determined from 10 measurements) was determined to be 6.63 cm^2 to 7.98 cm^2 with a standard deviation of 0.40 cm^2. The calibration stain dimensions are determined using a calibrated steel ruler with a measurement uncertainty of ± 0.008 mm. This level of uncertainty is not considered significant in the context of the confirming the required measured value is achieved.
	Turntable	Rotation speed 1 ± 0.1 full circle per minute	One revolution of the turntable is determined by timing 1 minute. The uncertainty associated with the timepiece used is determined to be at worst 2 second in 4 hours (± 0.00014 s) and not considered significant in the context of the measurand value and its acceptable tolerance range. Uncertainty in the reaction time is < 1 second which would equate to a maximum of 0.016 full circle. Hence, uncertainty is not considered significant in the context of the measurand value and its acceptable tolerance range.
	Hydraulic pump	Minimum supply pressure >400 kPa	Measurement uncertainty not relevant as calibration measurements are taken of the jet's pressure and the flow rate, which have their associated measurements of uncertainty.
	Timepiece	Accurate to 1 s	Uncertainty determined to be at worst 2 second in 4 hours (± 0.00014 s) and not considered significant in the context of the measurand value and its acceptable tolerance range.

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Annex A (continued)

Summary of Uncertainty Budgets

Aspect in Standard	Measurand	Parameter / Range	Details of measurement uncertainty considered and significance
Preparation of the spray application system	Hydraulic nozzles flow rate	Method A: 0.47 ± 0.05 l/min at 300 kPa Method B: 1.14 ± 0.10 l/min at 300 kPa	Flow rates are determined by measuring the volume of liquid released using a graduated measuring cylinder over a timed period of 30 second (or 15 seconds for Method B's higher flow rate). Data from calibrations show that the variability in the volume collected across six repeats each capturing 30 seconds of sprayed liquid to determine whether the flow rate is within acceptable limits, ranges from 8 to 14 ml all of which are within the ± 25 ml tolerance over 30 seconds (or 15 seconds for Method B) stated in the Standard. The accuracy, precision and ultimate determination of flow rate acceptability is not influenced significantly by the measurement uncertainty of ± 1 ml (for a Class A 250 ml cylinder).
	Spray nozzle pressure	300 ± 50 kPa	The four separate gauges are calibrated externally and have a measurement uncertainty of ± 0.027 bar (± 2.7 kPa). The gauge can be read to 25 kPa. Uncertainty is not considered significant in the context of the measurand value and its acceptable tolerance range.
	Spray nozzle position from target sheet	1.5 ± 0.1 m	Checked using a calibrated metre rule that has a measurement uncertainty of ± 0.020 mm. Uncertainty is not considered significant in the context of the measurand value and its acceptable tolerance range.
	Spray pattern alignment	Difference between centre line of the target sheet and the centre line of the spray patters should be a maximum of 10 cm.	Checked using a calibrated metre rule that has a measurement uncertainty of ± 0.020 mm. This uncertainty is not considered significant in the context of the measurand value and its acceptable tolerance range.
	Spray application time	1 minute	Timepiece uncertainty determined to be at worst 2 second in 4 hours (± 0.00014 s) and not considered significant in the context of the measurand value and its acceptable tolerance range.

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